

## Creating Wetland Excavations

**Overview:** Create Meanders, Oxbows, and Excavated pools for wetlands. A surveyed site with a surface model of the areas to be excavated is needed. Depending on the desired shape of the excavations, there are two methods of creating a shape. Method 1: covers a trapezoidal channel that has a constant bottom width. Method 2: covers a variable structure that can be any shape that can be constructed.

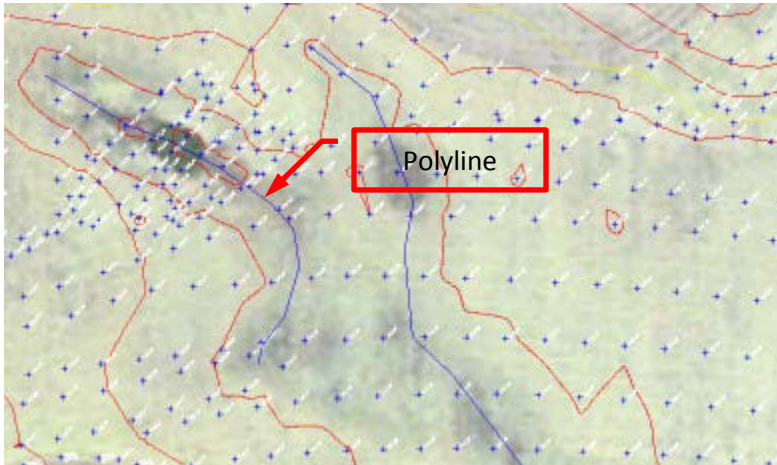
**Software:** AutoCAD Civil 3D 2016, Civil 3D Workspace, NRCS C3D 2016 template

**Prerequisite:** A surveyed site with a surface model covering the planned excavation areas.

<b>Notation:</b> <input type="text"/> Button to Press <i>Displayed Text</i> <b>Icon</b> <u>Action</u> {Text to Enter} <u>Menu Item</u> ...
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### **Excavated Channel (Method 1)**

- 1) Draw a polyline to indicate the centerline of the excavated channel using Tool Palette>NRCS 11x17B... Click *Plan Commands...* *Centerline Generic*



- 2) Click *Home... Create Design... Alignment... Create Alignment from Object...*
- 3) Select object. Press **Enter**. Click  **OK**. Or  **R** to reverse.
- 3) Input the Name to {CL Pool 1}.
- 4) Uncheck *Add Curves between Tangents*.
- 5) Check *Erase Existing Entities*. Click  **OK**
- 6) Click *Home... Create Design... Feature Line... Create Feature Line from Alignment...*
- 7) Click on the Alignment polyline.
- 8) Select *Plunge Pool – Excavation* under Site.
- 9) Input {Site 1} under Name.
- 10) Uncheck *Weed Points*.
- 11) Pulldown *Style = Stream Channel Cleanout Feature Line* . Click  **OK**
- 12) Select the Feature Line.

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- 13) On the context sensitive Feature Line ribbon tab, enable the Edit Elevations panel using *Modify... Edit Elevations...*
- 14) Click *Edit Elevations... Elevation Editor...* and a panorama window appears.
- 15) Select the Raise\Lower  button.
- 16) Input {742.00} for the desired bottom elevation. Press Enter
- 17) To change a single elevation Click into the elevation cell and type the new elevation. Press Enter.
- 18) Click  on the panorama window to close.
- 19) Enable the Edit Geometry panel using *Modify... Edit Geometry...*
- 20) Click *Edit Geometry... Stepped Offset* 
- 21) Input ½ the bottom width. E.g. {10} Press Enter.
- 22) Click either side of the CL of Bottom.
- 23) Input the relative elevation {0}. Press Enter.
- 24) Select the CL of Bottom. Click the other side of the CL of Bottom.
- 25) Input the relative elevation {0}. Press Enter. Press Enter.



Enclose the ends of the bottom channel.

- 26) Right Click the **Osnap Status**. Click *Settings...* and checkmark only *End Point* and *Object Snap On*. Click OK.
- 27) Click *Home... Create Design... Feature Line... Create Feature Line ...*
- 28) In the dialog box set the *Site* to *Plunge Pool - Excavation*, and set *Style* to *Stream Channel Cleanout Feature Line*. Click
- 29) Click on the first end of the right edge of bottom. Press Enter to accept the elevation.
- 30) Click on the first end of the left edge of bottom. Press Enter. Press Enter.
- 31) Repeat for the opposite end of bottom.


Join all of the outer bottom channel lines.

- 32) Select one of the bottom channel feature line. From *Feature Line... Edit Geometry...Join...*
- 33) Select the other 3 bottom channel feature lines. Press Enter and they will be joined.
- 34) Save.

Grade the bottom of the excavation to the Surface.

- 35) Click *Home... Create Design... Grading... Grading Creating Tools...*
- 36) Click **Set the Grading Group** .
- 37) Set the *Site* to *Plunge Pool - Excavation*.
- 38) Input a Grading Group Name e.g. {Pool 1} Click
- 39) Click **Set the Target Surface** . Select *Ognd*. Click

Up Slope grading

- 40) Pull down the *Select a Grading Criteria* to *Slope or Grade to Surface (Cut)*
- 41) Click **Create Grading**. 

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- 42) Select the outside edge of the Excavated Channel Bottom. Click outside of the edge.
- 43) Apply to entire length? Input Y Press Enter
- 44) Slope or grade? Input S Press Enter.
- 45) Cut Slope? Input 6. Press Enter. Press ESC


Fill in void areas within the excavation grading.

- 46) Click *Home... Create Design... Grading... Create Grading Infill ...*
- 47) Click into the surface voids inside of the added feature lines. Press Enter.
- 48) Press ESC. Close the Grading Creation toolbar.

### Create the Excavation Surface

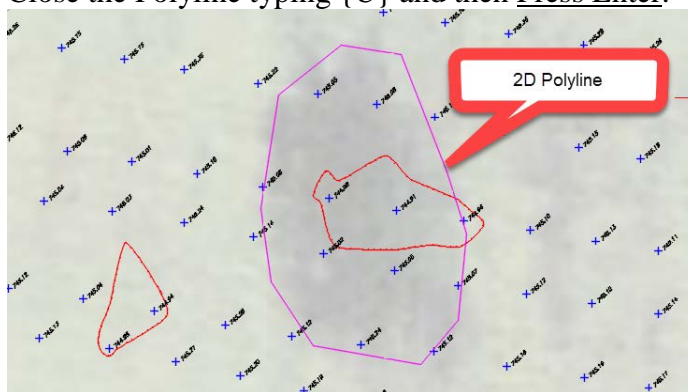
- 49) Toolspace> Prospector... *Sites... Plunge Pool - Excavation ...Grading Groups...* Right click *Pool 1...* Click *Properties*
- 50) Click the *Information* tab and Checkmark the *Automatic Surface Creation*
- 51) In Create Surface, pull down the *Style* to *\_Contours (1 and 5) and Triangles* Click
- 52) Click . Click .

Place slope labels on the cut slope.

- 53) *Annotate... Labels & Tables...Add Labels* 
- 54) Feature=*Surface*; Label Type = *Slope*; Slope Label Style = *Fini Run over Rise (H:V)*
- 55) Click
- 56) Select the surface.
- 57) For One-point input {o} Press Enter
- 58) Click a location to place each slope label.
- 59) Press ESC when done. In the Add Labels box click




## Excavated Channel (Method 2)

- 60) Using a 2d polyline from the Tool Palette draw a polyline to indicate the bottom of the excavated oxbow, meander, etc.
- 61) Close the Polyline typing {C} and then Press Enter.









- 62) Click *Home... Create Design... Feature Line... Create Feature Line from Object...*
- 63) Select the Polyline. Press Enter.



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- 64) Select *Plunge Pool – Excavation* under *Site*.
- 65) Pulldown the *Style = Stream Channel Cleanout Feature Line*
- 66) Check *Erase Existing Entities*.
- 67) Uncheck *Weed Points*. Click 
- 68) Select the *Feature Line*,
- 69) Right Click then click *Elevation Editor...* and a panorama window appears.
- 70) Select the **Raise\Lower**  button.
- 71) Input {742.00} for the desired bottom elevation. Press Enter
- 72) To change a single elevation click into the elevation cell and type the new elevation. Press Enter.
- 73) Click  on the panorama window to close.

### Grade the bottom of the excavation to the Surface.

- 74) Click *Home... Create Design... Grading... Grading Creating Tools...*
- 75) Click **Set the Grading Group** .
- 76) Set the *Site* to *Plunge Pool - Excavation*.
- 77) Click **Create a Grading Group** .
- 78) Input a Grading Group *Name* e.g. {Pool 2} Click  Click 
- 79) Click **Set the Target Surface** . Select *Ognd*. Click 

### Up Slope grading with varying slopes

- 80) Pulldown the *Select a Grading Criteria* to *Slope or Grade to Surface (Cut)*
- 81) Click **Create Grading**. 
- 82) Select the edge of the Excavation bottom. Click outside of the bottom.
- 83) Apply to entire length? Input *N* Press Enter
- 84) Click the starting location of the slope. Press Enter to accept the station.
- 85) Click the ending location of the constant slope. Press Enter to accept the station.
- 86) Slope or grade? Input *S* Press Enter.
- 87) Cut Slope? Input *10*. Press Enter
- 88) Select the Excavation feature line. Click outside of the bottom.
- 89) Leaving a gap after the first grading, click the starting location of the slope. Press Enter to accept the station.
- 90) Click the ending location of the slope. Press Enter to accept the station.
- 91) Slope or grade? Input *S* Press Enter.
- 92) Cut Slope? Input *20*. Press Enter
- 93) When done press ESC.
- 94) To place the transitions between gradings click **Create Transition** 
- 95) Select the Excavation feature line.
- 96) Click in the gap between gradings and repeat for all gaps.
- 97) Press ESC

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Fill in void areas within the excavation grading.

- 98) Click *Home... Create Design... Grading... Create Grading Infill ...*
- 99) Click into the surface voids inside of the added feature lines. Press Enter.
- 100) Press ESC. Close the Grading Creation toolbar.

### Create the Excavation Surface


- 101) *Toolspace> Prospector... Sites... Plunge Pool - Excavation ...Grading Groups...*  
Right click *Pool 2...* Click *Properties*
- 102) Click the *Information* tab and Checkmark the ***Automatic Surface Creation***
- 103) In Create Surface, pull down the *Style* to *\_Contours (1 and 5) and Triangles* Click  or *Grid Magneta (5x5)*
- 104) Click  . Click  .

Place slope labels on the cut slope.


- 105) *Annotate... Labels & Tables...Add Labels* 
- 106) *Feature=Surface; Label Type = Slope;*  
*Slope Label Style = Fini Run over Rise (H:V)*
- 107) Click
- 108) Select the surface.
- 109) For One-point input {o} Press Enter
- 110) Click a location to place each slope label.
- 111) Press ESC when done. In the Add Labels box click

## Create Volume Report


Compute earthwork volume

1. Click *Analyze... Volume and Materials... Volume Dashboard...*
2. Click **Create New Volume Surface** .
3. Input a Name E.g. {V Pool 2 - Ogn}
4. Set Style = *\_<off>*
5. Click in the *Base Surface* cell Select Eg. {Ogn}.
6. Click in the *Comparison Surface* cell Select Eg. {Pool 2}.
7. Click .
8. The Volume Panorama will show the volumes, to print the report, Click **Generate Report**.


To track depths of the Excavation.

9. Use *Home...Palettes* ▼.. *Coordinate Tracker*  on the *V Pool 2 – Ogn* surface to see the Cut or Fill depths.

### Transitions and Grading Around Corners (Optional)

The grading command called  **Create Transition** is available from the  **Create Grading** dropdown on the Grading Creation toolbar.

It can be used to transition between gradings that are of a similar kind. E.g. You can transition between 2 gradings that both use *Slope or Grade to Surface (Fill)*.


You can also insert transition points into an exist grading using the Points option that shows up after you click  **Create Transition**.

If you want to do a transition that goes around a corner, you might get better results if you apply an arc to the feature line at the corners.

-Applying an arc to a corner will allow the slopes to vary as it goes around the arc.

-Not applying an arc to corner will have the slopes at a constant value as it rotates around the corner.

To apply an arc to a feature line:

1. Select the feature line.
2. On the context sensitive Feature Line menu, enable the Edit Geometry panel and use the **Fillet**  command
3. Type {r} Enter to set the radius
4. Input a radius. E.g. {0.5} Press Enter
5. Then either click corners to apply the Fillet to or type {a} to apply the fillet to all corners of the feature line.
6. Press ESC to quit the command

Then you can create a grading that ends at the start of the radius, and another grading that starts at the end of the radius and use the  **Create Transition** going around the fillet.

The radius of a fillet can be modified but only if a grading is *not* attached to the feature line fillet. To edit it, select the feature line and on the Feature Line Ribbon use Edit Geometry.... Edit Curve...

An Edit Feature Line box will let you change the radius.