7 Input Requirements and Program Output for SAM.sed

Purpose

SAM.sed calculates sediment discharge rating curves for the bed material load using sediment transport functions. The input and output vary only insofar as different functions are selected. This chapter will address the input data requirements and discuss the associated output. Be aware that there is an option, SAM.aid (under Tools on the SAMwin main menu) that can provide guidance in the selection of sediment transport functions.

General

The SAM.sed module expects an input file designated as *xxxxxxxx*.**si**, where *x* can be any DOS acceptable character, including a space (but no embedded spaces), i.e., acceptable file names could be *say.si* or *ITSNEVER.SI*. SAM.sed will write a corresponding file *xxxxxxxx*.**so**, which is the sediment transport calculation's output file; and a *xxxxxxxx*..**yi** file which may be used as an input file to SAM.yld.

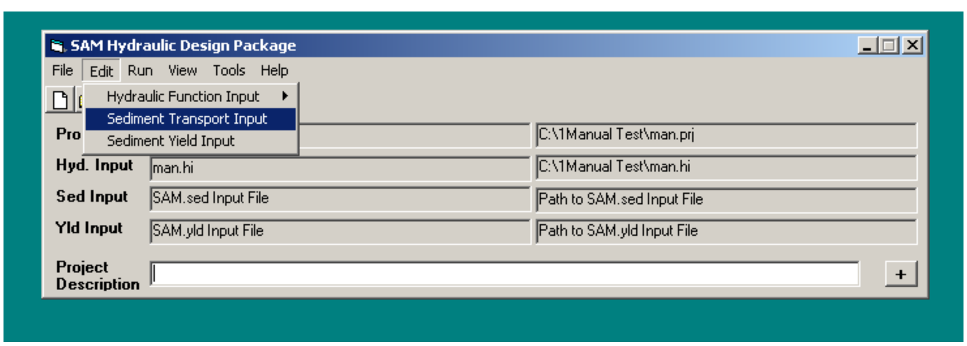

Figure 7.1. Accessing the Sediment Transport Input screens.

SAM.hyd generally creates a ".si" file. The ".si" file can be created or edited in SAMwin as shown in Figure 7.1. A sediment transport input file can also be created or edited using a system editor, or, in a DOS window only, by using SAM.m95 in combination with a TAPE95 from an HEC-2 execution (see

Appendix H). In some cases, modifications to the SAM.hyd-created ".si" file may be necessary before sediment transport calculations can be made.

The sample data sets used in the input and output discussions are those provided with the SAM package in the SEDPC.LIB files.

Program execution

The sediment transport calculations are made in SAMwin from the "Solve" button on the input screen, Figure 7.2, or from the "Run" dropdown menu on the opening screen, Figure 7.1. This second option is useful if a ready-to-run data set exists.

Selected output will scroll to the screen. The output coming to this window cannot be selected by the user. All output will be saved in the default output filename.

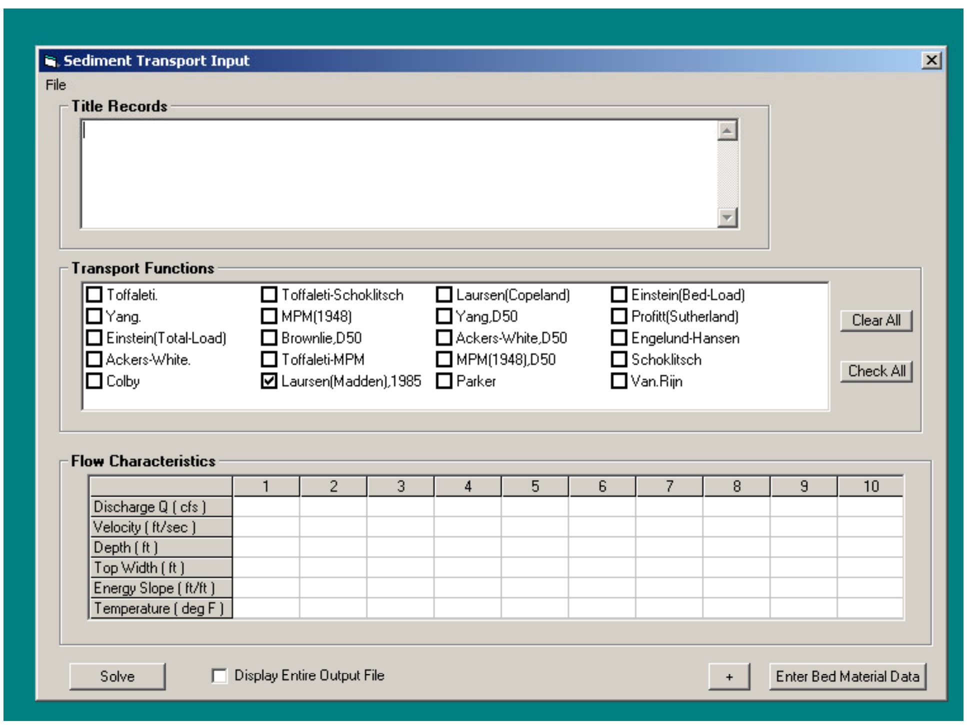

Figure 7.2. Sediment transport calculations input screen.

Title Records.

This area allows the user to input descriptive strings, up to 78 characters long, for use in identifying data sets. This input is optional.

Transport Functions. All sediment transport functions available in SAM.sed are listed here. The user can select functions to be calculated. The Laursen-Madden (1985) function is simply the one function that is on by default when the input file has been created by SAM.hyd.

Flow Characteristics. Generally, these fields would be filled with the calculated data from a SAM.hyd-generated input file. However, the user can input this information if so desired. A "column" of numbers is considered together for calculation purposes. The maximum is 10 columns.

Bed Material Gradation. This input is necessary for these calculations, Figure 8.3. DMAX is a required input whereas the specific gravity of sediment is optional (the value shown is the default value). The program will accept up to 18 points on the bed material gradation, and they **must** be input from largest grain size to smallest. However, a grain size for 100% finer and for 0% finer is not required.

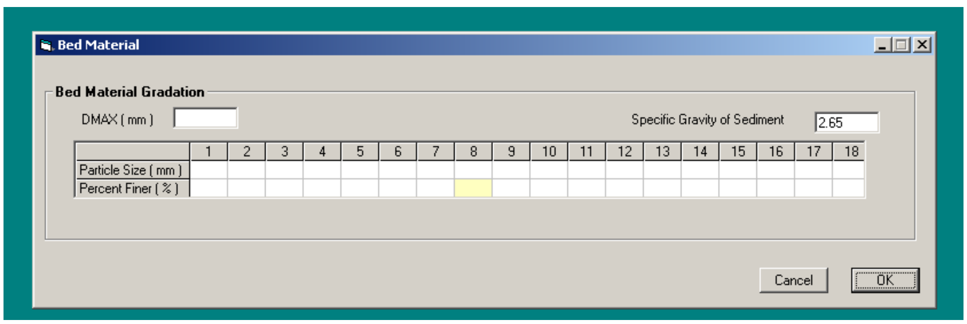

Figure 7.3. Bed Material Gradation data input screen.

" + " Box. This button toggles, opens/closes, a small window which will receive selected output. The output coming to this window cannot be selected by the user.

Display Entire Output File. When this box is checked the output file will open in its own window (using Notepad) after calculations are complete. If this button is not checked, some input will echo to the screen in the area mentioned above. The entire output file can also be viewed by checking the View menu of the SAM main window and selecting "Sediment Transport Results."

Solve. This button causes SAM.sed to execute.

Sample Input Data

In addition to the SAMwin option to create or edit a sediment transport input file, the input data file can be prepared with a system editor, or by the hydraulics calculations in SAM.hyd. (SAM.m95, which reads the HEC-2 output to create a SAM.sed input file, is not available in SAMwin). Of these, however, only

SAM.hyd provides the "effective" value for sediment transport variables. If channel and overbanks are specified in the SAM.hyd file, only the channel variables are transferred to the “.si” file. The discharge is the total discharge and is used only as an identifier and not used in the calculations.

The following example shows input data as created by running TEST 1C in SAM.hyd. Notice that only the `Laursen(Madden)` function shows "YES." Other transport functions can be “turned on” for computation with an editor or the SAMwin data entry windows.. The SAM.hyd input file from which this file was developed contained a PF-record so this required record is already in the file. If the record were not in the SAM.sed input file, it would also have to be added.

```
T1      FILE WRITTEN BY SAM.hyd
TF TOFFALETI.            NO
TF YANG.                 NO
TF EINSTEIN(TOTAL-LOAD)  NO
TF ACKERS-WHITE.         NO
TF COLBY                 NO
TF TOFFALETI-SCHOKLITSC  NO
TF MPM(1948).            NO
TF BROWNLIE,D50          NO
TF TOFFALETI-MPM         NO
TF LAURSEN(MADDEN),1985 YES
TF LAURSEN(COPELAND)     NO
TF YANG,D50              NO
TF ACKERS-WHITE,D50      NO
TF MPM(1948),D50         NO
TF PARKER                NO
TF EINSTEIN(BED-LOAD)    NO
TF PROFITT(SUTHERLAND)   NO
TF ENGELUND-HANSEN       NO
TF SCHOKLITSCH           NO
TF VAN.RIJN              NO
VE  1.29    2.77    5.41    7.41   10.14
DE  0.76    3.23    7.23    9.71   13.28
WI  103.   111.7   127.9   138.8   148.5
QW   100    1000    5000   10000   20000
ES521E-6
WT    50
PF                            1      .8      98     .48      50     .25      16
$$END
```

Sample Output Data

Selected results are printed to the screen as the program executes. The entire output is saved in the default output file. Also, the sediment transport rating curve needed for the sediment yield calculations is written to the default SAM.yld file.

Output Data Sets

The following output description refers to the output of Test 1C listed above. The Ackers-White,D50, and the Van Rijn functions have been selected in order to point out certain associated output.

```
********************************************************************************
*                                                                              *
*      SAMwin   ---   HYDRAULIC DESIGN PACKAGE FOR FLOOD CONTROL CHANNELS      *
*                                                                              *
*                         SEDIMENT TRANSPORT CALCULATIONS                      *
*                                                                              *
*                                  Version 1.0                                 *
*                                                                              *
*           A Product of the Flood Control Channels Research Program           *
* Coastal & Hydraulics Laboratory, USAE Engineer Research & Development Center *
*                                                                              *
*                              in cooperation with                             *
*                                                                              *
*               Owen Ayres & Associates, Inc., Ft. Collins, CO                 *
*                                                                              *
********************************************************************************


 Msg 1:  SED. READING INPUT DATA FROM FILE [  hydtests.si  ] THIS DIRECTORY.

 TABLE  1.  LIST INPUT DATA.

 T1
 TF LAURSEN(MADDEN),1985 YES
 TF ACKERS-WHITE,D50     YES
 TF VAN.RIJN             YES
 TR
 VE  1.29    2.77    5.41    7.41   10.14
 DE  0.76    3.23    7.23    9.71   13.28
 WI   103   111.7   127.9   138.8   148.5
 QW   100    1000    5000   10000   20000
 ES.00052
 WT    50
 PF                  1.0       1      .8      98     .48      50     .25      16
 SP  2.65
 $$END

 BED SEDIMENT FRACTIONS CALCULATED FROM PF-DATA.

   NO     PERCENT   PARTICLE   INCREMENTAL
           FINER      SIZE       FRACTION
      |      %     |    mm     |            |
 _____|____________|___________|____________|

    8 |    16.000 |    0.2500 |            |
      |           |           |  0.3783586 |
    9 |    53.836 |    0.5000 |            |
      |           |           |  0.4616414 |
   10 |   100.000 |    1.0000 |            |


    TABLE  3.  PROPERTIES OF THE WATER

                     KINEMATIC
  #  TEMP     RHO    VISCOSITY  UNIT WT
     DEG F  #-S2/FT4   SF/SEC    WATER
                      x10,000    #/FT3

  1   50.0    1.940      1.411   62.411
  2   50.0    1.940      1.411   62.411
  3   50.0    1.940      1.411   62.411
  4   50.0    1.940      1.411   62.411
  5   50.0    1.940      1.411   62.411
```

TABLE 2.1. HYDRAULIC PARAMETERS

N	TOTAL DISCHARGE CFS	EFFECTIVE DISCHARGE CFS	EFFECTIVE VELOCITY FPS	EFFECTIVE DEPTH FT	EFFECTIVE WIDTH FT	ENERGY SLOPE FT/FT
1	100.	101.	1.29	0.76	103.00	0.0005200
2	1000.	999.	2.77	3.23	111.70	0.0005200
3	5000.	5003.	5.41	7.23	127.90	0.0005200
4	10000.	9987.	7.41	9.71	138.80	0.0005200
5	20000.	19997.	10.14	13.28	148.50	0.0005200

TABLE 4.1 LAURSEN(MADDEN),1985 METHOD = NO. 13

SIZE CLASS no	GRAIN SIZE mm	PERCENT IN CLASS %	SEDIMENT TRANSPORT POTENTIAL TONS/DAY	SEDIMENT TRANSPORT CAPACITY TONS/DAY	SEDIMENT TRANSPORT CONC PPM
8	0.354	37.84	6.58286	2.49068	9.2248
9	0.707	46.16	0.100000E-06	0.461641E-07	0.17098E-06
Q, CFS = 100.000			QS, TOTAL =	2.49068	9.2248

TABLE 4.1 LAURSEN(MADDEN),1985 METHOD = NO. 13

SIZE CLASS no	GRAIN SIZE mm	PERCENT IN CLASS %	SEDIMENT TRANSPORT POTENTIAL TONS/DAY	SEDIMENT TRANSPORT CAPACITY TONS/DAY	SEDIMENT TRANSPORT CONC PPM
8	0.354	37.84	64645.7	24459.3	452.95
9	0.707	46.16	6936.62	3202.23	59.301
Q, CFS = 20000.0			QS, TOTAL =	27661.5	512.25

TABLE 4.1 ACKERS-WHITE,D50 METHOD = NO. 16

SIZE CLASS no	GRAIN SIZE mm	PERCENT IN CLASS %	SEDIMENT TRANSPORT POTENTIAL TONS/DAY	SEDIMENT TRANSPORT CAPACITY TONS/DAY	SEDIMENT TRANSPORT CONC PPM
1	0.466	100.00	6.72704	6.72704	24.915
Q, CFS = 100.000			QS, TOTAL =	6.72704	24.915

TABLE 4.1 ACKERS-WHITE,D50 METHOD = NO. 16

SIZE CLASS no	GRAIN SIZE mm	PERCENT IN CLASS %	SEDIMENT TRANSPORT POTENTIAL TONS/DAY	SEDIMENT TRANSPORT CAPACITY TONS/DAY	SEDIMENT TRANSPORT CONC PPM
1	0.466	100.00	87227.4	87227.4	1615.3
Q, CFS = 20000.0			QS, TOTAL =	87227.4	1615.3

VANRIJN -- CONCENTRATION CAPACITY PROFILE BY SIZE CLASS IN MG/L

SD(I)MM	REF CONC	Y/D=.1	Y/D=.2	Y/D=.3	Y/D=.5	Y/D=.7	Y/D=1.0
0.35367	1675.8	0.3	0.0	0.0	0.0	0.0	0.0
0.70734	694.5	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2370.3	0.3	0.0	0.0	0.0	0.0	0.0

TABLE 4.1 VAN.RIJN METHOD = NO. 23

SIZE CLASS no	GRAIN SIZE mm	PERCENT IN CLASS %	SEDIMENT TRANSPORT POTENTIAL TONS/DAY	SEDIMENT TRANSPORT CAPACITY TONS/DAY	SEDIMENT TRANSPORT CONC PPM
8	0.354	37.84	8.77455	3.31993	12.296
9	0.707	46.16	2.75041	1.26970	4.7026
Q, CFS = 100.000			QS, TOTAL =	4.58963	16.999

```
        VANRIJN -- CONCENTRATION CAPACITY PROFILE BY SIZE CLASS IN MG/L

   SD(I)MM   REF CONC   Y/D=.1   Y/D=.2   Y/D=.3   Y/D=.5   Y/D=.7  Y/D=1.0

   0.35367    42628.9   3650.2   1589.8    915.0      0.0    169.1     49.4
   0.70734    42082.9    425.7     90.0     32.1      0.0      1.4      0.1

   TOTAL      84711.9   4075.9   1679.8    947.0      0.0    170.5     49.6


        TABLE 4.1   VAN.RIJN            METHOD = NO. 23

SIZE     GRAIN    PERCENT   ---------SEDIMENT TRANSPORT----------
CLASS     SIZE   IN CLASS   POTENTIAL    CAPACITY      CONC
 no        mm        %       TONS/DAY    TONS/DAY       PPM
   8      0.354    37.84    226417.      85666.7      1586.4
   9      0.707    46.16    85322.8      39388.5      729.42
                                       ____________ ____________
Q, CFS =  20000.0          QS, TOTAL =   125055.      2315.8


TABLE 5.0  SUMMARY TABLE:   BED-MATERIAL SEDIMENT DISCHARGE, TONS/DAY

 Q |    WATER     |       TRANSPORT FUNCTIONS
NO |  DISCHARGE   |     LAURSEN   |   ACKERS-    |   VAN.RIJN   |
                   (MADDEN), 85|  WHITE, D50  |              |
 1 |       100.00          2.49|         6.73|         4.59|
 2 |      1000.00        150.64|       646.38|       271.79|
 3 |      5000.00       3276.38|      9240.40|      8683.24|
 4 |     10000.00       9779.14|     29045.88|     33187.63|
 5 |     20000.00      27661.49|     87227.36|    125055.28|

End of Job     PRINTOUT SAVED IN FILE hydtests.so
```

Output Data Description

Table 1 echoes the input data file. An un-numbered table lists the "Bed Sediment Fractions Calculated From PF-Data." The properties of water, Table 3, are calculated from the water temperature at sea-level. The hydraulic parameters from input data are listed in Table 2.1. Effective discharge is the product of the width, depth, and velocity and represents channel discharge. Table 4.1 presents detailed results of the sediment transport calculations by discharge, in rows by sediment size class and in columns as labeled. Notice the discharges are the total discharges from the QW-record. Concentration is calculated using total discharge, not channel discharge. There will also be a separate Table 4.1 for each sediment transport function selected in the input file. Only two discharges' output for each function are shown here.

The Van Rijn function provides additional printout – for each water discharge, the sediment concentration profile by size class is calculated in mg/l. Table 5 is a summary of the calculated total bed-material sediment discharge, in rows according to water discharge and in columns by sediment transport function.

Sample of Data Written to SAM.yld Input File

SAM.sed writes the sediment concentration rating curve calculated for each sediment transport function selected to the SAM.yld input file, as shown below.

```
TI      FILE WRITTEN BY SAM.sed
TF     LAURSEN(MADDEN),1985
QW   100    1000    5000   10000   20000
SC 9.225  55.792    243.    362.    512.
$JOB
TI      FILE WRITTEN BY SAM.sed
TF     ACKERS-WHITE,D50
QW   100    1000    5000   10000   20000
SC24.915    239.    684.   1076.   1615.
$JOB
TI      FILE WRITTEN BY SAM.sed
TF     VAN.RIJN
QW   100    1000    5000   10000   20000
SC16.999    101.    643.   1229.   2316.
$$END
```

A separate sediment concentration rating curve is written for each sediment transport function selected in SAM.sed. If there is only one discharge in the SAM.sed input file, no SAM.yld input file is written, as no curve had been calculated. A warning message to that effect is written to the end of the output file and is echoed to the printout area on the input window.