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Purpose

The Manual Calibration Program (MCP3) is used to develop parameters needed by NWSRFS models and techniques through the simulation of periods of historical records.

Manual adjustments to parameters are made until simulated response agrees satisfactorily with observed values. Comparisons of simulated and observed response can be obtained from a number of display and statistical techniques that are provided.

Program MCP3 is based on the Operations Table (see Chapter V.3 [Hyperlink]) and is compatible with the following other parts of NWSRFS:

- the Forecast Component of the Operational Forecast System (OFS)
- the Automatic Parameter Optimization Program (OPT3)
- the Extended Streamflow Prediction (ESP) function

The calibration programs, including MCP3, execute a single Segment for a relatively long period of record, usually in terms of years. The operational programs execute many Segments for periods in terms of days or at most months as in the case of ESP. MCP3 simulates a long period of record by executing the Operations Table one month at a time.

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Input Summary

The input data for MCP3 primarily consists of defining the Operations that are to be used and the time series needed to store the data needed by the Operations.

The input summary is divided into two parts:

- Required input.
- Optional input needed for special cases, such as executing partial months or generating debug output.

Card	Format	Column	Contents
Required input cards			
Card Group A contains general run information			
A1	A80	1-80	General information.
A2			Period of record for the run:
	I5	1-5	First month
	I5	5-10	First year (4 digits)
	I5	11-15	Last month
	I5	16-20	Last year (4 digits)
	2X,A3	23-25	Output units option; default is all output in Metric units; enter 'ENG' to get English units for all hydrograph displays and for output from most other Operations; few Operations only output in Metric units
Card Group D contains information about each time series that is used. All time series used by the Operations in card group E must be defined in this section. A more complete description of defining and identifying time series is contained in Chapter V.2 [Hyperlink].			
D1	A8	1-8	'DEF-TS'
Repeat card D2 through D4 for each time series that is used in the Operations Table.			
D2	A8	1-8	Time series identifier; all blanks or imbedded dashes are not allowed and the first 4 characters cannot be 'END '
	3X,A4	12-15	Time series data type code (see Section V.2.2 [Hyperlink])

Card	Format	Column	Contents
	3X,I2	19-20	Time series data time interval; allowable time intervals are 1, 2, 3, 4, 6, 8, 12 and 24 hours

The combination of the identifier, data type code and time interval must be unique for each time series used in a Segment.

	12X,A8	33-40	Type of time series: 'INTERNAL' = time series is only used internally within the Segment to transfer data from one Operation to another and is not read from a file or written to a file (default) 'INPUT' = time series is to be read from a data file 'OUTPUT' = time series is to be written to a data file during or after the execution of the Operations Table

Card D3 is only needed for INPUT time series.

D3			Time series location information (see Section V.2.4 [Hyperlink]); the data file must contain time series data for the entire run period specified on card A2

Card D4 is only needed for OUTPUT time series.

D4	A32	1-32	File name
	A12	40-51	Station identifier (optional)
	A20	52-71	General descriptive information about the time series (optional)
	A9	72-80	Format to be used for data values in the DATACARD output; default is 6F10.2; if specified must include parenthesis
D5	A4	1-4	'END '

Card Group E contains information about each Operation that is used. Operations must be input in the order they are to be executed. A general input summary for defining the Operations Table for all programs is given in Section V.3.1 [Hyperlink].

Repeat cards E1 and E2 for each Operation.

Card	Format	Column	Contents
E1	A8	1-8	Identifier for the type of Operation (see Section V.3.2 [Hyperlink])
	4X,A8	13-20	User supplied name for the Operation; all blanks and 'INPUT CO' are not allowed; name is not required for the 'CLEAR-TS' Operation

The combination of the identifier and name must be unique for each Operation within a Segment ('CLEAR-TS' Operations are an exception).

E2	-	-	The input cards for the Operation (see Section V.3.3 [Hyperlink])
E3	A4	1-4	'STOP'

Optional input cards

Use the following input to start and end in the middle of a month:

A2	-	1-25	Same as given specified
	5X,I5	31-35	Initial day of the run within the first month
	5X,I5	41-45	Last day of the run within the last month

Special features can be invoked by including card group B immediately after group A.

To generate debug output include cards B1 and B2.

B1	A8	1-8	'SETBUG'
B2	-	-	SETBUG input (see Section IX.3.3B-FSETBG [Hyperlink])

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Program Execution Information

See Chapter I.2 [Hyperlink] for information about how to execute the program.

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Error Messages

General error messages generated by the program MCP3 are as follows. Other error messages are generated when defining time series (see Section V.2.3 [Hyperlink]) or Operations (see Sections V.3.1 [Hyperlink] and V.3.3 [Hyperlink]).

1. **FATAL ERROR** PROGRAM IS TERMINATED BECAUSE ONE OR MORE ERRORS OCCURRED WHILE READING THE INPUT CARDS.

   Action: Correct all errors. The program will not execute until all errors are corrected.

2. **ERROR** DUE TO PRECEDING ERRORS IN READING DATA, EXECUTION WILL STOP, BUT READING OF TIME SERIES WILL CONTINUE.

   ERROR DUE TO PRECEDING ERRORS IN AN OPERATION, EXECUTION WILL STOP, BUT READING OF TIME SERIES WILL CONTINUE.

   ERROR DUE TO PRECEDING ERRORS WRITING DATA WILL STOP, BUT READING AND EXECUTION WILL CONTINUE.

   Action: Correct indicated errors.

3. **FATAL ERROR** THE ENDING DATE FOR THE RUN XX/XX/XXXX IS PRIOR TO THE STARTING DATE XX/XX/XXXX.

   Action: Correct run dates on card A2.

4. **FATAL ERROR** INPUT CARDS ARE NOT IN THE PROPER ORDER. A 'STOP' CARD WAS ENCOUNTERED BEFORE FINDING A 'DEF-TS ' CARD.

   Action: Check input cards.

5. **ERROR** INPUT TIME SERIES XXXXXXXX XXXX XX HOURS CONTAINS MISSING DATA FOR XX/XXXX. MISSING DATA ARE NOT ALLOWED FOR THIS DATA TYPE.

   Action: Edit the missing data values or change the data type code.

6. **ERROR** NOT ENOUGH SPACE ON THE WATER YEAR SCRATCH FILE.

   Action: Reduce the number of Operations that perform water year computations or displays or call to have the size of the scratch file increased.

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Output Data

Program MCP3 generates the following types of output:

1. Printer output consisting of several pages listing the run information including time series and Operations used, plus execution output from the Operations. Output generated by each Operation is described in Section V.3.3 [Hyperlink].

2. Time series output to the data file if specified in card group D of the input summary.

Sample Input and Output

Sample input is shown in Figure 1 [Bookmark] and sample output is shown in Figure 2 [Bookmark].

Figure 1. Sample input for program MCP3

```
                                    - Column -

    5   10   15   20   25   30   35   40   45   50   55   60   65   70   75   80
----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+
```



```
FRENCH BROAD RIVER BASIN ABOVE BLANTYRE, NORTH CAROLINA
   10 1953   01 1954
DEF-TS
BLANTYRE   MAP     6            INPUT
fromnas/Blantyre_MAP
BLANTYRE   RAIM    6
BLANTYRE   SASC   24
BLANTYRE   INFW    6
BLANTYRE   ROCL   24
BLANTYRE   SMZC   24
BLANTYRE   MAT     6            INPUT
fromnas/FrenchBroad_MAT
GREENVIL   PTPE   24            INPUT
fromnas/E.Greenville_PTPE
ROSMAN     QINE    3            INPUT
fromnas/FrenchBroad_QINE
BREVARD    QINE    3            INPUT
fromnas/Davidson_QINE
BLANTYRE   SQIN    3
BLANTYRE   QME    24            INPUT
fromnas/Blantyre_QME
BLANTYRE   SQME   24
BLANTYRE   QIN     6            INPUT
fromnas/FrenchBroad_QIN
END
SNOW-17     BLANTYRE
FRENCH BROAD-BLANTYE 915. 35.0           YES SUMS
    6  BLANTYRE MAP      1.000       BLANTYRE RAIM
  BLANTYRE MAT     6
                                BLANTYRE SASC   24
 1.30 0.90 0.400.100 125.
 0.15 0.50  0.0  1.0 0.10 0.20
 0.12 0.17 0.20 0.22 0.25 0.30 0.38 0.50 0.70
SAC-SMA     BLANTYRE
FRENCH BROAD-BLANTYE         6  BLANTYRE RAIM       BLANTYRE INFW
  BLANTYRE SASC   24  BLANTYRE  BLANTYRE SUMS
                     1.0001.000 85.0 25.00.3000.0350.1000.100    00.250
                       6.0 1.50 180.290.01000.0.100.00500.2000.300 0.0
  GREENVIL PTPE     0.700.500.360.220.321.201.101.101.100.900.750.75
                     70.0  0.0 130.  0.0 250. 200.                          10/53
UNIT-HG     BLANTYRE
FRENCH BROAD-BLANTYE          185.0   22
  BLANTYRE INFW    6  ROSMAN   QINE    3
    0.2600    3.0000    5.2900    3.1700    1.0500    0.7900    0.6300
    0.4700    0.4000    0.3400    0.3000    0.2700    0.2400    0.2100
    0.1800    0.1500    0.1200    0.0900    0.0700    0.0500    0.0300
    0.0200
LAG/K       ROSMAN
ROSMAN   QINE  3 BLANTYRE SQIN  3     5     0
    10.000     0.0      12.000   100.000    18.000   250.000           X
    18.000   300.000     9.000   450.000
     0.0
    0
UNIT-HG     BREVARD
FRENCH BROAD-BLANTYE          125.1   21
  BLANTYRE INFW    6  BREVARD  QINE    3
    0.1800    2.8200    4.0100    1.4800    0.5100    0.3900    0.3500
    0.2900    0.2600    0.2300    0.2000    0.1900    0.1700    0.1300
    0.1100    0.0800    0.0600    0.0500    0.0400    0.0200    0.0100
```

Figure 1. Sample input for program MCP3

```
                                    - Column -

    5   10   15   20   25   30   35   40   45   50   55   60   65   70   75   80
----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+

LAG/K       BREVARD
BREVARD  QINE  3 BLANTYRE SQIN  3     4     0
     5.000     0.0       6.000    70.000     9.000   200.000           X
     6.000   350.000
     0.0
    0
UNIT-HG     LOCAL
FRENCH BROAD-BLANTYE          176.0   22
  BLANTYRE INFW    6  BLANTYRE SQIN    3
    0.2500    2.8500    5.0300    3.0200    1.0000    0.7500    0.6000
    0.4500    0.3800    0.3200    0.2900    0.2600    0.2300    0.2000
    0.1700    0.1400    0.1100    0.0800    0.0700    0.0500    0.0300
    0.0200
LAG/K       BLANTYRE
BLANTYRE SQIN  3               0     0    12
     0.0
     9.000     0.0       3.000    50.000     9.000    90.000           X
    36.000   110.000    42.000   130.000    42.000   170.000           X
    36.000   180.000    21.000   200.000    12.000   260.000           X
     6.000   340.000     4.000   400.000     3.000   500.000
    0
MEAN-Q      BLANTYRE
  BLANTYRE SQIN    3  BLANTYRE SQME   24
INSQPLOT    BLANTYRE
FRENCH BROAD-BLANTYE    2    3    1
  BLANTYRE RAIM    6        RAIM+MELT
  BLANTYRE INFW    6        RUNOFF
  BLANTYRE QIN     6        OBSERVED        +
  BLANTYRE SQIN    3        SIMULATED       *
WY-PLOT     BLANTYRE
FRENCH BROAD-BLANTYE    2          767.0 200.  YES
  BLANTYRE QME         OBSERVED        +
  BLANTYRE SQME        SIMULATED       *
  BLANTYRE RAIM    6           BLANTYRE            BLANTYRE
STOP
```

Figure 2. Sample output for program MCP3

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```
NWSRFS CALIBRATION SYSTEM - PROGRAM MCP3     (VERSION: 3.2.26   - 01/20/99)              DATE=Mar  4, 1999 - 15:01:40

          ****************************************************************************************************
          ****************************************************************************************************
          *****                                                                                          *****
          *****                                                                                          *****
          *****     FRENCH BROAD RIVER BASIN ABOVE BLANTYRE, NORTH CAROLINA                              *****
          *****                                                                                          *****
          *****                                                                                          *****
          *****          PERIOD USED FOR THIS RUN --  OCT/1953 TO  JAN/1954                              *****
          *****                                                                                          *****
          *****                                                                                          *****
          ****************************************************************************************************
          ****************************************************************************************************

                 TIME SERIES USED FOR THIS SEGMENT.

                                  TIME          TIME         FILE                     DATA                                     EXTERNAL
    USER I.D.     DATA TYPE     INTERVAL     SERIES TYPE     TYPE PERIOD OF REC.  UNIT    "STAID"       DESCRIPTION      TS ID
    ---------     ---------     --------     -----------     ---- --------------- ---- ------------ --------------------
-----------------

 1.  BLANTYRE        MAP         6 HOURS       INPUT         CARD 10/1953-10/1954 IN   BLAN-MAP     MAP ABV BLAN00000230
/users/scv/nwsrfs/calb/sample/area_ts/fromnas/Blantyre_MAP

 2.  BLANTYRE        RAIM        6 HOURS       INTERNAL

 3.  BLANTYRE        SASC       24 HOURS       INTERNAL

 4.  BLANTYRE        INFW        6 HOURS       INTERNAL

 5.  BLANTYRE        ROCL       24 HOURS       INTERNAL

 6.  BLANTYRE        SMZC       24 HOURS       INTERNAL

 7.  BLANTYRE        MAT         6 HOURS       INPUT         CARD 10/1953-10/1954 DEGC BLAN-MAT     FRENCH BROAD00000260
/users/scv/nwsrfs/calb/sample/area_ts/fromnas/FrenchBroad_MAT

 8.  GREENVIL        PTPE       24 HOURS       INPUT         CARD 10/1953-10/1954 IN   BLAN-PTPE    E-GREENVILLE00000290
/users/scv/nwsrfs/calb/sample/area_ts/fromnas/E.Greenville_PTPE

 9.  ROSMAN          QINE        3 HOURS       INPUT         CARD 10/1953-10/1954 CMS  BLAN-QINE    FRENCH BROAD00000320
/users/scv/nwsrfs/calb/sample/area_ts/fromnas/FrenchBroad_QINE

10.  BREVARD         QINE        3 HOURS       INPUT         CARD 10/1953-10/1954 CMS  BLAN-QINE    DAVIDSON R  00000350
/users/scv/nwsrfs/calb/sample/area_ts/fromnas/Davidson_QINE

11.  BLANTYRE        SQIN        3 HOURS       INTERNAL

12.  BLANTYRE        QME        24 HOURS       INPUT         CARD 10/1953-10/1954 CFSD BLAN-QME     ME AT BLANTY00000380
/users/scv/nwsrfs/calb/sample/area_ts/fromnas/Blantyre_QME

13.  BLANTYRE        SQME       24 HOURS       INTERNAL

14.  BLANTYRE        QIN         6 HOURS       INPUT         CARD 10/1953-10/1954 CFS  BLAN-QIN     FRENCH BRD B00000410
/users/scv/nwsrfs/calb/sample/area_ts/fromnas/FrenchBroad_QIN

**********************************************************************

  456 OUT OF  3000 SPACES IN THE TS ARRAY HAVE BEEN USED.
         (PRECEEDING ERROR MESSAGES INDICATE IF MORE SPACE WAS NEEDED.)

 1860 SPACES HAVE BEEN ALLOCATED TO TIME SERIES DATA IN THE D ARRAY.

DEFINITION OF THE OPERATIONS TABLE.

          NOTE.....A CLEAR-TS OPERATION IS AUTOMATICALLY INSERTED FOR TIME SERIES (I.D.=BLANTYRE   TYPE=SQIN   DT= 3 HOURS)

                    ****************************************************

                    THE OPERATIONS USED FOR THIS SEGMENT ARE AS FOLLOWS.

                    ****************************************************

********************

SNOW-17  OPERATION     NAME=BLANTYRE

********************

          SNOW MODEL OPERATION FOR FRENCH BROAD-BLANTYE     ELEV= 915. M   LAT.= 35.0

               COMPUTATIONAL TIME INTERVAL IS  6 HOURS.

                    TIME SERIES USED BY THIS OPERATION.

               CONTENTS              I.D.       TYPE     TIME INTERVAL     OTHER

          PRECIPITATION            BLANTYRE     MAP         6 HOURS      PXADJ= 1.00
          AIR TEMPERATURE          BLANTYRE     MAT         6 HOURS      TAELEV= 915.
          RAIN+MELT                BLANTYRE     RAIM        6 HOURS
          SIM. AREAL COVER         BLANTYRE     SASC       24 HOURS

          SUMS OF WATER BALANCE VARIABLES ARE STORED.

          SNOW COVER VARIABLES DISPLAYED ON ALL SIGNIFICANT DAYS.
```

Figure 2. Sample output for program MCP3

```
          PARAMETER VALUES

               MAJOR PARAMETERS    SCF  MFMAX  MFMIN   UADJ     SI
                                  1.30    .90    .40   .100   125.

               MINOR PARAMETERS    NMF   TIPM  MBASE PXTEMP  PLWHC  DAYGM
                                   .15    .50     .0    1.0    .10    .20

               DEPLETION CURVE   WE/AI     .0   .1   .2   .3   .4   .5   .6   .7   .8   .9  1.0
                                 COVER   0.05  .12  .17  .20  .22  .25  .30  .38  .50  .70  1.0

          SNOW COVER CONDITIONS FOR FRENCH BROAD-BLANTYE

               NO SNOW COVER EXISTS

********************

SAC-SMA  OPERATION     NAME=BLANTYRE

********************

          SACRAMENTO SOIL-MOISTURE ACCOUNTING OPERATION FOR FRENCH BROAD-BLANTYE

               COMPUTATIONAL TIME INTERVAL IS  6 HOURS.

                    TIME SERIES USED BY THIS OPERATION.

               CONTENTS              I.D.       TYPE     TIME INTERVAL

          RAIN+MELT                BLANTYRE     RAIM        6 HOURS
          CHANNEL INFLOW(RUNOFF)   BLANTYRE     INFW        6 HOURS
          POTENTIAL ET             GREENVIL     PTPE       24 HOURS
          AREAL EXTENT OF SNOW     BLANTYRE     SASC       24 HOURS
          RUNOFF COMPONENTS        BLANTYRE     ROCL       24 HOURS
          SOIL STORAGE CONTENTS    BLANTYRE     SMZC       24 HOURS

          SUMS OF WATER BALANCE VARIABLES ARE STORED.

          PARAMETER VALUES - CAPACITIES ARE IN MM.

            PX-ADJ  PE-ADJ   UZTWM   UZFWM     UZK   PCTIM   ADIMP    RIVA     EFC   DAILY ET DIST.
             1.000   1.000     85.     25.    .300    .035    .100    .100    .250    UNIFORM

             PBASE   ZPERC    REXP   LZTWM   LZFSM   LZFPM    LZSK    LZPK   PFREE   RSERV    SIDE
              34.0     6.0    1.50    180.    290.   1000.   .1000   .0050     .20     .30     .00

          16TH OF MONTH VALUES     1     2     3     4     5     6     7     8     9    10    11    12
          PE-ADJUSTMENT          .70   .50   .36   .22   .32  1.20  1.10  1.10  1.10   .90   .75   .75

          SOIL-MOISTURE CONTENTS(MM) FOR FRENCH BROAD-BLANTYE

                 UZTWC   UZFWC   LZTWC   LZFSC   LZFPC   ADIMC
                   70.      .0    130.      .0    250.    200.

********************

UNIT-HG  OPERATION     NAME=BLANTYRE

********************

          UNIT HYDROGRAPH OPERATION FOR FRENCH BROAD-BLANTYE

               COMPUTATIONAL TIME INTERVAL IS  6 HOURS.

                    TIME SERIES USED BY THIS OPERATION.

               CONTENTS              I.D.       TYPE     TIME INTERVAL

          CHANNEL INFLOW (RUNOFF)  BLANTYRE     INFW        6 HOURS
          INSTANTANEOUS DISCHARGE  ROSMAN       QINE        3 HOURS

           6-HOUR UNIT HYDROGRAPH:  22 ORDINATES DEFINED AT   3-HOUR INTERVALS

          THE UNIT HYDROGRAPH REPRESENTS AN AREA OF ABOUT   185.0 SQ.KM.

          ORDINATE        1        2        3        4        5        6        7        8        9       10

          Q (CMS/MM)      .26     3.00     5.29     3.17     1.05      .79      .63      .47      .40      .34

          ORDINATE       11       12       13       14       15       16       17       18       19       20

          Q (CMS/MM)      .30      .27      .24      .21      .18      .15      .12      .09      .07      .05

          ORDINATE       21       22

          Q (CMS/MM)      .03      .02

          NO BASEFLOW WILL BE ADDED TO THE COMPUTED DISCHARGES.

          UNIT HYDROGRAPH CARRYOVER VALUES FOR FRENCH BROAD-BLANTYE

          INITIAL CARRYOVER VALUES HAVE BEEN SET TO ZERO.

********************

CLEAR-TS OPERATION     NAME=

********************

          THE FOLLOWING TIME SERIES IS SET TO ALL ZERO VALUES.
```

Figure 2. Sample output for program MCP3

```
              I.D.=BLANTYRE   TYPE=SQIN   TIME INTERVAL= 3 HOURS

********************

LAG/K    OPERATION     NAME=ROSMAN

********************

           LAG AND/OR K OPERATION
               COMPUTATIONAL TIME INTERVAL IS  3 HOURS.
                 TIME SERIES USED BY THIS OPERATION.
                    I.D.       TYPE     TIME INTERVAL
                  ROSMAN       QINE        3 HOURS
                  BLANTYRE     SQIN        3 HOURS

               NO FORT WORTH RFC TRANSMISSION LOSS COMPUTATIONS WILL BE DONE.

               LAG OPERATION WILL BE PERFORMED.
               A VARIABLE LAG WILL BE APPLIED.
               THE VARIABLE LAG TABLE CONTAINING   5 PAIRS OF LAG AND Q VALUES IS
               LAG (HOURS)       10.       12.       18.       18.        9.
               Q   (CMS)          .0     100.0     250.0     300.0     450.0

               K OPERATION WILL NOT BE PERFORMED.

           LAG AND/OR K CARRYOVER VALUES.
               LAG CARRYOVER HAS BEEN SET TO A DEFAULT VALUE OF ZERO.

********************

UNIT-HG  OPERATION     NAME=BREVARD

********************

          UNIT HYDROGRAPH OPERATION FOR FRENCH BROAD-BLANTYE

               COMPUTATIONAL TIME INTERVAL IS  6 HOURS.

                    TIME SERIES USED BY THIS OPERATION.

               CONTENTS              I.D.       TYPE     TIME INTERVAL

          CHANNEL INFLOW (RUNOFF)  BLANTYRE     INFW        6 HOURS
          INSTANTANEOUS DISCHARGE  BREVARD      QINE        3 HOURS

           6-HOUR UNIT HYDROGRAPH:  21 ORDINATES DEFINED AT   3-HOUR INTERVALS

          THE UNIT HYDROGRAPH REPRESENTS AN AREA OF ABOUT   125.1 SQ.KM.

          ORDINATE        1        2        3        4        5        6        7        8        9       10

          Q (CMS/MM)      .18     2.82     4.01     1.48      .51      .39      .35      .29      .26      .23

          ORDINATE       11       12       13       14       15       16       17       18       19       20

          Q (CMS/MM)      .20      .19      .17      .13      .11      .08      .06      .05      .04      .02

          ORDINATE       21

          Q (CMS/MM)      .01

          NO BASEFLOW WILL BE ADDED TO THE COMPUTED DISCHARGES.

          UNIT HYDROGRAPH CARRYOVER VALUES FOR FRENCH BROAD-BLANTYE

          INITIAL CARRYOVER VALUES HAVE BEEN SET TO ZERO.

********************

LAG/K    OPERATION     NAME=BREVARD

********************

           LAG AND/OR K OPERATION
               COMPUTATIONAL TIME INTERVAL IS  3 HOURS.
                 TIME SERIES USED BY THIS OPERATION.
                    I.D.       TYPE     TIME INTERVAL
                  BREVARD      QINE        3 HOURS
                  BLANTYRE     SQIN        3 HOURS

               NO FORT WORTH RFC TRANSMISSION LOSS COMPUTATIONS WILL BE DONE.

               LAG OPERATION WILL BE PERFORMED.
               A VARIABLE LAG WILL BE APPLIED.
               THE VARIABLE LAG TABLE CONTAINING   4 PAIRS OF LAG AND Q VALUES IS
               LAG (HOURS)        5.        6.        9.        6.
               Q   (CMS)          .0      70.0     200.0     350.0

               K OPERATION WILL NOT BE PERFORMED.

           LAG AND/OR K CARRYOVER VALUES.
               LAG CARRYOVER HAS BEEN SET TO A DEFAULT VALUE OF ZERO.

********************

UNIT-HG  OPERATION     NAME=LOCAL

********************

          UNIT HYDROGRAPH OPERATION FOR FRENCH BROAD-BLANTYE
```

Figure 2. Sample output for program MCP3

```
     COMPUTATIONAL TIME INTERVAL IS  6 HOURS.

          TIME SERIES USED BY THIS OPERATION.

     CONTENTS              I.D.       TYPE     TIME INTERVAL

CHANNEL INFLOW (RUNOFF)  BLANTYRE     INFW        6 HOURS
INSTANTANEOUS DISCHARGE  BLANTYRE     SQIN        3 HOURS

 6-HOUR UNIT HYDROGRAPH:  22 ORDINATES DEFINED AT   3-HOUR INTERVALS

THE UNIT HYDROGRAPH REPRESENTS AN AREA OF ABOUT   176.0 SQ.KM.

ORDINATE        1        2        3        4        5        6        7        8        9       10

Q (CMS/MM)      .25     2.85     5.03     3.02     1.00      .75      .60      .45      .38      .32

ORDINATE       11       12       13       14       15       16       17       18       19       20

Q (CMS/MM)      .29      .26      .23      .20      .17      .14      .11      .08      .07      .05

ORDINATE       21       22

Q (CMS/MM)      .03      .02

NO BASEFLOW WILL BE ADDED TO THE COMPUTED DISCHARGES.

UNIT HYDROGRAPH CARRYOVER VALUES FOR FRENCH BROAD-BLANTYE

INITIAL CARRYOVER VALUES HAVE BEEN SET TO ZERO.

********************

LAG/K    OPERATION     NAME=BLANTYRE

********************

 LAG AND/OR K OPERATION
     COMPUTATIONAL TIME INTERVAL IS  3 HOURS.
       TIME SERIES USED BY THIS OPERATION.
          I.D.       TYPE     TIME INTERVAL
        BLANTYRE     SQIN        3 HOURS

     NO FORT WORTH RFC TRANSMISSION LOSS COMPUTATIONS WILL BE DONE.

     LAG OPERATION WILL NOT BE PERFORMED.

     K OPERATION WILL BE PERFORMED.
     A VARIABLE K WILL BE APPLIED.
     THE VARIABLE K TABLE CONTAINING  12 PAIRS OF K AND Q VALUES IS
     K   (HOURS)         9.        3.        9.       36.       42.       42.       36.       21.       12.        6.
     Q   (CMS)          .0      50.0      90.0     110.0     130.0     170.0     180.0     200.0     260.0     340.0
     K   (HOURS)         4.        3.
     Q   (CMS)        400.0     500.0

 LAG AND/OR K CARRYOVER VALUES.
     K CARRYOVER HAS BEEN SET TO A DEFAULT VALUE OF ZERO.

********************

MEAN-Q   OPERATION     NAME=BLANTYRE

********************

     MEAN DISCHARGE OPERATION

     COMPUTATIONAL TIME INTERVAL IS  3 HOURS.

          TIME SERIES USED BY THIS OPERATION.

     CONTENTS              I.D.       TYPE     TIME INTERVAL

INSTANTANEOUS DISCHARGE  BLANTYRE     SQIN        3 HOURS
MEAN DISCHARGE           BLANTYRE     SQME       24 HOURS

     MEAN DISCHARGES ARE COMPUTED FOR 24 HOUR TIME PERIODS.

     INITIAL CARRYOVER VALUES HAVE BEEN SET TO THEIR DEFAULT VALUES.

********************

INSQPLOT OPERATION     NAME=BLANTYRE

********************

     INSTANTANEOUS FLOW PLOT DISCHARGE FOR FRENCH BROAD-BLANTYE

     PLOT TIME INTERVAL = 3 HOURS   NUMBER OF DISCHARGE TIME SERIES TO BE PLOTTED = 2

          TIME SERIES USED BY THIS OPERATION

     CONTENTS              I.D.       TYPE     TIME INTERVAL     PLOTTING SYMBOL

     RAIM+MELT             BLANTYRE   RAIM        6 HOURS              N/A

     RUNOFF                BLANTYRE   INFW        6 HOURS              N/A

     OBSERVED              BLANTYRE   QIN         6 HOURS               +

     SIMULATED             BLANTYRE   SQIN        3 HOURS               *
```

Figure 2. Sample output for program MCP3

```
          TIME SERIES ID=BLANTYRE TYPE=QIN  TIME INTERVAL= 6 HOURS MUST HAVE AT LEAST ONE NON-MISSING VALUE FOR
                                    A DAY BEFORE ANY TIME SERIES WILL BE PLOTTED

          THE FIRST 4 TIME SERIES WILL BE TABULATED

********************

WY-PLOT  OPERATION     NAME=BLANTYRE

********************

          PLOT MEAN DAILY FLOWS FOR FRENCH BROAD-BLANTYE

               AREA ABOVE FLOW-POINT=    767.0 KM2

               PLOT SCALE IS ARITHMETIC     MAX. ORDINATE=  200. CMSD

           2 DAILY FLOW TIME SERIES ARE PLOTTED

               T.S. I.D.   DATE TYPE       NAME     PLOT SYMBOL
               BLANTYRE      QME       OBSERVED          +
               BLANTYRE      SQME      SIMULATED         *

          DAILY TOTALS OF THE FOLLOWING TIME SERIES ARE TABULATED ON THE PLOT.

               T.S. I.D.     DATA TYPE     TIME INTERVAL
               BLANTYRE        RAIM           6 HOURS
               BLANTYRE        ROCL          24 HOURS
               BLANTYRE        SMZC          24 HOURS

          OPERATION USES RECORDS    1 THRU   24 ON SCRATCH FILE 10.

************************************************************

THIS IS THE END OF THE OPERATIONS TABLE FOR THIS SEGMENT.

************************************************************

THE MINIMUM TIME INTERVAL FOR WHICH THIS SEGMENT CAN BE EXECUTED IS  6 HOURS.

ACTUAL SPACE USED FOR THE P, C, T AND D ARRAYS FOR THIS SEGMENT:

     P ARRAY    653 OUT OF  15000 SPACES

     C ARRAY    180 OUT OF   2000 SPACES

     T ARRAY    108 OUT OF   2000 SPACES

     D ARRAY   2644 OUT OF 100000 SPACES

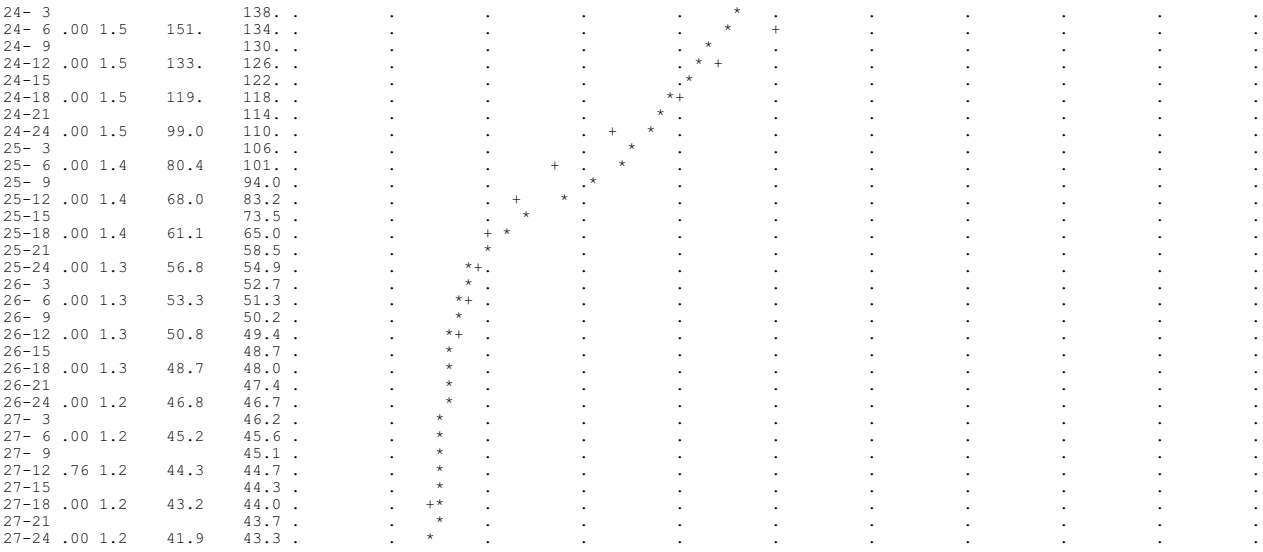
(PRECEEDING MESSAGES WILL INDICATE IF MORE SPACE WAS NEEDED FOR THE P, C AND T ARRAYS)

'BLANTYRE'   SNOW-17 OUTPUT FOR FRENCH BROAD-BLANTYE      1/1954          (UNITS ARE 'MM' EXCEPT FOR AREAL COVER
          DAILY OUTPUT IS FOR HOUR 24     TIME ZONE=INTL                          AND PCT. LIQ. WATER)

                                ENERGY   SIM. AREAL   PCT. LIQ.       HEAT                                        RAIN-SNOW
DAY      SNOWFALL        RAIN    EXCHANGE     COVER       WATER       DEFICIT     SIM. WE     OBS. WE  OBS. COVER   ELEVATION
 14           1.7         3.8         1.2       .18        10.0          .0           0.
 15           5.0         3.6         5.4       .00          .0          .0           0.

***** FRENCH BROAD-BLANTYE *****   INSTANTANEOUS DISCHARGE FROM JAN  1,1954 TO JAN 31,1954   TIME ZONE=INTL
     TIME SERIES TABULATED OR PLOTTED
   CONTENTS        I.D.    TYPE  TIME INTERVAL   PLOTTING SYMBOL     TABULATION LABEL(UNITS)
   RAIM+MELT     BLANTYRE  RAIM       6 HOURS           N/A                 PCN  (MM)
   RUNOFF        BLANTYRE  INFW       6 HOURS           N/A                 INFW (MM)
   OBSERVED      BLANTYRE  QIN        6 HOURS            +                  Q1  (CMS)
   SIMULATED     BLANTYRE  SQIN       3 HOURS            *                  Q2  (CMS)
TIME  PCN INFW    Q1     Q2  0.0      30.0      60.0      90.0     120.0     150.0     180.0     210.0     240.0     270.0     300.0
20- 3                   25.4 .       * .         .         .         .         .         .         .         .         .         .
20- 6 .00 .67    24.7   25.1 .       * .         .         .         .         .         .         .         .         .         .
20- 9                   24.8 .       * .         .         .         .         .         .         .         .         .         .
20-12 .25 .67    24.3   24.6 .       * .         .         .         .         .         .         .         .         .         .
20-15                   24.4 .       * .         .         .         .         .         .         .         .         .         .
20-18 5.3 1.2    23.6   24.6 .       * .         .         .         .         .         .         .         .         .         .
20-21                   25.6 .        *.         .         .         .         .         .         .         .         .         .
20-24  23 4.4    29.2   29.4 .         *         .         .         .         .         .         .         .         .         .
21- 3                   37.0 .         . *       .         .         .         .         .         .         .         .         .
21- 6  28 5.7    66.1   48.3 .         .     *   . +       .         .         .         .         .         .         .         .
21- 9                   63.6 .         .        .*         .         .         .         .         .         .         .         .
21-12 6.9 2.5    90.0   76.8 .         .        .     *   +         .         .         .         .         .         .         .
21-15                   87.6 .         .        .       *.          .         .         .         .         .         .         .
21-18 .00 1.2    92.9   93.8 .         .        .         .*        .         .         .         .         .         .         .
21-21                   96.1 .         .        .         . *       .         .         .         .         .         .         .
21-24  10 2.5    93.7   95.8 .         .        .         .+*       .         .         .         .         .         .         .
22- 3                   93.2 .         .        .         .*        .         .         .         .         .         .         .
22- 6  21 4.6    95.8   90.3 .         .        .         * +       .         .         .         .         .         .         .
22- 9                   89.1 .         .        .         *         .         .         .         .         .         .         .
22-12  53  17    124.   95.2 .         .        .         . *     .+          .         .         .         .         .         .
22-15                   105. .         .        .         .   *     .         .         .         .         .         .         .
22-18  12 4.3    144.   114. .         .        .         .     * .       +   .         .         .         .         .         .
22-21                   124. .         .        .         .       .*          .         .         .         .         .         .
22-24 4.8 2.7    172.   133. .         .        .         .         .   *     .      +  .         .         .         .         .
23- 3                   141. .         .        .         .         .     *   .         .         .         .         .         .
23- 6 .00 1.7    185.   149. .         .        .         .         .         *         . +       .         .         .         .
23- 9                   153. .         .        .         .         .         .*        .         .         .         .         .
23-12 .00 1.6    201.   153. .         .        .         .         .         .*        .      +  .         .         .         .
23-15                   151. .         .        .         .         .         *         .         .         .         .         .
23-18 .00 1.6    202.   149. .         .        .         .         .         *         .      +  .         .         .         .
23-21                   145. .         .        .         .         .       * .         .         .         .         .         .
23-24 .00 1.6    171.   142. .         .        .         .         .     *   .      +  .         .         .         .         .
```

Figure 2. Sample output for program MCP3



WATER YEAR 1954 MEAN DAILY FLOW PLOT FOR FRENCH BROAD-BLANTYE AREA= 767.0 SQ.KM UNITS ARE CMSD
PCN=PRECIP. OR RAIN+MELT (MM)
INFW=RUNOFF OR CHANNEL INFLOW (MM)

NUM.	T.S. I.D.	TYPE	NAME	SYM
1	BLANTYRE	QME	OBSERVED	+
2	BLANTYRE	SQME	SIMULATED	*

STREAMFLOW VOLUME SUMMARY

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
Q(1)	277.	317.	880.	1248.	0.	0.	0.	0.	0.	0.	0.	0.	2722. CMSD
	31.2	35.7	99.1	140.5	.0	.0	.0	.0	.0	.0	.0	.0	306.6 MM
Q(2)	248.	283.	834.	1188.	0.	0.	0.	0.	0.	0.	0.	0.	2554. CMSD
	27.9	31.9	94.0	133.9	.0	.0	.0	.0	.0	.0	.0	.0	287.7 MM
Q(2)-Q(1)	-3.3	-3.8	-5.1	-6.7	.0	.0	.0	.0	.0	.0	.0	.0	-18.9 MM

OCT, 1953 - NOV, 1953

DAY	PCN	Q(1)	Q(2)	20.0	40.0	60.0	80.0	100.0	120.0	140.0	160.	INFW	RUNOFF COMPONENTS % OF TOTAL. PRM	IMP	SUP	DIR	SUR	INT
1	.000	11.7	2.1	.* +	.	.	.	.	17.7 .000	50.3 .000	248.	1.05	100	0	0	0	0	0
2	.000	11.1	8.3	. * +	.	.	.	.	19.7 .000	50.6 .000	247.	1.05	100	0	0	0	0	0
3	.000	10.6	8.9	. *+	.	.	.	.	23.2 .000	51.1 .000	246.	1.01	100	0	0	0	0	0
4	.000	8.67	8.82	. *	.	.	.	.	26.4 .000	51.8 .000	245.	.999	100	0	0	0	0	0
5	.000	9.85	8.64	. *+	.	.	.	.	29.3 .000	52.4 .000	243.	.989	100	0	0	0	0	0
6	.000	10.3	8.5	. *+	.	.	.	.	32.0 .000	53.1 .000	242.	.977	100	0	0	0	0	0
7	.000	8.92	8.37	. *	.	.	.	.	34.2 .000	53.8 .000	241.	.975	100	0	0	0	0	0
8	.000	9.09	8.30	. *+	.	.	.	.	36.1 .000	54.4 .000	240.	.976	100	0	0	0	0	0
9	.000	8.58	8.28	. *	.	.	.	.	38.1 .000	55.2 .000	238.	.956	100	0	0	0	0	0
10	.000	8.83	8.20	. *	.	.	.	.	40.1 .000	55.9 .000	237.	.947	100	0	0	0	0	0
11	.000	8.64	8.10	. *	.	.	.	.	41.9 .000	56.7 .000	236.	.938	100	0	0	0	0	0
12	.000	8.33	7.98	. *	.	.	.	.	43.8 .000	57.6 .000	235.	.922	100	0	0	0	0	0
13	.000	8.18	7.86	. *	.	.	.	.	45.6 .000	58.5 .000	234.	.913	100	0	0	0	0	0
14	9.40	8.38	8.48	. *	.	.	.	.	36.4 .000	58.6 .000	233.	1.33	75	0	25	0	0	0
15	1.02	9.43	9.58	. *	.	.	.	.	35.8 .000	58.7 .000	231.	1.03	97	0	3	0	0	0
16	.000	8.83	8.86	. *	.	.	.	.	37.6 .000	59.4 .000	230.	.928	100	0	0	0	0	0
17	.000	8.24	8.13	. *	.	.	.	.	39.2 .000	60.0 .000	229.	.925	100	0	0	0	0	0
18	.000	8.44	7.87	. *	.	.	.	.	40.8 .000	60.6 .000	228.	.917	100	0	0	0	0	0
19	.000	9.40	7.76	. *+	.	.	.	.	42.3 .000	61.2 .000	227.	.910	100	0	0	0	0	0
20	.000	10.5	7.7	. *+	.	.	.	.	43.9 .000	62.0 .000	226.	.896	100	0	0	0	0	0
21	.000	10.2	7.5	. *+	.	.	.	.	45.8 .000	62.9 .000	225.	.861	100	0	0	0	0	0
22	.000	7.02	7.44	. *	.	.	.	.	46.8 .000	63.4 .000	223.	.906	100	0	0	0	0	0
23	.000	6.91	7.57	. +*	.	.	.	.	48.0 .000	64.1 .000	222.	.879	100	0	0	0	0	0
24	.000	8.38	7.46	. *	.	.	.	.	49.4 .000	64.9 .000	221.	.865	100	0	0	0	0	0
25	.000	8.13	7.33	. *	.	.	.	.	50.3 .000	65.5 .000	220.	.879	100	0	0	0	0	0
26	.508	7.99	7.32	. *	.	.	.	.	50.8 .000	66.1 .000	219.	.891	98	0	2	0	0	0
27	13.7	7.90	8.13	. *	.	.	.	.	37.4 .000	66.2 .000	218.	1.41	66	0	34	0	0	0
28	1.02	10.2	10.4	. *	.	.	.	.	37.0 .000	66.4 .000	217.	.953	96	0	4	0	0	0
29	.000	8.89	8.77	. *	.	.	.	.	38.0 .000	66.8 .000	216.	.892	100	0	0	0	0	0
30	.000	8.04	7.76	. *	.	.	.	.	39.2 .000	67.2 .000	215.	.880	100	0	0	0	0	0
31	.000	7.50	7.42	. *	.	.	.	.	40.4 .000	67.7 .000	214.	.868	100	0	0	0	0	0
1	.000	6.63	7.29	. +*	.	.	.	.	41.5 .000	68.1 .000	212.	.868	100	0	0	0	0	0
2	.000	7.02	7.24	. *	.	.	.	.	42.7 .000	68.6 .000	211.	.856	100	0	0	0	0	0
3	.000	8.13	7.15	. *	.	.	.	.	43.9 .000	69.1 .000	210.	.843	100	0	0	0	0	0
4	.000	7.65	7.07	. *	.	.	.	.	44.7 .000	69.5 .000	209.	.862	100	0	0	0	0	0
5	.000	7.28	7.13	. *	.	.	.	.	45.5 .000	69.8 .000	208.	.857	100	0	0	0	0	0
6	.000	7.22	7.11	. *	.	.	.	.	46.3 .000	70.2 .000	207.	.845	100	0	0	0	0	0
7	.000	7.16	7.07	. *	.	.	.	.	46.9 .000	70.5 .000	206.	.853	100	0	0	0	0	0
8	.000	6.46	7.10	. +*	.	.	.	.	47.5 .000	70.8 .000	205.	.855	100	0	0	0	0	0
9	.000	6.77	7.06	. +*	.	.	.	.	48.3 .000	71.3 .000	204.	.823	100	0	0	0	0	0
10	.000	6.94	6.91	. *	.	.	.	.	49.3 .000	71.8 .000	203.	.811	100	0	0	0	0	0
11	.000	7.08	6.82	. *+	.	.	.	.	50.0 .000	72.2 .000	202.	.819	100	0	0	0	0	0
12	.000	7.08	6.84	. *+	.	.	.	.	50.8 .000	72.7 .000	201.	.807	100	0	0	0	0	0
13	.000	7.08	6.78	. *+	.	.	.	.	51.5 .000	73.1 .000	200.	.809	100	0	0	0	0	0
14	.000	6.80	6.76	. *	.	.	.	.	52.1 .000	73.5 .000	199.	.811	100	0	0	0	0	0

Figure 2. Sample output for program MCP3

```
15  .000   6.23   6.76  .  *      .        .        .        .        .      52.8 .000 74.0 .000 198.  .792 100  0  0  0  0  0
16  .000   6.23   6.66  .  *      .        .        .        .        .      53.6 .000 74.5 .000 197.  .780 100  0  0  0  0  0
17  .000   6.80   6.59  .  *      .        .        .        .        .      54.3 .000 75.0 .000 196.  .782 100  0  0  0  0  0
18  .000   6.80   6.57  .  *      .        .        .        .        .      54.8 .000 75.3 .000 195.  .798 100  0  0  0  0  0
19  .000   6.94   6.57  .  *      .        .        .        .        .      55.5 .000 75.8 .000 194.  .771 100  0  0  0  0  0
20  46.7   9.34   6.59  .  * +    .        .        .        .        .       8.96 .000 75.9 .000 193. 2.46  34  0 66  0  0  0
21  2.03   17.6   16.7  .      *+.        .        .        .        .       7.45 .000 75.9 .000 192. .905  92  0  8  0  0  0
22  45.2   35.7   15.7  .       * .       + .      .        .        .       .048 .753 47.2 2.14 196. 4.85  17  1 33 32  0 17
23  .000   34.8   37.0  .         .       + *.     .        .        .       1.37 .000 46.6 1.97 195. 1.04  82 18  0  0  0  0
24  4.32   18.1   17.1  .        *.        .        .        .        .       .000 2.01 46.6 1.77 194. 1.27  67 13 12  8  0  0
25  .330   14.4   12.5  .     *+  .        .        .        .        .       .809 .000 45.0 1.71 194. 1.02  83 16  1  0  0  0
26  .000   12.9   10.4  .    *+   .        .        .        .        .       1.94 .000 45.0 1.54 193. .986  85 15  0  0  0  0
27  .000   11.9    9.5  .    *+   .        .        .        .        .       3.23 .000 45.1 1.38 192. .966  86 14  0  0  0  0
28  .000   10.6    9.0  .    *    .        .        .        .        .       4.51 .000 45.1 1.24 191. .948  87 13  0  0  0  0
29  .000   9.77   8.69  .   *+    .        .        .        .        .       5.58 .000 45.1 1.12 190. .931  88 12  0  0  0  0
30  .000   9.49   8.50  .   *+    .        .        .        .        .       6.65 .000 45.2 1.01 189. .916  89 11  0  0  0  0
                                UZTD AND LZTD=TENSION WATER DEFICITS                UZTD UZFW LZTD LZFS LZFP
                                                                                      UNITS ARE MM

  DEC, 1953 - JAN, 1954                                                                                    PRM   IMP   SUR
DAY  PCN    Q(1)   Q(2)          20.0      40.0      60.0      80.0     100.0      120.0     140.0     160.  INFW    SUP   DIR   INT
 1  .000   9.34   8.37  .   *+    .        .        .        .        .       7.69 .000 45.2 .906 188. .901  90 10  0  0  0  0
 2  .000   9.68   8.25  .   *+    .        .        .        .        .       8.73 .000 45.3 .816 187. .888  91  9  0  0  0  0
 3  22.4   9.54   8.01  .   *+    .        .        .        .        .       .000 6.68 40.2 1.12 187. 2.44  33  3 32 28  0  4
 4  41.7   32.8   35.6  .         .     + * .        .        .        .       .000 .000 2.76 3.65 192. 6.40  13  4 23 40  0 20
 5  .254   34.0   32.8  .         .     *+   .        .        .        .       .316 .000 2.76 3.28 191. 1.16  72 27  1  0  0  0
 6  39.9   33.7   28.3  .         .   *  +   .        .        .        .       .048 .142 .000 13.1 215. 6.84  13 10 20 42  0 14
 7  .000   52.4   43.1  .         .        . *   +     .        .        .       1.18 .000 .004 11.9 214. 2.07  45 55  0  0  0  0
 8  .254   29.7   24.6  .         . *  +   .          .        .        .       2.05 .000 .018 10.7 213. 1.96  47 52  0  0  0  0
 9  44.4   34.5   28.7  .         .   *  +   .        .        .        .       .000 5.37 .000 19.9 237. 8.28  12 15 19 42  0 12
10  .000   61.2   57.4  .         .        .        *.+      .        .       1.33 .000 .004 19.4 239. 2.93  35 63  0  0  0  2
11  .508   38.2   33.4  .         .      * +.       .        .        .       1.38 .000 .011 17.5 238. 2.73  38 61  1  0  0  0
12  31.5   45.9   41.8  .         .          .* +     .        .        .       .048 .000 .000 24.1 257. 7.57  14 26 15 35  0 10
13  19.6   48.1   44.0  .         .          . * +    .        .        .       .000 6.54 .000 25.4 264. 5.99  19 36 11 29  0  5
14  5.84   58.3   54.0  .         .          .     * +.       .        .       .286 .000 .000 26.3 271. 4.51  26 54  5 11  0  4
15  .254   44.5   39.9  .         .        * +      .        .        .       1.35 .000 .008 23.7 270. 3.46  34 66  0  0  0  0
16  .000   34.0   32.3  .         .     *+   .        .        .        .       2.66 .000 .027 21.3 268. 3.22  36 64  0  0  0  0
17  .000   28.0   28.1  .         .   *      .        .        .        .       3.76 .000 .055 19.2 267. 3.00  39 61  0  0  0  0
18  .000   23.7   25.5  .         . +*       .        .        .        .       4.48 .000 .080 17.3 266. 2.81  41 59  0  0  0  0
19  .000   22.0   23.7  .         .+*        .        .        .        .       5.37 .000 .116 15.5 264. 2.64  44 56  0  0  0  0
20  .508   21.1   22.3  .         .*         .        .        .        .       5.39 .000 .142 14.0 263. 2.51  46 54  1  0  0  0
21  10.2   21.5   23.1  .         .+*        .        .        .        .       .047 .000 .000 14.0 265. 3.17  36 39 11 13  0  0
22  4.06   22.6   24.6  .         .+*        .        .        .        .       .000 .000 .000 13.9 266. 2.90  40 43  5 13  0  0
23  .000   21.5   23.3  .         .+*        .        .        .        .       .748 .000 .002 12.5 265. 2.35  49 51  0  0  0  0
24  .000   20.0   20.5  .         *          .        .        .        .       1.86 .000 .012 11.2 264. 2.23  52 48  0  0  0  0
25  .000   19.0   19.0  .        *.          .        .        .        .       2.40 .000 .021 10.1 262. 2.11  54 46  0  0  0  0
26  .000   18.2   18.0  .        *.          .        .        .        .       3.66 .000 .051 9.10 261. 2.01  57 43  0  0  0  0
27  .000   17.5   17.1  .        *.          .        .        .        .       4.73 .000 .088 8.19 260. 1.92  59 41  0  0  0  0
28  4.83   17.3   16.4  .       *+.          .        .        .        .       .429 .000 .107 7.37 258. 2.00  56 35  8  0  0  0
29  4.57   18.0   18.1  .        *.          .        .        .        .       .000 .000 .000 7.91 260. 2.35  48 29  7 16  0  0
30  .000   17.8   18.0  .        *.          .        .        .        .       .369 .000 .000 7.12 258. 1.81  62 38  0  0  0  0
31  .000   15.7   16.2  .       * .          .        .        .        .       1.46 .000 .007 6.41 257. 1.74  65 35  0  0  0  0
 1  .000   14.9   15.2  .      +* .          .        .        .        .       3.08 .000 .035 5.77 256. 1.67  67 33  0  0  0  0
 2  .508   14.5   14.6  .      *  .          .        .        .        .       3.80 .000 .071 5.19 255. 1.62  68 31  1  0  0  0
 3  2.82   14.4   14.4  .      *  .          .        .        .        .       2.40 .000 .105 4.67 253. 1.65  67 27  6  0  0  0
 4  .000   14.4   14.3  .      *  .          .        .        .        .       3.46 .000 .130 4.21 252. 1.50  73 27  0  0  0  0
 5  .000   14.0   13.5  .      *  .          .        .        .        .       4.68 .000 .169 3.79 251. 1.45  75 25  0  0  0  0
 6  .000   13.8   13.1  .      *  .          .        .        .        .       6.04 .000 .230 3.41 249. 1.41  77 23  0  0  0  0
 7  .000   13.4   12.7  .     *+  .          .        .        .        .       7.22 .000 .296 3.07 248. 1.37  79 21  0  0  0  0
 8  .000   13.2   12.4  .     *+  .          .        .        .        .       8.37 .000 .373 2.76 247. 1.34  80 20  0  0  0  0
 9  .000   13.1   12.2  .     *+  .          .        .        .        .       9.50 .000 .462 2.48 246. 1.30  82 18  0  0  0  0
10  4.83   13.1   12.0  .     *+  .          .        .        .        .       5.16 .000 .502 2.24 244. 1.45  74 15 12  0  0  0
11  3.81   14.4   12.9  .     *+  .          .        .        .        .       1.52 .000 .507 2.01 243. 1.39  76 14 10  0  0  0
12  .000   14.4   13.0  .     *+  .          .        .        .        .       2.57 .000 .523 1.81 242. 1.23  86 14  0  0  0  0
13  .000   12.4   11.6  .     *   .          .        .        .        .       3.27 .000 .540 1.63 241. 1.20  87 13  0  0  0  0
14  5.06   12.5   11.4  .     *   .          .        .        .        .       .000 1.65 .543 1.47 240. 1.51  69  9 12 10  0  0
15  41.7   14.6   14.8  .      * .          .        .        .        .       .000 14.5 .000 10.1 257. 7.50  14  4 19 52  0 10
16  32.0   68.0   71.1  .         .        .        .    .   + *   .        .621 .000 .000 22.4 285. 8.58  14 20 13 35  0 17
17  .000   56.4   61.7  .         .        .      + .*       .        .       1.84 .000 .011 20.1 284. 3.17  39 61  0  0  0  0
18  .254   32.6   33.4  .         .     +*   .        .        .        .       1.93 .000 .016 18.1 282. 2.98  41 58  0  0  0  0
19  .508   26.9   26.9  .         .  *       .        .        .        .       1.59 .000 .018 16.3 281. 2.81  44 56  1  0  0  0
20  29.5   24.4   25.2  .         . +*       .        .        .        .       .000 13.3 .000 19.3 289. 6.93  18 21 15 39  0  8
21  46.0   80.4   70.7  .         .        .        .    *    +   .        .000 5.98 .000 33.0 322. 11.9  11 22 14 38  0 15
22  91.9   124.   103.  .         .        .        .        .       .*       . +       .         .  29.2   5 14 11 31 26 13
23  .000   185.   147.  .         .        .        .        .       .        .         .   *     +  6.54  25 74  0  0  0  1
24  .000   136.   126.  .         .        .        .        .       .        .  *    + .         .  5.99  27 73  0  0  0  0
25  .000   73.3   82.9  .         .        .        .      +  .*     .        2.28 .000 .019 40.8 371. 5.54  29 71  0  0  0  0
26  .000   51.3   49.8  .         .        .   *+   .        .        .       3.06 .000 .035 36.8 369. 5.14  31 69  0  0  0  0
27  .762   44.5   44.8  .         .        . *      .        .        .       3.84 .000 .077 33.1 368. 4.80  33 66  1  0  0  0
28  .508   39.4   41.3  .         .        +*       .        .        .       4.68 .000 .123 29.8 366. 4.47  36 64  0  0  0  0
29  .000   35.4   38.1  .         .      +*.        .        .        .       5.42 .000 .154 26.8 364. 4.16  38 62  0  0  0  0
30  .000   32.6   35.4  .         .     + * .       .        .        .       6.57 .000 .212 24.1 362. 3.89  40 60  0  0  0  0
31  .000   30.3   33.0  .         .    + *  .       .        .        .       7.84 .000 .290 21.7 360. 3.65  43 57  0  0  0  0
                                UZTD AND LZTD=TENSION WATER DEFICITS                UZTD UZFW LZTD LZFS LZFP
                                                                                      UNITS ARE MM

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            SUMMARY OF ERRORS AND WARNINGS FOR THIS RUN:
                      TOTAL NUMBER OF ERRORS=     0
                      TOTAL NUMBER OF WARNINGS=   0

            NATIONAL WEATHER SERVICE   -   RIVER FORECAST SYSTEM      Mar  4, 1999      TIME 15:01:50.00

            COMPLETION CODE= 0

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