Book Two - Appendices

Water-Quality Assessment Protocol for Texas River Basins: A Case Study on the Upper Neches River Basin Study Area for the Clean Rivers Program

A research proposal funded by:

Texas Water Development Board
P.O. Box 13231
1700 N. Congress Avenue
Austin, Texas 78711-3231

performed by:

Angelina & Neches River Authority
P.O. Box 387
210 Lufkin Avenue
Lufkin, Texas 75901
(409) 632-7795, FAX (409) 632-2564

with technical assistance from:

U.S. Geological Survey
Water Resources Division
8011 Cameron Road
Austin, Texas 78754-3898
(512) 873-3082, FAX (512) 873-3090

and

The University of Texas at Austin
Environmental and Water Resources Engineering (EWRE)
Austin, Texas
(512) 471-4616, FAX (512) 471-0592

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Appendix A

Example of TNRCC Water Quality Summary Statistics by Station

Station ID: 10515 Station#: 0600.1555 Lat: 31:46:25.00 Long: 095:36:45.01 County: 1 ANDERSON
BEAVER LAKE ON THE WEST SIDE OF SH LOOP 256 NORTHEAST OF PALESTINE

Segment : 0604
On Segment : No
Stream Seq : 00000
District# : 5
Basin : 6

HUC : 0
Reach : 0
On Reach : No
Mile PT. : 0.00

EPA Type(s)
RESERV
AMBNT

USGS Gauge#:
Eco-Region : 33

Date	Time	Depth (m)	Data Source	00010 WATER TEMP CENT	00300 DO MG/L	00078 TRANSP SECCHI METERS	31616 FEC COLI MFM-FCBR /100ML	72053 DAYS SINCE PRECIP	00671 PHOS-D ORTHO MG/L P	00665 PHOS-T P-WET MG/L	00620 NO3-N TOTAL MG/L
FEB-28-1979	11:45	0.30	AN	15.7	10.0						
MAR-29-1979	11:40	0.30	AN	20.3	10.0						
APR-25-1979	12:07	0.30	AN	25.6	7.8						

Date	Time	Depth (m)	Data Source	00615 NO2-N TOTAL MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00680 T ORG C C MG/L	00310 BOD 5 DAY MG/L	32211 CHLRPHYL A UG/L CORRECTD

Date	Time	Depth (m)	Data Source	32218 PHEOPHTN A UG/L

Summary Statistics For Station 10515

	00010 WATER TEMP CENT	00300 DO MG/L	00078 TRANSP SECCHI METERS	31616 FEC COLI MFM-FCBR /100ML	72053 DAYS SINCE PRECIP	00671 PHOS-D ORTHO MG/L P	00665 PHOS-T P-WET MG/L	00620 NO3-N TOTAL MG/L
Number Within Limits	3	3	0	0	0	0	0	0
Number Of Samples	3	3	0	0	0	0	0	0
Minimum	15.7	7.8	0	0	0	0	0	0
Maximum	25.6	10.0	0	0	0	0	0	0
Average	20.5	9.3	0	0	0	0	0	0
Standard Deviation	4.0	1.0	0	0	0	0	0	0
Coefficient Of Variation	19.7%	11.2%	0%	0%	0%	0%	0%	0%

	00615 NO2-N TOTAL MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00530 RESIDUE TOT NFLT MG/L	00535 RESIDUE VOL NFLT MG/L	00680 T ORG C C MG/L	00310 BOD 5 DAY MG/L	32211 CHLRPHYL A UG/L CORRECTD
Number Within Limits	0	0	0	0	0	0	0	0
Number Of Samples	0	0	0	0	0	0	0	0
Minimum	0	0	0	0	0	0	0	0
Maximum	0	0	0	0	0	0	0	0
Average	0	0	0	0	0	0	0	0
Standard Deviation	0	0	0	0	0	0	0	0
Coefficient Of Variation	0%	0%	0%	0%	0%	0%	0%	0%

	32218 PHEOPHTN A UG/L
Number Within Limits	0
Number Of Samples	0
Minimum	0
Maximum	0
Average	0
Standard Deviation	0
Coefficient Of Variation	0%

Appendix B

Example of USGS Water Quality Summary Statistics by Station

STATION NUMBER: 08032500 STATION NAME: NECHES RIVER NR ALT DRAINAGE AREA: SQ MI

STATE: TEXAS COUNTY: CHEROKEE LATITUDE/LONGITUDE: 313445 0950955

STATISTICAL SUMMARY OF SELECTED WATER QUALITY DATA COLLECTED FROM OCT 1967 TO DEC 1978

WATER-QUALITY CONSTITUENT	SAMPLE SIZE	DESCRIPTIVE STATISTICS MAXIMUM	MINIMUM	MEAN	PERCENT OF SAMPLES IN WHICH VALUES WERE LESS THAN OR EQUAL TO THOSE SHOWN 95 %	75 %	(MEDIAN) 50 %	25 %	5 %
TIMES	101	1830.000	720.000	1322.673	1713.500	1447.500	1320.000	1155.000	950.500
00010 WATER TEMPERATUR (DEGREES)	97	32.000	5.000	19.356	31.500	26.000	20.000	14.000	7.450
00028 ANALYZING AGENCY (CODE NUMBER)	4	80020.000	80020.000	--	--	--	--	--	--
00060 DISCHARGE CFS	93	16700.000	7.900	1444.171	5215.003	2075.000	630.000	147.500	36.100
00061 DISCHARGE, INST. CFS	44	4500.000	40.000	1183.455	4375.000	1925.000	650.000	212.500	56.500
00095 SPECIFIC CONDUCT US/CM @ 25C	152	607.000	94.000	233.467	374.700	272.750	226.000	181.250	116.600
00300 OXYGEN DISSOLVED (MG/L)	67	16.000	4.900	8.296	11.880	9.400	8.100	7.000	5.400
00301 OXYGEN DIS. PERC % OF SATURATIO	67	134.000	57.000	87.970	115.200	94.000	87.000	82.000	64.200
00310 BOD 5-DAY AT 20 (MG/L)	68	13.000	0.400	1.528	2.555	1.600	1.200	0.900	0.645
00400 PH, WH, FIELD (STANDARD UNIT	152	7.500	6.000	6.704	7.300	6.900	6.700	6.500	6.165
00405 CARBON DIOXIDE D (MG/L AS CO2)	45	58.000	2.600	14.891	39.600	19.000	12.000	6.500	2.860
00410 ALKALINITY,WH,FE (MG/L AS CACO3	136	47.000	7.000	23.956	41.000	30.000	24.000	16.000	11.000
00440 BICARBONATE,WH,F (MG/L AS HCO3)	136	57.000	8.000	29.228	50.000	36.000	29.000	20.000	13.850
00445 CARBONATE,WH,FET (MG/L AS CO3)	136	0.000	--	--	--	--	--	--	--
00530 RESIDUE TOTAL (MG/L)	1	178.000	--	--	--	--	--	--	--
00535 RESIDUE VOLATILE (MG/L)	1	148.000	--	--	--	--	--	--	--
00540 RESIDUE FIXED (MG/L)	1	30.000	--	--	--	--	--	--	--
00600 NITROGEN TOTAL (MG/L AS N)	29	2.300	0.410	0.800	1.700	0.910	0.710	0.620	0.450
00605 NITROGEN ORGANIC (MG/L AS N)	40	2.200	0.100	0.513	0.829	0.668	0.535	0.285	0.112
00610 NITROGEN AMMONIA (MG/L AS N)	54	0.240	--	0.049*	*0.185	*0.080	*0.020	*0.008	*0.002
00615 NITROGEN,NITRITE MG/L AS N	54	0.020	--	0.006*	*0.010	*0.010	*0.006	*0.004	*0.002
00620 NITROGEN NITRATE MG/L AS N	89	0.800	0.000	0.206	0.550	0.300	0.200	0.100	0.000
00625 NITROGEN AMM+ORG (MG/L AS N)	29	2.200	0.340	0.669	1.530	0.765	0.610	0.525	0.340
00630 NO2 + NO3 TOTAL (MG/L AS N)	29	0.300	0.010	0.130	0.275	0.175	0.120	0.080	0.020
00650 PHOSPHATE TOTAL (MG/L AS PO4)	13	0.350	0.060	0.164	0.350	0.185	0.180	0.110	0.060
00665 PHOSPHORUS TOTAL (MG/L AS P)	55	0.150	0.020	0.060	0.142	0.080	0.050	0.040	0.020
00900 HARDNESS TOTAL (MG/L AS CAO3)	136	170.000	22.000	45.154	61.150	50.000	44.000	38.250	26.700
00902 NONCARBONATE HAR (MG/L AS CACO3	136	46.000	0.000	20.162	36.300	26.000	18.000	14.250	8.000
00915 CALCIUM DISSOLVE (MG/L AS CA)	136	62.000	5.600	10.847	14.150	12.000	10.000	9.200	6.000

WATER-QUALITY CONSTITUENT	SAMPLE SIZE	DESCRIPTIVE STATISTICS MAXIMUM	MINIMUM	MEAN	PERCENT OF SAMPLES IN WHICH VALUES WERE LESS THAN OR EQUAL TO THOSE SHOWN 95 %	75 %	(MEDIAN) 50 %	25 %	5 %
00925 MAGNESIUM DISSOL (MG/L AS MG)	136	9.700	1.700	4.382	6.215	4.900	4.350	3.900	2.585
00930 SODIUM DISSOLVED (MG/L AS NA)	78	50.000	8.300	22.047	40.050	28.000	20.000	16.000	9.700
00931 SODIUM ADSORPTIO (RATIO)	133	4.500	0.500	1.628	3.000	2.000	1.600	1.000	0.800
00932 SODIUM, PERCENT PERCENT	98	73.000	15.000	52.439	65.000	58.000	52.000	46.000	42.000
00933 SODIUM+POTASSIUM (MG/L AS NA)	57	88.000	7.000	31.386	61.600	41.500	30.000	20.000	11.800
00935 POTASSIUM DISSOL (MG/L AS K)	42	4.800	2.500	3.498	4.485	3.875	3.400	3.175	2.630
00940 CHLORIDE DISSOLV (MG/L AS CL)	136	150.000	6.200	39.626	76.150	47.000	36.000	25.000	13.850
00945 SULFATE DISSOLVE (MG/L AS SO4)	136	40.000	9.600	19.975	33.150	23.000	19.000	15.000	11.000
00950 FLUORIDE DISSOLV (MG/L AS F)	117	0.300	--	0.122*	*0.300	*0.200	*0.100	*0.070	*0.040
00955 SILICA DISSOLVED (MG/L AS SIO2)	135	23.000	3.600	12.740	18.000	15.000	13.000	11.000	6.900
38260 DETERGENTS (MBAS MG/L	1	0.010	--	--	--	--	--	--	--
70301 DISSOLVED SOLIDS MG/L	134	320.000	53.000	129.373	201.250	148.250	125.500	101.000	76.000
70302 DISSOLVED SOLIDS TONS/DAY	133	2390.000	3.800	361.393	1161.000	559.500	206.000	60.800	18.320
70303 RESIDUE DIS TON/ T/AC-FT	135	0.440	0.070	0.176	0.270	0.200	0.170	0.140	0.100
71845 NITROGEN, NH4, T MG/L AS NH4	38	0.310	0.010	0.086	0.301	0.132	0.055	0.030	0.010
71851 NITR. NO3 AS NO3 MG/L AS NO3	62	3.200	0.000	0.727	1.995	1.025	0.700	0.300	0.000
71887 NITROGEN, TOTAL MG/L AS NO3	29	10.000	1.800	3.538	7.450	4.000	3.100	2.750	2.000
72000 ELEV.LSD(FT.AB.N FT (NGVD)	152	0.000	--	--	--	--	--	--	--
80155 DISCHARGE,SUSP.S T/DAY	5	0.000	--	--	--	--	--	--	--

* - VALUE IS ESTIMATED BY USING A LOG-PROBABILITY REGRESSION TO PREDICT THE VALUES OF DATA BELOW THE DETECTION LIMIT

Appendix C

FLOW.IN for Predicting Flows at Neches at Alto, 1975-1976

FLOW.IN (partial file)
Flow Routing from Neches to Alto - 1975-76

```
flows from neches to alto - '75-'76
No. of Branches                1 *
Internal Junctions             0 *
Time Steps Modeled           236 *
Model Starts                   0 time steps after midnight.
Output Given Every             1 Time Steps in FLOW.OUT.
0=Metric,1=English             1 *
Time Step Size            24.000 Hours.
Peak Discharge           100000. *
Branch  1 has  3 xsects & routes 1.00 of flow at JNCT  1 To JNCT  2
Grd R Mile   IOUT  Disch       A1        A2        AO        DF          W1     W2
  1 0.0000E+00 0  573.0     12.93     0.610      100.     5.995E+04  30.24  .210
  2  26.500    1  816.5     12.93     0.61       100.     5.995E+04  30.24  .210
  3  59.30     1  1060.     12.93     0.61       100.     5.995E+04  30.24  .210
for Time     1 NBC   2 *
 Branch      1 Grid  1 Q=    497.00      *
 Branch      1 Grid  2 Q=    343.80      *
for Time     2 NBC   2 *
 Branch      1 Grid  1 Q=    445.00      *
 Branch      1 Grid  2 Q=    298.20      *
for Time     3 NBC   2 *
 Branch      1 Grid  1 Q=    414.00      *
 Branch      1 Grid  2 Q=    267.00      *
for Time     4 NBC   2 *
 Branch      1 Grid  1 Q=    409.00      *
 Branch      1 Grid  2 Q=    248.40      *
for Time     5 NBC   2 *
 Branch      1 Grid  1 Q=    410.00      *
 Branch      1 Grid  2 Q=    245.40      *
for Time     6 NBC   2 *
 Branch      1 Grid  1 Q=    366.00      *
 Branch      1 Grid  2 Q=    246.00      *
for Time     7 NBC   2 *
 Branch      1 Grid  1 Q=    305.00      *
 Branch      1 Grid  2 Q=    219.60      *
for Time     8 NBC   2 *
 Branch      1 Grid  1 Q=    262.00      *
 Branch      1 Grid  2 Q=    183.00      *
for Time     9 NBC   2 *
 Branch      1 Grid  1 Q=    235.00      *
 Branch      1 Grid  2 Q=    157.20      *
for Time    10 NBC   2 *
 Branch      1 Grid  1 Q=    210.00      *
 Branch      1 Grid  2 Q=    141.00      *
for Time    11 NBC   2 *
 Branch      1 Grid  1 Q=    179.00      *
 Branch      1 Grid  2 Q=    126.00      *
for Time    12 NBC   2 *
 Branch      1 Grid  1 Q=    159.00      *
 Branch      1 Grid  2 Q=    107.40      *
for Time    13 NBC   2 *
 Branch      1 Grid  1 Q=    144.00      *
 Branch      1 Grid  2 Q=    95.400      *
for Time    14 NBC   2 *
 Branch      1 Grid  1 Q=    133.00      *
 Branch      1 Grid  2 Q=    86.400      *
for Time    15 NBC   2 *
 Branch      1 Grid  1 Q=    125.00      *
 Branch      1 Grid  2 Q=    79.800      *
for Time    16 NBC   2 *
 Branch      1 Grid  1 Q=    114.00      *
```

Appendix D

FLOW.IN for Predicting Flows at Neches at Alto, 1977-1978

FLOW.IN (partial file)
Flow Routing from Neches to Alto - 1977-78

```
flows from neches to alto - '77-'78
No. of Branches                1 *
Internal Junctions             0 *
Time Steps Modeled           182 *
Model Starts                   0 time steps after midnight.
Output Given Every             1 Time Steps in FLOW.OUT.
0=Metric,1=English             1 *
Time Step Size            24.000 Hours.
Peak Discharge           100000. *
Branch  1 has  3 xsects & routes 1.00 of flow at JNCT  1 To JNCT  2
Grd R Mile   IOUT  Disch        A1        A2        AO        DF        W1    W2
  1 0.0000E+00 0   67.0      12.93     0.610      100.     5.995E+04  30.24  .210
  2  26.500     1   79.5      12.93     0.61       100.     5.995E+04  30.24  .210
  3  59.30      1   92.0      12.93     0.61       100.     5.995E+04  30.24  .210
for Time     1 NBC   2 *
 Branch      1 Grid  1 Q=     65.000       *
 Branch      1 Grid  2 Q=     40.200       *
for Time     2 NBC   2 *
 Branch      1 Grid  1 Q=     64.000       *
 Branch      1 Grid  2 Q=     39.000       *
for Time     3 NBC   2 *
 Branch      1 Grid  1 Q=     63.000       *
 Branch      1 Grid  2 Q=     38.400       *
for Time     4 NBC   2 *
 Branch      1 Grid  1 Q=     63.000       *
 Branch      1 Grid  2 Q=     37.800       *
for Time     5 NBC   2 *
 Branch      1 Grid  1 Q=     63.000       *
 Branch      1 Grid  2 Q=     37.800       *
for Time     6 NBC   2 *
 Branch      1 Grid  1 Q=     63.000       *
 Branch      1 Grid  2 Q=     37.800       *
for Time     7 NBC   2 *
 Branch      1 Grid  1 Q=     66.000       *
 Branch      1 Grid  2 Q=     37.800       *
for Time     8 NBC   2 *
 Branch      1 Grid  1 Q=     65.000       *
 Branch      1 Grid  2 Q=     39.600       *
for Time     9 NBC   2 *
 Branch      1 Grid  1 Q=     64.000       *
 Branch      1 Grid  2 Q=     39.000       *
for Time    10 NBC   2 *
 Branch      1 Grid  1 Q=     63.000       *
 Branch      1 Grid  2 Q=     38.400       *
for Time    11 NBC   2 *
 Branch      1 Grid  1 Q=     65.000       *
 Branch      1 Grid  2 Q=     37.800       *
for Time    12 NBC   2 *
 Branch      1 Grid  1 Q=     69.000       *
 Branch      1 Grid  2 Q=     39.000       *
for Time    13 NBC   2 *
 Branch      1 Grid  1 Q=     67.000       *
 Branch      1 Grid  2 Q=     41.400       *
for Time    14 NBC   2 *
 Branch      1 Grid  1 Q=     66.000       *
 Branch      1 Grid  2 Q=     40.200       *
for Time    15 NBC   2 *
 Branch      1 Grid  1 Q=     65.000       *
 Branch      1 Grid  2 Q=     39.600       *
for Time    16 NBC   2 *
 Branch      1 Grid  1 Q=     64.000       *
```

Appendix E

FLOW.IN for Predicting Flows at Neches at Diboll, 1975-1976

FLOW.IN (partial file)
Flow Routing from Alto to Diboll - 1975-76

```
flows alto to diboll DAR=.5 for 1975
No. of Branches                1 *
Internal Junctions             0 *
Time Steps Modeled           235 *
Model Starts                   0 time steps after midnight.
Output Given Every             1 Time Steps in FLOW.OUT.
0=Metric,1=English             1 *
Time Step Size            24.000 Hours.
Peak Discharge           100000. *
Branch  1 has  3 xsects & routes 1.00 of flow at JNCT  1 To JNCT  2
Grd R Mile   IOUT  Disch        A1        A2        AO        DF        W1    W2
  1  59.300     0  1060.     10.676     0.610      300.     8.717E+04  28.96  .210
  2  97.150     0  1143.     10.676     0.610      300.     8.717E+04  28.96  .210
  3  129.70     1
for Time     1 NBC   2 *
 Branch      1 Grid  1 Q=     964.00       *
 Branch      1 Grid  2 Q=     530.00       *
for Time     2 NBC   2 *
 Branch      1 Grid  1 Q=     865.00       *
 Branch      1 Grid  2 Q=     482.00       *
for Time     3 NBC   2 *
 Branch      1 Grid  1 Q=     771.00       *
 Branch      1 Grid  2 Q=     432.50       *
for Time     4 NBC   2 *
 Branch      1 Grid  1 Q=     742.00       *
 Branch      1 Grid  2 Q=     385.50       *
for Time     5 NBC   2 *
 Branch      1 Grid  1 Q=     678.00       *
 Branch      1 Grid  2 Q=     371.00       *
for Time     6 NBC   2 *
 Branch      1 Grid  1 Q=     652.00       *
 Branch      1 Grid  2 Q=     339.00       *
for Time     7 NBC   2 *
 Branch      1 Grid  1 Q=     597.00       *
 Branch      1 Grid  2 Q=     326.00       *
for Time     8 NBC   2 *
 Branch      1 Grid  1 Q=     546.00       *
 Branch      1 Grid  2 Q=     298.50       *
for Time     9 NBC   2 *
 Branch      1 Grid  1 Q=     497.00       *
 Branch      1 Grid  2 Q=     273.00       *
for Time    10 NBC   2 *
 Branch      1 Grid  1 Q=     447.00       *
 Branch      1 Grid  2 Q=     248.50       *
for Time    11 NBC   2 *
 Branch      1 Grid  1 Q=     404.00       *
 Branch      1 Grid  2 Q=     223.50       *
for Time    12 NBC   2 *
 Branch      1 Grid  1 Q=     372.00       *
 Branch      1 Grid  2 Q=     202.00       *
for Time    13 NBC   2 *
 Branch      1 Grid  1 Q=     343.00       *
 Branch      1 Grid  2 Q=     186.00       *
for Time    14 NBC   2 *
 Branch      1 Grid  1 Q=     316.00       *
 Branch      1 Grid  2 Q=     171.50       *
for Time    15 NBC   2 *
 Branch      1 Grid  1 Q=     296.00       *
 Branch      1 Grid  2 Q=     158.00       *
for Time    16 NBC   2 *
 Branch      1 Grid  1 Q=     326.00       *
```

Appendix F

FLOW.IN for Predicting Flows at Neches at Diboll, 1977-1978

FLOW.IN (partial file)
Flow Routing from Alto to Diboll - 1977-78

```
this is real alto to diboll using DAR=.5 for 1977
No. of Branches                1 *
Internal Junctions             0 *
Time Steps Modeled           157 *
Model Starts                   0 time steps after midnight.
Output Given Every             1 Time Steps in FLOW.OUT.
0=Metric,1=English             1 *
Time Step Size            24.000 Hours.
Peak Discharge           100000. *
Branch  1 has  3 xsects & routes 1.00 of flow at JNCT  1 To JNCT  2
Grd R Mile   IOUT  Disch       A1        A2        AO        DF          W1     W2
  1  59.300     0   92.0     10.676     0.610      300.     8.717E+04  28.96  .210
  2  97.150     0   120.     10.676     0.61       300.     8.717E+04  28.96  .210
  3  129.70     1
for Time     1 NBC   2 *
 Branch      1 Grid  1 Q=     88.000      *
 Branch      1 Grid  2 Q=     46.000      *
for Time     2 NBC   2 *
 Branch      1 Grid  1 Q=     86.000      *
 Branch      1 Grid  2 Q=     44.000      *
for Time     3 NBC   2 *
 Branch      1 Grid  1 Q=     83.000      *
 Branch      1 Grid  2 Q=     43.000      *
for Time     4 NBC   2 *
 Branch      1 Grid  1 Q=     80.000      *
 Branch      1 Grid  2 Q=     41.500      *
for Time     5 NBC   2 *
 Branch      1 Grid  1 Q=     78.000      *
 Branch      1 Grid  2 Q=     40.000      *
for Time     6 NBC   2 *
 Branch      1 Grid  1 Q=     77.000      *
 Branch      1 Grid  2 Q=     39.000      *
for Time     7 NBC   2 *
 Branch      1 Grid  1 Q=     76.000      *
 Branch      1 Grid  2 Q=     38.500      *
for Time     8 NBC   2 *
 Branch      1 Grid  1 Q=     79.000      *
 Branch      1 Grid  2 Q=     38.000      *
for Time     9 NBC   2 *
 Branch      1 Grid  1 Q=     80.000      *
 Branch      1 Grid  2 Q=     39.500      *
for Time    10 NBC   2 *
 Branch      1 Grid  1 Q=     86.000      *
 Branch      1 Grid  2 Q=     40.000      *
for Time    11 NBC   2 *
 Branch      1 Grid  1 Q=     114.00      *
 Branch      1 Grid  2 Q=     43.000      *
for Time    12 NBC   2 *
 Branch      1 Grid  1 Q=     149.00      *
 Branch      1 Grid  2 Q=     57.000      *
for Time    13 NBC   2 *
 Branch      1 Grid  1 Q=     136.00      *
 Branch      1 Grid  2 Q=     74.500      *
for Time    14 NBC   2 *
 Branch      1 Grid  1 Q=     127.00      *
 Branch      1 Grid  2 Q=     68.000      *
for Time    15 NBC   2 *
 Branch      1 Grid  1 Q=     124.00      *
 Branch      1 Grid  2 Q=     63.500      *
for Time    16 NBC   2 *
 Branch      1 Grid  1 Q=     110.00      *
```

Appendix G

FLOW.IN for Predicting Flows at Neches at Rockland, 1975-1976

FLOW.IN (partial file)
Flow Routing from Diboll to Rockland - 1975-76

```
flows from diboll to rockland 7/75-
No. of Branches                1 *
Internal Junctions             0 *
Time Steps Modeled           235 *
Model Starts                   0 time steps after midnight.
Output Given Every             1 Time Steps in FLOW.OUT.
0=Metric,1=English             1 *
Time Step Size            24.000 Hours.
Peak Discharge           100000. *
Branch  1 has  3 xsects & routes 1.00 of flow at JNCT  0 To JNCT  1
Grd R Mile   IOUT  Disch       A1        A2        AO        DF          W1    W2
  1  129.7      0  2410.      10.4     0.610      500.     0.130E+06   24.0 0.210
  2  172.52     0  2700.      10.4     0.610      500.     0.130E+06   24.0 0.210
  3  197.4      1
for Time     1 NBC   2 *
 Branch      1 Grid  1 Q=    2190.0       *
 Branch      1 Grid  2 Q=    1928.0       *
for Time     2 NBC   2 *
 Branch      1 Grid  1 Q=    1920.0       *
 Branch      1 Grid  2 Q=    1752.0       *
for Time     3 NBC   2 *
 Branch      1 Grid  1 Q=    1760.0       *
 Branch      1 Grid  2 Q=    1536.0       *
for Time     4 NBC   2 *
 Branch      1 Grid  1 Q=    1570.0       *
 Branch      1 Grid  2 Q=    1408.0       *
for Time     5 NBC   2 *
 Branch      1 Grid  1 Q=    1390.0       *
 Branch      1 Grid  2 Q=    1256.0       *
for Time     6 NBC   2 *
 Branch      1 Grid  1 Q=    1200.0       *
 Branch      1 Grid  2 Q=    1112.0       *
for Time     7 NBC   2 *
 Branch      1 Grid  1 Q=    1080.0       *
 Branch      1 Grid  2 Q=    960.00       *
for Time     8 NBC   2 *
 Branch      1 Grid  1 Q=    968.00       *
 Branch      1 Grid  2 Q=    864.00       *
for Time     9 NBC   2 *
 Branch      1 Grid  1 Q=    886.00       *
 Branch      1 Grid  2 Q=    774.40       *
for Time    10 NBC   2 *
 Branch      1 Grid  1 Q=    813.00       *
 Branch      1 Grid  2 Q=    708.80       *
for Time    11 NBC   2 *
 Branch      1 Grid  1 Q=    744.00       *
 Branch      1 Grid  2 Q=    650.40       *
for Time    12 NBC   2 *
 Branch      1 Grid  1 Q=    682.00       *
 Branch      1 Grid  2 Q=    595.20       *
for Time    13 NBC   2 *
 Branch      1 Grid  1 Q=    603.00       *
 Branch      1 Grid  2 Q=    545.60       *
for Time    14 NBC   2 *
 Branch      1 Grid  1 Q=    538.00       *
 Branch      1 Grid  2 Q=    482.40       *
for Time    15 NBC   2 *
 Branch      1 Grid  1 Q=    525.00       *
 Branch      1 Grid  2 Q=    430.40       *
for Time    16 NBC   2 *
 Branch      1 Grid  1 Q=    567.00       *
```

Appendix H

FLOW.IN for Predicting Flows at Neches at Rockland, 1977-1978

FLOW.IN (partial file)
Flow Routing from Diboll to Rockland - 1977-78

```
flows from diboll to rockland 77-78
No. of Branches                1 *
Internal Junctions             0 *
Time Steps Modeled           157 *
Model Starts                   0 time steps after midnight.
Output Given Every             1 Time Steps in FLOW.OUT.
0=Metric,1=English             1 *
Time Step Size            24.000 Hours.
Peak Discharge           100000. *
Branch  1 has  3 xsects & routes 1.00 of flow at JNCT  0 To JNCT  1
Grd R Mile  IOUT  Disch       A1        A2        AO        DF          W1    W2
  1  129.7     0  133.0      10.4     0.610      500.     0.130E+06   24.0 0.210
  2  172.52    0  159.0      10.4     0.610      500.     0.130E+06   24.0 0.210
  3  197.4     1
for Time    1 NBC   2 *
 Branch     1 Grid  1 Q=    120.00      *
 Branch     1 Grid  2 Q=    106.40      *
for Time    2 NBC   2 *
 Branch     1 Grid  1 Q=    116.00      *
 Branch     1 Grid  2 Q=    96.000      *
for Time    3 NBC   2 *
 Branch     1 Grid  1 Q=    106.00      *
 Branch     1 Grid  2 Q=    92.800      *
for Time    4 NBC   2 *
 Branch     1 Grid  1 Q=    100.00      *
 Branch     1 Grid  2 Q=    84.800      *
for Time    5 NBC   2 *
 Branch     1 Grid  1 Q=    94.000      *
 Branch     1 Grid  2 Q=    80.000      *
for Time    6 NBC   2 *
 Branch     1 Grid  1 Q=    92.000      *
 Branch     1 Grid  2 Q=    75.200      *
for Time    7 NBC   2 *
 Branch     1 Grid  1 Q=    88.000      *
 Branch     1 Grid  2 Q=    73.600      *
for Time    8 NBC   2 *
 Branch     1 Grid  1 Q=    82.000      *
 Branch     1 Grid  2 Q=    70.400      *
for Time    9 NBC   2 *
 Branch     1 Grid  1 Q=    86.000      *
 Branch     1 Grid  2 Q=    65.600      *
for Time   10 NBC   2 *
 Branch     1 Grid  1 Q=    87.000      *
 Branch     1 Grid  2 Q=    68.800      *
for Time   11 NBC   2 *
 Branch     1 Grid  1 Q=    89.000      *
 Branch     1 Grid  2 Q=    69.600      *
for Time   12 NBC   2 *
 Branch     1 Grid  1 Q=    101.00      *
 Branch     1 Grid  2 Q=    71.200      *
for Time   13 NBC   2 *
 Branch     1 Grid  1 Q=    165.00      *
 Branch     1 Grid  2 Q=    80.800      *
for Time   14 NBC   2 *
 Branch     1 Grid  1 Q=    182.00      *
 Branch     1 Grid  2 Q=    132.00      *
for Time   15 NBC   2 *
 Branch     1 Grid  1 Q=    175.00      *
 Branch     1 Grid  2 Q=    145.60      *
for Time   16 NBC   2 *
 Branch     1 Grid  1 Q=    165.00      *
```

Appendix I

Solving for DAFLOW Hydraulic Parameters based on QUALTX parameters

In the use of QUALTX, the advective hydraulic characteristics are described by two exponential equations. These equations represent the relationship of discharge to velocity and depth as follows:

$$V = a\,Q^{b}$$

$$D = c\,Q^{d} + e$$

where:

V = mean velocity, m/s
Q = mean discharge, m^3/s
D = mean depth, m
a,b,c,d,e = constants

For the Angelina River (Segment 0611), the values for a,b,c,d,e were determined based on two dye studies.

Where e = 0 and width is defined as $W = W_1 \times Q^{W2}$:

$$a \times W_1 \times c = 1$$

and

$$W_1 = 1 / (a \times c)$$

$$W_2 = (1 - b - d)$$

Also, where e = 0,

$$A = V \times D = a\,Q^{b} \times c\,Q^{d} = A_1\,Q^{A2} + A_0$$

$$A = (a \times c) \times Q^{(b + d)}$$

therefore

$$A_1 = a \times c$$

$$A_2 = (b + d)$$

$$A_0 = 0$$

Based on the values for W1 and W2, one can solve for W. Using a representative discharge in the branch, one can solve for DF based on Equation 11 in the DAFLOW Manual (Jobson, 1989):

$$DF = Q / (2 * S_o * W)$$

All the hydraulic parameters used in QUALTX were converted into values for the DAFLOW program in the following results of an EXCEL spreadsheet.

Hydraulic Coefficients for DAFLOW Branches

(determined from QUAL-TX Model Parameters and Equation 11 in 1989 DAFLOW Manual)

BAYOU LANANA HYDRAULIC COEFFICIENTS

Rch	Brnch	a	b	c	d	A1	A2	W1	W2	W	Rep Q	DF
1	61	1.082	0.5	0.319	0.4	0.92	0.5	2.9	0.1	2.003	0.025	31.196
2	60	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0.01	0	0.01
3	58	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
4	59	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
5	62	1.082	0.5	0.319	0.4	0.92	0.5	2.9	0.1	2.003	0.025	31.196
6	62	1.082	0.5	0.319	0.4	0.92	0.5	2.9	0.1	2.003	0.025	31.196
7	62	0.722	0.5	0.287	0.4	1.39	0.5	4.83	0.1	4.201	0.25	148.77
8	62	0.422	0.5	0.254	0.4	2.37	0.5	9.33	0.1	7.67	0.141	45.96
9	62	0.482	0.5	0.228	0.4	2.07	0.5	9.1	0.1	7.678	0.183	59.584
10	62	0.428	0.5	0.491	0.4	2.34	0.5	4.76	0.1	4.015	0.183	113.94
11	62	0.374	0.5	0.353	0.4	2.67	0.5	7.57	0.1	6.391	0.183	71.58

UPPER ANGELINA HYDRAULIC COEFFICIENTS

Rch	Brnch	a	b	c	d	A1	A2	W1	W2	W	RepQ	DF
1	1	0.389	0.5	0.383	0.4	2.57	0.5	6.71	0.1	5.779	0.224	96.897
2	3	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0.01	0	0.01
3	2	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
4	4	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
5	5	0.389	0.5	0.383	0.4	2.57	0.5	6.71	0.1	5.779	0.224	96.897
6	5	0.389	0.5	0.383	0.4	2.57	0.5	6.71	0.1	5.779	0.224	96.897
7	5	0.326	0.5	0.45	0.4	3.07	0.5	6.82	0.1	5.885	0.23	97.707
8	6	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	3.956	0.0001	0.0632
9	6	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	3.956	0.0001	0.0632
10	7	0.326	0.5	0.45	0.4	3.07	0.5	6.82	0.1	5.885	0.2301	97.745
11	7	0.278	0.5	0.458	0.4	3.6	0.5	7.85	0.1	6.646	0.1881	70.762
12	8	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	3.956	0.0001	0.0632
13	11	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0.01	0	0.01
14	12	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
15	12	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
16	10	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
17	9	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	3.956	0.0001	0.0632
18	9	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	3.956	0.0001	0.0632
19	13	0.278	0.5	0.458	0.4	3.6	0.5	7.85	0.1	6.646	0.1882	70.796
20	15	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	8.439	0.195	57.767
21	17	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0.01	0	0.01
22	18	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
23	18	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
24	16	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
25	14	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	8.439	0.195	57.767
26	19	0.278	0.5	0.458	0.4	3.6	0.5	7.85	0.1	7.059	0.3442	121.89
27	19	0.292	0.5	0.399	0.4	3.42	0.5	8.58	0.1	7.826	0.3972	126.88

29	53	0.247	0.5	0.74	0.4	4.05	0.5	5.47	0.1	5.289	0.7132	337.1
30	53	0.259	0.5	0.633	0.4	3.86	0.5	6.1	0.1	6.03	0.8912	369.51
31	53	0.106	0.5	1.086	0.4	9.43	0.5	8.69	0.1	8.597	0.9012	262.07
32	53	0.103	0.5	0.708	0.4	9.71	0.5	13.71	0.1	13.579	0.9062	166.84
33	53	0.093	0.5	0.999	0.4	10.75	0.5	10.76	0.1	10.671	0.9172	214.88
34	53	0.083	0.5	1.31	0.4	12.05	0.5	9.2	0.1	9.119	0.9182	251.73
35	55	0.146	0.5	0.625	0.4	6.84	0.5	10.95	0.1	0.01	0	0.01
36	56	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
37	54	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
38	57	0.083	0.5	1.31	0.4	12.05	0.5	9.2	0.1	9.125	0.9242	253.21
39	62	0.374	0.5	0.353	0.4	2.67	0.5	7.57	0.1	6.391	0.183	71.58
40	63	0.044	0.5	1.715	0.4	22.73	0.5	13.25	0.1	13.607	1.3022	239.26
41	64	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
42	64	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
43	65	0.044	0.5	1.715	0.4	22.73	0.5	13.25	0.1	13.607	1.3022	239.26
44	65	0.044	0.5	1.715	0.4	22.73	0.5	13.25	0.1	13.607	1.3022	239.26
45	66	0.374	0.5	0.353	0.4	2.67	0.5	7.57	0.1	5.518	0.0421	19.07
46	67	0.043	0.6	1.86	0.1	23.26	0.4	12.5	0.3	13.664	1.3443	245.96
47	67	0.054	0.6	2.824	0.1	18.52	0.4	6.56	0.3	7.166	1.3443	468.97
48	67	0.04	0.6	1.354	0.1	25	0.4	18.46	0.3	20.178	1.3443	166.56
49	67	0.04	0.6	1.354	0.1	25	0.4	18.46	0.3	20.178	1.3443	166.56

MUD CREEK HYDRAULIC COEFFICIENTS

Rch	Brnch	a	b	c	d	A1	A2	W1	W2	W	Rep Q	DF
1	20	0.598	0.5	0.466	0.4	1.67	0.5	3.59	0.1	2.867	0.106	92.428
2	23	0.598	0.5	0.466	0.4	1.67	0.5	3.59	0.1	0	0	0.01
3	22	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
4	21	0.598	0.5	0.466	0.4	1.67	0.5	3.59	0.1	0	0	0.01
5	24	0.598	0.5	0.466	0.4	1.67	0.5	3.59	0.1	2.867	0.106	92.428
6	24	0.598	0.5	0.466	0.4	1.67	0.5	3.59	0.1	2.905	0.121	104.12
7	26	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
8	27	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
9	25	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
10	41	0.598	0.5	0.466	0.4	1.67	0.5	3.59	0.1	2.905	0.121	104.12
11	28	0.418	0.5	0.603	0.4	2.39	0.5	3.97	0.1	3.264	0.142	108.77
12	29	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
13	30	0.418	0.5	0.603	0.4	2.39	0.5	3.97	0.1	3.243	0.133	102.54
14	31	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
15	33	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
16	33	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
17	32	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
18	34	0.418	0.5	0.603	0.4	2.39	0.5	3.97	0.1	3.243	0.133	102.54
19	35	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
20	35	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
21	36	0.418	0.5	0.603	0.4	2.39	0.5	3.97	0.1	3.209	0.12	93.475
22	37	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
23	39	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
24	38	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
25	40	0.418	0.5	0.603	0.4	2.39	0.5	3.97	0.1	3.209	0.12	93.475
26	42	0.415	0.5	0.392	0.4	2.41	0.5	6.15	0.1	5.338	0.244	114.27
27	42	0.275	0.5	0.725	0.4	3.64	0.5	5.02	0.1	4.356	0.244	140.04
28	44	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
29	43	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01

30	45	0.161	0.5	0.625	0.4	6.21	0.5	9.94	0.1	0	0	0.01
31	46	0.275	0.5	0.725	0.4	3.64	0.5	5.02	0.1	4.356	0.244	140.04
32	49	0.427	0.5	0.332	0.4	2.34	0.5	7.05	0.1	4.693	0.017	9.0554
33	48	0.427	0.5	0.332	0.4	2.34	0.5	7.05	0.1	0	0	0.01
34	50	0.427	0.5	0.332	0.4	2.34	0.5	7.05	0.1	4.693	0.017	9.0554
35	47	0.427	0.5	0.332	0.4	2.34	0.5	7.05	0.1	0	0	0.01
36	47	0.427	0.5	0.332	0.4	2.34	0.5	7.05	0.1	0	0	0.01
37	47	0.427	0.5	0.332	0.4	2.34	0.5	7.05	0.1	0	0	0.01
38	47	0.427	0.5	0.332	0.4	2.34	0.5	7.05	0.1	0	0	0.01
39	51	0.312	0.5	0.631	0.4	3.21	0.5	5.08	0.1	3.38	0.017	12.576
40	51	0.312	0.5	0.631	0.4	3.21	0.5	5.08	0.1	3.865	0.065	42.048
41	52	0.144	0.5	0.946	0.4	6.94	0.5	7.34	0.1	6.542	0.316	120.76
42	52	0.144	0.5	0.946	0.4	6.94	0.5	7.34	0.1	6.542	0.316	120.76

NOTE: If a Branch ID is repeated it means the branch contains grids with different parameters

Appendix J

QUALTX Input Data for Segment 0611, September 1984 Calibration

Model Input for the Bayou Lanana Calibration Run
September 10-13, 1984

$$$ DATA TYPE 1 (TITLES AND CONTROL CARDS) $$$

```
CNTROL01     BAYOU LANANA
QM0615.CAL-EXP/09-12-84
CNTROL02     SEPTEMBER 12, 1984; TDWR IMS; CALIBRATION DATA SET
CNTROL03 YES ECHO DATA INPUT
CNTROL04  NO INTERMEDIATE SUMMARY
CNTROL05  NO FINAL REPORT
CNTROL06  NO LINE PRINTER PLOT
CNTROL07  NO GRAPHICS CAPABILITY
CNTROL08 YES METRIC UNITS
CNTROL09 YES OXYGEN DEPENDENT RATES
CNTROL10  NO SENSITIVITY ANALYSIS
CNTROL11 YES SPECIAL REPORT
ENDATA01
```

$$$ DATA TYPE 2 (MODEL OPTIONS) $$$

```
MODOPT01  NO TEMPERATURE
MODOPT02  NO SALINITY
MODOPT03 YES CONSERVATIVE MATERIAL  I = CONDUCTIVITY, UHMS/CM
MODOPT04 YES CONSERVATIVE MATERIAL II = CHLORIDE, MG/L
MODOPT05 YES DISSOLVED OXYGEN
MODOPT06 YES BIOCHEMICAL OXYGEN DEMAND
MODOPT07 YES NITROGEN
MODOPT08  NO PHOSPHORUS
MODOPT09  NO CHLOROPHYLL A
MODOPT10  NO MACROPHYTES
MODOPT11  NO COLIFORM
MODOPT12  NO NONCONSERVATIVE MATERIAL = MG/L
ENDATA02
```

$$$ DATA TYPE 3 (PROGRAM CONSTANTS) $$$

```
PROGRAM  PLOT CONTROL VALUE                  =       8.00
PROGRAM  EFFECTIVE BOD DUE TO ALGAE          =      0.25
PROGRAM  N PREFERENCE                        =      0.00
PROGRAM  N ALGAL UPTAKE                      =      0.01
PROGRAM  LOGICAL UNIT NUMBER FOR SEQUENCING  =      16.00
PROGRAM  SECOND LOGICAL UNIT NUMBER          =      17.00
PROGRAM  FLOW SPLIT                          =      77.00
PROGRAM  SPECIAL REPORT TYPE                 =       4.
PROGRAM  PLOT TYPE                           =       3.
ENDATA03
```

$$$ DATA TYPE 4 (TEMPERATURE CORRECTION CONSTANTS FOR RATE COEFFICIENTS) $$$

```
ENDATA04
```

$$$ DATA TYPE 5 (TEMPERATURE DATA) $$$

```
ENDATA05
```

$$$ DATA TYPE 6 (ALGAE CONSTANTS) $$$

```
ENDATA06
```

$$$ DATA TYPE 7 (MACROPHYTEW CONSTANTS) $$$

```
ENDATA07
```

$$$ DATA TYPE 8 (REACH ID DATA) $$$

```
REACH ID     1. BL HDWTR - TOLIVER BRANCH                38.5      38.0      .5
REACH ID     2. TO HDWTR - UNNAMED TRIBUTARY              2.5       2.0      .5
REACH ID     3. UN HDWTR - TOLIVER BR. CONF.              0.5       0.0      .1
REACH ID     4. TO UNNAMED TRIB - BAYOU CONF.             2.0       0.0      .5
REACH ID     5. BL TOLIVER BR. - FM 1878                 38.0      33.0      .5
REACH ID     6. BL FM 1878 - LOOP 224                    33.0      27.5      .5
REACH ID     7. BL LOOP 224 - NACOGDOCHES WWTP           27.5      24.0      .5
REACH ID     8. BL NACOGDOCHES WWTP - RKM 15.5           24.0      15.5      .5
REACH ID     9. BL RKM 15.5 - RKM 10.5                   15.5      10.5      .5
REACH ID    10. BL RKM 10.5 - RKM 0.5                    10.5       0.5      .5
REACH ID    11. BL RKM 0.5 - RKM 0.2                      0.5       0.2      .3
ENDATA08
```

$$$ DATA TYPE 9 (ADVECTIVE TRANSFER COEFFICIENTS) $$$

```
HYDR-1       1.      1.082      0.5      0.319      0.4        0.    .030
HYDR-1       2.      0.161      0.5      0.625      0.4        0.    .030
HYDR-1       3.      0.161      0.5      0.625      0.4        0.    .030
HYDR-1       4.      0.161      0.5      0.625      0.4        0.    .030
HYDR-1       5.      1.082      0.5      0.319      0.4        0.    .030
HYDR-1       6.      1.082      0.5      0.319      0.4        0.    .030
HYDR-1       7.      0.722      0.5      0.287      0.4        0.    .030
HYDR-1       8.      0.422      0.5      0.254      0.4        0.    .030
HYDR-1       9.      0.482      0.5      0.228      0.4        0.    .030
HYDR-1      10.      0.428      0.5      0.491      0.4        0.    .030
HYDR-1      11.      0.374      0.5      0.353      0.4        0.    .030
ENDATA09
```

$$$ DATA TYPE 10 (DISPERSIVE HYDRAULIC COEFFICIENTS) $$$

```
ENDATA10
```

$$$ DATA TYPE 11 (INITIAL CONDITIONS) $$$

```
INITIAL      1.      0.0      0.5      5.0      1.0      1.0      1.0      2.      0.0
INITIAL      2.      0.0      0.5      5.0      1.0      1.0      1.0      2.      0.0
INITIAL      3.      0.0      0.5      5.0      1.0      1.0      1.0      2.      0.0
INITIAL      4.      0.0      0.5      5.0      1.0      1.0      1.0      2.      0.0
INITIAL      5.      0.0      0.5      5.0      1.0      1.0      1.0      2.      0.0
INITIAL      6.     26.8      0.2      7.3      1.0      1.0      1.0      5.      0.0
INITIAL      7.     26.8      0.2      7.3      1.0      1.0      1.0      5.      0.0
INITIAL      8.     26.5      0.2      7.0      1.0      1.0      1.0      4.      0.0
INITIAL      9.     25.8      0.3      6.3      1.0      1.0      1.0      2.      0.0
INITIAL     10.     25.5      0.3      6.8      1.0      1.0      1.0      3.      0.0
INITIAL     11.     25.5      0.3      6.9      1.0      1.0      1.0      2.      0.0
ENDATA11
```

$$$ DATA TYPE 12 (REAERATION, SEDIMENT OXYGEN DEMAND, BOD COEFFICIENTS) $$$

```
COEF-1       1.  11.                    0.2      0.2      0.1      1.0     0.10
COEF-1       2.  11.                    0.2      0.2      0.1      1.0     0.10
COEF-1       3.  11.                    0.2      0.2      0.1      1.0     0.10
COEF-1       4.  11.                    0.2      0.2      0.1      1.0     0.10
COEF-1       5.  11.                    0.2      0.2      0.1      1.0     0.10
COEF-1       6.  11.                    0.2      0.2      0.1      1.0     0.10
COEF-1       7.  11.                    0.2      0.2      0.1      1.0     0.10
COEF-1       8.  11.                    0.2      0.2      0.1      1.0     0.10
COEF-1       9.  11.                    0.2      0.2      0.1      1.0     0.10
COEF-1      10.  11.                    0.2      0.2      0.1      1.0     0.10
COEF-1      11.  11.                    0.2      0.2      0.1      1.0     0.10
ENDATA12
```

```
$$$ DATA TYPE 13 (NITROGEN AND PHOSPHORUS COEFFICIENTS) $$$

COEF-2       1.     0.05     0.1     1.0     0.5     .01     0.0     0.2
COEF-2       2.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2       3.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2       4.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2       5.     0.05     0.1     1.0     0.5     .01     0.0     0.2
COEF-2       6.     0.05     0.1     1.0     0.5     .01     0.0     0.2
COEF-2       7.     0.05     0.1     1.0     0.5     .01     0.0     0.2
COEF-2       8.     0.05     0.1     1.0     0.5     .01     0.0     0.2
COEF-2       9.     0.05     0.1     1.0     0.5     .01     0.0     0.2
COEF-2      10.     0.05     0.1     1.0     0.5     .01     0.0     0.2
COEF-2      11.     0.05     0.1     1.0     0.5     .01     0.0     0.2
ENDATA13

$$$ DATA TYPE 14 (ALGAE AND MACROPHYTE COEFFICIENTS) $$$

ENDATA14

$$$ DATA TYPE 15 (COLIFORM AND NONCONSERVATIVE COEFFICIENTS) $$$

ENDATA15

$$$ DATA TYPE 16 (INCREMENTAL DATA FOR FLOW, TEMP, SALINITY, CONSERVATIVES) $$$
         Reach   Outflow  Inflow    Temp     Salin     Cl        C2

INCR-1       8.     -0.109
INCR-1       9.                0.042      25.8       0.3      488.       39.
ENDATA16

$$$ DATA TYPE 17 (INCREMENTAL DATA FOR DO. BOD, AND NITROGEN) $$$
         Reach        DO       BOD      ORG-N   NH-3     NO3+2
INCR-2       8.
INCR-2       9.         6.5       3.0       .50      .05        .20
ENDATA17

$$$ DATA TYPE 18 (INCREMENTAL DATA FOR P, FC, CHLOROPHYLL, AND NONCONSERVATIVES) $$$

ENDATA18

$$$ DATA TYPE 19 (NONPOINT SOURCE DATA) $$$

ENDATA19

$$$ DATA TYPE 20 (HEADWATER FLOWS, TEMP, SALINITY, CONSERVATIVES) $$$
         REACH                                FLOW     TEMP     SALIN    C1     C2
HDWTR-1      1. BAYOU LANANA                  0.025     26.8       0.2    348.     21.
HDWTR-1      2. TOLIVER BRANCH                0.000     29.7       0.5    792.     80.
HDWTR-1      3. PATEL DITCH                   0.000     29.7       0.5    792.     80.
ENDATA20

$$$ DATA TYPE 21 (HEADWATER DATA FOR DO, BOD, NITROGEN) $$$
         REACH        DO       BOD      ORG-N    NH-3     NO3+2

HDWTR-2      1.         7.3       5.0      0.52      0.08      0.23
HDWTR-2      2.         6.1       1.3      0.50      0.05      0.20
HDWTR-2      3.         6.1       1.3      0.50      0.05      0.20
ENDATA21

$$$ DATA TYPE 22 (HEADWATER DATA FOR P, CHLOROPHYLL, FC, NONCONS.) $$$

ENDATA22
```

```
$$$ DATA TYPE 23 (JUNCTION DATA) $$$

JUNCTION     8     2  PATEL DITCH CONFLUENCE
JUNCTION    12     1  TOLIVER BRANCH CONFLUENCE
ENDATA23


$$$ DATA TYPE 24 (WASTELOAD DATA FOR FLOW, TEMPERATURE, SALIN, AND CONS.) $$$
        ELEMENT  NAME                 FLOW     TEMP    SALIN      C1      C2

WSTLD-1     40. NACOGDOCHS 10342.004   0.225     27.7      0.3     503.      45.
ENDATA24

$$$ DATA TYPE 25 (WASTELOAD DATA FOR DO, BOD, AND NITROGEN) $$$
        ELEMENT     DO     BOD  %REMOV  ORG-N   NH3 %NITRIF NO3+2

WSTLD-2     40.      6.7      7.0       1.36     .04      3.12      0
ENDATA25                                  0

$$$ DATA TYPE 26 (WASTELOAD DATA - P, CHLORO, FC, AND NONCONS) $$$

ENDATA26

$$$ DATA TYPE 27 (LOWER BOUNDARY CONDITIONS) $$$

ENDATA27

$$$ DATA TYPE 28 (FLOW AUGMENTATION DATA) $$$

ENDATA28

$$$ DATA TYPE 29 (SENSITIVITY ANALYSIS) $$$

ENDATA29

$$$ DATA TYPE 30 (PLOT CONTROL CARDS) $$$

NUMBER OF PLOTS = 1
NUMBER OF REACHES IN PLOT 1 =   8                          INCREMENT = 0.5
PLOT RCH  1  5  6  7  8  9 10 11
ENDATA30
```

Model Input for the Mud Creek Calibration Run
September 10-13, 1984

$$$ DATA TYPE 1 (TITLES AND CONTROL CARDS) $$$

```
CNTROL01      MUD CREEK        SEGMENT 0616   QM0616.CAL/09-12-84
CNTROL02      SEPTEMBER 12, 1984; TDWR IMS; CALIBRATION DATA SET
CNTROL03 YES ECHO DATA INPUT
CNTROL04  NO INTERMEDIATE SUMMARY
CNTROL05  NO FINAL REPORT
CNTROL06  NO LOADING SUMMARY
CNTROL07  NO LINE PRINTER PLOT
CNTROL08  NO GRAPHICS CAPABILITY
CNTROL09 YES METRIC UNITS
CNTROL10 YES OXYGEN DEPENDENT RATES
CNTROL11  NO SENSITIVITY ANALYSIS
CNTROL12 YES SPECIAL REPORT
ENDATA01
```

$$$ DATA TYPE 2 (MODEL OPTIONS) $$$

```
MODOPT01  NO TEMPERATURE
MODOPT02 YES SALINITY
MODOPT03 YES CONSERVATIVE MATERIAL  I = CONDUCTIVITY, UHMS/CM
MODOPT04 YES CONSERVATIVE MATERIAL II = CHLORIDE, MG/L
MODOPT05 YES DISSOLVED OXYGEN
MODOPT06 YES BIOCHEMICAL OXYGEN DEMAND
MODOPT07 YES NITROGEN
MODOPT08  NO PHOSPHORUS
MODOPT09  NO CHLOROPHYLL A
MODOPT10  NO MACROPHYTES
MODOPT11  NO COLIFORM
MODOPT12  NO NONCONSERVATIVE MATERIAL = MG/L
ENDATA02
```

$$$ DATA TYPE 3 (PROGRAM CONSTANTS) $$$

```
PROGRAM  PLOT CONTROL VALUE                  =       3.00
PROGRAM  MAXIMUM ITERATION LIMIT             =       500.
PROGRAM  EFFECTIVE BOD DUE TO ALGAE          =      0.25
PROGRAM  N ALGAL UPTAKE                      =      0.01
PROGRAM  N PREFERENCE                        =      0.00
PROGRAM  LOGICAL UNIT NUMBER FOR SEQUENCING  =       15.0
PROGRAM  SPECIAL REPORT TYPE                 =      4.
PROGRAM  PLOT TYPE                           =      3.
ENDATA03
```

$$$ DATA TYPE 4 (TEMPERATURE CORRECTION CONSTANTS FOR RATE COEFFICIENTS) $$$

```
ENDATA04
```

$$$ DATA TYPE 5 (TEMPERATURE DATA) $$$

```
ENDATA05
```

$$$ DATA TYPE 6 (ALGAE CONSTANTS) $$$

```
ENDATA06
```

$$$ DATA TYPE 7 (MACROPHYTEW CONSTANTS) $$$

```
ENDATA07
```

$$$ DATA TYPE 8 (REACH ID DATA) $$$

REACH ID	1.	MU HDWTR - BLACKHAWK CREEK	79.0	78.0	1.0
REACH ID	2.	BL HDWTR - UNNAMED TRIBUTARY	6.1	5.0	.1
REACH ID	3.	UN HDWTR - BLACKHAWK CREEK CONF.	1.3	0.0	.1
REACH ID	4.	BL UNNAMED TRIB - MUD CREEK CONF.	5.0	0.0	1.0
REACH ID	5.	MU BLACKHAWK CREEK - SH 110	78.0	75.0	1.0
REACH ID	6.	MU SH 110 - KICKAPOO CREEK	75.0	73.0	1.0
REACH ID	7.	KI HDWTR - UNNAMED TRIBUTARY CONF.	16.0	15.0	1.0
REACH ID	8.	UN HDWTR - KICKAPOO CREEK	1.2	0.0	.1
REACH ID	9.	KI UNNAMED TRIB - MUD CREEK CONF.	15.0	0.0	1.0
REACH ID	10.	MU KICKAPOO CREEK - WEST MUD CREEK	73.0	67.0	1.0
REACH ID	11.	WM HDWTR - UNNAMED TRIBUTARY	32.0	30.0	1.0
REACH ID	12.	UN HDWTR - WEST MUD CREEK CONF.	0.9	0.0	.1
REACH ID	13.	WM UNNAMED TRIB - HENSHAW CREEK	30.0	24.0	1.0
REACH ID	14.	HE HDWTR - UNNAMED TRIBUTARY	2.0	1.0	1.0
REACH ID	15.	UN HDWTR - RKM 1.0	2.0	1.0	.1
REACH ID	16.	UN RKM 1.0 - HENSHAW CREEK CONF.	1.0	0.0	1.0
REACH ID	17.	HE UNNAMED TRIB - WEST MUD CK CONF.	1.0	0.0	1.0
REACH ID	18.	WM HENSHAW CREEK - UNNAMED TRIB.	24.0	21.0	1.0
REACH ID	19.	UN HDWTR - RKM 1.0	2.1	1.0	.1
REACH ID	20.	UN RKM 1.0 - WEST MUD CREEK CONF.	1.0	0.0	1.0
REACH ID	21.	WM UNNAMED TRIB - BRIAR BRANCH	21.0	13.0	1.0
REACH ID	22.	BR HDWTR - UNNAMED TRIBUTARY	9.0	8.0	1.0
REACH ID	23.	UN HDWTR - BRIAR BRANCH CONF.	0.7	0.0	.1
REACH ID	24.	BR UNNAMED TRIB - WEST MUD CK CONF.	8.0	0.0	1.0
REACH ID	25.	WM BRIAR BRANCH - MUD CREEK CONF.	13.0	0.0	1.0
REACH ID	26.	MU WEST MUD CREEK - FM 2064	67.0	51.0	1.0
REACH ID	27.	MU FM 2064 - CANEY CREEK	51.0	50.0	1.0
REACH ID	28.	CA HDWTR - UNNAMED TRIBUTARY	16.0	15.0	1.0
REACH ID	29.	UN HDWTR - CANEY CREEK CONF.	1.2	0.0	.1
REACH ID	30.	CA UNNAMED TRIB - MUD CREEK CONF.	15.0	0.0	1.0
REACH ID	31.	MU CANEY CREEK - KEYES CREEK	50.0	34.0	1.0
REACH ID	32.	KE HDWTR - WEST. LITH. DITCH	20.0	19.0	1.0
REACH ID	33.	WL WEST. LITH. DITCH	0.5	0.0	.1
REACH ID	34.	KE WEST. LITH. DITCH - RGS. CK.	19.0	6.0	1.0
REACH ID	35.	RA HDWTR - RKM 7.0	8.5	7.0	.1
REACH ID	36.	RA RKM 7.0 - RKM 4.0	7.0	4.0	1.0
REACH ID	37.	RA RKM 4.0 - RKM 3.0	4.0	3.0	.1
REACH ID	38.	RA RKM 3.0 - KEYES CONF.	3.0	0.0	1.0
REACH ID	39.	KE RKM 6.0 - RKM 3.0	6.0	3.0	1.0
REACH ID	40.	KE RKM 3.0 - MUD CREEK CONF.	3.0	0.0	1.0
REACH ID	41.	MU KEYES CREEK - US 84	34.0	9.0	1.0
REACH ID	42.	MU US 84 - ANGELINA RIVER	9.0	1.0	1.0

ENDATA08

$$$ DATA TYPE 9 (ADVECTIVE TRANSFER COEFFICIENTS) $$$

HYDR-1	1.	0.598	0.5	0.466	0.4	0.	0.03
HYDR-1	2.	0.598	0.5	0.466	0.4	0.	0.03
HYDR-1	3.	0.161	0.5	0.625	0.4	0.	0.03
HYDR-1	4.	0.598	0.5	0.466	0.4	0.	0.03
HYDR-1	5.	0.598	0.5	0.466	0.4	0.	0.03
HYDR-1	6.	0.598	0.5	0.466	0.4	0.	0.03
HYDR-1	7.	0.161	0.5	0.625	0.4	0.	0.03
HYDR-1	8.	0.161	0.5	0.625	0.4	0.	0.03
HYDR-1	9.	0.161	0.5	0.625	0.4	0.	0.03
HYDR-1	10.	0.598	0.5	0.466	0.4	0.	0.03
HYDR-1	11.	0.418	0.5	0.603	0.4	0.	0.03
HYDR-1	12.	0.161	0.5	0.625	0.4	0.	0.03
HYDR-1	13.	0.418	0.5	0.603	0.4	0.	0.03
HYDR-1	14.	0.161	0.5	0.625	0.4	0.	0.03
HYDR-1	15.	0.161	0.5	0.625	0.4	0.	0.03
HYDR-1	16.	0.161	0.5	0.625	0.4	0.	0.03

```
HYDR-1     17.      0.161       0.5       0.625       0.4         0.    0.03
HYDR-1     18.      0.418       0.5       0.603       0.4         0.    0.03
HYDR-1     19.      0.161       0.5       0.625       0.4         0.    0.03
HYDR-1     20.      0.161       0.5       0.625       0.4         0.    0.03
HYDR-1     21.      0.418       0.5       0.603       0.4         0.    0.03
HYDR-1     22.      0.161       0.5       0.625       0.4         0.    0.03
HYDR-1     23.      0.161       0.5       0.625       0.4         0.    0.03
HYDR-1     24.      0.161       0.5       0.625       0.4         0.    0.03
HYDR-1     25.      0.418       0.5       0.603       0.4         0.    0.03
HYDR-1     26.      0.415       0.5       0.392       0.4         0.    0.03
HYDR-1     27.      0.275       0.5       0.725       0.4         0.    0.03
HYDR-1     28.      0.161       0.5       0.625       0.4         0.    0.03
HYDR-1     29.      0.161       0.5       0.625       0.4         0.    0.03
HYDR-1     30.      0.161       0.5       0.625       0.4         0.    0.03
HYDR-1     31.      0.275       0.5       0.725       0.4         0.    0.03
HYDR-1     32.      0.427       0.5       0.332       0.4         0.    0.03
HYDR-1     33.      0.427       0.5       0.332       0.4         0.    0.03
HYDR-1     34.      0.427       0.5       0.332       0.4         0.    0.03
HYDR-1     35.      0.427       0.5       0.332       0.4         0.    0.03
HYDR-1     36.      0.427       0.5       0.332       0.4         0.    0.03
HYDR-1     37.      0.427       0.5       0.332       0.4         0.    0.03
HYDR-1     38.      0.427       0.5       0.332       0.4         0.    0.03
HYDR-1     39.      0.312       0.5       0.631       0.4         0.    0.03
HYDR-1     40.      0.312       0.5       0.631       0.4         0.    0.03
HYDR-1     41.      0.144       0.5       0.946       0.4         0.    0.03
HYDR-1     42.      0.144       0.5       0.946       0.4         0.    0.03
ENDATA09
```

$$$ DATA TYPE 10 (DISPERSIVE HYDRAULIC COEFFICIENTS) $$$

ENDATA10

$$$ DATA TYPE 11 (INITIAL CONDITIONS) $$$

```
INITIAL     1.     25.2      0.2       6.0       1.0       1.0       1.0       2.      0.0
INITIAL     2.      0.0      0.5       5.0       1.0       1.0       1.0       2.      0.0
INITIAL     3.      0.0      0.5       5.0       1.0       1.0       1.0       2.      0.0
INITIAL     4.      0.0      0.5       5.0       1.0       1.0       1.0       2.      0.0
INITIAL     5.     25.2      0.2       6.0       1.0       1.0       1.0       2.      0.0
INITIAL     6.     25.2      0.2       6.0       1.0       1.0       1.0       2.      0.0
INITIAL     7.      0.0      0.5       5.0       1.0       1.0       1.0       2.      0.0
INITIAL     8.      0.0      0.5       5.0       1.0       1.0       1.0       2.      0.0
INITIAL     9.      0.0      0.5       5.0       1.0       1.0       1.0       2.      0.0
INITIAL    10.     25.2      0.2       6.0       1.0       1.0       1.0       2.      0.0
INITIAL    11.     24.9      0.3       3.6       1.0       1.0       1.0       2.      0.0
INITIAL    12.      0.0      0.5       5.0       1.0       1.0       1.0       2.      0.0
INITIAL    13.     24.9      0.3       3.6       1.0       1.0       1.0       2.      0.0
INITIAL    14.      0.0      0.5       5.0       1.0       1.0       1.0       2.      0.0
INITIAL    15.      0.0      0.5       5.0       1.0       1.0       1.0       2.      0.0
INITIAL    16.      0.0      0.5       5.0       1.0       1.0       1.0       2.      0.0
INITIAL    17.      0.0      0.5       5.0       1.0       1.0       1.0       2.      0.0
INITIAL    18.     26.4      0.3       0.1       1.0       1.0       1.0       2.      0.0
INITIAL    19.      0.0      0.5       5.0       1.0       1.0       1.0       2.      0.0
INITIAL    20.      0.0      0.5       5.0       1.0       1.0       1.0       2.      0.0
INITIAL    21.     25.0      0.1       2.3       1.0       1.0       1.0       2.      0.0
INITIAL    22.      0.0      0.5       5.0       1.0       1.0       1.0       2.      0.0
INITIAL    23.      0.0      0.5       5.0       1.0       1.0       1.0       2.      0.0
INITIAL    24.      0.0      0.5       5.0       1.0       1.0       1.0       2.      0.0
INITIAL    25.     25.0      0.1       2.3       1.0       1.0       1.0       2.      0.0
INITIAL    26.     25.2      0.2       6.0       1.0       1.0       1.0       2.      0.0
INITIAL    27.     25.2      0.2       6.0       1.0       1.0       1.0       2.      0.0
INITIAL    28.      0.0      0.5       5.0       1.0       1.0       1.0       2.      0.0
INITIAL    29.      0.0      0.5       5.0       1.0       1.0       1.0       2.      0.0
INITIAL    30.      0.0      0.5       5.0       1.0       1.0       1.0       2.      0.0
```

```
INITIAL     31.     25.2     0.2     6.0     1.0     1.0     1.0     2.     0.0
INITIAL     32.      0.0     0.5     5.0     1.0     1.0     1.0     2.     0.0
INITIAL     33.      0.0     0.5     5.0     1.0     1.0     1.0     2.     0.0
INITIAL     34.      0.0     0.5     5.0     1.0     1.0     1.0     2.     0.0
INITIAL     35.      0.0     0.5     5.0     1.0     1.0     1.0     2.     0.0
INITIAL     36.      0.0     0.5     5.0     1.0     1.0     1.0     2.     0.0
INITIAL     37.      0.0     0.5     5.0     1.0     1.0     1.0     2.     0.0
INITIAL     38.      0.0     0.5     5.0     1.0     1.0     1.0     2.     0.0
INITIAL     39.      0.0     0.5     5.0     1.0     1.0     1.0     2.     0.0
INITIAL     40.     26.0     0.4     4.5     1.0     1.0     1.0     2.     0.0
INITIAL     41.     25.8     0.2     6.1     1.0     1.0     1.0     2.     0.0
INITIAL     42.     26.7     0.2     6.2     1.0     1.0     1.0     3.     0.0
ENDATA11
```

$$$ DATA TYPE 12 (REAERATION, SEDIMENT OXYGEN DEMAND, BOD COEFFICI

```
COEF-1      1.   11.                    0.5     0.2     0.1     1.0    0.05
COEF-1      2.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1      3.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1      4.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1      5.   11.                    0.5     0.2     0.1     1.0    0.05
COEF-1      6.   11.                    0.5     0.2     0.1     1.0    0.05
COEF-1      7.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1      8.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1      9.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     10.   11.                    0.5     0.2     0.1     1.0    0.05
COEF-1     11.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     12.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     13.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     14.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     15.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     16.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     17.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     18.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     19.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     20.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     21.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     22.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     23.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     24.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     25.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     26.   11.                    0.5     0.2     0.1     1.0    0.05
COEF-1     27.   11.                    0.5     0.2     0.1     1.0    0.05
COEF-1     28.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     29.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     30.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     31.   11.                    0.5     0.2     0.1     1.0    0.05
COEF-1     32.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     33.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     34.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     35.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     36.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     37.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     38.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     39.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     40.   11.                    0.2     0.2     0.1     1.0    0.05
COEF-1     41.   11.                    0.5     0.2     0.1     1.0    0.05
COEF-1     42.   11.                    0.5     0.2     0.1     1.0    0.05
ENDATA12
```

$$$ DATA TYPE 13 (NITROGEN AND PHOSPHORUS COEFFICIENTS) $$$

```
COEF-2      1.    0.05    0.1     1.0     0.5     .01     0.0     0.2
COEF-2      2.    0.05    0.1     1.0     0.3     .01     0.0     0.2
```

```
COEF-2       3.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2       4.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2       5.     0.05     0.1     1.0     0.5     .01     0.0     0.2
COEF-2       6.     0.05     0.1     1.0     0.5     .01     0.0     0.2
COEF-2       7.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2       8.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2       9.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      10.     0.05     0.1     1.0     0.5     .01     0.0     0.2
COEF-2      11.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      12.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      13.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      14.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      15.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      16.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      17.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      18.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      19.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      20.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      21.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      22.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      23.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      24.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      25.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      26.     0.05     0.1     1.0     0.5     .01     0.0     0.2
COEF-2      27.     0.05     0.1     1.0     0.5     .01     0.0     0.2
COEF-2      28.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      29.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      30.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      31.     0.05     0.1     1.0     0.5     .01     0.0     0.2
COEF-2      32.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      33.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      34.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      35.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      36.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      37.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      38.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      39.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      40.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      41.     0.05     0.1     1.0     0.5     .01     0.0     0.2
COEF-2      42.     0.05     0.1     1.0     0.5     .01     0.0     0.2
ENDATA13

$$$ DATA TYPE 14 (ALGAE AND MACROPHYTE COEFFICIENTS) $$$

ENDATA14

$$$ DATA TYPE 15 (COLIFORM AND NONCONSERVATIVE COEFFICIENTS) $$$

ENDATA15

$$$ DATA TYPE 16 (INCREMENTAL DATA FOR FLOW, TEMP, SALINITY, CONSERVATIVES) $$$
         Reach   Outflow  Inflow   Temp    Salin    Cl       C2

INCR-1      13.    -0.026   0.000     29.7      0.5      792.       80.
INCR-1      18.    -0.013   0.000     29.7      0.5      792.       80.
ENDATA16

$$$ DATA TYPE 17 (INCREMENTAL DATA FOR DO. BOD, AND NITROGEN) $$$
         Reach       DO      BOD     ORG-N  NH-3    NO3+2

INCR-2      13.       6.1       1.3       .50       .05       .20
INCR-2      18.       6.1       1.3       .50       .05       .20
ENDATA17
```

$$$ DATA TYPE 18 (INCREMENTAL DATA FOR P, FC, CHLOROPHYLL, AND NONCONSERVATIVES) $$$

ENDATA18

$$$ DATA TYPE 19 (NONPOINT SOURCE DATA) $$$

ENDATA19

$$$ DATA TYPE 20 (HEADWATER FLOWS, TEMP, SALINITY, CONSERVATIVES) $$$

	REACH		FLOW	TEMP	SALIN	C1	C2
HDWTR-1	1.	MUD CREEK	0.106	25.2	0.2	305.	17.
HDWTR-1	2.	BLACKHAWK CREEK	0.000	0.0	0.5	792.	80.
HDWTR-1	13.	MCKINNEY DITCH	0.000	0.0	0.5	792.	80.
HDWTR-1	36.	KICKAPOO CREEK	0.000	0.0	0.5	792.	80.
HDWTR-1	37.	ARP DITCH	0.000	0.0	0.5	792.	80.
HDWTR-1	70.	WEST MUD CREEK	0.017	24.9	0.3	579.	14.
HDWTR-1	72.	TALL TIMBERS DITCH	0.000	29.7	0.5	792.	80.
HDWTR-1	87.	HENSHAW CREEK	0.000	29.7	0.5	792.	80.
HDWTR-1	88.	WOODMARK DITCH	0.000	29.7	0.5	792.	80.
HDWTR-1	103.	FIRST CITY DITCH	0.000	29.7	0.5	792.	80.
HDWTR-1	123.	BRIAR BRANCH	0.000	29.7	0.5	792.	80.
HDWTR-1	124.	GREATER WHITEHOUSE	0.000	29.7	0.5	792.	80.
HDWTR-1	169.	CANEY CREEK	0.000	29.7	0.5	792.	80.
HDWTR-1	170.	TROUP DITCH	0.000	29.7	0.5	792.	80.
HDWTR-1	213.	KEYES CREEK	0.017	26.0	0.4	650.	36.
HDWTR-1	214.	WEST. LITH. DITCH	0.000	29.7	0.5	792.	80.
HDWTR-1	232.	RAGSDALE CREEK	0.000	29.7	0.5	792.	80.

ENDATA20

$$$ DATA TYPE 21 (HEADWATER DATA FOR DO, BOD, NITROGEN) $$$

	REACH	DO	BOD	ORG-N	NH-3	NO3+2
HDWTR-2	1.	6.0	2.5	0.68	0.12	0.86
HDWTR-2	2.	6.1	1.3	0.50	0.05	0.20
HDWTR-2	13.	6.1	1.3	0.50	0.05	0.20
HDWTR-2	36.	6.1	1.3	0.50	0.05	0.20
HDWTR-2	37.	6.1	1.3	0.50	0.05	0.20
HDWTR-2	70.	3.6	3.5	0.84	0.06	0.19
HDWTR-2	72.	6.1	1.3	0.50	0.05	0.20
HDWTR-2	87.	6.1	1.3	0.50	0.05	0.20
HDWTR-2	88.	6.1	1.3	0.50	0.05	0.20
HDWTR-2	103.	6.1	1.3	0.50	0.05	0.20
HDWTR-2	123.	6.1	1.3	0.50	0.05	0.20
HDWTR-2	124.	6.1	1.3	0.50	0.05	0.20
HDWTR-2	169.	6.1	1.3	0.50	0.05	0.20
HDWTR-2	170.	6.1	1.3	0.50	0.05	0.20
HDWTR-2	213.	4.5	6.5	1.61	0.59	3.01
HDWTR-2	214.	6.1	1.3	0.50	0.05	0.20
HDWTR-2	232.	6.1	1.3	0.50	0.05	0.20

ENDATA21

$$$ DATA TYPE 22 (HEADWATER DATA FOR P, CHLOROPHYLL, FC, NONCONS.) $$$

ENDATA22

$$$ DATA TYPE 23 (JUNCTION DATA) $$$

JUNCTION	26	12	MCKINNEY DITCH CONFLUENCE
JUNCTION	31	1	BLACKHAWK CREEK CONFLUENCE
JUNCTION	49	36	ARP DITCH CONFLUENCE
JUNCTION	64	35	KICKAPOO CREEK CONFLUENCE
JUNCTION	81	71	TALL TIMBERS CONFLUENCE
JUNCTION	99	87	WOODMARK DITCH CONFLUENCE
JUNCTION	100	86	HENSHAW CREEK CONFLUENCE

```
JUNCTION  115  102  FIRST CITY DITCH CONFLUENCE
JUNCTION  131  123  GREATER WHITEHOUSE CONFLUENCE
JUNCTION  139  122  BRIAR BRANCH CONFLUENCE
JUNCTION  152   69  WEST MUD CREEK CONFLUENCE
JUNCTION  182  169  TROUP DITCH CONFLUENCE
JUNCTION  197  168  CANEY CREEK CONFLUENCE
JUNCTION  219  213  WEST. LITH. DITCH CONFLUENCE
JUNCTION  263  231  RAGSDALE CREEK CONFLUENCE
JUNCTION  269  212  KEYES CREEK CONFLUENCE
ENDATA23
```

$$$ DATA TYPE 24 (WASTELOAD DATA FOR FLOW, TEMPERATURE, SALIN, AND CONS.) $$$

```
          ELEMENT  NAME              FLOW    TEMP    SALIN      C1      C2
WSTLD-1      31    WHITEHOUSE 11222.001    .015      27.5              903.      95.
WSTLD-1      64    ARP        10511.001    .003      27.5              903.      95.
WSTLD-1      70    TYLER      10653.002    .142      27.4              903.      42.
WSTLD-1     197    TROUP      10304.001    .007      27.5              903.      95.
WSTLD-1     266    JACKSONV'L 11222.001    .048      27.5              903.      95.
ENDATA24
```

$$$ DATA TYPE 25 (WASTELOAD DATA FOR DO, BOD, AND NITROGEN) $$$

```
          ELEMENT     DO    BOD  %REMOV  ORG-N   NH3 %NITRIF NO3+2
WSTLD-2      31       2.0    98.9 21.0    4.00   15.00 37.5    1.00
WSTLD-2      64       2.0    52.9 46.5    4.00    5.00 71.3    1.00
WSTLD-2      70       5.5    35.0  0.0    3.52   13.70  0.0     .49
WSTLD-2     197       2.0    48.3 46.5    4.00    5.00 71.3    1.00
WSTLD-2     266       2.0    50.4 35.8    4.00    5.00 58.5    1.00
ENDATA25
```

$$$ DATA TYPE 26 (WASTELOAD DATA - P, CHLORO, FC, AND NONCONS) $$$

ENDATA26

$$$ DATA TYPE 27 (LOWER BOUNDARY CONDITIONS) $$$

ENDATA27

$$$ DATA TYPE 28 (FLOW AUGMENTATION DATA) $$$

ENDATA28

$$$ DATA TYPE 29 (SENSITIVITY ANALYSIS) $$$

ENDATA29

$$$ DATA TYPE 30 (PLOT CONTROL CARDS)

```
NUMBER OF PLOTS = 2
NUMBER OF REACHES IN PLOT 1 =   5                          INCREMENT = 1.0
PLOT RCH 11 13 18 21 25
NUMBER OF REACHES IN PLOT 2 =   9                          INCREMENT = 0.5
PLOT RCH  1  5  6 10 26 27 31 41 42
ENDATA30
```

Model Input for the Upper Angelina River Calibration Run
September 10-13, 1984

$$$ DATA TYPE 1 (TITLES AND CONTROL CARDS) $$$

```
CNTROL01      ANGELINA RIVER      SEGMENT 0611   QM0611.CAL-EXP/09-12-84
CNTROL02      SEPTEMBER 12, 1984; TDWR IMS; CALIBRATION DATA SET
CNTROL03 YES ECHO DATA INPUT
CNTROL04  NO LOADING SUMMARY
CNTROL05  NO FINAL REPORT
CNTROL06  NO CAPSULE SUMMARY
CNTROL07  NO LINE PRINTER PLOT
CNTROL08  NO GRAPHICS CAPABILITY
CNTROL09 YES METRIC UNITS
CNTROL10 YES OXYGEN DEPENDENT RATES
CNTROL11  NO SENSITIVITY ANALYSIS
CNTROL12 YES SPECIAL REPORT
ENDATA01
```

$$$ DATA TYPE 2 (MODEL OPTIONS) $$$

```
MODOPT01  NO TEMPERATURE
MODOPT02 YES SALINITY
MODOPT03 YES CONSERVATIVE MATERIAL  I = CONDUCTIVITY, UHMS/CM
MODOPT04 YES CONSERVATIVE MATERIAL II = CHLORIDE, MG/L
MODOPT05 YES DISSOLVED OXYGEN
MODOPT06 YES BIOCHEMICAL OXYGEN DEMAND
MODOPT07 YES NITROGEN
MODOPT08  NO PHOSPHORUS
MODOPT09  NO CHLOROPHYLL A
MODOPT10  NO MACROPHYTES
MODOPT11  NO COLIFORM
MODOPT12  NO NONCONSERVATIVE MATERIAL = MG/L
ENDATA02
```

$$$ DATA TYPE 3 (PROGRAM CONSTANTS) $$$

```
PROGRAM  PLOT CONTROL VALUE                =       3.0
PROGRAM  EFFECTIVE BOD DUE TO ALGAE        =      0.25
PROGRAM  N ALGAL UPTAKE                    =      0.01
PROGRAM  N PREFERENCE                      =      0.00
PROGRAM  SPECIAL REPORT TYPE               =      4.
PROGRAM  PLOT TYPE                         =      3.
ENDATA03
```

$$$ DATA TYPE 4 (TEMPERATURE CORRECTION CONSTANTS FOR RATE COEFFICIENTS) $$$

```
ENDATA04
```

$$$ DATA TYPE 5 (TEMPERATURE DATA) $$$

```
ENDATA05
```

$$$ DATA TYPE 6 (ALGAE CONSTANTS) $$$

```
ENDATA06
```

$$$ DATA TYPE 7 (MACROPHYTE CONSTANTS) $$$

```
ENDATA07
```

$$$ DATA TYPE 8 (REACH ID DATA) $$$

REACH ID	1. AR HDWTR - SHAWNEE CREEK	243.0	242.5	.5
REACH ID	2. SH HDWTR - BRUMLEY CREEK	15.0	14.0	1.0
REACH ID	3. BR HDWTR - SHAWNEE CREEK CONF.	0.7	0.0	.1
REACH ID	4. SH BRUMLEY CK - ANGELINA CONF.	14.0	0.0	1.0
REACH ID	5. AR SHAWNEE CK - RKM 242.0	242.5	242.0	.5
REACH ID	6. AR RKM 242.0 - FM 1798	242.0	231.0	1.0
REACH ID	7. AR FM 1798 - ANADARKO CREEK	231.0	222.0	1.0
REACH ID	8. AN HDWTR - RKM 2.0	4.0	2.0	1.0
REACH ID	9. AN RKM 2.0 - ANGELINA CONF.	2.0	0.0	1.0
REACH ID	10. AR ANADARKO CK - FM 1662	222.0	217.0	1.0
REACH ID	11. AR FM 1662 - STRIKER CREEK	217.0	206.0	1.0
REACH ID	12. ST HDWTR - BOWLES CREEK	25.0	24.0	1.0
REACH ID	13. BO HDWTR - NEW LONDON DITCH	31.0	30.0	1.0
REACH ID	14. NL HDWTR - RKM 1.0	1.9	1.0	.1
REACH ID	15. NL RKM 1.0 - BOWLES CK CONF.	1.0	0.0	1.0
REACH ID	16. BO NEW LONDON D. - STRIKER CK CONF.	30.0	0.0	1.0
REACH ID	17. ST BOWLES CK. - RKM 5.0	24.0	5.0	1.0
REACH ID	18. ST RKM 5.0 - ANGELINA CONF.	5.0	0.0	1.0
REACH ID	19. AR STRIKER CK. - E. FORK ANGELINA	206.0	200.0	1.0
REACH ID	20. EF HDWTR - DILL CREEK	22.0	21.0	1.0
REACH ID	21. DI HDWTR - CUSHING DITCH	6.0	5.0	1.0
REACH ID	22. CU HDWTR - RKM 2.0	2.8	2.0	.1
REACH ID	23. CU RKM 2.0 - DILL CK. CONF.	2.0	0.0	1.0
REACH ID	24. DI CUSHING D. - E. FORK ANG. CONF.	5.0	0.0	1.0
REACH ID	25. EF DILL CK. - ANGELINA CONF.	21.0	0.0	1.0
REACH ID	26. AR E. FORK ANGELINA - SH 204	200.0	194.0	1.0
REACH ID	27. AR SH 204 - MUD CREEK	194.0	185.0	1.0
REACH ID	28. MU RKM 1.0 - ANGELINA CONF.	1.0	0.0	1.0
REACH ID	29. AR MUD CREEK - FM 343	185.0	171.0	1.0
REACH ID	30. AR FM 343 - SH 21	171.0	155.0	1.0
REACH ID	31. AR SH 21 - FM 1911	155.0	133.0	1.0
REACH ID	32. AR FM 1911 - SH 7	133.0	109.0	1.0
REACH ID	33. AR SH 7 - RKM 91.0	109.0	91.0	1.0
REACH ID	34. AR RKM 91.0 - PROCELLA CK.	91.0	90.5	.5
REACH ID	35. PR HDWTR - UNNAMED TRIBUTARY	11.0	10.0	1.0
REACH ID	36. UN HDWTR - PROCELLA CK CONF.	1.2	0.0	.1
REACH ID	37. PR UNNAMED TRIB. - ANGELINA CONF.	10.0	0.0	1.0
REACH ID	38. AR PROCELLA. CK - BAYOU LANANA	90.5	89.5	.5
REACH ID	39. BL RKM 0.2 - ANGELINA CONF.	0.2	0.0	.2
REACH ID	40. AR BAYLOU LANANA - UNNAMED TRIB.	89.5	89.0	.5
REACH ID	41. UN HDWTR - RKM 4.0	5.2	4.0	.1
REACH ID	42. UN RKM 4.0 - ANGELINA CONF.	4.0	0.0	1.0
REACH ID	43. AR UNNAMED TRIB - ANGELINA CONF.	89.0	88.5	.5
REACH ID	44. AR SOUTHERN P - BL BIFURCATION	88.5	87.5	.5
REACH ID	45. BL LANANA BIFURCATION	1.5	0.0	.5
REACH ID	46. AR LB BIFURCATION - RKM 86.0	87.5	86.0	.5
REACH ID	47. AR RKM 86.0 - RKM 83.0	86.0	83.0	.5
REACH ID	48. AR RKM 83.0 - RIVER CREST ESTATES	83.0	79.0	.5
REACH ID	49. AR RIVER CREST - PAPER MILL CREEK	79.0	76.5	.5

ENDATA08

$$$ DATA TYPE 9 (ADVECTIVE TRANSFER COEFFICIENTS) $$$

HYDR-1	1.	0.389	0.5	0.383	0.4	0.	0.03
HYDR-1	2.	0.482	0.5	0.228	0.4	0.	0.03
HYDR-1	3.	0.482	0.5	0.228	0.4	0.	0.03
HYDR-1	4.	0.482	0.5	0.228	0.4	0.	0.03
HYDR-1	5.	0.389	0.5	0.383	0.4	0.	0.03
HYDR-1	6.	0.389	0.5	0.383	0.4	0.	0.03
HYDR-1	7.	0.326	0.5	0.450	0.4	0.	0.03
HYDR-1	8.	0.161	0.5	0.625	0.4	0.	0.03

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HYDR-1      9.      0.161      0.5      0.625      0.4      0.      0.03
HYDR-1     10.      0.326      0.5      0.450      0.4      0.      0.03
HYDR-1     11.      0.278      0.5      0.458      0.4      0.      0.03
HYDR-1     12.      0.161      0.5      0.625      0.4      0.      0.03
HYDR-1     13.      0.161      0.5      0.625      0.4      0.      0.03
HYDR-1     14.      0.161      0.5      0.625      0.4      0.      0.03
HYDR-1     15.      0.161      0.5      0.625      0.4      0.      0.03
HYDR-1     16.      0.161      0.5      0.625      0.4      0.      0.03
HYDR-1     17.      0.161      0.5      0.625      0.4      0.      0.03
HYDR-1     18.      0.161      0.5      0.625      0.4      0.      0.03
HYDR-1     19.      0.278      0.5      0.458      0.4      0.      0.03
HYDR-1     20.      0.161      0.5      0.625      0.4      0.      0.03
HYDR-1     21.      0.161      0.5      0.625      0.4      0.      0.03
HYDR-1     22.      0.161      0.5      0.625      0.4      0.      0.03
HYDR-1     23.      0.161      0.5      0.625      0.4      0.      0.03
HYDR-1     24.      0.161      0.5      0.625      0.4      0.      0.03
HYDR-1     25.      0.161      0.5      0.625      0.4      0.      0.03
HYDR-1     26.      0.278      0.5      0.458      0.4      0.      0.03
HYDR-1     27.      0.292      0.5      0.399      0.4      0.      0.03
HYDR-1     28.      0.144      0.5      0.946      0.4      0.      0.03
HYDR-1     29.      0.247      0.5      0.740      0.4      0.      0.03
HYDR-1     30.      0.259      0.5      0.633      0.4      0.      0.03
HYDR-1     31.      0.106      0.5      1.086      0.4      0.      0.03
HYDR-1     32.      0.103      0.5      0.708      0.4      0.      0.03
HYDR-1     33.      0.093      0.5      0.999      0.4      0.      0.03
HYDR-1     34.      0.083      0.5      1.310      0.4      0.      0.03
HYDR-1     35.      0.161      0.5      0.625      0.4      0.      0.03
HYDR-1     36.      0.161      0.5      0.625      0.4      0.      0.03
HYDR-1     37.      0.161      0.5      0.625      0.4      0.      0.03
HYDR-1     38.      0.083      0.5      1.310      0.4      0.      0.03
HYDR-1     39.      0.374      0.5      0.353      0.4      0.      0.03
HYDR-1     40.      0.044      0.5      1.715      0.4      0.      0.03
HYDR-1     41.      0.161      0.5      0.625      0.4      0.      0.03
HYDR-1     42.      0.161      0.5      0.625      0.4      0.      0.03
HYDR-1     43.      0.044      0.5      1.715      0.4      0.      0.03
HYDR-1     44.      0.044      0.5      1.715      0.4      0.      0.03
HYDR-1     45.      0.374      0.5      0.353      0.4      0.      0.03
HYDR-1     46.      0.043      0.6      1.860      0.1      0.      0.03
HYDR-1     47.      0.054      0.6      2.824      0.1      0.      0.03
HYDR-1     48.      0.040      0.6      1.354      0.1      0.      0.03
HYDR-1     49.      0.040      0.6      1.354      0.1      0.      0.03
ENDATA09

$$$ DATA TYPE 10 (DISPERSIVE HYDRAULIC COEFFICIENTS) $$$

ENDATA10

$$$ DATA TYPE 11 (INITIAL CONDITIONS) $$$

INITIAL     1.       0.0      0.5      5.0      1.0      1.0      1.0      2.      0.0
INITIAL     2.       0.0      0.5      5.0      1.0      1.0      1.0      2.      0.0
INITIAL     3.       0.0      0.5      5.0      1.0      1.0      1.0      2.      0.0
INITIAL     4.       0.0      0.5      5.0      1.0      1.0      1.0      2.      0.0
INITIAL     5.       0.0      0.5      5.0      1.0      1.0      1.0      2.      0.0
INITIAL     6.       0.0      0.5      5.0      1.0      1.0      1.0      2.      0.0
INITIAL     7.      25.4      0.1      5.5      1.0      1.0      1.0      2.      0.0
INITIAL     8.       0.0      0.5      5.0      1.0      1.0      1.0      2.      0.0
INITIAL     9.      25.3      0.1      6.6      1.0      1.0      1.0      2.      0.0
INITIAL    10.      25.2      0.1      5.7      1.0      1.0      1.0      2.      0.0
INITIAL    11.      25.3      0.1      5.8      1.0      1.0      1.0      2.      0.0
INITIAL    12.       0.0      0.5      5.0      1.0      1.0      1.0      2.      0.0
INITIAL    13.       0.0      0.5      5.0      1.0      1.0      1.0      2.      0.0
INITIAL    14.       0.0      0.5      5.0      1.0      1.0      1.0      2.      0.0
INITIAL    15.       0.0      0.5      5.0      1.0      1.0      1.0      2.      0.0
```

INITIAL	16.	0.0	0.5	5.0	1.0	1.0	1.0	2.	0.0
INITIAL	17.	0.0	0.5	5.0	1.0	1.0	1.0	2.	0.0
INITIAL	18.	26.6	0.3	3.7	1.0	1.0	1.0	11.	0.0
INITIAL	19.	25.5	0.1	6.7	1.0	1.0	1.0	2.	0.0
INITIAL	20.	0.0	0.5	5.0	1.0	1.0	1.0	2.	0.0
INITIAL	21.	0.0	0.5	5.0	1.0	1.0	1.0	2.	0.0
INITIAL	22.	0.0	0.5	5.0	1.0	1.0	1.0	2.	0.0
INITIAL	23.	0.0	0.5	5.0	1.0	1.0	1.0	2.	0.0
INITIAL	24.	0.0	0.5	5.0	1.0	1.0	1.0	2.	0.0
INITIAL	25.	24.8	0.0	6.3	1.0	1.0	1.0	2.	0.0
INITIAL	26.	25.5	0.1	7.2	1.0	1.0	1.0	2.	0.0
INITIAL	27.	25.6	0.1	7.6	1.0	1.0	1.0	2.	0.0
INITIAL	28.	25.9	0.2	6.9	1.0	1.0	1.0	2.	0.0
INITIAL	29.	25.9	0.2	6.9	1.0	1.0	1.0	2.	0.0
INITIAL	30.	26.9	0.2	6.2	1.0	1.0	1.0	4.	0.0
INITIAL	31.	27.4	0.2	6.5	1.0	1.0	1.0	2.	0.0
INITIAL	32.	28.6	0.2	6.0	1.0	1.0	1.0	4.	0.0
INITIAL	33.	27.6	0.2	6.9	1.0	1.0	1.0	2.	0.0
INITIAL	34.	27.3	0.2	7.5	1.0	1.0	1.0	2.	0.0
INITIAL	35.	0.0	0.5	5.0	1.0	1.0	1.0	2.	0.0
INITIAL	36.	0.0	0.5	5.0	1.0	1.0	1.0	2.	0.0
INITIAL	37.	0.0	0.5	5.0	1.0	1.0	1.0	2.	0.0
INITIAL	38.	27.3	0.2	7.5	1.0	1.0	1.0	2.	0.0
INITIAL	39.	25.5	0.3	7.6	1.0	1.0	1.0	2.	0.0
INITIAL	40.	27.7	0.2	7.2	1.0	1.0	1.0	3.	0.0
INITIAL	41.	0.0	0.5	5.0	1.0	1.0	1.0	2.	0.0
INITIAL	42.	0.0	0.5	5.0	1.0	1.0	1.0	2.	0.0
INITIAL	43.	27.7	0.2	7.2	1.0	1.0	1.0	3.	0.0
INITIAL	44.	28.2	0.2	6.9	1.0	1.0	1.0	4.	0.0
INITIAL	45.	25.5	0.3	7.6	1.0	1.0	1.0	2.	0.0
INITIAL	46.	28.1	0.2	6.8	1.0	1.0	1.0	4.	0.0
INITIAL	47.	28.0	0.2	6.6	1.0	1.0	1.0	4.	0.0
INITIAL	48.	27.5	0.2	5.8	1.0	1.0	1.0	4.	0.0
INITIAL	49.	27.5	0.2	5.8	1.0	1.0	1.0	4.	0.0

ENDATA11

$$$ DATA TYPE 12 (REAERATION, SEDIMENT OXYGEN DEMAND, BOD COEFFICIENTS) $$$

COEF-1	1.	11.	0.5	0.2	0.1	1.0	0.05
COEF-1	2.	11.	0.2	0.2	0.1	1.0	0.05
COEF-1	3.	11.	0.2	0.2	0.1	1.0	0.05
COEF-1	4.	11.	0.2	0.2	0.1	1.0	0.05
COEF-1	5.	11.	0.5	0.2	0.1	1.0	0.05
COEF-1	6.	11.	0.5	0.2	0.1	1.0	0.05
COEF-1	7.	11.	0.5	0.2	0.1	1.0	0.05
COEF-1	8.	11.	0.5	0.2	0.1	1.0	0.05
COEF-1	9.	11.	0.5	0.2	0.1	1.0	0.05
COEF-1	10.	11.	0.5	0.2	0.1	1.0	0.05
COEF-1	11.	11.	0.5	0.2	0.1	1.0	0.05
COEF-1	12.	11.	0.2	0.2	0.1	1.0	0.05
COEF-1	13.	11.	0.2	0.2	0.1	1.0	0.05
COEF-1	14.	11.	0.2	0.2	0.1	1.0	0.05
COEF-1	15.	11.	0.2	0.2	0.1	1.0	0.05
COEF-1	16.	11.	0.2	0.2	0.1	1.0	0.05
COEF-1	17.	11.	0.2	0.2	0.1	1.0	0.05
COEF-1	18.	11.	0.5	0.2	0.1	1.0	0.05
COEF-1	19.	11.	0.5	0.2	0.1	1.0	0.05
COEF-1	20.	11.	0.2	0.2	0.1	1.0	0.05
COEF-1	21.	11.	0.2	0.2	0.1	1.0	0.05
COEF-1	22.	11.	0.2	0.2	0.1	1.0	0.05
COEF-1	23.	11.	0.2	0.2	0.1	1.0	0.05
COEF-1	24.	11.	0.2	0.2	0.1	1.0	0.05
COEF-1	25.	11.	0.5	0.2	0.1	1.0	0.05
COEF-1	26.	11.	0.5	0.2	0.1	1.0	0.05

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COEF-1     27.   11.                          0.5     0.2     0.1     1.0     0.05
COEF-1     28.   11.                          0.5     0.2     0.1     1.0     0.05
COEF-1     29.   11.                          0.5     0.2     0.1     1.0     0.05
COEF-1     30.   11.                          0.5     0.2     0.1     1.0     0.05
COEF-1     31.   11.                          0.5     0.2     0.1     1.0     0.05
COEF-1     32.   11.                          0.5     0.2     0.1     1.0     0.05
COEF-1     33.   11.                          0.5     0.2     0.1     1.0     0.05
COEF-1     34.   11.                          0.5     0.2     0.1     1.0     0.05
COEF-1     35.   11.                          0.2     0.2     0.1     1.0     0.05
COEF-1     36.   11.                          0.2     0.2     0.1     1.0     0.05
COEF-1     37.   11.                          0.2     0.2     0.1     1.0     0.05
COEF-1     38.   11.                          0.5     0.2     0.1     1.0     0.05
COEF-1     39.   11.                          0.5     0.2     0.1     1.0     0.05
COEF-1     40.   11.                          0.5     0.2     0.1     1.0     0.05
COEF-1     41.   11.                          0.2     0.2     0.1     1.0     0.05
COEF-1     42.   11.                          0.2     0.2     0.1     1.0     0.05
COEF-1     43.   11.                          0.5     0.2     0.1     1.0     0.05
COEF-1     44.   11.                          0.5     0.2     0.1     1.0     0.05
COEF-1     45.   11.                          0.5     0.2     0.1     1.0     0.05
COEF-1     46.   11.                          1.0     0.2     0.1     1.0     0.05
COEF-1     47.   11.                          1.0     0.2     0.1     1.0     0.05
COEF-1     48.   11.                          1.0     0.2     0.1     1.0     0.05
COEF-1     49.   11.                          1.0     0.2     0.1     1.0     0.05
ENDATA12
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$$$ DATA TYPE 13 (NITROGEN AND PHOSPHORUS COEFFICIENTS) $$$

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COEF-2      1.    0.05    0.1     1.0     0.5     .01     0.0     0.2
COEF-2      2.    0.05    0.1     1.0     0.3     .01     0.0     0.2
COEF-2      3.    0.05    0.1     1.0     0.3     .01     0.0     0.2
COEF-2      4.    0.05    0.1     1.0     0.3     .01     0.0     0.2
COEF-2      5.    0.05    0.1     1.0     0.5     .01     0.0     0.2
COEF-2      6.    0.05    0.1     1.0     0.5     .01     0.0     0.2
COEF-2      7.    0.05    0.1     1.0     0.5     .01     0.0     0.2
COEF-2      8.    0.05    0.1     1.0     0.5     .01     0.0     0.2
COEF-2      9.    0.05    0.1     1.0     0.5     .01     0.0     0.2
COEF-2     10.    0.05    0.1     1.0     0.5     .01     0.0     0.2
COEF-2     11.    0.05    0.1     1.0     0.5     .01     0.0     0.2
COEF-2     12.    0.05    0.1     1.0     0.3     .01     0.0     0.2
COEF-2     13.    0.05    0.1     1.0     0.3     .01     0.0     0.2
COEF-2     14.    0.05    0.1     1.0     0.1     .01     0.0     0.2
COEF-2     15.    0.05    0.1     1.0     0.3     .01     0.0     0.2
COEF-2     16.    0.05    0.1     1.0     0.3     .01     0.0     0.2
COEF-2     17.    0.05    0.1     1.0     0.3     .01     0.0     0.2
COEF-2     18.    0.05    0.1     1.0     0.3     .01     0.0     0.2
COEF-2     19.    0.05    0.1     1.0     0.3     .01     0.0     0.2
COEF-2     20.    0.05    0.1     1.0     0.5     .01     0.0     0.2
COEF-2     21.    0.05    0.1     1.0     0.3     .01     0.0     0.2
COEF-2     22.    0.05    0.1     1.0     0.3     .01     0.0     0.2
COEF-2     23.    0.05    0.1     1.0     0.3     .01     0.0     0.2
COEF-2     24.    0.05    0.1     1.0     0.3     .01     0.0     0.2
COEF-2     25.    0.05    0.1     1.0     0.5     .01     0.0     0.2
COEF-2     26.    0.05    0.1     1.0     0.5     .01     0.0     0.2
COEF-2     27.    0.05    0.1     1.0     0.5     .01     0.0     0.2
COEF-2     28.    0.05    0.1     1.0     0.5     .01     0.0     0.2
COEF-2     29.    0.05    0.1     1.0     0.5     .01     0.0     0.2
COEF-2     30.    0.05    0.1     1.0     0.5     .01     0.0     0.2
COEF-2     31.    0.05    0.1     1.0     0.5     .01     0.0     0.2
COEF-2     32.    0.05    0.1     1.0     0.5     .01     0.0     0.2
COEF-2     33.    0.05    0.1     1.0     0.5     .01     0.0     0.2
COEF-2     34.    0.05    0.1     1.0     0.5     .01     0.0     0.2
COEF-2     35.    0.05    0.1     1.0     0.3     .01     0.0     0.2
COEF-2     36.    0.05    0.1     1.0     0.3     .01     0.0     0.2
COEF-2     37.    0.05    0.1     1.0     0.3     .01     0.0     0.2
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COEF-2      38.     0.05     0.1     1.0     0.5     .01     0.0     0.2
COEF-2      39.     0.05     0.1     1.0     0.5     .01     0.0     0.2
COEF-2      40.     0.05     0.1     1.0     0.5     .01     0.0     0.2
COEF-2      41.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      42.     0.05     0.1     1.0     0.3     .01     0.0     0.2
COEF-2      43.     0.05     0.1     1.0     0.5     .01     0.0     0.2
COEF-2      44.     0.05     0.1     1.0     0.5     .01     0.0     0.2
COEF-2      45.     0.05     0.1     1.0     0.5     .01     0.0     0.2
COEF-2      46.     0.05     0.1     1.0     0.5     .01     0.0     0.2
COEF-2      47.     0.05     0.1     1.0     0.5     .01     0.0     0.2
COEF-2      48.     0.05     0.1     1.0     0.5     .01     0.0     0.2
COEF-2      49.     0.05     0.1     1.0     0.5     .01     0.0     0.2
ENDATA13

$$$ DATA TYPE 14 (ALGAE AND MACROPHYTE COEFFICIENTS) $$$

ENDATA14

$$$ DATA TYPE 15 (COLIFORM AND NONCONSERVATIVE COEFFICIENTS) $$$

ENDATA15

$$$ DATA TYPE 16 (INCREMENTAL DATA FOR FLOW, TEMP, SALINITY, CONSERVATIVES) $$$
          Reach    Outflow   Inflow    Temp     Salin     Cl        C2
INCR-1      7.               0.006     25.4      0.2      182.      17.
INCR-1     10.               0.021     25.3      0.2      208.      16.
INCR-1     11.    -0.063
INCR-1     19.    -0.039
INCR-1     26.    -0.024
INCR-1     27.               0.077     25.6      0.2      151.      17.
INCR-1     29.               0.106     26.9      0.2      272.      27.
INCR-1     30.               0.072     26.9      0.2      272.      27.
INCR-1     31.               0.010     27.4      0.2      274.      47.
INCR-1     32.               0.005     28.6      0.2      318.      59.
INCR-1     33.               0.011     27.6      0.2      332.      64.
INCR-1     34.               0.001     27.3      0.2      337.      58.
INCR-1     38.               0.078     27.3      0.2      337.      58.
INCR-1     40.               0.059     27.7      0.2      341.      56.
INCR-1     43.               0.058     27.7      0.2      341.      56.
ENDATA16

$$$ DATA TYPE 17 (INCREMENTAL DATA FOR DO. BOD, AND NITROGEN) $$$
          Reach        DO       BOD      ORG-N   NH-3     NO3+2
INCR-2      7.          5.5       3.0       .50     .05       .20
INCR-2     10.          5.8       3.0       .50     .05       .20
INCR-2     11.
INCR-2     19.
INCR-2     26.
INCR-2     27.          6.5       3.0       .50     .05       .20
INCR-2     29.          6.4       3.0       .50     .05       .20
INCR-2     30.          6.4       3.0       .50     .05       .20
INCR-2     31.          6.3       3.0       .50     .05       .20
INCR-2     32.          6.2       3.0       .50     .05       .20
INCR-2     33.          6.3       3.0       .50     .05       .20
INCR-2     34.          6.3       3.0       .50     .05       .20
INCR-2     38.          6.3       3.0       .50     .05       .20
INCR-2     40.          6.3       3.0       .50     .05       .20
INCR-2     43.          6.3       3.0       .50     .05       .20
ENDATA17

$$$ DATA TYPE 18 (INCREMENTAL DATA FOR P, FC, CHLOROPHYLL, AND NONCONSERVATIVES) $$$

ENDATA18

$$$ DATA TYPE 19 (NONPOINT SOURCE DATA) $$$

ENDATA19
```

$$$ DATA TYPE 20 (HEADWATER FLOWS, TEMP, SALINITY, CONSERVATIVES) $$$

	REACH			FLOW	TEMP	SALIN	C1	C2
HDWTR-1	1.	ANGELINA RIVER		0.224	25.4	0.1	182.	17.
HDWTR-1	2.	SHAWNEE CREEK		0.000	29.7	0.5	792.	80.
HDWTR-1	3.	BRUMELY CREEK		0.000	29.7	0.5	792.	80.
HDWTR-1	45.	ANADARKO CREEK		.0001	25.3	0.1	182.	40.
HDWTR-1	65.	STRIKER CREEK		.0001	26.6	0.3	520.	104.
HDWTR-1	66.	BOWLES CREEK		0.000	29.7	0.5	792.	80.
HDWTR-1	67.	NEW LONDON DITCH		0.000	29.7	0.5	792.	80.
HDWTR-1	137.	EAST FORK ANGELINA		0.192	24.8	0.0	73.	8.
HDWTR-1	138.	DILL CREEK		0.000	29.7	0.5	792.	80.
HDWTR-1	139.	CUSHING DITCH		0.000	29.7	0.5	792.	80.
HDWTR-1	190.	MUD CREEK	15.					
HDWTR-1	286.	PROCELLA CREEK		0.000	29.7	0.5	792.	80.
HDWTR-1	287.	UNNAMED TRIBUTARY		0.000	29.7	0.5	792.	80.
HDWTR-1	311.	BAYOU LANANA	16.					
HDWTR-1	313.	UNNAMED TRIBUTARY		0.000	29.7	0.5	792.	80.
HDWTR-1	332.	BL BIFURCATION	17.					

ENDATA20

$$$ DATA TYPE 21 (HEADWATER DATA FOR DO, BOD, NITROGEN) $$$

	REACH	DO	BOD	ORG-N	NH-3	NO3+2
HDWTR-2	1.	5.5	3.0	0.38	0.02	0.76
HDWTR-2	2.	6.1	1.3	0.50	0.05	0.20
HDWTR-2	3.	6.1	1.3	0.50	0.05	0.20
HDWTR-2	45.	6.6	3.0	0.50	0.05	0.20
HDWTR-2	65.	3.7	3.0	0.80	0.15	0.08
HDWTR-2	66.	6.1	1.3	0.50	0.05	0.20
HDWTR-2	67.	6.1	1.3	0.50	0.05	0.20
HDWTR-2	137.	6.3	2.0	0.28	0.02	0.18
HDWTR-2	138.	6.1	1.3	0.50	0.05	0.20
HDWTR-2	139.	6.1	1.3	0.50	0.05	0.20
HDWTR-2	190.					
HDWTR-2	286.	6.1	1.3	0.50	0.05	0.20
HDWTR-2	287.	6.1	1.3	0.50	0.05	0.20
HDWTR-2	311.					
HDWTR-2	313.	6.1	1.3	0.50	0.05	0.20
HDWTR-2	332.					

ENDATA21

$$$ DATA TYPE 22 (HEADWATER DATA FOR P, CHLOROPHYLL, FC, NONCONS.) $$$

ENDATA22

$$$ DATA TYPE 23 (JUNCTION DATA) $$$

JUNCTION	10	2	BRUMELY CREEK CONFLUENCE
JUNCTION	24	1	SHAWNEE CREEK CONFLUENCE
JUNCTION	49	44	ANADARKO CREEK CONFLUENCE
JUNCTION	77	66	NEW LONDON DITCH CONFLUENCE
JUNCTION	107	65	BOWLES CREEK CONFLUENCE
JUNCTION	131	64	STRIKER CREEK CONFLUENCE
JUNCTION	149	138	CUSHING DITCH CONFLUENCE
JUNCTION	154	137	DILL CREEK CONFLUENCE
JUNCTION	175	136	EAST FORK ANGELINA CONFLUENCE
JUNCTION	191	189	MUD CREEK CONFLUENCE
JUNCTION	299	286	UNNAMED TRIBUTARY CONFLUENCE
JUNCTION	309	285	PROCELLA CREEK CONFLUENCE
JUNCTION	312	310	BAYOU LANANA CONFLUENCE
JUNCTION	329	312	UNNAMED TRIBUTARY CONFLUENCE
JUNCTION	335	331	BL BIFURCATION CONFLUENCE

ENDATA23

```
$$$ DATA TYPE 24 (WASTELOAD DATA FOR FLOW, TEMPERATURE, SALIN, AND CONS.) $$$
         ELEMENT  NAME                FLOW     TEMP    SALIN      C1      C2
WSTLD-1    154  CUSHING    10437.001     0.003     27.5               903.     95.
WSTLD-1    309  T.D. MHMR  10557.001     0.006     27.5               903.     95.
ENDATA24

$$$ DATA TYPE 25 (WASTELOAD DATA FOR DO, BOD, AND NITROGEN) $$$
         ELEMENT     DO    BOD  %REMOV  ORG-N   NH3 %NITRIF NO3+2
WSTLD-2    154        2.0    92.7   26.0    4.00      5.0   45.2   1.00
WSTLD-2    309        4.0    17.0   35.4    2.00      5.0   58.2   1.00
ENDATA25

$$$ DATA TYPE 26 (WASTELOAD DATA - P, CHLORO, FC, AND NONCONS) $$$

ENDATA26

$$$ DATA TYPE 27 (LOWER BOUNDARY CONDITIONS) $$$

ENDATA27

$$$ DATA TYPE 28 (FLOW AUGMENTATION DATA) $$$

ENDATA28

$$$ DATA TYPE 29 (SENSITIVITY ANALYSIS) $$$

ENDATA29

$$$ DATA TYPE 30 (PLOT CONTROL CARDS) $$$

NUMBER OF PLOTS = 1
NUMBER OF REACHES IN PLOT 3 =  23                              INCREMENT = 1.0
PLOT RCH  1  5  6  7 10 11 19 26 27 29 30 31 32 33 34 38 40 43 44 46 47 48 49
ENDATA30


ENDATA31
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Appendix K

FLOW.IN for Steady-State Replication of QUALTX Simulation

flows on the angelina-steady state

No. of Branches	67	*
Internal Junctions	33	*
Time Steps Modeled	1000	*
Model Starts	0	time steps after midnight.
Output Given Every	1	Time Steps in FLOW.OUT.
0=Metric,1=English	0	*
Time Step Size	1.000	Hours.
Peak Discharge	1.000	*

Branch 1 has 2 xsects & routes 1.00 of flow at JNCT 34 To JNCT 1

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.224	2.57	0.500	0.00	96.9	6.7	0.100
2	0.311	0							

Branch 2 has 3 xsects & routes 1.00 of flow at JNCT 35 To JNCT 2

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	0.062	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
3	0.435	0							

Branch 3 has 2 xsects & routes 1.00 of flow at JNCT 36 To JNCT 2

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	0.621	0							

Branch 4 has 2 xsects & routes 1.00 of flow at JNCT 2 To JNCT 1

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	8.699	0							

Branch 5 has 3 xsects & routes 1.00 of flow at JNCT 1 To JNCT 3

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.224	2.57	0.500	0.00	96.9	6.7	0.100
2	7.146	0	0.230	3.07	0.500	0.00	97.7	6.8	0.100
3	12.74	0							

Branch 6 has 3 xsects & routes 1.00 of flow at JNCT 37 To JNCT 3

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.0001	6.21	0.500	0.00	.063	9.9	0.100
2	0.6200	0	0.0001	6.21	0.500	0.00	.063	9.9	0.100
3	2.485	0							

Branch 7 has 4 xsects & routes 1.00 of flow at JNCT 3 To JNCT 4

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.2301	3.07	0.500	0.00	97.75	6.8	0.100
2	0.010	0	0.2511	3.07	0.500	0.00	105.74	6.8	0.100
3	3.107	0	0.1881	3.60	0.500	0.00	70.76	7.8	0.100
4	9.94	0							

Branch 8 has 2 xsects & routes 1.00 of flow at JNCT 40 To JNCT 6

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.0001	6.21	0.500	0.00	.063	9.9	0.100
2	0.621	0							

Branch 9 has 2 xsects & routes 1.00 of flow at JNCT 6 To JNCT 4

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.0001	6.21	0.500	0.00	.063	9.9	0.100
2	14.912	0							

Branch 10 has 2 xsects & routes 1.00 of flow at JNCT 5 To JNCT 6

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	18.64	0							

Branch 11 has 2 xsects & routes 1.00 of flow at JNCT 38 To JNCT 5

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	0.621	0							

Branch 12 has 3 xsects & routes 1.00 of flow at JNCT 39 To JNCT 5

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	.062	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
3	1.18	0							

Branch 13 has 3 xsects & routes 1.00 of flow at JNCT 4 To JNCT 7

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.1882	3.60	0.500	0.00	70.80	7.9	0.100

2	0.010	0	0.1492	3.60	0.500	0.00	70.80	7.9	0.100
3	3.728	0							

Branch 14 has 5 xsects & routes 1.00 of flow at JNCT 8 To JNCT 7

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.192	6.21	0.500	0.00	56.97	9.9	0.100
2	0.010	0	0.195	6.21	0.500	0.00	57.77	9.9	0.100
3	0.621	0	0.195	6.21	0.500	0.00	57.77	9.9	0.100
4	7.394	1	0.195	6.21	0.500	0.00	57.77	9.9	0.100
5	13.048	0							

Branch 15 has 2 xsects & routes 1.00 of flow at JNCT 41 To JNCT 8

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.192	6.21	0.500	0.00	57.00	9.9	0.100
2	0.621	0							

Branch 16 has 2 xsects & routes 1.00 of flow at JNCT 9 To JNCT 8

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.0000	6.21	0.500	0.00	0.01	9.9	0.100
2	3.107	0							

Branch 17 has 2 xsects & routes 1.00 of flow at JNCT 43 To JNCT 9

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	0.621	0							

Branch 18 has 2 xsects & routes 1.00 of flow at JNCT 42 To JNCT 9

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.0000	6.21	0.500	0.00	0.01	9.9	0.100
2	1.740	0							

Branch 19 has 4 xsects & routes 1.00 of flow at JNCT 7 To JNCT 10

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.3442	3.60	0.500	0.00	121.89	7.9	0.100
2	0.010	0	0.3202	3.60	0.500	0.00	114.22	7.9	0.100
3	3.732	0	0.3972	3.42	0.500	0.00	126.88	8.6	0.100
4	9.322	0							

Branch 20 has 2 xsects & routes 1.00 of flow at JNCT 60 To JNCT 25

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.106	1.67	0.500	0.00	92.48	3.6	0.100
2	0.621	0							

Branch 21 has 3 xsects & routes 1.00 of flow at JNCT 26 To JNCT 25

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.00	1.67	0.500	0.00	0.01	3.6	0.100
2	0.621	0	0.00	1.67	0.500	0.00	0.01	3.6	0.100
3	3.107	0							

Branch 22 has 3 xsects & routes 1.00 of flow at JNCT 58 To JNCT 26

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	0.0621	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
3	0.808	0							

Branch 23 has 3 xsects & routes 1.00 of flow at JNCT 59 To JNCT 26

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.00	1.67	0.500	0.00	0.01	3.6	0.100
2	0.062	0	0.00	1.67	0.500	0.00	0.01	3.6	0.100
3	0.684	0							

Branch 24 has 5 xsects & routes 1.00 of flow at JNCT 25 To JNCT 23

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.106	1.67	0.500	0.00	92.43	3.6	0.100
2	0.010	0	0.121	1.67	0.500	0.00	104.12	3.6	0.100
3	1.864	0	0.121	1.67	0.500	0.00	104.12	3.6	0.100
4	1.988	1	0.121	1.67	0.500	0.00	104.12	3.6	0.100
5	3.107	0							

Branch 25 has 2 xsects & routes 1.00 of flow at JNCT 24 To JNCT 23

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	.01	9.9	0.100
2	9.320	0							

Branch 26 has 2 xsects & routes 1.00 of flow at JNCT 57 To JNCT 24

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	0.621	0							

Branch 27 has 3 xsects & routes 1.00 of flow at JNCT 56 To JNCT 24

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	0.0621	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
3	0.7456	0							

Branch 28 has 5 xsects & routes 1.00 of flow at JNCT 55 To JNCT 22

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.142	2.39	0.500	0.00	108.77	4.0	0.100
2	0.010	0	0.159	2.39	0.500	0.00	120.42	4.0	0.100
3	0.1864	1	0.159	2.39	0.500	0.00	120.42	4.0	0.100
4	0.190	0	0.159	2.39	0.500	0.00	120.42	4.0	0.100
5	1.243	0							

Branch 29 has 3 xsects & routes 1.00 of flow at JNCT 54 To JNCT 22

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	0.0621	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
3	0.559	0							

Branch 30 has 3 xsects & routes 1.00 of flow at JNCT 22 To JNCT 21

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.159	2.39	0.500	0.00	120.42	4.0	0.100
2	0.010	0	0.133	2.39	0.500	0.00	102.54	4.0	0.100
3	3.728	0							

Branch 31 has 2 xsects & routes 1.00 of flow at JNCT 52 To JNCT 20

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	0.621	0							

Branch 32 has 2 xsects & routes 1.00 of flow at JNCT 20 To JNCT 21

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	0.621	0							

Branch 33 has 3 xsects & routes 1.00 of flow at JNCT 53 To JNCT 20

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	0.062	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
3	1.243	0							

Branch 34 has 3 xsects & routes 1.00 of flow at JNCT 21 To JNCT 19

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.133	2.39	0.500	0.00	102.54	4.0	0.100
2	0.010	0	0.120	2.39	0.500	0.00	93.48	4.0	0.100
3	1.864	0							

Branch 35 has 2 xsects & routes 1.00 of flow at JNCT 51 To JNCT 19

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	1.305	0							

Branch 36 has 3 xsects & routes 1.00 of flow at JNCT 19 To JNCT 18

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.120	2.39	0.500	0.00	93.48	4.0	0.100
2	2.796	1	0.120	2.39	0.500	0.00	93.48	4.0	0.100
3	4.971	0							

Branch 37 has 2 xsects & routes 1.00 of flow at JNCT 49 To JNCT 17

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	0.621	0							

Branch 38 has 2 xsects & routes 1.00 of flow at JNCT 17 To JNCT 18

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	4.971	0							

Branch 39 has 3 xsects & routes 1.00 of flow at JNCT 50 To JNCT 17

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	0.0621	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
3	0.435	0							

Branch 40 has 2 xsects & routes 1.00 of flow at JNCT 18 To JNCT 16

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.120	2.39	0.500	0.00	93.48	4.0	0.100
2	8.077	0							

Branch 41 has 3 xsects & routes 1.00 of flow at JNCT 23 To JNCT 16

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.121	1.67	0.500	0.00	104.12	3.6	0.100
2	0.010	0	0.124	1.67	0.500	0.00	106.44	3.6	0.100
3	3.728	0							

Branch 42 has 3 xsects & routes 1.00 of flow at JNCT 16 To JNCT 14

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.244	2.41	0.500	0.00	140.04	6.2	0.100
2	9.942	0	0.244	3.64	0.500	0.00	140.04	5.0	0.100
3	10.563	0							

Branch 43 has 3 xsects & routes 1.00 of flow at JNCT 47 To JNCT 15

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	0.062	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
3	0.745	0							

Branch 44 has 2 xsects & routes 1.00 of flow at JNCT 48 To JNCT 15

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	0.621	0							

Branch 45 has 2 xsects & routes 1.00 of flow at JNCT 15 To JNCT 14

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	9.321	0							

Branch 46 has 4 xsects & routes 1.00 of flow at JNCT 14 To JNCT 11

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.244	3.64	0.500	0.00	140.04	5.0	0.100
2	0.010	0	0.251	3.64	0.500	0.00	143.65	5.0	0.100
3	4.3495	0	0.251	3.64	0.500	0.00	143.65	5.0	0.100
4	9.942	0							

Branch 47 has 4 xsects & routes 1.00 of flow at JNCT 44 To JNCT 12

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	2.34	0.500	0.00	0.01	7.1	0.100
2	0.062	0	0.000	2.34	0.500	0.00	0.01	7.1	0.100
3	2.796	0	0.000	2.34	0.500	0.00	0.01	7.1	0.100
4	5.282	0							

Branch 48 has 3 xsects & routes 1.00 of flow at JNCT 45 To JNCT 13

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	2.34	0.500	0.00	0.01	7.1	0.100
2	0.062	0	0.000	2.34	0.500	0.00	0.01	7.1	0.100
3	.3107	0							

Branch 49 has 2 xsects & routes 1.00 of flow at JNCT 46 To JNCT 13

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.017	2.34	0.500	0.00	9.06	7.1	0.100
2	0.621	0							

Branch 50 has 2 xsects & routes 1.00 of flow at JNCT 13 To JNCT 12

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.017	2.34	0.500	0.00	9.06	7.1	0.100
2	8.077	0							

Branch 51 has 4 xsects & routes 1.00 of flow at JNCT 12 To JNCT 11

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.017	3.21	0.500	0.00	12.576	5.1	0.100
2	1.864	0	0.065	3.21	0.500	0.00	42.068	5.1	0.100
3	2.175	1	0.065	3.21	0.500	0.00	42.068	5.1	0.100
4	3.728	0							

Branch 52 has 3 xsects & routes 1.00 of flow at JNCT 11 To JNCT 10

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.316	6.94	0.500	0.00	120.76	7.3	0.100
2	15.534	0	0.316	6.94	0.500	0.00	120.76	7.3	0.100
3	21.127	0							

Branch 53 has 10 xsects & routes 1.00 of flow at JNCT 10 To JNCT 27

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	1	0.7132	4.05	0.500	0.00	337.10	5.5	0.100
2	0.010	0	0.8192	4.05	0.500	0.00	381.87	5.5	0.100
3	8.699	0	0.8912	3.86	0.500	0.00	369.51	6.1	0.100
4	18.517	1	0.8912	3.86	0.500	0.00	369.51	6.1	0.100
5	18.64	0	0.9012	9.43	0.500	0.00	262.07	8.7	0.100
6	32.31	0	0.9062	9.71	0.500	0.00	166.84	13.7	0.100

7	47.22	0	0.9172	10.75	0.500	0.00	214.88	10.8	0.100
8	58.41	0	0.9182	12.05	0.500	0.00	251.73	9.2	0.100
9	58.68	1	0.9182	12.05	0.500	0.00	251.73	9.2	0.100
10	58.72	0							

Branch 54 has 2 xsects & routes 1.00 of flow at JNCT 28 To JNCT 27

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	6.2136	0							

Branch 55 has 2 xsects & routes 1.00 of flow at JNCT 62 To JNCT 28

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.84	0.500	0.00	0.01	11.0	0.100
2	0.621	0							

Branch 56 has 3 xsects & routes 1.00 of flow at JNCT 61 To JNCT 28

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	0.0621	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
3	0.7456	0							

Branch 57 has 5 xsects & routes 1.00 of flow at JNCT 27 To JNCT 29

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.9182	12.05	0.500	0.00	251.73	9.2	0.100
2	0.010	0	0.9242	12.05	0.500	0.00	253.21	9.2	0.100
3	0.020	0	1.0022	12.05	0.500	0.00	272.40	9.2	0.100
4	0.311	0	1.0022	12.05	0.500	0.00	272.40	9.2	0.100
5	0.621	0							

Branch 58 has 3 xsects & routes 1.00 of flow at JNCT 64 To JNCT 31

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	0.0621	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
3	0.3107	0							

Branch 59 has 2 xsects & routes 1.00 of flow at JNCT 31 To JNCT 30

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	1.243	0							

Branch 60 has 2 xsects & routes 1.00 of flow at JNCT 63 To JNCT 31

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
2	.3107	0							

Branch 61 has 2 xsects & routes 1.00 of flow at JNCT 65 To JNCT 30

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.025	0.92	0.500	0.00	31.20	2.9	0.100
2	.3107	0							

Branch 62 has 13 xsects & routes 1.00 of flow at JNCT 30 To JNCT 29

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.025	0.92	0.500	0.00	31.20	2.9	0.100
2	3.106	1	0.025	0.92	0.500	0.00	31.20	2.9	0.100
3	6.524	0	0.025	1.39	0.500	0.00	18.73	4.8	0.100
4	8.555	0	0.250	1.39	0.500	0.00	148.77	4.8	0.100
5	8.575	1	0.250	1.39	0.500	0.00	148.77	4.8	0.100
6	8.699	0	0.141	2.37	0.500	0.00	45.96	9.3	0.100
7	13.981	1	0.141	2.07	0.500	0.00	47.12	9.1	0.100
8	13.983	0	0.183	2.07	0.500	0.00	59.58	9.1	0.100
9	16.963	1	0.183	2.07	0.500	0.00	59.58	9.1	0.100
10	17.088	0	0.183	2.34	0.500	0.00	113.94	4.8	0.100
11	23.301	0	0.183	2.67	0.500	0.00	71.58	7.6	0.100
12	23.550	1	0.183	2.67	0.500	0.00	71.58	7.6	0.100
13	23.612	0							

Branch 63 has 3 xsects & routes 1.00 of flow at JNCT 29 To JNCT 32

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	1.0022	22.73	0.500	0.00	229.65	13.3	0.100
2	0.010	0	1.2442	22.73	0.500	0.00	229.65	13.3	0.100
3	0.3107	0							

Branch 64 has 4 xsects & routes 1.00 of flow at JNCT 66 To JNCT 32

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	0.010	9.9	0.100
2	0.0621	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100
3	0.746	0	0.000	6.21	0.500	0.00	0.01	9.9	0.100

```
  4  3.231     0
Branch 65 has  4 xsects & routes 1.00 of flow at JNCT 32 To JNCT 33
Grd R Mile  IOUT  Disch        A1        A2        AO        DF        W1    W2
  1  0.000     0  1.2442     22.73     0.500     0.00     229.65      13.3 0.100
  2  0.010     0  1.3022     22.73     0.500     0.00     239.26      13.3 0.100
  3  0.373     1  1.3022     22.73     0.500     0.00     239.26      13.3 0.100
  4  0.932     0
Branch 66 has  3 xsects & routes 1.00 of flow at JNCT 67 To JNCT 33
Grd R Mile  IOUT  Disch        A1        A2        AO        DF        W1    W2
  1  0.000     0  0.0429      2.67     0.500     0.00      19.07       7.6 0.100
  2  0.062     1  0.0429      2.67     0.500     0.00      19.07       7.6 0.100
  3  0.932     0
Branch 67 has  6 xsects & routes 1.00 of flow at JNCT 33 To JNCT 68
Grd R Mile  IOUT  Disch        A1        A2        AO        DF        W1    W2
  1  0.000     0  1.3443     23.26     0.500     0.00     245.96      12.5 0.300
  2  0.932     0  1.3443     18.52     0.500     0.00     468.97       6.6 0.300
  3  0.994     1  1.3443     18.52     0.500     0.00     468.97       6.6 0.300
  4  2.796     0  1.3443     25.00     0.500     0.00     166.56      18.5 0.300
  5  5.282     0  1.3443     25.00     0.500     0.00     166.56      18.5 0.300
  6  6.835     0
for Time     1 NBC  36 *
 Branch      1 Grid  1 Q=     0.2240      *
 Branch      5 Grid  2 Q=     0.0060      *
 Branch      6 Grid  1 Q=     0.0001      *
 Branch      7 Grid  2 Q=     0.0210      *
 Branch      7 Grid  3 Q=    -0.0630      *
 Branch      8 Grid  1 Q=     0.0001      *
 Branch     13 Grid  2 Q=    -0.0390      *
 Branch     14 Grid  2 Q=     0.0030      *
 Branch     15 Grid  1 Q=     0.1920      *
 Branch     19 Grid  2 Q=    -0.0240      *
 Branch     19 Grid  3 Q=     0.0770      *
 Branch     20 Grid  1 Q=     0.1060      *
 Branch     24 Grid  2 Q=     0.0150      *
 Branch     28 Grid  1 Q=     0.1420      *
 Branch     28 Grid  2 Q=     0.0170      *
 Branch     30 Grid  2 Q=    -0.0260      *
 Branch     34 Grid  2 Q=    -0.0130      *
 Branch     41 Grid  2 Q=     0.0030      *
 Branch     46 Grid  2 Q=     0.0070      *
 Branch     49 Grid  1 Q=     0.0170      *
 Branch     51 Grid  2 Q=     0.0480      *
 Branch     53 Grid  2 Q=     0.1060      *
 Branch     53 Grid  3 Q=     0.0720      *
 Branch     53 Grid  5 Q=     0.0100      *
 Branch     53 Grid  6 Q=     0.0050      *
 Branch     53 Grid  7 Q=     0.0110      *
 Branch     53 Grid  8 Q=     0.0010      *
 Branch     57 Grid  2 Q=     0.0060      *
 Branch     57 Grid  3 Q=     0.0780      *
 Branch     61 Grid  1 Q=     0.0250      *
 Branch     62 Grid  4 Q=     0.2250      *
 Branch     62 Grid  5 Q=    -0.1090      *
 Branch     62 Grid  8 Q=     0.0420      *
 Branch     63 Grid  2 Q=     0.0590      *
 Branch     65 Grid  2 Q=     0.0580      *
 Branch     66 Grid  1 Q=     0.0429      *
for time     2  NBC  0 *
for time     3  NBC  0 *
for time     4  NBC  0 *
for time     5  NBC  0 *
for time     6  NBC  0 *
for time     7  NBC  0 *
for time     8  NBC  0 *
for time     9  NBC  0 *
for time    10  NBC  0 *
```

Appendix L

Subroutine fink.f Used in BLTM Model Applications

```
C
C*****CALCULATE THE CONSTITUENT COEFFICIENTS*****************************
C
      SUBROUTINE FINK (K,MX,J,NEQ,PV,PT,
     $ Q,A,W,XK,S,CR,IRC,NNN,LUOUT)
C
C     DEFINE VARIABLES:
C
C      NAME                                PURPOSE
C     ------  ------------------------------------------------------------
C      A   AVERAGE AREA OF THE SUBREACH [SQ M]
C      CR(E,L) REFERENCE (EQUILIBRIUM) CONCENTRATION IN EQUATION E FOR
C              CONSTITUENT L
C      J     TIME STEP
C      K     PARCEL NUMBER
C      MX    GRID JUST UPSTREAM OF PARCEL'S UPSTREAM BOUNDRY
C      NEQ   NUMBER OF EQUATIONS (CONSTITUENTS)
C      NBRCH NUMBER OF BRANCHES
C      NXSEC(N) NUMBER OF SUBREACHES IN BRANCH N
C      NNN BRANCH NUMBER
C      IENG input units: 0=metric, 1=English
C      IRC   CODE TO SET READ FOR NEW DATA EACH TIME STEP
C      PT(L,K) CONCENTRATION ON CONSTITUENT L IN PARCEL K
C      S(L)    SOURCE FLUX OF CONSTITUENT L [UNITS PER HOUR]
C      TE    Equilibrium water temperature, degrees C
C      V     Wind speed in meters/second
C      W      AVERAGE TOP WIDTH OF THE SUBREACH [M]
C      XK(L,LL) EXCHANGE COEFFICIENT FOR CONSTITUENT L DUE TO THE
C              CONCENTRATION OF CONSTITUENT LL
C     GROMAX MAXIMUM SPECIFIC GROWTH RATE OF ALGAE [PER DAY]
C     CKN NITROGEN HALF-SATURATION CONSTANT FOR ALGAE [MG/L]
C     CKP PHOSPHORUS HALF-SATURATION CONST. FOR ALGAE [MG/L]
C     EXCOEF= LIGHT EXTINCTION COEF.FOR ALGAE [PER METER]
C     CKL LIGHT HALF-SATURATION CONST.FOR ALGAE [LANGLEY/MIN]
C     SONET LIGHT INTENSITY [LANGLEY/MIN]
C     RESPRT ALGAE RESPIRATION RATE [PER DAY]
C     ALGSET(N,I)=LOCAL SETTLING RATE FOR ALGAE [M/DAY]
C     ALPHA1=FRACTION OF ALGAE WHICH IS NITROGEN
C     CKNH3(N,I)= RATE CONSTANT FOR BIOLOGICAL OXIDATION OF NH3 TO NO3
C                 IN PER DAY
C     SNH3(N,I)=BENTHOS SOURCE RATE FOR NH3 [GM-N/DAY M]
C     CKNO2(N,I)=RATE CONSTANT FOR BIOLOGICAL OXIDATION OF NO2-NO3
C                [PER DAY]
C     ALPHA3=OXYGEN PRODUCTION PER UNIT OF ALGAE GROWTH
C     ALPHA2=FRACTION OF ALGAE BIOMASS THAT IS PHOSPHORUS
C     ALPHA4=OXYGEN UPTAKE PER UNIT OF ALGAE EXPIRED
C     ALPHA5=OXYGEN UPTAKE PER UNIT OF NH3 OXIDATION
C     ALPHA6=OXYGEN UPTAKE PER UNIT OF NO2 OXIDATION
C     SPHOS(N,I)=BENTHOS SOURCE RATE FOR PHOSPHORUS [GRAM/DAY M]
C     CK1(N,I)=CARBONACEOUS BOD DECAY RATE [PER DAY]
C     CK3(N,I)=CARBONACEOUS BOD SINK RATE [PER DAY]
C     CK2(N,I)=REAERATION RATE [PER DAY]
C     CK4(N,I)=BENTHOS CONSUMPTION OF OXYGEN [GM/DAY M]
C     CK5(N,I)=COLIFORM DIE-OFF RATE [PER DAY]
C     CK6(N,I)=ARBITRARY NON-CONSERVATIVE DECAY RATE [PER DAY]
C     A1=CONSTANT IN WIND FUNCTION [MM/DAY KPA] SUGEST 3.01
C     B1=MASS TRANSFER COEF [MM/DAY KPA(M/S)]  SUGEST 1.13
C
C***  BEGIN DIMENSIONING DEFINITION
C
C     NOBR      Maximum number of branches allowed in model
C     NOSC      Maximum number of cross sections (grids) allowed in branch
C     NOPR      Maximum number of parcels allowed in branch
C                (NOPR should be at least 20 + 2 times NOSC)
C     NOCO      Maximum number of constituents allowed
C
```

```
      INTEGER NOBR,NOSC,NOPR,NOCO
      PARAMETER (NOBR=75, NOSC=15, NOPR=100, NOCO=10)
C
C     + + + LOCAL VARIABLES + + +
      INTEGER I,I1,IRC,J,K,LUOUT,LUQ2,MX,NEQ,NNN,NXSEC(NOBR)
      REAL    CKNH3(NOBR,NOSC),CKNO2(NOBR,NOSC),ALGSET(NOBR,NOSC),
     #        SPHOS(NOBR,NOSC),SNH3(NOBR,NOSC),CK1(NOBR,NOSC),
     #        CK2(NOBR,NOSC),CK3(NOBR,NOSC),CK4(NOBR,NOSC),
     #        CK5(NOBR,NOSC),CK6(NOBR,NOSC),XK(NOCO,NOCO),
     #        S(NOCO),CR(NOCO,NOCO),PT(NOCO,NOPR)
      COMMON NXSEC,NBRCH,IENG
      SAVE CKNH3,CKNO2,ALGSET,SPHOS,SNH3,GROMAX,RESPRT,
     1     CKN,CKP,CKL,EXCOEF,SONET,A1,B1,TE,V
     2  ALPHA1,ALPHA2,ALPHA3,ALPHA4,ALPHA5,ALPHA6
     3  CK1,CK2,CK3,CK4,CK5,CK6
      IF(IRC.NE.1)GO TO 3
      IF(J.NE.1)GO TO 2
      LUQ2=19
      OPEN(LUQ2,FILE='qual2.in')
      WRITE(LUOUT,6000)
 6000 FORMAT(/,30X,'Reaction Kinetics')
      READ(LUQ2,3305)A1,B1,GROMAX,CKN,CKP,EXCOEF,CKL,RESPRT
      WRITE(LUOUT,6001)
 6001 FORMAT(/,' TEMPERATURE')
      WRITE(LUOUT,6002)A1,B1
 6002 FORMAT('      WIND FUNCTION=',F6.2,'+',F6.2,'V [MM/DAY KPA WHEN V I
     $N M/S].')
      WRITE(LUOUT,*)'ALGAE'
      WRITE(LUOUT,6003)GROMAX
 6003 FORMAT('      MAXIMUM SPECIFIC GROWTH RATE=',F7.3,' [PER DAY].')
      WRITE(LUOUT,6004)RESPRT
 6004 FORMAT('      ALGAE RESPIRATION RATE      =',F7.3,' [PER DAY].')
      WRITE(LUOUT,6005)CKN
 6005 FORMAT('      NITROGEN HALF-SAT. CONSTANT =',F7.3,' [MGL/L].')
      WRITE(LUOUT,6006)CKP
 6006 FORMAT('      PHOSPHORUS HALF-SAT. CONST. =',F7.3,' [MGL/L].')
      WRITE(LUOUT,6007)EXCOEF
 6007 FORMAT('      LIGHT EXTINCTION COEF.      =',F7.3,' [PER METER].')
      READ(LUQ2,3305)ALPHA1,ALPHA2,ALPHA3,ALPHA4,ALPHA5,ALPHA6
 3305 FORMAT(10X,10F7.3)
      WRITE(LUOUT,6008)ALPHA1
 6008 FORMAT('      FRACTION OF NITROGEN/ALGAE  =',F7.3,' .')
      WRITE(LUOUT,6009)ALPHA2
 6009 FORMAT('      FRACTION PHOSPHORUS/ALGAE   =',F7.3,' .')
      WRITE(LUOUT,6010)ALPHA3
 6010 FORMAT('      OXYGEN PRODUCTION/GROWTH    =',F7.3,' .')
      WRITE(LUOUT,6011)ALPHA4
 6011 FORMAT('      OXYGEN UPTAKE/EXPIRATION    =',F7.3,' .')
      WRITE(LUOUT,6012)ALPHA5
 6012 FORMAT('      OXYGEN USED TO OXIDIZE NH3  =',F7.3,' .')
      WRITE(LUOUT,6013)ALPHA6
 6013 FORMAT('      OXYGEN USED TO OXIDIZE NO2  =',F7.3,' .')
      WRITE(LUOUT,6014)
 6014 FORMAT('   BR GRID    ALGSET NH3-DECAY BNTHO-NH3 NO2-DECAY BNTHO-P
     $HO        K1  BOD-SINK        K2 BNTHO-OXY  COLI-DIE  ARB-RATE')
      WRITE(LUOUT,6015)
 6015 FORMAT(10X,'     M/DAY   PER DAY  GM/DAY M   PER DAY  GM/DAY M   P
     $ER DAY   PER DAY   PER DAY  GM/DAY M   PER DAY   PER DAY')
      DO 1 N=1,NBRCH
       I1=NXSEC(N)-1
       DO 1 I=1,I1
        READ(LUQ2,3305)ALGSET(N,I),CKNH3(N,I),SNH3(N,I),CKNO2(N,I),
     $  SPHOS(N,I)
        READ(LUQ2,3305)CK1(N,I),CK2(N,I),CK3(N,I),CK4(N,I),CK5(N,I),
     #     CK6(N,I)
      IF(I.EQ.1)WRITE(LUOUT,6016)N,I,ALGSET(N,I),CKNH3(N,I),SNH3(N,I),
```

```
     $ CKNO2(N,I),SPHOS(N,I),CK1(N,I),CK3(N,I),CK2(N,I),CK4(N,I),
     % CK5(N,I),CK6(N,I)
 6016 FORMAT(2I5,11F10.3)
      IF(I.GT.1)WRITE(LUOUT,6017)I,ALGSET(N,I),CKNH3(N,I),SNH3(N,I),
     $ CKNO2(N,I),SPHOS(N,I),CK1(N,I),CK3(N,I),CK2(N,I),CK4(N,I),
     % CK5(N,I),CK6(N,I)
 6017 FORMAT(5X,I5,11F10.3)
    1 CONTINUE
    2 CONTINUE
      IF(IRC.NE.1)GO TO 3
      READ(LUQ2,3305)TE,V,SONET
      WRITE(LUOUT,*)J,TE,V,SONET
    3 CONTINUE
C
C     TEMPERATURE (SIMPLIFIED TEMPERATURE ALGORITHM)
C
      IF(IENG.EQ.0)THEN
       AL=0.3048*0.3048*A
       WL=0.3048*W
      ELSE
       AL=A
       WL=W
      END IF
      CPR= 100.0
      SIG= 1.171E-7/24.0
      AL= 595.9-0.545*PT(1,K)
      PSI= (A1+B1*V)/(24.0*10.0)
      TAB= PT(1,K)+273.16
      DFT=1.1532E11*EXP(-4271.1/(PT(1,K)+242.63))
     1             /((PT(1,K)+242.63)**2)
      XKX= 4.0*0.97*SIG*(TAB**3)+AL*PSI*(DFT+0.06)
      XK(1,1)=0.0
      IF(A.GT.0.0)XK(1,1)= -XKX*WL/(AL*CPR)
      CR(1,1)=TE
C
C     ALGAE
C
      XK(2,2)=0.0
      IF(A.LE.0.0)GO TO 5
      DEXCOF=EXCOEF*AL/WL
      GRO=GROMAX*1.047**(PT(1,K)-20.0)
      IGRO=IFIX(PT(5,K)+CKN)
      IF(IGRO.NE.0)GRO=GRO*(PT(5,K)/(PT(5,K)+CKN))
     1          *(PT(6,K)/(PT(6,K)+CKP))*(1.0/DEXCOF)
     2          *LOG((CKL+SONET)/(CKL+SONET*EXP(-DEXCOF)))
C
      TRSPRT=RESPRT*1.047**(PT(1,K)-20.0)
      XK(2,2)=(GRO-TRSPRT-ALGSET(NNN,MX)*WL/AL)/24.0
C
C     AMMONIA NITROGEN
C
    5 XK(3,2)=ALPHA1*TRSPRT/24.0
      XK(3,3)=-(CKNH3(NNN,MX)*1.047**(PT(1,K)-20.0))/24.0
      IF(PT(8,K).GT.0.0)XK(3,3)=XK(3,3)*(1.0-EXP(-PT(8,K)))
      IF(PT(8,K).LT.0.0)XK(3,3)=0.0
      IF(A.GT.0.0)S(3)=SNH3(NNN,MX)/(AL*24.0)
C
C     NITRITE NITROGEN
C
      XK(4,3)=-XK(3,3)
      XK(4,4)=0.0
      IF(A.GT.0.0)XK(4,4)=-CKNO2(NNN,MX)*1.047**(PT(1,K)-20.0)/24.0
      IF(PT(8,K).GT.0.0)XK(4,4)=XK(4,4)*(1.0-EXP(-PT(8,K)))
      IF(PT(8,K).LT.0.0) XK(4,4)=0.0
C
C     NITRATE NITROGEN
```

Appendix M

BLTM.IN for Steady-State Replication of QUALTX Simulation

```
default bltm.in for angelina 0611
HEADER 1        67      33    1000      10       0       1       1       0       0
HEADER 2      1.00    0.00
LABEL            1    temp       1
LABEL            2    alge       2
LABEL            3    nh3        3
LABEL            4    no2        4
LABEL            5    no3        5
LABEL            6    phos       6
LABEL            7    bod        7
LABEL            8    oxy        8
LABEL            9    coli       9
LABEL           10    cond      10
Branch    1      2      34       1       2
 Grid     1  0.000       1    0.00   25.40    0.00    0.00    0.00    0.00    0.00    0.00
             0.00    0.00    0.00
 Grid     2  0.311       1
Branch    2      3      35       2       3
 Grid     1  0.000       1    0.00   25.40    0.00    0.00    0.00    0.00    0.00    0.00
             0.00    0.00    0.00
 Grid     2  0.062       1    0.00   25.40    0.00    0.00    0.00    0.00    0.00    0.00
             0.00    0.00    0.00
 Grid     3  0.435       1
Branch    3      2      36       2       2
 Grid     1  0.000       1    0.00   25.40    0.00    0.00    0.00    0.00    0.00    0.00
             0.00    0.00    0.00
 Grid     2  0.621       1
Branch    4      2       2       1       2
 Grid     1  0.000       1    0.00   25.40    0.00    0.00    0.00    0.00    0.00    0.00
             0.00    0.00    0.00
 Grid     2  8.699       1
Branch    5      3       1       3       3
 Grid     1  0.000       1    0.00   25.40    0.00    0.00    0.00    0.00    0.00    0.00
             0.00    0.00    0.00
 Grid     2  7.146       1    0.00   25.40    0.00    1.00    0.00    1.00    0.00    3.00
             5.50    0.00  100.00
 Grid     3 12.740       1
Branch    6      3      37       3       3
 Grid     1  0.000       1    0.00   25.30    0.00    0.05    0.00    0.20    0.00    3.00
             6.60    0.00  182.00
 Grid     2  0.620       1    0.00   25.30    0.00    0.05    0.00    0.20    0.00    3.00
             6.60    0.00  182.00
 Grid     3  2.485       1
Branch    7      4       3       4       4
 Grid     1  0.000       1    0.00   25.30    0.00    0.05    0.00    0.20    0.00    3.00
             5.80    0.00  208.00
 Grid     2  0.010       1    0.00   25.30    0.00    0.05    0.00    0.20    0.00    3.00
             5.80    0.00  208.00
 Grid     3  3.107       1    0.00   25.30    0.00    0.05    0.00    0.20    0.00    3.00
             5.80    0.00  208.00
 Grid     4  9.940       1
Branch    8      2      40       6       2
 Grid     1  0.000       1    0.00   26.60    0.00    0.15    0.00    0.08    0.00    3.00
             3.70    0.00  520.00
 Grid     2  0.621       1
Branch    9      2       6       4       2
 Grid     1  0.000       1    0.00   26.60    0.00    0.15    0.00    0.08    0.00    3.00
             3.70    0.00  520.00
 Grid     2 14.912       1
Branch   10      2       5       6       2
 Grid     1  0.000       1    0.00   26.60    0.00    0.00    0.00    0.00    0.00    0.00
             0.00    0.00    0.00
 Grid     2 18.640       1
Branch   11      2      38       5       2
 Grid     1  0.000       1    0.00   26.60    0.00    0.00    0.00    0.00    0.00    0.00
             0.00    0.00    0.00
```

```
 Grid    2  0.621      1
Branch  12      3     39      5      3
 Grid    1  0.000      1   0.00  26.60   0.00   0.00   0.00   0.00   0.00   0.00
            0.00   0.00   0.00
 Grid    2  0.062      1   0.00  26.60   0.00   0.00   0.00   0.00   0.00   0.00
            0.00   0.00   0.00
 Grid    3  1.180      1
Branch  13      3      4      7      3
 Grid    1  0.000      1   0.00  25.50   0.00   0.05   0.00   0.20   0.00   3.00
            6.70   0.00   0.00
 Grid    2  0.010      1   0.00  25.50   0.00   0.05   0.00   0.20   0.00   3.00
            6.70   0.00   0.00
 Grid    3  3.728      1
Branch  14      5      8      7      5
 Grid    1  0.000      1   0.00  24.80   0.00   1.00   0.00   1.00   1.00   0.00
            6.30   0.00   0.00
 Grid    2  0.010      1   0.00  24.80   0.00   1.00   0.00   1.00   1.00   0.00
            6.30   0.00   0.00
 Grid    3  0.621      1   0.00  24.80   0.00   1.00   0.00   1.00   1.00   0.00
            6.30   0.00   0.00
 Grid    4  7.394      1   0.00  24.80   0.00   1.00   0.00   1.00   1.00   0.00
            6.30   0.00   0.00
 Grid    5 13.048      1
Branch  15      2     41      8      2
 Grid    1  0.000      1   0.00  24.80   0.00   0.00   0.00   0.00   0.00   0.00
            0.00   0.00   0.00
 Grid    2  0.621      1
Branch  16      2      9      8      2
 Grid    1  0.000      1   0.00  24.80   0.00   0.00   0.00   0.00   0.00   0.00
            0.00   0.00   0.00
 Grid    2  3.107      1
Branch  17      2     43      9      2
 Grid    1  0.000      1   0.00  24.80   0.00   0.00   0.00   0.00   0.00   0.00
            0.00   0.00   0.00
 Grid    2  0.621      1
Branch  18      2     42      9      2
 Grid    1  0.000      1   0.00  24.80   0.00   0.00   0.00   0.00   0.00   0.00
            0.00   0.00   0.00
 Grid    2  1.740      1
Branch  19      4      7     10      4
 Grid    1  0.000      1   0.00  25.50   0.00   0.00   0.00   1.00   1.00   0.00
            7.20   0.00 100.00
 Grid    2  0.010      1   0.00  25.60   0.00   1.00   0.00   1.00   1.00   0.00
            7.60   0.00 100.00
 Grid    3  3.732      1   0.00  25.60   0.00   1.00   0.00   1.00   1.00   0.00
            7.60   0.00 100.00
 Grid    4  9.322      1
Branch  20      2     60     25      2
 Grid    1  0.000      1   0.00  25.20   0.00   1.00   0.00   1.00   1.00   0.00
            6.00   0.00 100.00
 Grid    2  0.621      1
Branch  21      3     26     25      3
 Grid    1  0.000      1   0.00  25.20   0.00   0.00   0.00   0.00   0.00   0.00
            0.00   0.00   0.00
 Grid    2  0.621      1   0.00  25.20   0.00   0.00   0.00   0.00   0.00   0.00
            0.00   0.00   0.00
 Grid    3  3.107      1
Branch  22      3     58     26      3
 Grid    1  0.000      1   0.00  25.20   0.00   0.00   0.00   0.00   0.00   0.00
            0.00   0.00   0.00
 Grid    2  0.062      1   0.00  25.20   0.00   0.00   0.00   0.00   0.00   0.00
            0.00   0.00   0.00
 Grid    3  0.808      1
Branch  23      3     59     26      3
 Grid    1  0.000      1   0.00  25.20   0.00   0.00   0.00   0.00   0.00   0.00
            0.00   0.00   0.00
```

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 Grid    2  0.062      1    0.00  25.20   0.00   0.00   0.00   0.00   0.00   0.00
              0.00   0.00    0.00
 Grid    3  0.684      1
Branch  24       5     25      23       3
 Grid    1  0.000      1    0.00  25.20   0.00   1.00   0.00   1.00   1.00   0.00
              6.00   0.00  200.00
 Grid    2  0.010      1    0.00  25.20   0.00   1.00   0.00   1.00   1.00   0.00
              6.00   0.00  200.00
 Grid    3  1.864      1    0.00  25.20   0.00   1.00   0.00   1.00   1.00   0.00
              6.00   0.00  200.00
 Grid    4  1.988      1    0.00  25.20   0.00   1.00   0.00   1.00   1.00   0.00
              6.00   0.00  200.00
 Grid    5  3.107      1
Branch  25       2     24      23       2
 Grid    1  0.000      1    0.00  25.20   0.00   0.00   0.00   0.00   0.00   0.00
              0.00   0.00    0.00
 Grid    2  9.320      1
Branch  26       2     57      24       2
 Grid    1  0.000      1    0.00  25.20   0.00   0.00   0.00   0.00   0.00   0.00
              0.00   0.00    0.00
 Grid    2  0.621      1
Branch  27       3     56      24       3
 Grid    1  0.000      1    0.00  25.20   0.00   0.00   0.00   0.00   0.00   0.00
              0.00   0.00    0.00
 Grid    2  0.062      1    0.00  25.20   0.00   0.00   0.00   0.00   0.00   0.00
              0.00   0.00    0.00
 Grid    3  0.746      1
Branch  28       5     55      22       5
 Grid    1  0.000      1    0.00  24.90   0.00   1.00   0.00   1.00   1.00   0.00
              3.60   0.00    0.00
 Grid    2  0.010      1    0.00  24.90   0.00   1.00   0.00   1.00   1.00   0.00
              3.60   0.00    0.00
 Grid    3  0.186      1    0.00  24.90   0.00   1.00   0.00   1.00   1.00   0.00
              3.60   0.00    0.00
 Grid    4  0.190      1    0.00  24.90   0.00   1.00   0.00   1.00   1.00   0.00
              3.60   0.00    0.00
 Grid    5  1.243      1
Branch  29       3     54      22       3
 Grid    1  0.000      1    0.00  26.40   0.00   0.00   0.00   0.00   0.00   0.00
              0.00   0.00    0.00
 Grid    2  0.062      1    0.00  26.40   0.00   0.00   0.00   0.00   0.00   0.00
              0.00   0.00    0.00
 Grid    3  0.559      1
Branch  30       3     22      21       3
 Grid    1  0.000      1    0.00  26.40   0.00   1.00   0.00   1.00   1.00   0.00
              3.60   0.00    0.00
 Grid    2  0.010      1    0.00  26.40   0.00   1.00   0.00   1.00   1.00   0.00
              3.60   0.00    0.00
 Grid    3  3.728      1
Branch  31       2     52      20       2
 Grid    1  0.000      1    0.00  25.00   0.00   0.00   0.00   0.00   0.00   0.00
              0.00   0.00    0.00
 Grid    2  0.621      1
Branch  32       2     20      21       2
 Grid    1  0.000      1    0.00  25.00   0.00   0.00   0.00   0.00   0.00   0.00
              0.00   0.00    0.00
 Grid    2  0.621      1
Branch  33       3     53      20       3
 Grid    1  0.000      1    0.00  25.00   0.00   0.00   0.00   0.00   0.00   0.00
              0.00   0.00    0.00
 Grid    2  0.062      1    0.00  25.00   0.00   0.00   0.00   0.00   0.00   0.00
              0.00   0.00    0.00
 Grid    3  1.243      1
Branch  34       3     21      19       3
 Grid    1  0.000      1    0.00  26.40   0.00   1.00   0.00   1.00   1.00   0.00
              0.10   0.00  300.00
```

```
 Grid     2  0.010       1    0.00  26.40   0.00   1.00   0.00   1.00   1.00   0.00
             0.10    0.00 300.00
 Grid     3  1.864       1
Branch   35       2      51      19       2
 Grid     1  0.000       1    0.00  25.00   0.00   0.00   0.00   0.00   0.00   0.00
             0.00    0.00   0.00
 Grid     2  1.305       1
Branch   36       3      19      18       3
 Grid     1  0.000       1    0.00  25.00   0.00   1.00   0.00   1.00   1.00   0.00
             2.30    0.00 100.00
 Grid     2  2.796       1    0.00  25.00   0.00   1.00   0.00   1.00   1.00   0.00
             2.30    0.00 100.00
 Grid     3  4.971       1
Branch   37       2      49      17       2
 Grid     1  0.000       1    0.00  25.00   0.00   0.00   0.00   0.00   0.00   0.00
             0.00    0.00   0.00
 Grid     2  0.621       1
Branch   38       2      17      18       2
 Grid     1  0.000       1    0.00  25.00   0.00   0.00   0.00   0.00   0.00   0.00
             0.00    0.00   0.00
 Grid     2  4.971       1
Branch   39       3      50      17       2
 Grid     1  0.000       1    0.00  25.00   0.00   0.00   0.00   0.00   0.00   0.00
             0.00    0.00   0.00
 Grid     2  0.062       1    0.00  25.00   0.00   0.00   0.00   0.00   0.00   0.00
             0.00    0.00   0.00
 Grid     3  0.435       1
Branch   40       2      18      16       2
 Grid     1  0.000       1    0.00  25.00   0.00   1.00   0.00   1.00   1.00   0.00
             2.30    0.00   0.00
 Grid     2  8.077       1
Branch   41       3      23      16       3
 Grid     1  0.000       1    0.00  25.20   0.00   1.00   0.00   1.00   1.00   0.00
             6.00    0.00 100.00
 Grid     2  0.010       1    0.00  25.20   0.00   1.00   0.00   1.00   1.00   0.00
             6.00    0.00 100.00
 Grid     3  3.728       1
Branch   42       3      16      14       3
 Grid     1  0.000       1    0.00  25.20   0.00   1.00   0.00   1.00   1.00   0.00
             6.00    0.00 200.00
 Grid     2  9.942       1    0.00  25.20   0.00   1.00   0.00   1.00   1.00   0.00
             6.00    0.00 200.00
 Grid     3 10.563       1
Branch   43       3      47      15       3
 Grid     1  0.000       1    0.00  26.00   0.00   0.00   0.00   0.00   0.00   0.00
             0.00    0.00   0.00
 Grid     2  0.062       1    0.00  26.00   0.00   0.00   0.00   0.00   0.00   0.00
             0.00    0.00   0.00
 Grid     3  0.745       1
Branch   44       2      48      15       2
 Grid     1  0.000       1    0.00  26.00   0.00   0.00   0.00   0.00   0.00   0.00
             0.00    0.00   0.00
 Grid     2  0.621       1
Branch   45       2      15      14       2
 Grid     1  0.000       1    0.00  26.00   0.00   0.00   0.00   0.00   0.00   0.00
             0.00    0.00   0.00
 Grid     2  9.321       1
Branch   46       4      14      11       4
 Grid     1  0.000       1    0.00  25.20   0.00   1.00   0.00   1.00   1.00   0.00
             6.00    0.00 200.00
 Grid     2  0.010       1    0.00  25.20   0.00   1.00   0.00   1.00   1.00   0.00
             6.00    0.00 200.00
 Grid     3  4.350       1    0.00  25.20   0.00   1.00   0.00   1.00   1.00   0.00
             6.00    0.00 200.00
 Grid     4  9.942       1
Branch   47       4      44      12       4
```

Grid	1	0.000	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00							
Grid	2	0.062	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00							
Grid	3	2.796	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00							
Grid	4	5.282	1								
Branch	48	3	45	13	3						
Grid	1	0.000	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00							
Grid	2	0.062	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00							
Grid	3	0.311	1								
Branch	49	2	46	13	2						
Grid	1	0.000	1	0.00	26.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00							
Grid	2	0.621	1								
Branch	50	2	13	12	2						
Grid	1	0.000	1	0.00	26.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00							
Grid	2	8.077	1								
Branch	51	4	12	11	4						
Grid	1	0.000	1	0.00	26.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00							
Grid	2	1.864	1	0.00	26.00	2.00	1.00	0.00	1.00	1.00	0.00
		4.50	0.00	400.00							
Grid	3	2.175	1	0.00	26.00	2.00	1.00	0.00	1.00	1.00	0.00
		4.50	0.00	400.00							
Grid	4	3.728	1								
Branch	52	3	11	10	3						
Grid	1	0.000	1	0.00	25.80	2.00	1.00	0.00	1.00	1.00	0.00
		4.50	0.00	200.00							
Grid	2	15.534	1	0.00	26.70	2.00	1.00	0.00	1.00	1.00	0.00
		6.20	0.00	200.00							
Grid	3	21.127	1								
Branch	53	10	10	27	10						
Grid	1	0.000	1	0.00	25.90	2.00	1.00	0.00	1.00	1.00	0.00
		6.90	0.00	200.00							
Grid	2	0.010	1	0.00	25.90	2.00	1.00	0.00	1.00	1.00	0.00
		6.90	0.00	200.00							
Grid	3	8.699	1	0.00	26.90	4.00	1.00	0.00	1.00	1.00	0.00
		6.20	0.00	200.00							
Grid	4	18.517	1	0.00	26.90	4.00	1.00	0.00	1.00	1.00	0.00
		6.20	0.00	200.00							
Grid	5	18.640	1	0.00	27.40	2.00	1.00	0.00	1.00	1.00	0.00
		6.50	0.00	200.00							
Grid	6	32.310	1	0.00	28.60	4.00	1.00	0.00	1.00	1.00	0.00
		6.00	0.00	200.00							
Grid	7	47.220	1	0.00	27.60	2.00	1.00	0.00	1.00	1.00	0.00
		6.90	0.00	200.00							
Grid	8	58.410	1	0.00	27.30	2.00	1.00	0.00	1.00	1.00	0.00
		7.50	0.00	200.00							
Grid	9	58.680	1	0.00	27.30	2.00	1.00	0.00	1.00	1.00	0.00
		7.50	0.00	200.00							
Grid	10	58.720	1								
Branch	54	2	28	27	2						
Grid	1	0.000	1	0.00	27.30	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00							
Grid	2	6.214	1								
Branch	55	2	62	28	2						
Grid	1	0.000	1	0.00	27.30	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00							
Grid	2	0.621	1								
Branch	56	3	61	28	3						
Grid	1	0.000	1	0.00	27.30	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00							

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 Grid     2  0.062       1    0.00  27.30    0.00    0.00    0.00    0.00    0.00    0.00
               0.00    0.00    0.00
 Grid     3  0.746       1
Branch   57       5      27      29       5
 Grid     1  0.000       1    0.00  27.30    2.00    1.00    0.00    1.00    1.00    0.00
               7.50    0.00  200.00
 Grid     2  0.010       1    0.00  27.30    2.00    1.00    0.00    1.00    1.00    0.00
               7.50    0.00  200.00
 Grid     3  0.005       1    0.00  27.30    2.00    1.00    0.00    1.00    1.00    0.00
               7.50    0.00  200.00
 Grid     4  0.311       1    0.00  27.30    2.00    1.00    0.00    1.00    1.00    0.00
               7.50    0.00  200.00
 Grid     5  0.621       1
Branch   58       3      64      31       3
 Grid     1  0.000       1    0.00  26.80    0.00    0.00    0.00    0.00    0.00    0.00
               0.00    0.00    0.00
 Grid     2  0.062       1    0.00  26.80    0.00    0.00    0.00    0.00    0.00    0.00
               0.00    0.00    0.00
 Grid     3  0.311
Branch   59       2      31      30       2
 Grid     1  0.000       1    0.00  26.80    0.00    0.00    0.00    0.00    0.00    0.00
               0.00    0.00    0.00
 Grid     2  1.243       1
Branch   60       2      63      31       2
 Grid     1  0.000       1    0.00  26.80    0.00    0.00    0.00    0.00    0.00    0.00
               0.00    0.00    0.00
 Grid     2  0.311       1
Branch   61       2      65      30       2
 Grid     1  0.000       1    0.00  26.80    0.00    0.00    0.00    0.00    0.00    0.00
               0.00    0.00    0.00
 Grid     2  0.311       1
Branch   62      13      30      29      13
 Grid     1  0.000       1    0.00  26.80    0.00    0.00    0.00    0.00    0.00    0.00
               0.00    0.00    0.00
 Grid     2  3.106       1    0.00  26.80    0.00    0.00    0.00    0.00    0.00    0.00
               0.00    0.00    0.00
 Grid     3  6.524       1    0.00  26.80    0.00    1.00    0.00    1.00    1.00    0.00
               7.30    0.00  200.00
 Grid     4  8.555       1    0.00  26.80    5.00    1.00    0.00    1.00    1.00    0.00
               7.30    0.00  200.00
 Grid     5  8.575       1    0.00  26.60    5.00    0.00    0.00    1.00    1.00    0.00
               7.00    0.00  200.00
 Grid     6  8.699       1    0.00  25.80    2.00    1.00    0.00    1.00    1.00    0.00
               6.30    0.00  300.00
 Grid     7 13.981       1    0.00  25.50    3.00    1.00    0.00    1.00    1.00    0.00
               6.80    0.00  300.00
 Grid     8 13.983       1    0.00  25.50    2.00    1.00    0.00    1.00    1.00    0.00
               6.90    0.00  300.00
 Grid     9 16.963       1    0.00  25.50    2.00    1.00    0.00    1.00    1.00    0.00
               6.90    0.00  300.00
 Grid    10 17.088       1    0.00  25.50    2.00    1.00    0.00    1.00    1.00    0.00
               6.90    0.00  300.00
 Grid    11 23.301       1    0.00  25.50    2.00    1.00    0.00    1.00    1.00    0.00
               6.90    0.00  300.00
 Grid    12 23.550       1    0.00  25.50    2.00    1.00    0.00    1.00    1.00    0.00
               0.00    0.00    0.00
 Grid    13 23.612       1
Branch   63       3      29      32       3
 Grid     1  0.000       1    0.00  27.70    3.00    1.00    0.00    1.00    1.00    0.00
               7.20    0.00  200.00
 Grid     2  0.010       1    0.00  27.70    3.00    1.00    0.00    1.00    1.00    0.00
               7.20    0.00    0.00
 Grid     3  0.311       1
Branch   64       4      66      32       4
 Grid     1  0.000       1    0.00  28.00    0.00    0.00    0.00    0.00    0.00    0.00
               0.00    0.00    0.00
```

```
 Grid     2  0.062      1    0.00  28.00   0.00   0.00   0.00   0.00   0.00   0.00
                0.00   0.00    0.00
 Grid     3  0.746      1    0.00  28.00   0.00   0.00   0.00   0.00   0.00   0.00
                0.00   0.00    0.00
 Grid     4  3.231      1
Branch   65      4     32      33      4
 Grid     1  0.000      1    0.00  27.70   3.00   1.00   0.00   1.00   1.00   0.00
                7.20   0.00  200.00
 Grid     2  0.010      1    0.00  28.20   4.00   1.00   0.00   1.00   1.00   0.00
                6.90   0.00  200.00
 Grid     3  0.373      1    0.00  28.20   4.00   1.00   0.00   1.00   1.00   0.00
                6.90   0.00  200.00
 Grid     4  0.932      1
Branch   66      3     67      33      3
 Grid     1  0.000      1    0.00  25.50   2.00   1.00   0.00   1.00   1.00   0.00
                7.60   0.00  300.00
 Grid     2  0.062      1    0.00  25.50   2.00   1.00   0.00   1.00   1.00   0.00
                7.60   0.00  300.00
 Grid     3  0.932      1
Branch   67      6     33      68      6
 Grid     1  0.000      1    0.00  28.10   4.00   1.00   0.00   1.00   1.00   0.00
                6.80   0.00  200.00
 Grid     2  0.932      1    0.00  28.10   4.00   1.00   0.00   1.00   1.00   0.00
                6.60   0.00  200.00
 Grid     3  0.994      1    0.00  28.10   4.00   1.00   0.00   1.00   1.00   0.00
                6.60   0.00  200.00
 Grid     4  2.796      1    0.00  27.50   4.00   1.00   0.00   1.00   1.00   0.00
                5.80   0.00  200.00
 Grid     5  5.282      1    0.00  27.50   4.00   1.00   0.00   1.00   1.00   0.00
                5.80   0.00  200.00
 Grid     6  6.835      1
Time      1     36
  B  1 G  1  25.40  0.00   0.02   0.00  0.76  0.00   3.00   5.50   0.00 182.00
  B  5 G  2  25.40  0.00   0.05   0.00  0.20  0.00   3.00   5.50   0.00 182.00
  B  6 G  1  25.30  0.00   0.05   0.00  0.20  0.00   3.00   6.60   0.00 182.00
  B  7 G  2  25.30  0.00   0.05   0.00  0.20  0.00   3.00   5.80   0.00 208.00
  B  7 G  3   0.00  0.00   0.00   0.00  0.00  0.00   0.00   0.00   0.00   0.00
  B  8 G  1  26.60  0.00   0.15   0.00  0.08  0.00   3.00   3.70   0.00 520.00
  B 13 G  2   0.00  0.00   0.00   0.00  0.00  0.00   0.00   0.00   0.00 000.00
  B 14 G  2  27.50  0.00   5.00   0.00  1.00  0.00  68.60   2.00   0.00 903.00
  B 15 G  1  24.80  0.00   0.02   0.00  0.18  0.00   2.00   6.30   0.00  73.00
  B 19 G  2   0.00  0.00   0.00   0.00  0.00  0.00   0.00   0.00   0.00   0.00
  B 19 G  3  25.60  0.00   0.05   0.00  0.20  0.00   3.00   6.50   0.00 151.00
  B 20 G  1  25.20  0.00   0.12   0.00  0.86  0.00   2.50   6.00   0.00 305.00
  B 24 G  2  27.50  0.00  15.00   0.00  1.00  0.00  78.13   2.00   0.00 903.00
  B 28 G  1  27.40  0.00  13.70   0.00  0.49  0.00  35.00   5.50   0.00 903.00
  B 28 G  2  24.90  0.00   0.06   0.00  0.19  0.00   3.50   3.60   0.00 579.00
  B 30 G  2  29.70  0.00   0.05   0.00  0.20  0.00   1.30   6.10   0.00 792.00
  B 34 G  2  29.70  0.00   0.05   0.00  0.20  0.00   1.30   6.10   0.00 792.00
  B 41 G  2  25.20  0.00   5.00   0.00  1.00  0.00  28.30   2.00   0.00 903.00
  B 46 G  2  27.50  0.00   5.00   0.00  1.00  0.00  25.84   2.00   0.00 903.00
  B 49 G  1  26.00  0.00   0.59   0.00  3.01  0.00   6.50   4.50   0.00 650.00
  B 51 G  2  27.50  0.00   5.00   0.00  1.00  0.00  32.36   2.00   0.00 903.00
  B 53 G  2  26.90  0.00   0.05   0.00  0.20  0.00   3.00   6.40   0.00 272.00
  B 53 G  3  26.90  0.00   0.05   0.00  0.20  0.00   3.00   6.40   0.00 272.00
  B 53 G  5  27.40  0.00   0.05   0.00  0.20  0.00   3.00   6.30   0.00 274.00
  B 53 G  6  28.60  0.00   0.05   0.00  0.20  0.00   3.00   6.20   0.00  59.00
  B 53 G  7  27.60  0.00   0.05   0.00  0.20  0.00   3.00   6.30   0.00 332.00
  B 53 G  8  27.30  0.00   0.05   0.00  0.20  0.00   3.00   6.30   0.00 337.00
  B 57 G  2  27.50  0.00   5.00   0.00  1.00  0.00  10.98   4.00   0.00 903.00
  B 57 G  3  27.30  0.00   0.05   0.00  0.20  0.00   3.00   6.30   0.00 337.00
  B 61 G  1  26.80  0.00   0.08   0.00  0.23  0.00   5.00   7.30   0.00 348.00
  B 62 G  4  27.70  0.00   0.04   0.00  0.00  0.00   7.00   6.70   0.00 503.00
  B 62 G  5   0.00  0.00   0.00   0.00  0.00  0.00   0.00   0.00   0.00   0.00
  B 62 G  8  25.80  0.00   0.05   0.00  0.20  0.00   3.00   6.50   0.00 488.00
  B 63 G  2  27.70  0.00   0.05   0.00  0.20  0.00   3.00   6.30   0.00 341.00
```

B 65 G	2	27.70	0.00	0.05	0.00	0.20	0.00	3.00	6.30	0.00	341.00
B 66 G	1	25.50	0.00	0.42	0.00	0.52	0.00	2.03	7.38	0.00	487.00

Time	2	0
Time	3	0
Time	4	0
Time	5	0
Time	6	0
Time	7	0
Time	8	0
Time	9	0
Time	10	0
Time	11	0
Time	12	0
Time	13	0
Time	14	0
Time	15	0
Time	16	0
Time	17	0
Time	18	0
Time	19	0
Time	20	0
Time	21	0
Time	22	0
Time	23	0
Time	24	0
Time	25	0
Time	26	0
Time	27	0
Time	28	0
Time	29	0
Time	30	0
Time	31	0
Time	32	0
Time	33	0
Time	34	0
Time	35	0
Time	36	0
Time	37	0
Time	38	0
Time	39	0
Time	40	0
Time	41	0
Time	42	0
Time	43	0
Time	44	0
Time	45	0
Time	46	0
Time	47	0
Time	48	0
Time	49	0
Time	50	0
Time	51	0
Time	52	0
Time	53	0
Time	54	0
Time	55	0
Time	56	0
Time	57	0
Time	58	0
Time	59	0
Time	60	0
Time	61	0
Time	62	0

Appendix N

QUAL2.IN for Steady-State Replication of QUALTX Simulation

HEADER 1		3.01	1.13	2.0	0.3	0.04	0.1	0.03	0.2
HEADER 2		0.08	0.012	1.6	2.0	3.43	1.14		
B 1 G	1	1.5	0.3	3.6	1.5	6.0			
B 1 G	1	1.10	4.0	0.24	0.6	1.8	0.00		
B 2 G	1	1.5	0.3	3.6	1.5	6.0			
B 2 G	1	1.10	4.0	0.24	0.6	1.8	0.00		
B 2 G	2	1.5	0.3	3.6	1.5	6.0			
B 2 G	2	1.10	4.0	0.24	0.6	1.8	0.00		
B 3 G	1	1.5	0.3	3.6	1.5	6.0			
B 3 G	1	1.10	4.0	0.24	0.6	1.8	0.00		
B 4 G	1	1.5	0.3	3.6	1.5	6.0			
B 4 G	1	1.10	4.0	0.24	0.6	1.8	0.00		
B 5 G	1	1.5	0.3	3.6	1.5	6.0			
B 5 G	1	1.10	4.0	0.24	0.6	1.8	0.00		
B 5 G	2	1.5	0.3	3.6	1.5	6.0			
B 5 G	2	1.10	4.0	0.24	0.6	1.8	0.00		
B 6 G	1	1.5	0.3	3.6	1.5	6.0			
B 6 G	1	1.10	4.0	0.24	0.6	1.8	0.00		
B 6 G	2	1.5	0.3	3.6	1.5	6.0			
B 6 G	2	1.10	4.0	0.24	0.6	1.8	0.00		
B 7 G	1	1.5	0.3	3.6	1.5	6.0			
B 7 G	1	1.10	4.0	0.24	0.6	1.8	0.00		
B 7 G	2	1.5	0.3	3.6	1.5	6.0			
B 7 G	2	1.10	4.0	0.24	0.6	1.8	0.00		
B 7 G	3	1.5	0.3	3.6	1.5	6.0			
B 7 G	3	1.10	4.0	0.24	0.6	1.8	0.00		
B 8 G	1	1.5	0.3	3.6	1.5	6.0			
B 8 G	1	1.10	4.0	0.24	0.6	1.8	0.00		
B 9 G	1	1.5	0.3	3.6	1.5	6.0			
B 9 G	1	1.10	4.0	0.24	0.6	1.8	0.00		
B 10 G	1	1.5	0.3	3.6	1.5	6.0			
B 10 G	1	1.10	4.0	0.24	0.6	1.8	0.00		
B 11 G	1	1.5	0.3	3.6	1.5	6.0			
B 11 G	1	1.10	4.0	0.24	0.6	1.8	0.00		
B 12 G	1	1.5	0.3	3.6	1.5	6.0			
B 12 G	1	1.10	4.0	0.24	0.6	1.8	0.00		
B 12 G	2	1.5	0.3	3.6	1.5	6.0			
B 12 G	2	1.10	4.0	0.24	0.6	1.8	0.00		
B 13 G	1	1.5	0.3	3.6	1.5	6.0			
B 13 G	1	1.10	4.0	0.24	0.6	1.8	0.00		
B 13 G	2	1.5	0.3	3.6	1.5	6.0			
B 13 G	2	1.10	4.0	0.24	0.6	1.8	0.00		
B 14 G	1	1.5	0.3	3.6	1.5	6.0			
B 14 G	1	1.10	4.0	0.24	0.6	1.8	0.00		
B 14 G	2	1.5	0.3	3.6	1.5	6.0			
B 14 G	2	1.10	4.0	0.24	0.6	1.8	0.00		
B 14 G	3	1.5	0.3	3.6	1.5	6.0			
B 14 G	3	1.10	4.0	0.24	0.6	1.8	0.00		
B 14 G	4	1.5	0.3	3.6	1.5	6.0			
B 14 G	4	1.10	4.0	0.24	0.6	1.8	0.00		
B 15 G	1	1.5	0.3	3.6	1.5	6.0			
B 15 G	1	1.10	4.0	0.24	0.6	1.8	0.00		
B 16 G	1	1.5	0.3	3.6	1.5	6.0			
B 16 G	1	1.10	4.0	0.24	0.6	1.8	0.00		
B 17 G	1	1.5	0.3	3.6	1.5	6.0			
B 17 G	1	1.10	4.0	0.24	0.6	1.8	0.00		
B 18 G	1	1.5	0.3	3.6	1.5	6.0			
B 18 G	1	1.10	4.0	0.24	0.6	1.8	0.00		
B 19 G	1	1.5	0.3	3.6	1.5	6.0			
B 19 G	1	1.10	4.0	0.24	0.6	1.8	0.00		
B 19 G	2	1.5	0.3	3.6	1.5	6.0			
B 19 G	2	1.10	4.0	0.24	0.6	1.8	0.00		
B 19 G	3	1.5	0.3	3.6	1.5	6.0			
B 19 G	3	1.10	4.0	0.24	0.6	1.8	0.00		
B 20 G	1	1.5	0.3	3.6	1.5	6.0			
B 20 G	1	1.10	4.0	0.24	0.6	1.8	0.00		
⋮									

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 B 65 G  2    1.5     0.3     3.6     1.5     6.0
 B 65 G  2   1.10     4.0    0.24     0.6     1.8    0.00
 B 65 G  3    1.5     0.3     3.6     1.5     6.0
 B 65 G  3   1.10     4.0    0.24     0.6     1.8    0.00
 B 66 G  1    1.5     0.3     3.6     1.5     6.0
 B 66 G  1   1.10     4.0    0.24     0.6     1.8    0.00
 B 66 G  2    1.5     0.3     3.6     1.5     6.0
 B 66 G  2   1.10     4.0    0.24     0.6     1.8    0.00
 B 67 G  1    1.5     0.3     3.6     1.5     6.0
 B 67 G  1   1.10     4.0    0.24     0.6     1.8    0.00
 B 67 G  2    1.5     0.3     3.6     1.5     6.0
 B 67 G  2   1.10     4.0    0.24     0.6     1.8    0.00
 B 67 G  3    1.5     0.3     3.6     1.5     6.0
 B 67 G  3   1.10     4.0    0.24     0.6     1.8    0.00
 B 67 G  4    1.5     0.3     3.6     1.5     6.0
 B 67 G  4   1.10     4.0    0.24     0.6     1.8    0.00
 B 67 G  5    0.5     0.3     3.6     1.5     6.0
 B 67 G  5   1.10     4.0    0.24     0.6     1.8    0.00
TIME     1  26.00    4.47   3.000
TIME     2  26.00    4.47   3.000
TIME     3  26.00    4.47   3.000
TIME     4  26.00    4.47   3.000
TIME     5  26.00    4.47   3.000
TIME     6  26.00    4.47   3.000
TIME     7  26.00    4.47   3.000
TIME     8  26.00    4.47   3.000
TIME     9  26.00    4.47   3.000
TIME    10  26.00    4.47   3.000
TIME    11  26.00    4.47   3.000
TIME    12  26.00    4.47   3.000
TIME    13  26.00    4.47   3.000
TIME    14  26.00    4.47   3.000
TIME    15  26.00    4.47   3.000
TIME    16  26.00    4.47   3.000
TIME    17  26.00    4.47   3.000
TIME    18  26.00    4.47   3.000
TIME    19  26.00    4.47   3.000
TIME    20  26.00    4.47   3.000
TIME    21  26.00    4.47   3.000
TIME    22  26.00    4.47   3.000
```

Appendix O

New fink.f Subroutine for Future DAFLOW/BLTM Applications in Texas

NOTE: New Parts of this Subroutine are Boxed Off...

```
C
C*****CALCULATE THE CONSTITUENT COEFFICIENTS************
C
      SUBROUTINE FINK (K,MX,J,NEQ,PV,PT,
     $ Q,A,W,XK,S,CR,IRC,NNN,LUOUT)
C
C     DEFINE VARIABLES:
C
C      NAME                                  PURPOSE
C     ------------------------------------------------------------
C      A   AVERAGE AREA OF THE SUBREACH [SQ M]
C      CR(E,L) REFERENCE (EQUILIBRIUM) CONCENTRATION IN EQUATION E
C             FOR CONSTITUENT L
C      J     TIME STEP
C      K     PARCEL NUMBER
C      MX    GRID JUST UPSTREAM OF PARCEL'S UPSTREAM BOUNDRY
C      NEQ   NUMBER OF EQUATIONS (CONSTITUENTS)
C      NBRCH NUMBER OF BRANCHES
C      NXSEC(N) NUMBER OF SUBREACHES IN BRANCH N
C      NNN BRANCH NUMBER
C      IENG input units: 0=metric, 1=English
C      IRC   CODE TO SET READ FOR NEW DATA EACH TIME STEP
C      PT(L,K) CONCENTRATION ON CONSTITUENT L IN PARCEL K
C      S(L)   SOURCE FLUX OF CONSTITUENT L [UNITS PER HOUR]
C      TE    Equilibrium water temperature, degrees C
C      V     Wind speed in meters/second
C      W      AVERAGE TOP WIDTH OF THE SUBREACH [M]
C      XK(L,LL) EXCHANGE COEFFICIENT FOR CONSTITUENT L DUE TO THE
C             CONCENTRATION OF CONSTITUENT LL
C     GROMAX MAXIMUM SPECIFIC GROWTH RATE OF ALGAE [PER DAY]
C     CKN NITROGEN HALF-SATURATION CONSTANT FOR ALGAE [MG/L]
C     CKP PHOSPHORUS HALF-SATURATION CONST. FOR ALGAE [MG/L]
C     EXCOEF= LIGHT EXTINCTION COEF.FOR ALGAE [PER METER]
C     CKL LIGHT HALF-SATURATION CONST.FOR ALGAE [LANGLEY/MIN]
C     SONET LIGHT INTENSITY [LANGLEY/MIN]
C     RESPRT ALGAE RESPIRATION RATE [PER DAY]
C     ALGSET(N,I)=LOCAL SETTLING RATE FOR ALGAE [M/DAY]
C     ALPHA1=FRACTION OF ALGAE WHICH IS NITROGEN
C     CKNH3(N,I)= RATE CONSTANT FOR BIOLOGICAL OXIDATION OF NH3
C           TO NO3 [PER DAY]
C     SNH3(N,I)=BENTHOS SOURCE RATE FOR NH3 [GM-N/DAY M]
C     CKNO2(N,I)=RATE CONSTANT FOR BIOLOGICAL OXIDAT OF NO2-NO3
C                [PER DAY]
C     ALPHA3=OXYGEN PRODUCTION PER UNIT OF ALGAE GROWTH
C     ALPHA2=FRACTION OF ALGAE BIOMASS THAT IS PHOSPHORUS
C     ALPHA4=OXYGEN UPTAKE PER UNIT OF ALGAE EXPIRED
C     ALPHA5=OXYGEN UPTAKE PER UNIT OF NH3 OXIDATION
C     ALPHA6=OXYGEN UPTAKE PER UNIT OF NO2 OXIDATION
C     SPHOS(N,I)=BENTHOS SOURCE RATE FOR PHOSPHORUS [GRAM/DAY M]
C     CK1(N,I)=CARBONACEOUS BOD DECAY RATE [PER DAY]
C     CK3(N,I)=CARBONACEOUS BOD SINK RATE [PER DAY]
C     CK2(N,I)=REAERATION RATE [PER DAY]
C     CK4(N,I)=BENTHOS CONSUMPTION OF OXYGEN [GM/DAY M]
C     CK5(N,I)=COLIFORM DIE-OFF RATE [PER DAY]
C     CK6(N,I)=ARBITRARY NON-CONSERVATIVE DECAY RATE [PER DAY]
C     A1=CONSTANT IN WIND FUNCTION [MM/DAY KPA] SUGEST 3.01
C     B1=MASS TRANSFER COEF [MM/DAY KPA(M/S)]  SUGEST 1.13
C
C
C     New terms for the Simulation of Organic Nitrogen,
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C      Organic Phosphorus, Suspended Solids, and a Toxic
C
C      CKORGN(N,I) or CKORGN(NNN,MX)=ORGANIC NITROGEN DECAY
C                                   RATE [PER DAY]
C      SORGN(N,I) OR SORGN(NNN,MK)=ORGANIC NITROGEN SOURCE
C                                   RATE [PER DAY]
C      CKORGP(N,I) or CKORGP(NNN,MX)=ORGANIC PHOSPHORUS DECAY
C                                     RATE  [PER DAY]
C      SORGP(N,I) OR SORGP(NNN,MK)=ORGANIC PHOSPHORUS SOURCE
C                                   RATE [PER DAY]
C      MINU=MINIMUM VELOCITY BELOW WHICH THE RESUSPENSION
C                  VELOCITY IS CONSTANT, ABOVE WHICH IT INCREASES
C                  BY APAR*U**NPAR [FT2/SEC] or [M2/SEC]
C      U=VELOCITY OF DISCHARGE IN THE GRID [FT2/SEC] or [M2/SEC]
C      VRES(N,I) OR VRES(NNN,MX)=RESUSPENSION VELOCITY OF
C                                   SUSPENDED SOLIDS [M/DAY]
C      APAR(N,I) OR APAR(NNN,MX)=VELOCITY PARAMETER
C      NPAR(N,I) OR NPAR(NNN,MX)=VELOCITY PARAMETER
C      VSET(N,I) OR VSET(NNN,MX)=SETTLING VELOCITY OF SUSPENDED
C                                SOLIDS [M/DAY]
C      CM2(N,I) OR CM2(NNN,MX)=CONCENTRATION OF SOLIDS IN THE
C                               BED SEDIMENT [MG/LITER]
C      CGAS=CONCENTRATION OF TOXIC IN THE GAS PHASE [MG/L]
C      HENRY=HENRY'S CONSTANT FOR THE TOXIC SUBSTANCE
C      FD1=FRACTION OF THE TOXIC DISSOLVED IN THE WATER
C      FD2=FRACTION OF THE TOXIC DISSOLVED IN THE SEDIMENT
C      FP1=FRACTION OF THE TOXIC IN SOLID PHASE IN THE WATER
C      FP2=FRACTION OF THE TOXIC IN SOLID PHASE IN THE SEDIMENT
C      CKPART(N,I) OR CKPART(NNN,MX)=PARTITIONING COEFFICIENT
C                                   [LITERS/KG]
C      CKKF(N,I) OR CKKF(NNN,MX)=DIFFUSION RATE BETWEEN WATER
C                                AND SEDIMENT [METER/DAY]
C      CKKD1(N,I) OR CKKD1(NNN,MX)=DECAY RATE [PER DAY]
C      CKKL(N,I) OR CKKL(NNN,MX)=VOLATILIZATION RATE [PER DAY]
C      CTOX2(N,I) OR CTOX2(NNN,MX)=CONCENTRATION OF THE TOXIC
C                                   SUBSTANCE IN THE SEDIMENTS
C                                   [MG/LITER]
C      CKPOROS(N,I) OR CKPOROS(NNN,MX)=POROSITY OF SEDIMENT
C                                   [LITER/LITER]
C
C
C***   BEGIN DIMENSIONING DEFINITION
C
C      NOBR     Maximum number of branches allowed in model
C      NOSC     Maximum number of cross sections (grids) allowed in
C                 branch
C      NOPR     Maximum number of parcels allowed in branch
C                (NOPR should be at least 20 + 2 times NOSC)
C      NOCO     Maximum number of constituents allowed
C
       INTEGER NOBR,NOSC,NOPR,NOCO
       PARAMETER (NOBR=75, NOSC=15, NOPR=100, NOCO=14)
C
C      + + + LOCAL VARIABLES + + +
       INTEGER I,I1,IRC,J,K,LUOUT,LUQ2,MX,NEQ,NNN,NXSEC(NOBR)
       REAL    CKNH3(NOBR,NOSC),CKNO2(NOBR,NOSC),ALGSET(NOBR,NOSC),
      #        SPHOS(NOBR,NOSC),SNH3(NOBR,NOSC),CK1(NOBR,NOSC),
      #        CK2(NOBR,NOSC),CK3(NOBR,NOSC),CK4(NOBR,NOSC),
      #        CK5(NOBR,NOSC),CK6(NOBR,NOSC),XK(NOCO,NOCO),
      #        S(NOCO),CR(NOCO,NOCO),PT(NOCO,NOPR)
       COMMON NXSEC,NBRCH,IENG
       SAVE CKNH3,CKNO2,ALGSET,SPHOS,SNH3,GROMAX,RESPRT,
      1     CKN,CKP,CKL,EXCOEF,SONET,A1,B1,TE,V
```

```
     2  ALPHA1,ALPHA2,ALPHA3,ALPHA4,ALPHA5,ALPHA6
     3  CK1,CK2,CK3,CK4,CK5,CK6
      IF(IRC.NE.1)GO TO 3
      IF(J.NE.1)GO TO 2
      LUQ2=19
      OPEN(LUQ2,FILE='qual2.in')
      WRITE(LUOUT,6000)
 6000 FORMAT(/,30X,'Reaction Kinetics')
      READ(LUQ2,3305)A1,B1,GROMAX,CKN,CKP,EXCOEF,CKL,RESPRT
      WRITE(LUOUT,6001)
 6001 FORMAT(/,' TEMPERATURE')
      WRITE(LUOUT,6002)A1,B1
 6002 FORMAT('      WIND FUNCTION=',F6.2,'+',F6.2,'V [MM/DAY KPA
     $WHEN V IN M/S].')
      WRITE(LUOUT,*)'ALGAE'
      WRITE(LUOUT,6003)GROMAX
 6003 FORMAT('      MAXIMUM SPECIFIC GROWTH RATE=',F7.3,' [PER
     &DAY].')
      WRITE(LUOUT,6004)RESPRT
 6004 FORMAT('      ALGAE RESPIRATION RATE      =',F7.3,' [PER
     &DAY].')
      WRITE(LUOUT,6005)CKN
 6005 FORMAT('      NITROGEN HALF-SAT. CONSTANT =',F7.3,'
     &[MGL/L].')
      WRITE(LUOUT,6006)CKP
 6006 FORMAT('      PHOSPHORUS HALF-SAT. CONST. =',F7.3,'
     &[MGL/L].')
      WRITE(LUOUT,6007)EXCOEF
 6007 FORMAT('      LIGHT EXTINCTION COEF.      =',F7.3,' [PER
     &METER].')
      READ(LUQ2,3305)ALPHA1,ALPHA2,ALPHA3,ALPHA4,ALPHA5,ALPHA6
 3305 FORMAT(10X,10F7.3)
      WRITE(LUOUT,6008)ALPHA1
 6008 FORMAT('      FRACTION OF NITROGEN/ALGAE  =',F7.3,' .')
      WRITE(LUOUT,6009)ALPHA2
 6009 FORMAT('      FRACTION PHOSPHORUS/ALGAE   =',F7.3,' .')
      WRITE(LUOUT,6010)ALPHA3
 6010 FORMAT('      OXYGEN PRODUCTION/GROWTH    =',F7.3,' .')
      WRITE(LUOUT,6011)ALPHA4
 6011 FORMAT('      OXYGEN UPTAKE/EXPIRATION    =',F7.3,' .')
      WRITE(LUOUT,6012)ALPHA5
 6012 FORMAT('      OXYGEN USED TO OXIDIZE NH3  =',F7.3,' .')
      WRITE(LUOUT,6013)ALPHA6
 6013 FORMAT('      OXYGEN USED TO OXIDIZE NO2  =',F7.3,' .')
      WRITE(LUOUT,6014)
 6014 FORMAT('   BR GRID    ALGSET NH3-DECAY BNTHO-NH3 NO2-DECAY
     &BNTHO-PHO        K1  BOD-SINK        K2 BNTHO-OXY  COLI-DIE
     &ARB-RATE')
      WRITE(LUOUT,6015)
 6015 FORMAT(10X,'     M/DAY   PER DAY  GM/DAY M   PER DAY
     &GM/DAY M   PER DAY   PER DAY   PER DAY  GM/DAY M   PER DAY
     &PER DAY')
      DO 1 N=1,NBRCH
       I1=NXSEC(N)-1
       DO 1 I=1,I1
        READ(LUQ2,3305)ALGSET(N,I),CKNH3(N,I),SNH3(N,I),CKNO2(N,I),
     &  SPHOS(N,I)
        READ(LUQ2,3305)CK1(N,I),CK2(N,I),CK3(N,I),CK4(N,I),CK5(N,I),
     &     CK6(N,I)
      IF(I.EQ.1)WRITE(LUOUT,6016)N,I,ALGSET(N,I),CKNH3(N,I),SNH3(N,I),
     $ CKNO2(N,I),SPHOS(N,I),CK1(N,I),CK3(N,I),CK2(N,I),CK4(N,I),
     % CK5(N,I),CK6(N,I)
 6016 FORMAT(2I5,11F10.3)
      IF(I.GT.1)WRITE(LUOUT,6017)I,ALGSET(N,I),CKNH3(N,I),SNH3(N,I),
```

```
     $ CKNO2(N,I),SPHOS(N,I),CK1(N,I),CK3(N,I),CK2(N,I),CK4(N,I),
     % CK5(N,I),CK6(N,I)
 6017 FORMAT(5X,I5,11F10.3)
    1 CONTINUE
    2 CONTINUE
      IF(IRC.NE.1)GO TO 3
      READ(LUQ2,3305)TE,V,SONET
      WRITE(LUOUT,*)J,TE,V,SONET
    3 CONTINUE
C
C     TEMPERATURE (SIMPLIFIED TEMPERATURE ALGORITHM)
C
      IF(IENG.EQ.0)THEN
       AL=0.3048*0.3048*A
       WL=0.3048*W
       SAL=PV*0.3048*0.3048*WL/AL
      ELSE
       AL=A
       WL=W
       SAL=PV*WL/AL
      END IF
      CPR= 100.0
      SIG= 1.171E-7/24.0
      AL= 595.9-0.545*PT(1,K)
      PSI= (A1+B1*V)/(24.0*10.0)
      TAB= PT(1,K)+273.16
      DFT=1.1532E11*EXP(-4271.1/(PT(1,K)+242.63))
     1             /((PT(1,K)+242.63)**2)
      XKX= 4.0*0.97*SIG*(TAB**3)+AL*PSI*(DFT+0.06)
      XK(1,1)=0.0
      IF(A.GT.0.0)XK(1,1)= -XKX*WL/(AL*CPR)
      CR(1,1)=TE
C
C     ALGAE
C
      XK(2,2)=0.0
      IF(A.LE.0.0)GO TO 5
      DEXCOF=EXCOEF*AL/WL
      GRO=GROMAX*1.047**(PT(1,K)-20.0)
      IGRO=IFIX(PT(5,K)+CKN)
      IF(IGRO.NE.0)GRO=GRO*(PT(5,K)/(PT(5,K)+CKN))
     1          *(PT(6,K)/(PT(6,K)+CKP))*(1.0/DEXCOF)
     2          *LOG((CKL+SONET)/(CKL+SONET*EXP(-DEXCOF)))
C
      TRSPRT=RESPRT*1.047**(PT(1,K)-20.0)
      XK(2,2)=(GRO-TRSPRT-ALGSET(NNN,MX)*WL/AL)/24.0
C
C     AMMONIA NITROGEN
C
    5 XK(3,11)=XK(11,11)
      XK(3,3)=-(CKNH3(NNN,MX)*1.047**(PT(1,K)-20.0))/24.0
      IF(PT(8,K).GT.0.0)XK(3,3)=XK(3,3)*(1.0-EXP(-PT(8,K)))
      IF(PT(8,K).LT.0.0)XK(3,3)=0.0
      IF(A.GT.0.0)S(3)=SNH3(NNN,MX)/(AL*24.0)
C
C     NITRITE NITROGEN
C
      XK(4,3)=-XK(3,3)
      XK(4,4)=0.0
      IF(A.GT.0.0)XK(4,4)=-CKNO2(NNN,MX)*1.047**(PT(1,K)-
     &      20.0)/24.0
      IF(PT(8,K).GT.0.0)XK(4,4)=XK(4,4)*(1.0-EXP(-PT(8,K)))
      IF(PT(8,K).LT.0.0) XK(4,4)=0.0
```

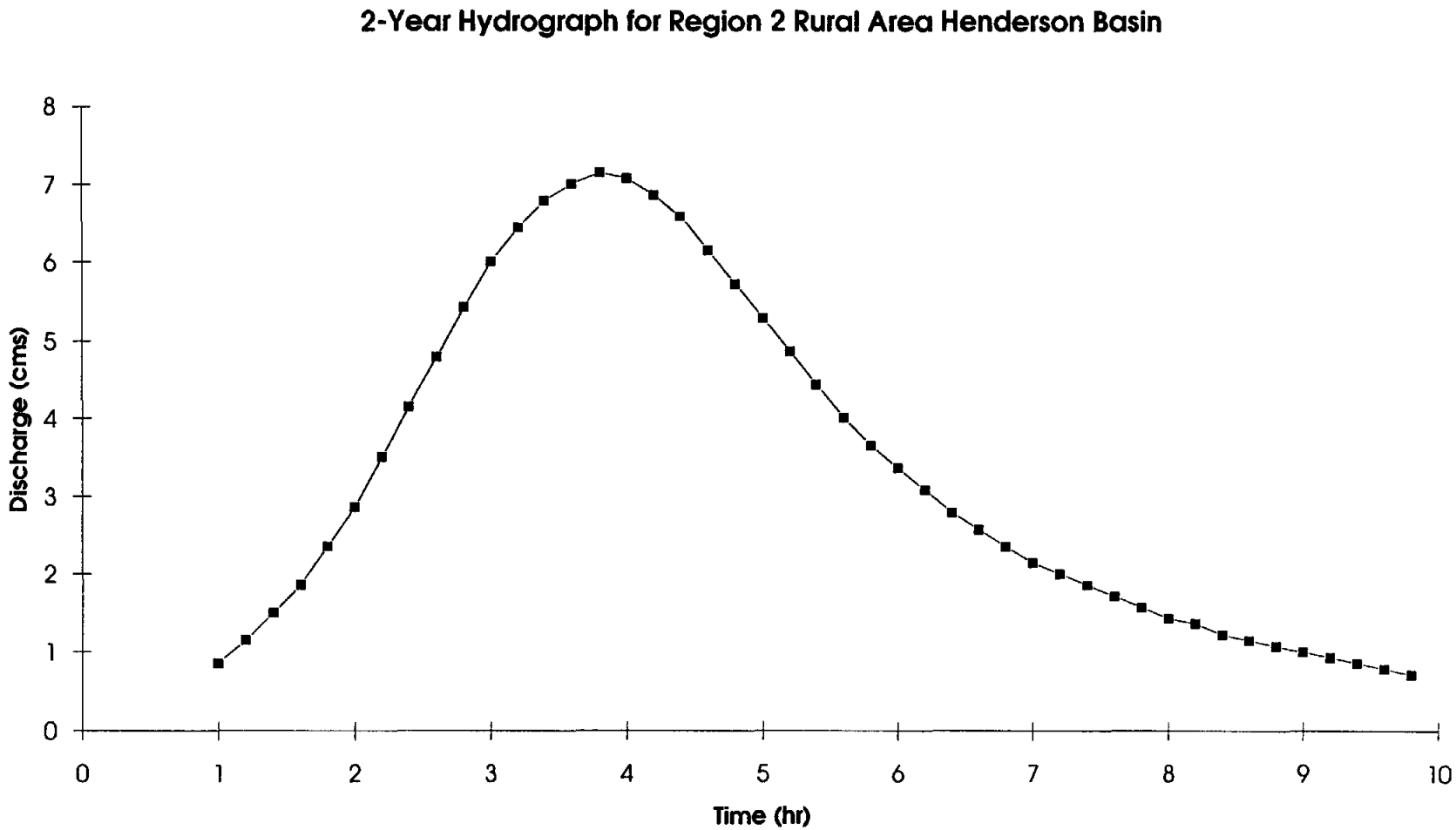
```
C
C     NITRATE NITROGEN
C
      XK(5,2)=-ALPHA1*GRO/24.0
      XK(5,4)=-XK(4,4)
C
C     DISSOLVED ORTHOPHOSPHATE
C
      XK(6,2)=-ALPHA2*GRO/24.0
      S(6)=0.0
      IF(A.GT.0.0)S(6)=SPHOS(NNN,MX)/(AL*24.0)
C
C     BOD
C
      TCK1=CK1(NNN,MX)*1.047**(PT(1,K)-20.0)
      IF(PT(8,K).GT.0.0)TCK1=TCK1*(1.0-EXP(-PT(8,K)))
      IF(PT(8,K).LT.0.0)TCK1=0.0
      XK(7,7)=-(TCK1+CK3(NNN,MX))/24.0
C
C     DISSOLVED OXYGEN
C
      PTF=PT(1,K)*1.8+32.0
      CR(8,8)=24.89+PTF*(-0.426+PTF*(0.00373-PTF*0.0000133))
      XK(8,8)=-(CK2(NNN,MX)*1.0159**(PT(1,K)-20.0))/24.0
      XK(8,7)=-TCK1/24.0
      XK(8,3)=ALPHA5*XK(3,3)
      XK(8,2)=(ALPHA3*GRO-ALPHA4*TRSPRT)/24.0
      XK(8,4)= ALPHA6*XK(4,4)
      S(8)=0.0
      IF(A.GT.0.0)S(8)=-CK4(NNN,MX)/(24.0*AL)
C
C     COLIFORM
C
      XK(9,9)=0.0
      IF(A.GT.0.0)XK(9,9)=-CK5(NNN,MX)*1.047**(PT(1,K)-20.0)/24.0
C
C     ARBITRARY NONCONSERVATIVE CONSTITUENT
C
      XK(10,10)=-(CK6(NNN,MX)*1.047**(PT(1,K)-20.0))/24.0
      IRC=0
      RETURN
      END
C
C     ORGANIC NITROGEN

C
      XK(11,2)=ALPHA1*TRSPRT/24.0
      XK(11,11)=-CKORGN(NNN,MX)*1.047**(PT(1,K)-20.0))/24.0
      S(11)=SORGN(NNN,MX)/(AL*24.0)
C
C     ORGANIC PHOSPHORUS
C
      XK(12,2)=ALPHA2*TRSPRT/24.0
      XK(12,12)=-CKORGP(NNN,MX)*1.047**(PT(1,K)-20.0))/24.0
      S(12)=SORGP(NNN,MX)/(AL*24.0)
C
C     SUSPENDED SOLIDS
C
      U=Q/WL
      IF(U.GE.MINU)VRES(NNN,MX)=VRES(NNN,MX)
     &      +APAR(NNN,MX)*U**NPAR(NNN,MX)
      IF(U.LT.MINU)VRES(NNN,MX)=VRES(NNN,MX)
      XK(13,13)=-VSET(NNN,MX)*WL/AL/24.0
      S(13)=VRES(NNN,MX)*CM2(NNN,MX)*WL/AL/24.0
```

```
C
C     TOXIC SUBSTANCE
C
      TOXSAT=CGAS/HENRY
      FD1=1/(1+CKPART(NNN,MX)*PT(13,K))
      FD2=1/(1+CKPART(NNN,MX)*CM2(NNN,MX)
      FP1=(CKPART*PT(13,K))/(1+CKPART(NNN,MX)*PT(13,K))
      FP2=(CKPART*CM2(NNN,MX))/(1+CKPART(NNN,MX)*CM2(NNN,MX)
      XK(14,14)=-CKKF(NNN,MX)*AL*FD1-CKKD1(NNN,MX)*FD1
     &                -CKKL(NNN,MX)*AL*FD1
      S(14)=CKKF(NNN,MX)*AL*FD2*CTOX2(NNN,MX)/CKPOROS(NNN,MX)
     &                +CKKL(NNN,MX)*AL*TOXSAT
     &                +VRES(NNN,MX)*AL*FP2*CTOX2(NNN,MX)
```

Appendix P

Example Hydrograph for Unsteady-State Simulation


2-Year Hydrograph for Region 2 Rural Area Henderson Basin
Discharge (cms)
0
1
2
3
4
5
6
7
8
Time (hr)
0
1
2
3
4
5
6
7
8
9
10

Appendix Q

FLOW.IN for Unsteady-State Application of DAFLOW

flows on the angelina-steady state

No. of Branches	67	*
Internal Junctions	33	*
Time Steps Modeled	1000	*
Model Starts	0	time steps after midnight.
Output Given Every	1	Time Steps in FLOW.OUT.
0=Metric,1=English	0	*
Time Step Size	1.000	Hours.
Peak Discharge	10.00	*

Branch 1 has 2 xsects & routes 1.00 of flow at JNCT 34 To JNCT 1

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.224	2.57	0.500	0.00	96.9	6.7	0.100
2	0.311	0							

Branch 2 has 4 xsects & routes 1.00 of flow at JNCT 35 To JNCT 2

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
2	0.062	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
3	0.425	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
4	0.435	0							

Branch 3 has 4 xsects & routes 1.00 of flow at JNCT 36 To JNCT 2

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
2	0.600	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
3	0.610	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
4	0.621	0							

Branch 4 has 2 xsects & routes 1.00 of flow at JNCT 2 To JNCT 1

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
2	8.699	0							

Branch 5 has 4 xsects & routes 1.00 of flow at JNCT 1 To JNCT 3

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.224	2.57	0.500	0.00	96.9	6.7	0.100
2	0.010	0	0.224	2.57	0.500	0.00	96.9	6.7	0.100
3	7.146	0	0.230	3.07	0.500	0.00	97.7	6.8	0.100
4	12.74	0							

Branch 6 has 3 xsects & routes 1.00 of flow at JNCT 37 To JNCT 3

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.0001	6.21	0.500	0.00	1.00	9.9	0.100
2	0.6200	0	0.0001	6.21	0.500	0.00	1.00	9.9	0.100
3	2.485	0							

Branch 7 has 5 xsects & routes 1.00 of flow at JNCT 3 To JNCT 4

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.2301	3.07	0.500	0.00	97.75	6.8	0.100
2	0.005	0	0.2301	3.07	0.500	0.00	97.75	6.8	0.100
3	0.010	0	0.2511	3.07	0.500	0.00	105.74	6.8	0.100
4	3.107	0	0.1881	3.60	0.500	0.00	70.76	7.8	0.100
5	9.94	1							

Branch 8 has 2 xsects & routes 1.00 of flow at JNCT 40 To JNCT 6

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.0001	6.21	0.500	0.00	1.00	9.9	0.100
2	0.621	0							

Branch 9 has 2 xsects & routes 1.00 of flow at JNCT 6 To JNCT 4

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.0001	6.21	0.500	0.00	1.00	9.9	0.100
2	14.912	0							

Branch 10 has 2 xsects & routes 1.00 of flow at JNCT 5 To JNCT 6

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
2	18.64	0							

Branch 11 has 2 xsects & routes 1.00 of flow at JNCT 38 To JNCT 5

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
2	0.621	0							

Branch 12 has 3 xsects & routes 1.00 of flow at JNCT 39 To JNCT 5

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100

```
  2  .062      0  0.000      6.21      0.500      0.00      1.00        9.9 0.100
  3  1.18      0
Branch 13 has  4 xsects & routes 1.00 of flow at JNCT  4 To JNCT  7
Grd R Mile  IOUT  Disch        A1        A2        AO        DF         W1    W2
  1  0.000     0  0.1882     3.60      0.500     0.00      70.80       7.9 0.100
  2  0.005     0  0.1882     3.60      0.500     0.00      70.80       7.9 0.100
  3  0.010     0  0.1492     3.60      0.500     0.00      70.80       7.9 0.100
  4  3.728     0
Branch 14 has  5 xsects & routes 1.00 of flow at JNCT  8 To JNCT  7
Grd R Mile  IOUT  Disch        A1        A2        AO        DF         W1    W2
  1  0.000     0  0.192      6.21      0.500     0.00      56.97       9.9 0.100
  2  0.010     0  0.195      6.21      0.500     0.00      57.77       9.9 0.100
  3  0.621     0  0.195      6.21      0.500     0.00      57.77       9.9 0.100
  4  7.394     0  0.195      6.21      0.500     0.00      57.77       9.9 0.100
  5  13.048    0
Branch 15 has  2 xsects & routes 1.00 of flow at JNCT 41 To JNCT  8
Grd R Mile  IOUT  Disch        A1        A2        AO        DF         W1    W2
  1  0.000     0  0.192      6.21      0.500     0.00      57.00       9.9 0.100
  2  0.621     0
Branch 16 has  2 xsects & routes 1.00 of flow at JNCT  9 To JNCT  8
Grd R Mile  IOUT  Disch        A1        A2        AO        DF         W1    W2
  1  0.000     0  0.0000     6.21      0.500     0.00      1.00        9.9 0.100
  2  3.107     0
Branch 17 has  2 xsects & routes 1.00 of flow at JNCT 43 To JNCT  9
Grd R Mile  IOUT  Disch        A1        A2        AO        DF         W1    W2
  1  0.000     0  0.000      6.21      0.500     0.00      1.00        9.9 0.100
  2  0.621     0
Branch 18 has  2 xsects & routes 1.00 of flow at JNCT 42 To JNCT  9
Grd R Mile  IOUT  Disch        A1        A2        AO        DF         W1    W2
  1  0.000     0  0.0000     6.21      0.500     0.00      1.00        9.9 0.100
  2  1.740     0
Branch 19 has  5 xsects & routes 1.00 of flow at JNCT  7 To JNCT 10
Grd R Mile  IOUT  Disch        A1        A2        AO        DF         W1    W2
  1  0.000     0  0.3442     3.60      0.500     0.00     121.89       7.9 0.100
  2  0.005     1  0.3442     3.60      0.500     0.00     121.89       7.9 0.100
  3  0.010     0  0.3202     3.60      0.500     0.00     114.22       7.9 0.100
  4  3.732     0  0.3972     3.42      0.500     0.00     126.88       8.6 0.100
  5  9.322     0
Branch 20 has  2 xsects & routes 1.00 of flow at JNCT 60 To JNCT 25
Grd R Mile  IOUT  Disch        A1        A2        AO        DF         W1    W2
  1  0.000     0  0.106      1.67      0.500     0.00      92.48       3.6 0.100
  2  0.621     0
Branch 21 has  3 xsects & routes 1.00 of flow at JNCT 26 To JNCT 25
Grd R Mile  IOUT  Disch        A1        A2        AO        DF         W1    W2
  1  0.000     0  0.00       1.67      0.500     0.00      1.00        3.6 0.100
  2  0.621     0  0.00       1.67      0.500     0.00      1.00        3.6 0.100
  3  3.107     0
Branch 22 has  3 xsects & routes 1.00 of flow at JNCT 58 To JNCT 26
Grd R Mile  IOUT  Disch        A1        A2        AO        DF         W1    W2
  1  0.000     0  0.000      6.21      0.500     0.00      1.00        9.9 0.100
  2  0.0621    0  0.000      6.21      0.500     0.00      1.00        9.9 0.100
  3  0.808     0
Branch 23 has  3 xsects & routes 1.00 of flow at JNCT 59 To JNCT 26
Grd R Mile  IOUT  Disch        A1        A2        AO        DF         W1    W2
  1  0.000     0  0.00       1.67      0.500     0.00      1.00        3.6 0.100
  2  0.062     0  0.00       1.67      0.500     0.00      1.00        3.6 0.100
  3  0.684     0
Branch 24 has  5 xsects & routes 1.00 of flow at JNCT 25 To JNCT 23
Grd R Mile  IOUT  Disch        A1        A2        AO        DF         W1    W2
  1  0.000     0  0.106      1.67      0.500     0.00      92.43       3.6 0.100
  2  0.010     0  0.121      1.67      0.500     0.00     104.12       3.6 0.100
  3  1.864     0  0.121      1.67      0.500     0.00     104.12       3.6 0.100
  4  1.988     0  0.121      1.67      0.500     0.00     104.12       3.6 0.100
  5  3.107     0
Branch 25 has  2 xsects & routes 1.00 of flow at JNCT 24 To JNCT 23
Grd R Mile  IOUT  Disch        A1        A2        AO        DF         W1    W2
```

1	0.000	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
2	9.320	0							

Branch 26 has 2 xsects & routes 1.00 of flow at JNCT 57 To JNCT 24

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
2	0.621	0							

Branch 27 has 3 xsects & routes 1.00 of flow at JNCT 56 To JNCT 24

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
2	0.0621	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
3	0.7456	0							

Branch 28 has 5 xsects & routes 1.00 of flow at JNCT 55 To JNCT 22

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.142	2.39	0.500	0.00	108.77	4.0	0.100
2	0.010	0	0.159	2.39	0.500	0.00	120.42	4.0	0.100
3	0.1864	0	0.159	2.39	0.500	0.00	120.42	4.0	0.100
4	0.190	0	0.159	2.39	0.500	0.00	120.42	4.0	0.100
5	1.243	0							

Branch 29 has 3 xsects & routes 1.00 of flow at JNCT 54 To JNCT 22

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
2	0.0621	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
3	0.559	0							

Branch 30 has 3 xsects & routes 1.00 of flow at JNCT 22 To JNCT 21

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.159	2.39	0.500	0.00	120.42	4.0	0.100
2	0.010	0	0.133	2.39	0.500	0.00	102.54	4.0	0.100
3	3.728	0							

Branch 31 has 2 xsects & routes 1.00 of flow at JNCT 52 To JNCT 20

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
2	0.621	0							

Branch 32 has 2 xsects & routes 1.00 of flow at JNCT 20 To JNCT 21

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
2	0.621	0							

Branch 33 has 3 xsects & routes 1.00 of flow at JNCT 53 To JNCT 20

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
2	0.062	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
3	1.243	0							

Branch 34 has 3 xsects & routes 1.00 of flow at JNCT 21 To JNCT 19

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.133	2.39	0.500	0.00	102.54	4.0	0.100
2	0.010	0	0.120	2.39	0.500	0.00	93.48	4.0	0.100
3	1.864	0							

Branch 35 has 2 xsects & routes 1.00 of flow at JNCT 51 To JNCT 19

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
2	1.305	0							

Branch 36 has 3 xsects & routes 1.00 of flow at JNCT 19 To JNCT 18

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.120	2.39	0.500	0.00	93.48	4.0	0.100
2	2.796	0	0.120	2.39	0.500	0.00	93.48	4.0	0.100
3	4.971	0							

Branch 37 has 2 xsects & routes 1.00 of flow at JNCT 49 To JNCT 17

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
2	0.621	0							

Branch 38 has 2 xsects & routes 1.00 of flow at JNCT 17 To JNCT 18

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
2	4.971	0							

Branch 39 has 3 xsects & routes 1.00 of flow at JNCT 50 To JNCT 17

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100

2	0.0621	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
3	0.435	0							

Branch 40 has 2 xsects & routes 1.00 of flow at JNCT 18 To JNCT 16

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.120	2.39	0.500	0.00	93.48	4.0	0.100
2	8.077	0							

Branch 41 has 3 xsects & routes 1.00 of flow at JNCT 23 To JNCT 16

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.121	1.67	0.500	0.00	104.12	3.6	0.100
2	0.010	0	0.124	1.67	0.500	0.00	106.44	3.6	0.100
3	3.728	0							

Branch 42 has 3 xsects & routes 1.00 of flow at JNCT 16 To JNCT 14

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.244	2.41	0.500	0.00	140.04	6.2	0.100
2	9.942	0	0.244	3.64	0.500	0.00	140.04	5.0	0.100
3	10.563	0							

Branch 43 has 3 xsects & routes 1.00 of flow at JNCT 47 To JNCT 15

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
2	0.062	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
3	0.745	0							

Branch 44 has 2 xsects & routes 1.00 of flow at JNCT 48 To JNCT 15

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
2	0.621	0							

Branch 45 has 2 xsects & routes 1.00 of flow at JNCT 15 To JNCT 14

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	1.00	9.9	0.100
2	9.321	0							

Branch 46 has 4 xsects & routes 1.00 of flow at JNCT 14 To JNCT 11

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.244	3.64	0.500	0.00	140.04	5.0	0.100
2	0.010	0	0.251	3.64	0.500	0.00	143.65	5.0	0.100
3	4.3495	0	0.251	3.64	0.500	0.00	143.65	5.0	0.100
4	9.942	0							

Branch 47 has 4 xsects & routes 1.00 of flow at JNCT 44 To JNCT 12

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	2.34	0.500	0.00	1.00	7.1	0.100
2	0.062	0	0.000	2.34	0.500	0.00	1.00	7.1	0.100
3	2.796	0	0.000	2.34	0.500	0.00	1.00	7.1	0.100
4	5.282	0							

Branch 48 has 3 xsects & routes 1.00 of flow at JNCT 45 To JNCT 13

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	2.34	0.500	0.00	1.00	7.1	0.100
2	0.062	0	0.000	2.34	0.500	0.00	1.00	7.1	0.100
3	.3107	0							

Branch 49 has 2 xsects & routes 1.00 of flow at JNCT 46 To JNCT 13

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.017	2.34	0.500	0.00	9.06	7.1	0.100
2	0.621	0							

Branch 50 has 2 xsects & routes 1.00 of flow at JNCT 13 To JNCT 12

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.017	2.34	0.500	0.00	9.06	7.1	0.100
2	8.077	0							

Branch 51 has 4 xsects & routes 1.00 of flow at JNCT 12 To JNCT 11

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.017	3.21	0.500	0.00	12.576	5.1	0.100
2	1.864	0	0.065	3.21	0.500	0.00	42.068	5.1	0.100
3	2.175	0	0.065	3.21	0.500	0.00	42.068	5.1	0.100
4	3.728	0							

Branch 52 has 3 xsects & routes 1.00 of flow at JNCT 11 To JNCT 10

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.316	6.94	0.500	0.00	120.76	7.3	0.100
2	15.534	0	0.316	6.94	0.500	0.00	120.76	7.3	0.100
3	21.127	0							

Branch 53 has 10 xsects & routes 1.00 of flow at JNCT 10 To JNCT 27

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	1	0.7132	4.05	0.500	0.00	337.10	5.5	0.100
2	0.100	1	0.8192	4.05	0.500	0.00	381.87	5.5	0.100
3	8.699	1	0.8912	3.86	0.500	0.00	369.51	6.1	0.100
4	18.517	1	0.8912	3.86	0.500	0.00	369.51	6.1	0.100
5	18.64	1	0.9012	9.43	0.500	0.00	262.07	8.7	0.100
6	32.31	1	0.9062	9.71	0.500	0.00	166.84	13.7	0.100
7	47.22	1	0.9172	10.75	0.500	0.00	214.88	10.8	0.100
8	58.41	1	0.9182	12.05	0.500	0.00	251.73	9.2	0.100
9	58.68	1	0.9182	12.05	0.500	0.00	251.73	9.2	0.100
10	58.72	1							

Branch 54 has 2 xsects & routes 1.00 of flow at JNCT 28 To JNCT 27

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	1	0.000	6.21	0.500	0.00	1.00	9.9	0.100
2	6.2136	1							

Branch 55 has 2 xsects & routes 1.00 of flow at JNCT 62 To JNCT 28

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	1	0.000	6.84	0.500	0.00	1.00	11.0	0.100
2	0.621	1							

Branch 56 has 3 xsects & routes 1.00 of flow at JNCT 61 To JNCT 28

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	1	0.000	6.21	0.500	0.00	1.00	9.9	0.100
2	0.0621	1	0.000	6.21	0.500	0.00	1.00	9.9	0.100
3	0.7456	1							

Branch 57 has 5 xsects & routes 1.00 of flow at JNCT 27 To JNCT 29

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	1	0.9182	12.05	0.500	0.00	251.73	9.2	0.100
2	0.010	1	0.9242	12.05	0.500	0.00	253.21	9.2	0.100
3	0.020	1	1.0022	12.05	0.500	0.00	272.40	9.2	0.100
4	0.311	1	1.0022	12.05	0.500	0.00	272.40	9.2	0.100
5	0.621	1							

Branch 58 has 3 xsects & routes 1.00 of flow at JNCT 64 To JNCT 31

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	1.000	9.9	0.100
2	0.0621	0	0.000	6.21	0.500	0.00	1.000	9.9	0.100
3	0.3107	0							

Branch 59 has 2 xsects & routes 1.00 of flow at JNCT 31 To JNCT 30

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	1.000	9.9	0.100
2	1.243	0							

Branch 60 has 2 xsects & routes 1.00 of flow at JNCT 63 To JNCT 31

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.000	6.21	0.500	0.00	1.000	9.9	0.100
2	.3107	0							

Branch 61 has 2 xsects & routes 1.00 of flow at JNCT 65 To JNCT 30

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.025	0.92	0.500	0.00	31.20	2.9	0.100
2	.3107	0							

Branch 62 has 13 xsects & routes 1.00 of flow at JNCT 30 To JNCT 29

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	0.025	0.92	0.500	0.00	31.20	2.9	0.100
2	3.106	0	0.025	0.92	0.500	0.00	31.20	2.9	0.100
3	6.524	0	0.025	1.39	0.500	0.00	18.73	4.8	0.100
4	8.555	0	0.250	1.39	0.500	0.00	148.77	4.8	0.100
5	8.575	0	0.250	1.39	0.500	0.00	148.77	4.8	0.100
6	8.699	0	0.141	2.37	0.500	0.00	45.96	9.3	0.100
7	13.981	0	0.141	2.07	0.500	0.00	47.12	9.1	0.100
8	13.983	0	0.183	2.07	0.500	0.00	59.58	9.1	0.100
9	16.963	0	0.183	2.07	0.500	0.00	59.58	9.1	0.100
10	17.088	0	0.183	2.34	0.500	0.00	113.94	4.8	0.100
11	23.301	0	0.183	2.67	0.500	0.00	71.58	7.6	0.100
12	23.550	0	0.183	2.67	0.500	0.00	71.58	7.6	0.100
13	23.612	0							

Branch 63 has 3 xsects & routes 1.00 of flow at JNCT 29 To JNCT 32

Grd	R Mile	IOUT	Disch	A1	A2	AO	DF	W1	W2
1	0.000	0	1.0022	22.73	0.500	0.00	229.65	13.3	0.100

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  2  0.010      0  1.2442    22.73      0.500      0.00      229.65     13.3 0.100
  3  0.3107     0
Branch 64 has  4 xsects & routes 1.00 of flow at JNCT 66 To JNCT 32
Grd R Mile   IOUT  Disch        A1         A2         AO         DF         W1     W2
  1  0.000      0  0.000      6.21      0.500      0.00       1.00       9.9 0.100
  2  0.0621     0  0.000      6.21      0.500      0.00       1.00       9.9 0.100
  3  0.746      0  0.000      6.21      0.500      0.00       1.00       9.9 0.100
  4  3.231      0
Branch 65 has  4 xsects & routes 1.00 of flow at JNCT 32 To JNCT 33
Grd R Mile   IOUT  Disch        A1         A2         AO         DF         W1     W2
  1  0.000      0  1.2442    22.73      0.500      0.00      229.65     13.3 0.100
  2  0.010      0  1.3022    22.73      0.500      0.00      239.26     13.3 0.100
  3  0.373      0  1.3022    22.73      0.500      0.00      239.26     13.3 0.100
  4  0.932      0
Branch 66 has  3 xsects & routes 1.00 of flow at JNCT 67 To JNCT 33
Grd R Mile   IOUT  Disch        A1         A2         AO         DF         W1     W2
  1  0.000      0  0.0429     2.67      0.500      0.00       19.07      7.6 0.100
  2  0.062      0  0.0429     2.67      0.500      0.00       19.07      7.6 0.100
  3  0.932      0
Branch 67 has  6 xsects & routes 1.00 of flow at JNCT 33 To JNCT 68
Grd R Mile   IOUT  Disch        A1         A2         AO         DF         W1     W2
  1  0.000      0  1.3443    23.26      0.500      0.00      245.96     12.5 0.300
  2  0.932      0  1.3443    18.52      0.500      0.00      468.97      6.6 0.300
  3  0.994      0  1.3443    18.52      0.500      0.00      468.97      6.6 0.300
  4  2.796      0  1.3443    25.00      0.500      0.00      166.56     18.5 0.300
  5  5.282      0  1.3443    25.00      0.500      0.00      166.56     18.5 0.300
  6  6.835      0
for Time     1 NBC  36 *
 Branch      1 Grid  1 Q=     0.2240      *
 Branch      5 Grid  3 Q=     0.0060      *
 Branch      6 Grid  1 Q=     0.0001      *
 Branch      7 Grid  3 Q=     0.0210      *
 Branch      7 Grid  4 Q=    -0.0630      *
 Branch      8 Grid  1 Q=     0.0001      *
 Branch     13 Grid  3 Q=    -0.0390      *
 Branch     14 Grid  2 Q=     0.0030      *
 Branch     15 Grid  1 Q=     0.1920      *
 Branch     19 Grid  3 Q=    -0.0240      *
 Branch     19 Grid  4 Q=     0.0770      *
 Branch     20 Grid  1 Q=     0.1060      *
 Branch     24 Grid  2 Q=     0.0150      *
 Branch     28 Grid  1 Q=     0.1420      *
 Branch     28 Grid  2 Q=     0.0170      *
 Branch     30 Grid  2 Q=    -0.0260      *
 Branch     34 Grid  2 Q=    -0.0130      *
 Branch     41 Grid  2 Q=     0.0030      *
 Branch     46 Grid  2 Q=     0.0070      *
 Branch     49 Grid  1 Q=     0.0170      *
 Branch     51 Grid  2 Q=     0.0480      *
 Branch     53 Grid  2 Q=     0.1060      *
 Branch     53 Grid  3 Q=     0.0720      *
 Branch     53 Grid  4 Q=     0.0100      *
 Branch     53 Grid  5 Q=     0.0050      *
 Branch     53 Grid  6 Q=     0.0110      *
 Branch     53 Grid  8 Q=     0.0010      *
 Branch     57 Grid  2 Q=     0.0060      *
 Branch     57 Grid  3 Q=     0.0780      *
 Branch     61 Grid  1 Q=     0.0250      *
 Branch     62 Grid  4 Q=     0.2250      *
 Branch     62 Grid  5 Q=    -0.1090      *
 Branch     62 Grid  8 Q=     0.0420      *
 Branch     63 Grid  2 Q=     0.0590      *
 Branch     65 Grid  2 Q=     0.0580      *
 Branch     66 Grid  1 Q=     0.0429      *
for time     2  NBC   0 *
for time     3  NBC   0 *
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for time    4  NBC  0 *
for time    5  NBC  0 *
for time    6  NBC  0 *
for time    7  NBC  0 *
for time    8  NBC  0 *
for time    9  NBC  0 *
for time   10  NBC  0 *
for time   11  NBC  0 *
for time   12  NBC  0 *
for time   13  NBC  0 *
for time   14  NBC  0 *
for time   15  NBC  0 *
for time   16  NBC  0 *
for time   17  NBC  0 *
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for time   19  NBC  0 *
for time   20  NBC  0 *
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for time   22  NBC  0 *
for time   23  NBC  0 *
for time   24  NBC  0 *
for time   25  NBC  0 *
for time   26  NBC  0 *
for time   27  NBC  0 *
for time   28  NBC  0 *
for time   29  NBC  0 *
for time   30  NBC  0 *
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for time   35  NBC  0 *
for time   36  NBC  0 *
for time   37  NBC  0 *
for time   38  NBC  0 *
for time   39  NBC  0 *
for time   40  NBC  0 *
for time   41  NBC  0 *
for time   42  NBC  0 *
for time   43  NBC  0 *
for time   44  NBC  0 *
for time   45  NBC  0 *
for time   46  NBC  0 *
for time   47  NBC  0 *
for time   48  NBC  0 *
for time   49  NBC  0 *
for time   50  NBC  0 *
for time   51  NBC  0 *
for time   52  NBC  0 *
for time   53  NBC  0 *
for time   54  NBC  0 *
for time   55  NBC  0 *
for time   56  NBC  0 *
for time   57  NBC  0 *
for time   58  NBC  0 *
for time   59  NBC  0 *
for time   60  NBC  0 *
for time   61  NBC  0 *
for time   62  NBC  0 *
for time   63  NBC  0 *
for time   64  NBC  0 *
for time   65  NBC  0 *
for time   66  NBC  0 *
for time   67  NBC  0 *
for time   68  NBC  0 *
for time   69  NBC  0 *
```

```
for time   70  NBC  0 *
for time   71  NBC  0 *
for time   72  NBC  0 *
for time   73  NBC  0 *
for time   74  NBC  0 *
for time   75  NBC  0 *
for time   76  NBC  0 *
for time   77  NBC  0 *
for time   78  NBC  0 *
for time   79  NBC  0 *
for time   80  NBC  0 *
for time   81  NBC  0 *
for time   82  NBC  0 *
for time   83  NBC  0 *
for time   84  NBC  0 *
for time   85  NBC  0 *
for time   86  NBC  0 *
for time   87  NBC  0 *
for time   88  NBC  0 *
for time   89  NBC  0 *
for time   90  NBC  0 *
for time   91  NBC  0 *
for time   92  NBC  0 *
for time   93  NBC  0 *
for time   94  NBC  0 *
for time   95  NBC  0 *
for time   96  NBC  0 *
for time   97  NBC  0 *
for time   98  NBC  0 *
for time   99  NBC  0 *
for time  100  NBC  0 *
for time  101  NBC  0 *
for time  102  NBC  0 *
for time  103  NBC  0 *
for time  104  NBC  0 *
for time  105  NBC  0 *
for time  106  NBC  0 *
for time  107  NBC  0 *
for time  108  NBC  0 *
for time  109  NBC  0 *
for time  110  NBC  0 *
for time  111  NBC  0 *
for time  112  NBC  0 *
for time  113  NBC  0 *
for time  114  NBC  0 *
for time  115  NBC  0 *
for time  116  NBC  0 *
for time  117  NBC  0 *
for time  118  NBC  0 *
for time  119  NBC  0 *
for time  120  NBC  3 *
 Branch     3 Grid  2 Q=    0.8600      *
 Branch     3 Grid  3 Q=    46.250      *
 Branch    19 Grid  2 Q=    5.5000      *
for time  121  NBC  5 *
 Branch     2 Grid  3 Q=    3.0800      *
 Branch     3 Grid  2 Q=    2.8600      *
 Branch     3 Grid  3 Q=    9.3400      *
 Branch    13 Grid  2 Q=    9.3300      *
 Branch    19 Grid  2 Q=    1.1000      *
for time  122  NBC  7 *
 Branch     2 Grid  3 Q=    6.8600      *
 Branch     3 Grid  2 Q=    6.0000      *
 Branch     3 Grid  3 Q=    0.0000      *
 Branch     5 Grid  2 Q=    5.8300      *
 Branch     7 Grid  2 Q=    4.0000      *
```

```
 Branch    13 Grid  2 Q=    9.3300      *
 Branch    19 Grid  2 Q=    0.0000      *
for time  123  NBC  5 *
 Branch     2 Grid  3 Q=    10.650      *
 Branch     3 Grid  2 Q=    7.0700      *
 Branch     5 Grid  2 Q=    9.3900      *
 Branch     7 Grid  2 Q=    6.4700      *
 Branch    13 Grid  2 Q=    14.490      *
for time  124  NBC  5 *
 Branch     2 Grid  3 Q=    11.710      *
 Branch     3 Grid  2 Q=    5.2900      *
 Branch     5 Grid  2 Q=    13.760      *
 Branch     7 Grid  2 Q=    9.4800      *
 Branch    13 Grid  2 Q=    15.930      *
for time  125  NBC  5 *
 Branch     2 Grid  3 Q=    9.4600      *
 Branch     3 Grid  2 Q=    3.3600      *
 Branch     5 Grid  2 Q=    19.420      *
 Branch     7 Grid  2 Q=    13.250      *
 Branch    13 Grid  2 Q=    12.880      *
for time  126  NBC  5 *
 Branch     2 Grid  3 Q=    6.6200      *
 Branch     3 Grid  2 Q=    2.1400      *
 Branch     5 Grid  2 Q=    26.710      *
 Branch     7 Grid  2 Q=    17.840      *
 Branch    13 Grid  2 Q=    9.0100      *
for time  127  NBC  5 *
 Branch     2 Grid  3 Q=    4.6100      *
 Branch     3 Grid  2 Q=    1.4300      *
 Branch     5 Grid  2 Q=    33.990      *
 Branch     7 Grid  2 Q=    23.240      *
 Branch    13 Grid  2 Q=    6.2800      *
for time  128  NBC  5 *
 Branch     2 Grid  3 Q=    3.3100      *
 Branch     3 Grid  2 Q=    1.0000      *
 Branch     5 Grid  2 Q=    40.790      *
 Branch     7 Grid  2 Q=    28.810      *
 Branch    13 Grid  2 Q=    4.5100      *
for time  129  NBC  5 *
 Branch     2 Grid  3 Q=    2.3700      *
 Branch     3 Grid  2 Q=    0.6500      *
 Branch     5 Grid  2 Q=    45.320      *
 Branch     7 Grid  2 Q=    33.970      *
 Branch    13 Grid  2 Q=    3.2200      *
for time  130  NBC  5 *
 Branch     2 Grid  3 Q=    1.7700      *
 Branch     3 Grid  2 Q=    0.0000      *
 Branch     5 Grid  2 Q=    47.910      *
 Branch     7 Grid  2 Q=    37.680      *
 Branch    13 Grid  2 Q=    2.4100      *
for time  131  NBC  4 *
 Branch     2 Grid  3 Q=    1.3000      *
 Branch     5 Grid  2 Q=    48.080      *
 Branch     7 Grid  2 Q=    40.090      *
 Branch    13 Grid  2 Q=    1.7700      *
for time  132  NBC  4 *
 Branch     2 Grid  3 Q=    0.0000      *
 Branch     5 Grid  2 Q=    45.320      *
 Branch     7 Grid  2 Q=    41.080      *
 Branch    13 Grid  2 Q=    0.0000      *
for time  133  NBC  2 *
 Branch     5 Grid  2 Q=    40.790      *
 Branch     7 Grid  2 Q=    39.870      *
for time  134  NBC  2 *
 Branch     5 Grid  2 Q=    35.940      *
 Branch     7 Grid  2 Q=    37.340      *
```

```
for time  135  NBC  2 *
 Branch     5 Grid  2 Q=    31.080       *
 Branch     7 Grid  2 Q=    33.680       *
for time  136  NBC  2 *
 Branch     5 Grid  2 Q=    26.390       *
 Branch     7 Grid  2 Q=    30.010       *
for time  137  NBC  2 *
 Branch     5 Grid  2 Q=    22.820       *
 Branch     7 Grid  2 Q=    26.350       *
for time  138  NBC  2 *
 Branch     5 Grid  2 Q=    19.590       *
 Branch     7 Grid  2 Q=    22.760       *
for time  139  NBC  2 *
 Branch     5 Grid  2 Q=    17.000       *
 Branch     7 Grid  2 Q=    19.960       *
for time  140  NBC  2 *
 Branch     5 Grid  2 Q=    14.570       *
 Branch     7 Grid  2 Q=    17.520       *
for time  141  NBC  2 *
 Branch     5 Grid  2 Q=    12.950       *
 Branch     7 Grid  2 Q=    15.330       *
for time  142  NBC  2 *
 Branch     5 Grid  2 Q=    11.330       *
 Branch     7 Grid  2 Q=    13.500       *
for time  143  NBC  2 *
 Branch     5 Grid  2 Q=    9.7100       *
 Branch     7 Grid  2 Q=    11.900       *
for time  144  NBC  2 *
 Branch     5 Grid  2 Q=    8.5800       *
 Branch     7 Grid  2 Q=    10.670       *
for time  145  NBC  2 *
 Branch     5 Grid  2 Q=    7.6100       *
 Branch     7 Grid  2 Q=    9.4500       *
for time  146  NBC  2 *
 Branch     5 Grid  2 Q=    6.8000       *
 Branch     7 Grid  2 Q=    8.2400       *
for time  147  NBC  2 *
 Branch     5 Grid  2 Q=    5.9900       *
 Branch     7 Grid  2 Q=    7.4300       *
for time  148  NBC  2 *
 Branch     5 Grid  2 Q=    5.1800       *
 Branch     7 Grid  2 Q=    6.6000       *
for time  149  NBC  2 *
 Branch     5 Grid  2 Q=    0.0000       *
 Branch     7 Grid  2 Q=    5.9900       *
for time  150  NBC  1 *
 Branch     7 Grid  2 Q=    5.3800       *
for time  151  NBC  1 *
 Branch     7 Grid  2 Q=    4.7700       *
for time  152  NBC  1 *
 Branch     7 Grid  2 Q=    4.1600       *
for time  153  NBC  1 *
 Branch     7 Grid  2 Q=    0.0000       *
for time  154  NBC  0 *
for time  155  NBC  0 *
.
.
.
.
.
.
.
for time 1000  NBC  0 *
```

Appendix R

BLTM.IN for Unsteady-State Application of BLTM

```
default bltm.in for angelina 0611
HEADER 1        67      33    1000      10       0       1       1       0       0
HEADER 2      1.00    0.00
LABEL            1    temp       1
LABEL            2    alge       2
LABEL            3    nh3        3
LABEL            4    no2        4
LABEL            5    no3        5
LABEL            6    phos       6
LABEL            7    bod        7
LABEL            8    oxy        8
LABEL            9    coli       9
LABEL           10    cond      10
Branch   1       2      34       1       2
 Grid    1   0.000       0    0.00   25.40    0.00    0.02    0.00    0.76    0.00    3.00
             5.50    0.00    0.00
 Grid    2   0.311       0
Branch   2       4      35       2       3
 Grid    1   0.000       0    0.00   25.40    0.00    0.00    0.00    0.00    0.00    0.00
             8.07    0.00    0.00
 Grid    2   0.062       0    0.00   25.40    0.00    0.00    0.00    0.00    0.00    0.00
             8.07    0.00    0.00
 Grid    3   0.425       0    0.00   25.40    0.00    0.00    0.00    0.00    0.00    0.00
             8.07    0.00    0.00
 Grid    4   0.435       0
Branch   3       4      36       2       2
 Grid    1   0.000       0    0.00   25.40    0.00    0.00    0.00    0.00    0.00    0.00
             8.07    0.00    0.00
 Grid    2   0.600       0    0.00   25.40    0.00    0.00    0.00    0.00    0.00    0.00
             8.07    0.00    0.00
 Grid    3   0.610       0    0.00   25.40    0.00    0.00    0.00    0.00    0.00    0.00
             8.07    0.00    0.00
 Grid    4   0.621       0
Branch   4       2       2       1       2
 Grid    1   0.000       0    0.00   25.40    0.00    0.00    0.00    0.00    0.00    0.00
             8.07    0.00    0.00
 Grid    2   8.699       0
Branch   5       4       1       3       3
 Grid    1   0.000       0    0.00   25.40    0.00    0.02    0.00    0.76    0.00    2.85
             5.704     0.0  182.00
 Grid    2   0.010       0    0.00   25.40    0.00    0.02    0.03    0.76    0.00    2.85
             5.704     0.0  182.00
 Grid    3   7.146       0    0.00  25.402    0.00    0.02    0.03   0.753   0.008    .921
             7.527    0.00  182.00
 Grid    4  12.740       0
Branch   6       3      37       3       3
 Grid    1   0.000       0    0.00  25.337    0.00    0.19    .004    .352    .208    .064
             8.038    0.00  182.00
 Grid    2   0.620       0    0.00  25.337    0.00    0.19    .004    .352    .208    .064
             8.038    0.00  182.00
 Grid    3   2.485       0
Branch   7       5       3       4       4
 Grid    1   0.000       0    0.00  25.395    0.00    .022    .003    .707    .013    .525
             7.727    0.00  184.12
 Grid    2   0.005       0    0.00  25.395    0.00    .022    .003    .707    .013    .525
             7.727    0.00  184.12
 Grid    3   0.010       0    0.00  25.395    0.00    .022    .003    .707    .013    .525
             7.727    0.00  184.12
 Grid    4   3.107       0    0.00  25.395    0.00    .021    .004    .708    .017    .307
             7.886    0.00  184.17
 Grid    5   9.940       0
Branch   8       2      40       6       2
 Grid    1   0.000       0    0.00  26.588    0.00    0.05    .009    .215    .073    .233
             7.651    0.00  520.00
 Grid    2   0.621       0
Branch   9       2       6       4       2
```

```
 Grid    1  0.000      0   0.00 26.541   0.00  0.016   .003   .439   .380   .001
            7.884   0.00 519.99
 Grid    2 14.912      0
Branch  10      2      5      6      2
 Grid    1  0.000      0   0.00  26.60   0.00   0.00   0.00   0.00   0.00   0.00
            7.883   0.00   0.00
 Grid    2 18.640      0
Branch  11      2     38      5      2
 Grid    1  0.000      0   0.00  26.60   0.00   0.00   0.00   0.00   0.00   0.00
            7.883   0.00   0.00
 Grid    2  0.621      0
Branch  12      3     39      5      3
 Grid    1  0.000      0   0.00  26.60   0.00   0.00   0.00   0.00   0.00   0.00
            7.883   0.00   0.00
 Grid    2  0.062      0   0.00  26.60   0.00   0.00   0.00   0.00   0.00   0.00
            7.883   0.00   0.00
 Grid    3  1.180      0
Branch  13      4      4      7      3
 Grid    1  0.000      0   0.00  31.73   0.00   .024   .005   .895   .035   .065
           10.036   0.00 230.31
 Grid    2  0.005      0   0.00  31.71   0.00   .024   .005   .895   .035   .065
           10.036   0.00 230.31
 Grid    3  0.010      0   0.00  31.71   0.00   .024   .005   .895   .035   .065
           10.036   0.00 230.31
 Grid    4  3.728      0
Branch  14      5      8      7      5
 Grid    1  0.000      0   0.00  24.84  0.000   .092   .001   .192   .002  2.504
            6.889   0.00 84.972
 Grid    2  0.010      0   0.00  24.84   0.00   .092   .001   .192   .002  2.504
            6.889   0.00 84.972
 Grid    3  0.621      0   0.00 24.843   0.00   .093   .005   .193   .003  2.100
            7.096   0.00 85.769
 Grid    4  7.394      0   0.00 24.855   0.00   .055   .012   .234   .021  .1170
            8.071   0.00 85.769
 Grid    5 13.048      0
Branch  15      2     41      8      2
 Grid    1  0.000      0   0.00  24.80   0.00   0.02   0.00   0.18   0.00   2.00
             6.30   0.00  73.00
 Grid    2  0.621      0
Branch  16      2      9      8      2
 Grid    1  0.000      0   0.00  24.80   0.00   0.00   0.00   0.00   0.00   0.00
            8.163   0.00   0.00
 Grid    2  3.107      0
Branch  17      2     43      9      2
 Grid    1  0.000      0   0.00  24.80   0.00   0.00   0.00   0.00   0.00   0.00
             0.00   0.00   0.00
 Grid    2  0.621      0
Branch  18      2     42      9      2
 Grid    1  0.000      0   0.00  24.80   0.00   0.00   0.00   0.00   0.00   0.00
            8.163   0.00   0.00   0.00
 Grid    2  1.740      0
Branch  19      5      7     10      4
 Grid    1  0.000      0   0.00 29.857   0.00   .033   .007   .580   .042   .014
            8.312   0.00 159.22
 Grid    2  0.005      0   0.00 29.857   0.00   .033   .007   .580   .042   .014
            8.312   0.00 159.22
 Grid    3  0.010      0   0.00 29.857   0.00   .033   .007   .580   .042   .014
            8.312   0.00 159.22
 Grid    4  3.732      0   0.00 29.486   0.00   .031   .006   .554   .042   .241
            7.438   0.00 158.52
 Grid    5  9.322      0
Branch  20      2     60     25      2
 Grid    1  0.000      1   0.00  25.20   0.00   .012   0.00   .860   0.00   2.50
             6.00   0.00 305.00
 Grid    2  0.621      1
Branch  21      3     26     25      3
```

```
 Grid    1  0.000       1    0.00  25.20   0.00    0.00   0.00   0.00   0.00   0.00
              8.10    0.00    0.00
 Grid    2  0.621       1    0.00  25.20   0.00    0.00   0.00   0.00   0.00   0.00
              8.10    0.00    0.00
 Grid    3  3.107       1
Branch  22      3      58      26       3
 Grid    1  0.000       0    0.00  25.20   0.00    0.00   0.00   0.00   0.00   0.00
              8.10    0.00    0.00
 Grid    2  0.062       0    0.00  25.20   0.00    0.00   0.00   0.00   0.00   0.00
              8.10    0.00    0.00
 Grid    3  0.808       0
Branch  23      3      59      26       3
 Grid    1  0.000       0    0.00  25.20   0.00    0.00   0.00   0.00   0.00   0.00
              8.10    0.00    0.00
 Grid    2  0.062       0    0.00  25.20   0.00    0.00   0.00   0.00   0.00   0.00
              8.10    0.00    0.00
 Grid    3  0.684       0
Branch  24      5      25      23       3
 Grid    1  0.000       1    0.00 25.479   0.00   1.925   .002   .877   .001 11.485
              5.771   0.00  377.64
 Grid    2  0.010       1    0.00 25.479   0.00   1.925   .002   .877   .001 11.485
              5.771   0.00  377.64
 Grid    3  1.864       1    0.00 25.485   0.00   1.842   .105   .896   .002  8.873
              4.965   0.00  379.13
 Grid    4  1.988       1    0.00 25.485   0.00   1.842   .105   .896   .002  8.873
              4.965   0.00  379.13
 Grid    5  3.107       1
Branch  25      2      24      23       2
 Grid    1  0.000       1    0.00  25.20   0.00    0.00   0.00   0.00   0.00   0.00
              8.10    0.00    0.00
 Grid    2  9.320       1
Branch  26      2      57      24       2
 Grid    1  0.000       0    0.00  25.20   0.00    0.00   0.00   0.00   0.00   0.00
              8.10    0.00    0.00
 Grid    2  0.621       0
Branch  27      3      56      24       3
 Grid    1  0.000       0    0.00  25.20   0.00    0.00   0.00   0.00   0.00   0.00
              8.10    0.00    0.00
 Grid    2  0.062       0    0.00  25.20   0.00    0.00   0.00   0.00   0.00   0.00
              8.10    0.00    0.00
 Grid    3  0.746       0
Branch  28      5      55      22       5
 Grid    1  0.000       0    0.00 27.139   0.00  12.279   0.00   .459   0.00 31.718
              5.302 0.00869.238
 Grid    2  0.010       0    0.00 27.139   0.00  12.279   0.00   .459   0.00 31.718
              5.302 0.00869.238
 Grid    3  0.186       0    0.00 27.139   0.00  12.279   0.00   .459   0.00 31.718
              5.302 0.00869.238
 Grid    4  0.190       0    0.00 27.139   0.00  12.279   0.00   .459   0.00 31.718
              5.302 0.00869.238
 Grid    5  1.243       0
Branch  29      3      54      22       3
 Grid    1  0.000       0    0.00  26.40   0.00    0.00   0.00   0.00   0.00   0.00
              7.913   0.00    0.00
 Grid    2  0.062       0    0.00  26.40   0.00    0.00   0.00   0.00   0.00   0.00
              7.913   0.00    0.00
 Grid    3  0.559       0
Branch  30      3      22      21       3
 Grid    1  0.000       0    0.00 32.267   0.00  13.846   .629   .628   .002 30.273
              1.356 0.001032.71
 Grid    2  0.010       0    0.00 32.267   0.00  13.846   .629   .628   .002 30.273
              1.356 0.001032.71
 Grid    3  3.728       0
Branch  31      2      52      20       2
 Grid    1  0.000       0    0.00  25.00   0.00    0.00   0.00   0.00   0.00   0.00
              8.131   0.00    0.00
```

```
 Grid    2  0.621      0
Branch  32      2     20     21      2
 Grid    1  0.000      0   0.00  25.00   0.00   0.00   0.00   0.00   0.00   0.00
            8.131   0.00   0.00
 Grid    2  0.621      0
Branch  33      3     53     20      3
 Grid    1  0.000      0   0.00  25.00   0.00   0.00   0.00   0.00   0.00   0.00
            8.131   0.00   0.00
 Grid    2  0.062      0   0.00  25.00   0.00   0.00   0.00   0.00   0.00   0.00
            8.131   0.00   0.00
 Grid    3  1.243      0
Branch  34      3     21     19      3
 Grid    1  0.000      0   0.00 35.641   0.00 13.738  1.608  1.343   .007 20.204
            0.757   0.001140.96
 Grid    2  0.010      0   0.00 35.641   0.00 13.738  1.608  1.343   .007 20.204
            0.757   0.001140.96
 Grid    3  1.864      0
Branch  35      2     51     19      2
 Grid    1  0.000      0   0.00  25.00   0.00   0.00   0.00   0.00   0.00   0.00
            8.131   0.00   0.00
 Grid    2  1.305      0
Branch  36      3     19     18      3
 Grid    1  0.000      0   0.00 35.633   0.00 12.912  1.890  1.888   .010 15.187
            .6420   0.001140.96
 Grid    2  2.796      0   0.00 35.623   0.00 11.672  2.110  2.909   .013  9.680
            .6420   0.001140.96
 Grid    3  4.971      0
Branch  37      2     49     17      2
 Grid    1  0.000      0   0.00  25.00   0.00   0.00   0.00   0.00   0.00   0.00
            8.131   0.00   0.00
 Grid    2  0.621      0
Branch  38      2     17     18      2
 Grid    1  0.000      0   0.00  25.00   0.00   0.00   0.00   0.00   0.00   0.00
            8.131   0.00   0.00
 Grid    2  4.971      0
Branch  39      3     50     17      2
 Grid    1  0.000      0   0.00  25.00   0.00   0.00   0.00   0.00   0.00   0.00
            8.131   0.00   0.00
 Grid    2  0.062      0   0.00  25.00   0.00   0.00   0.00   0.00   0.00   0.00
            8.131   0.00   0.00
 Grid    3  0.435      0
Branch  40      2     18     16      2
 Grid    1  0.000      0   0.00  35.613   0.0010.451  2.148  4.095   .016  5.998
            1.023   0.001140.96
 Grid    2  8.077      0
Branch  41      3     23     16      3
 Grid    1  0.000      1   0.00 25.479   0.00  1.842  0.151   .926   .003  7.889
            4.856   0.00391.541
 Grid    2  0.010      1   0.00 25.479   0.00  1.842  0.151   .926   .003  7.889
            4.856   0.00391.541
 Grid    3  3.728      1
Branch  42      3     16     14      3
 Grid    1  0.000      0   0.00 30.447   0.00  3.916   .877  4.905   .017  2.692
            4.018   0.00760.243
 Grid    2  9.942      0   0.00 30.430   0.00  2.576   .631  6.496   .026  0.468
            5.614   0.00760.243
 Grid    3 10.563      0
Branch  43      3     47     15      3
 Grid    1  0.000      0   0.00  26.00   0.00   0.00   0.00   0.00   0.00   0.00
            7.975   0.00   0.00
 Grid    2  0.062      0   0.00  26.00   0.00   0.00   0.00   0.00   0.00   0.00
            7.975   0.00   0.00
 Grid    3  0.745      0
Branch  44      2     48     15      2
 Grid    1  0.000      0   0.00  26.00   0.00   0.00   0.00   0.00   0.00   0.00
            7.975   0.00   0.00
```

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 Grid    2  0.621      0
Branch  45      2     15     14      2
 Grid    1  0.000      0   0.00  26.00   0.00   0.00   0.00   0.00   0.00   0.00
            7.975   0.00   0.00
 Grid    2  9.321      0
Branch  46      4     14     11      4
 Grid    1  0.000      0   0.00 30.349   0.00  2.509  0.584  6.512  0.026  1.060
            5.643  0.00764.097
 Grid    2  0.010      0   0.00 30.349   0.00  2.509  0.584  6.512  0.026  1.060
            5.643  0.00764.097
 Grid    3  4.350      0   0.00 30.337   0.00  1.900  0.463  7.421  0.032  0.337
            6.10   0.00764.097
 Grid    4  9.942      0
Branch  47      4     44     12      4
 Grid    1  0.000      0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
            0.00   0.00   0.00
 Grid    2  0.062      0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
            0.00   0.00   0.00
 Grid    3  2.796      0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
            0.00   0.00   0.00
 Grid    4  5.282      0
Branch  48      3     45     13      3
 Grid    1  0.000      0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
            0.00   0.00   0.00
 Grid    2  0.062      0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
            0.00   0.00   0.00
 Grid    3  0.311      0
Branch  49      2     46     13      2
 Grid    1  0.000      0   0.00  26.00   0.00   0.59   0.00   3.01   0.00   6.50
            4.50   0.00 650.00
 Grid    2  0.621      0
Branch  50      2     13     12      2
 Grid    1  0.000      0   0.00  26.00   0.00   .275   .052  3.291   0.03  0.861
            7.404  0.00649.995
 Grid    2  8.077      0
Branch  51      4     12     11      4
 Grid    1  0.000      0   0.00  26.00   0.00   .271   .052  3.295   0.03  0.803
            7.435  0.00649.994
 Grid    2  1.864      0   0.00 26.867   0.00  2.926   .066  2.006   .017 17.494
            3.836  0.00796.206
 Grid    3  2.175      0   0.00 27.107   0.00  3.599   .142  1.638   .011 20.192
            2.155  0.00836.829
 Grid    4  3.728      0
Branch  52      3     11     10      3
 Grid    1  0.000      0   0.00 29.572   0.001  .536   .126  8.104   0.085  .237
            7.041  0.00 778.91
 Grid    2 15.534      0   0.00 29.572   0.001  .536   .126  8.104   0.085  .237
            7.041  0.00 778.91
 Grid    3 21.127      0
Branch  53     10     10     27     10
 Grid    1  0.000      0   0.00 28.956   0.000  0.218  0.050  3.418  0.055  0.500
            7.165  .000412.175
 Grid    2  0.010      0   0.00 28.956   0.000  0.218  0.050  3.418  0.055  0.500
            7.165  .000412.175
 Grid    3  8.699      0   0.00 28.932   0.000  0.174  0.042  3.445  0.060  0.208
            7.326  .000411.023
 Grid    4 18.517      0   0.00 28.765   0.000  0.116  0.028  3.255  0.064  0.106
            7.438  .000400.159
 Grid    5 18.640      0   0.00 28.765   0.000  0.116  0.028  3.255  0.064  0.106
            7.438  .000400.159
 Grid    6 32.310      0   0.00 28.709   0.001  0.046  0.011  3.324  0.090  0.012
            7.538  .000397.882
 Grid    7 47.220      0   0.00 28.619   0.004  0.023  0.005  3.334  0.118  0.023
            7.558  .000396.584
 Grid    8 58.410      0   0.00 28.563   0.011  0.018  0.004  3.341  0.142  0.003
            7.580  .000396.141
```

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 Grid     9 58.680      0    0.00 28.563  0.011  0.018  0.004  3.341  0.142  0.003
           7.580  .000396.141
 Grid    10 58.720      0
Branch   54      2     28     27      2
 Grid     1  0.000      0    0.00 27.30   0.00   0.00   0.00   0.00   0.00   0.00
           7.77  0.00   0.00
 Grid     2  6.214      0
Branch   55      2     62     28      2
 Grid     1  0.000      0    0.00 27.30   0.00   0.00   0.00   0.00   0.00   0.00
           7.77  0.00   0.00
 Grid     2  0.621      0
Branch   56      3     61     28      3
 Grid     1  0.000      0    0.00 27.30   0.00   0.00   0.00   0.00   0.00   0.00
           7.77  0.00   0.00
 Grid     2  0.062      0    0.00 27.30   0.00   0.00   0.00   0.00   0.00   0.00
           7.77  0.00   0.00
 Grid     3  0.746      0
Branch   57      5     27     29      5
 Grid     1  0.000      0    0.00 28.464  0.010  0.048  0.003  3.096  0.131  0.286
           7.465  .00394.652
 Grid     2  0.010      0    0.00 28.464  0.010  0.048  0.003  3.096  0.131  0.286
           7.465  .00394.652
 Grid     3  0.005      0    0.00 28.464  0.010  0.048  0.003  3.096  0.131  0.286
           7.465  .00394.652
 Grid     4  0.311      0    0.00 28.459  0.010  0.049  0.004  3.083  0.130  0.279
           7.463  .000394.587
 Grid     5  0.621      0
Branch   58      3     64     31      3
 Grid     1  0.000      0    0.00 26.80   0.00   0.00   0.00   0.00   0.00   0.00
           7.852  0.00   0.00
 Grid     2  0.062      0    0.00 26.80   0.00   0.00   0.00   0.00   0.00   0.00
           7.852  0.00   0.00
 Grid     3  0.311      0
Branch   59      2     31     30      2
 Grid     1  0.000      0    0.00 26.80   0.00   0.00   0.00   0.00   0.00   0.00
           7.852  0.00   0.00
 Grid     2  1.243      0
Branch   60      2     63     31      2
 Grid     1   0.00      0    0.00 26.80   0.00   0.00   0.00   0.00   0.00   0.00
           7.852  0.00   0.00
 Grid     2  0.311      0
Branch   61      2     65     30      2
 Grid     1  0.000      0    0.00 26.80   .000  0.080   .000  0.230   .000  5.000
           7.300  .000348.00
 Grid     2  0.311      0
Branch   62     13     30     29     13
 Grid     1  0.000      0    0.00 26.80   .000  0.079   .001   .230   .000  4.717
           7.150  .00348.000
 Grid     2  3.106      0    0.00 26.80   .000  0.071   .008   .233   .004  2.641
           6.804  .00348.000
 Grid     3  6.524      0    0.00 26.799  .000  0.064   .011   .240   .007  1.478
           7.107  .00348.000
 Grid     4  8.555      0    0.00 27.075  .000  0.052   .008   .172   .008  2.568
           7.112  .00395.537
 Grid     5  8.575      0    0.00 27.075  .000  0.052   .008   .172   .008  2.568
           7.112  .00395.537
 Grid     6  8.699      0    0.00 27.615  .000  0.041  0.002  0.023   .001  5.939
           6.556  .00488.484
 Grid     7 13.981      0    0.00 27.223  .000   .038   .005   .066   .006  2.157
           6.691  .00488.380
 Grid     8 13.983      0    0.00 27.223  .000   .038   .005   .066  0.006  2.157
           6.691  .00488.380
 Grid     9 16.963      0    0.00 27.193  .000   .036   .006   .071  0.009  1.398
           7.034  .00488.370
 Grid    10 17.088      0    0.00 27.193  .000   .036   .006   .071  0.009  1.398
           7.034  .00488.370
```

```
 Grid   11 23.301      0    0.00 27.190   .000    .031    .006    .079    .015    .463
           7.520   .00488.370
 Grid   12 23.550      0    0.00 27.190   .000    .031    .006    .080    .016    .430
           7.538   .00488.370
 Grid   13 23.612      0
Branch  63      3     29      32       3
 Grid    1  0.000      0    0.00 28.234   .009    .045    .005  2.514    .110    .378
           7.436   .00406.060
 Grid    2  0.010      0    0.00 28.234   .009    .045    .005  2.514    .110    .378
           7.436   .00406.060
 Grid    3  0.311      0
Branch  64      4     66      32       4
 Grid    1  0.000      0    0.00  28.00   0.00    0.00    0.00    0.00    0.00    0.00
           7.672    0.00    0.00
 Grid    2  0.062      0    0.00  28.00   0.00    0.00    0.00    0.00    0.00    0.00
           7.672    0.00    0.00
 Grid    3  0.746      0    0.00  28.00   0.00    0.00    0.00    0.00    0.00    0.00
           7.672    0.00    0.00
 Grid    4  3.231      0
Branch  65      4     32      33       4
 Grid    1  0.000      0    0.00 28.209   .009    .044    .006  2.412    .105    .422
           7.412   .00403.168
 Grid    2  0.010      0    0.00 28.209   .009    .044    .006  2.412    .105    .422
           7.412   .00403.168
 Grid    3  0.373      0    0.00 28.205   .009    .043    .006  2.405    .106    .344
           7.444   .00402.916
 Grid    4  0.932      0
Branch  66      3     67      33       3
 Grid    1  0.000      0    0.00 25.500   .000    .420    .000    .520    .000   2.03
           7.380   .00487.000
 Grid    2  0.062      0    0.00 25.500   .000    .420    .000    .520    .000   2.03
           7.380   .00487.000
 Grid    3  0.932      0
Branch  67      6     33      68       6
 Grid    1  0.000      0    0.00 28.114   .010    .051    .008  2.348    .105    .266
           7.495   .00405.583
 Grid    2  0.932      0    0.00 28.107   .012    .046    .009  2.354    .108  0.144
           7.555   .00405.556
 Grid    3  0.994      0    0.00 28.107   .012    .046    .009  2.354    .108  0.144
           7.555   .00405.556
 Grid    4  2.796      0    0.00 28.100   .014    .040    .009  2.363    .114    .054
           7.607   .00405.494
 Grid    5  5.282      0    0.00 28.066   .032   0.031   0.007  2.375   0.125   0.009
           7.647   .00405.347
 Grid    6  6.835      0
Time     1     36
 B  1 G  1  25.40   0.00    0.02    0.00   0.76    0.00    3.00    5.50    0.00 182.00
 B  5 G  3  25.40   0.00    0.05    0.00   0.20    0.00    3.00    5.50    0.00 182.00
 B  6 G  1  25.30   0.00    0.05    0.00   0.20    0.00    3.00    6.60    0.00 182.00
 B  7 G  3  25.30   0.00    0.05    0.00   0.20    0.00    3.00    5.80    0.00 208.00
 B  7 G  4   0.00   0.00    0.00    0.00   0.00    0.00    0.00    0.00    0.00   0.00
 B  8 G  1  26.60   0.00    0.15    0.00   0.08    0.00    3.00    3.70    0.00 520.00
 B 13 G  3   0.00   0.00    0.00    0.00   0.00    0.00    0.00    0.00    0.00 000.00
 B 14 G  2  27.50   0.00    5.00    0.00   1.00    0.00   68.60    2.00    0.00 903.00
 B 15 G  1  24.80   0.00    0.02    0.00   0.18    0.00    2.00    6.30    0.00  73.00
 B 19 G  3   0.00   0.00    0.00    0.00   0.00    0.00    0.00    0.00    0.00   0.00
 B 19 G  4  25.60   0.00    0.05    0.00   0.20    0.00    3.00    6.50    0.00 151.00
 B 20 G  1  25.20   0.00    0.12    0.00   0.86    0.00    2.50    6.00    0.00 305.00
 B 24 G  2  27.50   0.00   15.00    0.00   1.00    0.00   78.13    2.00    0.00 903.00
 B 28 G  1  27.40   0.00   13.70    0.00   0.49    0.00   35.00    5.50    0.00 903.00
 B 28 G  2  24.90   0.00    0.06    0.00   0.19    0.00    3.50    3.60    0.00 579.00
 B 30 G  2  29.70   0.00    0.05    0.00   0.20    0.00    1.30    6.10    0.00 792.00
 B 34 G  2  29.70   0.00    0.05    0.00   0.20    0.00    1.30    6.10    0.00 792.00
 B 41 G  2  25.20   0.00    5.00    0.00   1.00    0.00   28.30    2.00    0.00 903.00
 B 46 G  2  27.50   0.00    5.00    0.00   1.00    0.00   25.84    2.00    0.00 903.00
 B 49 G  1  26.00   0.00    0.59    0.00   3.01    0.00    6.50    4.50    0.00 650.00
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B	51	G	2	27.50	0.00	5.00	0.00	1.00	0.00	32.36	2.00	0.00	903.00
B	53	G	2	26.90	0.00	0.05	0.00	0.20	0.00	3.00	6.40	0.00	272.00
B	53	G	3	26.90	0.00	0.05	0.00	0.20	0.00	3.00	6.40	0.00	272.00
B	53	G	5	27.40	0.00	0.05	0.00	0.20	0.00	3.00	6.30	0.00	274.00
B	53	G	6	28.60	0.00	0.05	0.00	0.20	0.00	3.00	6.20	0.00	59.00
B	53	G	7	27.60	0.00	0.05	0.00	0.20	0.00	3.00	6.30	0.00	332.00
B	53	G	8	27.30	0.00	0.05	0.00	0.20	0.00	3.00	6.30	0.00	337.00
B	57	G	2	27.50	0.00	5.00	0.00	1.00	0.00	10.98	4.00	0.00	903.00
B	57	G	3	27.30	0.00	0.05	0.00	0.20	0.00	3.00	6.30	0.00	337.00
B	61	G	1	26.80	0.00	0.08	0.00	0.23	0.00	5.00	7.30	0.00	348.00
B	62	G	4	27.70	0.00	0.04	0.00	0.00	0.00	7.00	6.70	0.00	503.00
B	62	G	5	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B	62	G	8	25.80	0.00	0.05	0.00	0.20	0.00	3.00	6.50	0.00	488.00
B	63	G	2	27.70	0.00	0.05	0.00	0.20	0.00	3.00	6.30	0.00	341.00
B	65	G	2	27.70	0.00	0.05	0.00	0.20	0.00	3.00	6.30	0.00	341.00
B	66	G	1	25.50	0.00	0.42	0.00	0.52	0.00	2.03	7.38	0.00	487.00
Time			2	0									
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Time   118       0
Time   119       0
Time   120       3
 B  3 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B  3 G  3  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B 19 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
Time   121       5
 B  2 G  3  26.00    0.00    1.00    1.00    2.00    0.00   15.00    2.50    0.009999.00
 B  3 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B  3 G  3  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B 13 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B 19 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
Time   122       7
 B  2 G  3  26.00    0.00    1.00    1.00    2.00    0.00   15.00    2.50    0.009999.00
 B  3 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B  3 G  3  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B  5 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B  7 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B 13 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B 19 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
Time   123       5
 B  2 G  3  26.00    0.00    1.00    1.00    2.00    0.00   15.00    2.50    0.009999.00
 B  3 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B  5 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B  7 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B 13 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
Time   124       5
 B  2 G  3  26.00    0.00    1.00    1.00    2.00    0.00   15.00    2.50    0.009999.00
 B  3 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B  5 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B  7 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B 13 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
Time   125       5
 B  2 G  3  26.00    0.00    1.00    1.00    2.00    0.00   15.00    2.50    0.009999.00
 B  3 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B  5 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B  7 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B 13 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
Time   126       5
 B  2 G  3  26.00    0.00    1.00    1.00    2.00    0.00   15.00    2.50    0.009999.00
 B  3 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B  5 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B  7 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B 13 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
Time   127       5
 B  2 G  3  26.00    0.00    1.00    1.00    2.00    0.00   15.00    2.50    0.009999.00
 B  3 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B  5 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B  7 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B 13 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
Time   128       5
 B  2 G  3  26.00    0.00    1.00    1.00    2.00    0.00   15.00    2.50    0.009999.00
 B  3 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B  5 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B  7 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B 13 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
Time   129       5
 B  2 G  3  26.00    0.00    1.00    1.00    2.00    0.00   15.00    2.50    0.009999.00
 B  3 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B  5 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B  7 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B 13 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
Time   130       5
 B  2 G  3  26.00    0.00    1.00    1.00    2.00    0.00   15.00    2.50    0.009999.00
 B  3 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
 B  5 G  2  26.00    0.00    1.00    1.00    5.00    0.00   10.00    5.50    0.009999.00
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 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
 B 13 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   131      4
 B  2 G  3  26.00   0.00   1.00   1.00   2.00   0.00  15.00   2.50   0.009999.00
 B  5 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
 B 13 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   132      4
 B  2 G  3  26.00   0.00   1.00   1.00   2.00   0.00  15.00   2.50   0.009999.00
 B  5 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
 B 13 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   133      2
 B  5 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   134      2
 B  5 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   135      2
 B  5 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   136      2
 B  5 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   137      2
 B  5 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   138      2
 B  5 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   139      2
 B  5 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   140      2
 B  5 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   141      2
 B  5 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   142      2
 B  5 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   143      2
 B  5 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   144      2
 B  5 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   145      2
 B  5 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   146      2
 B  5 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   147      2
 B  5 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   148      2
 B  5 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   149      2
 B  5 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   150      1
 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   151      1
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 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   152       1
 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   153       1
 B  7 G  2  26.00   0.00   1.00   1.00   5.00   0.00  10.00   5.50   0.009999.00
Time   154       0
Time   155       0
Time   156       0
Time   157       0
Time   158       0
Time   159       0
Time   160       0
Time   161       0
Time   162       0
Time   163       0
Time   164       0
Time   165       0
Time   166       0
Time   167       0
Time   168       0
Time   169       0
Time   170       0
Time   171       0
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Time  1000       0
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