Program documentation of the program LEVEL2LAYER.EXE

The program is made for changing abstraction files from information of the screen level into information of the MIKE SHE layer.

The program reads an abstraction T0-file with specified levels of the screens for each well. From the corresponding MIKE SHE flow setup file (fif-file), information of the position of the calculation layers along with the horizontal hydraulic conductivity for each layer will be retrieved. The information provides an offset to create a new abstraction file containing references to the calculation layer numbers instead, to insert in the MIKE SHE flow setup.

If a screen covers more than one calculation layer the program will make two or more abstraction references to all screen layers with a relative distribution of the abstraction rate. In this case, the program takes into account different transmissivities of different calculation layers. If for instance, a layer has a relative small screen presence, but a relatively large transmissivity, such a layer can still end up with a large abstraction contribution.

User procedure

-Install LEVEL2LAYER.EXE in your $SHEDIR\bin (e.g. C:\she2000\bin) directory.
-Create your MIKE SHE setup as you would normally do it.
-From the SZ boundary conditions menu F1.5: specify the final abstraction file with references to layers, e.g. TIME\abs-level.t0.
-Run the MIKE SHE setup program. Notice: The still non-existent specified abstraction file will be checked only in the attempt to perform a flow calculation.
-Create an input abstraction file with specified screen levels, see Figure 1. **Notice**: Set upper screen level in front of lower screen level.
-From the working directory: Run LEVEL2LAYER.EXE from a DOS-prompt. You will be prompted for:
    -Setup name (no fif-extension)
    -Input abstraction file name with specified screen levels
    -Output abstraction file name with specified layers
-Inspect the produced output abstraction file with specified layers, see Figure 2.
-Eventually, inspect the error file (SIGNALS\'setup name'.err)
-Now, the produced abstraction file should serve to perform the flow calculation right away.

Partitioning the abstraction rates

For each abstraction record the program will find the part of the layers to be covered by the screen. The screen coverage will be calculated as the length of the screen present in a given layer. By summing the products of the screen coverage and the hydraulic conductivity for each layer, the sum of transmissivity for the entire screen will be obtained. The partition factor or weight of the abstraction contribution for a single calculation layer can subsequently be calculated as the product of the screen coverage of the layer and the horizontal hydraulic conductivity of the layer, relative to the sum of transmissivity for the entire screen.

```
FILETYPE DATATYPE VERNO:    4  51 525
TEXTLINE               :   Abstraction Data (Test, 1990-1996)
NREC DELVAL            :   3 -999.0
START DATE             :  1990   1   1   0   0
END DATE               :  1996  12  15   0   0
UTM XY-UNIT            :  32  2
   1     653976.000    6130222.000   26.0 -26.0  'Dalmose   '
   2     652284.000    6132693.000   35.0   4.0  'Flakkebj  '
   3     650961.000    6131734.000   16.0  -6.0  'Gimlinge  '
1990   1   1   0   0     62.     28.     46.
1990   2  15   0   0     28.     46.     11.
1991   3  15   0   0     46.     11.     35.
1992   4  15   0   0     62.     28.     46.
1996  12  15   0   0     30.     24.      9.
```

Figure 1 *Example of the input file structure. The only difference from the standard MIKE SHE T0-abstraction file format is in the specification of the abstraction locations. Below the header (first 6 lines), the different abstractions should be specified by: Abstraction number, x-coordinate, y-coordinate, upper screen level, lower screen level, and finally the name of the abstraction.*

```
FILETYPE DATATYPE VERNO:        4     51    544
USERTEXT               :   Abstraction Data (Test, 1990-1996)
NREC DELETE            :     9  -.999E+03
START DATE             : 1990  1  1  0  0
END   DATE             : 1996 12 15  0  0
UTM XY-UNIT            :  32  2
   1     653976.000    6130222.000   27.4  1     653976.000    6130222.000     653976.000
6130222.000  Dalmose
   2     653976.000    6130222.000   27.4  2     653976.000    6130222.000     653976.000
6130222.000  Dalmose
   3     653976.000    6130222.000   27.4  3     653976.000    6130222.000     653976.000
6130222.000  Dalmose
   4     653976.000    6130222.000   27.4  4     653976.000    6130222.000     653976.000
6130222.000  Dalmose
   5     652284.000    6132693.000   41.3  1     652284.000    6132693.000     652284.000
6132693.000  Flakkebj
   6     652284.000    6132693.000   41.3  2     652284.000    6132693.000     652284.000
6132693.000  Flakkebj
   7     652284.000    6132693.000   41.3  3     652284.000    6132693.000     652284.000
6132693.000  Flakkebj
   8     650961.000    6131734.000   25.0  2     650961.000    6131734.000     650961.000
6131734.000  Gimlinge
   9     650961.000    6131734.000   25.0  3     650961.000    6131734.000     650961.000
6131734.000  Gimlinge
1990   1   1   0   0       .08      3.85       .21     57.86       .15     27.78       .07
45.35       .65
1990   2  15   0   0       .04      1.74       .10     26.13       .25     45.63       .12
10.85       .15
1991   3  15   0   0       .06      2.85       .16     42.93       .06     10.91       .03
34.51       .49
1992   4  15   0   0       .08      3.85       .21     57.86       .15     27.78       .07
45.35       .65
1996  12  15   0   0       .04      1.86       .10     28.00       .13     23.81       .06
8.87        .13
```

Figure 2 *Example of the output file structure. For a thorough description of this format, see MIKE SHE PP - User manual.*

Limitations of the current version:

Maximum number of temporal data postings = 10000
Maximum number of abstraction wells = 10000
Maximum number of calculation layers = 100

This can be changed by request.

Check of abstraction file records

The program will perform a few checks on the input data:
-If the specified upper screen level is below the specified lower screen level for an abstraction, a warning is issued.
-If the specified upper screen level is above topography for an abstraction, a warning is issued.
-If the specified lower screen level is below bottom level of the lowest layer for an abstraction, a warning is issued.

Program structure

```
PROGRAM LEVEL2LAYER
! ---------------------------------------------------------------------
!    PROGRAM FOR CHANGING ABSTRACTION FILE LEVEL TO MIKE SHE LAYER
!
!    09.00.JSC
! ---------------------------------------------------------------------
! --- DECLARATIONS
! --- FUNCTIONS
! --- ALLOCATABLE ARRAYS
! --- DATA SPECIFICATIONS

! --- INITIALISATION

! --- READ SETUP NAME
! --- READ ABSTRACTION FILE NAME FOR INPUT
! --- READ ABSTRACTION FILE NAME FOR OUTPUT
! --- READ ABSTRACTION FILE HEADER

! --- OPEN ERROR FILE
! --- OPEN ABSTRACTION FILE AND READ HEADER

! --- READ ABSTRACTION FILE RECORDS
! --- CHECK ABSTRACTION FILE RECORDS

! --- OPEN FLOW INPUT FILE
! --- GET GENERAL DATA FROM FLOW INPUT FILE (NUMBER OF GEOLOGICAL LAYERS)

! --- ALLOCATE ARRAYS
! --- REFERENCE FROM NREF TO I, J COORDINATES

! --- READ TOPOGRAPHY

! --- FOR EACH RECORD: FOR EACH LAYER:
! --- READ LEVEL OF LAYER
! --- READ HYDRAULIC CONDUCTIVITY OF LAYER

! --- CHECK SCREEN LEVELS 1 AND 2 VERSUS TOPOGRAPHY AND BOTTOM LEVEL OF LOWEST
LAYER, RESPECTIVELY

! --- FOR EACH RECORD: FIND THE PART OF LAYERS TO BE COVERED BY SCREEN
! --- FIND FIRST LAYER OF ABSTRACTION
! --- CALCULATE SUM OF TRANSMISSIVITIES

! --- FOR EACH RECORD: FIND RELATIVE PART OF LAYERS TO BE COVERED BY SCREEN
! --- NOTICE: WEIGHT IS DEFINED ON BASIS OF TRANSMISSIVITY OF LAYERS COVERED BY
SCREEN
! --- COUNT NO. OF NEW RECORDS TO BE WRITTEN TO HEADER OF NEW ABSTRACTION T0-FILE

! --- WRITE HEADER OF NEW ABSTRACTION T0-FILE

! --- WRITE RECORDS OF NEW ABSTRACTION T0-FILE

! --- READ INPUT ABSTRACTION FILE SERIES
! --- CALCULATE WEIGHTED SERIES OF NEW ABSTRACTION T0-FILE
! --- WRITE WEIGHTED SERIES TO NEW ABSTRACTION T0-FILE

! --- END OF PROGRAM
```