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SYNTHETIC DATA GENERATOR-
A JOINT DISTRIBUTION TECHNIQUE

BY

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SYNTHETIC DATA GENERATOR - A JOINT DISTRIBUTION TECHNIQUE (Technical Supplement)

by

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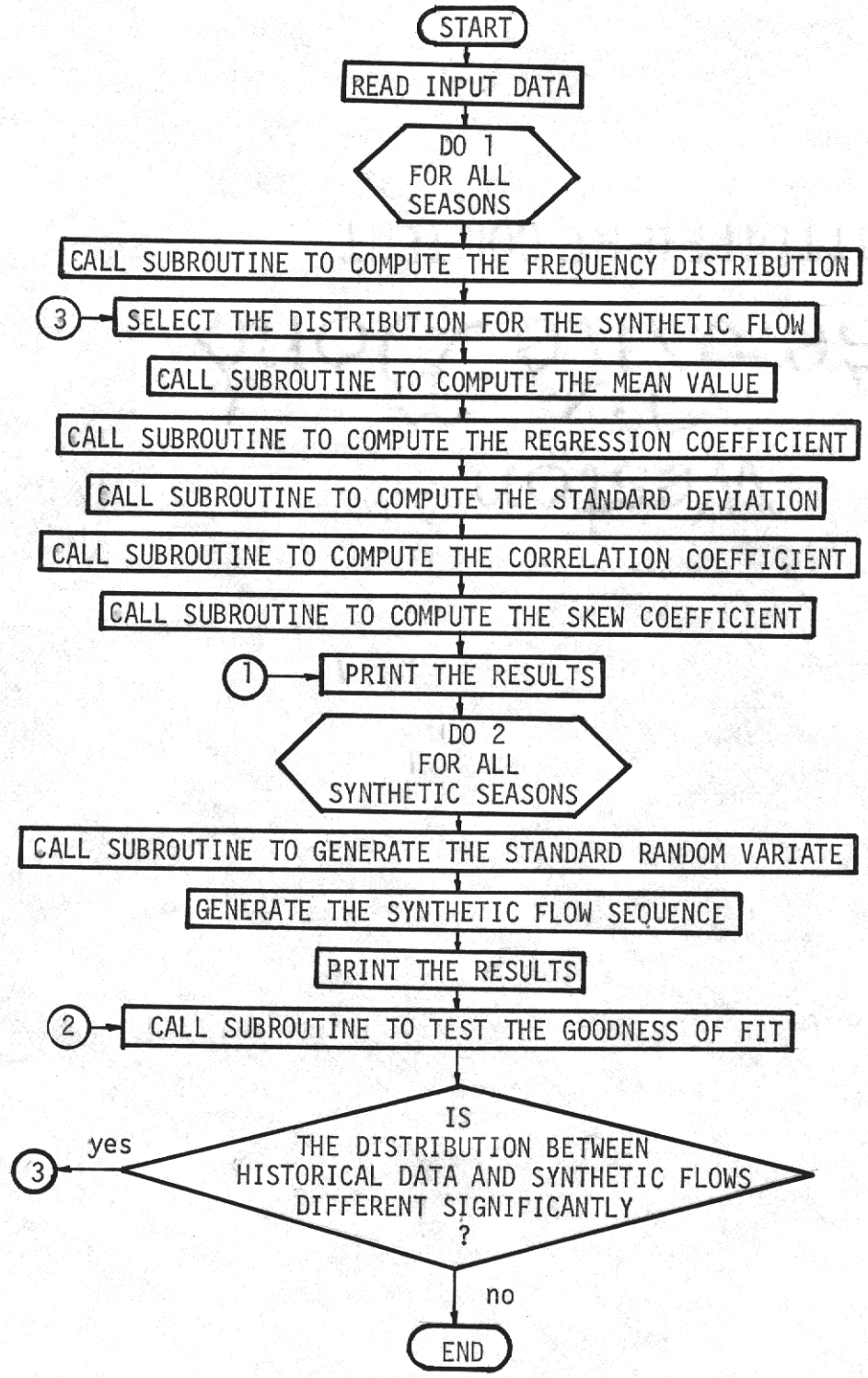
PREFACE

This publication is a technical supplement to technical publication No. 76-1, 1976 entitled, "Synthetic Data Generator - A Joint Distribution Technique" by Sun-Fu Shih, Resource Planning Department, Central and Southern Florida Flood Control District. The main portions of this technical supplement are the systematic flow chart for the synthetic process; the nomenclature for computer programs; and the computer programs for synthetic monthly data based on normal distribution, log normal distribution, log Pearson Type III distribution and square root normal distribution. The subroutine programs used to compute the mean value of data, the trend of data, variance and standard deviation, the correlation coefficient, the skewness coefficient, a normally distributed random number with a given mean and standard deviation, generating the random number, the frequency distribution, and Chi-square test for goodness-of-fit, are also included.

APPENDIX 1: Systematic Flow Chart For Synthetic Streamflow.



APPENDIX 2. Nomenclature for Computer Programs

1. Input Variable Definitions:

ANAME	Identification readings for job output
L	Years of observed data
NS	Number of seasons per year (for example, 12 months in monthly synthesized sequence).
NF	Number of intervals used in frequency analysis
A(I,J)	Monthly streamflow data
L1	Length of years to be generated

2. Output Variable Definitions:

AA(I)	Annual observed streamflow
J	Month index
XM(J)	Mean value of jth month
XB(J)	Regression coefficient for estimating flow in (jth)st month from that of ith month
XSIG(J)	Standard deviation of observed streamflow for jth month
RH(J)	Lag one correlation between flows in jth and (j+1)st months.
X(I+1)	Synthesized flow in (I+1)st month
S1	Sum of negative values of the synthesized sequence
I1	Number of negative values occurring during the generating process
S2	Total value of the synthesized sequence
VA	Variance of the synthesized flow sequence
SIG	Standard deviation of the synthesized flow sequence
DV	Average monthly value of the synthesized flow sequence
X5(J)	Annual synthesized flow in jth year

APPENDIX 2. (continued)

YMAX	Maximum value in the flow sequence
YMIN	Minimum value in the flow sequence
YY(I+1)	Frequency interval used in frequency subroutine
N(I)	Number of time occurrence in ith interval
XN(I)	Percent of time occurrence in ith interval
XNN(I+1)	Percent of time equal to or less than value indicated
Y1(I+1,J1)	Frequency of ith interval in J1th month
J1	Month index used in Chi-square tests
XSQ	Chi-square test value
SKC	Skewness coefficient

APPENDIX 3. COMPUTER PROGRAM FOR SYNTHETIC MONTHLY STREAMFLOW BASED ON THE NORMAL DISTRIBUTION (SFLOWND)

```
      PROGRAM SFLOWND
C   SYNTHETIC FLOW BASED ON THE NORMAL DISTRIBUTION
      DIMENSION X(45),A(45,12),XM(13),XB(13),X1(45),XSIG(13),RH(13)
      DIMENSION ANME(10),AA(45),Y1(21),Y2(21),Y11(21,13),Y22(21,13)
      READ(60,10) (ANME(I),I=1,10)
   10 FORMAT(10A8)
      WRITE(61,11) (ANME(I),I=1,10)
   11 FORMAT(1H1,10X,10A8//)
C     L=YEARS OF SYNTHETIC RECORD, NS=NUMBER OF SEASONS PER YEAR
C     A(I,J)= MONTHLY STREAMFLOW DATA
C     L1=SYNTHETIC YEARS,   NF=NO. OF FREQUENCY INTERVAL.
      READ(60,1) L,NS,NF
    1 FORMAT(3I10)
      WRITE(61,30)
   30 FORMAT(/2X,40HMEAN MONTHLY STREAMFLOW DATA, UNIT = CFS//)
      DO 5 I=1,L
      READ(60,2) (A(I,J),J=1,NS)
      AB=0.0
      DO 14 J=1,NS
   14 AB=AB+A(I,J)
      AA(I)=AB
    5 WRITE(61,13) (A(I,J),J=1,NS),AA(I)
      WRITE(61,31)
   31 FORMAT(/2X,49HMEAN MONTHLY STREAMFLOW DATA, UNIT = ACRE-FT./DAY//)
      DO 19 I=1,L
      DO 20 J=1,NS
   20 A(I,J)=A(I,J)*1.983471
      AA(I)=AA(I)*1.983471
   19 WRITE(61,13) (A(I,J),J=1,NS),AA(I)
    2 FORMAT(8X,12F6.0)
   13 FORMAT(13F9.2)
      WRITE(61,32)
   32 FORMAT(/2X,29HANNUAL FREQUENCY DISTRIBUTION//)
      CALL FREQ(AA,L,NF,Y1,Y2)
      NF1=NF+1
      Y11(1,13)=Y1(1)
      DO 23 I1=2,NF1
      I3=I1-1
      Y11(I1,13)=Y1(I1)
   23 Y22(I3,13)=Y2(I3)
      DO 4 J=1,NS
      DO 3 I=1,L
    3 X(I)=A(I,J)
      WRITE(61,33) J
   33 FORMAT(/2X,6HMONTH=,I4,25H   FREQUENCY DISTRIBUTION//)
      CALL FREQ(X,L,NF,Y1,Y2)
      Y11(1,J)=Y1(1)
      DO 24 I2=2,NF1
      I3=I2-1
      Y11(I2,J)=Y1(I2)
   24 Y22(I3,J)=Y2(I3)
      CALL AGM11(X,L,XMU)
      XM(J)=XMU
      IF(J.EQ.NS) GO TO 6
      DO 9 I=1,L
    9 X1(I)=A(I,J+1)
      GO TO 7
    6 DO 8 I=1,L
    8 X1(I)=A(I,1)
    7 CALL AGM11(X1,L,XM1)
      CALL AG12A(B,X,X1,L,XMU,XM1)
```

```
      XB(J)=B
      CALL AGM22(VAR,SIGMA,X,L,XMU)
      XSIG(J)=SIGMA
      SIG1=SIGMA
      CALL AGM22(VAR,SIGMA,X1,L,XM1)
      SIG2=SIGMA
      CALL AGM32(SIG1,SIG2,L,X,X1,XMU,XM1,RHO)
      RH(J)=RHO
    4 WRITE(61,22) XM(J),XB(J),XSIG(J),RH(J)
   22 FORMAT(/2X,5HMEAN=,F15.6,14H   REG. COEF.=,F10.6,12H   ST. DEV.=,F
     115.6,15H   CORR. COEF.=,F9.6/)
   16 READ(60,1) L1
      IF(L1.EQ.0) GO TO 17
      WRITE(61,18) L1
   18 FORMAT(1H1,5X,26HSYNTHETIC FLOW WITH YEARS=,I10//)
      CALL AGM31(XB,XSIG,RH,L,NS,XM,NF,L1,Y11,Y22)
      GO TO 16
   17 CALL EXIT
      END



      SUBROUTINE AGM31(B,XSIG,RHO,L,NS,XMU,NF,L1,Y11,Y22)
C     SYNTHETIC STREAM FLOW SEQUENCE (SEASONAL FLOWS)
      DIMENSION X(4801),XMU(13),XSIG(13),RHO(13),B(13)
      DIMENSION X5(501),Y11(21,13),Y22(21,13)
      IX=135
      AM=0.0
      S=1.0
      I=1
      X(I)=XMU(1)
      XMU(13)=XMU(1)
      XSIG(13)=XSIG(1)
      I1=0
      S1=0.0
      S2=X(I)/10000.
      X111=X(I)
      DO 2 K=1,L1
      DO 2 J=1,NS
      TERM1=B(J)*(X111-XMU(J))
      CALL GAUSS(IX,IY,S,AM,Z)
      IX=IY
      TERM2=1-RHO(J)*RHO(J)
      TERM3=Z*SQRT(TERM2)*XSIG(J+1)
      X(I+1)=XMU(J+1)+TERM1+TERM3
      IF(X(I+1)) 6,10,10
    6 WRITE(61,3) X(I+1)
      S1=S1+X(I+1)
      X(I+1)=0.0
      I1=I1+1
   10 S2=S2+X(I+1)/10000.0
      X111=X(I+1)
      I=I+1
    2 CONTINUE
      WRITE(61,9) S1,I1,S2
    9 FORMAT(2X,22HSUM OF NEGATIVE VALUE=,F15.5,16H  NO. OF N. V. =,I10,
     118H  TOTAL VOL 10**4=,F20.6)
      WRITE(61,3)(X(J),J=1,I)
    3 FORMAT(12F10.2)
      KI=1
      DO 5 J=1,NS
      KK=1
```

```
      SUM=0.0
      DO 4 K=KI,I,12
      X5(KK)=X(K)
      KK=KK+1
    4 SUM=SUM+X(K)
      CALL XFREQ(X5,L1,NF,Y11,Y22,J,L)
      KI=KI+1
      DV=SUM/L1
      CALL AGM22(VA,SIG,X5,L1,DV)
      WRITE(61,15) VA,SIG
   15 FORMAT(/2X,9HVARIANCE=,F20.6,17H   STANDARD DEV.=,F20.6/)
    5 WRITE(61,12) DV
   12 FORMAT(/2X,21HAVERAGE MONTHLY FLOW=,F15.6/)
      NN=NS
      KK=1
      DO 8 J=1,L1
      SU=0.0
      DO 7 K=KK,NN
    7 SU=SU+X(K)
      X5(J)=SU
      KK=KK+NS
    8 NN=NN+NS
      WRITE(61,14)
   14 FORMAT(//10X,21HANNUAL SYNTHETIC FLOW/)
      WRITE(61,3) (X5(J),J=1,L1)
      CALL XFREQ(X5,L1,NF,Y11,Y22,13,L)
      RETURN
      END
```

APPENDIX 4. COMPUTER PROGRAM FOR SYNTHETIC MONTHLY STREAMFLOW BASED ON THE Log NORMAL DISTRIBUTION (SFLOWLD)

```
      PROGRAM SFLOWLD
C   SYNTHETIC FLOW BASED ON THE LOG NORMAL DISTRIBUTION
      DIMENSION X(45),A(45,12),XM(13),XB(13),X1(45),XSIG(13),RH(13)
      DIMENSION ANME(10),AA(45),Y1(21),Y2(21),Y11(21,13),Y22(21,13)
      READ(60,10) (ANME(I),I=1,10)
   10 FORMAT(10A8)
      WRITE(61,11) (ANME(I),I=1,10)
   11 FORMAT(1H1,10X,10A8//)
C     L=YEARS OF SYNTHETIC RECORD, NS=NUMBER OF SEASONS PER YEAR
C     A(I,J)= MONTHLY STREAMFLOW DATA
C     L1=SYNTHETIC YEARS,   NF=NO. OF FREQUENCY INTERVAL.
      READ(60,1) L,NS,NF
    1 FORMAT(3I10)
      WRITE(61,30)
   30 FORMAT(/2X,40HMEAN MONTHLY STREAMFLOW DATA, UNIT = CFS//)
      DO 5 I=1,L
      READ(60,2) (A(I,J),J=1,NS)
      AB=0.0
      DO 14 J=1,NS
   14 AB=AB+A(I,J)
      AA(I)=AB
    5 WRITE(61,13) (A(I,J),J=1,NS),AA(I)
      WRITE(61,31)
   31 FORMAT(/2X,49HMEAN MONTHLY STREAMFLOW DATA, UNIT = ACRE-FT./DAY//)
      DO 19 I=1,L
      DO 20 J=1,NS
   20 A(I,J)=A(I,J)*1.983471
      AA(I)=AA(I)*1.983471
   19 WRITE(61,13) (A(I,J),J=1,NS),AA(I)
    2 FORMAT(8X,12F6.0)
   13 FORMAT(13F9.2)
      WRITE(61,32)
   32 FORMAT(/2X,29HANNUAL FREQUENCY DISTRIBUTION//)
      CALL FREQ(AA,L,NF,Y1,Y2)
      NF1=NF+1
      Y11(1,13)=Y1(1)
      DO 23 I1=2,NF1
      I3=I1-1
      Y11(I1,13)=Y1(I1)
   23 Y22(I3,13)=Y2(I3)
      DO 4 J=1,NS
      DO 3 I=1,L
    3 X(I)=A(I,J)
      WRITE(61,33) J
   33 FORMAT(/2X,6HMONTH=,I4,25H   FREQUENCY DISTRIBUTION//)
      CALL FREQ(X,L,NF,Y1,Y2)
      Y11(1,J)=Y1(1)
      DO 24 I2=2,NF1
      I3=I2-1
      Y11(I2,J)=Y1(I2)
   24 Y22(I3,J)=Y2(I3)
      DO 21 I=1,L
      IF(X(I).EQ.0.0) X(I)=1.0
   21 X(I)=ALOG(X(I))
      CALL AGM11(X,L,XMU)
      XM(J)=XMU
      IF(J.EQ.NS) GO TO 6
      DO 9 I=1,L
    9 X1(I)=ALOG(A(I,J+1))
      GO TO 7
    6 DO 8 I=1,L
```

```
    8 X1(I)=ALOG(A(I,1))
    7 CALL AGM11(X1,L,XM1)
      CALL AG12A(B,X,X1,L,XMU,XM1)
      XB(J)=B
      CALL AGM22(VAR,SIGMA,X,L,XMU)
      XSIG(J)=SIGMA
      SIG1=SIGMA
      CALL AGM22(VAR,SIGMA,X1,L,XM1)
      SIG2=SIGMA
      CALL AGM32(SIG1,SIG2,L,X,X1,XMU,XM1,RHO)
      RH(J)=RHO
    4 WRITE(61,22) XM(J),XB(J),XSIG(J),RH(J)
   22 FORMAT(/2X,5HMEAN=,F15.6,14H   REG. COEF.=,F10.6,12H   ST. DEV.=,F
     115.6,15H   CORR. COEF.=,F9.6/)
   16 READ(60,1) L1
      IF(L1.EQ.0) GO TO 17
      WRITE(61,18) L1
   18 FORMAT(1H1,5X,26HSYNTHETIC FLOW WITH YEARS=,I10//)
      CALL AGM31(XB,XSIG,RH,L,NS,XM,NF,L1,Y11,Y22)
      GO TO 16
   17 CALL EXIT
      END



      SUBROUTINE AGM31(B,XSIG,RHO,L,NS,XMU,NF,L1,Y11,Y22)
C     SYNTHETIC STREAM FLOW SEQUENCE (SEASONAL FLOWS)
      DIMENSION X(4801),XMU(13),XSIG(13),RHO(13),B(13)
      DIMENSION X5(501),Y11(21,13),Y22(21,13)
      IX=135
      AM=0.0
      S=1.0
      I=1
      X11=XMU(1)
C     X(I)=10.0**X11
      X(I)=EXP(X11)
      XMU(13)=XMU(1)
      XSIG(13)=XSIG(1)
      I1=0
      S1=0.0
      S2=X(I)/10000.
      DO 2 K=1,L1
      DO 2 J=1,NS
      TERM1=B(J)*(X11-XMU(J))
      CALL GAUSS(IX,IY,S,AM,Z)
      IX=IY
      TERM2=1-RHO(J)*RHO(J)
      TERM3=Z*XSIG(J+1)*SQRT(TERM2)
      X12=XMU(J+1)+TERM1+TERM3
      IF(X12) 6,10,10
    6 WRITE(61,3) X12
      X12=0.0
      S1=S1+EXP(X12)
      I1=I1+1
   10 X(I+1)=EXP(X12)
      S2=S2+X(I+1)/10000.0
      X11=X12
      I=I+1
    2 CONTINUE
      WRITE(61,9) S1,I1,S2
    9 FORMAT(2X,22HSUM OF NEGATIVE VALUE=,F15.5,16H  NO. OF N. V. =,I10,
     118H  TOTAL VOL 10**4=,F20.6)
```

```
      WRITE(61,3)(X(J),J=1,I)
    3 FORMAT(12F10.2)
      KI=1
      DO 5 J=1,NS
      KK=1
      SUM=0.0
      DO 4 K=KI,I,12
      X5(KK)=X(K)
      KK=KK+1
    4 SUM=SUM+X(K)
      CALL XFREQ(X5,L1,NF,Y11,Y22,J,L)
      KI=KI+1
      DV=SUM/L1
      CALL AGM22(VA,SIG,X5,L1,DV)
      WRITE(61,15) VA,SIG
   15 FORMAT(/2X,9HVARIANCE=,F20.6,17H   STANDARD DEV.=,F20.6/)
    5 WRITE(61,12) DV
   12 FORMAT(/2X,21HAVERAGE MONTHLY FLOW=,F15.6/)
      NN=NS
      KK=1
      DO 8 J=1,L1
      SU=0.0
      DO 7 K=KK,NN
    7 SU=SU+X(K)
      X5(J)=SU
      KK=KK+NS
    8 NN=NN+NS
      WRITE(61,14)
   14 FORMAT(//10X,21HANNUAL SYNTHETIC FLOW/)
      WRITE(61,3) (X5(J),J=1,L1)
      CALL XFREQ(X5,L1,NF,Y11,Y22,13,L)
      RETURN
      END
```

APPENDIX 5. COMPUTER PROGRAM FOR SYNTHETIC MONTHLY STREAMFLOW BASED ON THE Log PEARSON TYPE III DISTRIBUTION (SFLOWLPD)

```
      PROGRAM SFLOWLPD
C   SYNTHETIC FLOW BASED ON THE LOG PEARSON TYPE III DISTRIBUTION
      DIMENSION X(45),A(45,12),XM(13),XB(13),X1(45),XSIG(13),RH(13)
      DIMENSION ANME(10),AA(45),Y1(21),Y2(21),Y11(21,13),Y22(21,13)
      DIMENSION SK(13),X2(45),X3(45),XMM(13),XSI(13)
      READ(60,10) (ANME(I),I=1,10)
   10 FORMAT(10A8)
      WRITE(61,11) (ANME(I),I=1,10)
   11 FORMAT(1H1,10X,10A8//)
C     L=YEARS OF SYNTHETIC RECORD, NS=NUMBER OF SEASONS PER YEAR
C     A(I,J)= MONTHLY STREAMFLOW DATA
C     L1=SYNTHETIC YEARS,   NF=NO. OF FREQUENCY INTERVAL.
      READ(60,1) L,NS,NF
    1 FORMAT(3I10)
      WRITE(61,30)
   30 FORMAT(/2X,40HMEAN MONTHLY STREAMFLOW DATA, UNIT = CFS//)
      DO 5 I=1,L
      READ(60,2) (A(I,J),J=1,NS)
      AB=0.0
      DO 14 J=1,NS
   14 AB=AB+A(I,J)
      AA(I)=AB
    5 WRITE(61,13) (A(I,J),J=1,NS),AA(I)
      WRITE(61,31)
   31 FORMAT(/2X,49HMEAN MONTHLY STREAMFLOW DATA, UNIT = ACRE-FT./DAY//)
      DO 19 I=1,L
      DO 20 J=1,NS
   20 A(I,J)=A(I,J)*1.983471
      AA(I)=AA(I)*1.983471
   19 WRITE(61,13) (A(I,J),J=1,NS),AA(I)
    2 FORMAT(8X,12F6.0)
   13 FORMAT(13F9.2)
      WRITE(61,32)
   32 FORMAT(/2X,29HANNUAL FREQUENCY DISTRIBUTION//)
      CALL FREQ(AA,L,NF,Y1,Y2)
      NF1=NF+1
      Y11(1,13)=Y1(1)
      DO 23 I1=2,NF1
      I3=I1-1
      Y11(I1,13)=Y1(I1)
   23 Y22(I3,13)=Y2(I3)
      DO 4 J=1,NS
      DO 3 I=1,L
    3 X(I)=A(I,J)
      WRITE(61,33) J
   33 FORMAT(/2X,6HMONTH=,I4,25H   FREQUENCY DISTRIBUTION//)
      CALL FREQ(X,L,NF,Y1,Y2)
      Y11(1,J)=Y1(1)
      DO 24 I2=2,NF1
      I3=I2-1
      Y11(I2,J)=Y1(I2)
   24 Y22(I3,J)=Y2(I3)
      DO 21 I=1,L
      IF(X(I).EQ.0.0) X(I)=1.0
   21 X(I)=ALOG(X(I))
      CALL AGM11(X,L,XMU)
      XMM(J)=XMU
      CALL AGM22(VAR,SIGMA,X,L,XMU)
      XSI(J)=SIGMA
      CALL AGM23(X,L,XMU,SIGMA,SKC)
      SK(J)=SKC
```

```
      CALL AGM24(X,L,XMU,SIGMA,X2)
      WRITE(61,13) (X2(I),I=1,L)
      CALL AGM25(X2,L,SKC,X3)
      WRITE(61,13) (X3(I),I=1,L)
      IF(J.EQ.NS) GO TO 6
      DO 9 I=1,L
    9 X(I)=ALOG(A(I,J+1))
      GO TO 7
    6 DO 8 I=1,L
    8 X(I)=ALOG(A(I,1))
    7 CALL AGM11(X,L,XMU)
      CALL AGM22(VAR,SIGMA,X,L,XMU)
      CALL AGM23(X,L,XMU,SIGMA,SKC)
      CALL AGM24(X,L,XMU,SIGMA,X2)
      CALL AGM25(X2,L,SKC,X1)
      CALL AGM11(X3,L,XMU)
      XM(J)=XMU
      CALL AGM11(X1,L,XM1)
      CALL AG12A(B,X3,X1,L,XMU,XM1)
      XB(J)=B
      CALL AGM22(VAR,SIGMA,X3,L,XMU)
      XSIG(J)=SIGMA
      SIG1=SIGMA
      CALL AGM22(VAR,SIGMA,X1,L,XM1)
      SIG2=SIGMA
      CALL AGM32(SIG1,SIG2,L,X3,X1,XMU,XM1,RHO)
      RH(J)=RHO
    4 WRITE(61,22) XM(J),XB(J),XSIG(J),RH(J)
   22 FORMAT(/2X,5HMEAN=,F15.6,14H   REG. COEF.=,F10.6,12H   ST. DEV.=,F
     115.6,15H   CORR. COEF.=,F9.6/)
   16 READ(60,1) L1
      IF(L1.EQ.0) GO TO 17
      WRITE(61,18) L1
   18 FORMAT(1H1,5X,26HSYNTHETIC FLOW WITH YEARS=,I10//)
      CALL AGM31(XB,XSIG,RH,L,NS,XM,NF,L1,Y11,Y22,SK,XMM,XSI)
      GO TO 16
   17 CALL EXIT
      END



      SUBROUTINE AGM31(B,XSIG,RHO,L,NS,XMU,NF,L1,Y11,Y22,SK,XMM,XSI)
      DIMENSION X(4801),XMU(13),XSIG(13),RHO(13),B(13)
      DIMENSION X5(501),Y11(21,13),Y22(21,13),SK(13),XMM(13),XSI(13)
C     SYNTHETIC STREAM FLOW SEQUENCE (SEASONAL FLOWS)
      IX=135
      AM=0.0
      S=1.0
      I=1
      X11=XMU(1)
      TP1=(SK(1)/6.0)*(X11-SK(1)/6.0)+1.0
      TP2=1.0
      IF(TP1.GE.0.0) GO TO 15
      TP1=-TP1
      TP2=-1.0
   15 X14=(TP2*TP1**3.0-1.0)*2.0/SK(1)
      X15=X14*XSI(1)+XMM(1)
      X(I)=EXP(X15)
      XMU(13)=XMU(1)
      XSIG(13)=XSIG(1)
      SK(13)=SK(1)
      XMM(13)=XMM(1)
```

```
      XSI(13)=XSI(1)
      I1=0
      S1=0.0
      S2=X(I)/10000.
      DO 2 K=1,L1
      DO 2 J=1,NS
      TERM1=B(J)*(X11-XMU(J))
      CALL GAUSS(IX,IY,S,AM,Z)
      IX=IY
      TERM2=1-RHO(J)*RHO(J)
      TERM3=Z*XSIG(J+1)*SQRT(TERM2)
      X12=XMU(J+1)+TERM1+TERM3
      IF(X12) 6,10,10
    6 CONTINUE
      S1=S1+X12
      I1=I1+1
   10 TP1=(SK(J+1)/6.0)*(X12-SK(J+1)/6.0)+1.0
      TP2=1.0
      IF(TP1.GE.0.0) GO TO 16
      TP1=-TP1
      TP2=-1.0
   16 X14=(TP2*TP1**3.0-1.0)*2.0/SK(J+1)
      X15=X14*XSI(J+1)+XMM(J+1)
      X(I+1)=EXP(X15)
      S2=S2+X(I+1)/10000.0
      X11=X12
      I=I+1
    2 CONTINUE
      WRITE(61,9) S1,I1,S2
    9 FORMAT(2X,22HSUM OF NEGATIVE VALUE=,F15.5,16H  NO. OF N. V. =,I10,
     118H  TOTAL VOL 10**4=,F20.6)
      WRITE(61,3)(X(J),J=1,I)
    3 FORMAT(12F10.2)
      KI=1
      DO 5 J=1,NS
      KK=1
      SUM=0.0
      DO 4 K=KI,I,12
      X5(KK)=X(K)
      KK=KK+1
    4 SUM=SUM+X(K)
      CALL XFREQ(X5,L1,NF,Y11,Y22,J,L)
      KI=KI+1
      DV=SUM/L1
      CALL AGM22(VA,SIG,X5,L1,DV)
      WRITE(61,15) VA,SIG
   15 FORMAT(/2X,9HVARIANCE=,F20.6,17H   STANDARD DEV.=,F20.6/)
    5 WRITE(61,12) DV
   12 FORMAT(/2X,21HAVERAGE MONTHLY FLOW=,F15.6/)
      NN=NS
      KK=1
      DO 8 J=1,L1
      SU=0.0
      DO 7 K=KK,NN
    7 SU=SU+X(K)
      X5(J)=SU
      KK=KK+NS
    8 NN=NN+NS
      WRITE(61,14)
   14 FORMAT(//10X,21HANNUAL SYNTHETIC FLOW/)
      WRITE(61,3) (X5(J),J=1,L1)
      CALL XFREQ(X5,L1,NF,Y11,Y22,13,L)
```

```
      RETURN
      END


      SUBROUTINE AGM23(X,N,XM,SIG,SKC)
C      COMPUTE SKEWNESS COEFFICIENTS
      DIMENSION X(1)
      SUM=0.0
      DO 1 I=1,N
      DIFFS=(X(I)-XM)*(X(I)-XM)*(X(I)-XM)
    1 SUM=SUM+DIFFS
      FN=N
      SKC=FN*SUM/((FN-1.0)*(FN-2.0)*SIG*SIG*SIG)
      WRITE(61,2) SKC
    2 FORMAT(/2X,21HSKEWNESS COEFFICIENT=,F20.6/)
      RETURN
      END


      SUBROUTINE AGM24(X,N,XM,SIG,X2)
      DIMENSION X(1),X2(1)
C     X2=(X-M)/S
      DO 1 I=1,N
    1 X2(I)=(X(I)-XM)/SIG
      RETURN
      END


      SUBROUTINE AGM25(X2,N,SKC,X3)
C      NORMAL STANDARD DEVIATE
      DIMENSION X2(1),X3(1)
      DO 1 I=1,N
      S1=X2(I)*SKC*0.5+1.0
      TP=1.0
      IF(S1.GE.0.0) GO TO 2
      S1=-S1
      TP=-1.0
    2 X3(I)=(6.0/SKC)*(TP*S1**(1.0/3.0)-1.0)+SKC/6.0
    1 CONTINUE
      RETURN
      END
```

APPENDIX 6. COMPUTER PROGRAM FOR SYNTHETIC MONTHLY STREAMFLOW BASED ON THE SQUARE ROOT NORMAL DISTRIBUTION (SFLOWSD)

```
      PROGRAM SFLOWSD
C   SYNTHETIC FLOW BASED ON THE SQUARE ROOT DISTRIBUTION
      DIMENSION X(45),A(45,12),XM(13),XB(13),X1(45),XSIG(13),RH(13)
      DIMENSION ANME(10),AA(45),Y1(21),Y2(21),Y11(21,13),Y22(21,13)
      READ(60,10) (ANME(I),I=1,10)
   10 FORMAT(10A8)
      WRITE(61,11) (ANME(I),I=1,10)
   11 FORMAT(1H1,10X,10A8//)
C     L=YEARS OF SYNTHETIC RECORD, NS=NUMBER OF SEASONS PER YEAR
C     A(I,J)= MONTHLY STREAMFLOW DATA
C     L1=SYNTHETIC YEARS,   NF=NO. OF FREQUENCY INTERVAL.
      READ(60,1) L,NS,NF
    1 FORMAT(3I10)
      WRITE(61,30)
   30 FORMAT(/2X,40HMEAN MONTHLY STREAMFLOW DATA, UNIT = CFS//)
      DO 5 I=1,L
      READ(60,2) (A(I,J),J=1,NS)
      AB=0.0
      DO 14 J=1,NS
   14 AB=AB+A(I,J)
      AA(I)=AB
    5 WRITE(61,13) (A(I,J),J=1,NS),AA(I)
      WRITE(61,31)
   31 FORMAT(/2X,49HMEAN MONTHLY STREAMFLOW DATA, UNIT = ACRE-FT./DAY//)
      DO 19 I=1,L
      DO 20 J=1,NS
   20 A(I,J)=A(I,J)*1.983471
      AA(I)=AA(I)*1.983471
   19 WRITE(61,13) (A(I,J),J=1,NS),AA(I)
    2 FORMAT(8X,12F6.0)
   13 FORMAT(13F9.2)
      WRITE(61,32)
   32 FORMAT(/2X,29HANNUAL FREQUENCY DISTRIBUTION//)
      CALL FREQ(AA,L,NF,Y1,Y2)
      NF1=NF+1
      Y11(1,13)=Y1(1)
      DO 23 I1=2,NF1
      I3=I1-1
      Y11(I1,13)=Y1(I1)
   23 Y22(I3,13)=Y2(I3)
      DO 4 J=1,NS
      DO 3 I=1,L
    3 X(I)=A(I,J)
      WRITE(61,33) J
   33 FORMAT(/2X,6HMONTH=,I4,25H   FREQUENCY DISTRIBUTION//)
      CALL FREQ(X,L,NF,Y1,Y2)
      Y11(1,J)=Y1(1)
      DO 24 I2=2,NF1
      I3=I2-1
      Y11(I2,J)=Y1(I2)
   24 Y22(I3,J)=Y2(I3)
      DO 21 I=1,L
      IF(X(I).EQ.0.0) X(I)=1.0
   21 X(I)=SQRT(X(I))
      CALL AGM11(X,L,XMU)
      XM(J)=XMU
      IF(J.EQ.NS) GO TO 6
      DO 9 I=1,L
    9 X1(I)=SQRT(A(I,J+1))
      GO TO 7
    6 DO 8 I=1,L
```

```
  8 X1(I)=SQRT(A(I,1))
  7 CALL AGM11(X1,L,XM1)
    CALL AG12A(B,X,X1,L,XMU,XM1)
    XB(J)=B
    CALL AGM22(VAR,SIGMA,X,L,XMU)
    XSIG(J)=SIGMA
    SIG1=SIGMA
    CALL AGM22(VAR,SIGMA,X1,L,XM1)
    SIG2=SIGMA
    CALL AGM32(SIG1,SIG2,L,X,X1,XMU,XM1,RHO)
    RH(J)=RHO
  4 WRITE(61,22) XM(J),XB(J),XSIG(J),RH(J)
 22 FORMAT(/2X,5HMEAN=,F15.6,14H   REG. COEF.=,F10.6,12H   ST. DEV.=,F
   115.6,15H   CORR. COEF.=,F9.6/)
 16 READ(60,1) L1
    IF(L1.EQ.0) GO TO 17
    WRITE(61,18) L1
 18 FORMAT(1H1,5X,26HSYNTHETIC FLOW WITH YEARS=,I10//)
    CALL AGM31(XB,XSIG,RH,L,NS,XM,NF,L1,Y11,Y22)
    GO TO 16
 17 CALL EXIT
    END



    SUBROUTINE AGM31(B,XSIG,RHO,L,NS,XMU,NF,L1,Y11,Y22)
C       SYNTHETIC STREAM FLOW SEQUENCE (SEASONAL FLOWS)
    DIMENSION X(4801),XMU(13),XSIG(13),RHO(13),B(13)
    DIMENSION X5(501),Y11(21,13),Y22(21,13)
    IX=135
    AM=0.0
    S=1.0
    I=1
    X(I)=XMU(1)*XMU(1)
    X11=X(I)
    XMU(13)=XMU(1)
    XSIG(13)=XSIG(1)
    I1=0
    S1=0.0
    S2=X(I)/10000.
    DO 2 K=1,L1
    DO 2 J=1,NS
    X11=SQRT(X11)
    TERM1=B(J)*(X11-XMU(J))
    CALL GAUSS(IX,IY,S,AM,Z)
    IX=IY
    TERM2=1-RHO(J)*RHO(J)
    TERM3=Z*XSIG(J+1)*SQRT(TERM2)
    X12=(XMU(J+1)+TERM1+TERM3)*(XMU(J+1)+TERM1+TERM3)
    IF(X12) 6,10,10
  6 WRITE(61,3) X12
    S1=S1+X12
    X12=0.0
    I1=I1+1
 10 X(I+1)=X12
    S2=S2+X(I+1)/10000.0
    X11=X12
    I=I+1
  2 CONTINUE
    WRITE(61,9) S1,I1,S2
  9 FORMAT(2X,22HSUM OF NEGATIVE VALUE=,F15.5,16H  NO. OF N. V. =,I10,
   118H  TOTAL VOL 10**4=,F20.6)
```

```
      WRITE(61,3)(X(J),J=1,I)
    3 FORMAT(12F10.2)
      KI=1
      DO 5 J=1,NS
      KK=1
      SUM=0.0
      DO 4 K=KI,I,12
      X5(KK)=X(K)
      KK=KK+1
    4 SUM=SUM+X(K)
      CALL XFREQ(X5,L1,NF,Y11,Y22,J,L)
      KI=KI+1
      DV=SUM/L1
      CALL AGM22(VA,SIG,X5,L1,DV)
      WRITE(61,15) VA,SIG
   15 FORMAT(/2X,9HVARIANCE=,F20.6,17H   STANDARD DEV.=,F20.6/)
    5 WRITE(61,12) DV
   12 FORMAT(/2X,21HAVERAGE MONTHLY FLOW=,F15.6/)
      NN=NS
      KK=1
      DO 8 J=1,L1
      SU=0.0
      DO 7 K=KK,NN
    7 SU=SU+X(K)
      X5(J)=SU
      KK=KK+NS
    8 NN=NN+NS
      WRITE(61,14)
   14 FORMAT(//10X,21HANNUAL SYNTHETIC FLOW/)
      WRITE(61,3) (X5(J),J=1,L1)
      CALL XFREQ(X5,L1,NF,Y11,Y22,13,L)
      RETURN
      END
```

APPENDIX 7. COMPUTER PROGRAM FOR SYNTHETIC MONTHLY STREAMFLOW BASED ON THE JOINING OF NORMAL AND SQUARE ROOT DISTRIBUTION (NSD)

```
      PROGRAM SFLOWNSD
C    SYNTHETIC FLOW BASED ON NORMAL AND SQUARE ROOT DISTRIBUTION
      DIMENSION X(45),A(45,12),XM(13),XB(13),X1(45),XSIG(13),RH(13)
      DIMENSION ANME(10),AA(45),Y1(21),Y2(21),Y11(21,13),Y22(21,13)
      DIMENSION X2(45),X3(45),XMS(13),XBB(13),XSI(13),RHH(13)
      READ(60,10) (ANME(I),I=1,10)
   10 FORMAT(10A8)
      WRITE(61,11) (ANME(I),I=1,10)
   11 FORMAT(1H1,10X,10A8//)
C     L=YEARS OF SYNTHETIC RECORD, NS=NUMBER OF SEASONS PER YEAR
C     A(I,J)= MONTHLY STREAMFLOW DATA
C     L1=SYNTHETIC YEARS,   NF=NO. OF FREQUENCY INTERVAL.
      READ(60,1) L,NS,NF
    1 FORMAT(3I10)
      WRITE(61,30)
   30 FORMAT(/2X,40HMEAN MONTHLY STREAMFLOW DATA, UNIT = CFS//)
      DO 5 I=1,L
      READ(60,2) (A(I,J),J=1,NS)
      AB=0.0
      DO 14 J=1,NS
   14 AB=AB+A(I,J)
      AA(I)=AB
    5 WRITE(61,13) (A(I,J),J=1,NS),AA(I)
      WRITE(61,31)
   31 FORMAT(/2X,49HMEAN MONTHLY STREAMFLOW DATA, UNIT = ACRE-FT./DAY//)
      DO 19 I=1,L
      DO 20 J=1,NS
   20 A(I,J)=A(I,J)*1.983471
      AA(I)=AA(I)*1.983471
   19 WRITE(61,13) (A(I,J),J=1,NS),AA(I)
    2 FORMAT(8X,12F6.0)
   13 FORMAT(13F9.2)
      WRITE(61,32)
   32 FORMAT(/2X,29HANNUAL FREQUENCY DISTRIBUTION//)
      CALL FREQ(AA,L,NF,Y1,Y2)
      NF1=NF+1
      Y11(1,13)=Y1(1)
      DO 23 I1=2,NF1
      I3=I1-1
      Y11(I1,13)=Y1(I1)
   23 Y22(I3,13)=Y2(I3)
      DO 4 J=1,NS
      DO 3 I=1,L
      X2(I)=SQRT(A(I,J))
    3 X(I)=A(I,J)
      WRITE(61,33) J
   33 FORMAT(/2X,6HMONTH=,I4,25H   FREQUENCY DISTRIBUTION//)
      CALL FREQ(X,L,NF,Y1,Y2)
      Y11(1,J)=Y1(1)
      DO 24 I2=2,NF1
      I3=I2-1
      Y11(I2,J)=Y1(I2)
   24 Y22(I3,J)=Y2(I3)
      CALL AGM11(X,L,XMU)
      XM(J)=XMU
      CALL AGM11(X2,L,XM2)
      XMS(J)=XM2
      IF(J.EQ.NS) GO TO 6
      DO 9 I=1,L
      X3(I)=SQRT(A(I,J+1))
    9 X1(I)=A(I,J+1)
```

```
      GO TO 7
    6 DO 8 I=1,L
      X3(I)=SQRT(A(I,1))
    8 X1(I)=A(I,1)
    7 CALL AGM11(X1,L,XM1)
      CALL AG12A(B,X,X1,L,XMU,XM1)
      XB(J)=B
      CALL AGM22(VAR,SIGMA,X,L,XMU)
      XSIG(J)=SIGMA
      SIG1=SIGMA
      CALL AGM22(VAR,SIGMA,X1,L,XM1)
      SIG2=SIGMA
      CALL AGM32(SIG1,SIG2,L,X,X1,XMU,XM1,RHO)
      RH(J)=RHO
      CALL AGM11(X3,L,XM3)
      CALL AG12A(BB,X2,X3,L,XM2,XM3)
      XBB(J)=BB
      CALL AGM22(VAR,SIGM,X2,L,XM2)
      XSI(J)=SIGM
      SIG3=SIGM
      CALL AGM22(VAR,SIGM,X3,L,XM3)
      SIG4=SIGM
      CALL AGM32(SIG3,SIG4,L,X2,X3,XM2,XM3,RHOO)
      RHH(J)=RHOO
      WRITE(61,22) XMS(J),XBB(J),XSI(J),RHH(J)
    4 WRITE(61,22) XM(J),XB(J),XSIG(J),RH(J)
   22 FORMAT(/2X,5HMEAN=,F15.6,14H   REG. COEF.=,F10.6,12H   ST. DEV.=,F
     115.6,15H   CORR. COEF.=,F9.6/)
   16 READ(60,1) L1
      IF(L1.EQ.0) GO TO 17
      WRITE(61,18) L1
   18 FORMAT(1H1,5X,26HSYNTHETIC FLOW WITH YEARS=,I10//)
      CALL AGM31(XB,XSIG,RH,L,NS,XM,NF,L1,Y11,Y22,XBB,XSI,RHH,XMS)
      GO TO 16
   17 CALL EXIT
      END


      SUBROUTINE AGM31(B,XSIG,RHO,L,NS,XMU,NF,L1,Y11,Y22,XBB,XSI,RHH,XMS
     1)
C     SYNTHETIC STREAM FLOW SEQUENCE (SEASONAL FLOWS)
      DIMENSION X(4801),XMU(13),XSIG(13),RHO(13),B(13),XMS(13)
      DIMENSION X5(501),Y11(21,13),Y22(21,13),XBB(13),XSI(13),RHH(13)
      IX=135
      AM=0.0
      S=1.0
      I=1
      X(I)=XMS(1)*XMS(1)
      X11=X(I)
      XSI(13)=XSI(1)
      XMS(13)=XMS(1)
      XMU(13)=XMU(1)
      XSIG(13)=XSIG(1)
      I1=0
      S1=0.0
      S2=X(I)/10000.
      DO 2 K=1,L1
      DO 2 J=1,NS
      IF(J.EQ.2.OR.J.EQ.6.OR.J.EQ.7.OR.J.EQ.8.OR.J.EQ.12) GO TO 15
      IF(J.EQ.5) GO TO 15
      TERM1=B(J)*(X11-XMU(J))
```

```
      CALL GAUSS(IX,IY,S,AM,Z)
      IX=IY
      TERM2=1-RHO(J)*RHO(J)
      TERM3=Z*XSIG(J+1)*SQRT(TERM2)
      X12=XMU(J+1)+TERM1+TERM3
      GO TO 16
   15 X11=SQRT(X11)
      TER1=XBB(J)*(X11-XMS(J))
      CALL GAUSS(IX,IY,S,AM,Z)
      IX=IY
      TER2=1-RHH(J)*RHH(J)
      TER3=Z*XSI(J+1)*SQRT(TER2)
      X12=(XMS(J+1)+TER1+TER3)*(XMS(J+1)+TER1+TER3)
   16 CONTINUE
      IF(X12) 6,10,10
    6 WRITE(61,3) X12
       S1=S1+X12
      X12=0.0
      I1=I1+1
   10 X(I+1)=X12
      S2=S2+X(I+1)/10000.0
      X11=X12
      I=I+1
    2 CONTINUE
      WRITE(61,9) S1,I1,S2
    9 FORMAT(2X,22HSUM OF NEGATIVE VALUE=,F15.5,16H  NO. OF N. V. =,I10,
     118H  TOTAL VOL 10**4=,F20.6)
      WRITE(61,3)(X(J),J=1,I)
    3 FORMAT(12F10.2)
      KI=1
      DO 5 J=1,NS
      KK=1
      SUM=0.0
      DO 4 K=KI,I,12
      X5(KK)=X(K)
      KK=KK+1
    4 SUM=SUM+X(K)
      CALL XFREQ(X5,L1,NF,Y11,Y22,J,L)
      KI=KI+1
      DV=SUM/L1
      CALL AGM22(VA,SIG,X5,L1,DV)
      WRITE(61,15) VA,SIG
   15 FORMAT(/2X,9HVARIANCE=,F20.6,17H   STANDARD DEV.=,F20.6/)
    5 WRITE(61,12) DV
   12 FORMAT(/2X,21HAVERAGE MONTHLY FLOW=,F15.6/)
      NN=NS
      KK=1
      DO 8 J=1,L1
      SU=0.0
      DO 7 K=KK,NN
    7 SU=SU+X(K)
      X5(J)=SU
      KK=KK+NS
    8 NN=NN+NS
      WRITE(61,14)
   14 FORMAT(//10X,21HANNUAL SYNTHETIC FLOW/)
      WRITE(61,3) (X5(J),J=1,L1)
      CALL XFREQ(X5,L1,NF,Y11,Y22,13,L)
      RETURN
      END
```

APPENDIX 8. SUBROUTINE PROGRAMS FOR AGM11, AGM12A, AGM22, AGM32, GAUSS, RANDD, FREQ AND XFREQ.

```
      SUBROUTINE AGM11(X,N,XMU)
C     TO COMPUTE THE MEAN VALUE OF DATA
      DIMENSION X(50)
      SUM=0.0
      DO 3 I=1,N
    3 SUM=SUM+X(I)
      XN=N
      XMU=SUM/XN
      RETURN
      END



      SUBROUTINE AG12A(B,X,X1,N,XMU,XM1)
C     COMPUTE THE SLOPE OF DATA
C     B=SLOPE
      DIMENSION X(50),X1(50)
      SUMP=0.0
      SUMS=0.0
      DO 1 I=1,N
      SUMPI=X1(I)*X(I)
      SUMP=SUMP+SUMPI
      SUMSI=X(I)*X(I)
    1 SUMS=SUMS+SUMSI
      XN=N
      B=(SUMP-XN*XM1*XMU)/(SUMS-XN*XMU*XMU)
      RETURN
      END



      SUBROUTINE AGM22(VAR,SIGMA,X,N,XMU)
C     COMPUTE VARIANCE AND STANDARD DEVIATION
      DIMENSION X(501)
      SUM=0.0
      DO 1 I=1,N
      DIFFS=(X(I)-XMU)*(X(I)-XMU)
    1 SUM=SUM+DIFFS
      VAR=SUM/(N-1)
      SIGMA=SQRT(VAR)
      RETURN
      END



      SUBROUTINE AGM32(SIGMA1,SIGMA2,N,X,X1,XMU,XM1,RHO)
C     COMPUTE THE CORRELATION COEFFICIENTS
      DIMENSION X(50),X1(50)
      SUM=0.0
      K=N-1
      DO 1 I=1,K
      PROD=(X(I)-XMU)*(X1(I)-XM1)
    1 SUM=SUM+PROD
      RHO=SUM/(K*SIGMA1*SIGMA2)
      RETURN
      END



      SUBROUTINE GAUSS(IX,IY,S,AM,Z)
C     COMPUTES A NORMALLY DISTRIBUTED RANDOM NUMBER WITH A GIVEN
```

```
C       MEAN AND STANDARD DEVIATION
        A=0.0
        DO 1 I=1,12
        CALL RANDD(IX,IY,Y)
        IX=IY
      1 A=A+Y
        Z=(A-6.0)*S+AM
        RETURN
        END



        SUBROUTINE RANDD(IX,IY,YFL)
C       GENERATE THE RANDOM NUMBER
        IY=IX*4099
        IF(IY)5,6,6
      5 IY=IY+8388607+1
      6 YFL=IY
        YFL=YFL/8388607
        RETURN
        END



        SUBROUTINE FREQ(X,L,NN,YY,XN)
C       COMPUTE THE FREQUENCY DISTRIBUTION
C       X=INPUT DATA,   L=LENTH OF INPUT DATA,  NN=NO. OF FREQ. INTERVAL
        DIMENSION X(501),N(20),YY(21),XN(20),XNN(21)
        YMIN=1.0E30
        YMAX=-1.0E30
        DO 7 I=1,L
        IF(X(I)-YMIN) 9,10,10
      9 YMIN=X(I)
     10 IF(X(I)-YMAX) 7,7,11
     11 YMAX=X(I)
      7 CONTINUE
        WRITE(61,12) YMAX,YMIN
     12 FORMAT(2X,5HYMAX=,F15.4,8H   YMIN=,F15.4)
        YMAMI=(YMAX-YMIN)/NN
        YY(1)=YMIN-0.0001
        DO 1 I=1,NN
      1 YY(I+1)=I*YMAMI+YMIN
        DO 2 I=1,NN
      2 N(I)=0
        DO 3 J=1,L
        DO 3 I=1,NN
        IF(X(J).LE.YY(I+1).AND.X(J).GT.YY(I)) N(I)=N(I)+1
      3 CONTINUE
        I=1
        FNSL=L
        XNN(I)=0.0
        DO 4 I=1,NN
        XN(I)=N(I)/FNSL
      4 XNN(I+1)=XNN(I)+XN(I)
        WRITE(61,13)
     13 FORMAT(/2X,58HCLASS INTERVAL   OBS. FREQ.   PROB. FCN.   CUM. PROB
       1. FCN./)
        DO 6 I=1,NN
      6 WRITE(61,5) YY(I+1),N(I),XN(I),XNN(I+1)
      5 FORMAT(F15.5,I10,2F15.5)
        RETURN
        END
```

```
      SUBROUTINE XFREQ(X,L1,NN,Y1,Y2,J1,L)
C     CHI-SQUARE TEST FOR GOODNESS-OF-FIT
      DIMENSION X(501),Y1(21,13),Y2(21,13),N(20),XN(20),XNN(21)
      DO 2 I=1,NN
    2 N(I)=0
      DO 3 J=1,L1
      IF(X(J).LE.Y1(1,J1)) N(1)=N(1)+1
      IF(X(J).GT.Y1(NN+1,J1)) N(NN)=N(NN)+1
      DO 3 I=1,NN
      IF(X(J).LE.Y1(I+1,J1).AND.X(J).GT.Y1(I,J1)) N(I)=N(I)+1
    3 CONTINUE
      I=1
      FNSL=L1
      XNN(I)=0.0
      DO 4 I=1,NN
      XN(I)=N(I)/FNSL
    4 XNN(I+1)=XNN(I)+XN(I)
      WRITE(61,12)
   12 FORMAT(/2X,58HCLASS INTERVAL   OBS. FREQ.   PROB. FCN.   CUM. PROB
     1. FCN./)
      DO 6 I=1,NN
    6 WRITE(61,5) Y1(I+1,J1),N(I),XN(I),XNN(I+1)
    5 FORMAT(F15.5,I10,2F15.5)
      XSQ=0.0
      DO 7 I=1,NN
      IF(XN(I).EQ.0.0) GO TO 9
      XSQ=XSQ+(((Y2(I,J1)-XN(I))*(Y2(I,J1)-XN(I)))/XN(I))*L
      GO TO 7
    9 XSQ=XSQ+Y2(I,J1)*L
    7 CONTINUE
      IF(J1.EQ.13) GO TO 10
      WRITE(61,8) J1,XSQ
    8 FORMAT(/2X,6HMONTH=,I4,14H   CHI-SQUARE=,F20.6/)
      RETURN
   10 WRITE(61,11) XSQ
   11 FORMAT(/2X,18HANNUAL CHI-SQUARE=,F20.6/)
      RETURN
      END
```

ANNEX A: EXAMPLE OF COMPUTER OUTPUT

DATA OF MEAN MONTHLY STREAM FLOW KISSIMMEE RIVER

SYNTHETIC FLOW BASED ON THE NORMAL DISTRIBUTION

MEAN MONTHLY STREAMFLOW DATA. UNIT = CFS

JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	ANNUAL
1826.00	1467.00	1158.00	883.00	681.00	768.00	1323.00	1560.00	2929.00	5344.00	3325.00	2529.00	23793.00
2019.00	1945.00	1984.00	2916.00	3379.00	10030.00	7775.00	4714.00	4250.00	4510.00	3360.00	2630.00	49512.00
2840.00	2770.00	3110.00	2830.00	2360.00	1670.00	1270.00	1140.00	1290.00	1170.00	1030.00	872.00	22352.00
737.00	598.00	502.00	381.00	328.00	802.00	549.00	851.00	2120.00	1270.00	1120.00	875.00	10133.00
720.00	612.00	545.00	550.00	384.00	341.00	998.00	2490.00	7740.00	5010.00	3040.00	2180.00	24610.00
1650.00	1420.00	1260.00	1300.00	1290.00	3970.00	7200.00	5180.00	4190.00	2949.00	2097.00	1494.00	34000.00
1185.00	939.00	706.00	575.00	431.00	314.00	462.00	524.00	1288.00	3000.00	1735.00	1349.00	12508.00
1234.00	1847.00	2929.00	2076.00	1516.00	1678.00	1760.00	1916.00	2123.00	2298.00	2135.00	1748.00	23260.00
1464.00	1346.00	1264.00	1396.00	1081.00	980.00	1005.00	957.00	1045.00	2339.00	2645.00	3522.00	19044.00
2148.00	1722.00	1364.00	999.00	674.00	761.00	1059.00	1544.00	1270.00	1356.00	1342.00	1005.00	15244.00
815.00	668.00	489.00	415.00	376.00	319.00	1018.00	1977.00	3535.00	3148.00	2397.00	1807.00	16964.00
1605.00	1497.00	1468.00	1496.00	1118.00	1042.00	1392.00	1783.00	2707.00	2654.00	1551.00	1219.00	19532.00
1496.00	1738.00	1556.00	1847.00	1908.00	1470.00	2878.00	3399.00	2440.00	2975.00	2916.00	2397.00	27020.00
2838.00	2592.00	3799.00	2534.00	1802.00	2616.00	2412.00	2227.00	2139.00	1783.00	1329.00	1098.00	27169.00
900.00	754.00	748.00	562.00	445.00	482.00	1025.00	1355.00	1719.00	3066.00	1722.00	1382.00	14160.00
1162.00	945.00	734.00	976.00	644.00	536.00	613.00	952.00	1237.00	1349.00	1741.00	1598.00	12487.00
1474.00	1320.00	1079.00	797.00	557.00	476.00	1809.00	3219.00	6155.00	6126.00	4378.00	3301.00	30691.00
2504.00	1835.00	1624.00	1170.00	998.00	1003.00	949.00	1340.00	2059.00	2168.00	1778.00	1521.00	18949.00
1269.00	1088.00	1589.00	1656.00	1301.00	2772.00	5223.00	5603.00	8975.00	9134.00	6240.00	4680.00	49530.00
4115.00	3836.00	2695.00	2093.00	1698.00	1406.00	1453.00	1683.00	5832.00	11500.00	5384.00	3549.00	45244.00
2436.00	1838.00	1310.00	943.00	683.00	596.00	977.00	1879.00	4839.00	6869.00	4128.00	2448.00	28946.00
1793.00	1520.00	1184.00	869.00	701.00	741.00	744.00	558.00	620.00	1427.00	1693.00	1147.00	12997.00
1080.00	1105.00	917.00	1452.00	1681.00	939.00	1510.00	1975.00	1581.00	3939.00	2733.00	2286.00	21198.00
1804.00	1527.00	1335.00	1394.00	1469.00	1580.00	1566.00	1716.00	1938.00	3579.00	3813.00	2397.00	24118.00
1827.00	1611.00	1466.00	1533.00	1485.00	1429.00	1658.00	2518.00	7463.00	11780.00	7678.00	6984.00	47432.00
5399.00	3715.00	2769.00	1941.00	1632.00	3424.00	3253.00	2344.00	2321.00	2619.00	1590.00	1616.00	32623.00
1336.00	1233.00	925.00	745.00	492.00	470.00	1130.00	1126.00	1124.00	802.00	547.00	467.00	10397.00
395.00	326.00	263.00	171.00	116.00	99.00	125.00	140.00	465.00	3398.00	2289.00	1375.00	9162.00
1151.00	1019.00	1402.00	1667.00	2229.00	1905.00	2461.00	3468.00	4554.00	4247.00	2671.00	1786.00	28560.00
2315.00	2959.00	3111.00	3097.00	2626.00	1951.00	2072.00	1915.00	1812.00	1330.00	834.00	710.00	24732.00
734.00	807.00	1712.00	2725.00	2233.00	4484.00	5897.00	5351.00	6128.00	8118.00	6688.00	4517.00	49394.00
3059.00	2983.00	3783.00	5992.00	3866.00	2850.00	3990.00	9293.00	11860.00	11480.00	7066.00	4249.00	70471.00
2891.00	2321.00	1834.00	1519.00	1037.00	772.00	937.00	1131.00	1068.00	537.00	378.00	283.00	14708.00
217.00	171.00	135.00	114.00	72.00	258.00	1122.00	1251.00	2830.00	1337.00	487.00	318.00	8312.00
277.00	423.00	849.00	510.00	404.00	536.00	565.00	460.00	610.00	715.00	541.00	604.00	6494.00
820.00	2135.00	2360.00	1590.00	1516.00	1428.00	651.00	971.00	2423.00	2539.00	839.00	395.00	17667.00
735.00	943.00	1705.00	1147.00	449.00	405.00	1031.00	1880.00	1983.00	2056.00	1615.00	656.00	14605.00
1040.00	2206.00	3994.00	2903.00	1769.00	1909.00	1963.00	3321.00	2700.00	2765.00	907.00	246.00	25723.00
195.00	259.00	171.00	102.00	389.00	493.00	540.00	1700.00	2451.00	1670.00	260.00	250.00	8480.00
230.00	200.00	170.00	102.00	196.00	3500.00	6750.00	3730.00	2980.00	2280.00	790.00	350.00	21278.00
1458.00	512.00	3563.00	2771.00	1737.00	1626.00	367.00	1417.00	1999.00	10000.00	2972.00	3712.00	32134.00
4390.00	2748.00	3535.00	2664.00	326.00	389.00	794.00	334.00	189.00	501.00	122.00	254.00	16246.00
803.00	2408.00	333.00	13.00	3.00	362.00	748.00	721.00	1584.00	929.00	186.00	62.00	8152.00
18.00	208.00	83.00	387.00	729.00	2064.00	1412.00	476.00	514.00	36.00	109.00	188.00	6224.00
583.00	1928.00	1931.00	3525.00	2150.00	583.00	1310.00	2678.00	4217.00	1210.00	163.00	68.00	20346.00

MEAN MONTHLY STREAMFLOW DATA, UNIT = ACRE-FT./DAY

JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	ANNUAL
3621.82	2909.75	2296.86	1751.40	1350.74	1523.31	2624.13	3094.21	5809.59	10599.67	6595.04	5016.20	47192.73

4004.63	3857.85	3935.21	5783.80	6702.15	19894.21	15421.49	9350.08	8429.75	8945.45	6664.46	5216.53	98205.62
5633.06	5494.21	6168.59	5613.22	4680.99	3312.40	2519.01	2261.16	2558.68	2320.66	2042.98	1729.59	44334.54
1461.82	1186.12	995.70	755.70	650.58	1590.74	1088.93	1687.93	4204.96	2519.01	2221.49	1735.54	20098.51
1428.10	1213.88	1080.99	1090.91	761.65	676.36	1979.50	4938.84	15352.07	9937.19	6029.75	4323.97	48813.22
3272.73	2816.53	2499.17	2578.51	2558.68	7874.38	14280.99	10274.38	8310.74	5849.26	4159.34	2963.31	67438.01
2350.41	1862.48	1400.33	1140.50	854.88	622.81	916.36	1039.34	2554.71	5950.41	3441.32	2675.70	24809.26
2447.60	3663.47	5809.59	4117.69	3006.94	3328.26	3490.91	3800.33	4210.91	4558.02	4234.71	3467.11	46135.54
2903.80	2669.75	2507.11	2768.93	2144.13	1943.80	1993.39	1898.18	2072.73	4639.34	5246.28	6985.78	37773.22
4260.50	3415.54	2705.45	1981.49	1336.86	1509.42	2100.50	3062.48	2519.01	2689.59	2661.82	1993.39	30236.03
1616.53	1324.96	969.92	823.14	745.79	632.73	2019.17	3921.32	7011.57	6243.97	4754.38	3584.13	33647.60
3183.47	2969.26	2911.74	2967.27	2217.52	2066.78	2760.99	3536.53	5369.26	5264.13	3076.36	2417.85	38741.16
2967.27	3447.27	3086.28	3663.47	3784.46	2915.70	5708.43	6741.82	4839.67	5900.83	5783.80	4754.38	53593.39
5629.09	5141.16	7535.21	5026.12	3574.21	5188.76	4784.13	4417.19	4242.64	3536.53	2636.03	2177.85	53888.92
1785.12	1495.54	1483.64	1114.71	882.64	956.03	2033.06	2687.60	3409.59	6081.32	3415.54	2741.16	28085.95
2304.79	1874.38	1455.87	1935.87	1277.36	1063.14	1215.87	1888.26	2453.55	2675.70	3453.22	3169.59	24767.60
2923.64	2618.18	2140.17	1580.83	1104.79	944.13	3588.10	6384.79	12208.26	12150.74	8683.64	6547.44	60874.71
4966.61	3639.67	3221.16	2320.66	1979.50	1989.42	1882.31	2657.85	4083.97	4300.17	3526.61	3016.86	37584.79
2517.02	2158.02	3151.74	3284.63	2580.50	5498.18	10359.67	11113.39	17801.65	18117.02	12376.86	9282.64	98241.32
8161.98	7608.59	5345.45	4151.40	3367.93	2788.76	2881.98	3338.18	11567.60	22809.92	10679.01	7039.34	89740.16
4831.74	3645.62	2598.35	1870.41	1354.71	1182.15	1937.85	3726.94	9598.02	13624.46	8187.77	4855.54	57413.55
3556.36	3014.88	2348.43	1723.64	1390.41	1469.75	1475.70	1106.78	1229.75	2830.41	3358.02	2275.04	25779.17
2142.15	2191.74	1818.84	2880.00	3334.21	1862.48	2995.04	3917.36	3135.87	7812.89	5420.83	4534.21	42045.62
3578.18	3028.76	2647.93	2764.96	2913.72	3133.88	3106.12	3403.64	3843.97	7098.84	7562.97	4754.38	47837.35
3623.80	3195.37	2907.77	3040.66	2945.45	2834.38	3288.59	4994.38	14802.64	23365.29	15229.09	13852.56	94080.00
10708.76	7368.59	5492.23	3849.92	3237.02	6791.40	6452.23	4649.26	4603.64	5194.71	3153.72	3205.29	64706.77
2649.92	2445.62	1834.71	1477.69	975.87	932.23	2241.32	2233.39	2229.42	1590.74	1084.96	926.28	20622.15
783.47	646.61	521.65	339.17	230.08	196.36	247.93	277.69	922.31	6739.83	4540.17	2727.27	18172.56
2282.98	2021.16	2780.83	3306.45	4421.16	3778.51	4881.32	6878.68	9032.73	8423.80	5297.85	3542.48	56647.93
4591.74	5869.09	6170.58	6142.81	5208.59	3869.75	4109.75	3798.35	3594.05	2638.02	1654.21	1408.26	49055.20
1455.87	1600.66	3395.70	5404.96	4429.09	8893.88	11696.53	10613.55	12154.71	16101.82	13265.45	8959.34	97971.57
6067.44	5916.69	7503.47	11884.96	7668.10	5652.89	7914.05	18432.40	23523.97	22770.25	14015.21	8427.77	139777.18
5734.21	4603.64	3637.69	3012.89	2056.86	1531.24	1858.51	2243.31	2118.35	1065.12	749.75	561.32	29172.89
430.41	339.17	267.77	226.12	142.81	511.74	2225.45	2481.32	5613.22	2651.90	965.95	630.74	16486.61
549.42	839.01	1683.97	1011.57	801.32	1063.14	1120.66	912.40	1209.92	1418.18	1073.06	1198.02	12880.66
1626.45	4234.71	4680.99	3153.72	3006.94	2832.40	1291.24	1925.95	4805.95	5036.03	1664.13	783.47	35041.98
1457.85	1870.41	3381.82	2275.04	890.58	803.31	2044.96	3728.93	3933.22	4078.02	3203.31	1301.16	28968.59
2062.81	4375.54	7921.98	5758.02	3508.76	3786.45	3893.55	6587.11	5355.37	5484.30	1799.01	487.93	51020.82
386.78	513.72	339.17	202.31	771.57	977.85	1071.07	3371.90	4861.49	3312.40	515.70	495.87	16819.83
456.20	396.69	337.19	202.31	388.76	6942.15	13388.43	7398.35	5910.74	4522.31	1566.94	694.21	42204.30
2891.90	1015.54	7067.11	5496.20	3445.29	3225.12	727.93	2810.58	3964.96	19834.71	5894.88	7362.64	63736.86
8707.44	5450.58	7011.57	5283.97	646.61	771.57	1574.88	662.48	374.88	993.72	241.98	503.80	32223.47
1592.73	4776.20	660.50	25.79	5.95	718.02	1483.64	1430.08	3141.82	1842.64	368.93	122.98	16169.26
35.70	412.56	164.63	767.60	1445.95	4093.88	2800.66	944.13	1019.50	71.40	216.20	372.89	12345.12
1156.36	3824.13	3830.08	6991.74	4264.46	1156.36	2598.35	5311.74	8364.30	2400.00	323.31	134.88	40355.70

ANNUAL FREQUENCY DISTRIBUTION

YMAX= 139777.1848 YMIN= 12345.1235

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
18716.72657	6	.13333	.13333
25088.32964	4	.08889	.22222
31459.93270	5	.11111	.33333
37831.53577	5	.11111	.44444
44203.13884	4	.08889	.53333
50574.74191	6	.13333	.66667
56946.34497	4	.08889	.75556
63317.94804	2	.04444	.80000
69689.55111	3	.06667	.86667
76061.15417	0	0	.86667

82432.75724	0	0	.86667
88804.36031	0	0	.86667
95175.96337	2	.04444	.91111
101547.56644	3	.06667	.97778
107919.16951	0	0	.97778
114290.77258	0	0	.97778
120662.37564	0	0	.97778
127033.97871	0	0	.97778
133405.58178	0	0	.97778
139777.18484	1	.02222	1.00000

MONTH= 1 FREQUENCY DISTRIBUTION

YMAX= 10708.7599 YMIN= 35.7025

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
569.35535	5	.11111	.11111
1103.00822	1	.02222	.13333
1636.66110	8	.17778	.31111
2170.31397	3	.06667	.37778
2703.96684	6	.13333	.51111
3237.61971	5	.11111	.62222
3771.27259	5	.11111	.73333
4304.92546	2	.04444	.77778
4838.57833	2	.04444	.82222
5372.23120	1	.02222	.84444
5905.88408	3	.06667	.91111
6439.53695	1	.02222	.93333
6973.18982	0	0	.93333
7506.84269	0	0	.93333
8040.49557	0	0	.93333
8574.14844	1	.02222	.95556
9107.80131	1	.02222	.97778
9641.45418	0	0	.97778
10175.10706	0	0	.97778
10708.75993	1	.02222	1.00000

MEAN= 3128.903464 REG. COEF.= .679379 ST. DEV.= 2966.838545 CORR. COEF.= .850733

MONTH= 2 FREQUENCY DISTRIBUTION

YMAX= 7608.5948 YMIN= 339.1735

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
702.64460	5	.11111	.11111
1066.11566	2	.04444	.15556
1429.58672	3	.06667	.22222
1793.05778	2	.04444	.26667
2156.52884	4	.08889	.35556
2519.99991	3	.06667	.42222
2883.47097	3	.06667	.48889
3246.94203	5	.11111	.60000
3610.41309	2	.04444	.64444
3973.88415	5	.11111	.75556
4337.35521	1	.02222	.77778
4700.82627	2	.04444	.82222
5064.29733	1	.02222	.84444

5427.76839	1	.02222	.86667
5791.23945	2	.04444	.91111
6154.71051	2	.04444	.95556
6518.18157	0	0	.95556
6881.65263	0	0	.95556
7245.12370	0	0	.95556
7608.59476	2	.04444	1.00000

MEAN= 2999.184460 REG. COEF.= .859816 ST. DEV.= 1829.430398 CORR. COEF.= .718502

MONTH= 3 FREQUENCY DISTRIBUTION

YMAX= 7921.9832 YMIN= 164.6281

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
552.49585	5	.11111	.11111
940.36360	1	.02222	.13333
1328.23136	3	.06667	.20000
1716.09911	4	.08889	.28889
2103.96686	2	.04444	.33333
2491.83462	3	.06667	.40000
2879.70237	6	.13333	.53333
3267.57013	5	.11111	.64444
3655.43788	3	.06667	.71111
4043.30563	2	.04444	.75556
4431.17339	0	0	.75556
4819.04114	1	.02222	.77778
5206.90890	0	0	.77778
5594.77665	2	.04444	.82222
5982.64440	1	.02222	.84444
6370.51216	2	.04444	.88889
6758.37991	0	0	.88889
7146.24767	2	.04444	.93333
7534.11542	1	.02222	.95556
7921.98317	2	.04444	1.00000

MEAN= 3149.002637 REG. COEF.= .891276 ST. DEV.= 2179.523702 CORR. COEF.= .831620

MONTH= 4 FREQUENCY DISTRIBUTION

YMAX= 11884.9582 YMIN= 25.7851

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
618.74378	5	.11111	.11111
1211.70243	7	.15556	.26667
1804.66109	4	.08889	.35556
2397.61974	5	.11111	.46667
2990.57840	5	.11111	.57778
3583.53706	5	.11111	.68889
4176.49571	4	.08889	.77778
4769.45437	0	0	.77778
5362.41302	2	.04444	.82222
5955.37168	5	.11111	.93333
6548.33033	1	.02222	.95556
7141.28899	1	.02222	.97778
7734.24764	0	0	.97778

8327.20630	0	0	.97778
8920.16495	0	0	.97778
9513.12361	0	0	.97778
10106.08227	0	0	.97778
10699.04092	0	0	.97778
11291.99958	0	0	.97778
11884.95823	1	.02222	1.00000

MEAN= 2967.625233 REG. COEF.= .670577 ST. DEV.= 2301.503271 CORR. COEF.= .839654

MONTH= 5 FREQUENCY DISTRIBUTION

YMAX= 7668.0989 YMIN= 5.9504

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
389.05784	4	.08889	.08889
772.16526	5	.11111	.20000
1155.27268	6	.13333	.33333
1538.38011	6	.13333	.46667
1921.48753	0	0	.46667
2304.59495	4	.08889	.55556
2687.70238	2	.04444	.60000
3070.80980	4	.08889	.68889
3453.91723	4	.08889	.77778
3837.02465	3	.06667	.84444
4220.13207	0	0	.84444
4603.23950	3	.06667	.91111
4986.34692	1	.02222	.93333
5369.45434	1	.02222	.95556
5752.56177	0	0	.95556
6135.66919	0	0	.95556
6518.77661	0	0	.95556
6901.88404	1	.02222	.97778
7284.99146	0	0	.97778
7668.09889	1	.02222	1.00000

MEAN= 2334.369059 REG. COEF.= 1.200746 ST. DEV.= 1746.715609 CORR. COEF.= .644186

MONTH= 6 FREQUENCY DISTRIBUTION

YMAX= 19894.2141 YMIN= 196.3636

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
1181.25615	15	.33333	.33333
2166.14868	10	.22222	.55556
3151.04120	5	.11111	.66667
4135.93373	7	.15556	.82222
5120.82625	0	0	.82222
6105.71878	3	.06667	.88889
7090.61130	2	.04444	.93333
8075.50383	1	.02222	.95556
9060.39635	1	.02222	.97778
10045.28888	0	0	.97778
11030.18140	0	0	.97778
12015.07393	0	0	.97778
12999.96645	0	0	.97778

13984.85898	0	0	.97778
14969.75150	0	0	.97778
15954.64403	0	0	.97778
16939.53655	0	0	.97778
17924.42908	0	0	.97778
18909.32160	0	0	.97778
19894.21413	1	.02222	1.00000

MEAN= 3007.338730 REG. COEF.= .949508 ST. DEV.= 3327.989464 CORR. COEF.= .854044

MONTH= 7 FREQUENCY DISTRIBUTION

YMAX= 15421.4870 YMIN= 247.9339

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
1006.61153	3	.06667	.06667
1765.28919	8	.17778	.24444
2523.96685	12	.26667	.51111
3282.64451	7	.15556	.66667
4041.32216	4	.08889	.75556
4799.99982	2	.04444	.80000
5558.67748	1	.02222	.82222
6317.35514	1	.02222	.84444
7076.03279	1	.02222	.86667
7834.71045	0	0	.86667
8593.38811	1	.02222	.88889
9352.06577	0	0	.88889
10110.74342	0	0	.88889
10869.42108	1	.02222	.91111
11628.09874	0	0	.91111
12386.77640	1	.02222	.93333
13145.45405	0	0	.93333
13904.13171	1	.02222	.95556
14662.80937	1	.02222	.97778
15421.48703	1	.02222	1.00000

MEAN= 3779.437875 REG. COEF.= .713552 ST. DEV.= 3682.506341 CORR. COEF.= .768547

MONTH= 8 FREQUENCY DISTRIBUTION

YMAX= 18432.3960 YMIN= 277.6859

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
1185.42144	6	.13333	.13333
2093.15695	5	.11111	.24444
3000.89245	7	.15556	.40000
3908.62795	10	.22222	.62222
4816.36346	4	.08889	.71111
5724.09896	3	.06667	.77778
6631.83446	2	.04444	.82222
7539.56997	3	.06667	.88889
8447.30547	0	0	.88889
9355.04097	1	.02222	.91111
10262.77647	0	0	.91111
11170.51198	3	.06667	.97778
12078.24748	0	0	.97778

12985.98298	0	0	.97778
13893.71849	0	0	.97778
14801.45399	0	0	.97778
15709.18949	0	0	.97778
16616.92500	0	0	.97778
17524.66050	0	0	.97778
18432.39600	1	.02222	1.00000

MEAN= 4265.211961 REG. COEF.= 1.150804 ST. DEV.= 3428.921395 CORR. COEF.= .807501

MONTH= 9 FREQUENCY DISTRIBUTION

YMAX= 23523.9661 YMIN= 374.8760

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
1532.33052	5	.11111	.11111
2689.78502	7	.15556	.26667
3847.23953	5	.11111	.37778
5004.69403	10	.22222	.60000
6162.14853	5	.11111	.71111
7319.60303	1	.02222	.73333
8477.05753	3	.06667	.80000
9634.51204	2	.04444	.84444
10791.96654	0	0	.84444
11949.42104	1	.02222	.86667
13106.87554	2	.04444	.91111
14264.33004	0	0	.91111
15421.78455	2	.04444	.95556
16579.23905	0	0	.95556
17736.69355	0	0	.95556
18894.14805	1	.02222	.97778
20051.60255	0	0	.97778
21209.05706	0	0	.97778
22366.51156	0	0	.97778
23523.96606	1	.02222	1.00000

MEAN= 5963.459832 REG. COEF.= .993432 ST. DEV.= 4866.076965 CORR. COEF.= .791945

MONTH= 10 FREQUENCY DISTRIBUTION

YMAX= 23365.2884 YMIN= 71.4050

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
1236.09913	3	.06667	.06667
2400.79330	5	.11111	.17778
3565.48747	8	.17778	.35556
4730.18164	5	.11111	.46667
5894.87581	5	.11111	.57778
7059.56998	5	.11111	.68889
8224.26415	2	.04444	.73333
9388.95833	2	.04444	.77778
10553.65250	1	.02222	.80000
11718.34667	1	.02222	.82222
12883.04084	1	.02222	.84444
14047.73501	1	.02222	.86667
15212.42918	0	0	.86667

16377.12335	1	.02222	.88889
17541.81752	0	0	.88889
18706.51170	1	.02222	.91111
19871.20587	1	.02222	.93333
21035.90004	0	0	.93333
22200.59421	0	0	.93333
23365.28838	3	.06667	1.00000

MEAN= 7022.016265 REG. COEF.= .563941 ST. DEV.= 6169.552979 CORR. COEF.= .894548

MONTH= 11 FREQUENCY DISTRIBUTION

YMAX= 15229.0903 YMIN= 216.1983

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
966.84294	7	.15556	.15556
1717.48754	5	.11111	.26667
2468.13214	3	.06667	.33333
3218.77674	5	.11111	.44444
3969.42134	5	.11111	.55556
4720.06594	3	.06667	.62222
5470.71054	4	.08889	.71111
6221.35514	3	.06667	.77778
6971.99974	2	.04444	.82222
7722.64434	1	.02222	.84444
8473.28894	1	.02222	.86667
9223.93354	1	.02222	.88889
9974.57814	0	0	.88889
10725.22274	1	.02222	.91111
11475.86734	0	0	.91111
12226.51194	0	0	.91111
12977.15654	1	.02222	.93333
13727.80114	1	.02222	.95556
14478.44574	1	.02222	.97778
15229.09034	0	0	.97778

MEAN= 4511.911676 REG. COEF.= .736088 ST. DEV.= 3809.687283 CORR. COEF.= .921534

MONTH= 12 FREQUENCY DISTRIBUTION

YMAX= 13852.5615 YMIN= 122.9752

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
809.45452	10	.22222	.22222
1495.93383	4	.08889	.31111
2182.41314	4	.08889	.40000
2868.89245	5	.11111	.51111
3555.37177	6	.13333	.64444
4241.85108	1	.02222	.66667
4928.33039	5	.11111	.77778
5614.80971	2	.04444	.82222
6301.28902	0	0	.82222
6987.76833	2	.04444	.86667
7674.24765	2	.04444	.91111
8360.72696	0	0	.91111
9047.20627	2	.04444	.95556

9733.68559	1	.02222	.97778
10420.16490	0	0	.97778
11106.64421	0	0	.97778
11793.12352	0	0	.97778
12479.60284	0	0	.97778
13166.08215	0	0	.97778
13852.56146	0	0	.97778

MEAN= 3443.481965 REG. COEF.= .140510 ST. DEV.= 2953.324282 CORR. COEF.= .160906

SYNTHETIC FLOW WITH YEARS= 45

SUM OF NEGATIVE VALUE= -57533.11405 NO. OF N. V. = 48 TOTAL VOL 10**4= 214.003578

JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
3128.90	2449.69	3187.86	3542.89	4818.53	5005.43	4820.24	7725.86	8280.79	13157.65	9606.77	6555.78
3125.91	3382.57	2100.85	2379.10	2557.87	2121.51	620.56	363.47	0	3534.31	0	0
5037.80	4586.17	6986.75	7937.93	6137.31	9222.77	11373.64	10015.03	6574.30	10518.34	5721.90	4621.56
3378.67	3694.80	1105.55	0	1064.49	14.71	2080.95	6173.74	12495.55	7694.96	5620.40	3899.16
4556.95	3437.06	1679.76	328.77	777.79	3675.06	4324.64	4503.14	4586.47	11937.01	8314.53	5226.88
3873.96	4390.21	4517.56	6033.80	4812.52	5605.91	6122.14	4063.01	3616.25	0	3347.98	3219.65
3330.52	2651.25	2503.91	1528.14	2342.21	4.63	3092.15	1680.41	3290.93	7717.19	4513.05	5439.80
5263.49	4710.80	5066.42	4756.89	3697.94	5786.35	4107.18	2515.71	6725.41	2043.30	922.14	1860.33
3243.96	2204.63	1662.89	444.15	0	0	0	0	5311.00	7278.57	6227.95	4335.22
1790.46	2020.02	47.26	132.19	2035.86	918.30	2550.58	3250.13	10390.50	15240.11	8573.58	3930.08
6428.81	5739.58	3364.06	3337.15	991.37	1631.10	2950.56	1887.69	5582.63	8420.44	5032.25	2853.72
0	1688.26	35.10	996.49	2189.15	0	1090.44	1571.04	5762.48	3258.82	1520.50	0
2069.64	3090.57	4651.79	4916.67	5254.71	4542.15	3637.68	4954.91	10447.77	10472.73	9364.07	7653.78
5488.36	4268.05	5035.84	5882.13	5625.37	8621.30	10217.80	9455.63	6930.15	1529.34	2008.98	1453.60
1991.04	972.51	0	579.34	0	601.07	5311.39	4237.13	0	8081.36	7685.25	4441.25
2066.36	2740.36	2237.19	863.03	0	2382.45	4203.95	6175.80	10726.73	4197.40	4067.13	2211.84
0	1666.59	2698.59	1207.49	1910.87	1378.78	5816.59	4776.12	11136.34	13939.72	10003.63	7543.57
1531.89	916.04	0	0	595.99	0	1795.39	1904.45	10702.92	11191.06	5153.62	2881.35
1748.79	2102.32	3759.12	1705.83	2732.46	7482.86	9538.60	4680.50	810.37	6219.94	6534.03	4937.19
3199.01	2781.30	3575.68	3238.79	951.64	2892.44	1259.84	4023.67	1877.18	12878.81	5941.39	5736.41
2621.47	1618.87	2062.74	1888.22	609.78	0	714.49	0	0	0	3634.68	3388.60
6674.13	5936.10	5833.54	4364.30	4373.97	5609.95	8524.56	9351.63	12836.30	13188.93	7057.83	5915.69
3488.07	4324.10	3154.43	1994.62	473.50	3149.08	4381.22	5487.67	7384.44	8376.15	2070.14	2299.52
3415.91	2176.62	692.01	198.70	367.99	0	1670.51	418.98	0	0	3218.62	4001.20
4814.66	5281.21	4875.58	4966.67	4632.30	8724.25	9959.52	9845.34	11476.80	5883.12	3696.32	5244.00
2501.33	667.55	1978.58	1209.59	198.46	0	236.06	220.42	5057.49	4670.71	5405.31	4983.48
3313.17	3400.96	2208.87	1044.21	0	0	4671.52	3603.21	5799.56	5518.61	3596.22	1852.71
2320.45	1564.86	1915.97	4373.97	3616.56	7254.61	10896.91	8746.99	10449.11	20550.30	9960.82	7024.39
5304.42	4836.82	5754.52	3815.12	2961.73	4792.38	8386.55	8031.76	11371.19	5482.33	1300.16	977.68
5301.06	5853.29	5522.54	5386.59	2479.44	4500.14	4993.13	5491.36	6169.54	5253.36	3678.16	3652.04
2970.37	3464.89	3029.88	3608.48	1132.46	0	3005.74	6399.92	3573.60	1856.13	3443.54	3627.40
2340.34	1517.45	1453.29	2041.50	2862.18	0	3223.10	5759.66	3885.69	2395.03	2217.66	1966.48
5347.37	3793.69	5935.38	6908.69	4620.66	5164.87	7438.85	5995.99	4159.50	6472.13	5044.69	5271.84
4381.01	4201.75	4151.06	4790.90	3349.16	3760.66	1502.82	2700.52	6015.73	0	1154.96	31.98
2855.78	2314.46	4096.76	1604.10	0	0	2584.75	4456.83	7094.09	10220.79	3726.83	1977.00
3108.84	681.98	2864.17	3814.09	3994.98	106.97	1557.55	467.38	0	0	0	837.71
2660.05	2445.76	3223.50	4691.38	4228.47	599.07	2997.43	408.04	0	3281.16	770.81	0
7049.51	5492.75	6664.27	7462.84	3818.03	3208.52	7332.15	5569.01	11897.85	10620.10	5269.99	4257.76
0	437.81	3329.19	3356.53	2472.65	2477.20	7614.91	8587.94	11037.68	3691.80	5285.67	4139.21
1599.78	1355.11	0	945.79	532.34	383.55	2067.69	3686.31	5800.38	2821.08	0	582.76
142.98	2066.38	3402.45	257.36	765.22	0	4043.78	1137.42	1510.24	0	159.31	610.38
5070.10	5447.91	6605.81	5828.75	3665.76	3713.41	7108.93	7486.45	14369.49	14953.14	10576.71	7612.16
5846.60	5497.29	6986.28	7444.46	5852.10	7650.13	5284.95	1846.66	4170.29	4381.15	2267.71	451.95
484.13	867.16	0	1226.03	2916.23	1354.32	0	3673.39	10196.52	8052.45	4121.10	3084.55
3595.62	2133.45	828.44	1416.27	2193.89	4995.70	6300.16	2972.86	6667.67	3546.88	0	1257.20
3444.78											

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
569.35535	5	.11111	.11111
1103.00822	0	0	.11111
1636.66110	2	.04444	.15556
2170.31397	5	.11111	.26667
2703.96684	5	.11111	.37778
3237.61971	6	.13333	.51111

3771.27259	7	.15556	.66667
4304.92546	1	.02222	.68889
4838.57833	3	.06667	.75556
5372.23120	6	.13333	.88889
5905.88408	2	.04444	.93333
6439.53695	1	.02222	.95556
6973.18982	1	.02222	.97778
7506.84269	1	.02222	1.00000
8040.49557	0	0	1.00000
8574.14844	0	0	1.00000
9107.80131	0	0	1.00000
9641.45418	0	0	1.00000
10175.10706	0	0	1.00000
10708.75993	0	0	1.00000

MONTH= 1 CHI-SQUARE= 31.738095

VARIANCE= 3280208.529907 STANDARD DEV.= 1811.134597

AVERAGE MONTHLY FLOW= 3375.698962

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
702.64460	3	.06667	.06667
1066.11566	3	.06667	.13333
1429.58672	1	.02222	.15556
1793.05778	5	.11111	.26667
2156.52884	4	.08889	.35556
2519.99991	5	.11111	.46667
2883.47097	3	.06667	.53333
3246.94203	1	.02222	.55556
3610.41309	4	.08889	.64444
3973.88415	2	.04444	.68889
4337.35521	3	.06667	.75556
4700.82627	2	.04444	.80000
5064.29733	2	.04444	.84444
5427.76839	1	.02222	.86667
5791.23945	4	.08889	.95556
6154.71051	2	.04444	1.00000
6518.18157	0	0	1.00000
6881.65263	0	0	1.00000
7245.12370	0	0	1.00000
7608.59476	0	0	1.00000

MONTH= 2 CHI-SQUARE= 34.600000

VARIANCE= 2590737.098083 STANDARD DEV.= 1609.576683

AVERAGE MONTHLY FLOW= 3041.577522

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
552.49585	6	.13333	.13333
940.36360	2	.04444	.17778
1328.23136	1	.02222	.20000
1716.09911	3	.06667	.26667

2103.96686	4	.08889	.35556
2491.83462	2	.04444	.40000
2879.70237	3	.06667	.46667
3267.57013	4	.08889	.55556
3655.43788	4	.08889	.64444
4043.30563	1	.02222	.66667
4431.17339	2	.04444	.71111
4819.04114	2	.04444	.75556
5206.90890	3	.06667	.82222
5594.77665	1	.02222	.84444
5982.64440	3	.06667	.91111
6370.51216	0	0	.91111
6758.37991	2	.04444	.95556
7146.24767	2	.04444	1.00000
7534.11542	0	0	1.00000
7921.98317	0	0	1.00000

MONTH= 3 CHI-SQUARE= 25.833333

VARIANCE= 4261595.604614 STANDARD DEV.= 2064.363244

AVERAGE MONTHLY FLOW= 3128.565471

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
618.74378	8	.17778	.17778
1211.70243	6	.13333	.31111
1804.66109	5	.11111	.42222
2397.61974	4	.08889	.51111
2990.57840	0	0	.51111
3583.53706	4	.08889	.60000
4176.49571	3	.06667	.66667
4769.45437	4	.08889	.75556
5362.41302	3	.06667	.82222
5955.37168	3	.06667	.88889
6548.33033	1	.02222	.91111
7141.28899	1	.02222	.93333
7734.24764	2	.04444	.97778
8327.20630	1	.02222	1.00000
8920.16495	0	0	1.00000
9513.12361	0	0	1.00000
10106.08227	0	0	1.00000
10699.04092	0	0	1.00000
11291.99958	0	0	1.00000
11884.95823	0	0	1.00000

MONTH= 4 CHI-SQUARE= 16.991667

VARIANCE= 5282484.295654 STANDARD DEV.= 2298.365570

AVERAGE MONTHLY FLOW= 2987.776742

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
389.05784	7	.15556	.15556
772.16526	5	.11111	.26667

1155.27268	5	.11111	.37778
1538.38011	0	0	.37778
1921.48753	1	.02222	.40000
2304.59495	3	.06667	.46667
2687.70238	4	.08889	.55556
3070.80980	4	.08889	.64444
3453.91723	1	.02222	.66667
3837.02465	4	.08889	.75556
4220.13207	1	.02222	.77778
4603.23950	2	.04444	.82222
4986.34692	4	.08889	.91111
5369.45434	1	.02222	.93333
5752.56177	1	.02222	.95556
6135.66919	1	.02222	.97778
6518.77661	1	.02222	1.00000
6901.88404	0	0	1.00000
7284.99146	0	0	1.00000
7668.09889	0	0	1.00000

MONTH= 5 CHI-SQUARE= 27.819048

VARIANCE= 3385164.950623 STANDARD DEV.= 1839.881776

AVERAGE MONTHLY FLOW= 2458.087452

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
1181.25615	18	.40000	.40000
2166.14868	4	.08889	.48889
3151.04120	4	.08889	.57778
4135.93373	4	.08889	.66667
5120.82625	5	.11111	.77778
6105.71878	4	.08889	.86667
7090.61130	0	0	.86667
8075.50383	3	.06667	.93333
9060.39635	2	.04444	.97778
10045.28888	1	.02222	1.00000
11030.18140	0	0	1.00000
12015.07393	0	0	1.00000
12999.96645	0	0	1.00000
13984.85898	0	0	1.00000
14969.75150	0	0	1.00000
15954.64403	0	0	1.00000
16939.53655	0	0	1.00000
17924.42908	0	0	1.00000
18909.32160	0	0	1.00000
19894.21413	0	0	1.00000

MONTH= 6 CHI-SQUARE= 23.083333

VARIANCE= 8234207.319214 STANDARD DEV.= 2869.530854

AVERAGE MONTHLY FLOW= 2874.035906

1006.61153	5	.11111	.11111
1765.28919	5	.11111	.22222
2523.96685	3	.06667	.28889
3282.64451	7	.15556	.44444
4041.32216	1	.02222	.46667
4799.99982	6	.13333	.60000
5558.67748	4	.08889	.68889
6317.35514	3	.06667	.75556
7076.03279	0	0	.75556
7834.71045	4	.08889	.84444
8593.38811	2	.04444	.88889
9352.06577	0	0	.88889
10110.74342	2	.04444	.93333
10869.42108	1	.02222	.95556
11628.09874	2	.04444	1.00000
12386.77640	0	0	1.00000
13145.45405	0	0	1.00000
13904.13171	0	0	1.00000
14662.80937	0	0	1.00000
15421.48703	0	0	1.00000

MONTH= 7 CHI-SQUARE= 58.350000

VARIANCE= 9633599.489990 STANDARD DEV.= 3103.804035

AVERAGE MONTHLY FLOW= 4475.813331

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
1185.42144	8	.17778	.17778
2093.15695	5	.11111	.28889
3000.89245	3	.06667	.35556
3908.62795	4	.08889	.44444
4816.36346	7	.15556	.60000
5724.09896	4	.08889	.68889
6631.83446	5	.11111	.80000
7539.56997	1	.02222	.82222
8447.30547	2	.04444	.86667
9355.04097	3	.06667	.93333
10262.77647	3	.06667	1.00000
11170.51198	0	0	1.00000
12078.24748	0	0	1.00000
12985.98298	0	0	1.00000
13893.71849	0	0	1.00000
14801.45399	0	0	1.00000
15709.18949	0	0	1.00000
16616.92500	0	0	1.00000
17524.66050	0	0	1.00000
18432.39600	0	0	1.00000

MONTH= 8 CHI-SQUARE= 32.502381

VARIANCE= 8567520.238281 STANDARD DEV.= 2927.032668

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
1532.33052	8	.17778	.17778
2689.78502	1	.02222	.20000
3847.23953	3	.06667	.26667
5004.69403	4	.08889	.35556
6162.14853	7	.15556	.51111
7319.60303	6	.13333	.64444
8477.05753	2	.04444	.68889
9634.51204	0	0	.68889
10791.96654	6	.13333	.82222
11949.42104	5	.11111	.93333
13106.87554	2	.04444	.97778
14264.33004	0	0	.97778
15421.78455	1	.02222	1.00000
16579.23905	0	0	1.00000
17736.69355	0	0	1.00000
18894.14805	0	0	1.00000
20051.60255	0	0	1.00000
21209.05706	0	0	1.00000
22366.51156	0	0	1.00000
23523.96606	0	0	1.00000

MONTH= 9 CHI-SQUARE= 66.896429

VARIANCE= 16905996.382813 STANDARD DEV.= 4111.690210

AVERAGE MONTHLY FLOW= 6359.353501

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
1236.09913	6	.13333	.13333
2400.79330	4	.08889	.22222
3565.48747	5	.11111	.33333
4730.18164	4	.08889	.42222
5894.87581	4	.08889	.51111
7059.56998	2	.04444	.55556
8224.26415	5	.11111	.66667
9388.95833	2	.04444	.71111
10553.65250	3	.06667	.77778
11718.34667	2	.04444	.82222
12883.04084	2	.04444	.86667
14047.73501	3	.06667	.93333
15212.42918	1	.02222	.95556
16377.12335	1	.02222	.97778
17541.81752	0	0	.97778
18706.51170	0	0	.97778
19871.20587	0	0	.97778
21035.90004	1	.02222	1.00000
22200.59421	0	0	1.00000
23365.28838	0	0	1.00000

MONTH= 10 CHI-SQUARE= 21.016667

VARIANCE= 24370886.847656 STANDARD DEV.= 4936.687842

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
966.84294	7	.15556	.15556
1717.48754	3	.06667	.22222
2468.13214	4	.08889	.31111
3218.77674	1	.02222	.33333
3969.42134	7	.15556	.48889
4720.06594	3	.06667	.55556
5470.71054	6	.13333	.68889
6221.35514	3	.06667	.75556
6971.99974	2	.04444	.80000
7722.64434	2	.04444	.84444
8473.28894	1	.02222	.86667
9223.93354	1	.02222	.88889
9974.57814	3	.06667	.95556
10725.22274	2	.04444	1.00000
11475.86734	0	0	1.00000
12226.51194	0	0	1.00000
12977.15654	0	0	1.00000
13727.80114	0	0	1.00000
14478.44574	0	0	1.00000
15229.09034	0	0	1.00000

MONTH= 11 CHI-SQUARE= 25.821429

VARIANCE= 9003741.148926 STANDARD DEV.= 3000.623460

AVERAGE MONTHLY FLOW= 4395.920025

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
809.45452	7	.15556	.15556
1495.93383	4	.08889	.24444
2182.41314	4	.08889	.33333
2868.89245	3	.06667	.40000
3555.37177	4	.08889	.48889
4241.85108	6	.13333	.62222
4928.33039	4	.08889	.71111
5614.80971	6	.13333	.84444
6301.28902	2	.04444	.88889
6987.76833	1	.02222	.91111
7674.24765	4	.08889	1.00000
8360.72696	0	0	1.00000
9047.20627	0	0	1.00000
9733.68559	0	0	1.00000
10420.16490	0	0	1.00000
11106.64421	0	0	1.00000
11793.12352	0	0	1.00000
12479.60284	0	0	1.00000
13166.08215	0	0	1.00000
13852.56146	0	0	1.00000

MONTH= 12 CHI-SQUARE= 17.702381

AVERAGE MONTHLY FLOW= 3418.863705

ANNUAL SYNTHETIC FLOW

72280.38	20186.15	88733.50	47222.99	53348.08	49602.99	38094.18	47455.97	30708.36	50879.07	48219.37	18112.29
71056.47	66516.55	33900.36	41872.25	62078.28	36672.71	52252.02	48356.16	16538.86	89666.91	46582.97	16160.53
79399.78	27128.98	35009.05	88674.94	63014.65	58280.64	36112.41	29662.37	66153.65	36040.56	40931.41	17433.67
25305.68	78642.79	52430.59	19774.77	14095.51	92438.61	57679.57	35975.87	35908.13			

CLASS INTERVAL	OBS. FREQ.	PROB. FCN.	CUM. PROB. FCN.
18716.72657	5	.11111	.11111
25088.32964	2	.04444	.15556
31459.93270	4	.08889	.24444
37831.53577	7	.15556	.40000
44203.13884	3	.06667	.46667
50574.74191	6	.13333	.60000
56946.34497	4	.08889	.68889
63317.94804	4	.08889	.77778
69689.55111	2	.04444	.82222
76061.15417	2	.04444	.86667
82432.75724	2	.04444	.91111
88804.36031	2	.04444	.95556
95175.96337	2	.04444	1.00000
101547.56644	0	0	1.00000
107919.16951	0	0	1.00000
114290.77258	0	0	1.00000
120662.37564	0	0	1.00000
127033.97871	0	0	1.00000
133405.58178	0	0	1.00000
139777.18484	0	0	1.00000

ANNUAL CHI-SQUARE= 14.854762