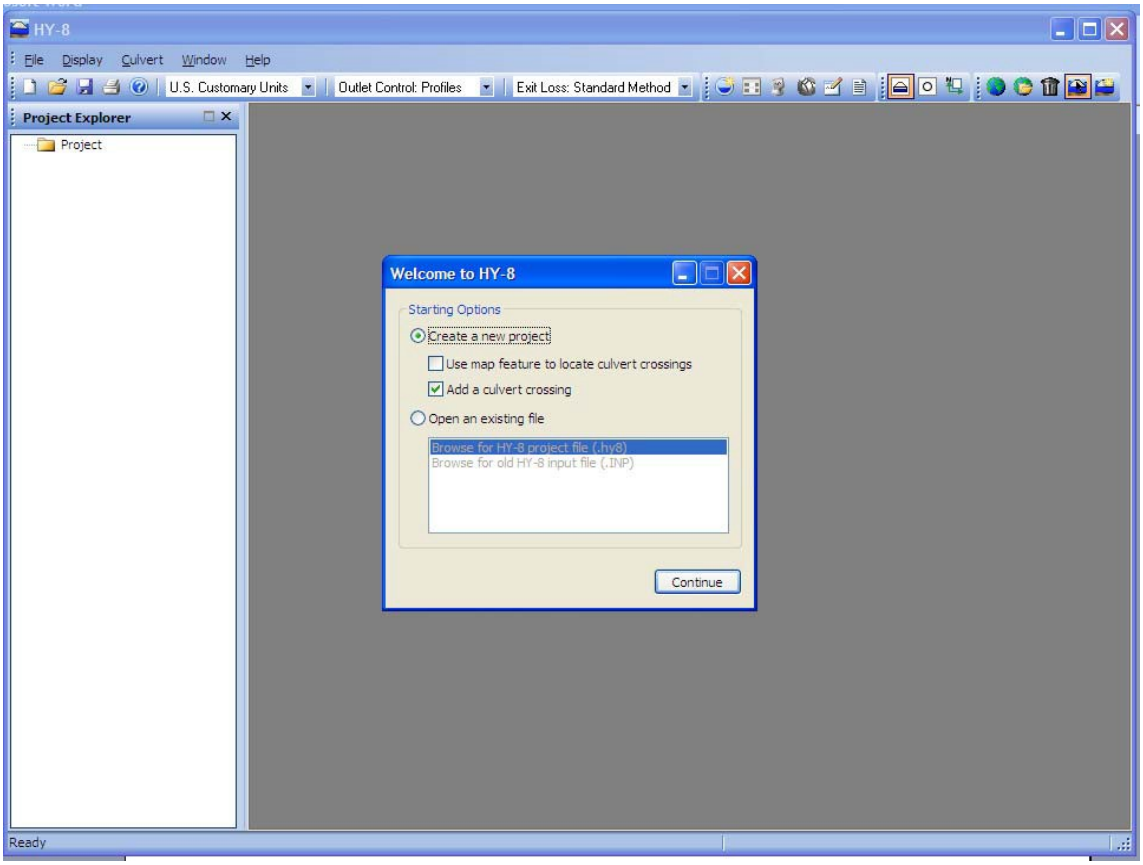
# HY-8 Quick Tutorial

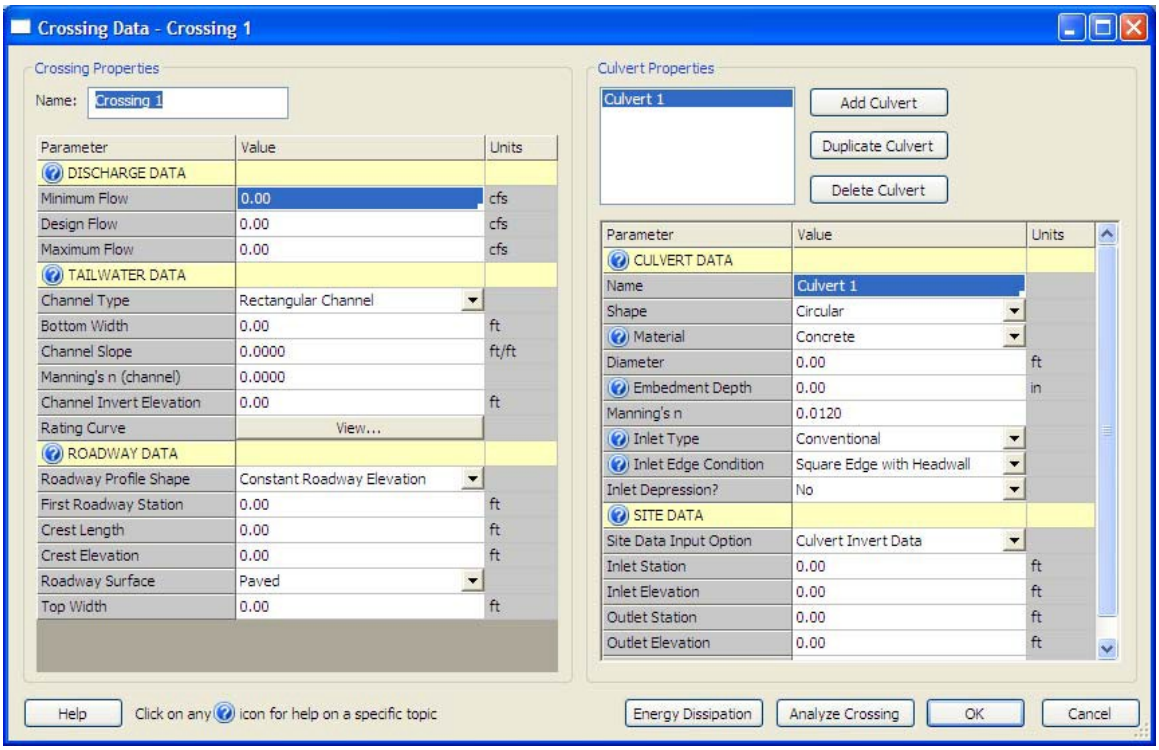
This tutorial shows how to setup a single culvert in HY-8. The tutorial also shows how to view all the results of the culvert analysis. It is meant to be an introduction to using HY-8 for culvert analysis and is by no means a comprehensive reference to all the capabilities of HY-8. A more complete list of HY-8's capabilities is contained in the HY-8 help file.

## Starting a Project

1. Startup HY-8. The following window will appear:



2. Select *Continue* to add a new culvert crossing.




## Entering Project Data

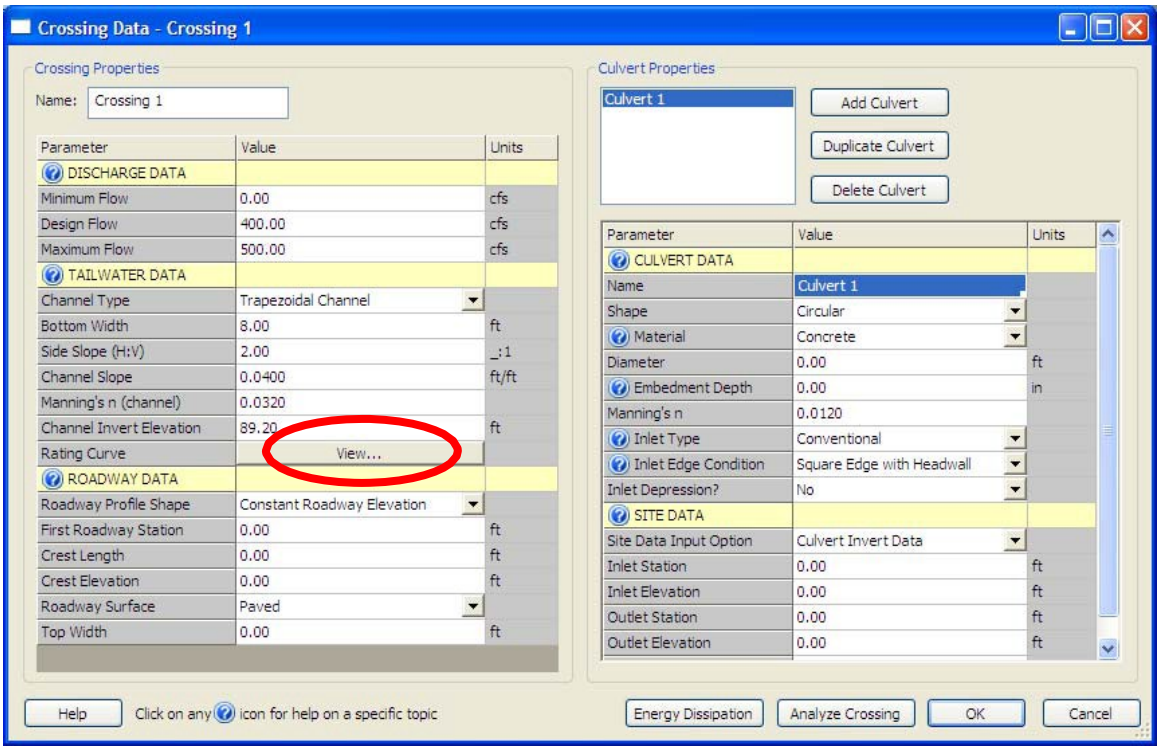
3. Enter the following into the "Discharge Data" section of the *Crossing Data* window:

| | |
|---|---|
| Minimum Flow | 0.0 cfs |
| Design Flow | 400.0 cfs |
| Maximum Flow | 500.0 cfs |

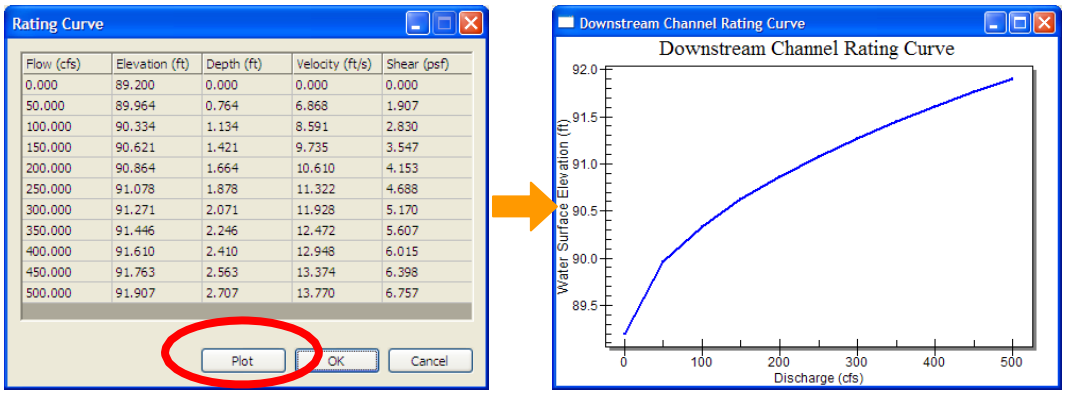
4. Enter the following into the "Tailwater Data" section of the *Crossing Data* window:

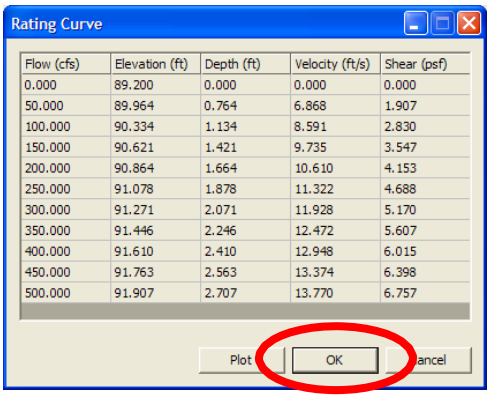
| | |
|---|---|
| Channel Type | Trapezoidal Channel |
| Bottom Width | 8.0 ft |
| Side Slope (H:V) | 2.0 (_:1) |
| Channel Slope | 0.04 ft/ft |
| Manning's n (channel) | 0.032 |
| Channel Invert Elevation | 89.2 ft |

5. Select the “View” button to view the rating curve:




6. Plot the Rating Curve if you wish, but when you are finished, close the plot window and choose “OK” in the Rating Curve window.






7. Enter the following into the "Roadway Data" section of the *Crossing Data* window:

| | |
|---|---|
| Roadway Profile Shape | Constant Roadway Elevation |
| First Roadway Station | 0.0 ft |
| Crest Length | 100.0 ft |
| Crest Elevation | 110.0 ft |
| Roadway Surface | Paved |
| Top Width | 150.0 ft |

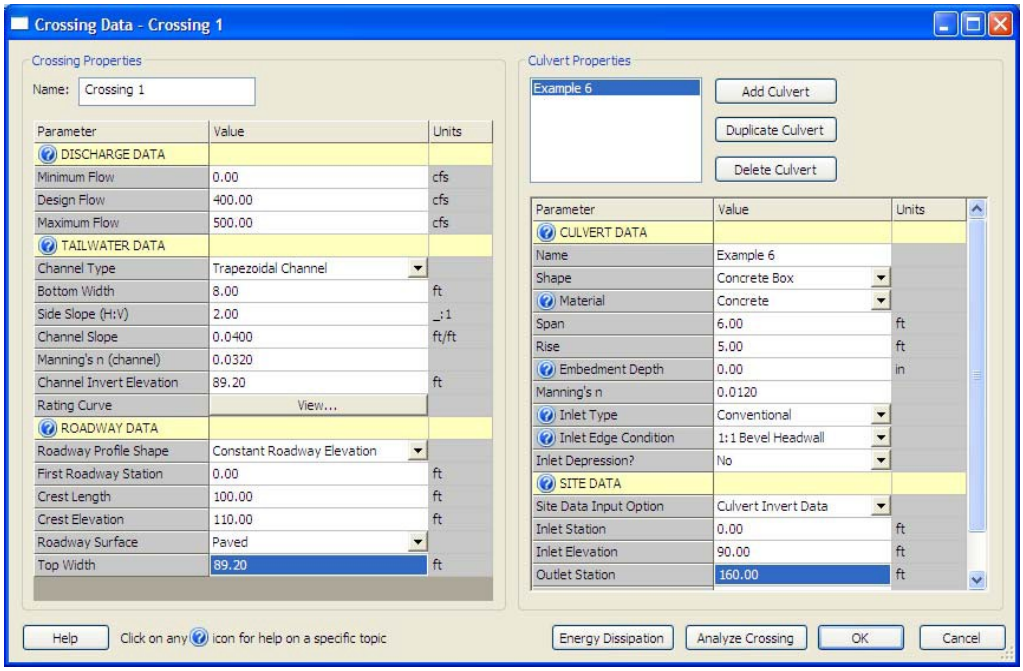
8. Enter the following into the "Culvert Data" section of the *Crossing Data* window:

| | |
|---|---|
| Name | Example 6 |
| Shape | Concrete Box |
| Material | Concrete |
| Span | 6.0 ft |
| Rise | 5.0 ft |
| Embedment depth | 0.00 in[1] |
| Manning's n | 0.012 |
| Inlet Type | Straight |
| Inlet Edge Condition | 1:1 Bevel Headwall |
| Inlet Depression? | No |

[1] OPTIONAL: Embedment depth is a NEW feature that allows a user to bury a culvert – perhaps for fish passage purposes. The depth of embedment is always a positive number (or zero – for no embedment). So burying this box culvert 6 inches would require placing a "6.0" in the field. This means that of the 5 foot rise, only 4.5 feet is "open" for hydraulic purposes. The remaining 0.5 feet = 6 inches) is buried with some bed material (user specified "n" value). The culvert invert elevations (next step) should reflect the buried depth. The elevation of the embedment at the culvert outlet should correspond to the elevation of the tailwater channel invert (= 89.2 feet).

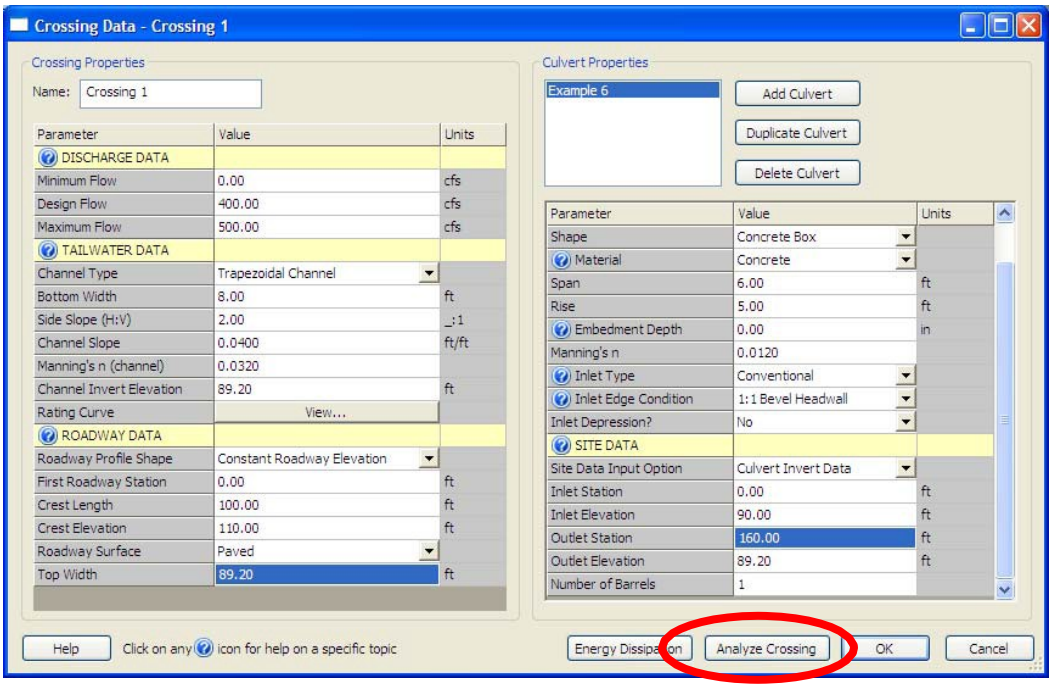
9. Enter the following into the "Site Data" section of the *Crossing Data* window:

| Site Data Input Option | Culvert Invert Data |
|---|---|
| Inlet Station | 0.0 ft |
| Inlet Elevation | 90.0 ft |
| Outlet Station | 160.0 ft |
| Outlet Elevation | 89.2 ft |
| Number of Barrels | 1 |

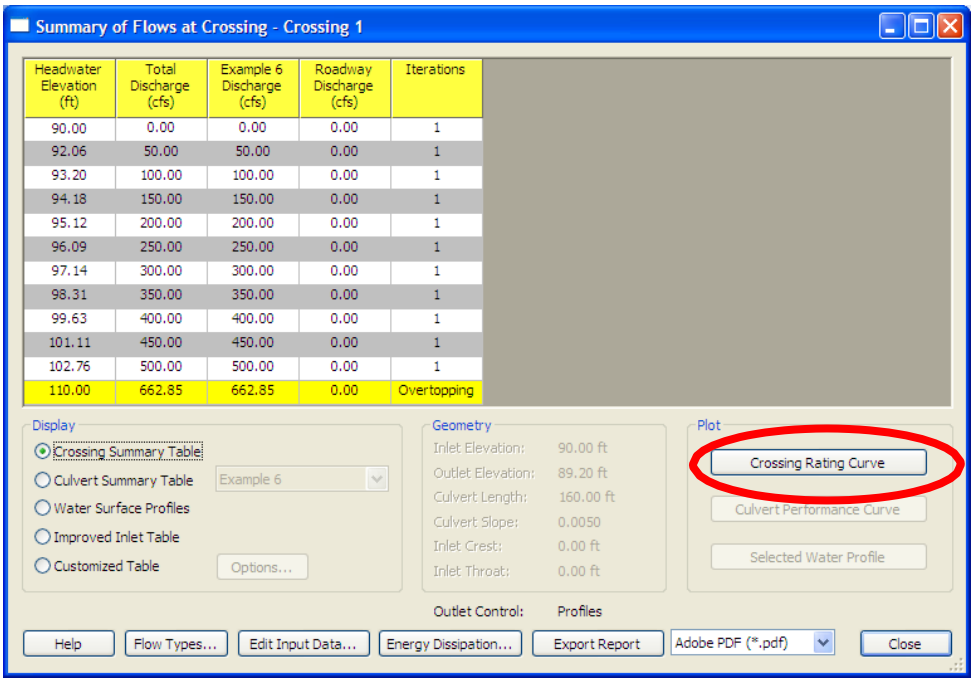


# Running an Analysis

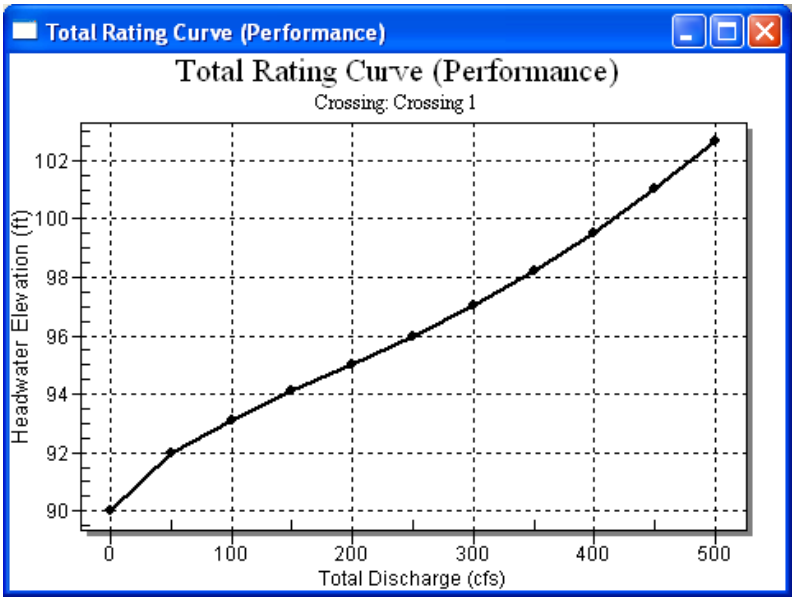
10. Select the *Analyze Crossing* button at the bottom of the *Crossing Data* window. (This runs the analysis, but does not save the information).



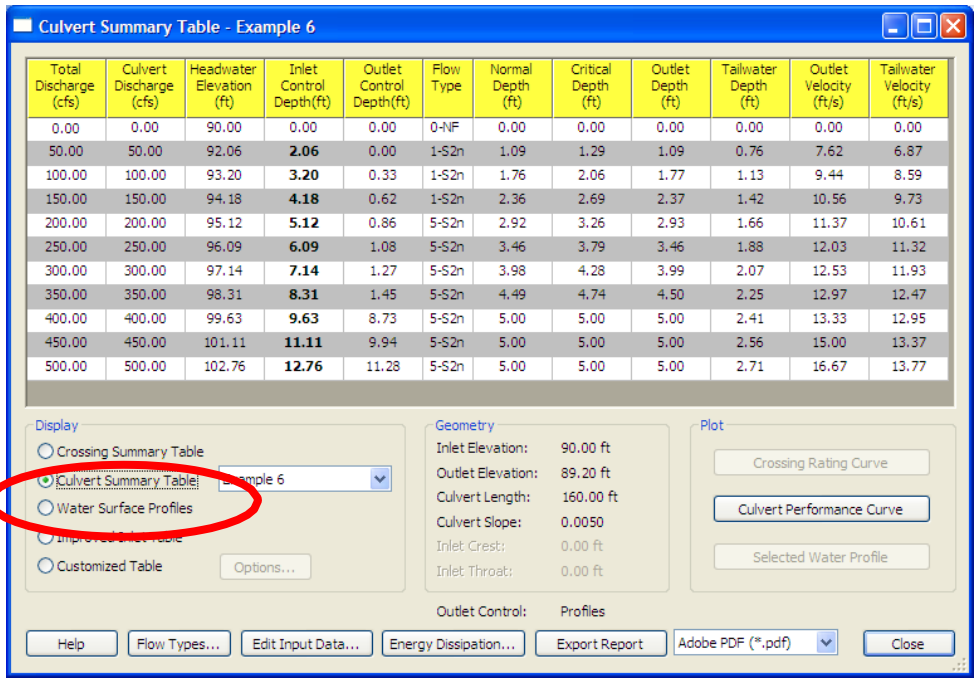

11. Select the *Crossing Rating Curve* button.



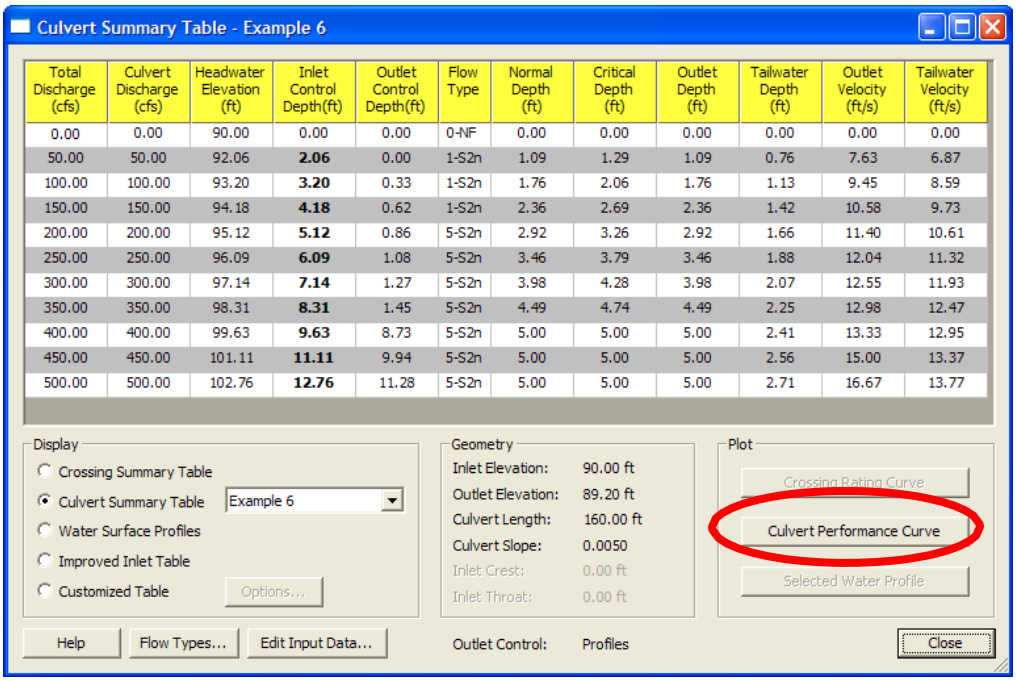
12. A plot of the rating curve (Headwater Elevation vs. Discharge) will appear. After viewing this curve, close the plot window.



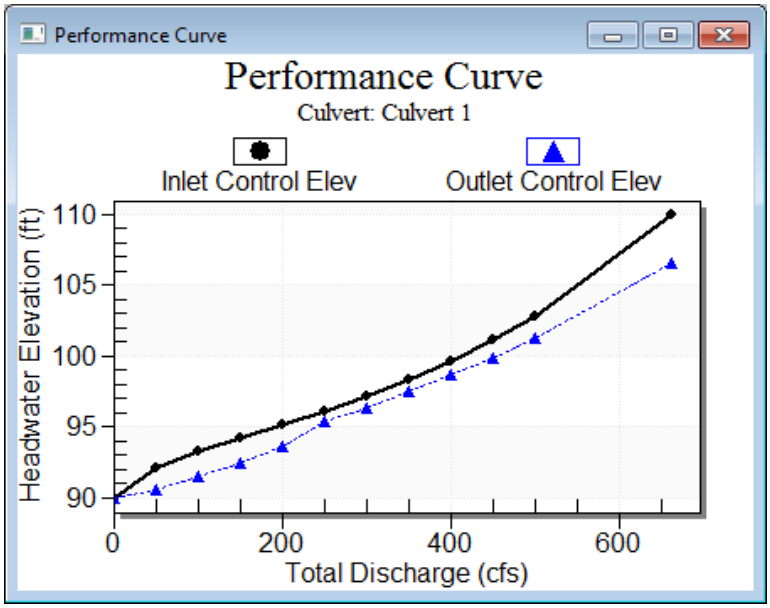

13. Select the *Culvert Summary Table* option in the *Display* box. Any of the data displayed in any of the spreadsheets in this window can be selected, copied (using *Ctrl+C*), and pasted into any spreadsheet program.



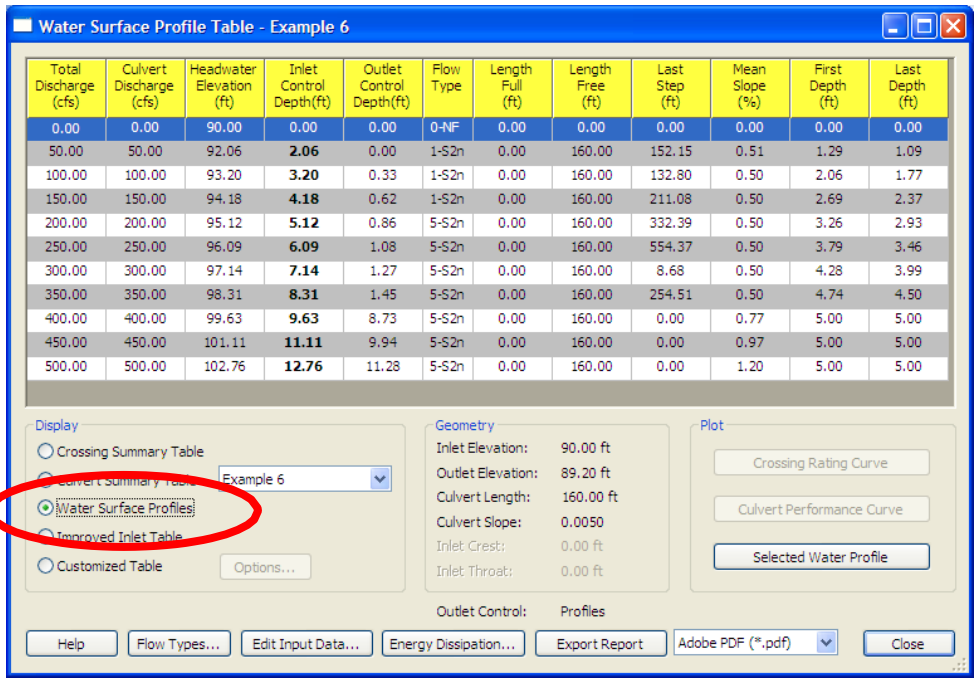
14. Select the *Culvert Performance Curve* button.



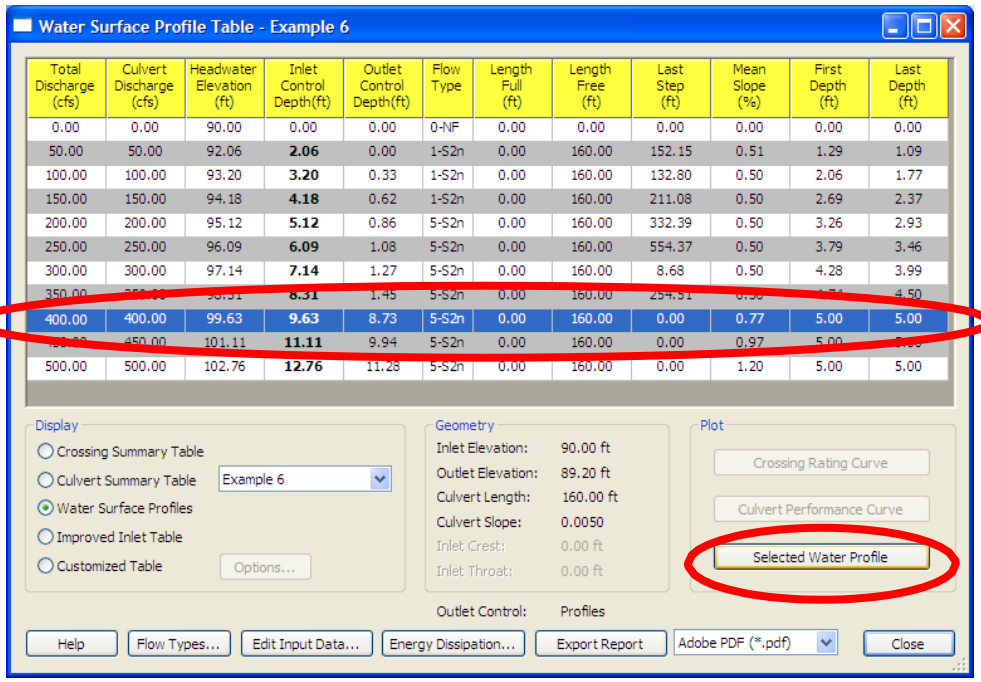

15. A plot of the performance curve (Inlet/Outlet control Headwater Elevation vs. Discharge) will appear. After viewing this curve, close the plot window.



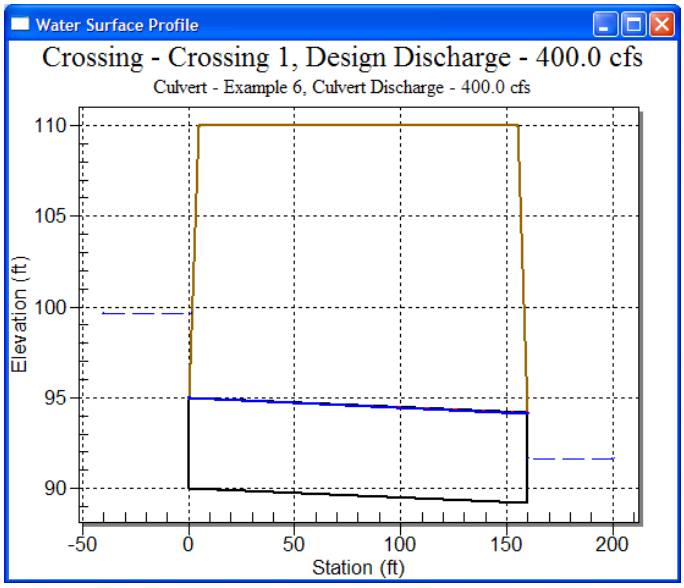
16. Select the *Water Surface Profiles* option in the *Display* box.



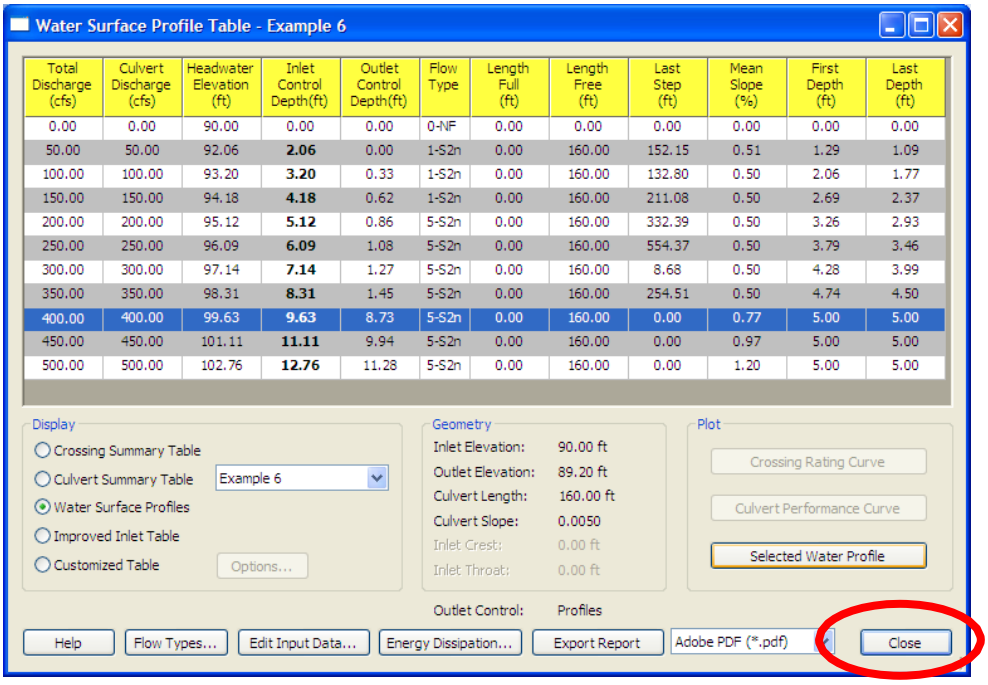

17. Select the 400 cfs profile (third from the bottom) and select the *Selected Water Profile* button.



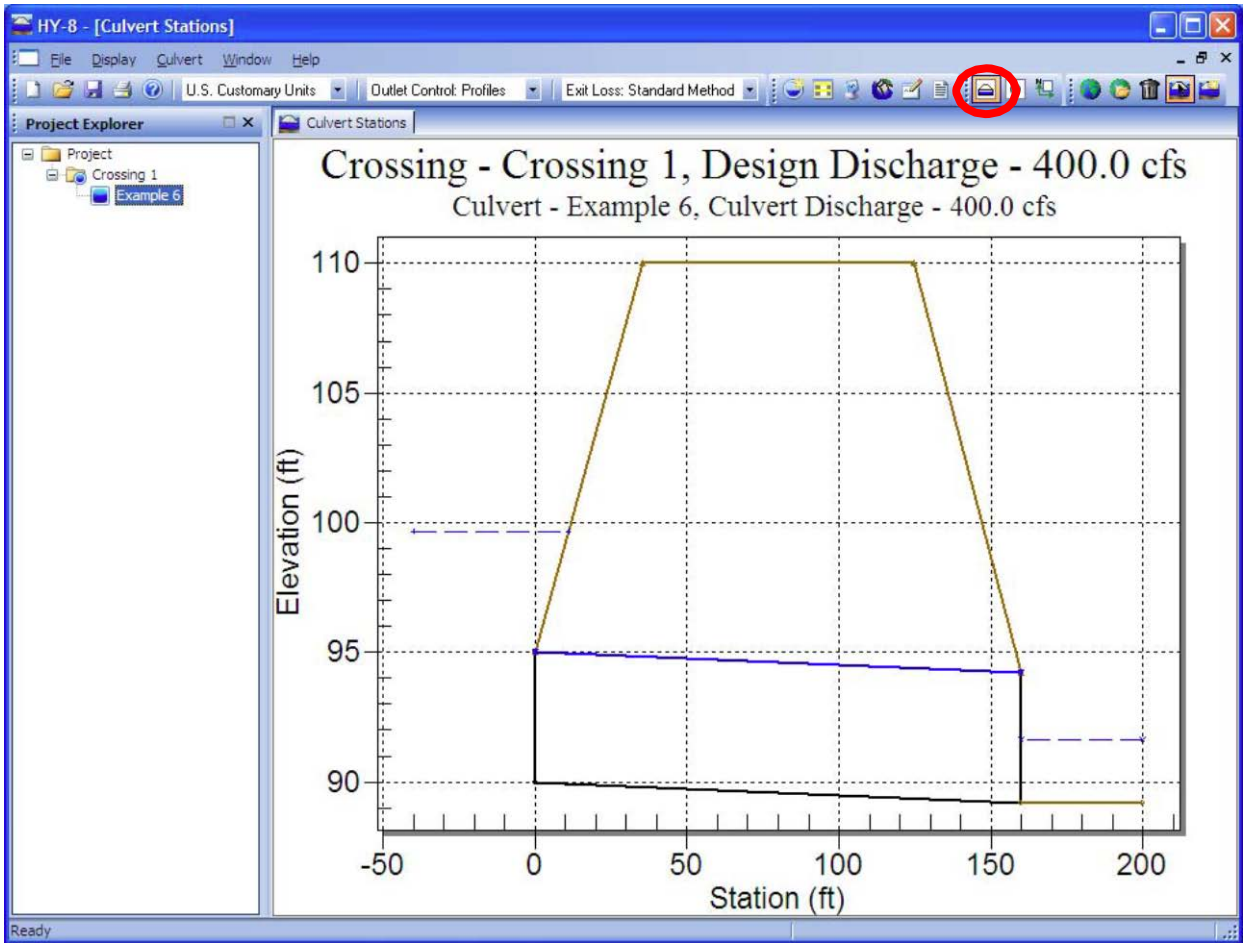
18. A plot of the culvert profile (for the selected discharge of 400 cfs) will appear. After viewing this curve, close the plot window.




19. Select the *Close* button on the Analysis window.



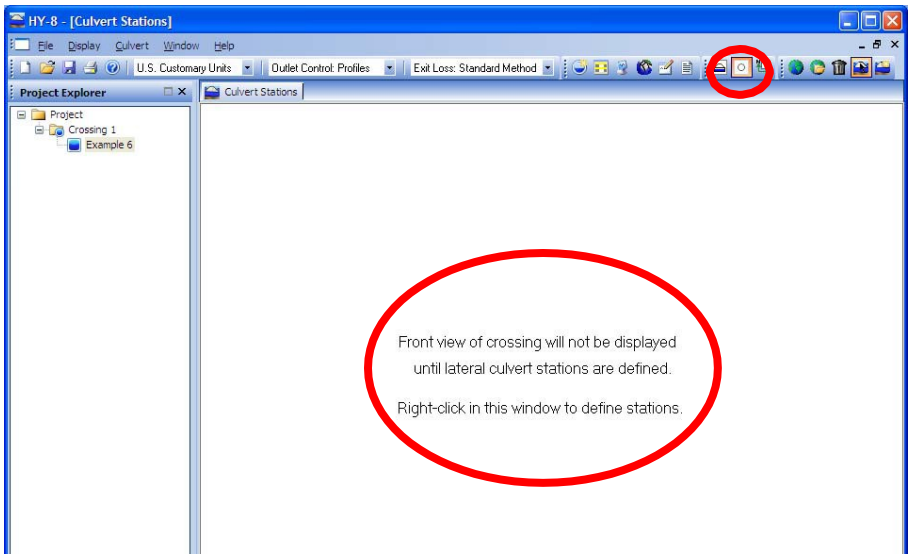
20. Select the "Example 6" culvert in the project explorer to show the culvert profile for the design discharge in the main window. Notice that the Culvert Profile icon is active.



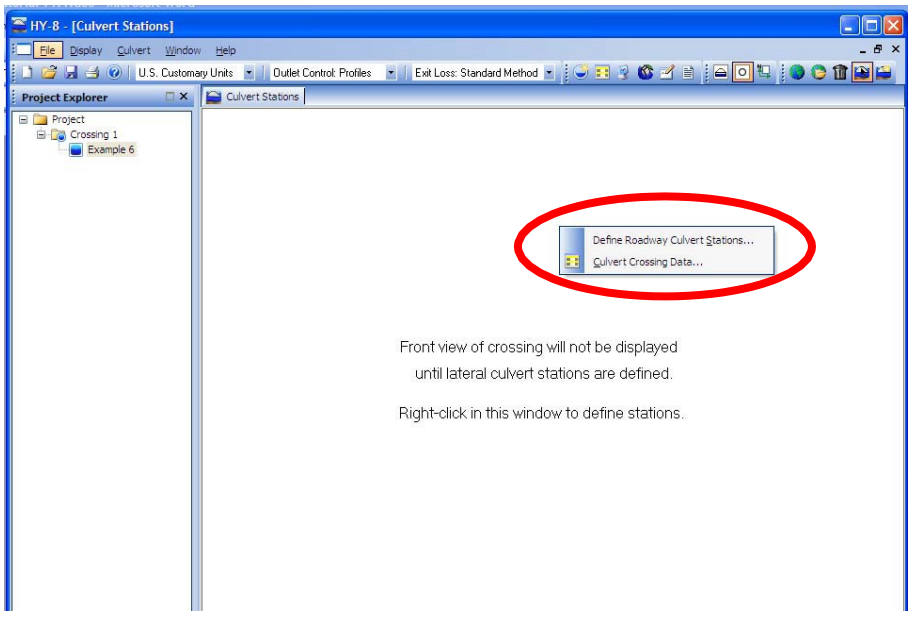
## *Optional: Defining Front View*

Should the user wish to define the front view, they can do so at this (or any other time after entering crossing and culvert information). Recall that details regarding this option were discussed earlier in this document.

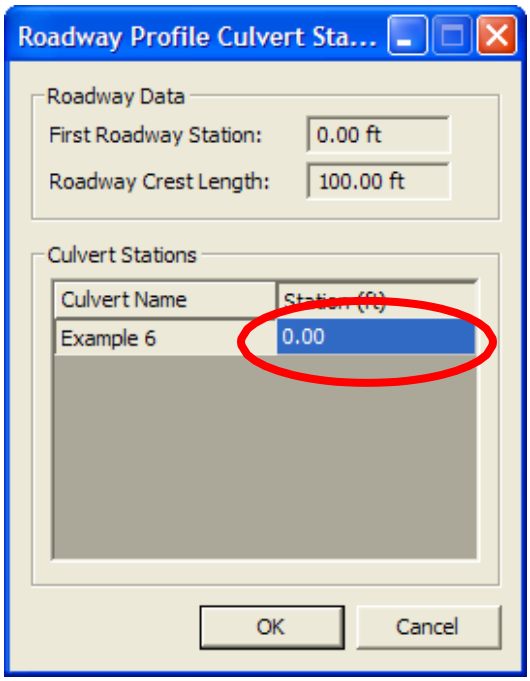
FV-1 Select the Front View icon. A message will appear in the Main Window describing the requirement to define lateral culvert stations. Right click to do so.



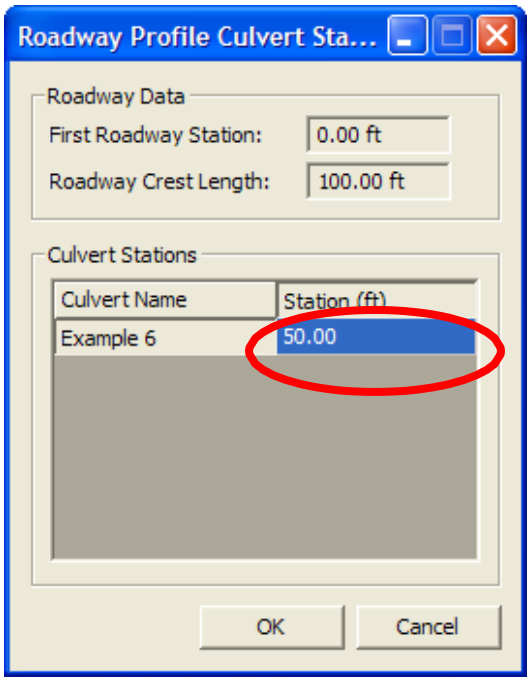

FV-2 A message will appear. Select “Define Roadway Culvert Stations”



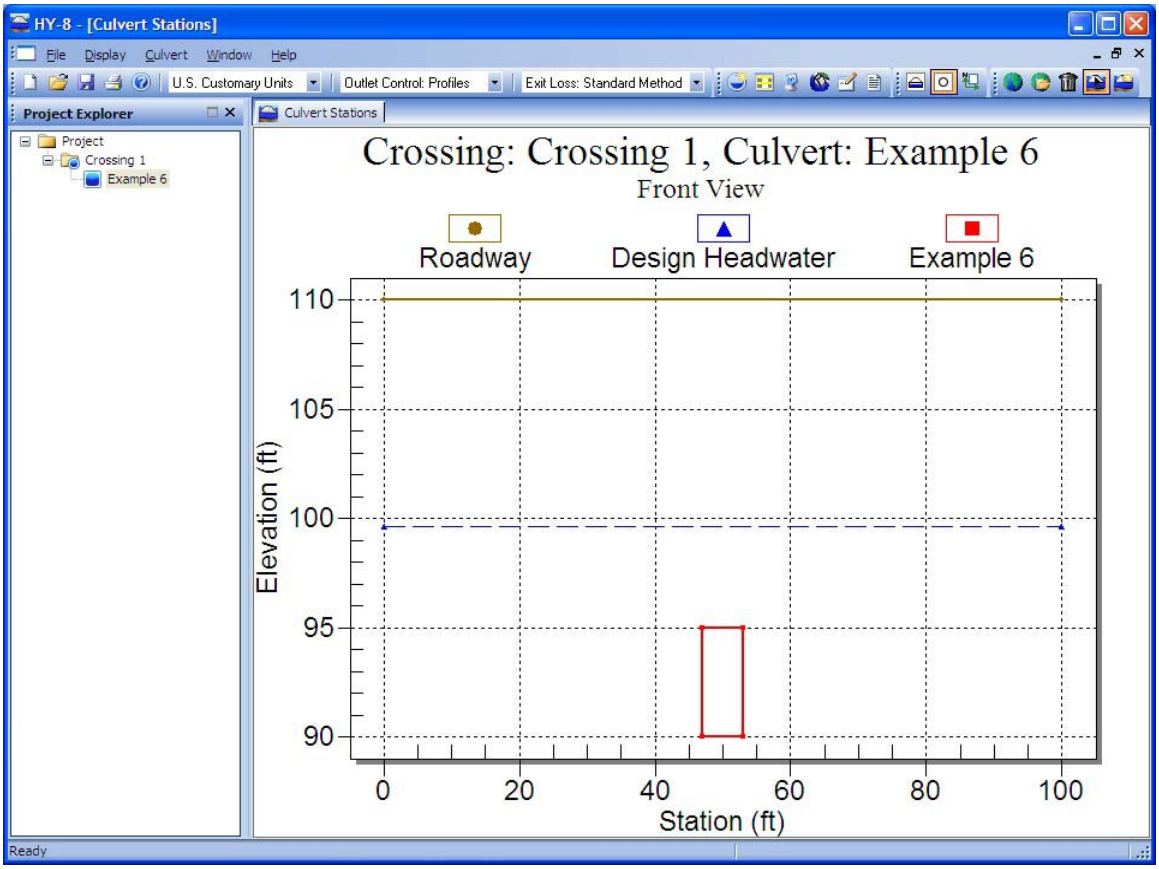
FV-3 The Roadway Profile window appears. Notice that the roadway station data (0.00 ft and 100.00 ft) entered back in Step 7 is in the Window. Click on the Example 6 Station field (currently the default of zero).




FV-4 Enter the station of the centerline of the culvert system. For this example, let's assume that this is at roadway station 50.0 feet (or halfway between the roadway section acting as a weir).



FV-5 Choose “OK” and the Main Window presents the Front View of the crossing.



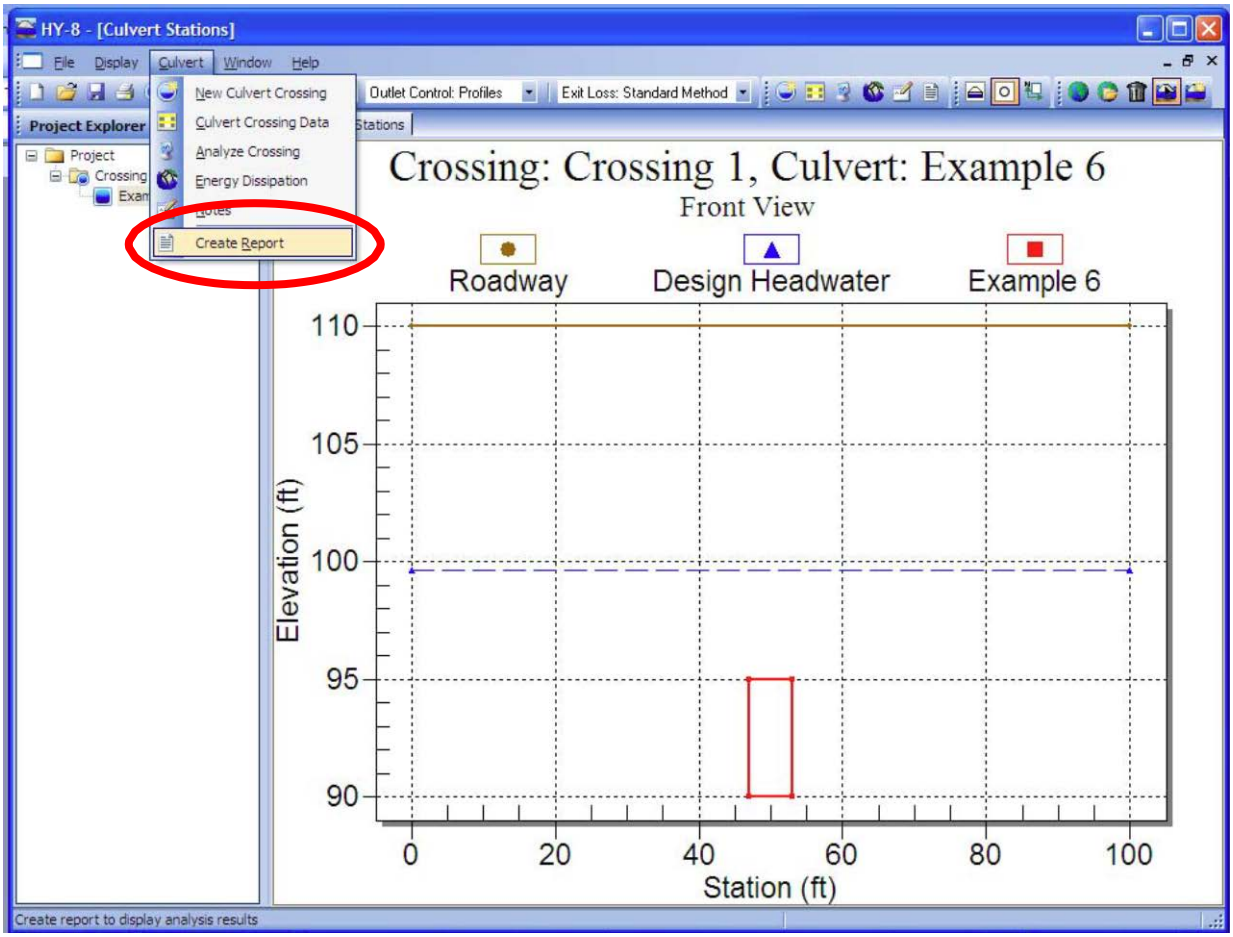

The user can “switch” between the Front View and Side View by selecting the appropriate icon. Notice that when the cursor is over a toolbar icon, a short help message in the lower left of the program window appears.

## Saving the Project File

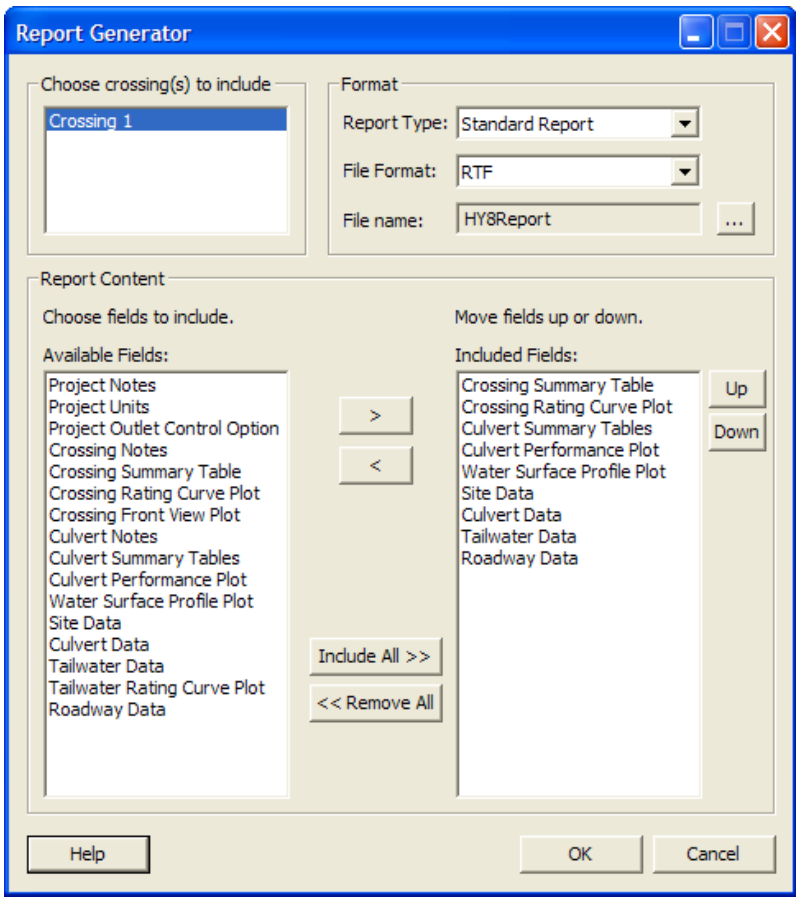
21. This may be a good time to Save the Project File. Select the *Save As* option from the *File* menu. When prompted, call the project file *QuickTutorial* . The program will automatically add the .HY8 extension to this file.

## Viewing Report

22. Select the *Create Report* option from the *Culvert* menu.



23. The *Report Generator* window will appear:




24. Select OK to export the data in the *Included fields* window to a report file. Additional data could be exported by selecting some or all items in the *Available fields* window and using the right arrow (>) to copy the fields from the available fields to the included fields window.

25. After selecting OK, a rich text (RTF) file is exported and opened in Microsoft Word or whatever application is assigned to open RTF files (possibly WordPad if you do not have Microsoft Word installed). The report could have been exported in PDF format by selecting PDF for the *File Format* in the *Report Generator* window.

## *Optional: Editing a HY-8 Report*

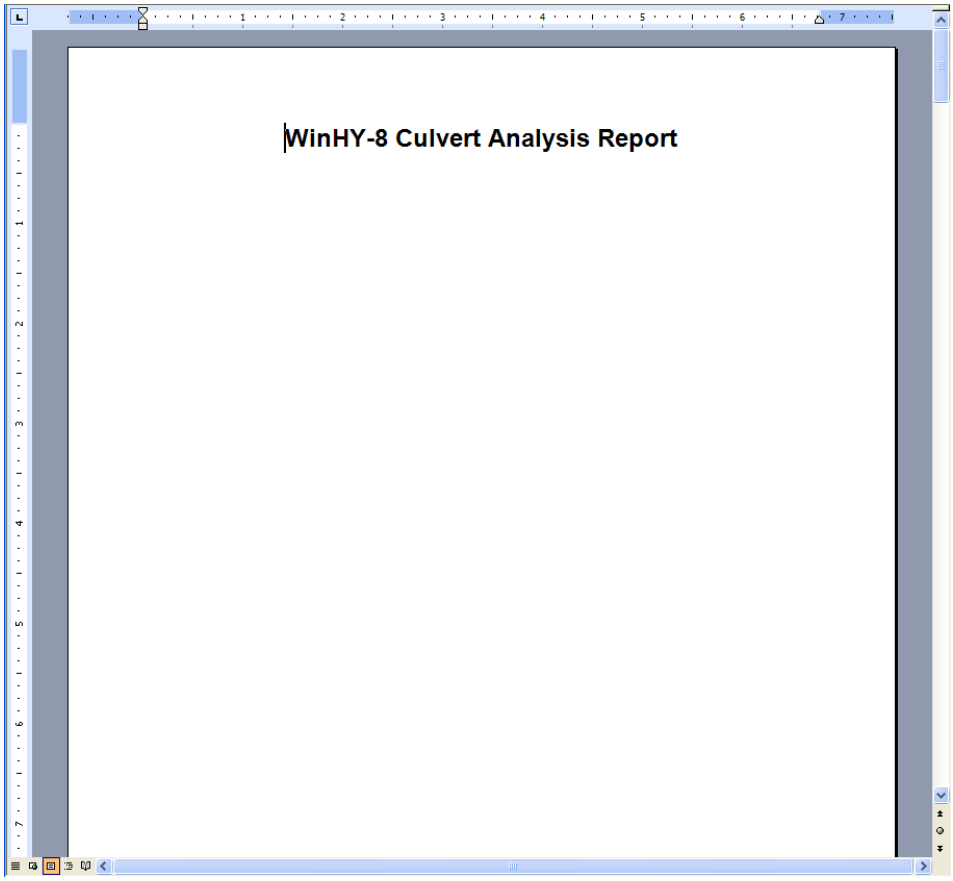
The DOS version of HY-8 generated a comprehensive table that could be sent to a text file. However the old version lacked the ability to include graphs and take advantage of formatting in modern word processing programs

The Windows version of HY-8 includes Report Generation tools that are customizable, allow many options for plots, and are saved in rich text format (RTF) or portable document format (PDF). The primary target for the report is an MS-Word document; however, an rtf format is readable by most Windows-based word processing programs.

A few issues related to Report Generation exist with this version. Each time a table or graph is written to the report, the report starts a new page. This can make reports longer (wasting paper). A limitation in the report generation library routine does not allow tables and graphs to be "docked" in line with text. When trying to condense a report, these tables and plots may cover the text.

The following steps will describe how to edit a RTF formatted HY-8 report in Word to condense the number of pages and make the document more concise. User experienced with other common word processing programs would apply analogous protocols.

ED-1 If you have Microsoft Word, you should see the following view after exporting the report:



ED-2. Scroll down to the following page. You should see the following table:

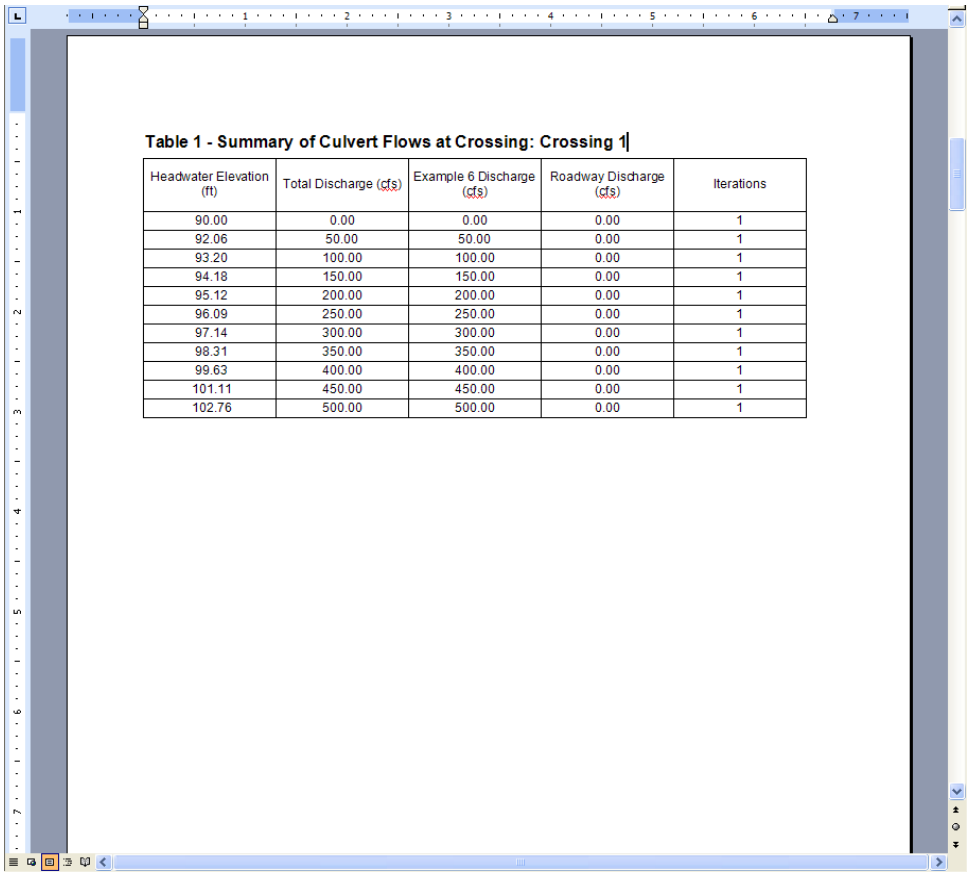
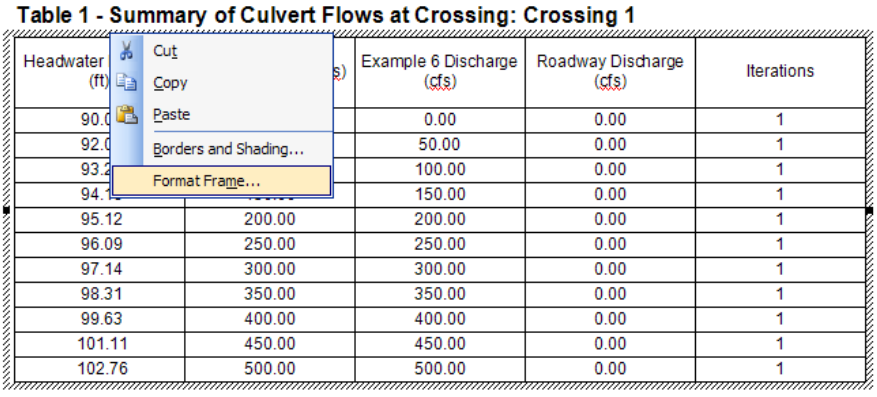


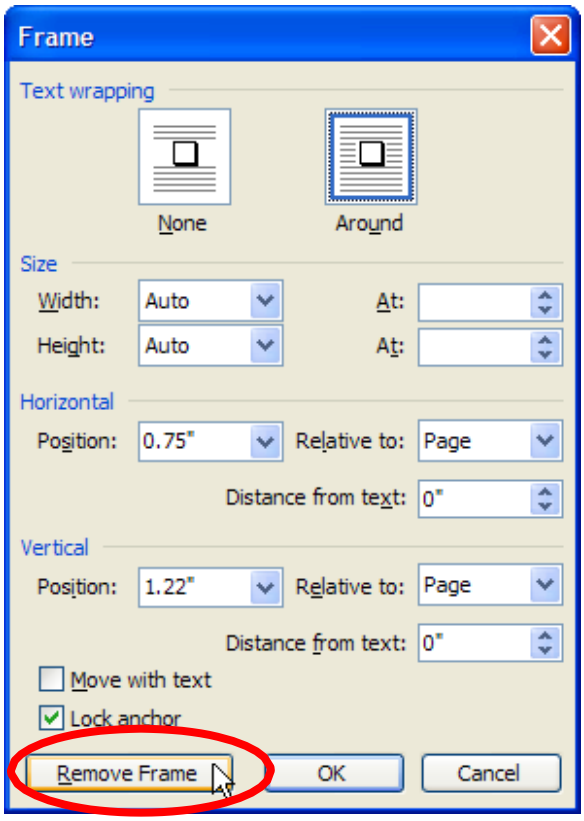
**Table 1 - Summary of Culvert Flows at Crossing: Crossing 1**

| Headwater Elevation (ft) | Total Discharge (cfs) | Example 6 Discharge (cfs) | Roadway Discharge (cfs) | Iterations |
|---|---|---|---|---|
| 90.00 | 0.00 | 0.00 | 0.00 | 1 |
| 92.06 | 50.00 | 50.00 | 0.00 | 1 |
| 93.20 | 100.00 | 100.00 | 0.00 | 1 |
| 94.18 | 150.00 | 150.00 | 0.00 | 1 |
| 95.12 | 200.00 | 200.00 | 0.00 | 1 |
| 96.09 | 250.00 | 250.00 | 0.00 | 1 |
| 97.14 | 300.00 | 300.00 | 0.00 | 1 |
| 98.31 | 350.00 | 350.00 | 0.00 | 1 |
| 99.63 | 400.00 | 400.00 | 0.00 | 1 |
| 101.11 | 450.00 | 450.00 | 0.00 | 1 |
| 102.76 | 500.00 | 500.00 | 0.00 | 1 |

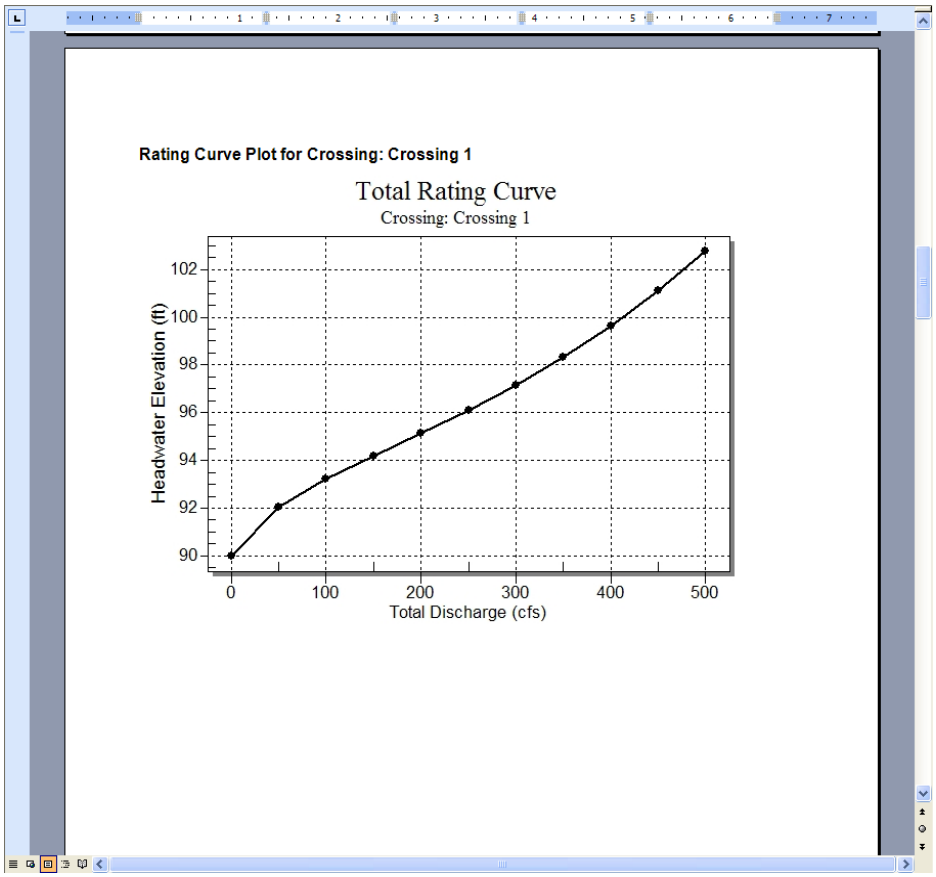
ED-3. Click within the table so the border appears around the table. Then right-click on the border of the table and select the *Format Frame* option as shown below:



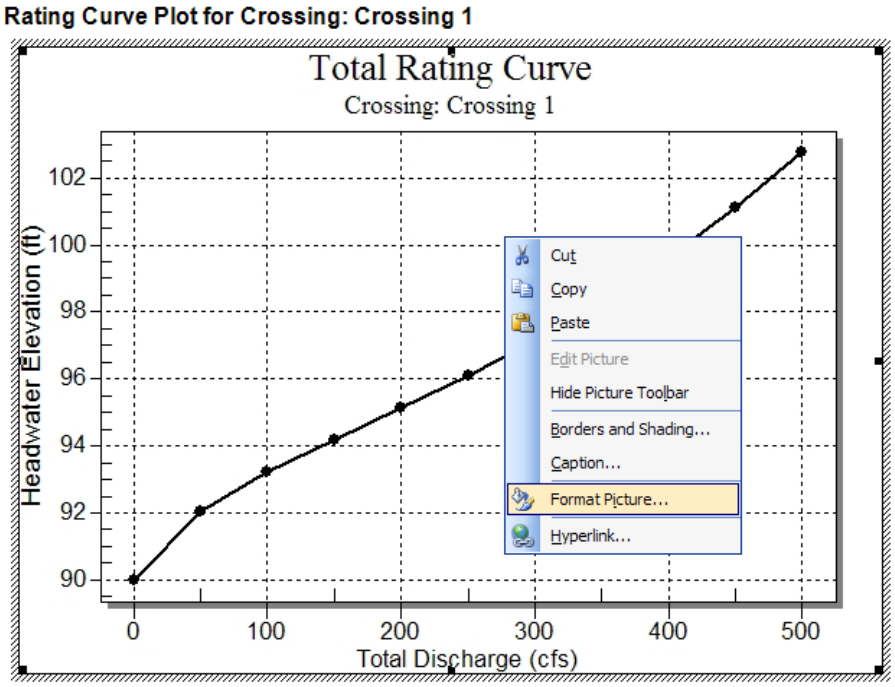
ED-4. In the *Frame* window, select the *Remove Frame* button:



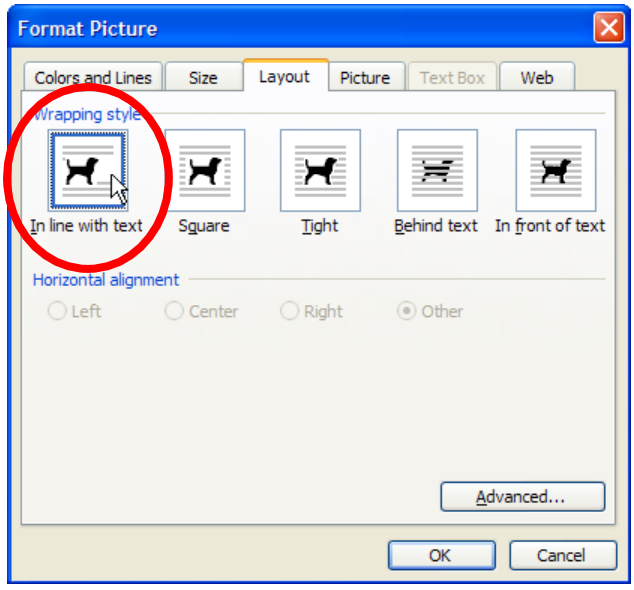
ED-5. Scroll down to the next page. You should see the following graph:



ED-6. Right-click on this graph and select the *Format Picture* option:




ED-7. In the *Format Picture* window, select the *Layout* tab, select the *In line with text* option, and select OK.



ED-8. Continue editing all your tables and graphs as described in the steps above by locking the anchor on all the tables and setting the graphs so they are all in line with the text.

ED-9. Select the *View* | *Normal* menu item. Finish formatting your report document by removing all the unwanted page breaks and adding any additional information you wish to add to the report. After you are done editing, you can select the *View* | *Print Layout* menu item to see what the report will look like when it is printed.

# Getting Help

Beyond this and the HDS-5 document, the majority of the HY-8 documentation is self contained within the program. The functional use of the program is documented in the hyper-linked help file available from the Help menu or by selecting help buttons or icons (  ) from the graphical user interface. While the help file is organized to provide context-sensitive help, it can be printed out and organized into a hard copy manual.

Additionally, the National Highway Institute provides courses on application of the HY-8 software (135081 – Introduction to Hydraulic Highway Software" and other courses).

While FHWA does not offer any user support (as described in the Terms and Conditions for downloading and using the program), comments and bug reports may be sent to:

CommentsOnHY8@dot.gov