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A COMPUTER PROGRAM FOR SIMULATING SALINITY LOADS IN STREAMS

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ABSTRACT

A FORTRAN IV program that simulates salinity loads in streams is described. Daily values of stream-discharge in cubic feet per second, or stream-discharge and specific conductance in micromhos, are used to estimate daily loads in tons by one of five available methods. The loads are then summarized by computing either total and mean monthly loads or various statistics for each calendar day. Results are output in tabular and, if requested, punch card format. User selection of appropriate methods for estimating and summarizing daily loads is provided through the coding of program control cards. The program is designed to interface directly with data retrieved from the U.S. Geological Survey WATSTORE Daily Values File.



INTRODUCTION

A common problem facing the water planner is the estimation of stream-salinity loads from limited water-quality data. These data usually consist of analyses of the major inorganic constituents from discrete samples collected at monthly intervals. Estimation of loads directly from these data will not account for the natural variability in composition of streamflow between sample collections. Numerous techniques have been described to estimate daily loads indirectly from some relationship of concentration to mean daily discharge or specific conductance (DeLong, 1977; Steele, 1973). By using one of these techniques, it is possible to obtain fairly accurate estimates of salinity loads. The large number of calculations involved in estimating daily loads over several years indicates the need for a digital computer program. This is even more apparent if the daily loads are to be summarized in a useful form. The purpose of this report is to document a FORTRAN IV program that computes and summarizes daily salinity loads in tons from daily values of stream-discharge in cubic feet per second, or stream-discharge and specific conductance in micromhos. The program is called DVLOAD.

PROGRAM DESCRIPTION

The purpose of program DVLOAD is to produce a useful summary of daily salinity loads in tons. This is accomplished by the inclusion of numerous computational and output options that the user can specify through program control cards. These options are described in the following sections. A program flow chart is given in figure 1.



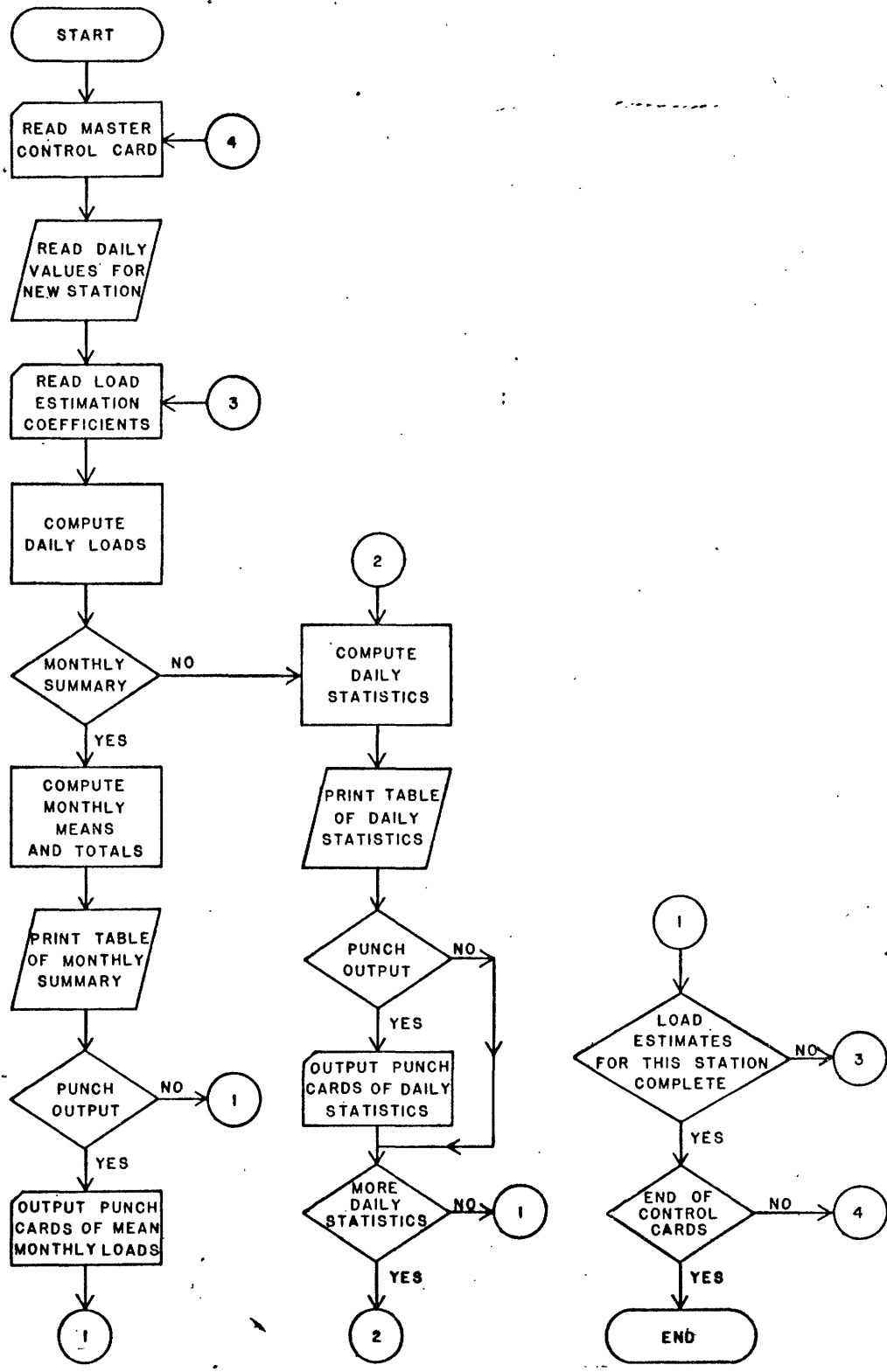


Figure 1.--Flow chart for DVLOAD program



Data Requirements

Data requirements include a record of daily values of stream-discharge in cubic feet per second, or stream-discharge and specific conductance in micromhos. The record format is the U.S. Geological Survey WATSTORE Daily Values monthly character format (Hutchison, 1975). This allows the user to retrieve data from the WATSTORE system and compute stream loads in a single job without reformatting the data.

Program DVLOAD has been written to allow wide variations in the length of record retrieved from the Daily Values File and is tolerant of large periods of missing data. Program options allow for the estimation of loads for any number of different sites with as many as forty years of record for each site. If more than 40 years of record are required the computer program must be modified. If a period of missing data is encountered, DVLOAD will not estimate loads for the period. The load summaries produced by DVLOAD will not be based on this period. Water years with greater than 20 percent missing data are flagged by DVLOAD.

Daily Load Estimation

The selection of a method for estimating daily loads is left as a user option. One or more of the available methods can be applied to data at a single site. In this manner, comparisons of different estimation techniques can be made. The five procedures are:



Option no. 1--useable only if discharge and specific conductance
data are available.

$$C = E + F K$$

$$L = 0.0027 C Q$$

Option no. 2

$$\log (C) = B_0 + B_1 \sin (at) + B_2 \cos (at) + \\ [B_3 + B_4 \sin (at) + B_5 \cos (at)] \log (Q)$$

$$L = 0.0027 C Q$$

Option no. 3

$$\log (K) = B_0 + B_1 \sin (at) + B_2 \cos (at) + \\ [B_3 + B_4 \sin (at) + B_5 \cos (at)] \log (Q)$$

$$C = E + F K$$

$$L = 0.0027 C Q$$

Option no. 4

$$C = B_0 + B_1 \sin (at) + B_2 \cos (at) + \\ [B_3 + B_4 \sin (at) + B_5 \cos (at)]/Q$$

$$L = 0.0027 C Q$$

Option no. 5

$$K = B_0 + B_1 \sin (at) + B_2 \cos (at) + \\ [B_3 + B_4 \sin (at) + B_5 \cos (at)]/Q$$

$$C = E + F K$$

$$L = 0.0027 C Q$$



Where B_0 through B_5 , E and F = regression coefficients, supplied
by the user

C = concentration, in milligrams per liter

K = specific conductance, in micromhos
per centimeter at 25°C

Q = daily mean discharge, in cubic feet
per second

t = water-year day (table 1)

a = 0.0172 radians per day

L = daily load, in tons per day

One commonly used technique for estimating loads from values of discharge is to use the equation

$$\log (C) = B_0 + B_3 \log (Q)$$

where the variables are defined as above. This can be accomplished by using option number 2 and setting B_1 , B_2 , B_4 , and B_5 to zero. The affect of using the more complex equation with all coefficients nonzero is to introduce a harmonic function that describes seasonal trends (DeLong, 1977).



Table 1.--Sequence number conversion, date to water-year day

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
1	1	32	62	93	124	152	183	213	244	274	305	336
2	2	33	63	94	125	153	184	214	245	275	306	337
3	3	34	64	95	126	154	185	215	246	276	307	338
4	4	35	65	96	127	155	186	216	247	277	308	339
5	5	36	66	97	128	156	187	217	248	278	309	340
6	6	37	67	98	128	157	188	218	249	279	310	341
7	7	38	68	99	130	158	189	219	250	280	311	342
8	8	39	69	100	131	159	190	220	251	281	312	343
9	9	40	70	101	132	160	191	221	252	282	313	344
10	10	41	71	102	133	161	192	222	253	283	314	345
11	11	42	72	103	134	162	193	223	254	284	315	346
12	12	43	73	104	135	163	194	224	255	285	316	347
13	13	44	74	105	136	164	195	225	256	286	317	348
14	14	45	75	106	137	165	196	226	257	287	318	349
15	15	46	76	107	138	166	197	227	258	288	319	350
16	16	47	77	108	139	167	198	228	259	289	320	351
17	17	48	78	109	140	168	199	229	260	290	321	352
18	18	49	79	110	141	169	200	230	261	291	322	353
19	19	50	80	111	142	170	201	231	262	292	323	354
20	20	51	81	112	143	171	202	232	263	293	324	355
21	21	52	82	113	144	172	203	233	264	294	325	356
22	22	53	83	114	145	173	204	234	265	295	326	357
23	23	54	84	115	146	174	205	235	266	296	327	358
24	24	55	85	116	147	175	206	236	267	297	328	359
25	25	56	86	117	148	176	207	237	268	298	329	360
26	26	57	87	118	149	177	208	238	269	299	330	361
27	27	58	88	119	150	178	209	239	270	300	331	362
28	28	59	89	120	151	179	210	240	271	301	332	363
29	29	60	90	121	(152)	180	211	241	272	302	333	364
30	30	61	91	122	---	181	212	242	273	303	334	365
31	31	--	92	123	---	182	---	243	---	304	335	---

Note: For months of March through September add one (1) to number in table for sequence conversion of days for leap years.



Statistics Computation

Once a set of daily load estimates is completed for a site DVLOAD will summarize it by one of two user specified procedures. The first procedure computes total and mean loads for each month of record. Days for which no load is computed, because of missing discharge or specific conductance record, are not used in calculating mean monthly loads. Total monthly load is determined by assuming that the mean load extends over the entire month. A similar procedure is followed to determine annual loads. Mean and total loads are computed regardless of the amount of missing data.

The second method available to summarize daily loads is to compute various statistical parameters for each water year day. This option allows the user to obtain an idea of how load varies seasonally over the entire period of record. The statistics that the user may select are the maximum daily load, minimum daily load and the mean daily load. If three or more years of data are available, the user may also request the variance, standard deviation, coefficient of variation, and skewness coefficient for each day. As with the monthly summaries, statistics are not based on periods of missing data.

Program Output

DVLOAD produces output in two forms. Printed tables of the appropriate load summary are output. Examples of line printer output are given in a later section (tables 5 and 6). An option is also available to produce punch cards of statistics in a format suitable for use in other FORTRAN programs or with off-line equipment.



The format of punch card output shown in figure 2 is described below:

<u>Columns</u>	<u>Description</u>
1 - 15	Station identification number, right justified.
16, 28, 40, 52	Blank
17 - 27, 29 - 39, 41 - 51, 53 - 63	Monthly or daily statistics using a G11.4 FORTRAN format specification.
64 - 80	Blank

If a monthly summary is requested, the four values represent mean monthly loads. A combination of three cards, therefore, represents the mean monthly loads over a single water year. Each group of three cards is preceded by a card indicating the load estimation technique used and the water year. If a daily statistic summary is requested, then eight punch cards are used to represent the daily statistic for a month. Depending upon the month, values for days 29 through 32 may have no meaning. To denote this, negative values are punched. Each card deck representing the range of a statistic over the water year is preceded by a title card. An example of punch card output is presented in a later section (table 7).

PROGRAM USE

Program DVLOAD is intended for use by hydrologists and water planners and involves a minimum of effort in data input preparation. For this reason, it was designed to interface directly with output from the Geological Survey WATSTORE Daily Values File retrieval program (Hutchison, 1975). By doing this, the user of Geological Survey data need only be concerned with obtaining estimates for the equation coefficients used in calculating daily loads, retrieving the proper daily values, and applying the load program. For the purpose of this discussion, it is assumed that the equation coefficients have been estimated by the least squares technique, Newton's method, or another appropriate procedure.





Retrieval of Daily Values

The Daily Values File retrieval program has been well documented (Hutchison, 1975). Application of DVLOAD requires that several additional restrictions be placed on the retrieval process. Data retrieved from the Daily Values File must be passed to the load program in the monthly character format (table 2). As many stations as desired may be processed in a single job. If more than 40 years of data are retrieved for a station the computer program must be modified. Care must be taken to insure that the order of stations retrieved from the Daily Values File corresponds with the DVLOAD program control cards described below. If they do not correspond, an error message will be printed and program execution will stop.

Program Control Cards

The program control cards allow the user to select options described previously. Two types of control cards must be coded for each station that is to be processed. The master control card contains information about a particular station and describes the type of load summary to be used for the station. Only one master control card per station is coded. The load estimation control card is used to define the procedure followed in computing daily loads and to define the equation coefficients used in the procedure. It follows the master control card and may be repeated as often as desired for each station and parameter. The sets of master and load estimation control cards must be ordered to correspond with the order of sites on the monthly character file of daily values described previously. A detailed discussion of the control card formats is presented in a later section.



Table 2.--Monthly character format

Byte position	Format	Name	Description
9 - 23	3A4, A3	ID	Station identification number
28 - 42	I5	ITEST	STORET EPA parameter code
43 - 46	I4	K	Calendar year
47 - 48	I2	J	Month number
61 - 277	31A7	VALUE(31)	Thirty-one daily values (7 characters each). Decimal point is included when applicable. A blank field indicates no value stored.



CONTROL CARD FORMATS

Master Control Card

<u>Columns</u>	<u>Format</u>	<u>Name</u>	<u>Description</u>
1-15	3A4, A3	SITEID(4)	Station identification number, right justified
17	I1	ITYPE	Code "1" to compute monthly summary. Leave blank for daily statistics.
19	I1	ISTAT(1)	Code "1" to compute maximum daily loads or card output of mean monthly loads, depending on the load summary requested.
20	I1	IPUNCH(1)	Code "1" for card output of maximum daily loads.
22	I1	ISTAT(2)	Code "1" to compute minimum daily loads.
23	I1	IPUNCH(2)	Code "1" for card output of minimum daily loads.
25	I1	ISTAT(3)	Code "1" to compute mean daily loads.
26	I1	IPUNCH(3)	Code "1" for card output of mean daily loads.
28	I1	ISTAT(4)	Code "1" to compute the variance of daily loads.
29	I1	IPUNCH(4)	Code "1" for card output of variance.
31	I1	ISTAT(5)	Code "1" to compute the standard deviation of daily loads.
32	I1	IPUNCH(5)	Code "1" for card output of standard deviations.
34	I1	ISTAT(6)	Code "1" to compute the coefficient of variation of daily loads.
35	I1	IPUNCH(6)	Code "1" for card output of coefficients of variation.



Master Control Card--continued

<u>Columns</u>	<u>Format</u>	<u>Name</u>	<u>Description</u>
37	I1	ISTAT(7)	Code "1" to compute the coefficient of skewness of daily loads.
38	I1	IPUNCH(7)	Code "1" for card output of coefficients of skewness.
39-43	I5	IPAR	EPA STORET code for specific conductance. If not needed, leave blank.

Load Estimation Control Card

<u>Columns</u>	<u>Format</u>	<u>Name</u>	<u>Description</u>
1	I1	IOPT	Option number for load estimates.
5-13	F9.4	CONST(1)	Coefficient B_0
14-22	F9.4	CONST(2)	Coefficient B_1
23-31	F9.4	CONST(3)	Coefficient B_2
32-40	F9.4	CONST(4)	Coefficient B_3
41-49	F9.4	CONST(5)	Coefficient B_4
50-58	F9.4	CONST(6)	Coefficient B_5
59-67	F9.4	CONST(7)	Coefficient E
68-76	F9.4	CONST(8)	Coefficient F
80	I1	IZ	Code "1" to indicate the last load estimation control card for a station. Otherwise leave blank.



Recommended Job Control Language

The following job control cards are recommended for running program DVLOAD with data stored in the WATSTORE daily values file. In addition to the following statements, the user must supply a JOB card and any applicable ROUTE or RELAY cards.

```
/*SETUP    tape no./9
/*PRØCLIB  WRD.PRØCLIB
// EXEC DVRETR,AGENCY=USGS,VØLL=tape no.
//HDR.SYSIN DD *
```

Retrieval Cards

```
/*
//DVR.TAPE7 DD DSN=&&TAPE,UNIT=SYSDK,DISP=(,PASS),SPACE=(TRK,(10,1)),
// DCB=(RECFM=FB,LRECL=408,BLKSIZE=8160,DEN=,TRTCH=),VØL=SER=,LABEL=
// EXEC FTG1CLG,REGIØN.GØ=250K
//FØRT.SYSIN DD *
```

DVLOAD Fortran Source Deck

```
/*
//GØ.FT01F001 DD DSN=&&TAPE,UNIT=SYSDK,DISP=(ØLD,PASS)
//GØ.FT02F001 DD DSN=&&WØRK,UNIT=SYSDK,DISP=(,DELETE),
// DCB=(RECFM=F,LRECL=220,BLKSIZE=220),SPACE=(TRK,(1,1))
//GØ.SYSIN DD *
```

Program Control Cards

```
/*
```

Program DVLOAD has been stored on SYS1.LOADLIB on the U.S. Geological Survey Reston 2 computer. This eliminates the need to compile the FORTRAN source deck with each computer run. To use this load module, remove the statements

```
//EXEC FTG1CLG,REGIØN.GØ=250K
//FØRT.SYSIN DD *
```

DVLOAD Fortran Source Deck

```
/*
```

from the above job control cards. Replace them with the statement

```
//EXEC FØTRUN, PRØG=K344,REGIØN.GØ=230K
```



EXAMPLE

This example demonstrates the use of the load program to estimate and summarize daily loads of dissolved solids at two locations in the Green River Basin of southwestern Wyoming. The program options used at each location are shown in table 3. Equation coefficients used to estimate daily loads are provided by DeLong (1977 p 30.31). Control cards for both the WATSTORE daily values retrieval program and the load program are presented in table 4. Line printer output is shown in tables 5 and 6 while punch card output is presented in table 7. The program was run on the U.S. Geological Survey IBM 370-155 computer at Reston, Virginia, using the Job Control Language described in this report at a cost of approximately \$12.



Table 3.--Program options used in example problem

	09188500 - Green River at Warren Bridge, near Daniel, Wyo.	09216000 - Big Sandy River below Eden, Wyo.
Period of record	1970-73	1955-75
Daily load estimate method	Option no. 2	Option no. 2.
Type of load summary	Monthly	Mean daily statistics.
Type of punch card output	No punch card output	Punch card output of means.



Table 4.--Listing of control cards for example problem

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		



Table 5.--Line printer output for example problem, monthly summary

STATION NUMBER 1 0918R500												
AVERAGES ARE COMPUTED FROM THE NUMBER OF DAYS OF RECORD												
TOTALS ARE COMPUTED BY ASSUMING THE AVERAGE OVER THE ENTIRE MONTH												

WATER YEAR 1970												
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT
AVERAGE (TON/D)	131.	105.	83.8	99.5	115.	124.	122.	451.	561.	307.	175.	156.
TOTAL (TON)	.406E+04	.316E+04	.260E+04	.309E+04	.321E+04	.383E+04	.367E+04	.140E+05	.168E+05	.952E+04	.541E+04	.467E+04

WATER YEAR 1971												
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT
AVERAGE (TON/D)	131.	133.	147.	129.	102.	118.	165.	643.	771.	374.	231.	171.
TOTAL (TON)	.406E+04	.399E+04	.456E+04	.400E+04	.285E+04	.367E+04	.496E+04	.199E+05	.231E+05	.116E+05	.718E+04	.512E+04

WATER YEAR 1972												
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT
AVERAGE (TON/D)	157.	157.	123.	124.	119.	168.	255.	723.	806.	326.	216.	179.
TOTAL (TON)	.486E+04	.472E+04	.381E+04	.400E+04	.346E+04	.522E+04	.765E+04	.224E+05	.242E+05	.101E+05	.668E+04	.536E+04

WATER YEAR 1973												
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT
AVERAGE (TON/D)	180.	168.	141.	131.	123.	120.	136.	565.	449.	292.	186.	170.
TOTAL (TON)	.559E+04	.504E+04	.436E+04	.405E+04	.345E+04	.373E+04	.408E+04	.175E+05	.135E+05	.904E+04	.577E+04	.511E+04



Table 6.---Line printer output for example problem, daily statistics

STATION NUMBER : 09216000
 STATISTIC : MEAN
 BASED ON WATER YEARS 1955 THRU 1975

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT
1	1.49E+03	1.60E+03	1.79E+03	2.61E+03	2.87E+03	3.00E+03	1.00E+03	1.43E+03	1.43E+03	1.04E+03	1.26E+03	1.40E+03
2	1.50E+03	1.59E+03	1.79E+03	2.67E+03	2.88E+03	2.71E+03	988.	1.47E+03	1.39E+03	1.04E+03	1.28E+03	1.39E+03
3	1.49E+03	1.56E+03	1.81E+03	2.75E+03	2.85E+03	2.60E+03	1.01E+03	1.49E+03	1.39E+03	1.03E+03	1.29E+03	1.39E+03
4	1.50E+03	1.57E+03	1.82E+03	2.85E+03	2.99E+03	2.55E+03	1.06E+03	1.51E+03	1.39E+03	1.03E+03	1.28E+03	1.61E+03
5	1.50E+03	1.64E+03	1.85E+03	2.82E+03	3.01E+03	2.38E+03	1.07E+03	1.48E+03	1.36E+03	1.04E+03	1.27E+03	1.42E+03
6	1.51E+03	1.63E+03	1.85E+03	2.77E+03	2.82E+03	2.24E+03	1.04E+03	1.49E+03	1.34E+03	1.04E+03	1.28E+03	1.41E+03
7	1.50E+03	1.58E+03	1.92E+03	2.77E+03	2.75E+03	2.16E+03	1.05E+03	1.51E+03	1.31E+03	1.05E+03	1.27E+03	1.42E+03
8	1.51E+03	1.61E+03	2.00E+03	2.73E+03	2.63E+03	2.13E+03	1.07E+03	1.50E+03	1.27E+03	1.08E+03	1.29E+03	1.44E+03
9	1.48E+03	1.59E+03	2.02E+03	2.71E+03	2.66E+03	2.08E+03	1.05E+03	1.49E+03	1.19E+03	1.10E+03	1.30E+03	1.45E+03
10	1.48E+03	1.59E+03	2.02E+03	2.75E+03	2.69E+03	2.05E+03	1.06E+03	1.50E+03	1.21E+03	1.10E+03	1.29E+03	1.44E+03
11	1.49E+03	1.62E+03	2.12E+03	2.78E+03	2.73E+03	2.08E+03	1.06E+03	1.53E+03	1.22E+03	1.12E+03	1.31E+03	1.43E+03
12	1.53E+03	1.61E+03	2.13E+03	2.79E+03	2.91E+03	2.04E+03	1.08E+03	1.55E+03	1.20E+03	1.12E+03	1.31E+03	1.41E+03
13	1.53E+03	1.63E+03	2.14E+03	2.79E+03	2.79E+03	2.03E+03	1.09E+03	1.53E+03	1.16E+03	1.11E+03	1.31E+03	1.40E+03
14	1.53E+03	1.65E+03	2.16E+03	2.77E+03	2.78E+03	1.95E+03	1.10E+03	1.52E+03	1.12E+03	1.12E+03	1.30E+03	1.41E+03
15	1.53E+03	1.64E+03	2.17E+03	2.82E+03	2.82E+03	1.91E+03	1.14E+03	1.52E+03	1.09E+03	1.14E+03	1.30E+03	1.42E+03
16	1.53E+03	1.66E+03	2.15E+03	2.89E+03	2.95E+03	1.87E+03	1.16E+03	1.56E+03	1.05E+03	1.15E+03	1.31E+03	1.42E+03
17	1.53E+03	1.65E+03	2.13E+03	2.94E+03	2.94E+03	1.81E+03	1.16E+03	1.60E+03	1.04E+03	1.17E+03	1.32E+03	1.40E+03
18	1.54E+03	1.64E+03	2.15E+03	2.96E+03	2.89E+03	1.79E+03	1.17E+03	1.62E+03	1.05E+03	1.19E+03	1.32E+03	1.42E+03
19	1.54E+03	1.66E+03	2.16E+03	3.24E+03	2.90E+03	1.72E+03	1.21E+03	1.63E+03	1.05E+03	1.20E+03	1.30E+03	1.40E+03
20	1.52E+03	1.69E+03	2.15E+03	3.11E+03	2.90E+03	1.63E+03	1.24E+03	1.66E+03	1.08E+03	1.19E+03	1.29E+03	1.42E+03
21	1.52E+03	1.66E+03	2.19E+03	3.03E+03	2.78E+03	1.50E+03	1.27E+03	1.61E+03	1.10E+03	1.17E+03	1.29E+03	1.43E+03
22	1.51E+03	1.67E+03	2.24E+03	3.02E+03	2.91E+03	1.44E+03	1.28E+03	1.59E+03	1.11E+03	1.16E+03	1.29E+03	1.45E+03
23	1.59E+03	1.69E+03	2.25E+03	2.95E+03	2.86E+03	1.39E+03	1.30E+03	1.54E+03	1.11E+03	1.16E+03	1.29E+03	1.45E+03
24	1.58E+03	1.68E+03	2.25E+03	2.92E+03	3.12E+03	1.34E+03	1.28E+03	1.56E+03	1.08E+03	1.16E+03	1.30E+03	1.45E+03
25	1.59E+03	1.67E+03	2.21E+03	2.95E+03	2.81E+03	1.29E+03	1.30E+03	1.58E+03	1.09E+03	1.16E+03	1.30E+03	1.45E+03
26	1.53E+03	1.72E+03	2.25E+03	2.93E+03	3.10E+03	1.25E+03	1.33E+03	1.51E+03	1.07E+03	1.19E+03	1.33E+03	1.45E+03
27	1.53E+03	1.70E+03	2.29E+03	3.00E+03	3.09E+03	1.21E+03	1.34E+03	1.51E+03	1.06E+03	1.20E+03	1.35E+03	1.46E+03
28	1.54E+03	1.74E+03	2.36E+03	3.21E+03	3.05E+03	1.16E+03	1.36E+03	1.53E+03	1.05E+03	1.21E+03	1.35E+03	1.49E+03
29	1.58E+03	1.76E+03	2.41E+03	3.24E+03	5.77E+03	1.16E+03	1.38E+03	1.46E+03	1.04E+03	1.24E+03	1.36E+03	1.49E+03
30	1.60E+03	1.77E+03	2.47E+03	3.27E+03	-1.00E+20	1.15E+03	1.39E+03	1.45E+03	1.05E+03	1.25E+03	1.38E+03	1.48E+03
31	1.60E+03	-1.00E+20	2.57E+03	3.02E+03	-1.00E+20	1.11E+03	-1.00E+20	1.45E+03	-1.00E+20	1.24E+03	1.39E+03	-1.00E+20



Table 7.--Punch card output for example problem

09216000 / MEAN	LOAD OPTION = 2			
09216000	1493.	1503.	1494.	1497.
09216000	1504.	1513.	1503.	1512.
09216000	1480.	1475.	1487.	1528.
09216000	1529.	1529.	1531.	1527.
09216000	1533.	1542.	1537.	1517.
09216000	1517.	1514.	1592.	1557.
09216000	1552.	1522.	1531.	1538.
09216000	1583.	1598.	1601.	-.1000E+21
09216000	1603.	1586.	1565.	1568.
09216000	1637.	1631.	1580.	1611.
09216000	1586.	1593.	1624.	1607.
09216000	1626.	1651.	1636.	1660.
09216000	1651.	1642.	1658.	1686.
09216000	1660.	1675.	1688.	1684.
09216000	1668.	1670.	1705.	1739.
09216000	1759.	1768.	-.1000E+21	-.1000E+21
09216000	1789.	1794.	1806.	1822.
09216000	1849.	1853.	1923.	1998.
09216000	2024.	2022.	2120.	2127.
09216000	2139.	2160.	2173.	2147.
09216000	2133.	2154.	2163.	2153.
09216000	2192.	2240.	2249.	2249.
09216000	2205.	2245.	2295.	2359.
09216000	2405.	2467.	2568.	-.1000E+21
09216000	2607.	2673.	2753.	2854.
09216000	2824.	2775.	2771.	2734.
09216000	2706.	2749.	2779.	2794.
09216000	2790.	2767.	2819.	2893.
09216000	2942.	2961.	3237.	3108.
09216000	3027.	3016.	2955.	2919.
09216000	2955.	2926.	2998.	3206.
09216000	3243.	3267.	3016.	-.1000E+21
09216000	2871.	2878.	2850.	2991.
09216000	3005.	2816.	2750.	2628.
09216000	2661.	2692.	2726.	2910.
09216000	2790.	2778.	2822.	2949.
09216000	2944.	2888.	2901.	2905.
09216000	2781.	2908.	2863.	3120.
09216000	2812.	3104.	3090.	3046.
09216000	5773.	-.1000E+21	-.1000E+21	-.1000E+21
09216000	3004.	2707.	2602.	2548.
09216000	2384.	2238.	2164.	2130.
09216000	2076.	2054.	2085.	2051.
09216000	2026.	1949.	1914.	1869.
09216000	1812.	1794.	1720.	1631.
09216000	1501.	1441.	1387.	1345.
09216000	1292.	1249.	1208.	1164.
09216000	1159.	1150.	1108.	-.1000E+21
09216000	1001.	988.3	1012.	1056.
09216000	1069.	1055.	1055.	1015.
09216000	1055.	1063.	1059.	1076.
09216000	1087.	1102.	1136.	1160.
09216000	1158.	1173.	1211.	1243.
09216000	1266.	1282.	1299.	1282.
09216000	1300.	1327.	1344.	1360.
09216000	1383.	1385.	-.1000E+21	-.1000E+21



Table 7.--Punch card output for example problem--Continued

09216000	1432.	1465.	1494.	1507.
09216000	1484.	1495.	1513.	1499.
09216000	1488.	1500.	1533.	1551.
09216000	1535.	1523.	1517.	1563.
09216000	1596.	1622.	1635.	1660.
09216000	1613.	1587.	1583.	1562.
09216000	1579.	1510.	1511.	1527.
09216000	1464.	1454.	1451.	-.1000E+21
09216000	1426.	1394.	1383.	1390.
09216000	1358.	1336.	1312.	1272.
09216000	1181.	1210.	1224.	1200.
09216000	1165.	1119.	1089.	1053.
09216000	1038.	1050.	1050.	1076.
09216000	1101.	1114.	1110.	1084.
09216000	1077.	1077.	1064.	1049.
09216000	1041.	1049.	-.1000E+21	-.1000E+21
09216000	1039.	1044.	1026.	1030.
09216000	1040.	1039.	1053.	1079.
09216000	1098.	1100.	1117.	1122.
09216000	1111.	1124.	1143.	1154.
09216000	1166.	1192.	1200.	1194.
09216000	1171.	1161.	1161.	1160.
09216000	1164.	1190.	1198.	1209.
09216000	1236.	1247.	1244.	-.1000E+21
09216000	1261.	1276.	1292.	1283.
09216000	1269.	1284.	1274.	1291.
09216000	1295.	1285.	1309.	1310.
09216000	1310.	1298.	1302.	1315.
09216000	1315.	1318.	1297.	1289.
09216000	1284.	1290.	1290.	1301.
09216000	1297.	1326.	1348.	1346.
09216000	1357.	1375.	1390.	-.1000E+21
09216000	1397.	1390.	1393.	1410.
09216000	1418.	1408.	1424.	1440.
09216000	1450.	1436.	1428.	1408.
09216000	1396.	1405.	1420.	1418.
09216000	1404.	1418.	1403.	1422.
09216000	1429.	1453.	1454.	1455.
09216000	1451.	1447.	1463.	1477.
09216000	1487.	1479.	-.1000E+21	-.1000E+21



PROGRAM LISTING

C		10
C	*****	20
C	*****	30
C	DVLOAD	40
C	*****	50
C	PROGRAM TO ESTIMATE AND SUMMARIZE DAILY LOADS FROM	60
C	DAILY VALUES OF DISCHARGE OR DISCHARGE AND A SECOND	70
C	PARAMETER. ANY NUMBER OF STATIONS MAY BE PROCESSED	80
C	BY DVLOAD WITH UP TO 40 YEARS OF RECORD FOR EACH	90
C	STATION. DAILY OR MONTHLY STATISTICS ARE CALCULATED	100
C	AND OUTPUT IN TABULAR OR PUNCH CARD FORMAT. SEE THE	110
C	PROGRAM DOCUMENTATION FOR DETAILS ON INPUT FORMATS.	120
C	OPTIONS FOR ESTIMATING LOADS, COMPUTING STATISTICS AND	130
C	RECORDING RESULTS.	140
C		150
C	INPUT / OUTPUT	160
C	UNIT 1 - DAILY VALUES MONTHLY TAPE FORMAT	170
C	UNIT 2 - DIRECT ACCESS WORK FILE	180
C	UNIT 5 - INPUT CONTROL CARDS	190
C	UNIT 6 - LINE PRINTER OUTPUT	200
C	UNIT 7 - CARD PUNCH OUTPUT	210
C		220
C	VARIABLES IN COMMON	230
C		240
C	Q - ARRAY OF DISCHARGE	250
C	P - ARRAY OF SECOND PARAMETER USED IN LOAD	260
C	COMPUTATION	270
C	LOAD - ARRAY OF COMPUTED DAILY LOAD	280
C	STAT - ARRAY OF DAILY STATISTICS COMPUTED FROM LOAD	290
C	SITEID - ARRAY OF STATION NUMBER	300
C	IPAR - STORED CODE OF SECOND PARAMETER USED IN LOAD	310
C	COMPUTATION	320
C	IOPT - OPTION NUMBER USED IN LOAD COMPUTATION	330
C	NYRS - NUMBER OF YEARS OF RECORD RETRIEVED BY G490	340
C	INITYR - INITIAL WATER YEAR RETRIEVED BY G490	350
C		360
C	PROGRAM DESIGNED FOR A MAXIMUM OF 40 YEARS OF	370
C	RECORD. TO INCREASE THIS CHANGE THE Q, P, LOAD, IYRRET AND	380
C	ISAVE ARRAYS, ADJUST THE CORE REQUIREMENTS AND REINITIALIZE	390
C	NYRMAX.	400
C		410
C	INTEGER SITEID(4), ISTAT(7), IPUNCH(7), IYRRET(40), ISAVE(40)	420
C	REAL LOAD	430
C	DIMENSION CONST(8), Q(31,12,40), P(31,12,40), LOAD(31,12,40),	440
C	STAT(31,12)	450
C	COMMON Q, P, LOAD, STAT, SITEID, IPAR, IOPT, NYRS, INITYR, IYRRET	460
C	DATA NYRMAX / 40 /	470
C	100 DO 105 K=1,40	480
C	DO 105 J=1,12	490
C	DO 105 I=1,31	500
C	Q(I,J,K)=-99999.	510
C	P(I,J,K)=-99999.	520
C	105 CONTINUE	530
C	READ (5,10,END=600) SITEID, ITYPE, (ISTAT(I), IPUNCH(I), I=1,7), IPAR	540
C	CALL STORE (NYRMAX)	550
C	110 READ (5,11) IOPT, CONST, IZ	560
C	WRITE (6,12) SITEID, IOPT, CONST	570
C		580
C	FILL LOAD ARRAY	590
C		600



	DO 121 K=1,NYRS	610
	ISAVE(K)=IYRRET(K)	620
	IF (IYRRET(K).EQ.0) GO TO 121	630
	MISS=0	640
	LOADUM=0	650
	DO 120 J=1,12	660
	DO 120 I=1,31	670
	CALL CONVRT (Q(I,J,K),P(I,J,K),LOAD(I,J,K),CONST,IOPT,I,J)	680
	IF (LOAD(I,J,K).GE.0.0) LOADUM=1	690
	IF (LOAD(I,J,K).LT.0.0) MISS=MISS+1	700
120	CONTINUE	710
	IF (LOADUM.EQ.1) GO TO 122	720
	LOADUM=INITYR+K-1	730
	WRITE (6,13) LOADUM,SITEID	740
	IYRRET(K)=0	750
	GO TO 121	760
122	J=INITYR+K	770
	I=365	780
	IF (MOD(J,4).EQ.0) I=366	790
	J=J-1	800
	IF ((MISS-372+I)/I.GT.0.2) WRITE (6,21) J	810
121	CONTINUE	820
	IF (ITYPE.EQ.0) GO TO 200	830
	CALL MLOAD (ISTAT(1))	840
	GO TO 500	850
200	DO 201 K=1,NYRS	860
	IF (IYRRET(K).EQ.1) GO TO 201	870
	J=INITYR+K-1	880
	WRITE (6,20) J	890
201	CONTINUE	900
	IF (ISTAT(1).EQ.0) GO TO 220	910
C		920
C	COMPUTE MAXIMUM DAILY LOADS	930
C		940
	DO 210 J=1,12	950
	DO 210 I=1,31	960
	STAT(I,J)=-1E20	970
	DO 210 K=2,NYRS	980
	IF (LOAD(I,J,K).GT.STAT(I,J)) STAT(I,J)=LOAD(I,J,K)	990
210	CONTINUE	1000
	CALL PRINT (1)	1010
	IF (IPUNCH(1).EQ.1) CALL PUNCH (1)	1020
220	IF (ISTAT(2).EQ.0) GO TO 240	1030
C		1040
C	COMPUTE MINIMUM DAILY LOADS	1050
C		1060
	DO 230 J=1,12	1070
	DO 230 I=1,31	1080
	STAT(I,J)=1E20	1090
	DO 230 K=1,NYRS	1100
	IF (LOAD(I,J,K).LT.-1E19) GO TO 230	1110
	IF (LOAD(I,J,K).LT.STAT(I,J)) STAT(I,J)=LOAD(I,J,K)	1120
230	CONTINUE	1130
	CALL PRINT (2)	1140
	IF (IPUNCH(2).EQ.1) CALL PUNCH (2)	1150
240	IF (ISTAT(3).EQ.0) GO TO 280	1160
C		1170
C	COMPUTE MEAN DAILY LOADS	1180
C		1190
	DO 270 J=1,12	1200



	DO 270 I=1,31	1210
	NOCNT=0	1220
	STAT(I,J)=0.0	1230
	DO 260 K=1,NYRS	1240
	IF (LOAD(I,J,K).GT.-1E19) GO TO 250	1250
	NOCNT=NOCNT+1	1260
	GO TO 260	1270
250	STAT(I,J)=STAT(I,J)+LOAD(I,J,K)	1280
260	CONTINUE	1290
	OBS=FLOAT(NYRS-NOCNT)	1300
	IF (OBS.GT.0.1) GO TO 265	1310
	STAT(I,J)=-1E20	1320
	GO TO 270	1330
265	STAT(I,J)=STAT(I,J)/OBS	1340
270	CONTINUE	1350
	CALL PRINT (3)	1360
	IF (IPUNCH(3).EQ.1) CALL PUNCH (3)	1370
280	IF (ISTAT(4).EQ.0.AND.ISTAT(5).EQ.0.AND.ISTAT(6).EQ.0) GO TO 390	1380
C		1390
C	COMPUTE DAILY VARIANCE	1400
		1410
	DO 320 J=1,12	1420
	DO 320 I=1,31	1430
	NOCNT=0	1440
	SUM=0.0	1450
	DO 300 K=1,NYRS	1460
	IF (LOAD(I,J,K).GT.-1E19) GO TO 290	1470
	NOCNT=NOCNT+1	1480
	GO TO 300	1490
290	SUM=SUM+LOAD(I,J,K)**2.0	1500
300	CONTINUE	1510
	OBS=FLOAT(NYRS-NOCNT)	1520
	IF (OBS.GT.1.1) GO TO 310	1530
	STAT(I,J)=-1E20	1540
	GO TO 320	1550
310	STAT(I,J)=(SUM-(STAT(I,J)*OBS)**2.0*OBS)/(OBS-1.0)	1560
	STAT(I,J)=ABS(STAT(I,J))	1570
320	CONTINUE	1580
	IF (ISTAT(4).EQ.1) CALL PRINT (4)	1590
	IF (IPUNCH(4).EQ.1) CALL PUNCH (4)	1600
330	IF (ISTAT(5).EQ.0.AND.ISTAT(6).EQ.0) GO TO 390	1610
C		1620
C	COMPUTE DAILY STANDARD DEVIATION	1630
		1640
	DO 340 J=1,12	1650
	DO 340 I=1,31	1660
	IF (STAT(I,J).LT.-1E19) GO TO 340	1670
	STAT(I,J)=STAT(I,J)**0.5	1680
340	CONTINUE	1690
	IF (ISTAT(5).EQ.1) CALL PRINT (5)	1700
	IF (IPUNCH(5).EQ.1) CALL PUNCH (5)	1710
350	IF (ISTAT(6).EQ.0) GO TO 390	1720
C		1730
C	COMPUTE DAILY COEFFICIENT OF VARIATION	1740
		1750
	DO 380 J=1,12	1760
	DO 380 I=1,31	1770
	IF (STAT(I,J).LT.-1E19) GO TO 380	1780
	NOCNT=0	1790
	SUM=0.0	1800



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DO 370 K=1,NYRS
IF (LOAD(I,J,K).GT.-1E19) GO TO 360
NOCNT=NOCNT+1
GO TO 370
360 SUM=SUM+LOAD(I,J,K)
370 CONTINUE
375 STAT(I,J)=STAT(I,J)/SUM/FLOAT(NYRS-NOCNT)
380 CONTINUE
CALL PRINT (6)
IF (IPUNCH(6).EQ.1) CALL PUNCH (6)
390 IF (ISTAT(7).EQ.0) GO TO 500
C
C COMPUTE DAILY COEFFICIENT OF SKEWNESS
C
DO 420 J=1,12
DO 420 I=1,31
IF (STAT(I,J).LT.-1E19) GO TO 420
NOCNT=0
SUM=0.0
SUM2=0.0
SUM3=0.0
DO 410 K=1,NYRS
IF (LOAD(I,J,K).GT.-1E19) GO TO 400
NOCNT=NOCNT+1
GO TO 410
400 SUM=SUM+LOAD(I,J,K)
SUM2=SUM2+LOAD(I,J,K)**2.0
SUM3=SUM3+LOAD(I,J,K)**3.0
410 CONTINUE
OBS=FLOAT(NYRS-NOCNT)
IF(OBS.GT.2.1) GO TO 415
STAT(I,J)=-1E20
GO TO 420
415 STAT(I,J)=(OBS-1.0)**2.0*(OBS**2.0*SUM3-3.0*OBS*SUM*SUM2+2.0*SUM**
$ 3.0)/((OBS-2.0)*(OBS*SUM2-SUM**2.0))
420 CONTINUE
CALL PRINT (7)
IF (IPUNCH(7).EQ.1) CALL PUNCH (7)
500 IF (I2.EQ.1) GO TO 100
DO 510 K=1,NYRS
510 IYRRET(K)=ISAVE(K)
GO TO 110
600 STOP
10 FORMAT (3A4,A3,1X,11,7(1X,2I1),15)
11 FORMAT (I1,3X,8F9.4,3X,11)
12 FORMAT ('1',10X,'SUMMARY OF FOLLOWING LOAD ESTIMATES','0STATION N
NUMBER',3A4,A3/' OPTION NUMBER ',I2/' CONSTANTS',2X,F9.4/7(12X,F9.
24/))
13 FORMAT (' ***** WARNING LOADS NOT COMPUTED FOR WATER YEAR ',I4,
1 ' AT STATION ',3A4,A3/7X,'CHECK COEFFICIENTS OR IF OPTION'
2 ', ' 1 IS USED CHECK DATA RETRIEVAL OF SPECIFIC CONDUCTANCE'/)
20 FORMAT ('0 ***** WARNING - DATA NOT RETRIEVED FOR WATER YEAR '
1,I4)
21 FORMAT ('0NOTE -- NUMBER OF MISSING DAYS GREATER THAN 20 PERCENT F
1OR WATER YEAR ',I4)
END
C
C ***** STORE *****
C
C PURPOSE : TO FILL Q AND P ARRAYS FOR ONE STATION FROM DAILY

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C
C

VALUES STORED IN THE MONTHLY CHARACTER FORMAT.

		2410
		2420
	SUBROUTINE STORE (NYRMAX)	2430
	INTEGER SITEID(4),ID(4),IYRRET(40)	2440
	REAL LOAD	2450
	DOUBLE PRECISION VALUE(31),BLANK,FILL	2460
	DIMENSION Q(31,12,40),P(31,12,40),LOAD(31,12,40),STAT(31,12)	2470
	COMMON Q,P,LOAD,STAT,SITEID,IPAR,IOPT,NYRS,INITYR,IYRRET	2480
	DO 96 M=1,40	2490
96	IYRRET(M)=0	2500
	DATA BLANK,FILL/'','-99999.'/	2510
	DEFINE FILE 2 (1,220,E,IR)	2520
	READ(1,10,END=999) ID,ITEST,INITYR,J,VALUE	2530
	DO 97 M=1,4	2540
	IF (ID(M).EQ.SITEID(M)) GO TO 97	2550
	WRITE (6,11) ID,SITEID	2560
	STOP	2570
97	CONTINUE	2580
98	K=INITYR	2590
	IF (J.GE.10) INITYR=INITYR+1	2600
	NYRS=0	2610
	GO TO 101	2620
99	READ (1,10,END=999) ID,ITEST,K,J,VALUE	2630
	DO 100 M=1,4	2640
	IF (ID(M).NE.SITEID(M)) GO TO 300	2650
100	CONTINUE	2660
101	IF (J.GE.10) J=J-12	2670
	J=J+3	2680
	IF (J.LE.3) K=K+1	2690
	K=K-INITYR+1	2700
	IF (IYRRET(K).EQ.0) NYRS=NYRS+1	2710
	IF (NYRS.LE.NYRMAX) GO TO 109	2720
	WRITE (6,12) NYRMAX,SITEID	2730
	STOP	2740
109	IYRRET(K)=1	2750
	DO 110 M=1,31	2760
	IF (VALUE(M).EQ.BLANK) VALUE(M)=FILL	2770
110	CONTINUE	2780
	WRITE (2,1,20) VALUE	2790
	IF (ITEST.EQ.IPAR) GO TO 200	2800
	READ (2,1,21) (Q(I,J,K),I=1,31)	2810
	GO TO 99	2820
200	READ (2,1,21) (P(I,J,K),I=1,31)	2830
	GO TO 99	2840
300	BACKSPACE 1	2850
999	RETURN	2860
10	FORMAT (8X,3A4,A3,14X,I5,I4,I2,12X,31A7)	2870
11	FORMAT ('1 ***** ERROR - STATION NUMBER OF DAILY VALUES DATA	2880
	1SET ',3A4,A3/22X,'DIFFERS FROM THE NUMBER ON THE PROGRAM CONTROL C	2890
	3ARD ',3A4,A3/22X,'CHECK YOUR PROGRAM CONTROL CARDS')	2900
12	FORMAT ('1 ***** ERROR - MORE THAN ',I3,' YEARS OF DATA RETRI	2910
	IEVED FOR STATION ',3A4,A3/21X,'INCREASE ARRAY DIMENSIONS AND RERUN	2920
	2')	2930
20	FORMAT (31A7)	2940
21	FORMAT (31F7.0)	2950
	END	2960
		2970
C	*****	2980
C	CONVRT	2990
C	*****	3000
C	PURPOSE : TO FILL LOAD ARRAY USING OPTION SPECIFIED ON CONTROL	



		CARD (SEE DOCUMENTATION FOR DETAILS).	3010
C			3020
C		SUBROUTINE CONVRT (A,B,ANS,C,IOPT,I,J)	3030
		DIMENSION C(8),IDAY(12)	3040
		DATA IDAY /0,31,61,92,123,151,182,212,243,273,304,335 /	3050
		IF (A) 400,500,99	3060
99		GO TO (100,200,200,300,300),IOPT	3070
100		IF (B) 400,500,110	3080
110		ANS=C(7)+C(8)*B	3090
120		IF (ANS) 400,500,130	3100
130		ANS=0.0027*ANS*A	3110
		RETURN	3120
200		T=0.0172*FLOAT(IDAY(J)+I)	3130
		ANS=C(1)+C(2)*SIN(T)+C(3)*COS(T)+(C(4)+C(5)*SIN(T)+C(6)*COS(T))*	3140
S		ALOG10(A)	3150
		ANS=10.0**ANS	3160
		IF (IOPT,EQ,2) GO TO 120	3170
		ANS=C(7)+C(8)*ANS	3180
		GO TO 120	3190
300		T=0.0172*FLOAT(IDAY(J)+I)	3200
		ANS=C(1)+C(2)*SIN(T)+C(3)*COS(T)+(C(4)+C(5)*SIN(T)+C(6)*COS(T))/A	3210
		IF (IOPT,EQ,4) GO TO 120	3220
		ANS=C(7)+C(8)*ANS	3230
		GO TO 120	3240
400		ANS=-1E20	3250
		RETURN	3260
500		ANS=0.0	3270
		RETURN	3280
		END	3290
C			3300
C		***** PUNCH *****	3310
C			3320
C		PURPOSE : TO PRODUCE CARD OUTPUT OF A DAILY STATISTIC.	3330
C			3340
		SUBROUTINE PUNCH (L)	3350
		INTEGER SITEID(4),IYRRET(40)	3360
		DOUBLE PRECISION LAB(7)	3370
		REAL LOAD	3380
		DIMENSION Q(31,12,40),P(31,12,40),LOAD(31,12,40),STAT(31,12)	3390
		COMMON Q,P,LOAD,STAT,SITEID,IPAR,IOPT,NYRS,INITYR,IYRRET	3400
		DATA LAB /'MAXIMUM ','MINIMUM ','MEAN ','VARIANCE','STD DEV ',	3410
S		'COEF VAR','SKEWNESS'/	3420
		DUMMY=-1E20	3430
		WRITE (7,10) SITEID,LAB(L),IOPT	3440
10		FORMAT (3A4,A3,' / ','AR,' LOAD OPTION = ',I2)	3450
		DO 110 J=1,12	3460
		DO 100 M=1,25,4	3470
		N=M+3	3480
100		WRITE (7,11) SITEID,(STAT(I,J),I=M,N)	3490
110		WRITE (7,11) SITEID,(STAT(I,J),I=29,31),DUMMY	3500
11		FORMAT (3A4,A3,1X,4(G11.4,1X))	3510
		RETURN	3520
		END	3530
C			3540
C		***** PRINT *****	3550
C			3560
C		PURPOSE : TO PRODUCE TABULAR OUTPUT OF A DAILY STATISTIC.	3570
C			3580
		SUBROUTINE PRINT (L)	3590
		INTEGER SITEID(4),IYRRET(40)	3600



	REAL LOAD	3610
	DOUBLE PRECISION LAB(7)	3620
	DIMENSION Q(31,12,40),P(31,12,40),LOAD(31,12,40),STAT(31,12)	3630
	COMMON Q,P,LOAD,STAT,SITEID,IPAR,IOPT,NYRS,INITYR,IYRRET	3640
	DATA LAB /'MAXIMUM ','MINIMUM ','MEAN ','VARIANCE','STD DEV ',	3650
	5 'COEF VAR','SKEWNESS'/'	3660
	M=INITYR*NYRS-1	3670
	WRITE (6,10) SITEID,LAB(L),INITYR,M	3680
	LINES=1	3690
	DO 100 I=1,31	3700
	WRITE (6,11) I,(STAT(I,J),J=1,12)	3710
	IF (LINES.LT.4) GO TO 100	3720
	LINES=0	3730
	WRITE (6,12)	3740
100	LINES=LINES+1	3750
	RETURN	3760
10	FORMAT ('I',41X,10(' '), ' DAILY LOAD STATISTICS (TON/D) ',10(' ')/	3770
	1'0',15X,'STATION NUMBER : ',3A4,A3/16X,' STATISTIC : ',A8/16X,	3780
2	'BASED ON WATER YEARS ',14,' THRU ',14/	3790
3	/'0 DAY',6X,'OCT',7X,'NOV',7X,'DEC',7X,	3800
4	'JAN',7X,'FEB',7X,'MAR',7X,'APR',7X,'MAY',6X,'JUNE',6X,	3810
5	'JULY',7X,'AUG',6X,'SEPT'/'	3820
11	FORMAT (5X,12,3X,12(1PG9.3,1X))	3830
12	FORMAT (133X)	3840
	END	3850
C	***** MLOAD *****	3860
C		3870
C	PURPOSE : TO COMPUTE AVERAGE AND TOTAL MONTHLY LOADS AND	3880
C	OUTPUT RESULTS.	3890
C	SUBROUTINE MLOAD (L)	3900
	REAL LOAD,LSUM	3910
	DIMENSION AVG(12),SUM(12),Q(31,12,40),P(31,12,40),LOAD(31,12,40),	3920
5	STAT(31,12),DAYS(12)	3930
	INTEGER SITEID(4),IYRRET(40)	3940
	COMMON Q,P,LOAD,STAT,SITEID,IPAR,IOPT,NYRS,INITYR,IYRRET	3950
	DATA DAYS/31.0,30.0,31.0,31.0,28.0,31.0,30.0,31.0,30.0,31.0,31.0,	3960
6	30.0/	3970
	LINES=0	3980
	WRITE (6,11) SITEID	3990
	DO 160 K=1,NYRS	4000
	IF (IYRRET(K).EQ.1) GO TO 99	4010
	J=INITYR+K-1	4020
	WRITE (6,13) J	4030
	LINES=LINES+12	4040
	GO TO 160	4050
99	LCNT=0	4060
	QSUM=0.0	4070
	LSUM=0.0	4080
	N=INITYR+K-1	4090
	DO 130 J=1,12	4100
	SUM(J)=0.0	4110
	NOCNT=0	4120
	DO 120 I=1,31	4130
	IF (LOAD(I,J,K)) 100,110,110	4140
100	NOCNT=NOCNT+1	4150
	LCNT=LCNT+1	4160
	GO TO 120	4170
110	SUM(J)=SUM(J)+LOAD(I,J,K)	4180
	LSUM=LSUM+LOAD(I,J,K)	4190
		4200



QSUM=QSUM+Q(I,J,K)	4210
120 CONTINUE	4220
OBS=FLOAT(31-NOCNT)	4230
IF (OBS.GT.0.1) GO TO 125	4240
AVG(J)=-1E20	4250
SUM(J)=-1E20	4260
GO TO 130	4270
125 AVG(J)=SUM(J)/OBS	4280
SUM(J)=AVG(J)*DAYS(J)	4290
130 CONTINUE	4300
IF (MOD(N,4).EQ.0) SUM(5)=AVG(5)*29.0	4310
LSUM=LSUM/FLOAT(372-LCNT)	4320
QSUM=QSUM/FLOAT(372-LCNT)	4330
IF (MOD(N,4)) 133,132,133	4340
132 LSUM=LSUM*366.0	4350
QSUM=QSUM*366.0	4360
GO TO 134	4370
133 LSUM=LSUM*365.0	4380
QSUM=QSUM*365.0	4390
134 QSUM=LSUM/(0.0027*QSUM)	4400
WRITE (6,10) N,LSUM,QSUM,(AVG(J),J=1,12),(SUM(J),J=1,12)	4410
LINES=LINES+12	4420
IF (LINES.LT.48) GO TO 140	4430
WRITE (6,11) SITEID	4440
LINES=0	4450
GO TO 145	4460
140 WRITE (6,12)	4470
145 IF (L.EQ.0) GO TO 160	4480
WRITE (7,20) SITEID,IOPT,N	4490
DO 150 M=1,9,4	4500
N=M+3	4510
150 WRITE (7,21) SITEID,(AVG(J),J=M,N)	4520
160 CONTINUE	4530
RETURN	4540
10 FORMAT ('0WATER YEAR ',I4,1RX,'TOTAL ANNUAL LOAD (TON) = ',E10.4,	4550
15X,'MEAN ANNUAL CONCENTRATION (MG/L) = ',E10.4/'0',I4X,'OCT',7X,'NO	4560
2V',7X,'DEC',7X,'JAN',7X,'FEB',7X,'MAR',7X,'APR',7X,'MAY',6X,'JUNE'	4570
3,6X,'JULY',7X,'AUG',6X,'SEPT',/0AVERAGE',3X,12(1X,G9.3)/' (TON/D)'	4580
4/'0 TOTAL',4X,12(1X,G9.3)/' (TON)'/)	4590
11 FORMAT ('1',45X,10(' '), ' COMPUTED MONTHLY LOADS ',10(' ')/'0',5X,	4600
\$ 'STATION NUMBER : ',3A4,A3/11X,	4610
\$ 'AVERAGES ARE COMPUTED FROM THE NUMBER OF DAYS OF RECORD'/	4620
\$ 11X,'TOTALS ARE COMPUTED BY ASSUMING THE AVERAGE OVER THE	4630
SENTIPE MONTH'///)	4640
12 FORMAT (41X,44(' - '))	4650
13 FORMAT ('0'/'0 ***** WARNING - DATA NOT RETRIEVED FOR WATER YE	4660
1AR ',I4////////)	4670
20 FORMAT (3A4,A3,' / LOAD OPTION #',I2,' WATER YEAR ',I4)	4680
21 FORMAT (3A4,A3,4(1X,E11.4))	4690
END	4700



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