

## 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	<code>output.dss</code>
DSM2MODIFIER	<code>timevar_1</code>
TUTORIALINPUT	<code>../timeseries/tutorial.dss</code>
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
<i>input_node_conc_tutorial.inp</i>
<i>input_qual_ts_tutorial.inp</i>
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.