DRAINAGE DESIGN MANAGEMENT SYSTEM FOR WINDOWS

VERSION 5.3.0

TUTORIAL # 4
UPDATING NSTPS VALUES FOR CHANNEL ROUTING

KVL Consultants, Inc.

UPDATING NSTPS VALUES FOR CHANNEL ROUTING

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UPDATING NSTPS VALUES FOR CHANNEL ROUTING
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1.0   INTRODUCTION

This tutorial document is developed to guide users in evaluating the NSTPS parameter (HEC-1 RS card's first field) for channel flow routing in HEC-1 using DDMSW. The input data file is an existing HEC-1 input file where normal-depth storage routing methodology is used. The implemented tool within the DDMSW program creates an updated HEC-1 input file that includes a refined set of NSTPS values updated from two successive model runs.

NSTPS is normally evaluated from flow and reach characteristics of the project area. It is usually estimated by the following relation (HEC, 1998).

NSTPS = [Channel Reach Length / Average Flow Velocity] / Time Interval ….. (1)

It can also be estimated by:

NSTPS = [Difference in Time-to-Peak between Channel Inflow and Outflow Hydrographs for Routed Flows] / Time Interval ………………………… (2)

Normally, the determination of the refined values of NSTPS can be made from several runs of the HEC-1 model, until the values converge. There are rare occasions, however, when NSTPS do not converge (i.e., values swing back and forth between iterations). In these cases, the modeler should look into the matter and use engineering judgment to select appropriate values of NSTPS adequate for his/her modeling purposes. One possible solution is to manually use Manning's equation to estimate the channel flow velocity and then estimate NSTPS by Equation (1) above. The manually estimated NSTPS can then be entered into an HEC-1 input file for the channel routings whose NSTPS values do not converge. To detect if there are any channel routings whose NSTPS values do not converge, users can execute the tool within DDMSW twice (i.e., three (3) model iterative runs in each execution). Here, the second-time model execution (i.e., three more iterative model runs) provides refined NSTPS values for the HEC-1 input file. This process of executing the model twice will shed light if there is any instability in the NSTPS values.
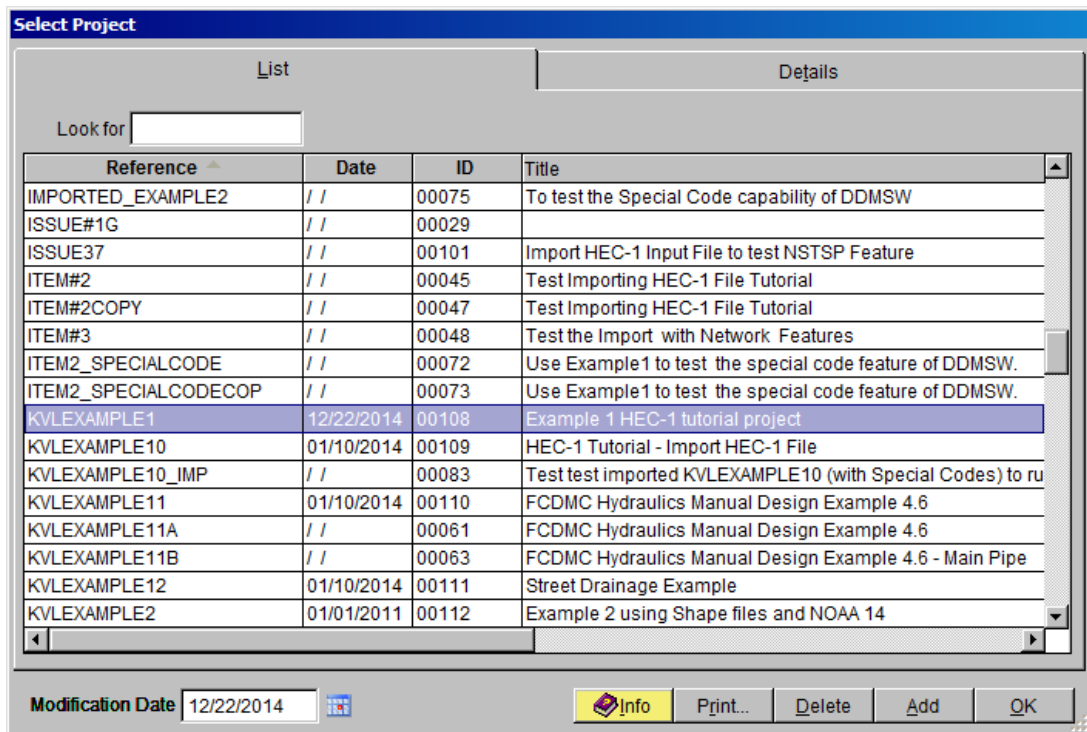
The program is based on two assumptions. The first assumption is that normal-depth channel routings are defined by RS cards with FLOW as a keyword in Field 2. It should be mentioned that there might be some exceptions to this assumption due to many combinations of routing parameters though this assumption is valid for most cases. Users should check to make sure that the intended channel routings are defined by RS card with FLOW as a keyword in Field 2. The second assumption is that all ID's in KK cards are unique. Users

should check to make sure that there are no duplicate **(ID's in)** KK cards. It is the users' responsibility to check and accept the final results.

For purposes of illustration, this tutorial will use KVLEXAMPLE1.DAT. After completing the tutorial, the user should test the tool using his or her project data.
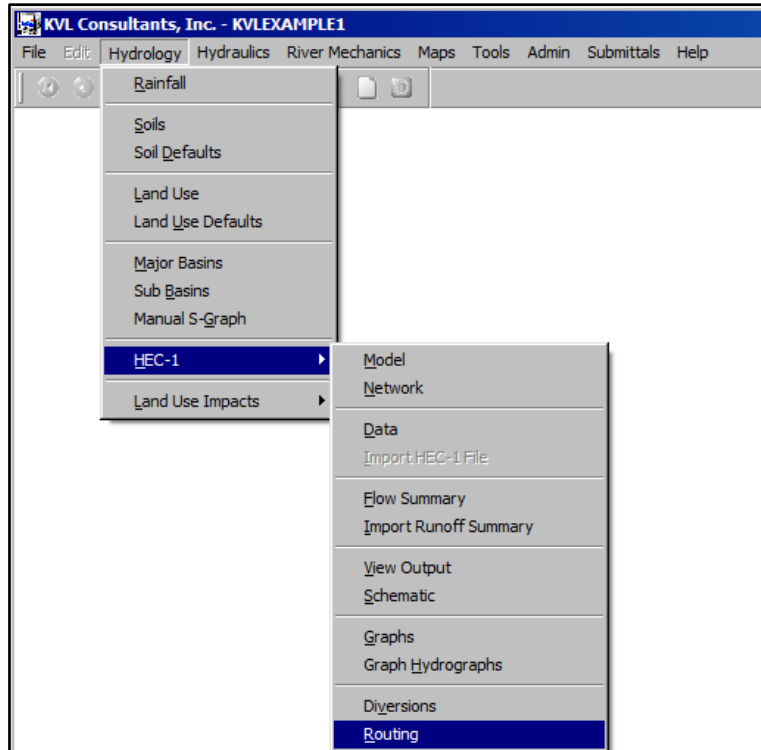
2.0   OPEN THE PROJECT

After launching the DDMSW program, open an existing project *('File => Select Project')*. Select **KVLEXAMPLE1** from the project list. Press *'OK'* to close the **SELECT PROJECT** form. [**Note:** Please use the DDMSW project file *'KVLExample1.zip'* that is bundled along with the tutorial document for this tutorial. To use the attached project data, delete first the *'KVLExample1'* project in DDMSW and once it is deleted, to import the *'KVLExample1.zip'* into DDMSW (*File ➔ Project Management➔Import*].

Select Project

List			Details

Look for [   ]

Reference ▲	Date	ID	Title
IMPORTED_EXAMPLE2	/ /	00075	To test the Special Code capability of DDMSW
ISSUE#1G	/ /	00029	
ISSUE37	/ /	00101	Import HEC-1 Input File to test NSTSP Feature
ITEM#2	/ /	00045	Test Importing HEC-1 File Tutorial
ITEM#2COPY	/ /	00047	Test Importing HEC-1 File Tutorial
ITEM#3	/ /	00048	Test the Import with Network Features
ITEM2_SPECIALCODE	/ /	00072	Use Example1 to test the special code feature of DDMSW.
ITEM2_SPECIALCODECOP	/ /	00073	Use Example1 to test the special code feature of DDMSW.
KVLEXAMPLE1	12/22/2014	00108	Example 1 HEC-1 tutorial project
KVLEXAMPLE10	01/10/2014	00109	HEC-1 Tutorial - Import HEC-1 File
KVLEXAMPLE10_IMP	/ /	00083	Test test imported KVLEXAMPLE10 (with Special Codes) to ru
KVLEXAMPLE11	01/10/2014	00110	FCDMC Hydraulics Manual Design Example 4.6
KVLEXAMPLE11A	/ /	00061	FCDMC Hydraulics Manual Design Example 4.6
KVLEXAMPLE11B	/ /	00063	FCDMC Hydraulics Manual Design Example 4.6 - Main Pipe
KVLEXAMPLE12	01/10/2014	00111	Street Drainage Example
KVLEXAMPLE2	01/01/2011	00112	Example 2 using Shape files and NOAA 14

Modification Date [12/22/2014]   [ ]   [◆Info] [Print...] [Delete] [Add] [OK]

3.0   ENTER INITIAL NSTPS VALUES

Go to the Routing Menu (*'Hydrology ➔ HEC-1 ➔ Routing'*).

On the **HEC-1 ROUTING DATA** form, check the custom check boxes to the right of the **'Steps'** field for all the return periods. This allows you to enter an initial step value into the current routing card. Enter initial step values into the '**Steps'** field. Now, uncheck the custom check boxes and press **'Save'.** Repeat for every routing card or record. When finished, press **'OK'** to close the **HEC-1 ROUTING DATA** form.

4.0 UPDATE THE MODEL

On the **HEC-1 DATA** form (*'Hydrology ➔ HEC-1 ➔ Data'*), press the *'Update'* button.

F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	Sort	Special Code ID
ID		KVL Cons	ultants,	Inc.							10	
ID		KVLEXAMP	LE1 - Ex	ample 1	HEC-1 tu	torial p	roject				20	
ID		100 YEAR									30	
ID		6 Hour	Storm								40	
ID		Unit Hyd	rograph:	Clark							50	
ID		Storm: M	ultiple								60	
ID		08/31/20	13								70	
ID		This is	the HEC-	1 tutori	al progr	am examp	le.				80	
*D	IAGRAM										90	
IT	5	1JAN99	0	2000							100	
IO	5										110	
IN	15										120	
*											130	
JD	3.250	0.0001									140	
PC	0.000	0.008	0.016	0.025	0.033	0.041	0.050	0.058	0.066	0.074	150	
PC	0.087	0.099	0.118	0.138	0.216	0.377	0.834	0.911	0.931	0.950	160	

On the **UPDATE HEC-1 DATA** form, press *'Yes'* to continue.

> **Update HEC-1 Data**
>
> This will update the HEC-1 model data for the current Major Basin.
>
> Initially select a Return Period for the Rainfall then the program will update the following (if appropriate):
>
> Rainfall Depth
> Diversions
> Storage Basins
> Routing Data
> Hydrographs
> Special Code
> Sub Basin Data
>
> Do you want to continue?
>
> [Yes] [No]

Select a return period. Press the *'OK'* button for DDMSW to update the HEC-1 model with the latest parameters from the data entry menus, including the initial routing NSTPS values. Press *'OK'* to close the **HEC-1 DATA** form.
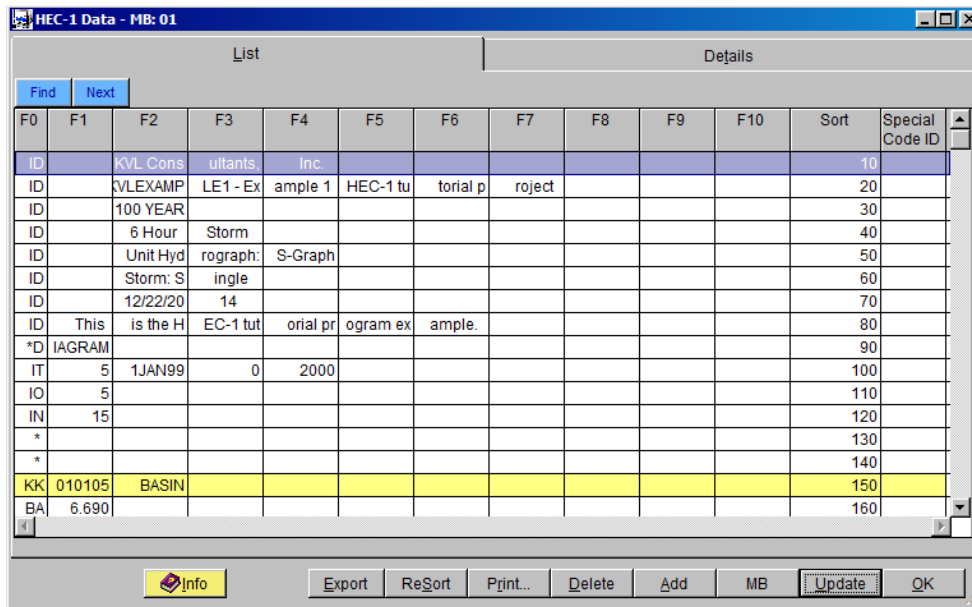
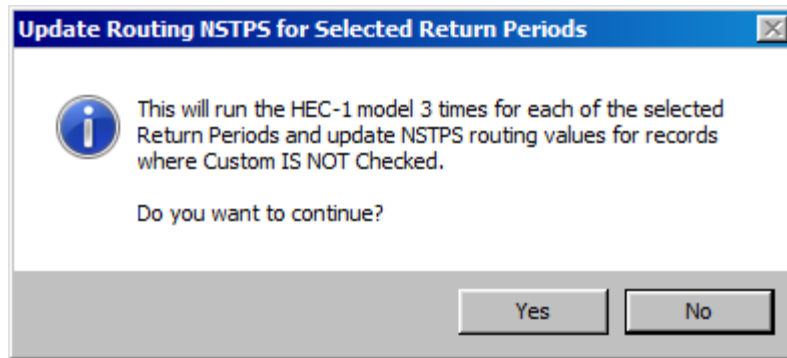## 5.0 EXECUTE PROGRAM TO EVALUATE NSTPS VALUES

On the **HEC-1 ROUTING DATA** form (*'Hydrology ➔ HEC-1 ➔ Routing'*), click the *"Update Steps from HEC-1'* button.
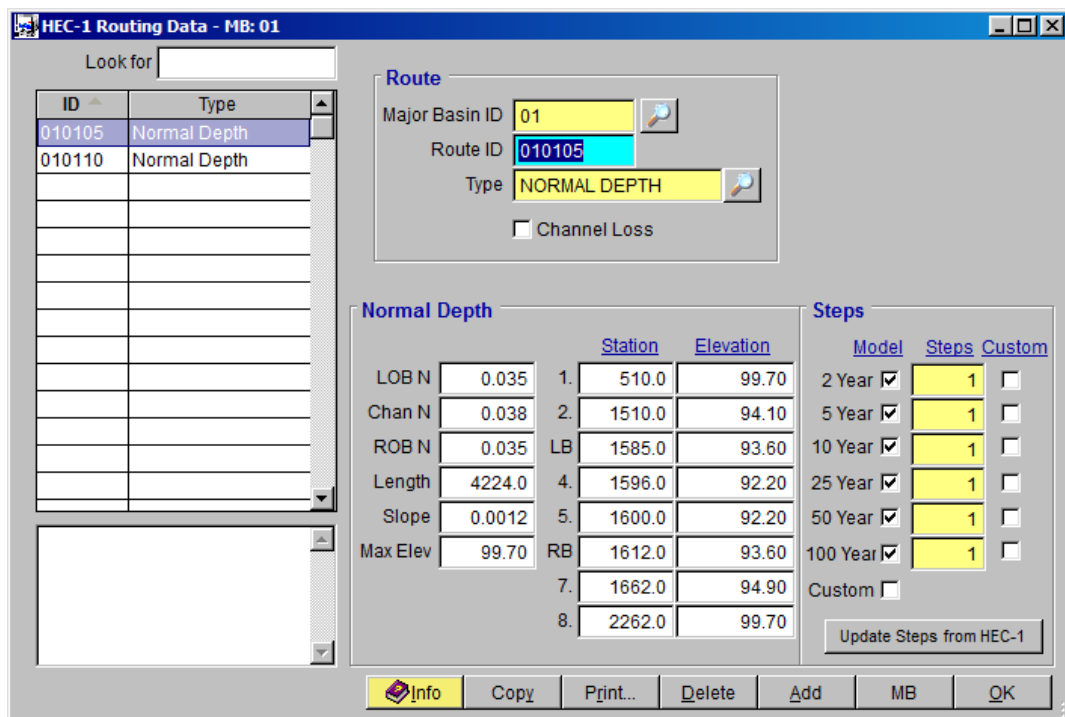
A pop-up message will appear stating that HEC-1 will run 3 times for each of the selected return periods. This will update the NSTPS routing values, only if the custom checkbox is unchecked. Press *'Yes'* to continue.

Update Routing NSTPS for Selected Return Periods

This will run the HEC-1 model 3 times for each of the selected Return Periods and update NSTPS routing values for records where Custom IS NOT Checked.

Do you want to continue?

Yes   No

After the last HEC-1 run is completed, the NSTPS values for the routing cards will be updated. Press **'OK'** to close the **HEC-1 ROUTING DATA** form.
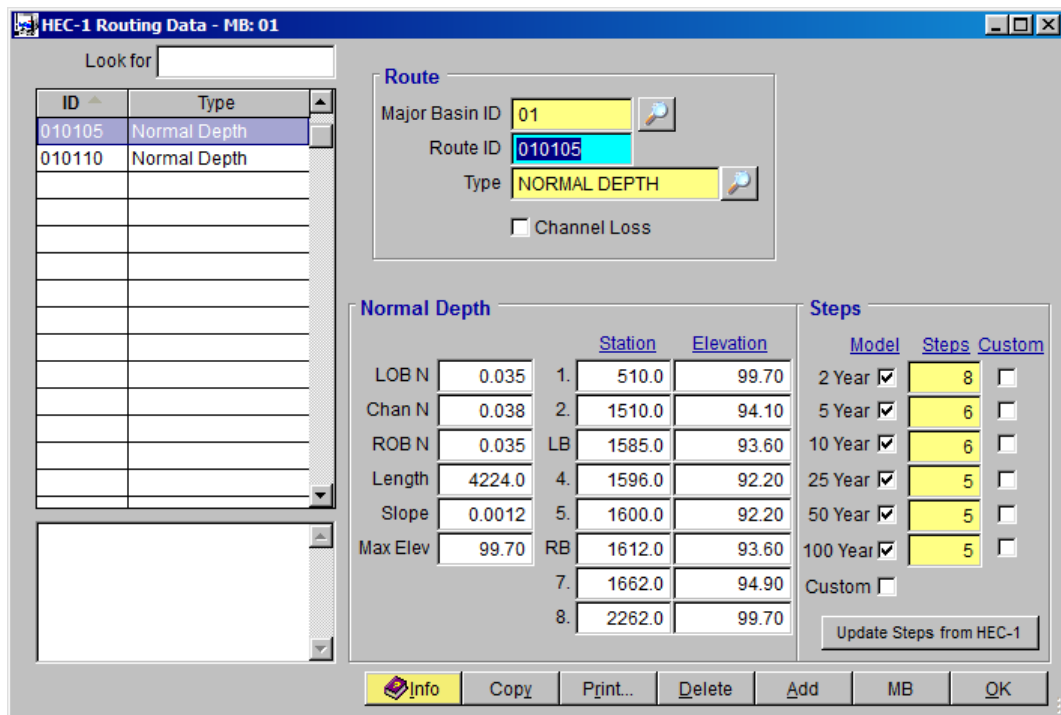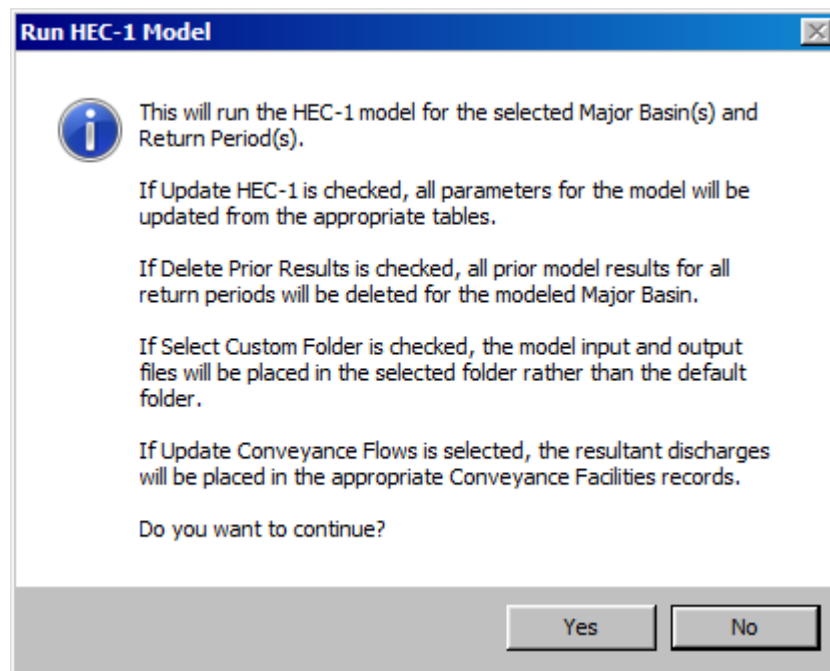

6.0 RUN THE MODEL

After all the NSTPS values have been determined and accepted, you can run the HEC-1 model to obtain your model results.

To run the model, open the **RUN HEC-1 MODEL** form (**'Hydrology ➔ HEC-1 ➔ Model'**) and check the following checkboxes: All the events in the '**Return Period'**, the '**Update HEC-1'** checkbox, and the **'Delete Prior Results'** checkbox. Finally, click the **'Run Model'** button to execute the program.
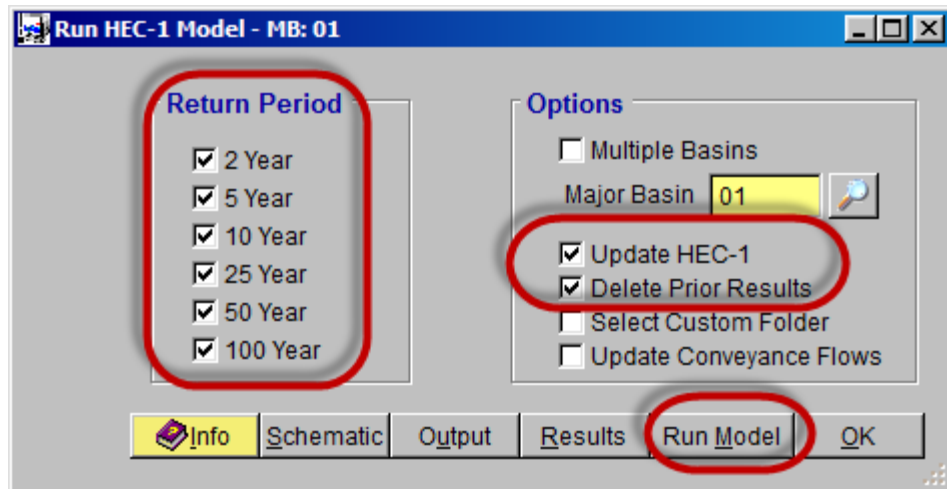
Click **'Yes'** twice to continue.

Afterwards, you can view the model results by clicking the **'Results'** button on the **RUN HEC-1 MODEL** form. Alternatively, you can also view the results from **'Hydrology ➔ HEC-1 ➔ Flow Summary'**.

7.0 NOTES

A. When you check the **'Custom'** checkbox (3rd column) next to the **'Steps'** field on the **HEC-1 ROUTING DATA** form (**'Hydrology ➔ HEC-1 ➔ Routing'**), the program will lock the entered values so they could not be changed even when the **'Update Steps from HEC-1'** button is pressed. Only the ones that are unchecked will be updated by the program.

B. If you receive '*Output file not found'* messages after pressing the **'Update Steps from HEC-1'** button, while on the **HEC-1 ROUTING DATA** form, check the model runs path (**'File ➔ Project Paths ➔ Model Runs Path'**) to ensure that you have set the path for the project; otherwise, define the **Model Runs Path** by using the ellipse (**...**) button on the right side of the **Model Runs Path** textbox.

C. To ensure that NSTPS values have reached stability, the tool may have to be executed more than once. To run the tool for the second or the third time, press the **'Update Steps from HEC-1'** button after the first or second execution.

D. Selecting the **'Custom'** checkbox, under the '**Model'** column (1st column) in the '**Steps**' data group, will default the tool to run only for the '**100 Year**' event.