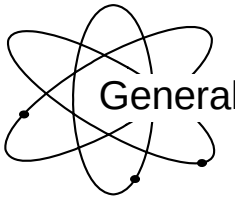
US Army Corps of Engineers
Hydrologic Engineering Center



STATS
Statistical Analysis of Time Series Data

User's Manual
Preliminary

December 1996

CPD-63

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14. ABSTRACT
STAT was written in response to the needs of Corps Districts for statistical analysis of time series data. STATS performs several types of statistical analysis: flow-duration analysis, graphical and analytical frequency analysis of annual events, monthly and annual statistics, departures of monthly and annual values from respective means, and volume duration analysis. It cal also determine the daily or monthly maximum and/or minimum values of each year from multiple years of data and can then perform frequency analysis on those values.

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Foreword

STATS was originated and written by Harold E. Kubik (Hydrologic Engineering Center, Davis, CA) in response to the needs of Corps Districts for statistical analysis of time series data. STATS has evolved over the years as new capabilities have been needed, and computer platforms have changed.

In the late 1980's, STATS had to be reconfigured from the Harris mini computer to the PC and to Unix-based systems. This current new version of STATS represents the culmination of those efforts. This new release is also the result of extensive modernizing and debugging of the code.

STATS and HEC-FFA. Users of STATS will notice similarities with HEC-FFA, some bordering on redundancy. However, the two programs address distinctly different needs. HEC-FFA's singular purpose is to perform the calculations associated with determining a flood flow frequency curve according to the guidelines specified in Bulletin 17B, "Guidelines for Determining Flood Flow Frequency" (U.S. Department of the Interior,1981). STATS, on the other hand, is a general purpose tool for use in a variety of statistical analyses. Some particular differences between the two programs are cited below.

- STATS performs several types of statistical analysis not found in HEC-FFA, such as flow-duration analysis.

- HEC-FFA weights a generalized skew (specified by the user) with the computed skew to determine the adopted skew. STATS does not support the input of a generalized skew. For more information on the terminologies of skew coefficients, see Appendix B.

- STATS can determine the daily or monthly maximum and/or minimum values of each year from multiple years of data and can then perform frequency analysis on those values.

- HEC-FFA performs analysis on annual peak flows only. In addition, the annual peak flow used by HEC-FFA is the instantaneous high flow for each year. STATS, on the other hand, operates on either maximum or minimum values. The maximum or minimum values used by STATS can be the average daily or average monthly, as well as multiple-day averages for volume duration analysis.

SECTION 1

INTRODUCTION

1.1 PURPOSE

This user's manual provides a description of the various capabilities and options in STATS. Example problems are provided (see Section 2) to familiarize the user with the software. Current capabilities and input-output descriptions are listed and described.

1.2 CURRENT CAPABILITIES OF STATS

STATS performs various analyses of time-series data. Current capabilities include the following:

- **Graphical and Analytical Frequency Analysis of Annual Events**: For example, given daily flow data for multiple years, STATS can select the minimum daily flow for each year and then calculate plotting positions for use in the development of a graphical frequency curve, or perform analytical frequency analysis using the Log-Pearson Type III distribution.

- **Flow-Duration Analysis**: Given daily flow data, STATS can compute the fraction or percent of time over the specified record that different daily flow values were exceeded.

- **Monthly and Annual Statistics**: STATS can provide a summary table of monthly and annual statistics for average, maximum, and minimum values.

- **Departures of Monthly and Annual Values From Respective Means**: STATS can provide a summary table of monthly and annual departures from respective means.

- **Volume Duration Analysis**: Given daily flow data, STATS can perform frequency analysis of annual maximum and/or minimum of multiple-day averages. Durations of 1, 3, 7, 15, 30, 60, 90, 120, and 183 days are currently available.

1.3 GENERAL INPUT AND OUTPUT INFORMATION

1.3.1 Program Execution

There are four ways to execute STATS:

If a DSS file is not used, STATS may be executed by:

(1) Creating and executing a batch file with the following command line:

STATS I = TEST.DAT O = TEST.OUT

This command line will execute STATS with an input file called TEST.DAT and an output file called TEST.OUT. To create a STATS input file, please refer to Appendix A.

(2) Typing the command line (shown above) in the directory where sample test data are located

If a DSS file is used, STATS may be executed by:

(3) Creating and executing a batch file with the following command line:

STATS I = TEST.DAT O = TEST.OUT DSSFILE = TEST.DSS

(4) Typing the command line (shown above) in the directory where sample test data are located

Note that the 'DSSFILE = TEST.DSS' specification may be replaced by two separate specifications such as 'DSSIN = TESTIN.DSS DSSOUT = TESTOUT.DSS.'

1.3.2 Output

The output file (e.g., TEST.OUT) generated by STATS can be viewed by typing "LIST TEST.OUT" after execution. In addition, the program output is formatted as an ASCII DOS file and can be printed directly or via any wordprocessor program.

Graphical plots can also be generated using the DSPLAY program (Refer to HEC-DSS User's Manual, March 1995 Version). DSPLAY is a graphics package that allows the user to plot data contained in the DSS file. During execution of the STATS program, the computed frequency curve, the expected probability curve, the confidence limits, and the flow-duration curve can be written to a DSS file (see ZW record in Appendix A). Through the use of the DSPLAY program, graphical plots can be generated on screen, sent to a printer, or sent to a meta file for importation into wordprocessors.

The example problems in the following section illustrates input preparation and output.

1.4 FUTURE DEVELOPMENT

Future development of the STATS program will occur on two fronts: (1) new analytical capabilities will be added to meet Corps needs; and (2) STATS will eventually be part of a larger, integrated hydrologic and statistical analysis package.

1.5 ACKNOWLEDGMENTS

The original version of STATS was written by Harold E. Kubik, who also began the work of converting it to the PC platform with the help of Mark R. Jensen. The first official version of STATS for the PC, and this user's manual, were developed by Edwin K. Yu under the guidance of Troy R. Nicolini. David M. Goldman and Arlen D. Feldman, Chief of the HEC Research Division, provided valuable guidance throughout the evolution of the STATS program.

The STATS program and this user's manual are dedicated to the memory of Harold E. Kubik.

SECTION 2

EXAMPLE PROBLEMS

Statistical Analysis of Time Series Data

There are six test examples provided in this section to familiarize the user with STATS. Each test example illustrates the different capabilities and options of STATS. A brief description of each test example is given. The first three examples do not use DSS, while the fourth through sixth examples use DSS.

The test examples are as follows.

TEST NO.1 -- Analytical Frequency Analysis (Calendar year, w/o DSS)

TEST NO.2 -- Graphical Frequency Analysis

TEST NO.3 -- Analytical Frequency Analysis with Flow-Duration Analysis

TEST NO.4 -- Analytical Frequency Analysis (Water year, with DSS)

TEST NO.5 -- Volume-Duration Analysis

TEST NO.6 -- Flow-Duration Analysis

2.1 EXAMPLE NO.1 - ANALYTICAL FREQUENCY ANALYSIS EXAMPLE

Given: Monthly flows from 1930-1939 (CFS)

Objective: Compute Log Pearson Type III frequency curve parameters, ordinates, and frequency plots of annual maximum and minimum flows. Analysis is based on the calendar year.

Solution: The STATS input file (TEST1.DAT) given below was developed to perform the required analysis. Note that both the J1 and LS records were used to specify the type of analysis needed for STATS. For more details on input records, see Appendix A.

Monthly flows were analyzed to determine the plotting positions for both annual maximum and minimum observed flows. STATS then calculated the computed and expected frequency ordinates for both annual maximum and minimum flows and generated the required frequency plots, containing both observed and computed values.

COMMAND LINE:
STATS I = TEST1.DAT O = TEST1.OUT

INPUT (TEST1.DAT)

```
TT  TEST NO. 1 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
TT  ANALYTICAL ANALYSIS OF MONTHLY FLOWS
TT  ANALYZE BOTH MAXIMUM AND MINIMUM VALUES (ANNUAL SERIES)
J1    10      12              1
ID WINNIBIGOSHISH RESERVOIR INFLOW
LS     3    FLOW                                    1     CFS
IN   130   212   483   356   498   924   484   186   464   509   337   278   234
IN   131   166   224   308   247   305   122   149   107    26   137   168   236
IN   132   263   289   273   425   906   289   155   101   209   138   361   295
IN   133   304   299   309   465   857   207   289   302   156    46   188   152
IN   134   161   146   187   224   189   184   178   244    95    32   104   144
IN   135   176   109    92   552   436   525   670    15    24   181   207   240
IN   136   189   181   370   509   899   259   282   253    65   206    76  1200
IN   137   198   296   318   682   907   476   205   141  1365   553   413   220
IN   138   258   235   227   815  2438  1496   177   467    48    44   272   175
IN   139   261   162   218   605   348   614   229    65   239   118    72   131
EJ
```

OUTPUT (EXAMPLE NO.1)

```
************************************      ************************************
*     STATS:BETA TEST VERSION      *      *                                  *
* STATISTICAL ANALYSIS-TIME SERIES *      *   U.S. ARMY CORPS OF ENGINEERS   *
*     PROGRAM DATE:  MAY 1987      *      * THE HYDROLOGIC ENGINEERING CENTER *
*     VERSION DATE:   ------       *      *         609 SECOND STREET        *
*         RUN DATE AND TIME:       *      *      DAVIS, CALIFORNIA 95616     *
*        18 JUL 96    15:39:22     *      *          (530) 756-1104          *
*                                  *      *                                  *
************************************      ************************************


 INPUT FILE NAME: test1.dat
OUTPUT FILE NAME: test1.out



** TITLE INFORMATION **
TT  TEST NO. 1 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
TT  ANALYTICAL ANALYSIS OF MONTHLY FLOWS
TT  ANALYZE BOTH MAXIMUM AND MINIMUM VALUES (ANNUAL SERIES)

**JOB SPECIFICATIONS**
   JSTAT    NPRDS     NYRS    MONWY    JBEGN     JEND     JPPF    MONSS    LOGTM    NDECM
J1    10       12                1

**LOCATION IDENTIFICATION**
ID WINNIBIGOSHISH RESERVOIR INFLOW

**LOCATION SPECIFICATIONS**
   IANAL     NAME     LOGT     NDEC     NSIG    IPRNT     UNIT
LS     3     FLOW                                 1      CFS

     SELECTED OUTPUT OPTIONS
       1 = LIST THE INPUT TIME SERIES DATA

**INPUT TIME SERIES DATA**
IN   130   212   483   356   498   924   484   186   464   509   337   278   234
IN   131   166   224   308   247   305   122   149   107    26   137   168   236
IN   132   263   289   273   425   906   289   155   101   209   138   361   295
IN   133   304   299   309   465   857   207   289   302   156    46   188   152
IN   134   161   146   187   224   189   184   178   244    95    32   104   144
IN   135   176   109    92   552   436   525   670    15    24   181   207   240
IN   136   189   181   370   509   899   259   282   253    65   206    76   120
IN   137   198   296   318   682   907   476   205   141  1365   553   413   220
IN   138   258   235   227   815  2438  1496   177   467    48    44   272   175
IN   139   261   162   218   605   348   614   229    65   239   118    72   131
```

ANALYSIS OF MAXIMUMS -

PLOTTING POSITIONS- WINNIBIGOSHISH RESERVOIR INFLOW

EVENTS ANALYZED					ORDERED EVENTS			
MON	DAY	YEAR	FLOW CFS	RANK	CALENDER YEAR	FLOW CFS	MEDIAN PLOT POS
5	-1	1930	924.	1	1938	2438.	6.73
3	-1	1931	308.	2	1937	1365.	16.35
5	-1	1932	906.	3	1930	924.	25.96
5	-1	1933	857.	4	1932	906.	35.58
8	-1	1934	244.	5	1936	899.	45.19
7	-1	1935	670.	6	1933	857.	54.81
5	-1	1936	899.	7	1935	670.	64.42
9	-1	1937	1365.	8	1939	614.	74.04
5	-1	1938	2438.	9	1931	308.	83.65
6	-1	1939	614.	10	1934	244.	93.27

***** ANALYTICAL FIT TO DATA *****

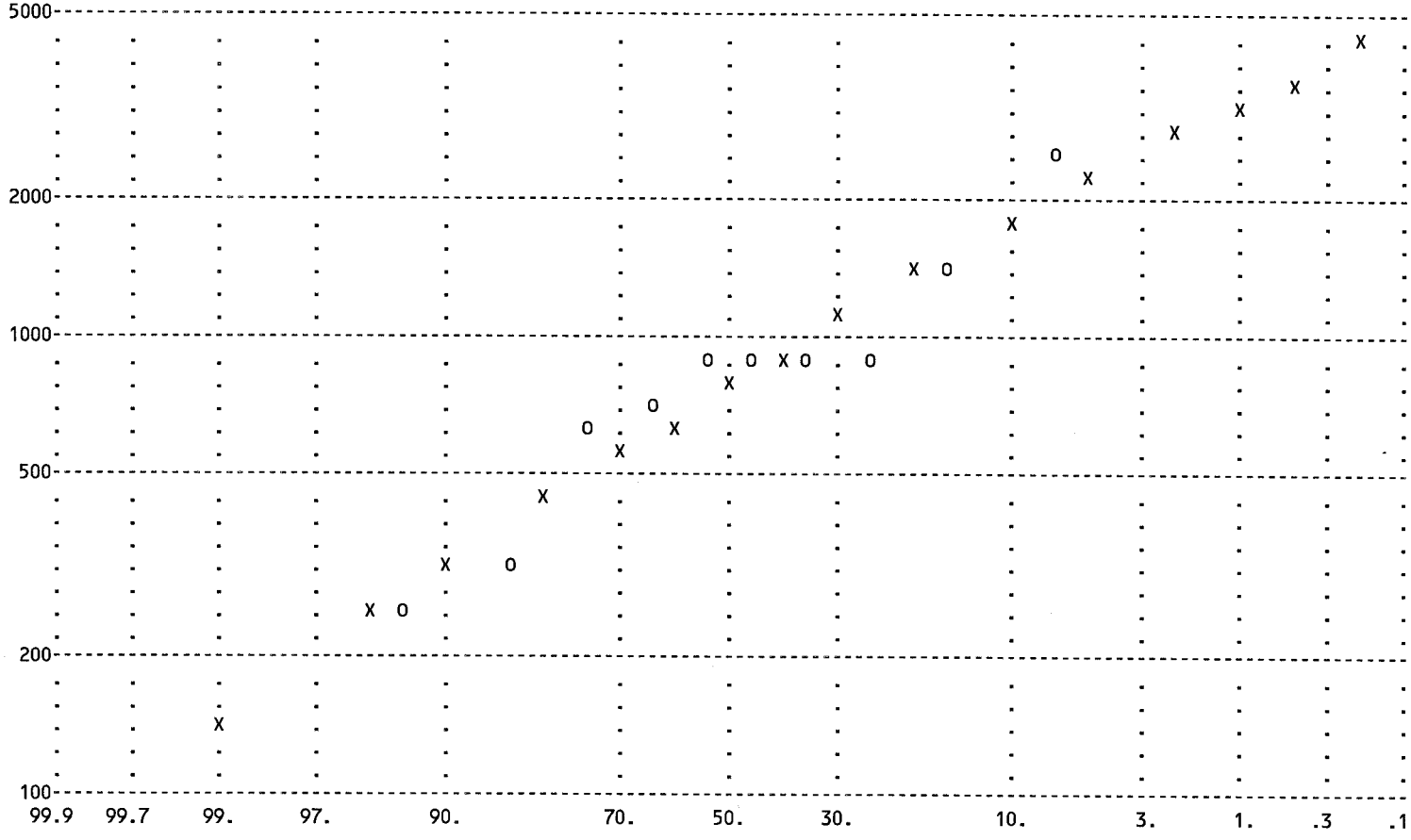
CAUTION FROM SUBROUTINE WTSKEW
***** NO GENERALIZED SKEW PROVIDED
ADOPTED SKEW SET TO COMPUTED SKEW

FREQUENCY CURVE- WINNIBIGOSHISH RESERVOIR INFLOW

FLOW IN CFS		PERCENT CHANCE	CONFIDENCE LIMITS	
COMPUTED	EXPECTED PROBABILITY	EXCEEDANCE	.05 LIMIT	.95 LIMIT
4400.	8000.	.2	14500.	2480.
3730.	5830.	.5	11200.	2190.
3250.	4600.	1.0	8970.	1960.
2780.	3610.	2.0	7030.	1740.
2190.	2580.	5.0	4860.	1430.
1760.	1950.	10.0	3490.	1200.
1340.	1410.	20.0	2340.	940.
1100.	1130.	30.0	1760.	776.
921.	933.	40.0	1400.	648.
779.	779.	50.0	1140.	538.
658.	649.	60.0	938.	438.
547.	530.	70.0	773.	344.
439.	413.	80.0	625.	253.
321.	284.	90.0	475.	160.
246.	200.	95.0	381.	106.
147.	90.	99.0	255.	48.

SYSTEMATIC STATISTICS			
LOG TRANSFORM: FLOW, CFS		NUMBER OF EVENTS	
MEAN	2.8822	HISTORIC EVENTS	0
STANDARD DEV	.2888	HIGH OUTLIERS	0
COMPUTED SKEW	-.2120	LOW OUTLIERS	0
GENERALIZED SKEW	-99.0000	ZERO OR MISSING	0
ADOPTED SKEW	-.2000	SYSTEMATIC EVENTS	10

-FREQUENCY PLOT - WINNIBIGOSHISH RESERVOIR INFLOW
BASED ON COMPUTED VALUES - FLOW IN CFS



PERCENT CHANCE EXCEEDANCE

LEGEND - O=OBSERVED VALUE, H=HIGH OUTLIER OR HISTORIC VALUE, L=LOW OUTLIER, Z=ZERO OR MISSING, X=COMPUTED CURV

ANALYSIS OF MINIMUMS

PLOTTING POSITIONS- WINNIBIGOSHISH RESERVOIR INFLOW

EVENTS ANALYZED				ORDERED EVENTS			
MON	DAY	YEAR	FLOW CFS	RANK	CALENDER YEAR	FLOW CFS	MEDIAN PLOT POS
7	-1	1930	186.	1	1935	15.	6.73
9	-1	1931	26.	2	1931	26.	16.35
8	-1	1932	101.	3	1934	32.	25.96
10	-1	1933	46.	4	1938	44.	35.58
10	-1	1934	32.	5	1933	46.	45.19
8	-1	1935	15.	6	1936	65.	54.81
9	-1	1936	65.	7	1939	65.	64.42
8	-1	1937	141.	8	1932	101.	74.04
10	-1	1938	44.	9	1937	141.	83.65
8	-1	1939	65.	10	1930	186.	93.27

***** ANALYTICAL FIT TO DATA *****

CAUTION FROM SUBROUTINE WTSKEW
***** NO GENERALIZED SKEW PROVIDED
ADOPTED SKEW SET TO COMPUTED SKEW

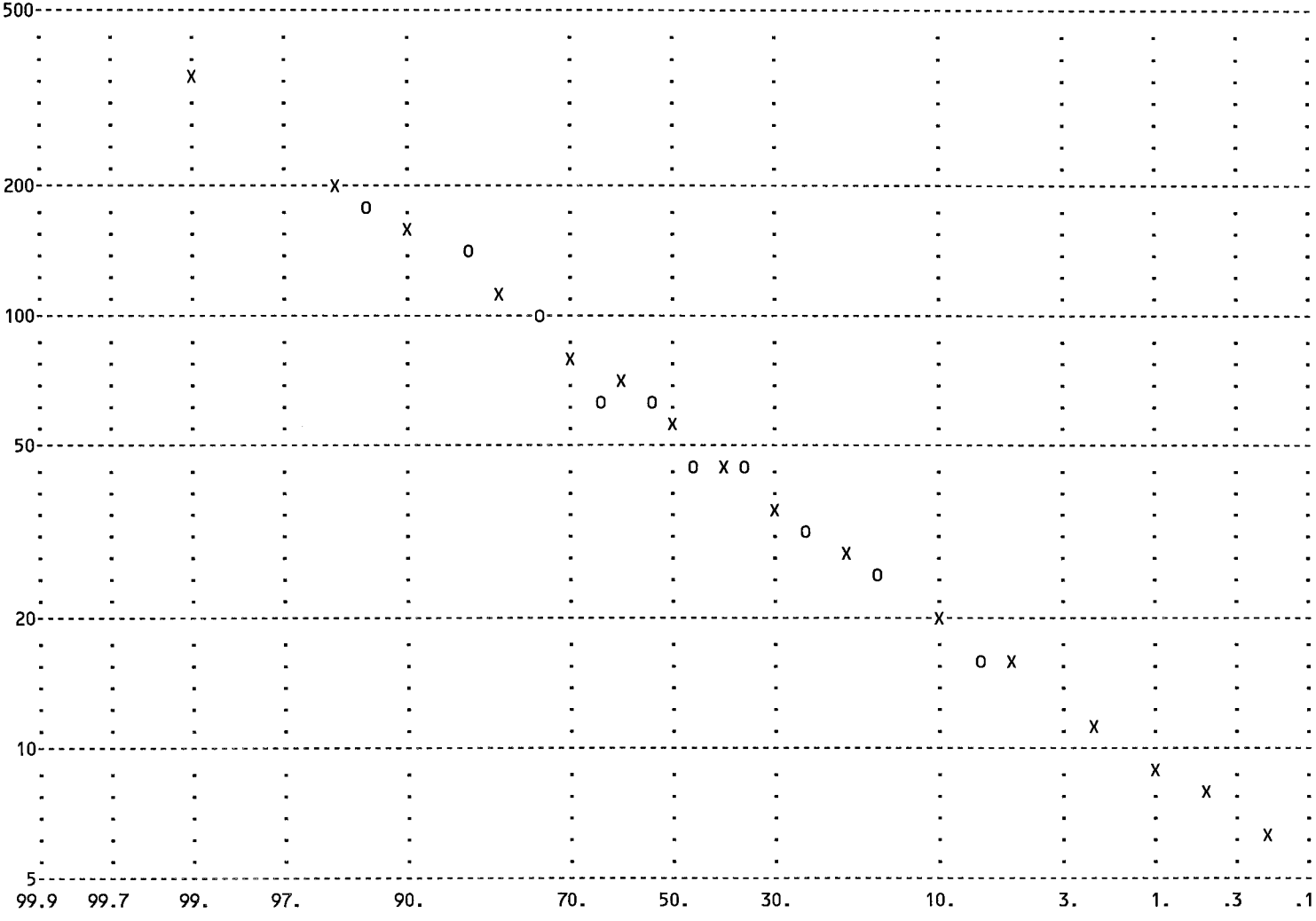
FREQUENCY CURVE- WINNIBIGOSHISH RESERVOIR INFLOW

FLOW IN CFS		PERCENT CHANCE NON-EXCEEDANCE	CONFIDENCE LIMITS	
COMPUTED	EXPECTED PROBABILITY		.05 LIMIT	.95 LIMIT
6.	2.	.2	12.	1.
8.	4.	.5	15.	2.
9.	6.	1.0	17.	3.
11.	8.	2.0	20.	4.
16.	13.	5.0	26.	6.
21.	18.	10.0	32.	9.
29.	27.	20.0	44.	15.
37.	36.	30.0	55.	21.
46.	45.	40.0	69.	28.
56.	56.	50.0	86.	36.
68.	69.	60.0	110.	45.
84.	87.	70.0	144.	56.
107.	114.	80.0	204.	71.
150.	171.	90.0	337.	95.
199.	247.	95.0	518.	121.
338.	553.	99.0	1180.	183.

SYSTEMATIC STATISTICS

LOG TRANSFORM: FLOW, CFS		NUMBER OF EVENTS	
MEAN	1.7451	HISTORIC EVENTS	0
STANDARD DEV	.3370	HIGH OUTLIERS	0
COMPUTED SKEW	-.0271	LOW OUTLIERS	0
GENERALIZED SKEW	-99.0000	ZERO OR MISSING	0
ADOPTED SKEW	.0000	SYSTEMATIC EVENTS	10

FREQUENCY PLOT - WINNIBIGOSHISH RESERVOIR INFLOW
BASED ON COMPUTED VALUES - FLOW IN CFS



PERCENT CHANCE NON-EXCEEDANCE

LEGEND - O=OBSERVED VALUE, H=HIGH OUTLIER OR HISTORIC VALUE, L=LOW OUTLIER, Z=ZERO OR MISSING, X=COMPUTED CURVE

TEST NO. 1 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
ANALYTICAL ANALYSIS OF MONTHLY FLOWS
ANALYZE BOTH MAXIMUM AND MINIMUM VALUES (ANNUAL SERIES)

-MONTHLY SUMMARY- WINNIBIGOSHISH RESERVOIR INFLOW

MONTHLY AND ANNUAL MEAN VALUES, FLOW IN CFS

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	ANNUAL
1930	212.	483.	356.	498.	924.	484.	186.	464.	509.	337.	278.	234.	414.
1931	166.	224.	308.	247.	305.	122.	149.	107.	26.	137.	168.	236.	183.
1932	263.	289.	273.	425.	906.	289.	155.	101.	209.	138.	361.	295.	309.
1933	304.	299.	309.	465.	857.	207.	289.	302.	156.	46.	188.	152.	298.
1934	161.	146.	187.	224.	189.	184.	178.	244.	95.	32.	104.	144.	157.
1935	176.	109.	92.	552.	436.	525.	670.	15.	24.	181.	207.	240.	269.
1936	189.	181.	370.	509.	899.	259.	282.	253.	65.	206.	76.	120.	284.
1937	198.	296.	318.	682.	907.	476.	205.	141.	1365.	553.	413.	220.	481.
1938	258.	235.	227.	815.	2438.	1496.	177.	467.	48.	44.	272.	175.	554.
1939	261.	162.	218.	605.	348.	614.	229.	65.	239.	118.	72.	131.	255.
MAX	304.	483.	370.	815.	2438.	1496.	670.	467.	1365.	553.	413.	295.	554.
MIN	161.	109.	92.	224.	189.	122.	149.	15.	24.	32.	72.	120.	157.
MEAN	219.	242.	266.	502.	821.	466.	252.	216.	274.	179.	214.	195.	320.
STDV	49.	107.	85.	180.	640.	398.	155.	159.	410.	160.	117.	58.	126.
SKEW	0.	1.	-1.	0.	2.	2.	3.	1.	3.	2.	0.	0.	1.

JOB COMPLETE

++++++++++++++++++++++
NORMAL STOP IN STATS
++++++++++++++++++++++

2.2 EXAMPLE NO.2 - GRAPHICAL FREQUENCY ANALYSIS EXAMPLE

Given: Monthly reservoir elevations from 1930-1935 (FEET)

Objective: Perform graphical frequency analysis on both maximum and minimum values. Use RV card to increase input values by 1290 feet. Only months of May thru September are to be analyzed. The calendar year is used.

Solution: The STATS input file (TEST2.DAT) given below was developed to perform the required analysis. The RV record was added to specify the addition of 1290 feet to each input value. In addition, a time window of May thru September was specified in the LS record to indicate that only values in this time window were analyzed. No graphical frequency plot was provided since the variations of stage were small. If needed, the graphical frequency ordinates may be manually fitted to a curve.

COMMAND LINE:
STATS I = TEST2.DAT O = TEST2.OUT

INPUT (TEST2.DAT)

```
TT  TEST NO. 2 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
TT  GRAPHICAL ANALYSIS OF MONTHLY RESERVOIR ELEVATIONS
TT  ONLY MONTHS OF MAY THRU SEPT USED IN ANALYSIS
TT  PRINTOUT SIX SIGNIFICANT FIGURES WITH TWO DECIMAL PLACES
TT  RV CARD USED TO ADD 1290 FEET TO INPUT VALUES
TT  LOG TRANSFORM AND FREQUENCY CURVE PLOT SUPPRESSED
J1     9      12       0       1       5       9                              -1
ID WINNIBIGOSHISH RESERVOIR ELEVATION, 1290 FEET ADDED TO INPUT
LS     3   STAGE       -1       2       6      17    FEET
RV     1    1290     1290    1290    1290    1290    1290    1290    1290    1290
RV  1290    1290     1290
IN   130  7.19  7.07  6.94  7.13  7.71  8.27  8.30  7.06  6.12  6.43  6.62  6.77
IN   131  6.87  6.92  6.94  7.01  7.18  7.29  7.18  6.96  6.80  6.76  6.80  6.90
IN   132  7.05  7.03  6.94  7.09  7.63  8.10  8.07  7.73  7.09  6.57  6.57  5.87
IN   133  5.05  5.05  5.05  5.36  5.97  6.39  6.25  5.85  5.29  4.94  4.94  4.94
IN   134  4.94  4.94  4.99  5.10  5.22  5.31  5.20  4.89  4.65  4.56  4.58  4.66
IN   135  4.78  4.88  4.92  5.18  5.60  6.01  6.48  6.71  6.61  6.59  6.68  6.80
EJ
```

OUTPUT (EXAMPLE NO.2)

```
**********************************      **************************************
*     STATS:BETA TEST VERSION      *      *                                    *
* STATISTICAL ANALYSIS-TIME SERIES *      *   U.S. ARMY CORPS OF ENGINEERS     *
*     PROGRAM DATE:  MAY 1987      *      * THE HYDROLOGIC ENGINEERING CENTER *
*     VERSION DATE:   ------       *      *         609 SECOND STREET          *
*         RUN DATE AND TIME:       *      *      DAVIS, CALIFORNIA 95616       *
*        19 JUL 96    11:20:35     *      *         (530) 756-1104             *
*                                  *      *                                    *
**********************************      **************************************


 INPUT FILE NAME: test2.dat
OUTPUT FILE NAME: test2.out



** TITLE INFORMATION **
TT  TEST NO. 2 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
TT  GRAPHICAL ANALYSIS OF MONTHLY RESERVOIR ELEVATIONS
TT  ONLY MONTHS OF MAY THRU SEPT USED IN ANALYSIS
TT  PRINTOUT SIX SIGNIFICANT FIGURES WITH TWO DECIMAL PLACES
TT  RV CARD USED TO ADD 1290 FEET TO INPUT VALUES
TT  LOG TRANSFORM AND FREQUENCY CURVE PLOT SUPPRESSED

**JOB SPECIFICATIONS**
   JSTAT   NPRDS    NYRS   MONWY   JBEGN    JEND    JPPF   MONSS   LOGTM   NDECM
J1     9      12       0       1       5       9                               -1

**LOCATION IDENTIFICATION**
ID WINNIBIGOSHISH RESERVOIR ELEVATION, 1290 FEET ADDED TO INPUT

**LOCATION SPECIFICATIONS**
   IANAL    NAME     LOGT    NDEC    NSIG   IPRNT    UNIT
LS     3   STAGE       -1       2       6      17    FEET

     SELECTED OUTPUT OPTIONS
       1 = LIST THE INPUT TIME SERIES DATA
      16 = SUPPRESS FREQUENCY PRINTER PLOT

**REVISION OF DATA**
   IFUNC   CONST(S)
RV     1    1290    1290    1290    1290    1290    1290    1290    1290    1290
RV  1290    1290    1290

**INPUT TIME SERIES DATA**
IN   130  7.19  7.07  6.94  7.13  7.71  8.27  8.30  7.06  6.12  6.43  6.62  6.77
IN   131  6.87  6.92  6.94  7.01  7.18  7.29  7.18  6.96  6.80  6.76  6.80  6.90
IN   132  7.05  7.03  6.94  7.09  7.63  8.10  8.07  7.73  7.09  6.57  6.57  5.87
IN   133  5.05  5.05  5.05  5.36  5.97  6.39  6.25  5.85  5.29  4.94  4.94  4.94
IN   134  4.94  4.94  4.99  5.10  5.22  5.31  5.20  4.89  4.65  4.56  4.58  4.66
IN   135  4.78  4.88  4.92  5.18  5.60  6.01  6.48  6.71  6.61  6.59  6.68  6.80
```

- ANALYSIS OF MAXIMUMS -

-PLOTTING POSITIONS- WINNIBIGOSHISH RESERVOIR ELEVATION, 1290 FEET ADDED TO INPUT

.....EVENTS ANALYZED.....				ORDERED EVENTS			
MON	DAY	YEAR	STAGE FEET	RANK	CALENDER YEAR	STAGE FEET	MEDIAN PLOT POS
7	-1	1930	1298.30	1	1930	1298.30	10.94
6	-1	1931	1297.29	2	1932	1298.10	26.56
6	-1	1932	1298.10	3	1931	1297.29	42.19
6	-1	1933	1296.39	4	1935	1296.71	57.81
6	-1	1934	1295.31	5	1933	1296.39	73.44
8	-1	1935	1296.71	6	1934	1295.31	89.06

**** GRAPHICAL FIT TO DATA *****

-FREQUENCY CURVE- WINNIBIGOSHISH RESERVOIR ELEVATION, 1290 FEET ADDED TO INPUT

.....STAGE IN FEET.....		PERCENT CHANCE EXCEEDANCE	...CONFIDENCE LIMITS...	
COMPUTED	EXPECTED PROBABILITY		.50 LIMIT	.50 LIMIT
1298.69	1298.69	.2	-1.00	-1.00
1298.62	1298.62	.5	-1.00	-1.00
1298.56	1298.56	1.0	-1.00	-1.00
1298.49	1298.49	2.0	-1.00	-1.00
1298.40	1298.40	5.0	-1.00	-1.00
1298.31	1298.31	10.0	-1.00	-1.00
1298.20	1298.20	20.0	-1.00	-1.00
1297.98	1297.98	30.0	-1.00	-1.00
1297.39	1297.39	40.0	-1.00	-1.00
1296.97	1296.97	50.0	-1.00	-1.00
1296.66	1296.66	60.0	-1.00	-1.00
1296.48	1296.48	70.0	-1.00	-1.00
1296.09	1296.09	80.0	-1.00	-1.00
1295.20	1295.20	90.0	-1.00	-1.00
1294.40	1294.40	95.0	-1.00	-1.00
1292.91	1292.91	99.0	-1.00	-1.00

- ANALYSIS OF MINIMUMS -

-PLOTTING POSITIONS- WINNIBIGOSHISH RESERVOIR ELEVATION, 1290 FEET ADDED TO INPUT

EVENTS ANALYZED				ORDERED EVENTS			
MON	DAY	YEAR	STAGE FEET	RANK	CALENDER YEAR	STAGE FEET	MEDIAN PLOT POS
9	-1	1930	1296.12	1	1934	1294.65	10.94
9	-1	1931	1296.80	2	1933	1295.29	26.56
9	-1	1932	1297.09	3	1935	1295.60	42.19
9	-1	1933	1295.29	4	1930	1296.12	57.81
9	-1	1934	1294.65	5	1931	1296.80	73.44
5	-1	1935	1295.60	6	1932	1297.09	89.06

**** GRAPHICAL FIT TO DATA *****

-FREQUENCY CURVE- WINNIBIGOSHISH RESERVOIR ELEVATION, 1290 FEET ADDED TO INPUT

STAGE IN FEET		PERCENT CHANCE NON-EXCEEDANCE	CONFIDENCE LIMITS	
COMPUTED	EXPECTED PROBABILITY		.50 LIMIT	.50 LIMIT
1292.66	1292.66	.2	-1.00	-1.00
1293.03	1293.03	.5	-1.00	-1.00
1293.33	1293.33	1.0	-1.00	-1.00
1293.66	1293.66	2.0	-1.00	-1.00
1294.15	1294.15	5.0	-1.00	-1.00
1294.59	1294.59	10.0	-1.00	-1.00
1295.09	1295.09	20.0	-1.00	-1.00
1295.37	1295.37	30.0	-1.00	-1.00
1295.55	1295.55	40.0	-1.00	-1.00
1295.84	1295.84	50.0	-1.00	-1.00
1296.21	1296.21	60.0	-1.00	-1.00
1296.69	1296.69	70.0	-1.00	-1.00
1296.93	1296.93	80.0	-1.00	-1.00
1297.11	1297.11	90.0	-1.00	-1.00
1297.24	1297.24	95.0	-1.00	-1.00
1297.48	1297.48	99.0	-1.00	-1.00

TEST NO. 2 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
GRAPHICAL ANALYSIS OF MONTHLY RESERVOIR ELEVATIONS
ONLY MONTHS OF MAY THRU SEPT USED IN ANALYSIS

-MONTHLY SUMMARY- WINNIBIGOSHISH RESERVOIR ELEVATION, 1290 FEET ADDED TO INPUT

MONTHLY AND ANNUAL MEAN VALUES, STAGE IN FEET

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	ANNUAL
1930	1297.19	1297.07	1296.94	1297.13	1297.71	1298.27	1298.30	1297.06	1296.12	1296.43	1296.62	1296.77	1297.13
1931	1296.87	1296.92	1296.94	1297.01	1297.18	1297.29	1297.18	1296.96	1296.80	1296.76	1296.80	1296.90	1296.97
1932	1297.05	1297.03	1296.94	1297.09	1297.63	1298.10	1298.07	1297.73	1297.09	1296.57	1296.57	1295.87	1297.14
1933	1295.05	1295.05	1295.05	1295.36	1295.97	1296.39	1296.25	1295.85	1295.29	1294.94	1294.94	1294.94	1295.42
1934	1294.94	1294.94	1294.99	1295.10	1295.22	1295.31	1295.20	1294.89	1294.65	1294.56	1294.58	1294.66	1294.92
1935	1294.78	1294.88	1294.92	1295.18	1295.60	1296.01	1296.48	1296.71	1296.61	1296.59	1296.68	1296.80	1295.94
MAX	1297.19	1297.07	1296.94	1297.13	1297.71	1298.27	1298.30	1297.73	1297.09	1296.76	1296.80	1296.90	1297.14
MIN	1294.78	1294.88	1294.92	1295.10	1295.22	1295.31	1295.20	1294.89	1294.65	1294.56	1294.58	1294.66	1294.92
MEAN	1295.98	1295.98	1295.96	1296.15	1296.55	1296.90	1296.91	1296.53	1296.09	1295.97	1296.03	1295.99	1296.25
STDV	1.17	1.13	1.07	1.02	1.09	1.19	1.17	1.01	.95	.96	.99	1.00	.96
SKEW	.01	.00	-.01	-.02	-.08	-.07	-.22	-.82	-.72	-.98	-1.00	-.53	-.41

JOB COMPLETE

++++++++++++++++++++++
NORMAL STOP IN STATS
++++++++++++++++++++++

2.3 EXAMPLE NO.3 - ANALYTICAL FRQUENCY ANALYSIS WITH FLOW DURATION ANALYSIS EXAMPLE

Given: Daily flows from 1922-1926 (CFS)

Objective: Compute Log-Pearson Type III frequency curve parameters, ordinates, and plots of annual maximum and minimum flows. Compute the flow-duration table and flow-duration curve for this specified period. Analysis is based on the calendar year.

Solution: The STATS input file (TEST3.DAT) given below was developed to perform the required analysis. Daily flows from 1922 to 1926 were analyzed to determine the plotting positions for both annual maximum and minimum observed flows. STATS then calculated the computed and expected frequency ordinates for both annual maximum and minimum flows and generated the required frequency plots, containing both observed and computed values.

Flow-duration analysis was also carried out using STATS. STATS used the class-interval method to generate the interpolated flow-duration table and curve.

COMMAND LINE:
STATS I = TEST3.DAT O = TEST3.OUT

INPUT (TEST3.DAT)

```
TT  TEST NO. 3 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
TT  ANALYTICAL ANALYSIS OF DAILY FLOWS
TT  COMPUTE DURATION CURVE ALONG WITH MAXIMUM AND MINIMUM ANALYSIS
TT  COMPUTE STATISTICS OF LOGS FOR MONTHLY SUMMARY TABLES
TT  INPUT LISTING OF DAILY DATA SUPPRESSED
TT  TEST OF 5 YEARS 1922-26
J1    14     365              1                                    -1
ID  KAW LAKE INFLOWS
LS     3                                      0
CL    29     100     200     300     400     500     600     700     800     900
CL  1000    2000    3000    4000    5000    6000    7000    8000    9000   10000
CL 20000   30000   40000   50000   60000   70000   80000   90000  100000  200000
BF     2     365
IN     1    1922
IN   105.    202.    105.     87.     92.    100.     83.    139.    275.    127.
IN   102.    105.    110.    115.    164.    251.    140.    129.    170.    154.
IN   174.    180.    169.    155.    140.    119.    101.     97.     92.     88.
IN    95.    104.    108.    138.    141.    117.    107.    119.    144.    102.
```

INPUT (CONTINUED):

```
IN    92.     95.     98.     87.    169.    318.    132.     95.     87.    116.
IN   186.    196.    261.    308.    428.    655.    645.    503.    398.    283.
IN   202.    270.    343.    352.    236.    353.    555.    546.    553.    532.
IN   533.    574.   1816.   6473.  12889.  14759.   9175.   5418.   3641.   2656.
IN  2110.   1809.   1796.   2067.   2546.   2168.   1679.   1385.   1236.   1146.
IN  1078.   1233.   4318.   5954.   5097.   3755.   8090.  26926.  29164.  27903.
IN 27845.  15308.   6453.   3687.   2932.   2603.   2415.   2217.   2046.   1875.
IN  1764.   1683.   1708.   2054.   2777.   3286.   4562.   5640.   5826.   5067.
IN  5725.  10923.  12719.  10292.   6889.   4270.   4343.  11152.  12461.  11097.
IN  8718.   6448.   5108.   3987.   3324.   2946.   2694.   2456.   2305.   3593.
IN  6646.  15578.  16726.  12131.   8167.   5443.   3864.   3712.   6079.   8108.
IN  6981.   4643.   3008.   2308.   2074.   1890.   1803.   1667.   1591.   1544.
IN  1478.   1410.   1348.   1290.   1245.   1168.   1133.   1173.   1179.   1198.
IN  1092.    983.    958.    925.    911.   1010.   1158.   1186.   1451.   1783.
IN  1630.   1629.   1916.   2135.   2134.   1841.   1581.   1338.   1169.   1088.
IN 15662.  29642.  47437.  46374.  29983.  11055.   5540.   7502.  20222.  23803.
IN 13947.   7641.   4785.   3550.   2842.   2501.   2237.   2013.   1789.   1654.
IN  1510.   1421.   1345.   1317.   1334.   1334.   1236.   1150.   1125.   1142.
IN  1226.   1339.   1262.   1135.   1054.    978.    958.    908.    826.    794.
IN   820.    878.    863.    735.    645.    588.    574.    577.    529.    504.
IN   486.    473.    463.    433.    420.    411.    385.    366.    352.    336.
IN   338.    468.    788.    678.    628.    518.    439.    410.    393.    378.
IN   360.    365.    378.    378.    372.    368.    361.    343.    333.    338.
IN   328.    331.    352.    430.    416.    393.    358.    343.    340.    344.
IN   343.    331.    311.    296.    294.    291.    289.    286.    291.    291.
IN   308.    335.    340.    309.    298.    298.    306.    306.    306.    306.
IN   304.    300.    311.    604.   1741.   2918.   2211.   1266.    927.    848.
IN   795.    721.    673.    587.    767.   4135.   8154.   8138.   5675.   3378.
IN  2421.   1925.   1629.   1377.   1233.   1133.   1059.    992.    932.    902.
IN   863.    838.    804.    775.    756.    741.    735.    744.    729.    702.
IN   725.    723.    688.    672.    668.    615.    545.    559.    534.    520.
IN   489.    458.    473.    526.    596.    591.    580.    604.    679.    749.
IN   701.    585.    488.    407.    314.
BF     2     365
IN     1    1923
IN   525.    561.    571.    489.    280.    236.    184.    152.    144.    142.
IN   135.    133.    133.    126.    144.    150.    126.    113.    118.    123.
IN   113.    123.    129.    108.    108.    116.    117.    108.    119.    136.
IN   147.    134.    113.    137.    205.    132.    126.    135.    134.    112.
IN   108.    108.    115.    130.    142.    122.    115.    105.     95.    105.
IN   110.    105.    123.    123.    113.     97.    105.    118.    113.    115.
IN   115.    122.    108.     93.    102.    105.    102.    102.    100.    147.
IN   289.    411.    435.    404.    358.    360.    405.    305.    256.    201.
IN   175.    162.    159.    137.    137.    132.    107.    100.     97.     95.
IN    92.    112.     26.     73.    536.    882.    597.    407.    263.    187.
IN   135.    122.    120.    186.    333.    184.    152.    125.    119.    123.
IN   117.    105.    150.    208.    217.    210.    301.    716.   1014.    426.
IN   426.    426.    426.    426.    426.    426.    426.    426.    426.    317.
IN   465.    416.    386.    398.    404.    370.    377.    375.    338.    423.
IN  3253.   6228.   7307.  11196.  15403.  14867.   9580.   5064.   4557.   5182.
IN  6737.   7366.   7693.   9012.   8414.   6779.  10541.  13392.  35711.  57284.
IN110960  92060.  68237.  50901.  33382.  32253.  49135.  47700.  35232.  24110.
IN 14306.  10476.   8870.   8320.   7121.   6290.   6109.   5826.   4423.   3970.
IN  3596.   3248.   2989.   2894.   3222.   3819.   3770.   3120.   2609.   2324.
IN  2127.   2015.   1963.   1892.   1952.   2125.   2190.   2274.   2494.   2585.
IN  2328.   1968.   1754.   1702.   1711.   1891.   2266.   2240.   2098.   2017.
IN  1973.   1834.   1715.   1686.   1713.   1917.   1760.   1637.   1586.   1497.
IN  1457.   1595.   1884.   1823.   1776.   1856.   2005.   2105.   2008.   1978.
IN  2077.   2478.   2371.   2800.   4123.   3978.   3671.   3559.   4644.   5730.
IN  5898.   5059.   4368.   3796.   3528.   3460.   3422.   3092.   2822.   2543.
IN  2332.   2121.   1961.   1833.   1793.   1802.   1762.   1642.   1601.   1589.
IN  1764.   2201.   2664.   2618.   2305.   2217.   2684.   3029.   2788.   1767.
IN  1014.   4255.   6127.   4696.   3816.   2989.   2781.   2482.   2322.   2217.
IN  2103.   2101.   2100.   2396.   4486.   6899.  10527.  11002.   8044.   6120.
IN  4948.   4207.   3769.   3445.   3192.   3031.   2884.   2759.   2675.   2600.
```

INPUT (CONTINUED):

```
IN 2484.  3232.  5544.  6331.  5076.  3973.  3649.  3676.  3691.  3409.
IN 3108.  2903.  2797.  2667.  2559.  2506.  2425.  2415.  2377.  2279.
IN 2191.  2165.  2130.  2050.  2010.  1944.  1914.  1846.  1806.  1729.
IN 1682.  1616.  1606.  1604.  1616.  1616.  1633.  1633.  1574.  1548.
IN 1548.  1540.  1511.  1462.  1444.  1495.  1702.  1853.  1852.  1706.
IN 1610.  1514.  1487.  1478.  1470.  1429.  1451.  1411.  1482.  1624.
IN 1683.  1653.  1675.  1597.  1435.
BF    2   366
IN    1  1924
IN 1175.   979.   942.   888.   672.   711.   852.  1020.  1090.  1089.
IN 1117.  1076.  1023.  1037.  1037.  1037.  1021.   866.   866.   981.
IN  965.  1019.  1095.  1064.  1062.  1063.  1093.  1142.  1271.  1479.
IN 1605.  1592.  1652.  1761.  1970.  2150.  1943.  1714.  1416.  1294.
IN 1384.  1561.  2243.  3304.  3117.  2713.  2533.  2408.  2350.  2245.
IN 2118.  2042.  2085.  2107.  2130.  1990.  1861.  1752.  1823.  1754.
IN 1705.  1728.  1688.  1689.  1722.  1728.  1632.  1556.  1550.  1458.
IN 1451.  1835.  2381.  2192.  2361.  3467.  4365.  4158.  4302.  4404.
IN 4612.  4627.  4502.  4371.  4184.  4215.  4302.  5039.  6329.  5953.
IN 4935.  4154.  3730.  3333.  3182.  3150.  3160.  2998.  2845.  2640.
IN 2497.  2363.  2255.  2186.  2218.  2168.  2140.  2124.  2088.  2011.
IN 1986.  1976.  1950.  1911.  2912.  8253. 11509.  8729.  3743.  7454.
IN16045. 24276. 21560. 12184. 10022.  6968.  5113.  4234.  3631.  3322.
IN 3105.  2911.  2638.  2480.  2347.  2227.  2112.  1997.  1902.  1858.
IN 1770.  1676.  1591.  1573.  1615.  1726.  1733.  1810.  1849.  1883.
IN 1845.  1744.  1840.  1923.  1936.  1848.  1748.  1673.  1559.  1498.
IN 1432.  1430.  1395.  1305.  1214.  1139.  1073.  1047.   951.   873.
IN  791.   765.   805.   878.   888.   781.   691.   676.   627.   595.
IN  610.   546.   533.   527.   524.   529.   501.   469.   418.   395.
IN  425.   430.   474.   491.   437.   826.  1296.  1973.  2024.  1845.
IN 1777.  1560.  1335.  1412.  1357.  1054.   835.   746.   667.   593.
IN  564.   520.   510.   500.   485.   474.   271.   451.  5068.  5682.
IN 2605.  1070.  1021.  1609.  1767.  1239.  1041.   915.   774.   658.
IN  587.   539.   473.   430.   430.   436.   409.   381.   370.   349.
IN  344.   357.   357.   339.   309.   280.   281.   274.   278.   277.
IN  265.   221.   190.   181.   193.   224.   207.   206.   207.   204.
IN  192.   325.  1060.  1137.   611.   404.   354.   321.   291.   292.
IN  322.   275.   255.   251.   231.   218.   215.   210.   219.   281.
IN  510.   757.   934.   990.   855.   685.   550.   469.   409.   392.
IN  380.   362.   324.   310.   315.   309.   304.   290.   298.   293.
IN  289.   292.   289.   295.   287.   265.   249.   242.   247.   242.
IN  251.   256.   261.   262.   260.   319.   385.   572.   657.   688.
IN  616.   547.   499.   477.   442.   428.   427.   398.   395.   396.
IN  391.   395.   386.   399.   399.   400.   385.   409.   440.   433.
IN  433.   466.   466.   464.   442.   409.   384.   394.   417.   415.
IN  383.   379.   378.   376.   369.   364.   367.   380.   386.   363.
IN  322.   318.   316.   311.   311.   310.
BF    2   365
IN    1  1925
IN  288.   275.   271.   275.   279.   286.   289.   295.   300.   290.
IN  255.   246.   250.   258.   266.   291.   318.   317.   301.   294.
IN  288.   288.   345.   627.  1073.  1261.   989.   691.   611.   554.
IN  468.   373.   286.   353.   508.   682.   744.   821.   877.   942.
IN  939.   866.   805.   793.   781.   742.   710.   697.   655.   624.
IN  623.   626.   631.   637.   593.   580.   520.   492.   489.   492.
IN  505.   491.   482.   454.   430.   440.   445.   458.   460.   460.
IN  485.   492.   495.   510.   505.   489.   518.   478.   475.   460.
IN  435.   426.   423.   414.   414.   383.   393.   400.   380.   388.
IN  420.   472.   567.   665.   693.   706.   768.  1341.  2322.  2380.
IN 1867.  1434.  1099.   945.   885.   830.   852.   827.   759.   661.
IN  586.   560.   588.   858.  1423.  1355.  1122.  1154.  1173.  1042.
IN  913.   796.   742.   712.   709.   709.   650.   620.  1908.  3884.
IN 2847.  1632.  1084.   889.   775.   697.   645.   668.   748.   748.
IN  696.   646.   636.   580.   637.   681.   614.   574.   511.   498.
IN  485.   463.   454.   423.   415.   528.   583.   466.   401.   363.
IN  361.   360.   486.  1088.  2032.  1925.  1366.   858.   630.   511.
```

INPUT (CONTINUED):

```
IN  451.   407.   343.   302.   311.   318.   285.   271.   264.   251.
IN  236.   217.   207.   196.   185.   187.   190.   187.   170.   161.
IN  170.   184.   204.   219.   222.   225.   233.   222.   200.   195.
IN  208.   254.   288.   263.   227.   219.   216.   230.   294.   289.
IN  353.   562.   828.   808.   939.  1214.  1204.  1185.  1085.  1035.
IN  917.   822.   815.   743.   662.   731.  1154.  1286.  1198.  1150.
IN 1103.  1024.  1008.   860.   720.   551.   448.   388.   350.   303.
IN  273.   247.   224.   214.   211.   199.   177.   186.   205.   222.
IN  201.   161.   167.   210.   236.   271.   298.   286.   269.   280.
IN  314.   289.   270.   420.  1298.  2621.  1893.  1165.   909.   774.
IN  700.   607.   535.   530.   613.   602.   452.   366.   322.   309.
IN  291.   256.   247.   239.   224.   240.   275.   275.   292.   317.
IN  319.   320.   331.   348.   356.   397.   482.   574.   450.   420.
IN  403.   365.   330.   308.   300.   313.   325.   327.   330.   455.
IN 1036.  1728.  1679.  1054.   850.   761.   728.   714.   673.   619.
IN  566.   577.   572.   538.   505.   498.   501.   480.   466.   463.
IN  460.   447.   441.   430.   408.   418.   428.   465.   505.   473.
IN  476.   478.   475.   480.   455.   433.   414.   404.   393.   394.
IN  402.   382.   380.   390.   408.   352.   291.   289.   288.   285.
IN  281.   285.   306.   335.   380.
BF    2    365
IN    1   1926
IN  433.   488.   522.   607.   713.   695.   709.   700.   596.   507.
IN  426.   370.   355.   393.   430.   494.   595.   691.   718.   708.
IN  608.   366.   331.   358.   410.   504.   549.   542.   529.   514.
IN  583.   626.   707.   663.   639.   667.   706.   679.   645.   643.
IN  601.   592.   577.   527.   493.   486.   505.   514.   572.   568.
IN  571.   596.   630.   655.   704.   752.   667.   495.   552.   639.
IN  654.   646.   618.   602.   569.   538.   546.   568.   538.   525.
IN  530.   534.   530.   526.   508.   505.   524.   530.   538.   555.
IN  581.   612.   624.   656.   666.   637.   631.   641.   670.   641.
IN  597.   601.   678.   839.  1072.  1404.  1643.  1546.  1423.  1524.
IN 2060.  2421.  2221.  1917.  1775.  1599.  1454.  1337.  1228.  1111.
IN 1021.   972.   934.   883.   825.   802.   763.   729.   714.   689.
IN  669.   630.   679.   808.   880.   799.   752.   741.   707.   763.
IN  861.   891.   795.   741.   708.   675.   671.   671.   657.   637.
IN  606.   568.   523.   497.   490.   445.   405.   368.   352.   350.
IN  365.   390.   422.   545.   707.   738.   598.   455.   365.   373.
IN  560.   751.   624.   418.   356.   323.   275.   263.   276.   256.
IN  244.   229.   241.   269.   279.   297.   333.   400.   418.   498.
IN  335.   264.   205.   174.   170.   176.   186.   191.   216.   335.
IN  358.   356.   393.   479.   561.   627.   576.   450.   355.   288.
IN  250.   232.   266.   340.   352.   295.   236.   204.   180.   161.
IN  153.   150.   150.   150.   167.   156.   142.   139.   136.   134.
IN  123.   115.   108.   110.   113.   158.   313.   814.  2172.  2478.
IN 2054.  2345.  1510.  1198.   857.   803.   916.   759.   482.   380.
IN  335.   467.   797.   558.   375.  12544.  16134.  30144.  14990.  3656.
IN 1802.   227.    92.   866.  1222.  1030.  1675.  1878.  1605.  1459.
IN 1163.   888.   769.   687.   577.   518.   491.   450.   444.   479.
IN  523.   531.   517.  17309.  31297.  63846.  68991.  57776.  33926.  18434.
IN 8363.  4479.  3134.  2869.  4233.  5923.  7339.  5790.  3841.  2800.
IN 2134.  1810.  1588.  1436.  1364.  1279.  1165.  1103.  1000.   953.
IN  941.   934.   938.   911.   854.   810.   771.   758.   752.   741.
IN 1048.  1871.  2660.  2858.  2653.  2296.  1775.  1635.  1667.  1591.
IN 1385.  1199.  1160.  1106.  1032.   976.   964.   952.   944.   932.
IN  907.   896.   876.   857.   821.   795.   795.   781.   773.   786.
IN  877.  1057.  1160.  1186.  1122.  1040.   965.   865.   727.   705.
IN  728.   763.   786.   808.   866.   935.   946.   932.   889.   865.
IN  832.   807.   799.   798.   796.
EJ
```

OUTPUT (EXAMPLE NO.3)

```
************************************      ************************************
*     STATS:BETA TEST VERSION      *      *                                  *
* STATISTICAL ANALYSIS-TIME SERIES *      *   U.S. ARMY CORPS OF ENGINEERS   *
*     PROGRAM DATE:  MAY 1987      *      * THE HYDROLOGIC ENGINEERING CENTER *
*     VERSION DATE:   ------       *      *         609 SECOND STREET        *
*         RUN DATE AND TIME:       *      *      DAVIS, CALIFORNIA 95616     *
*        19 JUL 96    11:48:46     *      *         (530) 756-1104           *
*                                  *      *                                  *
************************************      ************************************


 INPUT FILE NAME: test3.DAT
OUTPUT FILE NAME: test3.OUT



 ** TITLE INFORMATION **
 TT  TEST NO. 3 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
 TT  ANALYTICAL ANALYSIS OF DAILY FLOWS
 TT  COMPUTE DURATION CURVE ALONG WITH MAXIMUM AND MINIMUM ANALYSIS
 TT  COMPUTE STATISTICS OF LOGS FOR MONTHLY SUMMARY TABLES
 TT  INPUT LISTING OF DAILY DATA SUPPRESSED
 TT  TEST OF 5 YEARS 1922-26

 **JOB SPECIFICATIONS**
    JSTAT   NPRDS    NYRS   MONWY   JBEGN    JEND    JPPF   MONSS   LOGTM   NDECM
 J1    14     365               1                                       -1

 **LOCATION IDENTIFICATION**
 ID  KAW LAKE INFLOWS

 **LOCATION SPECIFICATIONS**
    IANAL    NAME    LOGT    NDEC    NSIG   IPRNT    UNIT
 LS     3                                      0

 **INPUT CLASS LIMITS**
 CL    29     100     200     300     400     500     600     700     800     900
 CL  1000    2000    3000    4000    5000    6000    7000    8000    9000   10000
 CL 20000   30000   40000   50000   60000   70000   80000   90000  100000  200000

 **BEFORE DATA CARD**
     IFMT   NPRDS
 BF     2     365

 **BEFORE DATA CARD**
     IFMT   NPRDS
 BF     2     365

 **BEFORE DATA CARD**
     IFMT   NPRDS
 BF     2     366

 **BEFORE DATA CARD**
     IFMT   NPRDS
 BF     2     365

 **BEFORE DATA CARD**
     IFMT   NPRDS
 BF     2     365
```

- ANALYSIS OF MAXIMUMS -

-PLOTTING POSITIONS- KAW LAKE INFLOWS

EVENTS ANALYZED				ORDERED EVENTS			
MON	DAY	YEAR	FLOW CFS	RANK	CALENDER YEAR	FLOW CFS	MEDIAN PLOT POS
7	12	1922	47437.	1	1923	110960.	12.96
6	10	1923	110960.	2	1926	68991.	31.48
5	1	1924	24276.	3	1922	47437.	50.00
5	10	1925	3884.	4	1924	24276.	68.52
10	4	1926	68991.	5	1925	3884.	87.04

***** ANALYTICAL FIT TO DATA *****

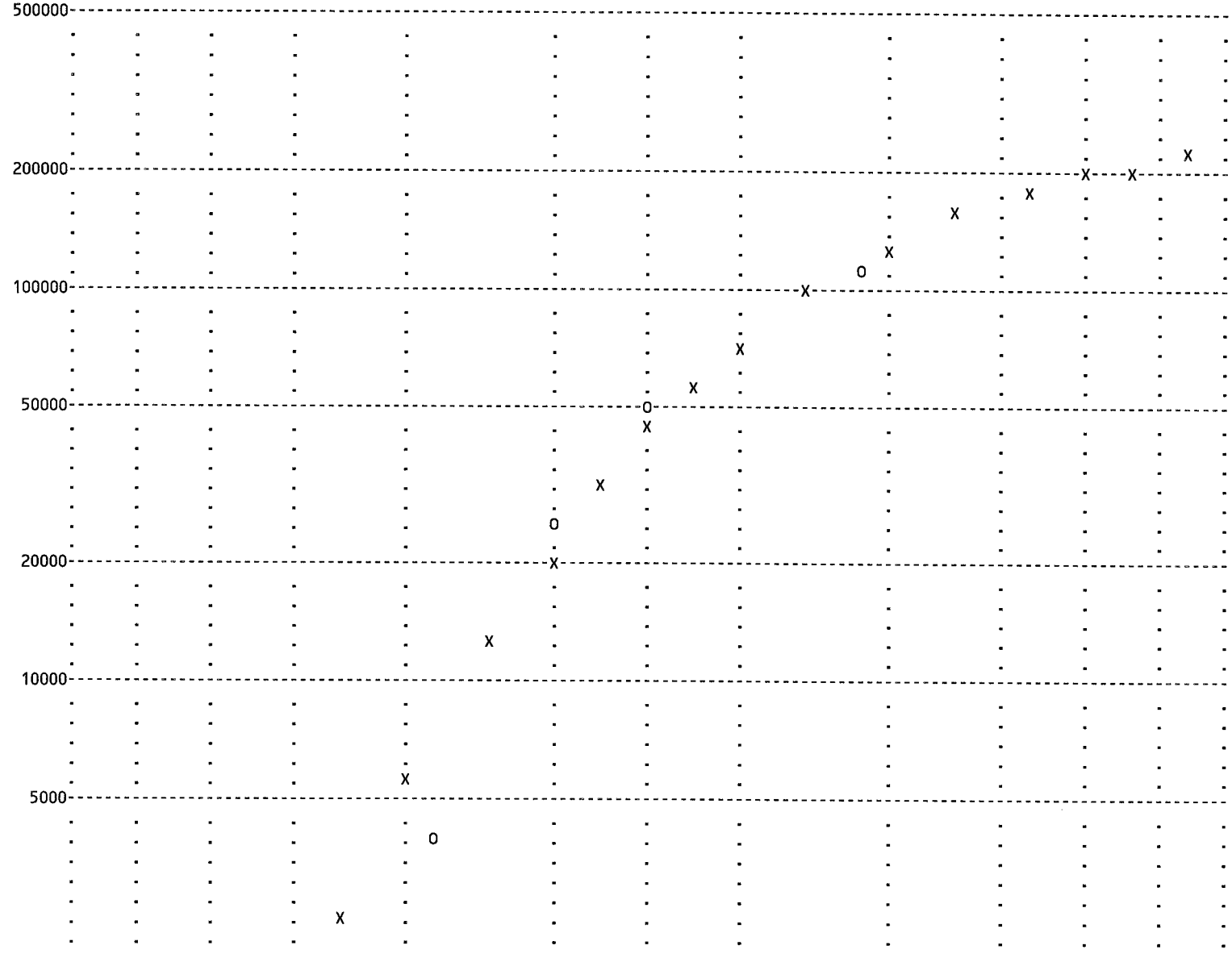
CAUTION FROM SUBROUTINE WTSKEW
***** NO GENERALIZED SKEW PROVIDED
ADOPTED SKEW SET TO COMPUTED SKEW

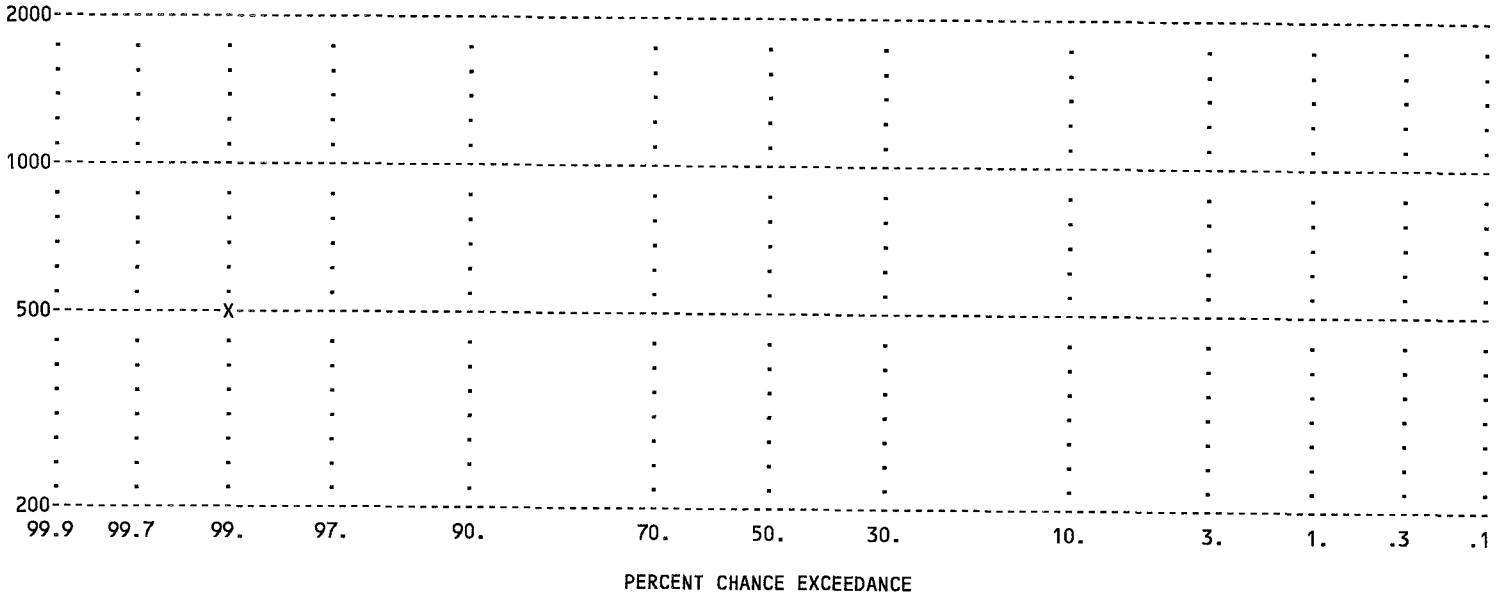
-FREQUENCY CURVE- KAW LAKE INFLOWS

FLOW IN CFS		PERCENT CHANCE	CONFIDENCE LIMITS	
COMPUTED	EXPECTED PROBABILITY	EXCEEDANCE	.05 LIMIT	.95 LIMIT
217000.	278000.	.2	4470000.	73900.
206000.	253000.	.5	4000000.	71100.
195000.	239000.	1.0	3550000.	68000.
181000.	227000.	2.0	3000000.	63900.
155000.	196000.	5.0	2130000.	56200.
129000.	157000.	10.0	1430000.	48000.
96000.	109000.	20.0	770000.	36600.
73500.	79900.	30.0	449000.	28000.
56200.	58700.	40.0	269000.	20800.
42300.	42300.	50.0	162000.	14600.
30700.	28800.	60.0	97600.	9190.
20900.	17800.	70.0	57800.	4850.
12600.	8870.	80.0	32800.	1840.
5600.	2410.	90.0	15900.	330.
2610.	474.	95.0	8820.	59.
486.	1.	99.0	2730.	1.

SYSTEMATIC STATISTICS			
LOG TRANSFORM: FLOW, CFS		NUMBER OF EVENTS	
MEAN	4.5069	HISTORIC EVENTS	0
STANDARD DEV	.5669	HIGH OUTLIERS	0
COMPUTED SKEW	-1.3201	LOW OUTLIERS	0
GENERALIZED SKEW	-99.0000	ZERO OR MISSING	0
ADOPTED SKEW	-1.3000	SYSTEMATIC EVENTS	5

FREQUENCY PLOT - KAW LAKE INFLOWS
BASED ON COMPUTED VALUES - FLOW IN CFS




2000
1000
500
200
X
99.9
99.7
99.
97.
90.
70.
50.
30.
10.
3.
1.
.3
.1
PERCENT CHANCE EXCEEDANCE

- ANALYSIS OF MINIMUMS -

-PLOTTING POSITIONS- KAW LAKE INFLOWS

EVENTS ANALYZED				ORDERED EVENTS			
MON	DAY	YEAR	FLOW CFS	RANK	CALENDER YEAR	FLOW CFS	MEDIAN PLOT POS
1	7	1922	83.	1	1923	26.	12.96
4	3	1923	26.	2	1922	83.	31.48
9	10	1924	181.	3	1926	92.	50.00
7	9	1925	161.	4	1925	161.	68.52
9	10	1926	92.	5	1924	181.	87.04

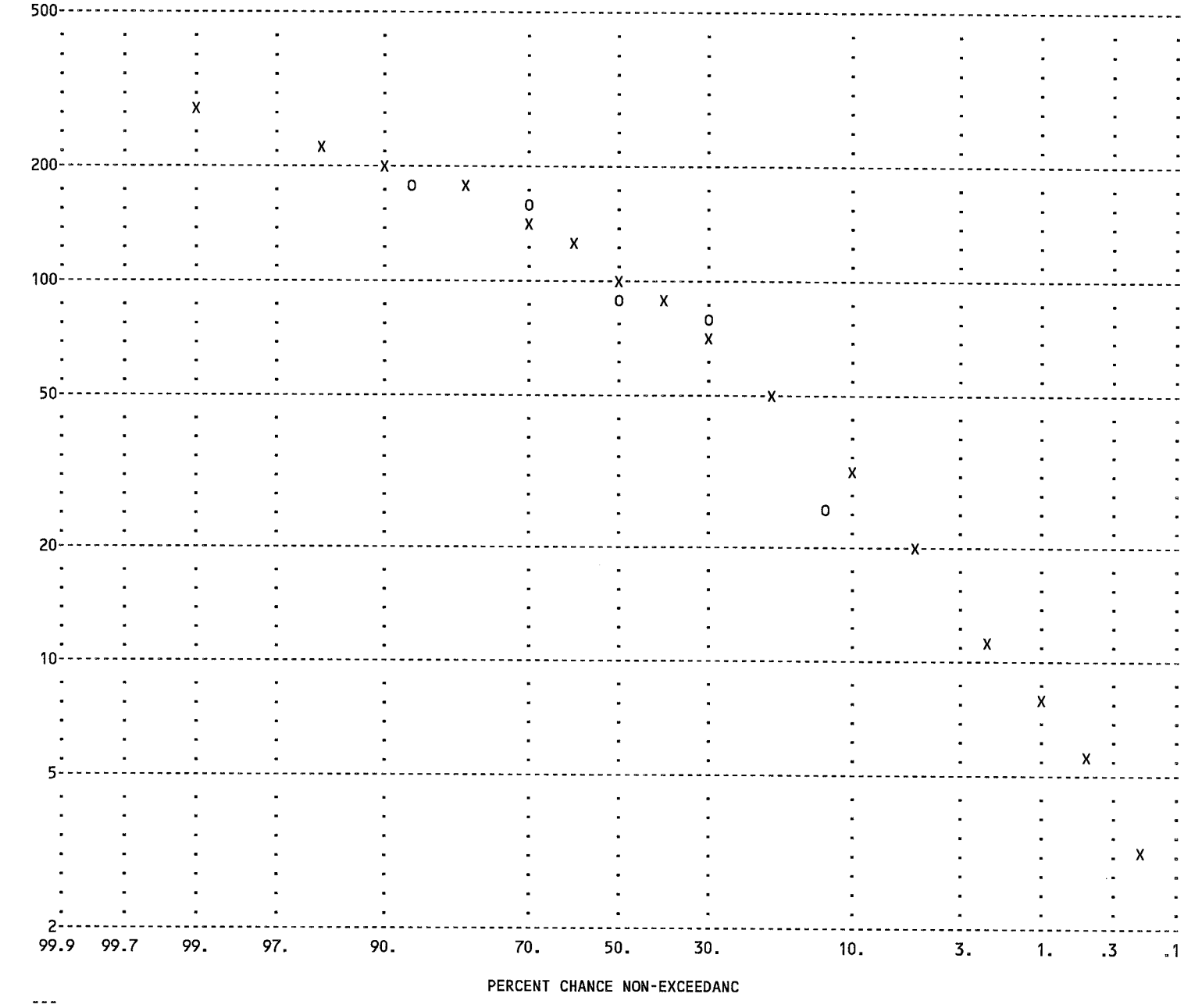
***** ANALYTICAL FIT TO DATA *****

CAUTION FROM SUBROUTINE WTSKEW
***** NO GENERALIZED SKEW PROVIDED
ADOPTED SKEW SET TO COMPUTED SKEW

-FREQUENCY CURVE- KAW LAKE INFLOWS

FLOW IN CFS		PERCENT	CONFIDENCE LIMITS	
COMPUTED	EXPECTED PROBABILITY	CHANCE NON-EXCEEDANCE	.05 LIMIT	.95 LIMIT
3.	0.	.2	12.	0.
5.	0.	.5	17.	0.
8.	0.	1.0	22.	0.
12.	2.	2.0	28.	1.
21.	8.	5.0	42.	2.
32.	20.	10.0	59.	6.
51.	42.	20.0	90.	16.
69.	63.	30.0	125.	29.
86.	83.	40.0	169.	42.
104.	104.	50.0	229.	55.
124.	127.	60.0	309.	69.
146.	153.	70.0	422.	82.
172.	186.	80.0	589.	97.
207.	236.	90.0	874.	115.
234.	274.	95.0	1140.	128.
274.	321.	99.0	1610.	145.

SYSTEMATIC STATISTICS			
LOG TRANSFORM: FLOW, CFS		NUMBER OF EVENTS	
MEAN	1.9525	HISTORIC EVENTS	0
STANDARD DEV	.3347	HIGH OUTLIERS	0
COMPUTED SKEW	-1.2276	LOW OUTLIERS	0
GENERALIZED SKEW	-99.0000	ZERO OR MISSING	0
ADOPTED SKEW	-1.2000	SYSTEMATIC EVENTS	5


-FREQUENCY PLOT - KAW LAKE INFLOWS
BASED ON COMPUTED VALUES - FLOW IN CFS
500
200
100
50
20
10
5
2
99.9
99.7
99.
97.
90.
70.
50.
30.
10.
3.
1.
.3
.1
PERCENT CHANCE NON-EXCEEDANC

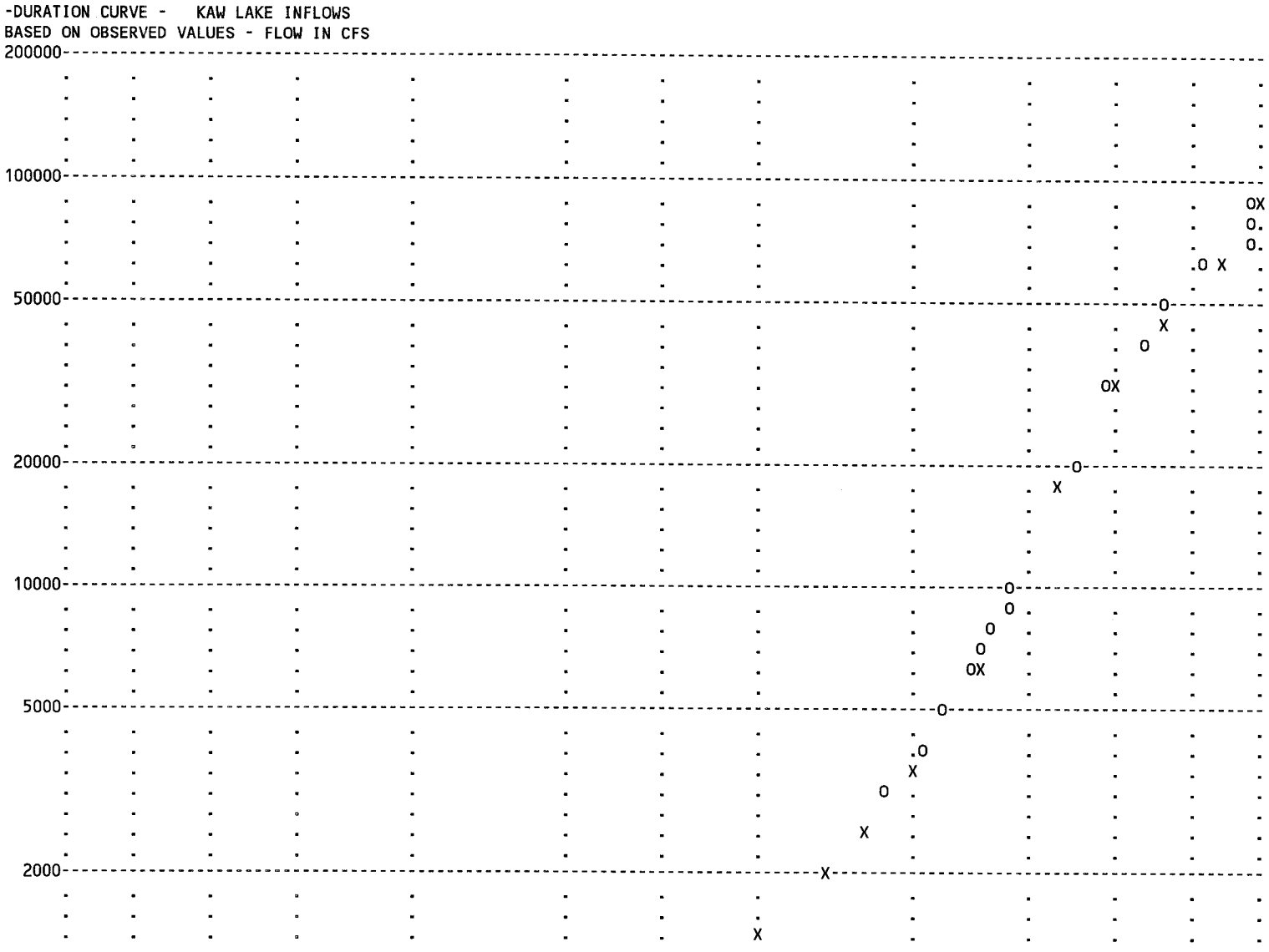
- DURATION ANALYSIS -

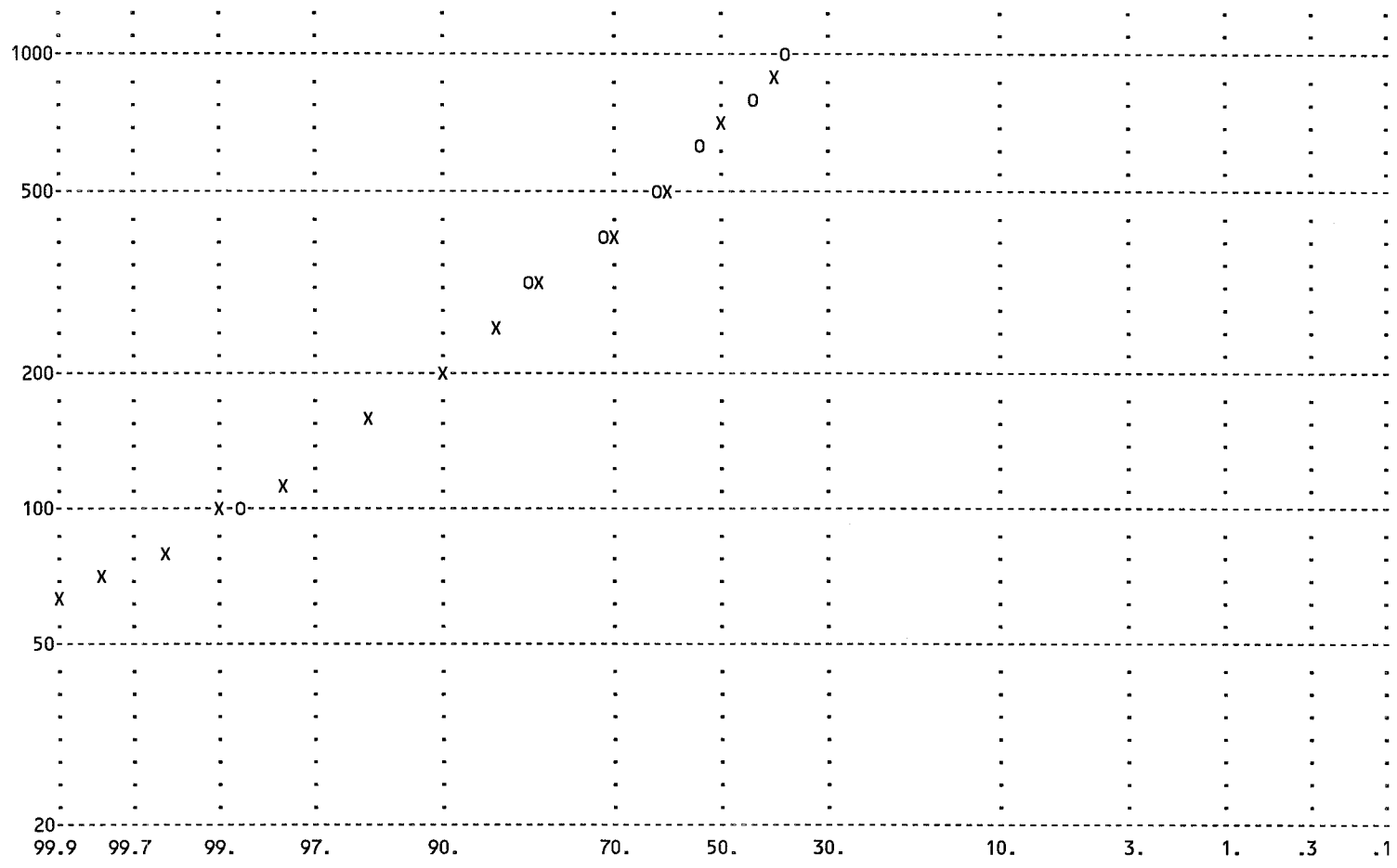
-DURATION DATA- KAW LAKE INFLOWS

CLASS NUMBER	LOWER CLASS LIMIT FLOW,CFS	NUMBER IN CLASS	ACCUM NUMBER	PERCENT EQUAL OR EXCEED	CLASS NUMBER	LOWER CLASS LIMIT FLOW,CFS	NUMBER IN CLASS	ACCUM NUMBER	PERCENT EQUAL OR EXCEED	CLASS NUMBER	LOWER CLASS LIMIT FLOW,CFS	NUMBER IN CLASS	ACCUM NUMBER	PERCENT EQUAL OR EXCEED
0	26.	22	1826	100.00										
1	100.	159	1804	98.80	11	2000.	145	366	20.04	21	30000.	7	19	1.04
2	200.	165	1645	90.09	12	3000.	57	221	12.10	22	40000.	4	12	.66
3	300.	186	1480	81.05	13	4000.	33	164	8.98	23	50000.	3	8	.44
4	400.	169	1294	70.87	14	5000.	26	131	7.17	24	60000.	3	5	.27
5	500.	128	1125	61.61	15	6000.	18	105	5.75	25	70000.	0	2	.11
6	600.	101	997	54.60	16	7000.	8	87	4.76	26	80000.	0	2	.11
7	700.	92	896	49.07	17	8000.	13	79	4.33	27	90000.	1	2	.11
8	800.	64	804	44.03	18	9000.	3	66	3.61	28	100000.	1	1	.05
9	900.	45	740	40.53	19	10000.	33	63	3.45	29	200000.	0	0	.00
10	1000.	329	695	38.06	20	20000.	11	30	1.64					

-INTERPOLATED DURATION CURVE- KAW LAKE INFLOWS

PERCENT EQUAL OR EXCEED	INTERPOLATED MAGNITUDE FLOW,CFS	PERCENT EQUAL OR EXCEED	INTERPOLATED MAGNITUDE FLOW,CFS
.01	111000.	60.00	521.
.05	111000.	70.00	409.
.10	92100.	80.00	311.
.20	63100.	85.00	256.
.50	46800.	90.00	201.
1.00	30900.	95.00	151.
2.00	17000.	98.00	114.
5.00	6690.	99.00	96.
10.00	3600.	99.50	82.
15.00	2530.	99.80	69.
20.00	2000.	99.90	61.
30.00	1350.	99.95	55.
40.00	919.	99.99	44.
50.00	682.	100.00	26.


-DURATION CURVE - KAW LAKE INFLOWS
BASED ON OBSERVED VALUES - FLOW IN CFS
200000
100000
50000
20000
10000
5000
2000



LEGEND - O=OBSERVED VALUE, H=HIGH OUTLIER OR HISTORIC VALUE, L=LOW OUTLIER, Z=ZERO OR MISSING, X=COMPUTED CURVE

TEST NO. 3 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
ANALYTICAL ANALYSIS OF DAILY FLOWS
COMPUTE DURATION CURVE ALONG WITH MAXIMUM AND MINIMUM ANALYSIS

-MONTHLY SUMMARY- KAW LAKE INFLOWS

MONTHLY AND ANNUAL MEAN VALUES, FLOW IN CFS

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	ANNUAL
1922	134.	212.	2584.	7176.	7254.	1541.	9611.	923.	412.	332.	1994.	610.	2752.
1923	191.	121.	191.	275.	3144.	25982.	2368.	2669.	2551.	4135.	2527.	1572.	3797.
1924	1043.	2035.	3240.	3924.	4377.	1151.	872.	1014.	330.	405.	392.	387.	1597.
1925	414.	657.	454.	1012.	933.	572.	232.	815.	520.	363.	628.	392.	581.
1926	530.	608.	583.	1226.	636.	408.	296.	664.	3276.	11545.	1298.	871.	1842.
MAX	1043.	2035.	3240.	7176.	7254.	25982.	9611.	2669.	3276.	11545.	2527.	1572.	3797.
MIN	134.	121.	191.	275.	636.	408.	232.	664.	330.	332.	392.	387.	581.
MEAN	463.	727.	1411.	2722.	3269.	5931.	2676.	1217.	1418.	3356.	1368.	766.	2114.

-STATISTICS OF THE LOGS OF VALUES GREATER THAN ZERO-

MEAN	2.554	2.664	2.926	3.196	3.355	3.206	3.027	3.026	2.954	3.073	3.041	2.820	3.250
STDV	.355	.476	.522	.551	.450	.714	.669	.234	.470	.718	.340	.256	.309
SKEW	.075	.147	.075	-.233	-.312	1.672	.632	1.750	.539	.815	-.420	.753	-1.021

TEST NO. 3 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
ANALYTICAL ANALYSIS OF DAILY FLOWS
COMPUTE DURATION CURVE ALONG WITH MAXIMUM AND MINIMUM ANALYSIS

-MONTHLY SUMMARY- KAW LAKE INFLOWS

MAXIMUM DAILY VALUES, FLOW IN CFS

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	ANNUAL
1922	275.	655.	14759.	29164.	16726.	4643.	47437.	1345.	788.	604.	8154.	756.	47437.
1923	571.	205.	435.	1014.	15403.	110960.	3819.	5898.	6127.	11002.	5076.	1853.	110960.
1924	1605.	3304.	6329.	16045.	24276.	1936.	2024.	5682.	1137.	990.	688.	466.	24276.
1925	1261.	942.	518.	2380.	3884.	2032.	562.	1286.	2621.	613.	1728.	505.	3884.
1926	718.	752.	670.	2421.	891.	751.	627.	2478.	30144.	68991.	2858.	1186.	68991.
MAX	1605.	3304.	14759.	29164.	24276.	110960.	47437.	5898.	30144.	68991.	8154.	1853.	110960.
MIN	275.	205.	435.	1014.	891.	751.	562.	1286.	788.	604.	688.	466.	3884.
MEAN	886.	1172.	4542.	10205.	12236.	24064.	10894.	3338.	8163.	16440.	3701.	953.	51110.

-STATISTICS OF THE LOGS OF VALUES GREATER THAN ZERO-

MEAN	2.872	2.899	3.230	3.687	3.867	3.636	3.422	3.431	3.527	3.489	3.430	2.918	4.507
STDV	.302	.431	.705	.618	.595	.836	.783	.323	.634	.917	.417	.253	.567
SKEW	-.502	.181	.720	.415	-1.138	1.625	1.236	.143	.856	.977	-.469	.533	-1.320

TEST NO. 3 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
ANALYTICAL ANALYSIS OF DAILY FLOWS
COMPUTE DURATION CURVE ALONG WITH MAXIMUM AND MINIMUM ANALYSIS

-MONTHLY SUMMARY- KAW LAKE INFLOWS

MINIMUM DAILY VALUES, FLOW IN CFS

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	ANNUAL
1922	83.	87.	202.	1078.	2305.	911.	1088.	463.	328.	286.	587.	314.	83.
1923	108.	95.	93.	26.	317.	3596.	1702.	1457.	1014.	2100.	1604.	1411.	26.
1924	672.	1294.	1451.	1911.	1573.	546.	395.	271.	181.	210.	242.	310.	181.
1925	246.	286.	380.	420.	485.	236.	161.	224.	161.	224.	300.	281.	161.
1926	331.	486.	505.	597.	350.	229.	150.	108.	92.	911.	741.	705.	92.
MAX	672.	1294.	1451.	1911.	2305.	3596.	1702.	1457.	1014.	2100.	1604.	1411.	181.
MIN	83.	87.	93.	26.	317.	229.	150.	108.	92.	210.	242.	281.	26.
MEAN	288.	450.	526.	806.	1006.	1104.	699.	505.	355.	746.	695.	604.	109.

-STATISTICS OF THE LOGS OF VALUES GREATER THAN ZERO-

MEAN	2.338	2.434	2.544	2.626	2.858	2.797	2.649	2.529	2.390	2.682	2.741	2.687	1.952
STDV	.369	.494	.446	.722	.395	.494	.477	.421	.396	.441	.328	.305	.335
SKEW	.178	.382	.170	-1.575	.579	.970	.237	.724	1.003	.919	.453	1.111	-1.228

JOB COMPLETE

++++++++++++++++++++++
NORMAL STOP IN STATS

2.4 EXAMPLE NO.4 - ANALYTICAL FREQUENCY ANALYSIS EXAMPLE

Given: Daily precipitation data (inches) from 1953-1962 at Stayton, Oregon (Data was retrieved from DSS)

Objective: Compute Log Pearson Type III frequency curve parameters and ordinates, and generate a frequency plot of annual maximum precipitation. Use RV card to multiply each input value by 100 inches. Analysis is based on water year.

Solution: The STATS input file (TEST4.DAT) given below was developed to perform the required analysis. The RV record was used to specify the multiplication of 100 to each precipitation value.

Daily precipitation values for each year were analyzed to determine its maximum value. For each annual maximum precipitation value, the plotting positions are then determined. STATS then calculated the computed and expected frequency ordinates and generated the required frequency plots, containing both observed and computed values.

COMMAND LINE:

STATS I = TEST4.DAT O = TEST4.OUT DSSFILE = STAYTON0.DSS

INPUT (TEST4.DAT)

```
TT  TEST NO.4 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
TT  ANALYTICAL FREQUENCY ANALYSIS OF DAILY PRECIPITATION
TT  ANALYSIS OF MAXIMUMS ONLY, WATER YEAR IS USED
TT  RV CARD USED TO MULTIPLY 100 INCHES TO INPUT VALUES
TT  DAILY PRECIP STAYTON, OREGON
TT  WY 1953-1962
TT  WY 1953 - WY 1962
TT     1       2       3       4       5       6       7
J1    10     365      10      10
ID  PRECIP AT STAYTON OREGON
LS     1    PPTN                                1  INCHES
RV     2     100
ZR  A=NWS-8095 B=STAYTON OR C=PRECIP-INC D=01JAN1951 E=1DAY F=DAILY OBS
ZT  2400    01OCT1952       2400    30SEP1962
EJ
```

OUTPUT (EXAMPLE NO.4)

```
************************************      ************************************
*     STATS:BETA TEST VERSION      *      *                                  *
* STATISTICAL ANALYSIS-TIME SERIES *      *   U.S. ARMY CORPS OF ENGINEERS   *
*     PROGRAM DATE:  MAY 1987      *      * THE HYDROLOGIC ENGINEERING CENTER *
*     VERSION DATE:   ------       *      *         609 SECOND STREET        *
*         RUN DATE AND TIME:       *      *      DAVIS, CALIFORNIA 95616     *
*        19 JUL 96    13:54:20     *      *         (530) 756-1104           *
*                                  *      *                                  *
************************************      ************************************


 INPUT FILE NAME: TEST4.DAT
OUTPUT FILE NAME: TEST4.OUT
 DSSIN FILE NAME: STAYTON0.DSS
DSSOUT FILE NAME: STAYTON0.DSS


   -----DSS---ZOPEN:  Existing File Opened,  File: STAYTON0.DSS
                      Unit:  71;  DSS Version: 6-GS

** TITLE INFORMATION **
TT  TEST NO.4 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
TT  ANALYTICAL FREQUENCY ANALYSIS OF DAILY PRECIPITATION
TT  ANALYSIS OF MAXIMUMS ONLY, WATER YEAR IS USED
TT  RV CARD USED TO MULTIPLY 100 INCHES TO INPUT VALUES
TT  DAILY PRECIP STAYTON, OREGON
TT  WY 1953-1994


**JOB SPECIFICATIONS**
   JSTAT   NPRDS    NYRS   MONWY   JBEGN    JEND    JPPF   MONSS   LOGTM   NDECM
J1    10     365      10      10

**LOCATION IDENTIFICATION**
ID  PRECIP AT STAYTON OREGON

**LOCATION SPECIFICATIONS**
   IANAL    NAME    LOGT    NDEC    NSIG   IPRNT    UNIT
LS     1    PPTN                               1  INCHES

     SELECTED OUTPUT OPTIONS
       1 = LIST THE INPUT TIME SERIES DATA

**REVISION OF DATA**
   IFUNC   CONST(S)
RV     2     100

**DSS READ PATHNAME**
ZR  A=NWS-8095 B=STAYTON OR C=PRECIP-INC D=01JAN1951 E=1DAY F=DAILY OBS

**DSS READ TIMES**
ZT      01OCT1952          30SEP1962


** END OF INPUT FOR LOCATION **
EJ ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

- ANALYSIS OF MAXIMUMS -

-PLOTTING POSITIONS- PRECIP AT STAYTON OREGON

.....EVENTS ANALYZED.....					..ORDERED EVENTS..			
MON	DAY	YEAR	PPTN INCHES		RANK	WATER YEAR	PPTN INCHES	MEDIAN PLOT POS
12	10	1952	134.		1	1956	447.	6.73
11	22	1953	229.		2	1961	310.	16.35
11	17	1954	157.		3	1959	235.	25.96
10	9	1955	447.		4	1954	229.	35.58
3	7	1957	123.		5	1958	220.	45.19
12	19	1957	220.		6	1962	177.	54.81
1	27	1959	235.		7	1960	170.	64.42
2	8	1960	170.		8	1955	157.	74.04
11	23	1960	310.		9	1953	134.	83.65
11	22	1961	177.		10	1957	123.	93.27

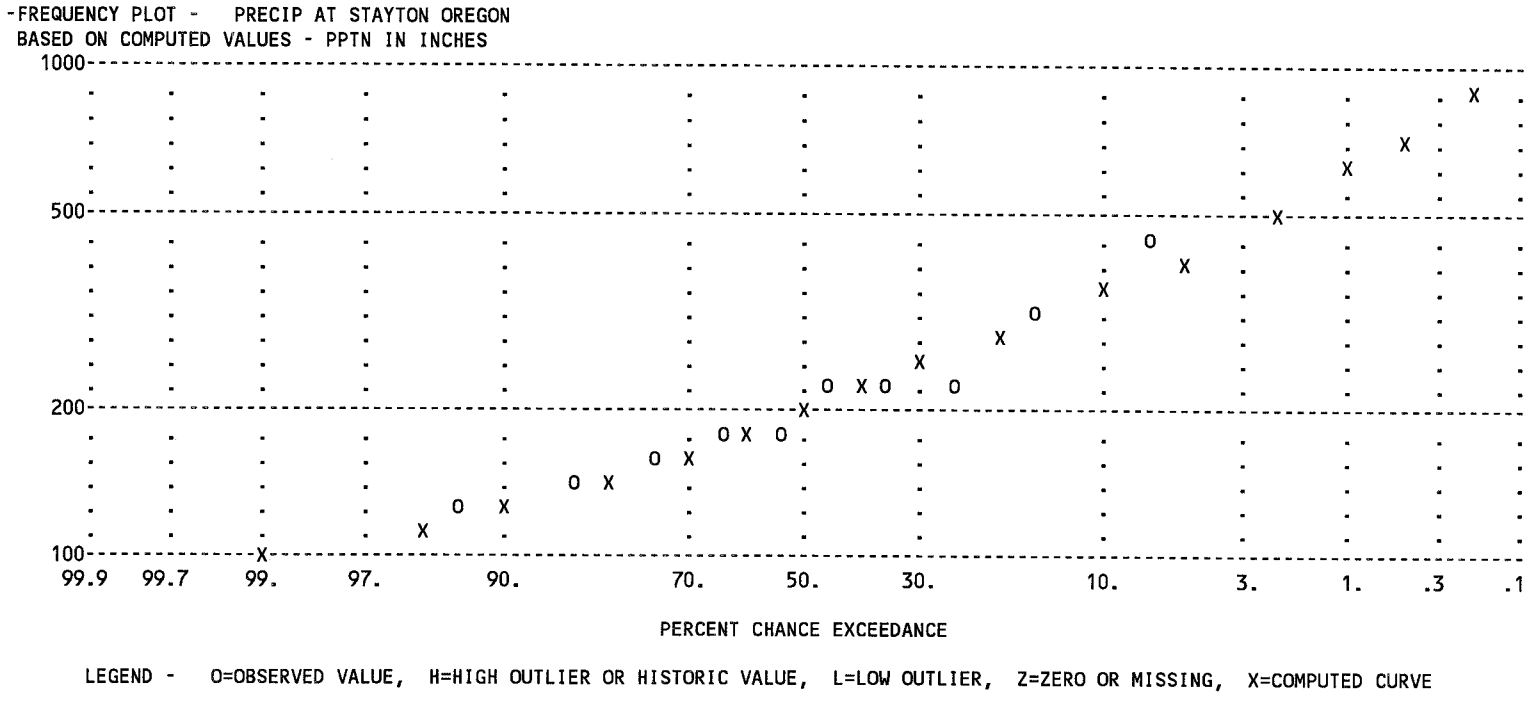
***** ANALYTICAL FIT TO DATA *****

CAUTION FROM SUBROUTINE WTSKEW
***** NO GENERALIZED SKEW PROVIDED
ADOPTED SKEW SET TO COMPUTED SKEW

-FREQUENCY CURVE- PRECIP AT STAYTON OREGON

.....PPTN IN INCHES....		PERCENT CHANCE EXCEEDANCE	...CONFIDENCE LIMITS...	
COMPUTED	EXPECTED PROBABILITY		.05 LIMIT	.95 LIMIT
883.	2030.	.2	2310.	566.
724.	1280.	.5	1680.	488.
619.	933.	1.0	1310.	434.
525.	697.	2.0	1010.	383.
417.	487.	5.0	702.	319.
345.	377.	10.0	524.	273.
279.	290.	20.0	383.	226.
242.	247.	30.0	315.	197.
216.	218.	40.0	272.	174.
195.	195.	50.0	242.	155.
178.	177.	60.0	218.	138.
162.	159.	70.0	199.	121.
146.	143.	80.0	180.	105.
129.	123.	90.0	161.	87.
117.	110.	95.0	149.	76.
101.	90.	99.0	131.	60.

SYSTEMATIC STATISTICS			
LOG TRANSFORM: PPTN, INCHES		NUMBER OF EVENTS	
MEAN	2.3106	HISTORIC EVENTS	0
STANDARD DEV	.1703	HIGH OUTLIERS	0
COMPUTED SKEW	.7383	LOW OUTLIERS	0
GENERALIZED SKEW	-99.0000	ZERO OR MISSING	0
ADOPTED SKEW	.7000	SYSTEMATIC EVENTS	10


-FREQUENCY PLOT - PRECIP AT STAYTON OREGON
BASED ON COMPUTED VALUES - PPTN IN INCHES
1000
500
200
100
99.9 99.7 99. 97. 90. 70. 50. 30. 10. 3. 1. .3 .1
PERCENT CHANCE EXCEEDANCE
LEGEND - O=OBSERVED VALUE, H=HIGH OUTLIER OR HISTORIC VALUE, L=LOW OUTLIER, Z=ZERO OR MISSING, X=COMPUTED CURVE

TEST NO.4 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
ANALYTICAL FREQUENCY ANALYSIS OF DAILY PRECIPITATION
ANALYSIS OF MAXIMUMS ONLY, WATER YEAR IS USED

-MONTHLY SUMMARY- PRECIP AT STAYTON OREGON

MONTHLY AND ANNUAL MEAN VALUES, PPTN IN INCHES

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	ANNUAL
1953	4.	5.	25.	40.	22.	20.	8.	21.	9.	0.	6.	4.	14.
1954	15.	35.	33.	38.	18.	14.	14.	8.	14.	3.	3.	7.	17.
1955	14.	22.	26.	9.	10.	20.	25.	6.	9.	5.	0.	12.	13.
1956	38.	24.	50.	42.	16.	23.	5.	8.	8.	0.	2.	4.	19.
1957	28.	6.	19.	13.	19.	30.	8.	13.	9.	1.	3.	3.	13.
1958	12.	11.	39.	32.	25.	13.	17.	4.	9.	0.	0.	7.	14.
1959	8.	35.	21.	39.	20.	16.	6.	12.	7.	2.	1.	8.	15.
1960	12.	10.	12.	16.	22.	31.	14.	19.	3.	0.	6.	3.	12.
1961	14.	40.	14.	15.	45.	31.	11.	13.	3.	2.	2.	6.	16.
1962	15.	21.	28.	7.	15.	27.	14.	12.	3.	0.	7.	9.	13.
MAX	38.	40.	50.	42.	45.	31.	25.	21.	14.	5.	7.	12.	19.
MIN	4.	5.	12.	7.	10.	13.	5.	4.	3.	0.	0.	3.	12.
MEAN	16.	21.	27.	25.	21.	22.	12.	12.	7.	1.	3.	6.	15.
STDV	10.	13.	12.	14.	9.	7.	6.	5.	4.	2.	3.	3.	2.
SKEW	1.	0.	1.	0.	2.	0.	1.	0.	0.	1.	0.	0.	1.

TEST NO.4 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
ANALYTICAL FREQUENCY ANALYSIS OF DAILY PRECIPITATION
ANALYSIS OF MAXIMUMS ONLY, WATER YEAR IS USED

-MONTHLY SUMMARY- PRECIP AT STAYTON OREGON

MAXIMUM DAILY VALUES, PPTN IN INCHES

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	ANNUAL
1953	54.	47.	134.	123.	123.	118.	73.	83.	88.	6.	62.	64.	134.
1954	132.	229.	212.	188.	166.	140.	90.	73.	83.	39.	29.	65.	229.
1955	123.	157.	125.	45.	78.	87.	135.	101.	95.	64.	0.	139.	157.
1956	447.	223.	217.	290.	152.	106.	42.	36.	61.	6.	33.	50.	447.
1957	104.	84.	84.	68.	63.	123.	67.	89.	118.	24.	31.	38.	123.
1958	65.	58.	220.	138.	92.	56.	96.	35.	72.	0.	4.	36.	220.
1959	80.	226.	92.	235.	221.	81.	67.	112.	63.	66.	29.	101.	235.
1960	65.	80.	123.	108.	170.	136.	64.	104.	66.	0.	49.	36.	170.
1961	163.	310.	146.	107.	308.	111.	62.	57.	57.	61.	45.	46.	310.
1962	132.	177.	167.	48.	56.	162.	140.	84.	69.	6.	130.	113.	177.
MAX	447.	310.	220.	290.	308.	162.	140.	112.	118.	66.	130.	139.	447.
MIN	54.	47.	84.	45.	56.	56.	42.	35.	57.	0.	0.	36.	123.
MEAN	137.	159.	152.	135.	143.	112.	84.	77.	77.	27.	41.	69.	220.
STDV	115.	89.	50.	81.	79.	31.	32.	27.	19.	28.	36.	36.	97.
SKEW	3.	0.	0.	1.	1.	0.	1.	-1.	1.	1.	2.	1.	2.

TEST NO.4 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
ANALYTICAL FREQUENCY ANALYSIS OF DAILY PRECIPITATION
ANALYSIS OF MAXIMUMS ONLY, WATER YEAR IS USED

-MONTHLY SUMMARY- PRECIP AT STAYTON OREGON

MINIMUM DAILY VALUES, PPTN IN INCHES

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	ANNUAL
1953	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1954	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1955	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1956	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1957	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1958	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1959	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1960	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1961	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1962	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MAX	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MIN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MEAN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
STDV	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SKEW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

JOB COMPLETE

```
   -----DSS---ZCLOSE Unit:  71,   File: STAYTON0.DSS
              Pointer Utilization:   .50
              Number of Records:     44
              File Size:     94.2  Kbytes
              Percent Inactive:    .0

++++++++++++++++++++++
 NORMAL STOP IN STATS
++++++++++++++++++++++
```

2.5 EXAMPLE NO.5 - VOLUME DURATION ANALYSIS EXAMPLE

Given: Daily Flows (CFS) from 1945-1955 at Fishkill, NY (Data was retrieved from DSS)

Objective: Analyze only minimum flows for this example, and compute the volume-duration tables and curves for durations of 1, 3, 7, 15, 30, 60, 90, 120, and 183 days. Use climatic year (e.g., from April 1, 1945 to March 30,1946) for this analysis.

Solution: The STATS input file (TEST5.DAT) given below was developed to perform the required analysis. Moving averages for each specified duration (1, 3, 7, 15 days, and etc.) for each climatic year were computed and the minimum values were used to determine the plotting positions. STATS then calculated the computed and expected frequency ordinates and generated the frequency curve for each of the specified duration.

COMMAND LINE:
STATS I = TEST5.DAT O = TEST5.OUT DSSFILE = TEST5.DSS

INPUT (TEST5.DAT)

```
TT TEST NO.5 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
TT VOLUME DURATION ANALYSIS OF DAILY FLOWS (CFS)
TT ANALYSIS OF MINIMUMS ONLY
TT CLIMATIC YEAR IS USED (e.g. APRIL 1, 1945 - MARCH 31, 1946)
TT FISHKILL CREEK AT BEACON, NY 1945-68
TT ANNUAL LOW FLOWS
J1    34     365      10       4                                          -1
ID FISHKILL CREEK AT BEACON, NY 1945-68
LS     2    FLOW              1       6            CFS
ZR A=FISHKILL B=01373500 C=FLOW D=01JAN1945 E=1DAY F=OBS
ZT  2400    01APR1945       2400    31MAR1955
ZW A=FISHKILL B=01373500 C=FREQ-FLOW D=01JAN1945 E=1DAY F=OBS
EJ
```

OUTPUT (EXAMPLE NO.5)

```
************************************     ************************************
*     STATS:BETA TEST VERSION      *     *                                  *
* STATISTICAL ANALYSIS-TIME SERIES *     *   U.S. ARMY CORPS OF ENGINEERS   *
*     PROGRAM DATE:  MAY 1987      *     * THE HYDROLOGIC ENGINEERING CENTER *
*     VERSION DATE:   ------       *     *        609 SECOND STREET         *
*         RUN DATE AND TIME:       *     *     DAVIS, CALIFORNIA 95616      *
*       19 JUL 96    14:42:05      *     *         (530) 756-1104           *
*                                  *     *                                  *
************************************     ************************************


 INPUT FILE NAME: TEST5.DAT
OUTPUT FILE NAME: TEST5.OUT
 DSSIN FILE NAME: FISH.DSS
DSSOUT FILE NAME: FISH.DSS


   -----DSS---ZOPEN:  Existing File Opened,  File: FISH.DSS
                      Unit:  71;  DSS Version: 6-JE

** TITLE INFORMATION **
TT TEST NO.5 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
TT VOLUME DURATION ANALYSIS OF DAILY FLOWS (CFS)
TT ANALYSIS OF MINIMUMS ONLY
TT CLIMATIC YEAR IS USED (e.g. APRIL 1, 1945 - MARCH 31, 1946)
TT FISHKILL CREEK AT BEACON, NY 1945-55
TT ANNUAL LOW FLOWS

**JOB SPECIFICATIONS**
   JSTAT    NPRDS     NYRS    MONWY    JBEGN     JEND     JPPF    MONSS    LOGTM    NDECM
J1    34      365       10        4                                          -1

**LOCATION IDENTIFICATION**
ID FISHKILL CREEK AT BEACON, NY 1945-55

**LOCATION SPECIFICATIONS**
   IANAL     NAME     LOGT     NDEC     NSIG    IPRNT     UNIT
LS     2     FLOW                1        6              CFS

**DSS READ PATHNAME**
ZR A=FISHKILL B=01373500 C=FLOW D=01JAN1945 E=1DAY F=OBS

**DSS READ TIMES**
ZT       01APR1945           31MAR1955

**DSS WRITE PATHNAME**
ZW A=FISHKILL B=01373500 C=FREQ-FLOW D=01JAN1945 E=1DAY F=OBS


** END OF INPUT FOR LOCATION **
EJ ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

- ANALYSIS OF MINIMUMS -

-PLOTTING POSITIONS- FISHKILL CREEK AT BEACON, NY 1945-55

EVENTS ANALYZED				ORDERED EVENTS			
MON	DAY	YEAR	FLOW CFS	RANK	WATER YEAR	FLOW CFS	MEDIAN PLOT POS
7	14	1945	92.0	1	1953	4.4	6.73
9	18	1946	9.4	2	1949	7.1	16.35
10	11	1947	9.4	3	1948	8.3	25.96
9	16	1948	8.3	4	1954	8.4	35.58
8	28	1949	7.1	5	1946	9.4	45.19
10	5	1950	22.0	6	1947	9.4	54.81
7	27	1951	20.0	7	1951	20.0	64.42
8	5	1952	34.0	8	1950	22.0	74.04
8	31	1953	4.4	9	1952	34.0	83.65
7	31	1954	8.4	10	1945	92.0	93.27

***** ANALYTICAL FIT TO DATA *****

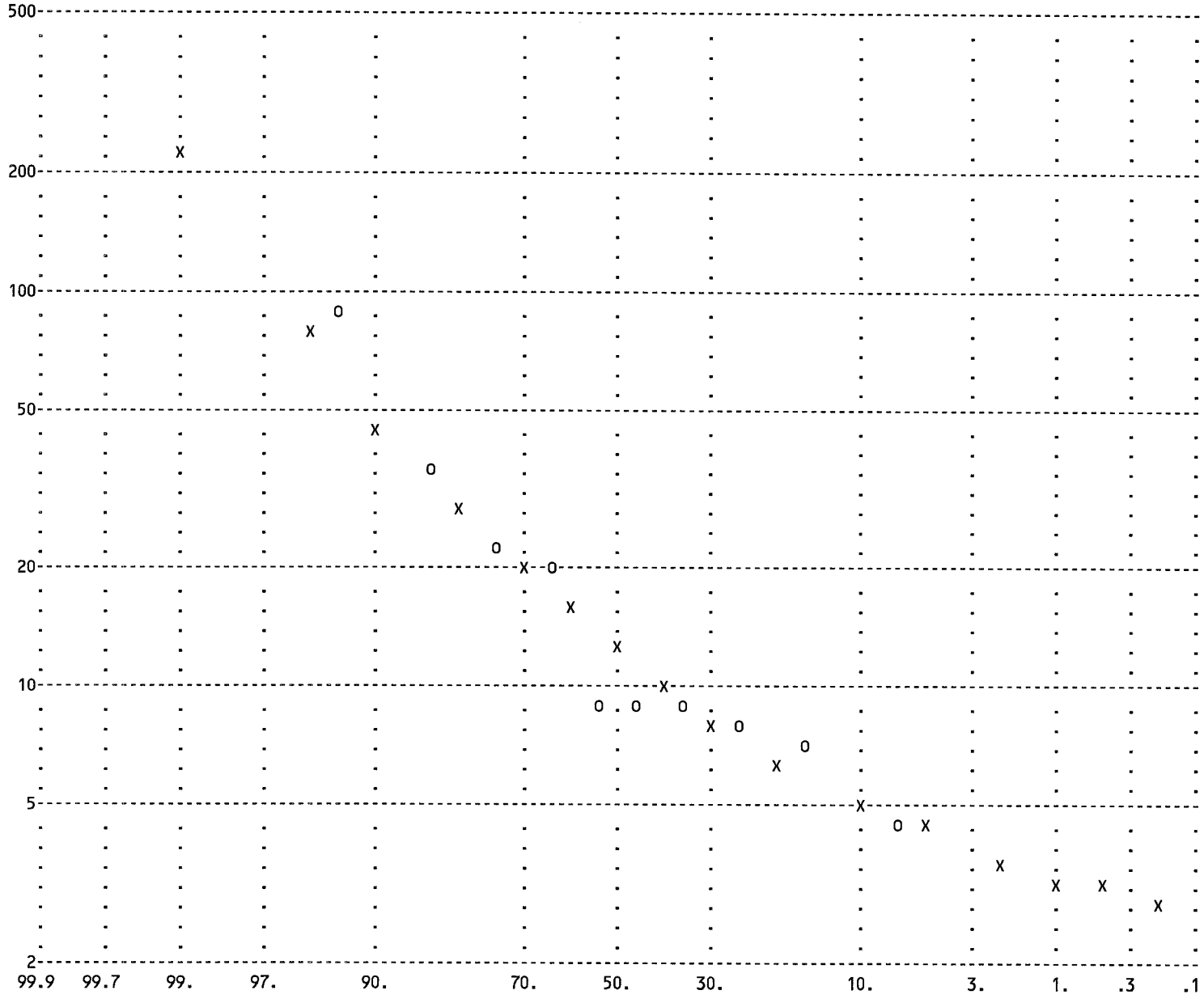
CAUTION FROM SUBROUTINE WTSKEW
***** NO GENERALIZED SKEW PROVIDED
ADOPTED SKEW SET TO COMPUTED SKEW

-FREQUENCY CURVE- FISHKILL CREEK AT BEACON, NY 1945-55

FLOW IN CFS		PERCENT CHANCE NON-EXCEEDANCE	CONFIDENCE LIMITS	
COMPUTED	EXPECTED PROBABILITY		.05 LIMIT	.95 LIMIT
2.9	2.4	.2	5.3	.9
3.1	2.6	.5	5.6	1.0
3.3	2.8	1.0	5.9	1.1
3.6	3.1	2.0	6.3	1.3
4.2	3.8	5.0	7.2	1.6
5.0	4.6	10.0	8.4	2.1
6.4	6.1	20.0	10.4	3.0
7.9	7.7	30.0	12.7	4.1
9.7	9.6	40.0	15.6	5.4
12.0	12.0	50.0	19.5	7.0
15.0	15.3	60.0	25.4	9.1
19.6	20.5	70.0	35.4	12.2
27.5	30.4	80.0	56.3	17.1
46.5	58.2	90.0	121.8	27.2
75.4	112.7	95.0	256.3	40.3
211.7	644.4	99.0	1313.8	89.5

SYSTEMATIC STATISTICS			
LOG TRANSFORM: FLOW, CFS		NUMBER OF EVENTS	
MEAN	1.1423	HISTORIC EVENTS	0
STANDARD DEV	.3915	HIGH OUTLIERS	0
COMPUTED SKEW	1.0305	LOW OUTLIERS	0
GENERALIZED SKEW	-99.0000	ZERO OR MISSING	0
ADOPTED SKEW	1.0000	SYSTEMATIC EVENTS	10

FREQUENCY PLOT - FISHKILL CREEK AT BEACON, NY 1945-55
BASED ON COMPUTED VALUES - FLOW IN CFS



- VOLUME-DURATION ANALYSIS -

TEST NO.5 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
VOLUME DURATION ANALYSIS OF DAILY FLOWS (CFS)
ANALYSIS OF MINIMUMS ONLY

- VOLUME-DURATION DATA - FISHKILL CREEK AT BEACON, NY 1945-55

	LOWEST MEAN VALUE FOR DURATION, FLOW IN CFS								
YEAR	1	3	7	15	30	60	90	120	183
1945	92.0	104.0	115.1	127.7	143.0	179.5	220.7	254.1	305.3
1946	9.4	12.8	17.6	21.3	28.5	49.8	62.1	58.7	75.4
1947	9.4	12.8	17.3	19.0	21.2	32.1	41.0	62.0	137.0
1948	8.3	10.2	15.7	15.7	18.9	21.6	27.4	33.5	78.1
1949	7.1	8.2	9.0	9.1	10.0	11.3	12.3	14.3	21.2
1950	22.0	22.0	23.9	27.0	32.6	37.0	43.1	51.1	119.0
1951	20.0	33.3	40.9	45.5	58.4	73.2	84.0	88.7	116.4
1952	34.0	39.7	43.0	44.0	46.2	64.6	100.1	97.9	135.3
1953	4.4	4.8	4.9	7.3	10.4	11.0	15.2	25.3	49.9
1954	8.4	9.5	12.3	14.6	16.7	22.9	39.8	99.8	160.8

- - - - STATISTICAL ANALYSIS OF 3-DAY LOW VALUES - - - -

-PLOTTING POSITIONS- FISHKILL CREEK AT BEACON, NY 1945-55

.....EVENTS ANALYZED.....				..ORDERED EVENTS..			
MON	DAY	YEAR	FLOW CFS	RANK	WATER YEAR	FLOW CFS	MEDIAN PLOT POS
0	0	1945	104.0	1	1953	4.8	6.73
0	0	1946	12.8	2	1949	8.2	16.35
0	0	1947	12.8	3	1954	9.5	25.96
0	0	1948	10.2	4	1948	10.2	35.58
0	0	1949	8.2	5	1946	12.8	45.19
0	0	1950	22.0	6	1947	12.8	54.81
0	0	1951	33.3	7	1950	22.0	64.42
0	0	1952	39.7	8	1951	33.3	74.04
0	0	1953	4.8	9	1952	39.7	83.65
0	0	1954	9.5	10	1945	104.0	93.27

***** ANALYTICAL FIT TO DATA *****

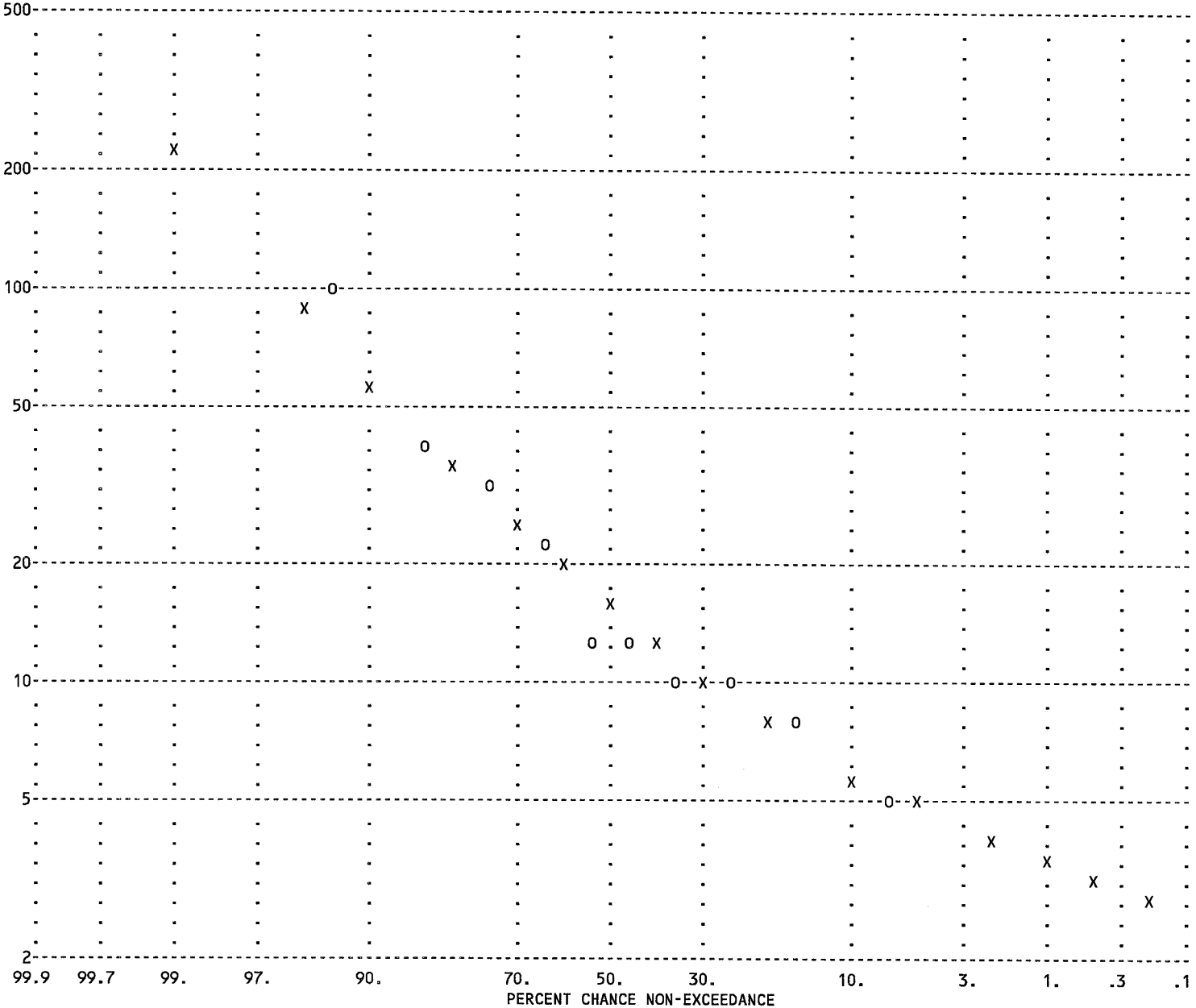
CAUTION FROM SUBROUTINE WTSKEW
***** NO GENERALIZED SKEW PROVIDED
ADOPTED SKEW SET TO COMPUTED SKEW

-FREQUENCY CURVE- FISHKILL CREEK AT BEACON, NY 1945-55

.....FLOW IN CFS.....		PERCENT	...CONFIDENCE LIMITS...	
COMPUTED	EXPECTED PROBABILITY	CHANCE NON-EXCEEDANCE	.05 LIMIT	.95 LIMIT
2.9	2.2	.2	5.5	.8
3.2	2.5	.5	5.9	.9
3.5	2.8	1.0	6.4	1.1
3.9	3.3	2.0	7.0	1.3
4.8	4.2	5.0	8.3	1.8
5.9	5.3	10.0	9.8	2.4
7.8	7.3	20.0	12.6	3.6
9.7	9.4	30.0	15.6	5.0
12.1	11.9	40.0	19.4	6.7
15.0	15.0	50.0	24.5	8.7
18.9	19.2	60.0	32.2	11.5
24.6	25.8	70.0	45.1	15.3
34.3	37.8	80.0	71.2	21.2
56.8	70.3	90.0	149.9	33.1
89.7	130.5	95.0	302.3	48.1
233.4	639.6	99.0	1367.8	100.9

SYSTEMATIC STATISTICS			
LOG TRANSFORM: FLOW, CFS		NUMBER OF EVENTS	
MEAN	1.2272	HISTORIC EVENTS	0
STANDARD DEV	.3946	HIGH OUTLIERS	0
COMPUTED SKEW	.7804	LOW OUTLIERS	0
GENERALIZED SKEW	-99.0000	ZERO OR MISSING	0
ADOPTED SKEW	.8000	SYSTEMATIC EVENTS	10

-FREQUENCY PLOT - FISHKILL CREEK AT BEACON, NY 1945-55
BASED ON COMPUTED VALUES - FLOW IN CFS



LEGEND - O=OBSERVED VALUE, H=HIGH OUTLIER OR HISTORIC VALUE, L=LOW OUTLIER, Z=ZERO OR MISSING, X=COMPUTED CURVE

- - - - STATISTICAL ANALYSIS OF 7-DAY LOW VALUES - - - -

-PLOTTING POSITIONS- FISHKILL CREEK AT BEACON, NY 1945-55

.....EVENTS ANALYZED.....					...ORDERED EVENTS...			
MON	DAY	YEAR	FLOW CFS	RANK	WATER YEAR	FLOW CFS	MEDIAN PLOT POS	
0	0	1945	115.1	1	1953	4.9	6.73	
0	0	1946	17.6	2	1949	9.0	16.35	
0	0	1947	17.3	3	1954	12.3	25.96	
0	0	1948	15.7	4	1948	15.7	35.58	
0	0	1949	9.0	5	1947	17.3	45.19	
0	0	1950	23.9	6	1946	17.6	54.81	
0	0	1951	40.9	7	1950	23.9	64.42	
0	0	1952	43.0	8	1951	40.9	74.04	
0	0	1953	4.9	9	1952	43.0	83.65	
0	0	1954	12.3	10	1945	115.1	93.27	

***** ANALYTICAL FIT TO DATA *****

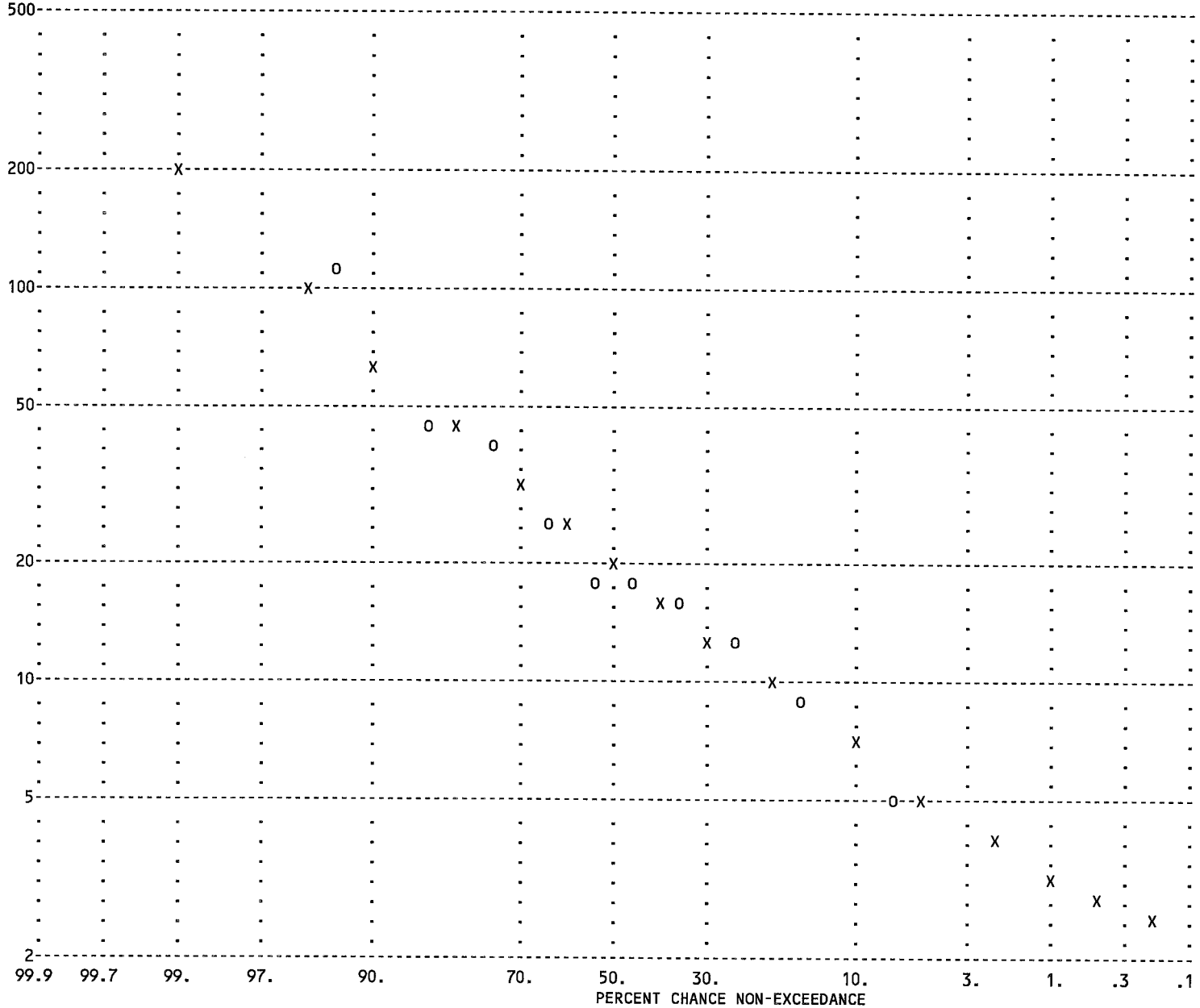
CAUTION FROM SUBROUTINE WTSKEW
***** NO GENERALIZED SKEW PROVIDED
ADOPTED SKEW SET TO COMPUTED SKEW

-FREQUENCY CURVE- FISHKILL CREEK AT BEACON, NY 1945-55

.....FLOW IN CFS.....		PERCENT CHANCE NON-EXCEEDANCE	...CONFIDENCE LIMITS...	
COMPUTED	EXPECTED PROBABILITY		.05 LIMIT	.95 LIMIT
2.4	1.3	.2	4.9	.5
2.9	1.8	.5	5.7	.7
3.3	2.3	1.0	6.4	.9
4.0	3.0	2.0	7.3	1.2
5.2	4.3	5.0	9.2	1.9
6.8	6.0	10.0	11.4	2.8
9.5	8.9	20.0	15.3	4.5
12.3	11.8	30.0	19.5	6.5
15.4	15.2	40.0	24.7	8.7
19.2	19.2	50.0	31.5	11.5
24.1	24.6	60.0	41.4	15.0
31.1	32.5	70.0	57.4	19.5
42.2	46.0	80.0	87.8	26.3
66.0	79.0	90.0	169.5	39.0
97.2	132.2	95.0	306.4	53.5
210.2	454.6	99.0	1030.6	97.8

SYSTEMATIC STATISTICS			
LOG TRANSFORM: FLOW, CFS		NUMBER OF EVENTS	
MEAN	1.3096	HISTORIC EVENTS	0
STANDARD DEV	.3873	HIGH OUTLIERS	0
COMPUTED SKEW	.4465	LOW OUTLIERS	0
GENERALIZED SKEW	-99.0000	ZERO OR MISSING	0
ADOPTED SKEW	.4000	SYSTEMATIC EVENTS	10

-FREQUENCY PLOT - FISHKILL CREEK AT BEACON, NY 1945-55
BASED ON COMPUTED VALUES - FLOW IN CFS



LEGEND - O=OBSERVED VALUE, H=HIGH OUTLIER OR HISTORIC VALUE, L=LOW OUTLIER, Z=ZERO OR MISSING, X=COMPUTED CURVE
--ZWRITE: /FISHKILL/01373500/FREQ-FLOW/7/1DAY/OBS/

- - - - STATISTICAL ANALYSIS OF 15-DAY LOW VALUES - - - -

-PLOTTING POSITIONS- FISHKILL CREEK AT BEACON, NY 1945-55

.....EVENTS ANALYZED.....					..ORDERED EVENTS..			
MON	DAY	YEAR	FLOW CFS	RANK	WATER YEAR	FLOW CFS	MEDIAN PLOT POS	
0	0	1945	127.7	1	1953	7.3	6.73	
0	0	1946	21.3	2	1949	9.1	16.35	
0	0	1947	19.0	3	1954	14.6	25.96	
0	0	1948	15.7	4	1948	15.7	35.58	
0	0	1949	9.1	5	1947	19.0	45.19	
0	0	1950	27.0	6	1946	21.3	54.81	
0	0	1951	45.5	7	1950	27.0	64.42	
0	0	1952	44.0	8	1952	44.0	74.04	
0	0	1953	7.3	9	1951	45.5	83.65	
0	0	1954	14.6	10	1945	127.7	93.27	

***** ANALYTICAL FIT TO DATA *****

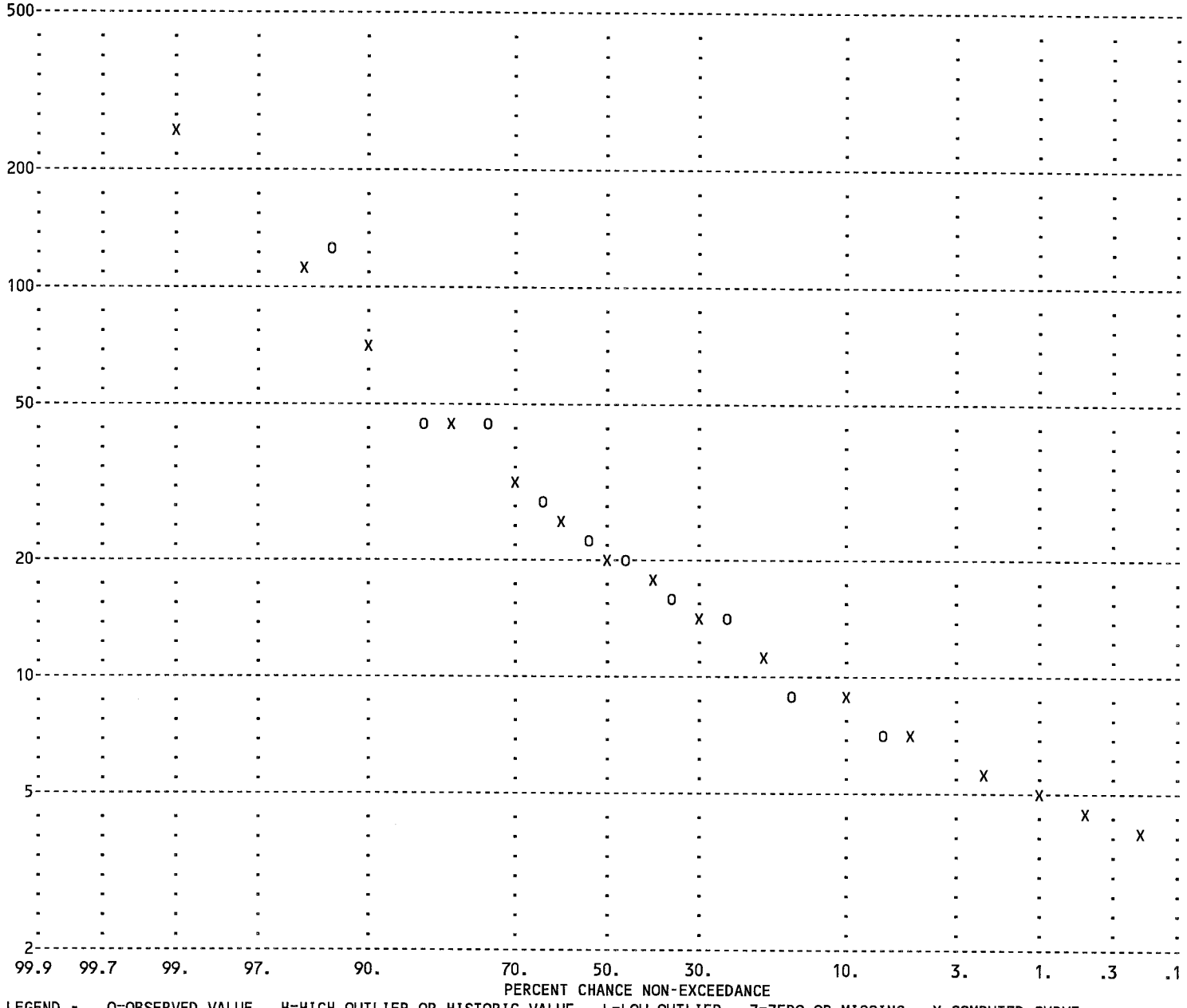
CAUTION FROM SUBROUTINE WTSKEW
***** NO GENERALIZED SKEW PROVIDED
ADOPTED SKEW SET TO COMPUTED SKEW

-FREQUENCY CURVE- FISHKILL CREEK AT BEACON, NY 1945-55

.....FLOW IN CFS.....		PERCENT CHANCE NON-	...CONFIDENCE LIMITS...	
COMPUTED	EXPECTED PROBABILITY	EXCEEDANCE	.05 LIMIT	.95 LIMIT
4.0	2.9	.2	7.5	1.2
4.5	3.4	.5	8.2	1.4
5.0	3.9	1.0	8.9	1.6
5.6	4.6	2.0	9.8	2.0
6.9	6.0	5.0	11.6	2.7
8.5	7.7	10.0	13.7	3.7
11.1	10.6	20.0	17.5	5.5
13.9	13.5	30.0	21.6	7.5
17.0	16.8	40.0	26.6	9.8
20.9	20.9	50.0	33.2	12.7
25.9	26.4	60.0	42.8	16.4
33.1	34.6	70.0	58.5	21.3
45.0	49.1	80.0	89.2	28.7
71.2	86.2	90.0	175.4	43.1
107.4	150.1	95.0	329.6	60.3
251.4	610.1	99.0	1261.8	116.6

SYSTEMATIC STATISTICS			
LOG TRANSFORM: FLOW, CFS		NUMBER OF EVENTS	
MEAN	1.3623	HISTORIC EVENTS	0
STANDARD DEV	.3676	HIGH OUTLIERS	0
COMPUTED SKEW	.7096	LOW OUTLIERS	0
GENERALIZED SKEW	-99.0000	ZERO OR MISSING	0
ADOPTED SKEW	.7000	SYSTEMATIC EVENTS	10

-FREQUENCY PLOT - FISHKILL CREEK AT BEACON, NY 1945-55
BASED ON COMPUTED VALUES - FLOW IN CFS



LEGEND - O=OBSERVED VALUE, H=HIGH OUTLIER OR HISTORIC VALUE, L=LOW OUTLIER, Z=ZERO OR MISSING, X=COMPUTED CURVE
--ZWRITE: /FISHKILL/01373500/FREQ-FLOW/15/1DAY/OBS/

- - - - STATISTICAL ANALYSIS OF 30-DAY LOW VALUES - - - -

-PLOTTING POSITIONS- FISHKILL CREEK AT BEACON, NY 1945-55

EVENTS ANALYZED				ORDERED EVENTS			
MON	DAY	YEAR	FLOW CFS	RANK	WATER YEAR	FLOW CFS	MEDIAN PLOT POS
0	0	1945	143.0	1	1949	10.0	6.73
0	0	1946	28.5	2	1953	10.4	16.35
0	0	1947	21.2	3	1954	16.7	25.96
0	0	1948	18.9	4	1948	18.9	35.58
0	0	1949	10.0	5	1947	21.2	45.19
0	0	1950	32.6	6	1946	28.5	54.81
0	0	1951	58.4	7	1950	32.6	64.42
0	0	1952	46.2	8	1952	46.2	74.04
0	0	1953	10.4	9	1951	58.4	83.65
0	0	1954	16.7	10	1945	143.0	93.27

***** ANALYTICAL FIT TO DATA *****

CAUTION FROM SUBROUTINE WTSKEW
***** NO GENERALIZED SKEW PROVIDED
ADOPTED SKEW SET TO COMPUTED SKEW

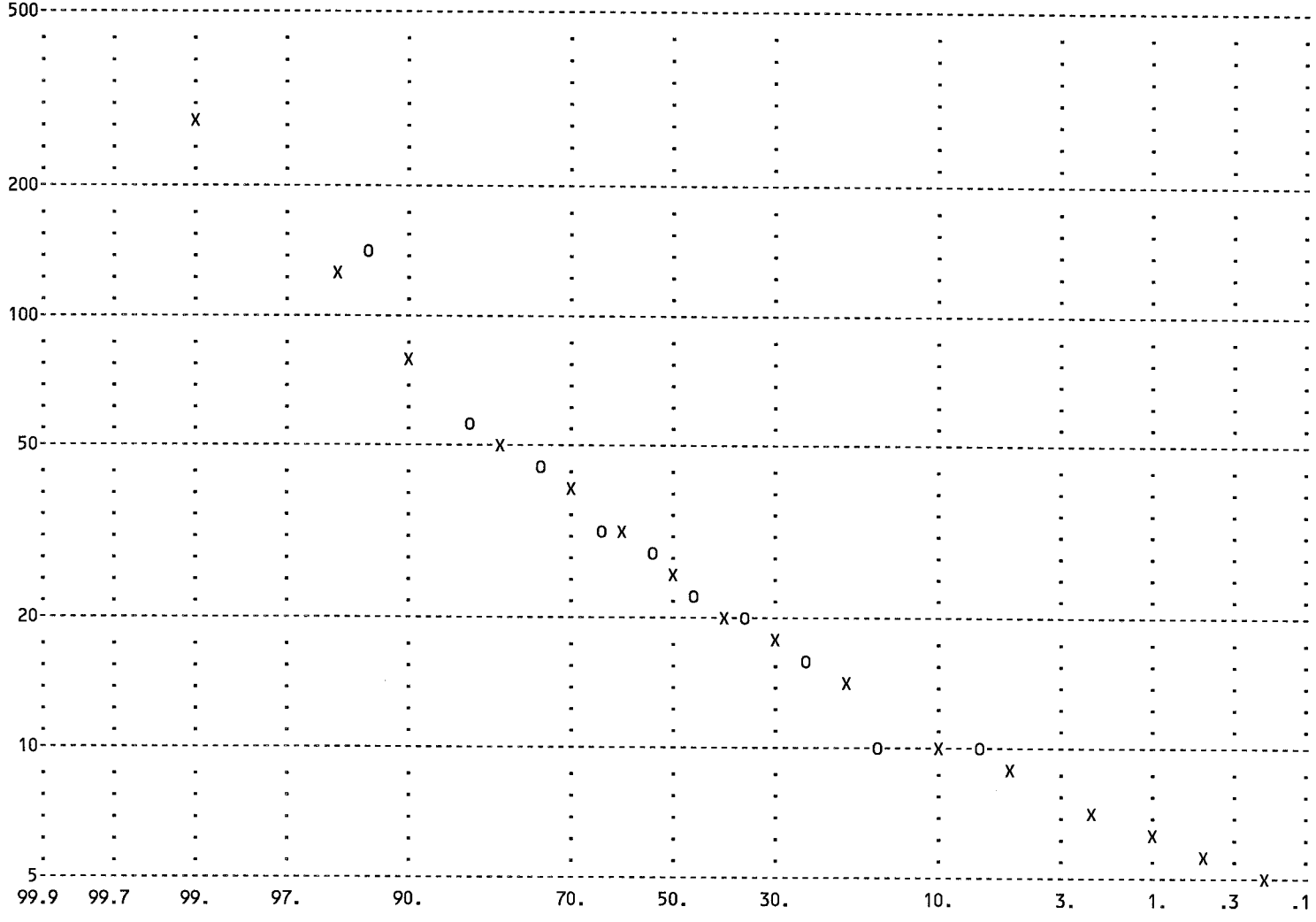
-FREQUENCY CURVE- FISHKILL CREEK AT BEACON, NY 1945-55

FLOW IN CFS		PERCENT CHANCE NON-EXCEEDANCE	CONFIDENCE LIMITS	
COMPUTED	EXPECTED PROBABILITY		.05 LIMIT	.95 LIMIT
5.1	3.7	.2	9.3	1.6
5.7	4.4	.5	10.2	1.8
6.3	5.0	1.0	11.0	2.1
7.1	5.9	2.0	12.1	2.6
8.6	7.5	5.0	14.2	3.5
10.5	9.6	10.0	16.7	4.7
13.7	13.0	20.0	21.2	6.9
16.9	16.4	30.0	25.9	9.3
20.6	20.3	40.0	31.6	12.1
25.1	25.1	50.0	39.1	15.5
30.9	31.4	60.0	50.1	19.8
39.1	40.8	70.0	67.7	25.5
52.5	57.2	80.0	101.7	34.1
81.8	98.4	90.0	195.3	50.4
121.6	168.0	95.0	359.0	69.7
276.4	650.3	99.0	1310.9	131.8

SYSTEMATIC STATISTICS

LOG TRANSFORM: FLOW, CFS		NUMBER OF EVENTS	
MEAN	1.4400	HISTORIC EVENTS	0
STANDARD DEV	.3547	HIGH OUTLIERS	0
COMPUTED SKEW	.7350	LOW OUTLIERS	0
GENERALIZED SKEW	-99.0000	ZERO OR MISSING	0
ADOPTED SKEW	.7000	SYSTEMATIC EVENTS	10

-FREQUENCY PLOT - FISHKILL CREEK AT BEACON, NY 1945-55
BASED ON COMPUTED VALUES - FLOW IN CFS



PERCENT CHANCE NON-EXCEEDANCE

LEGEND - O=OBSERVED VALUE, H=HIGH OUTLIER OR HISTORIC VALUE, L=LOW OUTLIER, Z=ZERO OR MISSING, X=COMPUTED CURVE
--ZWRITE: /FISHKILL/01373500/FREQ-FLOW/30/1DAY/OBS/

- - - - STATISTICAL ANALYSIS OF 60-DAY LOW VALUES - - - -

-PLOTTING POSITIONS- FISHKILL CREEK AT BEACON, NY 1945-55

.....EVENTS ANALYZED.....					...ORDERED EVENTS...			
MON	DAY	YEAR	FLOW CFS	RANK	WATER YEAR	FLOW CFS	MEDIAN PLOT POS
0	0	1945	179.5	1	1953	11.0	6.73
0	0	1946	49.8	2	1949	11.3	16.35
0	0	1947	32.1	3	1948	21.6	25.96
0	0	1948	21.6	4	1954	22.9	35.58
0	0	1949	11.3	5	1947	32.1	45.19
0	0	1950	37.0	6	1950	37.0	54.81
0	0	1951	73.2	7	1946	49.8	64.42
0	0	1952	64.6	8	1952	64.6	74.04
0	0	1953	11.0	9	1951	73.2	83.65
0	0	1954	22.9	10	1945	179.5	93.27

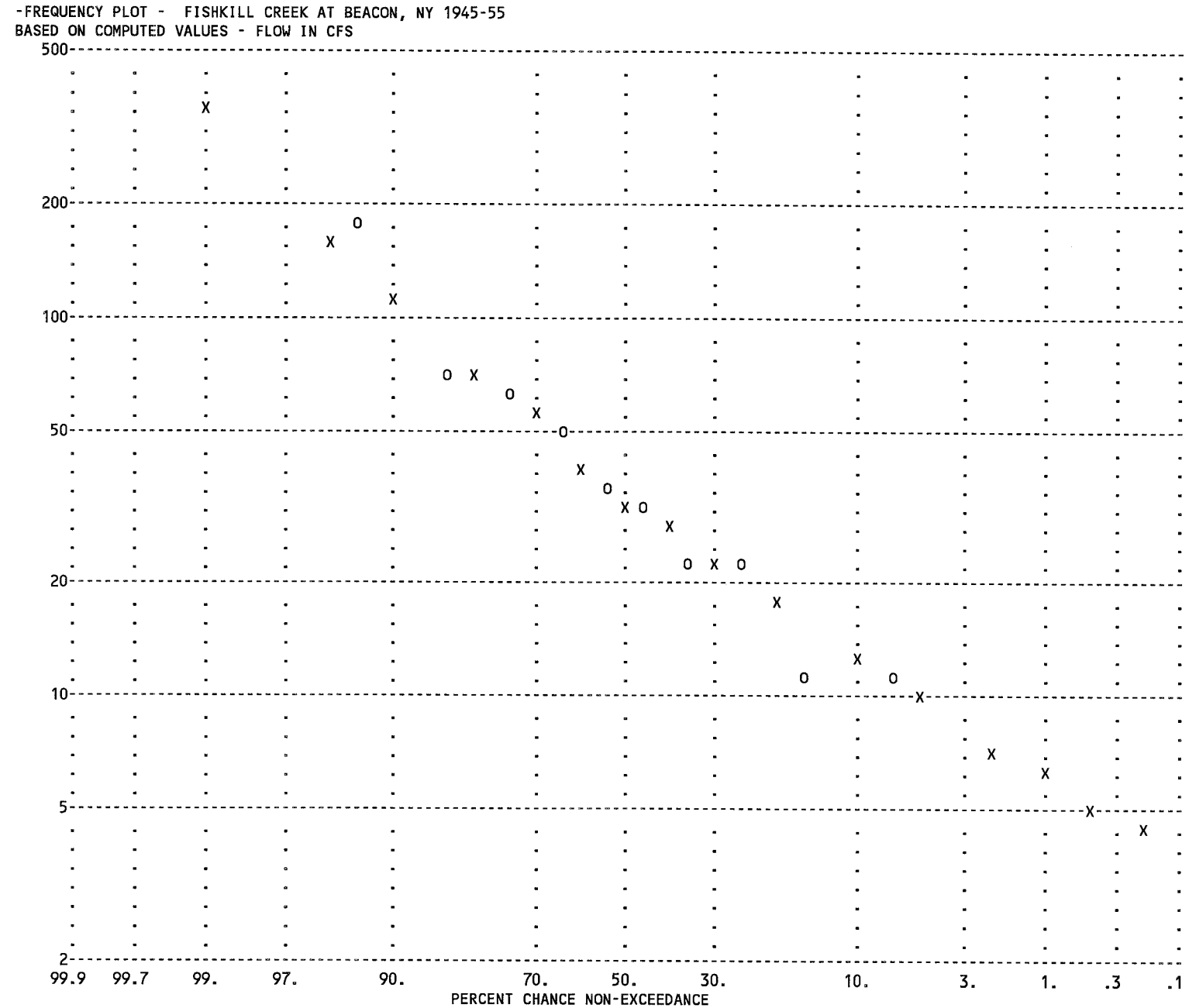
***** ANALYTICAL FIT TO DATA *****

CAUTION FROM SUBROUTINE WTSKEW
***** NO GENERALIZED SKEW PROVIDED
ADOPTED SKEW SET TO COMPUTED SKEW

-FREQUENCY CURVE- FISHKILL CREEK AT BEACON, NY 1945-55

.....FLOW IN CFS.....		PERCENT	...CONFIDENCE LIMITS...	
COMPUTED	EXPECTED PROBABILITY	CHANCE NON-EXCEEDANCE	.05 LIMIT	.95 LIMIT
4.4	2.5	.2	8.9	1.1
5.3	3.4	.5	10.2	1.4
6.1	4.2	1.0	11.4	1.7
7.2	5.5	2.0	13.1	2.3
9.5	7.9	5.0	16.3	3.4
12.2	10.8	10.0	20.1	5.1
16.9	15.8	20.0	26.8	8.2
21.6	20.9	30.0	33.9	11.6
27.0	26.5	40.0	42.6	15.5
33.4	33.4	50.0	54.0	20.3
41.7	42.5	60.0	70.4	26.2
53.3	55.6	70.0	96.7	33.9
71.8	78.0	80.0	146.1	45.3
110.7	131.9	90.0	276.6	66.3
161.2	217.3	95.0	491.8	90.4
341.0	721.4	99.0	1597.3	162.3

SYSTEMATIC STATISTICS			
LOG TRANSFORM: FLOW, CFS		NUMBER OF EVENTS	
MEAN	1.5489	HISTORIC EVENTS	0
STANDARD DEV	.3762	HIGH OUTLIERS	0
COMPUTED SKEW	.3517	LOW OUTLIERS	0
GENERALIZED SKEW	-99.0000	ZERO OR MISSING	0
ADOPTED SKEW	.4000	SYSTEMATIC EVENTS	10


-FREQUENCY PLOT - FISHKILL CREEK AT BEACON, NY 1945-55
BASED ON COMPUTED VALUES - FLOW IN CFS
500
200
100
50
20
10
5
2
99.9 99.7 99. 97. 90. 70. 50. 30. 10. 3. 1. .3 .1
PERCENT CHANCE NON-EXCEEDANCE
LEGEND - O=OBSERVED VALUE, H=HIGH OUTLIER OR HISTORIC VALUE, L=LOW OUTLIER, Z=ZERO OR MISSING, X=COMPUTED CURVE
--ZWRITE: /FISHKILL/01373500/FREQ-FLOW/60/1DAY/OBS/

- - - - STATISTICAL ANALYSIS OF 90-DAY LOW VALUES - - - -

-PLOTTING POSITIONS- FISHKILL CREEK AT BEACON, NY 1945-55

.....EVENTS ANALYZED.....				..ORDERED EVENTS..			
MON	DAY	YEAR	FLOW CFS	RANK	WATER YEAR	FLOW CFS	MEDIAN PLOT POS
0	0	1945	220.7	1	1949	12.3	6.73
0	0	1946	62.1	2	1953	15.2	16.35
0	0	1947	41.0	3	1948	27.4	25.96
0	0	1948	27.4	4	1954	39.8	35.58
0	0	1949	12.3	5	1947	41.0	45.19
0	0	1950	43.1	6	1950	43.1	54.81
0	0	1951	84.0	7	1946	62.1	64.42
0	0	1952	100.1	8	1951	84.0	74.04
0	0	1953	15.2	9	1952	100.1	83.65
0	0	1954	39.8	10	1945	220.7	93.27

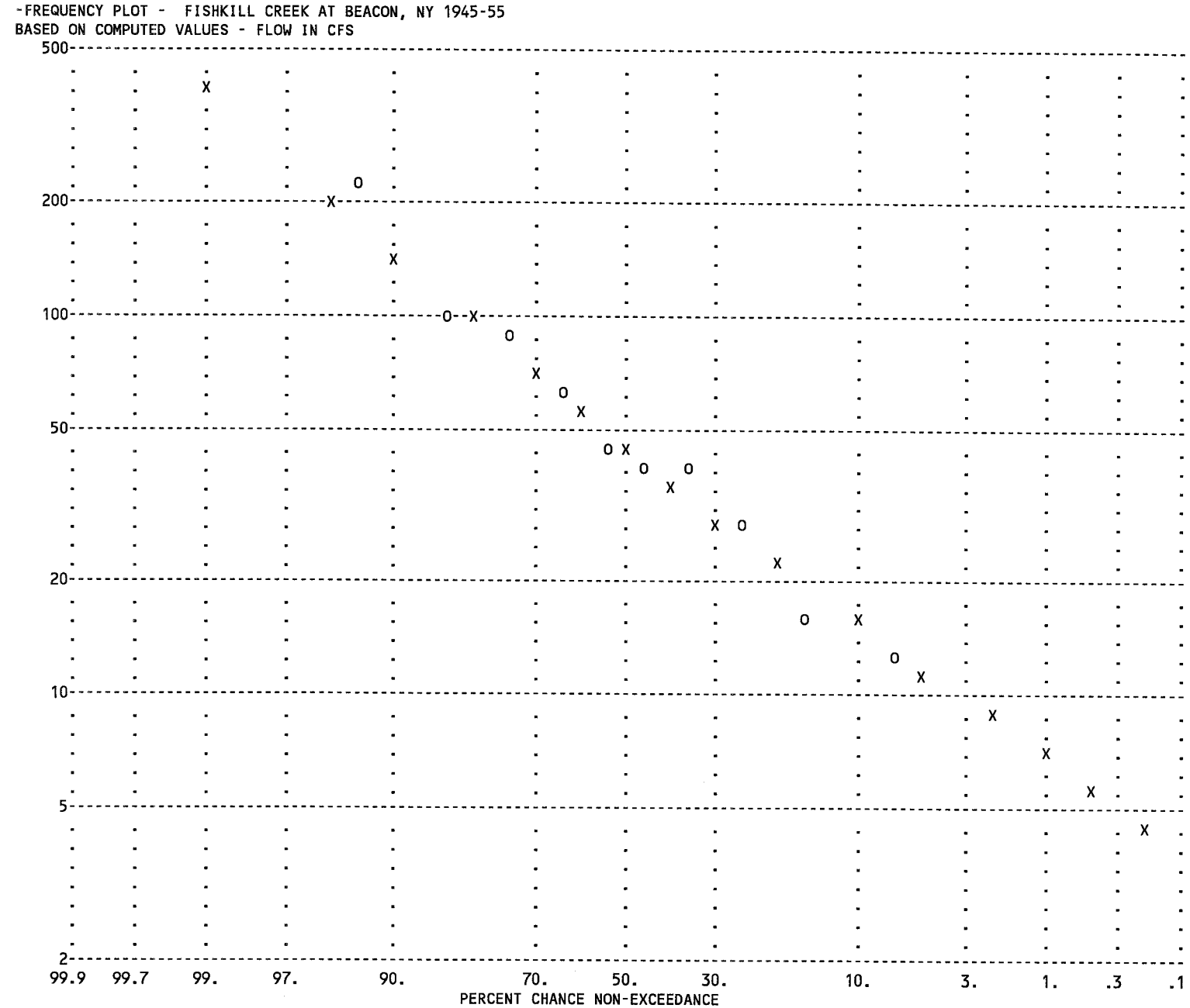
***** ANALYTICAL FIT TO DATA *****

CAUTION FROM SUBROUTINE WTSKEW
***** NO GENERALIZED SKEW PROVIDED
ADOPTED SKEW SET TO COMPUTED SKEW

-FREQUENCY CURVE- FISHKILL CREEK AT BEACON, NY 1945-55

.....FLOW IN CFS.....		PERCENT	...CONFIDENCE LIMITS...	
COMPUTED	EXPECTED PROBABILITY	CHANCE NON-EXCEEDANCE	.05 LIMIT	.95 LIMIT
4.7	2.1	.2	9.8	1.0
5.8	3.2	.5	11.6	1.4
6.9	4.4	1.0	13.4	1.8
8.5	6.0	2.0	15.7	2.5
11.6	9.4	5.0	20.1	4.1
15.4	13.5	10.0	25.5	6.3
22.0	20.5	20.0	34.9	10.6
28.5	27.5	30.0	44.8	15.4
35.9	35.3	40.0	56.8	20.8
44.6	44.6	50.0	72.5	27.2
55.7	56.7	60.0	94.7	35.0
70.8	73.8	70.0	129.7	45.1
94.4	102.2	80.0	193.5	59.5
142.1	166.9	90.0	353.3	85.2
200.8	263.1	95.0	599.5	113.4
392.8	751.2	99.0	1716.1	192.1

SYSTEMATIC STATISTICS			
LOG TRANSFORM: FLOW, CFS		NUMBER OF EVENTS	
MEAN	1.6620	HISTORIC EVENTS	0
STANDARD DEV	.3770	HIGH OUTLIERS	0
COMPUTED SKEW	.1747	LOW OUTLIERS	0
GENERALIZED SKEW	-99.0000	ZERO OR MISSING	0
ADOPTED SKEW	.2000	SYSTEMATIC EVENTS	10


-FREQUENCY PLOT - FISHKILL CREEK AT BEACON, NY 1945-55
BASED ON COMPUTED VALUES - FLOW IN CFS
500
200
100
50
20
10
5
2
99.9 99.7 99. 97. 90. 70. 50. 30. 10. 3. 1. .3 .1
PERCENT CHANCE NON-EXCEEDANCE
LEGEND - O=OBSERVED VALUE, H=HIGH OUTLIER OR HISTORIC VALUE, L=LOW OUTLIER, Z=ZERO OR MISSING, X=COMPUTED CURVE
--ZWRITE: /FISHKILL/01373500/FREQ-FLOW/90/1DAY/OBS/

- - - - STATISTICAL ANALYSIS OF 120-DAY LOW VALUES - - - -

-PLOTTING POSITIONS- FISHKILL CREEK AT BEACON, NY 1945-55

.....EVENTS ANALYZED.....				..........ORDERED EVENTS..........			
MON	DAY	YEAR	FLOW CFS	RANK	WATER YEAR	FLOW CFS	MEDIAN PLOT POS
0	0	1945	254.1	1	1949	14.3	6.73
0	0	1946	58.7	2	1953	25.3	16.35
0	0	1947	62.0	3	1948	33.5	25.96
0	0	1948	33.5	4	1950	51.1	35.58
0	0	1949	14.3	5	1946	58.7	45.19
0	0	1950	51.1	6	1947	62.0	54.81
0	0	1951	88.7	7	1951	88.7	64.42
0	0	1952	97.9	8	1952	97.9	74.04
0	0	1953	25.3	9	1954	99.8	83.65
0	0	1954	99.8	10	1945	254.1	93.27

***** ANALYTICAL FIT TO DATA *****

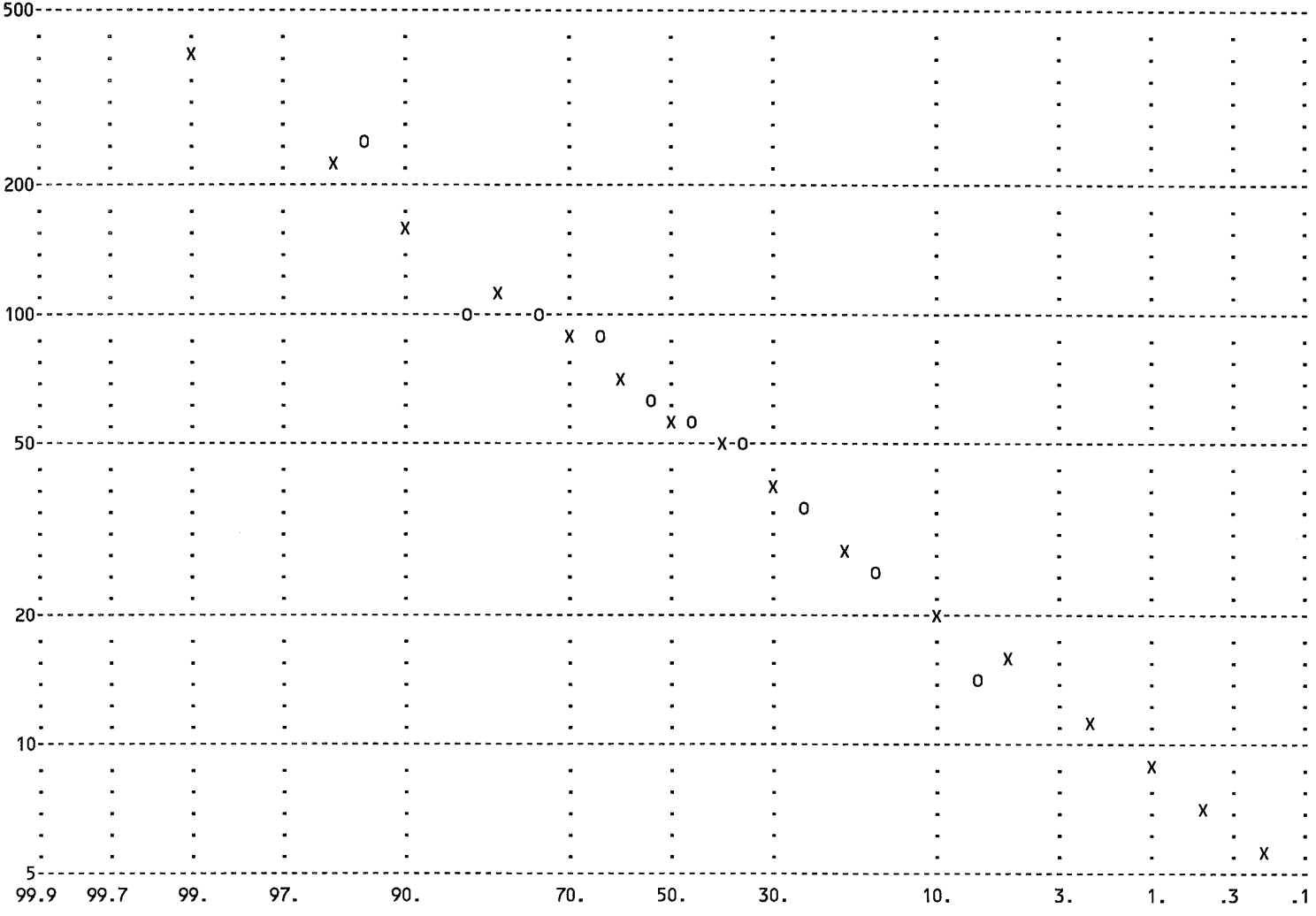
CAUTION FROM SUBROUTINE WTSKEW
***** NO GENERALIZED SKEW PROVIDED
ADOPTED SKEW SET TO COMPUTED SKEW

-FREQUENCY CURVE- FISHKILL CREEK AT BEACON, NY 1945-55

.....FLOW IN CFS.....		PERCENT	...CONFIDENCE LIMITS...	
COMPUTED	EXPECTED PROBABILITY	CHANCE NON-EXCEEDANCE	.05 LIMIT	.95 LIMIT
5.7	2.3	.2	12.0	1.2
7.3	3.7	.5	14.5	1.8
8.9	5.3	1.0	16.9	2.4
11.1	7.7	2.0	20.1	3.4
15.5	12.4	5.0	26.2	5.7
20.8	18.2	10.0	33.5	9.0
29.7	27.8	20.0	45.8	15.2
38.5	37.1	30.0	58.6	21.7
47.9	47.1	40.0	73.7	29.0
58.8	58.8	50.0	92.9	37.2
72.2	73.4	60.0	119.4	47.0
89.9	93.3	70.0	159.3	59.0
116.3	124.6	80.0	228.1	75.5
166.1	190.5	90.0	385.5	103.3
222.9	279.2	95.0	603.9	131.9
387.3	646.6	99.0	1431.4	204.1

SYSTEMATIC STATISTICS			
LOG TRANSFORM: FLOW, CFS		NUMBER OF EVENTS	
MEAN	1.7694	HISTORIC EVENTS	0
STANDARD DEV	.3519	HIGH OUTLIERS	0
COMPUTED SKEW	-.0361	LOW OUTLIERS	0
GENERALIZED SKEW	-99.0000	ZERO OR MISSING	0
ADOPTED SKEW	.0000	SYSTEMATIC EVENTS	10

-FREQUENCY PLOT - FISHKILL CREEK AT BEACON, NY 1945-55
BASED ON COMPUTED VALUES - FLOW IN CFS



LEGEND - O=OBSERVED VALUE, H=HIGH OUTLIER OR HISTORIC VALUE, L=LOW OUTLIER, Z=ZERO OR MISSING, X=COMPUTED CURVE
--ZWRITE: /FISHKILL/01373500/FREQ-FLOW/120/1DAY/OBS/

- - - - STATISTICAL ANALYSIS OF 183-DAY LOW VALUES - - - -

-PLOTTING POSITIONS- FISHKILL CREEK AT BEACON, NY 1945-55

.....EVENTS ANALYZED.....				..ORDERED EVENTS..			
MON	DAY	YEAR	FLOW CFS	RANK	WATER YEAR	FLOW CFS	MEDIAN PLOT POS
0	0	1945	305.3	1	1949	21.2	6.73
0	0	1946	75.4	2	1953	49.9	16.35
0	0	1947	137.0	3	1946	75.4	25.96
0	0	1948	78.1	4	1948	78.1	35.58
0	0	1949	21.2	5	1951	116.4	45.19
0	0	1950	119.0	6	1950	119.0	54.81
0	0	1951	116.4	7	1952	135.3	64.42
0	0	1952	135.3	8	1947	137.0	74.04
0	0	1953	49.9	9	1954	160.8	83.65
0	0	1954	160.8	10	1945	305.3	93.27

***** ANALYTICAL FIT TO DATA *****

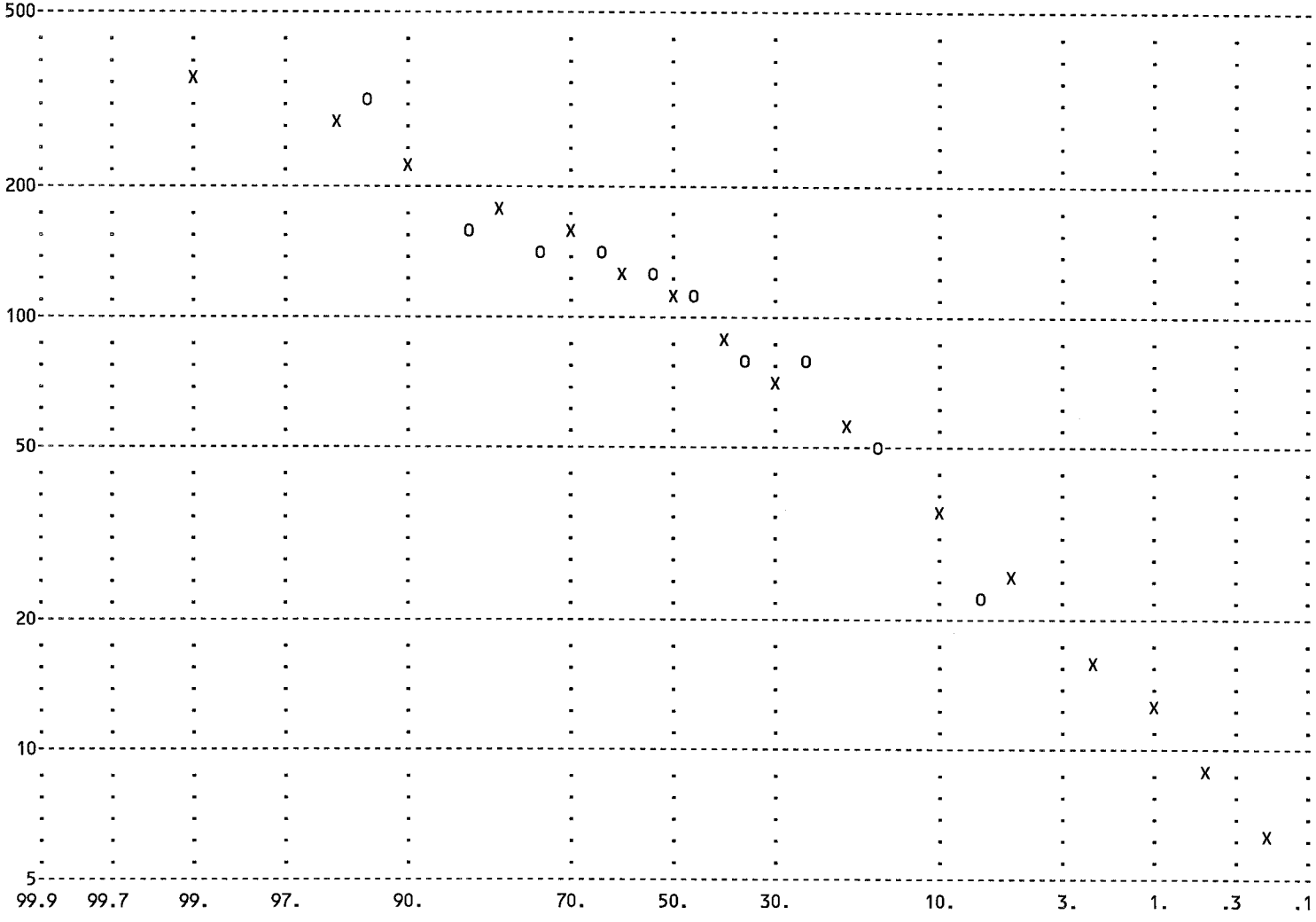
CAUTION FROM SUBROUTINE WTSKEW
***** NO GENERALIZED SKEW PROVIDED
ADOPTED SKEW SET TO COMPUTED SKEW

-FREQUENCY CURVE- FISHKILL CREEK AT BEACON, NY 1945-55

.....FLOW IN CFS.....		PERCENT CHANCE NON-EXCEEDANCE	...CONFIDENCE LIMITS...	
COMPUTED	EXPECTED PROBABILITY		.05 LIMIT	.95 LIMIT
6.0	1.1	.2	13.9	1.0
8.8	2.8	.5	18.6	1.8
12.0	5.3	1.0	23.4	2.9
16.4	9.5	2.0	29.8	4.8
25.7	19.0	5.0	42.2	9.7
37.0	31.2	10.0	56.9	17.0
55.4	51.2	20.0	81.4	30.9
72.3	69.6	30.0	105.6	44.5
89.3	87.9	40.0	132.7	58.3
107.4	107.4	50.0	165.0	72.4
127.6	129.2	60.0	205.1	87.2
151.3	155.4	70.0	258.0	103.7
181.7	189.8	80.0	333.9	123.2
227.5	245.3	90.0	464.1	150.5
267.5	298.4	95.0	592.0	172.7
343.4	409.4	99.0	868.5	211.9

SYSTEMATIC STATISTICS			
LOG TRANSFORM: FLOW, CFS		NUMBER OF EVENTS	
MEAN	1.9894	HISTORIC EVENTS	0
STANDARD DEV	.3153	HIGH OUTLIERS	0
COMPUTED SKEW	-.8003	LOW OUTLIERS	0
GENERALIZED SKEW	-99.0000	ZERO OR MISSING	0
ADOPTED SKEW	-.8000	SYSTEMATIC EVENTS	10

-FREQUENCY PLOT - FISHKILL CREEK AT BEACON, NY 1945-55
BASED ON COMPUTED VALUES - FLOW IN CFS



PERCENT CHANCE NON-EXCEEDANCE

LEGEND - O=OBSERVED VALUE, H=HIGH OUTLIER OR HISTORIC VALUE, L=LOW OUTLIER, Z=ZERO OR MISSING, X=COMPUTED CURVE
--ZWRITE: /FISHKILL/01373500/FREQ-FLOW/183/1DAY/OBS/

JOB COMPLETE

2.6 EXAMPLE NO.6 -- FLOW DURATION ANALYSIS EXAMPLE

Given: Daily flows (CFS) for the week of May 5-11 from 1953-1993 at the Ukiah gaging station (Data was retrieved from DSS)

Objective: Perform weekly flow duration analysis and compute the flow-duration table and flow-duration curve for this specified period. Analysis is based on water year.

Solution: The STATS input file (TEST6.DAT) given below was developed to perform the required analysis. STATS used the class-interval method to compute the interpolated flow-duration table and curve. Results were then written to DSS, and the observed and interpolated flow-duration curves were re-generated using the DSPLAY program. Using the DSPLAY program, graphical plots were displayed on screen and sent to a meta file (.CGM) for importation into a wordprocessor (i.e., WordPerfect).

COMMAND LINE:
STATS I = TEST6.DAT 0 = TEST6.OUT DSSFILE = UKIAH.DSS

INPUT (TEST6.DAT)

```
TT TEST NO.6 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
TT WEEKLY FLOW DURATION ANALYSIS USING UKIAH DAILY FLOWS
TT PERIOD OF ANALYSIS (1953-1993)
TT MAY 5-11 (WEEK #32)
J1     4     280       1
ID UKIAH, CA (RUSSIAN RIVER WATERSHED)
LS     3    FLOW              2       6            CFS
CL    24     1.0     5.0     10.     15.     20.     25.     30.     35.     40.
CL   45.     50.     55.     60.     65.     70.     75.     80.     85.     90.
CL   95.    100.    200.    300.    400.
ZR A=CE502 B=UKIAH C=FLOW D=01JAN1901 E=1DAY F=WEEK32
ZT  2400    01JAN1901       2400    07OCT1901
ZW A=CE502 B=UKIAH C=FREQ-FLOW D=01JAN1901 E=1DAY F=WEEK32
EJ
```

OUTPUT (EXAMPLE NO.6)

```
************************************      ************************************
*     STATS:BETA TEST VERSION      *      *                                  *
* STATISTICAL ANALYSIS-TIME SERIES *      *   U.S. ARMY CORPS OF ENGINEERS   *
*     PROGRAM DATE:  MAY 1987      *      * THE HYDROLOGIC ENGINEERING CENTER *
*     VERSION DATE:   ------       *      *         609 SECOND STREET        *
*         RUN DATE AND TIME:       *      *      DAVIS, CALIFORNIA 95616     *
*        19 JUL 96    16:49:25     *      *         (530) 756-1104           *
*                                  *      *                                  *
************************************      ************************************


 INPUT FILE NAME: TEST6.DAT
OUTPUT FILE NAME: TEST6.OUT
 DSSIN FILE NAME: UKIAH.DSS
DSSOUT FILE NAME: UKIAH.DSS


   -----DSS---ZOPEN:  Existing File Opened,  File: UKIAH.DSS
                      Unit:  71;  DSS Version: 6-JG

** TITLE INFORMATION **
TT TEST NO.6 -- STATISTICAL ANALYSIS OF TIME SERIES DATA
TT WEEKLY FLOW DURATION ANALYSIS USING UKIAH DAILY FLOWS
TT PERIOD OF ANALYSIS (1953-1993)
TT MAY 5-11 (WEEK #32)

**JOB SPECIFICATIONS**
   JSTAT    NPRDS     NYRS    MONWY    JBEGN     JEND     JPPF    MONSS    LOGTM    NDECM
J1     4      280        1

**LOCATION IDENTIFICATION**
ID UKIAH, CA (RUSSIAN RIVER WATERSHED)

**LOCATION SPECIFICATIONS**
   IANAL     NAME     LOGT     NDEC     NSIG    IPRNT     UNIT
LS     3     FLOW                 2        6              CFS

**INPUT CLASS LIMITS**
CL    24      1.0      5.0      10.      15.      20.      25.      30.      35.      40.
CL   45.      50.      55.      60.      65.      70.      75.      80.      85.      90.
CL   95.     100.     200.     300.     400.

**DSS READ PATHNAME**
ZR A=CE502 B=UKIAH C=FLOW D=01JAN1901 E=1DAY F=WEEK32

**DSS READ TIMES**
ZT      01JAN1901           07OCT1901

**DSS WRITE PATHNAME**
ZW A=CE502 B=UKIAH C=FREQ-FLOW D=01JAN1901 E=1DAY F=WEEK32


** END OF INPUT FOR LOCATION **
EJ ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

MONTH ORDER NUMBER OF WATER YEAR SET TO   1

--ZREAD:  /CE502/UKIAH/FLOW/01JAN1901/1DAY/WEEK32/
```

- DURATION ANALYSIS -

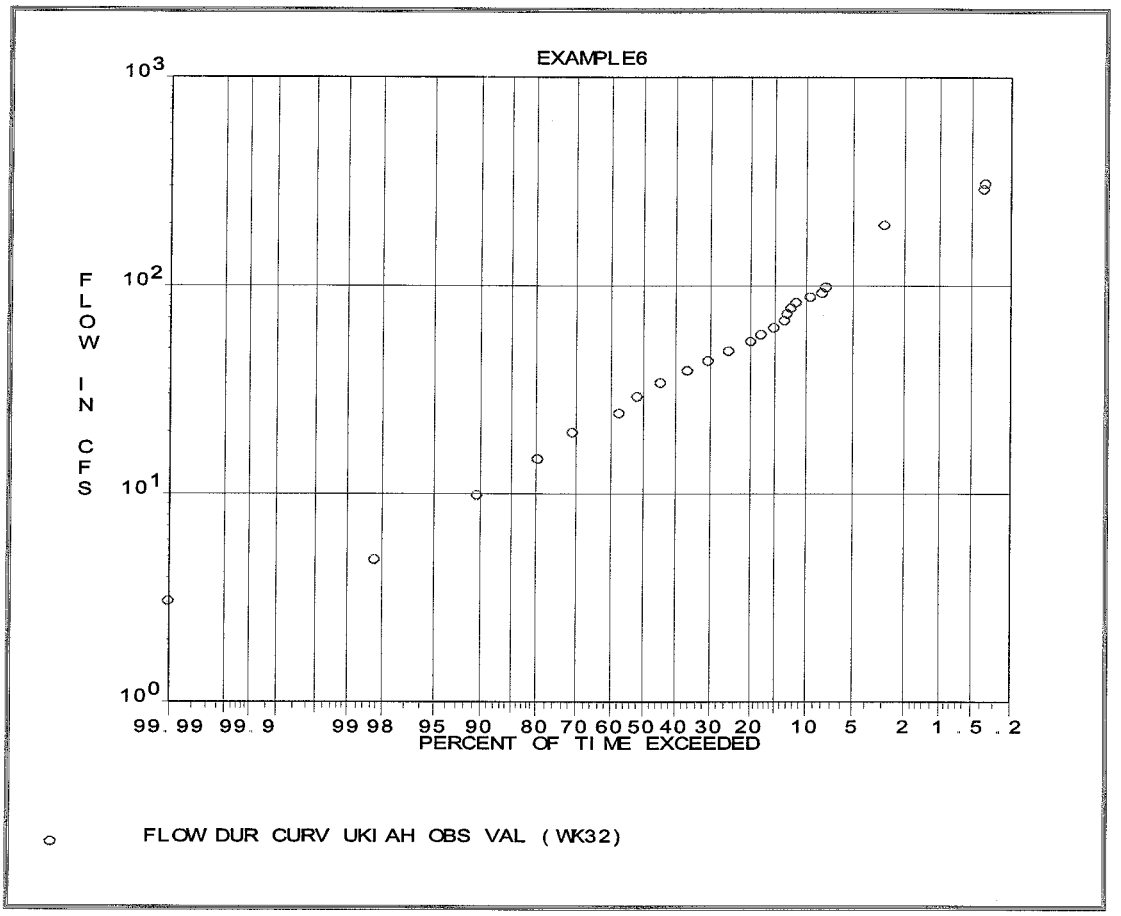
-DURATION DATA- UKIAH, CA (RUSSIAN RIVER WATERSHED)

CLASS NUMBER	LOWER CLASS LIMIT FLOW,CFS	NUMBER IN CLASS	ACCUM NUMBER	PERCENT EQUAL OR EXCEED	CLASS NUMBER	LOWER CLASS LIMIT FLOW,CFS	NUMBER IN CLASS	ACCUM NUMBER	PERCENT EQUAL OR EXCEED	CLASS NUMBER	LOWER CLASS LIMIT FLOW,CFS	NUMBER IN CLASS	ACCUM NUMBER	PERCENT EQUAL OR EXCEED
1	1.00	5	280	100.00	11	50.00	14	69	24.64	21	100.00	13	21	7.50
2	5.00	22	275	98.21	12	55.00	6	55	19.64	22	200.00	7	8	2.86
3	10.00	31	253	90.36	13	60.00	7	49	17.50	23	300.00	1	1	.36
4	15.00	24	222	79.29	14	65.00	5	42	15.00	24	400.00	0	0	.00
5	20.00	38	198	70.71	15	70.00	1	37	13.21					
6	25.00	16	160	57.14	16	75.00	2	36	12.86					
7	30.00	20	144	51.43	17	80.00	2	34	12.14					
8	35.00	23	124	44.29	18	85.00	6	32	11.43					
9	40.00	16	101	36.07	19	90.00	4	26	9.29					
10	45.00	16	85	30.36	20	95.00	1	22	7.86					

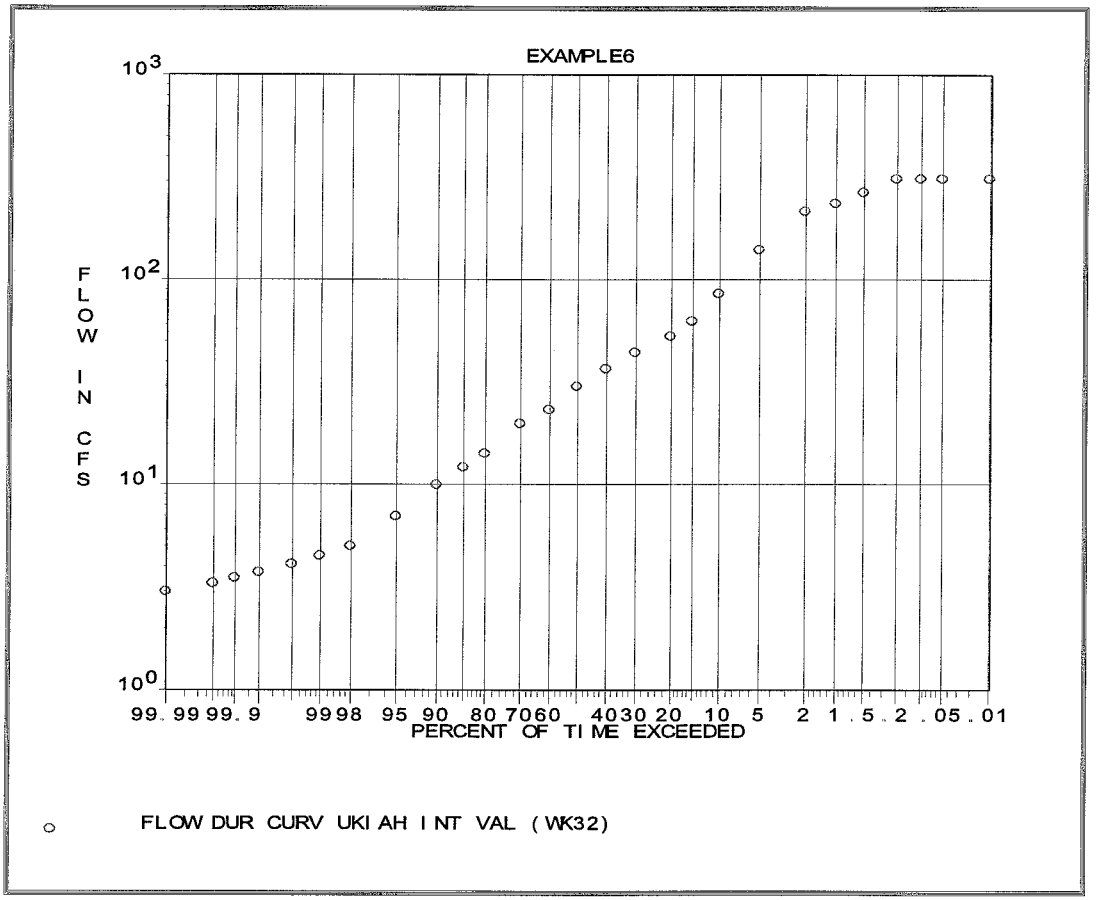
-INTERPOLATED DURATION CURVE- UKIAH, CA (RUSSIAN RIVER WATERSHED)

PERCENT EQUAL OR EXCEED	INTERPOLATED MAGNITUDE FLOW,CFS	PERCENT EQUAL OR EXCEED	INTERPOLATED MAGNITUDE FLOW,CFS
.01	319.00	60.00	23.71
.05	319.00	70.00	20.31
.10	319.00	80.00	14.65
.20	319.00	85.00	12.41
.50	273.65	90.00	10.18
1.00	242.04	95.00	7.15
2.00	219.23	98.00	5.11
5.00	143.29	99.00	4.58
10.00	88.36	99.50	4.20
15.00	65.00	99.80	3.82
20.00	54.50	99.90	3.60
30.00	45.31	99.95	3.41
40.00	37.53	99.99	3.08
50.00	31.08	100.00	2.50

FLOW DURATION CURVE BASED ON OBSERVED VALUES:



FLOW DURATION CURVE BASED ON INTERPOLATED VALUES:



APPENDIX A

INPUT FILE DESCRIPTION

Statistical Analysis of Time Series Data

This appendix contains a detailed description of each variable on each input record. In addition, it shows the sequential arrangement of records and the location of variables (called "field number") for each record. Note that many of the records can be skipped if certain options are not required.

To create an input file, certain guidelines must be followed. For instance, the location of variables for each input record is specified by the use of field numbers. The records are normally divided into ten fields of eight columns each except field 1. Variables occurring in field 1 may only occupy record columns 3-8 because record columns 1 and 2 are reserved for the required identification characters. The value of each variable are typically right justified, although there are a few exceptions. These exceptions are indicated in the input description. Any DOS Editor can be used to create an input file. However, COED, the Corps of Engineers Editor (U.S. Army Corps of Engineers, 1987), has features to assist in the alignment of the variables. Use the "HP ANY" command to set standard 8-column fields with right justification. Use the "HP OFF" command before entering left justification variables.

Each variable may assume different values and the conditions for each are described in this section. Some variables are used to indicate whether or not a program option is to be used. For these variables, the values are entered as integer numbers and must be right justified (entered on the far right side of the field) without any decimal points. Other variables are assigned numbers which express the variable's magnitude. For these, either a "+" or a "-" sign is shown in the description under "value" and the numerical value of the variable is entered as input. The location of variables on records is sometimes referred to by an abbreviated designation, for example, J1.4 means the fourth field of the J1 record.

Samples of input files can be found in the test examples provided in Section 2.

Input Description

For convenience, the table below summarizes all of the capabilities of STATS with corresponding J1.1 and LS.1 records needed for input.

	J1.1	LS.1	NOTES
Graphical Frequency Analysis of Maximums	1	1	
Graphical Frequency Analysis of Minimums	1	2	
Graphical Frequency Analysis of Maximums and Minimums	1	3	1
Analytical Frequency Analysis of Maximums	2	1	2
Analytical Frequency Analysis of Minimums	2	2	2
Analytical Frequency Analysis of Maximums and Minimums	2	3	1,2
Flow Duration Analysis	4	N/A	
Monthly and Annual Statistics	8	N/A	
Departures of Monthly and Annual Values from Respective Means	16	N/A	
Volume Duration, Graphical Analysis of Maximums	33	1	3,4
Volume Duration, Analytical Analysis of Maximums	34	1	2,3,4
Volume Duration, Graphical Analysis of Minimums	33	2	3,4
Volume Duration, Analytical Analysis of Minimums	34	2	2,3,4
Volume Duration Analysis of Maximums & Minimums (Graphical)	35	3	1,3,4
Volume Duration Analysis of Maximums & Minimums (Analytical)	35	3	1,2,3,4

NOTES:

1- If no LS record is supplied, LS.1 will be set to 3, which is the default.
2- No generalized skew is used.
3- Using J1.1 of 32 will not enable frequency analysis, regardless of the value of LS.1. J1.1 must be equal to 33, 34, or 35 to enable frequency analysis.
4- This is the name used in the STATS manual. In the Handbook of Hydrology (Maidment, 1992), it is called "Graphical Frequency Analysis of Annual Maximum/Minimum *d*-Day Averages", and in the Flood Frequency EM (US Army Corps of Engineers, 1993), it is called (for high flows) "Flood Volume Duration Frequency Computations."

SUMMARY OF INPUT RECORDS

Statistical Analysis of Time Series Data

I. Title Information:

TT Job Title Information (up to 78 characters)

II. Job Specification:

J1 JSTAT NPRDS NYRS MONWY JBEGN JEND MONSS LOGTM NDECM

III. Identification Specification:

ID Station Identification (up to 78 characters)

IV. Location Specification:

LS IANAL NAME LOGT NDEC NSIG IPRNT UNIT

V. Input Data Cards:

FR NFRQ FREQ(1) FREQ(2) FREQ(3) .....ETC.

SC NSCV XSC(1) YSC(1) XSC(2) YSC(2) .....ETC.

CL NCLV CLV(1) CLV(2) CLV(3) .....ETC.

RV IFUNC CONST OR CONST(S)

ZR DSS Read Pathname (A=,B=,C=,etc.)

ZT ITIMST IDATST ITIMEN IDATEN

ZW DSS Write Pathname (A=,B=,C=,etc.)

BF IFMT NPRDS

IN Input Time Series Data

EJ End of Job record

TI
J1

DECEMBER 1996

INPUT DESCRIPTION
STATISTICAL ANALYSIS OF TIME SERIES DATA
(STATS)

TI or TT Record - TITLE INFORMATION

Field	Variable	Value	Description
0	ICD	TI or TT	Record identifier.
1-10	TITLE	Alpha	Alphanumeric information to identify the job. As many TI records may be provided as necessary to input the desired descriptive information. Only the first three records are retained for labeling output tables.

J1 Record - JOB SPECIFICATIONS (optional record)

Field	Variable	Value	Description
0	ICD	J1	Record identifier.
1	JSTAT (3)	+	Statistical analysis options. The sum of the following options will govern kind of statistical analyses that are performed on the time series data. If blank, the default is 3, activating analysis options 1 and 2.
		1	Graphical frequency analysis of annual events.
		2	Analytical frequency analysis of annual events.
		4	Duration analysis, CL record must be provided.
		8	Monthly means of data by year and statistics of monthly and annual means. Statistics include the mean, standard deviation, skew, maximum and minimum.
		16	Departures of monthly and annual values from respective means.

J1

J1 record (Continued)

Field	Variable	Value	Description
		32	Volume-duration analysis of daily values. Durations of 1, 3, 7, 15, 30, 60, 90, 120, and 183 days are presently used.
2	NPRDS (365)	+	Nominal number of periods in each event, e.g., 365 if daily data and the event is a year, or 12 if monthly data.
3	NYRS	+	Number of years represented by the events. May be left blank if NYRS is equal to the number of input events.
4	MONWY (1)	+	Month order number of the first period in each event, e.g., 1 for JAN, 10 for OCT, etc. This value is used to specify the water year. If blank, 1 is assumed.
5	JBEGN (1)	+	Order number of first period in each event to select for analysis. If blank, period 1 is assumed. For example, JBEGN = 5 for month of May. JBEGN and JEND are used to select a specific set of sequential periods from each event.
6	JEND (NPRDS)	+	Order number of last period in time series to select for analysis. If blank, the last period is assumed.
7	JPPF (2)		Plotting position formula option.
		1	Weibull plotting positions.
		2	Median (Beard) plotting positions, default value.
		3	Hazen plotting positions.
8	MONSS (0)		Suppress printout of selected statistics of monthly means. Sum the following desired codes:
		0	No statistics printout suppression.
		1	Suppress printout of the maximums.
		2	Suppress printout of the minimums.

J1
ID

J1 record (Continued)

Field	Variable	Value	Description
		4	Suppress printout of the mean.
		Note - The following statistics of the logs may be suppressed if LOGTM = 1 (J1.9) :	
		8	Suppress printout of the mean of the logs.
		32	Suppress printout of the skew coefficient.
9	LOGTM (0)		Logarithmic transformation indicator for statistics of the monthly mean.
		-1	Use same transformation as LOGT (LS.3).
		0	No transformation.
		1	Log (base 10) transformation.
10	NDECM (0)		Number of decimal places for table of monthly means.
		-1	Use same number as NDEC (LS.4).
		+	0, 1, 2, or 3 allowed. If LOGTM (J1.9) specifies a log transform, the mean, standard deviation, and skew will be printed with four decimal places.

ID record - LOCATION IDENTIFICATION (required record)

Field	Variable	Value	Description
0	ICD	ID	Record identifier.
1 - 10	LOCID	Alpha	Alphanumeric information such as location identification, station number, etc. Although columns 3 - 80 may be used, only columns 3 - 48 are printed as table headings.

LS

LS record - LOCATION SPECIFICATIONS (optional record)

Field	Variable	Value	Description
0	ICD	LS	Record identifier.
1	IANAL (3)		Data selection option for frequency analysis specified by JSTAT (J1.1).
		1	Analyze the maximum values selected from each event.
		2	Analyze the minimum values from each event.
		3	Analyze both maximum and minimum values from each event.
2	NAME (FLOW)	Alpha	Variable name to be used for table and graph headings.
3	LOGT (1)		Logarithmic transformation indicator for frequency analysis.
		-1	No transformation.
		0,1	Log (base 10) transform.
4	NDEC (0)	+	Number of decimal places to print in tables of plotting positions and frequency curve ordinates; 0, 1, 2, or 3 allowed.
5	NSIG (3)		Number of significant figures in printout of computed frequency curve ordinates.
		-1	No rounding will be done.
		0	Round to three (3) significant figures, default.
		+	Round values to NSIG significant figures.
6	IPRNT (0)	+	The sum of the following printout suppression options will control the amount of output and diagnostic information.

LS

LS record (Continued)

Field	Variable	Value	Description
		0	Standard output will not be suppressed and no diagnostic information will be output.
		1	List the input time series data.
		2	Suppress printout of plotting position table.
		4	Suppress printout of frequency curve ordinates.
		8	Suppress printout of frequency statistics.
		16	Suppress frequency curve printer plots.
		32	Not used.
		64	Write duration curve ordinates to a file in computer program HYDUR format.
		128	Provide diagnostic output at various steps of interpolation for frequency curve ordinates.
7	UNIT (CFS)	Alpha	Units to be used for table and graph headings.

FR
SC

FR record - INPUT EXCEEDANCE FREQUENCIES (optional record)

This optional record specifies percent chance exceedance (exceedance frequency) values other than the following 12 default values:
0.2, 0.5, 1, 2, 5, 10, 20, 30, 40, 50, 60, 70, 80, 90, 95, and 99.

Field	Variable	Value	Description
0	ICD	FR	Record identifier.
1	NFRQ (12)	+	Number of percent chance exceedance values for which to compute frequency curve ordinates. Dimensioned for a maximum of 18 values.
2 -10	FREQ (see above)	+	Percent chance exceedance values. If there are more than 9 values, the 10th value must be in the first field of the second FR record.

SC record - SPECIFIED COORDINATES (optional record)

This record may be used to control the extrapolation at either or both ends of a graphical frequency curve. These specified points will be used in the polynomial curve fitting routines that estimate magnitudes of events for frequencies from the FR record that are beyond those of the input data (plotting positions).

Field	Variable	Value	Description
0	ICD	SC	Record identifier.
1	NSCV (0)	+	Number of pairs of specified coordinated. Dimensioned for 4.
2	XSC	+	Percent chance exceedance for the first coordinate.
3	YSC	+	Corresponding value of the response variable, for example, the flow or stage corresponding to the percent chance exceedance XSC.
4 - 9	XSC,YSC	+	Remaining pairs of data.

CL
RV

CL record - CLASS LIMITS FOR DURATION ANALYSIS (optional record)

This record specifies the number of classes and the lower limit for each class. Default values are not yet available.

Field	Variable	Value	Description
0	ICD	CL	Record identifier.
1	NCLV	+	Number of class limit values. Dimensioned for 59.
2	CLV	+	The lowest value (class limit) to be included in class 1. Smaller values will be assigned to class zero (0).
3 - 10	CLV	+	Repeat as required by NCLV. If there are more than 9 values, the 10th value will begin in the first field of the next record.

RV record - REVISION OF INPUT DATA (optional record)

This record is used to modify a set of data by the addition or multiplication of the specified constant.

Field	Variable	Value	Description
0	ICD	RV	Record identifier.
1	IFUNC		Mathematical operation to perform on data.
		1	Add the quantity CONST (RV.2) to each data value.
		2	Multiply the quantity CONST (RV.2) by each data value.
2-10	CONST(S)	+	For monthly data: input 12 CONST values (may be the same value) which will be used in the operations specified by IFUNC (RV.1). The 10th value must begin in the first field of the next record.
2	CONST	+	For daily data: input the CONST value which will be used in the operations specified by IFUNC (RV.1)

ZR
ZT

ZR record - DSS READ PATHNAME (optional record)

This record specifies the pathname for data to be acquired from the Data Storage System (DSS). The program will create "IN" records to be processed by the analysis portion of the program.

Field	Variable	Value	Description
0	ICD	ZR	Record identifier.
1 - 10	(pathname)	Alpha	Alphanumeric pathname of file as generated by DSS. Use the following format beginning in column 3: A=PROJECT B=LOCATION C=PARAMETER, ETC. Pathname parts A - E must be specified on the first ZR record. Subsequent ZR records need only provide those pathname parts that are different.

ZT Record - DSS TIME AND DATES (optional record)

This record is used to specify the starting and ending times and dates for the data to be acquired from DSS. This record must be provided after the first ZR record only and all times and dates remain fixed until a EJ record is encountered. Important: **Note that Fields 2, 3, 5, and 6 must be left justified.**

Field	Variable	Value	Description
0	ICD	ZT	Record identifier.
1	ITIMST	+	Starting time in hours and minutes in 24-hour time, e.g. 1305 for 5 minutes after 1 pm. Use zero (0) for daily, monthly, or annual data.
2 - 3	IDATST	Alpha	Starting date for analysis in military style, e.g. 01JAN1933. Locate within columns 13 to 24, **must be left justified**.
4	ITIMEN	+	Ending time in minutes (24-hour time).
5 - 6	IDATEN	Alpha	Ending date for analysis in military style. Locate within columns 37 - 48, **must be left justified**.

ZW

ZW record - DSS WRITE PATHNAME (optional record)

This record specifies the pathname in which to write frequency and duration curve ordinates (as requested by J1.1). A ZW record must be provided at each location for which frequency and duration relationships are to be written to a DSS file. (Currently volume-duration relationships can not be written to DSS.)

Field	Variable	Value	Description
0	ICD	ZW	Record identifier.
1 -10	(pathname)	Alpha	Alphanumeric pathname to be assigned to curves written to a DSS file. Parts A, B, C, E, and F in free format in columns 3 - 80 separated by space or comma. Each pathname part mat not exceed 32 characters. A = Project or Basin; i.e., OHIO RIVER. B = Location; i.e., CINCINNATI. C = Curve parameters. This part contains the two parameter names for the data. Valid parameters are FREQ-FLOW, FREQ-ELEV, etc. (These labels are used by the program to assign units to parameters; therefore, alternative labels should not be assigned.) D is assigned by the program to various output as follows: a. For frequency curve analysis output; MAX (or MIN) EVENTS - Ordinates for frequency curve based on plotting positions. Values may be from an analysis of maximum annual events (MAX) or minimum annual events (MIN). MAX (or MIN) COMPUTED - Ordinates for frequency curve based on evaluation of statistics computed from the data. MAX (or MIN) EXPECTED - Ordinates for frequency curve based on computed statistics and expected probability adjustment.

ZW

ZW Record (Continued)

Field	Variable	Value	Description
			MAX (or MIN) 5 (or 95) PER CONF LIMIT - Ordinates for the 5 (or 95) percent chance exceedance confidence limit curves around the computed frequency curve.
			b. For duration curve analysis output;
			FLOW-DUR DATA - Ordinates for duration curve based on class limits and computed percent of time equaled or exceeded.
			INTERPOLATED FLOW-DUR - Ordinates for duration curve based on even percentages with magnitudes interpolated between computed values.
			F = Unique descriptor to identify the conditions, operation plan, projects assumed in place, etc; i.e., INFLOW, OUTFLOW, NATURAL, REGULATED, OUTFLOW W/ PLAN B, etc.

Example ZW record:

ZW A=OHIO,B=CINCINNATI,C=FREQ-FLOW,F=OBSERVED W/ REGULATION

BF
IN

BF record - BEFORE DATA (optional record)

This record is used to specify an input data format that is different than the default format and/or a variable number of periods in each event.

Field	Variable	Value	Description
0	ICD	BF	Record identifier.
1	IFMT (1)	1	Data will be input with 12 values on each record (useful for monthly data). Columns 3 - 6 are for an optional integer location number, columns 7 - 8 are for the last two digits of the year, and columns 9 - 80 are for the 12 data values in each 6 column field.
		2	Data will be input with the first "IN" record containing an integer location number in columns 3 - 8 and the starting year in columns 13 - 16. The data will follow on successive "IN" records in 10 fields of 8 columns each.
		3	This format is generated by the program when the data read from DSS are monthly values.
		4	This format is generated by the program when the data read from DSS are daily values.
2	NPRDS	+	Actual number of periods for the event following on "IN" records until the next ID, BF, or EJ record.

IN record - TIME SERIES DATA (required record unless data acquired from DSS)

These records are used to input the time series information. If the data are input via DSS, these records will be generated by the program.

(Note - See BF record description for format of IN records.)

EJ

EJ record - END OF JOB INDICATOR (required between jobs)

An EJ record should be provided between time series data (jobs) at different locations when different job specifications (J1) are applicable. Otherwise, one EJ record at the very end is sufficient.

APPENDIX B

TERMINOLOGIES OF SKEW COEFFICIENTS

Statistical Analysis of Time Series Data

Often, different types of skew coefficients are termed differently even though they mean the same thing. Therefore, this appendix was added to help the reader distinguish between the terms. Note that the STATS program uses computed skew, generalized skew, and adopted skew.

- **COMPUTED SKEW, SAMPLE SKEW, OR STATION SKEW (G):**

$$G = \frac{N \times \Sigma (X - \bar{X})^3}{(N-1)(N-2)S^3}$$

X = *Logarithm of the magnitude of the annual event*
$\bar{X}$ = *Mean logarithm*
G = *Computed skew coefficient of logarithms*
N = *Number of events*
S = *Standard deviation of logarithms*

- **GENERALIZED OR REGIONAL SKEW (G):**

$$\bar{G} = \textit{BASED ON REGIONAL SKEW STUDY MAPS}$$

- **ADOPTED OR WEIGHTED SKEW (G_W):**

$$G_W = \frac{G\ (MSE_{\bar{G}}) + \bar{G}\ (MSE_G)}{MSE_{\bar{G}} + MSE_G}$$

where

G_W = *Adopted Skew of logarithms*
G = *Computed skew of logarithms*
$\overline{G}$ = *Generalized skew*
$MSE_{\overline{G}}$ = *Mean square error of generalized skew*
MSE_G = *Mean square error of computed skew*