Item to Design: Vegetated Waterway
The Process: RoadCalc uses cross section slices along with a design profile, alignment and template to perform earthwork quantity calculations and to create CAD lines and views. The designer puts the original survey into a cross section and profile format and then specifies a design profile & design template. RoadCalc will calculate cut & fill volumes and develop profile & cross section construction drawings for plotting.
(Using Eagle Point 2004 Q3 4.3.0 or newer)

Three different options for Part I of the process are available, depending on the survey method used:

- A - Cross Sections Using Level
- B - Total Station Topog
- C - Total Station Cross Sections

Part II of the process is the same for all survey methods.

General Steps used to Complete the Process.

Part I

a) Create an EP project and a RoadCalc sub project

b) Define the waterway centerline "alignment"

c) Process the survey data to obtain original ground Cross Sections & Profile

Part II

d) Create the Design Profiles

e) Determine the shape & size of the waterway.

f) Create the Typical Sections of the WW design for each reach

g) Run the design & review the cut/fill & volume results
If necessary repeat steps d) to f)

h) Develop Xsection drawing sheets

i) Develop Profile drawing sheet

Eagle Point Steps using the NRCS/EP Customized Menus

Item to Design: Vegetated Waterway
Survey Method: A level is used to obtain a profile of the proposed waterway centerline with cross section taken about every 400' apart or closer as needed. Survey notes can be hand recorded. The closer together that the cross sections are, the better the ability of the designer to obtain good earthwork quantities and determine proper fit of the plan waterway into the existing landscape. Cross sections should be taken at the farthest upstream and downstream extents of the waterway in order to obtain complete earthwork quantities.

Notation Method
Button to Press *Displayed Text* **Icon** Action {Text to Enter} *Menu Item…*

Things to do First

1. Create an Eagle Point project and have only one dwg file open.
2. In AutoCAD click on *Tools… Options…System…* .
3. Checkmark *Single drawing compatibility mode*. Click OK.

Enter Survey Data

1) Open the *WW Field Book.xls* spreadsheet.
2) Click Enable Macros.
3) Click the Clear Cells button to remove existing entries. Click on the Info Tab to find out more about saving input data.
4) Input TBM elevation & back sight.
5) Input the Station, Offset and Grade Rod for each shot.
6) If a turn is needed, input the backsight in column F on the same row as the foresight. A new H.I. will show up.
7) When done entering survey data Click Export As Station/Offset.
8) Browse to the desired location to save the file.
9) Input a filename for the Waterway Cross Section data. E.g. {Jones WW1 xs}. This file format is *Station, Offset, Elevation.*
10) Click Save.
11) Click *File… Exit…* and close out of the spreadsheet without saving.

Starting a RoadCalc Sub-Project Using an NRCS Prototype

1. At the EP Main Menu click on *File… New….*
2. Highlight *Road Calc Sub Project* and click Next.
3. Make sure that the correct main project name is highlighted in the top box.
4. Input a project description. E.g. {Jones WW 1}
5. At the prototype setting pull down to select *NRCS 11x17 Waterway*.
6. Click Next
7. Highlight the main project drawing and click Finish.

8. At the Open Project box highlight the Road Calc project.
9. Click OK.
10. Click on EP Main Menu *Tools…Plot Scales…*
11. Input the horizontal scale that you will use in a profile sheet. Example 1" = {100} feet. Press Tab.
12. Input the vertical scale that you will use in a profile sheet. Example 1" = {5} feet. Press Tab.
13. Click OK.

Remember: **You can minimize the Eagle Point & Road Calc menu but you should NOT close out the EP main menu.**

Input data for the centerline

1) Click *NRCS/EP… Waterway RoadCalc>> Alignment: Edit Data…*
2) Click **New PI**
3) Pulldown Method = *Coordinates*
4) In the Northing box, Input the value of the lowest stationing of the WW survey. E.g. {-30}.
5) Press Tab
6) In the Easting box Input 0
7) Click Apply
8) In the Northing box Input the value of the highest stationing of the WW survey. E.g. {2600}.
9) Press Tab
10) In the Easting box Input 0
11) Click Apply
12) Click Close
13) Click Station Data. Input the Beginning Station as the lowest stationing of the WW survey. E.g. {-30}. Click Ok. Click Yes if you have changed the stationing.
14) Click Close.

Importing Survey into Cross Sections

1) Click *NRCS/EP… Waterway RoadCalc>> Cross Sections: Import…*
2) Browse to the Project folder and Highlight the File Name to bring into the cross sections. E.g. {Jones WW1 xs.txt}.
3) Pulldown format as *Station-Offset*
4) Click Settings
5) Checkmark Station Tolerance and input 1. Press Tab.
6) Input Station Interval as 1. Press Tab.
7) Click OK to return to the Import Screen
8) Click OK and Points will be placed into the Road Calc Cross Sections.

Eagle Point Steps using the NRCS/EP Customized Menu

Item to Design: Vegetated Waterway

Notation Method
Button to Press *Displayed Text* **Icon** Action {Text to Enter} *Menu Item…*

Things to do First

Use one of the Part I methods to create the existing ground cross sections & profile.

Switching between Views

Use *NRCS/EP…WW RoadCalc >>Alignment… View Alignment* … to see the alignment (plan) view drawing.
Use *NRCS/EP…WW RoadCalc >>Cross Section… Edit Data…* Then Click **Query Cross Section** to view cross sections.
Use *NRCS/EP…WW RoadCalc >>Profile… View Profile Graphics…* to see the profile view.

Review the Orginal Ground Profile

1) Click *NRCS/EP… Waterway RoadCalc>> Profile: Edit Data…*
2) Pulldown to *Ognd*
3) To print the data, click the **Generate Profiles Report icon** and select the *Ognd Profile* as the one to print

Create the Design Profile (Centerline of Waterway) – Graphical Option

1) Use *NRCS/EP…WW RoadCalc >> Profile: View Profile …* to make sure you are in the profile view.
2) Click **Polyline**.
3) Draw a line which represents the proposed profile of the centerline of waterway. Do not worry about the correctness of these lines yet. Just get the general location of it.
4) Click *NRCS/EP…WW RoadCalc >> Profile:Convert Object…*
5) Select the line for the proposed FL of Waterway.
6) Press Enter
7) Click Next
8) Pulldown to *Centerline*
9) Click Finish. The waterway profile line becomes red.

10) Click *NRCS/EP…WW RoadCalc >> Profile: Edit Data…*
11) Pulldown to *Centerline*
12) Double Click to edit any VPI.
13) Change the stations to “even” amounts. Input the correct elevations for the VPIs.
14) Click Apply.
15) Click Close
16) Double Click to edit the next VPI.

17) Change the stations to "even" amounts. Input the correct elevations for the VPIs.
18) Click Apply.
19) Click Close
20) Repeat as needed.
21) Note the Grades for each reach of the waterway. (To print the data, click the **Generate Profiles Report icon** and select the *Centerline Profile* as the one to print.)
22) To check elevations of the Original Ground:
    A) Click Spot Elevations…
    B) Pulldown Profile to *Ognd*
    C) Input the Station where you want to know the elevation
    D) Click Calculate
    E) Click Close
23) Click Close.

Create the Design Profile (Centerline of Waterway) – Data Entry Option

1) Click *NRCS/EP…WW RoadCalc >> Profile*: *Edit Data…*
2) Pulldown to *Centerline*
3) Click New VPI.
4) Input the beginning Station. Press Tab
5) Input the Planned Elevation. Click Apply.

6) Pulldown Method to *Station/Elevation*	Or	Pulldown Method to *Grade/Distance*
7) Input the Station		Input the Grade
8) Input the Elevation		Input the Distance
9) Click Apply		Click Apply

10) Repeat for as many reaches as you need.
11) Watch for the Red planned Centerline Profile polyline in the CAD drawing.
12) Click Close.
13) Note the Grades for each reach of the waterway. (To print the data, click the **Generate Profiles Report icon** and select the *Centerline Profile* as the one to print.)
14) Click Close.

Determine Shape of Waterway

1) Click *NRCS/EP…WW RoadCalc >> Define WW Channel Shape …* to display the Define Channel box that shows the planned reaches of the waterway.
2) Click Calculate Shape to open up your default software for designing a waterway.
3) Compute the waterway design shape for all reaches, print those results, and then minimize or close the external waterway tool.

Create the Typical Section for your Waterway Shapes

1) From the *Design Channel* screen click New Channel Shape to create templates for the design shapes.
2) Pulldown to the desired shape *{Parabolic}* or *{Trapezoidal}*.
3) **If** the shape is parabolic
   A) Pulldown to Parabolic
   B) Input the planned Width and Depth.
4) **Or**, If the shape is trapezoidal
   A) Pulldown to Trapezoidal
   B) Input the Bottom Width, Depth, and Side Slope
5) Click Apply if you need to input more channel shapes.
6) Click OK when you are done entering the last shape.

Assign the Typical Section for your Waterway Shapes

1) In the *Design Channel* screen pulldown the Channel Section to the correct designed shape for each Reach.
2) Click OK when you are done selecting each shape.

Run the Prelimary Design & View the Sections

1) Click *NRCS/EP…WW RoadCalc >> Process*: *Run Design …*
2) Pulldown Method to *Step Through All*
3) Click Run
4) Pulldown the surface name to *Waterway*. Notice the depth of cut or fill at the various locations on the cross section by clicking the **Move left** or **Move right** arrows.
5) Click *View Next Cross Section* to scroll through the sections
6) Click Close

View the Centerline Profile Cut Values

1) Click *NRCS/EP…WW RoadCalc >> Output*: *Elevation/Depth at Offsets …*
2) Click Depth
3) Pulldown Bottom Top to *Ognd*
4) Pulldown Bottom Surface to *Waterway*
5) Click **New Offset** icon
6) Input 0 for the offset value to get the Centerline Cut/Fill. Click OK
7) If you wish to print the result Click the **Printer** icon.
8) Click Close

View the Cut Values at the Edges of the Waterway

1) Click *NRCS/EP…WW RoadCalc >> Output*: *Cross Section Staking …*
2) Click Calculate

3) View the *Toe Depth* Column to see the amount of cut or fill at the edge of the waterway at each cross section. A Cut means that the WW edge is in excavation. The Toe Offset is ½ of the top width at that station. If you scroll right you can see other info.
4) If you wish to print the results click the **Printer** icon. Click Print
5) Click Cancel

Review & Print Volumes

For Cross Sectional Volume Calculations (Starts & Stops at non-Phantom cross sections)
1) Click *NRCS/EP…WW RoadCalc >> Output*: *Volumes* …
2) Click **Print**
3) Click Close

Develop Xsection sheets

1) Click *NRCS/EP…WW RoadCalc >> Output: Cross Section Sheets* …
2) Click Stations to Plot
3) Highlight Stations to plot or not plot and Click mark on or mark off.
4) Click Ok
5) Pulldown Format to *Sheet settings*.
6) Click Edit
7) On the Sheet Dimensions Tab make changes to the # of Columns, etc
8) On the Grid Spacing Tab make changes to the Scales, etc
9) Click Ok
10) Click **New Cross Section Sheets**
11) Click Ok
12) Highlight the Sheet Number that you want to view.
13) Click **View Cross Section Sheets** (Binoculars)
14) Click Close

Develop Profile sheet

1) Click *NRCS/EP…WW RoadCalc >> Output: Plan & Profile Sheets* …
2) Pulldown Format to *Sheet settings*.
3) Click Edit
4) Select the Profile Tab and make changes to the Datum Elevation Interval. Click Ok
5) Pulldown Format to *Station/Elevation Intervals*.
6) Click Edit
7) Make changes to the Profile View Stationing & Elevation Intervals. Click Ok
8) Click **New Plan & Profile Sheets**
9) Click Ok
10) Click **View Cross Section Sheets** (Binoculars)
11) Click *View… Regen All…* if needed to make the girds reappear.
12) Click Close

13) To adjust the fit on the sheets Click *NRCS/EP…WW RoadCalc >> Output: Adjust Plan & Profile Sheets*
14) Click the black arrows to shift the sheet to line up the profile better.

Other Notes

If you change the Profile scales, you must go back to the *View Profile Graphics* in order for them to be rescaled correctly.
When you change a design, it does not delete the drawing sheets that are created using *NRCS/EP…WW RoadCalc >> Output: Cross-section…* or *NRCS/EP…WW RoadCalc >> Output: Plan & Profile…* You can remove them by highlighting those sheets in the dialog box and click on the **Delete Sheets** button if that particular sheet is not currently open.