AUTODESK UNIVERSITY

[LD17877]

[InfraWorks 360—There's a Trick to That]

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[Kimley-Horn]

Learning Objectives

- Create custom retaining walls
- Use SDF, blocks and Autodesk points for quick importing to InfraWorks 360
- Learn how to drape and modify raster images to stream line your workflows
- Create your own custom FBX objects to use in InfraWorks 360

Description

Intended for intermediate to advanced users of InfraWorks 360 and Autodesk® AutoCAD Civil 3D® software, this class is designed to show civil industry professionals techniques for creating renderings and depicting custom models utilizing multiple Autodesk, Inc., tools. Using tools provided in the Infrastructure Design Suite) AutoCAD Civil 3D, InfraWorks 360 software, Revit software, and 3DS Max software), this class will consist of a live demo showing how to create and use grading, site geometry, and custom Filmbox (FBX) models that you can use in your InfraWorks 360 models. This session features InfraWorks 360 and AutoCAD Raster Design.

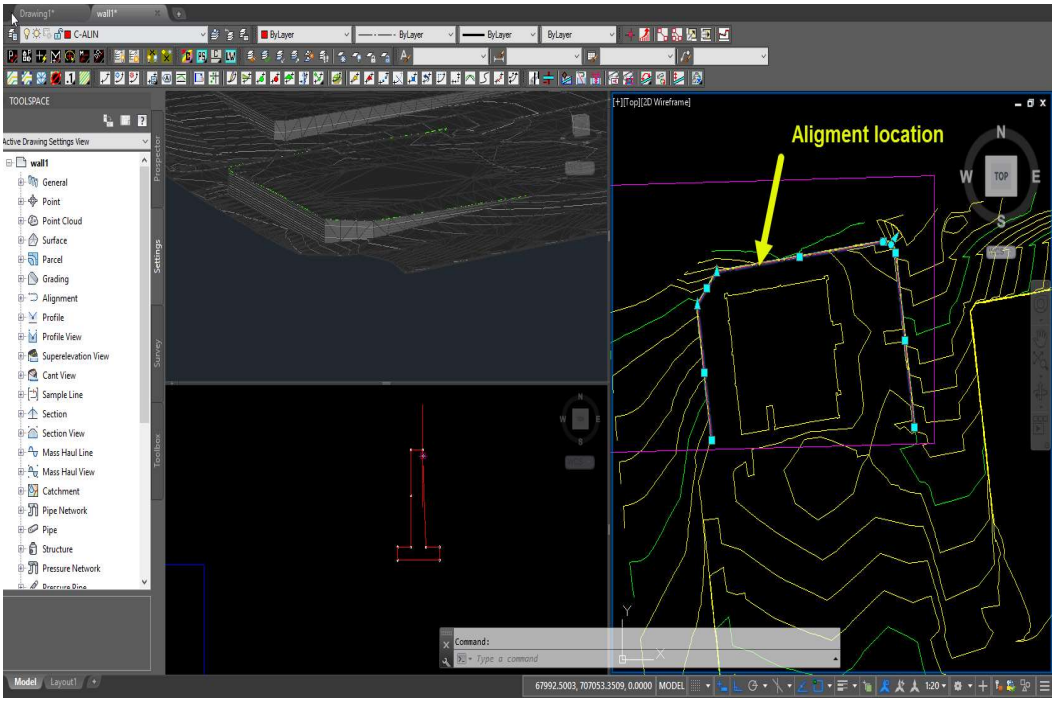
Your AU Expert

Juan Soto is a civil designer for Kimley-Horn in the Fort Worth, Texas, office. Kimley-Horn ranks in the top third of Engineering News-Record (ENR) top 500 design firms, and the company also ranked as one of the "100 Best Companies to Work For" by Fortune magazine. Juan has more than 20 years of experience with both Autodesk, Inc., and Bentley products. His experience includes a variety of project types, including land development, aviation, industrial, highway, conceptual master planning, and 10 years as a CAD manager and 3D marketing visualization specialist. Juan's current duties at Kimley-Horn also include being responsible for training users, generating 3D-visualization conceptual renderings to ensure constructability, and Building Information Modeling (BIM) coordination on projects. You can also find him contributing to the worlds of AutoCAD Civil 3D and InfraWorks360 software through his twitter account @civil3d_jedi, and Autodesk User Group International (AUGI) articles

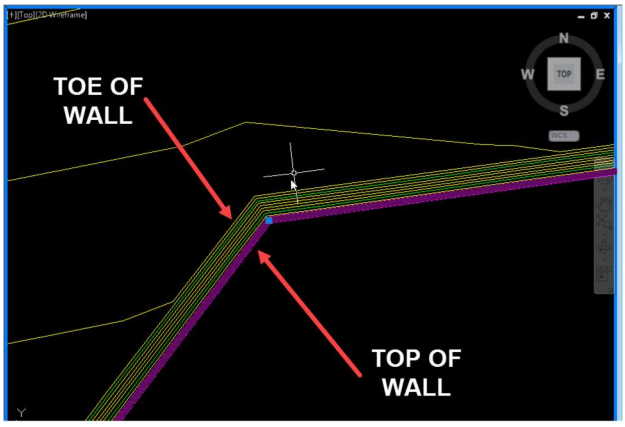
Retaining Wall workflow (exporting into InfraWorks 360)

One thing you will notice about generating walls in InfraWorks 360 is…well…there is no generate walls command. Finding a best practice or good workflow is your best option with the current version of the software. Let's look at one way to generate custom retaining walls using Autodesk tools.

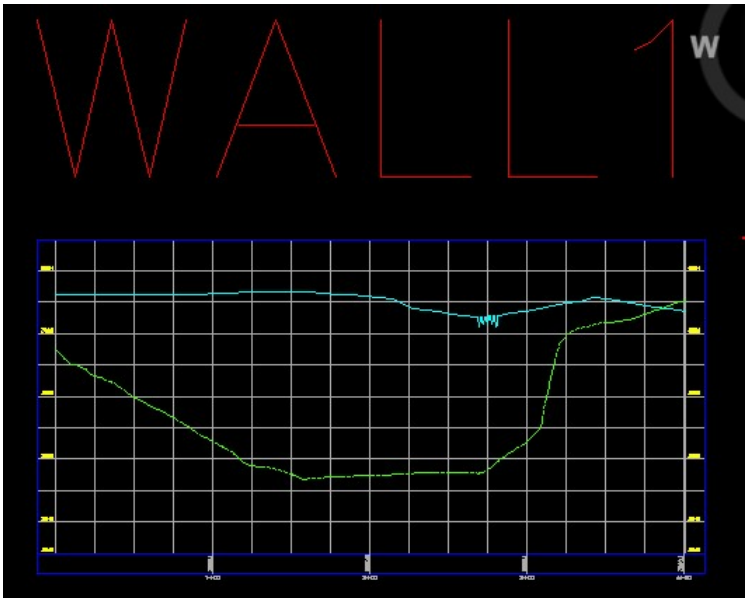
Begin by opening the drawing provided (wall1.dwg).
This file contains two surfaces EG and FG-Mass as well as a corridor assembly.



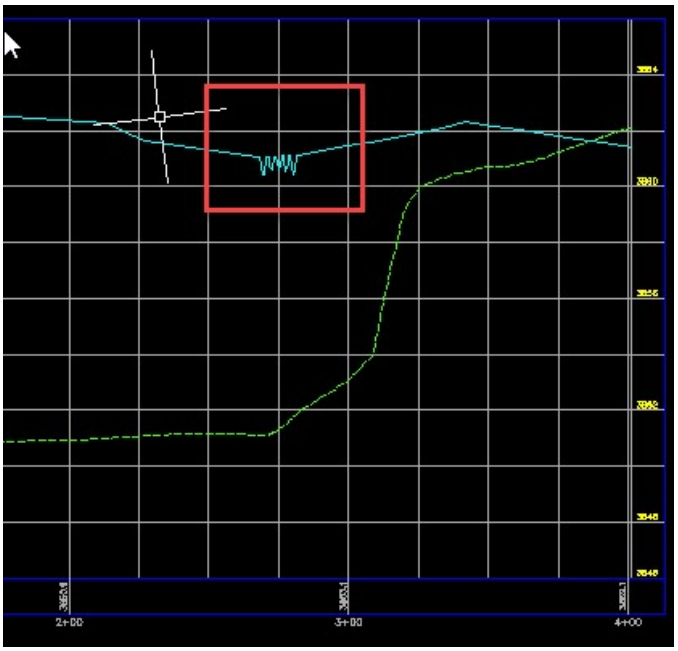
Create an alignment along the top of the wall. Typically, there will be a feature line or a polyline drawn to generate the top of the FG-MASS grading surface. This will identify the start and end of your wall.



Next generate a surface profile line using the Alignment that was just created.

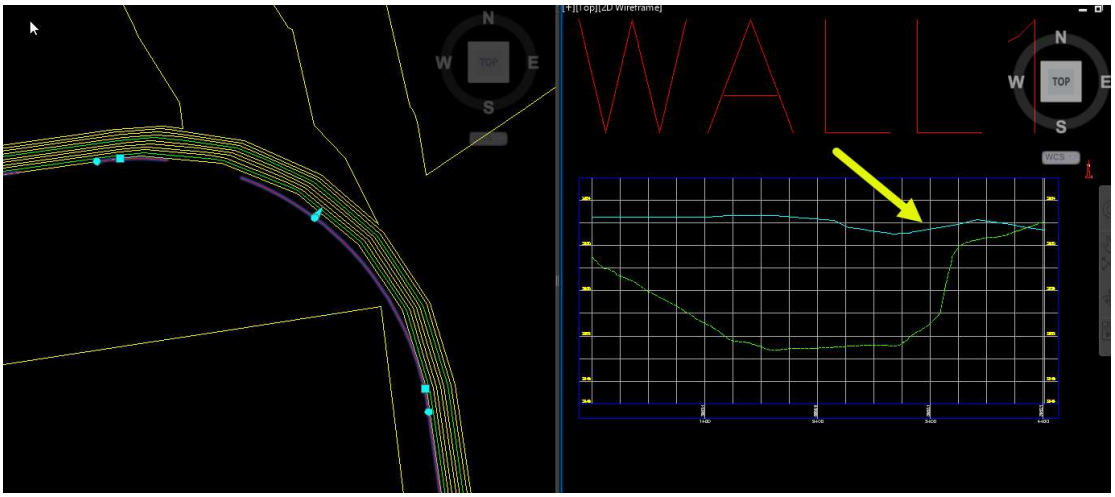


Note that sometimes the alignment catches elevations along the middle of the wall surface which can generate issue for the corridor.



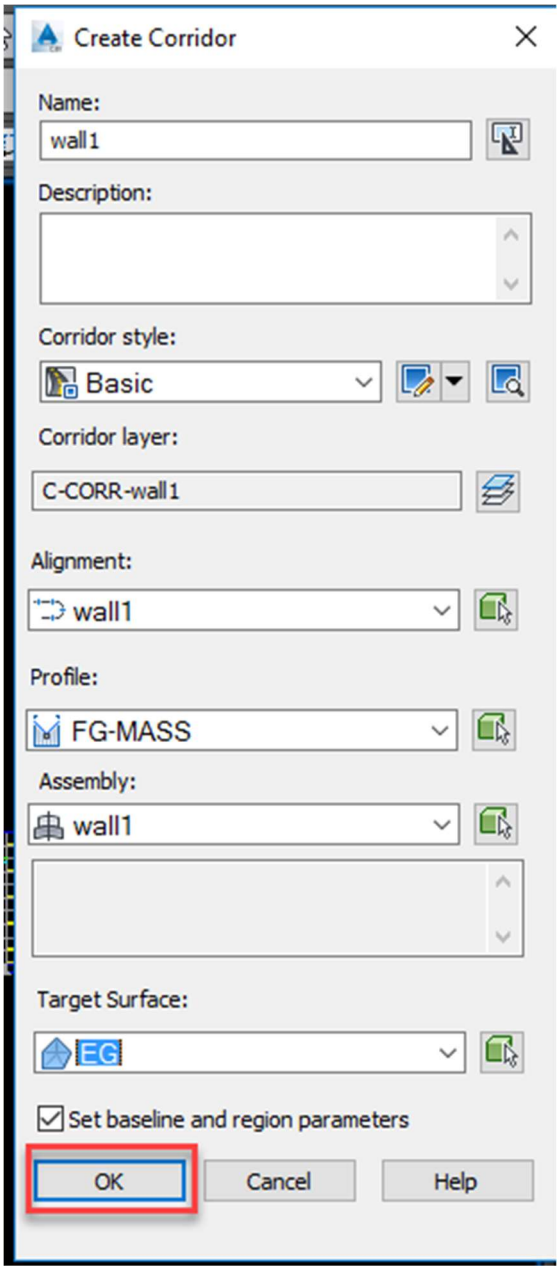
Simply select the alignment, grip the geometry point of the segment (in this case it's the alignment curve) and slightly stretch the segment away from the wall's toe.

The modification to the alignment should have removed the troubled area. This will be the top elevation of our proposed wall. You can also generate your own profile by creating it with Profile Tools.

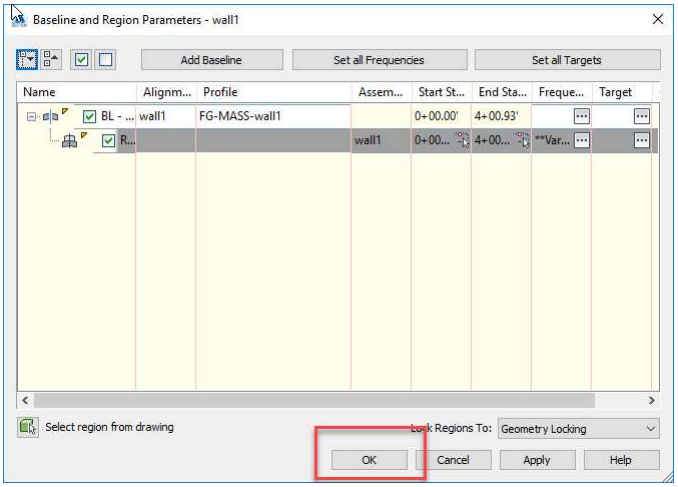


Now let's generate a corridor from our Civil 3D objects
Make sure that:

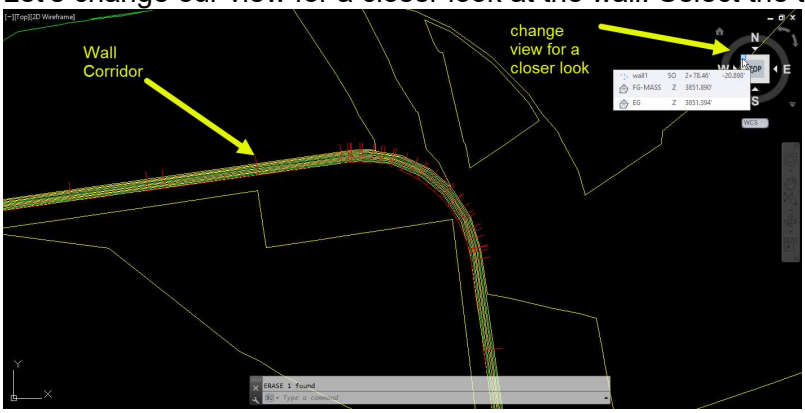
1. Using wall1 alignment
2. Using the FG-MASS profile line for your vertical on the profile setting
3. That you are using the wall1 assembly provided.
4. That Target Surface is set to EG.
5. Select ok after settings have been applied



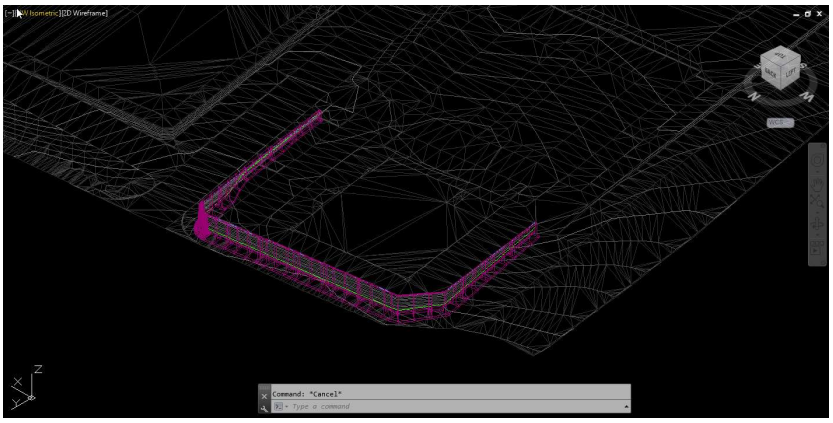
Next lets set the region parameters. We want the wall assembly to generate from beginning to end of the entire alignment so no need to adjust the stationing.
Select ok and let look at the results of the corridor.



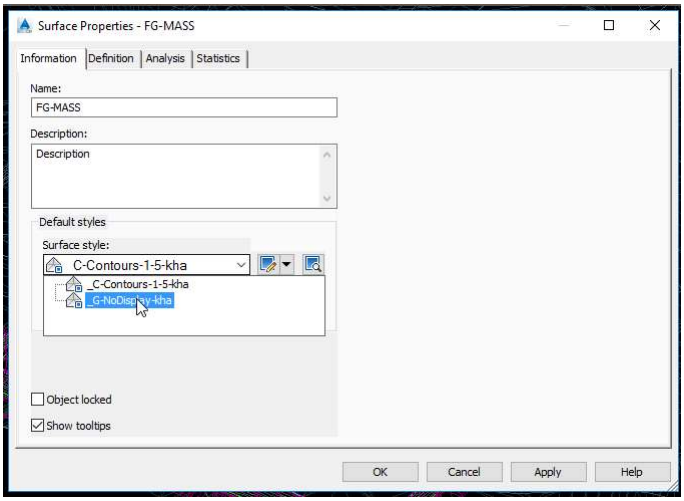
Let's change our view for a closer look at the wall. Select the top left corner of ViewCube.

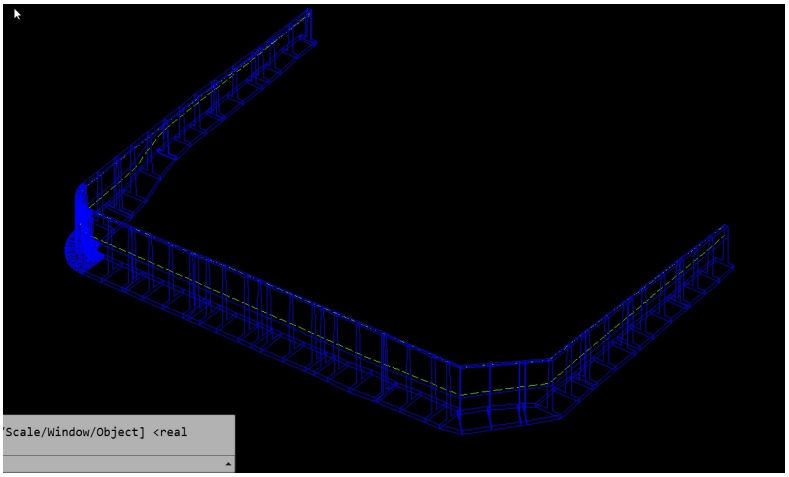


Your view should match the view below
At this point you should do a visual inspection of your wall to make sure it is matching the desired results

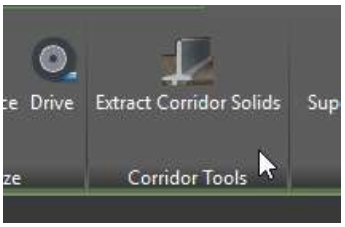


Next let's turn off the FG-MASS surface for clarity.
In Toolspace, Prospector tab, select the FG-MASS surface, right click Select surface properties.
On the Information tab, set surface style to _G-NoDisplay-kha then click OK.

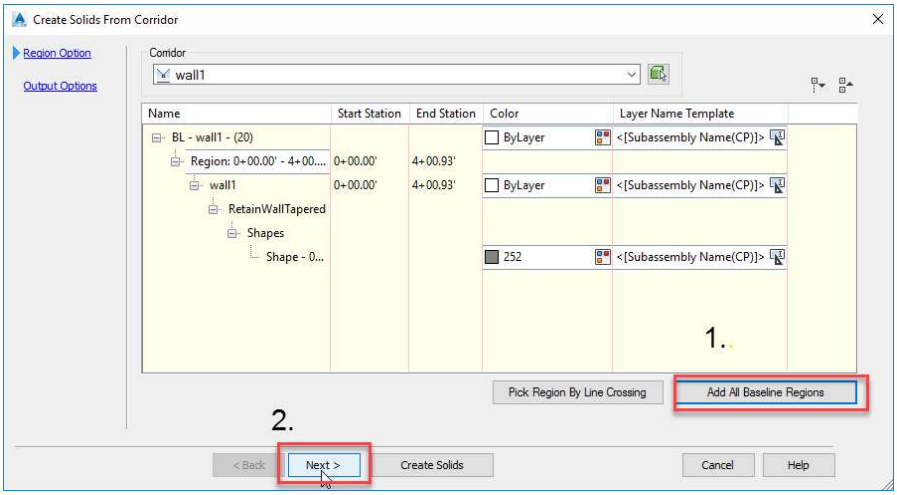




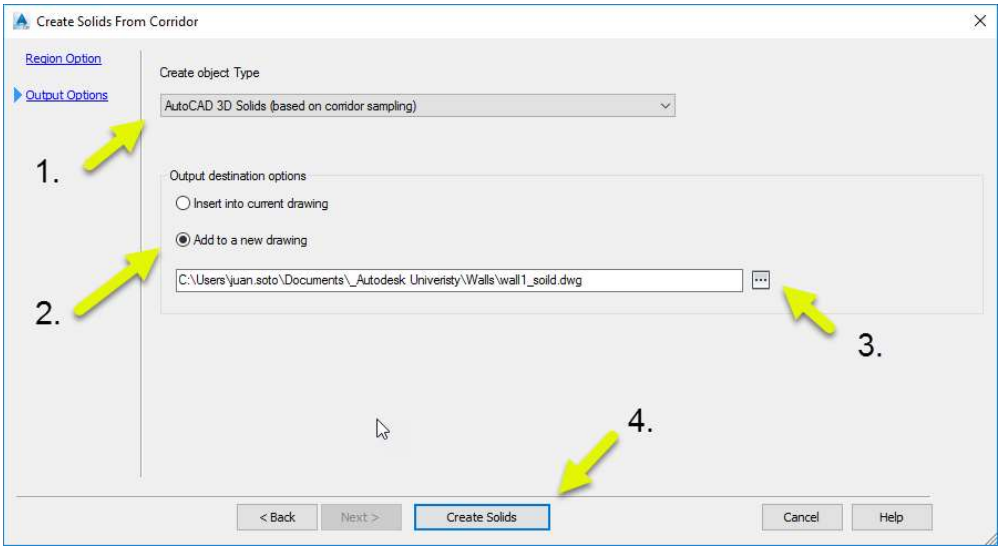
Now Let's export the wall to a solid
Select the corridor then at the command line type _AeccExportCorridorToSolids or on the ribbon Corridor contextual tab, from the Corridor Tools panel select Extract Corridor Solids.



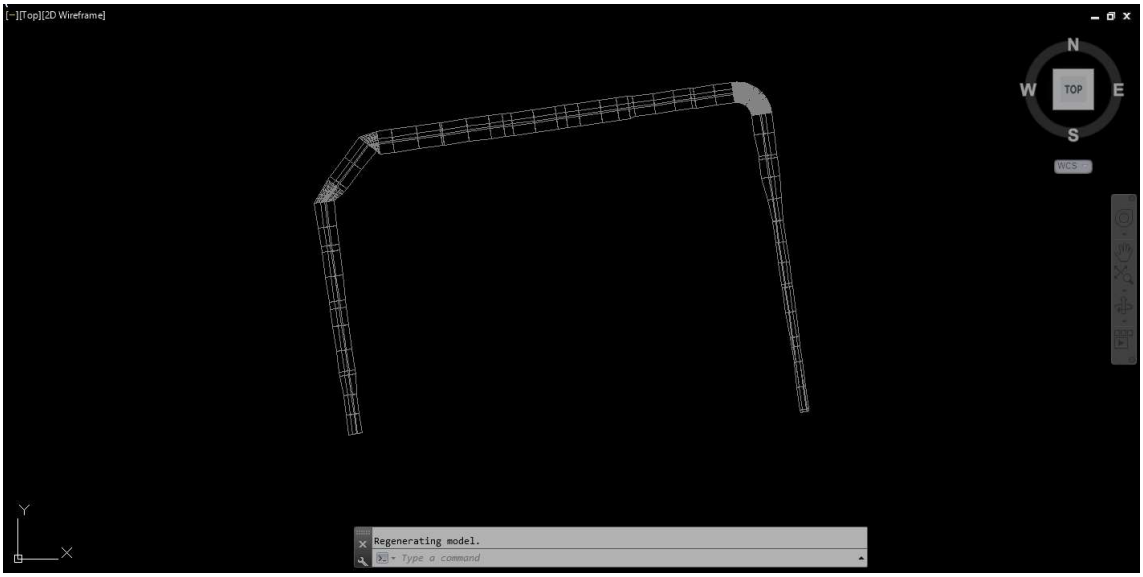
On the Region Option page of the Create Solids from Corridor wizard:
1. Select Add All Baseline Regions
2. Select Next



On the Output Options page of the Create Solids from Corridor wizard:
1. Set Create object Type to AutoCAD 3D Solids (based on corridor sampling)
2. Set Output destination options to Add to a new Drawing (for clarity)
3. Set a path and drawing name for the corridor solid file location and name the drawing wall1_solid.dwg
4. Select Create Solids



Open the Wall1_solid.dwg file with the solid object that you just created.

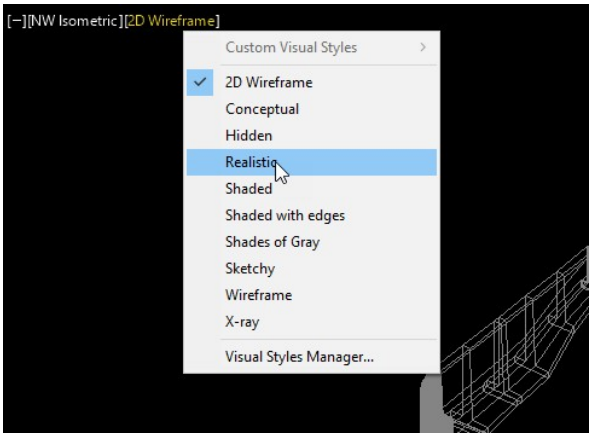


After generating this solid the workflow gets a little tricky. At this point you might think that the fastest thing to do is to set the coordinate system, export FBX, and then Import into InfraWorks 360? Right? Well not quite…

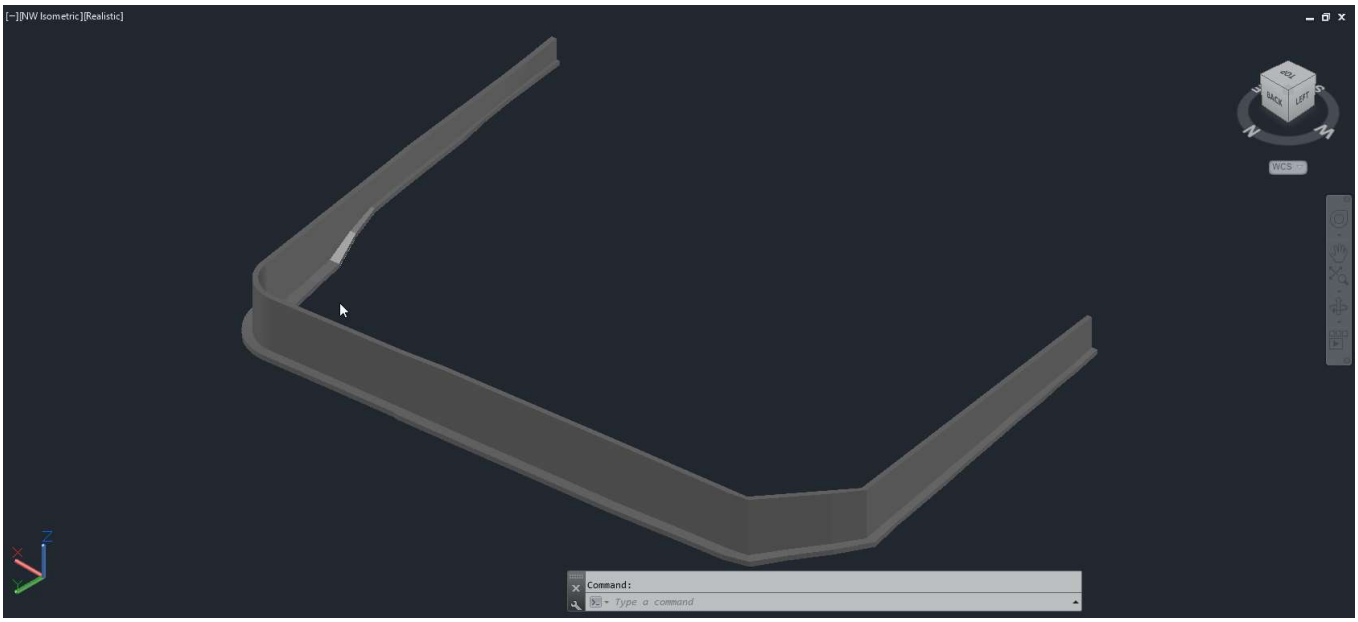
If all you need is the model, then those would be the next steps. Since we want to attach a material to our wall to give it that realism, we must assign a material before exporting. Depending on the tools you have, there will be different methods for applying the material to the object. If you only have AutoCAD or Civil 3D then follow these steps:

1. Set your view by selecting the top left corner of the view cube typically located in the upper right portion of the viewport.

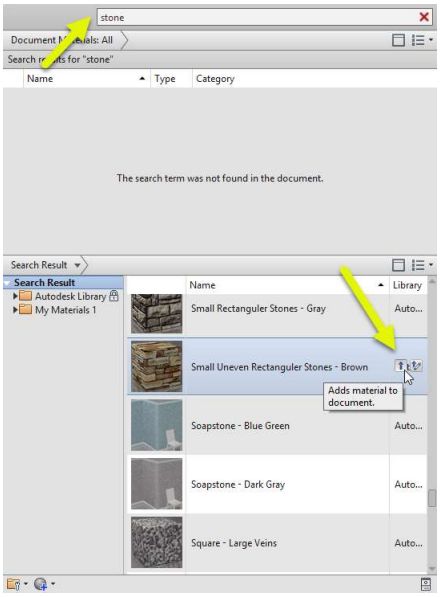
2. Select Realistic mode on the view control settings found in the upper left corner of the viewport.



See how plain the wall looks without a material applied?



3. At the command line, type MATBROWSEROPEN. This will open the Material Browser.
4. Search stone
5. Select Small Uneven Rectangular Stones – Brown

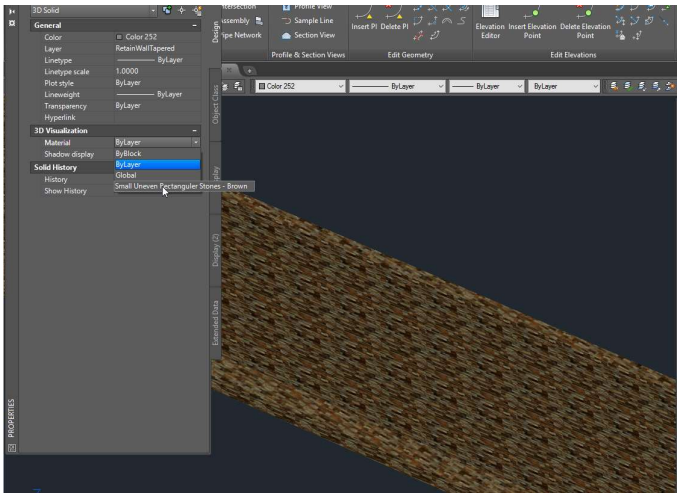


6. Select the Add Material to Document icon on the right.

Now that you have added the material to your drawing, let's apply it to the solid.

7. Select the solid (the wall), then in your properties palette change the material to Small Uneven Rectanguler Stones – Brown.

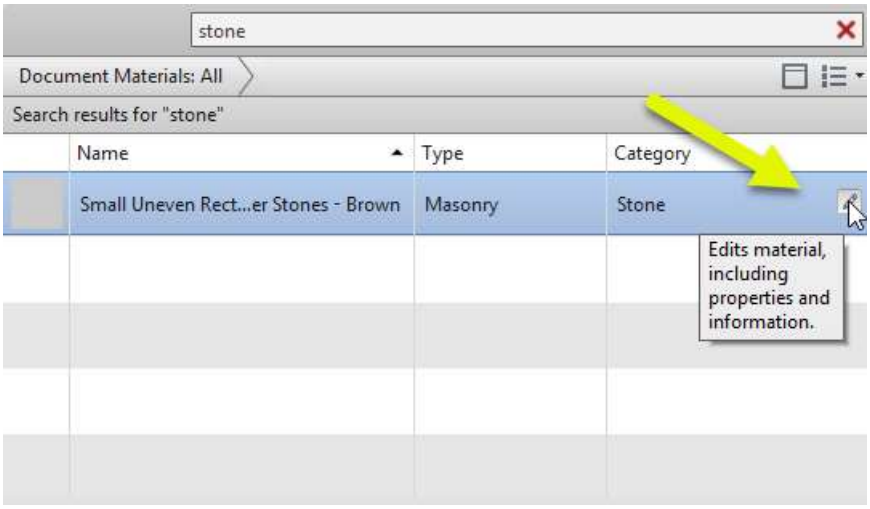
Once you've selected the material, it should look like this:



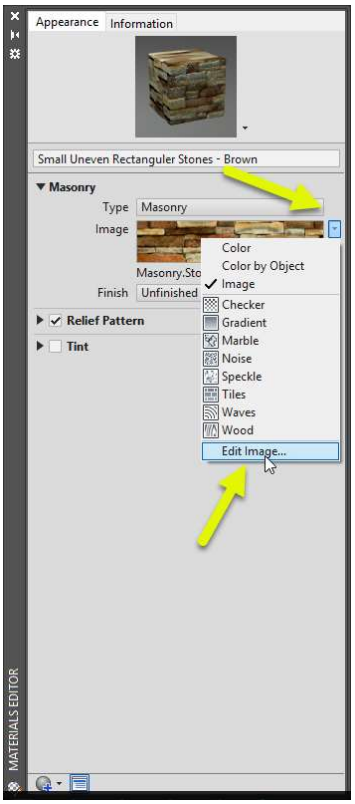
At this point it's a judement call on the scale and the positioning of the material on your wall.

If you need to modify the image or change the scale:

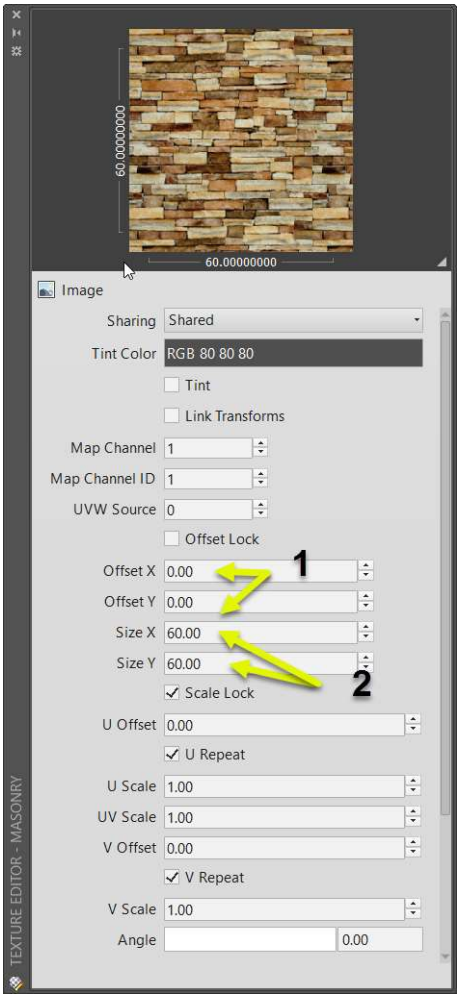
1. Select the edit image icon next to the material image.



2. Select Edit Image at the bottom of the listing.

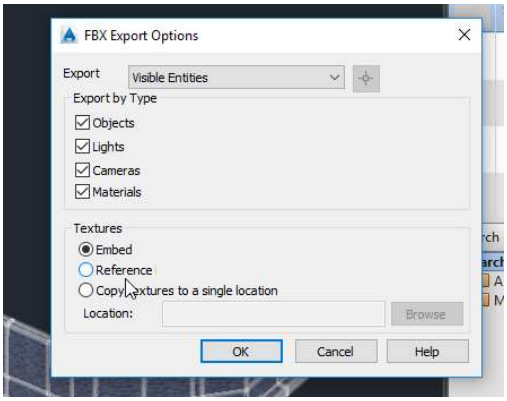


1. Sets the X and Y offest of the applied texture for the material
2. Sets the X and Y scale of the applied texute for the material

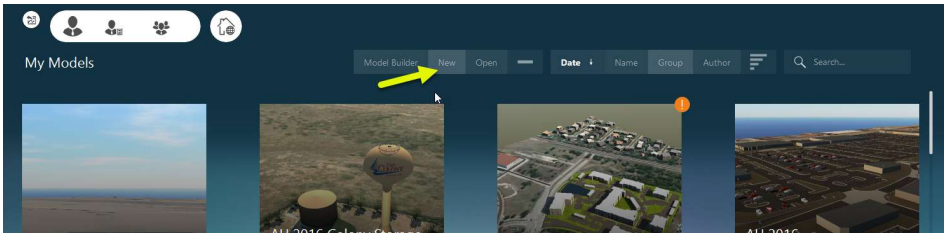


Now that you have applied the correct material it's time to export the solid.

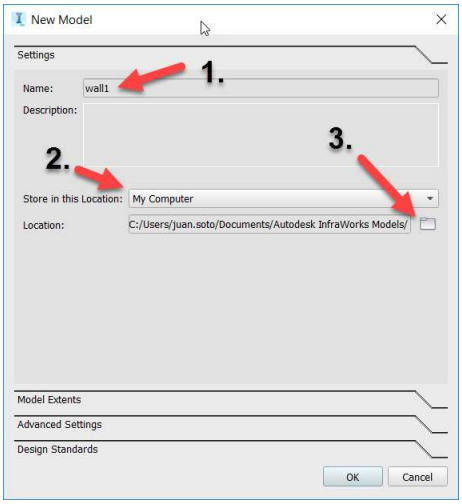
At the command line type FBXEXPORT



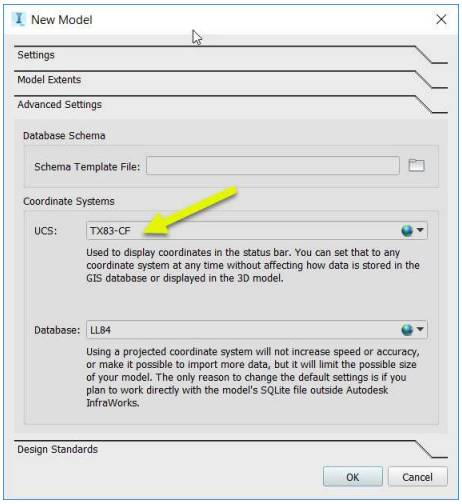
Switch over to InfraWorks 360 and let's start a new model



Next
1. Set model name
2. Set Cloud stored or My Computer
3. Stored Location.



Select Advance Setting to match site coordinate system.

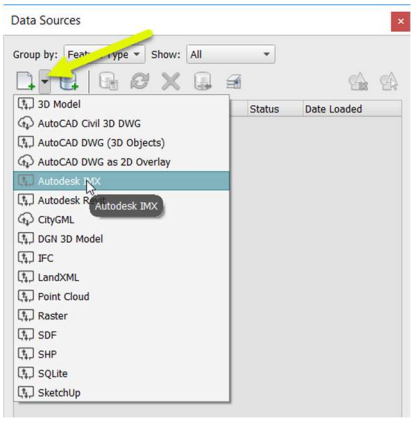


Select OK

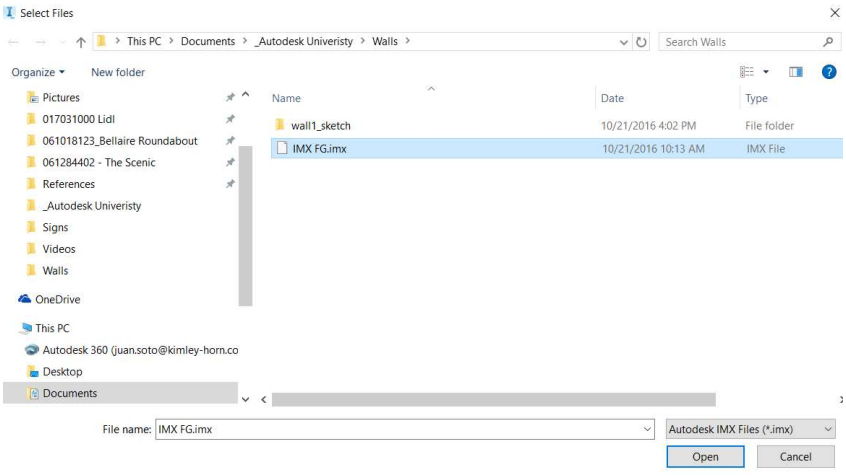
In your blank scene

1. Select Build, Manage, and Analyze Your Infrastructure Model
2. Select the Create and Manage your Model Icon
3. Select Data source

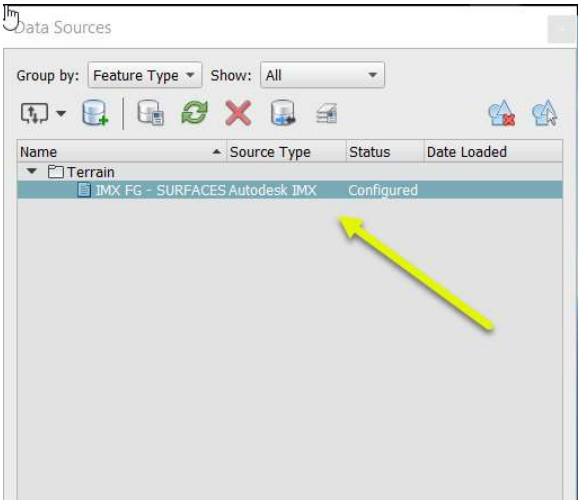
Select from data sources pull down menu and scroll down to Autodesk IMX



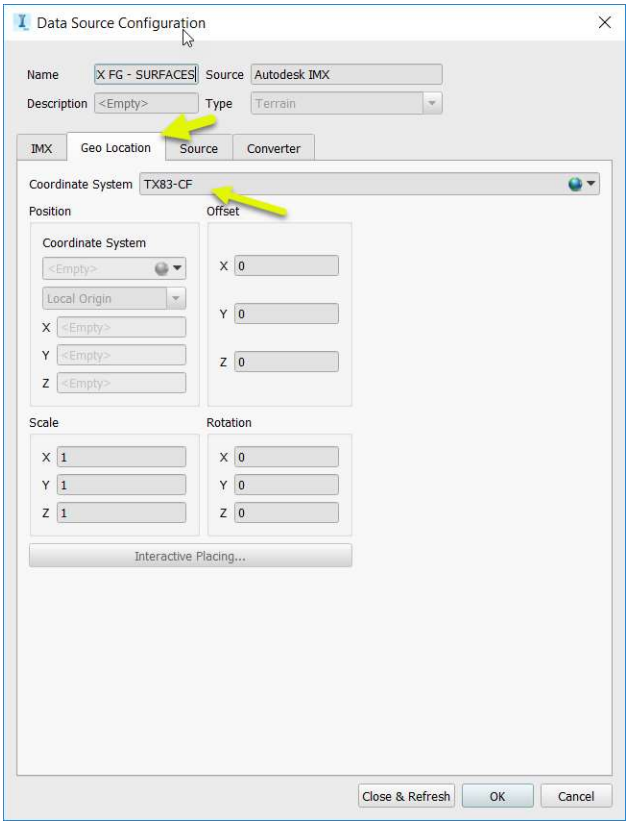
Path to IMX file provided in data set IMX FG.imx



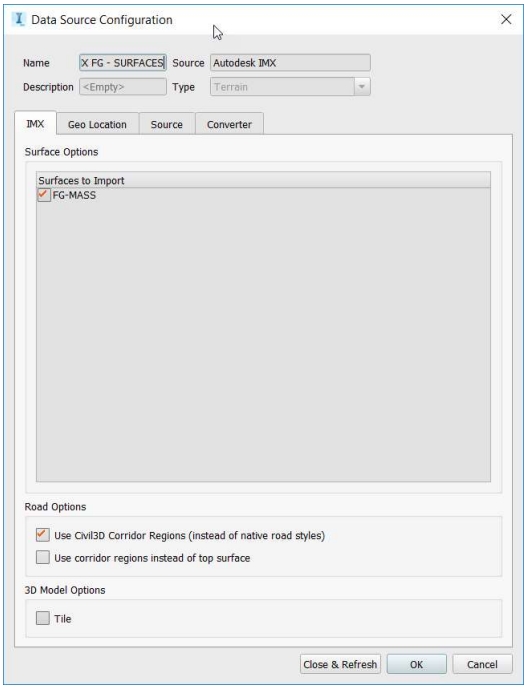
Double click to configure the IMX.



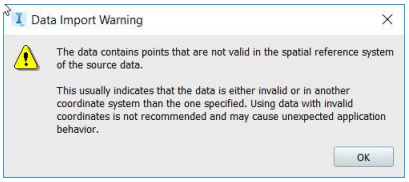
Select the Geo Location tab and make sure the Coordinate system is set to match our sites system TX83-CF.



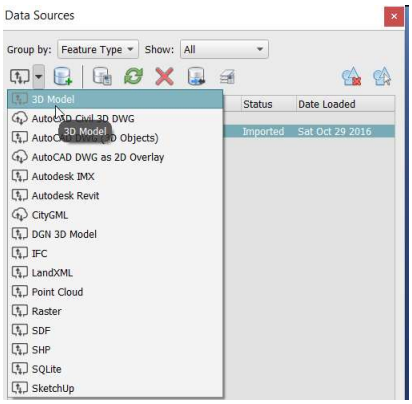
Select IMX tab and select FG-MASS check box, then select close and refresh



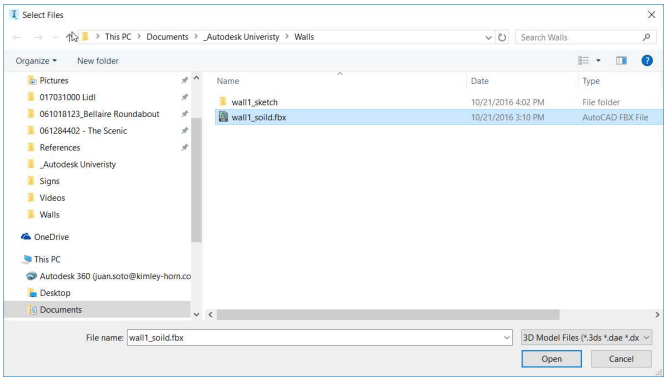
NOTE: This warning is common when a local survey system is set to your surveyed surface.
Select OK



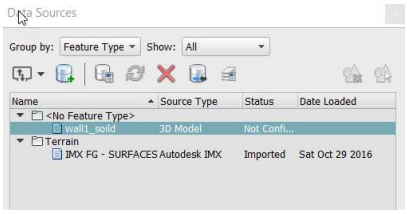
Next select the 3D Model from Data Sources



Select the wall1_solid.fbx we previous exported from the wall1_solid.dwg

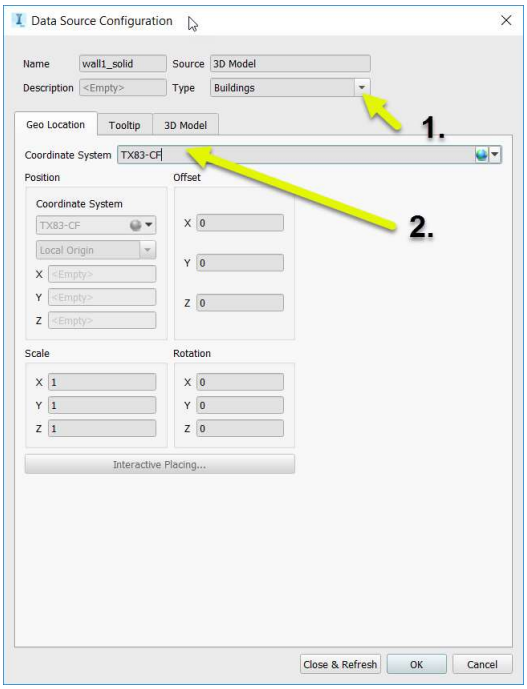


Double click on the wall1_solid listing

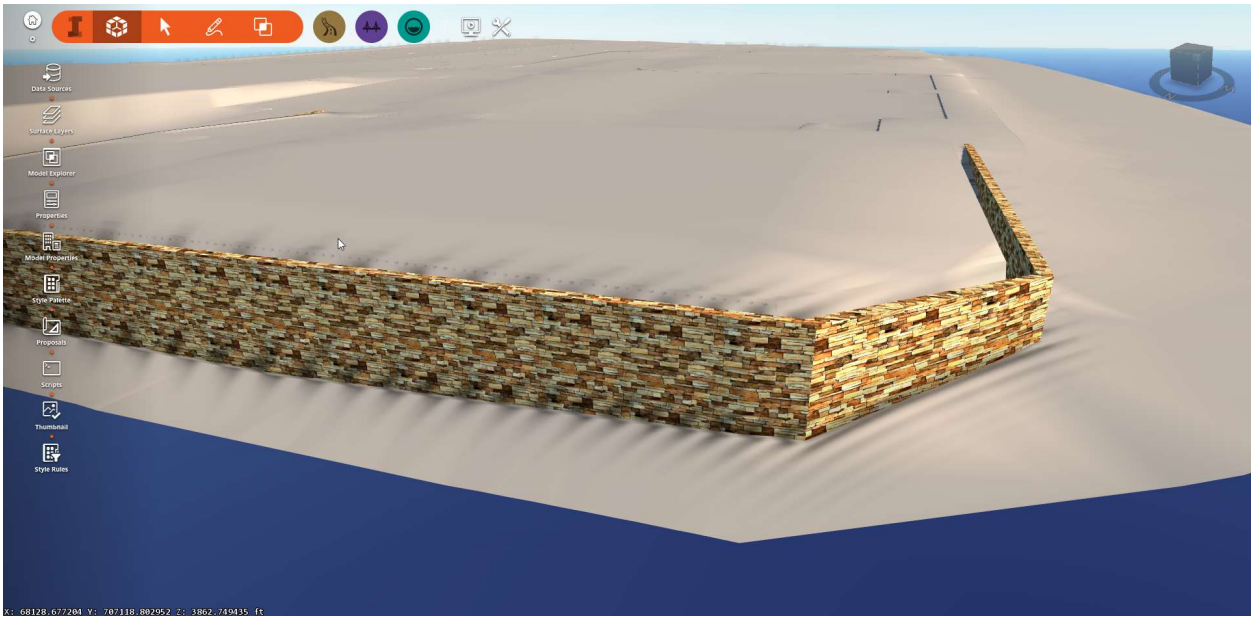


Select Geo Location Tab

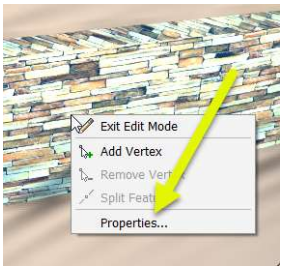
1. Set Type to Buildings
2. Set Coordinate system to TX83-CF
3. Close and Refresh



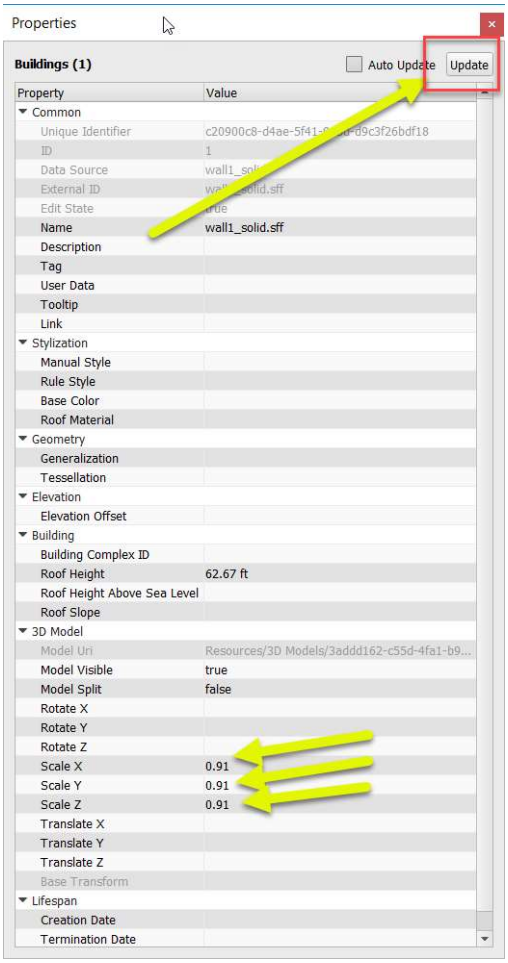
*Note: The fbx to solid export might have an issue with scale when using Civil 3D 2015. The same issue applies to Civil 3D 2017



Next scale and position as needed. Selecting the wall right clicking and select Properties



Set X,Y,Z scale factor
Make sure you select Update after the scale adjustment or it will not apply.



SDF VS Draping Raster Images

When generating InfraWorks 360 models, users have been creating closed polygons and importing sdf files to drape onto a terrain surface.

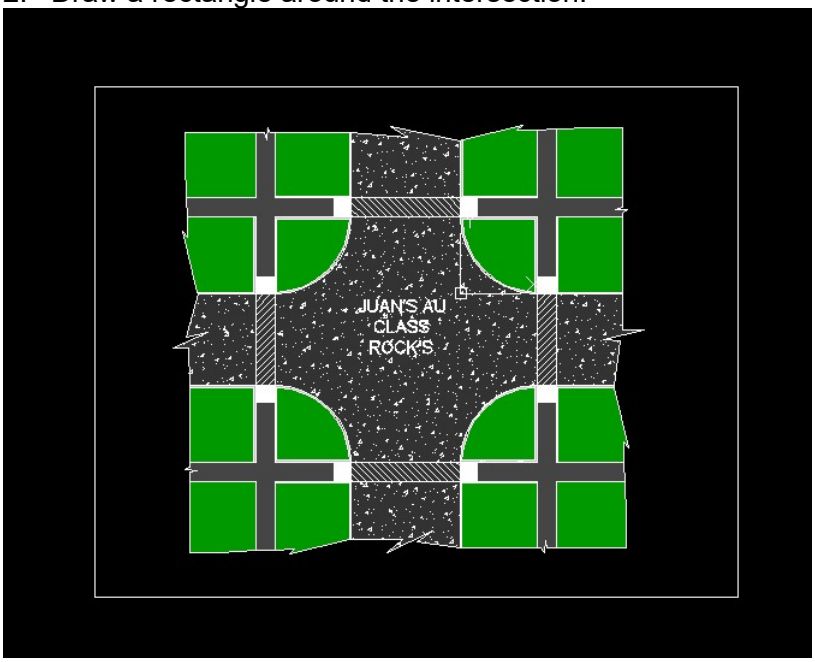
SDF

Let's look at a workflow that generates quick and easy sites in InfraWorks 360.

Draping Raster Images

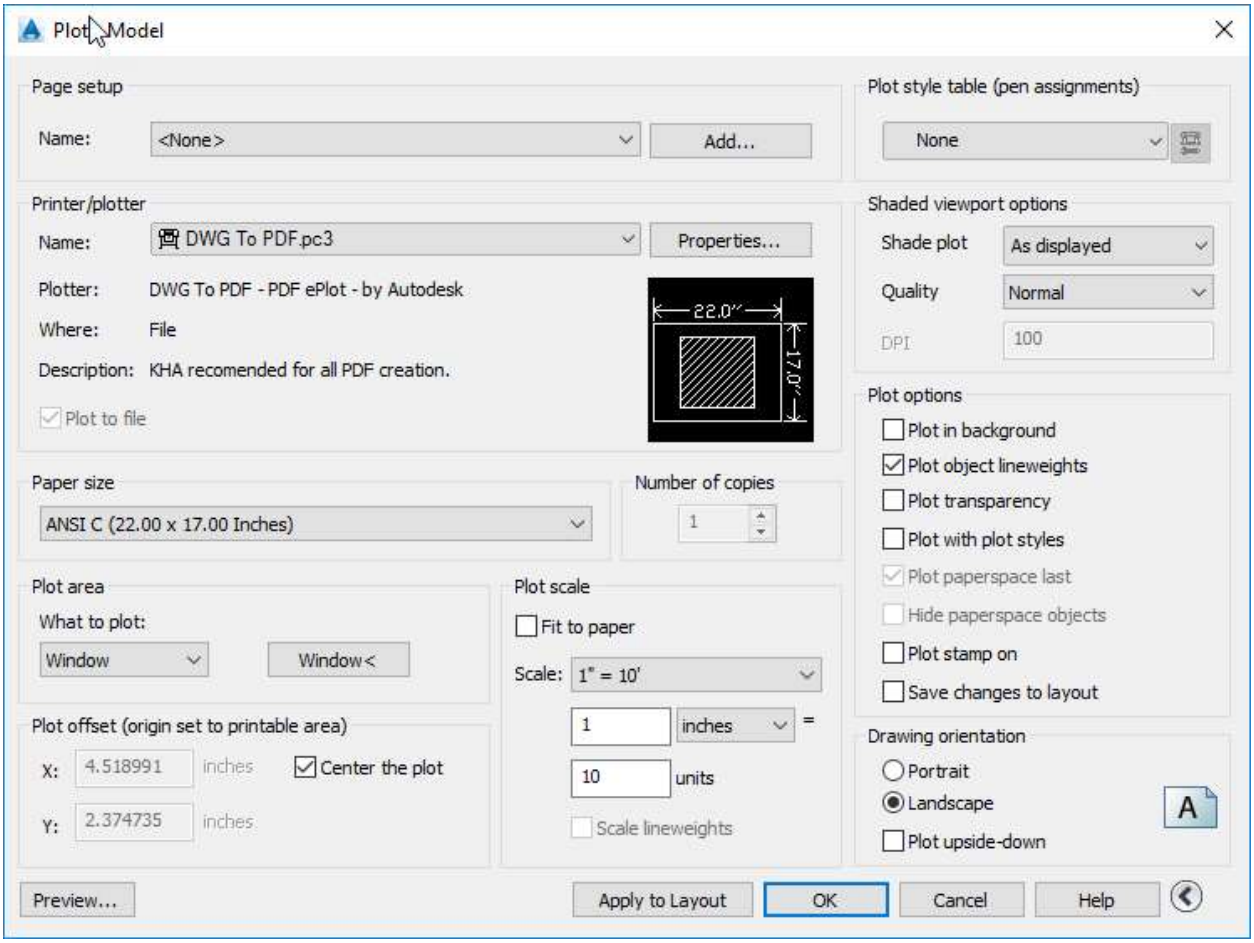
1. Open the provided drawing AU 2016 Raster.dwg

2. Draw a rectangle around the intersection.

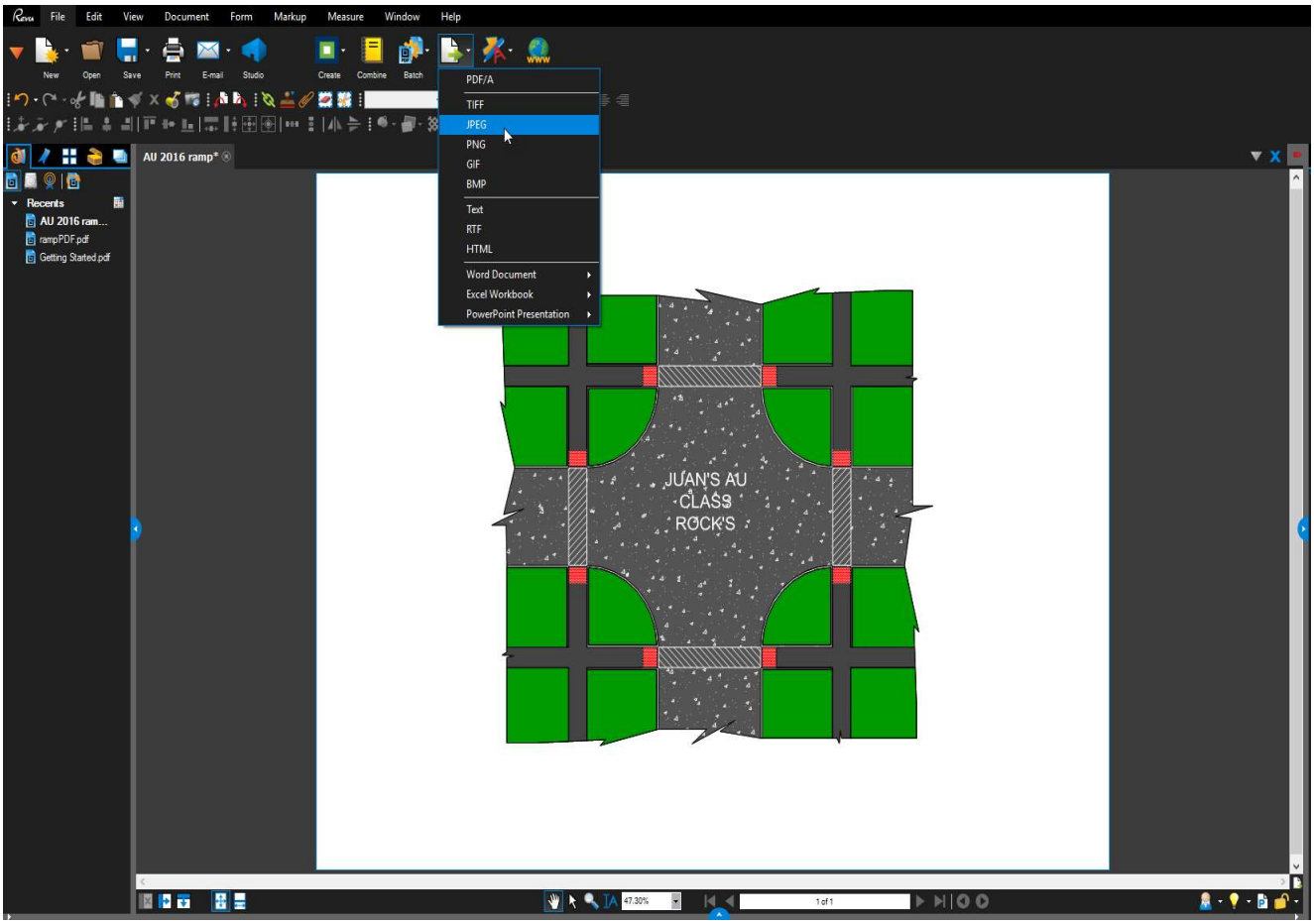


At the command line type plot and press enter.

3. Make sure your plot settings match the image below. Use the rectangle we generated for your window extents. The settings are important due to the scale, the location of the image when bring into InfraWorks 360 and the updating every time there is a change to the site work. The scale is important but as long as a scale is applied you can modify at a later time.
4. Click OK and save the pdf in the project location.

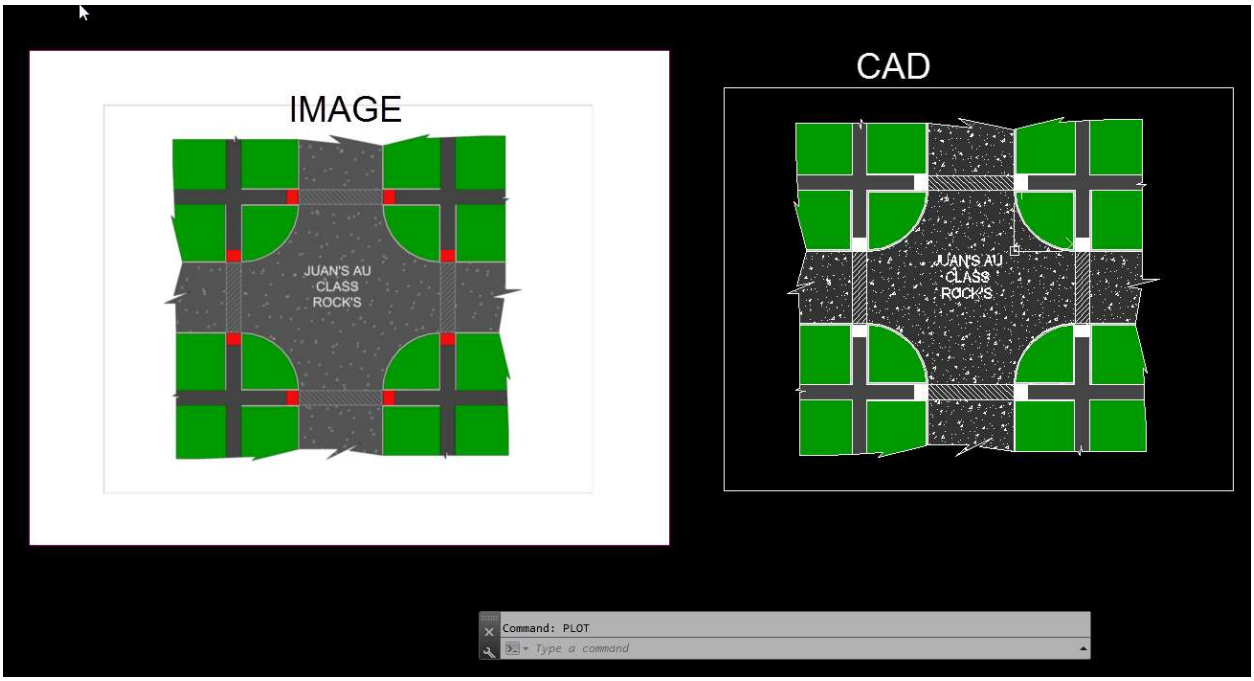


5. Open the PDF with a program that will allow you to export as an image. Ex..jpeg, tiff, bmp or any image that Civil 3D will import. For this demo I used Bluebeam.
6. Export the file, selecting the correct image type and save to the project location.

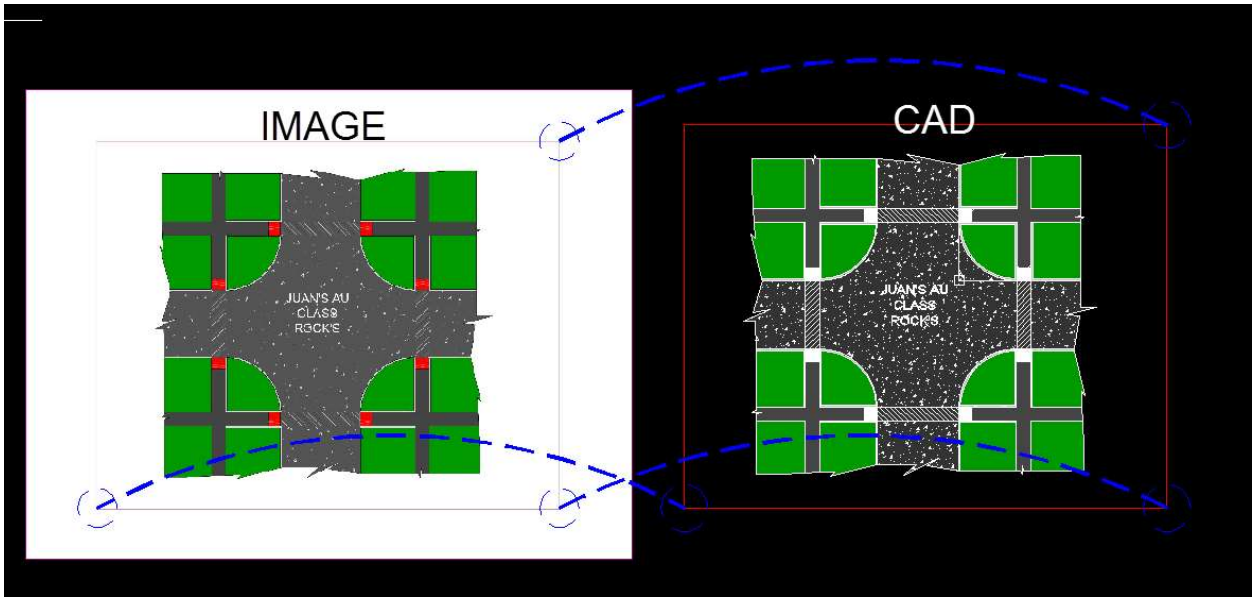


Back in the AutoCAD drawing (AU 2016 Raster.dwg) we will attach the image you just exported.

7. At the command line type attach or use your xref manager to bring in the image, place the image near the cad geometry and scale the image close to the desired size.



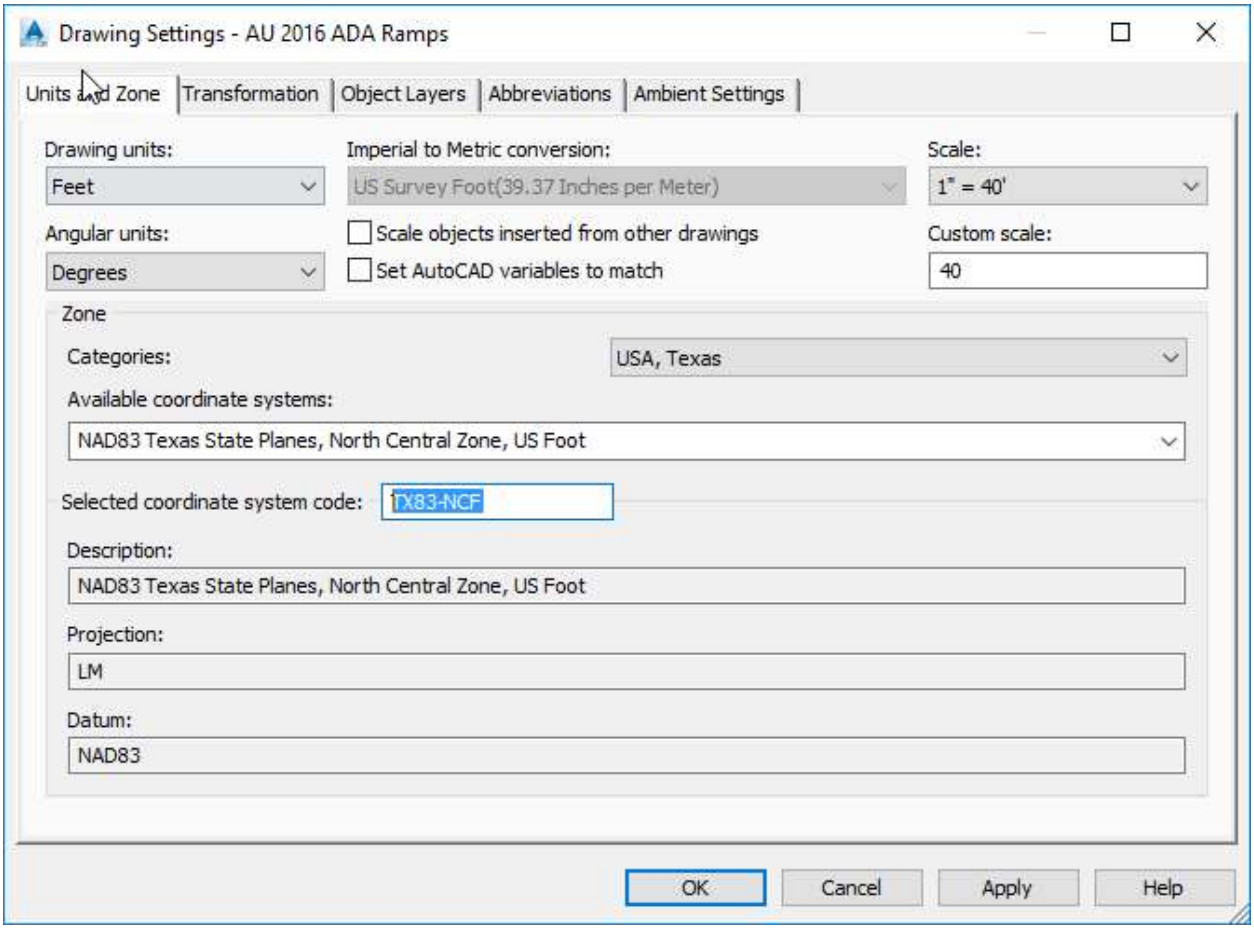
8. Using the rectangle, we made at the beginning of the exercise, use the align command to translate, scale, and rotate the image onto the cad geometry. Make sure the outlines matches as close as possible.



Now that the image has been located and scaled appropriately, create a world file for the image to use in InfraWorks 360.

9. Assign the project coordinate system:
    a. Open Toolspace and choose the Settings tab.
    b. Right click on the drawing name and from the menu, select Edit Drawing Settings.

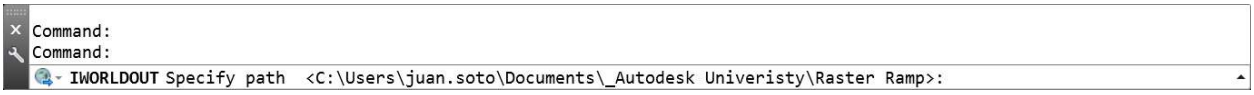
c. On the Units and Zone tab, choose the project's coordinate system.



This project uses the NAD83 Texas State Planes, North Central Zone, US Foot (TX83-NCF) coordinate system. Depending on the project, you may need to apply additional settings on the Transformation tab for your own project.

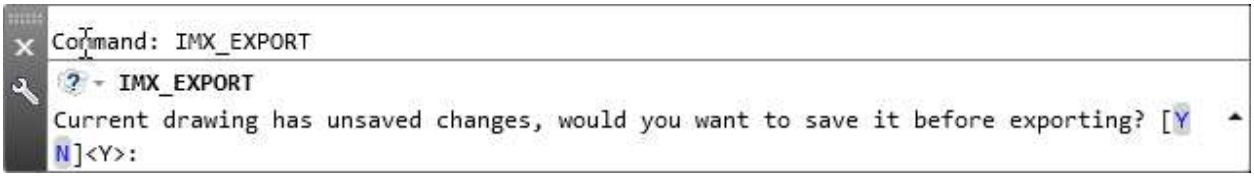
The next step in the workflow is to generate a world file for the image.

a. Make sure AutoCAD Raster Design is loaded.
b. At the command line type IWORLDOUT and press enter.
c. The command line will ask you for a path to export the world file. It's very important that the world file be placed and kept in the same location as the image file. The default path provided will match the path of the current drawing so just press enter.

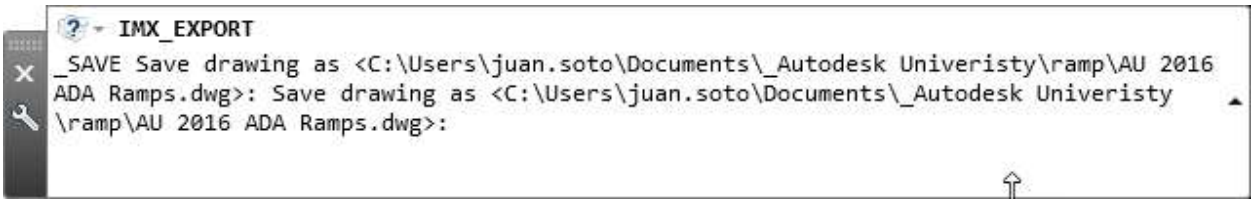


Now that our image is set and the world file created, it's time to export the FG surface provided in the AU 2016 Raster.Dwg

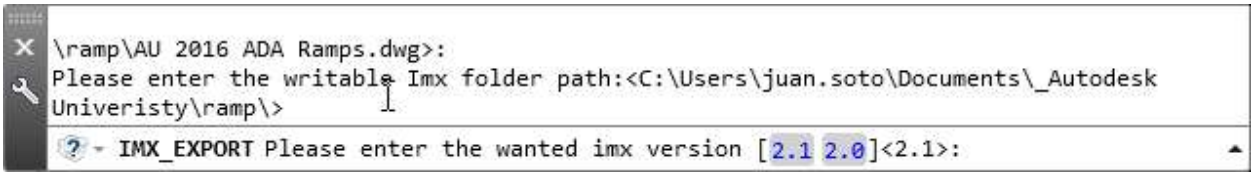
10. At the command line type IMX_EXPORT and press enter.



11. When prompted to save unsaved changes, press enter or select Y for yes.

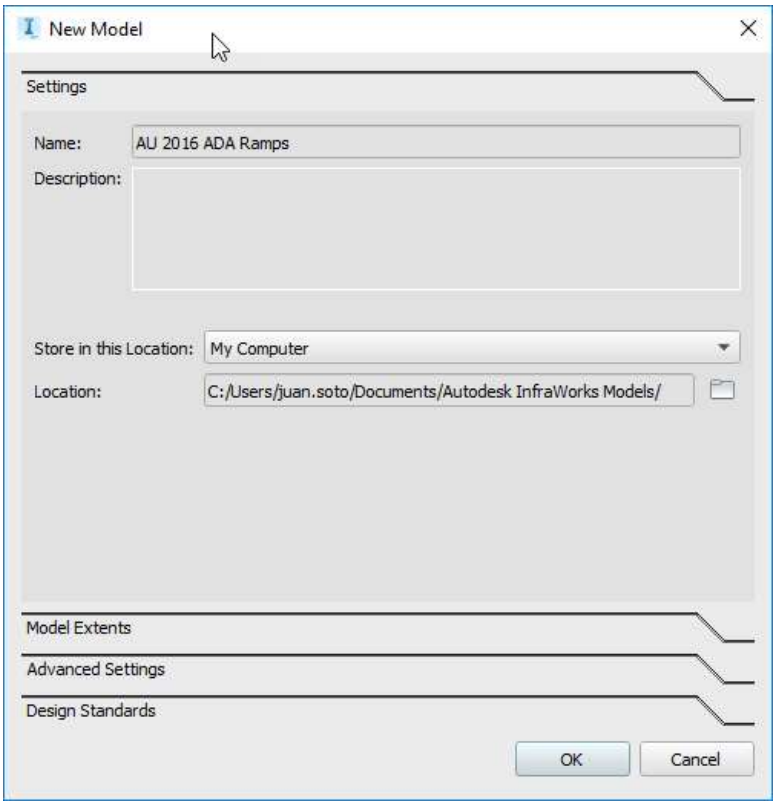


12. Press enter to accept the default location for the imx stored location (should be the same as your project file location).

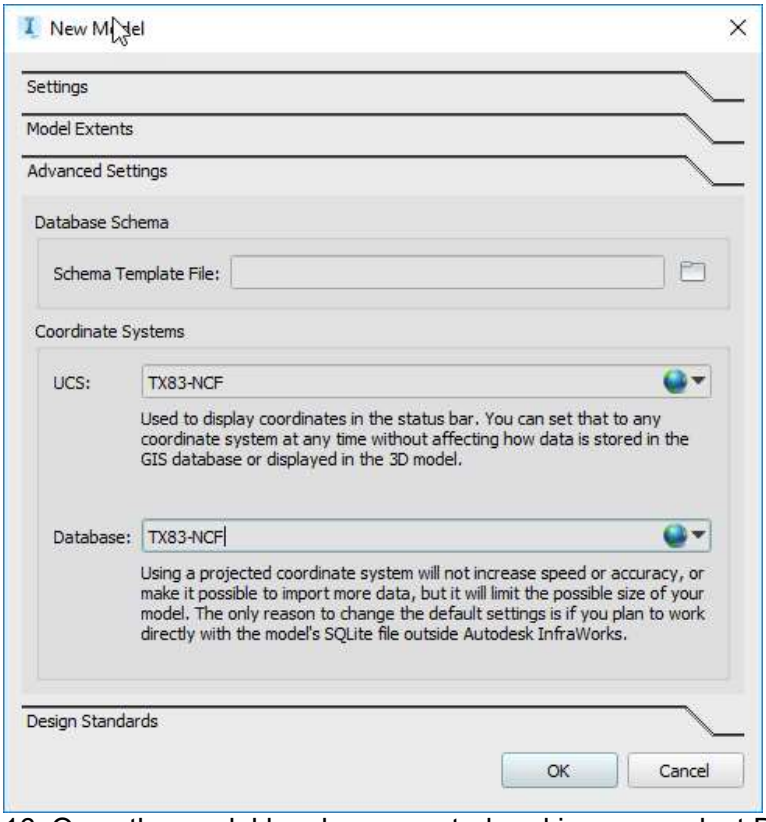


13. Press enter to accept the default IMX version.

14. Switch over to InfraWorks 360 and create a new model.

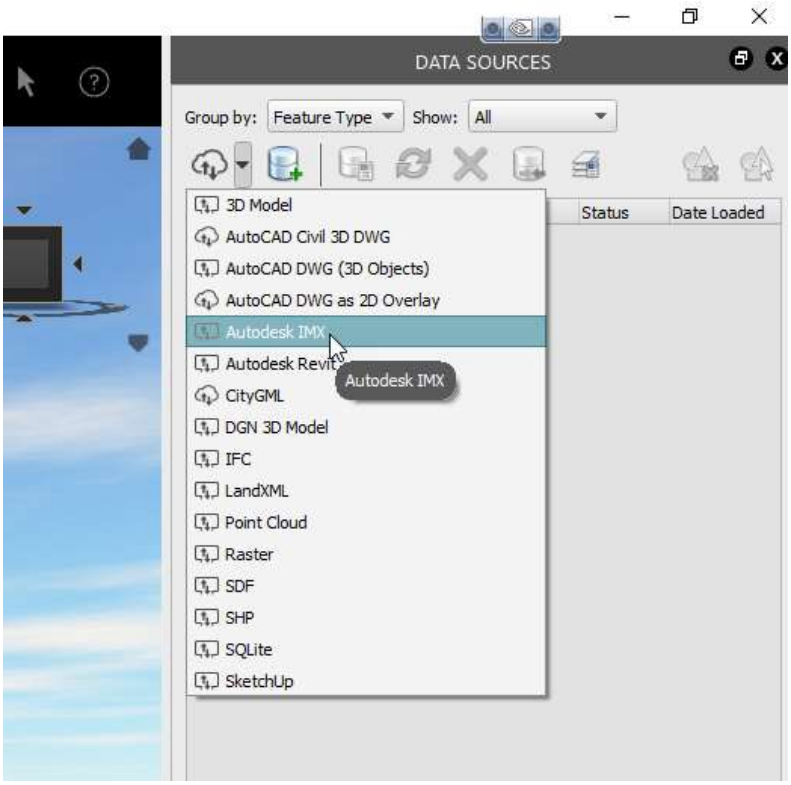


15. Set the coordinate system to match the project coordinate system you assigned in Civil 3D.

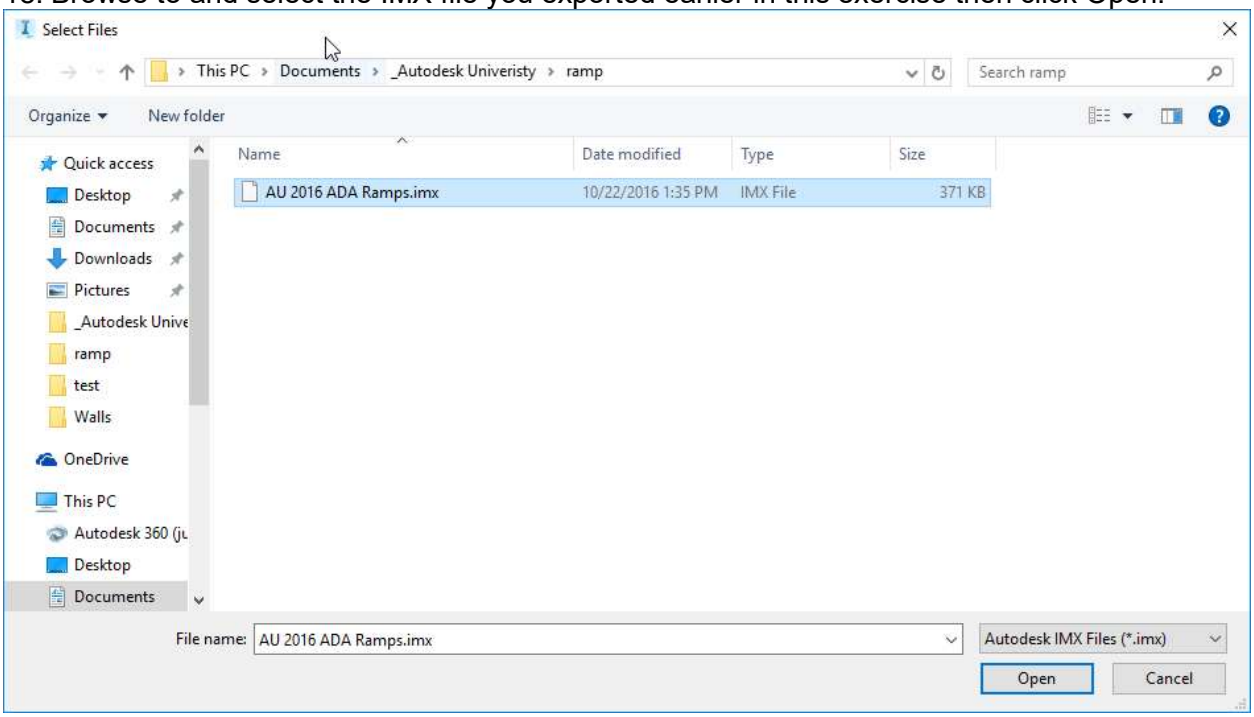


16. Once the model has been created and is open, select Data Sources from the InfraWorks Create and Manage menu.

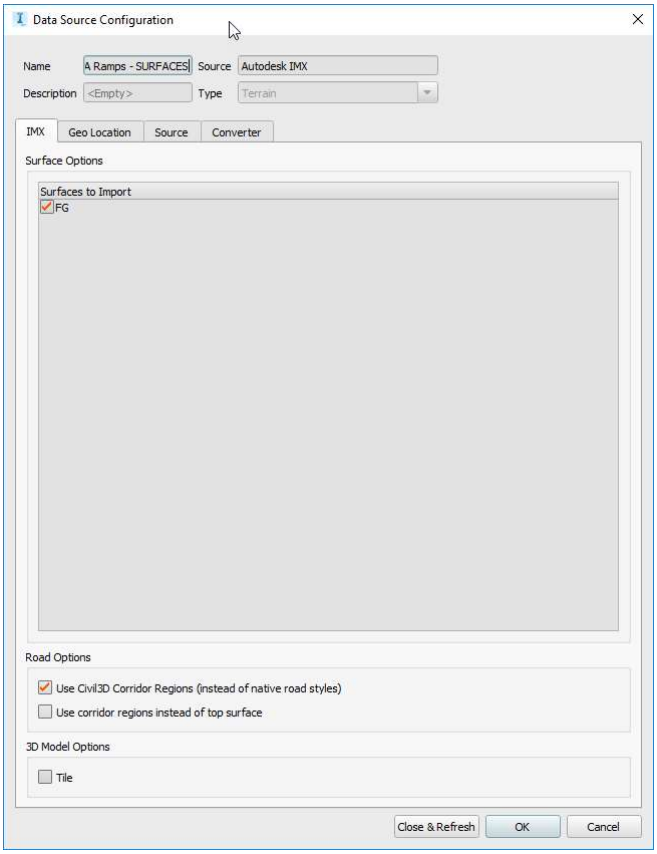
17. In the Data Sources palette, select Autodesk IMX from the data source type dropdown menu.



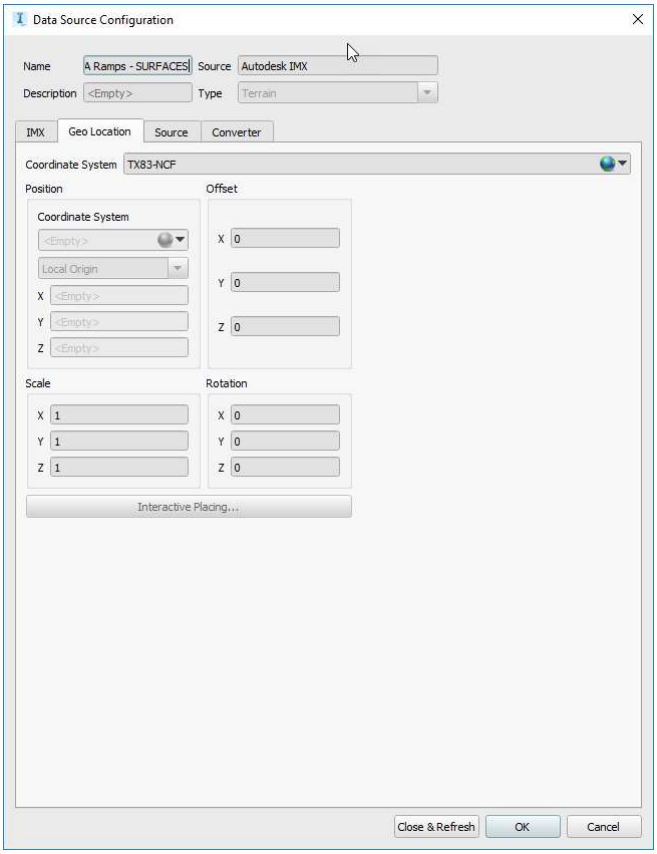
18. Browse to and select the IMX file you exported earlier in this exercise then click Open.



19. In the Data Source Configuration dialog, select the Geo Location Tab.



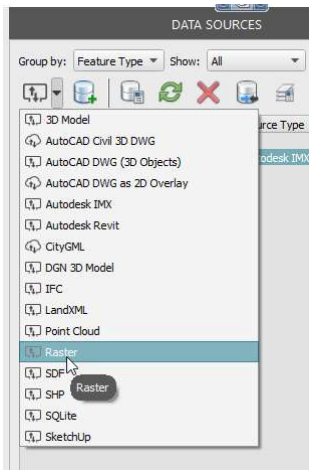
20. Set the Coordinate system to match the one previously assigned in the AutoCAD drawing.



21. Click Close & Refresh.

22. Import the image you generated earlier in the exercise.

    a. In the Data Sources palette, select Raster from the data source type dropdown menu.

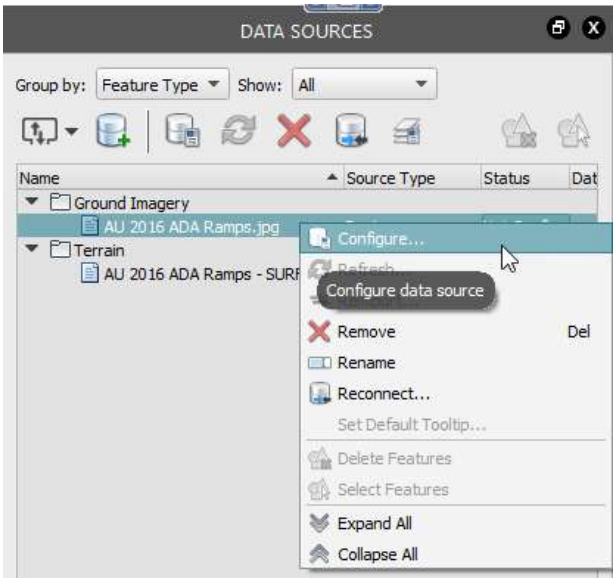


    b. Browse to and select the image file created earlier in this exercise.

    c. Click Open to connect the image to the model.

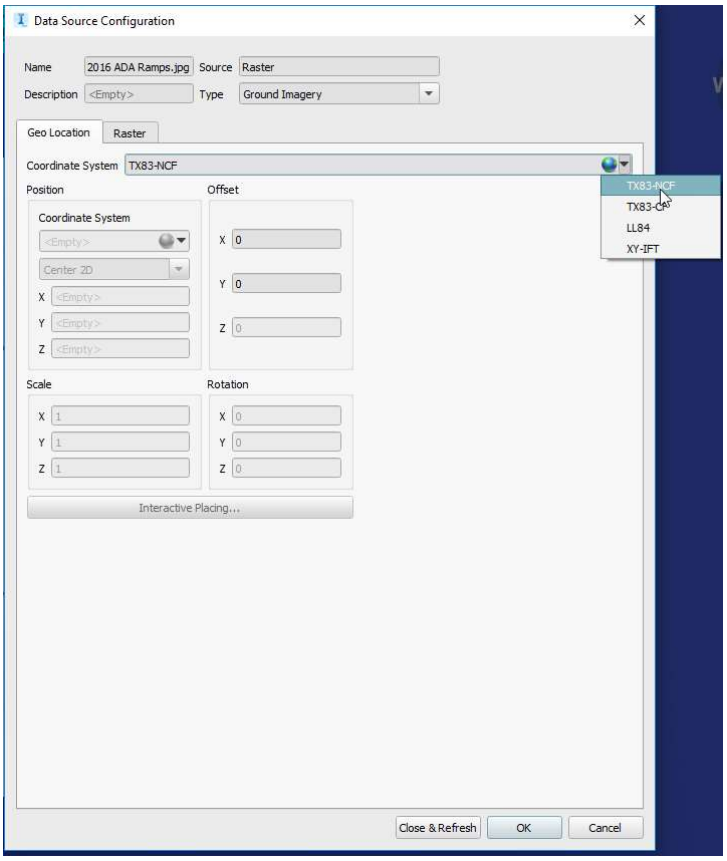
If you don't see the image after connecting it to the model, don't panic. You need to configure the connection so that the software knows how to place the image in the model.

d. In the Data Sources palette, select the image, right click, and select Configure.



e. Set the coordinate system to the same coordinate system (TX83-NCF) you used on the image world file drawing earlier in this exercise.

NOTE: The image is using the coordinates from the world file we generated to locate itself in the exact same location as where we placed it in our drawing.



f. Click Close & Refresh.

Your surface and image should line up perfectly depending on how good a job you did aligning the image in your CAD file.

SURVEY AND LANDSCAPE OBJECTS

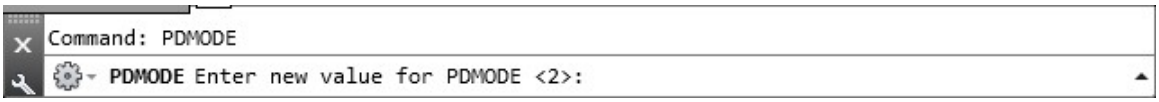
Over the time generating the InfraWorks 360 models one of the most time consuming processes has been the placement and accurate location of survey and landscape objects. For this exercise will go through a workflow that will help speed up the process.

The object of this exercise is to get the trees on the north side of our site in the surveyed location with any manual input.

1. Open the drawing named AU 2016 TREES1.dwg that is provided in the dataset.

2. Change the variable that handles the display for nodes style and node size in AutoCad

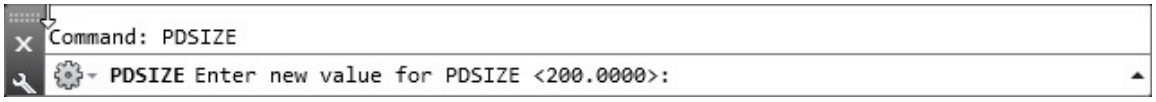
3. At the command line type PDmode and press enter. When prompted, set the value to 2 and press enter



PDmode sets the style of generic AutoCAD points.

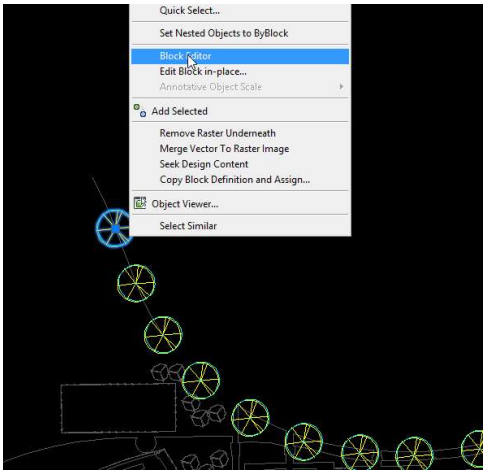
4. At the command line type PDsize and press enter. When prompted, set the value to 200 and press enter. You may decide to change this setting later.

PDsize sets the scale of generic AutoCAD points.



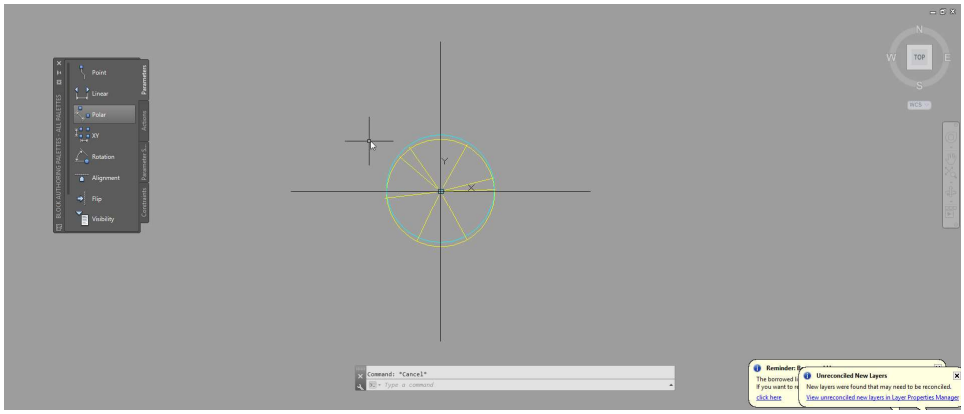
5. Select one of the trees and confirm that the objects are blocks.

6. Select one of the objects right click and select Block Editor from the menu. If you don't see a right click menu, choose one of the objects and type BEDIT at the command line, press enter, then click OK.

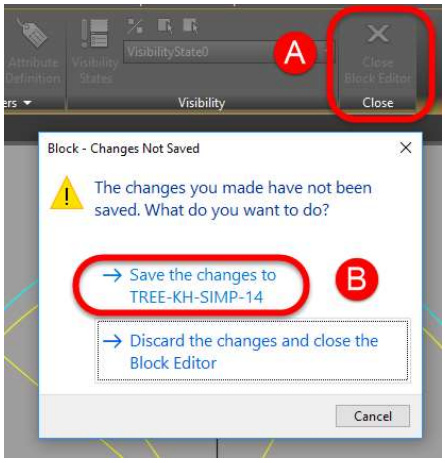


This will initiate the block editor mode.

7. At the command line enter point and select the center of the landscape tree. If there are multiple circles as shown in this image, you can also type 0,0 at the command line then press enter. This should place a point at the assigned insertion point of the block.



8. Click Close Block Editor on the ribbon tab then click Save the changes when prompted.



9. Repeat these steps for all the tree blocks that are needed in your InfraWorks 360 model.

I recommend using separate drawings for easier editing and exporting. If more than one style off trees is needed

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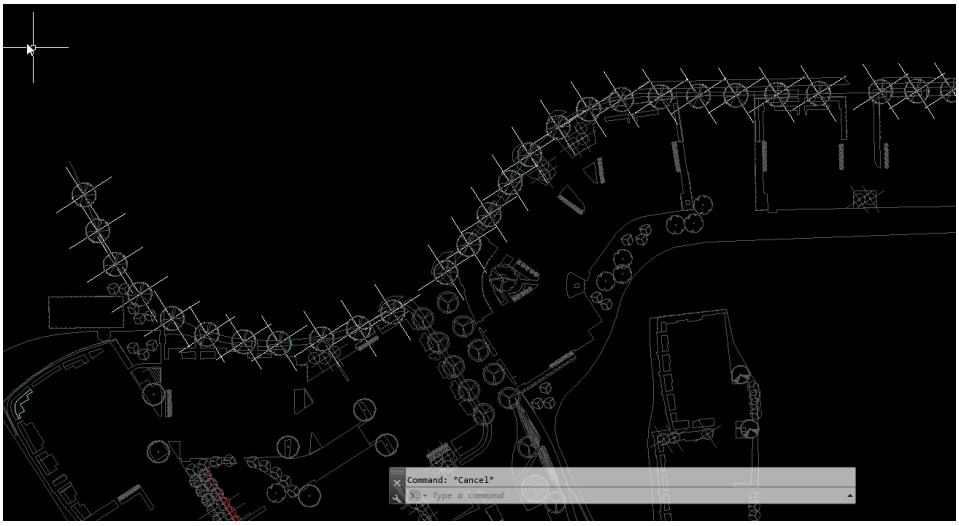
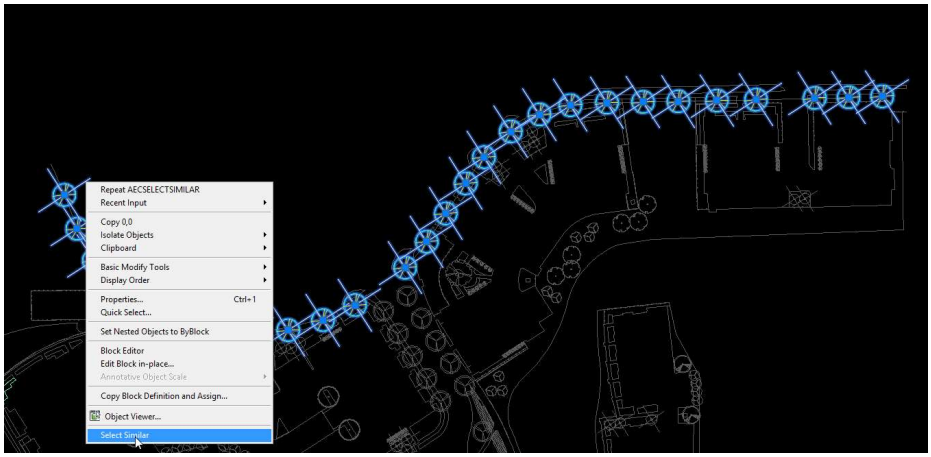


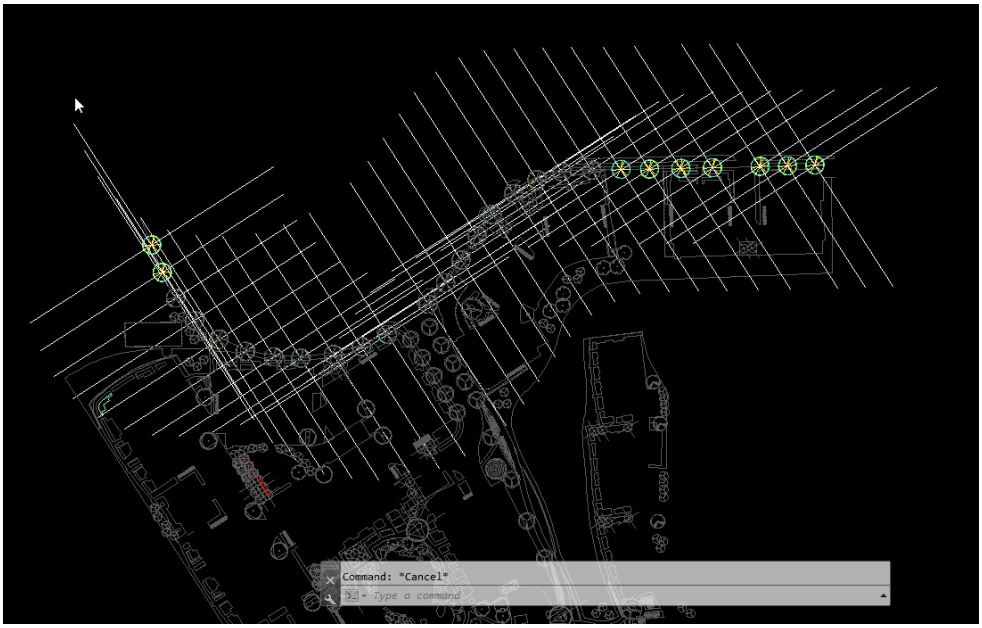
Notice how the change to the PDmode and PDsize system variables has made the AutoCAD points easy to identify inside the blocks that have been edited?

10. Select one of the tree blocks, right click, and choose select similar.

11. With the tree block selected, at the command line type X then press enter. This will explode the blocks.

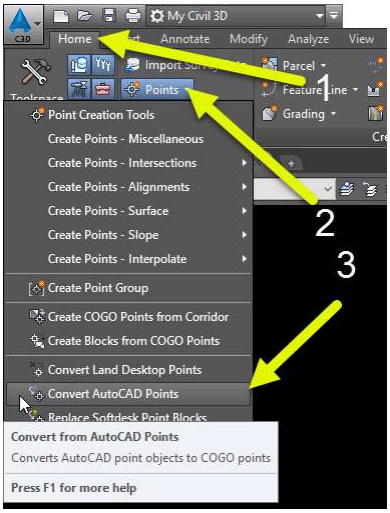


Depending on the PDmode and PDsize you set, your view should look similar to this with the modified system variables.

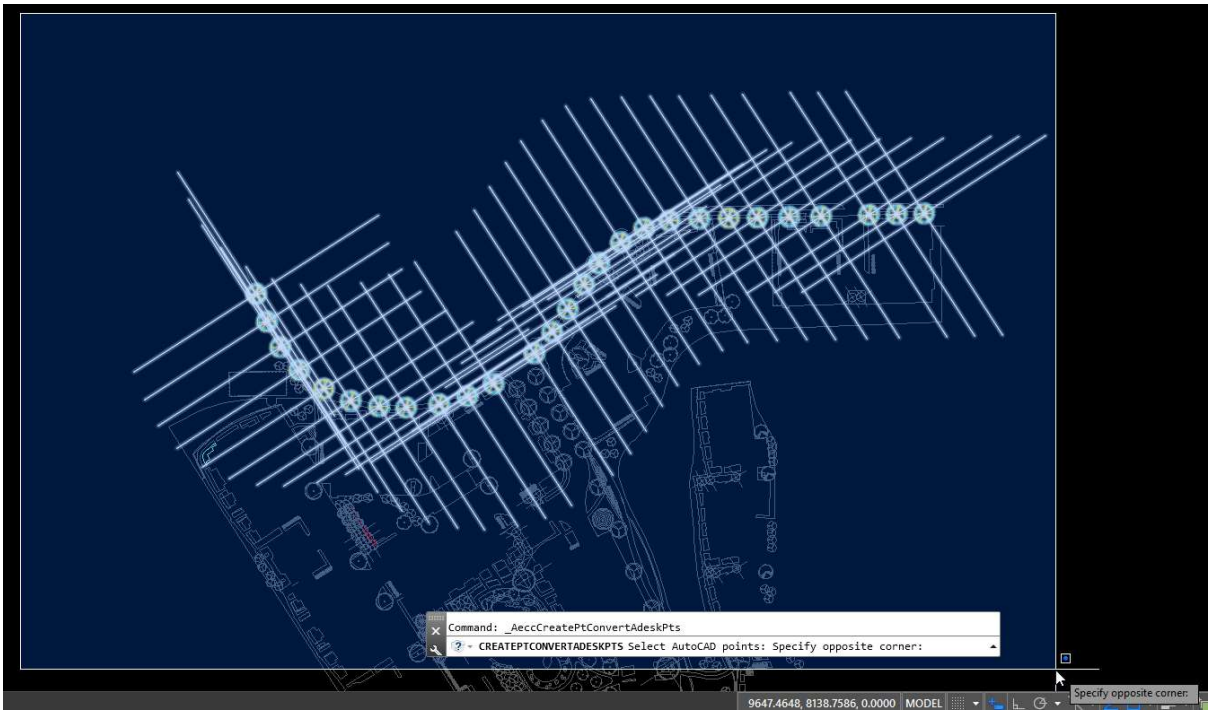


The next step will be to convert the generic AutoCAD points to Civil 3D points for exporting.

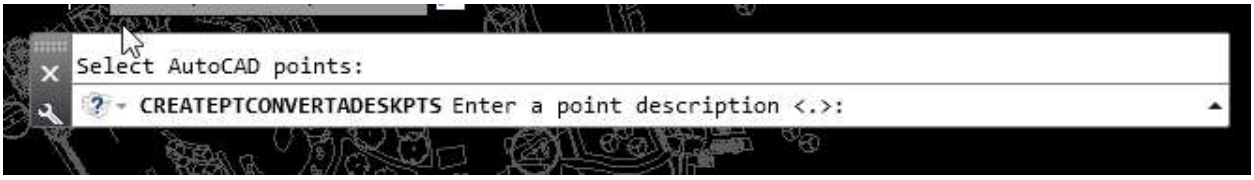
12. On the Home ribbon tab, select Points, then Convert AutoCAD Points.



13. Use a crossing window to select all of the AutoCAD points then press enter to end the selection process.



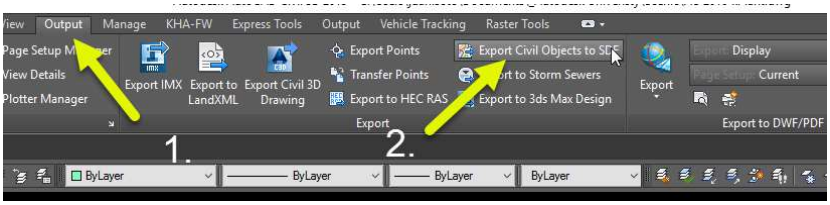
14. If prompted for a point description just press the **enter key and keep it pressed** as Civil 3D converts all the generic points to Civil 3D points with no descriptions.



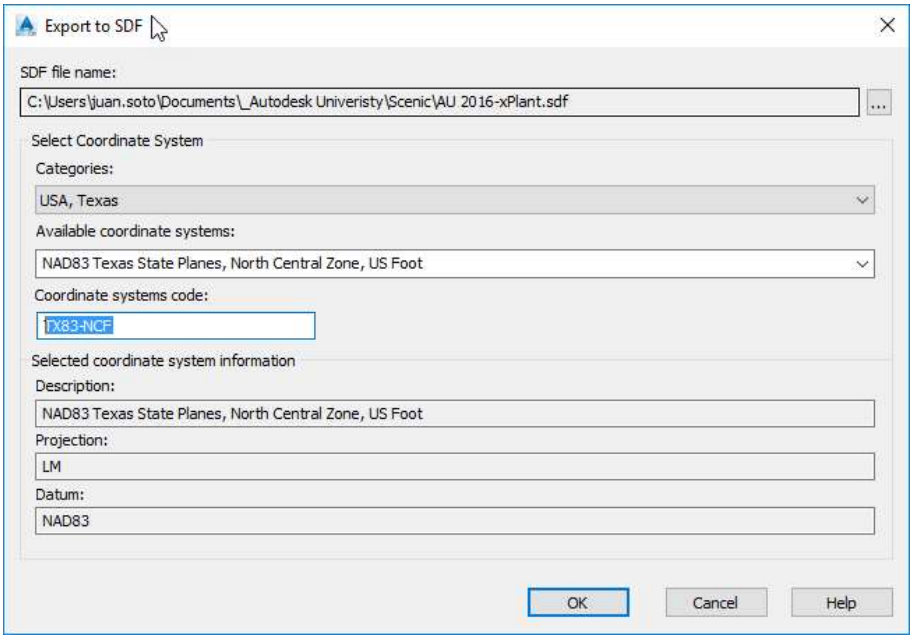
After the conversion process is complete, Civil 3D will use the default point and label styles to display all the converted points.

The points are now ready to export.

15. On the Output ribbon tab, Export panel, select Export Civil 3D objects to SDF.

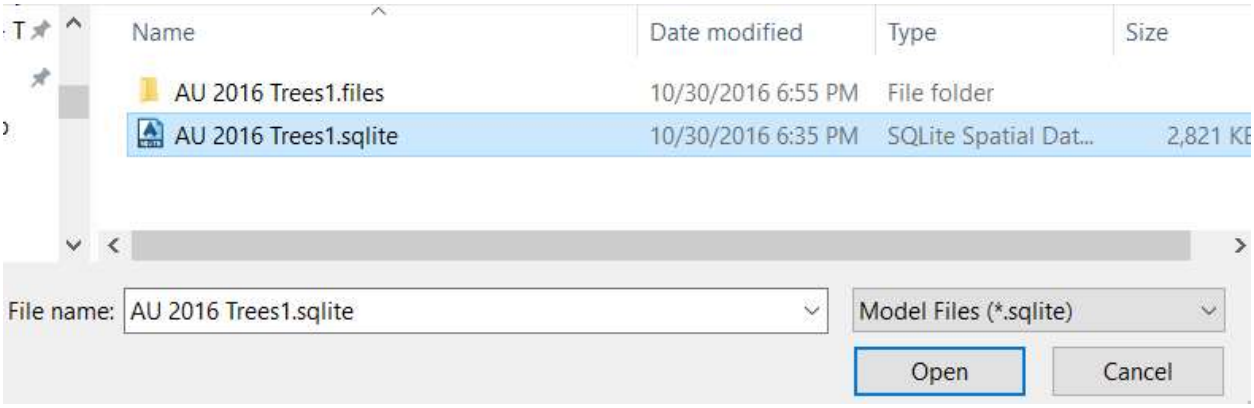


16. In the export to SDF dialog, set your coordinate system and the desired location for the sdf file then click OK.



17. Switch over to InfraWorks 360 and open a model.

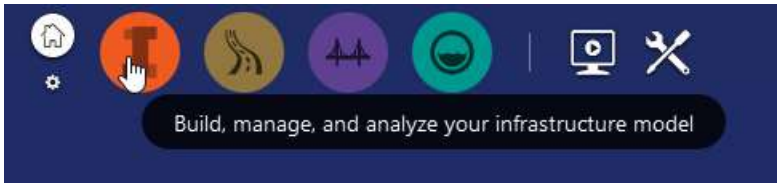
18. Select open and path to AU 2016 Tress1.sqlite provided in data set.



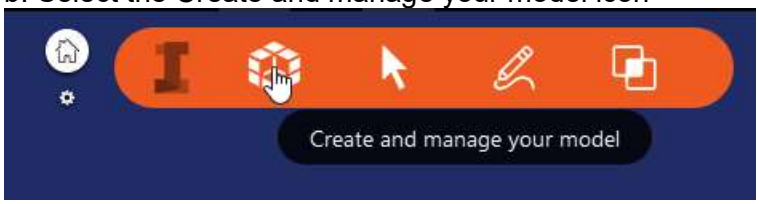
Will be using this model to add our landscape.

19. Once the model has been opened.

a. Select the “I”

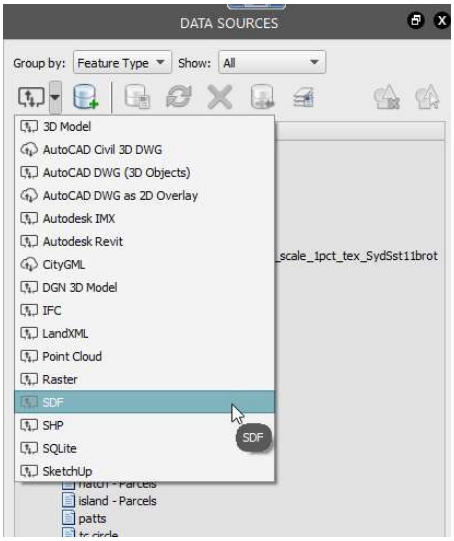


b. Select the Create and manage your model icon



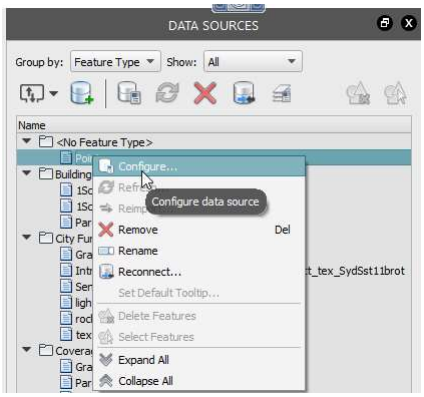
c. Next select Import and Configure data

20. In the Data Sources palette, select SDF from the data source type dropdown menu.



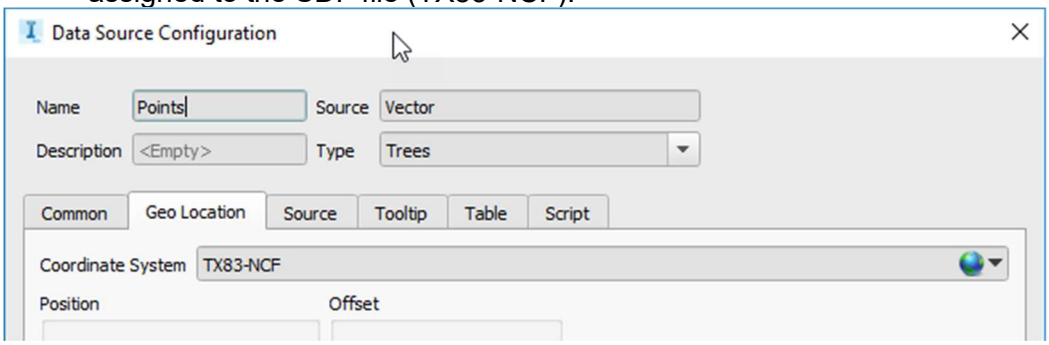
21. Browse to and select the AU 2016-xPlant.sdf file you exported earlier in this exercise then click Open.

22. In the Data Sources palette, select the file, right click, and select Configure.

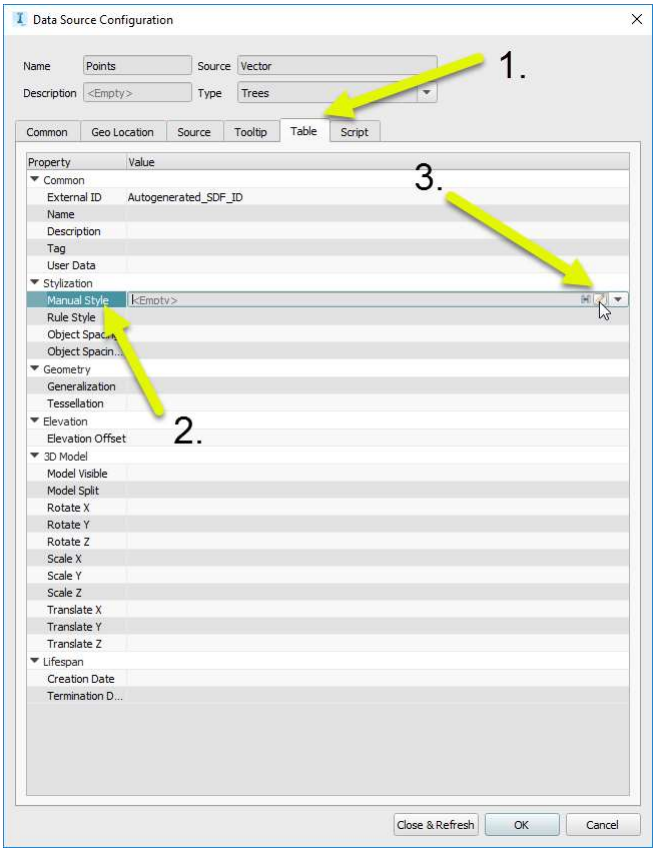


23. In the Data Source Configuration dialog:
    a. Set the Type category to Trees.

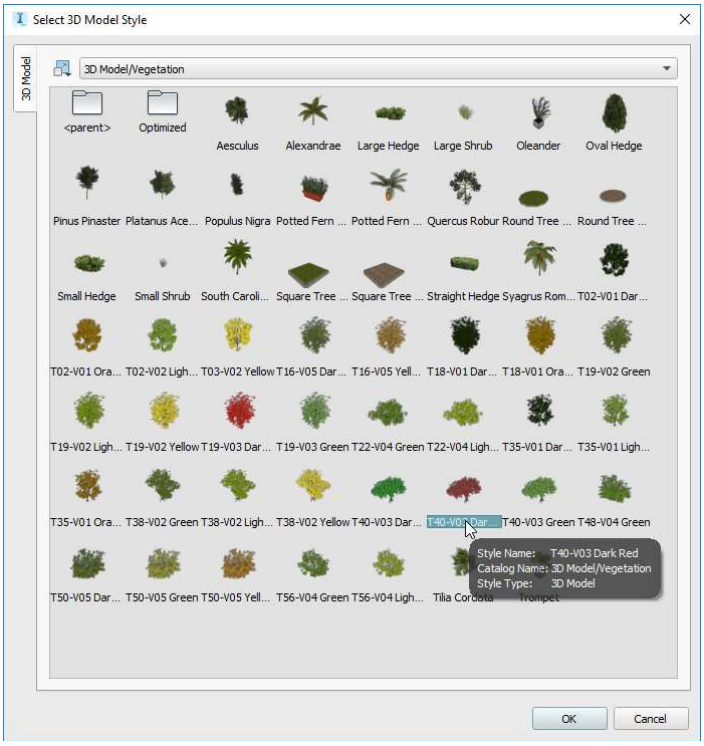
b. On the Geo Location tab and confirm that the coordinate system matches the one you assigned to the SDF file (TX83-NCF).



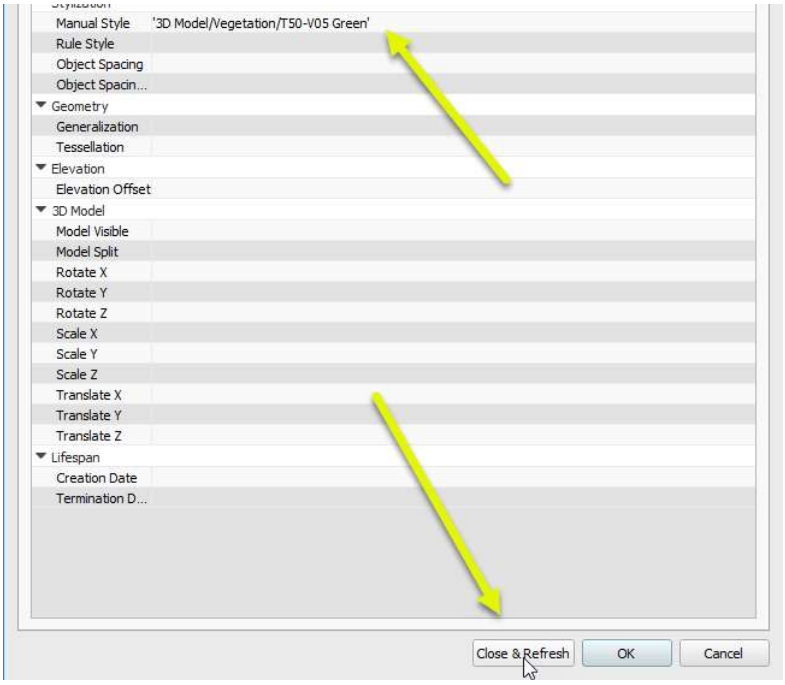
c. On the Table tab, select the Manual Style row, then select the Style Chooser icon.



d. In the Select 3D Model Style dialog, scroll through the trees, and select the type of tree you want (T40-V03Dark Red for this exercise) then select OK.



e. With the configuration changes now complete, select Close & Refresh to apply the changes.



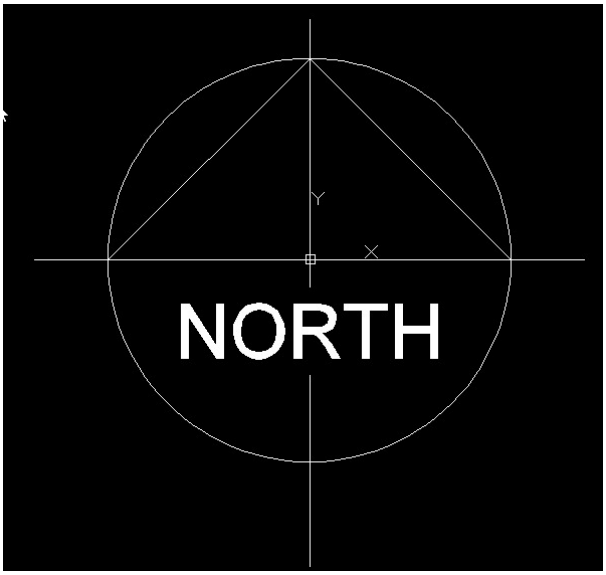
This workflow can be used to import several types of objects such as fire hydrants, light poles, vehicles, and many others.

Custom FBX Generation

Sometimes generating a custom object is going to be the only way to get your models correct. In this workflow I will show you process of creating a custom north arrow that was requested by one of our clients.

1. Open the drawing named AU_2016_NORTHARROW_PLAN.dwg provided in the dataset.

2. Select the objects then explode them. Repeat this process until only generic lines and text remain. Remove all hatches as well.



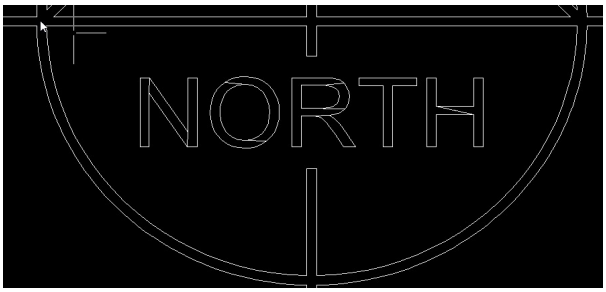
3. Offset the lines by 0.1 to each side. Next remove the original line, then extend or trim and add additional connecting segments as needed so that the segments combine to create closed polylines.

Now for the text portion of the block…

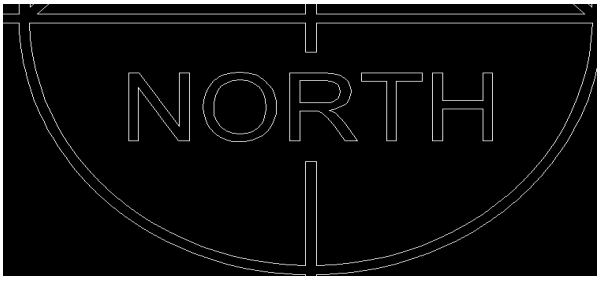
4. Select the text then at the command line type TXTEXP and press enter. This will explode the text into the geometry.

5. Extend or trim and add additional connecting segments as needed then use the JOIN or PEDIT command to combine the segments so that the segments combine to create closed polylines

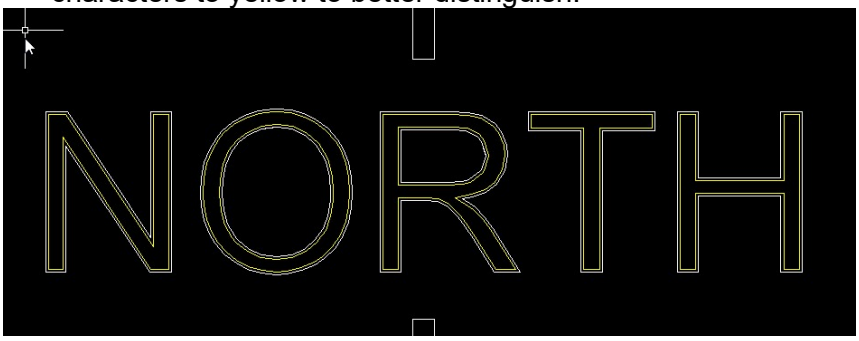
Before



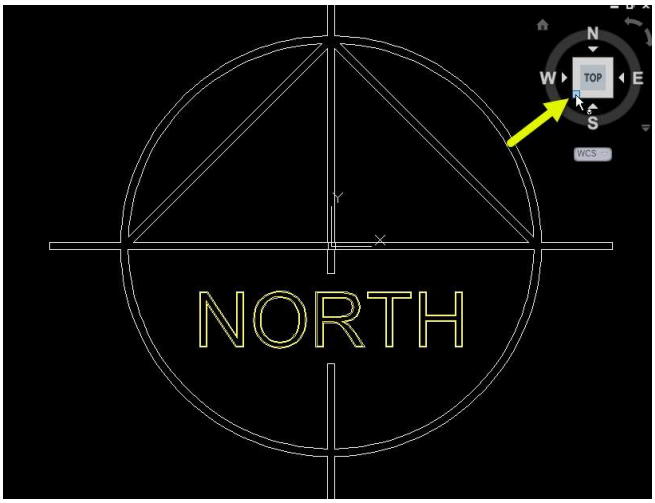
After



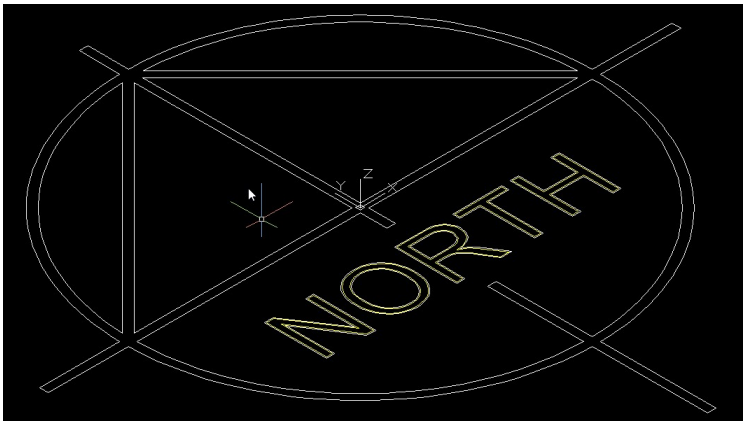
6. Offset the segments by 0.025 and again extend or trim and add additional connecting segments as needed then use the JOIN or PEDIT command to combine the segments so that the segments combine to create closed polylines. Change the color of the side characters to yellow to better distinguish.



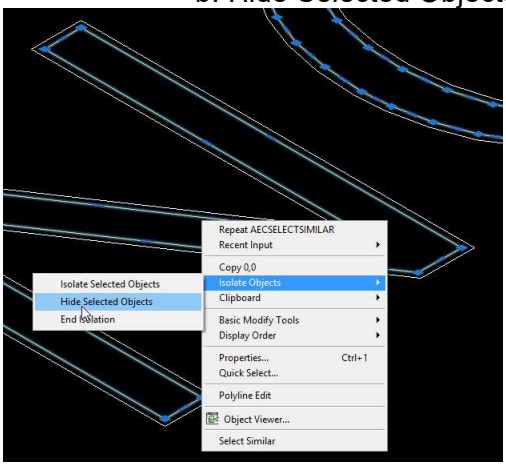
7. Use the View cube to set the view to southwest isometric.



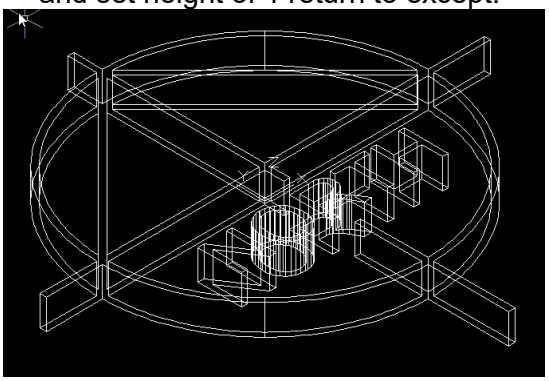
This will help us better see the extrusions that will be created.



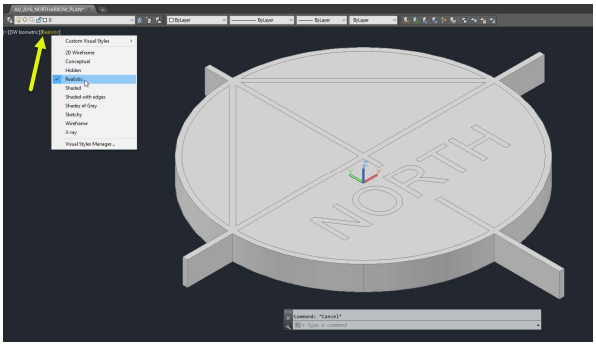
8. Select all the inside character (yellow objects) right click Select Similar from menu.
    a. Scroll to Isolate Objects
    b. Hide Selected Objects



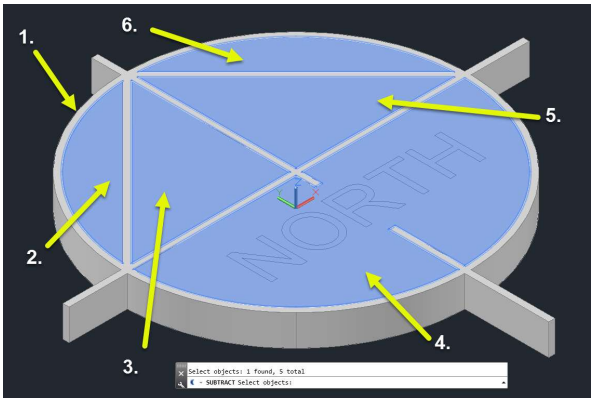
9. Select all remaining segments with a window selection. At command line type extrude and set height of 1 return to except.



10. Change the visual style to Realistic using the viewport control in the upper left corner of the viewport. This will help show the object better at this point.



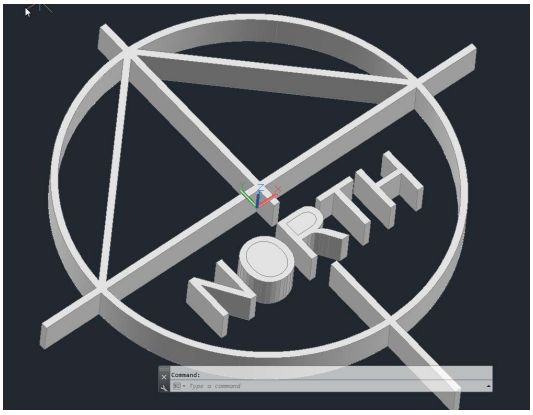
11. The next step will be to remove (subtract) some of the shapes to create openings in the solid.



a. At the command line, type SUBTRACT and press enter.

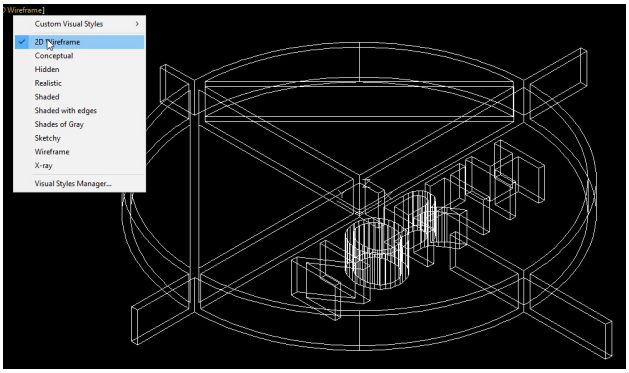
b. When prompted, select the outside ring (1) then press enter.

c. Now select the openings (2-6) in the model then press enter. The model should now look list this

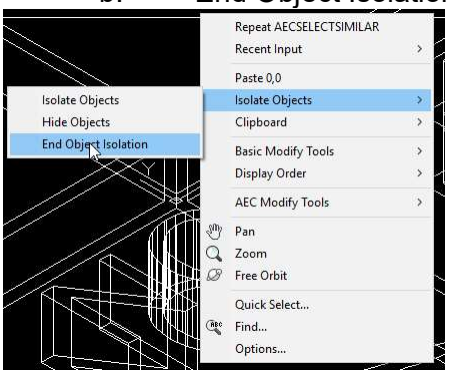


d. Repeat the process for the “O” and “R” in the model.

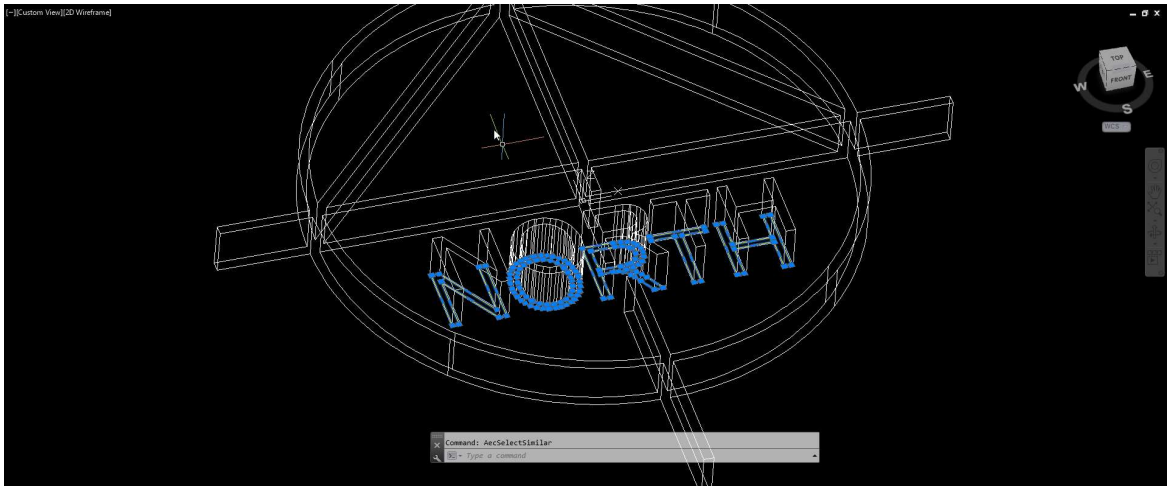
9. Using the viewport controls, set the visual style back to 2D wireframe.



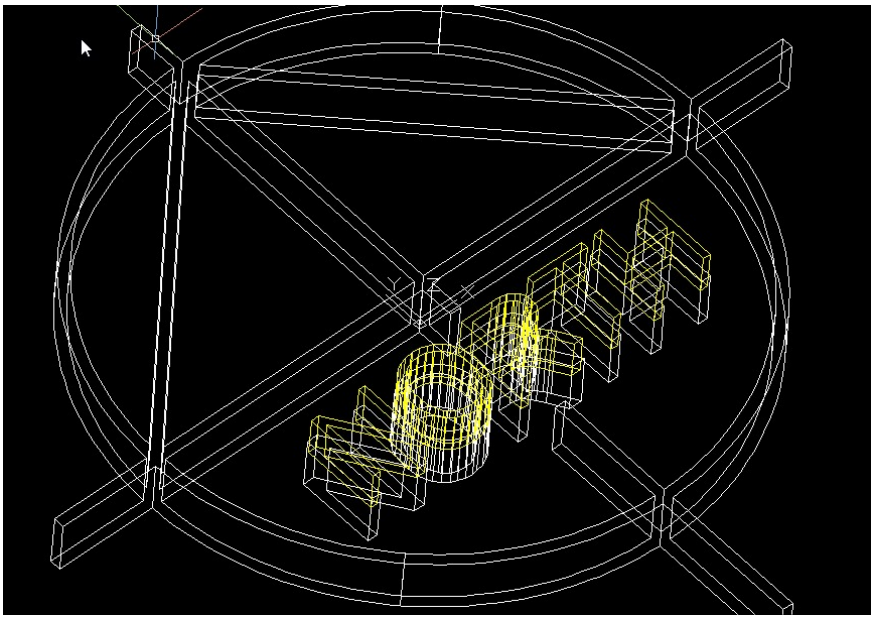
10 Next right click
a. Isolate Objects
b. End Object Isolation



Select the inside line work that makes up the word NORTH (yellow NORTH).

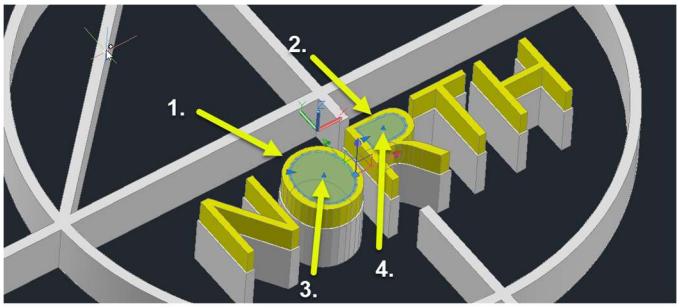


10. At command line enter Extrude
    a. Set height to 0.75 Enter to except
    b.Type move then “d” for displacement 0,0,0.75 enter to except.



11. Using the viewport controls, set the visual style back to Realistic.

12. Next use the SUBTRACT command again to clean up the “O” and the “R”.



a. At the command line type SUBTRACT and press enter.

b. Select the outside edges labeled 1 and 2 in the image then press enter.

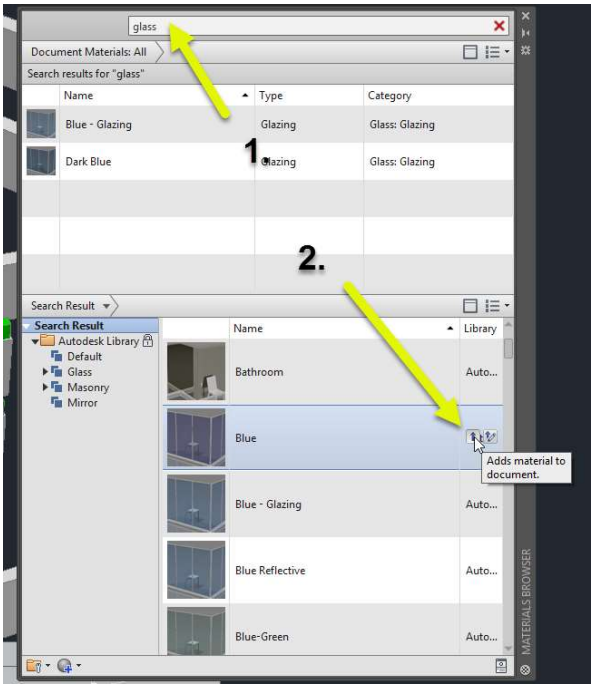
c. Select the inside objects labeled 3 and 4 then press enter.

13. The next step in this workflow is to apply materials to the model.

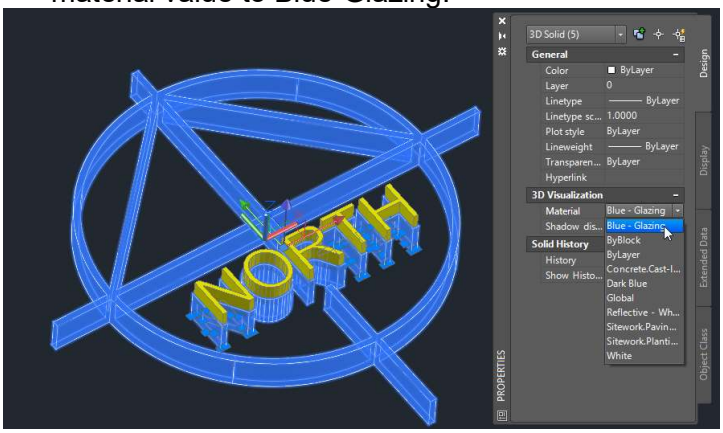
a. Type MATBROWSEROPEN and press enter.

b. In the Materials Browser palette, type GLASS in the search box.

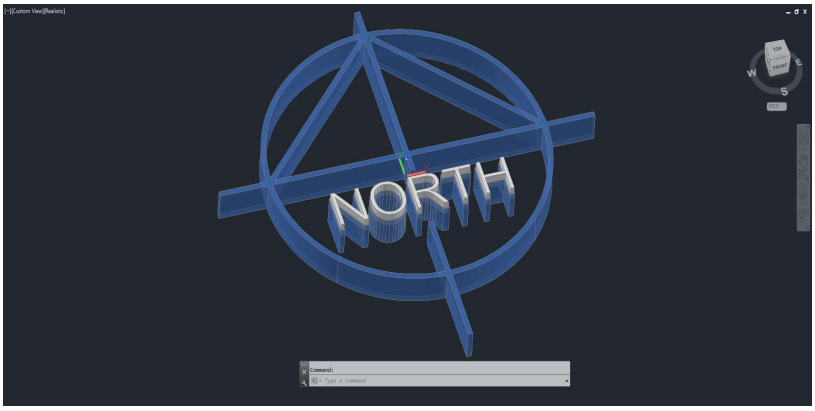
c. Locate the material named BLUE in the search results and select the Adds material to document icon.



d. Select the objects in the model except for the second extrusion of the word NORTH (previously shown as yellow in images). In the Properties palette set the material value to Blue-Glazing.



e. Select the second extrusion of the word NORTH (previously shown as green) and set to layer 0. Do not apply a material to the inside “NORTH” The difference in contrast helps identify the word NORTH in InfraWorks.

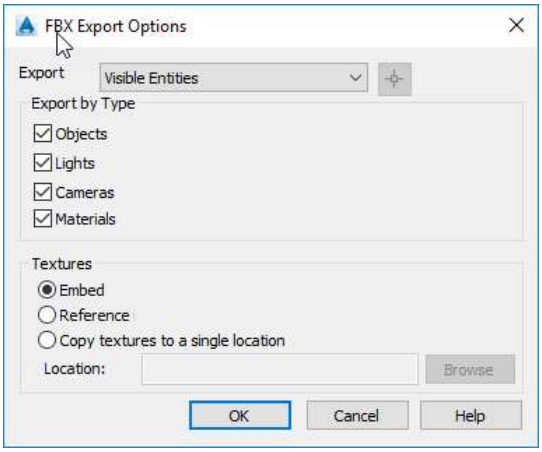


14. The final part of the process in Civil 3D is to export to FBX.

    a. At the command line, type FBXEXPORT then press enter.

    b. Browse to and select a folder to store the exported fbx file. The filename will default to the current drawing name with the FBX extension. Select OK.

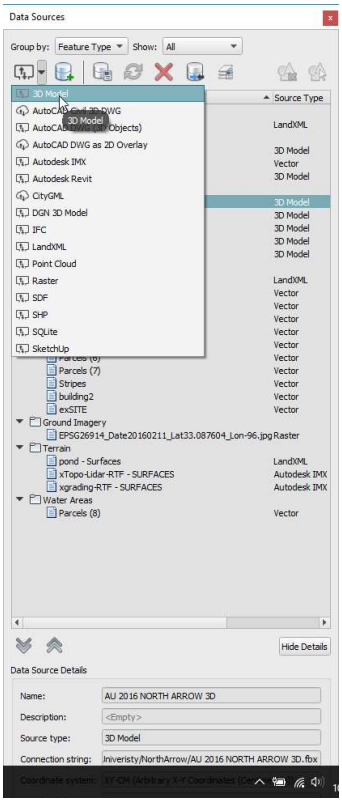
    c. In the FBX options box, match the settings shown here then select OK.



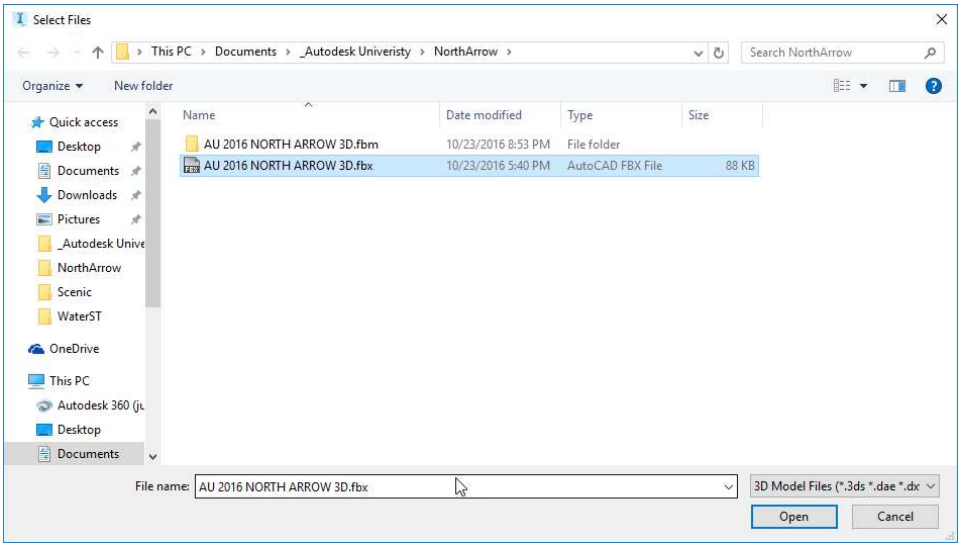
The object is now ready to import into InfraWorks 360.

15. Open any InfraWorks 360 model and select Data Sources from the InfraWorks Create and Manage menu.

16. In the Data Sources palette, select 3D Model from the data source type dropdown menu.

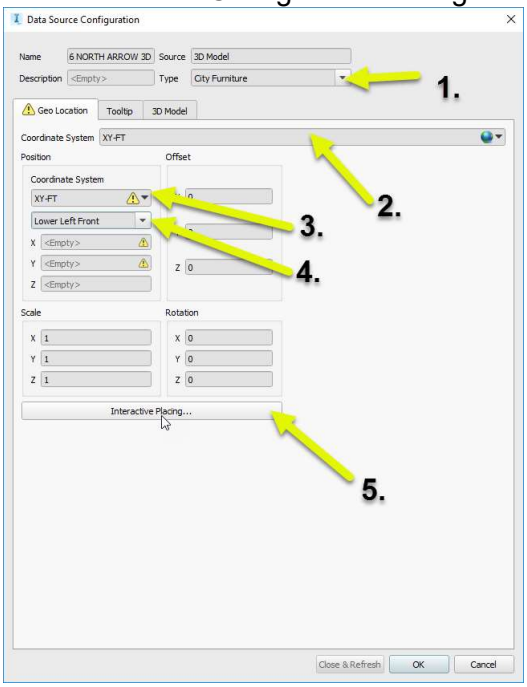


17. Browse to and select the FBX file you exported earlier in this exercise then click Open.



18. In the Data Sources palette, select the file, right click, and select Configure.

19. In the Data Source Configuration dialog:



a. Set the Type category to City Furniture.

b. On the Geo Location tab:

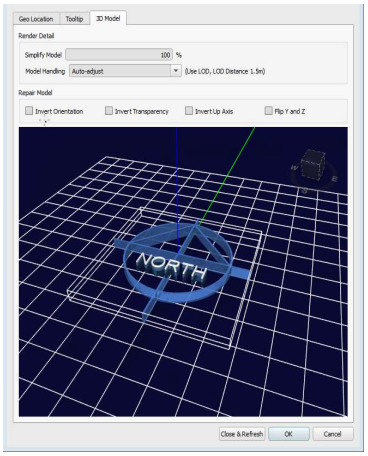
i. Set Coordinate System to XY-FT.

ii. Set Position to XY-FT.

iii. Set Origin to Lower Left Front.

iv. Select Interactive Placing and double click the position you want in the scene. You can adjust it later.

c. Select the 3D Model tab to preview the model.



d. Select Close & Refresh.

20. Position the North Arrow in your scene by moving and rotating the model as required to match plan north.