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Appendices to an Aqueous Environmental Simulation Model for Mid-south Lakes and Reservoirs

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APPENDICES TO

AN AQUEOUS ENVIRONMENTAL

SIMULATION MODEL FOR

MID-SOUTH LAKES AND RESERVOIRS

BY

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APPENDIX A

DOCUMENTATION OF COMPUTER PROGRAM

I. Program Information

Origin of Program:

General Office:

Director, Arkansas Water Resources Research Center
325 Administration Building, University of Arkansas
Fayetteville, Arkansas 72701
(501) 575-4403

Principal Investigator:

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Purpose of Program:

The program simulates some of the major physical, chemical and biological processes occuring within the aqueous phase of lakes and reservoirs. The program was developed to study the eutrophic development of these water bodies.

Problem Statement:

Inland lakes and man-made reservoirs constitute a sizable freshwater resource in the Mid-South region of the U.S.A. Maintaining this water of high quality for multiple uses will be a never-ending challenge as population increases and associated cultural developments crowd the lake shores and tributaries. A means of assessing the impact of proposed or present cultural developments upon the lake ecosystem is desirable. The regulation of chemical and energy inputs, which enter the lake through a combination of the tributaries, runoff or point sources, and the output is the major means of controlling and manipulating water quality within a lake or reservoir.

Areas of Application:

Comprehensive computer simulation models provide a means of assessing the impact of proposed or present cultural developments. These models are also capable of predicting proposed lake restoration programs and in this sense serve as tools of water quality control. (See Appendix C for specific applications).

Methods of Computation:

The IBM System/360 program for the simulation of continuous systems was used.

Basis for Selection of Method:

This program provides an application-oriented input language that accepts problems expressed in the form of a system of ordinary differential equations. Consult: IBM Application Program System/360 Continuous System Modeling Program User's Manual Program Number 360A-CX-16X, Edition GH20-0367-4, 5th (1972) of later editions.

Limitations and Restrictions:

See section in body of report titled: General Model Assumptions.

Definition of Technical Terms:

Variable and constant symbols used in the presentation of the model are the same as employed in the computer program. This technique was used to simplify the transition from the model development to the program application. All terms are defined and the units of measure are given in the model development section.

Physical Constants:

See Table 1 in body of report.

Functional Information:

The IBM System/360 CSMP automatically sorts the structure statements to establish the correct information flow. See User's Manual.

II. Usage Information

Program Language, Equipment and Operating System:

CSMP is a digital simulation language employing S/360 FORTRAN IV statements. The program requires a minimum of 102K bytes of storage (excluding that required by OS/360), the Standard Instruction Set, and the Floating-Point Option. In addition to the I/O units needed by the Operating System/360 for FORTRAN IV (Level G) compiling, the program requires three logical utility units. One of these must be a direct access storage device (DASD); the other two units may be portions of the required DASD, or may be portions of other DASD's or magnetic tape driver.

Input Requirements:

Inputs are in the form of function generators FUNCTION and constants CONSTANT. There is no data deck as such in CSMP. See program listing for format of function generators. In general, format is free form. See User's Manual.

Input Data Description:

Reservoir surface area vs. elevation, reservoir volume vs. elevation, tributary flows vs. Julian Day, reservoir surface temperature vs. Julian Day, tributary chemical concentration vs. Julian Day, etc. are input as function generators FUNCTION. The constants CONSTANT listed in Tables II through VI are inputted by variable name followed by numerical value. See program listing for point of input and User's Manual.

Program Output:

CSMP output includes a graphical display PRINTPLT or a numerical listing PRINT. See User's Manual.

Variable Definitions:

Each variable used in the program has been defined in the model development section of the report. See: Definition of Technical Terms entry.

Example Case:

Six case studies are presented in Appendix C.

Job Processing Time:

Each simulation run presented in Appendix C required less than six minutes CPU (Central Processing Unit) time using IBM 370/155. Output volume depends upon the number of variables designated PRINTPLT or PRINT by the user.

Miscellaneous:

It is recommended that the user become fairly familiar with the IBM System/360 Continuous System Modeling Program. See: IBM Application Program System/360 Continuous System Modeling Program User's Manual, Program Number 360A-CX-16X, Edition GH20-0367-4, 5th (1972) or later editions.

APPENDIX B

COMPUTER PROGRAM LISTING

****CONTINUOUS SYSTEM MODELING PROGRAM****

*** VERSION 1.3 ***

```
*.....
*          BASIS AND ASSUMPTIONS
*.....
*         DAILY BASIS WITH CONCENTRATION-TIME AS OUTPUTS.
*         DURING UNSTRATIFIED PERIODS WHOLE VOLUME SEGMENT IS ASSUMED AS
*         COMPLETELY MIXED., BUT DURING STRATIFIED PERIOD, EPILIMNION AND
*         HYPOLIMNION EXIST AS SEPARATE COMPLETELY MIXED REACTORS.
*.....
*         BEAVER RESERVOIR SURFACE AREA AS FUNCTION OF ELEVATION.DATA IN
*         PAIRS (ELEVATION IN FEET, SURFACE AREA IN ACRES)
*.....
FUNCTION AREA=914.,0.,916.,4.,918.,7.0,920.,10.,922.,14.,924.,18.,...
       926.,21.,928.,24.,930.,28.,932.,85.,934.,135.,936.,185.,938.,...
       240.,...
       940.,293.,950.,592.,960.,900.,970.,1300.,980.,1730.,990.,2360.,...
       1000.,3220.,1010.,4030.,1020.,5120.,1030.,6390.,1040.,7900.,...
       1050.,9750.,1060.,11880.,1070.,14030.,1080.,16210.,1090.,...
       18800.,1100.,21830.,1110.,24950.,1120.,28220.,1130.,31700.,...
       1132.,32420.
*.....
*         BEAVER RESERVOIR VOLUME AS FUNCTION OF ELEVATION, DATA IN PAIRS
*         (ELEVATION IN FEET,VOLUME IN ACRE-FEET)
*.....
FUNCTION VOL=914.,0.,916.,4.,918.,15.,920.,32.,922.,56.,924.,88.,...
       926.,127.,928.,172.,930.,224.,932.,337.,934.,557.,936.,877.,...
       938.,1300.,...
       940.,1840.,942.,2480.,944.,3250.,946.,4140.,948.,5150.,...
       950.,6280.,960.,13770.,970.,24730.,980.,39790.,990.,60030.,...
       1000.,87780.,1010.,123900.,1020.,169600.,1030.,226900.,...
       1040.,298100.,1050.,386100.,1060.,494000.,1070.,623400.,1080.,...
       774400.,1090.,949300.,1100.,1152300.,1110.,1386100.,1120.,...
       1651900.,1130.,1951500.,1132.,2015600.
*.....
*         WHITE RIVER INPUT FLOW RATE AS FUNCTION OF JULIAN DAYS, DATA
*         IN PAIRS ( JULIAN DAY,FLOW RATE IN CUBIC FEET PER SECOND)
*.....
FUNCTION FLOW=0.,539.7,15.,597.0,46.,734.6,74.,879.2,105.,1088.3,...
       135.,784.7,166.,130.9,196.,56.3,227.,15.9,258.,88.8,...
       288.,442.4,319.,354.1,349.,482.3,365.,539.7
```

```
*.....
*         BEAVER RESERVOIR SURFACE TEMPERATURE AS FUNCTION OF JULIAN DAYS
*         DATA IN PAIRS(JULIAN DAYS,TEMPERATURE IN F)
*.....
FUNCTION TEMP=0.,49.83,31.,47.17,59.,46.7,90.,54.5,120.,65.83,...
      151.,78.67,181.,84.12,212.,84.0,243.,79.12,273.,71.87,...
      304.,63.0,334.,56.17,365.,49.83
*.....
*         NITROGEN CONCENTRATION INPUT AT WAR EAGLE CREEK AS FUNCTION OF
*         JULIAN DAYS, DATA IN PAIRS(JULIAN DAY,NITROGEN CONCENTRATION IN
*         MG/LIT)
*.....
FUNCTION NWE=0.,.39,29.,.4,57.,.73,83.,.82,113.,.73,158.,.77,180.,...
      .58,192.,1.72,199.,0.,215.,0.,241.,0.,255.,.08,265.,0.,286.,...
      1.45,293.,2.01,314.,.51,326.,.16,335.,.25,342.,.13,353.,.39,...
      365.,.39
*.....
*         PHOSPHOROUS CONCENTRATION INPUT AT WAR EAGLE CREEK AS FUNCTION
*         OF JULIAN DAYS, DATA IN PAIRS (JULIAN DAY,PHOSPHOROUS CONCENTRATION
*         IN MG/LIT)
*.....
FUNCTION PWE=0.,0.,29.,0.,57.,0.,83.,.06,99.,.22,113.,.07,158.,.03,...
      182.,.06,192.,.0,199.,.02,215.,.01,230.,.62,234.,.03,241.,.0,...
      246.,.01,265.,.5,278.,.03,286.,.21,293.,.03,314.,.03,326.,.02,...
      338.,.01,353.,0.,365.,0.
*.....
*         WAR EAGLE CREEK INPUT FLOW RATE AS FUNCTION OF JULIAN DAYS,
*         DATA IN PAIRS(JULIAN DAY,FLOW RATE IN CUBIC FEET PER SECOND)
*.....
FUNCTION FLOWE=0.,220.18,15.,208.58,46.,330.82,74.,496.45,...
      105.,639.2,135.,702.77,166.,168.81,196.,126.59,227.,71.39,...
      258.,56.01,288.,125.6,319.,181.61,349.,232.18,365.,220.18
*.....
INITIAL
*     INITIAL CALCULATIONS
*.....
*         WHITE RIVER REACH(WTR), FIRST SEGMENT CALCULATIONS-- TOTAL
*         ELEVATION DROP(FEET),ELEVATION(FEET),MAXIMUM DEPTH(METERS),
*         TOTAL SEGMENT VOLUME(CUBIC FEET),TOTAL SURFACE AREA(SQUARE FEET)
*.....
      DELEV=DRPML*D1
      ELEWE=DELEV+BDEL
      MAXDP=DELEV*0.3048
      VB1=AFGEN(VOL,ELEWE)*43560.
      AREA1=AFGEN(AREA,ELEWE)*43560.
```

```
*.....
*       HOFFMAN POINT(HPT),SECOND SEGMENT CALCULATIONS-- AS ABOVE
*.....
      DELWE=DRPMWE*D2
      ELWEC=DELWE+BDEL
      MAXDWE=DELWE*.3048
      VB1WE=AFGEN(VOL,ELWEC)*43560.
      AREWE=AFGEN(AREA,ELWEC)*43560.
*.....
*       WATER WORKS(WWK), THIRD SEGMENT CALCULATIONS-- AS ABOVE
*.....
      DELWW=DRPML*D3
      ELEWW=DELWW+BDEL
      MAXDWW=DELWW*.3048
      VB1WWT=AFGEN(VOL,ELEWW)*43560.
      VB1WW=VB1WWT-VB1
      AREWWT=AFGEN(AREA,ELEWW)*43560.
      AREWW=AREWWT-AREA1
*.....
*       SEPTIC TANKS SEEPAGE RATES(CUBIC FEET PER DAY) TO THE THREE
*       SEGMENTS--(WTR),(HPT),AND (WWK) RESPECTIVELY
*.....
      QSEEP=WOPCD*POP/7.48/TRBL*D1
      QSEWE=WOPCD*POP/7.48/TRBL*D2
      QSEWW=WOPCD*POP/7.48/TRBL*(D3-D1)
*.....
*       AVERAGE DIFFUSIONAL CONSTANT (SQUARE METER PER DAY) AT STRATIFIED
*       PERIOD BETWEEN EPILIMNION AND HYPOLIMNION
*.....
      AT=2.*DZTMP*SQRT(TDIFS/(PI*1.))
*.....
*       INITIAL CONCENTRATIONS (MG/LIT) OF OMNIVOROUS AND CARNIVOROUS
*       FISH RESPECTIVELY
*.....
      FCVFI=1.-FOMFI
      COMFI=CFI*FOMFI
      CCVFI=CFI*FCVFI
*.....
*       INITIAL WEIGHT OF OMNIVOROUS FISH IN THE THREE SEGMENTS
*       RESPECTIVELY (GM)
*.....
      WOMFI=COMFI*VB1*.02832
      WOMIWE=COMFI*VB1WE*.02832
      WOMIWW=COMFI*VB1WW*.02832
*.....
*       INITIAL WEIGHT OF CARNIVOROUS FISH IN THE THREE SEGMENTS
*       RESPECTIVELY (GM)
```

```
      WCVFI=CCVFI*VB1*.02832
      WCVIWE=CCVFI*VB1WE*.02832
      WCVIWW=CCVFI*VB1WW*.02832
*.....
*         TOTAL RUNOFF RATE TO THIRD SEGMENT (CUBIC FEET/DAY)
*.....
      RUNOFF=RNCFSM*SM*3600.*24.
*.....
*     INITIAL CONDITIONS
*.....
*         POPULATION ALONG THE BANKS OF BEAVER RESERVOIR
*.....
      POP=8213.
*.....
*         TOTAL RIVER MILES OF 1 AND 2 SEGMENTS
*.....
      D1=18.0
      D2=11.
*.....
*         TOTAL RIVER MILES OF SEGMENTS 1 AND 3
*.....
      D3=26.
*.....
*         INITIAL CONCENTRATIONS OF OXYGEN IN THREE SEGMENTS RESPECTIVELY
*         (MG/LIT)
*.....
      COI=9.
      COIWE=9.2
      COIWW=9.8
*.....
*         INITIAL ORGANIC MATTER CONCENTRATIONS IN THREE SEGMENTS RESPECTIVELY
*         (MG/LIT)
*.....
      OMI=3.
      OMIWE=3.0
      OMIWW=3.0
*.....
*         INITIAL NITROGEN CONCENTRATIONS IN THREE SEGMENTS RESPECTIVELY
*         (MG/LIT)
*.....
      CNI=1.118
      CNIWE=1.0
      CNIWW=.931
*.....
*         INITIAL PHOSPHOROUS CONCENTRATIONS IN THREE SEGMENTS RESPECTIVLEY
*         (MG/LIT)
*.....
```

```
      CPI=.001
      CPIWE=.001
      CPIWW=.001
*.....................................................................
*        INITIAL PHYTOPLANKTON CONCENTRATIONS IN THREE SEGMENTS RESPECTIVELY
*        (MG/LIT)
*.....................................................................
      CAI=12.69
      CAIWE=100.
      CAIWW=54.5
*.....................................................................
*        INITIAL ZOOPLANKTON CONCENTRATIONS IN THREE SEGMENTS RESPECTIVELY
*        (MG/LIT)
*.....................................................................
      CZI=.0038
      CZIWE=.0038
      CZIWW=.0038
*.....................................................................
*        INITIAL FRACTION OF OMNIVOROUS FISH
*.....................................................................
      FOMFI=.9
*.....................................................................
*        INITIAL CONCENTRATION OF FISH BOTH CARNIVOROUS AND OMNIVOROUS FISH
*.....................................................................
      CFI=1.06
*.....................................................................
*        INITIAL BACTERIA CONCENTRATIONS IN THREE SEGMENTS RESPECTIVELY
*        (MG/LIT)
*.....................................................................
      BI=3.E-4
      BIWE=3.E-4
      BIWW=3.E-4
*.....................................................................
*     UNIVERSAL CONSTANTS
*.....................................................................
CONSTANT PI=3.1416,THETE=1.047,THETA=1.02,PFMAX=1.,PFMIN=0.,THSED=1.065
*.....................................................................
*     LAKE GEOMETRY CONSTANTS
*.....................................................................
CONSTANT DRPML=2.98,BDEL=914. ,XTCMIN=3. ,DRPMWE=5.97,E=1.0
*.....................................................................
*     TRIBUTARY FLOWS CONSTANTS
*.....................................................................
CONSTANT QFTP=363934.0,CNFTP=14.4,CPFTP=6.47,SCN=.635,SCP=.066
CONSTANT CNW=.31,CPW=.11,COI1=9.8,COI1WE=9.8,OMIN=3.0,OMINWE=3.0
CONSTANT RNCFSM=2.13,SM=10.0,CNRUN=14.0,CPRUN=6.0,OMRUN=3.0,O2RUN=10.0
CONSTANT BIN=3.E-4,BINWE=3.E-4,BINWW=3.E-4,WOPCD=60.0,TRBL=73.0
```

```
*.....................................................................
*     NUTRIENT SYSTEM CONSTANTS
*.....................................................................
CONSTANT AN=.100, AP=.0135, CNMIN=.005, CPMIN=.001,FRPF=.013,FRNF=.07
CONSTANT CNINF=6.50,CPINF=.35,CNINI=1.118,CPINI=.001
CONSTANT    CNIFWE=6.00,CPIFWE=.50,CNIFWW=4.5,CPIFWW=.15,CNINIW=1.0
CONSTANT CNINIK=.931,CPINIK=.001 ,CPINIW=.001
CONSTANT FRNA=.070,FRPA=.013
*.....................................................................
*     TURBULENT DIFFUSION CONSTANTS
*.....................................................................
CONSTANT TDIFS=0.30,TDIFU=1.5, D7TMP=17.7
*.....................................................................
*     THERMAL-TIME STRUCTURE CONSTANTS
*.....................................................................
CONSTANT TB=43., TZRO=80., TOVR=270. ,TMIX=15.
*.....................................................................
*     ALGAE SUBSYSTEM CONSTANTS
*.....................................................................
CONSTANT SVELA=0.05,KEP1=1.15, R=.634,M1AL=.67,KMN=.014,KMP=.001
CONSTANT CAMIN=1.20, KRA=.050, KGA=1.74, CA0=25.8 ,PFOAI=.75,CA0WE=25.8
CONSTANT IS=86.4
*.....................................................................
*     ZOOPLANKTON SYSTEM CONSTANTS
*.....................................................................
CONSTANT MGRZ=.138,K3=.0115,KMA=10.0,ZMORT=.005,M1ZOO=.67
CONSTANT PFOZI=.25, ZE=0.7, CZMIN=5.E-4 ,CZ0=3.E-3,CZOWE=3.E-3
*.....................................................................
*     OMNIVORE FISH SYSTEM CONSTANTS
*.....................................................................
CONSTANT MGROM=.0267,REROM=.0200,OMMORT=.005
CONSTANT KFZ=.10, KFA=10. ,FE=.6,M1OMF=.67
*.....................................................................
*     CARNIVORE FISH SYSTEM CONSTANTS
*.....................................................................
CONSTANT MGRCV=.028,RERCV=.02,CVMORT=.005,KCVOM=.10,M1CVF=.67
*.....................................................................
*     OXYGEN SYSTEM CONSTANTS
*.....................................................................
CONSTANT GMMA=.042, KL=5.0, KOSED=1.0, O2COM=1.5,COMIN=0.
*.....................................................................
*     ORGANIC MATTER SYSTEM CONSTANTS
*.....................................................................
CONSTANT KOM=14.5,KSOM=65., FOMA=.55, FSAD=.00001,ROMO=.00001,OMMIN=0.
CONSTANT COMINF=4.00,COMINI=3.00,COMINW=3.00,COMINK=3.00
*.....................................................................
*     BACTERIA SYSTEM CONSTANTS
```

```
CONSTANT Y=.40, KSNB=.014, KSPB=.001,   KDB=.18,B2MIN=3.E-9,KBO=1.0
*.....................................................................
DYNAMIC
*.....................................................................
*       HYDRAULICS
*.....................................................................
*       THERMOCLINE ELEVATIONS OF THE THREE SEGMENTS RESPECTIVELY (FEET)
*.....................................................................
      XTCEL=(MAXDP-XTC)/.3048+BDEL
      XWEEL=(MAXDWE-XTCWE)/.3048+BDEL
      XWWEL=(MAXDWW-XTCWW)/.3048+BDEL
*.....................................................................
*       THERMOCLINE AREAS OF THE THREE SEGMENTS RESPECTIVELY (SQUARE FEET)
*.....................................................................
      ATC=AFGEN(AREA,XTCEL)*43560.
      ATCWE=AFGEN(AREA,XWEEL)*43560.
      ATCWWT=AFGEN(AREA,XWWEL)*43560.
      ATCWW=ATCWWT-ATC
*.....................................................................
*       HYPOLIMNION VOLUMES OF THE THREE SEGMENTS RESPECTIVELY (CUBIC FEET)
*.....................................................................
      V2=AFGEN(VOL,XTCEL)*43560.
      V2WE=AFGEN(VOL,XWEEL)*43560.
      V2WWT=AFGEN(VOL,XWWEL)*43560.
      V2WW=V2WWT-V2
*.....................................................................
*       EPILIMNION VOLUMES OF THE THREE SEGMENTS RESPECTIVELY (CUBIC FEET)
*.....................................................................
      V1=VB1-V2
      V1WE=VB1WE-V2WE
      V1WW=VB1WW-V2WW
*.....................................................................
*       AVERAGE DEPTHS OF THE THREE SEGMENTS RESPECTIVELY (METERS)
*.....................................................................
      H1=V1/AREA1*.3048
      H1WE=V1WE/AREWE*.3048
      H1WW=V1WW/AREWW*.3048
*.....................................................................
*       COMBINED FLOW TO FIRST SEGMENT (CUBIC FEET/DAY)
*.....................................................................
      QW=AFGEN(FLOW,TIME)*3600.*24.
      Q0=QFTP+QW+QSEEP
*.....................................................................
*       COMBINED FLOW TO SECOND SEGMENT (CUBIC FEET/DAY)
*.....................................................................
      QWWE=AFGEN(FLOWE,TIME)*3600.*24.
      Q0WE=QSEWE+QWWE
```

```
*.....
*         COMBINED FLOW TO THIRD SEGMENT (CUBIC FEET/DAY)
*.....
      G0WW=Q0+Q0WE+QSEWW+RUNOFF
*.....
*         TOTAL VOLUMES OF THREE SEGMENTS (CUBIC FEET)
*.....
      VTOTAL=VB1+VB1WE+VB1WW
*.....
*     NUTRIENTS SYSTEMS
*.....
*         EPILIMNION NITROGEN BALANCE IN FIRST SEGMENT
*.....
      AL=CA**M1AL
      KDIF=AT*ATC/DZTMP
      CN0=(GSEEP*SCN+QFTP*CNFTP+QW*CNW)/G0
      NALG=AN*RAPGR*AL
      N2DF1=(KDIF/(V2+.001))*(CN2-CN1)/.3048
      EXCNF=FRNF*RESOM*(COMF**M1OMF)+FRNF*RESCV*(CCVF**M1CVF)
      EXCNA=FRNA*K2*AL
      C1NDT= (Q0/V1)*(CN0-CN1)-NALG+NUPS1+N2DF1+EXCNF+EXCNA
      CN1T=INTGRL(CNI ,D1NDT)
*.....
*         EPILIMNION NITROGEN BALANCE IN SECOND SEGMENT
*.....
      ALWE=CAWE**M1AL
      KDIFWE=AT*ATCWE/DZTMP
      CNINWF=AFGEN(NWE,TIME)
      CN0WE=(QSEWE*SCN+QWWE*CNINWF)/Q0WE
      NALGWE=AN*RAPGWE*ALWE
      N2D1WE=(KDIFWE/(V2WE+.001))*(CN2WE-CN1WE)/.3048
      EXNFWE=FRNF*RESOM*(COMFWE**M1OMF)+FRNF*RESCV*(CCVFWE**M1CVF)
      EXNAWE=FRNA*K2*ALWE
      D1NWE=(G0WE/V1WE)*(CN0WE-CN1WE)-NALGWE+NUP1WE+N2D1WE+EXNFWE+EXNAWE
      CN1TWE=INTGRL(CNIWE ,D1NWE)
*.....
*         EPILIMNION NITROGEN BALANCE IN THIRD SEGMENT
*.....
      ALWW=CAWW**M1AL
      KDIFWW=AT*ATCWW/DZTMP
      CN0WW=(Q0*CN1+Q0WE*CN1WE+QSEWW*SCN+RUNOFF*CNRUN)/Q0WW
      NALGWW=AN*RAPGWW*ALWW
      N2D1WW=(KDIFWW/(V2WW+.001))*(CN2WW-CN1WW)/.3048
      EXNFWW=FRNF*RESOM*(COMFWW**M1OMF)+FRNF*RESCV*(CCVFWW**M1CVF)
      EXNAWW=FRNA*K2*ALWW
      D1NWW=(Q0WW/V1WW)*(CN0WW-CN1WW)-NALGWW+NUP1WW+N2D1WW+EXNFWW+EXNAWW
      CN1TWW=INTGRL(CNIWW ,D1NWW)
```

```
*.....
*       HYPOLIMNION NITROGEN BALANCE IN FIRST SEGMENT
*.....
      D2NDT=NUPS2-N2DF1+EXCNF
      CN2T=INTGRL(CNI ,D2NDT)
*.....
*       HYPOLIMNION NITROGEN BALANCE IN SECOND SEGMENT
*.....
      D2NWE=NUP2WE-N2D1WE+EXNFWE
      CN2TWE=INTGRL(CNIWE ,D2NWE)
*.....
*       HYPOLIMNION NITROGEN BALANCE IN THIRD SEGMENT
*.....
      D2NWW=NUP2WW-N2D1WW+EXNFWW
      CN2TWW=INTGRL(CNIWW ,D2NWW)
*.....
*       VOLUMETRIC AVERAGE NITROGEN CONCENTRATIONS OF BOTH EPILIMNION
*       AND HYPOLIMNION IN THREE SEGMENTS RESPECTIVELY (MG/LIT)
*.....
      CN=((CN1*V1)+(CN2*V2))/VB1
      CNWE=((CN1WE*V1WE)+(CN2WE*V2WE))/VB1WE
      CNWW=((CN1WW*V1WW)+(CN2WW*V2WW))/VB1WW
*.....
*       EPILIMNION PHOSPHOROUS BALANCE IN FIRST SEGMENT
*.....
      CP0=(QSEEP*SCP+QFTP*CPFTP+QW*CPW)/Q0
      PALG=AP*RAPGR*AL
      P2DF1=(KDIF/(V2+.001))*(CP2-CP1)/.3048
      EXCPF=FRPF*RESOM*(COMF**M1OMF)+FRPF*RESCV*(CCVF**M1CVF)
      EXCPA=FRPA*K2*AL
      D1PDT= (Q0/V1)*(CP0-CP1)-PALG+PUPS1+P2DF1+EXCPF+EXCPA
      CP1T=INTGRL(CPI ,D1PDT)
*.....
*       EPILIMNION PHOSPHOROUS BALANCE IN SECOND SEGMENT
*.....
      CPINWE=AFGEN(PWE,TIME)
      CP0WE=(QSEWE*SCP+QWWE*CPINWE)/Q0WE
      PALGWE=AP*RAPGWE*ALWE
      P2D1WE=(KDIFWE/(V2WW+.001))*(CP2WE-CP1WE)/.3048
      EXPFWE=FRPF*RESOM*(COMFWE**M1OMF)+FRPF*RESCV*(CCVFWE**M1CVF)
      EXPAWE=FRPA*K2*ALWE
      D1PWE=(Q0WE/V1WE)*(CP0WE-CP1WE)-PALGWE+PUP1WE+P2D1WE+EXPFWE+EXPAWE
      CP1TWE=INTGRL(CPIWE ,D1PWE)
*.....
*       EPILIMNION PHOSPHOROUS BALANCE IN THIRD SEGMENT
*.....
      CP0WW=(Q0*CP1+Q0WE*CP1WE+QSEWW*SCP+RUNOFF*CPRUN)/Q0WW
      PALGWW=AP*RAPGWW*ALWW
```

```
      P2D1WW=(KD1FWW/(V2WW+.001))*(CP2WW-CP1WW)/.3048
      EXPFWW=FRPF*RESOM*(COMFWW**M)OMF)+FRPF*RESCV*(CCVFWW**M)CVF)
      EXPAWW=FRPA*K2*ALWW
      D1PWW=(Q0WW/V1WW)*(CP0WW-CP1WW)-PALGWW+PUP1WW+P2D1WW+EXPFWW+EXPAWW
      CP1TWW=INTGRL(CP1WW ,D1PWW)
*.....
*         HYPOLIMNION PHOSPHOROUS BALANCE IN FIRST SEGMENT
*.....
      D2PDT=PUPS2-P2DF1+EXCPF
      CP2T=INTGRL(CPI ,D2PDT)
*.....
*         HYPOLIMNION PHOSPHOROUS BALANCE IN SECOND SEGMENT
*.....
      D2PWE=PUP2WE-P2D1WE+EXPFWE
      CP2TWE=INTGRL(CP1WE ,D2PWE)
*.....
*         HYPOLIMNION PHOSPHOROUS BALANCE IN THIRD SEGMENT
*.....
      D2PWW=PUP2WW-P2D1WW+EXPFWW
      CP2TWW=INTGRL(CP1WW ,D2PWW)
*.....
*         VOLUMETRIC AVERAGE PHOSPHOROUS CONCENTRATIONS OF BOTH EPILIMNION
*         AND HYPOLIMNION IN THREE SEGMENTS RESPECTIVELY (MG/LIT)
*.....
      CP=((CP1*V1)+(CP2*V2))/VB1
      CPWE=((CP1WE*V1WE)+(CP2WE*V2WE))/VB1WE
      CPWW=((CP1WW*V1WW)+(CP2WW*V2WW))/VB1WW
*.....
*     PHYTOPLANKTON SYSTEM
*.....
*         TEMPERATURE,SUNLIGHT WITH ASSOCIATE FACTORS
*.....
      T=AFGEN(TEMP,TIME)
      TDGC=(T-32.)/1.8
      TH=.697*T8+.303*T
      TEMP2=THETE**((T-32.)/1.8-20.)
      TEMPTC=THETE**((TH-32.)/1.8-20.)
      SUFTEM=THETA**((T-32.)/1.8-20.)
      K1=KGA*SUFTEM
      K2=KRA*SUFTEM
      SMAX=188.3+97.1*SIN(2.*PI/365*(TIME-80.0))
      SMIN=105.9+63.3*SIN(2.*PI/365.0*(TIME-70.0))
      SC=(1.0+.01*E)*(SMIN+R*(SMAX-SMIN))
      AL01=SC/IS
*.....
*         PHYTOPLANKTON MASS BALANCE IN FIRST SEGMENT
*.....
```

```
      P1=CA/60.0
      SETLA=(SVELA/.3048)*AREA1*CA/VB1
      KE1=KEP1+0.0088*P1+0.054*P1**(2./3.0)
      AL11=(SC/IS)*EXP(-KE1*H1)
      R1=(2.718/(KE1*H1))*(EXP(-AL11)-EXP(-AL01))
      RAPGR=R1*K1*(CN1/(KMN+CN1))*(CP1/(KMP+CP1))
      RA=(RAPGR-K2)*CA-SETLA
      ROMFA=(MGROF/FE)*(COMF**M1OMF)*PFOMA*AAVIL/(AAVIL+ZAVIL)
      RAGZ= (GZ/ZE)*(CZ**M1ZOO)
      RA1=RA-RAGZ-ROMFA
      DCADT= (Q0/V1 )*(CA0-CA)+RA1
      CAT=INTGRL(CAI,DCADT)
*.....................................................................
*        PHYTOPLANKTON MASS BALANCE IN SECOND SEGMENT
*.....................................................................
      P1WE=CAWE/60.
      SETWE=(SVELA/.3048)*AREWE*CAWE/VB1WE
      KE1WE=KEP1+.0088*P1WE+.054*P1WE**(2./3.)
      AL11WE=(SC/IS)*EXP(-KE1WE*H1WE)
      R1WE=(2.718/(KE1WE*H1WE))*(EXP(-AL11WE)-EXP(-AL01))
      RAPGWE=R1WE*K1*(CN1WE/(KMN+CN1WE))*(CP1WE/(KMP+CP1WE))
      RAWE=(RAPGWE-K2)*CAWE-SETWE
      ROMFWE=(MGROWE/FE)*(COMFWE**M1OMF)*PFOAWE*AAVIWE/(AAVIWE+ZAVIWE)
      RAGZWE= (GZWE/ZE)*(CZWE**M1ZOO)
      RA1WE=RAWE-RAGZWE-ROMFWE
      DCAWE=(Q0WE/V1WE)*(CA0WE-CAWE)+RA1WE
      CATWE=INTGRL(CAIWE,DCAWE)
*.....................................................................
*        PHYTOPLANKTON MASS BALANCE IN THIRD SEGMENT
*.....................................................................
      CA0WW=(Q0*CA+Q0WE*CAWE)/Q0WW
      P1WW=CAWW/60.
      SETWW=(SVELA/.3048)*AREWW*CAWW/VB1WW
      KE1WW=KEP1+.0088*P1WW+.054*P1WW**(2./3.)
      AL11WW=(SC/IS)*EXP(-KE1WW*H1WW)
      R1WW=(2.718/(KE1WW*H1WW))*(EXP(-AL11WW)-EXP(-AL01))
      RAPGWW=R1WW*K1*(CN1WW/(KMN+CN1WW))*(CP1WW/(KMP+CP1WW))
      RAWW=(RAPGWW-K2)*CAWW-SETWW
      ROMFWW=(MGROWW/FE)*(COMFWW**M1OMF)*PFOAWW*AAVIWW/(AAVIWW+...
      ZAVIWW)
      RAGZWW= (GZWW/ZE)*(CZWW**M1ZOO)
      RA1WW=RAWW-RAGZWW-ROMFWW
      DCAWW=(Q0WW/V1WW)*(CA0WW-CAWW)+RA1WW
      CATWW=INTGRL(CAIWW,DCAWW)
*.....................................................................
*        VOLUMETRIC AVERAGE PHYTOPLANKTON CONCENTRATIONS IN THREE SEGMENTS
*        RESPECTIVELY (MG/LIT)
*.....................................................................
```

```
      CAM=CA*V1/VB1
      CAMWE=CAWE*V1WE/VB1WE
      CAMWW=CAWW*V1WW/VB1WW
*.....................................................................
*     ZOOPLANKTON SYSTEM
*.....................................................................
*        ZOOPLANKTON MASS BALANCE IN FIRST SEGMENT
*.....................................................................
      GZ=MGRZ*SUFTEM*(CAM/(CAM+KMA))
      DZ=K3*SUFTEM+ZMORT
      ROMFZ=(MGROF/FE)*(COMF**M1OMF)*PFOMZ*ZAVIL/(AAVIL+ZAVIL)
      RZ=(GZ-DZ)*CZ-ROMFZ
      DCZDT=(Q0/VB1)*(CZ0-CZ)+RZ
      CZT=INTGRL(CZI,DCZDT)
*.....................................................................
*        ZOOPLANKTON MASS BALANCE IN SECOND SEGMENT
*.....................................................................
      GZWE=MGRZ*SUFTEM*(CAMWE/(CAMWE+KMA))
      ROMZWE=(MGROWE/FE)*(COMFWE**M1OMF)*PFOZWE*ZAVIWE/(AAVIWE+ZAVIWE)
      RZWE=(GZWE-DZ)*CZWE-ROMZWE
      DCZWE= (Q0WE/VB1WE)*(CZ0WE-CZWE)+RZWE
      CZTWE=INTGRL(CZIWE,DCZWE)
*.....................................................................
*        ZOOPLANKTON MASS BALANCE IN THIRD SEGMENT
*.....................................................................
      CZ0WW=(Q0*CZ+Q0WE*CZWE)/Q0WW
      GZWW=MGRZ*SUFTEM*(CAMWW/(KMA+CAMWW))
      ROMZWW=(MGROWW/FE)*(COMFWW**M1OMF)*PFOZWW*ZAVIWW/(AAVIWW+ZAVIWW)
      RZWW=(GZWW-DZ)*CZWW-ROMZWW
      DCZWW=(Q0WW/VB1WW)*(CZ0WW-CZWW)+RZWW
      CZTWW=INTGRL(CZIWW,DCZWW)
*.....................................................................
*        VOLUMETRIC AVERAGE ZOOPLANKTON CONCENTRATIONS IN THREE SEGMENTS
*        (MG/LIT)
*.....................................................................
      MCZOO=(CZ*VB1+CZWE*VB1WE+CZWW*VB1WW)/VTOTAL
*.....................................................................
*      FISH SYSTEM
*.....................................................................
*       OMMNIVORES FISH
*.....................................................................
*          OMNIVOROUS FISH MASS BALANCE IN FIRST SEGMENT
*.....................................................................
      ZAVIL=(CZ/(KFZ+CZ))
      AAVIL=(CAM/(KFA+CAM))
      MGROF=MGROM*SUFTEM*(AAVIL+ZAVIL)
      RESOM=REROM*SUFTEM+OMMORT
      NRGOF=MGROF-RESOM
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      RCVOM=(MGRCF/FE)*(WCVF**M1CVF)
      DOFDT=NRGOF*WOMF-RCVOM
      WOMF=INTGRL(WOMFI,DOFDT)
      COMF=WOMF*1000./VB1/28.32
*.....................................................................
*          OMNIVOROUS FISH MASS BALANCE IN SECOND SEGMENT
*.....................................................................
      ZAVIWE=(CZWE/(KFZ+CZWE))
      AAVIWE=(CAMWE/(KFA+CAMWE))
      MGROWE=MGROM*SUFTEM*(AAVIWE+ZAVIWE)
      NGROWE=MGROWE-RESOM
      RCVOWE=(MGRCWE/FE)*(WCVFWE**M1CVF)
      DOFWE=NGROWE*WOMFWE-RCVOWE
      WOMFWE=INTGRL(WOMIWE,DOFWE)
      COMFWE=WOMFWE*1000./VB1WE/28.32
*.....................................................................
*          OMNIVOROUS FISH MASS BALANCE IN THIRD SEGMENT
*.....................................................................
      ZAVIWW=(CZWW/(KFZ+CZWW))
      AAVIWW=(CAMWW/(KFA+CAMWW))
      MGROWW=MGROM*SUFTEM*(AAVIWW+ZAVIWW)
      NGROWW=MGROWW-RESOM
      RCVOWW=(MGRCWW/FE)*(WCVFWW**M1CVF)
      DOFWW=NGROWW*WOMFWW-RCVOWW
      WOMFWW=INTGRL(WOMIWW,DOFWW)
      COMFWW=WOMFWW*1000./VB1WW/28.32
*.....................................................................
*        CARNIVORES FISH
*.....................................................................
*          CARNIVOROUS FISH MASS BALANCE IN FIRST SEGMENT
*.....................................................................
      MGRCF=MGRCV*SUFTEM*(COMF/(KCVOM+COMF))
      RESCV=RERCV*SUFTEM+CVMORT
      NRGCF=MGRCF-RESCV
      DCFDT=NRGCF*WCVF
      WCVF=INTGRL(WCVFI,DCFDT)
      CCVF=WCVF*1000./VB1/28.32
*.....................................................................
*          CARNIVOROUS FISH MASS BALANCE IN SECOND SEGMENT
*.....................................................................
      MGRCWE=MGRCV*SUFTEM*(COMFWE/(KCVOM+COMFWE))
      NRGCWE=MGRCWE-RESCV
      DCFWE=NRGCWE*WCVFWE
      WCVFWE=INTGRL(WCVIWE,DCFWE)
      CCVFWE=WCVFWE*1000./VB1WE/28.32
*.....................................................................
*          CARNIVOROUS FISH MASS BALANCE IN THIRD SEGMENT
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```
*.....................................................................
      MGRCWW=MGRCV*SUFTW**(COMFWW/(KCVOM+COMFWW))
      NRGCWW=MGRCWW-RESCV
      DCFWW=NRGCWW*WCVFWW
      WCVFWW=INTGRL(WCVIWW,DCFWW)
      CCVFWW=WCVFWW*1000./VB1WW/28.32
*.....................................................................
*        COMBINED CONCENTRATIONS OF BOTH OMNIVORES AND CARNIVORES IN
*        THREE SEGMENTS RESPECTIVELY (MG/LIT)
*.....................................................................
      CF=COMF+CCVF
      CFWE=COMFWE+CCVFWE
      CFWW=COMFWW+CCVFWW
*.....................................................................
*        VOLUMETRIC AVERAGE OF BOTH OMNIVORES AND CARNIVORES IN THREE
*        SEGMENTS  (MG/LIT)
*.....................................................................
      MCFISH=(CF*VB1+CFWE*VB1WE+CFWW*VB1WW)/VTOTAL
*.....................................................................
*        OXYGEN SYSTEM
*.....................................................................
*        OXYGEN SATURATION CONCENTRATIONS AS FUNCTION OF TEMPERATURE
*        IN DEGREE CENTIGRADE (MG/LIT)
*.....................................................................
      COS=14.5532-0.38217*TDGC+0.0054258*TDGC*TDGC
*.....................................................................
*        EPILIMNION OXYGEN BALANCE IN FIRST SEGMENT
*.....................................................................
      O2ALG=GMMA*RAPGR*AL
      O2SUF=(KL*AREA1/V1)*(COS-CO1)
      O2DIF=(KDIF/V1)*(CO1-CO2)/.3048
      O2OM1=O2COM*OMCN1
      DO21D=(Q0/V1)*(CO11-CO1)+O2SUF+O2ALG-O2DIF-O2OM1-O2SED1
      CO1T=INTGRL(CO1,DO21D)
*.....................................................................
*        EPILIMNION OXYGEN BALANCE IN SECOND SEGMENT
*.....................................................................
      O2ALWE=GMMA*RAPGWE*ALWE
      O2SUWE=(KL*AREWE/V1WE)*(COS-CO1WE)
      O2DIWE=(KDIFWE/V1WE)*(CO1WE-CO2WE)/.3048
      O0M1WE=O2COM*OMN1WE
      DO21WE=(Q0WE/V1WE)*(CO11WE-CO1WE)+O2SUWE+O2ALWE-O2D1WE-O0M1WE-...
      OSE1WE
      CO1TWE=INTGRL(CO1WE,DO21WE)
*.....................................................................
*        EPILIMNION OXYGEN BALANCE IN THIRD SEGMENT
*.....................................................................
      CO11WW=(Q0*CO1+Q0WE*CO1WE+RUNOFF*O2RUN)/Q0WW
      O2ALWW=GMMA*RAPGWW*ALWW
```

```
      O2SUWW=(KL*AREWW/V1WW)*(COS-CO1WW)
      O2DIWW=(KDIFWW/V1WW)*(CO1WW-CO2WW)/.3048
      OOM1WW=O2COM*OMN1WW
      DO21WW=(Q0WW/V1WW)*(COI1WW-CO1WW)+O2SUWW+O2ALWW-O2DIWW-OOM1WW-...
      OSE1WW
      CO1TWW=INTGRL(COIWW,DO21WW)
*.....................................................................
*        HYPOLIMNION OXYGEN BALANCE IN FIRST SEGMENT
*.....................................................................
      O2OM2=O2COM*OMCN2
      DO22D=O2DIF-O2OM2-O2SED2
      CO2T=INTGRL(COI,DO22D)
*.....................................................................
*        HYPOLIMNION OXYGEN BALANCE IN SECOND SEGMENT
*.....................................................................
      OOM2WE=O2COM*OMN2WE
      DO22WE=O2DIWE-OOM2WE-OSE2WE
      CO2TWE=INTGRL(COIWE,DO22WE)
*.....................................................................
*        HYPOLIMNION OXYGEN BALANCE IN THIRD SEGMENT
*.....................................................................
      OOM2WW=O2COM*OMN2WW
      DO22WW=O2DIWW-OOM2WW-OSE2WW
      CO2TWW=INTGRL(COIWW,DO22WW)
*.....................................................................
*        EPILIMNION OXYGEN CONCENTRATIONS LIMITATION BETWEEN MINIMUM AND
*        MAXIMUM IN THREE SEGMENTS RESPECTIVELY (MG/LIT)
*.....................................................................
      CO1=LIMIT(COMIN,1000.,CO1T)
      CO1WW=LIMIT(COMIN,1000.,CO1TWW)
      CO1WE=LIMIT(COMIN,1000.,CO1TWE)
*.....................................................................
*        HYPOLIMNION OXYGEN CONCENTRATIONS LIMITATION BETWEEN MINIMUM AND
*        MAXIMUM IN THREE SEGMENTS RESPECTIVELY (MG/LIT)
*.....................................................................
      CO2TT=LIMIT(COMIN,1000.,CO2T)
      CO2=CO2TT*(V2/(V2+.001))
      CO2TTW=LIMIT(COMIN,1000. ,CO2TWE)
      CO2WE=CO2TTW*(V2WE/(V2WE+.001))
      CO2TTK=LIMIT(COMIN,1000.,CO2TWW)
      CO2WW=CO2TTK*(V2WW/(V2WW+.001))
*.....................................................................
*        VOLUMETRIC AVERAGE OF BOTH EPILIMNION AND HYPOLIMNION OXYGEN
*        CONCENTRAITONS IN THREE SEGMENTS RESPECTIVELY (MG/LIT)
*.....................................................................
      O2=((CO1*V1)+(CO2*V2))/VB1
      O2WE=((CO1WE*V1WE)+(CO2WE*V2WE))/ VB1WE
      O2WW=((CO1WW*V1WW)+(CO2WW*V2WW))/VB1WW
```

```
*.....
*       ORGANIC MATTER
*.....
*       EPILIMNION ORGANIC MATTER BALANCE IN FIRST SEGMENT
*.....
      OMCN1=((KOM*OM1)/(KSOM+OM1))*B1*TEMP2
      OMALG=FSAD*SETLA*FOMA
      DOM1D=(Q0/V1)*(OMIN-OM1)+OMALG+ROMO-OMCN1+ROMS1
      OM1T=INTGRL(OMI,DOM1D)
*.....
*       EPILIMNION ORGANIC MATTER BALANCE IN SECOND SEGMENT
*.....
      OMN1WE=((KOM*OM1WE)/(KSOM+OM1WE))*B1WE*TEMP2
      OMALWE=FSAD*SETWE*FOMA
      DOM1WE=(Q0WE/V1WE)*(OMINWE-OM1WE)+OMALWE+ROMO-OMN1WE+ROMS1W
      OM1TWE=INTGRL(OMIWE,DOM1WE)
*.....
*       EPILIMNION ORGANIC MATTER BALANCE IN THIRD SEGMENT
*.....
      OMN1WW=((KOM*OM1WW)/(KSOM+OM1WW))*B1WW*TEMP2
      OMALWW=FSAD*SETWW*FOMA
      OMINWW=(Q0*OM1+Q0WE*OM1WE+RUNOFF*OMRUN)/Q0WW
      DOM1WW=(Q0WW/V1WW)*(OMINWW-OM1WW)+OMALWW+ROMO-OMN1WW+ROMS1K
      OM1TWW=INTGRL(OMIWW,DOM1WW)
*.....
*       HYPOLIMNION ORGANIC MATTER BALANCE IN FIRST SEGMENT
*.....
      OMCN2=((KOM*OM2)/(KSOM+OM2))*B2*TEMPTC
      DOM2D=OMALG+ROMO+ROMS2-OMCN2
      OM2T=INTGRL(OMI,DOM2D)
*.....
*       HYPOLIMNION ORGANIC MATTER BALANCE IN SECOND SEGMENT
*.....
      OMN2WE=((KOM*OM2WE)/(KSOM+OM2WE))*B2WE*TEMPTC
      DOM2WE=OMALWE+ROMO+ROMS2W-OMN2WE
      OM2TWE=INTGRL(OMIWE,DOM2WE)
*.....
*       HYPOLIMNION ORGANIC MATTER BALANCE IN THIRD SEGMENT
*.....
      OMN2WW=((KOM*OM2WW)/(KSOM+OM2WW))*B2WW*TEMPTC
      DOM2WW=OMALWW+ROMO+ROMS2K-OMN2WW
      OM2TWW=INTGRL(OMIWW,DOM2WW)
*.....
*       EPILIMNION ORGANIC MATTER CONCENTRATIONS LIMITATION BETWEEN MINIMUM
*       AND MAXIMUM IN THREE SEGMENTS RESPECTIVELY (MG/LIT)
*.....
      OM1=LIMIT(OMMIN,1000.,OM1T)
```

```
      OM1WE=LIMIT(OMMIN,1000., OM1TWE)
      OM1WW=LIMIT(OMMIN,1000.,OM1TWW)
*.....................................................................
*        HYPOLIMNION ORGANIC MATTER CONCENTRATIONS LIMITATION BETWEEN
*        MINIMUM AND MAXIMUM IN THREE SEGMENTS RESPECTIVELY (MG/LIT)
*.....................................................................
      OM2TT=LIMIT(OMMIN,1000.,OM2T)
      OM2=OM2TT*(V2/(V2+.001))
      OM2TTW=LIMIT(OMMIN,1000.,OM2TWE)
      OM2WE=OM2TTW*(V2WE/(V2WE+.001))
      OM2TTK=LIMIT(OMMIN,1000.,OM2TWW)
      OM2WW=OM2TTK*(V2WW/(V2WW+.001))
*.....................................................................
*        VOLUMETRIC AVERAGE OF BOTH EPILIMNION AND HYPOLIMNION ORGANIC
*        MATTER CONCENTRATIONS IN THREE SEGMENTS RESPECTIVELY (MG/LIT)
*.....................................................................
      OM=((OM1*V1)+(OM2*V2))/VB1
      OMWE=((OM1WE*V1WE)+(OM2WE*V2WE))/VB1WE
      OMWW=((OM1WW*V1WW)+(OM2WW*V2WW))/VB1WW
*.....................................................................
*        BACTERIA
*.....................................................................
*        EPILIMNION BACTERIA BALANCE IN FIRST SEGMENT
*.....................................................................
      BGR01=Y*OMCN1*(CN1/(KSNB+CN1))*(CP1/(KSPB+CP1))*(CO1/(KBO+CO1))
      RESB1=KDB*TEMP2
      BDI1=RESB1*B1
      DB1D=(Q0/V1)*(BIN-B1)+BGR01-BDI1
      B1=INTGRL(BI,DB1D)
*.....................................................................
*        EPILIMNION BACTERIA BALANCE IN SECOND SEGMENT
*.....................................................................
      BGR1WE=Y*OMN1WE*(CN1WE/(KSNB+CN1WE))*(CP1WE/(KSPB+CP1WE))*...
      (CO1WE/(KBO+CO1WE))
      BDI1WE=RESB1*B1WE
      DB1DWE=(Q0WE/V1WE)*(BINWE-B1WE)+BGR1WE-BDI1WE
      B1WE=INTGRL(BIWE,DB1DWE)
*.....................................................................
*        EPILIMNION BACTERIA BALANCE IN THIRD SEGMENT
*.....................................................................
      BGR1WW=Y*OMN1WW* (CN1WW/(KSNB+CN1WW))*(CP1WW/(KSPB+CP1WW))*...
      (CO1WW/(KBO+CO1WW))
      BDI1WW=RESB1*B1WW
      DB1DWW=(Q0WW/V1WW)*(BINWW-B1WW)+BGR1WW-BDI1WW
      B1WW=INTGRL(BIWW,DB1DWW)
*.....................................................................
*        HYPOLIMNION BACTERIA BALANCE IN FIRST SEGMENT
*.....................................................................
```

```
      BGR2=Y*OMN2*(CN2/(KSNR+CN2))*(CP2/(KSPR+CP2))*(CO2/(KBO+CO2))
      RESR2=KDR*TEMPTC
      BDI2=RESR2*B2
      DB2D=BGR2-BDI2
      B2T=INTGRL(BI ,DB2D)
*.....
*         HYPOLIMNION BACTERIA BALANCE IN SECOND SEGMENT
*.....
      BGR2WE=Y*OMN2WE*(CN2WE/(KSNR+CN2WE))*(CP2WE/(KSPR+CP2WE))*...
      (CO2WE/(KBO+CO2WE))
      BDI2WE=RESR2*B2WE
      DB2DWE=BGR2WE-BDI2WE
      B2TWE=INTGRL(BIWE ,DB2DWE)
*.....
*         HYPOLIMNION BACTERIA BALANCE IN THIRD SEGMENT
*.....
      BGR2WW=Y*OMN2WW*(CN2WW/(KSNR+CN2WW))*(CP2WW/(KSPR+CP2WW))*...
      (CO2WW/(KBO+CO2WW))
      BDI2WW=RESR2*B2WW
      DB2DWW=BGR2WW-BDI2WW
      B2TWW=INTGRL(BIWW ,DB2DWW)
*.....
*         HYPOLIMNION BACTERIA CONCENTRATIONS LIMITATION BETWEEN MINIMUM
*         AND MAXIMUM IN THREE SEGMENTS RESPECTIVELY (MG/LIT)
*.....
      B2TT=LIMIT(B2MIN,1000.,B2T)
      B2=B2TT*(V2/(V2+.001))
      B2TWE=LIMIT(B2MIN,1000.,B2TWE)
      B2WE=B2TWE*(V2WE/(V2WE+.001))
      B2TWW=LIMIT(B2MIN,1000.,B2TWW)
      B2WW=B2TWW*(V2WW/(V2WW+.001))
*.....
*         VOLUMETRIC AVERAGE OF BOTH EPILIMNION AND HYPOLIMNION BACTERIA
*         CONCENTRATIONS IN THREE SEGMENTS RESPECTIVELY (MG/LIT)
*.....
      BAC=((B1*V1)+(B2*V2))/VB1
      BACWE=((B1WE*V1WE)+(B2WE*V2WE))/VB1WE
      BACWW=((B1WW*V1WW)+(B2WW*V2WW))/VB1WW
*.....
*         SEDIMENT UPSURGE SYSTEM CONSTANT IN METER/DAY
*         UPSURGE CONSTANT DURING UNSTRATIFIED PERIOD(S) (METER/DAY)
*.....
      UPRMT=2.*SQRT(TDIFU/(PI*TMIX))
*.....
*         PHOSPHOROUS UPSURGE TO ENTIRE SEGMENT IN THREE SEGMENTS RESPECTIVELY
*         (MG/LIT-DAY)
*.....
```

```
      PUPS1=UPK1*(CPINF-CPINI)*AREA1/(V1*.3048)
      PUP1WE=UPK1WE*(CPIFWE-CPINIW)*AREWE/(V1WE*.3048)
      PUP1WW=UPK1WW*(CPIFWW-CPINIK)*AREWW/(V1WW*.3048)
*.....................................................................
*        PHOSPHOROUS UPSURGE TO HYPOLIMNION IN THREE SEGMENTS RESPECTIVELY
*        (MG/LIT-DAY)
*.....................................................................
      PUPS2=UPK2*(CPINF-CPINI)*ATC/((V2+.001)*.3048)
      PUP2WE=UPK2WE*(CPIFWE-CPINIW)*ATCWE/((V2WE+.001)*.3048)
      PUP2WW=UPK2WW*(CPIFWW-CPINIK)*ATCWW/((V2WW+.001)*.3048)
*.....................................................................
*        NITROGEN UPSURGE TO ENTIRE SEGMENT IN THREE SEGMENTS RESPECTIVELY
*        (MG/LIT-DAY)
*.....................................................................
      NUPS1=UPK1*(CNINF-CNINI)*AREA1/(V1*.3048)
      NUP1WE=UPK1WE*(CNIFWE-CNINIW)*AREWE/(V1WE*.3048)
      NUP1WW=UPK1WW*(CNIFWW-CNINIK)*AREWW/ (V1WW*.3048)
*.....................................................................
*        NITROGEN UPSURGE TO HYPOLIMNION IN THREE SEGMENTS RESPECTIVELY
*        (MG/LIT-DAY)
*.....................................................................
      NUPS2=UPK2*(CNINF-CNINI)*ATC/((V2+.001)*.3048)
      NUP2WE=UPK2WE*(CNIFWE-CNINIW)*ATCWE/((V2WE+.001)*.3048)
      NUP2WW=UPK2WW*(CNIFWW-CNINIK)*ATCWW/((V2WW+.001)*.3048)
*.....................................................................
*        ORGANIC MATTER UPSURGE TO ENTIRE SEGMENT IN THREE SEGMENTS RESPECTIVELY
*        (MG/LIT-DAY)
*.....................................................................
      ROMS1=UPK1*(COMINF-COMINI)*AREA1/(V1*.3048)
      ROMS1W=UPK1*(COMINF-COMINW)*AREWE/(V1WE*.3048)
      ROMS1K=UPK1WW*(COMINF-COMINK)*AREWW/(V1WW*.3048)
*.....................................................................
*        ORGANIC MATTER UPSURGE TO HYPOLIMNION IN THREE SEGMENTS RESPECTIVELY
*        (MG/LIT-DAY)
*.....................................................................
      ROMS2=UPK2*(COMINF-COMINI)*ATC/((V2+.001)*.3048)
      ROMS2W=UPK2*(COMINF-COMINW)*ATCWE/((V2WE+.001)*.3048)
      ROMS2K=UPK2WW*(COMINF-COMINK)*ATCWW/((V2WW+.001)*.3048)
*.....................................................................
*        LIMITING OUTPUT PHYTOPLANKTON AND ZOOPLANKTON CONCENTRATIONS
*        BELOW MINIMUM AND DETERMINING PREFERENCE FACTORS OF OMNIVORES ON
*        PHYTOPLANKTON AND ZOOPLANKTON IN THREE SEGMENTS RESPECTIVELY
*.....................................................................
PROCEDURE CA,CZ,PFOMA,PFOMZ=BLOKA(CAT,CAMIN,CZT,CZMIN,PFMAX,PFMIN,...
          PFOAI,PFOZI)
      IF(CAT-CAMIN) 1,1,2
    1 IF(CZT-CZMIN) 3,3,10
```

```
     2 IF(CZT-CZMIN) 11,11,12
     3 PFOMA=PFMIN
       PFOMZ=PFMIN
       CA=CAMIN
       CZ=CZMIN
       GO TO 50
    10  PFOMA=PFMIN
       PFOMZ=PFMAX
       CA=CAMIN
       CZ=CZT
       GO TO 50
    11  PFOMA=PFMAX
       PFOMZ=PFMIN
       CA=CAT
       CZ=CZMIN
       GO TO 50
    12 PFOMA=PFOAI
       PFOMZ=PFOZI
       CA=CAT
       CZ=CZT
    50 CONTINUE
ENDPRO
PROCEDURE CAWE,CZWE,PFOAWE,PFOZWE=BLOKB(CATWE,CAMIN,CZTWE,CZMIN,...
       PFMAX,PFMIN,PFOAI,PFOZI)
       IF(CATWE-CAMIN) 101,101,102
  101 IF(CZTWE-CZMIN) 103,103,110
  102 IF(CZTWE-CZMIN) 111,111,112
  103 PFOAWE=PFMIN
       PFOZWE=PFMIN
       CAWE=CAMIN
       CZWE=CZMIN
       GO TO 150
  110 PFOAWE=PFMIN
       PFOZWE=PFMAX
       CAWE=CAMIN
       CZWE=CZTWE
       GO TO 150
  111 PFOAWE=PFMAX
       PFOZWE=PFMIN
       CAWE=CATWE
       CZWE=CZMIN
       GO TO 150
  112 PFOAWE=PFOAI
       PFOZWE=PFOZI
       CAWE=CATWE
       CZWE=CZTWE
  150 CONTINUE
```

```
ENDPRO
PROCEDURE CAWW,CZWW,PFOAWW,PFOZWW=BLOKC(CATWW,CAMIN,CZTWW,CZMIN,...
      PFMAX,PFMIN,PFOAI,PFOZI)
      IF(CATWW-CAMIN) 201,201,202
  201 IF(CZTWW-CZMIN) 203,203,210
  202 IF(CZTWW-CZMIN) 211,211,212
  203 PFOAWW=PFMIN
      PFOZWW=PFMIN
      CAWW=CAMIN
      CZWW=CZMIN
      GO TO 250
  210 PFOAWW=PFMIN
      PFOZWW=PFMAX
      CAWW=CAMIN
      CZWW=CZTWW
      GO TO 250
  211 PFOAWW=PFMAX
      PFOZWW=PFMIN
      CAWW=CATWW
      CZWW=CZMIN
      GO TO 250
  212 PFOAWW=PFOAI
      PFOZWW=PFOZI
      CAWW=CATWW
      CZWW=CZTWW
  250 CONTINUE
ENDPRO
*.....................................................................
*        DETERMINING THERMOCLINE DEPTHS IN THREE SEGMENTS RESPECTIVELY
*.....................................................................
PROCEDURE  XTC=BLOKD(TZRO,TIME,MAXDP,TDIFS,TOVR,XTCMIN)
      IF (TIME-TZRO) 16,16,13
   16 XTC=MAXDP
      GO TO 15
   13 IF(TIME-TOVR) 14,14,16
   14 MODTM=TIME-TZRO
      XTC=SQRT(2.*TDIFS*MODTM)
      IF(XTC-XTCMIN) 80,80,81
   80 XTC=XTCMIN
      GO TO 15
   81 IF(XTC-MAXDP) 15,15,16
   15 CONTINUE
ENDPRO
PROCEDURE XTCWE=BLOKE(TZRO,TIME,MAXDWE,TDIFS,TOVR,XTCMIN)
      IF(TIME-TZRO) 116,116,113
  116 XTCWE=MAXDWE
      GO TO 115
```

```
    2 IF(CZT-CZMIN) 11,11,12
    3 PFOMA=PFMIN
        PFOMZ=PFMIN
        CA=CAMIN
        CZ=CZMIN
      GO TO 50
   10   PFOMA=PFMIN
        PFOMZ=PFMAX
        CA=CAMIN
        CZ=CZT
      GO TO 50
   11   PFOMA=PFMAX
        PFOMZ=PFMIN
        CA=CAT
        CZ=CZMIN
      GO TO 50
   12 PFOMA=PFOAI
        PFOMZ=PFOZI
        CA=CAT
        CZ=CZT
   50 CONTINUE
ENDPRO
PROCEDURE CAWE,CZWE,PFOAWE,PFOZWE=BLOKB(CATWE,CAMIN,CZTWE,CZMIN,...
      PFMAX,PFMIN,PFOAI,PFOZI)
      IF(CATWE-CAMIN) 101,101,102
  101 IF(CZTWE-CZMIN) 103,103,110
  102 IF(CZTWE-CZMIN) 111,111,112
  103 PFOAWE=PFMIN
      PFOZWE=PFMIN
      CAWE=CAMIN
      CZWE=CZMIN
      GO TO 150
  110 PFOAWE=PFMIN
      PFOZWE=PFMAX
      CAWE=CAMIN
      CZWE=CZTWE
      GO TO 150
  111 PFOAWE=PFMAX
      PFOZWE=PFMIN
      CAWE=CATWE
      CZWE=CZMIN
      GO TO 150
  112 PFOAWE=PFOAI
      PFOZWE=PFOZI
      CAWE=CATWE
      CZWE=CZTWE
  150 CONTINUE
```

```
ENDPRO
PROCEDURE CAWW,CZWW,PFOAWW,PFOZWW=BLOKC(CATWW,CAMIN,CZTWW,CZMIN,...
      PFMAX,PFMIN,PFOAI,PFOZI)
      IF(CATWW-CAMIN) 201,201,202
  201 IF(CZTWW-CZMIN) 203,203,210
  202 IF(CZTWW-CZMIN) 211,211,212
  203 PFOAWW=PFMIN
      PFOZWW=PFMIN
      CAWW=CAMIN
      CZWW=CZMIN
      GO TO 250
  210 PFOAWW=PFMIN
      PFOZWW=PFMAX
      CAWW=CAMIN
      CZWW=CZTWW
      GO TO 250
  211 PFOAWW=PFMAX
      PFOZWW=PFMIN
      CAWW=CATWW
      CZWW=CZMIN
      GO TO 250
  212 PFOAWW=PFOAI
      PFOZWW=PFOZI
      CAWW=CATWW
      CZWW=CZTWW
  250 CONTINUE
ENDPRO
*.....................................................................
*        DETERMINING THERMOCLINE DEPTHS IN THREE SEGMENTS RESPECTIVELY
*.....................................................................
PROCEDURE  XTC=BLOKD(TZRO,TIME,MAXDP,TDIFS,TOVR,XTCMIN)
      IF (TIME-TZRO) 16,16,13
   16 XTC=MAXDP
      GO TO 15
   13 IF(TIME-TOVR) 14,14,16
   14 MODTM=TIME-TZRO
      XTC=SQRT(2.*TDIFS*MODTM)
      IF(XTC-XTCMIN) 80,80,81
   80 XTC=XTCMIN
      GO TO 15
   81 IF(XTC-MAXDP) 15,15,16
   15 CONTINUE
ENDPRO
PROCEDURE XTCWE=BLOKE(TZRO,TIME,MAXDWE,TDIFS,TOVR,XTCMIN)
      IF(TIME-TZRO) 116,116,113
  116 XTCWE=MAXDWE
      GO TO 115
```

```
  113 IF(TIME-TOVR) 114,114,116
  114 MODTM=TIME-TZRO
      XTCWE=SQRT(2.*TDIFS*MODTM)
      IF(XTCWE-XTCMIN) 180,180,181
  180 XTCWE=XTCMIN
      GO TO 115
  181 IF(XTCWE-MAXDWE) 115,115,116
  115 CONTINUE
ENDPRO
PROCEDURE XTCWW=BLOKE(TZRO,TIME,MAXDWW,TDIFS,TOVR,XTCMIN)
      IF(TIME-TZRO) 216,216,213
  216 XTCWW=MAXDWW
      GO TO 215
  213 IF(TIME-TOVR) 214,214,216
  214 MODTM=TIME-TZRO
      XTCWW=SQRT(2.*TDIFS*MODTM)
      IF(XTCWW-XTCMIN) 280,280,281
  280 XTCWW=XTCMIN
      GO TO 215
  281 IF(XTCWW-MAXDWW) 215,215,216
  215 CONTINUE
ENDPRO
*.....................................................................
*       DETERMINING UPSURGE CONSTANTS TO HYPOLIMNION DURING STRATIFICATION
*       AND ENTIRE SEGMENT DURING UNSTRATIFICATION IN THREE SEGMENTS
*       RESPECTIVELY
*.....................................................................
PROCEDURE UPK1,UPK2=BLOKG(MAXDP,XTC,TDIFS,TIME,PI,UPKMT,TZRO,TOVR)
      IF(TIME-TZRO) 29,29,30
   29 UPK1=UPKMT
      UPK2=0.0
      GO TO 31
   30 IF(TIME-TOVR) 32,32,29
   32 TS=TIME-TZRO
      UPK2=(SQRT(TDIFS/(PI*(TS+1.))))*EXP(-((MAXDP-XTC)*(MAXDP-XTC)/...
      (16.*TDIFS*(TS+1.))))
      UPK1=0.0
   31 CONTINUE
ENDPRO
PROCEDURE UPK1WE,UPK2WE=BLOKH(MAXDWE,XTCWE,TDIFS,TIME,PI,UPKMT,TZRO,...
      TOVR)
      IF(TIME-TZRO) 129,129,130
  129 UPK1WE=UPKMT
      UPK2WE=0.0
      GO TO 131
  130 IF(TIME-TOVR) 132,132,129
  132 TS=TIME-TZRO
```

```
      UPK2WE=(SQRT(TDIFS/(PI*(TS+1.))))*EXP(-((MAXDWE-XTCWE)*(MAXDWE-...
     XTCWE)/(16.*TDIFS*(TS+1.))))
      UPK1WE=0.0
  131 CONTINUE
ENDPRO
PROCEDURE UPK1WW,UPK2WW=BLOKI(MAXDWW,XTCWW,TDIFS,TIME,PI,UPKMT,TZRO,...
     TOVR)
      IF(TIME-TZRO) 229,229,230
  229 UPK1WW=UPKMT
      UPK2WW=0.0
      GO TO 231
  230 IF(TIME-TOVR) 232,232,229
  232 TS=TIME-TZRO
      UPK2WW=(SQRT(TDIFS/(PI*(TS+1.))))*EXP(-((MAXDWW-XTCWW)*(MAXDWW-...
     XTCWW)/(16.*TDIFS*(TS+1.))))
      UPK1WW=0.0
  231 CONTINUE
ENDPRO
*.....................................................................
*        DETERMINING OXYGEN CONSUMPTION BY SEDIMENT IN HYPOLIMNION AND ENTIRE
*        SEGMENT IN THREE SEGMENTS RESPECTIVELY
*.....................................................................
PROCEDURE O2SED1,O2SED2=BLOKJ(V2,H1,T,KOSED,THSED,ATC,TH)
      IF(V2) 51,51,52
   51 O2SED1=KOSED*(THSED**((T-32.)/1.8-20.))/H1
      O2SED2=0.
      GO TO 53
   52 O2SED1=0.
      O2SED2=KOSED*(THSED**((TH-32.)/1.8-20.))*ATC/((V2+.001)*.3048)
   53 CONTINUE
ENDPRO
PROCEDURE OSE1WE,OSE2WE=BLOKK(V2WE,H1WE,T,KOSED,THSED,ATCWE,TH)
      IF(V2WE) 151,151,152
  151 OSE1WE=KOSED*(THSED**((T-32.)/1.8-20.))/H1WE
      OSE2WE=0.
      GO TO 153
  152 OSE1WE=0.
      OSE2WE=KOSED*(THSED**((TH-32.)/1.8-20.))*ATCWE/((V2WE+.001)*.3048)
  153 CONTINUE
ENDPRO
PROCEDURE OSE1WW,OSE2WW=BLOKL(V2WW,H1WW,T,KOSED,THSED,ATCWW,TH)
      IF(V2WW) 251,251,252
  251 OSE1WW=KOSED*(THSED**((T-32.)/1.8-20.))/H1WW
      OSE2WW=0.
      GO TO 253
  252 OSE1WW=0.
      OSE2WW=KOSED*(THSED**((TH-32.)/1.8-20.))*ATCWW/((V2WW+.001)*.3048)
  253 CONTINUE
```

```
ENDPRO
*.....
*         LIMITING EPILIMNION PHOSPHOROUS AND NITROGEN OUTPUT CONCENTRATIONS
*         IN THREE SEGMENTS RESPECTIVELY
*.....
PROCEDURE CP1,CN1,CP1WE,CN1WE,CP1WW,CN1WW=BLOKM(CNMIN,CPMIN,CP1T,...
       CN1T,CP1TWE,CN1TWE,CP1TWW,CN1TWW)
       IF(CP1T.LE.CPMIN) GO TO 17
       CP1=CP1T
       GO TO 18
   17  CP1=CPMIN
   18  IF(CP1TWE.LE.CPMIN) GO TO 19
       CP1WE=CP1TWE
       GO TO 20
   19  CP1WE=CPMIN
   20  IF(CP1TWW.LE.CPMIN) GO TO 21
       CP1WW=CP1TWW
       GO TO 22
   21  CP1WW=CPMIN
   22  IF(CN1T.LE.CNMIN) GO TO 23
       CN1=CN1T
       GO TO 24
   23  CN1=CNMIN
   24  IF(CN1TWE.LE.CNMIN) GO TO 25
       CN1WE=CN1TWE
       GO TO 26
   25  CN1WE=CNMIN
   26  IF(CN1TWW.LE.CNMIN) GO TO 27
       CN1WW=CN1TWW
       GO TO 28
   27  CN1WW=CNMIN
   28  CONTINUE
ENDPRO
*.....
*         LIMITING HYPOLIMNION PHOSPHOROUS AND NITROGEN OUTPUT CONCENTRATIONS
*         IN THREE SEGMENTS RESPECTIVELY
*.....
PROCEDURE CP2,CN2=BLOKN(V2,CP2T,CN2T,CPMIN,CNMIN)
       IF(CP2T-CPMIN) 33,33,34
   33  IF(CN2T-CNMIN) 35,35,36
   35  CP2=CPMIN*(V2/(V2+.001))
       CN2=CNMIN*(V2/(V2+.001))
       GO TO 37
   36  CP2=CPMIN*(V2/(V2+.001))
       CN2=CN2T*(V2/(V2+.001))
       GO TO 37
   34  IF(CN2T-CNMIN) 38,38,39
   38  CP2=CP2T*(V2/(V2+.001))
```

```
      CN2=CNMIN*(V2/(V2+.001))
      GO TO 37
   39 CP2=CP2T*(V2/(V2+.001))
      CN2=CN2T*(V2/(V2+.001))
   37 CONTINUE
ENDPRO
PROCEDURE CP2WE,CN2WE=BLOKQ(V2WE,CP2TWE,CN2TWE,CPMIN,CNMIN)
      IF(CP2TWE-CPMIN) 133,133,134
  133 IF(CN2TWE-CNMIN) 135,135,136
  135 CP2WE=CPMIN*(V2WE/(V2WE+.001))
      CN2WE=CNMIN*(V2WE/(V2WE+.001))
      GO TO 137
  136 CP2WE=CPMIN*(V2WE/(V2WE+.001))
      CN2WE=CN2TWE*(V2WE/(V2WE+.001))
      GO TO 137
  134 IF(CN2TWE-CNMIN) 138,138,139
  138 CP2WE=CP2TWE*(V2WE/(V2WE+.001))
      CN2WE=CNMIN*(V2WE/(V2WE+001))
      GO TO 137
  139 CP2WE=CP2TWE*(V2WE/(V2WE+.001))
      CN2WE=CN2TWE*(V2WE/(V2WE+.001))
  137 CONTINUE
ENDPRO
PROCEDURE CP2WW,CN2WW=BLOKP(V2WW,CP2TWW,CN2TWW,CPMIN,CNMIN)
      IF(CP2TWW-CPMIN) 233,233,234
  233 IF(CN2TWW-CNMIN) 235,235,236
  235 CP2WW=CPMIN*(V2WW/(V2WW+.001))
      CN2WW=CNMIN*(V2WW/(V2WW+.001))
      GO TO 237
  236 CP2WW=CPMIN*(V2WW/(V2WW+.001))
      CN2WW=CN2TWW*(V2WW/(V2WW+.001))
      GO TO 237
  234 IF(CN2TWW-CNMIN) 238,238,239
  238 CP2WW=CP2TWW*(V2WW/(V2WW+.001))
      CN2WW=CNMIN*(V2WW/(V2WW+.001))
      GO TO 237
  239 CP2WW=CP2TWW*(V2WW/(V2WW+.001))
      CN2WW=CN2TWW*(V2WW/(V2WW+.001))
  237 CONTINUE
ENDPRO
TIMER DELT=.200,OUTDEL=10.,FINTIM=370.
PRTPLT CAM,CAMWE,CAMWW,CZ,CZWE,CZWW,CN,CNWE,CNWW,CP,CPWE,CPWW
PRTPLT CF,CFWE,CFWW
PRTPLT MCFISH,MCZOO
PRTPLT OM,OMWE,OMWW,BAC,BACWE,BACWW
PRTPLT O2,O2WE,O2WW
METHOD RKSFX
LABEL EUTR MODEL
END
STOP
```

APPENDIX C

SELECTED CASE STUDIES

1. Introduction

After the simulation model was tuned to the Beaver Reservoir field data, it was used for further investigations. The "tuned model" represents Beaver Reservoir conditions as they existed in the early 1970's (i.e. 1970-75) and is defined: base case. Six selected cases were studied and compared with the base case. They were as follows:

a) Case I —— The effluent from the Fayetteville Treatment Plant to White River was stopped.

b) Case II —— The nitrogen in the Fayetteville Treatment Plant effluent was eliminated before mixing with White River flow.

c) Case III —— The phosphorus in the Fayetteville Treatment Plant effluent was eliminated before mixing with White River flow.

d) Case IV —— Effluent from septic tanks flowing into Beaver Reservoir was stopped.

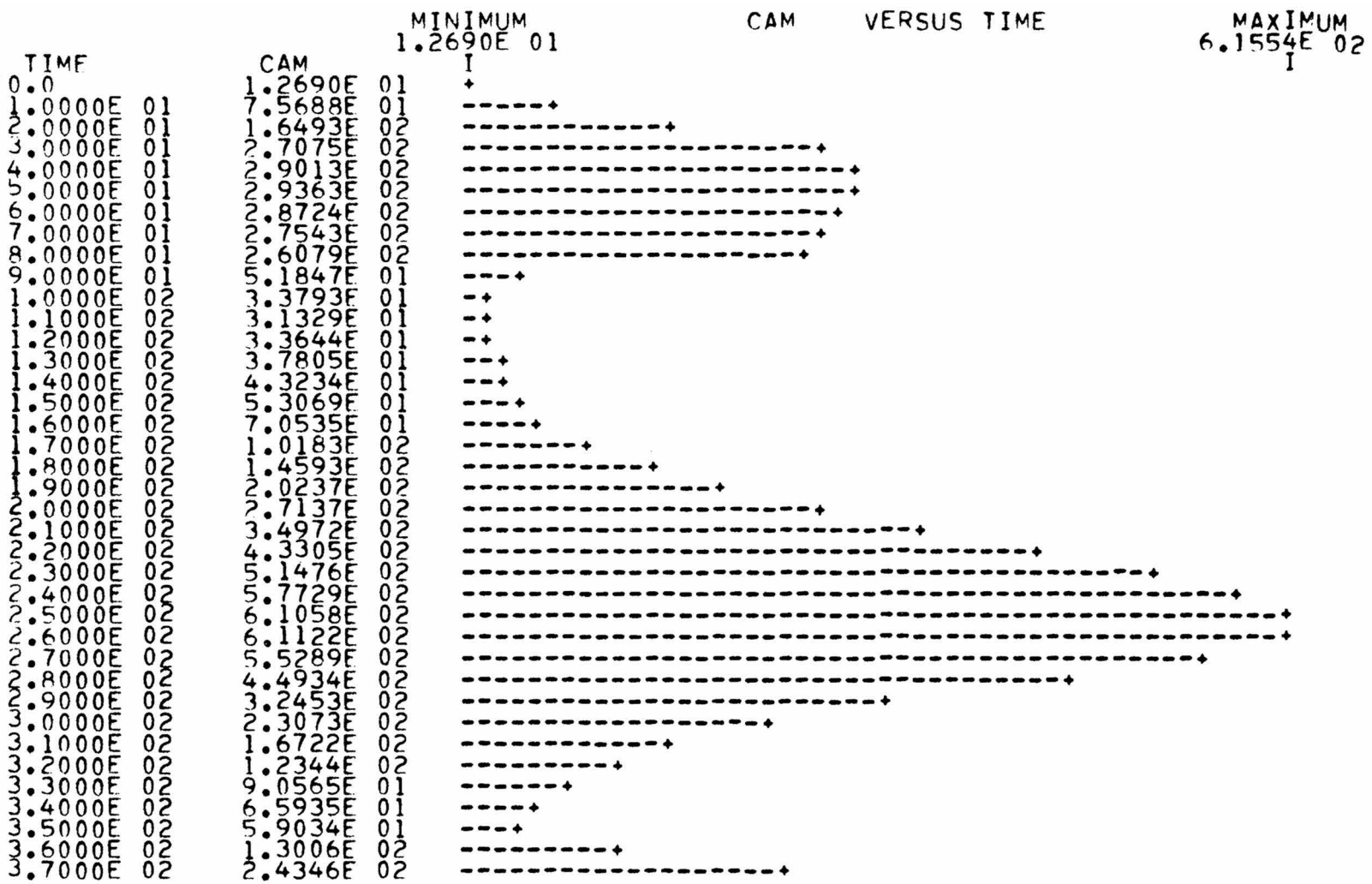
e) Case V —— All nitrogen and phosphorus in runoff and War Eagle Creek flow were eliminated before entering Beaver Reservoir.

f) Case VI —— Upsurge of nitrogen and phosphorus from rich sediments was stopped.

CSMP outputs (PRINT PLOTS) are presented as the results of all case studies. PRINT PLOTS include a computer generated graphical presentation plus numerical outputs. All PRINT PLOTS contain time (Julian Day) as the independent variable and represent one calendar year. Note that the scales of the dependent variables are adjusted to a maximum height of 12.5 centimeters. Graph height should, therefore, not be compared between cases. Make comparison of cases on the numerical magnitude of the dependent variable only.

2. Base Case

The base case is essentially the CSMP PRINT-PLOTS of the figures in the results section. Model constants which quantify this base case are presented in Tables II through VI. The simulated outputs follow:



TIME	CAM
0.0	1.2690E 01
1.0000E 01	7.5688E 01
2.0000E 01	1.6493E 02
3.0000E 01	2.7075E 02
4.0000E 01	2.9013E 02
5.0000E 01	2.9363E 02
6.0000E 01	2.8724E 02
7.0000E 01	2.7543E 02
8.0000E 01	2.6079E 02
9.0000E 01	5.1847E 01
1.0000E 02	3.3793E 01
1.1000E 02	3.1329E 01
1.2000E 02	3.3644E 01
1.3000E 02	3.7805E 01
1.4000E 02	4.3234E 01
1.5000E 02	5.3069E 01
1.6000E 02	7.0535E 01
1.7000E 02	1.0183E 02
1.8000E 02	1.4593E 02
1.9000E 02	2.0237E 02
2.0000E 02	2.7137E 02
2.1000E 02	3.4972E 02
2.2000E 02	4.3305E 02
2.3000E 02	5.1476E 02
2.4000E 02	5.7729E 02
2.5000E 02	6.1058E 02
2.6000E 02	6.1122E 02
2.7000E 02	5.5289E 02
2.8000E 02	4.4934E 02
2.9000E 02	3.2453E 02
3.0000E 02	2.3073E 02
3.1000E 02	1.6722E 02
3.2000E 02	1.2344E 02
3.3000E 02	9.0565E 01
3.4000E 02	6.5935E 01
3.5000E 02	5.9034E 01
3.6000E 02	1.3006E 02
3.7000E 02	2.4346E 02

CAMWE VERSUS TIME

MINIMUM 7.9500E 01 — MAXIMUM 6.3010E 02

TIME	CAMWE
0.0	1.0000E 02
1.0000E 01	2.0427E 02
2.0000E 01	3.3100E 02
3.0000E 01	4.0177E 02
4.0000E 01	4.5606E 02
5.0000E 01	4.9405E 02
6.0000E 01	5.1557E 02
7.0000E 01	5.2071E 02
8.0000E 01	5.1391E 02
9.0000E 01	1.8408E 02
1.0000E 02	1.9332E 02
1.1000E 02	2.0714E 02
1.2000E 02	2.1045E 02
1.3000E 02	2.0756E 02
1.4000E 02	2.0417E 02
1.5000E 02	2.1692E 02
1.6000E 02	2.5327E 02
1.7000E 02	3.1460E 02
1.8000E 02	3.8271E 02
1.9000E 02	4.4818E 02
2.0000E 02	5.0639E 02
2.1000E 02	5.5580E 02
2.2000E 02	5.9346E 02
2.3000E 02	6.1822E 02
2.4000E 02	6.2906E 02
2.5000E 02	6.2570E 02
2.6000E 02	6.0887E 02
2.7000E 02	5.7484E 02
2.8000E 02	5.4865E 02
2.9000E 02	4.6704E 02
3.0000E 02	3.8986E 02
3.1000E 02	3.1925E 02
3.2000E 02	2.5671E 02
3.3000E 02	2.0336E 02
3.4000E 02	1.5954E 02
3.5000E 02	1.2477E 02
3.6000E 02	9.8584E 01
3.7000E 02	7.9500E 01

CAMWW VERSUS TIME

MINIMUM 5.4500E 01 MAXIMUM 5.2186E 02

TIME	CAMWW
0.0	5.4500E 01
1.0000E 01	8.8501E 01
2.0000E 01	1.6058E 02
3.0000E 01	2.7888E 02
4.0000E 01	3.2949E 02
5.0000E 01	3.6620E 02
6.0000E 01	3.9026E 02
7.0000E 01	4.0169E 02
8.0000E 01	4.0172E 02
9.0000E 01	9.7685E 01
1.0000E 02	9.4343E 01
1.1000E 02	9.5678E 01
1.2000E 02	1.0152E 02
1.3000E 02	1.0863E 02
1.4000E 02	1.1728E 02
1.5000E 02	1.3337E 02
1.6000E 02	1.5942E 02
1.7000E 02	2.0141E 02
1.8000E 02	2.4998E 02
1.9000E 02	2.9954E 02
2.0000E 02	3.4556E 02
2.1000E 02	3.8435E 02
2.2000E 02	4.1312E 02
2.3000E 02	4.3015E 02
2.4000E 02	4.3205E 02
2.5000E 02	4.2413E 02
2.6000E 02	4.0952E 02
2.7000E 02	3.9023E 02
2.8000E 02	4.2897E 02
2.9000E 02	3.4886E 02
3.0000E 02	2.7818E 02
3.1000E 02	2.1932E 02
3.2000E 02	1.7197E 02
3.3000E 02	1.3383E 02
3.4000E 02	1.0313E 02
3.5000E 02	7.9263E 01
3.6000E 02	7.0398E 01
3.7000E 02	8.2490E 01

MCZOO VERSUS TIME

MINIMUM 8.5087E-04 — MAXIMUM 3.0101E-02

TIME	MCZOO	I
0.0	3.8000E-03	------+
1.0000E 01	3.6812E-03	----+
2.0000E 01	3.8294E-03	------+
3.0000E 01	4.0585E-03	------+
4.0000E 01	4.2789E-03	------+
5.0000E 01	4.4545E-03	-------+
6.0000E 01	4.5667E-03	-------+
7.0000E 01	4.6190E-03	-------+
8.0000E 01	4.6154E-03	-------+
9.0000E 01	4.3301E-03	------+
1.0000E 02	4.0208E-03	------+
1.1000E 02	3.7922E-03	------+
1.2000E 02	3.6568E-03	----+
1.3000E 02	3.5856E-03	----+
1.4000E 02	3.5563E-03	----+
1.5000E 02	3.5934E-03	----+
1.6000E 02	3.7188E-03	----+
1.7000E 02	3.9584E-03	------+
1.8000E 02	4.2934E-03	------+
1.9000E 02	4.7167E-03	-------+
2.0000E 02	5.2481E-03	--------+
2.1000E 02	5.9416E-03	---------+
2.2000E 02	6.8851E-03	----------+
2.3000E 02	8.2215E-03	------------+
2.4000E 02	1.0172E-02	----------------+
2.5000E 02	1.3014E-02	--------------------+
2.6000E 02	1.7097E-02	---------------------------+
2.7000E 02	2.2467E-02	------------------------------------+
2.8000E 02	2.7763E-02	--+
2.9000E 02	3.0101E-02	--+
3.0000E 02	2.7591E-02	--+
3.1000E 02	2.1102E-02	----------------------------------+
3.2000E 02	1.3521E-02	--------------------+
3.3000E 02	7.4676E-03	-----------+
3.4000E 02	3.7421E-03	-----+
3.5000E 02	1.8899E-03	-+
3.6000E 02	1.1256E-03	+
3.7000E 02	8.5087E-04	+

MCFISH VERSUS TIME

MINIMUM 1.0426E 00

MAXIMUM 2.1531E 00

TIME	MCFISH
0.0	1.0600E 00
1.0000E 01	1.0452E 00
2.0000E 01	1.0427E 00
3.0000E 01	1.0451E 00
4.0000E 01	1.0494E 00
5.0000E 01	1.0546E 00
6.0000E 01	1.0602E 00
7.0000E 01	1.0671E 00
8.0000E 01	1.0758E 00
9.0000E 01	1.0741E 00
1.0000E 02	1.0686E 00
1.1000E 02	1.0638E 00
1.2000E 02	1.0615E 00
1.3000E 02	1.0629E 00
1.4000E 02	1.0685E 00
1.5000E 02	1.0791E 00
1.6000E 02	1.0960E 00
1.7000E 02	1.1194E 00
1.8000E 02	1.1496E 00
1.9000E 02	1.1856E 00
2.0000E 02	1.2258E 00
2.1000E 02	1.2703E 00
2.2000E 02	1.3185E 00
2.3000E 02	1.3697E 00
2.4000E 02	1.4247E 00
2.5000E 02	1.4849E 00
2.6000E 02	1.5519E 00
2.7000E 02	1.6294E 00
2.8000E 02	1.7230E 00
2.9000E 02	1.8303E 00
3.0000E 02	1.9416E 00
3.1000E 02	2.0405E 00
3.2000E 02	2.1112E 00
3.3000E 02	2.1470E 00
3.4000E 02	2.1515E 00
3.5000E 02	2.1318E 00
3.6000E 02	2.1047E 00
3.7000E 02	2.0783E 00

BAC VERSUS TIME

MINIMUM 5.1956E-06 I

MAXIMUM 3.2414E-04 I

TIME	BAC	
0.0	3.0000E-04	----------+
1.0000E 01	2.8790E-04	----------+
2.0000E 01	2.4515E-04	---------+
3.0000E 01	2.1699E-04	--------+
4.0000E 01	1.8507E-04	-------+
5.0000E 01	1.7412E-04	-------+
6.0000E 01	1.7185E-04	-------+
7.0000E 01	1.6971E-04	-------+
8.0000E 01	1.6684E-04	-------+
9.0000E 01	2.8500E-04	----------+
1.0000E 02	2.9027E-04	----------+
1.1000E 02	2.7919E-04	----------+
1.2000E 02	2.7028E-04	----------+
1.3000E 02	2.6403E-04	----------+
1.4000E 02	2.6459E-04	----------+
1.5000E 02	2.6530E-04	----------+
1.6000E 02	2.6990E-04	----------+
1.7000E 02	2.7670E-04	----------+
1.8000E 02	2.8880E-04	----------+
1.9000E 02	2.7683E-04	----------+
2.0000E 02	1.9571E-04	--------+
2.1000E 02	5.8630E-05	-+
2.2000E 02	1.6011E-05	+
2.3000E 02	5.8130E-06	+
2.4000E 02	5.8645E-06	+
2.5000E 02	8.5634E-06	-+
2.6000E 02	1.2484E-05	---+
2.7000E 02	2.5196E-05	-----+
2.8000E 02	4.2082E-05	---------+
2.9000E 02	5.9632E-05	----------+
3.0000E 02	6.6282E-05	----------+
3.1000E 02	6.8040E-05	----------+
3.2000E 02	6.8321E-05	----------+
3.3000E 02	7.3511E-05	------------+
3.4000E 02	8.1984E-05	----------------+
3.5000E 02	1.0245E-04	---------+
3.6000E 02	1.6754E-04	----------+
3.7000E 02	2.0560E-04	

MINIMUM 6.8676E-06 BACWE VERSUS TIME MAXIMUM 2.2309E-03

TIME	BACWE	I
0.0	3.0000E-04	------+
1.0000E 01	2.1661E-04	-----+
2.0000E 01	1.5904E-04	---+
3.0000E 01	1.1350E-04	--+
4.0000E 01	9.1762E-05	-+
5.0000E 01	8.3067E-05	-+
6.0000E 01	8.2663E-05	-+
7.0000E 01	8.4662E-05	-+
8.0000E 01	8.6323E-05	-+
9.0000E 01	2.7713E-04	------+
1.0000E 02	2.9994E-04	------+
1.1000E 02	2.9192E-04	------+
1.2000E 02	2.8742E-04	------+
1.3000E 02	2.9549E-04	------+
1.4000E 02	3.1422E-04	------+
1.5000E 02	3.5164E-04	-------+
1.6000E 02	4.0924E-04	---------+
1.7000E 02	4.9364E-04	----------+
1.8000E 02	6.1778E-04	------------+
1.9000E 02	7.8358E-04	----------------+
2.0000E 02	9.9348E-04	--------------------+
2.1000E 02	1.2453E-03	-------------------------+
2.2000E 02	1.5372E-03	---------------------------------+
2.3000E 02	1.8547E-03	--+
2.4000E 02	2.1166E-03	---+
2.5000E 02	2.2309E-03	--+
2.6000E 02	2.1033E-03	---+
2.7000E 02	1.7042E-03	-----------------------------------+
2.8000E 02	8.7156E-06	+
2.9000E 02	1.1554E-05	+
3.0000E 02	1.4619E-05	+
3.1000E 02	1.7907E-05	+
3.2000E 02	2.1388E-05	+
3.3000E 02	2.5060E-05	+
3.4000E 02	2.8925E-05	+
3.5000E 02	3.2928E-05	+
3.6000E 02	3.5707E-05	+
3.7000E 02	3.7340E-05	+

BACWW VERSUS TIME

MINIMUM 2.7300E-05 MAXIMUM 6.0041E-04

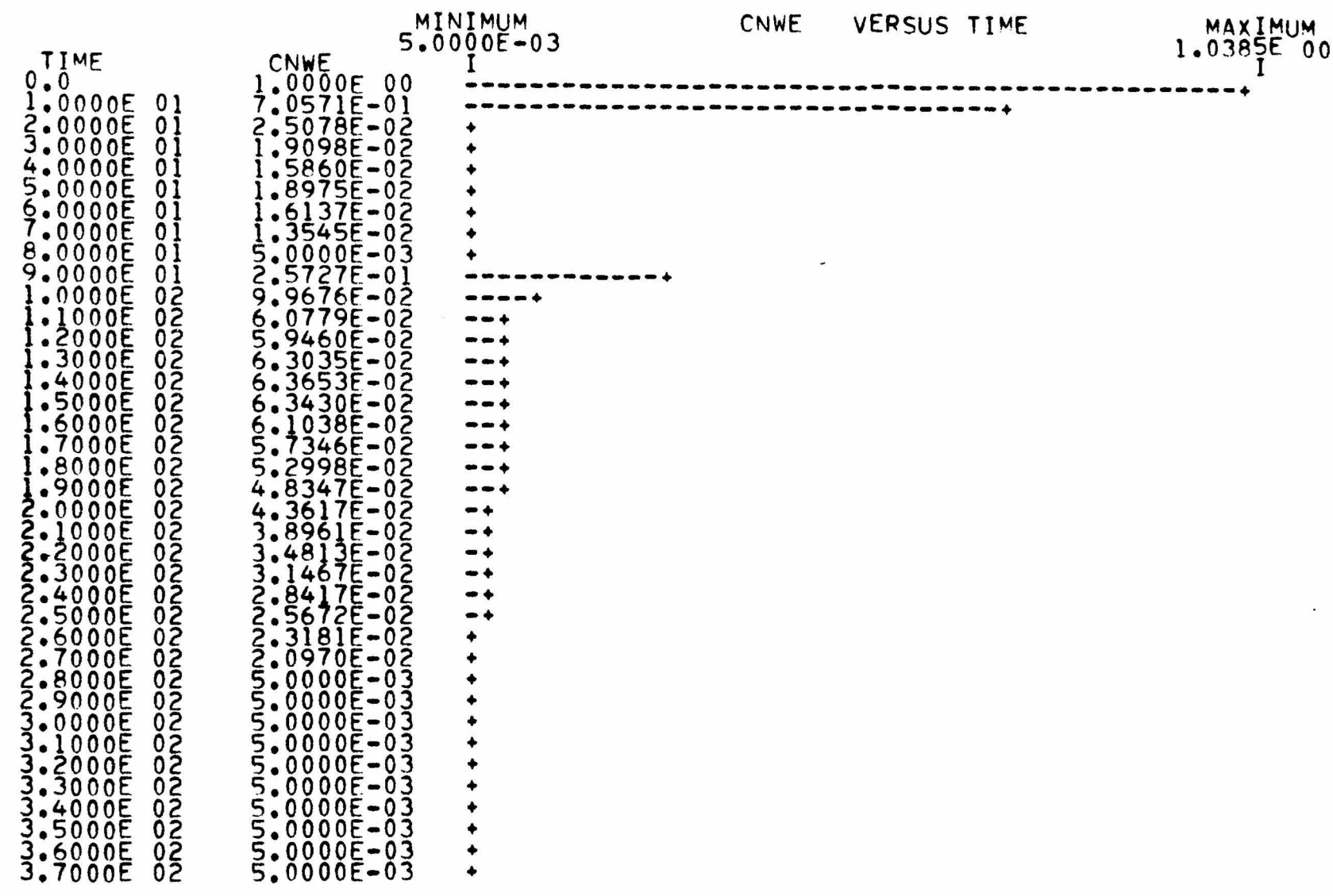
TIME	BACWW
0.0	3.0000E-04
1.0000E 01	2.2623E-04
2.0000E 01	2.0552E-04
3.0000E 01	2.0570E-04
4.0000E 01	1.7271E-04
5.0000E 01	1.6112E-04
6.0000E 01	1.5968E-04
7.0000E 01	1.5922E-04
8.0000E 01	1.5755E-04
9.0000E 01	3.3398E-04
1.0000E 02	3.7615E-04
1.1000E 02	3.9792E-04
1.2000E 02	4.0112E-04
1.3000E 02	3.9146E-04
1.4000E 02	3.7400E-04
1.5000E 02	3.5140E-04
1.6000E 02	3.3682E-04
1.7000E 02	3.2763E-04
1.8000E 02	3.3312E-04
1.9000E 02	3.4460E-04
2.0000E 02	3.6014E-04
2.1000E 02	3.7873E-04
2.2000E 02	4.0023E-04
2.3000E 02	4.2339E-04
2.4000E 02	4.5776E-04
2.5000E 02	4.9999E-04
2.6000E 02	5.4588E-04
2.7000E 02	6.0041E-04
2.8000E 02	3.2970E-05
2.9000E 02	4.4422E-05
3.0000E 02	5.0826E-05
3.1000E 02	5.4661E-05
3.2000E 02	5.7754E-05
3.3000E 02	6.3750E-05
3.4000E 02	7.1888E-05
3.5000E 02	8.0494E-05
3.6000E 02	8.7930E-05
3.7000E 02	9.3729E-05

MINIMUM 5.0000E-03 CN VERSUS TIME MAXIMUM 1.6789E 00

TIME	CN	
0.0	1.1180E 00	----------+
1.0000E 01	1.6613E 00	----------+
2.0000E 01	1.1368E 00	----------+
3.0000E 01	2.8508E-02	+
4.0000E 01	2.2839E-02	+
5.0000E 01	1.9988E-02	+
6.0000E 01	1.8371E-02	+
7.0000E 01	1.6750E-02	+
8.0000E 01	1.6039E-02	+
9.0000E 01	1.8517E-01	-----+
1.0000E 02	7.9252E-02	--+
1.1000E 02	7.2948E-02	--+
1.2000E 02	7.4532E-02	--+
1.3000E 02	6.9092E-02	-+
1.4000E 02	6.1717E-02	-+
1.5000E 02	5.3594E-02	-+
1.6000E 02	4.5823E-02	-+
1.7000E 02	3.8793E-02	-+
1.8000E 02	3.2722E-02	+
1.9000E 02	2.7766E-02	+
2.0000E 02	2.3424E-02	+
2.1000E 02	1.9893E-02	+
2.2000E 02	1.6875E-02	+
2.3000E 02	1.4454E-02	+
2.4000E 02	1.2456E-02	+
2.5000E 02	1.0840E-02	+
2.6000E 02	9.5407E-03	+
2.7000E 02	8.5498E-03	+
2.8000E 02	5.0000E-03	+
2.9000E 02	5.0000E-03	+
3.0000E 02	5.0000E-03	+
3.1000E 02	5.0000E-03	+
3.2000E 02	5.0000E-03	+
3.3000E 02	5.0000E-03	+
3.4000E 02	5.0000E-03	+
3.5000E 02	3.2200E-01	---------+
3.6000E 02	9.1762E-01	----------+
3.7000E 02	1.8214E-01	-----+

MINIMUM 5.0000E-03 CNWE VERSUS TIME MAXIMUM 1.0385E 00

TIME	CNWE
0.0	1.0000E 00
1.0000E 01	7.0571E-01
2.0000E 01	2.5078E-02
3.0000E 01	1.9098E-02
4.0000E 01	1.5860E-02
5.0000E 01	1.8975E-02
6.0000E 01	1.6137E-02
7.0000E 01	1.3545E-02
8.0000E 01	5.0000E-03
9.0000E 01	2.5727E-01
1.0000E 02	9.9676E-02
1.1000E 02	6.0779E-02
1.2000E 02	5.9460E-02
1.3000E 02	6.3035E-02
1.4000E 02	6.3653E-02
1.5000E 02	6.3430E-02
1.6000E 02	6.1038E-02
1.7000E 02	5.7346E-02
1.8000E 02	5.2998E-02
1.9000E 02	4.8347E-02
2.0000E 02	4.3617E-02
2.1000E 02	3.8961E-02
2.2000E 02	3.4813E-02
2.3000E 02	3.1467E-02
2.4000E 02	2.8417E-02
2.5000E 02	2.5672E-02
2.6000E 02	2.3181E-02
2.7000E 02	2.0970E-02
2.8000E 02	5.0000E-03
2.9000E 02	5.0000E-03
3.0000E 02	5.0000E-03
3.1000E 02	5.0000E-03
3.2000E 02	5.0000E-03
3.3000E 02	5.0000E-03
3.4000E 02	5.0000E-03
3.5000E 02	5.0000E-03
3.6000E 02	5.0000E-03
3.7000E 02	5.0000E-03



MINIMUM CNWW VERSUS TIME MAXIMUM
5.0000E-03 1.3041E 00

TIME	CNWW
0.0	9.3100E-01
1.0000E 01	1.2890E 00
2.0000E 01	1.0542E 00
3.0000E 01	4.9483E-02
4.0000E 01	1.9528E-02
5.0000E 01	1.6467E-02
6.0000E 01	1.4509E-02
7.0000E 01	1.2895E-02
8.0000E 01	1.3290E-02
9.0000E 01	4.2412E-01
1.0000E 02	2.1903E-01
1.1000E 02	1.2073E-01
1.2000E 02	7.9221E-02
1.3000E 02	6.4177E-02
1.4000E 02	5.9672E-02
1.5000E 02	5.8746E-02
1.6000E 02	5.9637E-02
1.7000E 02	6.0135E-02
1.8000E 02	5.9732E-02
1.9000E 02	5.8380E-02
2.0000E 02	5.6344E-02
2.1000E 02	5.3779E-02
2.2000E 02	5.0882E-02
2.3000E 02	4.7674E-02
2.4000E 02	4.5093E-02
2.5000E 02	4.2846E-02
2.6000E 02	4.0538E-02
2.7000E 02	3.8194E-02
2.8000E 02	5.0000E-03
2.9000E 02	5.0000E-03
3.0000E 02	5.0000E-03
3.1000E 02	5.0000E-03
3.2000E 02	5.0000E-03
3.3000E 02	5.0000E-03
3.4000E 02	5.0000E-03
3.5000E 02	5.0000E-03
3.6000E 02	5.0000E-03
3.7000E 02	5.0000E-03

MINIMUM CP VERSUS TIME MAXIMUM
1.0000E-03 1.4685E-02

TIME	CP	I
0.0	1.0000E-03	+
1.0000E 01	1.0000E-03	+
2.0000E 01	1.0000E-03	+
3.0000E 01	1.0000E-03	+
4.0000E 01	1.0000E-03	+
5.0000E 01	1.0000E-03	+
6.0000E 01	1.0000E-03	+
7.0000E 01	1.0000E-03	+
8.0000E 01	1.0000E-03	+
9.0000E 01	5.7310E-03	----------+
1.0000E 02	4.8541E-03	---------+
1.1000E 02	5.6957E-03	----------+
1.2000E 02	5.9188E-03	----------+
1.3000E 02	5.4916E-03	----------+
1.4000E 02	4.9445E-03	---------+
1.5000E 02	4.3645E-03	--------+
1.6000E 02	3.8170E-03	-------+
1.7000E 02	3.3256E-03	-------+
1.8000E 02	2.9045E-03	------+
1.9000E 02	2.5616E-03	-----+
2.0000E 02	2.2619E-03	----+
2.1000E 02	2.0187E-03	---+
2.2000E 02	1.8108E-03	--+
2.3000E 02	1.6450E-03	--+
2.4000E 02	1.5083E-03	-+
2.5000E 02	1.3981E-03	-+
2.6000E 02	1.3097E-03	-+
2.7000E 02	1.2428E-03	+
2.8000E 02	1.0000E-03	+
2.9000E 02	1.0000E-03	+
3.0000E 02	1.0000E-03	+
3.1000E 02	1.0000E-03	+
3.2000E 02	1.0000E-03	+
3.3000E 02	1.0000E-03	+
3.4000E 02	1.0000E-03	+
3.5000E 02	1.0000E-03	+
3.6000E 02	1.0000E-03	+
3.7000E 02	1.0000E-03	+

EUTR MODEL

MINIMUM 1.0000E-03 CPWE VERSUS TIME MAXIMUM 1.7245E-02

TIME	CPWE	I
0.0	1.0000E-03	+
1.0000E 01	1.0000E-03	+
2.0000E 01	1.0000E-03	+
3.0000E 01	1.0000E-03	+
4.0000E 01	1.0000E-03	+
5.0000E 01	1.0000E-03	+
6.0000E 01	1.0000E-03	+
7.0000E 01	1.0000E-03	+
8.0000E 01	1.0000E-03	+
9.0000E 01	9.5755E-03	----------+
1.0000E 02	6.6237E-03	----------+
1.1000E 02	6.8550E-03	----------+
1.2000E 02	8.2473E-03	----------+
1.3000E 02	9.4819E-03	----------+
1.4000E 02	1.0174E-02	----------+
1.5000E 02	1.0629E-02	----------+
1.6000E 02	1.0651E-02	----------+
1.7000E 02	1.0464E-02	----------+
1.8000E 02	1.0123E-02	----------+
1.9000E 02	9.6708E-03	----------+
2.0000E 02	9.1400E-03	----------+
2.1000E 02	8.5613E-03	----------+
2.2000E 02	8.0302E-03	----------+
2.3000E 02	7.5366E-03	----------+
2.4000E 02	7.0456E-03	----------+
2.5000E 02	6.6159E-03	----------+
2.6000E 02	6.2244E-03	----------+
2.7000E 02	5.8472E-03	----------+
2.8000E 02	1.0000E-03	+
2.9000E 02	1.0000E-03	+
3.0000E 02	1.0000E-03	+
3.1000E 02	1.0000E-03	+
3.2000E 02	1.0000E-03	+
3.3000E 02	1.0000E-03	+
3.4000E 02	1.0000E-03	+
3.5000E 02	1.0000E-03	+
3.6000E 02	1.0000E-03	+
3.7000E 02	1.0000E-03	+

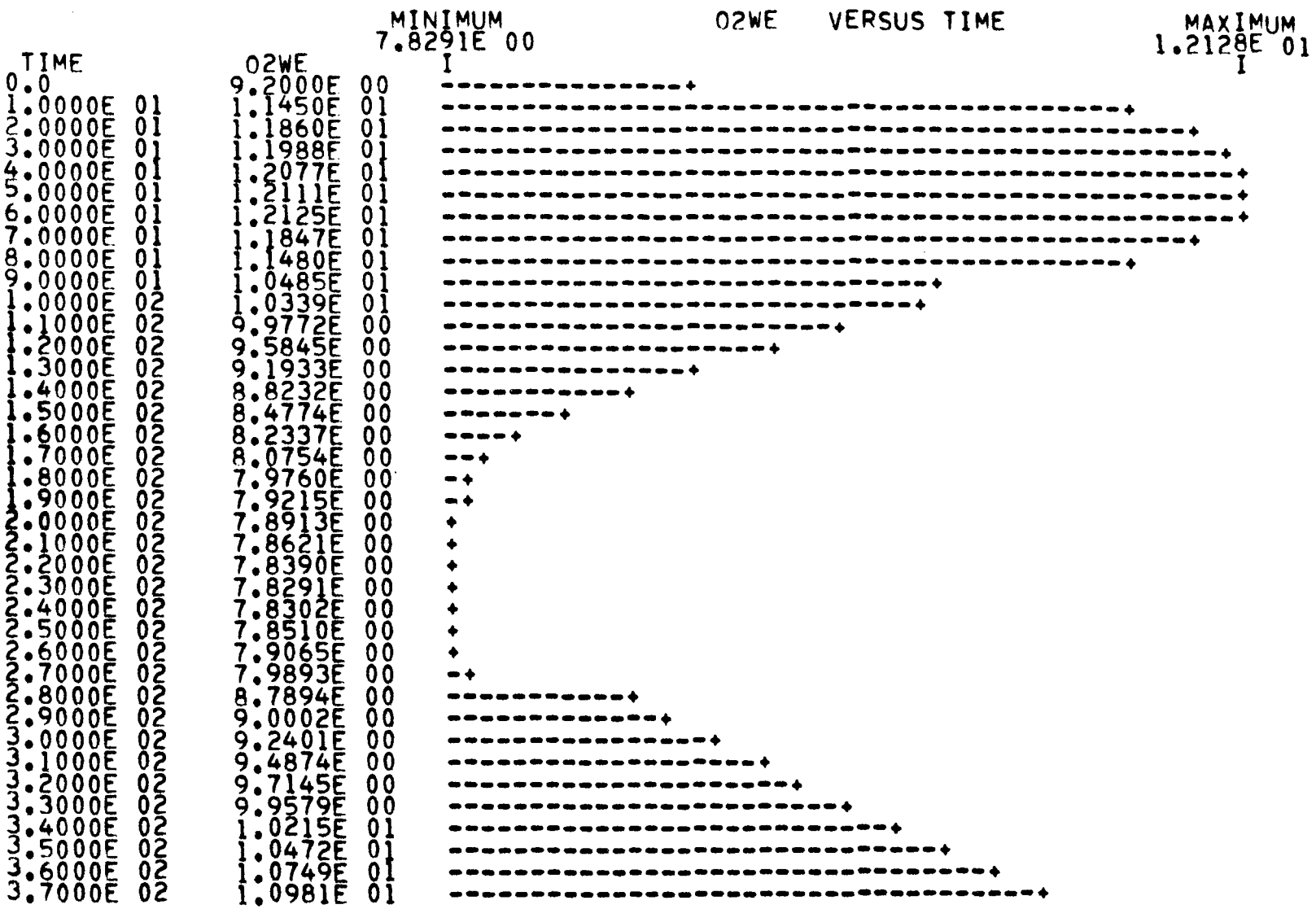
CPWW VERSUS TIME

MINIMUM 1.0000E-03 MAXIMUM 1.9949E-02

TIME	CPWW
0.0	1.0000E-03
1.0000E 01	1.0000E-03
2.0000E 01	1.0000E-03
3.0000E 01	1.0000E-03
4.0000E 01	1.0000E-03
5.0000E 01	1.0000E-03
6.0000E 01	1.0000E-03
7.0000E 01	1.0000E-03
8.0000E 01	1.0000E-03
9.0000E 01	1.2794E-02
1.0000E 02	8.5384E-03
1.1000E 02	6.4760E-03
1.2000E 02	5.6531E-03
1.3000E 02	5.3908E-03
1.4000E 02	5.2850E-03
1.5000E 02	5.1964E-03
1.6000E 02	5.1745E-03
1.7000E 02	5.1216E-03
1.8000E 02	5.0207E-03
1.9000E 02	4.8658E-03
2.0000E 02	4.6702E-03
2.1000E 02	4.4495E-03
2.2000E 02	4.2118E-03
2.3000E 02	3.9509E-03
2.4000E 02	3.7383E-03
2.5000E 02	3.5571E-03
2.6000E 02	3.3743E-03
2.7000E 02	3.1916E-03
2.8000E 02	1.0000E-03
2.9000E 02	1.0000E-03
3.0000E 02	1.0000E-03
3.1000E 02	1.0000E-03
3.2000E 02	1.0000E-03
3.3000E 02	1.0000E-03
3.4000E 02	1.0000E-03
3.5000E 02	1.0000E-03
3.6000E 02	1.0000E-03
3.7000E 02	1.0000E-03

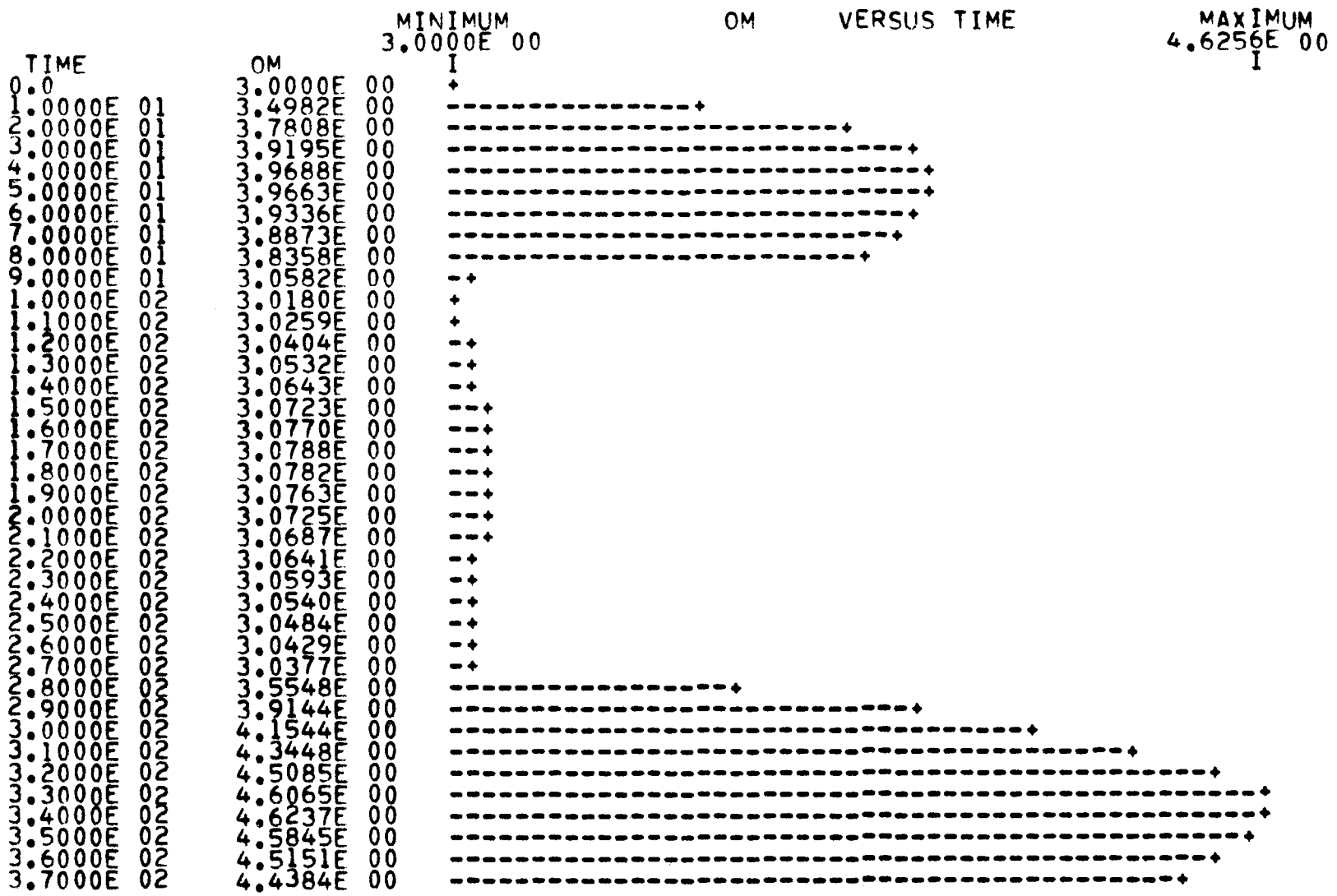
MINIMUM 7.3751E 00 — O2 VERSUS TIME — MAXIMUM 1.1786E 01

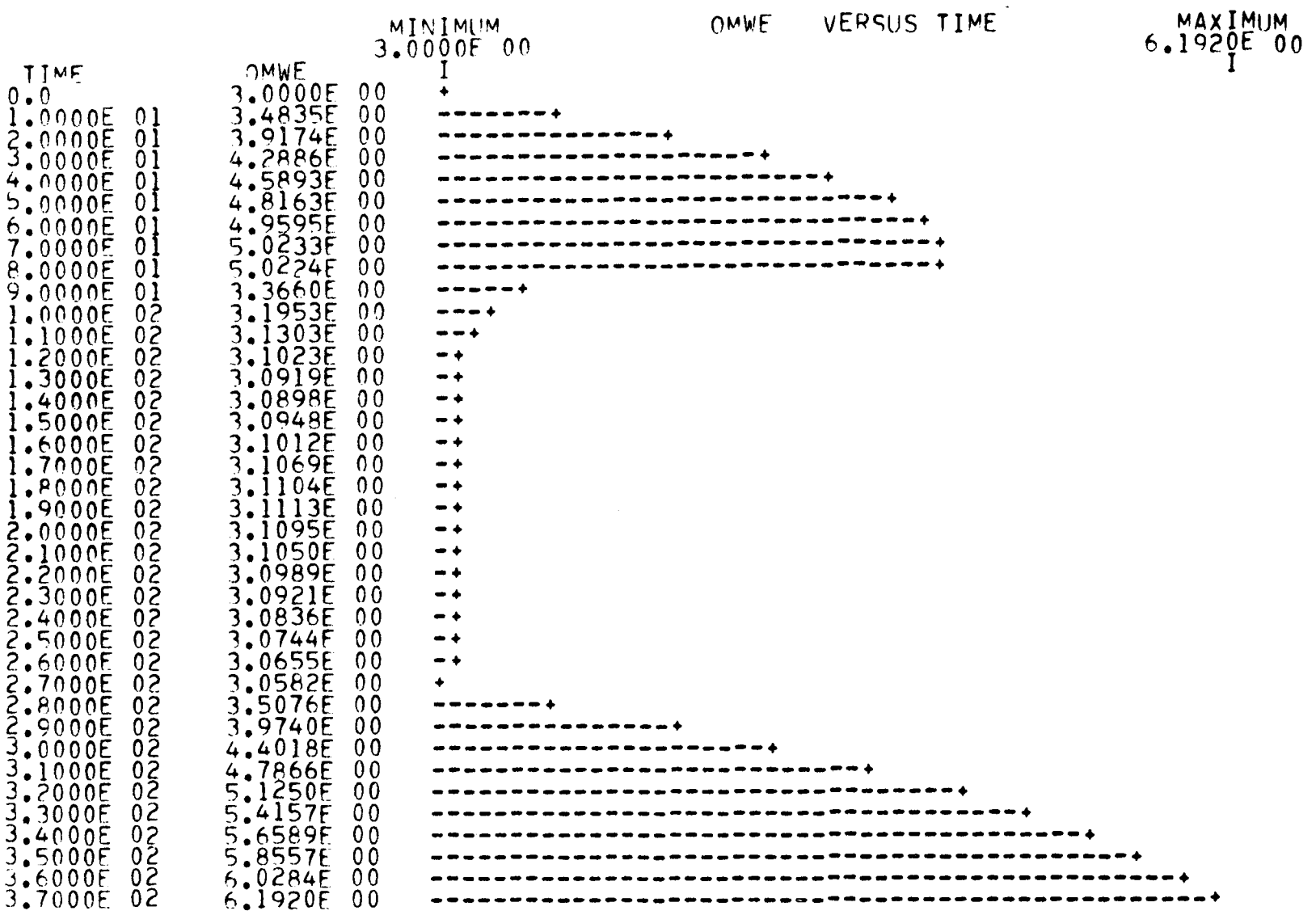
TIME	O2
0.0	9.0000E 00
1.0000E 01	1.1143E 01
2.0000E 01	1.1533E 01
3.0000E 01	1.1739E 01
4.0000E 01	1.1732E 01
5.0000E 01	1.1736E 01
6.0000E 01	1.1727E 01
7.0000E 01	1.1438E 01
8.0000E 01	1.1098E 01
9.0000E 01	1.0089E 01
1.0000E 02	9.8627E 00
1.1000E 02	9.4949E 00
1.2000E 02	9.1197E 00
1.3000E 02	8.7411E 00
1.4000E 02	8.3680E 00
1.5000E 02	8.0073E 00
1.6000E 02	7.7265E 00
1.7000E 02	7.5211E 00
1.8000E 02	7.4135E 00
1.9000E 02	7.3751E 00
2.0000E 02	7.3943E 00
2.1000E 02	7.5100E 00
2.2000E 02	7.7533E 00
2.3000E 02	8.0043E 00
2.4000E 02	8.2439E 00
2.5000E 02	8.4666E 00
2.6000E 02	8.6910E 00
2.7000E 02	8.9097E 00
2.8000E 02	8.8497E 00
2.9000E 02	9.0273E 00
3.0000E 02	9.2218E 00
3.1000E 02	9.4354E 00
3.2000E 02	9.6459E 00
3.3000E 02	9.8834E 00
3.4000E 02	1.0129E 01
3.5000E 02	1.0466E 01
3.6000E 02	1.1028E 01
3.7000E 02	1.1461E 01


MINIMUM
7.8291E 00
O2WE VERSUS TIME
MAXIMUM
1.2128E 01
TIME
O2WE
0.0 9.2000E 00
1.0000E 01 1.1450E 01
2.0000E 01 1.1860E 01
3.0000E 01 1.1988E 01
4.0000E 01 1.2077E 01
5.0000E 01 1.2111E 01
6.0000E 01 1.2125E 01
7.0000E 01 1.1847E 01
8.0000E 01 1.1480E 01
9.0000E 01 1.0485E 01
1.0000E 02 1.0339E 01
1.1000E 02 9.9772E 00
1.2000E 02 9.5845E 00
1.3000E 02 9.1933E 00
1.4000E 02 8.8232E 00
1.5000E 02 8.4774E 00
1.6000E 02 8.2337E 00
1.7000E 02 8.0754E 00
1.8000E 02 7.9760E 00
1.9000E 02 7.9215E 00
2.0000E 02 7.8913E 00
2.1000E 02 7.8621E 00
2.2000E 02 7.8390E 00
2.3000E 02 7.8291E 00
2.4000E 02 7.8302E 00
2.5000E 02 7.8510E 00
2.6000E 02 7.9065E 00
2.7000E 02 7.9893E 00
2.8000E 02 8.7894E 00
2.9000E 02 9.0002E 00
3.0000E 02 9.2401E 00
3.1000E 02 9.4874E 00
3.2000E 02 9.7145E 00
3.3000E 02 9.9579E 00
3.4000E 02 1.0215E 01
3.5000E 02 1.0472E 01
3.6000E 02 1.0749E 01
3.7000E 02 1.0981E 01

O2WW VERSUS TIME

TIME	O2WW	MINIMUM 7.9978E 00 … MAXIMUM 1.2151E 01
0.0	9.8000E 00	
1.0000E 01	1.1135E 01	
2.0000E 01	1.1691E 01	
3.0000E 01	1.2101E 01	
4.0000E 01	1.2085E 01	
5.0000E 01	1.2120E 01	
6.0000E 01	1.2150E 01	
7.0000E 01	1.1917E 01	
8.0000E 01	1.1546E 01	
9.0000E 01	1.0648E 01	
1.0000E 02	1.0424E 01	
1.1000E 02	1.0027E 01	
1.2000E 02	9.6274E 00	
1.3000E 02	9.2400E 00	
1.4000E 02	8.8757E 00	
1.5000E 02	8.5502E 00	
1.6000E 02	8.3159E 00	
1.7000E 02	8.1798E 00	
1.8000E 02	8.0894E 00	
1.9000E 02	8.0425E 00	
2.0000E 02	8.0222E 00	
2.1000E 02	8.0059E 00	
2.2000E 02	7.9988E 00	
2.3000E 02	8.0058E 00	
2.4000E 02	8.0039E 00	
2.5000E 02	8.0152E 00	
2.6000E 02	8.0599E 00	
2.7000E 02	8.1305E 00	
2.8000E 02	8.7334E 00	
2.9000E 02	8.8962E 00	
3.0000E 02	9.1225E 00	
3.1000E 02	9.3705E 00	
3.2000E 02	9.6073E 00	
3.3000E 02	9.8617E 00	
3.4000E 02	1.0132E 01	
3.5000E 02	1.0405E 01	
3.6000E 02	1.0727E 01	
3.7000E 02	1.1027E 01	


MINIMUM
3.0000E 00
OM VERSUS TIME
MAXIMUM
4.6256E 00
TIME
OM
0.0 3.0000E 00
1.0000E 01 3.4982E 00
2.0000E 01 3.7808E 00
3.0000E 01 3.9195E 00
4.0000E 01 3.9688E 00
5.0000E 01 3.9663E 00
6.0000E 01 3.9336E 00
7.0000E 01 3.8873E 00
8.0000E 01 3.8358E 00
9.0000E 01 3.0582E 00
1.0000E 02 3.0180E 00
1.1000E 02 3.0259E 00
1.2000E 02 3.0404E 00
1.3000E 02 3.0532E 00
1.4000E 02 3.0643E 00
1.5000E 02 3.0723E 00
1.6000E 02 3.0770E 00
1.7000E 02 3.0788E 00
1.8000E 02 3.0782E 00
1.9000E 02 3.0763E 00
2.0000E 02 3.0725E 00
2.1000E 02 3.0687E 00
2.2000E 02 3.0641E 00
2.3000E 02 3.0593E 00
2.4000E 02 3.0540E 00
2.5000E 02 3.0484E 00
2.6000E 02 3.0429E 00
2.7000E 02 3.0377E 00
2.8000E 02 3.5548E 00
2.9000E 02 3.9144E 00
3.0000E 02 4.1544E 00
3.1000E 02 4.3448E 00
3.2000E 02 4.5085E 00
3.3000E 02 4.6065E 00
3.4000E 02 4.6237E 00
3.5000E 02 4.5845E 00
3.6000E 02 4.5151E 00
3.7000E 02 4.4384E 00


MINIMUM
3.0000E 00
OMWE VERSUS TIME
MAXIMUM
6.1920E 00
TIME
OMWE
0.0 3.0000E 00
1.0000E 01 3.4835E 00
2.0000E 01 3.9174E 00
3.0000E 01 4.2886E 00
4.0000E 01 4.5893E 00
5.0000E 01 4.8163E 00
6.0000E 01 4.9595E 00
7.0000E 01 5.0233E 00
8.0000E 01 5.0224E 00
9.0000E 01 3.3660E 00
1.0000E 02 3.1953E 00
1.1000E 02 3.1303E 00
1.2000E 02 3.1023E 00
1.3000E 02 3.0919E 00
1.4000E 02 3.0898E 00
1.5000E 02 3.0948E 00
1.6000E 02 3.1012E 00
1.7000E 02 3.1069E 00
1.8000E 02 3.1104E 00
1.9000E 02 3.1113E 00
2.0000E 02 3.1095E 00
2.1000E 02 3.1050E 00
2.2000E 02 3.0989E 00
2.3000E 02 3.0921E 00
2.4000E 02 3.0836E 00
2.5000E 02 3.0744E 00
2.6000E 02 3.0655E 00
2.7000E 02 3.0582E 00
2.8000E 02 3.5076E 00
2.9000E 02 3.9740E 00
3.0000E 02 4.4018E 00
3.1000E 02 4.7866E 00
3.2000E 02 5.1250E 00
3.3000E 02 5.4157E 00
3.4000E 02 5.6589E 00
3.5000E 02 5.8557E 00
3.6000E 02 6.0284E 00
3.7000E 02 6.1920E 00

TIME	OMWW
0.0	3.0000E 00
1.0000E 01	3.3824E 00
2.0000E 01	3.7675E 00
3.0000E 01	4.1081E 00
4.0000E 01	4.3800E 00
5.0000E 01	4.5775E 00
6.0000E 01	4.7043E 00
7.0000E 01	4.7684E 00
8.0000E 01	4.7796E 00
9.0000E 01	3.1765E 00
1.0000E 02	3.0782E 00
1.1000E 02	3.0428E 00
1.2000E 02	3.0293E 00
1.3000E 02	3.0252E 00
1.4000E 02	3.0261E 00
1.5000E 02	3.0300E 00
1.6000E 02	3.0361E 00
1.7000E 02	3.0434E 00
1.8000E 02	3.0507E 00
1.9000E 02	3.0577E 00
2.0000E 02	3.0642E 00
2.1000E 02	3.0699E 00
2.2000E 02	3.0749E 00
2.3000E 02	3.0790E 00
2.4000E 02	3.0834E 00
2.5000E 02	3.0877E 00
2.6000E 02	3.0912E 00
2.7000E 02	3.0936E 00
2.8000E 02	3.3790E 00
2.9000E 02	3.7734E 00
3.0000E 02	4.1508E 00
3.1000E 02	4.5003E 00
3.2000E 02	4.8237E 00
3.3000E 02	5.1138E 00
3.4000E 02	5.3530E 00
3.5000E 02	5.5317E 00
3.6000E 02	5.6487E 00
3.7000E 02	5.7145E 00

3. Case I

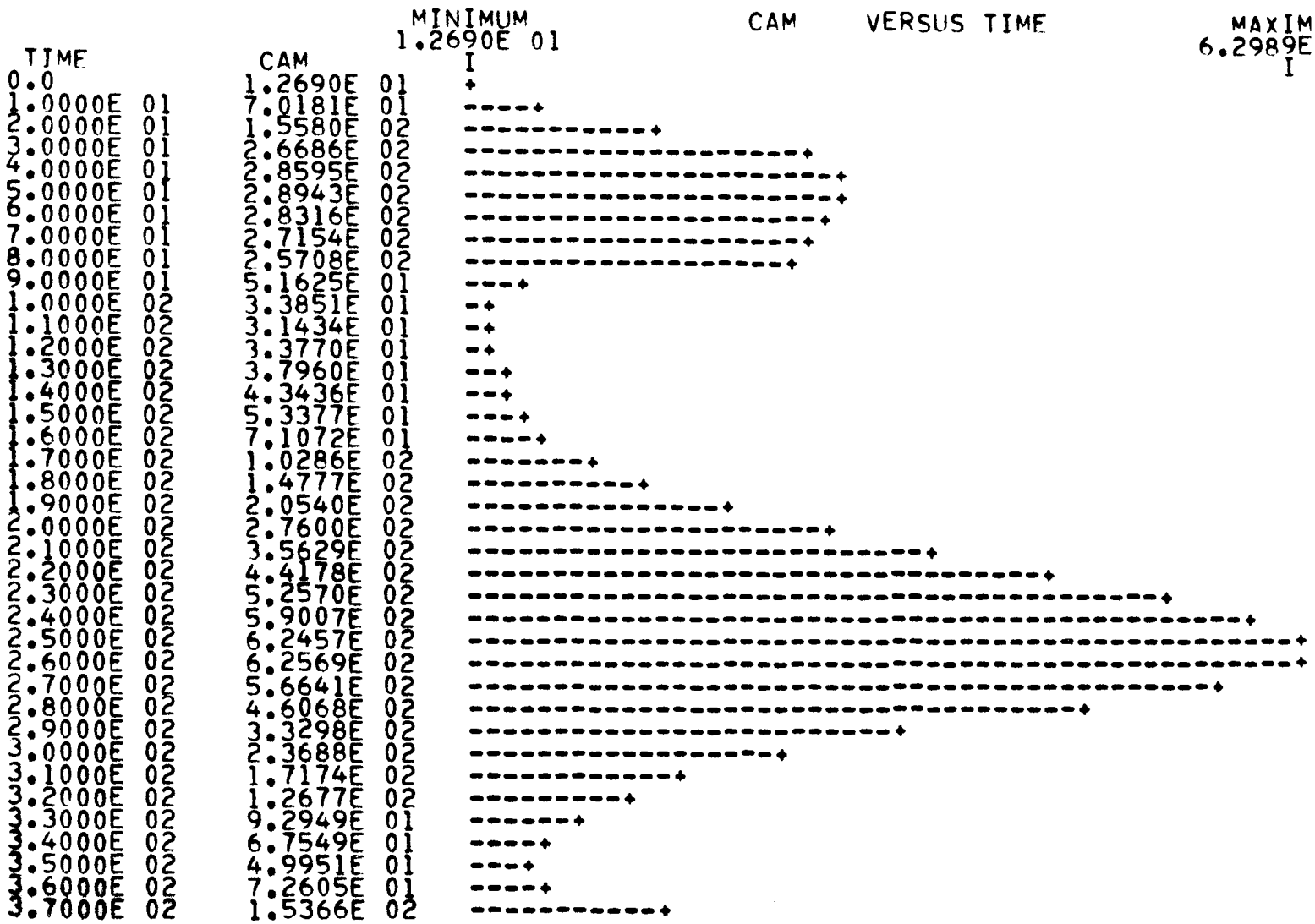
The effluent from Fayetteville Treatment Plant was stopped. This was achieved by setting the tributary flow parameter QFTP to zero in the main computer program. The simulated results were compared with those of the base case. The second segment was in parallel with the first segment, therefore, it was completely unaffected. As the Treatment Plant flow was stopped, the retention time of flows into the first and third segments were slightly increased. This allowed the phytoplankton to grow more steadily and, thus, increased phytoplankton concentrations slightly. As a result, overall fish and zooplankton concentrations also increased slightly. Since those changes were slight, there were minimal variations in the concentrations of bacteria, nutrients, oxygen and organic matter in both the first and third segments. The simulated outputs follow (the unchanged outputs are not included):

EUTR MODEL

CAM VERSUS TIME

MINIMUM 1.2690E 01

MAXIMUM 6.2989E 02



TIME	CAM
0.0	1.2690E 01
1.0000E 01	7.0181E 01
2.0000E 01	1.5580E 02
3.0000E 01	2.6686E 02
4.0000E 01	2.8595E 02
5.0000E 01	2.8943E 02
6.0000E 01	2.8316E 02
7.0000E 01	2.7154E 02
8.0000E 01	2.5708E 02
9.0000E 01	5.1625E 01
1.0000E 02	3.3851E 01
1.1000E 02	3.1434E 01
1.2000E 02	3.3770E 01
1.3000E 02	3.7960E 01
1.4000E 02	4.3436E 01
1.5000E 02	5.3377E 01
1.6000E 02	7.1072E 01
1.7000E 02	1.0286E 02
1.8000E 02	1.4777E 02
1.9000E 02	2.0540E 02
2.0000E 02	2.7600E 02
2.1000E 02	3.5629E 02
2.2000E 02	4.4178E 02
2.3000E 02	5.2570E 02
2.4000E 02	5.9007E 02
2.5000E 02	6.2457E 02
2.6000E 02	6.2569E 02
2.7000E 02	5.6641E 02
2.8000E 02	4.6068E 02
2.9000E 02	3.3298E 02
3.0000E 02	2.3688E 02
3.1000E 02	1.7174E 02
3.2000E 02	1.2677E 02
3.3000E 02	9.2949E 01
3.4000E 02	6.7549E 01
3.5000E 02	4.9951E 01
3.6000E 02	7.2605E 01
3.7000E 02	1.5366E 02

CAMWW VERSUS TIME

MINIMUM 5.4500E 01 MAXIMUM 5.2546E 02

TIME	CAMWW
0.0	5.4500E 01
1.0000E 01	8.7800E 01
2.0000E 01	1.5781E 02
3.0000E 01	2.7575E 02
4.0000E 01	3.2808E 02
5.0000E 01	3.6440E 02
6.0000E 01	3.8830E 02
7.0000E 01	3.9975E 02
8.0000E 01	3.9990E 02
9.0000E 01	9.7605E 01
1.0000E 02	9.4552E 01
1.1000E 02	9.5960E 01
1.2000E 02	1.0184E 02
1.3000E 02	1.0898E 02
1.4000E 02	1.1769E 02
1.5000E 02	1.3392E 02
1.6000E 02	1.6020E 02
1.7000E 02	2.0261E 02
1.8000E 02	2.5166E 02
1.9000E 02	3.0169E 02
2.0000E 02	3.4810E 02
2.1000E 02	3.8715E 02
2.2000E 02	4.1603E 02
2.3000E 02	4.3300E 02
2.4000E 02	4.3471E 02
2.5000E 02	4.2663E 02
2.6000E 02	4.1193E 02
2.7000E 02	3.9291E 02
2.8000E 02	4.3258E 02
2.9000E 02	3.5247E 02
3.0000E 02	2.8144E 02
3.1000E 02	2.2205E 02
3.2000E 02	1.7414E 02
3.3000E 02	1.3551E 02
3.4000E 02	1.0441E 02
3.5000E 02	8.0014E 01
3.6000E 02	6.3405E 01
3.7000E 02	6.3930E 01

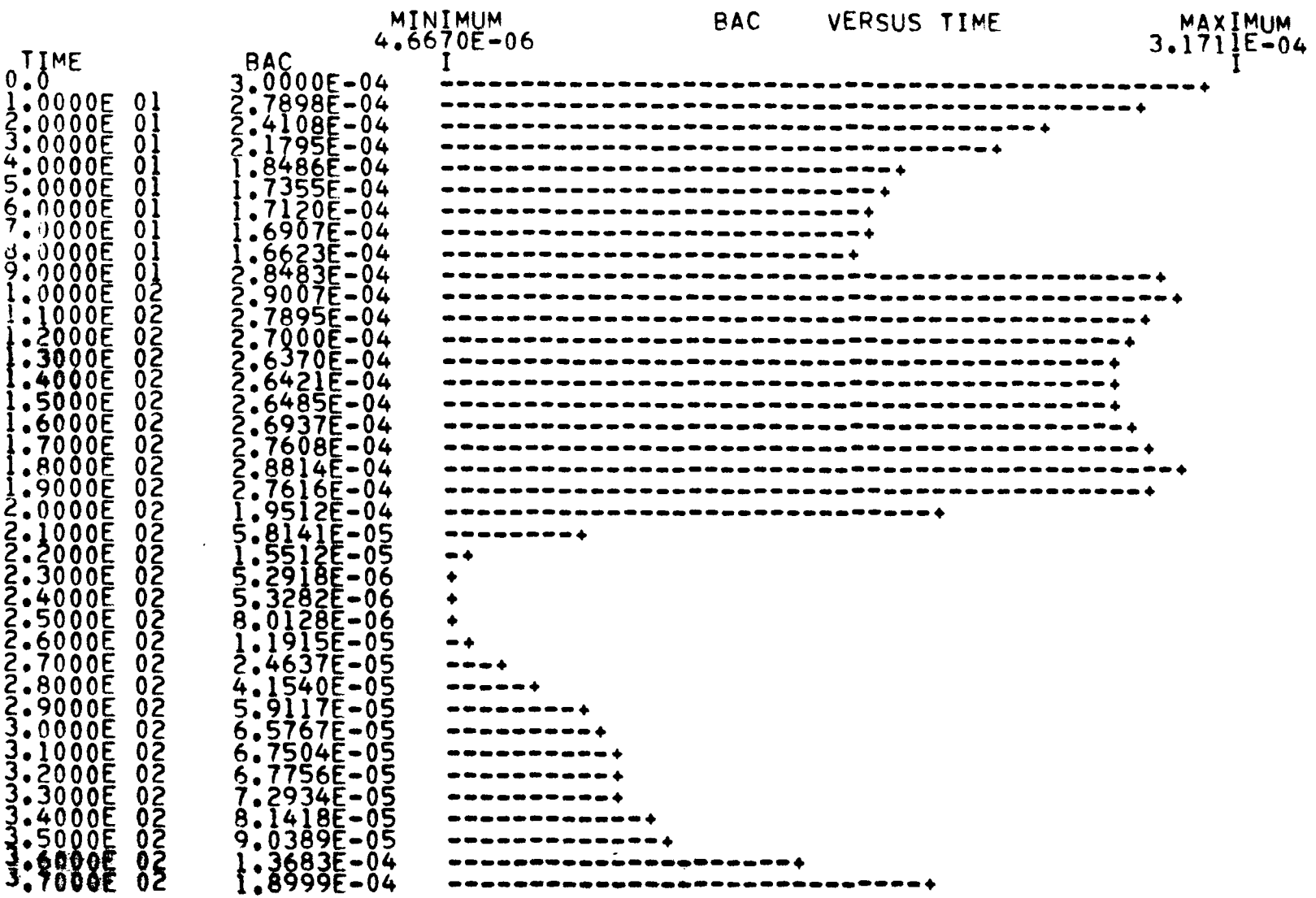
MINIMUM 8.7078E-04 — MCZOO VERSUS TIME — MAXIMUM 3.9402E-02

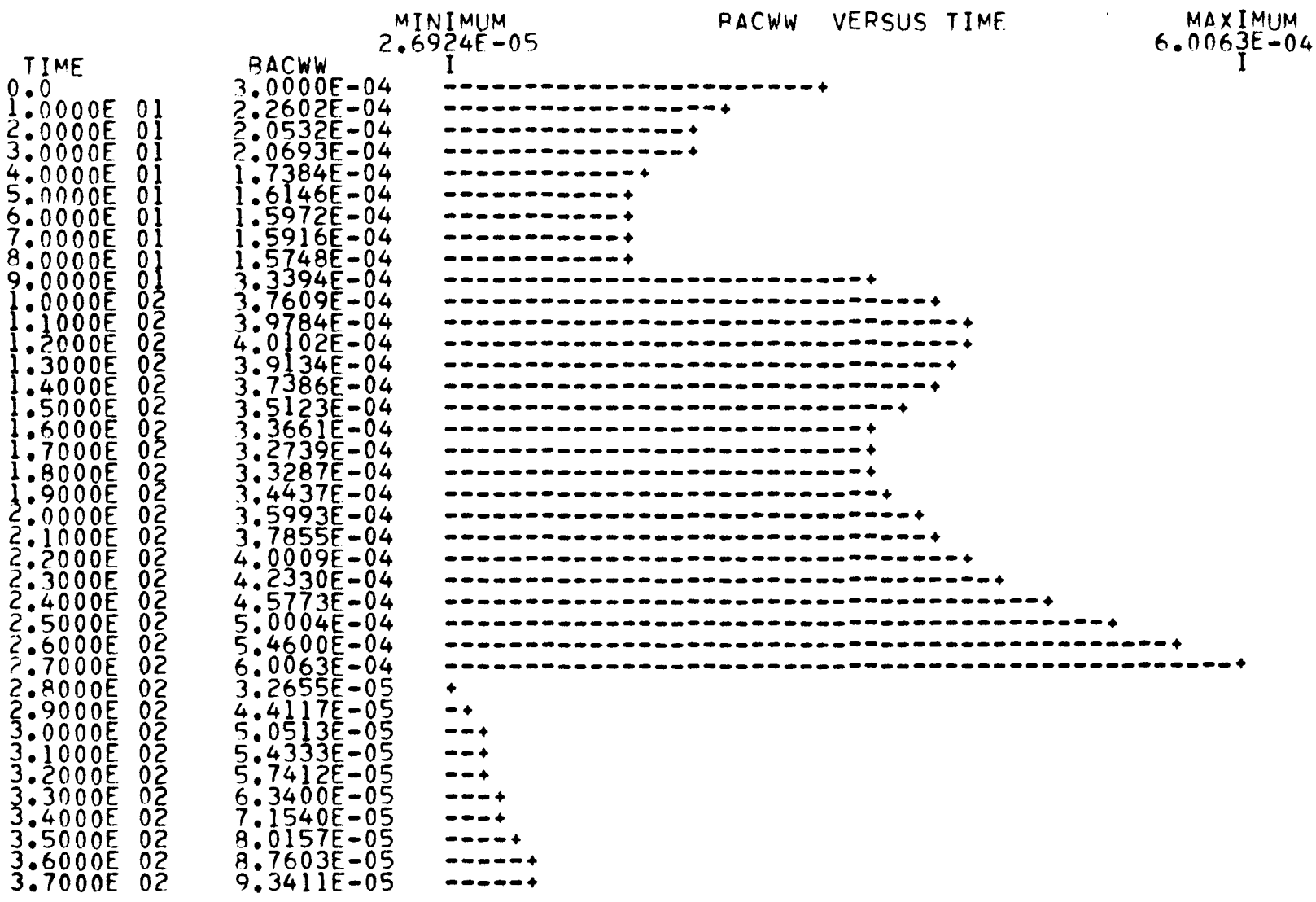
TIME	MCZOO	I
0.0	3.8000E-03	---+
1.0000E 01	3.6762E-03	---+
2.0000E 01	3.8207E-03	---+
3.0000E 01	4.0501E-03	----+
4.0000E 01	4.2738E-03	----+
5.0000E 01	4.4529E-03	----+
6.0000E 01	4.5683E-03	----+
7.0000E 01	4.6230E-03	----+
8.0000E 01	4.6211E-03	----+
9.0000E 01	4.3357E-03	----+
1.0000E 02	4.0267E-03	----+
1.1000E 02	3.7983E-03	---+
1.2000E 02	3.6629E-03	---+
1.3000E 02	3.5921E-03	---+
1.4000E 02	3.5634E-03	---+
1.5000E 02	3.6020E-03	---+
1.6000E 02	3.7305E-03	---+
1.7000E 02	3.9755E-03	----+
1.8000E 02	4.3191E-03	----+
1.9000E 02	4.7554E-03	-----+
2.0000E 02	5.3074E-03	-----+
2.1000E 02	6.0346E-03	------+
2.2000E 02	7.0361E-03	-------+
2.3000E 02	8.4763E-03	---------+
2.4000E 02	1.0623E-02	----------+
2.5000E 02	1.3843E-02	------------+
2.6000E 02	1.8669E-02	----------------+
2.7000E 02	2.5459E-02	----------------------+
2.8000E 02	3.3110E-02	------------------------------+
2.9000E 02	3.8528E-02	----------------------------------+
3.0000E 02	3.8800E-02	----------------------------------+
3.1000E 02	3.3098E-02	------------------------------+
3.2000E 02	2.3284E-02	--------------------+
3.3000E 02	1.3474E-02	----------+
3.4000E 02	6.5431E-03	-----+
3.5000E 02	2.8810E-03	--+
3.6000E 02	1.3814E-03	+
3.7000E 02	8.7078E-04	+

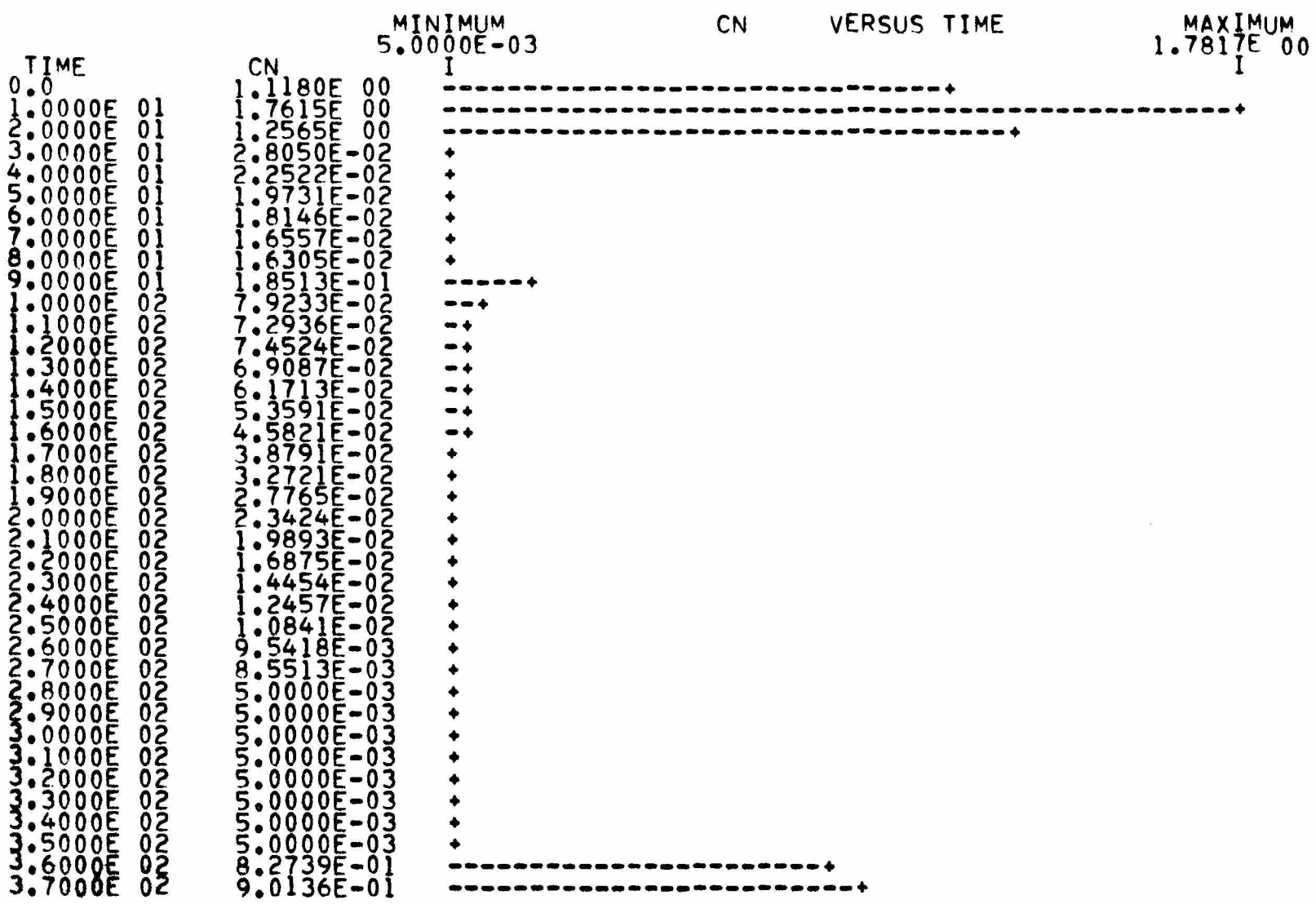
MCFISH VERSUS TIME

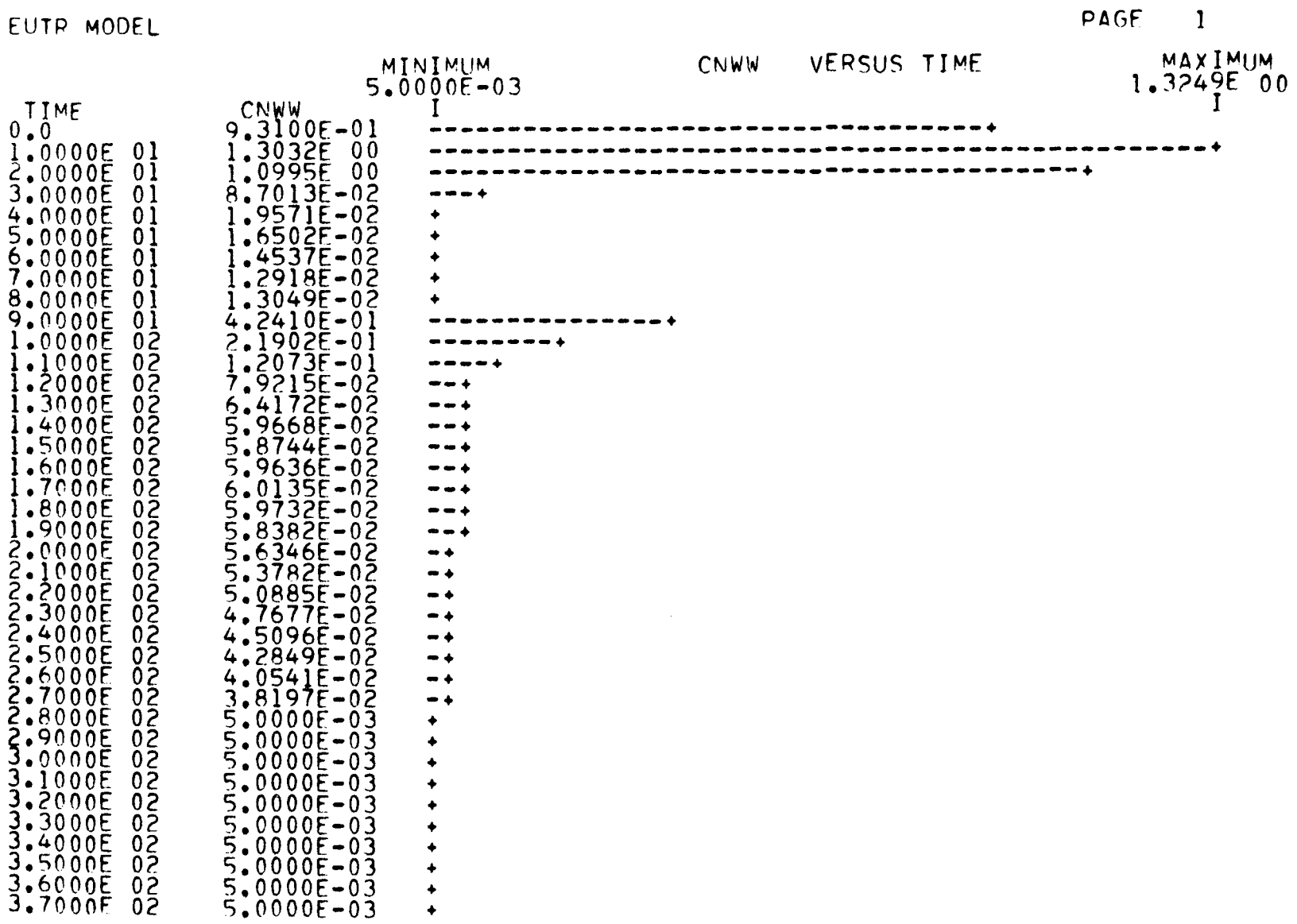
MINIMUM 1.0420E 00 — MAXIMUM 2.3359E 00

TIME	MCFISH	I
0.0	1.0600E 00	+
1.0000E 01	1.0449E 00	+
2.0000E 01	1.0420E 00	+
3.0000E 01	1.0443E 00	+
4.0000E 01	1.0486E 00	+
5.0000E 01	1.0537E 00	+
6.0000E 01	1.0593E 00	+
7.0000E 01	1.0662E 00	+
8.0000E 01	1.0748E 00	-+
9.0000E 01	1.0731E 00	-+
1.0000E 02	1.0676E 00	+
1.1000E 02	1.0629E 00	+
1.2000E 02	1.0607E 00	+
1.3000E 02	1.0622E 00	+
1.4000E 02	1.0678E 00	+
1.5000E 02	1.0786E 00	-+
1.6000E 02	1.0956E 00	--+
1.7000E 02	1.1191E 00	--+
1.8000E 02	1.1494E 00	----+
1.9000E 02	1.1855E 00	-----+
2.0000E 02	1.2260E 00	-------+
2.1000E 02	1.2706E 00	--------+
2.2000E 02	1.3192E 00	----------+
2.3000E 02	1.3709E 00	------------+
2.4000E 02	1.4267E 00	--------------+
2.5000E 02	1.4882E 00	----------------+
2.6000E 02	1.5576E 00	------------------+
2.7000E 02	1.6394E 00	----------------------+
2.8000E 02	1.7412E 00	--------------------------+
2.9000E 02	1.8633E 00	------------------------------+
3.0000E 02	1.9992E 00	----------------------------------+
3.1000E 02	2.1332E 00	------------------------------------+
3.2000E 02	2.2441E 00	--------------------------------------+
3.3000E 02	2.3127E 00	--+
3.4000E 02	2.3358E 00	--+
3.5000E 02	2.3222E 00	--+
3.6000E 02	2.2859E 00	--------------------------------------+
3.7000E 02	2.2492E 00	--------------------------------------+


MINIMUM
4.6670E-06
BAC VERSUS TIME
MAXIMUM
3.1711E-04
TIME
BAC
0.0 3.0000E-04
1.0000E 01 2.7898E-04
2.0000E 01 2.4108E-04
3.0000E 01 2.1795E-04
4.0000E 01 1.8486E-04
5.0000E 01 1.7355E-04
6.0000E 01 1.7120E-04
7.0000E 01 1.6907E-04
8.0000E 01 1.6623E-04
9.0000E 01 2.8483E-04
1.0000E 02 2.9007E-04
1.1000E 02 2.7895E-04
1.2000E 02 2.7000E-04
1.3000E 02 2.6370E-04
1.4000E 02 2.6421E-04
1.5000E 02 2.6485E-04
1.6000E 02 2.6937E-04
1.7000E 02 2.7608E-04
1.8000E 02 2.8814E-04
1.9000E 02 2.7616E-04
2.0000E 02 1.9512E-04
2.1000E 02 5.8141E-05
2.2000E 02 1.5512E-05
2.3000E 02 5.2918E-06
2.4000E 02 5.3282E-06
2.5000E 02 8.0128E-06
2.6000E 02 1.1915E-05
2.7000E 02 2.4637E-05
2.8000E 02 4.1540E-05
2.9000E 02 5.9117E-05
3.0000E 02 6.5767E-05
3.1000E 02 6.7504E-05
3.2000E 02 6.7756E-05
3.3000E 02 7.2934E-05
3.4000E 02 8.1418E-05
3.5000E 02 9.0389E-05
3.6000E 02 1.3683E-04
3.7000E 02 1.8999E-04


MINIMUM
2.6924E-05
BACWW VERSUS TIME
MAXIMUM
6.0063E-04
TIME
BACWW
0.0 3.0000E-04
1.0000E 01 2.2602E-04
2.0000E 01 2.0532E-04
3.0000E 01 2.0693E-04
4.0000E 01 1.7384E-04
5.0000E 01 1.6146E-04
6.0000E 01 1.5972E-04
7.0000E 01 1.5916E-04
8.0000E 01 1.5748E-04
9.0000E 01 3.3394E-04
1.0000E 02 3.7609E-04
1.1000E 02 3.9784E-04
1.2000E 02 4.0102E-04
1.3000E 02 3.9134E-04
1.4000E 02 3.7386E-04
1.5000E 02 3.5123E-04
1.6000E 02 3.3661E-04
1.7000E 02 3.2739E-04
1.8000E 02 3.3287E-04
1.9000E 02 3.4437E-04
2.0000E 02 3.5993E-04
2.1000E 02 3.7855E-04
2.2000E 02 4.0009E-04
2.3000E 02 4.2330E-04
2.4000E 02 4.5773E-04
2.5000E 02 5.0004E-04
2.6000E 02 5.4600E-04
2.7000E 02 6.0063E-04
2.8000E 02 3.2655E-05
2.9000E 02 4.4117E-05
3.0000E 02 5.0513E-05
3.1000E 02 5.4333E-05
3.2000E 02 5.7412E-05
3.3000E 02 6.3400E-05
3.4000E 02 7.1540E-05
3.5000E 02 8.0157E-05
3.6000E 02 8.7603E-05
3.7000E 02 9.3411E-05


MINIMUM
5.0000E-03
CN VERSUS TIME
MAXIMUM
1.7817E 00
TIME
CN
0.0 1.1180E 00
1.0000E 01 1.7615E 00
2.0000E 01 1.2565E 00
3.0000E 01 2.8050E-02
4.0000E 01 2.2522E-02
5.0000E 01 1.9731E-02
6.0000E 01 1.8146E-02
7.0000E 01 1.6557E-02
8.0000E 01 1.6305E-02
9.0000E 01 1.8513E-01
1.0000E 02 7.9233E-02
1.1000E 02 7.2936E-02
1.2000E 02 7.4524E-02
1.3000E 02 6.9087E-02
1.4000E 02 6.1713E-02
1.5000E 02 5.3591E-02
1.6000E 02 4.5821E-02
1.7000E 02 3.8791E-02
1.8000E 02 3.2721E-02
1.9000E 02 2.7765E-02
2.0000E 02 2.3424E-02
2.1000E 02 1.9893E-02
2.2000E 02 1.6875E-02
2.3000E 02 1.4454E-02
2.4000E 02 1.2457E-02
2.5000E 02 1.0841E-02
2.6000E 02 9.5418E-03
2.7000E 02 8.5513E-03
2.8000E 02 5.0000E-03
2.9000E 02 5.0000E-03
3.0000E 02 5.0000E-03
3.1000E 02 5.0000E-03
3.2000E 02 5.0000E-03
3.3000E 02 5.0000E-03
3.4000E 02 5.0000E-03
3.5000E 02 5.0000E-03
3.6000E 02 8.2739E-01
3.7000E 02 9.0136E-01



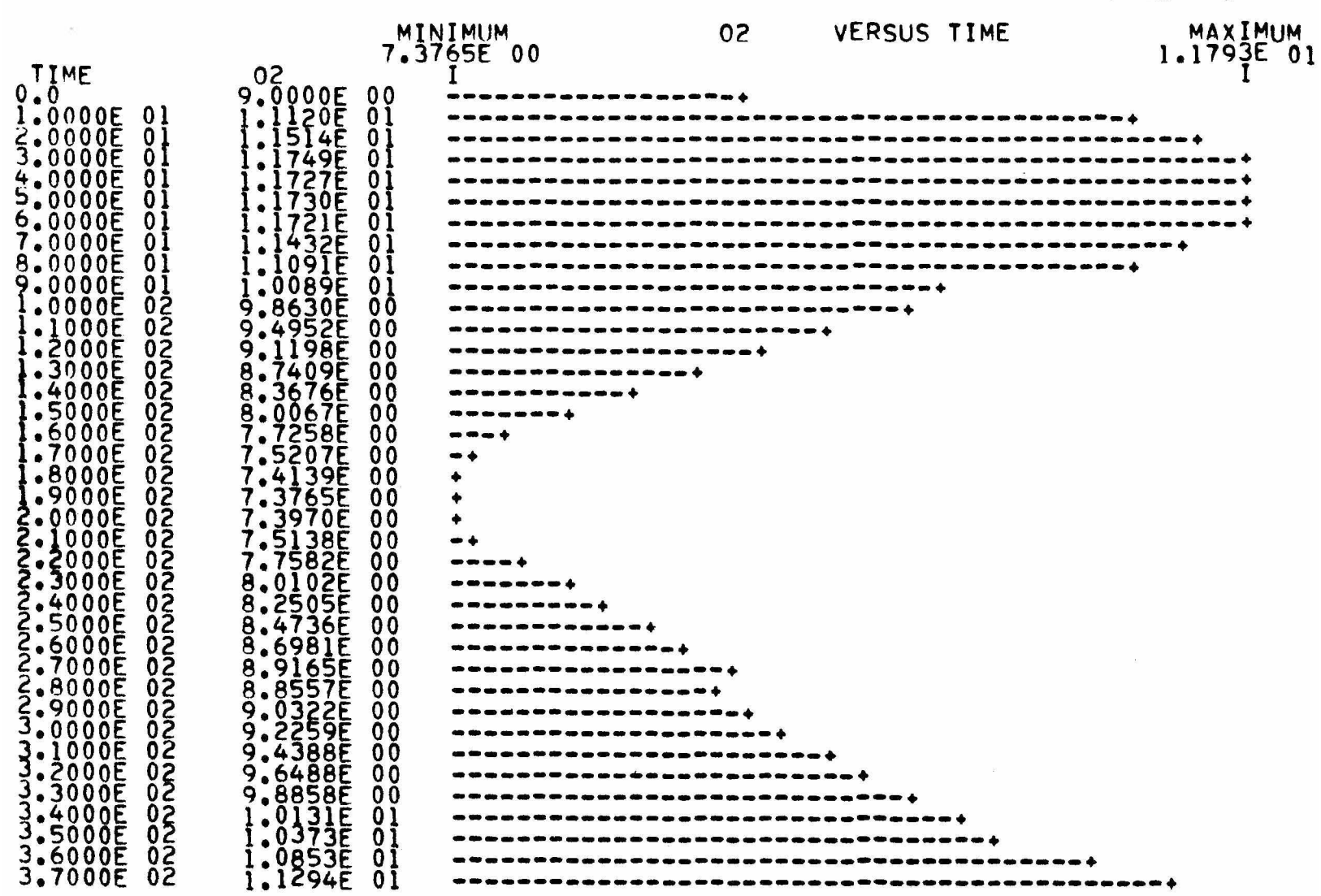
TIME	CNWW
0.0	9.3100E-01
1.0000E 01	1.3032E 00
2.0000E 01	1.0995E 00
3.0000E 01	8.7013E-02
4.0000E 01	1.9571E-02
5.0000E 01	1.6502E-02
6.0000E 01	1.4537E-02
7.0000E 01	1.2918E-02
8.0000E 01	1.3049E-02
9.0000E 01	4.2410E-01
1.0000E 02	2.1902E-01
1.1000E 02	1.2073E-01
1.2000E 02	7.9215E-02
1.3000E 02	6.4172E-02
1.4000E 02	5.9668E-02
1.5000E 02	5.8744E-02
1.6000E 02	5.9636E-02
1.7000E 02	6.0135E-02
1.8000E 02	5.9732E-02
1.9000E 02	5.8382E-02
2.0000E 02	5.6346E-02
2.1000E 02	5.3782E-02
2.2000E 02	5.0885E-02
2.3000E 02	4.7677E-02
2.4000E 02	4.5096E-02
2.5000E 02	4.2849E-02
2.6000E 02	4.0541E-02
2.7000E 02	3.8197E-02
2.8000E 02	5.0000E-03
2.9000E 02	5.0000E-03
3.0000E 02	5.0000E-03
3.1000E 02	5.0000E-03
3.2000E 02	5.0000E-03
3.3000E 02	5.0000E-03
3.4000E 02	5.0000E-03
3.5000E 02	5.0000E-03
3.6000E 02	5.0000E-03
3.7000E 02	5.0000E-03

MINIMUM CP VERSUS TIME MAXIMUM
1.0000E-03 1.4664E-02

TIME	CP	I
0.0	1.0000E-03	+
1.0000E 01	1.0000E-03	+
2.0000E 01	1.0000E-03	+
3.0000E 01	1.0000E-03	+
4.0000E 01	1.0000E-03	+
5.0000E 01	1.0000E-03	+
6.0000E 01	1.0000E-03	+
7.0000E 01	1.0000E-03	+
8.0000E 01	1.0000E-03	+
9.0000E 01	5.7237E-03	----------+
1.0000E 02	4.8506E-03	---------+
1.1000E 02	5.6936E-03	----------+
1.2000E 02	5.9174E-03	----------+
1.3000E 02	5.4906E-03	----------+
1.4000E 02	4.9438E-03	---------+
1.5000E 02	4.3639E-03	--------+
1.6000E 02	3.8166E-03	-------+
1.7000E 02	3.3253E-03	------+
1.8000E 02	2.9043E-03	-----+
1.9000E 02	2.5615E-03	----+
2.0000E 02	2.2619E-03	----+
2.1000E 02	2.0187E-03	---+
2.2000E 02	1.8108E-03	--+
2.3000E 02	1.6451E-03	--+
2.4000E 02	1.5084E-03	-+
2.5000E 02	1.3983E-03	-+
2.6000E 02	1.3099E-03	-+
2.7000E 02	1.2431E-03	+
2.8000E 02	1.0000E-03	+
2.9000E 02	1.0000E-03	+
3.0000E 02	1.0000E-03	+
3.1000E 02	1.0000E-03	+
3.2000E 02	1.0000E-03	+
3.3000E 02	1.0000E-03	+
3.4000E 02	1.0000E-03	+
3.5000E 02	1.0000E-03	+
3.6000E 02	1.0000E-03	+
3.7000E 02	1.0000E-03	+

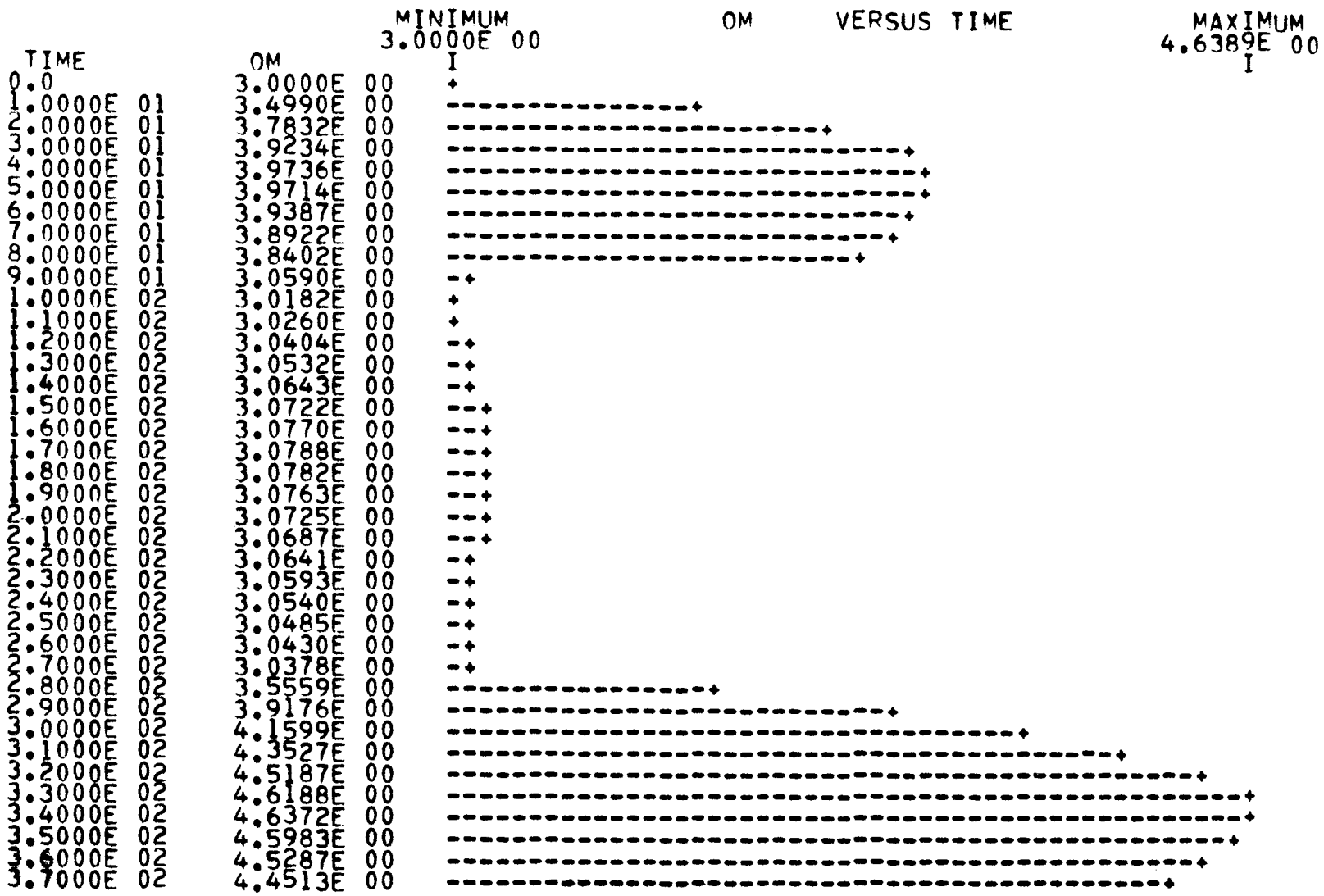
MINIMUM 1.0000E-03 CPWW VERSUS TIME MAXIMUM 1.9945E-02

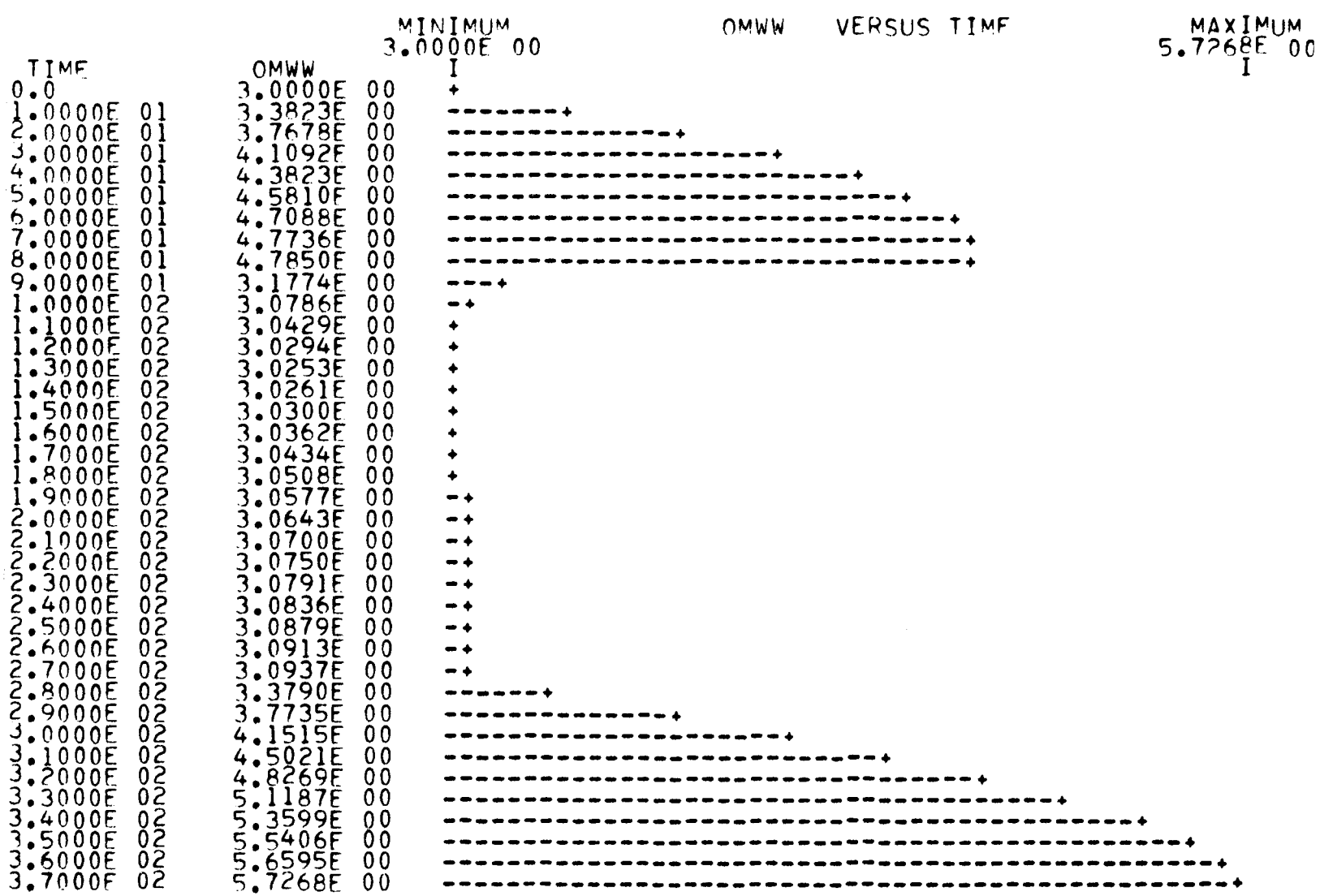
TIME	CPWW	I
0.0	1.0000E-03	+
1.0000E 01	1.0000E-03	+
2.0000E 01	1.0000E-03	+
3.0000E 01	1.0000E-03	+
4.0000E 01	1.0000E-03	+
5.0000E 01	1.0000E-03	+
6.0000E 01	1.0000E-03	+
7.0000E 01	1.0000E-03	+
8.0000E 01	1.0000E-03	+
9.0000E 01	1.2791E-02	----------+
1.0000E 02	8.5363E-03	----------+
1.1000E 02	6.4745E-03	----------+
1.2000E 02	5.6519E-03	----------+
1.3000E 02	5.3899E-03	----------+
1.4000E 02	5.2844E-03	----------+
1.5000E 02	5.1960E-03	----------+
1.6000E 02	5.1743E-03	----------+
1.7000E 02	5.1215E-03	----------+
1.8000E 02	5.0208E-03	----------+
1.9000E 02	4.8660E-03	----------+
2.0000E 02	4.6706E-03	----------+
2.1000E 02	4.4500E-03	----------+
2.2000E 02	4.2124E-03	---------+
2.3000E 02	3.9515E-03	--------+
2.4000E 02	3.7388E-03	--------+
2.5000E 02	3.5576E-03	-------+
2.6000E 02	3.3747E-03	-------+
2.7000E 02	3.1921E-03	------+
2.8000E 02	1.0000E-03	+
2.9000E 02	1.0000E-03	+
3.0000E 02	1.0000E-03	+
3.1000E 02	1.0000E-03	+
3.2000E 02	1.0000E-03	+
3.3000E 02	1.0000E-03	+
3.4000E 02	1.0000E-03	+
3.5000E 02	1.0000E-03	+
3.6000E 02	1.0000E-03	+
3.7000E 02	1.0000E-03	+


MINIMUM 7.3765E 00
02 VERSUS TIME
MAXIMUM 1.1793E 01
TIME
02
0.0 9.0000E 00
1.0000E 01 1.1120E 01
2.0000E 01 1.1514E 01
3.0000E 01 1.1749E 01
4.0000E 01 1.1727E 01
5.0000E 01 1.1730E 01
6.0000E 01 1.1721E 01
7.0000E 01 1.1432E 01
8.0000E 01 1.1091E 01
9.0000E 01 1.0089E 01
1.0000E 02 9.8630E 00
1.1000E 02 9.4952E 00
1.2000E 02 9.1198E 00
1.3000E 02 8.7409E 00
1.4000E 02 8.3676E 00
1.5000E 02 8.0067E 00
1.6000E 02 7.7258E 00
1.7000E 02 7.5207E 00
1.8000E 02 7.4139E 00
1.9000E 02 7.3765E 00
2.0000E 02 7.3970E 00
2.1000E 02 7.5138E 00
2.2000E 02 7.7582E 00
2.3000E 02 8.0102E 00
2.4000E 02 8.2505E 00
2.5000E 02 8.4736E 00
2.6000E 02 8.6981E 00
2.7000E 02 8.9165E 00
2.8000E 02 8.8557E 00
2.9000E 02 9.0322E 00
3.0000E 02 9.2259E 00
3.1000E 02 9.4388E 00
3.2000E 02 9.6488E 00
3.3000E 02 9.8858E 00
3.4000E 02 1.0131E 01
3.5000E 02 1.0373E 01
3.6000E 02 1.0853E 01
3.7000E 02 1.1294E 01

MINIMUM 8.0015E 00 — O2WW VERSUS TIME — MAXIMUM 1.2149E 01

TIME	O2WW
0.0	9.8000E 00
1.0000E 01	1.1132E 01
2.0000E 01	1.1684E 01
3.0000E 01	1.2105E 01
4.0000E 01	1.2087E 01
5.0000E 01	1.2119E 01
6.0000E 01	1.2148E 01
7.0000E 01	1.1916E 01
8.0000E 01	1.1545E 01
9.0000E 01	1.0648E 01
1.0000E 02	1.0425E 01
1.1000E 02	1.0028E 01
1.2000E 02	9.6282E 00
1.3000E 02	9.2408E 00
1.4000E 02	8.8765E 00
1.5000E 02	8.5512E 00
1.6000E 02	8.3173E 00
1.7000E 02	8.1818E 00
1.8000E 02	8.0920E 00
1.9000E 02	8.0456E 00
2.0000E 02	8.0256E 00
2.1000E 02	8.0095E 00
2.2000E 02	8.0024E 00
2.3000E 02	8.0092E 00
2.4000E 02	8.0070E 00
2.5000E 02	8.0180E 00
2.6000E 02	8.0623E 00
2.7000E 02	8.1328E 00
2.8000E 02	8.7359E 00
2.9000E 02	8.8988E 00
3.0000E 02	9.1251E 00
3.1000E 02	9.3728E 00
3.2000E 02	9.6093E 00
3.3000E 02	9.8634E 00
3.4000E 02	1.0133E 01
3.5000E 02	1.0405E 01
3.6000E 02	1.0702E 01
3.7000E 02	1.0993E 01


MINIMUM
3.0000E 00
OM VERSUS TIME
MAXIMUM
4.6389E 00
TIME
OM
0.0 3.0000E 00
1.0000E 01 3.4990E 00
2.0000E 01 3.7832E 00
3.0000E 01 3.9234E 00
4.0000E 01 3.9736E 00
5.0000E 01 3.9714E 00
6.0000E 01 3.9387E 00
7.0000E 01 3.8922E 00
8.0000E 01 3.8402E 00
9.0000E 01 3.0590E 00
1.0000E 02 3.0182E 00
1.1000E 02 3.0260E 00
1.2000E 02 3.0404E 00
1.3000E 02 3.0532E 00
1.4000E 02 3.0643E 00
1.5000E 02 3.0722E 00
1.6000E 02 3.0770E 00
1.7000E 02 3.0788E 00
1.8000E 02 3.0782E 00
1.9000E 02 3.0763E 00
2.0000E 02 3.0725E 00
2.1000E 02 3.0687E 00
2.2000E 02 3.0641E 00
2.3000E 02 3.0593E 00
2.4000E 02 3.0540E 00
2.5000E 02 3.0485E 00
2.6000E 02 3.0430E 00
2.7000E 02 3.0378E 00
2.8000E 02 3.5559E 00
2.9000E 02 3.9176E 00
3.0000E 02 4.1599E 00
3.1000E 02 4.3527E 00
3.2000E 02 4.5187E 00
3.3000E 02 4.6188E 00
3.4000E 02 4.6372E 00
3.5000E 02 4.5983E 00
3.6000E 02 4.5287E 00
3.7000E 02 4.4513E 00


MINIMUM
3.0000E 00
OMWW VERSUS TIME
MAXIMUM
5.7268E 00
TIME
OMWW
0.0 3.0000E 00
1.0000E 01 3.3823E 00
2.0000E 01 3.7678E 00
3.0000E 01 4.1092E 00
4.0000E 01 4.3823E 00
5.0000E 01 4.5810E 00
6.0000E 01 4.7088E 00
7.0000E 01 4.7736E 00
8.0000E 01 4.7850E 00
9.0000E 01 3.1774E 00
1.0000E 02 3.0786E 00
1.1000E 02 3.0429E 00
1.2000E 02 3.0294E 00
1.3000E 02 3.0253E 00
1.4000E 02 3.0261E 00
1.5000E 02 3.0300E 00
1.6000E 02 3.0362E 00
1.7000E 02 3.0434E 00
1.8000E 02 3.0508E 00
1.9000E 02 3.0577E 00
2.0000E 02 3.0643E 00
2.1000E 02 3.0700E 00
2.2000E 02 3.0750E 00
2.3000E 02 3.0791E 00
2.4000E 02 3.0836E 00
2.5000E 02 3.0879E 00
2.6000E 02 3.0913E 00
2.7000E 02 3.0937E 00
2.8000E 02 3.3790E 00
2.9000E 02 3.7735E 00
3.0000E 02 4.1515E 00
3.1000E 02 4.5021E 00
3.2000E 02 4.8269E 00
3.3000E 02 5.1187E 00
3.4000E 02 5.3599E 00
3.5000E 02 5.5406E 00
3.6000E 02 5.6595E 00
3.7000E 02 5.7268E 00

4. Case II

The nitrogen in Fayetteville Treatment Plant was eliminated before mixing with White River flow to the first segment. This was achieved by setting the parameter CNFTP to zero in the main computer program. The simulated results were compared with those of the base case. The second segment was in parallel with the first segment, therefore, it was completely unaffected. In the first and third segments, the phytoplankton concentrations decreased slightly as a result of the slight loss of nitrogen nutrient from the treatment effluent. In the beginning of the year, the slight decrease in phytoplankton concentrations reduced the growth rate of fish and zooplankton slightly. As the concentrations of fish were decreasing gradually, the predation of omnivores on zooplankton was reduced slightly. This reduction in predation induced the growth of the zooplankton despite the slight decrease in phytoplankton concentrations. As the zooplankton was increasing steadily, fish was then stimulated for growth. As a result, the overall fish and zooplankton concentrations were increased slightly. However, those changes were slight. There were only minimal changes in the concentrations of bacteria, phosphorus and oxygen and there was no change in the organic matter concentrations in both the first and third segments. The simulated outputs follow (the unchanged outputs are not included):

CAM VERSUS TIME

MINIMUM 1.2690E 01 I

MAXIMUM 6.1547E 02 I

TIME	CAM	
0.0	1.2690E 01	+
1.0000E 01	7.5687E 01	-----+
2.0000E 01	1.6483E 02	----------+
3.0000E 01	2.6575E 02	----------+
4.0000E 01	2.8457E 02	----------+
5.0000E 01	2.8792E 02	----------+
6.0000E 01	2.8164E 02	----------+
7.0000E 01	2.7007E 02	----------+
8.0000E 01	2.5577E 02	----------+
9.0000E 01	5.1151E 01	---+
1.0000E 02	3.3555E 01	-+
1.1000E 02	3.1231E 01	-+
1.2000E 02	3.3594E 01	-+
1.3000E 02	3.7775E 01	--+
1.4000E 02	4.3212E 01	--+
1.5000E 02	5.3050E 01	---+
1.6000E 02	7.0514E 01	----+
1.7000E 02	1.0181E 02	--------+
1.8000E 02	1.4590E 02	----------+
1.9000E 02	2.0232E 02	----------+
2.0000E 02	2.7132E 02	----------+
2.1000E 02	3.4966E 02	----------+
2.2000E 02	4.3299E 02	----------+
2.3000E 02	5.1469E 02	----------+
2.4000E 02	5.7722E 02	----------+
2.5000E 02	6.1051E 02	----------+
2.6000E 02	6.1115E 02	----------+
2.7000E 02	5.5283E 02	----------+
2.8000E 02	4.4928E 02	----------+
2.9000E 02	3.2448E 02	----------+
3.0000E 02	2.3067E 02	----------+
3.1000E 02	1.6716E 02	----------+
3.2000E 02	1.2338E 02	---------+
3.3000E 02	9.0508E 01	------+
3.4000E 02	6.5887E 01	----+
3.5000E 02	4.8879E 01	---+
3.6000E 02	7.8308E 01	-----+
3.7000E 02	1.6307E 02	----------+

CAMWW VERSUS TIME

MINIMUM 5.4500E 01 I

MAXIMUM 5.2184E 02 I

TIME	CAMWW
0.0	5.4500E 01
1.0000E 01	8.8500E 01
2.0000E 01	1.6055E 02
3.0000E 01	2.7749E 02
4.0000E 01	3.2705E 02
5.0000E 01	3.6335E 02
6.0000E 01	3.8721E 02
7.0000E 01	3.9861E 02
8.0000E 01	3.9877E 02
9.0000E 01	9.7157E 01
1.0000E 02	9.4115E 01
1.1000E 02	9.5582E 01
1.2000E 02	1.0147E 02
1.3000E 02	1.0860E 02
1.4000E 02	1.1726E 02
1.5000E 02	1.3336E 02
1.6000E 02	1.5941E 02
1.7000E 02	2.0140E 02
1.8000E 02	2.4997E 02
1.9000E 02	2.9953E 02
2.0000E 02	3.4555E 02
2.1000E 02	3.8434E 02
2.2000E 02	4.1310E 02
2.3000E 02	4.3014E 02
2.4000E 02	4.3204E 02
2.5000E 02	4.2412E 02
2.6000E 02	4.0951E 02
2.7000E 02	3.9022E 02
2.8000E 02	4.2895E 02
2.9000E 02	3.4883E 02
3.0000E 02	2.7814E 02
3.1000E 02	2.1927E 02
3.2000E 02	1.7192E 02
3.3000E 02	1.3378E 02
3.4000E 02	1.0308E 02
3.5000E 02	7.9032E 01
3.6000E 02	6.3400E 01
3.7000E 02	6.5506E 01

MINIMUM 8.4097E-04 — MCZ00 VERSUS TIME — MAXIMUM 3.2431E-02

TIME	MCZ00	I
0.0	3.8000E-03	----+
1.0000E 01	3.6812E-03	----+
2.0000E 01	3.8294E-03	----+
3.0000E 01	4.0582E-03	-----+
4.0000E 01	4.2778E-03	-----+
5.0000E 01	4.4529E-03	-----+
6.0000E 01	4.5649E-03	-----+
7.0000E 01	4.6172E-03	-----+
8.0000E 01	4.6136E-03	-----+
9.0000E 01	4.3274E-03	-----+
1.0000E 02	4.0184E-03	-----+
1.1000E 02	3.7910E-03	----+
1.2000E 02	3.6567E-03	----+
1.3000E 02	3.5865E-03	----+
1.4000E 02	3.5581E-03	----+
1.5000E 02	3.5961E-03	----+
1.6000E 02	3.7229E-03	----+
1.7000E 02	3.9648E-03	----+
1.8000E 02	4.3034E-03	-----+
1.9000E 02	4.7320E-03	------+
2.0000E 02	5.2717E-03	-------+
2.1000E 02	5.9782E-03	--------+
2.2000E 02	6.9431E-03	---------+
2.3000E 02	8.3157E-03	----------+
2.4000E 02	1.0330E-02	----------+
2.5000E 02	1.3290E-02	----------+
2.6000E 02	1.7594E-02	----------+
2.7000E 02	2.3365E-02	----------+
2.8000E 02	2.9293E-02	----------+
2.9000E 02	3.2390E-02	----------+
3.0000E 02	3.0444E-02	----------+
3.1000E 02	2.3910E-02	----------+
3.2000E 02	1.5613E-02	----------+
3.3000E 02	8.6571E-03	----------+
3.4000E 02	4.2645E-03	-----+
3.5000E 02	2.0685E-03	-+
3.6000E 02	1.1600E-03	+
3.7000E 02	8.4097E-04	+

MCFISH VERSUS TIME

MINIMUM 1.0426E 00 — MAXIMUM 2.1972E 00

TIME	MCFISH
0.0	1.0600E 00
1.0000E 01	1.0452E 00
2.0000E 01	1.0427E 00
3.0000E 01	1.0451E 00
4.0000E 01	1.0493E 00
5.0000E 01	1.0544E 00
6.0000E 01	1.0600E 00
7.0000E 01	1.0669E 00
8.0000E 01	1.0755E 00
9.0000E 01	1.0737E 00
1.0000E 02	1.0681E 00
1.1000E 02	1.0633E 00
1.2000E 02	1.0610E 00
1.3000E 02	1.0624E 00
1.4000E 02	1.0679E 00
1.5000E 02	1.0786E 00
1.6000E 02	1.0955E 00
1.7000E 02	1.1189E 00
1.8000E 02	1.1491E 00
1.9000E 02	1.1851E 00
2.0000E 02	1.2254E 00
2.1000E 02	1.2698E 00
2.2000E 02	1.3182E 00
2.3000E 02	1.3695E 00
2.4000E 02	1.4248E 00
2.5000E 02	1.4854E 00
2.6000E 02	1.5531E 00
2.7000E 02	1.6320E 00
2.8000E 02	1.7280E 00
2.9000E 02	1.8396E 00
3.0000E 02	1.9577E 00
3.1000E 02	2.0656E 00
3.2000E 02	2.1457E 00
3.3000E 02	2.1884E 00
3.4000E 02	2.1963E 00
3.5000E 02	2.1772E 00
3.6000E 02	2.1421E 00
3.7000E 02	2.1083E 00

MINIMUM BAC VERSUS TIME MAXIMUM
5.1949E-06 3.2413E-04

TIME	BAC
0.0	3.0000E-04
1.0000E 01	2.8790E-04
2.0000E 01	2.4508E-04
3.0000E 01	2.1526E-04
4.0000E 01	1.8425E-04
5.0000E 01	1.7367E-04
6.0000E 01	1.7156E-04
7.0000E 01	1.6948E-04
8.0000E 01	1.6664E-04
9.0000E 01	2.8498E-04
1.0000E 02	2.9025E-04
1.1000E 02	2.7916E-04
1.2000E 02	2.7024E-04
1.3000E 02	2.6399E-04
1.4000E 02	2.6454E-04
1.5000E 02	2.6524E-04
1.6000E 02	2.6982E-04
1.7000E 02	2.7660E-04
1.8000E 02	2.8869E-04
1.9000E 02	2.7672E-04
2.0000E 02	1.9562E-04
2.1000E 02	5.8604E-05
2.2000E 02	1.6005E-05
2.3000E 02	5.8116E-06
2.4000E 02	5.8642E-06
2.5000E 02	8.5633E-06
2.6000E 02	1.2484E-05
2.7000E 02	2.5196E-05
2.8000E 02	4.2082E-05
2.9000E 02	5.9632E-05
3.0000E 02	6.6282E-05
3.1000E 02	6.8040E-05
3.2000E 02	6.8321E-05
3.3000E 02	7.3511E-05
3.4000E 02	8.1984E-05
3.5000E 02	9.0933E-05
3.6000E 02	1.4251E-04
3.7000E 02	1.9325E-04

BACWW VERSUS TIME

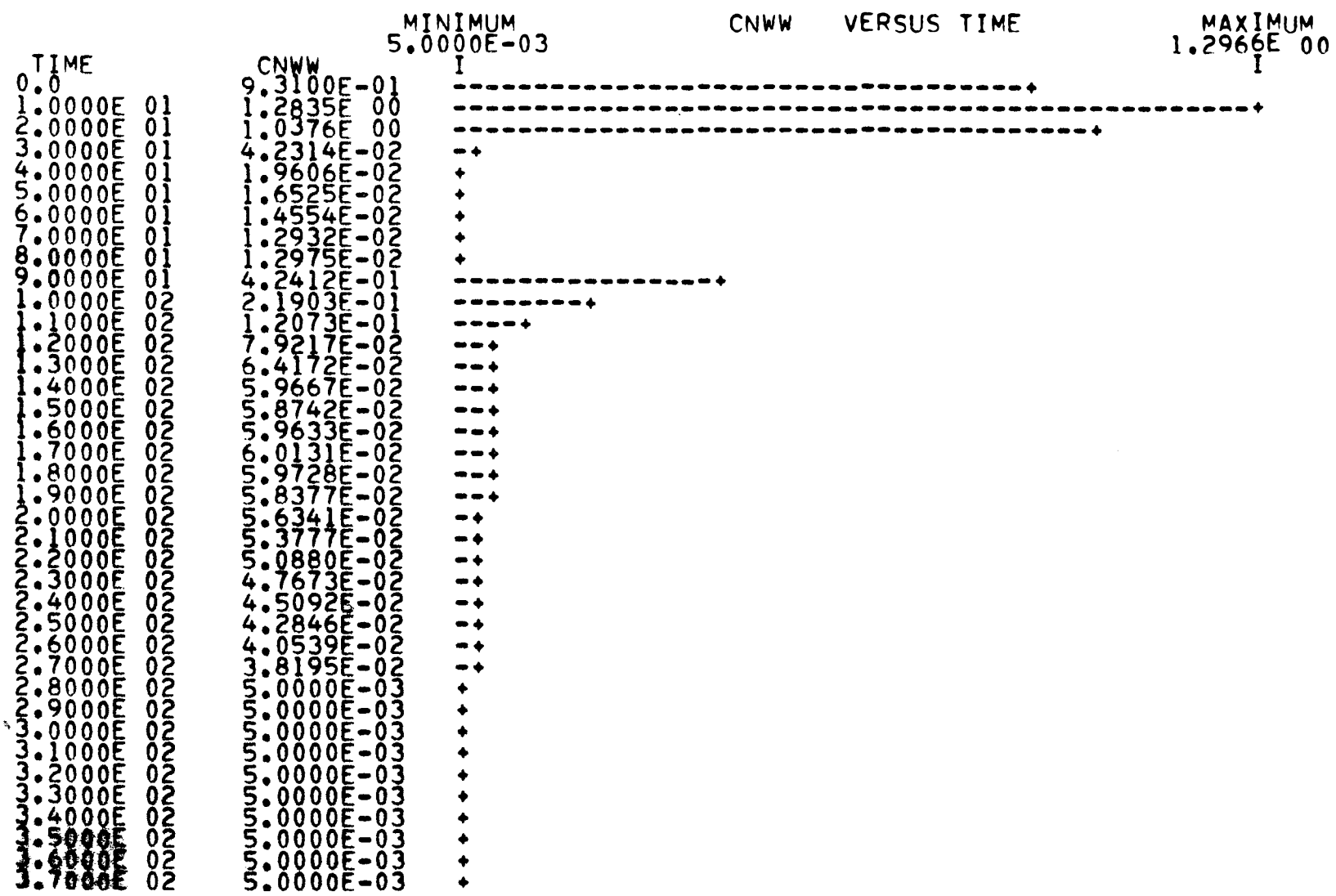
MINIMUM 2.7300E-05 I

MAXIMUM 6.0019E-04 I

TIME	BACWW
0.0	3.0000E-04
1.0000E 01	2.2623E-04
2.0000E 01	2.0551E-04
3.0000E 01	2.0510E-04
4.0000E 01	1.7245E-04
5.0000E 01	1.6112E-04
6.0000E 01	1.5976E-04
7.0000E 01	1.5932E-04
8.0000E 01	1.5766E-04
9.0000E 01	3.3398E-04
1.0000E 02	3.7613E-04
1.1000E 02	3.9790E-04
1.2000E 02	4.0109E-04
1.3000E 02	3.9142E-04
1.4000E 02	3.7395E-04
1.5000E 02	3.5134E-04
1.6000E 02	3.3675E-04
1.7000E 02	3.2756E-04
1.8000E 02	3.3303E-04
1.9000E 02	3.4450E-04
2.0000E 02	3.6003E-04
2.1000E 02	3.7860E-04
2.2000E 02	4.0009E-04
2.3000E 02	4.2323E-04
2.4000E 02	4.5759E-04
2.5000E 02	4.9980E-04
2.6000E 02	5.4568E-04
2.7000E 02	6.0019E-04
2.8000E 02	3.2970E-05
2.9000E 02	4.4422E-05
3.0000E 02	5.0826E-05
3.1000E 02	5.4661E-05
3.2000E 02	5.7754E-05
3.3000E 02	6.3750E-05
3.4000E 02	7.1888E-05
3.5000E 02	8.0494E-05
3.6000E 02	8.7928E-05
3.7000E 02	9.3724E-05

MINIMUM CN VERSUS TIME MAXIMUM
5.0000E-03 1.6321E 00

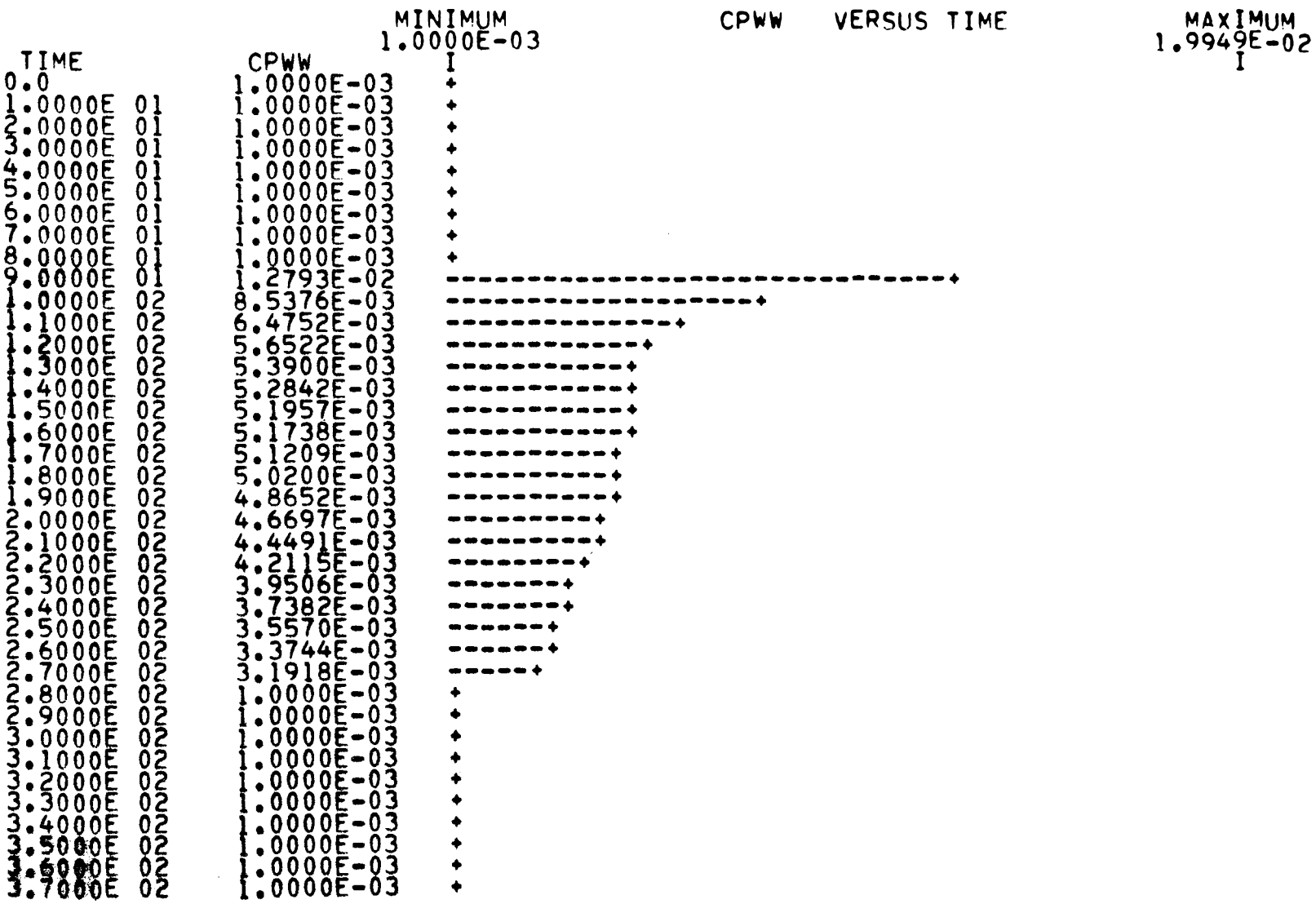
TIME	CN	I
0.0	1.1180E 00	----------+
1.0000E 01	1.6188E 00	----------+
2.0000E 01	1.0720E 00	----------+
3.0000E 01	2.8191E-02	+
4.0000E 01	2.2633E-02	+
5.0000E 01	1.9828E-02	+
6.0000E 01	1.8235E-02	+
7.0000E 01	1.6635E-02	+
8.0000E 01	1.5835E-02	+
9.0000E 01	1.8517E-01	-----+
1.0000E 02	7.9247E-02	--+
1.1000E 02	7.2943E-02	--+
1.2000E 02	7.4528E-02	--+
1.3000E 02	6.9089E-02	-+
1.4000E 02	6.1715E-02	-+
1.5000E 02	5.3592E-02	-+
1.6000E 02	4.5821E-02	-+
1.7000E 02	3.8792E-02	-+
1.8000E 02	3.2722E-02	+
1.9000E 02	2.7765E-02	+
2.0000E 02	2.3424E-02	+
2.1000E 02	1.9892E-02	+
2.2000E 02	1.6875E-02	+
2.3000E 02	1.4454E-02	+
2.4000E 02	1.2456E-02	+
2.5000E 02	1.0840E-02	+
2.6000E 02	9.5409E-03	+
2.7000E 02	8.5501E-03	+
2.8000E 02	5.0000E-03	+
2.9000E 02	5.0000E-03	+
3.0000E 02	5.0000E-03	+
3.1000E 02	5.0000E-03	+
3.2000E 02	5.0000E-03	+
3.3000E 02	5.0000E-03	+
3.4000E 02	5.0000E-03	+
3.5000E 02	5.0000E-03	+
3.6000E 02	8.9309E-01	----------+
3.7000E 02	8.3778E-01	----------+



TIME	CNWW
0.0	9.3100E-01
1.0000E 01	1.2835E 00
2.0000E 01	1.0376E 00
3.0000E 01	4.2314E-02
4.0000E 01	1.9606E-02
5.0000E 01	1.6525E-02
6.0000E 01	1.4554E-02
7.0000E 01	1.2932E-02
8.0000E 01	1.2975E-02
9.0000E 01	4.2412E-01
1.0000E 02	2.1903E-01
1.1000E 02	1.2073E-01
1.2000E 02	7.9217E-02
1.3000E 02	6.4172E-02
1.4000E 02	5.9667E-02
1.5000E 02	5.8742E-02
1.6000E 02	5.9633E-02
1.7000E 02	6.0131E-02
1.8000E 02	5.9728E-02
1.9000E 02	5.8377E-02
2.0000E 02	5.6341E-02
2.1000E 02	5.3777E-02
2.2000E 02	5.0880E-02
2.3000E 02	4.7673E-02
2.4000E 02	4.5092E-02
2.5000E 02	4.2846E-02
2.6000E 02	4.0539E-02
2.7000E 02	3.8195E-02
2.8000E 02	5.0000E-03
2.9000E 02	5.0000E-03
3.0000E 02	5.0000E-03
3.1000E 02	5.0000E-03
3.2000E 02	5.0000E-03
3.3000E 02	5.0000E-03
3.4000E 02	5.0000E-03
3.5000E 02	5.0000E-03
3.6000E 02	5.0000E-03
3.7000E 02	5.0000E-03

MINIMUM CP VERSUS TIME MAXIMUM
1.0000E-03 1.4683E-02

TIME	CP	I
0.0	1.0000E-03	+
1.0000E 01	1.0000E-03	+
2.0000E 01	1.0000E-03	+
3.0000E 01	1.0000E-03	+
4.0000E 01	1.0000E-03	+
5.0000E 01	1.0000E-03	+
6.0000E 01	1.0000E-03	+
7.0000E 01	1.0000E-03	+
8.0000E 01	1.0000E-03	+
9.0000E 01	5.7299E-03	----------+
1.0000E 02	4.8531E-03	---------+
1.1000E 02	5.6948E-03	----------+
1.2000E 02	5.9181E-03	----------+
1.3000E 02	5.4911E-03	----------+
1.4000E 02	4.9441E-03	---------+
1.5000E 02	4.3641E-03	--------+
1.6000E 02	3.8167E-03	-------+
1.7000E 02	3.3253E-03	-------+
1.8000E 02	2.9043E-03	------+
1.9000E 02	2.5615E-03	-----+
2.0000E 02	2.2618E-03	----+
2.1000E 02	2.0186E-03	---+
2.2000E 02	1.8108E-03	--+
2.3000E 02	1.6450E-03	--+
2.4000E 02	1.5083E-03	-+
2.5000E 02	1.3982E-03	-+
2.6000E 02	1.3097E-03	-+
2.7000E 02	1.2429E-03	+
2.8000E 02	1.0000E-03	+
2.9000E 02	1.0000E-03	+
3.0000E 02	1.0000E-03	+
3.1000E 02	1.0000E-03	+
3.2000E 02	1.0000E-03	+
3.3000E 02	1.0000E-03	+
3.4000E 02	1.0000E-03	+
3.5000E 02	1.0000E-03	+
3.6000E 02	1.0000E-03	+
3.7000E 02	1.0000E-03	+



TIME	CPWW
0.0	1.0000E-03
1.0000E 01	1.0000E-03
2.0000E 01	1.0000E-03
3.0000E 01	1.0000E-03
4.0000E 01	1.0000E-03
5.0000E 01	1.0000E-03
6.0000E 01	1.0000E-03
7.0000E 01	1.0000E-03
8.0000E 01	1.0000E-03
9.0000E 01	1.2793E-02
1.0000E 02	8.5376E-03
1.1000E 02	6.4752E-03
1.2000E 02	5.6522E-03
1.3000E 02	5.3900E-03
1.4000E 02	5.2842E-03
1.5000E 02	5.1957E-03
1.6000E 02	5.1738E-03
1.7000E 02	5.1209E-03
1.8000E 02	5.0200E-03
1.9000E 02	4.8652E-03
2.0000E 02	4.6697E-03
2.1000E 02	4.4491E-03
2.2000E 02	4.2115E-03
2.3000E 02	3.9506E-03
2.4000E 02	3.7382E-03
2.5000E 02	3.5570E-03
2.6000E 02	3.3744E-03
2.7000E 02	3.1918E-03
2.8000E 02	1.0000E-03
2.9000E 02	1.0000E-03
3.0000E 02	1.0000E-03
3.1000E 02	1.0000E-03
3.2000E 02	1.0000E-03
3.3000E 02	1.0000E-03
3.4000E 02	1.0000E-03
3.5000E 02	1.0000E-03
3.6000E 02	1.0000E-03
3.7000E 02	1.0000E-03

MINIMUM 02 VERSUS TIME MAXIMUM
7.3750E 00 1.1771E 01

TIME	02
0.0	9.0000E 00
1.0000E 01	1.1143E 01
2.0000E 01	1.1533E 01
3.0000E 01	1.1723E 01
4.0000E 01	1.1723E 01
5.0000E 01	1.1727E 01
6.0000E 01	1.1719E 01
7.0000E 01	1.1430E 01
8.0000E 01	1.1090E 01
9.0000E 01	1.0088E 01
1.0000E 02	9.8617E 00
1.1000E 02	9.4944E 00
1.2000E 02	9.1195E 00
1.3000E 02	8.7409E 00
1.4000E 02	8.3679E 00
1.5000E 02	8.0073E 00
1.6000E 02	7.7265E 00
1.7000E 02	7.5210E 00
1.8000E 02	7.4134E 00
1.9000E 02	7.3750E 00
2.0000E 02	7.3942E 00
2.1000E 02	7.5100E 00
2.2000E 02	7.7532E 00
2.3000E 02	8.0042E 00
2.4000E 02	8.2438E 00
2.5000E 02	8.4666E 00
2.6000E 02	8.6909E 00
2.7000E 02	8.9097E 00
2.8000E 02	8.8496E 00
2.9000E 02	9.0273E 00
3.0000E 02	9.2218E 00
3.1000E 02	9.4353E 00
3.2000E 02	9.6459E 00
3.3000E 02	9.8834E 00
3.4000E 02	1.0129E 01
3.5000E 02	1.0371E 01
3.6000E 02	1.0876E 01
3.7000E 02	1.1313E 01

MINIMUM 7.9978E 00 — O2WW VERSUS TIME — MAXIMUM 1.2148E 01

TIME	O2WW	I
0.0	9.8000E 00	----------+
1.0000E 01	1.1135E 01	----------+
2.0000E 01	1.1691E 01	----------+
3.0000E 01	1.2094E 01	----------+
4.0000E 01	1.2081E 01	----------+
5.0000E 01	1.2117E 01	----------+
6.0000E 01	1.2147E 01	----------+
7.0000E 01	1.1914E 01	----------+
8.0000E 01	1.1543E 01	----------+
9.0000E 01	1.0647E 01	----------+
1.0000E 02	1.0423E 01	----------+
1.1000E 02	1.0027E 01	----------+
1.2000E 02	9.6272E 00	----------+
1.3000E 02	9.2398E 00	----------+
1.4000E 02	8.8756E 00	----------+
1.5000E 02	8.5501E 00	----------+
1.6000E 02	8.3159E 00	----------+
1.7000E 02	8.1798E 00	----------+
1.8000E 02	8.0893E 00	----------+
1.9000E 02	8.0424E 00	----------+
2.0000E 02	8.0222E 00	----------+
2.1000E 02	8.0058E 00	----------+
2.2000E 02	7.9988E 00	----------+
2.3000E 02	8.0058E 00	----------+
2.4000E 02	8.0039E 00	----------+
2.5000E 02	8.0152E 00	----------+
2.6000E 02	8.0599E 00	----------+
2.7000E 02	8.1305E 00	----------+
2.8000E 02	8.7334E 00	----------+
2.9000E 02	8.8962E 00	----------+
3.0000E 02	9.1225E 00	----------+
3.1000E 02	9.3705E 00	----------+
3.2000E 02	9.6073E 00	----------+
3.3000E 02	9.8617E 00	----------+
3.4000E 02	1.0132E 01	----------+
3.5000E 02	1.0403E 01	----------+
3.6000E 02	1.0705E 01	----------+
3.7000E 02	1.0997E 01	----------+

5. Case III

The phosphorus in Fayetteville Treatment Plant effluent was eliminated before mixing with White River flow to the first segment. This was achieved by setting the parameter CPFTP to zero in the main computer program. The simulated results were compared with the base case. The second segment was in parallel with the first segment. Therefore, it was completely unaffected. In the first and second segments, the phytoplankton concentrations decreased slightly as a result of the slight loss of phosphorus nutrient from the treatment effluent. In the beginning of the year, the slight increase in phytoplankton concentrations reduced the growth rate of fish and zooplankton slightly. As the fish decreased gradually, the predation of omnivores on zooplankton was reduced slightly. This reduction in predation induced the growth of the zooplankton despite the slight decrease in phytoplankton concentrations. As the zooplankton was increasing steadily, fish was then stimulated for growth. As a result, the overall fish and zooplankton concentrations were increased slightly. However, those changes were slight. There were only minimal changes in the concentrations of bacteria, phosphorus, and oxygen and there was no change in the organic matter concentrations in both the first and third segments. The simulated outputs follow (the unchanged outputs are not included):

CAM VERSUS TIME

MINIMUM 1.2690E 01

MAXIMUM 6.1553E 02

TIME	CAM
0.0	1.2690E 01
1.0000E 01	7.0121E 01
2.0000E 01	1.5536E 02
3.0000E 01	2.7067E 02
4.0000E 01	2.9007E 02
5.0000E 01	2.9360E 02
6.0000E 01	2.8723E 02
7.0000E 01	2.7542E 02
8.0000E 01	2.6078E 02
9.0000E 01	5.1846E 01
1.0000E 02	3.3792E 01
1.1000E 02	3.1329E 01
1.2000E 02	3.3644E 01
1.3000E 02	3.7806E 01
1.4000E 02	4.3234E 01
1.5000E 02	5.3069E 01
1.6000E 02	7.0536E 01
1.7000E 02	1.0183E 02
1.8000E 02	1.4594E 02
1.9000E 02	2.0237E 02
2.0000E 02	2.7138E 02
2.1000E 02	3.4972E 02
2.2000E 02	4.3306E 02
2.3000E 02	5.1476E 02
2.4000E 02	5.7729E 02
2.5000E 02	6.1057E 02
2.6000E 02	6.1121E 02
2.7000E 02	5.5287E 02
2.8000E 02	4.4930E 02
2.9000E 02	3.2448E 02
3.0000E 02	2.3066E 02
3.1000E 02	1.6714E 02
3.2000E 02	1.2335E 02
3.3000E 02	9.0481E 01
3.4000E 02	6.5864E 01
3.5000E 02	5.9077E 01
3.6000E 02	1.3013E 02
3.7000E 02	2.4357E 02

CAMWW VERSUS TIME

MINIMUM 5.4500E 01 — MAXIMUM 5.2186E 02

TIME	CAMWW
0.0	5.4500E 01
1.0000E 01	8.7743E 01
2.0000E 01	1.5768E 02
3.0000E 01	2.7626E 02
4.0000E 01	3.2996E 02
5.0000E 01	3.6645E 02
6.0000E 01	3.9038E 02
7.0000E 01	4.0175E 02
8.0000E 01	4.0174E 02
9.0000E 01	9.7685E 01
1.0000E 02	9.4343E 01
1.1000E 02	9.5677E 01
1.2000E 02	1.0152E 02
1.3000E 02	1.0863E 02
1.4000E 02	1.1728E 02
1.5000E 02	1.3337E 02
1.6000E 02	1.5942E 02
1.7000E 02	2.0141E 02
1.8000E 02	2.4998E 02
1.9000E 02	2.9954E 02
2.0000E 02	3.4556E 02
2.1000E 02	3.8435E 02
2.2000E 02	4.1312E 02
2.3000E 02	4.3015E 02
2.4000E 02	4.3205E 02
2.5000E 02	4.2413E 02
2.6000E 02	4.0952E 02
2.7000E 02	3.9023E 02
2.8000E 02	4.2896E 02
2.9000E 02	3.4884E 02
3.0000E 02	2.7814E 02
3.1000E 02	2.1926E 02
3.2000E 02	1.7190E 02
3.3000E 02	1.3375E 02
3.4000E 02	1.0306E 02
3.5000E 02	7.9198E 01
3.6000E 02	7.0361E 01
3.7000E 02	8.2476E 01

MCZOO VERSUS TIME

MINIMUM 8.5555E-04 MAXIMUM 3.3806E-02

TIME	MCZOO
0.0	3.8000E-03
1.0000E 01	3.6756E-03
2.0000E 01	3.8195E-03
3.0000E 01	4.0485E-03
4.0000E 01	4.2724E-03
5.0000E 01	4.4514E-03
6.0000E 01	4.5666E-03
7.0000E 01	4.6211E-03
8.0000E 01	4.6190E-03
9.0000E 01	4.3342E-03
1.0000E 02	4.0248E-03
1.1000E 02	3.7959E-03
1.2000E 02	3.6603E-03
1.3000E 02	3.5893E-03
1.4000E 02	3.5604E-03
1.5000E 02	3.5984E-03
1.6000E 02	3.7256E-03
1.7000E 02	3.9683E-03
1.8000E 02	4.3084E-03
1.9000E 02	4.7395E-03
2.0000E 02	5.2833E-03
2.1000E 02	5.9964E-03
2.2000E 02	6.9724E-03
2.3000E 02	8.3643E-03
2.4000E 02	1.0414E-02
2.5000E 02	1.3438E-02
2.6000E 02	1.7863E-02
2.7000E 02	2.3859E-02
2.8000E 02	3.0146E-02
2.9000E 02	3.3691E-02
3.0000E 02	3.2114E-02
3.1000E 02	2.5619E-02
3.2000E 02	1.6933E-02
3.3000E 02	9.4298E-03
3.4000E 02	4.6086E-03
3.5000E 02	2.1871E-03
3.6000E 02	1.2025E-03
3.7000E 02	8.5555E-04

MCFISH VERSUS TIME

MINIMUM 1.0420E 00

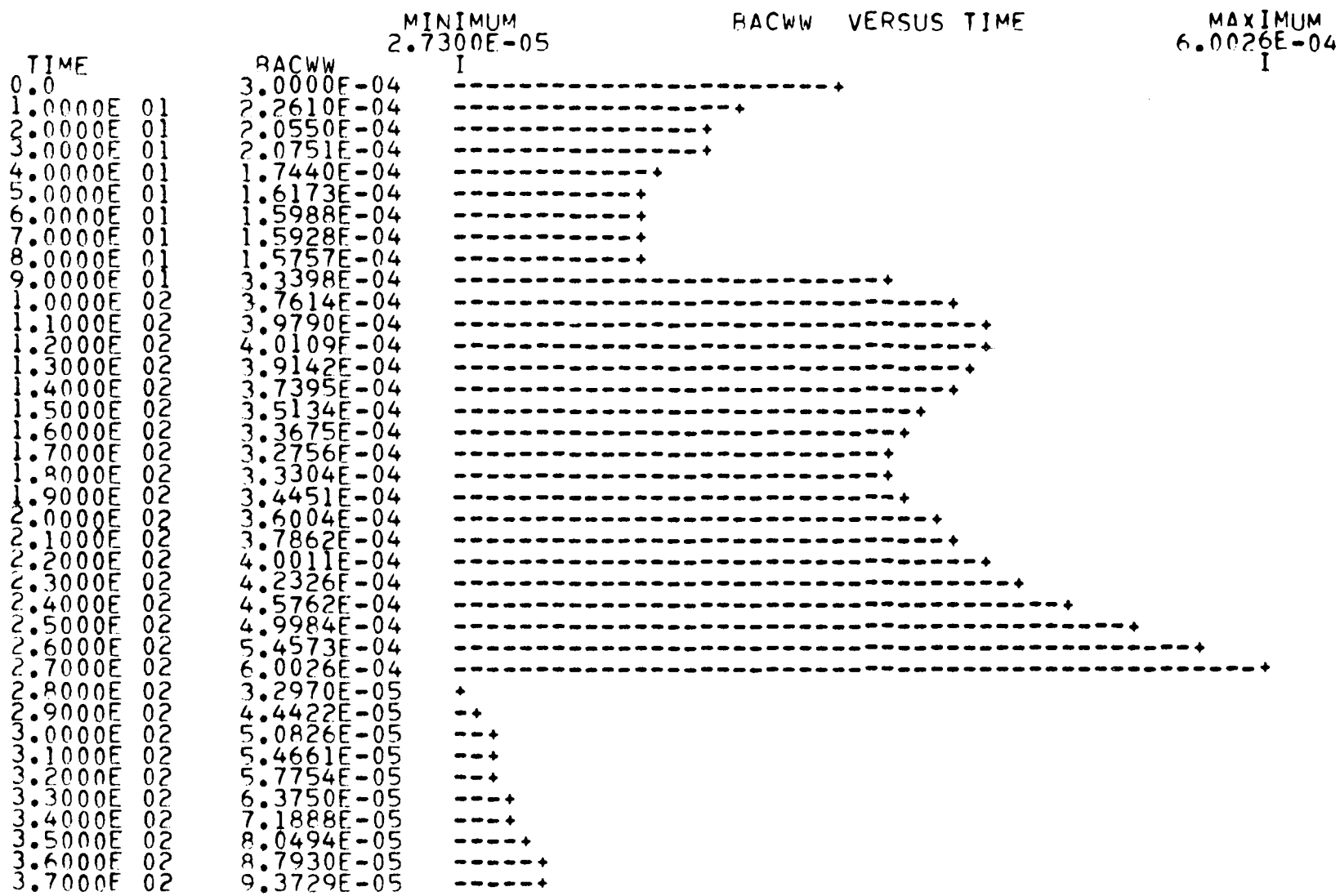
MAXIMUM 2.2235E 00

TIME	MCFISH	I
0.0	1.0600E 00	+
1.0000E 01	1.0449E 00	+
2.0000E 01	1.0420E 00	+
3.0000E 01	1.0443E 00	+
4.0000E 01	1.0486E 00	+
5.0000E 01	1.0537E 00	+
6.0000E 01	1.0594E 00	+
7.0000E 01	1.0663E 00	-+
8.0000E 01	1.0750E 00	-+
9.0000E 01	1.0733E 00	-+
1.0000E 02	1.0678E 00	-+
1.1000E 02	1.0630E 00	+
1.2000E 02	1.0608E 00	+
1.3000E 02	1.0622E 00	+
1.4000E 02	1.0678E 00	-+
1.5000E 02	1.0785E 00	-+
1.6000E 02	1.0954E 00	--+
1.7000E 02	1.1187E 00	---+
1.8000E 02	1.1490E 00	----+
1.9000E 02	1.1850E 00	------+
2.0000E 02	1.2253E 00	-------+
2.1000E 02	1.2698E 00	---------+
2.2000E 02	1.3182E 00	----------+
2.3000E 02	1.3696E 00	------------+
2.4000E 02	1.4250E 00	----------------+
2.5000E 02	1.4858E 00	------------------+
2.6000E 02	1.5539E 00	---------------------+
2.7000E 02	1.6336E 00	------------------------+
2.8000E 02	1.7309E 00	----------------------------+
2.9000E 02	1.8448E 00	------------------------------+
3.0000E 02	1.9667E 00	----------------------------------+
3.1000E 02	2.0799E 00	------------------------------------+
3.2000E 02	2.1657E 00	--------------------------------------+
3.3000E 02	2.2127E 00	--+
3.4000E 02	2.2229E 00	--+
3.5000E 02	2.2047E 00	--+
3.6000E 02	2.1772E 00	--------------------------------------+
3.7000E 02	2.1501E 00	------------------------------------+

BAC VERSUS TIME

MINIMUM 5.1950E-06 MAXIMUM 3.1708E-04

TIME	BAC
0.0	3.0000E-04
1.0000E 01	2.7895E-04
2.0000E 01	2.4117E-04
3.0000E 01	2.2000E-04
4.0000E 01	1.8609E-04
5.0000E 01	1.7444E-04
6.0000E 01	1.7195E-04
7.0000E 01	1.6974E-04
8.0000E 01	1.6684E-04
9.0000E 01	2.8498E-04
1.0000E 02	2.9022E-04
1.1000E 02	2.7913E-04
1.2000E 02	2.7022E-04
1.3000E 02	2.6396E-04
1.4000E 02	2.6451E-04
1.5000E 02	2.6521E-04
1.6000E 02	2.6979E-04
1.7000E 02	2.7658E-04
1.8000E 02	2.8867E-04
1.9000E 02	2.7670E-04
2.0000E 02	1.9562E-04
2.1000E 02	5.8605E-05
2.2000E 02	1.6005E-05
2.3000E 02	5.8117E-06
2.4000E 02	5.8642E-06
2.5000E 02	8.5633E-06
2.6000E 02	1.2484E-05
2.7000E 02	2.5196E-05
2.8000E 02	4.2082E-05
2.9000E 02	5.9632E-05
3.0000E 02	6.6282E-05
3.1000E 02	6.8040E-05
3.2000E 02	6.8321E-05
3.3000E 02	7.3511E-05
3.4000E 02	8.1984E-05
3.5000E 02	1.0256E-04
3.6000E 02	1.6762E-04
3.7000E 02	2.0566E-04


MINIMUM
2.7300E-05
BACWW VERSUS TIME
MAXIMUM
6.0026E-04
TIME
BACWW
0.0 3.0000E-04
1.0000E 01 2.2610E-04
2.0000E 01 2.0550E-04
3.0000E 01 2.0751E-04
4.0000E 01 1.7440E-04
5.0000E 01 1.6173E-04
6.0000E 01 1.5988E-04
7.0000E 01 1.5928E-04
8.0000E 01 1.5757E-04
9.0000E 01 3.3398E-04
1.0000E 02 3.7614E-04
1.1000E 02 3.9790E-04
1.2000E 02 4.0109E-04
1.3000E 02 3.9142E-04
1.4000E 02 3.7395E-04
1.5000E 02 3.5134E-04
1.6000E 02 3.3675E-04
1.7000E 02 3.2756E-04
1.8000E 02 3.3304E-04
1.9000E 02 3.4451E-04
2.0000E 02 3.6004E-04
2.1000E 02 3.7862E-04
2.2000E 02 4.0011E-04
2.3000E 02 4.2326E-04
2.4000E 02 4.5762E-04
2.5000E 02 4.9984E-04
2.6000E 02 5.4573E-04
2.7000E 02 6.0026E-04
2.8000E 02 3.2970E-05
2.9000E 02 4.4422E-05
3.0000E 02 5.0826E-05
3.1000E 02 5.4661E-05
3.2000E 02 5.7754E-05
3.3000E 02 6.3750E-05
3.4000E 02 7.1888E-05
3.5000E 02 8.0494E-05
3.6000E 02 8.7930E-05
3.7000E 02 9.3729E-05

MINIMUM CN VERSUS TIME MAXIMUM
5.0000E-03 1.8245E 00

TIME	CN	I
0.0	1.1180E 00	----------+
1.0000E 01	1.7997E 00	----------+
2.0000E 01	1.3181E 00	----------+
3.0000E 01	2.8521E-02	+
4.0000E 01	2.2843E-02	+
5.0000E 01	1.9989E-02	+
6.0000E 01	1.8372E-02	+
7.0000E 01	1.6750E-02	+
8.0000E 01	1.6062E-02	+
9.0000E 01	1.8514E-01	----+
1.0000E 02	7.9236E-02	--+
1.1000E 02	7.2938E-02	-+
1.2000E 02	7.4525E-02	-+
1.3000E 02	6.9087E-02	-+
1.4000E 02	6.1713E-02	-+
1.5000E 02	5.3591E-02	-+
1.6000E 02	4.5820E-02	-+
1.7000E 02	3.8791E-02	+
1.8000E 02	3.2721E-02	+
1.9000E 02	2.7765E-02	+
2.0000E 02	2.3424E-02	+
2.1000E 02	1.9892E-02	+
2.2000E 02	1.6874E-02	+
2.3000E 02	1.4454E-02	+
2.4000E 02	1.2456E-02	+
2.5000E 02	1.0840E-02	+
2.6000E 02	9.5410E-03	+
2.7000E 02	8.5503E-03	+
2.8000E 02	5.0000E-03	+
2.9000E 02	5.0000E-03	+
3.0000E 02	5.0000E-03	+
3.1000E 02	5.0000E-03	+
3.2000E 02	5.0000E-03	+
3.3000E 02	5.0000E-03	+
3.4000E 02	5.0000E-03	+
3.5000E 02	3.2546E-01	--------+
3.6000E 02	9.1968E-01	----------+
3.7000E 02	1.8306E-01	----+

CNWW VERSUS TIME

MINIMUM 5.0000E-03 MAXIMUM 1.3333E 00

TIME	CNWW	I
0.0	9.3100E-01	----------+
1.0000E 01	1.3090E 00	----------+
2.0000E 01	1.1165E 00	----------+
3.0000E 01	1.0286E-01	---+
4.0000E 01	1.9513E-02	+
5.0000E 01	1.6462E-02	+
6.0000E 01	1.4507E-02	+
7.0000E 01	1.2895E-02	+
8.0000E 01	1.3291E-02	+
9.0000E 01	4.2410E-01	----------+
1.0000E 02	2.1902E-01	--------+
1.1000E 02	1.2073E-01	-----+
1.2000E 02	7.9215E-02	--+
1.3000E 02	6.4172E-02	--+
1.4000E 02	5.9667E-02	--+
1.5000E 02	5.8742E-02	--+
1.6000E 02	5.9634E-02	--+
1.7000E 02	6.0132E-02	--+
1.8000E 02	5.9729E-02	--+
1.9000E 02	5.8378E-02	--+
2.0000E 02	5.6342E-02	-+
2.1000E 02	5.3778E-02	-+
2.2000E 02	5.0881E-02	-+
2.3000E 02	4.7673E-02	-+
2.4000E 02	4.5093E-02	-+
2.5000E 02	4.2847E-02	-+
2.6000E 02	4.0540E-02	-+
2.7000E 02	3.8197E-02	-+
2.8000E 02	5.0000E-03	+
2.9000E 02	5.0000E-03	+
3.0000E 02	5.0000E-03	+
3.1000E 02	5.0000E-03	+
3.2000E 02	5.0000E-03	+
3.3000E 02	5.0000E-03	+
3.4000E 02	5.0000E-03	+
3.5000E 02	5.0000E-03	+
3.6000E 02	5.0000E-03	+
3.7000E 02	5.0000E-03	+

MINIMUM CP VERSUS TIME MAXIMUM
1.0000E-03 1.4665E-02

TIME	CP	I
0.0	1.0000E-03	+
1.0000E 01	1.0000E-03	+
2.0000E 01	1.0000E-03	+
3.0000E 01	1.0000E-03	+
4.0000E 01	1.0000E-03	+
5.0000E 01	1.0000E-03	+
6.0000E 01	1.0000E-03	+
7.0000E 01	1.0000E-03	+
8.0000E 01	1.0000E-03	+
9.0000E 01	5.7242E-03	----------+
1.0000E 02	4.8510E-03	---------+
1.1000E 02	5.6939E-03	----------+
1.2000E 02	5.9176E-03	----------+
1.3000E 02	5.4907E-03	----------+
1.4000E 02	4.9438E-03	---------+
1.5000E 02	4.3639E-03	--------+
1.6000E 02	3.8166E-03	-------+
1.7000E 02	3.3252E-03	-------+
1.8000E 02	2.9042E-03	------+
1.9000E 02	2.5614E-03	-----+
2.0000E 02	2.2618E-03	----+
2.1000E 02	2.0186E-03	---+
2.2000E 02	1.8107E-03	--+
2.3000E 02	1.6450E-03	--+
2.4000E 02	1.5083E-03	-+
2.5000E 02	1.3982E-03	-+
2.6000E 02	1.3097E-03	-+
2.7000E 02	1.2429E-03	+
2.8000E 02	1.0000E-03	+
2.9000E 02	1.0000E-03	+
3.0000E 02	1.0000E-03	+
3.1000E 02	1.0000E-03	+
3.2000E 02	1.0000E-03	+
3.3000E 02	1.0000E-03	+
3.4000E 02	1.0000E-03	+
3.5000E 02	1.0000E-03	+
3.6000E 02	1.0000E-03	+
3.7000E 02	1.0000E-03	+

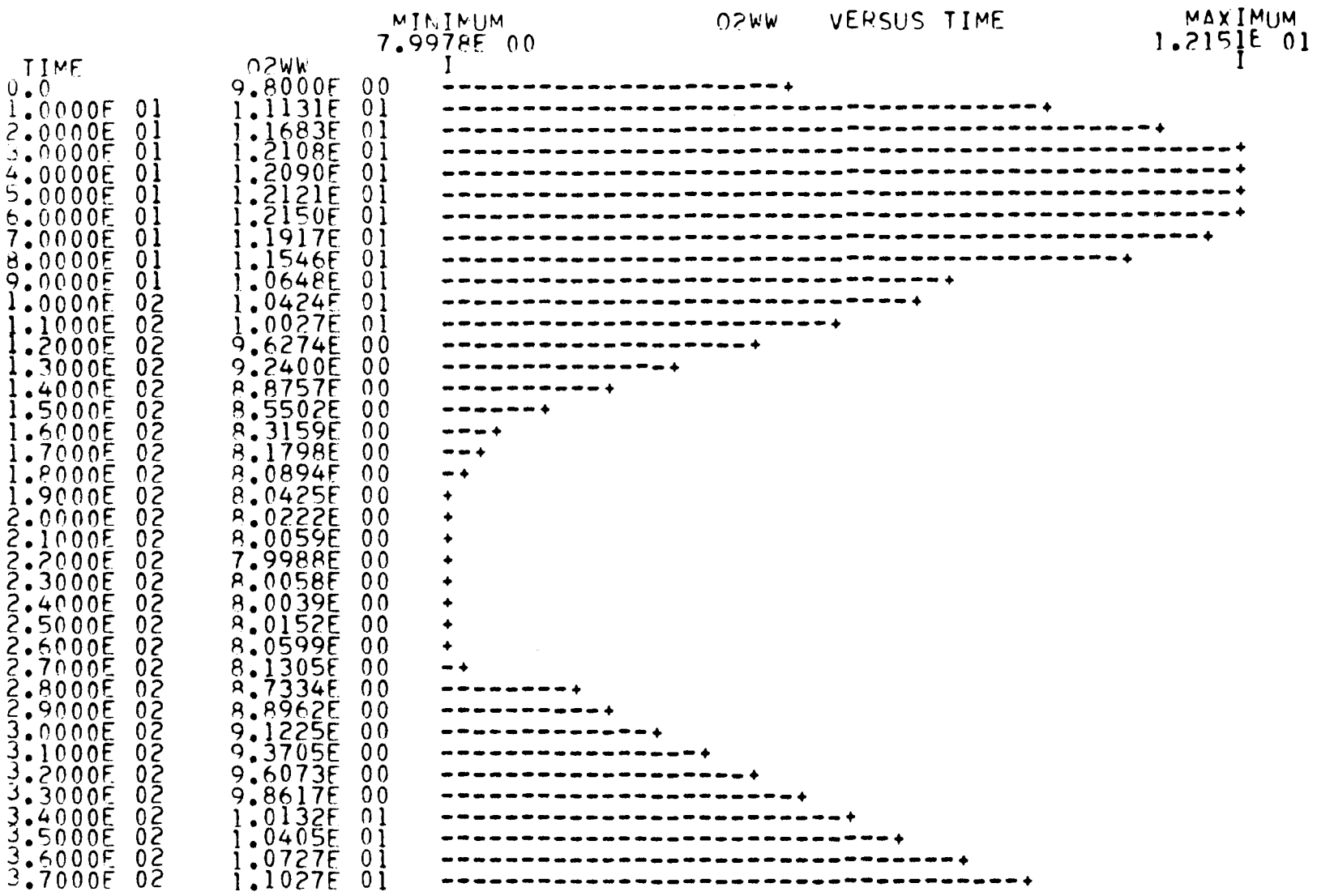
CPWW VERSUS TIME

MINIMUM 1.0000E-03 MAXIMUM 1.9945E-02

TIME	CPWW	I
0.0	1.0000E-03	+
1.0000E 01	1.0000E-03	+
2.0000E 01	1.0000E-03	+
3.0000E 01	1.0000E-03	+
4.0000E 01	1.0000E-03	+
5.0000E 01	1.0000E-03	+
6.0000E 01	1.0000E-03	+
7.0000E 01	1.0000E-03	+
8.0000E 01	1.0000E-03	+
9.0000E 01	1.2791E-02	----------+
1.0000E 02	8.5365E-03	----------+
1.1000E 02	6.4746E-03	----------+
1.2000E 02	5.6519E-03	----------+
1.3000E 02	5.3899E-03	----------+
1.4000E 02	5.2842E-03	----------+
1.5000E 02	5.1957E-03	----------+
1.6000E 02	5.1739E-03	----------+
1.7000E 02	5.1210E-03	----------+
1.8000E 02	5.0201E-03	----------+
1.9000E 02	4.8653E-03	----------+
2.0000E 02	4.6698E-03	----------+
2.1000E 02	4.4492E-03	----------+
2.2000E 02	4.2116E-03	---------+
2.3000E 02	3.9508E-03	--------+
2.4000E 02	3.7383E-03	--------+
2.5000E 02	3.5572E-03	-------+
2.6000E 02	3.3746E-03	-------+
2.7000E 02	3.1920E-03	------+
2.8000E 02	1.0000E-03	+
2.9000E 02	1.0000E-03	+
3.0000E 02	1.0000E-03	+
3.1000E 02	1.0000E-03	+
3.2000E 02	1.0000E-03	+
3.3000E 02	1.0000E-03	+
3.4000E 02	1.0000E-03	+
3.5000E 02	1.0000E-03	+
3.6000E 02	1.0000E-03	+
3.7000E 02	1.0000E-03	+

MINIMUM 7.3751E 00 — 02 VERSUS TIME — MAXIMUM 1.1805E 01

TIME	02
0.0	9.0000E 00
1.0000E 01	1.1119E 01
2.0000E 01	1.1512E 01
3.0000E 01	1.1766E 01
4.0000E 01	1.1733E 01
5.0000E 01	1.1736E 01
6.0000E 01	1.1727E 01
7.0000E 01	1.1438E 01
8.0000E 01	1.1098E 01
9.0000E 01	1.0089E 01
1.0000E 02	9.8627E 00
1.1000E 02	9.4949E 00
1.2000E 02	9.1197E 00
1.3000E 02	8.7411E 00
1.4000E 02	8.3680E 00
1.5000E 02	8.0073E 00
1.6000E 02	7.7265E 00
1.7000E 02	7.5211E 00
1.8000E 02	7.4135E 00
1.9000E 02	7.3751E 00
2.0000E 02	7.3943E 00
2.1000E 02	7.5100E 00
2.2000E 02	7.7533E 00
2.3000E 02	8.0043E 00
2.4000E 02	8.2439E 00
2.5000E 02	8.4666E 00
2.6000E 02	8.6910E 00
2.7000E 02	8.9097E 00
2.8000E 02	8.8497E 00
2.9000E 02	9.0273E 00
3.0000E 02	9.2218E 00
3.1000E 02	9.4353E 00
3.2000E 02	9.6459E 00
3.3000E 02	9.8833E 00
3.4000E 02	1.0129E 01
3.5000E 02	1.0467E 01
3.6000E 02	1.1028E 01
3.7000E 02	1.1461E 01


MINIMUM
7.9978E 00
O2WW VERSUS TIME
MAXIMUM
1.2151E 01
TIME
O2WW
0.0 9.8000E 00
1.0000E 01 1.1131E 01
2.0000E 01 1.1683E 01
3.0000E 01 1.2108E 01
4.0000E 01 1.2090E 01
5.0000E 01 1.2121E 01
6.0000E 01 1.2150E 01
7.0000E 01 1.1917E 01
8.0000E 01 1.1546E 01
9.0000E 01 1.0648E 01
1.0000E 02 1.0424E 01
1.1000E 02 1.0027E 01
1.2000E 02 9.6274E 00
1.3000E 02 9.2400E 00
1.4000E 02 8.8757E 00
1.5000E 02 8.5502E 00
1.6000E 02 8.3159E 00
1.7000E 02 8.1798E 00
1.8000E 02 8.0894E 00
1.9000E 02 8.0425E 00
2.0000E 02 8.0222E 00
2.1000E 02 8.0059E 00
2.2000E 02 7.9988E 00
2.3000E 02 8.0058E 00
2.4000E 02 8.0039E 00
2.5000E 02 8.0152E 00
2.6000E 02 8.0599E 00
2.7000E 02 8.1305E 00
2.8000E 02 8.7334E 00
2.9000E 02 8.8962E 00
3.0000E 02 9.1225E 00
3.1000E 02 9.3705E 00
3.2000E 02 9.6073E 00
3.3000E 02 9.8617E 00
3.4000E 02 1.0132E 01
3.5000E 02 1.0405E 01
3.6000E 02 1.0727E 01
3.7000E 02 1.1027E 01

6. Case IV

The effluent from septic tanks flowing into Beaver Reservoir in all three segments was stopped. This was achieved by setting the parameter POP (population) to zero in the main computer program. The simulated results were compared with those of the base case. Flows from septic tanks were considered in all three segments. Therefore, all segments were affected. However, the flow from septic tanks to each segment was smaller in comparing with river flows. As a result, there were only minimal changes in all three segments. The simulated outputs follow:

CAM VERSUS TIME

MINIMUM 1.2690E 01 — MAXIMUM 6.1618E 02

TIME	CAM
0.0	1.2690E 01
1.0000E 01	7.5689E 01
2.0000E 01	1.6495E 02
3.0000E 01	2.7080E 02
4.0000E 01	2.9018E 02
5.0000E 01	2.9369E 02
6.0000E 01	2.8730E 02
7.0000E 01	2.7548E 02
8.0000E 01	2.6083E 02
9.0000E 01	5.1865E 01
1.0000E 02	3.3805E 01
1.1000E 02	3.1338E 01
1.2000E 02	3.3651E 01
1.3000E 02	3.7813E 01
1.4000E 02	4.3244E 01
1.5000E 02	5.3083E 01
1.6000E 02	7.0560E 01
1.7000E 02	1.0188E 02
1.8000E 02	1.4602E 02
1.9000E 02	2.0250E 02
2.0000E 02	2.7158E 02
2.1000E 02	3.5001E 02
2.2000E 02	4.3344E 02
2.3000E 02	5.1524E 02
2.4000E 02	5.7786E 02
2.5000E 02	6.1120E 02
2.6000E 02	6.1186E 02
2.7000E 02	5.5350E 02
2.8000E 02	4.4984E 02
2.9000E 02	3.2491E 02
3.0000E 02	2.3100E 02
3.1000E 02	1.6743E 02
3.2000E 02	1.2359E 02
3.3000E 02	9.0677E 01
3.4000E 02	6.6012E 01
3.5000E 02	5.8755E 01
3.6000E 02	1.2955E 02
3.7000E 02	2.4282E 02

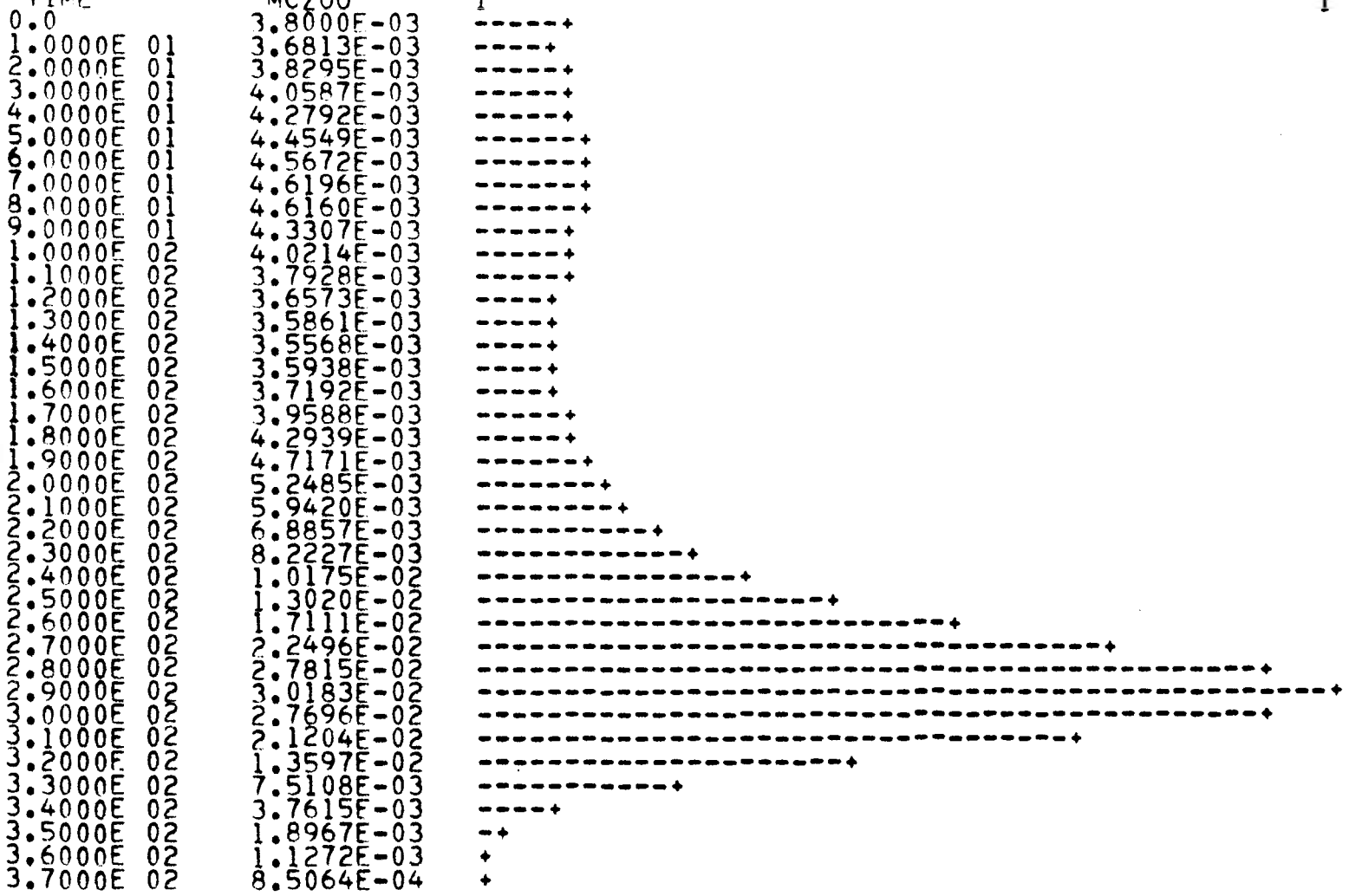
MINIMUM 7.9555E 01 — CAMWE VERSUS TIME — MAXIMUM 6.3042E 02

TIME	CAMWE
0.0	1.0000E 02
1.0000E 01	2.0428E 02
2.0000E 01	3.3102E 02
3.0000E 01	4.0180E 02
4.0000E 01	4.5611E 02
5.0000E 01	4.9411E 02
6.0000E 01	5.1564E 02
7.0000E 01	5.2079E 02
8.0000E 01	5.1399E 02
9.0000E 01	1.8413E 02
1.0000E 02	1.9339E 02
1.1000E 02	2.0723E 02
1.2000E 02	2.1054E 02
1.3000E 02	2.0766E 02
1.4000E 02	2.0427E 02
1.5000E 02	2.1703E 02
1.6000E 02	2.5339E 02
1.7000E 02	3.1476E 02
1.8000E 02	3.8291E 02
1.9000E 02	4.4841E 02
2.0000E 02	5.0665E 02
2.1000E 02	5.5608E 02
2.2000E 02	5.9375E 02
2.3000E 02	6.1853E 02
2.4000E 02	6.2937E 02
2.5000E 02	6.2601E 02
2.6000E 02	6.0918E 02
2.7000E 02	5.7513E 02
2.8000E 02	5.4894E 02
2.9000E 02	4.6729E 02
3.0000E 02	3.9007E 02
3.1000E 02	3.1944E 02
3.2000E 02	2.5686E 02
3.3000E 02	2.0349E 02
3.4000E 02	1.5964E 02
3.5000E 02	1.2485E 02
3.6000E 02	9.8652E 01
3.7000E 02	7.9555E 01

MINIMUM 5.4500E 01 — CAMWW VERSUS TIME — MAXIMUM 5.2221E 02

TIME	CAMWW	
0.0	5.4500E 01	+
1.0000E 01	8.8502E 01	---+
2.0000E 01	1.6058E 02	----------+
3.0000E 01	2.7890E 02	----------+
4.0000E 01	3.2953E 02	----------+
5.0000E 01	3.6625E 02	----------+
6.0000E 01	3.9032E 02	----------+
7.0000E 01	4.0176E 02	----------+
8.0000E 01	4.0183E 02	----------+
9.0000E 01	9.7722E 01	----+
1.0000E 02	9.4386E 01	----+
1.1000E 02	9.5723E 01	----+
1.2000E 02	1.0157E 02	-----+
1.3000E 02	1.0868E 02	-----+
1.4000E 02	1.1734E 02	------+
1.5000E 02	1.3345E 02	--------+
1.6000E 02	1.5952E 02	----------+
1.7000E 02	2.0155E 02	----------+
1.8000E 02	2.5017E 02	----------+
1.9000E 02	2.9977E 02	----------+
2.0000E 02	3.4583E 02	----------+
2.1000E 02	3.8464E 02	----------+
2.2000E 02	4.1342E 02	----------+
2.3000E 02	4.3046E 02	----------+
2.4000E 02	4.3235E 02	----------+
2.5000E 02	4.2442E 02	----------+
2.6000E 02	4.0979E 02	----------+
2.7000E 02	3.9049E 02	----------+
2.8000E 02	4.2928E 02	----------+
2.9000E 02	3.4913E 02	----------+
3.0000E 02	2.7840E 02	----------+
3.1000E 02	2.1950E 02	----------+
3.2000E 02	1.7212E 02	----------+
3.3000E 02	1.3395E 02	--------+
3.4000E 02	1.0323E 02	-----+
3.5000E 02	7.9326E 01	--+
3.6000E 02	7.0365E 01	-+
3.7000E 02	8.2351E 01	--+

MINIMUM 8.5064E-04 — MCZ00 VERSUS TIME — MAXIMUM 3.0183E-02



TIME	MCZ00
0.0	3.8000E-03
1.0000E 01	3.6813E-03
2.0000E 01	3.8295E-03
3.0000E 01	4.0587E-03
4.0000E 01	4.2792E-03
5.0000E 01	4.4549E-03
6.0000E 01	4.5672E-03
7.0000E 01	4.6196E-03
8.0000E 01	4.6160E-03
9.0000E 01	4.3307E-03
1.0000E 02	4.0214E-03
1.1000E 02	3.7928E-03
1.2000E 02	3.6573E-03
1.3000E 02	3.5861E-03
1.4000E 02	3.5568E-03
1.5000E 02	3.5938E-03
1.6000E 02	3.7192E-03
1.7000E 02	3.9588E-03
1.8000E 02	4.2939E-03
1.9000E 02	4.7171E-03
2.0000E 02	5.2485E-03
2.1000E 02	5.9420E-03
2.2000E 02	6.8857E-03
2.3000E 02	8.2227E-03
2.4000E 02	1.0175E-02
2.5000E 02	1.3020E-02
2.6000E 02	1.7111E-02
2.7000E 02	2.2496E-02
2.8000E 02	2.7815E-02
2.9000E 02	3.0183E-02
3.0000E 02	2.7696E-02
3.1000E 02	2.1204E-02
3.2000E 02	1.3597E-02
3.3000E 02	7.5108E-03
3.4000E 02	3.7615E-03
3.5000E 02	1.8967E-03
3.6000E 02	1.1272E-03
3.7000E 02	8.5064E-04

MCFISH VERSUS TIME

MINIMUM 1.0426E 00

MAXIMUM 2.1550E 00

TIME	MCFISH	I
0.0	1.0600E 00	+
1.0000E 01	1.0452E 00	+
2.0000E 01	1.0427E 00	+
3.0000E 01	1.0451E 00	+
4.0000E 01	1.0494E 00	+
5.0000E 01	1.0546E 00	+
6.0000E 01	1.0602E 00	+
7.0000E 01	1.0671E 00	-+
8.0000E 01	1.0758E 00	-+
9.0000E 01	1.0741E 00	-+
1.0000E 02	1.0686E 00	-+
1.1000E 02	1.0638E 00	+
1.2000E 02	1.0615E 00	+
1.3000E 02	1.0630E 00	+
1.4000E 02	1.0685E 00	-+
1.5000E 02	1.0792E 00	-+
1.6000E 02	1.0961E 00	--+
1.7000E 02	1.1195E 00	---+
1.8000E 02	1.1497E 00	----+
1.9000E 02	1.1857E 00	------+
2.0000E 02	1.2260E 00	--------+
2.1000E 02	1.2704E 00	----------+
2.2000E 02	1.3187E 00	------------+
2.3000E 02	1.3699E 00	--------------+
2.4000E 02	1.4249E 00	----------------+
2.5000E 02	1.4851E 00	------------------+
2.6000E 02	1.5521E 00	------------------------+
2.7000E 02	1.6297E 00	---------------------------+
2.8000E 02	1.7234E 00	-------------------------------+
2.9000E 02	1.8309E 00	----------------------------------+
3.0000E 02	1.9424E 00	---------------------------------------+
3.1000E 02	2.0416E 00	---+
3.2000E 02	2.1127E 00	--+
3.3000E 02	2.1489E 00	--+
3.4000E 02	2.1535E 00	--+
3.5000E 02	2.1339E 00	--+
3.6000E 02	2.1067E 00	--+
3.7000E 02	2.0802E 00	--+

BAC VERSUS TIME

MINIMUM 5.1721E-06

MAXIMUM 3.2414E-04

TIME	BAC
0.0	3.0000E-04
1.0000E 01	2.8790E-04
2.0000E 01	2.4514E-04
3.0000E 01	2.1698E-04
4.0000E 01	1.8505E-04
5.0000E 01	1.7410E-04
6.0000E 01	1.7183E-04
7.0000E 01	1.6969E-04
8.0000E 01	1.6682E-04
9.0000E 01	2.8499E-04
1.0000E 02	2.9026E-04
1.1000E 02	2.7918E-04
1.2000E 02	2.7027E-04
1.3000E 02	2.6402E-04
1.4000E 02	2.6458E-04
1.5000E 02	2.6529E-04
1.6000E 02	2.6988E-04
1.7000E 02	2.7668E-04
1.8000E 02	2.8878E-04
1.9000E 02	2.7681E-04
2.0000E 02	1.9569E-04
2.1000E 02	5.8610E-05
2.2000E 02	1.5989E-05
2.3000E 02	5.7898E-06
2.4000E 02	5.8406E-06
2.5000E 02	8.5388E-06
2.6000E 02	1.2458E-05
2.7000E 02	2.5171E-05
2.8000E 02	4.2058E-05
2.9000E 02	5.9609E-05
3.0000E 02	6.6259E-05
3.1000E 02	6.8017E-05
3.2000E 02	6.8295E-05
3.3000E 02	7.3485E-05
3.4000E 02	8.1959E-05
3.5000E 02	1.0207E-04
3.6000E 02	1.6730E-04
3.7000E 02	2.0553E-04

BACWE VERSUS TIME

MINIMUM 6.8571E-06 MAXIMUM 2.2311E-03

TIME	BACWE
0.0	3.0000E-04
1.0000E 01	2.1661E-04
2.0000E 01	1.5903E-04
3.0000E 01	1.1349E-04
4.0000E 01	9.1747E-05
5.0000E 01	8.3051E-05
6.0000E 01	8.2647E-05
7.0000E 01	8.4646E-05
8.0000E 01	8.6311E-05
9.0000E 01	2.7713E-04
1.0000E 02	2.9993E-04
1.1000E 02	2.9192E-04
1.2000E 02	2.8742E-04
1.3000E 02	2.9548E-04
1.4000E 02	3.1422E-04
1.5000E 02	3.5163E-04
1.6000E 02	4.0924E-04
1.7000E 02	4.9364E-04
1.8000E 02	6.1779E-04
1.9000E 02	7.8360E-04
2.0000E 02	9.9352E-04
2.1000E 02	1.2454E-03
2.2000E 02	1.5373E-03
2.3000E 02	1.8549E-03
2.4000E 02	2.1168E-03
2.5000E 02	2.2311E-03
2.6000E 02	2.1036E-03
2.7000E 02	1.7045E-03
2.8000E 02	8.7052E-06
2.9000E 02	1.1543E-05
3.0000E 02	1.4607E-05
3.1000E 02	1.7894E-05
3.2000E 02	2.1374E-05
3.3000E 02	2.5046E-05
3.4000E 02	2.8911E-05
3.5000E 02	3.2914E-05
3.6000E 02	3.5691E-05
3.7000E 02	3.7324E-05

MINIMUM 2.7267E-05 BACWW VERSUS TIME MAXIMUM 6.0053E-04

TIME	BACWW
0.0	3.0000E-04
1.0000E 01	2.2623E-04
2.0000E 01	2.0552E-04
3.0000E 01	2.0569E-04
4.0000E 01	1.7269E-04
5.0000E 01	1.6110E-04
6.0000E 01	1.5966E-04
7.0000E 01	1.5920E-04
8.0000E 01	1.5755E-04
9.0000E 01	3.3398E-04
1.0000E 02	3.7614E-04
1.1000E 02	3.9791E-04
1.2000E 02	4.0112E-04
1.3000E 02	3.9146E-04
1.4000E 02	3.7400E-04
1.5000E 02	3.5140E-04
1.6000E 02	3.3682E-04
1.7000E 02	3.2763E-04
1.8000E 02	3.3312E-04
1.9000E 02	3.4461E-04
2.0000E 02	3.6016E-04
2.1000E 02	3.7876E-04
2.2000E 02	4.0027E-04
2.3000E 02	4.2344E-04
2.4000E 02	4.5783E-04
2.5000E 02	5.0007E-04
2.6000E 02	5.4598E-04
2.7000E 02	6.0053E-04
2.8000E 02	3.2943E-05
2.9000E 02	4.4396E-05
3.0000E 02	5.0799E-05
3.1000E 02	5.4633E-05
3.2000E 02	5.7725E-05
3.3000E 02	6.3720E-05
3.4000E 02	7.1858E-05
3.5000E 02	8.0464E-05
3.6000E 02	8.7902E-05
3.7000E 02	9.3701E-05

MINIMUM CN VERSUS TIME MAXIMUM
5.0000E-03 1.6791E 00

TIME	CN
0.0	1.1180E 00
1.0000E 01	1.6615E 00
2.0000E 01	1.1369E 00
3.0000E 01	2.8501E-02
4.0000E 01	2.2833E-02
5.0000E 01	1.9983E-02
6.0000E 01	1.8367E-02
7.0000E 01	1.6746E-02
8.0000E 01	1.6185E-02
9.0000E 01	1.8517E-01
1.0000E 02	7.9252E-02
1.1000E 02	7.2948E-02
1.2000E 02	7.4532E-02
1.3000E 02	6.9092E-02
1.4000E 02	6.1717E-02
1.5000E 02	5.3594E-02
1.6000E 02	4.5823E-02
1.7000E 02	3.8793E-02
1.8000E 02	3.2723E-02
1.9000E 02	2.7766E-02
2.0000E 02	2.3424E-02
2.1000E 02	1.9893E-02
2.2000E 02	1.6875E-02
2.3000E 02	1.4454E-02
2.4000E 02	1.2456E-02
2.5000E 02	1.0840E-02
2.6000E 02	9.5407E-03
2.7000E 02	8.5498E-03
2.8000E 02	5.0000E-03
2.9000E 02	5.0000E-03
3.0000E 02	5.0000E-03
3.1000E 02	5.0000E-03
3.2000E 02	5.0000E-03
3.3000E 02	5.0000E-03
3.4000E 02	5.0000E-03
3.5000E 02	3.1491E-01
3.6000E 02	9.1919E-01
3.7000E 02	1.8774E-01

MINIMUM CNWE VERSUS TIME MAXIMUM
5.0000E-03 1.0385E 00

TIME	CNWE	I
0.0	1.0000E 00	----------+
1.0000E 01	7.0569E-01	-------+
2.0000E 01	2.5075E-02	+
3.0000E 01	1.9096E-02	+
4.0000E 01	1.5858E-02	+
5.0000E 01	1.8973E-02	+
6.0000E 01	1.6135E-02	+
7.0000E 01	1.3543E-02	+
8.0000E 01	5.0000E-03	+
9.0000E 01	2.5727E-01	---+
1.0000E 02	9.9676E-02	-+
1.1000E 02	6.0780E-02	-+
1.2000E 02	5.9461E-02	-+
1.3000E 02	6.3035E-02	-+
1.4000E 02	6.3653E-02	-+
1.5000E 02	6.3431E-02	-+
1.6000E 02	6.1038E-02	-+
1.7000E 02	5.7346E-02	-+
1.8000E 02	5.2999E-02	-+
1.9000E 02	4.8347E-02	-+
2.0000E 02	4.3617E-02	-+
2.1000E 02	3.8961E-02	-+
2.2000E 02	3.4813E-02	-+
2.3000E 02	3.1467E-02	-+
2.4000E 02	2.8418E-02	-+
2.5000E 02	2.5672E-02	-+
2.6000E 02	2.3181E-02	+
2.7000E 02	2.0970E-02	+
2.8000E 02	5.0000E-03	+
2.9000E 02	5.0000E-03	+
3.0000E 02	5.0000E-03	+
3.1000E 02	5.0000E-03	+
3.2000E 02	5.0000E-03	+
3.3000E 02	5.0000E-03	+
3.4000E 02	5.0000E-03	+
3.5000E 02	5.0000E-03	+
3.6000E 02	5.0000E-03	+
3.7000E 02	5.0000E-03	+

MINIMUM CNWW VERSUS TIME MAXIMUM
5.0000E-03 1.3041E 00

TIME	CNWW	I
0.0	9.3100E-01	----------+
1.0000E 01	1.2890E 00	----------+
2.0000E 01	1.0543E 00	----------+
3.0000E 01	4.9499E-02	-+
4.0000E 01	1.9526E-02	+
5.0000E 01	1.6466E-02	+
6.0000E 01	1.4508E-02	+
7.0000E 01	1.2894E-02	+
8.0000E 01	1.2774E-02	+
9.0000E 01	4.2412E-01	----------+
1.0000E 02	2.1903E-01	---------+
1.1000E 02	1.2073E-01	----+
1.2000E 02	7.9222E-02	--+
1.3000E 02	6.4177E-02	--+
1.4000E 02	5.9672E-02	--+
1.5000E 02	5.8747E-02	--+
1.6000E 02	5.9638E-02	--+
1.7000E 02	6.0136E-02	--+
1.8000E 02	5.9732E-02	--+
1.9000E 02	5.8381E-02	--+
2.0000E 02	5.6345E-02	-+
2.1000E 02	5.3780E-02	-+
2.2000E 02	5.0883E-02	-+
2.3000E 02	4.7675E-02	-+
2.4000E 02	4.5094E-02	-+
2.5000E 02	4.2847E-02	-+
2.6000E 02	4.0539E-02	-+
2.7000E 02	3.8195E-02	-+
2.8000E 02	5.0000E-03	+
2.9000E 02	5.0000E-03	+
3.0000E 02	5.0000E-03	+
3.1000E 02	5.0000E-03	+
3.2000E 02	5.0000E-03	+
3.3000E 02	5.0000E-03	+
3.4000E 02	5.0000E-03	+
3.5000E 02	5.0000E-03	+
3.6000E 02	5.0000E-03	+
3.7000E 02	5.0000E-03	+

MINIMUM CP VERSUS TIME MAXIMUM
1.0000E-03 1.4685E-02

TIME	CP	I
0.0	1.0000E-03	+
1.0000E 01	1.0000E-03	+
2.0000E 01	1.0000E-03	+
3.0000E 01	1.0000E-03	+
4.0000E 01	1.0000E-03	+
5.0000E 01	1.0000E-03	+
6.0000E 01	1.0000E-03	+
7.0000E 01	1.0000E-03	+
8.0000E 01	1.0000E-03	+
9.0000E 01	5.7310E-03	----------+
1.0000E 02	4.8541E-03	---------+
1.1000E 02	5.6957E-03	----------+
1.2000E 02	5.9189E-03	----------+
1.3000E 02	5.4917E-03	----------+
1.4000E 02	4.9445E-03	---------+
1.5000E 02	4.3645E-03	--------+
1.6000E 02	3.8170E-03	-------+
1.7000E 02	3.3256E-03	-------+
1.8000E 02	2.9045E-03	------+
1.9000E 02	2.5616E-03	-----+
2.0000E 02	2.2619E-03	----+
2.1000E 02	2.0187E-03	---+
2.2000E 02	1.8108E-03	--+
2.3000E 02	1.6450E-03	--+
2.4000E 02	1.5083E-03	-+
2.5000E 02	1.3981E-03	-+
2.6000E 02	1.3097E-03	-+
2.7000E 02	1.2428E-03	+
2.8000E 02	1.0000E-03	+
2.9000E 02	1.0000E-03	+
3.0000E 02	1.0000E-03	+
3.1000E 02	1.0000E-03	+
3.2000E 02	1.0000E-03	+
3.3000E 02	1.0000E-03	+
3.4000E 02	1.0000E-03	+
3.5000E 02	1.0000E-03	+
3.6000E 02	1.0000E-03	+
3.7000E 02	1.0000E-03	+

MINIMUM 1.0000E-03 CPWE VERSUS TIME MAXIMUM 1.7245E-02

TIME	CPWE	I
0.0	1.0000E-03	+
1.0000E 01	1.0000E-03	+
2.0000E 01	1.0000E-03	+
3.0000E 01	1.0000E-03	+
4.0000E 01	1.0000E-03	+
5.0000E 01	1.0000E-03	+
6.0000E 01	1.0000E-03	+
7.0000E 01	1.0000E-03	+
8.0000E 01	1.0000E-03	+
9.0000E 01	9.5755E-03	----------+
1.0000E 02	6.6238E-03	------+
1.1000E 02	6.8551E-03	-------+
1.2000E 02	8.2473E-03	---------+
1.3000E 02	9.4819E-03	----------+
1.4000E 02	1.0174E-02	-----------+
1.5000E 02	1.0629E-02	-----------+
1.6000E 02	1.0651E-02	-----------+
1.7000E 02	1.0464E-02	-----------+
1.8000E 02	1.0123E-02	-----------+
1.9000E 02	9.6708E-03	----------+
2.0000E 02	9.1400E-03	----------+
2.1000E 02	8.5614E-03	---------+
2.2000E 02	8.0303E-03	--------+
2.3000E 02	7.5367E-03	-------+
2.4000E 02	7.0456E-03	-------+
2.5000E 02	6.6159E-03	------+
2.6000E 02	6.2244E-03	------+
2.7000E 02	5.8473E-03	-----+
2.8000E 02	1.0000E-03	+
2.9000E 02	1.0000E-03	+
3.0000E 02	1.0000E-03	+
3.1000E 02	1.0000E-03	+
3.2000E 02	1.0000E-03	+
3.3000E 02	1.0000E-03	+
3.4000E 02	1.0000E-03	+
3.5000E 02	1.0000E-03	+
3.6000E 02	1.0000E-03	+
3.7000E 02	1.0000E-03	+

MINIMUM CPWW VERSUS TIME MAXIMUM
1.0000E-03 1.9950E-02

TIME	CPWW	I
0.0	1.0000E-03	+
1.0000E 01	1.0000E-03	+
2.0000E 01	1.0000E-03	+
3.0000E 01	1.0000E-03	+
4.0000E 01	1.0000E-03	+
5.0000E 01	1.0000E-03	+
6.0000E 01	1.0000E-03	+
7.0000E 01	1.0000E-03	+
8.0000E 01	1.0000E-03	+
9.0000E 01	1.2794E-02	----------+
1.0000E 02	8.5384E-03	----------+
1.1000E 02	6.4761E-03	----------+
1.2000E 02	5.6531E-03	----------+
1.3000E 02	5.3909E-03	----------+
1.4000E 02	5.2851E-03	----------+
1.5000E 02	5.1965E-03	----------+
1.6000E 02	5.1747E-03	----------+
1.7000E 02	5.1218E-03	----------+
1.8000E 02	5.0208E-03	----------+
1.9000E 02	4.8659E-03	----------+
2.0000E 02	4.6704E-03	----------+
2.1000E 02	4.4496E-03	----------+
2.2000E 02	4.2120E-03	----------+
2.3000E 02	3.9510E-03	----------+
2.4000E 02	3.7384E-03	----------+
2.5000E 02	3.5572E-03	----------+
2.6000E 02	3.3744E-03	----------+
2.7000E 02	3.1917E-03	----------+
2.8000E 02	1.0000E-03	+
2.9000E 02	1.0000E-03	+
3.0000E 02	1.0000E-03	+
3.1000E 02	1.0000E-03	+
3.2000E 02	1.0000E-03	+
3.3000E 02	1.0000E-03	+
3.4000E 02	1.0000E-03	+
3.5000E 02	1.0000E-03	+
3.6000E 02	1.0000E-03	+
3.7000E 02	1.0000E-03	+

MINIMUM 7.3751E 00 — 02 VERSUS TIME — MAXIMUM 1.1746E 01

TIME	02
0.0	9.0000E 00
1.0000E 01	1.1144E 01
2.0000E 01	1.1533E 01
3.0000E 01	1.1739E 01
4.0000E 01	1.1732E 01
5.0000E 01	1.1736E 01
6.0000E 01	1.1728E 01
7.0000E 01	1.1438E 01
8.0000E 01	1.1098E 01
9.0000E 01	1.0090E 01
1.0000E 02	9.8627E 00
1.1000E 02	9.4949E 00
1.2000E 02	9.1197E 00
1.3000E 02	8.7411E 00
1.4000E 02	8.3680E 00
1.5000E 02	8.0073E 00
1.6000E 02	7.7265E 00
1.7000E 02	7.5211E 00
1.8000E 02	7.4135E 00
1.9000E 02	7.3751E 00
2.0000E 02	7.3944E 00
2.1000E 02	7.5102E 00
2.2000E 02	7.7535E 00
2.3000E 02	8.0045E 00
2.4000E 02	8.2442E 00
2.5000E 02	8.4670E 00
2.6000E 02	8.6913E 00
2.7000E 02	8.9100E 00
2.8000E 02	8.8499E 00
2.9000E 02	9.0275E 00
3.0000E 02	9.2220E 00
3.1000E 02	9.4355E 00
3.2000E 02	9.6461E 00
3.3000E 02	9.8835E 00
3.4000E 02	1.0129E 01
3.5000E 02	1.0463E 01
3.6000E 02	1.1027E 01
3.7000E 02	1.1460E 01

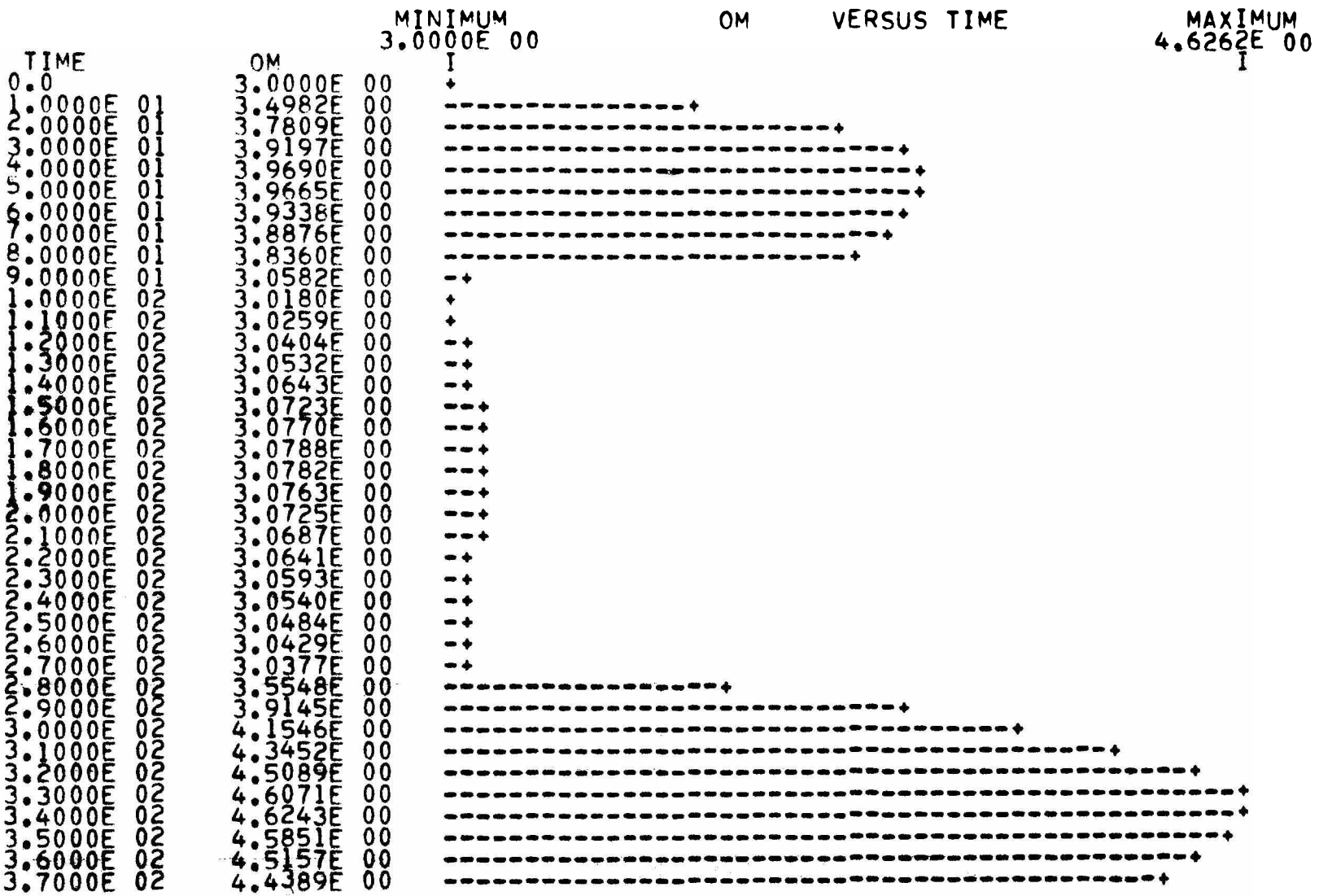
O2WE VERSUS TIME

MINIMUM 7.8293E 00 MAXIMUM 1.2128E 01

TIME	O2WE	I
0.0	9.2000E 00	----------+
1.0000E 01	1.1450E 01	----------+
2.0000E 01	1.1861E 01	----------+
3.0000E 01	1.1988E 01	----------+
4.0000E 01	1.2077E 01	----------+
5.0000E 01	1.2111E 01	----------+
6.0000E 01	1.2125E 01	----------+
7.0000E 01	1.1847E 01	----------+
8.0000E 01	1.1480E 01	----------+
9.0000E 01	1.0485E 01	----------+
1.0000E 02	1.0339E 01	----------+
1.1000E 02	9.9773E 00	----------+
1.2000E 02	9.5846E 00	----------+
1.3000E 02	9.1934E 00	----------+
1.4000E 02	8.8233E 00	----------+
1.5000E 02	8.4775E 00	-------+
1.6000E 02	8.2338E 00	----+
1.7000E 02	8.0756E 00	--+
1.8000E 02	7.9762E 00	-+
1.9000E 02	7.9217E 00	-+
2.0000E 02	7.8915E 00	+
2.1000E 02	7.8623E 00	+
2.2000E 02	7.8392E 00	+
2.3000E 02	7.8293E 00	+
2.4000E 02	7.8303E 00	+
2.5000E 02	7.8512E 00	+
2.6000E 02	7.9067E 00	+
2.7000E 02	7.9895E 00	-+
2.8000E 02	8.7895E 00	----------+
2.9000E 02	9.0003E 00	----------+
3.0000E 02	9.2402E 00	----------+
3.1000E 02	9.4875E 00	----------+
3.2000E 02	9.7146E 00	----------+
3.3000E 02	9.9580E 00	----------+
3.4000E 02	1.0215E 01	----------+
3.5000E 02	1.0472E 01	----------+
3.6000E 02	1.0749E 01	----------+
3.7000E 02	1.0981E 01	----------+

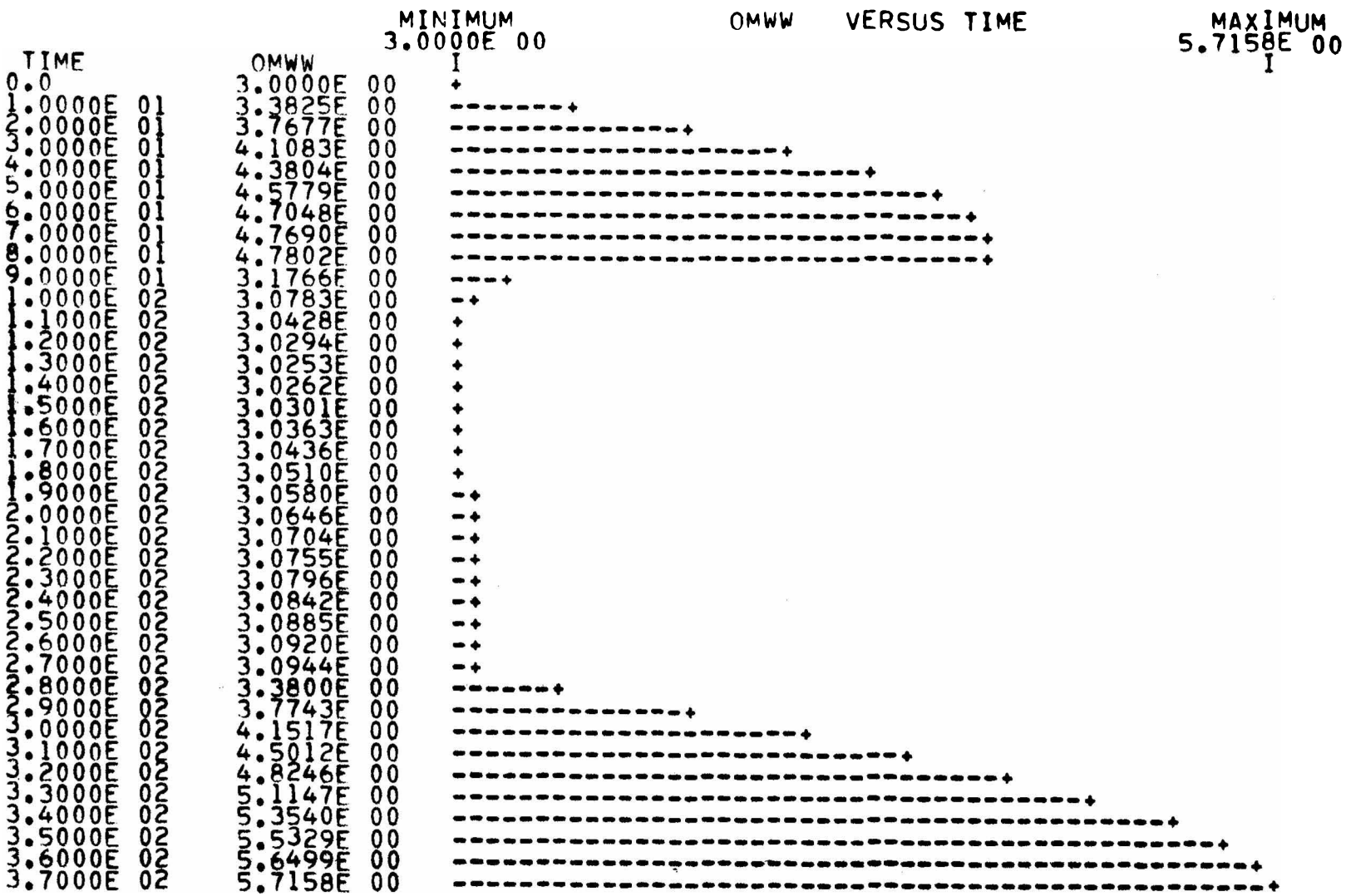
MINIMUM 7.9984E 00 — O2WW VERSUS TIME — MAXIMUM 1.2151E 01

TIME	O2WW	
0.0	9.8000E 00	----------
1.0000E 01	1.1135E 01	----------
2.0000E 01	1.1691E 01	----------
3.0000E 01	1.2101E 01	----------
4.0000E 01	1.2085E 01	----------
5.0000E 01	1.2120E 01	----------
6.0000E 01	1.2150E 01	----------
7.0000E 01	1.1918E 01	----------
8.0000E 01	1.1547E 01	----------
9.0000E 01	1.0649E 01	----------
1.0000E 02	1.0425E 01	----------
1.1000E 02	1.0027E 01	----------
1.2000E 02	9.6277E 00	----------
1.3000E 02	9.2403E 00	----------
1.4000E 02	8.8760E 00	----------
1.5000E 02	8.5505E 00	----------
1.6000E 02	8.3162E 00	----------
1.7000E 02	8.1802E 00	----------
1.8000E 02	8.0898E 00	----------
1.9000E 02	8.0430E 00	----------
2.0000E 02	8.0227E 00	----------
2.1000E 02	8.0064E 00	----------
2.2000E 02	7.9994E 00	----------
2.3000E 02	8.0063E 00	----------
2.4000E 02	8.0044E 00	----------
2.5000E 02	8.0157E 00	----------
2.6000E 02	8.0603E 00	----------
2.7000E 02	8.1309E 00	----------
2.8000E 02	8.7338E 00	----------
2.9000E 02	8.8966E 00	----------
3.0000E 02	9.1229E 00	----------
3.1000E 02	9.3709E 00	----------
3.2000E 02	9.6076E 00	----------
3.3000E 02	9.8620E 00	----------
3.4000E 02	1.0132E 01	----------
3.5000E 02	1.0405E 01	----------
3.6000E 02	1.0727E 01	----------
3.7000E 02	1.1027E 01	----------


MINIMUM
3.0000E 00
OM VERSUS TIME
MAXIMUM
4.6262E 00
TIME
OM
0.0 3.0000E 00
1.0000E 01 3.4982E 00
2.0000E 01 3.7809E 00
3.0000E 01 3.9197E 00
4.0000E 01 3.9690E 00
5.0000E 01 3.9665E 00
6.0000E 01 3.9338E 00
7.0000E 01 3.8876E 00
8.0000E 01 3.8360E 00
9.0000E 01 3.0582E 00
1.0000E 02 3.0180E 00
1.1000E 02 3.0259E 00
1.2000E 02 3.0404E 00
1.3000E 02 3.0532E 00
1.4000E 02 3.0643E 00
1.5000E 02 3.0723E 00
1.6000E 02 3.0770E 00
1.7000E 02 3.0788E 00
1.8000E 02 3.0782E 00
1.9000E 02 3.0763E 00
2.0000E 02 3.0725E 00
2.1000E 02 3.0687E 00
2.2000E 02 3.0641E 00
2.3000E 02 3.0593E 00
2.4000E 02 3.0540E 00
2.5000E 02 3.0484E 00
2.6000E 02 3.0429E 00
2.7000E 02 3.0377E 00
2.8000E 02 3.5548E 00
2.9000E 02 3.9145E 00
3.0000E 02 4.1546E 00
3.1000E 02 4.3452E 00
3.2000E 02 4.5089E 00
3.3000E 02 4.6071E 00
3.4000E 02 4.6243E 00
3.5000E 02 4.5851E 00
3.6000E 02 4.5157E 00
3.7000E 02 4.4389E 00

MINIMUM OMWF VERSUS TIME MAXIMUM
3.0000E 00 6.1928E 00

TIME	OMWF	I
0.0	3.0000E 00	+
1.0000E 01	3.4835E 00	--------+
2.0000E 01	3.9174E 00	----------+
3.0000E 01	4.2887E 00	----------+
4.0000E 01	4.5895E 00	----------+
5.0000E 01	4.8166E 00	----------+
6.0000E 01	4.9598E 00	----------+
7.0000E 01	5.0236E 00	----------+
8.0000E 01	5.0228E 00	----------+
9.0000E 01	3.3661E 00	------+
1.0000E 02	3.1954E 00	---+
1.1000E 02	3.1303E 00	--+
1.2000E 02	3.1023E 00	-+
1.3000E 02	3.0919E 00	-+
1.4000E 02	3.0898E 00	-+
1.5000E 02	3.0949E 00	-+
1.6000E 02	3.1012E 00	-+
1.7000E 02	3.1070E 00	-+
1.8000E 02	3.1105E 00	-+
1.9000E 02	3.1113E 00	-+
2.0000E 02	3.1095E 00	-+
2.1000E 02	3.1050E 00	-+
2.2000E 02	3.0989E 00	-+
2.3000E 02	3.0921E 00	-+
2.4000E 02	3.0836E 00	-+
2.5000E 02	3.0744E 00	-+
2.6000E 02	3.0655E 00	-+
2.7000E 02	3.0582E 00	+
2.8000E 02	3.5076E 00	--------+
2.9000E 02	3.9741E 00	----------+
3.0000E 02	4.4019E 00	----------+
3.1000E 02	4.7868E 00	----------+
3.2000E 02	5.1253E 00	----------+
3.3000E 02	5.4161E 00	----------+
3.4000E 02	5.6594E 00	----------+
3.5000E 02	5.8563E 00	----------+
3.6000E 02	6.0291E 00	----------+
3.7000E 02	6.1928E 00	----------+


MINIMUM
3.0000E 00
OMWW VERSUS TIME
MAXIMUM
5.7158E 00
TIME
OMWW
0.0 3.0000E 00
1.0000E 01 3.3825E 00
2.0000E 01 3.7677E 00
3.0000E 01 4.1083E 00
4.0000E 01 4.3804E 00
5.0000E 01 4.5779E 00
6.0000E 01 4.7048E 00
7.0000E 01 4.7690E 00
8.0000E 01 4.7802E 00
9.0000E 01 3.1766E 00
1.0000E 02 3.0783E 00
1.1000E 02 3.0428E 00
1.2000E 02 3.0294E 00
1.3000E 02 3.0253E 00
1.4000E 02 3.0262E 00
1.5000E 02 3.0301E 00
1.6000E 02 3.0363E 00
1.7000E 02 3.0436E 00
1.8000E 02 3.0510E 00
1.9000E 02 3.0580E 00
2.0000E 02 3.0646E 00
2.1000E 02 3.0704E 00
2.2000E 02 3.0755E 00
2.3000E 02 3.0796E 00
2.4000E 02 3.0842E 00
2.5000E 02 3.0885E 00
2.6000E 02 3.0920E 00
2.7000E 02 3.0944E 00
2.8000E 02 3.3800E 00
2.9000E 02 3.7743E 00
3.0000E 02 4.1517E 00
3.1000E 02 4.5012E 00
3.2000E 02 4.8246E 00
3.3000E 02 5.1147E 00
3.4000E 02 5.3540E 00
3.5000E 02 5.5329E 00
3.6000E 02 5.6499E 00
3.7000E 02 5.7158E 00

7. Case V

All nitrogen and phosphorus in runoff and War Eagle Creek flow were eliminated before entering Beaver Reservoir in the third and second segments, respectively. This was achieved by setting parameters CNRUN, CPRUN, CNINWE and CPINWE to zero in the main computer program. The simulated results were compared with those of the base case. Only nutrients in runoff and War Eagle Creek flow were eliminated. Therefore, the first segment was completely unaffected. Nutrients concentrations in the second and third segments decreased slightly. This reduced the growth rate of phytoplankton slightly. This, in turn, reduced the growth rates of fish and zooplankton slightly. In the later part of the year, the zooplankton was induced for faster growth as predation by omnivorous fish was decreasing. Eventually, the overall zooplankton concentration increased slightly. Since the changes were slight, there were only minimal changes in bacteria and oxygen, but organic matter remained unchanged. The simulated outputs follow (the unchanged outputs are not included):

CAMWE VERSUS TIME

MINIMUM 7.9301E 01 MAXIMUM 6.2735E 02

TIME	CAMWE
0.0	1.0000E 02
1.0000E 01	2.0418E 02
2.0000E 01	3.2604E 02
3.0000E 01	3.9425E 02
4.0000E 01	4.4520E 02
5.0000E 01	4.7862E 02
6.0000E 01	4.9414E 02
7.0000E 01	4.9298E 02
8.0000E 01	4.8010E 02
9.0000E 01	1.7377E 02
1.0000E 02	1.8425E 02
1.1000E 02	1.9896E 02
1.2000E 02	2.0341E 02
1.3000E 02	2.0163E 02
1.4000E 02	1.9917E 02
1.5000E 02	2.1230E 02
1.6000E 02	2.4854E 02
1.7000E 02	3.0944E 02
1.8000E 02	3.7724E 02
1.9000E 02	4.4263E 02
2.0000E 02	5.0097E 02
2.1000E 02	5.5065E 02
2.2000E 02	5.8869E 02
2.3000E 02	6.1389E 02
2.4000E 02	6.2519E 02
2.5000E 02	6.2230E 02
2.6000E 02	6.0592E 02
2.7000E 02	5.7233E 02
2.8000E 02	5.4645E 02
2.9000E 02	4.6531E 02
3.0000E 02	3.8850E 02
3.1000E 02	3.1820E 02
3.2000E 02	2.5590E 02
3.3000E 02	2.0275E 02
3.4000E 02	1.5908E 02
3.5000E 02	1.2442E 02
3.6000E 02	9.8326E 01
3.7000E 02	7.9301E 01

CAMWW VERSUS TIME

MINIMUM 5.4500E 01 — MAXIMUM 5.1998E 02

TIME	CAMWW	
0.0	5.4500E 01	+
1.0000E 01	8.7657E 01	---+
2.0000E 01	1.5929E 02	----------+
3.0000E 01	2.6495E 02	----------+
4.0000E 01	3.1239E 02	----------+
5.0000E 01	3.4791E 02	----------+
6.0000E 01	3.7089E 02	----------+
7.0000E 01	3.8113E 02	----------+
8.0000E 01	3.7978E 02	----------+
9.0000E 01	9.3882E 01	-----+
1.0000E 02	9.0855E 01	---+
1.1000E 02	9.2483E 01	-----+
1.2000E 02	9.8552E 01	-----+
1.3000E 02	1.0588E 02	-----+
1.4000E 02	1.1472E 02	------+
1.5000E 02	1.3086E 02	--------+
1.6000E 02	1.5679E 02	----------+
1.7000E 02	1.9847E 02	----------+
1.8000E 02	2.4677E 02	----------+
1.9000E 02	2.9618E 02	----------+
2.0000E 02	3.4217E 02	----------+
2.1000E 02	3.8106E 02	----------+
2.2000E 02	4.1001E 02	----------+
2.3000E 02	4.2729E 02	----------+
2.4000E 02	4.2952E 02	----------+
2.5000E 02	4.2197E 02	----------+
2.6000E 02	4.0772E 02	----------+
2.7000E 02	3.8882E 02	----------+
2.8000E 02	4.2769E 02	----------+
2.9000E 02	3.4801E 02	----------+
3.0000E 02	2.7759E 02	----------+
3.1000E 02	2.1890E 02	----------+
3.2000E 02	1.7166E 02	----------+
3.3000E 02	1.3360E 02	----------+
3.4000E 02	1.0296E 02	----------+
3.5000E 02	7.9134E 01	--+
3.6000E 02	7.0303E 01	-+
3.7000E 02	8.2420E 01	--+

MCZOO VERSUS TIME

MINIMUM 8.5650E-04 MAXIMUM 3.0230E-02

TIME	MCZOO
0.0	3.8000E-03
1.0000E 01	3.6797E-03
2.0000E 01	3.8273E-03
3.0000E 01	4.0554E-03
4.0000E 01	4.2733E-03
5.0000E 01	4.4476E-03
6.0000E 01	4.5590E-03
7.0000E 01	4.6105E-03
8.0000E 01	4.6060E-03
9.0000E 01	4.3136E-03
1.0000E 02	4.0021E-03
1.1000E 02	3.7753E-03
1.2000E 02	3.6437E-03
1.3000E 02	3.5778E-03
1.4000E 02	3.5545E-03
1.5000E 02	3.5985E-03
1.6000E 02	3.7329E-03
1.7000E 02	3.9848E-03
1.8000E 02	4.3352E-03
1.9000E 02	4.7758E-03
2.0000E 02	5.3253E-03
2.1000E 02	6.0361E-03
2.2000E 02	6.9945E-03
2.3000E 02	8.3415E-03
2.4000E 02	1.0296E-02
2.5000E 02	1.3137E-02
2.6000E 02	1.7216E-02
2.7000E 02	2.2581E-02
2.8000E 02	2.7880E-02
2.9000E 02	3.0230E-02
3.0000E 02	2.7739E-02
3.1000E 02	2.1259E-02
3.2000E 02	1.3663E-02
3.3000E 02	7.5678E-03
3.4000E 02	3.7970E-03
3.5000E 02	1.9152E-03
3.6000E 02	1.1369E-03
3.7000E 02	8.5650E-04

MCFISH VERSUS TIME

MINIMUM 1.0425E 00

MAXIMUM 2.1504E 00

TIME	MCFISH	
0.0	1.0600E 00	+
1.0000E 01	1.0451E 00	+
2.0000E 01	1.0425E 00	+
3.0000E 01	1.0449E 00	+
4.0000E 01	1.0490E 00	+
5.0000E 01	1.0539E 00	+
6.0000E 01	1.0594E 00	+
7.0000E 01	1.0661E 00	-+
8.0000E 01	1.0746E 00	-+
9.0000E 01	1.0723E 00	-+
1.0000E 02	1.0661E 00	-+
1.1000E 02	1.0608E 00	+
1.2000E 02	1.0580E 00	+
1.3000E 02	1.0590E 00	+
1.4000E 02	1.0641E 00	+
1.5000E 02	1.0744E 00	-+
1.6000E 02	1.0910E 00	--+
1.7000E 02	1.1141E 00	---+
1.8000E 02	1.1442E 00	----+
1.9000E 02	1.1800E 00	------+
2.0000E 02	1.2202E 00	--------+
2.1000E 02	1.2646E 00	----------+
2.2000E 02	1.3130E 00	------------+
2.3000E 02	1.3644E 00	--------------+
2.4000E 02	1.4196E 00	----------------+
2.5000E 02	1.4800E 00	------------------+
2.6000E 02	1.5473E 00	----------------------+
2.7000E 02	1.6251E 00	------------------------+
2.8000E 02	1.7189E 00	----------------------------+
2.9000E 02	1.8264E 00	------------------------------------+
3.0000E 02	1.9379E 00	--+
3.1000E 02	2.0370E 00	--+
3.2000E 02	2.1080E 00	--+
3.3000E 02	2.1442E 00	---+
3.4000E 02	2.1490E 00	---+
3.5000E 02	2.1294E 00	---+
3.6000E 02	2.1023E 00	---+
3.7000E 02	2.0759E 00	---+

MINIMUM 6.8676E-06 BACWE VERSUS TIME MAXIMUM 2.2218E-03

TIME	BACWE
0.0	3.0000E-04
1.0000E 01	2.1655E-04
2.0000E 01	1.5744E-04
3.0000E 01	1.1224E-04
4.0000E 01	9.0678E-05
5.0000E 01	8.1996E-05
6.0000E 01	8.1464E-05
7.0000E 01	8.3319E-05
8.0000E 01	8.4855E-05
9.0000E 01	2.7699E-04
1.0000E 02	2.9983E-04
1.1000E 02	2.9178E-04
1.2000E 02	2.8723E-04
1.3000E 02	2.9523E-04
1.4000E 02	3.1388E-04
1.5000E 02	3.5115E-04
1.6000E 02	4.0855E-04
1.7000E 02	4.9264E-04
1.8000E 02	6.1634E-04
1.9000E 02	7.8150E-04
2.0000E 02	9.9053E-04
2.1000E 02	1.2412E-03
2.2000E 02	1.5317E-03
2.3000E 02	1.8477E-03
2.4000E 02	2.1082E-03
2.5000E 02	2.2218E-03
2.6000E 02	2.0947E-03
2.7000E 02	1.6972E-03
2.8000E 02	8.7155E-06
2.9000E 02	1.1554E-05
3.0000E 02	1.4619E-05
3.1000E 02	1.7906E-05
3.2000E 02	2.1388E-05
3.3000E 02	2.5060E-05
3.4000E 02	2.8925E-05
3.5000E 02	3.2928E-05
3.6000E 02	3.5706E-05
3.7000E 02	3.7340E-05

MINIMUM 2.7300E-05 RACWW VERSUS TIME MAXIMUM 5.9647E-04

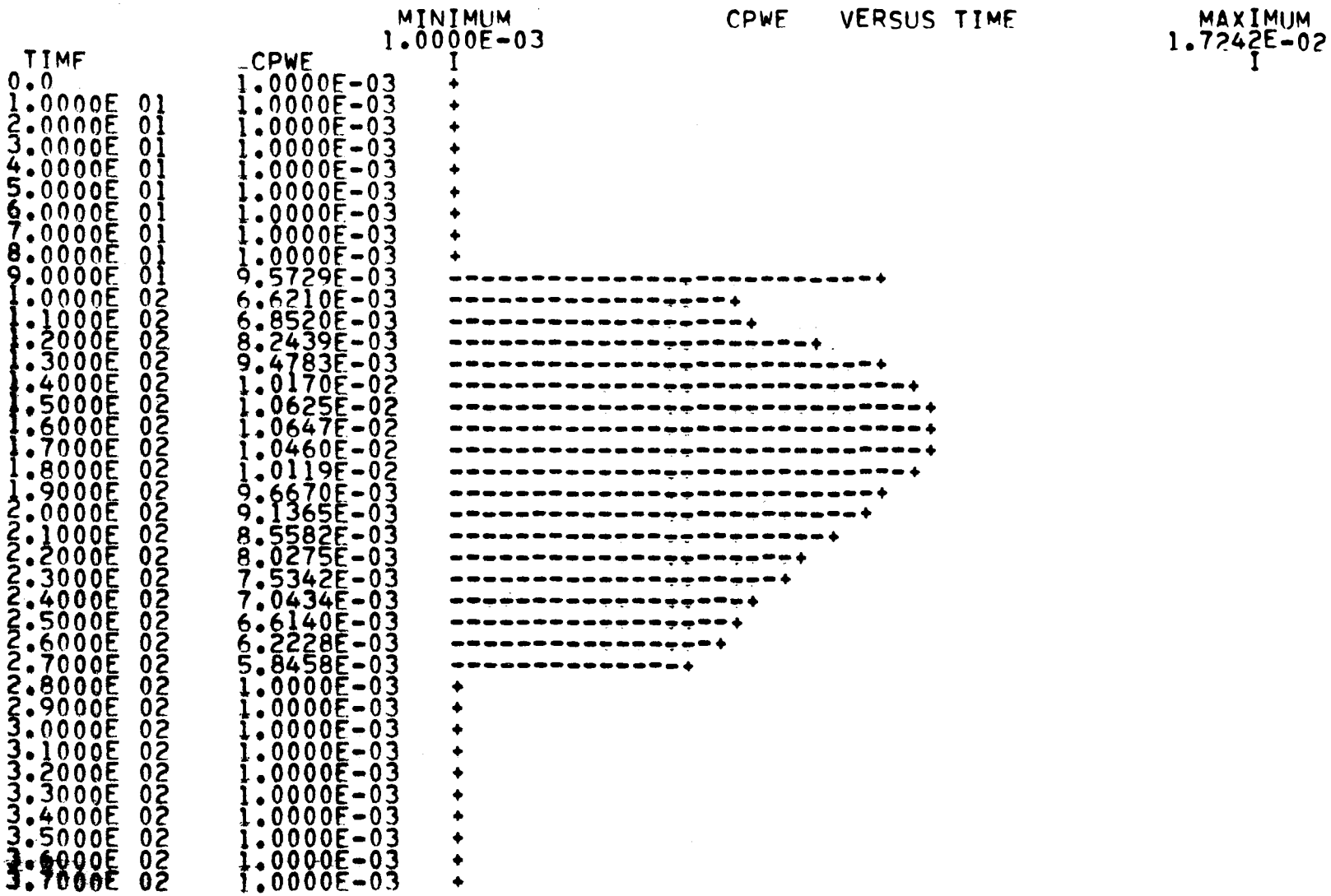
TIME	RACWW	I
0.0	3.0000E-04	----------+
1.0000E 01	2.2457E-04	----------+
2.0000E 01	2.0445E-04	----------+
3.0000E 01	1.9653E-04	----------+
4.0000E 01	1.6601E-04	----------+
5.0000E 01	1.5642E-04	----------+
6.0000E 01	1.5602E-04	----------+
7.0000E 01	1.5616E-04	----------+
8.0000E 01	1.5485E-04	----------+
9.0000E 01	3.3393E-04	----------+
1.0000E 02	3.7605E-04	----------+
1.1000E 02	3.9774E-04	----------+
1.2000E 02	4.0084E-04	----------+
1.3000E 02	3.9106E-04	----------+
1.4000E 02	3.7348E-04	----------+
1.5000E 02	3.5076E-04	----------+
1.6000E 02	3.3603E-04	----------+
1.7000E 02	3.2668E-04	----------+
1.8000E 02	3.3198E-04	----------+
1.9000E 02	3.4324E-04	----------+
2.0000E 02	3.5855E-04	----------+
2.1000E 02	3.7688E-04	----------+
2.2000E 02	3.9810E-04	----------+
2.3000E 02	4.2096E-04	----------+
2.4000E 02	4.5499E-04	----------+
2.5000E 02	4.9684E-04	----------+
2.6000E 02	5.4233E-04	----------+
2.7000E 02	5.9647E-04	----------+
2.8000E 02	3.2970E-05	+
2.9000E 02	4.4422E-05	-+
3.0000E 02	5.0826E-05	--+
3.1000E 02	5.4661E-05	--+
3.2000E 02	5.7754E-05	--+
3.3000E 02	6.3750E-05	---+
3.4000E 02	7.1888E-05	---+
3.5000E 02	8.0494E-05	----+
3.6000E 02	8.7930E-05	-----+
3.7000E 02	9.3729E-05	-----+

MINIMUM CNWF VERSUS TIME MAXIMUM
5.0000E-03 1.0282E 00

TIME	CNWF	
0.0	1.0000E 00	----------+
1.0000E 01	6.6682E-01	------+
2.0000E 01	2.4616E-02	+
3.0000E 01	1.8744E-02	+
4.0000E 01	1.5437E-02	+
5.0000E 01	1.7979E-02	+
6.0000E 01	1.5058E-02	+
7.0000E 01	1.2637E-02	+
8.0000E 01	5.0000E-03	+
9.0000E 01	2.5726E-01	---+
1.0000E 02	9.9663E-02	--+
1.1000E 02	6.0766E-02	--+
1.2000E 02	5.9446E-02	--+
1.3000E 02	6.3021E-02	--+
1.4000E 02	6.3639E-02	--+
1.5000E 02	6.3416E-02	--+
1.6000E 02	6.1024E-02	--+
1.7000E 02	5.7333E-02	--+
1.8000E 02	5.2986E-02	--+
1.9000E 02	4.8336E-02	--+
2.0000E 02	4.3608E-02	-+
2.1000E 02	3.8953E-02	-+
2.2000E 02	3.4806E-02	-+
2.3000E 02	3.1461E-02	-+
2.4000E 02	2.8413E-02	-+
2.5000E 02	2.5669E-02	-+
2.6000E 02	2.3178E-02	+
2.7000E 02	2.0967E-02	+
2.8000E 02	5.0000E-03	+
2.9000E 02	5.0000E-03	+
3.0000E 02	5.0000E-03	+
3.1000E 02	5.0000E-03	+
3.2000E 02	5.0000E-03	+
3.3000E 02	5.0000E-03	+
3.4000E 02	5.0000E-03	+
3.5000E 02	5.0000E-03	+
3.6000E 02	5.0000E-03	+
3.7000E 02	5.0000E-03	+

MINIMUM 5.0000E-03 CNWW VERSUS TIME MAXIMUM 1.1924E 00

TIME	CNWW	I
0.0	9.3100E-01	----------+
1.0000E 01	1.1909E 00	----------+
2.0000E 01	8.7991E-01	---------+
3.0000E 01	2.2402E-02	+
4.0000E 01	1.7780E-02	+
5.0000E 01	1.5124E-02	+
6.0000E 01	1.3405E-02	+
7.0000E 01	1.1980E-02	+
8.0000E 01	1.3976E-02	+
9.0000E 01	4.2407E-01	-----+
1.0000E 02	2.1899E-01	----+
1.1000E 02	1.2069E-01	---+
1.2000E 02	7.9177E-02	--+
1.3000E 02	6.4130E-02	--+
1.4000E 02	5.9623E-02	--+
1.5000E 02	5.8696E-02	--+
1.6000E 02	5.9586E-02	--+
1.7000E 02	6.0084E-02	--+
1.8000E 02	5.9682E-02	--+
1.9000E 02	5.8333E-02	--+
2.0000E 02	5.6300E-02	--+
2.1000E 02	5.3739E-02	--+
2.2000E 02	5.0847E-02	-+
2.3000E 02	4.7644E-02	-+
2.4000E 02	4.5068E-02	-+
2.5000E 02	4.2826E-02	-+
2.6000E 02	4.0522E-02	-+
2.7000E 02	3.8181E-02	-+
2.8000E 02	5.0000E-03	+
2.9000E 02	5.0000E-03	+
3.0000E 02	5.0000E-03	+
3.1000E 02	5.0000E-03	+
3.2000E 02	5.0000E-03	+
3.3000E 02	5.0000E-03	+
3.4000E 02	5.0000E-03	+
3.5000E 02	5.0000E-03	+
3.6000E 02	5.0000E-03	+
3.7000E 02	5.0000E-03	+



TIME	CPWE
0.0	1.0000E-03
1.0000E 01	1.0000E-03
2.0000E 01	1.0000E-03
3.0000E 01	1.0000E-03
4.0000E 01	1.0000E-03
5.0000E 01	1.0000E-03
6.0000E 01	1.0000E-03
7.0000E 01	1.0000E-03
8.0000E 01	1.0000E-03
9.0000E 01	9.5729E-03
1.0000E 02	6.6210E-03
1.1000E 02	6.8520E-03
1.2000E 02	8.2439E-03
1.3000E 02	9.4783E-03
1.4000E 02	1.0170E-02
1.5000E 02	1.0625E-02
1.6000E 02	1.0647E-02
1.7000E 02	1.0460E-02
1.8000E 02	1.0119E-02
1.9000E 02	9.6670E-03
2.0000E 02	9.1365E-03
2.1000E 02	8.5582E-03
2.2000E 02	8.0275E-03
2.3000E 02	7.5342E-03
2.4000E 02	7.0434E-03
2.5000E 02	6.6140E-03
2.6000E 02	6.2228E-03
2.7000E 02	5.8458E-03
2.8000E 02	1.0000E-03
2.9000E 02	1.0000E-03
3.0000E 02	1.0000E-03
3.1000E 02	1.0000E-03
3.2000E 02	1.0000E-03
3.3000E 02	1.0000E-03
3.4000E 02	1.0000E-03
3.5000E 02	1.0000E-03
3.6000E 02	1.0000E-03
3.7000E 02	1.0000E-03

CPWW VERSUS TIME

MINIMUM 1.0000E-03 MAXIMUM 1.9940E-02

TIME	CPWW	I
0.0	1.0000E-03	+
1.0000E 01	1.0000E-03	+
2.0000E 01	1.0000E-03	+
3.0000E 01	1.0000E-03	+
4.0000E 01	1.0000E-03	+
5.0000E 01	1.0000E-03	+
6.0000E 01	1.0000E-03	+
7.0000E 01	1.0000E-03	+
8.0000E 01	1.0000E-03	+
9.0000E 01	1.2786E-02	----------+
1.0000E 02	8.5312E-03	----------+
1.1000E 02	6.4686E-03	----------+
1.2000E 02	5.6450E-03	----------+
1.3000E 02	5.3822E-03	----------+
1.4000E 02	5.2759E-03	----------+
1.5000E 02	5.1872E-03	----------+
1.6000E 02	5.1651E-03	----------+
1.7000E 02	5.1122E-03	----------+
1.8000E 02	5.0114E-03	----------+
1.9000E 02	4.8569E-03	----------+
2.0000E 02	4.6620E-03	----------+
2.1000E 02	4.4420E-03	----------+
2.2000E 02	4.2053E-03	----------+
2.3000E 02	3.9454E-03	----------+
2.4000E 02	3.7337E-03	----------+
2.5000E 02	3.5533E-03	----------+
2.6000E 02	3.3713E-03	----------+
2.7000E 02	3.1892E-03	----------+
2.8000E 02	1.0000E-03	+
2.9000E 02	1.0000E-03	+
3.0000E 02	1.0000E-03	+
3.1000E 02	1.0000E-03	+
3.2000E 02	1.0000E-03	+
3.3000E 02	1.0000E-03	+
3.4000E 02	1.0000E-03	+
3.5000E 02	1.0000E-03	+
3.6000E 02	1.0000E-03	+
3.7000E 02	1.0000E-03	+

MINIMUM 7.8255E 00 O2WE VERSUS TIME MAXIMUM 1.2096E 01

TIME	O2WE
0.0	9.2000E 00
1.0000E 01	1.1450E 01
2.0000E 01	1.1846E 01
3.0000E 01	1.1975E 01
4.0000E 01	1.2060E 01
5.0000E 01	1.2087E 01
6.0000E 01	1.2092E 01
7.0000E 01	1.1807E 01
8.0000E 01	1.1431E 01
9.0000E 01	1.0471E 01
1.0000E 02	1.0325E 01
1.1000E 02	9.9650E 00
1.2000E 02	9.5738E 00
1.3000E 02	9.1840E 00
1.4000E 02	8.8151E 00
1.5000E 02	8.4699E 00
1.6000E 02	8.2266E 00
1.7000E 02	8.0686E 00
1.8000E 02	7.9695E 00
1.9000E 02	7.9155E 00
2.0000E 02	7.8858E 00
2.1000E 02	7.8573E 00
2.2000E 02	7.8347E 00
2.3000E 02	7.8255E 00
2.4000E 02	7.8271E 00
2.5000E 02	7.8485E 00
2.6000E 02	7.9044E 00
2.7000E 02	7.9876E 00
2.8000E 02	8.7880E 00
2.9000E 02	8.9991E 00
3.0000E 02	9.2392E 00
3.1000E 02	9.4866E 00
3.2000E 02	9.7140E 00
3.3000E 02	9.9575E 00
3.4000E 02	1.0214E 01
3.5000E 02	1.0472E 01
3.6000E 02	1.0749E 01
3.7000E 02	1.0981E 01

MINIMUM 7.9937E 00 — O2WW VERSUS TIME — MAXIMUM 1.2110E 01

TIME	O2WW
0.0	9.8000E 00
1.0000E 01	1.1131E 01
2.0000E 01	1.1686E 01
3.0000E 01	1.2029E 01
4.0000E 01	1.2038E 01
5.0000E 01	1.2079E 01
6.0000E 01	1.2109E 01
7.0000E 01	1.1876E 01
8.0000E 01	1.1503E 01
9.0000E 01	1.0639E 01
1.0000E 02	1.0416E 01
1.1000E 02	1.0019E 01
1.2000E 02	9.6203E 00
1.3000E 02	9.2333E 00
1.4000E 02	8.8695E 00
1.5000E 02	8.5444E 00
1.6000E 02	8.3103E 00
1.7000E 02	8.1742E 00
1.8000E 02	8.0839E 00
1.9000E 02	8.0373E 00
2.0000E 02	8.0174E 00
2.1000E 02	8.0014E 00
2.2000E 02	7.9948E 00
2.3000E 02	8.0023E 00
2.4000E 02	8.0009E 00
2.5000E 02	8.0127E 00
2.6000E 02	8.0577E 00
2.7000E 02	8.1288E 00
2.8000E 02	8.7323E 00
2.9000E 02	8.8955E 00
3.0000E 02	9.1220E 00
3.1000E 02	9.3702E 00
3.2000E 02	9.6070E 00
3.3000E 02	9.8615E 00
3.4000E 02	1.0132E 01
3.5000E 02	1.0405E 01
3.6000E 02	1.0726E 01
3.7000E 02	1.1027E 01

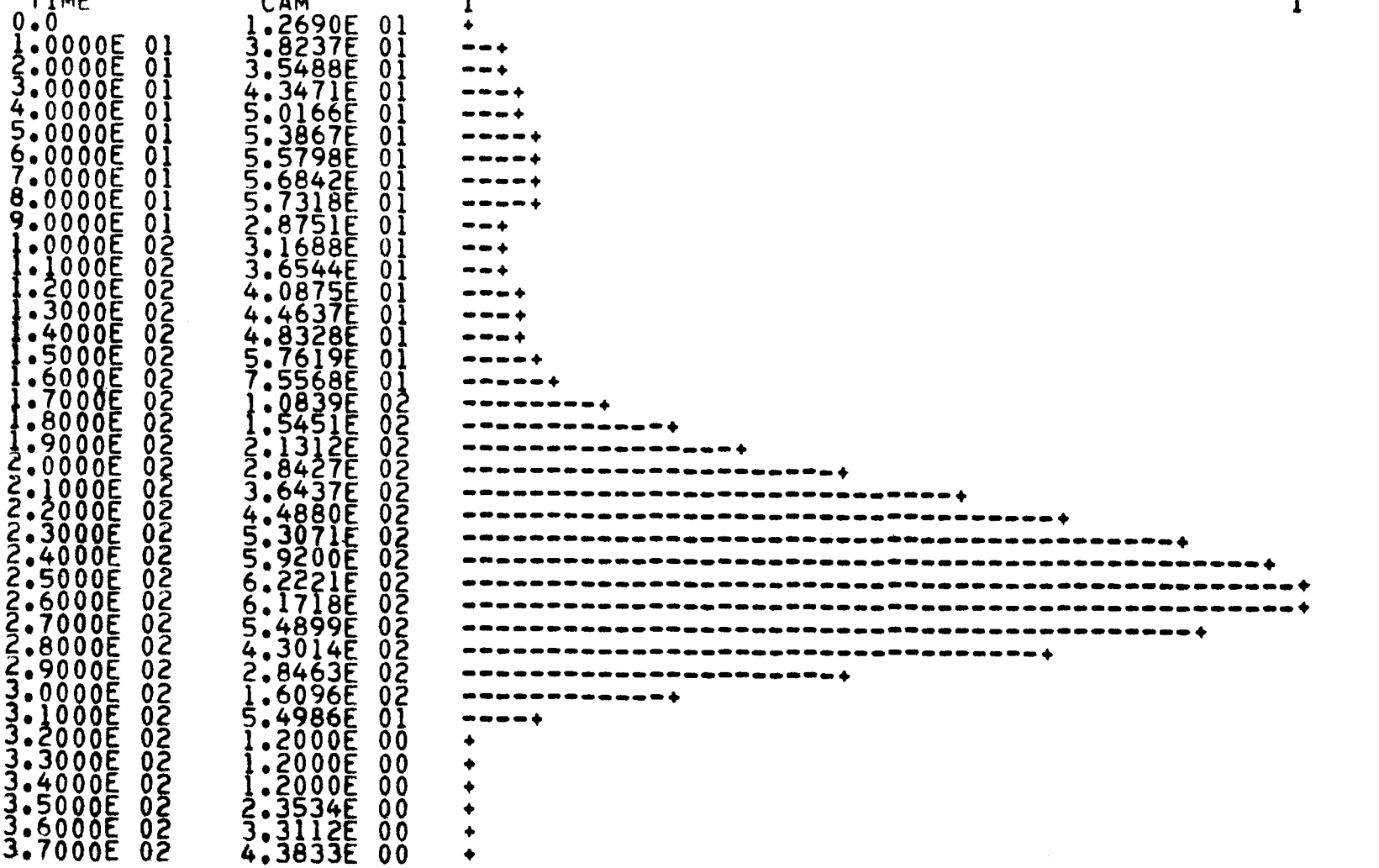
8. Case VI

Upsurge of nitrogen and phosphorous from rich sediment was stopped. This was achieved by taking away those upsurge program statements of nitrogen and phosphorus to both the entire segment and epilimnion in all three segments. It is a characteristic of CSMP that all upsurge terms encountered in the nutrient balance equations in the main program will be automatically set to zero. Normally, this could also be achieved by setting the turbulent diffusivities in both stratified and unstratified periods to zero, but these parameters were also used in the diffusion equations across the thermocline (i.e. between hypolimnion and epilimnion). The simulated results were compared with those of the base case. In all the three segments, phytoplankton decreased drastically in the beginning of the year as a result of the sudden drop of nutrient concentrations. This sudden drop in phytoplankton concentrations reduced the growth rate of the fish sharply. This induced the rapid growth of zooplankton as predation by omnivores dropped sharply. Around the middle of the year, phytoplankton under favorable conditions increased sharply. This sudden increase stimulated the growth of zooplankton sharply. In the later part of the year, fish concentrations increased sharply as a result of the rapid growth of zooplankton. This increased the predation of phytoplankton by omnivorous fish, and thus phytoplankton concentrations dropped drastically. In general, the concentrations of nutrients decreased sharply. However, in the third segment, concentrations of phosphorous in the later part of the year showed a tremendous increase. This could be explained by the fact that the concentrations of phytoplankton dropped to the minimum detectable concentrations for a longer period of time than the other two segments. This reduced the nutrients uptake by phytoplankton tremendously. The concentrations of bacteria decreased slightly in the first segment, but decreased tremendously in the second and third segments as the result of the sharp decrease of nutrients. Although the phytoplankton decreased drastically, concentrations of oxygen dropped only slightly. The reduction of oxygen from phytoplankton was compensated by reduction of oxygen consumed by bacteria and by the increase in absorption rate through the air-water interface. The

reduction in bacteria concentrations did not result in a sharp increase in organic matter concentrations. This was because phytoplankton settling rate was drastically reduced and thus caused a slight decrease in organic matter concentrations in all three segments. The overall result of this case showed a very strong prey-predator relationship in the lake ecosystem. The simulated outputs follow:

CAM VERSUS TIME

MINIMUM 1.2000E 00 MAXIMUM 6.2489E 02



TIME	CAM
0.0	1.2690E 01
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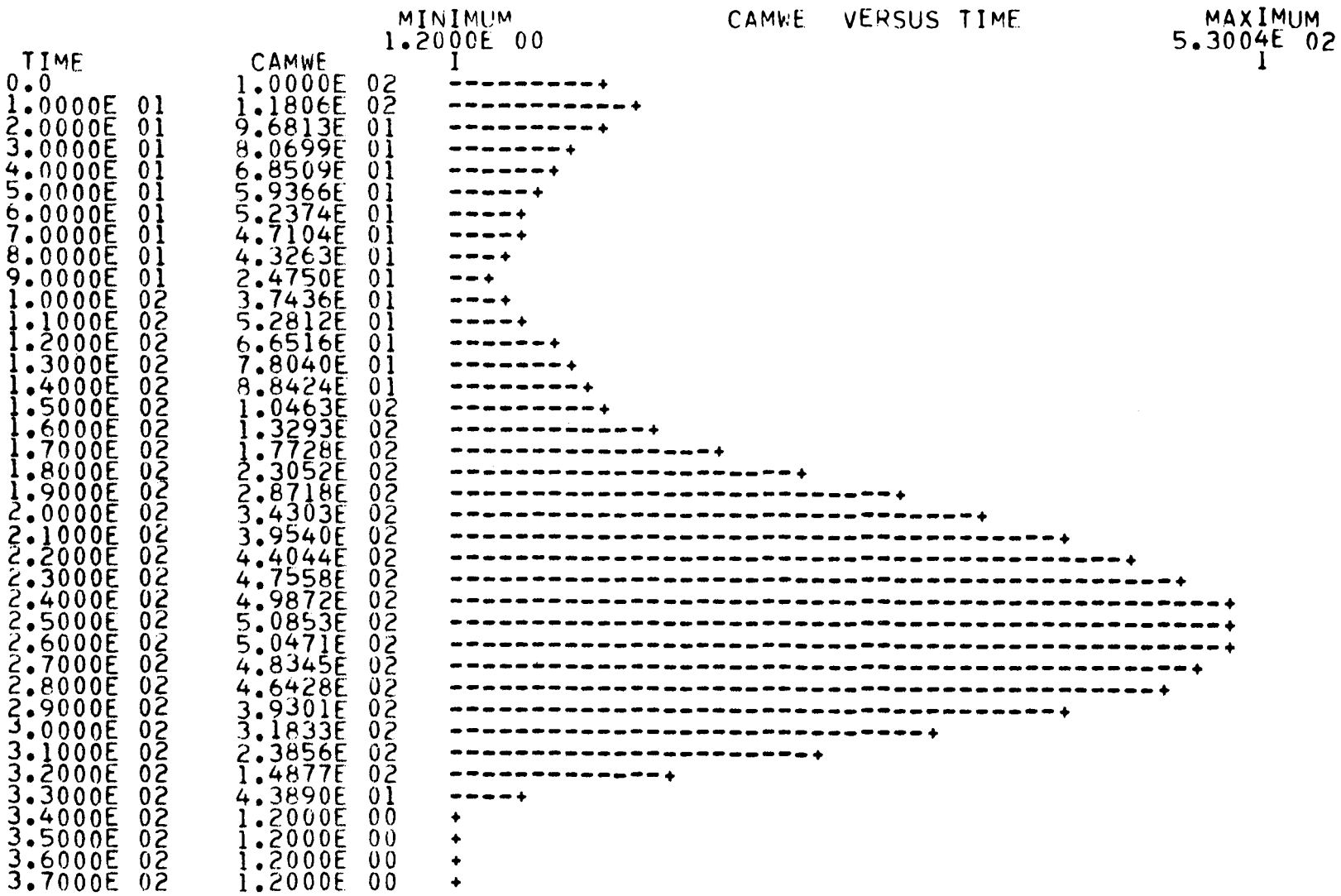
2.0000E 01	3.5488E 01
3.0000E 01	4.3471E 01
4.0000E 01	5.0166E 01
5.0000E 01	5.3867E 01
6.0000E 01	5.5798E 01
7.0000E 01	5.6842E 01
8.0000E 01	5.7318E 01
9.0000E 01	2.8751E 01
1.0000E 02	3.1688E 01
1.1000E 02	3.6544E 01
1.2000E 02	4.0875E 01
1.3000E 02	4.4637E 01
1.4000E 02	4.8328E 01
1.5000E 02	5.7619E 01
1.6000E 02	7.5568E 01
1.7000E 02	1.0839E 02
1.8000E 02	1.5451E 02
1.9000E 02	2.1312E 02
2.0000E 02	2.8427E 02
2.1000E 02	3.6437E 02
2.2000E 02	4.4880E 02
2.3000E 02	5.3071E 02
2.4000E 02	5.9200E 02
2.5000E 02	6.2221E 02
2.6000E 02	6.1718E 02
2.7000E 02	5.4899E 02
2.8000E 02	4.3014E 02
2.9000E 02	2.8463E 02
3.0000E 02	1.6096E 02
3.1000E 02	5.4986E 01
3.2000E 02	1.2000E 00
3.3000E 02	1.2000E 00
3.4000E 02	1.2000E 00
3.5000E 02	2.3534E 00
3.6000E 02	3.3112E 00
3.7000E 02	4.3833E 00


MINIMUM
1.2000E 00
CAMWE VERSUS TIME
MAXIMUM
5.3004E 02
TIME
CAMWE
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2.0000E 01 9.6813E 01
3.0000E 01 8.0699E 01
4.0000E 01 6.8509E 01
5.0000E 01 5.9366E 01
6.0000E 01 5.2374E 01
7.0000E 01 4.7104E 01
8.0000E 01 4.3263E 01
9.0000E 01 2.4750E 01
1.0000E 02 3.7436E 01
1.1000E 02 5.2812E 01
1.2000E 02 6.6516E 01
1.3000E 02 7.8040E 01
1.4000E 02 8.8424E 01
1.5000E 02 1.0463E 02
1.6000E 02 1.3293E 02
1.7000E 02 1.7728E 02
1.8000E 02 2.3052E 02
1.9000E 02 2.8718E 02
2.0000E 02 3.4303E 02
2.1000E 02 3.9540E 02
2.2000E 02 4.4044E 02
2.3000E 02 4.7558E 02
2.4000E 02 4.9872E 02
2.5000E 02 5.0853E 02
2.6000E 02 5.0471E 02
2.7000E 02 4.8345E 02
2.8000E 02 4.6428E 02
2.9000E 02 3.9301E 02
3.0000E 02 3.1833E 02
3.1000E 02 2.3856E 02
3.2000E 02 1.4877E 02
3.3000E 02 4.3890E 01
3.4000E 02 1.2000E 00
3.5000E 02 1.2000E 00
3.6000E 02 1.2000E 00
3.7000E 02 1.2000E 00

CAMWW VERSUS TIME

MINIMUM 1.2000E 00 MAXIMUM 4.5047E 02

TIME	CAMWW	I
0.0	5.4500E 01	------+
1.0000E 01	7.8067E 01	--------+
2.0000E 01	6.6523E 01	-------+
3.0000E 01	6.4835E 01	-------+
4.0000E 01	6.6133E 01	-------+
5.0000E 01	6.8589E 01	-------+
6.0000E 01	7.0897E 01	-------+
7.0000E 01	7.2533E 01	-------+
8.0000E 01	7.2961E 01	-------+
9.0000E 01	2.2558E 01	--+
1.0000E 02	2.9500E 01	---+
1.1000E 02	3.6904E 01	---+
1.2000E 02	4.4747E 01	-----+
1.3000E 02	5.2914E 01	-----+
1.4000E 02	6.2049E 01	------+
1.5000E 02	7.6004E 01	--------+
1.6000E 02	9.6614E 01	----------+
1.7000E 02	1.2834E 02	-------------+
1.8000E 02	1.6710E 02	----------------+
1.9000E 02	2.0952E 02	--------------------+
2.0000E 02	2.5175E 02	------------------------+
2.1000E 02	2.9041E 02	----------------------------+
2.2000E 02	3.2212E 02	------------------------------+
2.3000E 02	3.4424E 02	--------------------------------+
2.4000E 02	3.5422E 02	---------------------------------+
2.5000E 02	3.5555E 02	---------------------------------+
2.6000E 02	3.4929E 02	--------------------------------+
2.7000E 02	3.3686E 02	-------------------------------+
2.8000E 02	3.6321E 02	----------------------------------+
2.9000E 02	2.7073E 02	------------------------+
3.0000E 02	1.6365E 02	----------------+
3.1000E 02	5.8443E 01	------+
3.2000E 02	1.2000E 00	+
3.3000E 02	1.2000E 00	+
3.4000E 02	1.2000E 00	+
3.5000E 02	1.2000E 00	+
3.6000E 02	1.2000E 00	+
3.7000E 02	1.2000E 00	+

MINIMUM 2.8351E-03 — MCZ00 VERSUS TIME — MAXIMUM 6.5654E 02

TIME	MCZ00	1
0.0	3.8000E-03	+
1.0000E 01	3.6052E-03	+
2.0000E 01	3.5290E-03	+
3.0000E 01	3.4681E-03	+
4.0000E 01	3.4390E-03	+
5.0000E 01	3.4279E-03	+
6.0000E 01	3.4207E-03	+
7.0000E 01	3.4143E-03	+
8.0000E 01	3.4094E-03	+
9.0000E 01	2.9391E-03	+
1.0000E 02	2.8433E-03	+
1.1000E 02	3.0139E-03	+
1.2000E 02	3.3233E-03	+
1.3000E 02	3.7362E-03	+
1.4000E 02	4.2577E-03	+
1.5000E 02	5.0268E-03	+
1.6000E 02	6.2875E-03	+
1.7000E 02	8.4500E-03	+
1.8000E 02	1.1933E-02	+
1.9000E 02	1.7486E-02	+
2.0000E 02	2.6598E-02	+
2.1000E 02	4.2662E-02	+
2.2000E 02	7.4441E-02	+
2.3000E 02	1.4851E-01	+
2.4000E 02	3.5633E-01	+
2.5000E 02	1.0212E 00	+
2.6000E 02	3.2217E 00	+
2.7000E 02	1.0156E 01	+
2.8000E 02	3.0332E 01	--+
2.9000E 02	8.2650E 01	------+
3.0000E 02	2.0840E 02	----------+
3.1000E 02	4.8053E 02	----------+
3.2000E 02	6.1882E 02	----------+
3.3000E 02	6.3701E 02	----------+
3.4000E 02	5.9630E 02	----------+
3.5000E 02	4.9397E 02	----------+
3.6000E 02	4.0814E 02	----------+
3.7000E 02	3.3754E 02	----------+

MINIMUM 7.7369E-01 — MCFISH VERSUS TIME — MAXIMUM 1.5972E 01

TIME	MCFISH
0.0	1.0600E 00
1.0000E 01	1.0409E 00
2.0000E 01	1.0250E 00
3.0000E 01	1.0076E 00
4.0000E 01	9.8990E-01
5.0000E 01	9.7199E-01
6.0000E 01	9.5366E-01
7.0000E 01	9.3534E-01
8.0000E 01	9.1733E-01
9.0000E 01	8.7084E-01
1.0000E 02	8.3425E-01
1.1000E 02	8.0909E-01
1.2000E 02	7.9166E-01
1.3000E 02	7.8036E-01
1.4000E 02	7.7447E-01
1.5000E 02	7.7468E-01
1.6000E 02	7.8257E-01
1.7000E 02	7.9957E-01
1.8000E 02	8.2798E-01
1.9000E 02	8.7020E-01
2.0000E 02	9.3052E-01
2.1000E 02	1.0182E 00
2.2000E 02	1.1490E 00
2.3000E 02	1.3477E 00
2.4000E 02	1.6527E 00
2.5000E 02	2.1078E 00
2.6000E 02	2.7532E 00
2.7000E 02	3.6338E 00
2.8000E 02	4.8011E 00
2.9000E 02	6.2976E 00
3.0000E 02	8.1717E 00
3.1000E 02	1.0436E 01
3.2000E 02	1.2235E 01
3.3000E 02	1.3601E 01
3.4000E 02	1.4400E 01
3.5000E 02	1.4888E 01
3.6000E 02	1.5413E 01
3.7000E 02	1.5972E 01

MINIMUM BAC VERSUS TIME MAXIMUM
3.1137E-06 3.0000E-04

TIME	BAC
0.0	3.0000E-04
1.0000E 01	2.1644E-04
2.0000E 01	1.4618E-04
3.0000E 01	1.4396E-04
4.0000E 01	1.4707E-04
5.0000E 01	1.4947E-04
6.0000E 01	1.5263E-04
7.0000E 01	1.5318E-04
8.0000E 01	1.5204E-04
9.0000E 01	2.8552E-04
1.0000E 02	2.8077E-04
1.1000E 02	2.2957E-04
1.2000E 02	1.6953E-04
1.3000E 02	1.2562E-04
1.4000E 02	9.5272E-05
1.5000E 02	6.7518E-05
1.6000E 02	4.2723E-05
1.7000E 02	2.1240E-05
1.8000E 02	1.3866E-05
1.9000E 02	1.0199E-05
2.0000E 02	7.4270E-06
2.1000E 02	5.6864E-06
2.2000E 02	4.2269E-06
2.3000E 02	3.1559E-06
2.4000E 02	5.2620E-06
2.5000E 02	8.4256E-06
2.6000E 02	1.2452E-05
2.7000E 02	2.5189E-05
2.8000E 02	4.2082E-05
2.9000E 02	5.9630E-05
3.0000E 02	6.6277E-05
3.1000E 02	6.8030E-05
3.2000E 02	6.8300E-05
3.3000E 02	7.3486E-05
3.4000E 02	8.1961E-05
3.5000E 02	9.0915E-05
3.6000E 02	9.9351E-05
3.7000E 02	1.0626E-04

BACWE VERSUS TIME

MINIMUM 4.8368E-06 — MAXIMUM 3.0000E-04

TIME	BACWE
0.0	3.0000E-04
1.0000E 01	1.5585E-04
2.0000E 01	7.9799E-05
3.0000E 01	5.5501E-05
4.0000E 01	5.0285E-05
5.0000E 01	5.2219E-05
6.0000E 01	5.7948E-05
7.0000E 01	6.3639E-05
8.0000E 01	6.7714E-05
9.0000E 01	2.7452E-04
1.0000E 02	2.9422E-04
1.1000E 02	2.6602E-04
1.2000E 02	2.1136E-04
1.3000E 02	1.5425E-04
1.4000E 02	1.0903E-04
1.5000E 02	7.2876E-05
1.6000E 02	4.6034E-05
1.7000E 02	2.6853E-05
1.8000E 02	1.8375E-05
1.9000E 02	1.3914E-05
2.0000E 02	1.1075E-05
2.1000E 02	8.8539E-06
2.2000E 02	7.1509E-06
2.3000E 02	5.8599E-06
2.4000E 02	5.2959E-06
2.5000E 02	4.9978E-06
2.6000E 02	4.8790E-06
2.7000E 02	6.3048E-06
2.8000E 02	8.7144E-06
2.9000E 02	1.1553E-05
3.0000E 02	1.4617E-05
3.1000E 02	1.7904E-05
3.2000E 02	2.1384E-05
3.3000E 02	2.5053E-05
3.4000E 02	2.8912E-05
3.5000E 02	3.2911E-05
3.6000E 02	3.5688E-05
3.7000E 02	3.7322E-05

MINIMUM BACWW VERSUS TIME MAXIMUM
1.3806E-05 3.9076E-04

TIME	BACWW	I
0.0	3.0000E-04	----------+
1.0000E 01	2.1913E-04	----------+
2.0000E 01	1.4114E-04	----------+
3.0000E 01	1.3085E-04	----------+
4.0000E 01	1.3536E-04	----------+
5.0000E 01	1.4346E-04	----------+
6.0000E 01	1.5256E-04	----------+
7.0000E 01	1.5843E-04	----------+
8.0000E 01	1.6011E-04	----------+
9.0000E 01	3.3320E-04	----------+
1.0000E 02	3.7317E-04	----------+
1.1000E 02	3.9033E-04	----------+
1.2000E 02	3.8111E-04	----------+
1.3000E 02	3.4401E-04	----------+
1.4000E 02	2.8433E-04	----------+
1.5000E 02	2.1394E-04	----------+
1.6000E 02	1.5142E-04	----------+
1.7000E 02	1.0009E-04	----------+
1.8000E 02	6.9489E-05	-------+
1.9000E 02	4.9500E-05	----+
2.0000E 02	3.5815E-05	--+
2.1000E 02	2.6333E-05	-+
2.2000E 02	1.9681E-05	+
2.3000E 02	1.5092E-05	+
2.4000E 02	1.3845E-05	+
2.5000E 02	1.4085E-05	+
2.6000E 02	1.5396E-05	+
2.7000E 02	2.2878E-05	-+
2.8000E 02	3.2966E-05	--+
2.9000E 02	4.4417E-05	----+
3.0000E 02	5.1386E-05	----+
3.1000E 02	6.5577E-05	------+
3.2000E 02	7.4937E-05	--------+
3.3000E 02	8.5489E-05	---------+
3.4000E 02	9.7952E-05	----------+
3.5000E 02	1.1079E-04	----------+
3.6000E 02	1.2212E-04	----------+
3.7000E 02	1.3117E-04	----------+

MINIMUM CN VERSUS TIME MAXIMUM
5.0000E-03 1.1180E 00

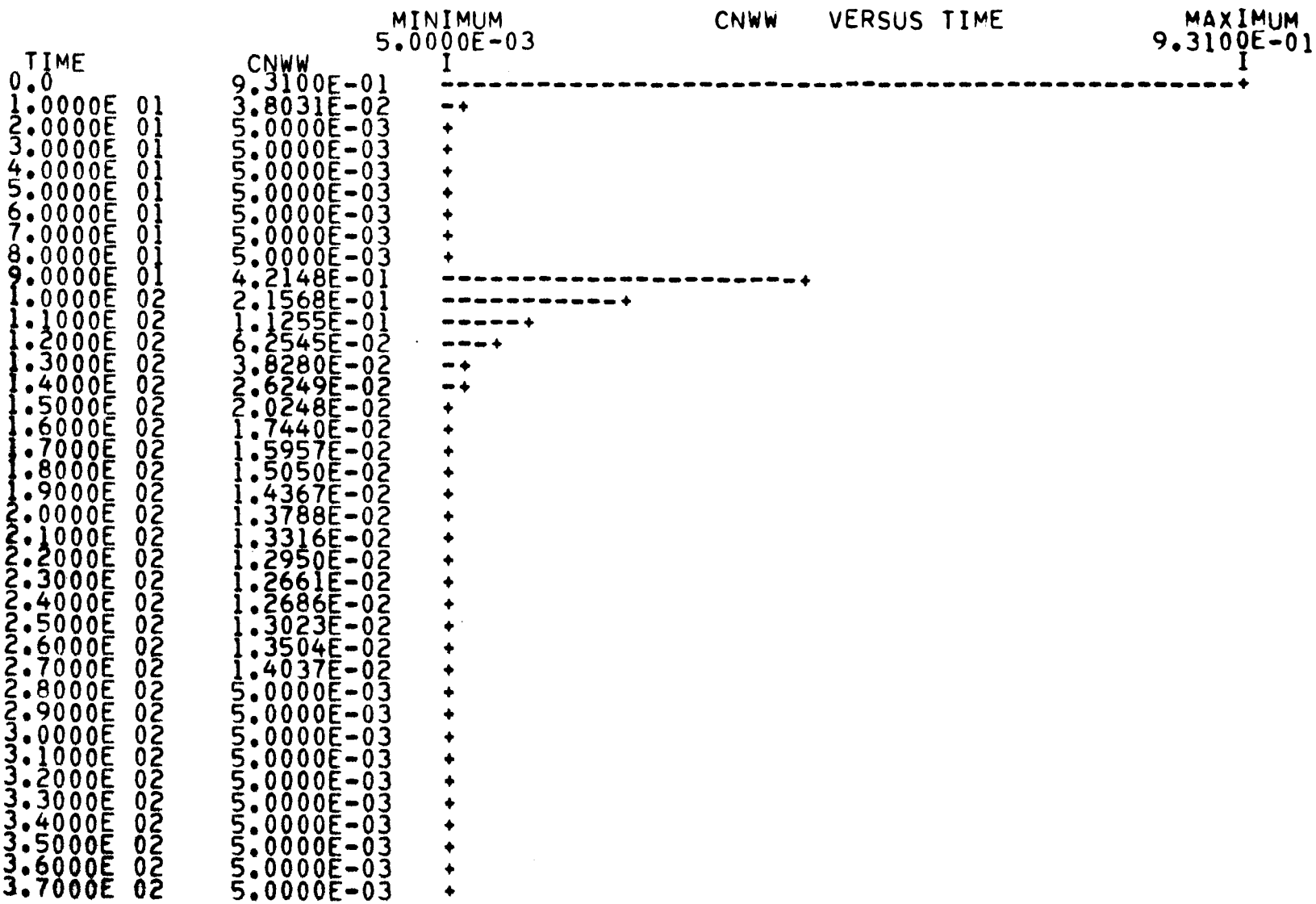
TIME	CN
0.0	1.1180E 00
1.0000E 01	5.4049E-03
2.0000E 01	5.0000E-03
3.0000E 01	5.0000E-03
4.0000E 01	5.0000E-03
5.0000E 01	5.0000E-03
6.0000E 01	5.0000E-03
7.0000E 01	5.0000E-03
8.0000E 01	5.0000E-03
9.0000E 01	1.7944E-01
1.0000E 02	4.7883E-02
1.1000E 02	1.6118E-02
1.2000E 02	9.3596E-03
1.3000E 02	7.6015E-03
1.4000E 02	6.9496E-03
1.5000E 02	6.5497E-03
1.6000E 02	6.2352E-03
1.7000E 02	5.9790E-03
1.8000E 02	5.7824E-03
1.9000E 02	5.6298E-03
2.0000E 02	5.5027E-03
2.1000E 02	5.4060E-03
2.2000E 02	5.3257E-03
2.3000E 02	5.2725E-03
2.4000E 02	5.2323E-03
2.5000E 02	5.2033E-03
2.6000E 02	5.1780E-03
2.7000E 02	5.1640E-03
2.8000E 02	5.0000E-03
2.9000E 02	5.0000E-03
3.0000E 02	5.0000E-03
3.1000E 02	5.0000E-03
3.2000E 02	5.0000E-03
3.3000E 02	5.0000E-03
3.4000E 02	5.0000E-03
3.5000E 02	5.0000E-03
3.6000E 02	5.0000E-03
3.7000E 02	5.0000E-03

CNWE VERSUS TIME

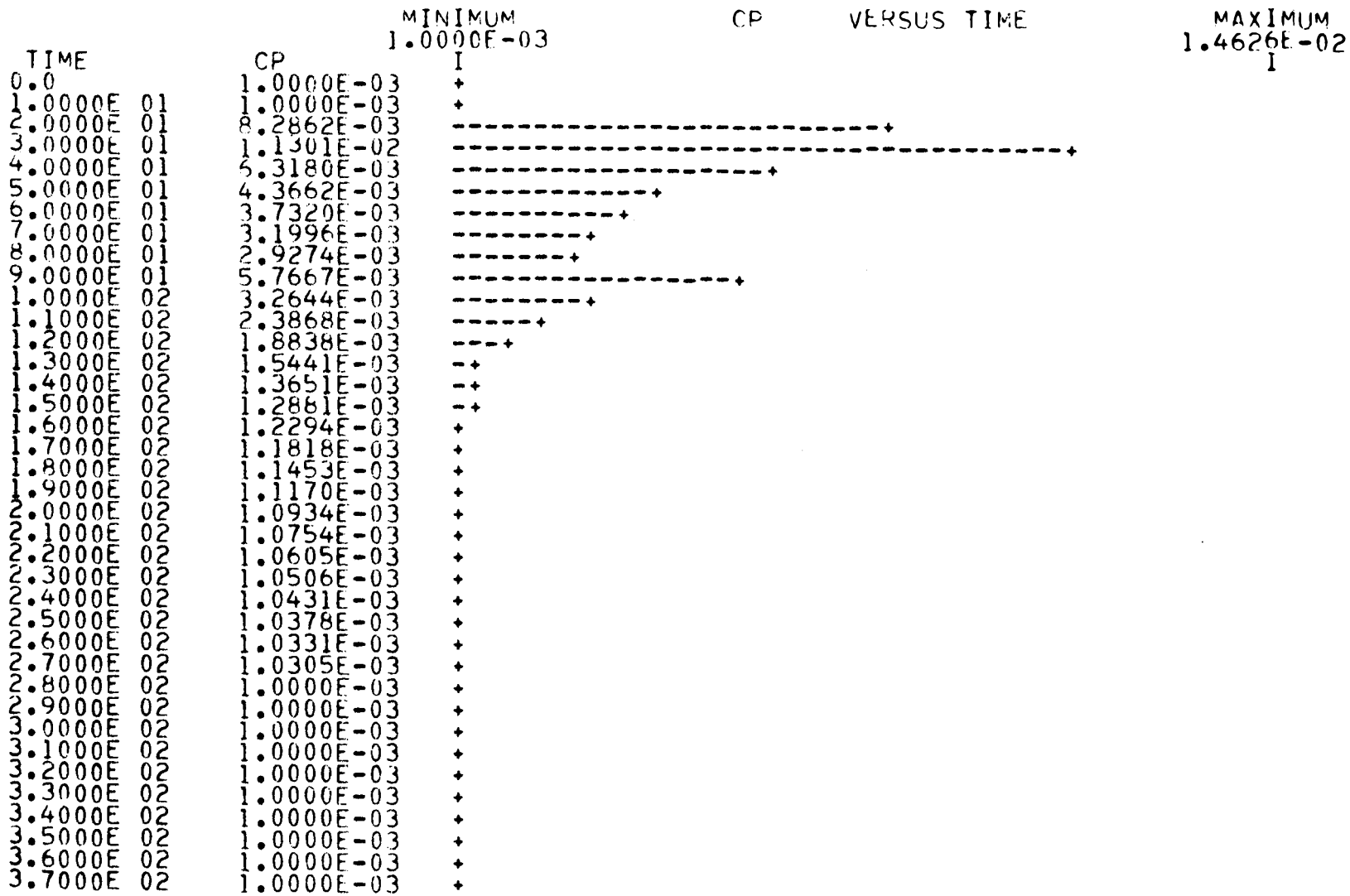
MINIMUM 5.0000E-03

MAXIMUM 1.0000E 00

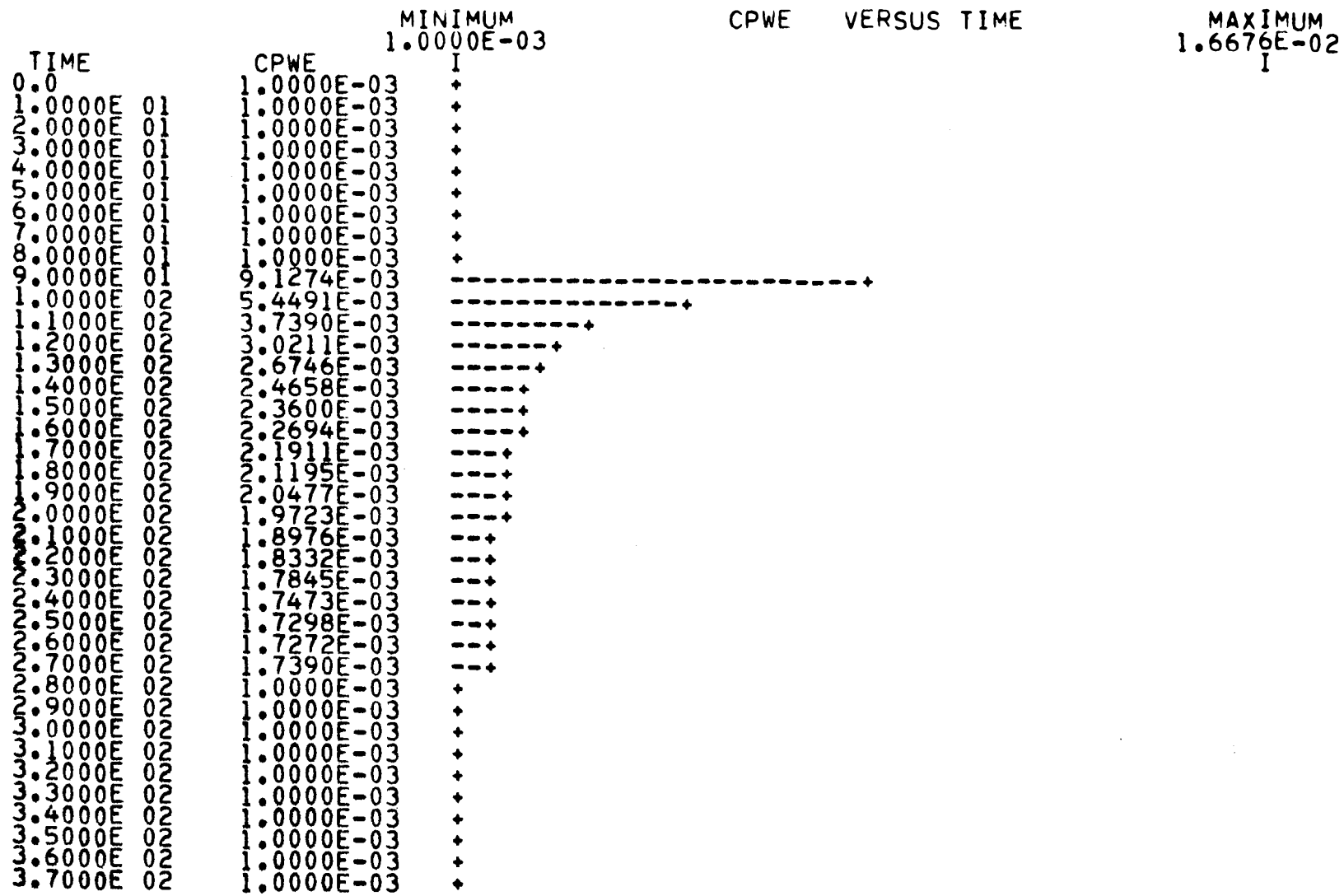
TIME	CNWE
0.0	1.0000E 00
1.0000E 01	5.0000E-03
2.0000E 01	5.0000E-03
3.0000E 01	5.0000E-03
4.0000E 01	5.0000E-03
5.0000E 01	5.0000E-03
6.0000E 01	5.0000E-03
7.0000E 01	5.0000E-03
8.0000E 01	5.0000E-03
9.0000E 01	2.5505E-01
1.0000E 02	9.0512E-02
1.1000E 02	3.4739E-02
1.2000E 02	1.7730E-02
1.3000E 02	1.2357E-02
1.4000E 02	1.0382E-02
1.5000E 02	9.6303E-03
1.6000E 02	9.1509E-03
1.7000E 02	8.7351E-03
1.8000E 02	8.3616E-03
1.9000E 02	7.9987E-03
2.0000E 02	7.6431E-03
2.1000E 02	7.3123E-03
2.2000E 02	7.0277E-03
2.3000E 02	6.8361E-03
2.4000E 02	6.6893E-03
2.5000E 02	6.5868E-03
2.6000E 02	6.5133E-03
2.7000E 02	6.4774E-03
2.8000E 02	5.0000E-03
2.9000E 02	5.0000E-03
3.0000E 02	5.0000E-03
3.1000E 02	5.0000E-03
3.2000E 02	5.0000E-03
3.3000E 02	5.0000E-03
3.4000E 02	5.0000E-03
3.5000E 02	5.0000E-03
3.6000E 02	5.0000E-03
3.7000E 02	5.0000E-03



TIME	CNWW
0.0	9.3100E-01
1.0000E 01	3.8031E-02
2.0000E 01	5.0000E-03
3.0000E 01	5.0000E-03
4.0000E 01	5.0000E-03
5.0000E 01	5.0000E-03
6.0000E 01	5.0000E-03
7.0000E 01	5.0000E-03
8.0000E 01	5.0000E-03
9.0000E 01	4.2148E-01
1.0000E 02	2.1568E-01
1.1000E 02	1.1255E-01
1.2000E 02	6.2545E-02
1.3000E 02	3.8280E-02
1.4000E 02	2.6249E-02
1.5000E 02	2.0248E-02
1.6000E 02	1.7440E-02
1.7000E 02	1.5957E-02
1.8000E 02	1.5050E-02
1.9000E 02	1.4367E-02
2.0000E 02	1.3788E-02
2.1000E 02	1.3316E-02
2.2000E 02	1.2950E-02
2.3000E 02	1.2661E-02
2.4000E 02	1.2686E-02
2.5000E 02	1.3023E-02
2.6000E 02	1.3504E-02
2.7000E 02	1.4037E-02
2.8000E 02	5.0000E-03
2.9000E 02	5.0000E-03
3.0000E 02	5.0000E-03
3.1000E 02	5.0000E-03
3.2000E 02	5.0000E-03
3.3000E 02	5.0000E-03
3.4000E 02	5.0000E-03
3.5000E 02	5.0000E-03
3.6000E 02	5.0000E-03
3.7000E 02	5.0000E-03



TIME	CP
0.0	1.0000E-03
1.0000E 01	1.0000E-03
2.0000E 01	8.2862E-03
3.0000E 01	1.1301E-02
4.0000E 01	5.3180E-03
5.0000E 01	4.3662E-03
6.0000E 01	3.7320E-03
7.0000E 01	3.1996E-03
8.0000E 01	2.9274E-03
9.0000E 01	5.7667E-03
1.0000E 02	3.2644E-03
1.1000E 02	2.3868E-03
1.2000E 02	1.8838E-03
1.3000E 02	1.5441E-03
1.4000E 02	1.3651E-03
1.5000E 02	1.2881E-03
1.6000E 02	1.2294E-03
1.7000E 02	1.1818E-03
1.8000E 02	1.1453E-03
1.9000E 02	1.1170E-03
2.0000E 02	1.0934E-03
2.1000E 02	1.0754E-03
2.2000E 02	1.0605E-03
2.3000E 02	1.0506E-03
2.4000E 02	1.0431E-03
2.5000E 02	1.0378E-03
2.6000E 02	1.0331E-03
2.7000E 02	1.0305E-03
2.8000E 02	1.0000E-03
2.9000E 02	1.0000E-03
3.0000E 02	1.0000E-03
3.1000E 02	1.0000E-03
3.2000E 02	1.0000E-03
3.3000E 02	1.0000E-03
3.4000E 02	1.0000E-03
3.5000E 02	1.0000E-03
3.6000E 02	1.0000E-03
3.7000E 02	1.0000E-03

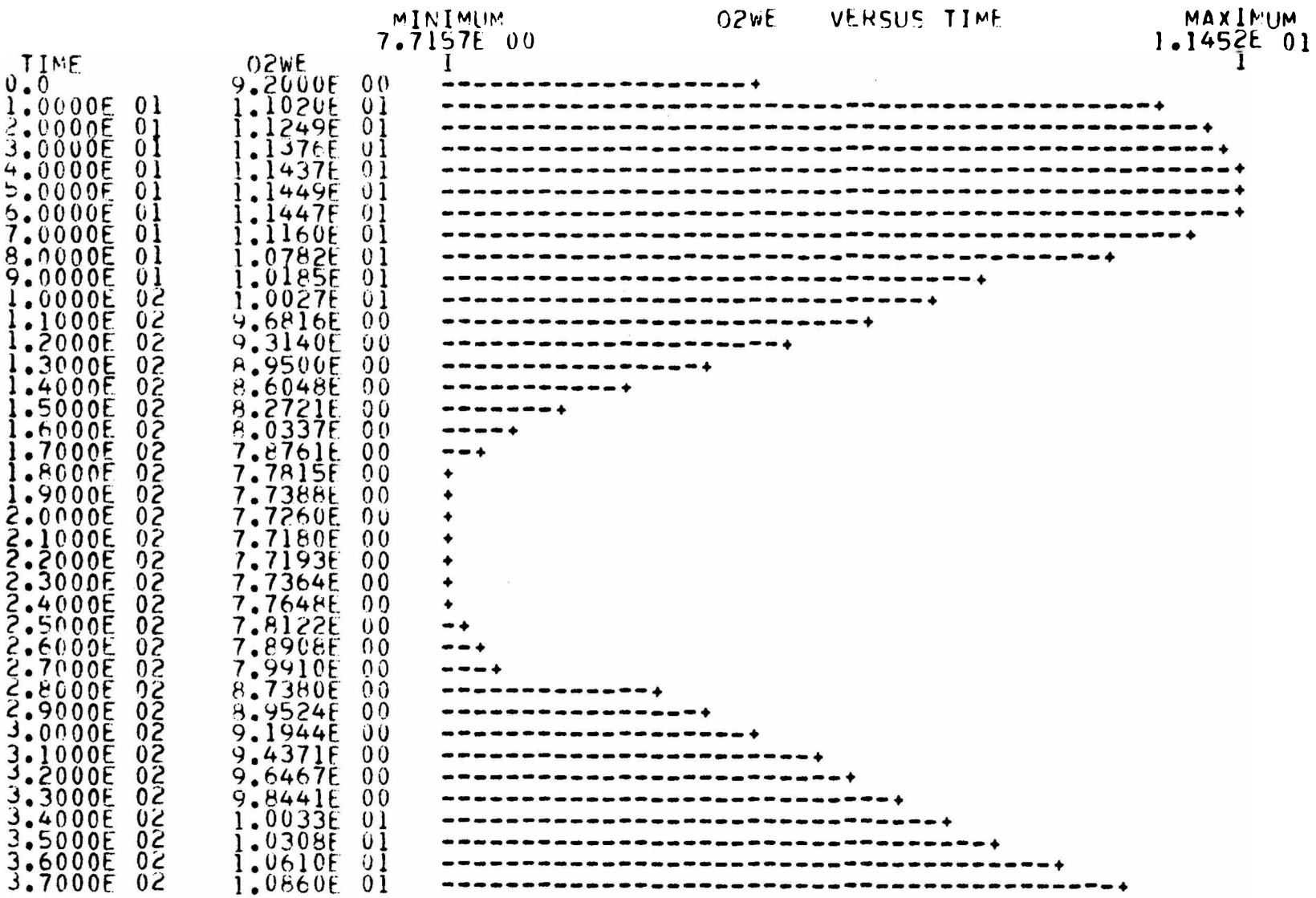

MINIMUM
1.0000E-03
CPWE VERSUS TIME
MAXIMUM
1.6676E-02
TIME
CPWE
0.0 1.0000E-03
1.0000E 01 1.0000E-03
2.0000E 01 1.0000E-03
3.0000E 01 1.0000E-03
4.0000E 01 1.0000E-03
5.0000E 01 1.0000E-03
6.0000E 01 1.0000E-03
7.0000E 01 1.0000E-03
8.0000E 01 1.0000E-03
9.0000E 01 9.1274E-03
1.0000E 02 5.4491E-03
1.1000E 02 3.7390E-03
1.2000E 02 3.0211E-03
1.3000E 02 2.6746E-03
1.4000E 02 2.4658E-03
1.5000E 02 2.3600E-03
1.6000E 02 2.2694E-03
1.7000E 02 2.1911E-03
1.8000E 02 2.1195E-03
1.9000E 02 2.0477E-03
2.0000E 02 1.9723E-03
2.1000E 02 1.8976E-03
2.2000E 02 1.8332E-03
2.3000E 02 1.7845E-03
2.4000E 02 1.7473E-03
2.5000E 02 1.7298E-03
2.6000E 02 1.7272E-03
2.7000E 02 1.7390E-03
2.8000E 02 1.0000E-03
2.9000E 02 1.0000E-03
3.0000E 02 1.0000E-03
3.1000E 02 1.0000E-03
3.2000E 02 1.0000E-03
3.3000E 02 1.0000E-03
3.4000E 02 1.0000E-03
3.5000E 02 1.0000E-03
3.6000E 02 1.0000E-03
3.7000E 02 1.0000E-03

MINIMUM CPWW VERSUS TIME MAXIMUM
1.0000E-03 1.9483E-01

TIME	CPWW	I
0.0	1.0000E-03	+
1.0000E 01	1.0000E-03	+
2.0000E 01	1.0638E-02	--+
3.0000E 01	3.7126E-02	----------+
4.0000E 01	4.5495E-02	------------+
5.0000E 01	4.2380E-02	-----------+
6.0000E 01	3.3305E-02	---------+
7.0000E 01	2.1954E-02	------+
8.0000E 01	1.2204E-02	--+
9.0000E 01	1.2430E-02	--+
1.0000E 02	8.1090E-03	-+
1.1000E 02	5.8155E-03	-+
1.2000E 02	4.6144E-03	+
1.3000E 02	3.9516E-03	+
1.4000E 02	3.5279E-03	+
1.5000E 02	3.2326E-03	+
1.6000E 02	3.0597E-03	+
1.7000E 02	2.9324E-03	+
1.8000E 02	2.8257E-03	+
1.9000E 02	2.7241E-03	+
2.0000E 02	2.6262E-03	+
2.1000E 02	2.5423E-03	+
2.2000E 02	2.4757E-03	+
2.3000E 02	2.4225E-03	+
2.4000E 02	2.4273E-03	+
2.5000E 02	2.4899E-03	+
2.6000E 02	2.5793E-03	+
2.7000E 02	2.6783E-03	+
2.8000E 02	1.0000E-03	+
2.9000E 02	1.0000E-03	+
3.0000E 02	4.8466E-03	+
3.1000E 02	2.9966E-02	-------+
3.2000E 02	8.1493E-02	--------------------+
3.3000E 02	1.2743E-01	---------------------------------+
3.4000E 02	1.5893E-01	--+
3.5000E 02	1.7820E-01	--+
3.6000E 02	1.8910E-01	--+
3.7000E 02	1.9483E-01	--+

MINIMUM 7.3979E 00 O2 VERSUS TIME MAXIMUM 1.1289E 01

TIME	O2
0.0	9.0000E 00
1.0000E 01	1.0947E 01
2.0000E 01	1.1056E 01
3.0000E 01	1.1206E 01
4.0000E 01	1.1267E 01
5.0000E 01	1.1281E 01
6.0000E 01	1.1285E 01
7.0000E 01	1.1007E 01
8.0000E 01	1.0680E 01
9.0000E 01	1.0035E 01
1.0000E 02	9.8597E 00
1.1000E 02	9.5194E 00
1.2000E 02	9.1497E 00
1.3000E 02	8.7666E 00
1.4000E 02	8.3858E 00
1.5000E 02	8.0230E 00
1.6000E 02	7.7424E 00
1.7000E 02	7.5390E 00
1.8000E 02	7.4340E 00
1.9000E 02	7.3979E 00
2.0000E 02	7.4185E 00
2.1000E 02	7.5250E 00
2.2000E 02	7.7666E 00
2.3000E 02	8.0163E 00
2.4000E 02	8.2541E 00
2.5000E 02	8.4745E 00
2.6000E 02	8.6957E 00
2.7000E 02	8.9095E 00
2.8000E 02	8.8413E 00
2.9000E 02	9.0055E 00
3.0000E 02	9.1758E 00
3.1000E 02	9.3432E 00
3.2000E 02	9.4839E 00
3.3000E 02	9.7454E 00
3.4000E 02	1.0025E 01
3.5000E 02	1.0294E 01
3.6000E 02	1.0567E 01
3.7000E 02	1.0776E 01


MINIMUM
7.7157E 00
O2WE VERSUS TIME
MAXIMUM
1.1452E 01
TIME
O2WE
0.0 9.2000E 00
1.0000E 01 1.1020E 01
2.0000E 01 1.1249E 01
3.0000E 01 1.1376E 01
4.0000E 01 1.1437E 01
5.0000E 01 1.1449E 01
6.0000E 01 1.1447E 01
7.0000E 01 1.1160E 01
8.0000E 01 1.0782E 01
9.0000E 01 1.0185E 01
1.0000E 02 1.0027E 01
1.1000E 02 9.6816E 00
1.2000E 02 9.3140E 00
1.3000E 02 8.9500E 00
1.4000E 02 8.6048E 00
1.5000E 02 8.2721E 00
1.6000E 02 8.0337E 00
1.7000E 02 7.8761E 00
1.8000E 02 7.7815E 00
1.9000E 02 7.7388E 00
2.0000E 02 7.7260E 00
2.1000E 02 7.7180E 00
2.2000E 02 7.7193E 00
2.3000E 02 7.7364E 00
2.4000E 02 7.7648E 00
2.5000E 02 7.8122E 00
2.6000E 02 7.8908E 00
2.7000E 02 7.9910E 00
2.8000E 02 8.7380E 00
2.9000E 02 8.9524E 00
3.0000E 02 9.1944E 00
3.1000E 02 9.4371E 00
3.2000E 02 9.6467E 00
3.3000E 02 9.8441E 00
3.4000E 02 1.0033E 01
3.5000E 02 1.0308E 01
3.6000E 02 1.0610E 01
3.7000E 02 1.0860E 01

MINIMUM 7.8750E 00 — O2WW VERSUS TIME — MAXIMUM 1.1636E 01

TIME	O2WW
0.0	9.8000E 00
1.0000E 01	1.1076E 01
2.0000E 01	1.1273E 01
3.0000E 01	1.1454E 01
4.0000E 01	1.1560E 01
5.0000E 01	1.1606E 01
6.0000E 01	1.1635E 01
7.0000E 01	1.1403E 01
8.0000E 01	1.1033E 01
9.0000E 01	1.0437E 01
1.0000E 02	1.0222E 01
1.1000E 02	9.8497E 00
1.2000E 02	9.4657E 00
1.3000E 02	9.0873E 00
1.4000E 02	8.7290E 00
1.5000E 02	8.4066E 00
1.6000E 02	8.1720E 00
1.7000E 02	8.0325E 00
1.8000E 02	7.9408E 00
1.9000E 02	7.8970E 00
2.0000E 02	7.8838E 00
2.1000E 02	7.8773E 00
2.2000E 02	7.8822E 00
2.3000E 02	7.9023E 00
2.4000E 02	7.9143E 00
2.5000E 02	7.9398E 00
2.6000E 02	7.9979E 00
2.7000E 02	8.0812E 00
2.8000E 02	8.6886E 00
2.9000E 02	8.8470E 00
3.0000E 02	9.0630E 00
3.1000E 02	9.3784E 00
3.2000E 02	9.4477E 00
3.3000E 02	9.6840E 00
3.4000E 02	9.9798E 00
3.5000E 02	1.0279E 01
3.6000E 02	1.0588E 01
3.7000E 02	1.0857E 01

MINIMUM OM VERSUS TIME MAXIMUM
3.0000E 00 4.6255E 00

TIME	OM
0.0	3.0000E 00
1.0000E 01	3.4983E 00
2.0000E 01	3.7812E 00
3.0000E 01	3.9200E 00
4.0000E 01	3.9692E 00
5.0000E 01	3.9665E 00
6.0000E 01	3.9337E 00
7.0000E 01	3.8874E 00
8.0000E 01	3.8358E 00
9.0000E 01	3.0578E 00
1.0000E 02	3.0176E 00
1.1000E 02	3.0257E 00
1.2000E 02	3.0405E 00
1.3000E 02	3.0538E 00
1.4000E 02	3.0654E 00
1.5000E 02	3.0740E 00
1.6000E 02	3.0795E 00
1.7000E 02	3.0821E 00
1.8000E 02	3.0823E 00
1.9000E 02	3.0812E 00
2.0000E 02	3.0778E 00
2.1000E 02	3.0737E 00
2.2000E 02	3.0684E 00
2.3000E 02	3.0628E 00
2.4000E 02	3.0569E 00
2.5000E 02	3.0508E 00
2.6000E 02	3.0448E 00
2.7000E 02	3.0392E 00
2.8000E 02	3.5548E 00
2.9000E 02	3.9144E 00
3.0000E 02	4.1544E 00
3.1000E 02	4.3448E 00
3.2000E 02	4.5084E 00
3.3000E 02	4.6064E 00
3.4000E 02	4.6236E 00
3.5000E 02	4.5844E 00
3.6000E 02	4.5152E 00
3.7000E 02	4.4388E 00

MINIMUM OMWE VERSUS TIME MAXIMUM
3.0000E 00 6.1915E 00

TIME	OMWE	I
0.0	3.0000E 00	+
1.0000E 01	3.4836E 00	-------+
2.0000E 01	3.9177E 00	----------+
3.0000E 01	4.2892E 00	----------+
4.0000E 01	4.5899E 00	----------+
5.0000E 01	4.8169E 00	----------+
6.0000E 01	4.9599E 00	----------+
7.0000E 01	5.0236E 00	----------+
8.0000E 01	5.0226E 00	----------+
9.0000E 01	3.3652E 00	------+
1.0000E 02	3.1944E 00	---+
1.1000E 02	3.1295E 00	--+
1.2000E 02	3.1017E 00	-+
1.3000E 02	3.0918E 00	-+
1.4000E 02	3.0904E 00	-+
1.5000E 02	3.0964E 00	-+
1.6000E 02	3.1041E 00	-+
1.7000E 02	3.1115E 00	-+
1.8000E 02	3.1171E 00	-+
1.9000E 02	3.1206E 00	-+
2.0000E 02	3.1222E 00	-+
2.1000E 02	3.1218E 00	-+
2.2000E 02	3.1209E 00	-+
2.3000E 02	3.1206E 00	-+
2.4000E 02	3.1193E 00	-+
2.5000E 02	3.1172E 00	-+
2.6000E 02	3.1144E 00	-+
2.7000E 02	3.1110E 00	-+
2.8000E 02	3.5069E 00	-------+
2.9000E 02	3.9733E 00	----------+
3.0000E 02	4.4012E 00	----------+
3.1000E 02	4.7860E 00	----------+
3.2000E 02	5.1244E 00	----------+
3.3000E 02	5.4151E 00	----------+
3.4000E 02	5.6583E 00	----------+
3.5000E 02	5.8551E 00	----------+
3.6000E 02	6.0278E 00	----------+
3.7000E 02	6.1915E 00	----------+

MINIMUM OMWW VERSUS TIME MAXIMUM
3.0000E 00 5.7137E 00

TIME	OMWW	I
0.0	3.0000E 00	+
1.0000E 01	3.3824E 00	-------+
2.0000E 01	3.7678E 00	--------------+
3.0000E 01	4.1086E 00	---------------------+
4.0000E 01	4.3807E 00	------------------------+
5.0000E 01	4.5781E 00	---------------------------+
6.0000E 01	4.7047E 00	-----------------------------+
7.0000E 01	4.7687E 00	------------------------------+
8.0000E 01	4.7797E 00	------------------------------+
9.0000E 01	3.1761E 00	---+
1.0000E 02	3.0778E 00	-+
1.1000E 02	3.0423E 00	+
1.2000E 02	3.0289E 00	+
1.3000E 02	3.0249E 00	+
1.4000E 02	3.0261E 00	+
1.5000E 02	3.0304E 00	+
1.6000E 02	3.0372E 00	+
1.7000E 02	3.0454E 00	+
1.8000E 02	3.0537E 00	+
1.9000E 02	3.0618E 00	-+
2.0000E 02	3.0694E 00	-+
2.1000E 02	3.0764E 00	-+
2.2000E 02	3.0827E 00	-+
2.3000E 02	3.0881E 00	-+
2.4000E 02	3.0940E 00	-+
2.5000E 02	3.1000E 00	-+
2.6000E 02	3.1052E 00	-+
2.7000E 02	3.1094E 00	--+
2.8000E 02	3.3786E 00	-------+
2.9000E 02	3.7731E 00	--------------+
3.0000E 02	4.1505E 00	---------------------+
3.1000E 02	4.5000E 00	---------------------------+
3.2000E 02	4.8232E 00	-------------------------------+
3.3000E 02	5.1132E 00	----------------------------------+
3.4000E 02	5.3523E 00	------------------------------------+
3.5000E 02	5.5309E 00	-------------------------------------+
3.6000E 02	5.6479E 00	--------------------------------------+
3.7000E 02	5.7137E 00	---------------------------------------+

9. Comment

In a short period of a few years, either Case II or Case III is recommended. Both cases showed a slight decrease in overall phytoplankton concentrations, but showed slight increases in overall zooplankton and fish concentrations. Therefore, in either case, fish production could be increased with the reduction in phytoplankton. Also, either case could be achieved easily in the existing Treatment Plant. In both cases, the main source of nutrients will be from the rich sediment upsurge. As time progresses, the nutrients in the rich sediment will be depleted gradually. Eventually, Case VI will be reached and desirable (or undesirable) effects will occur.