

8/10/16 - Surfaces and Volumes for Stockpiles

Situation: Contractor has stockpiled material in an area that was not included in my original ground. I need quantities. I'm told that the material was piled up in a v-swale that is about 1.5' deep. Survey crew has shot the top of the stockpile.

Overall plan: get stockpile surface from survey crew, create a stockpile base surface, modify the "flat" base surface to have a swale, calculate triangle volume, create an alignment, generate cross sections, calculate the stockpile end-area volume, and generate a volume report to compare.

Launch InRoads - open stockpile.dgn , Default model

Load stockpile.dtm into InRoads

Check properties of surface and ensure that type = Design on Main tab; On Advanced tab set cross-section style to DTM_finish 2
Existing type is for the original ground surface as surveyed.

Design type is for the surface that you are designing that you will be comparing against the existing surface for volumes.

View triangles of existing ground (01234e) - color magenta, level E_Terr_DISPLAY_Triangles

View Triangles of surveyed stockpile - color green, level #plot_border

Note - no existing OG in the area of the stockpile

Can create an OG surface under the stockpile from the exterior boundary of the stockpile.

Create new empty surface named Stock_OG, type=existing

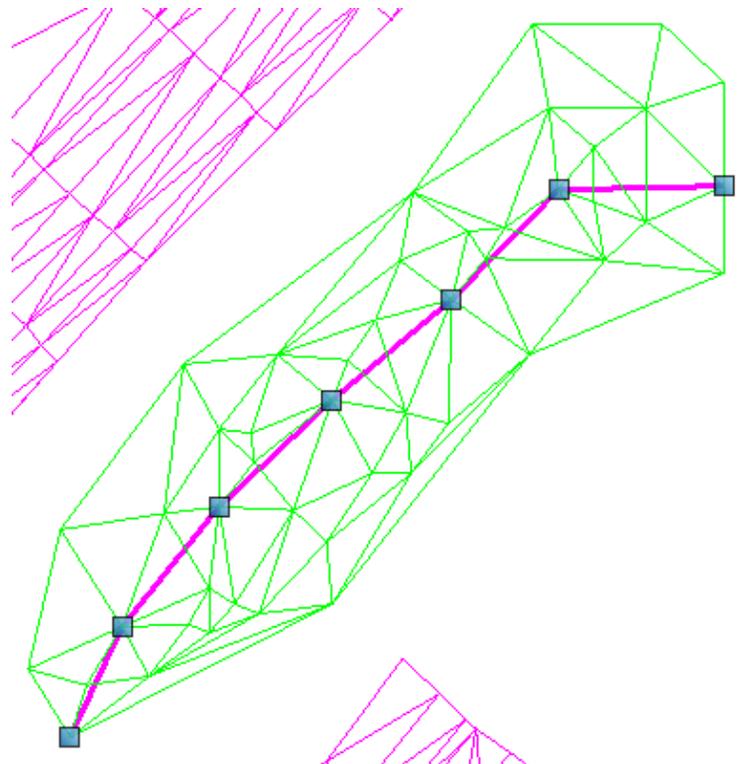
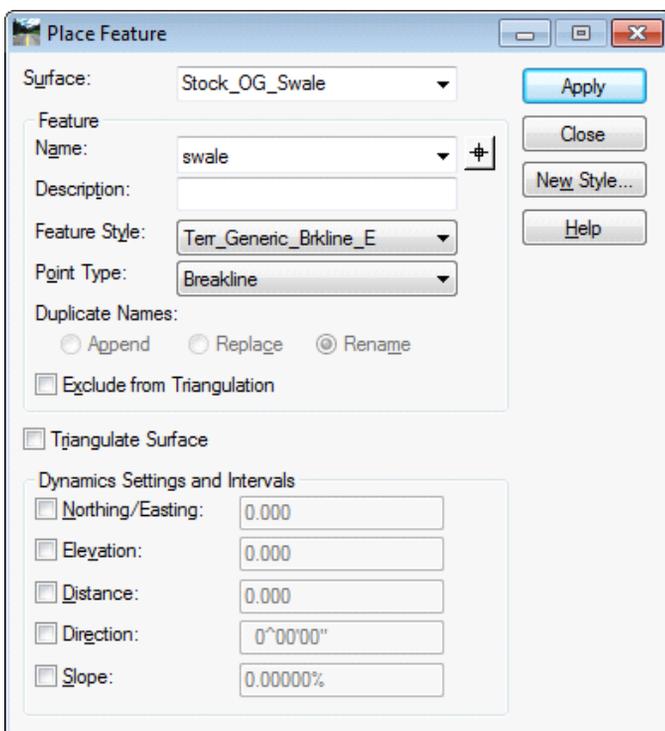
Use Surface>Edit Surface>Copy Portion of Surface... command to copy the exterior boundary (named perimeter) from stockpile to Stock_OG.

Triangulate; Save As... Stock_OG.dtm

Next step - Modify Stock_OG by adding one feature to produce a swale below the stockpile.

Use Surface>Copy Surface... and create a new surface named Stock_OG_Swale. Use this method so that you get a DTM with a new internal identifier. If you use Windows to copy the surface or use save as - the internal ID will be the same and you cannot load both surfaces at the same time for comparison!

With Stock_OG_Swale active, use Surface>Design Surface>Place Feature... (like placing a linestring, except InRoads knows it is a feature in the active surface). Follow the prompts in the lower left corner - invoke AccuSnap by pressing the <Ctrl>+<Shift> keys on the keyboard and left clicking when the correct vertex has the yellow AccuSnap X on it. Right-click after placing the last point. See picture below - points were placed from the south to the north.



Now I need to apply elevations that result in about 1.5' deep swale - daylighting at the upper (pt 7) and lower (pt 1) edges of the stockpile.

Use the command Surface>Edit Surface>Edit Feature Point.... And select the feature named Swale from the "Stock_OG_Swale" surface. Point 1 is at 1578 and point 7 is at 1575, and I think incrementing the elevations by -0.5' every point will make a nice swale: pt2=1577.5, pt3=1577.0, pt4=1576.5, pt5=1576.0, pt6=1575.5 . Use forward/back arrow keys in the Edit Feature Point dialog until the cyan-colored locator is on a point - type in the new elevation, click [Apply].

Triangulate Stock_OG_Swale and Save As!

View triangles of each surface in turn

Stock_OG - color=cyan, level = #plot_shape

Stock_OG_Swale - color=red, level = #plot_layout

Rotate view and use Illustration presentation display to see the differences (subtle) between Stock_OG and Stock_OG_Swale.

Next step - Triangle Volumes

Use Evaluation>Volumes>Triangle Volume...

Don't forget to [Add] before you [Apply]. The surface TYPE does not matter here - not one bit.

Original Surface = Stock_OG_Swale

Design Surface = stockpile

[Add]

Original Surface = Stock_OG

Design Surface = stockpile

[Add]

[Apply] - the Civil Report Browser will open to a report that shows two paragraphs

Next step - Prepare for Cross Sections for End-Area Volumes

Cross sections:

You may have multiple existing, design, or substrata in a given cross section set. However, you must have only one existing surface for any given cross section at a given station in order to compute volumes. If you have more than one design surface in a section, they should not overlap.

If I wish to compare the stockpile against a surface beneath it and achieve positive quantities - the stockpile must be the "Design" type surface.

1. Set Surface Properties for cross section display - right-click properties.
Set Stock_OG_Swale to Dtm_finish_3 (red) (to match plan view colors)
Set Stock_OG to dtm_finish_7 (cyan)
2. Right-click Geometry - New - name Stockpile
3. Draw a line down the middle of the stockpile; select the line and choose File>Import>Geometry (From Graphics) - name it "stockpile", style=ODOT; [Apply]
4. Save geometry project to Stockpile.alg
5. Create new file -Xsec.dgn - I always put xsecs in their own file and only use the Default model
6. Evaluation>Cross Sections
7. Cut cross sections: Use previous model to get back to stockpile view - use targeting buttons under the Controls for station; AccuSnap with <Ctrl>+<Shift> to enter stations - snap to furthest south vertex for start station, snap to furthest north vertex for stop station; interval = 5' (ensure that start and stop stations are the points furthest back and ahead that will have 0 area - you want the calculation to wedge ahead and back to 0. You may display all surfaces: Stockpile (Design), Stock_OG (Existing), and Stock_OG_Swale (Existing)
8. Zoom into sections to see swale cross section.
9. Calculate End-Area Volume (bottom-most folder on the Cross Sections dialog)
In the General section - check on the Design type surface and only one of the Existing type surfaces. You can run this report twice, each time with a different Existing type surface checked. Don't check both at the same time - the existing surfaces overlap and the results will be not correct.