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

2) Draw a line that represents the centerline of the proposed waterway, snapping to the proposed CL shots.
3) Place a radius at each vertex along the centerline to make sure that shots fall in the "outside triangle" don't get lost.
   A) Click **Fillet**. Input R. Press Enter. Input 1. Press Enter.
   B) Input P. Press Enter.
   C) Select the polyline.
4) Click *NRCS/EP… Waterway RoadCalc>> Alignment: Convert Object …*
5) Click on the line that represents the centerline. Press Enter
6) Click a point close to the end of the waterway with the lower stationing.
7) Pulldown Alignment as *Centerline*.
8) **If** the beginning stationing of the centerline is know:
   A) Input a Beginning stationing of the alignment. E.g. {0}
   B) Click Apply.
9) Or, **If** a reference point or baseline exists along the centerline with a known stationing:
   A) Click Station Data…
   B) Click Reference Station…
   C) Click in Northing
   D) Click the **Pick In CAD** button.
   E) Snap to the intersection of the centerline & the known baseline reference point.
   F) Input the Station value of the baseline E.g. {350}
   G) Click OK
   H) Note that the Beginning Station value appears in the box. If this looks realistic Click OK
   I) Click Apply.
10) Click *NRCS/EP… Waterway RoadCalc>> Alignment: Edit Data…*
11) Pulldown Alignment as *Centerline*.
12) Review the alignment points & coordinates. Click Close.

Place Station Labels into Drawing

1) From AutoCAD Click *EP... Drafting*. (Drafting menu will appear within CAD menu)
2) Click *Annotate… Alignment Stationing…*
3) Click Defined Alignments…
4) Select the Centerline and Click OK
5) Click Apply Click Close
6) Click *EP… AutoCAD…* to switch out of the Drafting menu.

Place an object for the centerline Original Ground & convert it to a Profile

1) Click **3D Polyline**
2) Draw a 3D line that represents the centerline of the proposed waterway, snapping to the proposed CL shots.
3) Click *NRCS/EP… Profiles/Sections… Setup Profile Coordinate System…*
4) Select the PCS for the current Road Calc Project .e.g {Road Calc PCS 01}.

5) Click Close.
6) Click *NRCS/EP… Profiles/Sections… Profile from Object…*
7) Select the 3D polyline.
8) Click Yes
9) Click *NRCS/EP… Waterway RoadCalc>>Profile: Convert Object …*
10) Select the polyline. Press Enter
11) Click Next
12) Pulldown Destination Profile name to *Ognd*
13) Click Finish

Converting Survey into Cross Sections

1) Switch back to the plan view. Click *NRCS/EP… Waterway RoadCalc>> Alignment: View Alignment …*
2) Click Yes
3) Click *NRCS/EP… Waterway RoadCalc>> Data Transfer-- Export …*
4) Browse to the Project folder and input a File Name for a point export of the cross sections. E.g. {Jensen XS.txt}.
5) Pulldown format as *Station-Offset, Comma Delimited*
6) Click *Alignment…*
7) Select your current Road Calc Sub Project Alignment
8) Click *Settings…*
9) Checkmark Station Tolerance
10) Set Tolerance to 5 & Interval to 5
11) Set the Station Precision to 0 and Elevation & Offset to 2.
12) Click OK.
13) Click OK.
14) Pulldown Selection Method to *AutoCAD* Click Apply.
15) Within AutoCAD Select **only** the shots needed for the complete cross sections.
16) When done Press Enter.
17) Number of nodes selected will show up. Click OK.
18) Click on *NRCS/EP… Waterway RoadCalc>> Cross Section: Import…*
19) Browse to the Project folder and Highlight the File Name to bring into the cross sections. E.g. {Jensen XS.txt}.
20) Pulldown format as *Station-Offset, Comma Delimited*
21) Pulldown Import to Surface as *Ognd*
22) Click Edit File
23) The first column of this file is the *station*. Some lines have more than one offset/elevation listed with it. **Important:** Edit this file so that all shots that are supposed to be in same cross section have the same *station* number.
24) Click File… Save…
25) Click File… Exit…
26) Click OK

View the Cross Section Data

1) Click *NRCS/EP… Waterway RoadCalc>> Cross Section: Edit Data…*
2) Highlight the desired station in the top half of the screen and the data points for that station will appear in the bottom portion of the screen.
3) Click on the **Query Cross Section** icon to preview of any Cross Section. Use the + or – buttons to scroll through each of the cross sections. Click Close when done.
4) Click Close

View the Existing Ground Profile

1) Click *NRCS/EP… Waterway RoadCalc>> Profile*: *View Profile …*
2) Click Yes when asked to save the drawing. The Existing Ground Profile will appear.
3) An extra line will be added that connects the centerline at each cross section. Turn off layer C.Prof.Ongd.Og_0 to make that line disappear.

Continue with Instructions in Part II

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.

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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.