

HOW TO TURN

REAL-WORLD BUILDINGS INTO 3D MODELS

FOR IMPORT
INTO

AVONTUS DESIGNER[®]

NO LIDAR SCANNER NEEDED

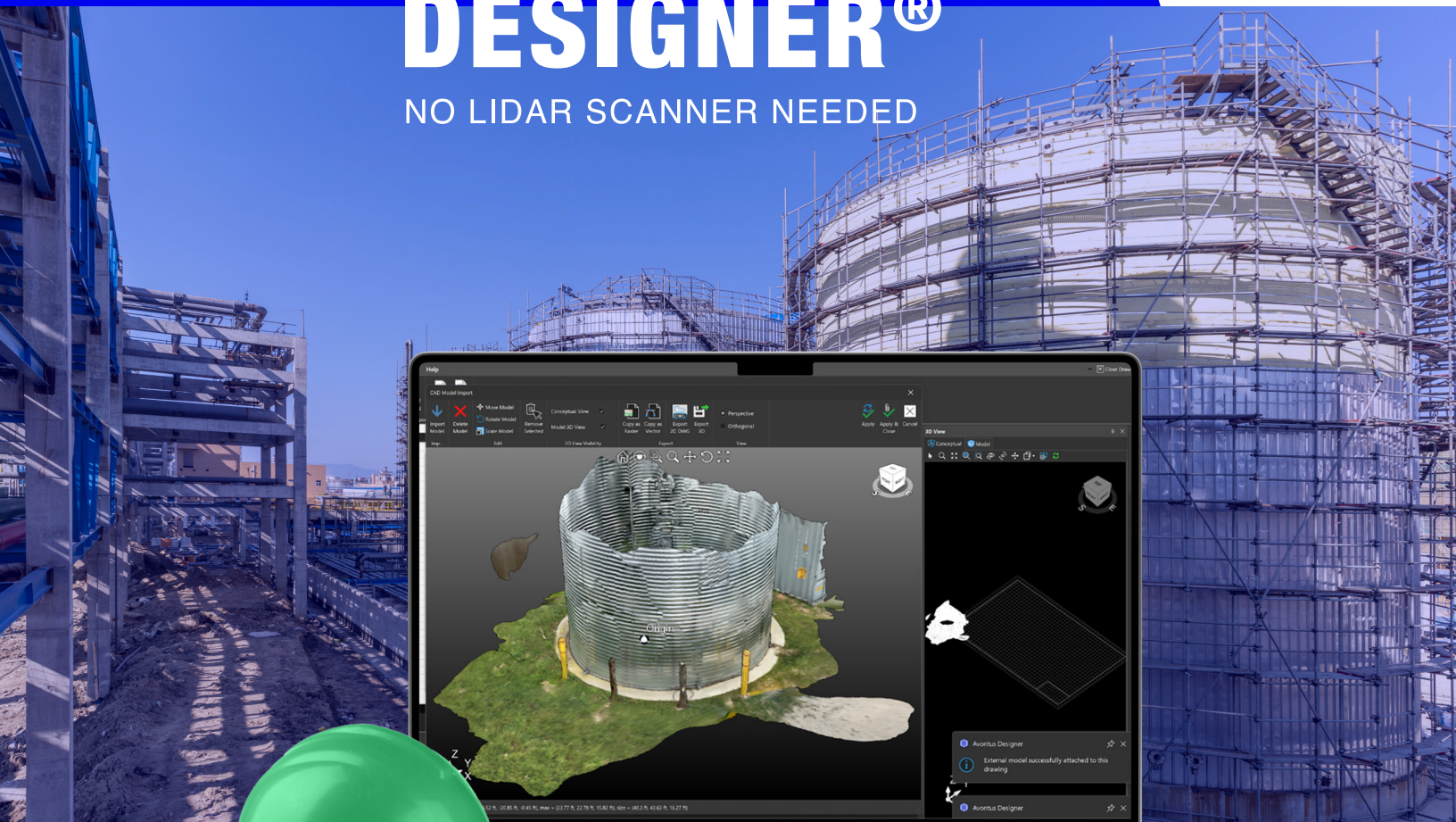


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INTRODUCTION

Finally, you can skip manual measuring and drawing in the field – and you don't need an expensive laser or LiDAR scanner. These instructions explain how to use your iPhone, iPad, Android phone or tablet, or drone to scan a structure, edit the scan, and import the scan into [Avontus Designer®](#) where you can quickly create a scaffolding drawing.

By generating a scan of your structure, you will create a “digital twin” of the building. A digital twin is a digital replica of the actual building. This digital counterpart mirrors the building's physical details, as you will see in the images in this guide.

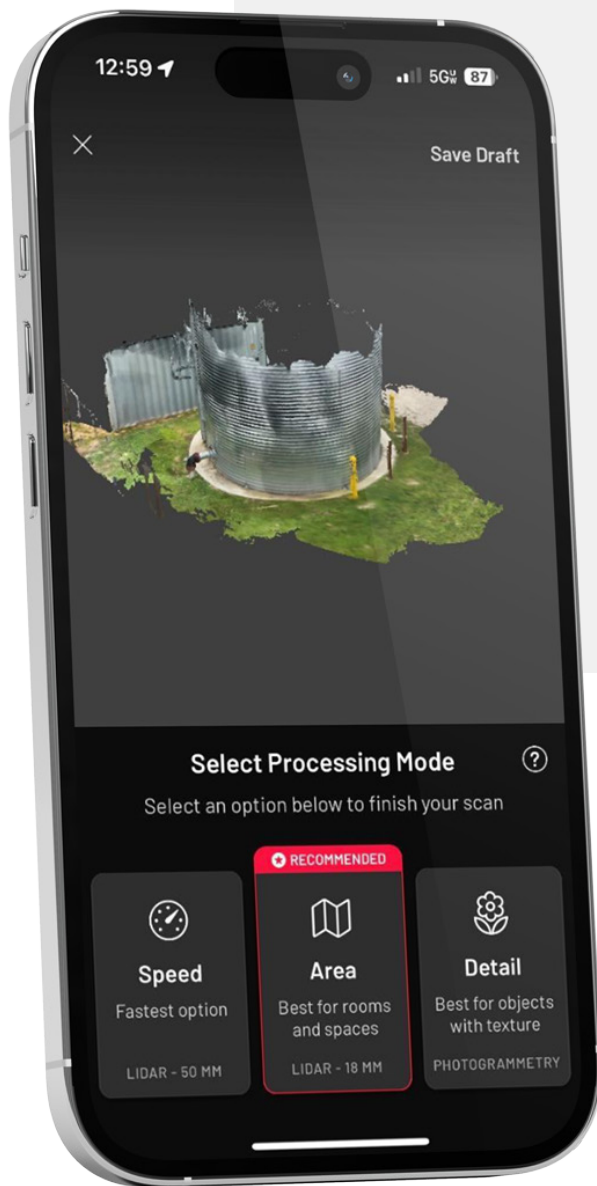
This document describes how to:

- **Create a 3D building model with an iPhone, iPad, or Android Device**
- **Create a 3D building model with a drone**
- **Use MeshLab to reduce your file size**
- **Import your model into Avontus Designer**
- **Use the free app Avontus Viewer to share and view your scaffold designs in virtual and augmented reality**

A note about document links:

If you are viewing this document in Adobe Reader and cannot access a link, please see [Allow or block website links in PDFs](#).

HOW TO CREATE A 3D BUILDING MODEL WITH AN IPHONE, IPAD, OR ANDROID DEVICE



REQUIREMENTS

- ✓ A cell phone or tablet that can create 3D models via photogrammetry or 3D scanning. (See more details under Scaniverse.)
An iPhone was used for these instructions.
- ✓ A scanning application, such as [Scaniverse](#)
- ✓ If your file size is large, an editing program, such as the free triangular mesh editor [Meshlab](#)

SCANIVERSE

Scaniverse 3D Scanner is a scanning application that works with newer iPhones, iPads, and Android devices. Download it from Apple's App Store or Google Play and watch a 3-minute video to learn how to use the app: scaniverse.com/support. See the same page for the type of devices that work with the app.

To the right is a structure for which you will learn how to:

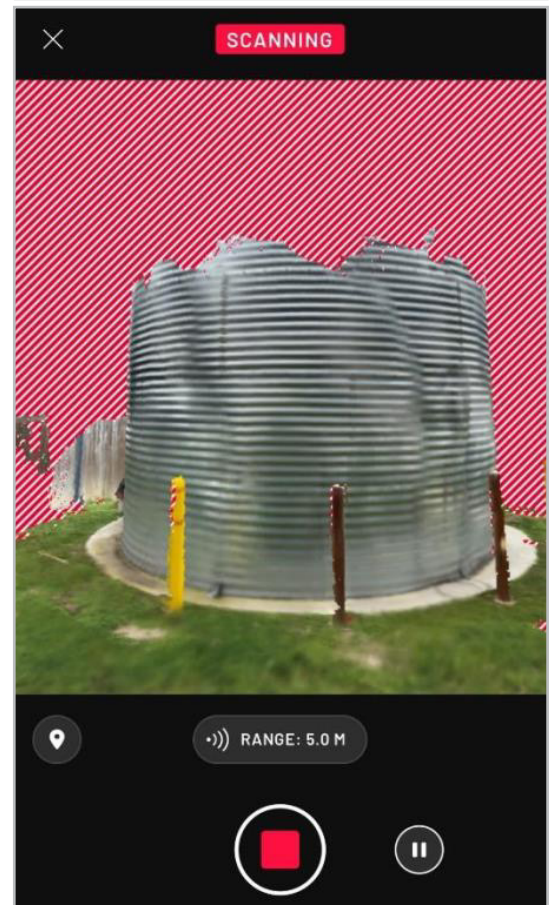
- ✓ Create a model
- ✓ Remove unnecessary elements to reduce the file size
- ✓ Import the 3D model into Avontus Designer

STEPS

- 1 After downloading Scaniverse on a compatible iOS or Android device, tap **New Scan**. (View the brief “How to Scan” instructions at the bottom of the next screen.)
- 2 Under **Select Scan Type**, select **Mesh**.
- 3 On the following screen, choose **Large Object/Area** for the scan size.
- 4 Set the range (optional), press the record button, and move around the structure, keeping it in the camera’s view.

During scanning, areas not yet captured will appear in red and white stripes while showing the parts that have been added to the draft model. Continue to move around and scan in all details that you would like captured. Make sure to look out for obstructed areas. Get in and behind any parts that you need to be captured.

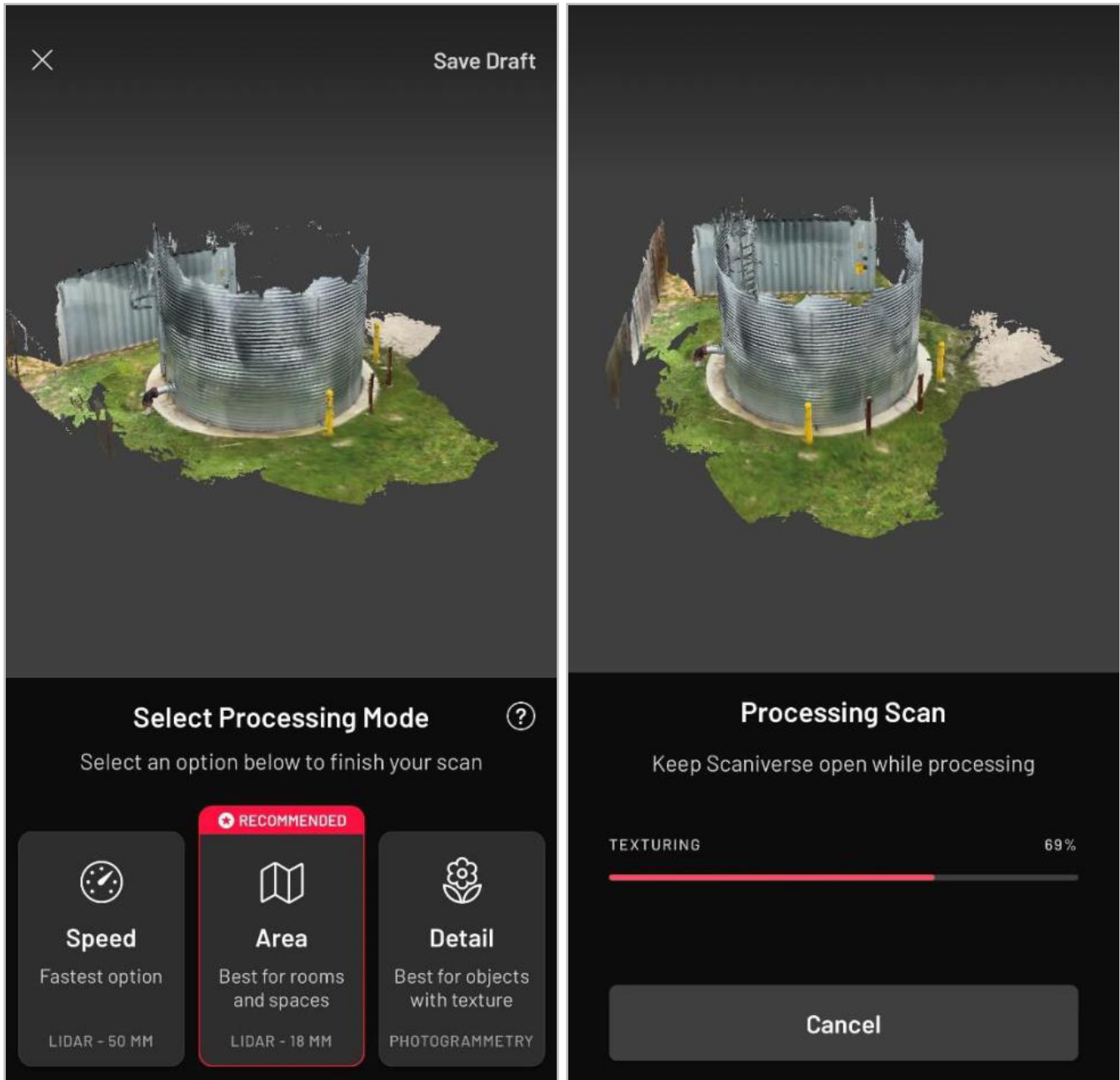
When creating a scan, you can only generate an image of what your device can view. This is a great system for bringing in ground and base conditions where you will erect your scaffolding. To scan higher elements, your device will need to be higher; you may need to [use a drone](#) instead.



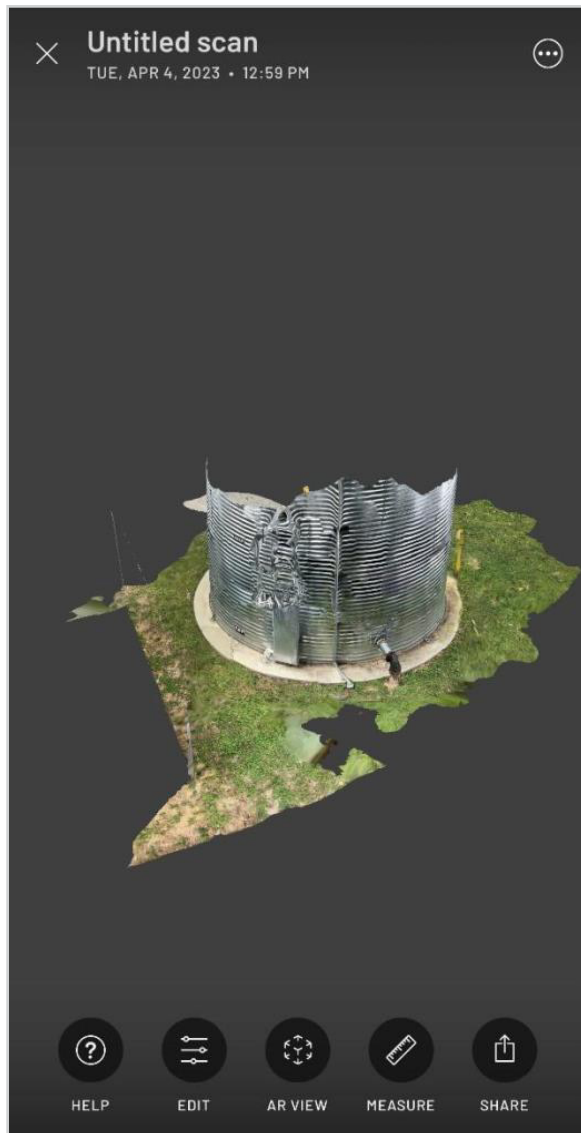
TIPS

- To minimize file size, scan only details that are relevant to where you need scaffolding.
- Make a few reference measurements to verify the model’s scale in Avontus Designer. While onsite, you could manually measure between the bollards, for example, or from the fence line to the tank.

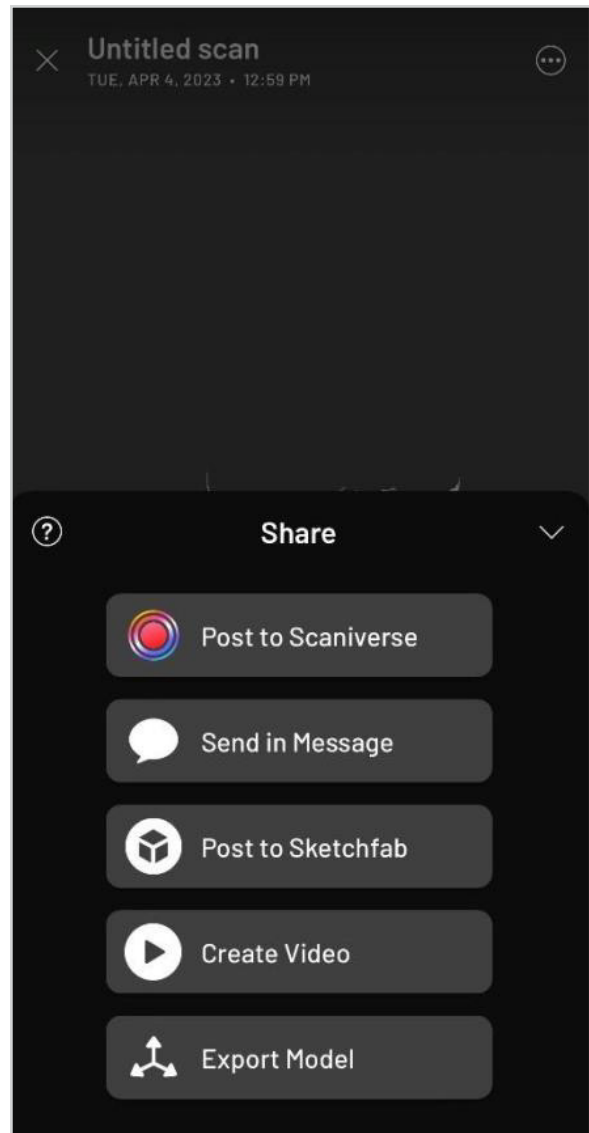
- 5 When you have finished scanning, press the stop button, then select a processing mode to finish. It is generally recommended to select the **Area** processing mode, as this will process more quickly and lead to a smaller overall file size but, if more detail is required for the model, you can select **Detail** mode.



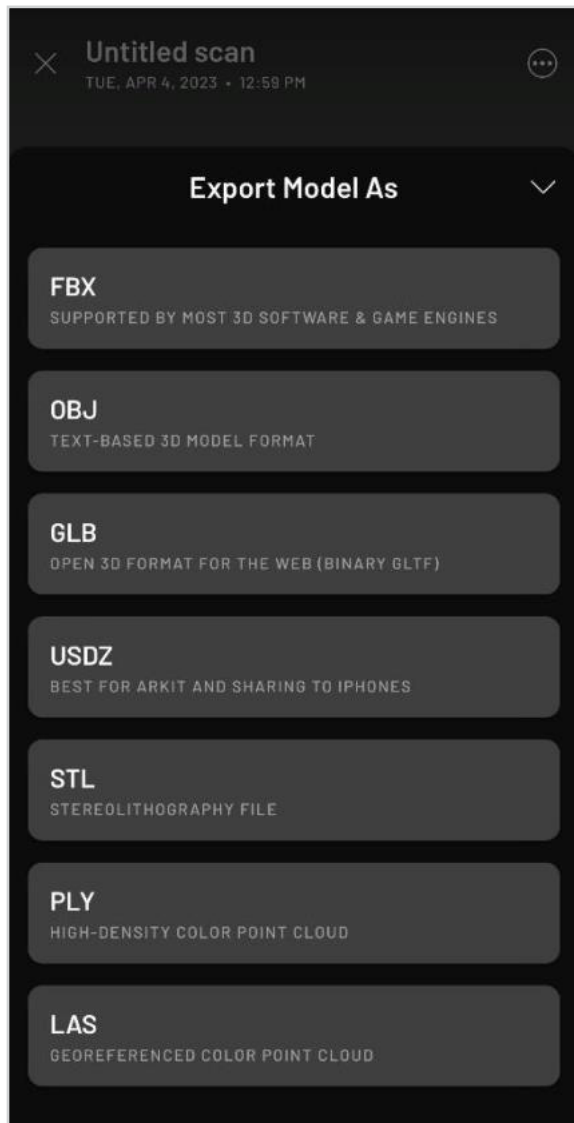
Once the scan is processed, you can preview the model on your device to make sure that you have captured all the details that you need. You can rotate the object with one finger and zoom in or out with two fingers on the screen.



- 6 After you've verified that you have captured everything that you need, select **Share**, then **Export Model**.



- 7 Under **Export Model As** select **OBJ**.



We recommend .OBJ files (and their associated .MTL files for the textures on the model). To optimize workflow, keep file sizes below a total of 20 MB.

- 8 Move the file from your device to your computer. A few options are to:



attach it to an email, if file size permits



upload to a cloud storage provider and download to your computer



transfer to a USB drive or other storage media



connect the device via cable to your computer

If the file size is less than 20 MB, go to the [Avontus Designer 3D Model Import](#) section.

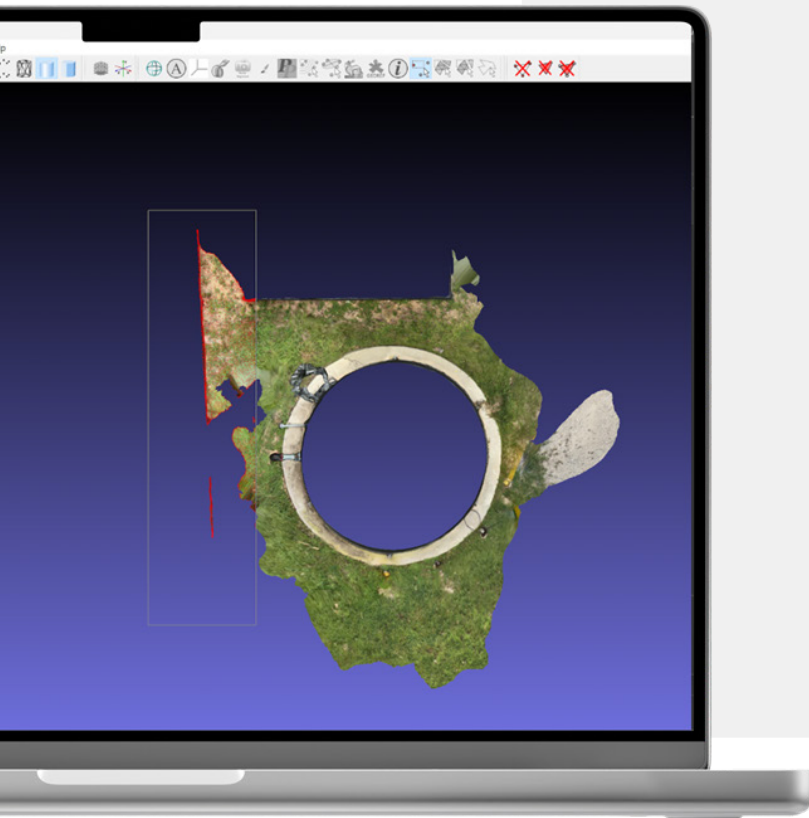
If the file is larger than 20 MB, go to the [MeshLab](#) section.

HOW TO CREATE A 3D BUILDING MODEL WITH A DRONE



REQUIREMENTS

- ✓ A drone with a good camera, stabilization, and battery life, and the ability to take photos and video as well as articulate and refocus the camera. A DJI mini 3 drone was used for these instructions.
- ✓ Drone license and training as required by local laws
- ✓ Approval to operate the drone in the required location
- ✓ No obstructions where the drone will operate (e.g., trees, wires)
- ✓ Area to take off and land safely
- ✓ Daylight and good weather (no rain or high winds)
- ✓ Free or paid [PolyCam](#) account
- ✓ Free [ImageToSTL.com](#) software, if using a free PolyCam account
- ✓ Free [MeshLab](#) software



Before beginning, be aware of PolyCam's limitations:

Free PolyCam account:

1. **Photos:** Minimum 20 images, maximum 150 images (PNG, JPG)
2. **Video:** Minimum 0:15 minutes, maximum 3 minutes, 16 GB (MP4, MOV, AVI, M4V)

Paid PolyCam account:

1. **Photos:** Maximum 1000 - 2000 images depending on processing mode
2. **Video:** 15-30 minutes depending on processing mode

STEPS

- 1 Fly the drone around the structure at multiple heights and angles while either recording video or taking photos. Ensure that all needed areas are recorded.
- 2 Transfer the video or photos from your drone to your computer.
- 3 Upload data to the [PolyCam](#) website.
View a quick overview here: <https://www.youtube.com/shorts/HxQs3k4KUIE>
- 4 Export the processed model from PolyCam.
 - a. **Paid account:**
Export the file as .OBJ or .STL
 - b. **Free account:**
Export the file as .GLTF, which is the only file type available with a free account. As this file type cannot be directly imported into Avontus Designer, you will need to open the .GLTF file in a program such as [ImageToSTL.com](#), and then re-export the file in a Designer-supported format such as .OBJ or .STL.
- 5 If the file size is less than 20 MB, jump to the [Avontus Designer 3D Model Import](#) section. If the file size is larger, see the [MeshLab](#) section to reduce the file size.

MESHLAB

MeshLab is an open-source tool for editing 3D meshes on your computer. You can use this application to reduce the file size.

Download MeshLab

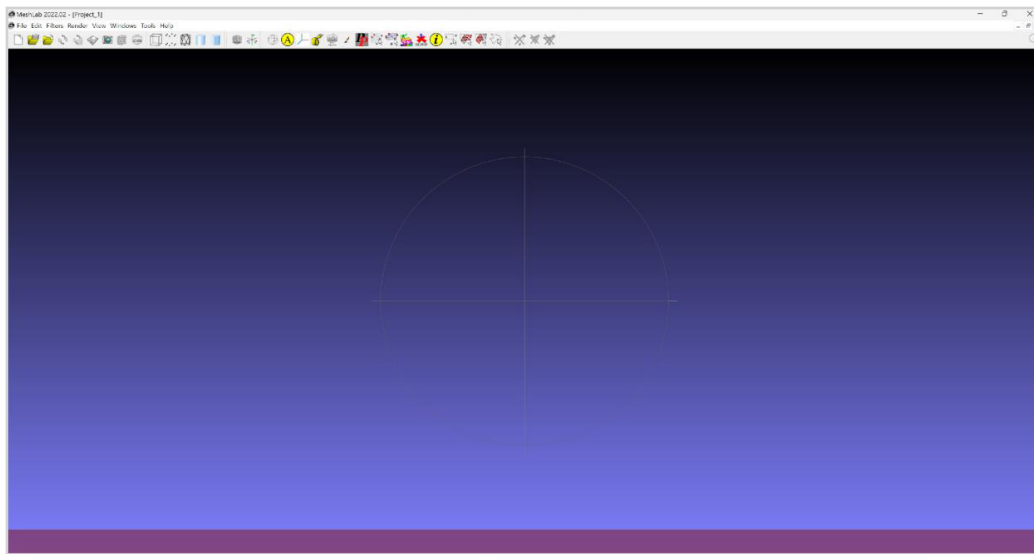
<https://www.meshlab.net/#download>

Basic MeshLab tutorials

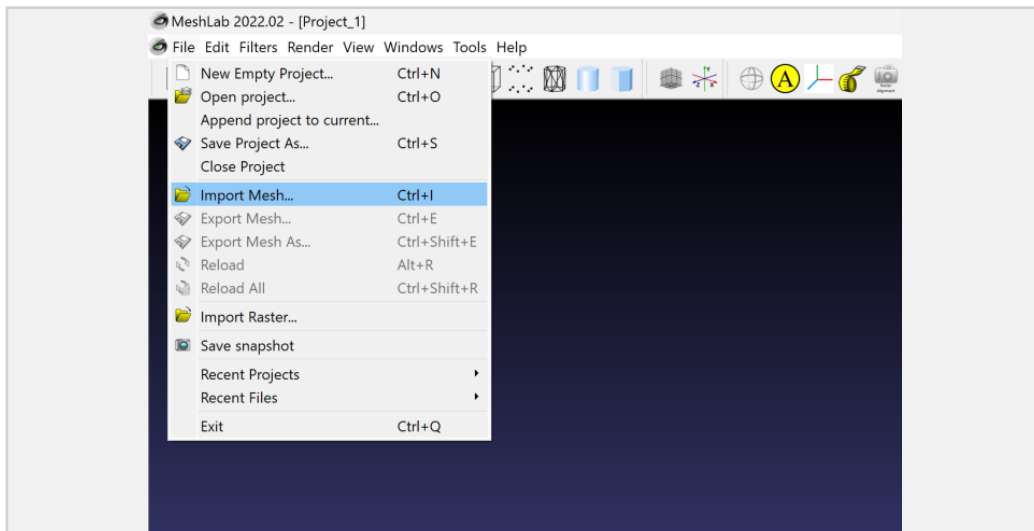
<https://www.meshlab.net/#support>

STEPS

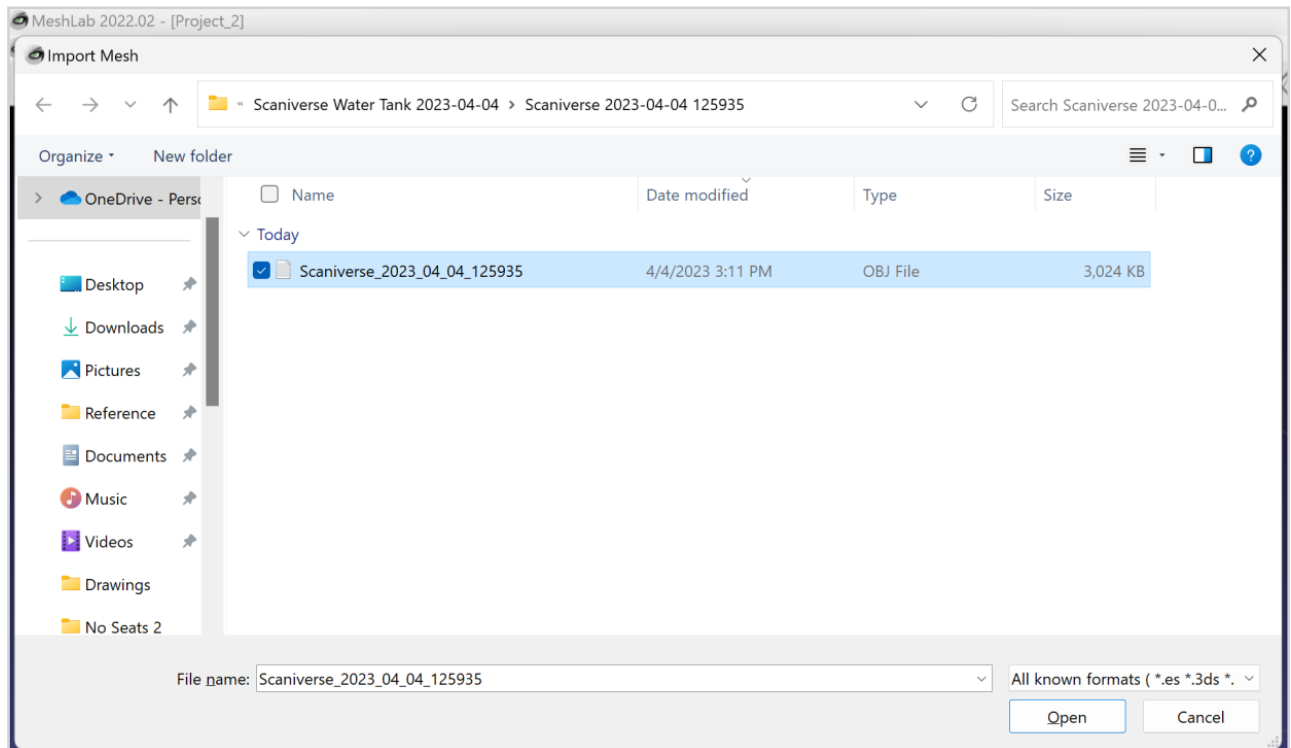
- 1 Open **MeshLab** and you will see this screen.



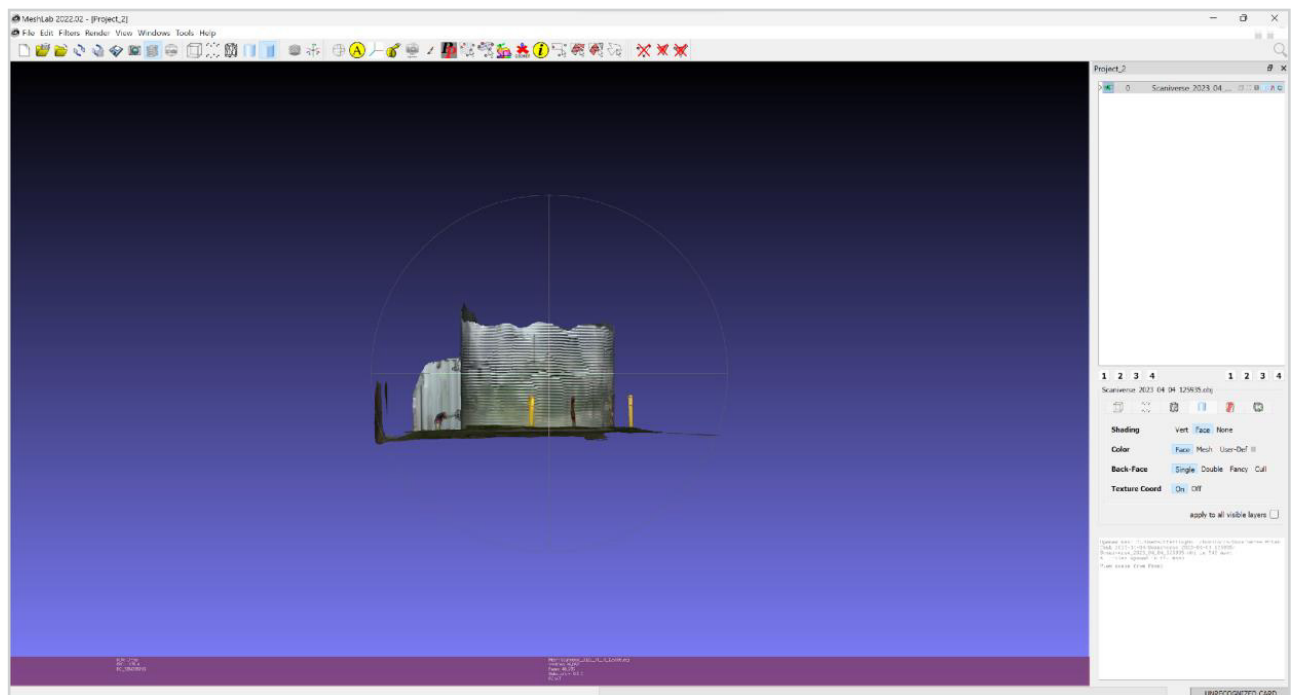
- 2 From the **File** menu, select **Import Mesh...**



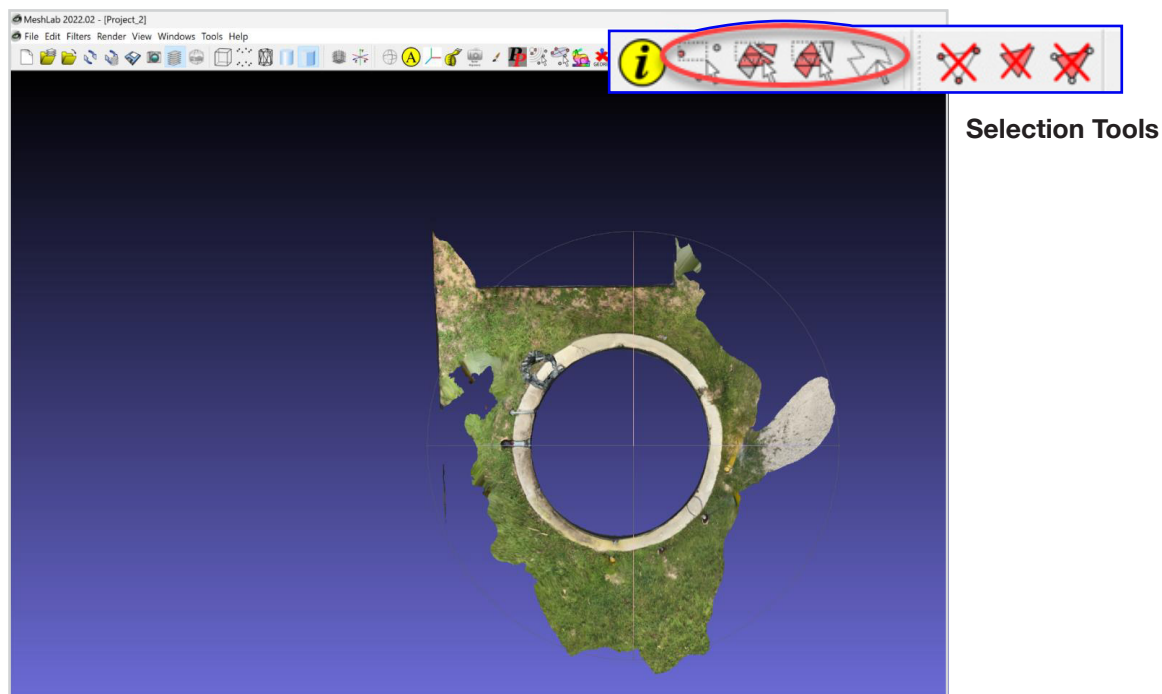
- 3 Navigate to your saved .OBJ file and select **Open**.



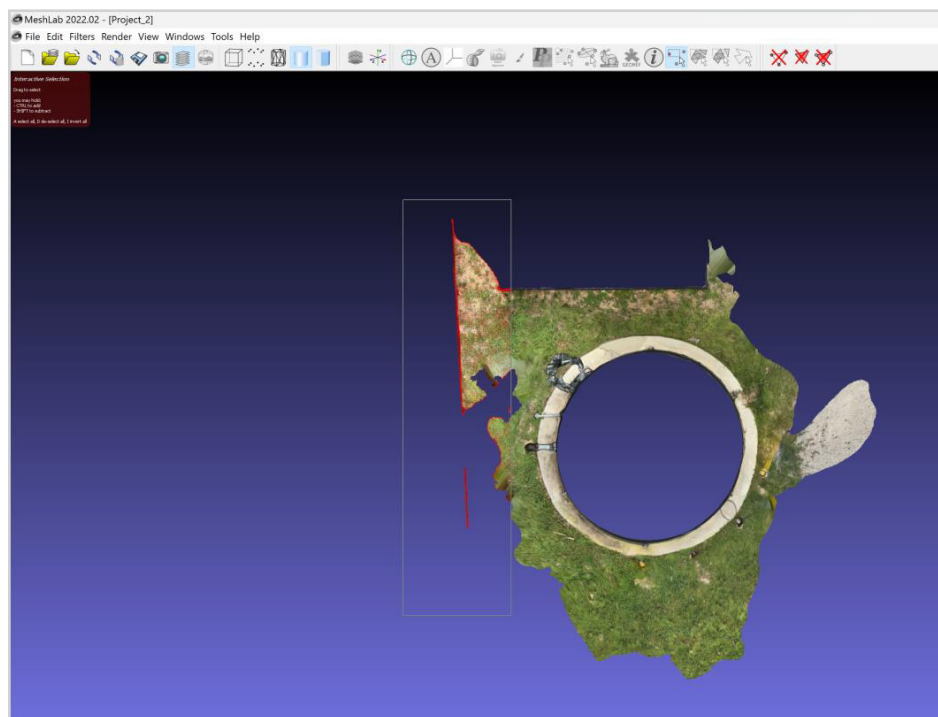
- 4 Interact with the scanned structure via the mouse and keyboard controls. You can left-mouse click and drag along each axis to rotate the model and CTRL + left-mouse click and drag to pan the model. Under **Help**, select **On screen quick help** to see the navigation options.



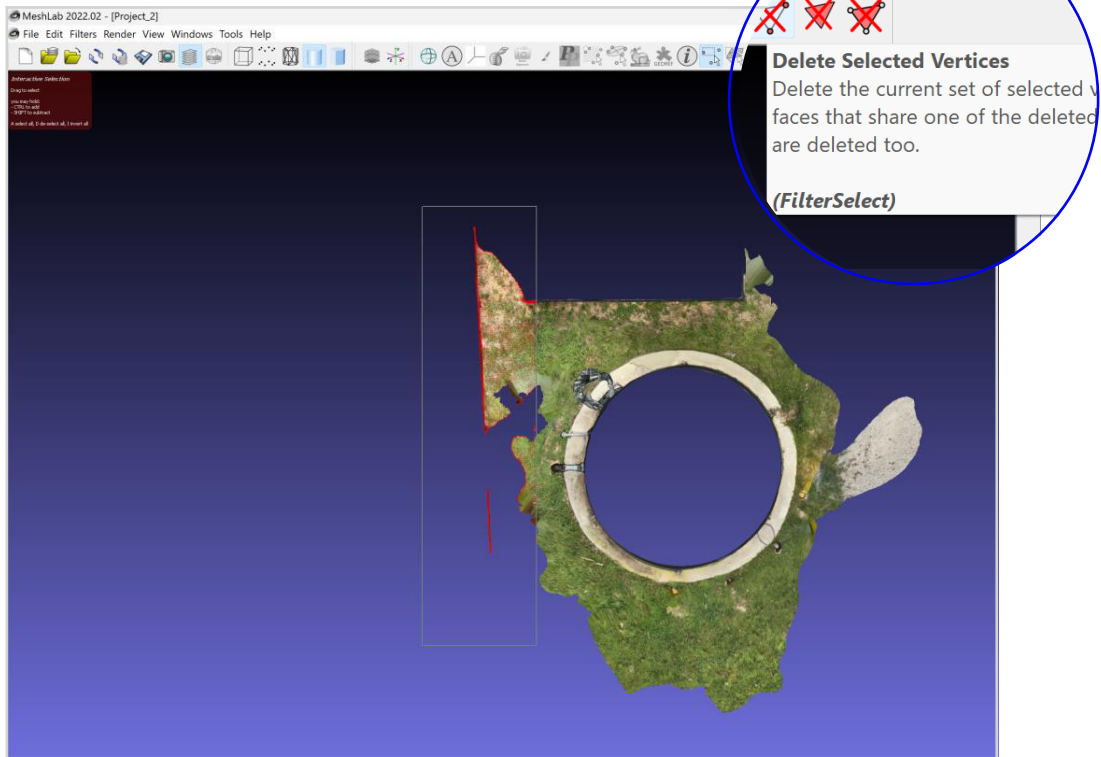
- 5 Generally, it is best practice to move to the plan view and cut out unnecessary details to reduce the file size and clean up the model. You can achieve this by choosing one of the selection tools at the top and one of the removal tools next to them after selecting the areas you wish to remove.



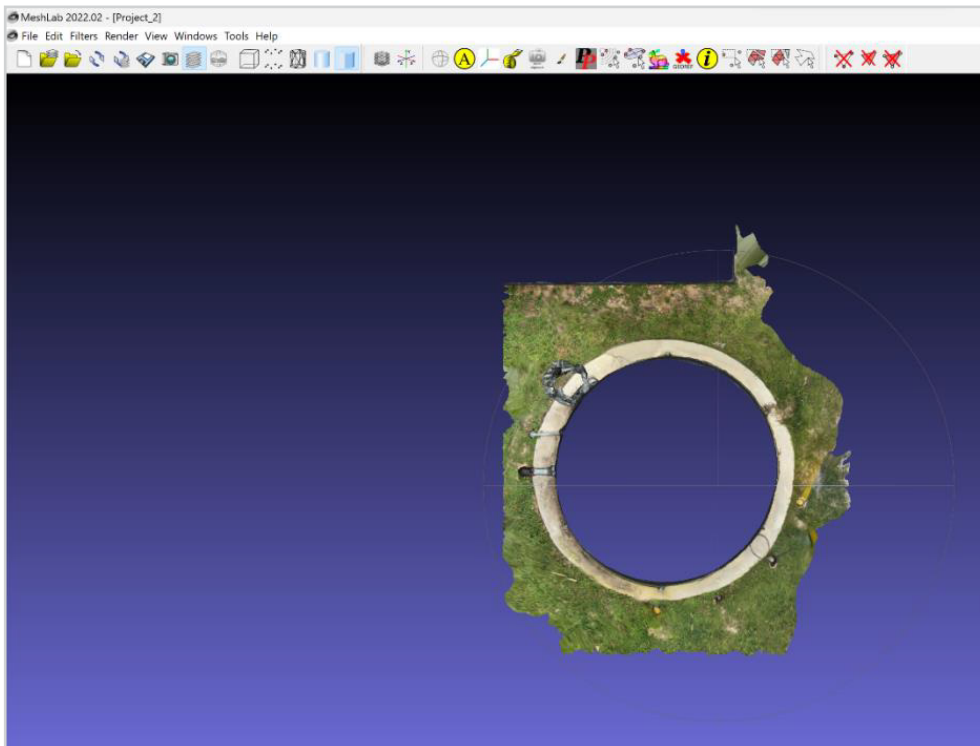
The area in the rectangle has been selected.



Face and Vertices Removal Tools:

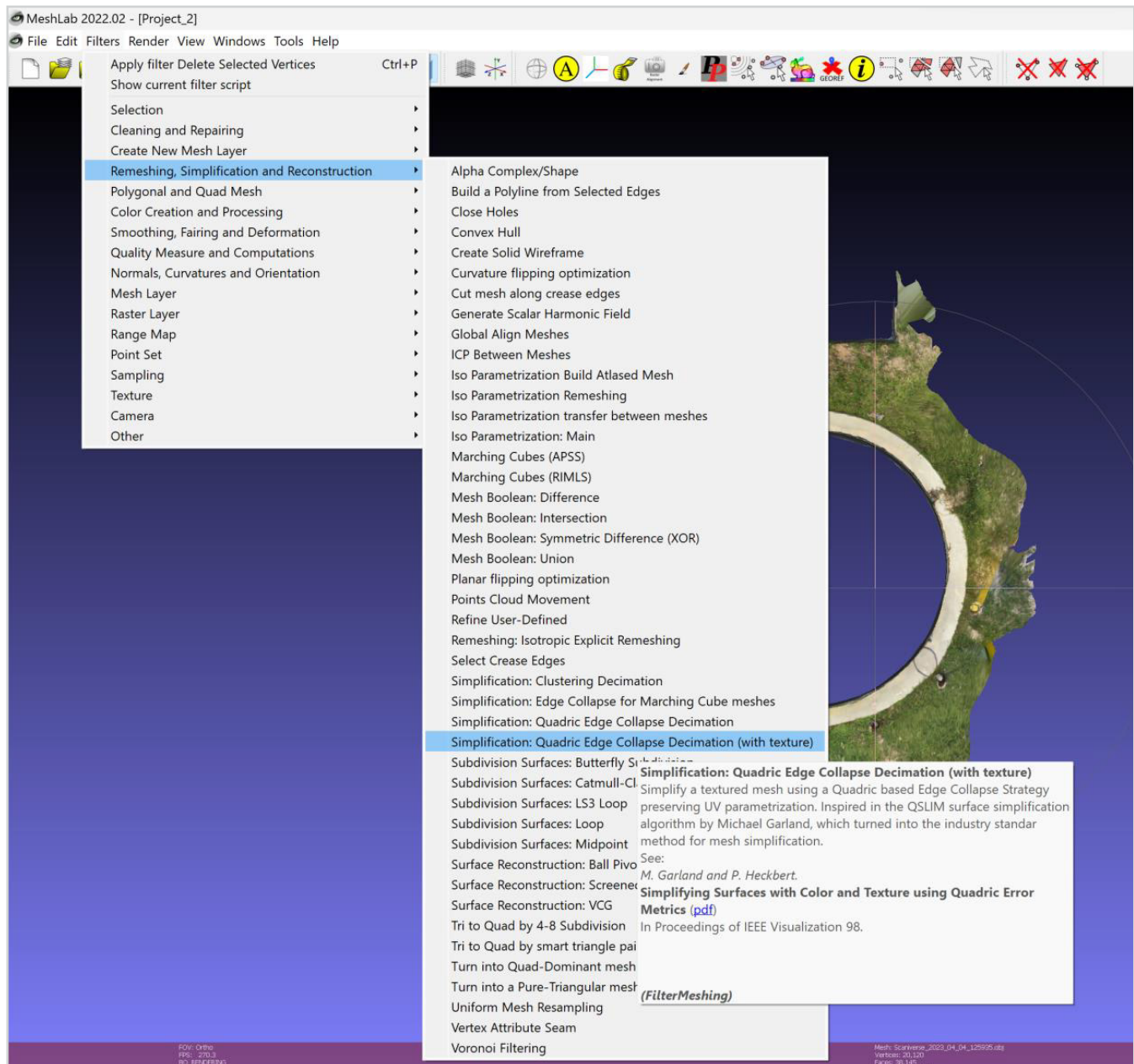


The cleaned-up image:

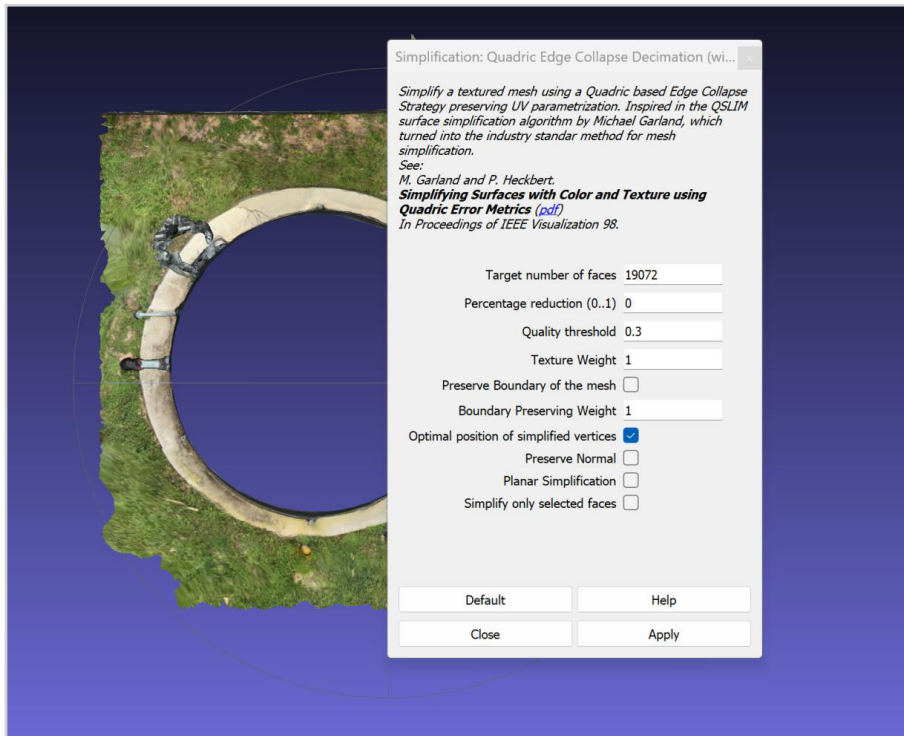


Once you have removed unneeded elements from the model, you can reduce the complexity of the model by decreasing the number of faces and vertices that compose the model.

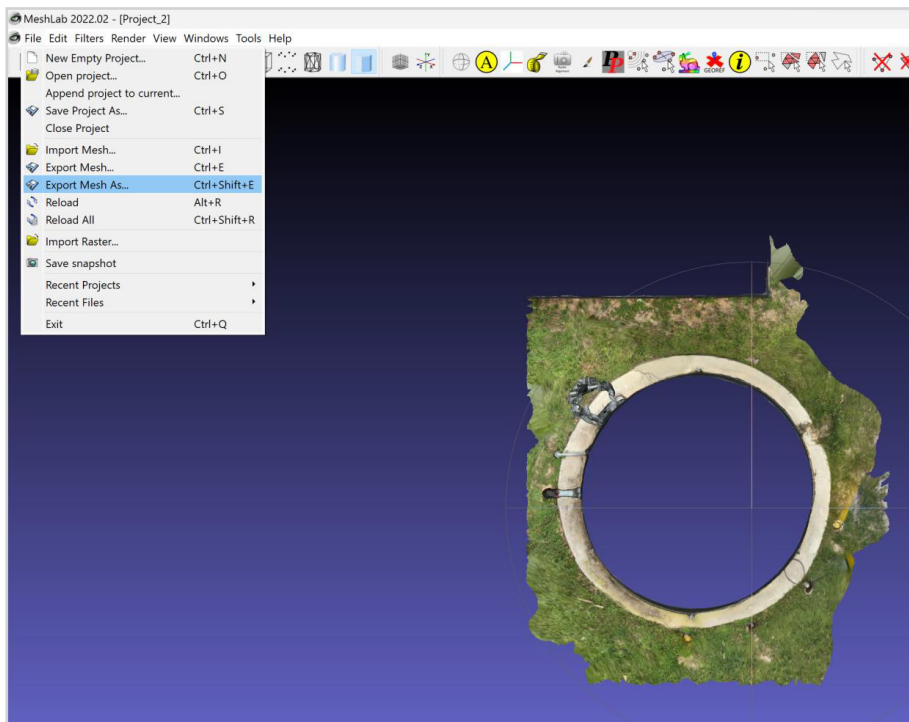
To do this, first select **Filters** from the menu bar, then **Remeshing, Simplification and Reconstruction**, and then **Simplification: Quadric Edge Collapse Decimation (with texture)**.



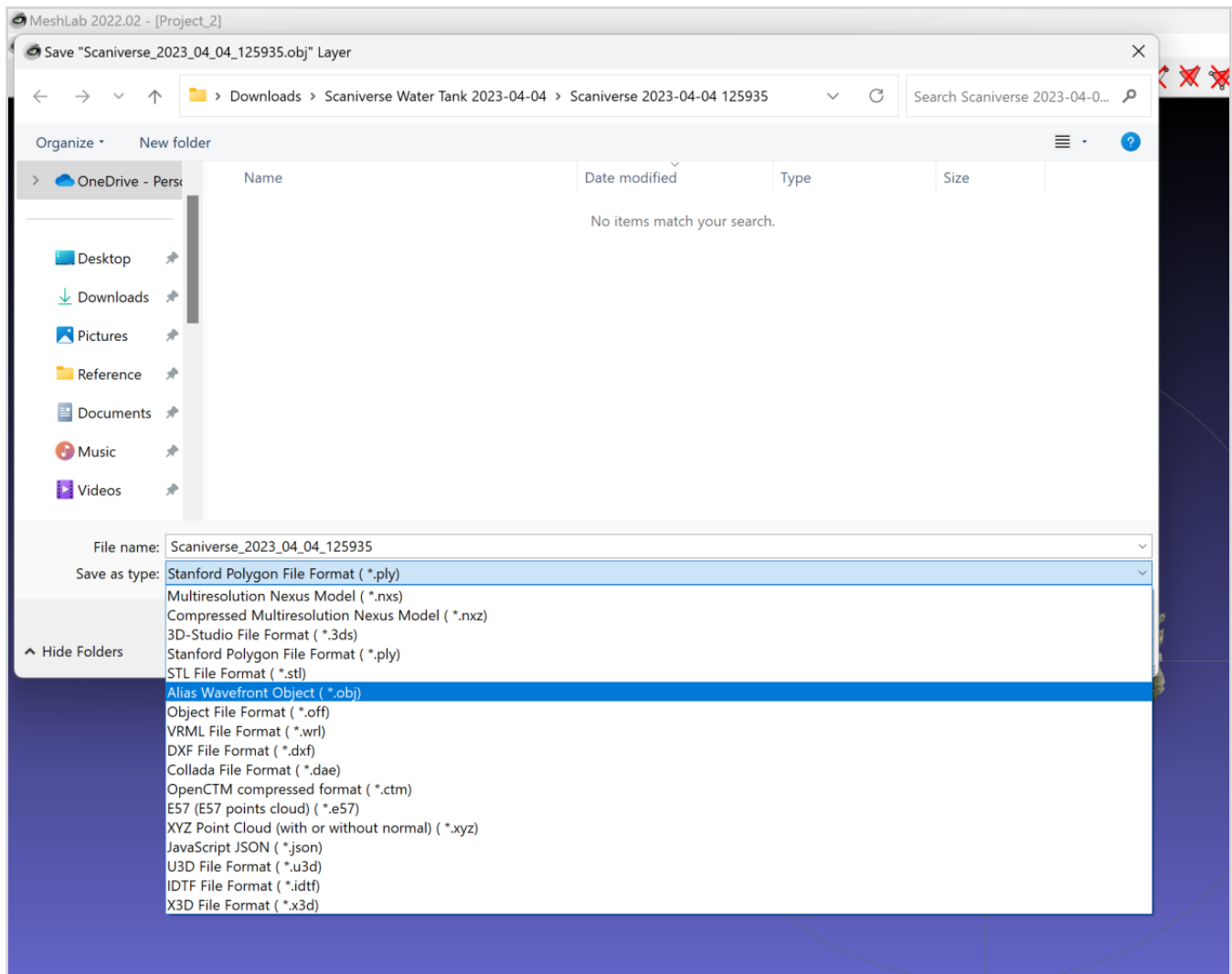
In this window, target 50,000 faces or fewer. Experiment with these values to retain the required detail in the model but ensure the final model output is less than 20 MB.



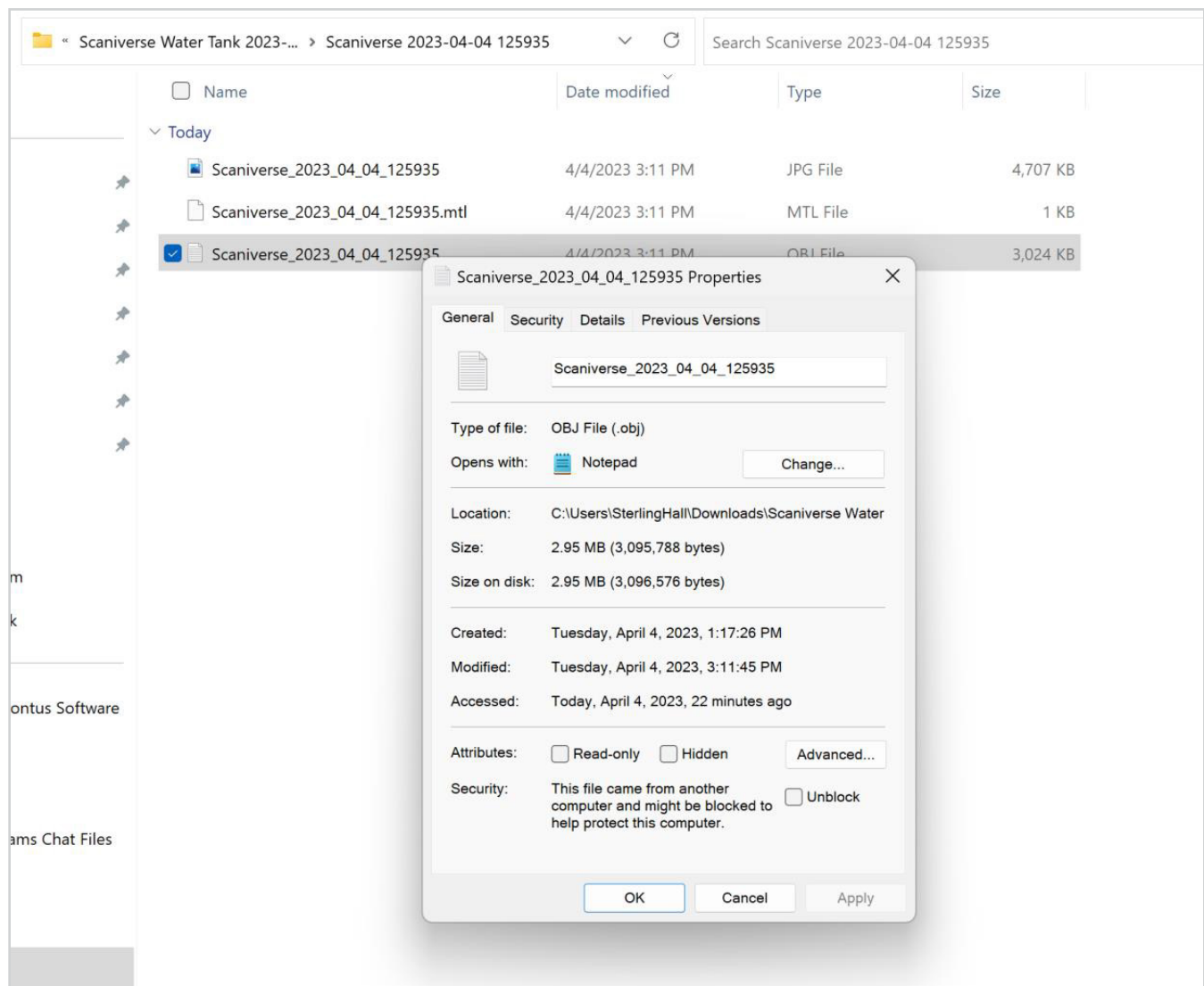
Once you have performed this operation, you can export the revised model. Select **File**, then **Export Mesh As...**



Then change the file type in the **Save as type** dropdown to **Alias Wavefront Object (*.obj)**, name the file, and **Save**.



Navigate to where you saved your file and verify that the file size is 20 MB or less; you can see the file size in your Windows browser or in the file properties. Then see [Avontus Designer 3D Model Import](#).

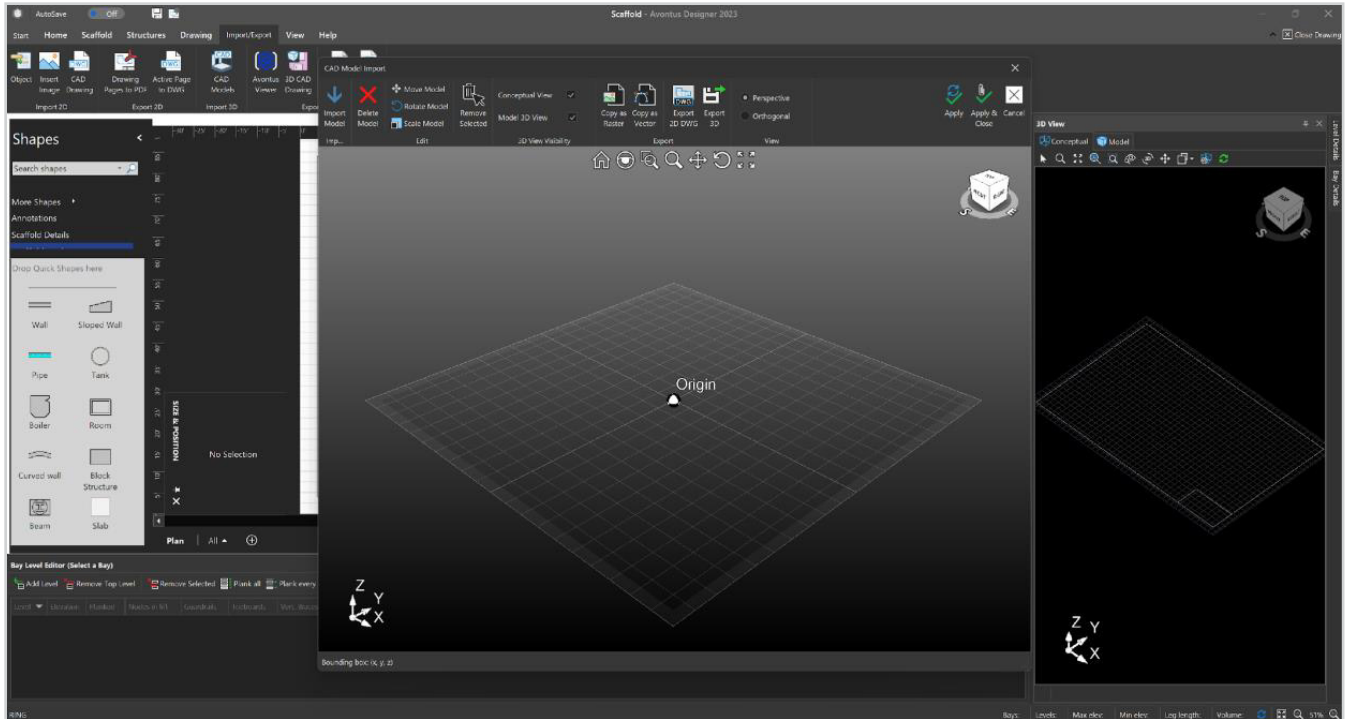


AVONTUS DESIGNER

3D MODEL IMPORT

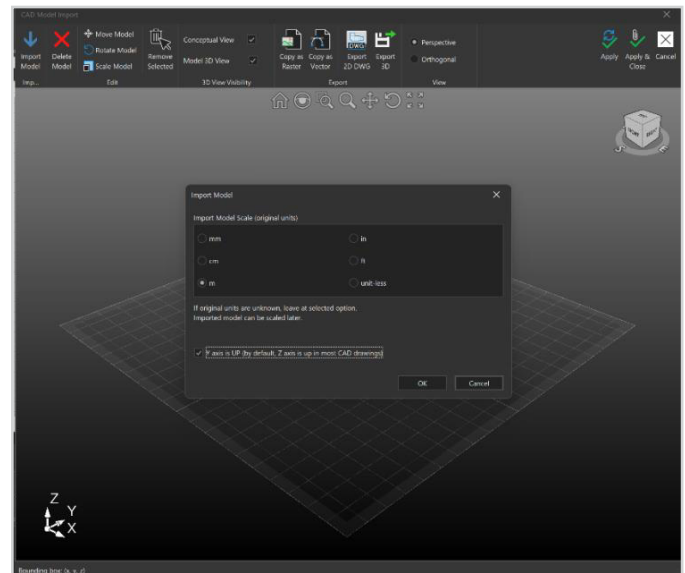
Next you will import your model, which is a digital twin of your structure, into Avontus Designer.

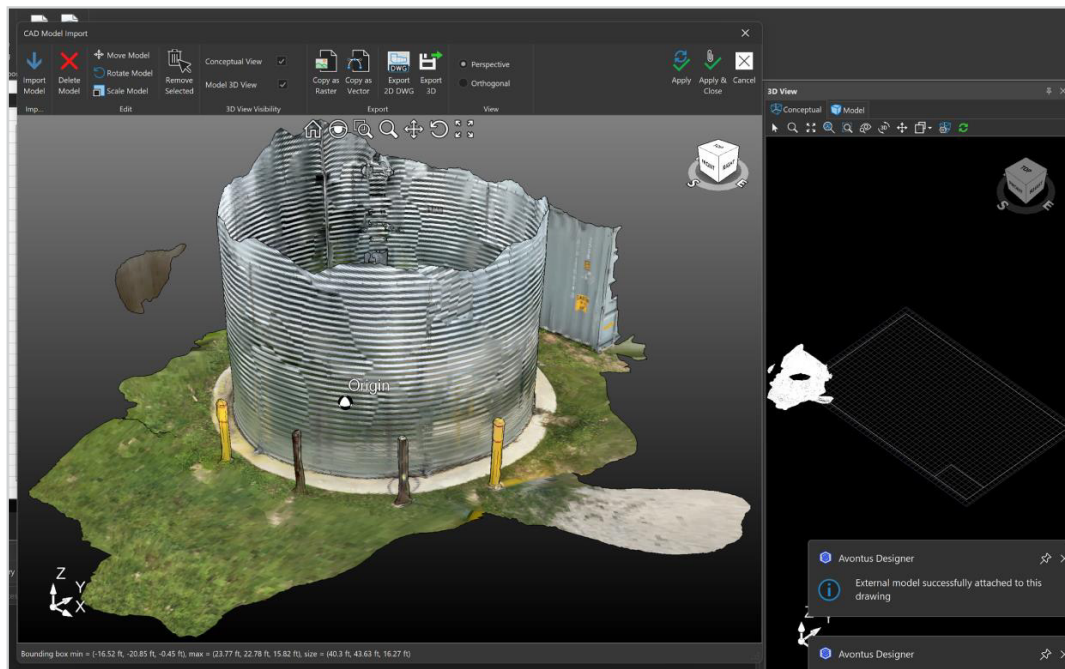
In Avontus Designer, select the **Import/Export** menu. Then, under **Import 3D**, select **CAD Model Import**.



Select **Import Model** and navigate to where you saved your .obj file. When prompted, select **m** (meters), check the **Y axis is UP** box, and check the **Automatically move model closer to origin** box.

Click **Apply** at the top right to place the model at the origin of your 3D view without closing your CAD Model Import Box.





Use the **Select All** button to select the entire imported model.

Next, use the **Dynamic Transform** option. This will bring up a 3D cursor with arrows that corresponds to each axis. Click and drag each of these arrows to move your model to your desired location on the drawing page. (You can also use the **Move** box to transform the model by fixed distances and the **Rotate** box to rotate the model on any axis.)

Once aligned, select **Apply**, then close the 3D import dialog box. If needed, go to the **Home** tab and select **Page Setup** to change your drawing page size and scale so your model fits the page.

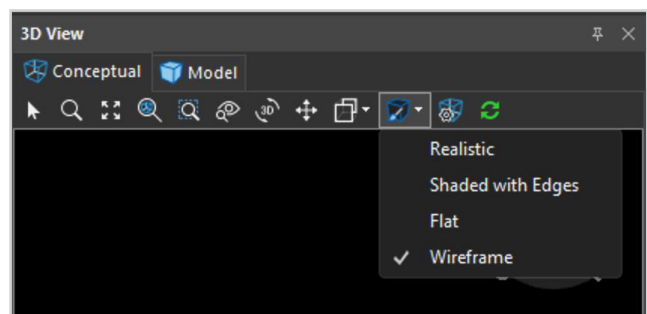
When the model is placed properly, verify a few reference measurements on your model with the integrated measuring tools in Avontus Designer to ensure that the model is at the correct scale. (Make sure to check it in an elevation view and move the imported reference model up and down, as needed).

Once the model import is complete, you should have a 2D plan view reference on the drawing page and a 3D view in the model windows - all at the correct scale.

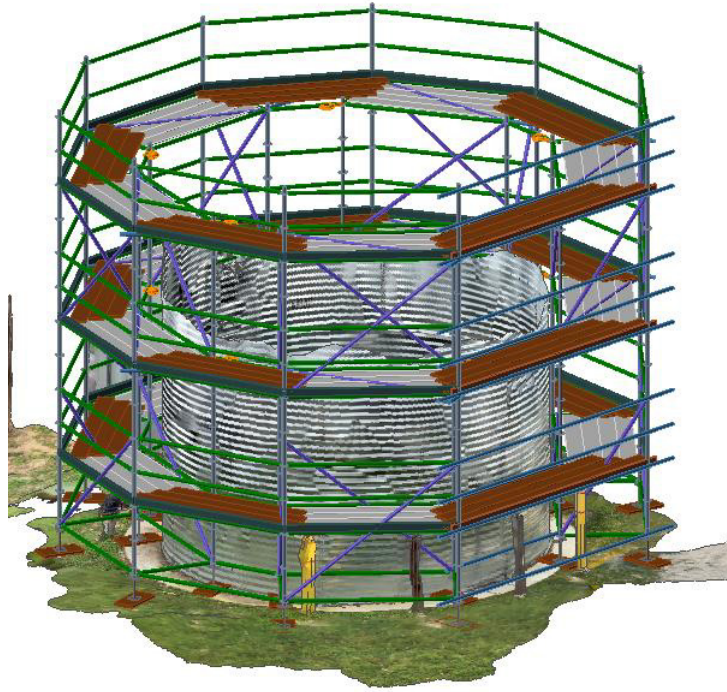
From here, you will be able to design scaffolds in and around your model, using your 2D drawing as a reference.

TIP

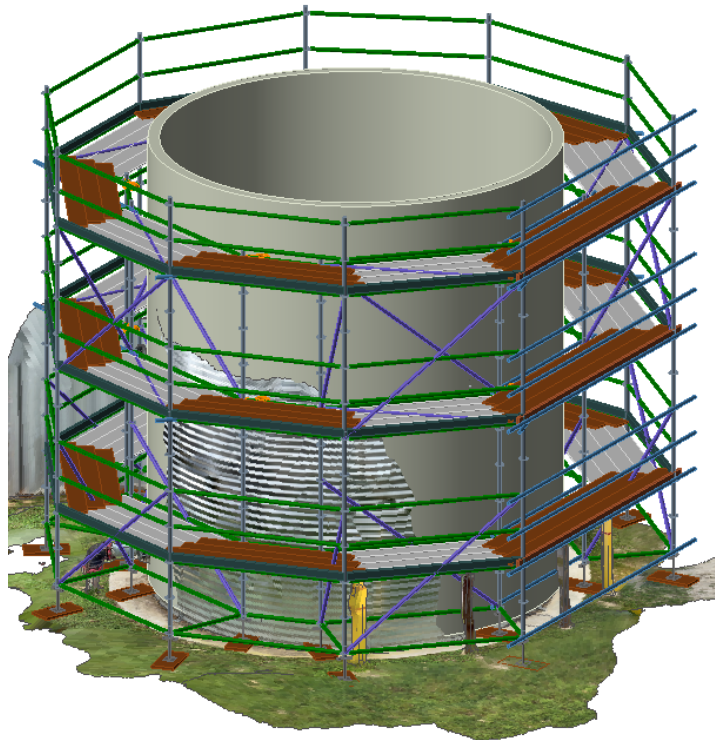
When using the Conceptual View in your 3D View window (Conceptual View is automatically updated as you make any changes without having to reload, unlike Model View), you will see a feature that allows you to change your view style. The default is a wireframe, which will give you a wireframe of your reference model (and which will lack texture information if your model has it). You can select any of the other options to get more detail. (The Realistic style will show more detail of your model but may come at the cost of performance.)



This is a scaffold around the Scaniverse model.



If you prefer, you can add a tank shape to the model to fill in the gaps.



Here is an example of modifications that can be made to the scaffolding to account for details on the model. In this case, the inside ledger was removed at the base of this bay to allow for clearance of the pipe at the base of the tank.



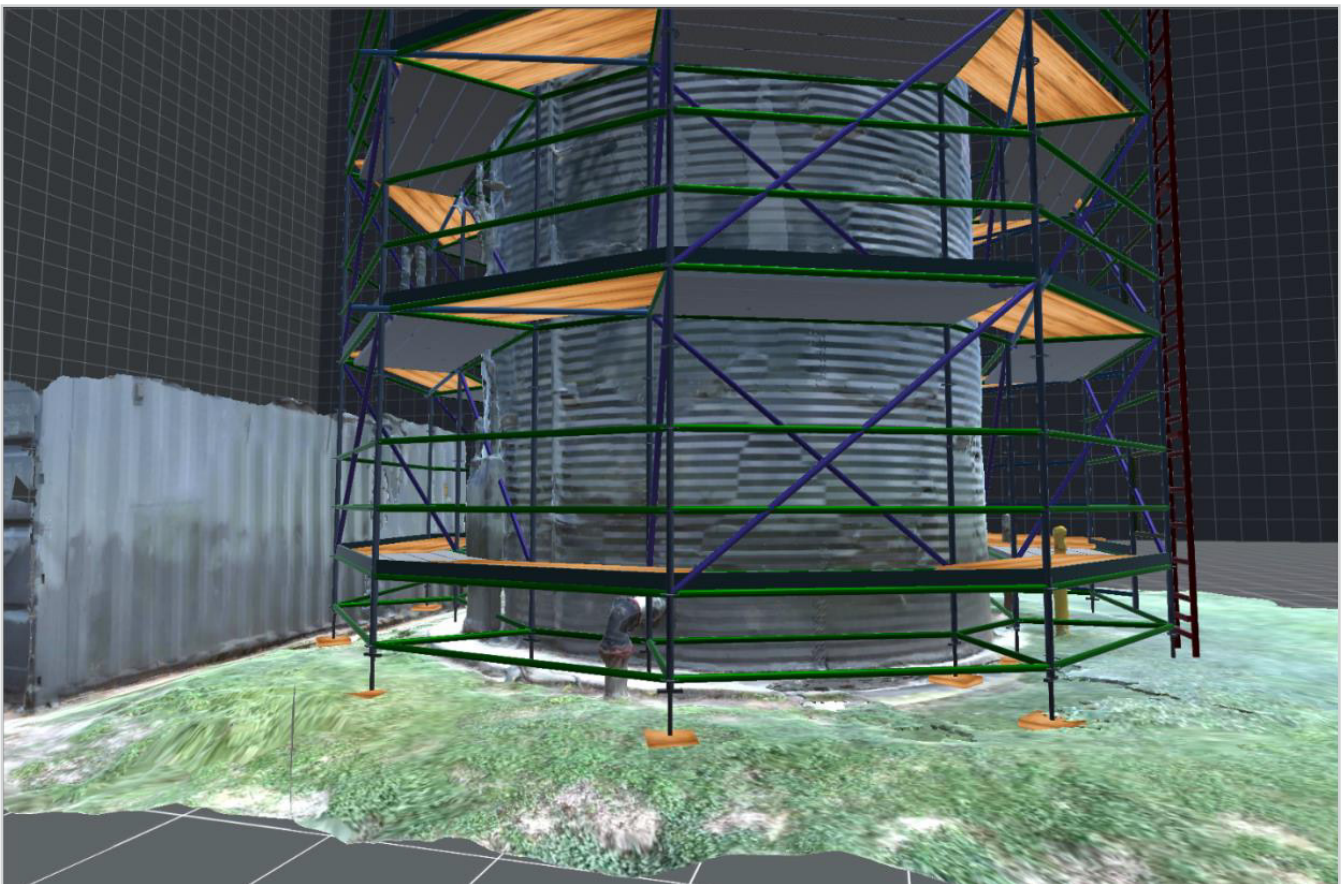
AVONTUS VIEWER

VIRTUAL AND AUGMENTED REALITY VISUALIZATION

To bring your scaffold designs to life, use the free [Avontus Viewer](#) app to share, showcase, and experience your designs in both virtual and augmented reality. Whether demonstrating your vision to clients or conducting pre-installation walkthroughs with your crew, Avontus Viewer lets you explore every angle of your design with ease. You can use Avontus Viewer:

- on your desktop or phone, to view the design in 3D and navigate around the structure.
- on your phone or tablet with an AR target, to see the scaffold projected onto the actual structure in augmented reality.
- on your phone with a Viewer lens, to “fly through” your designs in immersive virtual reality.

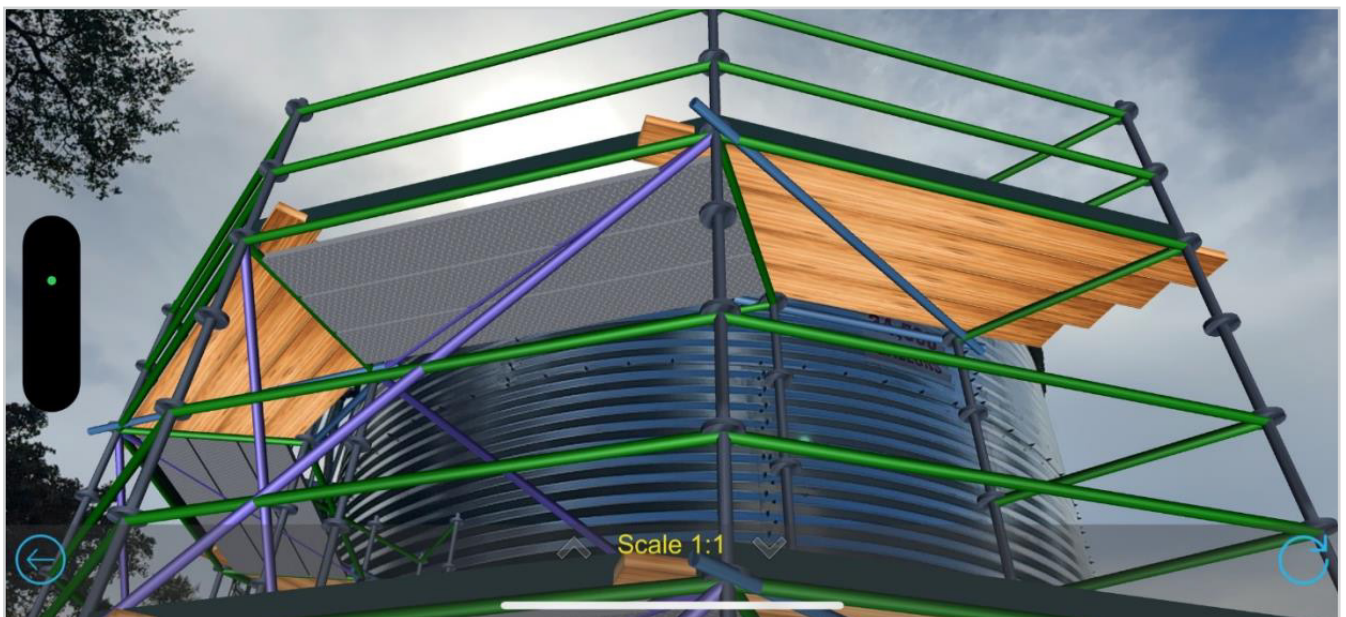
Current customers can order an AR target and Viewer lens [here](#).



The model and scaffold viewed on a laptop with Avontus Viewer.



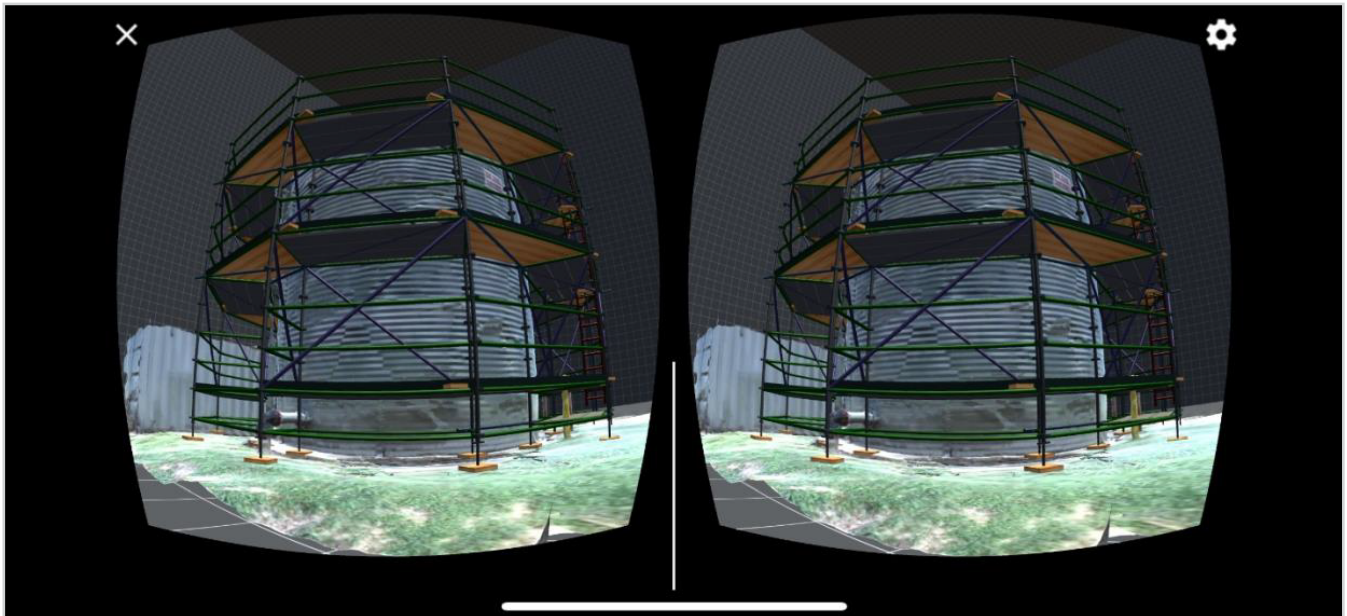
The actual structure (left) viewed with the digital twin and scaffold (right) on a mobile device in the field.



The scaffold design projected onto the actual structure as viewed on a mobile device.



A close-up of the potential obstruction and the virtual scaffold around it.



When viewed on your phone with a Viewer lens, this image becomes 3D and you can move through it with simple touches to your phone screen.

If you aren't yet using [Avontus Designer](#) and [Avontus Viewer](#), contact us at sales@avontus.com for a demo and free yourself from the tape measure!

