Trouble Shooting Workshop

Introduction

This workshop will help students learn how to trouble shoot instability problems associated with developing unsteady flow models with HEC-RAS. This workshop contains four separate instability problems, which are to be solved by the student. *While the data is from actual studies, the models and results of this workshop do not represent current or future conditions of the rivers.*

Problem Description 1

The stream for this example is a section of Beaver Creek located near Kentwood, Louisiana. A project file (**Stability1**) with the title "**Stability Problem Number 1**" has been loaded on your workshop computers. The file contains all the data for this workshop. The geometry for this example includes the bridge crossing and interpolated cross sections.

Task 1

Load the project file and run the model. Examine the output for instabilities. Based on the output, geometry, boundary conditions, and initial conditions form a hypothesis on what is causing the instability. If time permits, revise the model based on your hypothesis until a stable computation is achieved.

Note on Viewing Profile Plot

Stepping through a time series animation with the **Profile Plot** is a good starting point to view where and when an instability occurred. When the **Profile Plot Window** is first opened the program will default to the maximum water surface. Unfortunately, when the program goes unstable the maximum water surface will usually have erroneous data. The bad data skews the dimensions of the plot, as seen in Figure 1.

The view needs to be corrected to analyze the instability. Under the **Options** menu of the **Profile Plot**, select **Profiles.** Next, clear the maximum water surface profile from the selection window and select the first profile. An example is shown in Figure 2. This should restore the view, then proceed through the time steps for analysis.
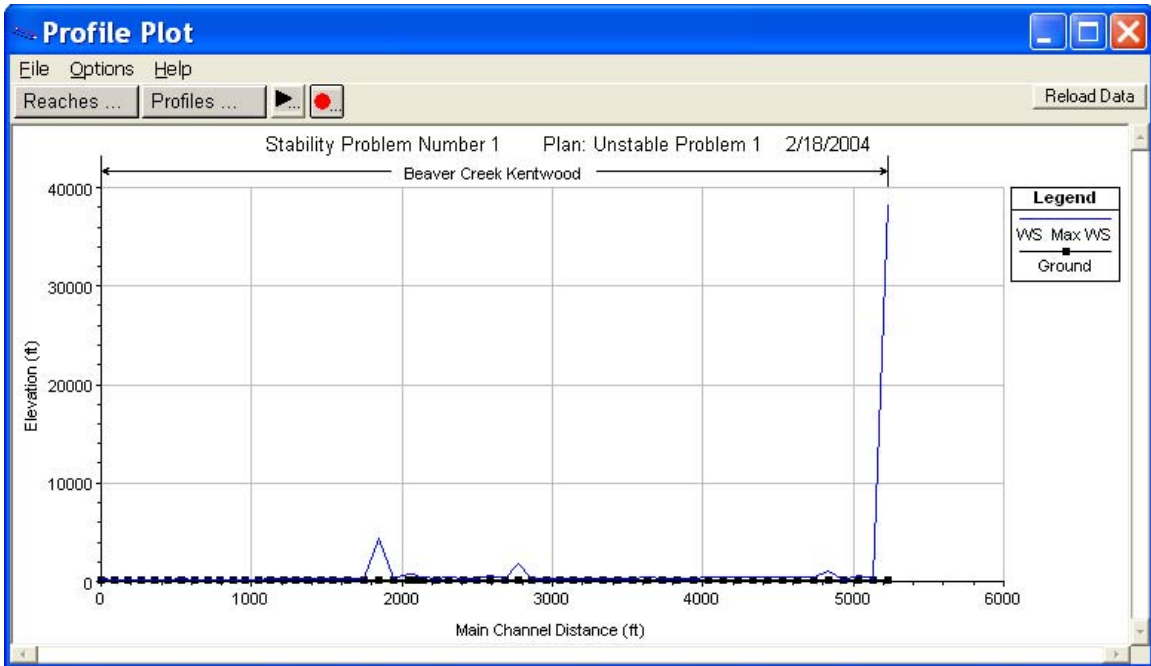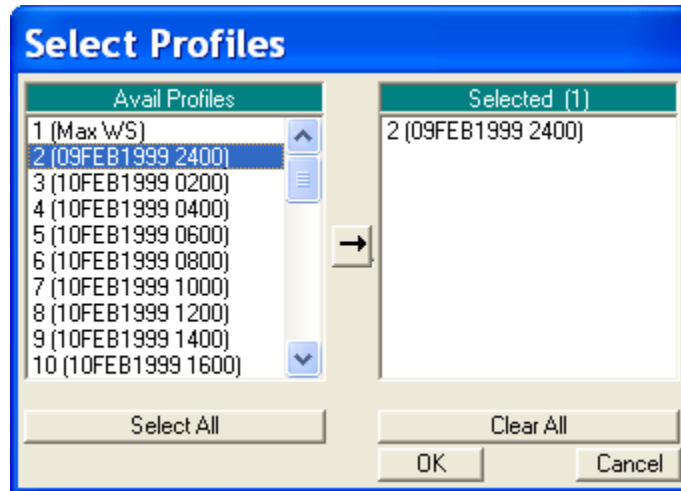
Figure 1 Maximum Water Surface Plot of Instability

Figure 2 Initial Profile Selected

Questions

At what time step and at what location did the program begin to go unstable?

What caused the instability?

If you were able to fix the instability, how was this achieved?

Problem Description 2

The stream for this example is a section of Beaver Creek located near Kentwood, Louisiana. A project file (**Stability2**) with the title "**Stability Problem Number 2**" has been loaded on your workshop computers. The file contains all the data for this workshop. The geometry for this example includes a bridge, interpolated cross sections, lateral weir with gates, and a storage area.

Note: The computation interval for this simulation is set to 5 minutes. Determine what is causing the instability without adjusting this interval.

Task 2

Load the project file and run the model. Examine the output for instabilities. Based on the output, geometry, boundary conditions, and initial conditions form a hypothesis on what is causing the instability. If time permits, revise the model based on your hypothesis until a stable computation is achieved.

Questions

At what time step and at what location did the program begin to go unstable?

What caused the instability?

If you were able to fix the instability, how was this achieved?

Problem Description 3

The stream for this example is a section of Beaver Creek located near Kentwood, Louisiana. A project file (**Stability3**) with the title "**Stability Problem Number 3**" has been loaded on your workshop computers. The file contains all the data for this workshop. The geometry for this example includes the bridge crossing and interpolated cross sections.

Note: The computation interval for this simulation is set to 5 minutes. Determine what is causing the instability without adjusting this interval.

Task 3

Load the project file and run the model. Examine the output for instabilities. Based on the output, geometry, boundary conditions, and initial conditions form a hypothesis on what is causing the instability. If time permits, revise the model based on your hypothesis until a stable computation is achieved.

Questions

At what time step and at what location did the program begin to go unstable?

What caused the instability?

If you were able to fix the instability, how was this achieved?

Problem Description 4

The stream for this example is a section of Brunner River located near Jensen Town. The reach is a trapezoidal, concrete lined channel. A project file (**Stability4**) with the title "**Stability Problem Number 4**" has been loaded on your workshop computers. The file contains all the data for this workshop

Note: The computation interval for this simulation is set to 1 minute. Determine what is causing the instability without adjusting this interval.

Task 4

Load the project file and run the model. Examine the output for instabilities. Based on the output, geometry, boundary conditions, and initial conditions form a hypothesis on what is causing the instability. If time permits, revise the model based on your hypothesis until a stable computation is achieved.

Questions

At what time step and at what location did the program begin to go unstable?

What caused the instability?

If you were able to fix the instability, how was this achieved?