

## 4.4(3) RCHRES Block

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

## RCHRES

```
  General input
  [section HYDR input]
  [section ADCALC input]
  [section CONS input]
  [section HTRCH input]
  [section SEDTRN input]
  [section GQUAL input]
  [input for RQUAL sections]
  [section OXRX input]
  [section NUTRX input]
  [section PLANK input]
  [section PHCARB input]
END RCHRES
```

```
*****
```

## Explanation

This block contains the data that are domestic to all RCHRES processing units in the RUN. The general input is always relevant; other input is only required if the module section concerned is active.

## 4.4(3).1 RCHRES BLOCK -- General input

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
  Table-type ACTIVITY
  [Table-type PRINT-INFO]
  Table-type GEN-INFO
*****
```

## Explanation

The exact format of each of the tables mentioned above is detailed in the documentation which follows. Tables enclosed in brackets [], above, are not always required; for example, because all values can be defaulted.

## 4.4(3).1.1 Table-type ACTIVITY -- Active Sections Vector

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
Layout:
```

```
ACTIVITY
<-range><-----a-s-vector----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END ACTIVITY
```

Example:

```
ACTIVITY
RCHRES  Active sections***
# - # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
1   7   1   1   1   1   1   1   1   0   0   0
END ACTIVITY
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<a-s-vector>	HYDRFG,ADFG,CONSFG,HTFG,SEDFG GQALFG,OXFG,NUTFG,PLKFG,PHFG	10I5	0	0	1

## Explanation

The RCHRES module is divided into eleven sections. The values supplied in this table specify which sections are active and which are not, for each operation involving the RCHRES module. A value of 0 means inactive and 1 means active (see below). Any meaningful subset of sections may be active, with the following provisos: 1) Section ADCALC must be active if any "quality" sections (CONS through PHCARB) are active. 2) If any section in the RQUAL group (Section OXRX through PHCARB) is active, all preceding RQUAL sections must also be active.

## 4.4(3).1.2 Table-type PRINT-INFO -- Printout information for RCHRES

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
PRINT-INFO
<-range><-----print-flags-----><piv><pyr>
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END PRINT-INFO
```

```
*****
Example
*****
```

```
PRINT-INFO
  RCHRES  Printout level flags***
  # - # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR***
  1   7   2   2   2   5   5   2   3   3           10  12
END PRINT-INFO
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<print-flags>	PFLAG(10)	10I5	4	2	6
<pivl>	PIVL	I5	1	1	1440
<pyr>	PYREND	I5	9	1	12

## Explanation

HSPF permits the user to vary the printout level (maximum frequency) for the various active sections of an operation. The meaning of each permissible value for PFLAG(\*) is:

- 2 means every PIVL intervals
- 3 means every day
- 4 means every month
- 5 means every year
- 6 means never

In the example above, output from RCHRESs 1 through 7 will occur as follows:

## Section    Maximum frequency

HYDR	10 intervals
ADCALC	10 intervals
CONS	10 intervals
HTRCH	year
SEDTRN	year
GQUAL	10 intervals
OXRX	day
NUTRX	day
PLANK	month (defaulted)
PHCARB	month (defaulted)

A value need only be supplied for PIVL if one or more sections have a printout level of 2. For those sections, printout will occur every PIVL intervals (that is, every  $PDEL T = PIVL * DELT$  minutes. PIVL must be chosen such that there are an integer number of PDEL T periods in a day.

HSPF will automatically provide printed output at all standard intervals greater than the specified minimum interval. In the above example, output for section NUTRX will be printed at the end of each day, month, and year.

PYREND is the calendar month which will terminate the year for printout purposes. Thus, the annual summary can reflect the situation over the past water year or the past calendar year, etc.

## 4.4(3).1.3 Table-type GEN-INFO -- Other general information for RCHRES

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
GEN-INFO
<-range><-----rchid-----><nex>      <unitsyst><-printu-><lak>
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END GEN-INFO
```

```
*****
Example
*****
```

```
GEN-INFO
RCHRES      Name      Nexits      UnitSysts  Printout      ***
# - #              t-series Engl Metr LKFG      ***
              in  out
4      East River-mile 4      2      1      1      23      0
END GEN-INFO
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<rchid>	RCHID(5)	5A4	none	none	none
<nex>	NEXITS	I5	1	1	5
<unit-syst>	IUNITS	5X,I5	1	1	2
	OUNITS	I5	1	1	2
<printu>	PUNIT(2)	2I5	0	0	99
<lak>	LKFG	I5	0	0	1

## Explanation

Any string of up to 20 characters may be supplied as the identifier for a RCHRES.

NEXITS is the number of exits from the RCHRES. A maximum of 5 exits can be handled.

The values supplied for IUNITS and OUNITS indicate the system of units for input and output time series, respectively. 1 means English units, 2 means Metric units.

Note: All operations in the run must use the same units system for data in the UCI file; therefore, this system of units is specified by EMFG in the GLOBAL block.

The values supplied for PUNIT(\*) indicate the destinations (files) of printout in English and metric units, respectively. A value of 0 means no printout is required in that unit system. A non-zero value means printout is required in that system and is the unit number of the file to which printout is to be written. The unit number is associated with a filename in the FILES BLOCK.

LKFG indicates whether the RCHRES is a lake (1) or a stream/river (0). This flag affects the method of calculating bed shear stress (in Section HYDR) and the reaeration coefficient (Section OXR).

4.4(3).2 RCHRES BLOCK -- Section HYDR input

```
*****
      1      2      3      4      5      6      7      8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
[Table-type HYDR-PARM1]
  Table-type HYDR-PARM2
[Table-type MON-CONVF]      ---  if VCONFIG = 1 (in Table-type HYDR-PARM1)
[Table-type HYDR-INIT]
                                ---
[Table-type HYDR-CATEGORY]  |
[Table-type HYDR-CINIT]    |
[Table-type HYDR-CPREC]    |      if "categories" are being simulated
[Table-type HYDR-CEVAP]    |
[Table-type HYDR-CFVOL]    |
[Table-type HYDR-CDEMAND]  |
                                ---
```

\*\*\*\*\*

Explanation

The exact format of each of the tables mentioned above is detailed in the documentation which follows.

Tables enclosed in brackets [], above, are not always required.

## 4.4(3).2.1 Table-type HYDR-PARM1 -- Flags for HYDR section

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
HYDR-PARM1
<-range> <v><1><2><3> <---odfvfg---> <---odgtfg---> <----funct---->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END HYDR-PARM1
```

```
*****
Example
*****
```

```
HYDR-PARM1
RCHRES  Flags for HYDR section***
# - #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each  FUNCT for each
      FG FG FG FG  possible  exit *** possible  exit  possible  exit
1    7  0  1  1  1    0  0  0  0  1    1  1  1  1  1    3  3  3  3  3
END HYDR-PARM1
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<v>	VCONFIG	I3	0	0	1
<1>	AUX1FG	I3	0	0	1
<2>	AUX2FG	I3	0	0	1
<3>	AUX3FG	I3	0	0	1
<odfvfg>	ODFVFG(5)	5I3	0	-5	8
<odgtfg>	ODGTFG(5)	5I3	0	0	5
<funct>	FUNCT(5)	5I3	1	1	3



## Explanation

A value of 1 for VCONFIG means that F(vol) (volume-dependent) outflow demand components are multiplied by a factor which is allowed to vary through the year. These monthly adjustment factors are input in Table-type MON-CONVF in this section.

A value of 1 for AUX1FG means a routine will be called to compute depth, stage, surface area, average depth, and top width, and values for these parameters will be reported in the printout. These are used in the calculation of precipitation and evaporation fluxes, and simulation of most water quality sections. A value of 0 suppresses the calculation and printout of this information.

A value of 1 for AUX2FG means average velocity and average cross sectional area will be calculated, and values for these parameters will be reported in the printout. These are used in the simulation of oxygen. A value of 0 suppresses the calculation/printout of this information. If AUX2FG is 1, AUX1FG must also be 1.

A value of 1 for AUX3FG means the shear velocity and bed shear stress will be calculated. These are used in the calculation of deposition and scour of sediment (inorganic and organic). AUX3FG may only be turned ON (=1) if AUX1FG and AUX2FG are also 1.

The value specified for ODFVFG(I) determines the F(vol) component of the outflow demand for exit I. A value of 0 means that the outflow demand does not have a volume dependent component. A value greater than 0 indicates the column number in the FTABLE which contains the F(vol) component. If the value specified for ODFVFG is less than 0, the absolute value indicates the element of array COLIND() which defines a pair of columns in the FTABLE which are used to evaluate the F(vol) component. Further explanation of this latter option is provided in the functional description of the HYDR section in Part E. A value of ODFVFG can be specified for each exit from a RCHRES. (Note: COLIND is specified as a time series.)

The value specified for ODGTFG(I) determines the G(t) (time-dependent) component of the outflow demand for exit I. A value of 0 means that the outflow demand does not have such a component. A value greater than 0 indicates the element (index) number of the array OUTDGT() (or array COTDGT() if Categories are being simulated) which contains the G(t) component. A value of ODGTFG can be specified for each exit from a RCHRES. (Note: OUTDGT and COTDGT are specified in the form of time series.)

FUNCT determines the function used to combine the components of an outflow demand. The possible values and their meanings are:

- 1 means use the smaller of F(vol) and G(t)
- 2 means use the larger of F(vol) and G(t)
- 3 means use the sum of F(vol) and G(t)

## 4.4(3).2.2 Table-type HYDR-PARM2 -- Parameters for HYDR section

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
HYDR-PARM2
```

```
<-range><-----hydr-parm2----->
```

```
. . . . .
(repeats until all operations of this type are covered)
```

```
. . . . .
```

```
END HYDR-PARM2
```

```
*****
```

```
Example
```

```
*****
```

```
HYDR-PARM2
```

```
RCHRES ***
```

```
# - # DSN FTBN      LEN      DELTH      STCOR      KS***      DB50
1      17      2.7      120.      3.2      .5      0.2
2      100      2      1.5      60.      1.      .5      0.2
```

```
END HYDR-PARM2
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<hydr-parm2>	FTBDSN	F5.0	0	0	999	none	Both
	FTABNO	F5.0	none	1	999	none	Both
	LEN	F10.0	none	0.01	none	miles	Engl
			none	0.016	none	km	Metric
	DELTH	F10.0	0.0	0.0	none	ft	Engl
			0.0	0.0	none	m	Metric
	STCOR	F10.0	0.0	none	none	ft	Engl
			0.0	none	none	m	Metric
	KS	F10.0	0.0	0.0	.99	none	Both
	DB50	F10.0	.01	.0001	100.	in	Engl
			.25	.0025	2500.	mm	Metric

Explanation

FTBDSN is the WDM table data-set number containing the F-Table. If FTBDSN is greater than zero, the system searches the WDM file for the F-Table.

If FTBDSN = 0, FTABNO is the ID number for the F-Table (located in the FTABLES Block) which contains the geometric and hydraulic properties of the RCHRES. If FTBDSN > 0, FTABNO is the WDM table indicator specifying which table (within the WDM table data set given by FTBDSN) contains the F-Table.

LEN is the length of the RCHRES.

DELTH is the drop in water elevation from the upstream to the downstream extremities of the RCHRES. (It is used if section OXRX is active and reaeration is being computed using the Tsivoglou-Wallace equation; or if section SEDTRN is active and sandload transport capacity is being computed using either the Toffaleti or Colby method).

STCOR is the correction to the RCHRES depth to calculate stage.  
(Depth + STCOR = Stage)

KS is the weighting factor for hydraulic routing. Choice of a realistic KS value is discussed in the functional description of the HYDR section in Part E.

DB50 is the median diameter of the bed sediment (assumed constant throughout the run). This value is used to:

1. Calculate the bed shear stress if the RCHRES is a lake.
2. Calculate the rate of sand transport if the Colby or Toffaleti methods are used.

Note: The value input for DB50 is also used in section SEDTRN as the sand particle diameter required for sandload computations.

4.4(3).2.3 Table-type MON-CONVF -- Monthly F(vol) adjustment factors

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
MON-CONVF
<-range><-----mon-convf----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END MON-CONVF
```

```
*****
Example
*****
```

```
MON-CONVF
  RCHRES  Monthly F(vol) adjustment factors***
  # - #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC***
  1   7  .97  .89  .89  .91  .93  .93  .94  .95  .95  .98  .98  .97
END MON-CONVF
*****
```

Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<mon-convf>	CONVFM(12)	12F5.0	0.0	0.0	none

Note: The input monthly values apply to the first day of the month, and values for intermediate days are obtained by interpolating between successive monthly values.

## 4.4(3).2.4 Table-type HYDR-INIT -- Initial conditions for HYDR section

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
HYDR-INIT
<-range><--vol--->   ct<-----colind----->   <-----outdgt----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END HYDR-INIT
```

```
*****
Example
*****
```

```
HYDR-INIT
      Initial conditions for HYDR section      ***
RCHRES      VOL  Cat  Initial value of COLIND ***  Initial value of OUTDGT
# - #      ac-ft      for each possible exit ***  for each possible exit
      <----->   <><---><---><---><---><---> *** <---><---><---><---><--->
1          12.050   UN          4.0                      1.2          1.8
END HYDR-INIT
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<vol>	VOL	F10.0	0.0	0.0	none	acre-ft	Engl
			0.0	0.0	none	Mm3	Metric
ct	CAT	A2	blank	none	none	none	Both
<colind>	COLIND(5)	5F5.0	4.0	4.0	8.0	none	Both
<outdgt>	OUTDGT(5)	5F5.0	0.0	0.0	none	ft3/s	Engl
			0.0	0.0	none	m3/s	Metric

## Explanation

VOL is the initial volume of water in the RCHRES.

CAT may be either an integer or a category identifier (ID tag - defined in the CATEGORY block). If it is a tag, all initial volume belongs to that category. If CAT is an integer, the initial volume is divided according to Table-type HYDR-CINIT, where CAT entries are expected. If CAT is zero or blank, the initial volume is divided equally among all active categories. CAT is ignored if no CATEGORY block is present in the UCI file.

The value of COLIND(I) for exit I indicates the pair of columns in the FTABLE that are used to evaluate the initial value of the F(vol) (volume-dependent) component of outflow demand for the exit.

The array OUTDGT(I) specifies the initial value of the outflow demand for exit I, i.e., the G(t) (time-dependent) component. It is ignored if a Category block is present in the UCI file. Initial values for COTDGT are found in Table-type HYDR-CDEMAND.

A non-zero value of COLIND(I) is only meaningful if the outflow from exit I has an F(vol) component. Similarly, a non-zero value for OUTDGT(I) is only meaningful if the outflow from exit I has a G(t) component.

4.4(3).2.5 Table-type HYDR-CATEGORY -- Categories associated with outflows and other fluxes

\*\*\*\*\*  
1 2 3 4 5 6 7 8  
123456789012345678901234567890123456789012345678901234567890  
\*\*\*\*\*  
Layout  
\*\*\*\*\*

HYDR-CATEGORY  
cpr cev cf1 cf2 cf3 cf4 cf5 ncgt  
<range> <> <> <> <> <> <> <> <>  
. . . . .  
(repeats until all operations of this type are covered)  
. . . . .  
END HYDR-CATEGORY

\*\*\*\*\*  
Example  
\*\*\*\*\*

HYDR-CATEGORY  
Categories specified for Outflows, Precipitation and Evaporation \*\*\*  
RCHRES Prec Evap<-----FVOL----->NCOGT \*\*\*  
# - # 1 2 3 4 5 \*\*\*  
<---><---><---><---><---><---><---> \*\*\*  
1 UN 4 TX 2 3  
END HYDR-CATEGORY

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
cpr	CPREC	A2	none	none	none	none	Both
cev	CEVAP	A2	none	none	none	none	Both
cf1-cf5	CFVOL(*)	A2	none	none	none	none	Both
ncgt	NOCGT	I5	0	0	20	none	Both

## Explanation

CPREC, CEVAP, CFVOL(\*)

This table may be used to specify the categories that are impacted by outflows and other fluxes. For the physical quantities precipitation, evaporation, and exit-specific F(vol) outflow, categories may be specified in one of two ways: 1) A single category is specified by its two-character tag, right-justified in the field. 2) If more than one category must be specified, then the number of categories is placed in the field. Then the multiple categories are fully specified in Table-types HYDR-CPREC, HYDR-CEVAP, and HYDR-CFVOL. If the field is blank or zero, or the table is omitted, then water is added to or subtracted from all categories in proportion to their current storage fraction.

NCOGT is the number of COTDGT time series specifying category-associated demands from the reach. These time series are assigned priorities and initial values in Table-type HYDR-CDEMAND. The time series are input in the time series blocks (e.g., EXT SOURCES). (See the Time Series Catalog for RCHRES).



## 4.4(3).2.6 Table-type HYDR-CINIT -- Allocation of initial volumes to categories

```
*****
      1         2         3         4         5         6         7         8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

HYDR-CINIT

```
      ct cfrac  ct cfrac  ct cfrac  ct cfrac  ct cfrac  ct cfrac  ct cfrac
<-range>  <><---->  <><---->  <><---->  <><---->  <><---->  <><---->  <><---->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END HYDR-CINIT
```

\*\*\*\*\*

Example

\*\*\*\*\*

HYDR-CINIT

\*\*\* Initial Category Storage Fractions

```
*** RCHRES   c cfrac   c cfrac   c cfrac   c cfrac   c cfrac   c cfrac   c cfrac
*** # - #   <><---->  <><---->  <><---->  <><---->  <><---->  <><---->  <><---->
      1      UN    0.2  TX    0.1  CU    0.1  FG    0.1  Z1    0.1  MI    0.05  A0    0.1
      1      BB    0.1  AA    0.05  BB    0.1
END HYDR-CINIT
```

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
ct	CINIT(*)	A2	none	none	none	none	Both
cfrac	CFRAC(*)	F6.0	0.0	0.0	1.0	none	Both

Explanation

This table is required when CAT in Table-type HYDR-INIT is a positive integer. CAT defines the number of pairs to be specified in this table; up to seven pairs can be specified on a line.

CINIT is a two-character category tag.

CFRAC is the fraction of the initial volume belonging to the corresponding category. The sum of all fractions must be 1.0; alternatively, if all CFRACS are blank or zero, the initial volume will be equally divided among all categories.

4.4(3).2.7 Table-type HYDR-CPREC -- Allocation of precipitation to categories

\*\*\*\*\*  
1 2 3 4 5 6 7 8  
1234567890123456789012345678901234567890123456789012345678901234567890  
\*\*\*\*\*  
Layout  
\*\*\*\*\*

HYDR-CPREC  
ct cfrac ct cfrac ct cfrac ct cfrac ct cfrac ct cfrac ct cfrac  
<-range> <><----> <><----> <><----> <><----> <><----> <><----> <><---->  
. . . . .  
(repeats until all operations of this type are covered)  
. . . . .  
END HYDR-CPREC

\*\*\*\*\*  
Example  
\*\*\*\*\*

HYDR-CPREC  
\*\*\* Category Fractions for precipitation  
\*\*\* RCHRES ct cfrac ct cfrac ct cfrac ct cfrac ct cfrac ct cfrac ct cfrac  
\*\*\* # - # <><----> <><----> <><----> <><----> <><----> <><----> <><---->  
1 UN 0.2 TX 0.1 CU 0.1 FG 0.1 Z1 0.1 MI 0.05 A0 0.1  
1 BB 0.1 AA 0.05 BB 0.1  
END HYDR-CPREC

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
ct	CPRECC(*)	A2	none	none	none	none	Both
cfrac	CPRECF(*)	F6.0	0.0	0.0	1.0	none	Both

### Explanation

This table is required when CPREC in Table-type HYDR-CATEGORY is a positive integer. CPREC defines the number of pairs to be specified in this table; up to seven pairs can be specified on a line.

CPRECC is a two-character category tag.

CPRECF is the fraction of the precipitation which will be assigned to the corresponding category. The sum of all fractions must be 1.0; alternatively if all fractions are blank or zero, the precipitation will be equally divided among all the categories listed.

## 4.4(3).2.8 Table-type HYDR-CEVAP -- Allocation of evaporation to categories

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
HYDR-CEVAP
      ct pr  frac  ct pr  frac  ct pr  frac  ct pr  frac  ct pr  frac
<-range>  <><-><---->  <><-><---->  <><-><---->  <><-><---->  <><-><---->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END HYDR-CEVAP
```

```
*****
Example
*****
```

```
HYDR-CEVAP
  Category Fractions and Priorities for Evaporation ***
RCHRES  ct pr  frac  ct pr  frac  ct pr  frac  ct pr  frac  ct pr  frac ***
# - #    <><-><---->  <><-><---->  <><-><---->  <><-><---->  <><-><----> ***
1      UN  1      CU  2    0.5  MI  2    0.5  TX  3    1.0  BB  4
1      AA  4
END HYDR-CEVAP
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
ct	CEVAPC(*)	A2	none	none	none	none	Both
pr	CEVAPP(*)	I3	0	0	none	none	Both
cfrac	CEVAPF(*)	F6.0	0.0	0.0	1.0	none	Both

### Explanation

This table is required when CEVAP in Table-type HYDR-CATEGORY is a positive integer. CEVAP defines the number of categories to be specified in this table; up to five categories can be specified on a line.

CEVAPC is a two-character category tag.

CEVAPP is an integer signifying the priority of the corresponding category when subtracting evaporation. Water is taken from the lowest priority categories first, then from the next-lowest priority categories, and so on. Categories with zero or undefined priority are taken last.

CEVAPF is the fraction of the evaporation which will be assigned to the corresponding category at a given priority level. The sum of all fractions at a priority level must be 1.0; alternatively, if they are all blank or zero, the evaporative loss will be equally divided among all the categories listed.

4.4(3).2.9 Table-type HYDR-CFVOL -- Allocation of volume-dependent outflow to categories

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout  
\*\*\*\*\*

HYDR-CFVOL

```
      ct x pr frac  ct x pr frac  ct x pr frac  ct x pr frac
<-range>  <><><-><---->  <><><-><---->  <><><-><---->  <><><-><---->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END HYDR-CFVOL
```

\*\*\*\*\*  
Example  
\*\*\*\*\*

HYDR-CFVOL

Category Fractions and Priorities for F(VOL) Outflow \*\*\*

```
RCHRES  ct x pr frac  ct x pr frac  ct x pr frac  ct x pr frac  ***
# - #  <><><-><---->  <><><-><---->  <><><-><---->  <><><-><---->  ***
1      UN 1  1      CU 1  2    0.5  MI 1  2    0.5  UN 2  1    0.5
1      BB 2  1    0.5  AA 2  2
END HYDR-CFVOL
```

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
ct	CFVOLC(*)	A2	none	none	none	none	Both
x	CFVOLT(*)	I2	0	0	5	none	Both
pr	CFVOLP(*)	I3	0	0	none	none	Both
cfrac	CFVOLF(*)	F6.0	0.0	0.0	1.0	none	Both

## Explanation

This table is required when any member of CFVOL in Table-type HYDR-CATEGORY is a positive integer. The number of categories given in this table is the sum of the integer CFVOLs in HYDR-CATEGORY; up to four can be specified on a line.

CFVOLC is a two-character category tag.

CFVOLE is the number of the exit for which the category is being specified.

CFVOLP is an integer signifying the priority of the corresponding category when subtracting  $F(vol)$  (volume-dependent) outflow. Water is taken from the lowest priority categories first, then from the next-lowest priority categories, and so on. Categories with zero or undefined priority are taken last.

CFVOLF is the fraction of the  $F(vol)$  outflow which will be assigned to the corresponding category at a given priority level. The sum of all fractions at a priority level must sum to 1.0; alternatively, if all fractions for a priority level are blank or zero, the outflow demand will be equally divided among all of those categories.

## 4.4(3).2.10 Table-type HYDR-CDEMAND -- Allocation of time-dependent outflow to categories

```
*****
      1         2         3         4         5         6         7         8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

HYDR-CDEMAND

```
      ct x  py  pm pd cotdgt  ct x  py  pm pd cotdgt
<-range>  <><> <--> <> <> <---->  <><> <--> <> <> <---->
```

```
. . . . .
(repeats until all operations of this type are covered)
```

```
. . . . .
END HYDR-CDEMAND
```

\*\*\*\*\*

Example

\*\*\*\*\*

HYDR-CDEMAND

Category Priorities and Initial Values for G(T) Demands \*\*\*

```
      ct x  Priority  COTDGT  ct x  Priority  COTDGT ***
RCHRES      (yyyy/mm/dd) (cfs)      (yyyy/mm/dd) (cfs) ***
# - #  <><> <--> <> <> <---->  <><> <--> <> <> <---->
1      UN 1 1865      50.0  MI 1 1900/01      30.0
1      CU 2 1900/05/01  25.0
```

END HYDR-CDEMAND

\*\*\*\*\*

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
ct	COGTC(*)	A2	none	none	none	none	Both
x	COGTE(*)	I2	0	0	5	none	Both
py	COGTPY(*)	I4	0	0	none	none	Both
pm	COGTPM(*)	I2	1	1	12	none	Both
pd	COGTPD(*)	I2	1	1	31	none	Both
cotdgt	COTDGT(*)	F6.0	0.0	0.0	none	none	Both



# Explanation

This table is used in conjunction with the time-series COTDGT to specify outflow demands which are a function of time, and to allocate these outflow demands among categories. The table may be omitted when NCOGT in Table-type HYDR-CATEGORY is zero.

COGTC is a two-character category tag.

COGTE is the exit number for the demand being specified.

COGTPY (year), COGTPM (month), and COGTPD (day) signify the priority date of the corresponding demand timeseries. Multiple demands on the same category are satisfied from earliest to latest priority date. Unspecified (blank) priorities are satisfied last.

## 4.4(3).3 RCHRES BLOCK -- Section ADCALC input

```

*****
      1      2      3      4      5      6      7      8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****

```

[Table-type ADCALC-DATA]

```

*****

```

# Explanation

The exact format of this input is detailed below. Table ADCALC-DATA is not always required because its contents can be defaulted.

4.4(3).3.1 Table-type ADCALC-DATA -- Data for section ADCALC

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
ADCALC-DATA
<-range><---adcalc-data---->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END ADCALC-DATA
```

```
*****
Example
*****
```

```
ADCALC-DATA
  RCHRES  Data for section ADCALC ***
  # - #      CRRAT      VOL      ***
  5          1.7      324.
END ADCALC-DATA
```

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<adcalc-data>	CRRAT	2F10.0	1.5	1.0	none	none	Both
	VOL		0.0	0.0	none	acre-ft	Engl
			0.0	0.0	none	Mm3	Metric

Explanation

Section ADCALC must be active if any of the following sections are active.

CRRAT is the ratio of maximum velocity to mean velocity in the RCHRES cross-section under typical flow conditions.

VOL is the volume of water in the RCHRES at the start of the simulation. Input of this value is not necessary if section HYDR is active. (Note: Metric units are 10\*\*6 m3).

4.4(3).4 RCHRES BLOCK -- Section CONS input

\*\*\*\*\*  
1 2 3 4 5 6 7 8  
123456789012345678901234567890123456789012345678901234567890  
\*\*\*\*\*  
Layout  
\*\*\*\*\*

[Table-type NCONS]  
[Table-type CONS-AD-FLAGS]  
Table-type CONS-DATA --- | repeat for each conservative constituent  
---

\*\*\*\*\*

Explanation

The exact formats of these tables are detailed below. Table-type NCONS is not required if only one conservative constituent is being simulated (default value).

4.4(3).4.1 Table-type NCONS -- Number of conservative constituents simulated

```
*****
      1      2      3      4      5      6      7      8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
      NCONS
      <-range><ncn>
      . . . . .
      (repeats until all operations of this type are covered)
      . . . . .
      END NCONS
```

```
*****
Example
*****
```

```
      NCONS
      RCHRES      ***
      # - #NCONS  ***
      1      7      4
      END NCONS
```

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<ncn>	NCONS	I5	1	1	10

Explanation

NCONS is the number of conservative constituents being simulated.

## 4.4(3).4.2 Table-type CONS-AD-FLAGS -- Atmospheric deposition flags for CONS

```
*****
      1         2         3         4         5         6         7         8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
CONS-AD-FLAGS
<-range> <f><c> <f><c> <f><c> <f><c> <f><c> <f><c> <f><c> <f><c> <f><c> <f><c>
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END CONS-AD-FLAGS
```

```
*****
Example
*****
```

```
CONS-AD-FLAGS
RCHRES                      Atmospheric deposition flags ***
***      CONS1  CONS2  CONS3  CONS4  CONS5  CONS6  CONS7  CONS8  CONS9  QAL10
#*** # <F><C> <F><C> <F><C> <F><C> <F><C> <F><C> <F><C> <F><C> <F><C> <F><C>
1      7  -1 10  -1 -1  11 12  13 -1  10  0   0 11   0 -1   0  0           -1  0
END CONS-AD-FLAGS
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<f><c>	COADFG(*)	(1X,2I3)	0	-1	none

## Explanation

COADFG is an array of flags indicating the source of atmospheric deposition data for the CONS section. Each CONS has two flags. The first is for dry or total deposition flux, and the second is for wet deposition concentration. The flag values indicate:

- 0 No deposition of this type is simulated
- 1 Deposition of this type is input as time series COADFX or COADCN
- >0 Deposition of this type is input in the MONTH-DATA table with the corresponding table ID number.

## 4.4(3).4.3 Table-type CONS-DATA -- Information about one conservative substance

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

CONS-DATA

<-range><----conid-----><---con--> <concid><--conv--> <qtyid->

. . . . .

(repeats until all operations of this type are covered)

. . . . .

END CONS-DATA

\*\*\*\*\*

Example

\*\*\*\*\*

CONS-DATA

RCHRES Data for conservative constituent No. 3 \*\*\*

# - #	Substance-id	Conc	ID	CONV	QTYID ***
1 7	Total Diss Solids	251.3	mg/l	1000.	kg

END CONS-DATA

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<conid>	CONID(5)	5A4	blank	none	none	none	Both
<con>	CON	F10.0	0.0	0.0	none	concid	Both
<concid>	CONCID	2A4	blank	none	none	none	Both
<conv>	CONV	F10.0	none	1.0E-30	none	see below	
<qtyid>	QTYID	2A4	blank	none	none	none	Both

## Explanation

Any string of up to 20 characters may be supplied as the name of the conservative constituent (CONID).

CON is the initial concentration of the conservative constituent.

CONCID is a string of up to 8 characters which specifies the concentration units for the conservative constituent. If the constituent provides the alkalinity time series for section PHCARB, CONCID must be mg/l as CaCO<sub>3</sub>.

QTYID is a string of up to 8 characters which specifies the units in which the total flow of constituent into, or out of, the RCHRES will be expressed, e.g., "kg".

CONV is the conversion factor from QTYID/VOL to the desired concentration units (CONCID):  $CONC = CONV * (QTYID / VOL)$ . If English units are being used (EMFG = 1 in the GLOBAL Block), VOL is in ft<sup>3</sup>; if Metric units are in effect (EMFG = 2), VOL is in m<sup>3</sup>. For example, if:

CONCID is mg/l

QTYID is kg

VOL is in m<sup>3</sup>,

then CONV=1000.

4.4(3).5 RCHRES BLOCK -- Section HTRCH input

```
*****
      1      2      3      4      5      6      7      8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
[Table-type HT-BED-FLAGS]
[Table-type HEAT-PARM]

[Table-type HT-BED-PARM]          --- | if BEDFLG = 1 or 2
[Table-type MON-HT-TGRND]  if TGFLG = 3 |
                                     ---
                                     ---
[Table-type HT-BED-DELH]          | if BEDFLG = 3
[Table-type HT-BED-DELTT]         |
                                     ---

[Table-type HEAT-INIT]

*****
```

Explanation

The exact format of each of the tables above is detailed in the documentation which follows. Tables in brackets [] need not always be supplied; for example, because all of the inputs have default values.



## 4.4(3).5.1 Table-type HT-BED-FLAGS -- Flags for bed conduction in section HTRCH

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
HT-BED-FLAGS
<-range><bfg><gfg><tst>
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END HT-BED-FLAGS
```

\*\*\*\*\*

Example

\*\*\*\*\*

```
HT-BED-FLAGS
RCHRES                      ***
# - # BDFG TGFG TSTP ***
1      3      55
2      2      2
END HT-BED-FLAGS
```

\*\*\*\*\*

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<bfg>	BEDFLG	I5	0	0	3
<gfg>	TGFLG	I5	2	1	3
<tst>	TSTOP	I5	55	1	100

## Explanation

BEDFLG is the bed conduction flag, with the following meanings:

- 0 - bed conduction is not simulated
- 1 - single interface (water-mud) heat transfer method
- 2 - two-interface (water-mud and mud-ground) heat transfer method
- 3 - Jobson method

TGFLG specifies the source of the ground temperature for the bed conduction; used when BEDFLG is 1 or 2 (TGFLG: 1=time series; 2=single value; 3=monthly values).

TSTOP is the number of time steps (prior to the current time step) that impact the heat flux at the current time step; used only when the Jobson method is in effect.

## 4.4(3).5.2 Table-type HEAT-PARM -- Parameters for section HTRCH

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
HEAT-PARM
```

```
<-range><--elev--><--eldat--><--cfsx--><--ktrd--><--kcnd--><--kevp-->
```

```
. . . . .
```

```
(repeats until all operations of this type are covered)
```

```
. . . . .
```

```
END HEAT-PARM
```

```
*****
```

```
Example
```

```
*****
```

```
HEAT-PARM
```

```
      RCHRES      ELEV      ELDAT      CFSAX      KATRAD      KCOND      KEVAP ***
```

```
      # - #          ft          ft          .          .          .          . ***
```

```
      1   7      2000.      1500.          .5          6.5          11.          4.
```

```
END HEAT-PARM
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<elev>	ELEV	F10.0	0.0	0.0	30000.	ft	Engl
			0.0	0.0	10000.	m	Metric
<eldat>	ELDAT	F10.0	0.0	none	none	ft	Engl
			0.0	none	none	m	Metric
<cfsx>	CFSAX	F10.0	1.0	0.001	2.0	none	Both
<ktrd>	KATRAD	F10.0	9.37	1.00	20.	none	Both
<kcnd>	KCOND	F10.0	6.12	1.00	20.	none	Both
<kevp>	KEVAP	F10.0	2.24	1.00	10.	none	Both

## Explanation

ELEV is the mean RCHRES elevation.

ELDAT is the difference in elevation between the RCHRES and the air temperature gage (positive if RCHRES is higher than the gage).

CFSAX is the correction factor for solar radiation; it is the fraction of the RCHRES surface exposed to radiation.

KATRAD is the longwave radiation coefficient.

KCOND is the conduction-convection heat transport coefficient.

KEVAP is the evaporation coefficient.

## 4.4(3).5.3 Table-type HT-BED-PARM -- Bed conduction parameters for section HTRCH

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

HT-BED-PARM

&lt;-range&gt;&lt;-muddep-&gt;&lt;--tgrnd-&gt;&lt;--kmud--&gt;&lt;-kgrnd--&gt;

. . . . .

(repeats until all operations of this type are covered)

. . . . .

END HT-BED-PARM

\*\*\*\*\*

Example

\*\*\*\*\*

HT-BED-PARM

```
      RCHRES      MUDDEP      TGRND      KMUD      KGRND      ***
      # - #          m      deg C      (kcal/m2/C/hr)      ***
      1      7      0.1      20.      50.4      1.42
```

END HT-BED-PARM

\*\*\*\*\*

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<-muddep->	MUDDEP	F10.0	0.33	0.01	none	ft	Engl
			0.1	0.01	none	m	Metric
<--tgrnd->	TGRND	F10.0	59.	14.	113.	deg F	Engl
			15.	-10.	45.	deg C	Metric
<--kmud-->	KMUD	F10.0	50.	0.0	none	kcal/m2/C/hr	Both
<--kgrnd->	KGRND	F10.0	1.4	0.0	none	kcal/m2/C/hr	Both

## Explanation

MUDDEP is the depth of the mud layer in the two-interface model (BEDFLG = 2).

TGRND is the constant (TGFLG = 2) ground temperature; it is used in the one and two-interface models (BEDFLG = 1 or 2). Optionally, the ground temperature can be input in the form of twelve monthly values or a time series.

KMUD is the heat conduction coefficient between water and the mud/ground; it is used if BEDFLG = 1 or 2. Typical values range from 3 to 100 kcal/m2/C/hr.

KGRND is the heat conduction coefficient between ground and mud in the two-interface model (BEDFLG = 2).

#### 4.4(3).5.4 Table-type MON-HT-TGRND -- Monthly ground temperatures for bed heat conduction algorithms

```
*****
      1         2         3         4         5         6         7         8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

MON-HT-TGRND

<-range><-----12-values----->

. . . . .  
(repeats until all operations of this type are covered)

. . . . .  
END MON-HT-TGRND

\*\*\*\*\*

Example

\*\*\*\*\*

MON-HT-TGRND

```
      RCHRES  TG1  TG2  TG3  TG4  TG5  TG6  TG7  TG8  TG9  TG10 TG11 TG12***
      # - #
      1    7  15.  16.  17.  18.  19.  20.  20.  20.  20.  18.  17.  16.
END MON-HT-TGRND
```

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<12-values>	TGRNDM(1-12)	F5.0	none none	14. -10.	113. 45	deg F deg C	English Metric

Explanation

TGRNDM(1) through TGRNDM(12) are monthly ground temperatures for use in the bed heat conduction models. This table must be included in the UCI only if TGFLG is assigned a value of 3 and BEDFLG = 1 or 2 in Table-type HT-BED-FLAGS.

Note: The input monthly values apply to the first day of the month, and values for intermediate days are obtained by interpolating between successive monthly values.

## 4.4(3).5.5 Table-type HT-BED-DELH -- Heat fluxes for Jobson bed heat conduction method

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

HT-BED-DELH

&lt;-range&gt;&lt;--delh1-&gt;&lt;--delh2-&gt;&lt;--delh3-&gt;&lt;--delh4-&gt;&lt;--delh5-&gt;&lt;--delh6-&gt;&lt;--delh7-&gt;

.

.

&lt;-range&gt;&lt;--delh99-&gt;&lt;--delh100&gt;

```
. . . . .
(repeats until all operations of this type are covered)
```

```
. . . . .
```

END HT-BED-DELH

\*\*\*\*\*

Example

\*\*\*\*\*

HT-BED-DELH

RCHRES ***	DELH	DELH	DELH	DELH	DELH	DELH	DELH	DELH
# - # ***	1	2	3	4	5	6	7	
1	-14.2	-9.44	-7.80	-6.66	-5.77	-5.34	-4.99	
1	-4.71	-4.47	-4.27	-3.81	-3.93	-3.53	-3.66	

etc

END HT-BED-DELH

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<--delhi->	DELH(100)	F10.0	0.0	none	none	btu/ft2/F/iv1	English
			0.0	none	none	kcal/m2/C/iv1	Metric

Explanation

DELH are bed sediment-to-water heat fluxes (per one degree increase in water temperature) for the past TSTOP time intervals; used in the Jobson bed-conduction method. A maximum of 100 values of DELH are possible.

Caution: DELH values are dependent on the time step (INDELT in GLOBAL Block).

#### 4.4(3).5.6 Table-type HT-BED-DELTT -- Initial temperature changes for Jobson bed conduction method

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
HT-BED-DELTT
<-range><-deltti1-><-deltti2-><-deltti3-><-deltti4-><-deltti5-><-deltti6-><-deltti7->
.
.
<-range><deltti99-><deltti100>
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END HT-BED-DELTT
```

```
*****
Example
*****
```

```
HT-BED-DELTT
RCHRES *** DELTT      DELTT      DELTT      DELTT      DELTT      DELTT      DELTT
# - # ***      1          2          3          4          5          6          7
          ***      8          9         10         11         12         13         14
1          14.2      9.44      7.80      6.66      5.77      5.34      4.99
1          4.71      4.47      4.27      3.81      3.93      3.53      3.66
etc
END HT-BED-DELTT
```

```
*****
```

#### Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<-deltti->	DELTT(100)	F10.0	0.0	none	none	deg F	English
			0.0	none	none	deg C	Metric

#### Explanation

DELTT are initial water temperature changes for the TSTOP time intervals immediately preceding the starting time of the simulation; used in the Jobson bed-conduction method. A maximum of 100 values of DELTT are possible. DELTT values are positive if the water temperature increases.

## 4.4(3).5.7 Table-type HEAT-INIT -- Initial conditions for HTRCH

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
HEAT-INIT
<-range><----init-temp----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END HEAT-INIT
```

```
*****
Example
*****
```

```
HEAT-INIT
  RCHRES      TW      AIRTMP ***
  # - #      degF      degF ***
  1   7      62.      70.
END HEAT-INIT
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<init-temp>	TW	F10.0	60.	32.	200.	degF	Engl
			15.5	0.0	95.	degC	Metric
	AIRTMP	F10.0	60.	-90.	150.	degF	Engl
			15.5	-70.0	65.	degC	Metric

## Explanation

TW is the initial water temperature and AIRTMP indicates the initial air temperature at the RCHRES.

4.4(3).6 RCHRES-BLOCK -- Section SEDTRN input

```
*****
      1      2      3      4      5      6      7      8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
[Table-type SANDFG]
Table-type SED-GENPARM
Table-type SED-HYDPARM -- only if Section HYDR is inactive
Table-type SAND-PM
Table-type SILT-CLAY-PM -- include twice, 1st for silt, 2nd for clay
[Table-type SSED-INIT]
[Table-type BED-INIT]
```

```
*****
```

Explanation

The exact format of each of the tables above is detailed in the documentation which follows. Tables in brackets [] need not always be supplied; for example, because all of the inputs have default values.



4.4(3).6.1 Table-type SANDFG -- Sandload method flag

\*\*\*\*\*  
1 2 3 4 5 6 7 8  
123456789012345678901234567890123456789012345678901234567890  
\*\*\*\*\*  
Layout  
\*\*\*\*\*

```
SANDFG
<-range><sfg>
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END SANDFG
```

\*\*\*\*\*  
Example  
\*\*\*\*\*

```
SANDFG
  RCHRES      ***
  # - # SDFG  ***
  2          2
END SANDFG
```

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<sfg>	SANDFG	I5	3	1	3

Explanation

SANDFG indicates the method that will be used for sandload simulation:  
1 = Toffaleti method  
2 = Colby method  
3 = user-specified power function method.

## 4.4(3).6.2 Table-type SED-GENPARM -- General sediment related parameters

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
SED-GENPARM
<-range><-----gen-parm----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END SED-GENPARM
```

```
*****
Example
*****
```

```
SED-GENPARM
  RCHRES    BEDWID    BEDWRN    POR***
  # - #      (m)      (m)      ***
  3   10     30.      2.      0.4
END SED-GENPARM
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<gen-parm>	BEDWID	F10.0	none	1.0	none	ft	Engl
			none	0.3	none	m	Metric
	BEDWRN	F10.0	100.	.001	none	ft	Engl
			30.5	.0003	none	m	Metric
	POR	F10.0	0.5	0.1	0.9	none	Both

## Explanation

BEDWID is the width of the cross-section over which HSPF will assume bed sediment is deposited (regardless of stage, top-width, etc); BEDWID is constant. It is used to estimate the depth of bed sediment.

BEDWRN is the bed depth which, if exceeded (e.g., through deposition) will cause a warning message to be printed in the echo file (MESSU).

POR is the porosity of the bed (volume voids/total volume). It is used to estimate bed depth.

4.4(3).6.3 Table-type SED-HYDPARM -- Parameters normally read in Section HYDR

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
SED-HYDPARM
<-range><-----sed-hydparm----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END SED-HYDPARM
```

```
*****
Example
*****
```

```
SED-HYDPARM
  RCHRES      LEN      DELTH      DB50***
  # - #      (km)      (m)      (mm)***
  2          5.0      4.0      0.5
  5          20.0      5.0      0.3
END SED-HYDPARM
```

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<sed-hydparm>	LEN	F10.0	none	0.01	none	miles	Engl
			none	0.016	none	km	Metric
	DELTH	F10.0	0.0	0.0	none	ft	Engl
			0.0	0.0	none	m	Metric
	DB50	F10.0	.01	.0001	100.	in	Engl
			.25	.0025	2500.	mm	Metric

Explanation

This table is only required and read if Section HYDR is not active. Normally these parameters are supplied in Table-type HYDR-PARM2; see section HYDR for definitions.

## 4.4(3).6.4 Table-type SAND-PM -- Parameters related to sand transport

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

SAND-PM

<-range><-----sand-parms----->

. . . . .  
(repeats until all operations of this type are covered)

. . . . .

END SAND-PM

\*\*\*\*\*

Example

\*\*\*\*\*

SAND-PM

```
RCHRES      D      W ***
# - #      (in)  (in/sec) ***
3          .01    1.2
```

END SAND-PM

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<sand-parms>	D	F10.0	none	.001	100.	in	Engl
			none	.025	2500.	mm	Metric
	W	F10.0	none	.02	500.	in/sec	Engl
			none	.5	12500.	mm/sec	Metric
	RHO	F10.0	2.65	1.0	4.0	gm/cm3	Both
	KSAND	F10.0	0.0	0.0	none	complex	Both
	EXPSND	F10.0	0.0	0.0	none	complex	Both

Explanation

D is the effective diameter of the transported sand particles, and W is the corresponding fall velocity in still water. Note: the sand transport algorithms do not actually use D; they use DB50, supplied in Table-type HYDR-PARM2. D is included here for consistency with the input data supplied for cohesive sediment.

RHO is the density of the sand particles.

KSAND and EXPSND are the coefficient and exponent in the sandload power function formula. These values should be input if SANDFG=3.

## 4.4(3).6.5 Table-type SILT-CLAY-PM -- Parameters for silt or clay

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
SILT-CLAY-PM
```

```
<-range><-----silt-clay-pm----->
```

```
. . . . .
(repeats until all operations of this type are covered)
```

```
. . . . .
```

```
END SILT-CLAY-PM
```

```
*****
```

```
Example
```

```
*****
```

```
SILT-CLAY-PM
```

```

RCHRES      D      W      RHO      TAUCD      TAUCS      M      ***
# - #      (mm)  (mm/sec) (gm/cm3)  (kg/m2)  (kg/m2) (kg/m2.d) ***
6          .03      .80      2.7      2.0      2.5      0.1
9          .04      1.5      2.6      2.0      3.0      .08
```

```
END SILT-CLAY-PM
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<silt-clay-pm>	D	F10.0	0.0	0.0	.003	in	Engl
			0.0	0.0	.07	mm	Metric
	W	F10.0	0.0	0.0	.2	in/sec	Engl
			0.0	0.0	5.0	mm/sec	Metric
	RHO	F10.0	2.65	2.0	4.0	gm/cm3	Both
	TAUCD	F10.0	1.0E10	1.0E-10	none	lb/ft2	Engl
			1.0E10	1.0E-10	none	kg/m2	Metric
	TAUCS	F10.0	1.0E10	1.0E-10	none	lb/ft2	Engl
			1.0E10	1.0E-10	none	kg/m2	Metric
	M	F10.0	0.0	0.0	none	lb/ft2.d	Engl
			0.0	0.0	none	kg/m2.d	Metric

# Explanation

This table must be supplied twice; first for silt, then for clay.

D is the effective diameter of the particles and W is the corresponding fall velocity in still water.

RHO is the density of the particles.

TAUCD is the critical bed shear stress for deposition. Above this stress, there will be no deposition; as the stress drops below this value to zero, deposition will gradually increase to the value implied by the fall velocity in still water.

TAUCS is the critical bed shear stress for scour. Below this value, there will be no scour; above it, scour will steadily increase.

In general TAUCD should be less than or equal to TAUCS.

M is the erodibility coefficient of the sediment.

Note that the default values for W, TAUCD, TAUCS, and M have been set so that silt and clay will behave as "washload"; that is, material will settle at the rate implied by W (defaulted to zero) and there will be no scour; the material will behave like a conservative substance.

4.4(3).6.6 Table-type SSED-INIT -- Initial concentrations of suspended sediment

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
```

Layout  
\*\*\*\*\*

```
SSED-INIT
<-range><-----ssed-init----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END SSED-INIT
```

\*\*\*\*\*  
Example  
\*\*\*\*\*

```
SSED-INIT
  RCHRES      Suspended sed concs (mg/l) ***
  # - #       Sand      Silt      Clay ***
  1   5       100.      50.      20.
END SSED-INIT
```

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<ssed-init>	SSED(3)	3F10.0	0.0	0.0	none	mg/l	Both

Explanation

The three values supplied are the initial concentrations of suspended sand, silt, and clay, respectively.

## 4.4(3).6.7 Table-type BED-INIT -- Initial content of bed sediment

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
BED-INIT
<-range><-bed-dep><fracsand><fracsilt><fracclay>
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END BED-INIT
```

```
*****
Example
*****
```

```
BED-INIT
  RCHRES      BEDDEP      Initial bed composition      ***
  # - #        (m)        Sand      Silt      Clay ***
  3           1.5         0.6       0.2       0.2
END BED-INIT
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<bed-dep>	BEDDEP	F10.0	0.0	0.0	none	ft	Engl
			0.0	0.0	none	m	Metric
<fracsand>	temporary	F10.0	1.0	.0001	1.0	none	Both
<fracsilt>	array	F10.0	0.0	0.0	.9999	none	Both
<fracclay>		F10.0	0.0	0.0	.9999	none	Both

## Explanation

BEDDEP is the initial total depth (thickness) of the bed.

The three values supplied under <fracsand>, <fracsilt>, and <fracclay> are the initial fractions (by weight) of sand, silt, and clay in the bed material. The default values are arranged to simulate an all-sand bed. The sum of the fractions must be 1.00.



4.4(3).7 RCHRES-BLOCK -- Section GQUAL input

```
*****
      1      2      3      4      5      6      7      8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
[Table-type GQ-GENDATA]
[Table-type GQ-AD-FLAGS]
```

next 15 tables -- repeat for each qual

```
Table-type GQ-QALDATA
[Table-type GQ-QALFG]
[Table-type GQ-FLG2]
Table-type GQ-HYDPM -- only if qual undergoes hydrolysis (QALFG(1,I)=1)
Table-type GQ-ROXPM -- only if qual undergoes oxidation (QALFG(2,I)=1)
[Table-type GQ-PHOTPM] -- only if qual undergoes photolysis (QALFG(3,I)=1)
Table-type GQ-CFGAS -- only if qual undergoes volatilization (QALFG(4,I)=1)
```

next 2 tables -- only if qual undergoes biodegradation (QALFG(5,I)=1)

```
Table-type GQ-BIOPM
Table-type MON-BIO -- only if biomass is input monthly (GQPM2(7,I)=3)
Table-type GQ-GENDECAY -- only if qual has "general" decay (QALFG(6,I)=1)
```

next 5 tables -- only if qual is sediment associated (QALFG(7,I)=1)

```
[Table-type GQ-SEDDECAY]
Table-type GQ-KD
Table-type GQ-ADRATE
[Table-type GQ-ADTHETA]
[Table-type GQ-SEDCONC]
```

```
[Table-type GQ-VALUES]
```

next 3 tables -- only if the data are to be read as monthly values  
(Source flag in Table-type GQ-GENDATA is ON)

```
[Table-type MON-WATEMP]
[Table-type MON-PHVAL] -- only if there is hydrolysis (any QALFG(1)=1)
[Table-type MON-ROXYGEN] -- only if there is oxidation (any QALFG(2)=1)
```

next 8 tables -- only if there is photolysis (any QALFG(3) = 1)

```
Table-type GQ-ALPHA
[Table-type GQ-GAMMA]
[Table-type GQ-DELTA]
[Table-type GQ-CLDFACT]
```

```

next 3 tables -- only if the data are to be read as monthly values
                (Source flag in Table-type GQ-GENDATA is ON)
[Table-type MON-CLOUD]
[Table-type MON-SEDCONC]
[Table-type MON-PHYTO]
[Table-type SURF-EXPOSED] -- only if Section HTRCH is inactive
                           (see Section PLANK for documentation)

next 7 tables -- only if there is volatilization (any QALFG(4) = 1)
[Table-type OX-FLAGS]
[Table-type ELEV]
[Table-type OX-CFOREA]
[Table-type OX-TSIVOGLOU]
[Table-type OX-LEN-DELTH]
[Table-type OX-TCGINV]
[Table-type OX-REAPARM]
[Table-type GQ-DAUGHTER] -- repeat for each decay process that produces
                           daughter quals from parents

```

\*\*\*\*\*

#### Explanation

A "qual" is a generalized quality constituent simulated using this module section.

The exact format of each of the tables above, except those "borrowed" from Sections OXRX and PLANK, is detailed in the documentation which follows. Tables in brackets [] need not always be supplied; for example, because all of the inputs have default values.

## 4.4(3).7.1 Table-type GQ-GENDATA -- General input for Section GQUAL

```

*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****

```

```

GQ-GENDATA
<-range><ngq><-----source-fgs-----><lat>
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END GQ-GENDATA

```

```

*****
Example
*****

```

```

GQ-GENDATA
  RCHRES NGQL TPFQ PHFG ROFG CDFG SDFG PYFG  LAT***
  # - #
  1   7   3   2   2   1   2   2   3   48
END GQ-GENDATA

```

```

*****

```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<ngq>	NGQUAL	I5	1	1	3	none	Both
<source-fgs>	TEMPFG	I5	2	1	3	none	Both
	PHFLAG	I5	2	1	3	none	Both
	ROXFG	I5	2	1	3	none	Both
	CLDFG	I5	2	1	3	none	Both
	SDFG	I5	2	1	3	none	Both
	PHYTFG	I5	2	1	3	none	Both
	LAT	I5	0	-54	54	degrees	Both

## Explanation

NGQUAL - number of generalized constituents (quals) being simulated.

TEMPFG - source of water temperature data. 1 means a time series - either input or computed; 2 means a single user-supplied value; 3 means 12 user-supplied values (one for each month).

PHFLAG - source of pH data. Input only if any QALFG(1)=1. Source designation scheme is the same as for TEMPG.

ROXFG - source of free radical oxygen data. Input only if any QALFG(2)=1. Source designation scheme is the same as for TEMPG.

CLDFG - source of cloud cover data. Input only if any QALFG(3)=1. Source designation scheme is the same as for TEMPG.

SDFG - source of total sediment concentration data. Input only if any QALFG(3)=1. Source designation scheme is the same as for TEMPG.

PHYTFG - source of phytoplankton data. Input only if any QALFG(3)=1. Source designation scheme is the same as for TEMPG.

LAT - latitude of the RCHRES. Input only if any QALFG(3)=1. Positive for northern hemisphere.

4.4(3).7.2 Table-type GQ-AD-FLAGS -- Atmospheric deposition flags for GQUAL

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
GQ-AD-FLAGS
<-range> <f><c> <f><c> <f><c>
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END GQ-AD-FLAGS
```

```
*****
Example
*****
```

```
GQ-AD-FLAGS
  RCHRES Atmospheric deposition flags ***
  ***   GQUAL1 GQUAL2 GQUAL3
  #*** # <F><C> <F><C> <F><C>
  1     7  -1 10  -1 -1  11 12
END GQ-AD-FLAGS
```

```
*****
```

Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<f><c>	GQADFG(*)	(1X,2I3)	0	-1	none

Explanation

GQADFG is an array of flags indicating the source of atmospheric deposition data. Each GQUAL has two flags. The first is for dry or total deposition flux, and the second is for wet deposition concentration. The flag values indicate:

- 0 No deposition of this type is simulated
- 1 Deposition of this type is input as time series GQADFX or GQADCN
- >0 Deposition of this type is input in the MONTH-DATA table with the corresponding table ID number.

## 4.4(3).7.3 Table-type GQ-QALDATA -- Data for a generalized quality constituent

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
GQ-QALDATA
<-range><-----gqid-----><--dqual-->      <cu><--conv-->  <qtyid->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END GQ-QALDATA
```

```
*****
Example
*****
```

```
GQ-QALDATA
RCHRES   ***              GQID      DQAL      CONCID      CONV      QTYID
# - #    ***
1    7          Coliforms      2.0          #          .001          #
END GQ-QALDATA
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<gqid>	GQID	5A4	none	none	none	none	Both
<dqual>	DQAL	F10.0	0.0	0.0	none	concid	Both
<cu>	CONCID	A4	none	none	none	none	Both
<conv>	CONV	F10.0	none	1.0E-30	none	see below	
<qtyid>	QTYID	2A4	none	none	none	none	Both

## Explanation

GQID - Name of constituent (qual).  
DQAL - Initial dissolved concentration of qual.  
CONCID - Concentration units (implied that it is "per liter") eg."mg"(/l).  
QTYID - Name of mass quantity unit for qual.  
CONV - Factor to convert from QTYID/VOL to concentration (CONCID) units:  
Conc= CONV\* QTYID/VOL (in the English system, VOL is in ft3)  
(in the Metric system, VOL is in m3).

## 4.4(3).7.4 Table-type GQ-QALFG -- First set of flags for a qual

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
GQ-QALFG
<-range><-----degrad-fgs-----><sfg>
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END GQ-QALFG
```

```
*****
Example
*****
```

```
GQ-QALFG
RCHRES HDRL OXID PHOT VOLT BIOD GEN SDAS***
# - #
1 7 1 1 0 0 1 0 1
END GQ-QALFG
```

```
*****
Details
```

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<degrad-fgs>	QALFG(1)	I5	0	0	1	none	Both
	QALFG(2)	I5	0	0	1	none	Both
	QALFG(3)	I5	0	0	1	none	Both
	QALFG(4)	I5	0	0	1	none	Both
	QALFG(5)	I5	0	0	1	none	Both
	QALFG(6)	I5	0	0	1	none	Both
<sfg>	QALFG(7)	I5	0	0	1	none	Both

## Explanation

QALFG(1) - indicates whether hydrolysis is considered for dissolved qual.  
 QALFG(2) - indicates whether oxidation by free radical oxygen is considered for dissolved qual.  
 QALFG(3) - indicates whether photolysis is considered for dissolved qual.  
 QALFG(4) - indicates whether volatilization is considered for dissolved qual.  
 QALFG(5) - indicates whether biodegradation is considered for dissolved qual.  
 QALFG(6) - indicates whether general first order decay is considered for dissolved qual.  
 QALFG(7) - indicates whether or not qual is associated with sediment. If so, adsorption/desorption of qual is simulated.

## 4.4(3).7.5 Table-type GQ-FLG2 -- Second set of flags for a qual

```
*****
      1         2         3         4         5         6         7         8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
GQ-FLG2
<-range><-----daughter proc-----><sbm>
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END GQ-FLG2
```

```
*****
Example
*****
```

```
GQ-FLG2
RCHRES HDRL OXID PHOT VOLT BIOD GEN SBMS***
# - #
1 7 0 0 1 0 1 0 2
END GQ-FLG2
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<daughter proc>	GQPM2(1)	I5	0	0	1	none	Both
	GQPM2(2)	I5	0	0	1	none	Both
	GQPM2(3)	I5	0	0	1	none	Both
	GQPM2(4)	I5	0	0	1	none	Both
	GQPM2(5)	I5	0	0	1	none	Both
	GQPM2(6)	I5	0	0	1	none	Both
<sbm>	GQPM2(7)	I5	2	1	3	none	Both

## Explanation

GQPM2(1) through GQPM2(6) indicate whether or not this qual is a daughter product through each of the six decay processes (1-hydrolysis, 2-oxidation, 3-photolysis, 4-reserved for future use, 5-biodegradation, 6-general first order decay). GQPM2(7) indicates the source of biomass data for qual. Input only if QALFG(5)=1. (1=time series, 2=single value, 3=twelve monthly values)



## 4.4(3).7.6 Table-type GQ-HYDPM -- Hydrolysis parameters

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
GQ-HYDPM
<-range><-----hydroly-parms----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END GQ-HYDPM
```

```
*****
Example
*****
```

```
GQ-HYDPM
RCHRES      KA      KB      KN      THHYD***
# - #
1    7      5000.    50.    .00004    1.03
END GQ-HYDPM
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<hydroly-parms>	KA	F10.0	none	1.0E-30	none	/M-sec	Both
	KB	F10.0	none	1.0E-30	none	/M-sec	Both
	KN	F10.0	none	1.0E-30	none	/sec	Both
	THHYD	F10.0	1.0	1.0	2.0	none	Both

## Explanation

KA - second-order acid rate constant for hydrolysis  
KB - second-order base rate constant for hydrolysis  
KN - first-order rate constant of neutral reaction with water  
THHYD - temperature correction coefficient for hydrolysis

## 4.4(3).7.7 Table-type GQ-ROXPM -- Parameters for free radical oxidation of qual

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

GQ-ROXPM

&lt;-range&gt;&lt;-----rox-pm-----&gt;

. . . . .

(repeats until all operations of this type are covered)

. . . . .

END GQ-ROXPM

\*\*\*\*\*

Example

\*\*\*\*\*

GQ-ROXPM

RCHRES            KOX            THOX\*\*\*

# - #                            \*\*\*

1    7    .000014            1.01

END GQ-ROXPM

\*\*\*\*\*

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<rox-pm>	KOX	F10.0	none	1.0E-30	none	/M.sec	Both
	THOX	F10.0	1.0	1.0	2.0	none	Both

## Explanation

KOX - second-order rate constant for oxidation by free radical oxygen

THOX - temperature correction coefficient for oxidation by free radical oxygen

## 4.4(3).7.8 Table-type GQ-PHOTPM -- Parameters for photolysis

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

GQ-PHOTPM

&lt;-range&gt;&lt;-----first-7-----&gt;

&lt;-range&gt;&lt;-----second-7-----&gt;

&lt;-range&gt;&lt;-----last-4-----&gt;&lt;--phi--&gt;&lt;-theta--&gt;

. . . . .

(repeats until all operations of this type are covered)

. . . . .

END GQ-PHOTPM

\*\*\*\*\*

Example

\*\*\*\*\*

GQ-PHOTPM

```
# - #***      K1         K2         K3         K4         K5         K6         K7
# - #***      K8         K9         K10        K11        K12        K13        K14
# - #***      K15        K16        K17        K18        PHI         THETA
1   7         .5         .5         .5         .5         .5         .5         .5
1   7         .5         .5         .5         .5         .5         .5         .5
1   7         .5         .5         .5         .5         .47        1.02
```

END GQ-PHOTPM

\*\*\*\*\*

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<first-7>	PHOTPM(1-7)	F10.0	0.0	0.0	none	l/M.cm	Both
<second-7>	PHOTPM(8-14)	F10.0	0.0	0.0	none	l/M.cm	Both
<last-4>	PHOTPM(15-18)	F10.0	0.0	0.0	none	l/M.cm	Both
<phi>	PHOTPM(19)	F10.0	1.0	.0001	10.0	M/E	Both
<theta>	PHOTPM(20)	F10.0	1.0	1.0	2.0	none	Both

## Explanation

PHOTPM(1) through PHOTPM(18) are molar absorption coefficients for qual for 18 wavelength ranges of light (see functional description for subroutine DDECAY in Part E).

PHOTPM(19) is the quantum yield for the qual in air-saturated pure water.

PHOTPM(20) is the temperature correction coefficient for photolysis.

When an entry has to be continued onto more than 1 line:

1. No blank or comment lines may be put between any of the lines for a continued entry. Put all comments ahead of the entry. (See above example).
2. The <range> specification must be repeated for each line onto which the entry is continued.

#### 4.4(3).7.9 Table-type GQ-CFGAS -- Ratio of volatilization rate to oxygen reaeration rate

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

GQ-CFGAS

<-range><--cfgas->

. . . . .

(repeats until all operations of this type are covered)

. . . . .

END GQ-CFGAS

\*\*\*\*\*

Example

\*\*\*\*\*

GQ-CFGAS

RCHRES        CFGAS\*\*\*

# - #        \*\*\*

1    7        .70

END GQ-CFGAS

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<cfgas>	CFGAS	F10.0	none	1.0E-30	none	none	Both

Explanation

CFGAS is the ratio of the volatilization rate to the oxygen reaeration rate.

4.4(3).7.10 Table-type GQ-BIOPM -- Biodegradation parameters

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
GQ-BIOPM
<-range><-----bioparm----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END GQ-BIOPM
```

```
*****
Example
*****
```

```
GQ-BIOPM
  RCHRES      BIOCON      THBIO      BIO***
  # - #
  1   7        .31        1.07        .04
END GQ-BIOPM
```

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<bioparm>	BIOCON	F10.0	none	1.0E-30	none	l/mg/day	Both
	THBIO	F10.0	1.07	1.0	2.0	none	Both
	BIO	F10.0	none	0.00001	none	mg/l	Both

Explanation

BIOCON - second order rate constant for biodegradation of qual by biomass  
 THBIO - temperature correction coefficient for biodegradation of qual  
 BIO - concentration of the biomass which causes biodegradation of qual

## 4.4(3).7.11 Table-type MON-BIO -- Monthly values of biomass

```
*****
      1         2         3         4         5         6         7         8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
MON-BIO
<-range><-----12-values----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END MON-BIO
```

```
*****
Example
*****
```

```
MON-BIO
  RCHRES  BM1  BM2  BM3  BM4  BM5  BM6  BM7  BM8  BM9  BM10  BM11  BM12***
  # - #
  1   7  .03 .035  .03  .02  .02  .03  .03  .035 .040 .060 .050 .035
END MON-BIO
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<12-values>	BIOM(1-12)	F5.0	none	0.00001	none	mg/l	Both

## Explanation

BIOM(1) through BIOM(12) are monthly concentrations of biomass that cause biodegradation of qual. This table must be included in the UCI only if GQPM2(7) is assigned a value of 3 in Table-type GQ-FLG2.

Note: The input monthly values apply to the first day of the month, and values for intermediate days are obtained by interpolating between successive monthly values.

## 4.4(3).7.12 Table-type GQ-GENDECAY -- Parameters for "general" decay of qual

```

*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****

```

```

GQ-GENDECAY
<-range><----decay-pms----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END GQ-GENDECAY

```

```

*****
Example
*****

```

```

GQ-GENDECAY
  RCHRES      FSTDEC      THFST***
  # - #              ***
  1   7          0.2      1.05
END GQ-GENDECAY

```

```

*****

```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<decay-pms>	FSTDEC	F10.0	none	.00001	none	/day	Both
	THFST	F10.0	1.07	1.0	2.0	none	Both

## Explanation

FSTDEC - first-order decay rate for qual

THFST - temperature correction coefficient for first-order decay of qual



#### 4.4(3).7.13 Table-type GQ-SEDDECAY -- Parameters for decay of contaminant adsorbed to sediment

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

GQ-SEDDECAY

<-range><-----ads-decay----->

. . . . .

(repeats until all operations of this type are covered)

. . . . .

END GQ-SEDDECAY

\*\*\*\*\*

Example

\*\*\*\*\*

GQ-SEDDECAY

```
      RCHRES      KSUSP      THSUSP      KBED      THBED***
      # - #
      1    7      .01      1.06      .005      1.03
END GQ-SEDDECAY
```

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<ads-decay>	ADDCPM(1)	F10.0	0.0	0.0	none	/day	Both
	ADDCPM(2)	F10.0	1.07	1.0	2.0	none	Both
	ADDCPM(3)	F10.0	0.0	0.0	none	/day	Both
	ADDCPM(4)	F10.0	1.07	1.0	2.0	none	Both

Explanation

ADDCPM(1) - decay rate for qual adsorbed to suspended sediment

ADDCPM(2) - temperature correction coefficient for decay of qual on suspended sediment

ADDCPM(3) - decay rate for qual adsorbed to bed sediment

ADDCPM(4) - temperature correction coefficient for decay of qual on bed sediment

## 4.4(3).7.14 Table-type GQ-KD -- Adsorption coefficients of qual

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
GQ-KD
<-range><-----k-part----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END GQ-KD
```

```
*****
Example
*****
```

```
GQ-KD
  RCHRES      ADPM1      ADPM2      ADPM3      ADPM4      ADPM5      ADPM6***
  # - #
  1   7       1.0       5000      15000        .3       1000       4000
END GQ-KD
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<k-part>	ADPM(1,1)	F10.0	none	1.0E-10	none	1/mg	Both
	ADPM(2,1)	F10.0	none	1.0E-10	none	1/mg	Both
	ADPM(3,1)	F10.0	none	1.0E-10	none	1/mg	Both
	ADPM(4,1)	F10.0	none	1.0E-10	none	1/mg	Both
	ADPM(5,1)	F10.0	none	1.0E-10	none	1/mg	Both
	ADPM(6,1)	F10.0	none	1.0E-10	none	1/mg	Both

## Explanation

ADPM(1,1) through ADPM(6,1) are distribution coefficients for qual with:  
 1-suspended sand, 2-suspended silt, 3-suspended clay, 4-bed sand, 5-bed silt, and  
 6-bed clay.

## 4.4(3).7.15 Table-type GQ-ADRATE -- Adsorption/desorption rate parameters

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
GQ-ADRATE
<-range><-----k-adsdes----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END GQ-ADRATE
```

```
*****
Example
*****
```

```
GQ-ADRATE
RCHRES      ADPM1      ADPM2      ADPM3      ADPM4      ADPM5      ADPM6***
# - #
1    7      400.      400.      400.      .0028      .0028      .0028
END GQ-ADRATE
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<k-adsdes>	ADPM(1,2)	F10.0	none	.00001	none	/day	Both
	ADPM(2,2)	F10.0	none	.00001	none	/day	Both
	ADPM(3,2)	F10.0	none	.00001	none	/day	Both
	ADPM(4,2)	F10.0	none	.00001	none	/day	Both
	ADPM(5,2)	F10.0	none	.00001	none	/day	Both
	ADPM(6,2)	F10.0	none	.00001	none	/day	Both

## Explanation

ADPM(1,2) through ADPM(6,2) are transfer rates between adsorbed and desorbed states of qual with: 1-suspended sand, 2-suspended silt, 3-suspended clay, 4-bed sand, 5-bed silt, and 6-bed clay.

#### 4.4(3).7.16 Table-type GQ-ADTHETA-- Adsorption/desorption temperature correction parameters

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

GQ-ADTHETA

<-range><-----thet-adsdes----->

. . . . .  
(repeats until all operations of this type are covered)

. . . . .  
END GQ-ADTHETA

\*\*\*\*\*

Example

\*\*\*\*\*

GQ-ADTHETA

```
      RCHRES      ADPM1      ADPM2      ADPM3      ADPM4      ADPM5      ADPM6***
      # - #
      1    7      1.07      1.07      1.07      1.04      1.04      1.04
END GQ-ADTHETA
```

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<thet-adsdes>	ADPM(1,3)	F10.0	1.07	1.0	2.0	none	Both
	ADPM(2,3)	F10.0	1.07	1.0	2.0	none	Both
	ADPM(3,3)	F10.0	1.07	1.0	2.0	none	Both
	ADPM(4,3)	F10.0	1.07	1.0	2.0	none	Both
	ADPM(5,3)	F10.0	1.07	1.0	2.0	none	Both
	ADPM(6,3)	F10.0	1.07	1.0	2.0	none	Both

Explanation

ADPM(1,3) through ADPM(6,3) are temperature correction coefficients for adsorption/desorption on: 1-suspended sand, 2-suspended silt, 3-suspended clay, 4-bed sand, 5-bed silt, 6-bed clay.

## 4.4(3).7.17 Table-type GQ-SEDCONC -- Initial concentrations on sediment

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
GQ-SEDCONC
<-range><-----sedconc----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END GQ-SEDCONC
```

```
*****
Example
*****
```

```
GQ-SEDCONC
  RCHRES      SQAL1      SQAL2      SQAL3      SQAL4      SQAL5      SQAL6***
  # - #
  1   7        1.3        8.4        8.9        1.9        8.4        9.2
END GQ-SEDCONC
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<sedconc>	SQAL(1-6)	F10.0	0.0	0.0	none	concu/mg	Both

## Explanation

SQAL(1) through SQAL(6) are initial concentrations of qual on: 1-suspended sand, 2-suspended silt, 3-suspended clay, 4-bed sand, 5-bed silt, 6-bed clay.

## 4.4(3).7.18 Table-type GQ-VALUES -- Initial values for inputs which are constant

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

GQ-VALUES

&lt;-range&gt;&lt;--twat--&gt;&lt;-phval--&gt;&lt;---roc--&gt;&lt;---cld--&gt;&lt;---sdcnc--&gt;&lt;---phy---&gt;

. . . . .

(repeats until all operations of this type are covered)

. . . . .

END GQ-VALUES

\*\*\*\*\*

Example

\*\*\*\*\*

GQ-VALUES

RCHRES	TWAT	PHVAL	ROC	CLD	SDCNC	PHY***
# - #						***
1 7	22.	7.	.07	1.	11.	.007

END GQ-VALUES

\*\*\*\*\*

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<twat>	TWAT	F10.0	60. 15.5	32. 0.1	212. 100.	deg F deg C	Engl Metric
<phval>	PHVAL	F10.0	7.0	1.0	14.	none	Both
<roc>	ROC	F10.0	0.0	0.0	none	mole/l	Both
<cld>	CLD	F10.0	0.0	0.0	10.	tenths	Both
<sdcnc>	SDCNC	F10.0	0.0	0.0	none	mg/l	Both
<phy>	PHY	F10.0	0.0	0.0	none	mg/l	Both

## Explanation

In Table-type GQ-GENDATA, values for data source flags are specified. If any of the flags are assigned a value of 2, a single constant value for that data type must be provided in this table. For example, if ROXFG=2 a value for free radical oxygen concentration (ROC) must be supplied in columns 31-40 of this table.

TWAT - water temperature  
PHVAL - pH  
ROC - free radical oxygen concentration  
CLD - cloud cover  
SDCNC - total suspended sediment concentration  
PHY - phytoplankton concentration (as biomass)

## 4.4(3).7.19 Table-type MON-WATEMP -- Monthly values of water temperature

```
*****
      1      2      3      4      5      6      7      8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
MON-WATEMP
```

```
<-range><-----12-values----->
```

```
. . . . .
```

```
(repeats until all operations of this type are covered)
```

```
. . . . .
```

```
END MON-WATEMP
```

```
*****
```

```
Example
```

```
*****
```

```
MON-WATEMP
```

```
  RCHRES   T1    T2    T3    T4    T5    T6    T7    T8    T9    T10   T11   T12***
```

```
  # - #
```

```
  1    7   34   37   39   42   55   59   64   62   58   54   46   38
```

```
END MON-WATEMP
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<12-values>	TEMPM(1-12)	F5.0	60. 15.5	32. 0.1	212. 100.	degF degC	Engl Metric

## Explanation

In Table-type GQ-GENDATA, values for data source flags are specified. If TEMPPFG is assigned a value of 3, 12 monthly values for water temperature must be supplied in this table.

Note: The input monthly values apply to the first day of the month, and values for intermediate days are obtained by interpolating between successive monthly values.



## 4.4(3).7.20 Table-type MON-PHVAL -- Monthly values of pH

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
MON-PHVAL
<-range><-----12-values----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END MON-PHVAL
```

```
*****
Example
*****
```

```
MON-PHVAL
  RCHRES  PH1  PH2  PH3  PH4  PH5  PH6  PH7  PH8  PH9  PH10 PH11 PH12***
# - #
  1    7  6.8  6.8  6.4  6.1  5.9  5.6  5.6  5.9  6.1  6.4  6.8  6.8
END MON-PHVAL
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<12-values>	PHVALM(1-12)	F5.0	7.0	1.0	14.0	none	Both

## Explanation

In Table-type GQ-GENDATA, values for data source flags are specified. If PHFLAG is assigned a value of 3, 12 monthly values for pH must be supplied in this table.

Note: The input monthly values apply to the first day of the month, and values for intermediate days are obtained by interpolating between successive monthly values.

## 4.4(3).7.21 Table-type MON-ROXYGEN -- Monthly values of free radical oxygen

```
*****
      1         2         3         4         5         6         7         8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
MON-ROXYGEN
<-range><-----12-values----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END MON-ROXYGEN
```

```
*****
Example
*****
```

```
MON-ROXYGEN
  RCHRES  OX1  OX2  OX3  OX4  OX5  OX6  OX7  OX8  OX9  OX10 OX11 OX12***
  # - #
  1   7  .09  .09  .10  .11  .12  .12  .12  .12  .12  .10  .09  .09
END MON-ROXYGEN
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<12-values>	ROCM(1-12)	F5.0	0.0	0.0	none	mole/l	Both

## Explanation

In Table-type GQ-GENDATA, values for data source flags are specified. If ROXFG is assigned a value of 3, 12 monthly values for free radical oxygen concentration must be supplied in this table.

Note: The input monthly values apply to the first day of the month, and values for intermediate days are obtained by interpolating between successive monthly values.

## 4.4(3).7.22 Table-type GQ-ALPHA -- Values of base absorbance coefficient

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
GQ-ALPHA
<-range><-----first-7----->
<-range><-----second-7----->
<-range><-----last-4----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END GQ-ALPHA
```

```
*****
Example
*****
```

```
GQ-ALPHA
RCHRES***
# - #***      K1         K2         K3         K4         K5         K6         K7
# - #***      K8         K9         K10        K11        K12        K13        K14
# - #***      K15        K16        K17        K18
1   7         .008       .009       .010       .011       .011       .011       .012
1   7         .013       .015       .016       .017       .018       .019       .020
1   7         .021       .022       .024       .024
END GQ-ALPHA
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<first-7>	ALPH(1-7)	F10.0	none	.00001	none	/cm	Both
<second-7>	ALPH(8-14)	F10.0	none	.00001	none	/cm	Both
<last-4>	ALPH(15-18)	F10.0	none	.00001	none	/cm	Both

## Explanation

ALPH(1) through ALPH(18) are base absorption coefficients for 18 wavelengths of light passing through clear water.

This table is necessary only when a qual undergoes photolysis; i.e., when any QALFG(3)=1 in Table-type GQ-QALFG.

When an entry has to be continued onto more than 1 line:

1. No blank or comment lines may be put between any of the lines for a continued entry. Put all comments ahead of the entry. (See above example).
2. The <range> specification must be repeated for each line onto which the entry is continued.

## 4.4(3).7.23 Table-type GQ-GAMMA -- Values of sediment absorbance coefficient

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
GQ-GAMMA
<-range><-----first-7----->
<-range><-----second-7----->
<-range><-----last-4----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END GQ-GAMMA
```

```
*****
Example
*****
```

```
GQ-GAMMA
RCHRES***
# - #***      K1         K2         K3         K4         K5         K6         K7
# - #***      K8         K9         K10        K11        K12        K13        K14
# - #***      K15        K16        K17        K18
1   4         .001       .001       .001       .001       .001       .001       .001
1   4         .001       .002       .002       .002       .002       .002       .002
1   4         .002       .002       .002       .002
END GQ-GAMMA
```

```
*****
Details
```

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<first-7>	GAMM(1-7)	F10.0	0.0	0.0	none	l/mg.cm	Both
<second-7>	GAMM(8-14)	F10.0	0.0	0.0	none	l/mg.cm	Both
<last-4>	GAMM(15-18)	F10.0	0.0	0.0	none	l/mg.cm	Both

## Explanation

GAMM(1) through GAMM(18) are increments to the base absorbance coefficient (Table-type GQ-ALPHA) for light passing through sediment-laden water.

This is table necessary only when a qual undergoes photolysis; i.e., when any QALFG(3)=1 in Table-type GQ-QALFG.

See rules for continuing an entry onto more than 1 line in Explanation for Table-type GQ-ALPHA.

#### 4.4(3).7.24 Table-type GQ-DELTA -- Values of phytoplankton absorbance coefficient

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
GQ-DELTA
<-range><-----first-7----->
<-range><-----second-7----->
<-range><-----last-4----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END GQ-DELTA
```

```
*****
Example
*****
```

```
GQ-DELTA
RCHRES***
# - #***      K1        K2        K3        K4        K5        K6        K7
# - #***      K8        K9        K10       K11       K12       K13       K14
# - #***      K15       K16       K17       K18
1   4         .0007     .0007     .0007     .0007     .0007     .0007     .0007
1   4         .0007     .0007     .0007     .0007     .0007     .0007     .0007
1   4         .0007     .0007     .0007     .0007
END GQ-DELTA
```

```
*****
Details
```

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<first-7>	DEL(1-7)	F10.0	0.0	0.0	none	l/mg.cm	Both
<second-7>	DEL(8-14)	F10.0	0.0	0.0	none	l/mg.cm	Both
<last-4>	DEL(15-18)	F10.0	0.0	0.0	none	l/mg.cm	Both

#### Explanation

DEL(1) through DEL(18) are increments to the base absorption coefficient (Table-type GQ-ALPHA) for light passing through plankton-laden water.

This table is necessary only when a qual undergoes photolysis; i.e., when any QALFG(3)=1 in Table-type GQ-QALFG.

See rules for continuing an entry onto more than 1 line in Explanation for Table-type GQ-ALPHA.

## 4.4(3).7.25 Table-type GQ-CLDFACT -- Light extinction efficiency of cloud cover

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
GQ-CLDFACT
<-range><-----first-7----->
<-range><-----second-7----->
<-range><-----last-4----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END GQ-CLDFACT
```

```
*****
Example
*****
```

```
GQ-CLDFACT
RCHRES***
# - #***      F1         F2         F3         F4         F5         F6         F7
# - #***      F8         F9         F10        F11        F12        F13        F14
# - #***      F15        F16        F17        F18
1   4          .10        .10        .10        .15        .15        .15        .15
1   4          .17        .17        .17        .17        .18        .19        .20
1   4          .21        .21        .21        .21
END GQ-CLDFACT
```

```
*****
Details
```

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<first-7>	KCLD(1-7)	F10.0	0.0	0.0	1.0	none	Both
<second-7>	KCLD(8-14)	F10.0	0.0	0.0	1.0	none	Both
<last-4>	KCLD(15-18)	F10.0	0.0	0.0	1.0	none	Both

## Explanation

KCLD(1) through KCLD(18) are values of light extinction efficiency of cloud cover for each of 18 wavelengths.

This table is necessary only when a qual undergoes photolysis; i.e., when any QALFG(3)=1 in Table-type GQ-QALFG.

See rules for continuing an entry onto more than 1 line in Explanation for Table-type GQ-ALPHA.

## 4.4(3).7.26 Table-type MON-CLOUD -- Monthly values of cloud cover

```
*****
      1         2         3         4         5         6         7         8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
MON-CLOUD
```

```
<-range><-----12-values----->
```

```
. . . . .
(repeats until all operations of this type are covered)
```

```
. . . . .
```

```
END MON-CLOUD
```

```
*****
```

```
Example
```

```
*****
```

```
MON-CLOUD
```

```
  RCHRES   C1    C2    C3    C4    C5    C6    C7    C8    C9    C10   C11   C12***
# - #
  1    7    3    3    4    3    2    1    1    1    0    1    1    2
END MON-CLOUD
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<12-values>	CLDM(1-12)	F5.0	0.0	0.0	10.0	tenths	Both

## Explanation

CLDM(1) through CLDM(12) are monthly values of average cloud cover. This table must be included in the UCI only if CLDFG=3 in Table-type GQ-GENDATA.

Note: The input monthly values apply to the first day of the month, and values for intermediate days are obtained by interpolating between successive monthly values.



## 4.4(3).7.27 Table-type MON-SEDCONC -- Monthly values of sediment concentration

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
MON-SEDCONC
```

```
<-range><-----12-values----->
```

```
. . . . .
(repeats until all operations of this type are covered)
```

```
. . . . .
```

```
END MON-SEDCONC
```

```
*****
```

```
Example
```

```
*****
```

```
MON-SEDCONC
```

```
  RCHRES  SC1  SC2  SC3  SC4  SC5  SC6  SC7  SC8  SC9  SC10 SC11 SC12***
# - #
  1    7    2.   4.  10. 120.  75.  10.   8.   8.   6.   6.   4.   4.
```

```
END MON-SEDCONC
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<12-values>	SDCNM(1-12)	F5.0	0.0	0.0	none	mg/l	Both

## Explanation

SDCNM(1) through SDCNM(12) are monthly average suspended sediment concentration values. This table must be included in the UCI only if SDFG=3 in Table-type GQ-GENDATA.

Note: The input monthly values apply to the first day of the month, and values for intermediate days are obtained by interpolating between successive monthly values.

#### 4.4(3).7.28 Table-type MON-PHYTO -- Monthly values of phytoplankton concentration

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

MON-PHYTO

<-range><-----12-values----->

. . . . .  
(repeats until all operations of this type are covered)

. . . . .  
END MON-PHYTO

\*\*\*\*\*

Example

\*\*\*\*\*

MON-PHYTO

```
      RCHRES   P1    P2    P3    P4    P5    P6    P7    P8    P9   P10   P11   P12***
      # - #
      1    7   .01   .03   .03   .03   .04   .11   .33   .47   .31   .17   .15   .06
END MON-PHYTO
```

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<12-values>	PHYM(1-12)	F5.0	0.0	0.0	none	mg/l	Both

Explanation

PHYM(1) through PHYM(12) are monthly values of phytoplankton concentration. This table must be included in the UCI only if PHYTFG=3 in Table-type GQ-GENDATA.

Note: The input monthly values apply to the first day of the month, and values for intermediate days are obtained by interpolating between successive monthly values.

## 4.4(3).7.29 Table-type GQ-DAUGHTER -- Relationship between parent and daughter quals

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

GQ-DAUGHTER

&lt;-range&gt;&lt;--zero--&gt;&lt;2-from-1&gt;&lt;3-from-1&gt;

&lt;-range&gt;&lt;--zero--&gt;&lt;--zero--&gt;&lt;3-from-2&gt;

&lt;-range&gt;&lt;--zero--&gt;&lt;--zero--&gt;&lt;--zero--&gt;

. . . . .

(repeats until all operations of this type are covered)

. . . . .

END GQ-DAUGHTER

\*\*\*\*\*

Example

\*\*\*\*\*

GQ-DAUGHTER

RCHRES

\*\*\*

# - # ZERO 2F1 3F1\*\*\*

# - # ZERO ZERO 3F2\*\*\*

# - # ZERO ZERO ZERO\*\*\*

1 7 0.0 .36 .02

1 7 0.0 0.0 1.24

1 7 0.0 0.0 0.0

END GQ-DAUGHTER

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<zero>	0.0						
<2-from-1>	C(2,1)	F10.0	0.0	0.0	none	none	Both
<3-from-1>	C(3,1)	F10.0	0.0	0.0	none	none	Both
<3-from-2>	C(3,2)	F10.0	0.0	0.0	none	none	Both

Explanation

This table-type specifies the relationship between parent and daughter compounds. For example, variable C(2,1) indicates the amount of qual #2 which is produced by decay of qual #1 through one of the decay processes. The table must be repeated in sequence for each decay process that produces daughter quals from decay of parent quals. The proper sequence is: 1-hydrolysis, 2-oxidation by free radical oxygen, 3-photolysis, 4-(reserved for future use), 5-biodegradation, 6-general first order decay. For example, if biodegradation is the only process of interest, five of these tables must be included in the UCI file, and the fifth one should contain nonzero values.

4.4(3).8 RCHRES-BLOCK -- Input for RQUAL sections

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

```
[Table-type BENTH-FLAG]
[Table-type SCOUR-PARMS]
  Section OXR input
[Section NUTRX input]  if NUTRX is active
[Section PLANK input]  if PLANK is active
[Section PHCARB input] if PHCARB is active
```

\*\*\*\*\*

Explanation

The exact format of each of the tables above is detailed in the documentation which follows. Tables in brackets [] need not always be supplied; for example, because all of the inputs have default values.

## 4.4(3).8.01 Table-type BENTH-FLAG -- Benthic release flag

```

*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****

```

Layout

\*\*\*\*\*

BENTH-FLAG

<-range><ben>

. . . . .

(repeats until all operations of this type are covered)

. . . . .

END BENTH-FLAG

\*\*\*\*\*

Example

\*\*\*\*\*

BENTH-FLAG

RCHRES BENF\*\*\*

# - # \*\*\*

1 7

END BENTH-FLAG

\*\*\*\*\*

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<ben>	BENRFG	I5	0	0	1	none	Both

## Explanation

If BENRFG is 1, benthic influences are considered in the following sections.

## 4.4(3).8.02 Table-type SCOUR-PARMS -- Benthic scour parameters

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
SCOUR-PARMS
<-range><----scour-params---->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END SCOUR-PARMS
```

```
*****
Example
*****
```

```
SCOUR-PARMS
  RCHRES    SCRVEL    SCRML***
  # - #      ft/sec      ***
  1   7      15.        3.
END SCOUR-PARMS
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<scour-params>	SCRVEL	F10.0	10.	.01	none	ft/sec	Engl
			3.05	.01	none	m/sec	Metric
	SCRML	F10.0	2.0	1.0	none	none	Both

## Explanation

SCRVEL is the threshold velocity above which the effect of scouring on benthic release rates is considered.

SCRML is the multiplier by which benthic releases are increased during scouring.

4.4(3).8.1 RCHRES-BLOCK -- Section OXRX input

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
+ [Table-type OX-FLAGS]
  Table-type OX-GENPARM
+ [Table-type ELEV]          if section HTRCH is not active
  [Table-type OX-BENPARM]    if BENRFG=1 (Table-type BENTH-FLAG)
+ [Table-type OX-CFOREA]     if LKFG=1 (Table-type GEN-INFO)

                                --- if
+ [Table-type OX-TSIVOGLOU]  | REAMFG=1
+ Table-type OX-LEN-DELTH    | (Tsivoglou)   if
                                ---         LKFG=0
+ [Table-type OX-TCGINV]     if REAMFG=2 (Owen/Churchill,etc.)
+ Table-type OX-REAPARM      if REAMFG=3
                                ---

[Table-type OX-INIT]
```

\*\*\*\*\*

Note: If any of the tables marked "+" above were supplied in your input for Section GQUAL, they must not be repeated here (these are the tables used to calculate the oxygen reaeration coefficient, which, under certain conditions, is also needed in Section GQUAL).

Explanation

The conditions under which data from the various tables are needed are indicated above. REAMFG is the reaeration method flag, defined in Table-type OX-FLAGS below.

The exact format of each of the tables above is detailed in the documentation which follows. Tables in brackets [] need not always be supplied; for example, because all of the inputs have default values.

4.4(3).8.1.1 Table-type OX-FLAGS -- Oxygen flags

\*\*\*\*\*  
1 2 3 4 5 6 7 8  
123456789012345678901234567890123456789012345678901234567890  
\*\*\*\*\*  
Layout  
\*\*\*\*\*

OX-FLAGS  
<-range><oxf>  
. . . . .  
(repeats until all operations of this type are covered)  
. . . . .  
END OX-FLAGS

\*\*\*\*\*  
Example  
\*\*\*\*\*

OX-FLAGS  
RCHRES REAM \*\*\*  
# - # \*\*\*  
1 7 2  
END OX-FLAGS

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<oxf>	REAMFG	I5	2	1	3	none	Both

Explanation

REAMFG indicates the method used to calculate the reaeration coefficient for free-flowing streams.

- 1 Tsivoglou method is used.
- 2 Owens, Churchill, or O'Connor-Dobbins method is used depending on velocity and depth of water.
- 3 Coefficient is calculated as a power function of velocity and/or depth; user inputs exponents for velocity and depth and an empirical constant (REAK).



## 4.4(3).8.1.2 Table-type OX-GENPARM -- General oxygen parameters

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
OX-GENPARM
<-range><-----ox-genparm----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END OX-GENPARM
```

```
*****
Example
*****
```

```
OX-GENPARM
  RCHRES      KBOD20      TCBOD      KODSET      SUPSAT***
  # - #        /hr        ft/hr        ***
  1   7        0.1        1.06        8.0        1.2
END OX-GENPARM
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<ox-genparm>	KBOD20	F10.0	none	1.0E-30	none	/hr	Both
	TCBOD	F10.0	1.075	1.0	2.0	none	Both
	KODSET	F10.0	0.0	0.0	none	ft/hr	Engl
			0.0	0.0	none	m/hr	Metric
	SUPSAT	F10.0	1.15	1.0	2.0	none	Both

## Explanation

KBOD20 is the unit BOD decay rate @ 20 degrees C.  
 TCBOD is the temperature correction coefficient for BOD decay.  
 KODSET is the rate of BOD settling.  
 SUPSAT is the maximum allowable dissolved oxygen supersaturation (expressed as a multiple of the dissolved oxygen saturation concentration).

4.4(3).8.1.3 Table-type ELEV -- RCHRES elevation above sea level

```
*****
      1      2      3      4      5      6      7      8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
      ELEV
      <-range><--elev-->
      . . . . .
      (repeats until all operations of this type are covered)
      . . . . .
      END ELEV
```

```
*****
Example
*****
```

```
      ELEV
      RCHRES      ELEV***
      # - #      ft***
      1      7      2100.
      END ELEV
```

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<elev>	ELEV	F10.0	0.0	0.0	30000	ft	Engl
			0.0	0.0	10000	m	Metric

Explanation

ELEV is the mean RCHRES elevation above sea level.

## 4.4(3).8.1.4 Table-type OX-BENPARM -- Oxygen benthic parameters

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
OX-BENPARM
```

```
<-range><-----ox-benparm----->
```

```
. . . . .
(repeats until all operations of this type are covered)
```

```
. . . . .
END OX-BENPARM
```

## Example

```
*****
```

```
OX-BENPARM
```

```
      RCHRES      BENOD      TCBEN      EXPOD      BRBOD(1)  BRBOD(2)      EXPREL  ***
      # - #      mg/m2.hr                        mg/m2.hr  mg/m2.hr      ***
      1      7      1.0
END OX-BENPARM
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<ox-benparm>	BENOD	F10.0	0.0	0.0	none	mg/m2.hr	Both
	TCBEN	F10.0	1.074	1.0	2.0	none	Both
	EXPOD	F10.0	1.22	0.1	none	none	Both
	BRBOD(1)	F10.0	72.	.0001	none	mg/m2.hr	Both
	BRBOD(2)	F10.0	100.	.0001	none	mg/m2.hr	Both
	EXPREL	F10.0	2.82	0.1	none	none	Both

## Explanation

This table is used if BENRFG = 1 in Table-type BENTH-FLAG (see RQUAL section).

BENOD is the benthic oxygen demand at 20 degrees C (with unlimited DO concentration) (demand is, thus, proportional to the water temperature).?

TCBEN is the temperature correction coefficient for benthic oxygen demand.

EXPOD is the exponential factor in the dissolved oxygen term of the benthic oxygen demand equation.

BRBOD(1) is the benthic release rate of BOD under aerobic conditions, and BRBOD(2) is the increment to benthic release of BOD under anaerobic conditions.

EXPREL is the exponent in the DO term of the benthic BOD release equation.

4.4(3).8.1.5 Table-type OX-CFOREA -- Lake reaeration correction coefficient

\*\*\*\*\*  
1 2 3 4 5 6 7 8  
123456789012345678901234567890123456789012345678901234567890  
\*\*\*\*\*  
Layout  
\*\*\*\*\*

```
OX-CFOREA
<-range><-cforea->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END OX-CFOREA
```

\*\*\*\*\*  
Example  
\*\*\*\*\*

```
OX-CFOREA
RCHRES      CFOREA***
# - #      ***
1   7      0.8
END OX-CFOREA
```

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<cforea>	CFOREA	F10.0	1.0	.001	10.

Explanation

CFOREA is a correction factor in the lake reaeration equation; it accounts for good or poor circulation characteristics.

#### 4.4(3).8.1.6 Table-type OX-TSIVOGLOU -- Parameters for the Tsivoglou calculation of reaeration rate

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

```
OX-TSIVOGLOU
<-range><---ox-tsivoglou--->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END OX-TSIVOGLOU
```

\*\*\*\*\*

Example

\*\*\*\*\*

```
OX-TSIVOGLOU
  RCHRES      REAKT      TCGINV***
  # - #        /ft        ***
  1   7        .07        1.1
END OX-TSIVOGLOU
```

\*\*\*\*\*

#### Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<ox-tsivoglou>	REAKT	F10.0	0.08	0.001	1.0	/ft	Both
	TCGINV	F10.0	1.047	1.0	2.0	none	Both

#### Explanation

This table is required if REAMFG is 1.

REAKT is the empirical constant in Tsivoglou's equation for reaeration (escape coefficient).

TCGINV is the temperature correction coefficient for surface gas invasion.

4.4(3).8.1.7 Table-type OX-LEN-DELTH -- Length and water elevation drop of reach

\*\*\*\*\*  
1 2 3 4 5 6 7 8  
1234567890123456789012345678901234567890123456789012345678901234567890  
\*\*\*\*\*  
Layout  
\*\*\*\*\*

OX-LEN-DELTH  
<-range><---ox-len-delth--->  
. . . . .  
(repeats until all operations of this type are covered)  
. . . . .  
END OX-LEN-DELTH

\*\*\*\*\*  
Example  
\*\*\*\*\*

OX-LEN-DELTH  
RCHRES        LEN        DELTH\*\*\*  
# - #        miles        ft\*\*\*  
1    7        10.        200.  
END OX-LEN-DELTH

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<ox-len-delth>	LEN	F10.0	none	.01	none	miles	Engl
			none	.01	none	km	Metric
	DELTH	F10.0	none	0.00001	none	ft	Engl
			none	0.00001	none	m	Metric

Explanation

This table is only relevant if HYDR is inactive and REAMFG = 1.

LEN is the length of the RCHRES.

DELTH is the (energy) drop of the RCHRES over its length.

4.4(3).8.1.8 Table-type OX-TCGINV -- Owen/Churchill/O'Connor-Dobbins data  
(temperature correction coefficient)

\*\*\*\*\*  
1 2 3 4 5 6 7 8  
1234567890123456789012345678901234567890123456789012345678901234567890  
\*\*\*\*\*

Layout  
\*\*\*\*\*

```
OX-TCGINV
<-range><-tcginv->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END OX-TCGINV
```

\*\*\*\*\*  
Example  
\*\*\*\*\*

```
OX-TCGINV
RCHRES      TCGINV***
# - #      ***
1   7      1.07
END OX-TCGINV
```

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<tcginv>	TCGINV	F10.0	1.047	1.0	2.0

Explanation

This table is used when REAMFG = 2.

TCGINV is the temperature correction coefficient for surface gas invasion.

4.4(3).8.1.9 Table-type OX-REAPARM -- Parameters for user-supplied reaeration formula

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
OX-REAPARM
<-range><-----ox-reaparm----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END OX-REAPARM
```

```
*****
Example
*****
```

```
OX-REAPARM
  RCHRES      TCGINV      REAK      EXPRED      EXPREV***
  # - #              /hr              ***
  1   7          1.08          1.0          -2.0          0.7
END OX-REAPARM
```

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<ox-reaparm>	TCGINV	F10.0	1.047	1.0	2.0	none	Both
	REAK	F10.0	none	1.0E-30	none	/hr	Both
	EXPRED	F10.0	0.0	none	0.0	none	Both
	EXPREV	F10.0	0.0	0.0	none	none	Both

Explanation

This table is used when REAMFG = 3.

TCGINV - See explanation for Table-type OX-TSIVOGLOU.

REAK is the empirical constant in the equation used to calculate the reaeration coefficient.

EXPRED is the exponent to depth and EXPREV is the exponent to velocity in the reaeration coefficient equation.



4.4(3).8.1.10 Table-type OX-INIT -- Initial concentrations for the OXRX section

```
*****
      1         2         3         4         5         6         7         8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
OX-INIT
<-range><-----ox-init----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END OX-INIT
```

```
*****
Example
*****
```

```
OX-INIT
  RCHRES      DOX      BOD      SATDO***
  # - #      mg/l      mg/l      mg/l***
  1   7      26.      17.2      43.
END OX-INIT
```

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<ox-init>	DOX	F10.0	0.0	0.0	20.0	mg/l	Both
	BOD	F10.0	0.0	0.0	none	mg/l	Both
	SATDO	F10.0	10.0	0.1	20.0	mg/l	Both

Explanation

DOX is the initial dissolved oxygen.  
 BOD is the initial biochemical oxygen demand.  
 SATDO is the initial dissolved oxygen saturation concentration.

4.4(3).8.2 RCHRES-BLOCK -- Section NUTRX input

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
[Table-type NUT-FLAGS]
[Table-type NUT-AD-FLAGS]
[Table-type CONV-VAL1]
[Table-type NUT-BENPARM]  if BENRFG=1 in Table-type BENTH-FLAG
  Table-type NUT-NITDENIT
[Table-type NUT-NH3VOLAT] if NH3 volatilization is simulated
                        (TAMFG=1 and AMVFG=1 in Table-type NUT-FLAGS)
[Table-type MON-PHVAL]   if NH3 is simulated and monthly values of pH are being
                        input (TAMFG=1 and PHFLAG=3 in Table-type NUT-FLAGS)
                        see section GQUAL for documentation
                        ---
[Table-type NUT-BEDCONC]   |      if NH3 or PO4 adsorption is simulated
[Table-type NUT-ADSPARM]   |--- ((TAMFG=1 and ADNHF=1) or
[Table-type NUT-ADSINIT]   |      (PO4FG=1 and ADPOFG=1) in Table-type NUT-FLAGS)
                        ---
[Table-type NUT-DINIT]
*****
```

Explanation

The exact format of each of the tables above is detailed in the documentation which follows. Tables in brackets [] need not always be supplied; for example, because all of the inputs have default values.

BENRFG indicates whether or not benthal influences are considered. TAMFG indicates whether or not ammonia is simulated, and ADNHF indicates whether ammonia adsorption is considered. PO4FG indicates whether or not ortho-phosphorus is simulated, and ADPOFG indicates whether PO4 adsorption is considered.

## 4.4(3).8.2.1 Table-type NUT-FLAGS -- Nutrient flags

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
NUT-FLAGS
<-range><-----nut-flags----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END NUT-FLAGS
```

```
*****
Example
*****
```

```
NUT-FLAGS
  RCHRES  TAM  NO2  PO4  AMV  DEN  ADNH  ADPO  PHFL  ***
  # - #
  1   7   1           1
END NUT-FLAGS
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<nut-flags>	TAMFG,NO2FG, PO4FG,AMVFG, DENFG,ADNHFG, ADPOFG	7I5	0	0	1
	PHFLG	I5	2	1	3

## Explanation

TAMFG - If on, total ammonia is simulated.  
 NO2FG - If on, nitrite is simulated.  
 PO4FG - If on, ortho-phosphorus is simulated.  
 AMVFG - If on, ammonia volatilization is enabled.  
 DENFG - If on, denitrification is enabled.  
 ADNHFG - If on, NH<sub>4</sub> adsorption is simulated.  
 ADPOFG - If on, PO<sub>4</sub> adsorption is simulated.  
 PHFLAG - Source of pH data (1=time series, 2=constant, 3=monthly values).

## 4.4(3).8.2.2 Table-type NUT-AD-FLAGS -- Atmospheric deposition flags for nutrients

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
NUT-AD-FLAGS
<-range> <f><c> <f><c> <f><c>
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END NUT-AD-FLAGS
```

```
*****
Example
*****
```

```
NUT-AD-FLAGS
  RCHRES Atmospheric deposition flags ***
    ***      NO3      NH3      PO4
    #*** # <F><C> <F><C> <F><C>
    1      7  -1 10  -1 -1  11 12
  END NUT-AD-FLAGS
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<f><c>	NUADFG(*)	(1X,2I3)	0	-1	none

## Explanation

NUADFG is an array of flags indicating the source of atmospheric deposition data. Each nutrient has two flags. The first is for dry or total deposition flux, and the second is for wet deposition concentration. The flag values indicate:

- 0 No deposition of this type is simulated
- 1 Deposition of this type is input as time series NUADFX or NUADCN
- >0 Deposition of this type is input in the MONTH-DATA table with the corresponding table ID number.

## 4.4(3).8.2.3 Table-type CONV-VAL1 -- Conversion factors for nutrients

```

*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****

```

```

CONV-VAL1
<-range><-----conv-val1----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END CONV-VAL1

```

```

*****
Example
*****

```

```

CONV-VAL1
  RCHRES      CVBO      CVBPC      CVBPN      BPCNTC***
  # - #      mg/mg    mols/mol  mols/mol
  1   7      4.0      67.      33.      77.
END CONV-VAL1

```

```

*****

```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<conv-val1>	CVBO	F10.0	1.98	1.0	5.0	mg/mg	Both
	CVBPC	F10.0	106.	50.	200.	mols/mol	Both
	CVBPN	F10.0	16.	10.	50.	mols/mol	Both
	BPCNTC	F10.0	49.	10.	100.	none	Both

## Explanation

CVBO - Conversion from milligrams biomass to milligrams oxygen.  
 CVBPC - Conversion from biomass expressed as phosphorus to carbon.  
 CVBPN - Conversion from biomass expressed as phosphorus to nitrogen.  
 BPCNTC - Percentage of biomass which is carbon (by weight).

## 4.4(3).8.2.4 Table-type NUT-BENPARM -- Nutrient benthic parameters

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
NUT-BENPARM
<-range><-----nut-benparm----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END NUT-BENPARM
```

```
*****
Example
*****
```

```
NUT-BENPARM
  RCHRES  BRTAM(1)  BRTAM(2)  BRPO4(1)  BRPO4(2)  ANAER***
  # - #  mg/m2.hr  mg/m2.hr  mg/m2.hr  mg/m2.hr  mg/l***
  1   7    10.     20.     1.0      4.0      .001
END NUT-BENPARM
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<nut-benparm>	BRTAM(1)	5F10.0	0.0	0.0	none	mg/m2.hr	Both
	BRTAM(2)		0.0	0.0	none	mg/m2.hr	Both
	BRPO4(1)		0.0	0.0	none	mg/m2.hr	Both
	BRPO4(2)		0.0	0.0	none	mg/m2.hr	Both
	ANAER		.005	.0001	1.0	mg/l	Both

## Explanation

This table is used if BENRFG = 1 in Table-type BENTH-FLAG (see RQUAL section).

BRTAM(1) and BRTAM(2) are the benthic release rates of ammonia under aerobic and anaerobic conditions, respectively.

BRPO4(1) and BRPO4(2) are the benthic release rates of ortho-phosphorus. The subscripts are the same as BRTAM.

ANAER is the concentration of dissolved oxygen below which anaerobic conditions are assumed to exist.

## 4.4(3).8.2.5 Table-type NUT-NITDENIT -- Nitrification and denitrification parameters.

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

NUT-NITDENIT

<-range><-----nut-nitdenit----->

. . . . .  
(repeats until all operations of this type are covered)

. . . . .  
END NUT-NITDENIT

## Example

\*\*\*\*\*

NUT-NITDENIT

```
      RCHRES      KTAM20      KNO220      TCNIT      KNO320      TCDEN      DENOXT ***
      # - #          /hr          /hr          /hr          /hr          mg/l ***
      1   7          .05          .05          1.1          .05          1.08          4.0
END NUT-NITDENIT
```

\*\*\*\*\*

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units
<nut-nitdenit>	KTAM20	6F10.0	none	0.001	none	/hr
	KNO220		none	0.001	none	/hr
	TCNIT		1.07	1.0	2.0	
	KNO320		none	0.001	none	/hr
	TCDEN		1.07	1.0	2.0	
	DENOXT		2.00	0.0	none	mg/l

## Explanation

KTAM20 and KNO220 are the nitrification rates of ammonia and nitrite, respectively, at 20 degrees C.

KNO320 is the nitrate denitrification rate at 20 degrees C.

TCNIT and TCDEN are the temperature correction coefficients for nitrification and denitrification, respectively.

DENOXT is the dissolved oxygen concentration threshold for denitrification.

## 4.4(3).8.2.6 Table-type NUT-NH3VOLAT -- Ammonia volatilization parameters

```

*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****

```

```

NUT-NH3VOLAT
<-range><---nut-nh3volat--->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END NUT-NH3VOLAT

```

```

*****
Example
*****

```

```

NUT-NH3VOLAT
  RCHRES      EXPNVG      EXPNVL ***
  # - #              ***
  5   6          0.6      0.8
END NUT-NH3VOLAT

```

```

*****

```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<nut-nh3volat>	EXPNVG	F10.0	0.5	0.1	2.0	none	Both
	EXPNVL	F10.0	.6667	0.1	2.0	none	Both

## Explanation

EXPNVG is the exponent in the gas layer mass transfer coefficient equation for NH3 volatilization.

EXPNVL is the exponent in the liquid layer mass transfer coefficient equation for NH3 volatilization.



4.4(3).8.2.7 Table-type NUT-BEDCONC -- Bed concentrations of adsorbed NH3 and PO4

```
*****
      1      2      3      4      5      6      7      8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
NUT-BEDCONC
<-range><-----nut-bedconc----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END NUT-BEDCONC
```

```
*****
Example
*****
```

```
NUT-BEDCONC
  RCHRES      Bed concentrations of NH4 & PO4 (mg/kg)      ***
  # - #  NH4-sand  NH4-silt  NH4-clay  PO4-sand  PO4-silt  PO4-clay ***
  2   3    0.01    0.02    0.03    0.10    0.20    0.30
END NUT-BEDCONC
```

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units
<nut-bedconc>	BNH4(3)	3F10.0	0.0	0.0	none	mg/kg
	BPO4(3)	3F10.0	0.0	0.0	none	mg/kg

Explanation

BNH4(1-3) are the constant bed concentrations of ammonia-N adsorbed to sand, silt, and clay.

BPO4(1-3) are the constant bed concentrations of ortho-phosphorus-P adsorbed to sand, silt, and clay.

## 4.4(3).8.2.8 Table-type NUT-ADSPARM -- Adsorption coefficients for ammonia and ortho-phosphorus

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
NUT-ADSPARM
<-range><-----nut-adsparm----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END NUT-ADSPARM
```

```
*****
Example
*****
```

```
NUT-ADSPARM
  RCHRES      Partition coefficients for NH4 AND PO4 (cm3/g)      ***
  # - # NH4-sand NH4-silt NH4-clay PO4-sand PO4-silt PO4-clay ***
  2   3   0.10   0.30   0.50   0.10   0.50   0.80
END NUT-ADSPARM
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units
<nut-adsparm>	ADNHPM(3)	3F10.0	1.E-10	1.E-10	none	cm3/g
	ADPOPM(3)	3F10.0	1.E-10	1.E-10	none	cm3/g

## Explanation

ADNHPM(1-3) are the adsorption coefficients (Kd) for ammonia-N adsorbed to sand, silt, and clay.

ADPOPM(1-3) are the adsorption coefficients for ortho-phosphorus-P adsorbed to sand, silt, and clay.

## 4.4(3).8.2.9 Table-type NUT-DINIT -- Initial concentrations of dissolved nutrients

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
NUT-DINIT
<-range><-----nut-dinit----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END NUT-DINIT
```

```
*****
Example
*****
```

```
NUT-DINIT
RCHRES      NO3      TAM      NO2      PO4      PHVAL      ***
# - #      mg/l      mg/l      mg/l      mg/l      ph units      ***
1   3      1.0      0.3      0.01     0.02      7.
END NUT-DINIT
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units
<nut-dinit>	NO3	5F10.0	0.0	0.0	none	mg/l
	TAM		0.0	0.0	none	mg/l
	NO2		0.0	0.0	none	mg/l
	PO4		0.0	0.0	none	mg/l
	PHVAL		7.0	0.0	14.0	pH units

## Explanation

NO3, TAM, and NO2 are the initial concentrations of nitrate, total ammonia, and nitrite (as N).

PO4 is the initial concentration of ortho-phosphorus (as P).

PHVAL is the constant pH value if PHFLG=2, and the initial value of pH if PHFLG=1 or 3.

4.4(3).8.2.10 Table-type NUT-ADSINIT -- Initial concentrations of NH3 and PO4 adsorbed to suspended sediment

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
NUT-ADSINIT
<-range><-----nut-adsinit----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END NUT-ADSINIT
```

```
*****
Example
*****
```

```
NUT-ADSINIT
  RCHRES      Initial suspended NH4 and PO4 concentrations (mg/kg) ***
  # - #  NH4-sand  NH4-silt  NH4-clay  PO4-sand  PO4-silt  PO4-clay ***
  2   3    0.10    0.30    0.50    0.10    0.50    0.80
END NUT-ADSINIT
```

```
*****
```

#### Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units
<nut-adsinit>	SNH4(3)	3F10.0	0.0	0.0	none	mg/kg
	SPO4(3)	3F10.0	0.0	0.0	none	mg/kg

#### Explanation

SNH4(1-3) are the initial concentrations of ammonia-N adsorbed to sand, silt, and clay.

SPO4(1-3) are the initial concentrations of ortho-phosphorus-P adsorbed to sand, silt, and clay.

#### 4.4(3).8.3 RCHRES-BLOCK -- Section PLANK input

```

*****
          1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****

```

## Layout

\* \* \* \* \*

```

Table-type  PLNK-FLAGS
[Table-type  PLK-AD-FLAGS]
Table-type  SURF-EXPOSED      if section HTRCH is inactive
Table-type  PLNK-PARM1
[Table-type  PLNK-PARM2]
[Table-type  PLNK-PARM3]

```

Table-type PHYTO-PARM

Table-type ZOO-PARM1

[Table-type ZOO-PARM2]

```

---
|  if
|  ZOOFG=1

```

```

-----
|
|  if
|  PHYFG=1
|

```

[Table-type BENAL-PARM] if BALFG=1

[Table-type PLNK-INIT]

\*\*\*\*\*

Explanation

The exact format of each of the tables above is detailed in the documentation which follows. Tables in brackets [] need not always be supplied; for example, because all of the inputs have default values.

PHYFG, ZOOFG and BALFG are flags which indicate whether or not phytoplankton, zooplankton, and benthic algae are being simulated. They are documented under Table-type PLNK-FLAGS below.

## 4.4(3).8.3.1 Table-type PLNK-FLAGS -- Plankton flags

```
*****
      1         2         3         4         5         6         7         8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

PLNK-FLAGS

<-range><-----plnk-flags----->

. . . . .

(repeats until all operations of this type are covered)

. . . . .

END PLNK-FLAGS

\*\*\*\*\*

Example

\*\*\*\*\*

PLNK-FLAGS

RCHRES PHYF ZOOF BALF SDLT AMRF DECF NSFG ZFOO \*\*\*

# - # \*\*\*

1 7 1 1 3

END PLNK-FLAGS

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<plnk-flags>	PHYFG,ZOOFG, BALFG,SDLTFG, AMRFG,DECFG, NSFG ZFOOD	7I5  I5	0  2	0  1	1  3

Explanation

The following, except for ZFOOD, are the conditions when the flag is on:

PHYFG - Phytoplankton are simulated.

ZOOFG - Zooplankton are simulated.

BALFG - Benthic algae are simulated.

SDLTFG - Influence of sediment washload on light extinction is simulated.

AMRFG - Ammonia retardation of nitrogen-limited growth is enabled.

DECFG - Linkage between carbon dioxide and phytoplankton growth is decoupled.

NSFG - Ammonia is included as part of available nitrogen supply in nitrogen limited growth calculations.

ZFOOD - Indicates the quality of zooplankton food.

## 4.4(3).8.3.2 Table-type PLNK-AD-FLAGS -- Atmospheric deposition flags for refractory organics

```
*****
      1         2         3         4         5         6         7         8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

PLK-AD-FLAGS

&lt;-range&gt; &lt;f&gt;&lt;c&gt; &lt;f&gt;&lt;c&gt; &lt;f&gt;&lt;c&gt;

```
. . . . .
(repeats until all operations of this type are covered)
```

END PLK-AD-FLAGS

\*\*\*\*\*

Example

\*\*\*\*\*

PLK-AD-FLAGS

RCHRES Atmospheric deposition flags \*\*\*

\*\*\* ORN ORP ORC

#\*\*\* # &lt;F&gt;&lt;C&gt; &lt;F&gt;&lt;C&gt; &lt;F&gt;&lt;C&gt;

1 7 -1 10 -1 -1 11 12

END PLK-AD-FLAGS

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<f><c>	PLADFG(*)	(1X,2I3)	0	-1	none

Explanation

PLADFG is an array of flags indicating the source of atmospheric deposition data. Each organic constituent has two flags. The first is for dry or total deposition flux, and the second is for wet deposition concentration. The flag values indicate:

- 0 No deposition of this type is simulated
- 1 Deposition of this type is input as time series PLADFX or PLADCN
- >0 Deposition of this type is input in the MONTH-DATA table with the corresponding table ID number.

4.4(3).8.3.3 Table-type SURF-EXPOSED -- Correction factor for solar radiation data

\*\*\*\*\*  
1 2 3 4 5 6 7 8  
123456789012345678901234567890123456789012345678901234567890  
\*\*\*\*\*  
Layout  
\*\*\*\*\*

SURF-EXPOSED  
<-range><surf-exp>  
. . . . .  
(repeats until all operations of this type are covered)  
. . . . .  
END SURF-EXPOSED

\*\*\*\*\*  
Example  
\*\*\*\*\*

SURF-EXPOSED  
RCHRES CFSAX \*\*\*  
# - # \*\*\*  
1 7 .5  
END SURF-EXPOSED

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<surf-exp>	CFSAX	F10.0	1.0	0.001	1.0	none	Both

Explanation

This factor is used to adjust the input solar radiation to make it applicable to the RCHRES; for example, to account for shading of the surface by trees or buildings.



## 4.4(3).8.3.4 Table-type PLNK-PARM1 -- First group of general plankton parameters

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

PLNK-PARM1

<-range><-----plnk-parm1----->

. . . . .

(repeats until all operations of this type are covered)

. . . . .

END PLNK-PARM1

Example

\*\*\*\*\*

PLNK-PARM1

```
      RCHRES      RATCLP      NONREF      LITSED      ALNPR      EXTB      MALGR***
      # - #
      1   7         .5         .3         .4         0.1
      END PLNK-PARM1
```

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<plnk-parm1>	RATCLP	F10.0	.6	.01	none	none	Both
	NONREF	F10.0	.5	.01	1.0	none	Both
	LITSED	F10.0	0.0	0.0	none	l/mg.ft	Both
	ALNPR	F10.0	1.0	.01	1.0	none	Both
	EXTB	F10.0	none	.001	none	/ft	Engl
			none	.001	none	/m	Metric
	MALGR	F10.0	.3	.001	none	/hr	Both

Explanation

RATCLP is the ratio of chlorophyll A content of biomass to phosphorus content.

NONREF is the non-refractory fraction of algae and zooplankton biomass.

LITSED is the multiplication factor to total sediment concentration to determine sediment contribution to light extinction.

ALNPR is the fraction of nitrogen requirements for phytoplankton growth that is satisfied by nitrate.

EXTB is the base extinction coefficient for light.

MALGR is the maximum unit algal growth rate.

## 4.4(3).8.3.5 Table-type PLNK-PARM2 -- second group of general plankton parameters

```
*****
1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

PLNK-PARM2

&lt;-range&gt;&lt;-----plnk-parm2-----&gt;

. . . . .

(repeats until all operations of this type are covered)

. . . . .

END PLNK-PARM2

Example

\*\*\*\*\*

PLNK-PARM2

```
RCHRES *** CMLLT      CMMN      CMMNP      CMMP      TALGRH      TALGRL      TALGRM
# - # ***ly/min      mg/l      mg/l      mg/l      degF      degF      degF
1   7      .01      .05      .04      85.0      44.0      71.0
```

END PLNK-PARM2

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<plnk-parm2>	CMLLT	F10.0	.033	1.0E-6	none	ly/min	Both
	CMMN	F10.0	.045	1.0E-6	none	mg/l	Both
	CMMNP	F10.0	.0284	1.0E-6	none	mg/l	Both
	CMMP	F10.0	.015	1.0E-6	none	mg/l	Both
	TALGRH	F10.0	95.	50.	212.	degF	Engl
			35.	10.	100.	degC	Metric
	TALGRL	F10.0	43.	-120.	212.	degF	Engl
			6.1	-84.	100.	degC	Metric
	TALGRM	F10.0	77.	32.	212.	degF	Engl
			25.	0.0	100.	degC	Metric

Explanation

CMLLT is the Michaelis-Menten constant for light limited growth.

CMMN is the nitrate Michaelis-Menten constant for nitrogen limited growth.

CMMNP is the nitrate Michaelis-Menten constant for phosphorus limited growth.

CMMP is the phosphate Michaelis-Menten constant for phosphorus limited growth.

TALGRH is the temperature above which algal growth ceases.

TALGRL is the temperature below which algal growth ceases.

TALGRM is the temperature below which algal growth is retarded.

## 4.4(3).8.3.6 Table-type PLNK-PARM3 -- Third group of general plankton parameters

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
PLNK-PARM3
```

```
<-range><-----plnk-parm3----->
```

```
. . . . .
(repeats until all operations of this type are covered)
```

```
END PLNK-PARM3
```

```
*****
```

```
Example
```

```
*****
```

```
PLNK-PARM3
```

```
      RCHRES      ALR20      ALDH      ALDL      OXALD      NALDH      PALDH***
      # - #        /hr        /hr        /hr        /hr        mg/l        mg/l***
      1   7                .02                .04
END PLNK-PARM3
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<plnk-parm3>	ALR20	F10.0	.004	1.0E-6	none	/hr	Both
	ALDH	F10.0	.01	1.0E-6	none	/hr	Both
	ALDL	F10.0	.001	1.0E-6	none	/hr	Both
	OXALD	F10.0	.03	1.0E-6	none	/hr	Both
	NALDH	F10.0	0.0	0.0	none	mg/l	Both
	PALDH	F10.0	0.0	0.0	none	mg/l	Both

## Explanation

ALR20 is the algal unit respiration rate at 20 degrees C.

ALDH is the high algal unit death rate.

ALDL is the low algal unit death rate.

OXALD is the increment to phytoplankton unit death rate due to anaerobic conditions.

NALDH is the inorganic nitrogen concentration below which high algal death rate occurs (as nitrogen).

PALDH is the inorganic phosphorus concentration below which high algal death rate occurs (as phosphorus).

## 4.4(3).8.3.7 Table-type PHYTO-PARM -- Phytoplankton parameters

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
PHYTO-PARM
```

```
<-range><-----phyto-parm----->
```

```
. . . . .
(repeats until all operations of this type are covered)
```

```
. . . . .
```

```
END PHYTO-PARM
```

## Example

```
*****
```

```
PHYTO-PARM
```

```
      RCHRES      SEED      MXSTAY      OREF      CLALDH      PHYSET      REFSET***
      # - #      mg/l      mg/l      ft3/s      ug/l      ft/hr      ft/hr***
      1   7      2.0      15.      8.0
END PHYTO-PARM
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<phyto-parm>	SEED	F10.0	0.0	0.0	none	mg/l	Both
	MXSTAY	F10.0	0.0	0.0	none	mg/l	Both
	OREF	F10.0	0.0001	0.0001	none	ft3/s	Engl
			0.0001	0.0001	none	m3/s	Metric
	CLALDH	F10.0	50.0	.01	none	ug/l	Both
	PHYSET	F10.0	0.0	0.0	none	ft/hr	Engl
			0.0	0.0	none	m/hr	Metric
	REFSET	F10.0	0.0	0.0	none	ft/hr	Engl
			0.0	0.0	none	m/hr	Metric

## Explanation

SEED is the minimum concentration of plankton not subject to advection (i.e., at high flow).

MXSTAY is the concentration of plankton not subject to advection at very low flow. OREF is the outflow at which the concentration of plankton not subject to advection is midway between SEED and MXSTAY.

CLALDH is the chlorophyll A concentration above which high algal death rate occurs. PHYSET is the rate of phytoplankton settling.

REFSET is the rate of settling for dead refractory organics.

## 4.4(3).8.3.8 Table-type ZOO-PARM1 -- First group of zooplankton parameters

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
ZOO-PARM1
<-range><-----zoo-parm1----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END ZOO-PARM1
```

```
*****
Example
*****
```

```
ZOO-PARM1
  RCHRES      MZOEAT      ZFIL20      ZRES20      ZD      OXZD***
  # - #  mg/l.hr  l/mgzoo.hr      /hr      /hr      /hr***
  1   7      .098      0.2
END ZOO-PARM1
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<zoo-parm1>	MZOEAT	F10.0	.055	.001	none	mg phyto/ mg zoo/hr	Both
	ZFIL20	F10.0	none	0.001	none	l/mg zoo/hr	Both
	ZRES20	F10.0	.0015	1.0E-6	none	/hr	Both
	ZD	F10.0	.0001	1.0E-6	none	/hr	Both
	OXZD	F10.0	.03	1.0E-6	none	/hr	Both

## Explanation

MZOEAT is the maximum zooplankton unit ingestion rate.

ZFIL20 is the zooplankton filtering rate at 20 degrees C.

ZRES20 is the zooplankton unit respiration rate at 20 degrees C.

ZD is the natural zooplankton unit death rate.

OXZD is the increment to unit zooplankton death rate due to anaerobic conditions.

4.4(3).8.3.9 Table-type ZOO-PARM2 -- Second group of zooplankton parameters

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
ZOO-PARM2
<-range><-----zoo-parm2----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END ZOO-PARM2
```

```
*****
Example
*****
```

```
ZOO-PARM2
  RCHRES    TCZFIL    TCZRES    ZEXDEL    ZOMASS***
  # - #
  1   7      1.2      1.1      0.8
END ZOO-PARM2
```

```
*****
```

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<zoo-parm2>	TCZFIL	F10.0	1.17	1.0	2.0	none	Both
	TCZRES	F10.0	1.07	1.0	2.0	none	Both
	ZEXDEL	F10.0	0.7	.001	1.0	none	Both
	ZOMASS	F10.0	.0003	1.0E-6	1.0	mg/org	Both

Explanation

TCZFIL and TCZRES are the temperature correction coefficients for filtering and respiration, respectively.

ZEXDEL is the fraction of non-refractory zooplankton excretion which is immediately decomposed when the ingestion rate is greater than MZOEAT.

ZOMASS is the average weight of a zooplankton organism.

## 4.4(3).8.3.10 Table-type BENAL-PARM -- Benthic algae parameters

```

*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****

```

```

BENAL-PARM
<-range><-----benal-parm----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END BENAL-PARM

```

```

*****
Example
*****

```

```

BENAL-PARM
  RCHRES      MBAL      CFBALR      CFBALG***
  # - #      mg/m2
  1   7      520.      .56      .80
END BENAL-PARM

```

```

*****

```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<benal-parm>	MBAL	F10.0	600.	.01	none	mg/m2	Both
	CFBALR	F10.0	1.0	.01	1.0	none	Both
	CFBALG	F10.0	1.0	.01	1.0	none	Both

## Explanation

MBAL is the maximum benthic algae density (as biomass).

CFBALR and CFBALG are the ratios of benthic algal to phytoplankton respiration and growth rates, respectively.

## 4.4(3).8.3.11 Table-type PLNK-INIT -- Initial plankton conditions

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
PLNK-INIT
<-range><-----plank-init----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END PLNK-INIT
```

```
*****
Example
*****
```

```
PLNK-INIT
  RCHRES      PHYTO      ZOO      BENAL      ORN      ORP      ORC***
  # - #      mg/l      org/l      mg/m2      mg/l      mg/l      mg/l***
  1   7      .0001      .05      .002      .01      .02      .01
END PLNK-INIT
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<plank-init>	PHYTO	F10.0	.96E-6	1.0E-10	none	mg/l	Both
	ZOO	F10.0	.03	1.0E-6	none	org/l	Both
	BENAL	F10.0	1.0E-8	1.0E-10	none	mg/m2	Both
	ORN	F10.0	0.0	0.0	none	mg/l	Both
	ORP	F10.0	0.0	0.0	none	mg/l	Both
	ORC	F10.0	0.0	0.0	none	mg/l	Both

## Explanation

PHYTO is the initial phytoplankton concentration, as biomass.  
 ZOO is the initial zooplankton concentration.  
 BENAL is the initial benthic algae density, as biomass.  
 ORN is the initial dead refractory organic nitrogen concentration.  
 ORP is the initial dead refractory organic phosphorus concentration.  
 ORC is the initial dead refractory organic carbon concentration.



4.4(3).8.4 RCHRES-BLOCK -- Section PHCARB input

```
*****
      1      2      3      4      5      6      7      8
123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

[Table-type PH-PARM1]

[Table-type PH-PARM2]

[Table-type PH-INIT ]

\*\*\*\*\*

Explanation

The exact format of each of the tables above is detailed in the documentation which follows. Tables in brackets [] need not always be supplied; for example, because all of the inputs have default values.

## 4.4(3).8.4.1 Table-type PH-PARM1 -- Flags for pH simulation

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

PH-PARM1

&lt;-range&gt;&lt;ph-parml&gt;

. . . . .

(repeats until all operations of this type are covered)

. . . . .

END PH-PARM1

\*\*\*\*\*

Example

\*\*\*\*\*

PH-PARM1

RCHRES PHCN ALKC\*\*\*

# - # \*\*\*

1 7 30 9

END PH-PARM1

\*\*\*\*\*

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<ph-parml>	PHCNT	I5	25	1	100
	ALKCON	I5	1	1	10

## Explanation

PHCNT is the maximum number of iterations used to solve for the pH.

ALKCON is the number of the conservative substance (in section CONS) which is used to simulate alkalinity. Alkalinity must be simulated in order to obtain valid results.

## 4.4(3).8.4.2 Table-type PH-PARM2 -- Parameters for pH simulation

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
PH-PARM2
<-range><-----ph-parm2----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END PH-PARM2
```

```
*****
Example
*****
```

```
PH-PARM2
  RCHRES      CFCINV  BRCO2(1)  BRCO2(2)***
  # - #              mg/m2.hr  mg/m2.hr***
  1   7           .901      72.0    65.1
END PH-PARM2
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<ph-parm2>	CFCINV	F10.0	.913	.001	1.0	none	Both
	BRCO2(1)	F10.0	62.	.01	none	mg/m2.hr	Both
	BRCO2(2)	F10.0	62.	.01	none	mg/m2.hr	Both

## Explanation

CFCINV is the ratio of the carbon dioxide invasion rate to the oxygen reaeration rate (which is computed in section OXRX).

BRCO2 is the benthal release rate of CO<sub>2</sub> (as carbon) for: (1) aerobic and (2) anaerobic conditions.

## 4.4(3).8.4.3 Table-type PH-INIT -- Initial conditions for pH simulation

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
PH-INIT
<-range><-----ph-init----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END PH-INIT
```

```
*****
Example
*****
```

```
PH-INIT
  RCHRES      TIC      CO2      PH***
  # - #      mg/l      mg/l      ***
  1   7      2.0      .03      8.0
END PH-INIT
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<ph-init>	TIC	F10.0	0.0	0.0	none	mg/l	Both
	CO2	F10.0	0.0	0.0	none	mg/l	Both
	PH	F10.0	7.0	1.0	15.0	none	Both

## Explanation

TIC is the initial total inorganic carbon.  
CO2 is the initial carbon dioxide (as carbon).  
PH is the initial pH.

## 4.4(11) COPY Block

```

*****
      1      2      3      4      5      6      7      8
123456789012345678901234567890123456789012345678901234567890
*****

```

Layout

\*\*\*\*\*

COPY

Table-type TIMESERIES

END COPY

```

*****

```

## Explanation

The COPY module is used to copy one or more time series from one location (source) to another (target). See Section 4.2(11) in Part E for a detailed description of its function.

## 4.4(11).1 Table-type TIMESERIES -- Number of time series to be copied

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

TIMESERIES

&lt;-range&gt;&lt;npt&gt;&lt;nmn&gt;

. . . . .

(repeats until all operations of this type are covered)

. . . . .

END TIMESERIES

\*\*\*\*\*

Example

\*\*\*\*\*

TIMESERIES

Copy-opn \*\*\*

# - # NPT NMN\*\*\*

1 7 4

END TIMESERIES

\*\*\*\*\*

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<npt>	NPT	I5	0	0	20
<nmn>	NMN	I5	0	0	20

## Explanation

NPT is the number of point-valued time series to be copied.

NMN is the number of mean-valued time series to be copied.

## 4.4(12) PLTGEN Block

```

*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
PLTGEN
  Table-type PLOTINFO
  Table-type GEN-LABELS
  Table-type SCALING
  Table-type CURV-DATA (repeats for each time series to be written to PLTGEN file)
END PLTGEN
*****

```

## Explanation

The PLTGEN module prepares one or more time series for display on a plotter. It writes the time series, and associated title and scaling information, to a "pltgen" file which must be input to a stand-alone program that translates the data into commands that drive the plotter. See Section 4.2(12) of Part E for further details.

## 4.4(12).1 Table-type PLOTINFO -- General plot information

```

*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
  PLOTINFO
  <-range><fil><npt><nmn><lab><pyr><piv>
  . . . . .
  (repeats until all operations of this type are covered)
  . . . . .
  END PLOTINFO
*****
Example
*****

```

```

PLOTINFO
Plot-opn ***
  # - # FILE  NPT  NMN LABL  PYR PIVL ***
  1   3          2
END PLOTINFO

```

```

*****

```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<fil>	PLOTFL	I5	30	30	99
<npt>	NPT	I5	0	0	10
<nmn>	NMN	I5	0	0	10
<lab>	LABLFG	I5	0	-1	1
<pyr>	PYREND	I5	9	1	12
<piv>	PIVL	I5	1	-2	1440

## Explanation

PLOTFL is the file unit number of the PLTGEN file (output of this operation).

NPT is the number of point-valued time series to be written to the file.

NMN is the number of mean-valued time series to be written to the file.

LABLFG indicates how the plot will be labeled:

-1 means no labels

0 means standard labeling; that is, one set of X and Y axes and associated labels will be drawn for entire plot.

1 means separate X and Y axes and labels will be drawn for each "frame" of the plot (e.g., each water year).

PYREND is the calendar month which terminates a plot frame (eg. a water year).

PIVL is the number of basic time intervals (DELT minutes each) to be aggregated to get to the interval of the data written to the PLTGEN file. A PIVL of -1 causes a monthly PLTGEN file to be written. A PIVL of -2 causes an annual PLTGEN file to be written.



## 4.4(12).2 Table-type GEN-LABELS -- General plot labels

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
GEN-LABELS
<-range><----- title ----->          <-----ylabl----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END GEN-LABELS
```

```
*****
Example
*****
```

```
GEN-LABELS
Plot-opn ***
# - # General title                      Y-axis label ***
1   3 Reservoir inflow and outflow rates Flow (ft3/sec)
END GEN-LABELS
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<title>	TITLE	10A4	none	none	none
<ylabl>	YLABL	5A4	none	none	none

## Explanation

TITLE is the general plot title.

YLABL is the label to be placed on the Y-axis.

## 4.4(12).3 Table-type SCALING -- Scaling information

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
SCALING
<-range><--ymin--><--ymax--><--ivlin--><-thresh->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END SCALING
```

```
*****
Example
*****
```

```
SCALING
Plot-opn ***
  # - #      YMIN      YMAX      IVLIN      THRESH ***
  1   3              500.        48.
END SCALING
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<ymin>	YMIN	F10.0	0.0	none	none	See Note	Both
<ymax>	YMAX	F10.0	none	none	none	See Note	Both
<ivlin>	IVLIN	F10.0	none	0.0	none	ivl/in	Both
<thresh>	THRESH	F10.0	-1.0E30	none	none	See Note	Both

Note: Units are defined by the user, in field YLABL of Table-type GEN-LABELS

## Explanation

YMIN and YMAX are the minimum and maximum ordinate (Y axis) values.

IVLIN is the horizontal (time) scale; that is, number of intervals (in pltgen file) per inch on graph.

THRESH is the write threshold value. If the value for any time series is greater than the threshold, a full record is written to the PLTGEN file for the current PLTGEN file time interval.

4.4(12).4 Table-type CURV-DATA -- Data for each time series on pltgen file  
(Table must be repeated for each time series on the pltgen file)

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

CURV-DATA

<-range> <-----label-----><lin><int><col> <tr>

. . . . .

(repeats until all operations of this type are covered)

. . . . .

END CURV-DATA

\*\*\*\*\*

Example

\*\*\*\*\*

CURV-DATA

Plot-opn      Curve label              Line Intg    Col Tran \*\*\*

  # - #                              type    eqv code code \*\*\*

    1    3    Inflow                  10     1     1 AVER

END CURV-DATA

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<label>	LABEL	4A4	none	none	none
<lin>	LINTYP	I5	0	none	none
<int>	INTEQ	I5	0	0	13
<col>	COLCOD	I5	0	0	10
<tr>	TRAN	A4	SUM	none	none

### Explanation

LABEL is a descriptive label for this particular curve (time series).

LINTYP describes the type of line to be drawn for this curve. It also determines the frequency of plotted symbols:

A zero value means points are connected by straight lines; no symbols are drawn at individual data points.

A positive value means points are connected by straight lines; the magnitude determines the frequency of plotted symbols (e.g., 4 means plot a symbol at every 4th point obtained from the pltgen file).

A negative value means no connecting lines are drawn. Only symbols are plotted; the absolute value determines the frequency (as above).

INTEQ is the integer equivalent of the symbols to be plotted for this curve (i.e., indicates which symbol to use). It is only meaningful if LINTYP is not zero. Value of 2 might mean a triangle, etc.

COLCOD is the color code for this curve. The meaning depends on how the stand-alone plot program is set up; e.g., 1 might mean red pen, 2 blue pen, etc.

TRAN is the transformation code used to aggregate data from the basic interval (internal time step) to the PLTGEN file interval. Valid values are: SUM, AVER, MAX, MIN, and LAST.

Note: The stand-alone program, which reads the pltgen file and drives the plotter, must translate these data into plotter commands.

## 4.4(13) DISPLY Block

```
*****
      1      2      3      4      5      6      7      8
123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

DISPLY

Table-type DISPLY-INFO1

[Table-type DISPLY-INFO2]

END DISPLY

\*\*\*\*\*

## Explanation

The DISPLY module summarizes a time series and presents the results in neatly formatted tables. Data can be displayed at any HSPF-supported interval. See Section 4.2(13) of Part E for further information.

4.4(13).1 Table-type DISPLY-INFO1 -- Contains most of the information necessary to generate data displays.

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
DISPLY-INFO1
<-range><-----title----->    <tr><piv>    d<fil><pyr>    d<fil><ynd>
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END DISPLY-INFO1
```

```
*****
Example
*****
```

```
DISPLY-INFO1
#through#***<-----Title----->    <-short-span->
***                                <---disply---> <annual summary ->
***                                TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
1    Daily precip in TSS #20 (in)          1    2    20    6
2    Simulated soil temp (Deg C)  AVER    4    1    21    1    1    22    6
END DISPLY-INFO1
```

```
*****
Details
```

Symbol	Fortran name(s)	Format	Def	Min	Max
<title>	TITLE(*)	7A4	none	none	none
<tr>	TRAN	A4	SUM	none	none
<piv>	PIVL	I5	0	0	1440
d	DIGIT1	A1	0	0	7
<fil>	FILE1	I5	6	6	99
<pyr>	PYRFG	I5	0	0	1
d	DIGIT2	A1	0	0	7
<fil>	FILE2	I5	6	6	99
<ynd>	PYREND	I5	9	1	12

## Explanation

TITLE is the title that will be printed at the top of each page of the display.

TRAN is the transformation code, used to aggregate data from the basic interval (internal time step) to the various display intervals (for both short- and long-span displays). Valid values are: SUM, AVER, MAX, MIN, LAST.

PIVL is the number of basic time intervals (DELT mins each) to be aggregated to get to the interval of the data printed in a short-span display (e.g., In the above example, if DELT were 15 mins for DISPLY operation #2, then the data in the short-span summary tables would be displayed at an interval of 1 hour (PIVL=4). If PIVL=0, a short-span display is not produced.

DIGIT1 and DIGIT2 are the number of decimal digits to be used to print data in the short-span and long-span displays, respectively. Note that it is up to the user to ensure that this value falls in the valid range 0-7. HSPF does not check this.

FILE1 and FILE2 are the file unit numbers of the files to which short-and long-span displays will be routed.

PYRFG indicates whether or not a long-span display (annual summary of daily values) is required. Value of 1 means it is, 0 means it is not.

PYREND is the calendar month which will appear at the right-hand extremity of an annual summary. This enables the user to decide whether the data should be displayed on a calendar year or some other (e.g., water year) basis.

4.4(13).2 Table-type DISPLY-INFO2 -- Additional optional information for module DISPLY.

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

DISPLY-INFO2

<-range><--mult--><---add--><-thresh1><-thresh2>

. . . . .

(repeats until all operations of this type are covered)

. . . . .

END DISPLY-INFO2

\*\*\*\*\*

Example

\*\*\*\*\*

DISPLY-INFO2

#through# Convert DegC to F      Display negative data \*\*\*

          Mult            Add      THRESH1            \*\*\*

      2      5            1.8            32.0            -999.

END DISPLY-INFO2

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max	Units	Unit system
<mult>	A	F10.0	1.0	none	none	none	Both
<add>	B	F10.0	0.0	none	none	none	Both
<thresh1>	THRESH1	F10.0	0.0	none	none	none	Both
<thresh2>	THRESH2	F10.0	0.0	none	none	none	Both



## Explanation

This table is usually not supplied.

A and B are parameters used to convert the data from internal units to display units:

$$\text{Display value} = A * (\text{internal value}) + B$$

The conversion is done before any aggregation of data to larger time steps (i.e., larger than the simulation time interval) is performed. Note that the default values of A and B result in no change.

THRSH1 and THRSH2 are threshold values for the short-span and long-span displays, respectively (THRSH2 is not presently used). THRSH1 can be used to reduce the quantity of printout produced in a short-span display; it functions as follows: When the individual values in a row of the display have been aggregated to get the "row value" (hour- or day-value, depending on the display interval), if the row-value is greater than THRSH1 the row is printed, else it is omitted. Thus, for example, the default of 0.0 will ensure that rows of data containing all zeros are omitted.

## 4.4(14) DURANL Block

```

*****
          1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****

```

```

DURANL
  Table-type GEN-DURDATA
  [Table-type SEASON]
  [Table-type DURATIONS]
  [Table-type LEVELS]
  [Table-type LCONC]
END DURANL

```

```

*****

```

## Explanation

The DURANL module performs duration and excursion analysis on a time series. For example, it analyzes the frequency with which N consecutive values in the time series exceed a specified set of values, called "levels". N is the "duration" of the excursion; up to 10 durations may be used in one duration analysis operation. The user may specify that only those data falling within a specified time in each year (analysis season) be processed. For further details see Section 4.2(14) of Part E.

## 4.4(14).1 Table-type GEN-DURDATA -- General information for duration analysis

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

GEN-DURDATA

&lt;-range&gt;&lt;-----title-----&gt;&lt;-nd&gt;&lt;-nl&gt;&lt;-pr&gt;&lt;-pu&gt;

. . . . .

(repeats until all operations of this type are covered)

. . . . .

END GEN-DURDATA

\*\*\*\*\*

Example

\*\*\*\*\*

GEN-DURDATA

```
#through#<***-----title-----> NDUR NLEV PRFG  P- LCNU LCOU
      ***                                UNIT
```

```
1      Simulated DO in Reach 40          5    2          2    0
END GEN-DURDATA
```

\*\*\*\*\*

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<title>	TITLE(*)	10A4	none	none	none
<nd>	NDUR	I5	1	1	10
<nl>	NLEV	I5	1	1	20
<pr>	PRFG	I5	1	1	7
<pu>	PUNIT	I5	6	1	99
<lcn>	LCNUM	I5	0	0	5
<lco>	LCOUT	I5	0	0	1

## Explanation

TITLE is the title which the user gives to the duration analysis operation; usually, something which identifies the time series being analyzed.

NDUR is the number of durations for which the time series will be analyzed.

NLEV is the number of user-specified levels which will be used in analyzing the time series.

PRFG is a flag which governs the quantity of information printed out. A value of 1 results in minimal (basic) output. Increasing the value (up to the maximum of 7) results in increased detail of output.

PUNIT is the file unit number to which the output of the duration analysis operation will be written. Each duration analysis operation must have a unique file unit number.

LCNUM indicates the number of lethal concentration curves to be used in the analysis. A zero means no lethality analysis is to be performed.

LCOUT is a flag which governs the printout of intermediate lethal event information (1=on).

## 4.4(14).2 Table-type SEASON -- The analysis season for the durational analysis

```
*****
      1         2         3         4         5         6         7         8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

SEASON

<-range>            <---start-->            <----end---->

. . . . .

(repeats until all operations of this type are covered)

. . . . .

END SEASON

\*\*\*\*\*

Example

\*\*\*\*\*

SEASON

\*\*\*

Start

End

#through#\*\*\*

mo da hr mn

mo da hr mn

1 10

02

02

END SEASON

\*\*\*\*\*

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<start>	SESONS(2-5)	4(1X,I2)	see below		
<end>	SESONE(2-5)	4(1X,I2)	see below		

## Explanation

This table is used if one wishes to specify an analysis season; that is, only data falling between the specified starting and ending month/day/hour/minute (in each year) should be considered.

## Note:

1. The defaults, minima, maxima and other values for specifying the starting and ending date/times are the same as those given in the discussion of the GLOBAL Block (Section 4.2). If any fields in the starting date/time are blank they default to the earliest meaningful value; for the ending date/time they default to the latest possible values. Thus, the analysis season in the example above includes the entire month of February.
2. Although it is not meaningful to provide for a "year" in the fields documented above (since the analysis season applies to every year in the run), the four spaces preceding both the <start> and <end> fields should be left blank because the system does, in fact, read the year and expects it to be blank or zero.
3. The defaults imply that, if this table is omitted, the analysis season extends from January 1 through December 31.

## 4.4(14).3 Table-type DURATIONS -- Durations to be used in the analysis

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
DURATIONS
<-range><-d1><-----others----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END DURATIONS
```

```
*****
Example
*****
```

```
DURATIONS
#through#***<---Durations----->
      *** 1      2      3      4      5
1      2      1    10    15    20    40
3          1    20    21    22
END DURATIONS
```

```
*****
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<d1>	DURAT(1)	I5	1	1	1
<others>	DURAT(2-10)	9I5	2	2	none

## Explanation

DURAT(\*) is an array which contains the NDUR different durations for which the time series will be analyzed (NDUR was specified in Table-type GEN-DURDATA). The durations are expressed in multiples of the internal time step specified in the OPN SEQUENCE Block (Section 4.3). Thus, if DELT= 5 min and the duration is 3, the time series will be analyzed with a window of 15 minutes. The analysis algorithm requires that the first duration be 1 time step, but the others can have any integer value.

## 4.4(14).4 Table-type LEVELS -- Levels to be used in the analysis

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

LEVELS

&lt;-range&gt;&lt;----- first 14 -----&gt;

&lt;-range&gt;&lt;----- last 6 -----&gt;

```
. . . . .
(repeats until all operations of this type are covered)
. . . . .
```

END LEVELS

\*\*\*\*\*

Example

\*\*\*\*\*

LEVELS

```
      #through#*** 2      3      4      5      6      7      8      9      10      11      12      13      14
15
      #through#***16      17      18      19      20      21
1      -30. -10.   0.  10.  20.  40.  80. 100. 200.1000. 2.E3 3.E3 5.E3 1.E4
1      2.E4 3.E4
      #through#*** 2      3      4      5
2      -20.   0.  20.  50.
END LEVELS
```

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<first14>	LEVEL(2-15)	14F5.0	0.0	none	none
<last6>	LEVEL(16-21)	6F5.0	0.0	none	none

## Explanation

LEVEL(2 through 21) contains the 20 possible user-specified levels for which the input time series will be analyzed. (LEVEL(1) and LEVEL(22) are reserved for system use, and this does not affect the user since only LEVEL(2) through (21) can be specified). The actual number of levels (NLEV) was specified in Table-type GEN-DURDATA. If NLEV is greater than 14, the entry for a given operation must be continued to the next line; up to 2 lines may be required to cover all the levels. In the example above, operation 1 has 16 user-specified levels and thus requires 2 lines, but operation 2 only requires 1 line because it has only 4 user-specified levels.

When an entry has to be continued onto more than 1 line:

1. No blank or comment lines may be put between any of the lines for a continued entry. Put all comments ahead of the entry. (See operation 1 in above example).
2. The <range> specification must be repeated for each line onto which the entry is continued.

Note that the levels must be specified in ascending order. The system checks that this requirement is not violated.



4.4(14).5 Table-type LCONC -- Lethal concentrations to be used in the analysis  
Table repeats for each lethal concentration curve-LCNUM times

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

LCONC

<-range><-----first-7----->

<-range><-----last-3----->

. . . . .

(repeats until all operations of this type are covered)

. . . . .

END LCONC

\*\*\*\*\*

Example

\*\*\*\*\*

LCONC

```
  # - #***      LC1      LC2      LC3      LC4      LC5      LC6      LC7
  # - #***      LC8      LC9     LC10
  1   2         1.       3.       6.       8.      15.       5.       8.
  1   2         20.      30.      60.
```

END LCONC

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<first-7>	LCONC(1-7,I)	7F10.0	0.0	none	none
<last-3>	LCONC(8-10,I)	3F10.0	0.0	none	none

Explanation

LCONC(\*) is an array which contains the NDUR different lethal levels which are used in a lethal concentration analysis. If no lethality analysis is being done, this table may be omitted.

#### 4.4(15) GENER Block

```
*****
      1      2      3      4      5      6      7      8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
GENER
  Table-type OPCODE
  [Table-type NTERMS]      only required if OPCODE = 8
  [Table-type COEFFS]      only required if OPCODE = 8,
  [Table-type PARM]        only required if OPCODE = 9, 10, 11, 24, 25, or 26

END GENER
```

```
*****
```

#### Explanation

The GENER module generates a time series from one or two input time series. Usually, only Table-type OPCODE is required. However, if OPCODE = 8 (power series), you need to supply the number of terms in the power series and the values of the coefficients. If OPCODE = 9, 10, 11, 24, 25, or 26, then Table-type PARM is required to input the constant required in the operation.

#### 4.4(15).1 Table-type OP CODE -- Operation code for time series generation

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

```
OPCODE
<-range><opn>
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END OPCODE
```

\*\*\*\*\*

Example

\*\*\*\*\*

```
OPCODE
  #through#  OP- ***
            CODE ***
  1      3      8
  5      20
END OPCODE
```

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<opn>	OPCODE	I5	none	1	26

## Explanation

OPCODE is the operation code. If A and B are the input time series and C is the generated time series, the functions performed for the allowable range of values of OPCODE are:

OPCODE	Definition
1	$C = \text{Abs}(A)$
2	$C = \text{Sqrt}(A)$
3	$C = \text{Trunc}(A)$
4	$C = \text{Ceil}(A)$
5	$C = \text{Floor}(A)$
6	$C = \text{loge}(A)$
7	$C = \text{log10}(A)$
8	$C = K(1) + K(2) * A + K(3) * A^2 + (\text{up to 7 terms})$
9	$C = K^{**}A$
10	$C = A^{**}K$
11	$C = A + K$
12	$C = \text{Sin}(A)$
13	$C = \text{Cos}(A)$
14	$C = \text{Tan}(A)$
15	$C = \text{Sum}(A)$
16	$C = A + B$
17	$C = A - B$
18	$C = A * B$
19	$C = A / B$
20	$C = \text{Max} (A, B)$
21	$C = \text{Min} (A, B)$
22	$C = A^{**}B$
23	$C = \text{cumulative departure of } A \text{ below } B$
24	$C = K$
25	$C = \text{Max} (A, K)$
26	$C = \text{Min} (A, K)$

If OPCODE is less than 15, or OPCODE equals 25 or 26, only one input time series is required; if OPCODE is 24, no input time series are required; otherwise two input time series are required. Note that the operation is performed on the data when they are in internal form (timestep=DELT, units=internal units). For further details, see Section 4.2(15) of Part E.

#### 4.4(15).2 Table-type NTERMS -- Number of terms in power series

```
*****
      1      2      3      4      5      6      7      8
123456789012345678901234567890123456789012345678901234567890
*****
```

Layout

\*\*\*\*\*

NTERMS

<-range><-nt>

. . . . .

(repeats until all operations of this type are covered)

. . . . .

END NTERMS

\*\*\*\*\*

Example

\*\*\*\*\*

NTERMS

#through#NTERMS \*\*\*

1 2 4

END NTERMS

\*\*\*\*\*

Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<nt>	NTERMS	I5	2	1	7

Explanation

This table is only relevant if OPCODE=8. NTERMS is the total number of terms in the power series:

$$C = K(1) + K(2) * A + K(3) * A ** 2 \quad \text{etc.}$$

The default value of 2 was chosen because this option will probably be used most often (to perform a linear transformation).

#### 4.4(15).3 Table-type COEFFS -- Coefficients in generating power function

```
*****
      1      2      3      4      5      6      7      8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
COEFFS
<-range><-----coeffs----->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END COEFFS
```

```
*****
Example
*****
```

```
COEFFS
  #through# ***      K1      K2      K3
    1      7      -2.0      1.5      0.2
END COEFFS
```

```
*****
```

#### Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<coeffs>	K(*)	7F10.0	0.0	none	none

#### Explanation

This table is only relevant if OPCODE=8. K(1 through NTERMS) are the coefficients in the power function:

$$C = K(1) + K(2)*A + K(3)*A**2 + \text{etc.}$$

#### 4.4(15).4 Table-type PARM -- Constant for GENER operation

```
*****
      1         2         3         4         5         6         7         8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
PARM
<-range><--con--->
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END PARM
```

```
*****
Example
*****
```

```
PARM
  # - # ***      K
  1   7          2.5
END PARM
```

```
*****
```

#### Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<con>	K	F10.0	1.0	none	none

#### Explanation

This table is only relevant if OPCODE is 9, 10, 11, 24, 25, or 26.

K is the constant required in the operation.

## 4.4(16) MUTSIN Block

```

*****
      1      2      3      4      5      6      7      8
123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****

```

```

MUTSIN
  Table-type MUTSINFO

```

```

END MUTSIN

```

```

*****

```

## Explanation

The MUTSIN module is used to copy one or more time series from a PLTGEN file or its equivalent to one or more targets. The targets may be data sets in the TSS or WDM (specified in the EXT-TARGETS Block) or input time series in other operations (specified in the NETWORK Block). See Section 4.2(16) in Part E for a detailed description of MUTSIN's function.



## 4.4(16).1 Table-type MUTSINFO -- Information about time series to be copied

```
*****
      1          2          3          4          5          6          7          8
1234567890123456789012345678901234567890123456789012345678901234567890
*****
Layout
*****
```

```
MUTSINFO
<-range><mfl><npt><nmn><nli><mis>
. . . . .
(repeats until all operations of this type are covered)
. . . . .
END MUTSINFO
```

```
*****
Example
*****
```

```
MUTSINFO
# - # MFL NPT NMN NLI MSFG ***
1   30  1  1  25  0
END MUTSINFO
```

## Details

Symbol	Fortran name(s)	Format	Def	Min	Max
<mfl>	MUTFL	I5	30	30	99
<npt>	NPT	I5	0	0	10
<nmn>	NMN	I5	0	0	10
<nli>	NLINES	I5	25	1	none
<mis>	MISSFG	I5	0	0	3

## Explanation

MUTFL is the file unit number of the PLTGEN-format file being input.  
NPT is the number of point-valued time series to be input.  
NMN is the number of mean-valued time series to be input.  
NLINES is the number of lines to skip at the beginning of the file.  
MISSFG is the missing data action flag.

- 0 - stop on missing data
- 1 - fill missing data with 0.0
- 2 - fill missing data with -1.0E30
- 3 - fill missing data with next value