Tutorial 4: Time Varying Data

The purpose of this tutorial is to incorporate time-varying information to the model. In the previous sections, all boundary conditions and gate timings were set as constant, and no input files were needed. In this section, the model is set to read time-varying information stored in HEC-DSS files. The following steps will instruct you on how to add the time-varying information.

1. Change the Transfer Flows to HEC-DSS input:

a. Create a new file in Notepad++ or another text editor called input_hydro_ts_tutorial.inp

b. In the new file, create the *TRANSFER_TIME_SERIES table*:

```
INPUT_TRANSFER_FLOW
TRANSFER_NAME     FILLIN        FILE        PATH
END
```

c. Enter the following values into the appropriate fields:

   i) Input Name: *transfer_1*

   ii) Fillin: *linear*

   iii) Input File: *${TUTORIALINPUT}*

   iv) Path/Value: */TUTORIAL/TRANSFER/FLOW//15MIN/CONSTANT/*

d. Open hydro.inp. The input file uses an ENVVAR reference as the filename, so add the definition of TUTORIALINPUT. At the same time, set DSM2MODIFIER to timevar_1:

```
ENVVAR
NAME            VALUE
HYDROOUTDSSFILE output.dss
DSM2MODIFIER    timevar_1
TUTORIALINPUT   ../timeseries/tutorial.dss
END
```

e. We are going to replace the existing time series with the new file, so you should make sure it is listed below the other files.

```
HYDRO_TIME_SERIES
input_boundary_hydro_tutorial.inp
input_transfer_flow_tutorial.inp
input_hydro_ts_tutorial.inp
END
```

f. Save the current settings.

g. Open qual.inp and set DSM2MODIFIER to timevar_1 as well (hydro.inp and qual.inp must agree or the tidefile won't be found).

2. Running HYDRO and QUAL

a. In Windows Explorer, navigate to the directory: *{DSM2_home}**tutorial**simple*\.

b. Right-click on the directory, *t4_timevar*, and select *Open Command Window Here*.

c. In the command window, type: *hydro hydro.inp*. Examine echo_hydro.inp. Did the time series assignment get used?

d. In the command window, type: *qual qual.inp*.

e. Open the *output.dss* file in the *t4_timevar* directory, and verify that the results are identical to the results from the previous tutorial (located in the *t3_layering* directory). Why is this?

3. Adjust DSM2MODIFIER to represent a variant scenario:

a. In Windows Explorer, navigate to the directory: *{DSM2_home}**tutorial**simple**t4_timevar*

b. Open *hydro.inp* for editing.

c. In the *ENVVAR* section, change the *DSM2MODIFIER* environment variable from *timevar_1* to *timevar_2*.

d. Open *qual.inp* for editing.

e. In the *ENVVAR* section, change the *DSM2MODIFIER* environment variable from *timevar_1* to *timevar_2*.

4. Add Source information into HYDRO:

a. In *input_hydro_ts_tutorial.inp*, create the table for node sources:

```
SOURCE_FLOW
NAME     NODE    SIGN     FILLIN        FILE        PATH
END
```

b. Enter the following values into the appropriate fields:

   i) Name: *source1*

   ii) Node: *5*

   iii) Input File: *${TUTORIALINPUT}*

   iv) Path/Value: */TUTORIAL/SOURCE/FLOW//15MIN/CONSTANT/*

   v) Sign: *1*

   vi) Fillin: *linear*

c. Save the current settings.

5. Add Corresponding Source information into QUAL:

1) Create a file called *input_qual_ts_tutorial.inp*

b. In input_qual_ts_tutorial.inp, create the NODE_CONCENTRATION table

```
NODE_CONCENTRATION
NAME    NODE_NO    VARIABLE   FILLIN    FILE   PATH
END
```

1) Enter the following values into the appropriate fields:

   i) Input Name: *source1*

   ii) Node: *5*

   iii) Variable: *ec*

   iv) Input File: *${TUTORIALINPUT}*

   v) Path/Value: */TUTORIAL/SOURCE/EC//15MIN/CONSTANT/*

   vi) Fillin: *last*

2) Add the ENVVAR definition for TUTORIALINPUT in qual.inp

```
TUTORIALINPUT    ./timeseries/tutorial.dss
```

c. In qual.inp, make sure that the file gets used:

```
QUAL_TIME_SERIES
input_node_conc_tutorial.inp
input_qual_ts_tutorial.inp
END
```

6. Add Time-varying Tide Information for Downstream Boundary in HYDRO:

1) Reopen *tutorial_hydro_ts.inp*
2) Create the *BOUNDARY_STAGE* table.

```
BOUNDARY_STAGE
NAME    NODE_NO    VARIABLE   FILLIN    FILE   PATH
END
```

3) In the *Boundary Stage table* enter the following values into the appropriate fields:
   i) Input Name: *downstream_stage*
   ii) Node: *7*
   iii) Input File: *${TUTORIALINPUT}*
   iv) Path/Value: */TUTORIAL/DOWNSTREAM/STAGE//15MIN/REALISTIC/*
   v) Fillin: *linear*

7. Add Downstream Boundary in QUAL:

a. Re-open *input_qual_ts_tutorial.inp*.
b. In the *Boundary Concentration table*:
   1) Enter the following values into the appropriate fields:
      i) Input Name: *downstream_stage*
      ii) Node: *7*
      iii) *Variable: ec*
      iv) Input File: *${TUTORIALINPUT}*
      v) Path/Value: */TUTORIAL/DOWNSTREAM/EC//15MIN/REALISTIC/*
      vi) Fillin: *last*

8. Add a Gate Time Series to HYDRO:

This gate time series will control the weir. The pipe is to be left open all the time (its default).

a. Create a file for the gate input called *input_ gate_tutorial.inp*
b. *Create the GATE_TIME_SERIES table:*
c. In the *Gate Time Series table* enter the following values into the appropriate fields:

i) Gate: *gate_1*

ii) Device: *weir*

iii) Variable: *op_from_node*

iv) Input File: *${TUTORIALINPUT}*

v) Path/Value: */TUTORIAL/GATE/FLAP_OP//IR-YEAR/CONSTANT/*

vi) Fillin: *none* (Can you tell why fillin is “none” for this time series?)

d. Add the include file to hydro.inp. The time series block should look as follows:

```
HYDRO_TIME_SERIES
input_boundary_hydro_tutorial.inp
input_transfer_flow_tutorial.inp
input_hydro_ts_tutorial.inp
input_gate_tutorial.inp
END
```

e. Save the current settings.

9. Running HYDRO and QUAL

a. In Windows Explorer, navigate to the directory: *{DSM2_home}**tutorial**simple*\.

b. Right-click on the directory, *t4_timevar*, and select *Open Command Window Here*.

c. In the command window, type: *hydro hydro.inp*.

d. In the command window, type: *qual qual.inp*.

e. Open the *output.dss* file in the *t4_timevar* directory, and examine the results.