



Natural Resources Conservation Service

AutoCAD Civil 3D 2020

Working with LiDAR

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Topics Covered:

- Overview of LiDAR
- LiDAR file types
- Creating and exporting LiDAR in ArcMap
- Adding LiDAR into Civil 3D
- Working with LiDAR in Civil 3D
- Comparing LiDAR with your surveyed data

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Overview of LiDAR

What is LiDAR?

LiDAR (which stands for Light Detection and Ranging) is a remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the Earth

Why use LiDAR?

Can be used in conjunction with surveyed points to obtain a broader view of the project design to assist in the approval process



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Overview of LiDAR

Can you use LiDAR for design work?

Depending on your Area Engineer, LiDAR may be used for some project designs

**MAKE SURE THAT YOU OBTAIN APPROVAL
FROM YOUR AREA ENGINEER PRIOR TO
COMPLETING A DESIGN WHEN USING LIDAR
ONLY**

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LiDAR file types

Common file formats used in LiDAR creation:

- .tif
- .dem
- .asc
- .txt
- .adf

There are other file types that can be imported into Civil 3D, but we will only go over .tif and .adf file types

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Creating LiDAR file in ArcMap

Before you open ArcMap

You will need to Borrow the following Licenses to use the *NRCS Engineering Tools Toolbox*:

1. **Go** to bottom left of your computer screen and click the Microsoft Icon
2. **Type** in “*ArcGIS Administrator*” in the search bar, **Click** to open.
3. The ArcGIS Administrator Window appears.
4. In the left hand column **Click** Folder “*Borrow/Return*”
5. To the right hand side of the window, you will **Check** “*3D Analyst*” and “*Spatial Analyst*”
6. **Click** Apply and Ok
7. Make sure that you have either a “**scratch**” or “**workspace**” folder created in you C:Drive

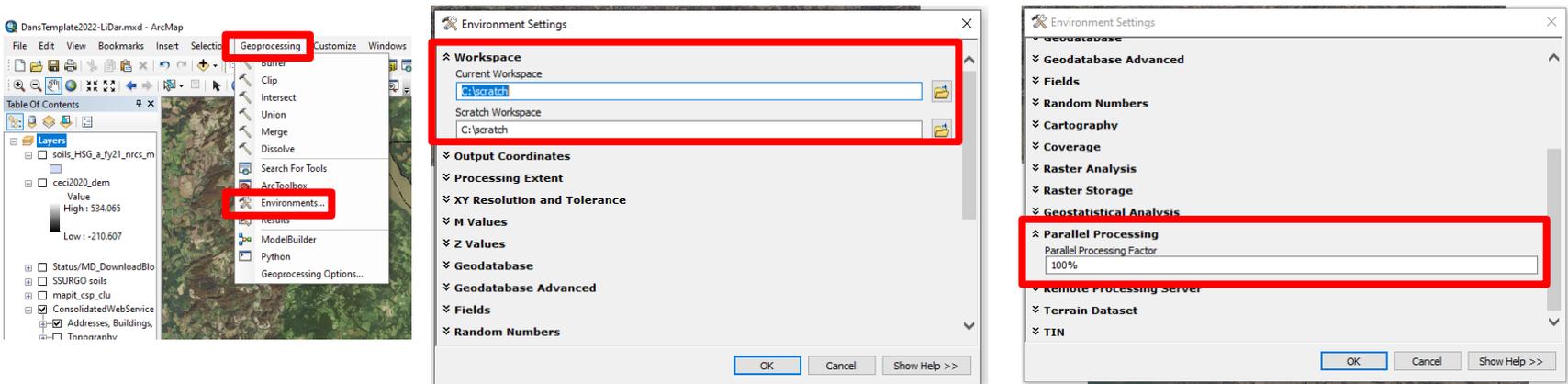
**Notice* you can only borrow these licenses for 180 days. (Your computer should warn you when they will expire, and then you will need to *re-new* both licenses by following *Steps 1-6* again)

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Creating LiDAR file in ArcMap

When you open up ArcGIS you need to verify the 2 items below:

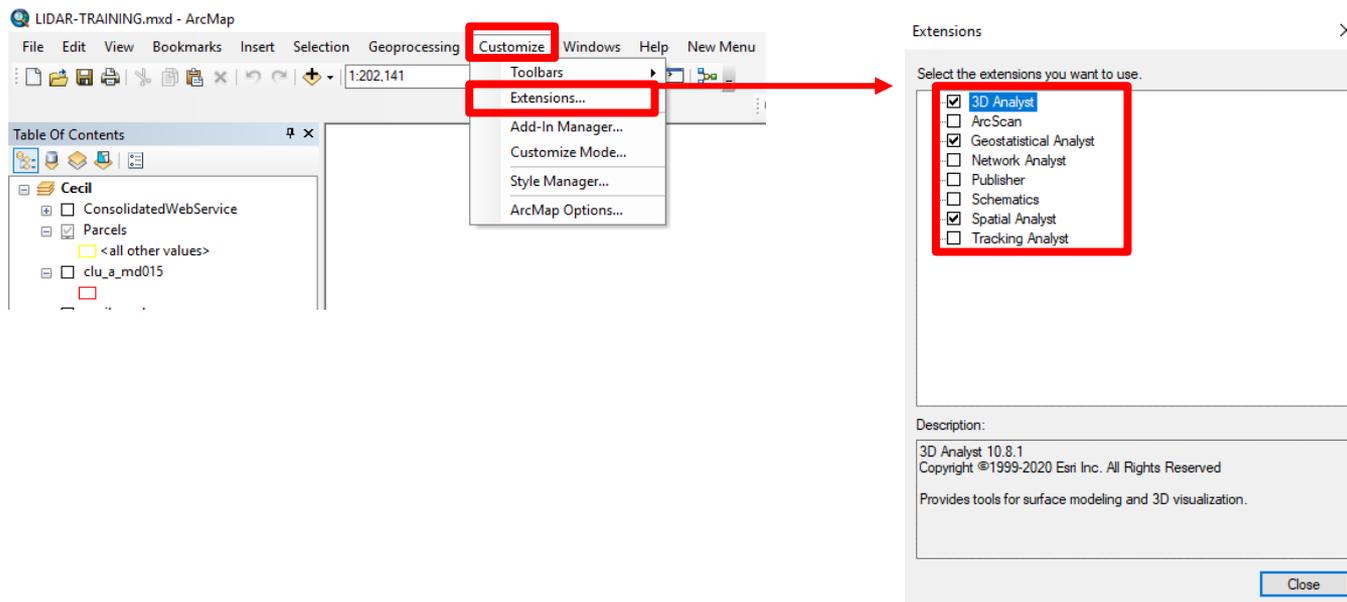
1. Geoprocessing Tab>Environments>**Workspace**
 - a) Current Workspace – Make sure this is set to either “scratch” or “workspace”
 - b) Scratch Workspace – Make sure this is set to either “scratch” or “workspace” (this should match your current workspace)
2. Geoprocessing Tab>Environments>**Parallel Processing**
 - a) Make sure this is set to 100%



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Creating LiDAR file in ArcMap

Make sure you have the following Extensions checked by going into the Customize Tab>Extensions

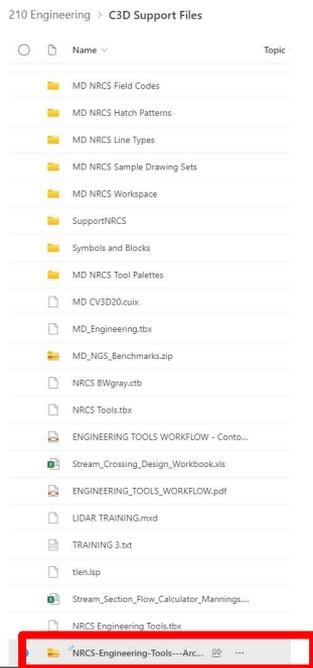


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Creating LiDAR file in ArcMap

You will need to add the

NRCS Engineering Tools Toolbox



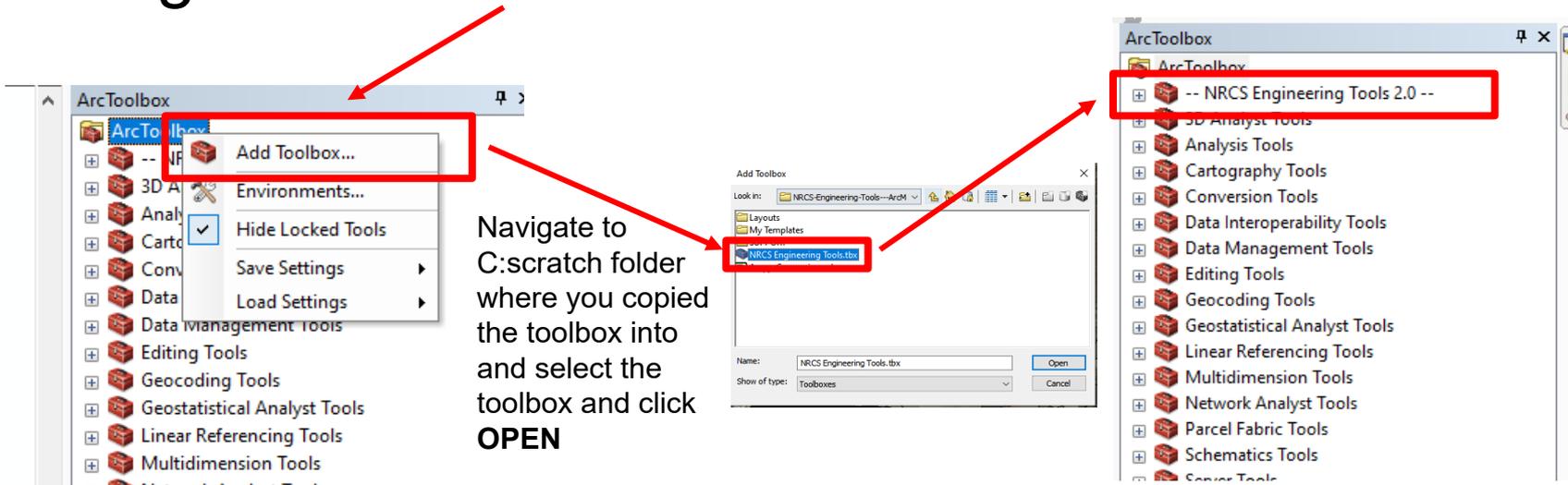
Goto the MD NRCS Sharepoint site under 210 Engineering/C3D Support Files and download the **NRCS-Engineering-Tools---ArcMap-master.zip** file into the C:scratch folder location and extract the folder into this location

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Creating LiDAR file in ArcMap

 Click on the ToolBox icon to open the ArcToolbox window

right click > Add Toolbox



Navigate to C:\scratch folder where you copied the toolbox into and select the toolbox and click **OPEN**

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Creating LiDAR file in ArcMap

Before continuing, you must first have your DEM loaded into your map. The DEM file is located in the following location:

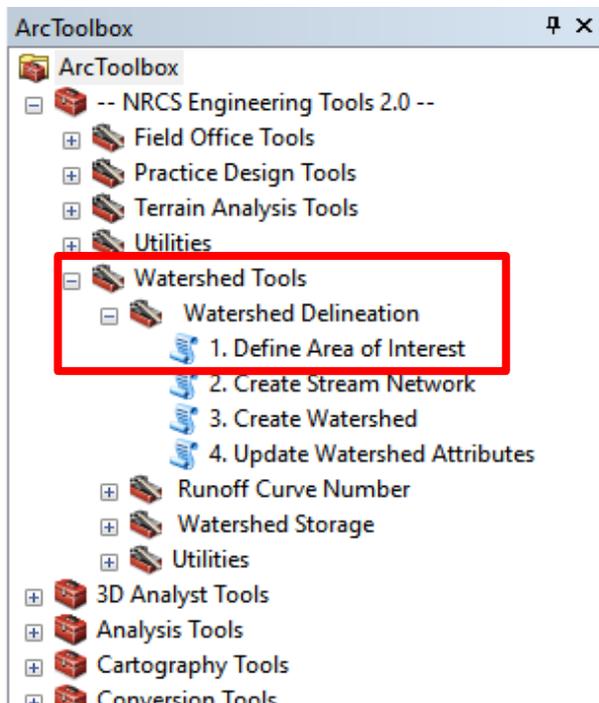
F:\geodata/elevation/LiDAR_AllCounties

It's highly recommended to copy this file into a folder located on your C: drive.

You may also have an updated DEM file from your County that you may be using, just make sure that the file is located on your C: drive.

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Creating LiDAR file in ArcMap



Expand the toolbox and expand Field Office Tools.

Expand “Watershed Tools” and Expand “Watershed Delineation”
Select 1. Define Area of Interest

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Creating LiDAR file in ArcMap

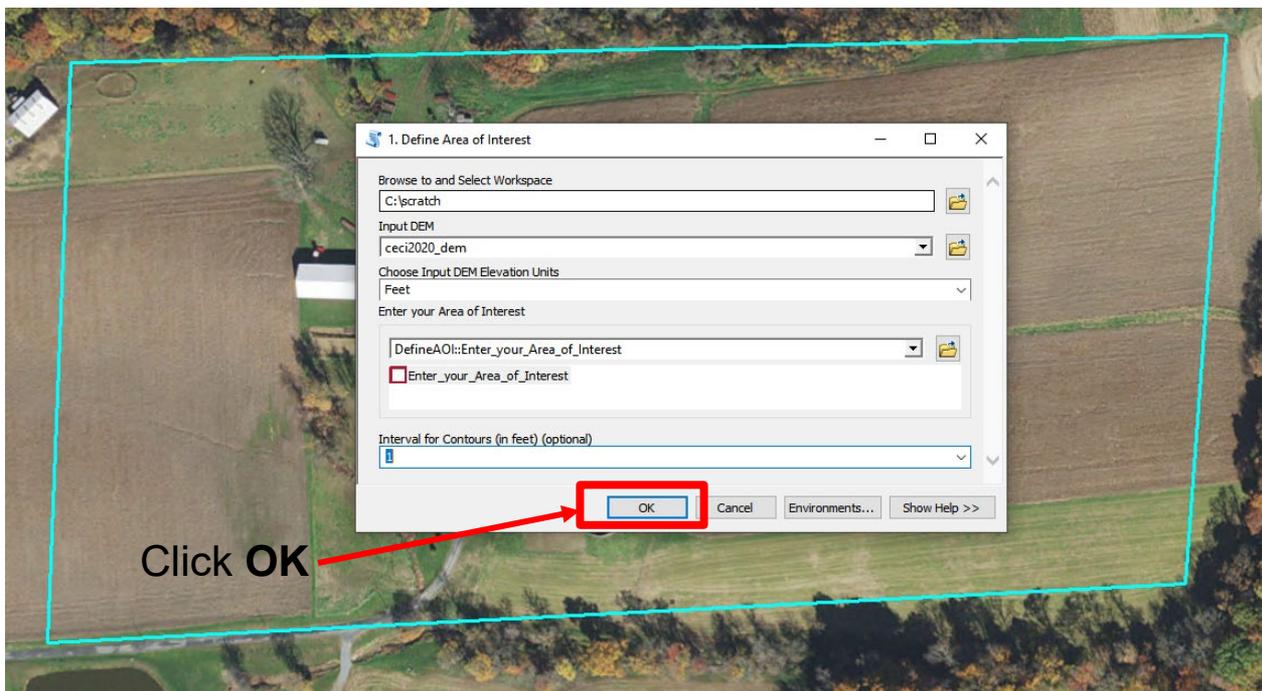
Browse to and Select Workspace: This should be your C:\scratch or C:\workspace

Input DEM: Select your County DEM

Choose Input DEM Elevation Units: Select Feet

Enter your Area of Interest: Draw you AOI

Interval for Contours: Select your contour intervals

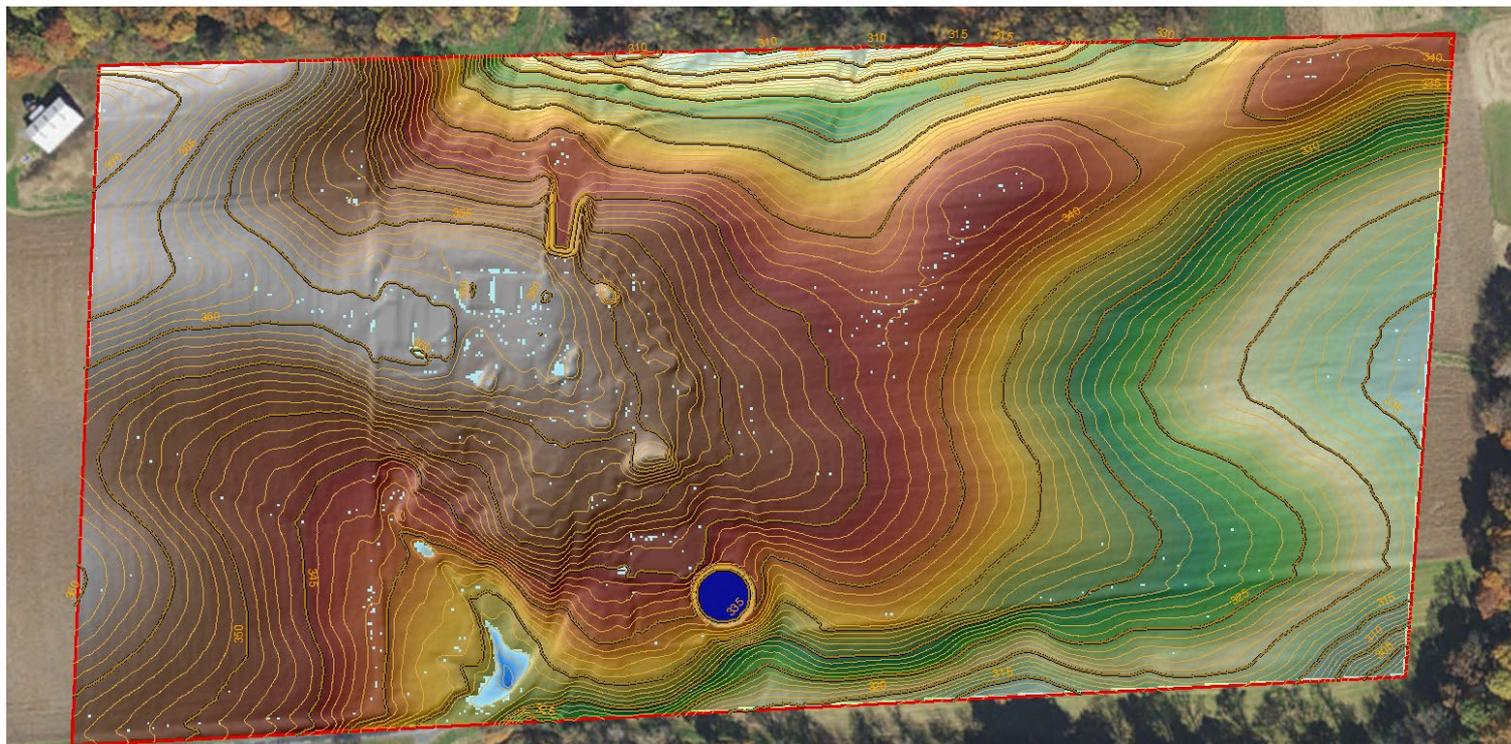


Click **OK**

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Creating LiDAR file in ArcMap

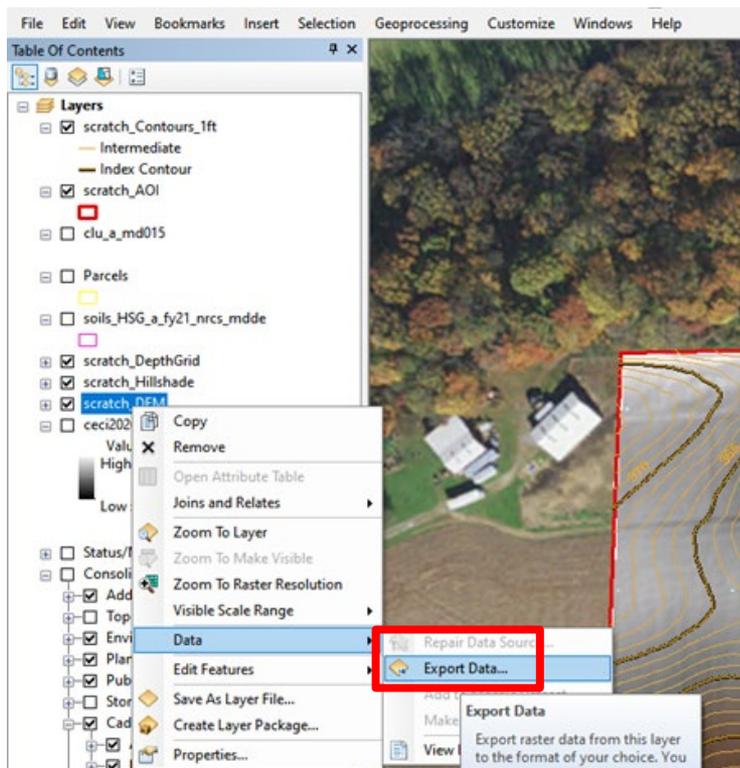
Area of Interest Clipped



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Creating LiDAR file in ArcMap

Now that you have the clipped DEM, you can now export it as a .tiff file

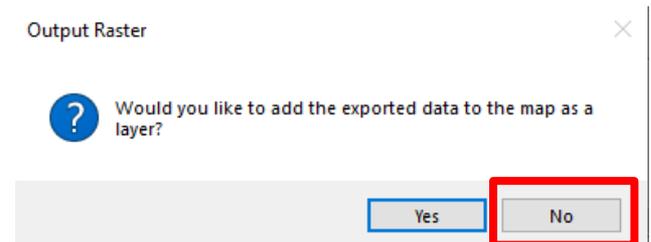
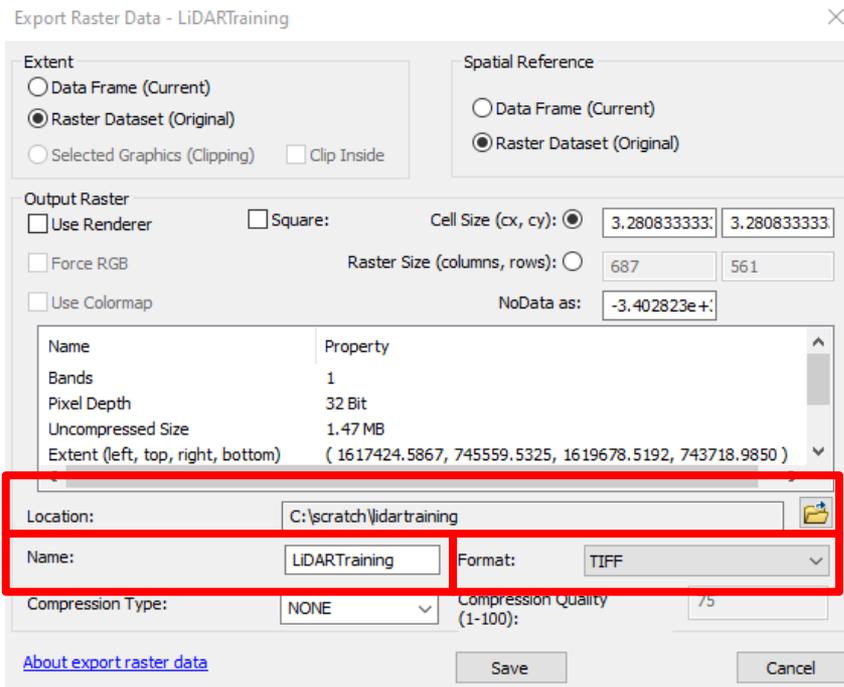


right click on the clipped DEM file>Data>Export Data...

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Creating LiDAR file in ArcMap

Pick the **location**, **name** and **format**
Click **Save**

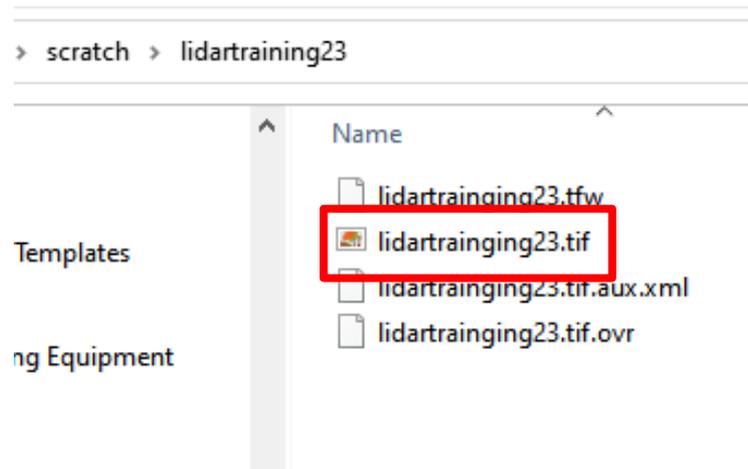


Click **NO**

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Creating LiDAR file in ArcMap

When you open up your file you will see the .tif file that you can upload into Civil 3D

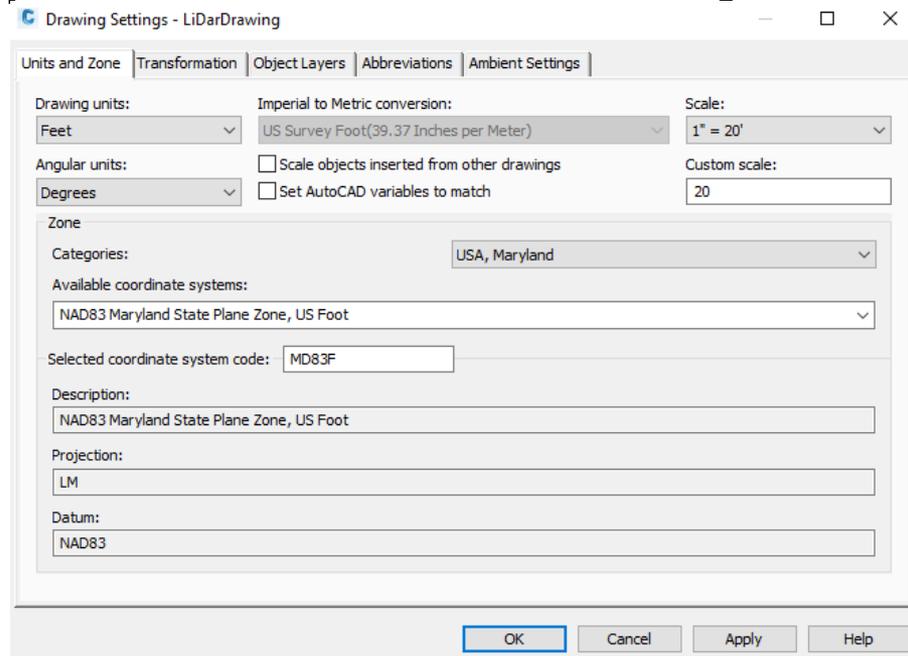


You can now close ArcMap

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Importing LiDAR into Civil 3D

When importing the file into Civil 3D make sure that you are in a Maryland Template. The templates have a projection set to them already and will import that data correctly.



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Importing LiDAR into Civil 3D

Keep in mind the size of the file that you have generated for your LiDAR. You don't want to make the file size too big because it will slow down Civil 3D!

Before you import your file into Civil 3D, make sure that you copy the file into your working folder of the design. This will be the location that you will use to import the file.

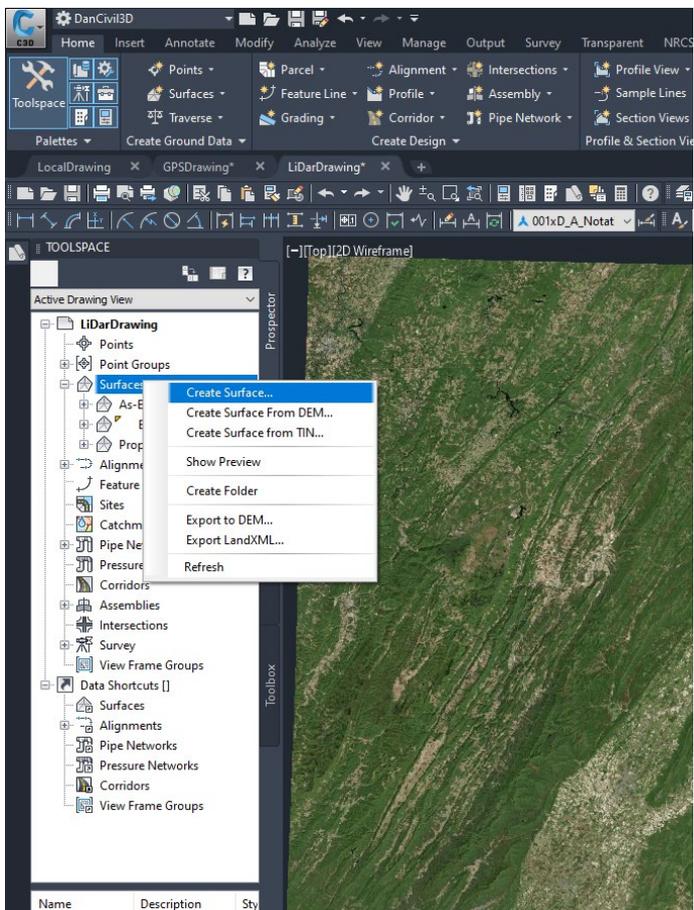
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Importing LiDAR into Civil 3D



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Importing LiDAR into Civil 3D



To create the LiDar surface:

Right click on Surfaces <Create Surface...>

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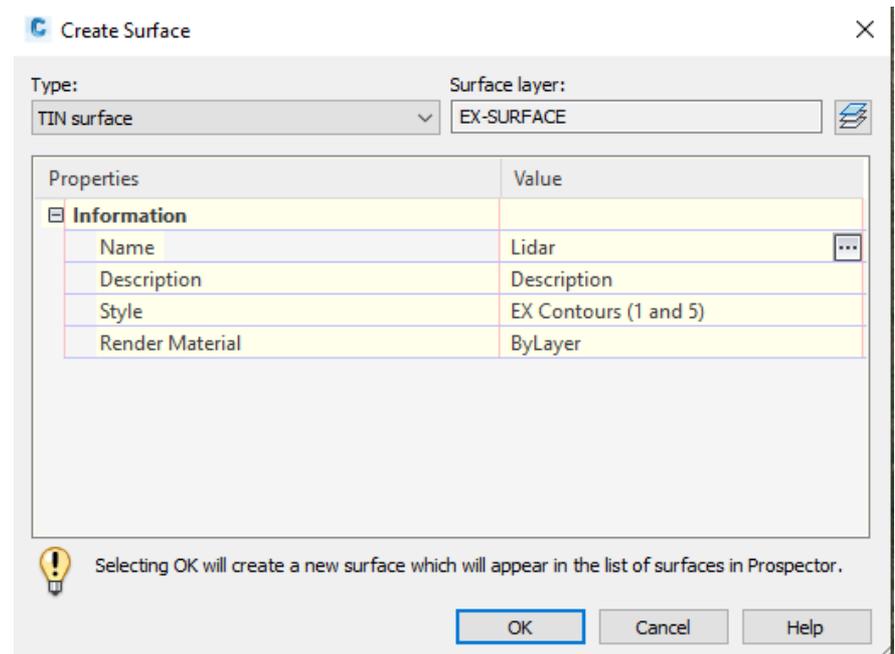
Importing LiDAR into Civil 3D

Create Surface Window

Name the surface

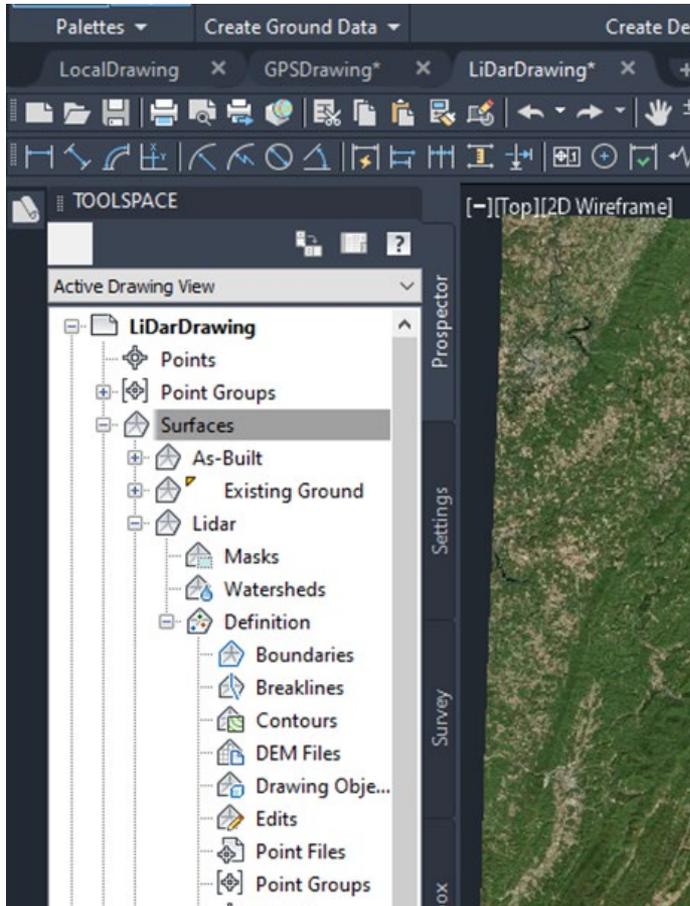
Select the style

Click **OK**



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Importing LiDAR into Civil 3D



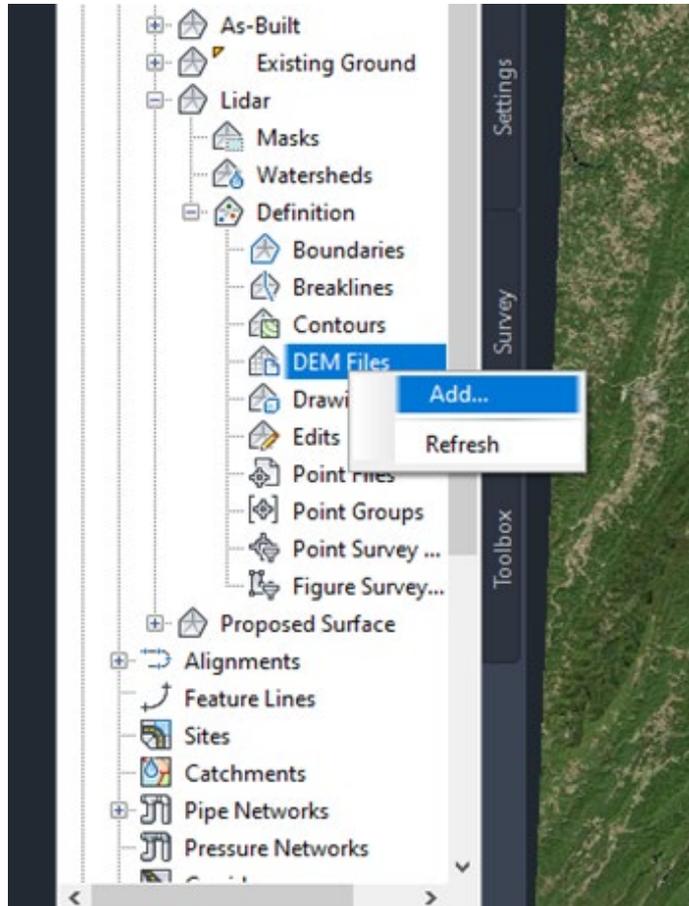
Expand Surfaces:

Expand the new surface you just created

Expand <Definition>

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Importing LiDAR into Civil 3D



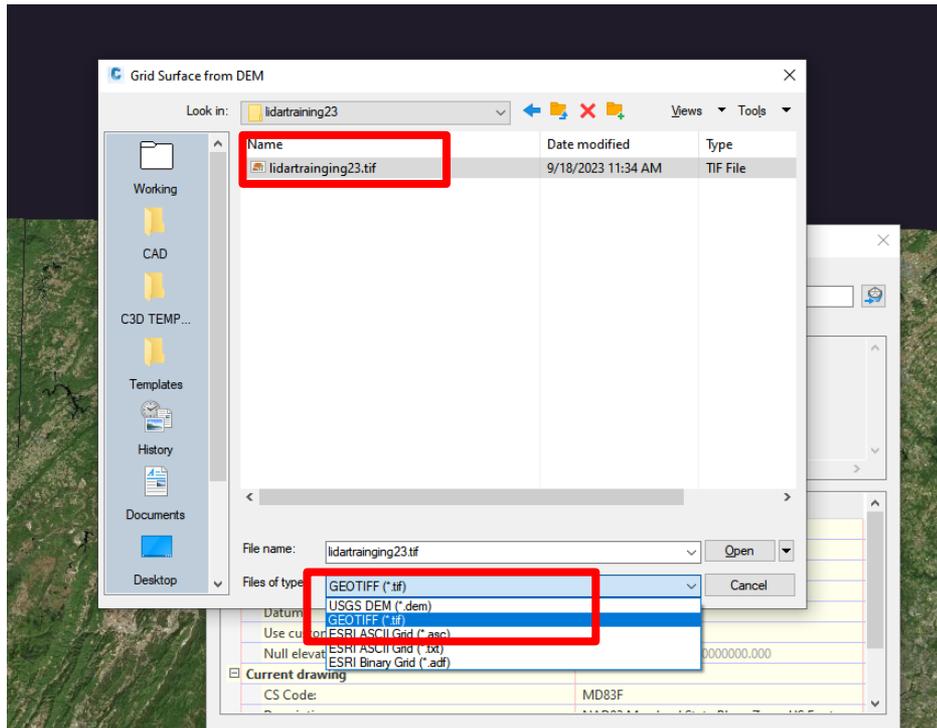
Right click DEM Files:

Select <Add...>

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Importing LiDAR into Civil 3D

Navigate to the file you want to import as your DEM file. Make sure that you have the correct file type selected if you don't see your file.

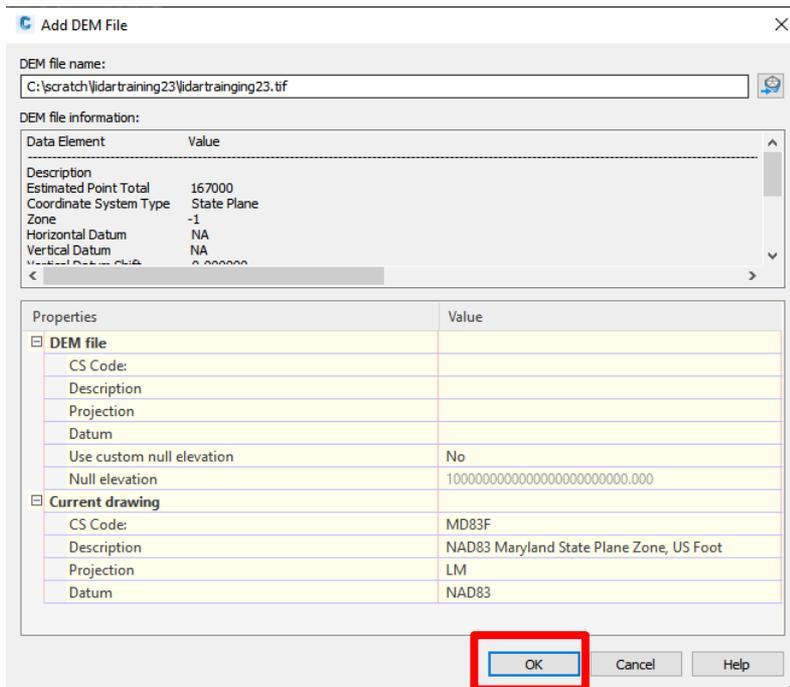


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Importing LiDAR into Civil 3D

You will get an overview of the data that you are about to import.

Click **OK**



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Importing LiDAR into Civil 3D

Now you can **<zoom to>** your surface that you created



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Level of Detail

Level of Detail

If you have a large area and your computer is running slow, you can turn the Level of detail ON to speed up the regen process

In the command line: type **levelofdetail** This will turn it on and show less information the more you are zoomed out

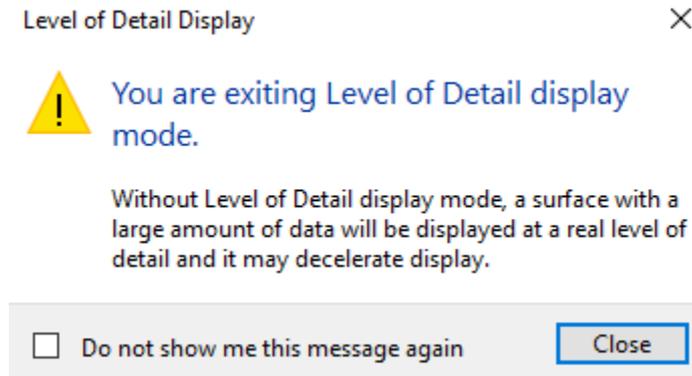
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Level of Detail

Level of Detail

To turn it back off:

In the command line: type **levelofdetailoff**

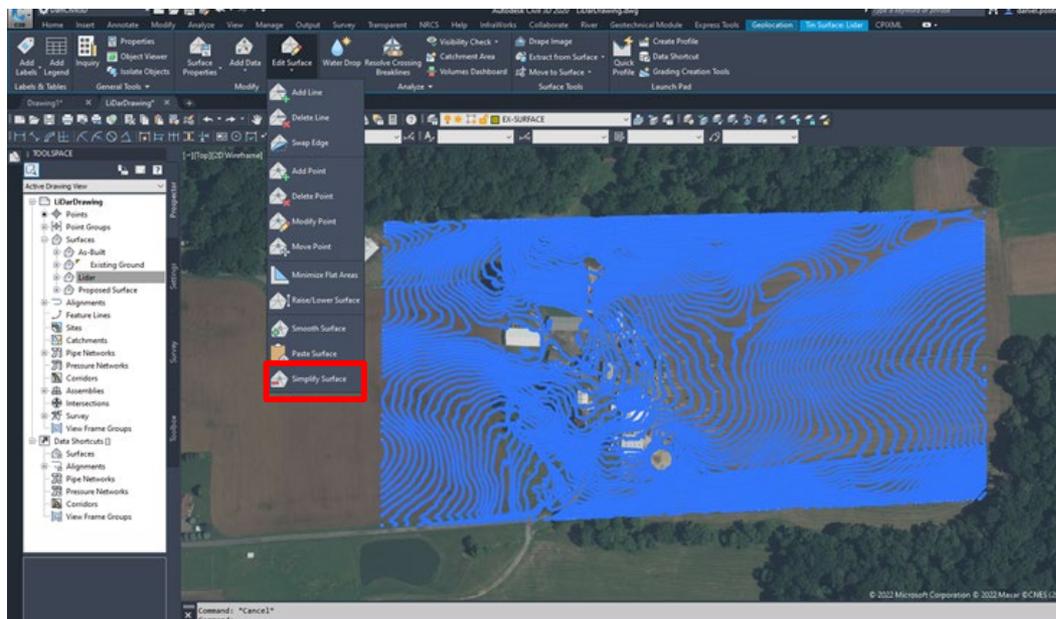


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Simplify Surface

If you have a large amount of data you can use the “Simplify Surface” to reduce the amount of points

Select the surface, contextual ribbon <Edit Surface>, Select “Simplify Surface”



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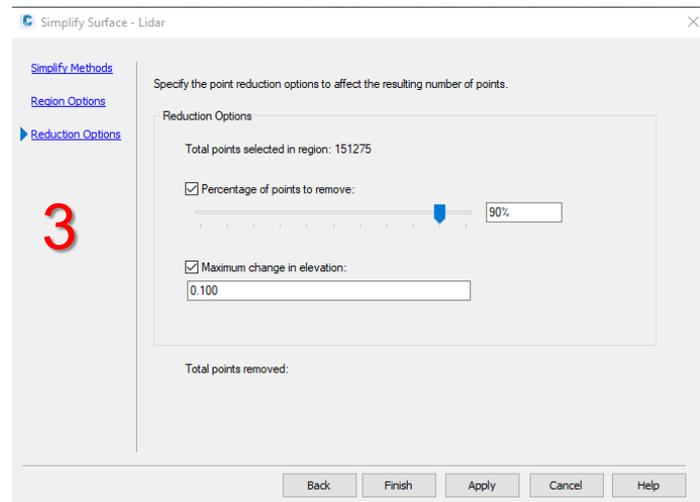
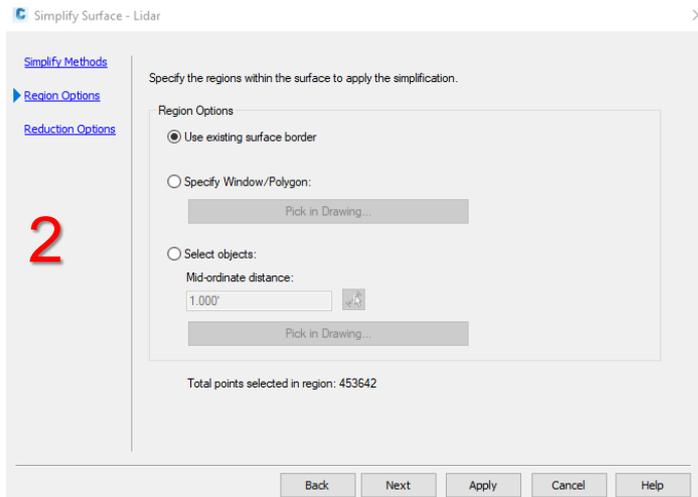
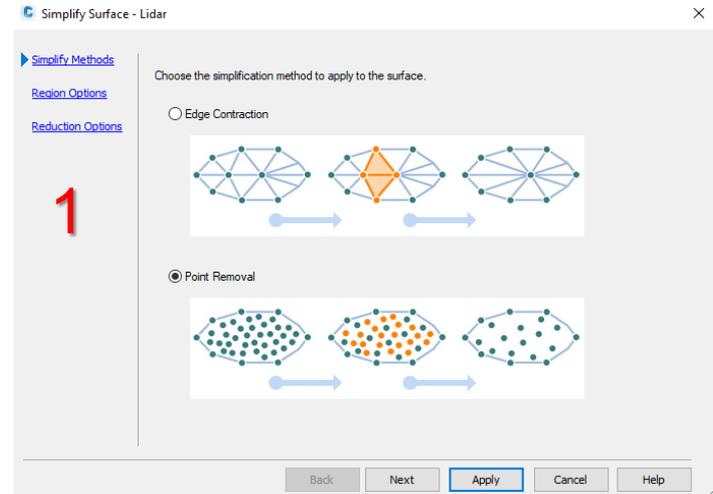
Simplify Surface

Simplify Surface Window

Select Point Removal

Select Region

Check Percentage (90%) and
Maximum change in elevation
(0.10)

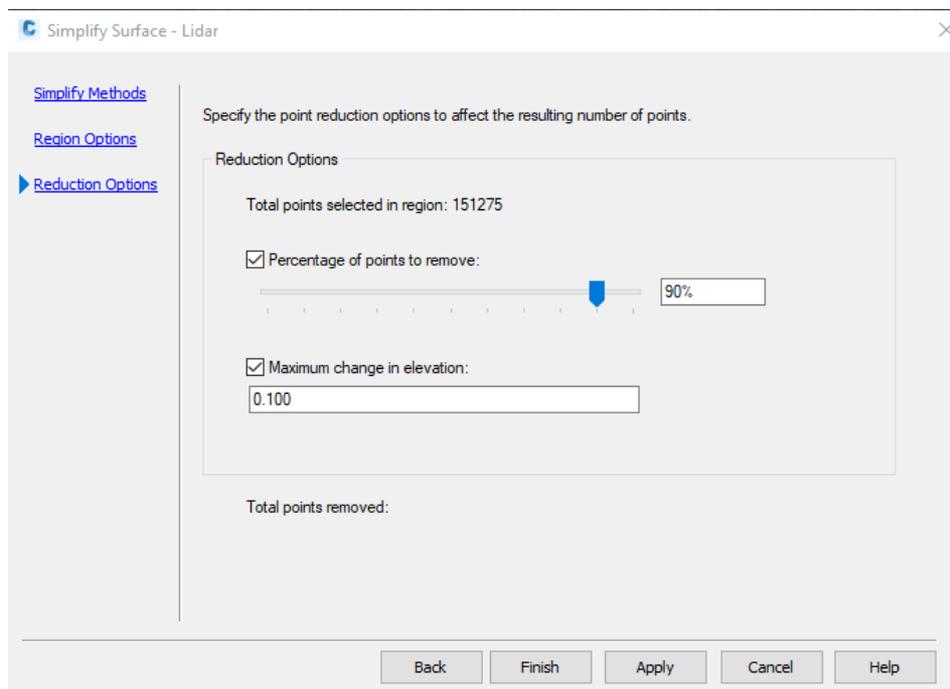


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Simplify Surface

Simplify Surface Window

Click **Apply**, then **Finish**



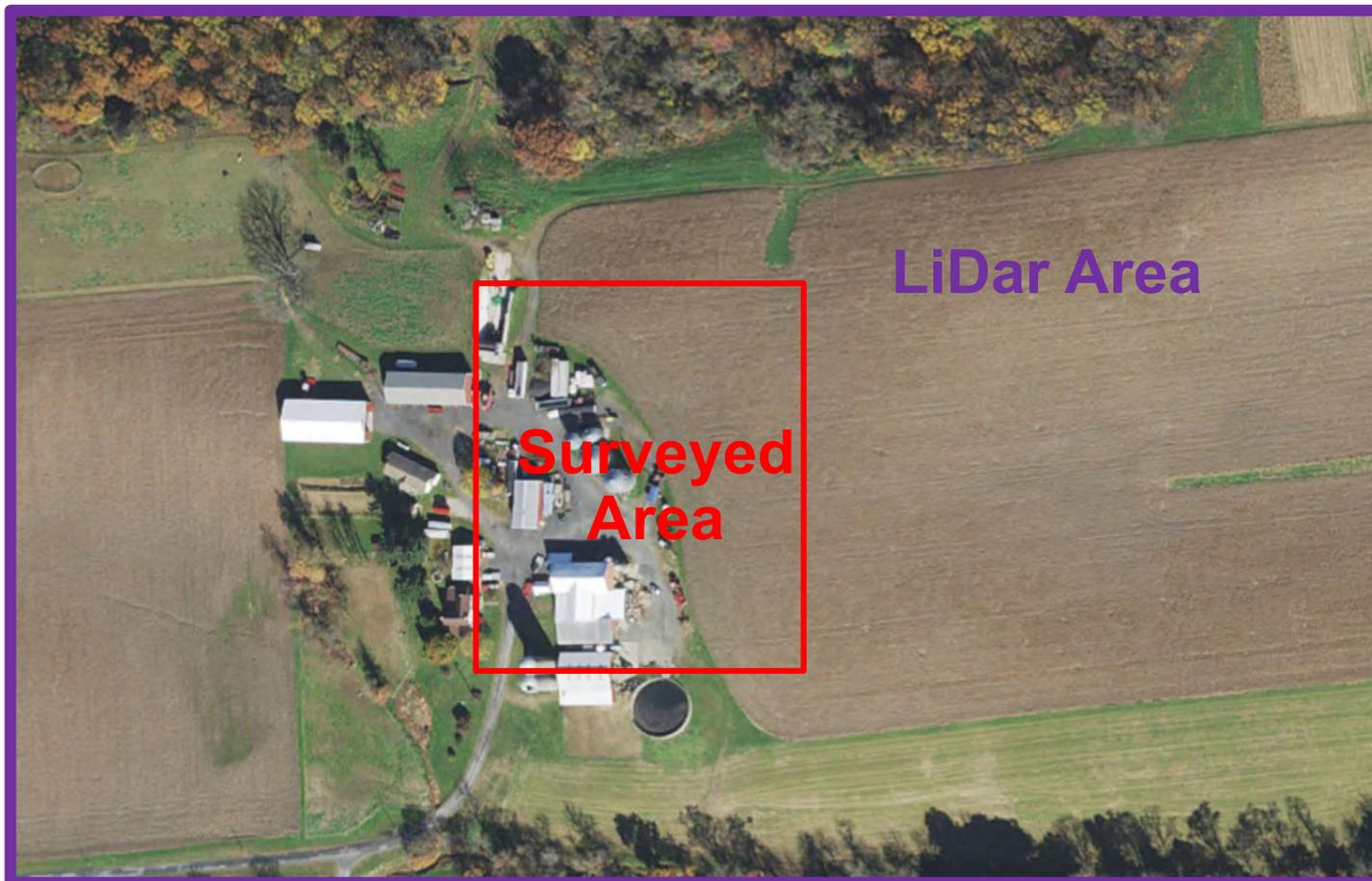
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Showing LiDAR and Surveyed Surfaces

If you have a surveyed site and would like to show contours outside of that area, you can now “Clip” the surveyed area from your LiDAR surface. Please keep in mind that the elevations may not “match” to your surveyed data elevations. The LiDAR contours are mainly used to show the “Big Picture” of the design.

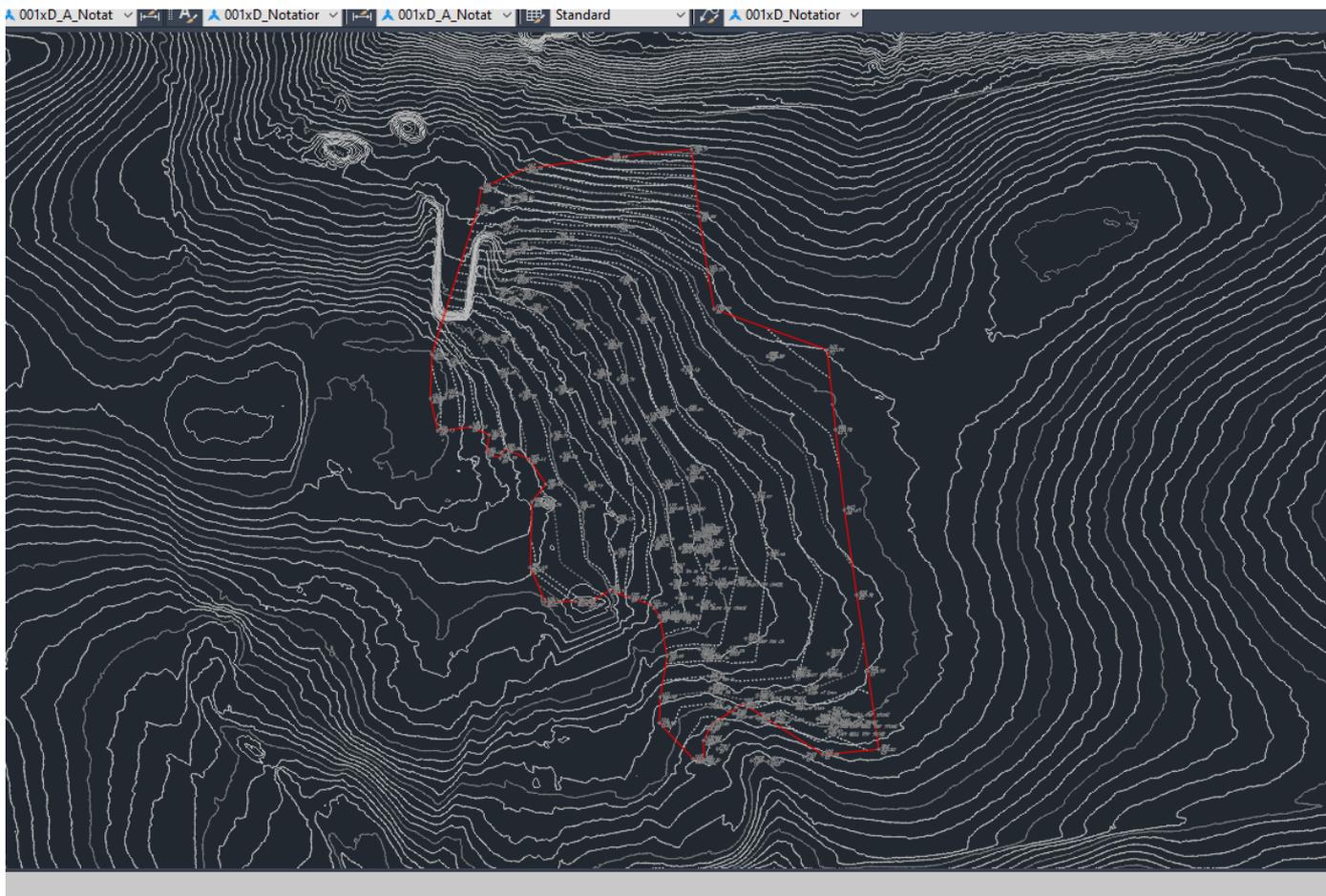
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Showing LiDAR and Surveyed Surfaces



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Showing LiDAR and Surveyed Surfaces

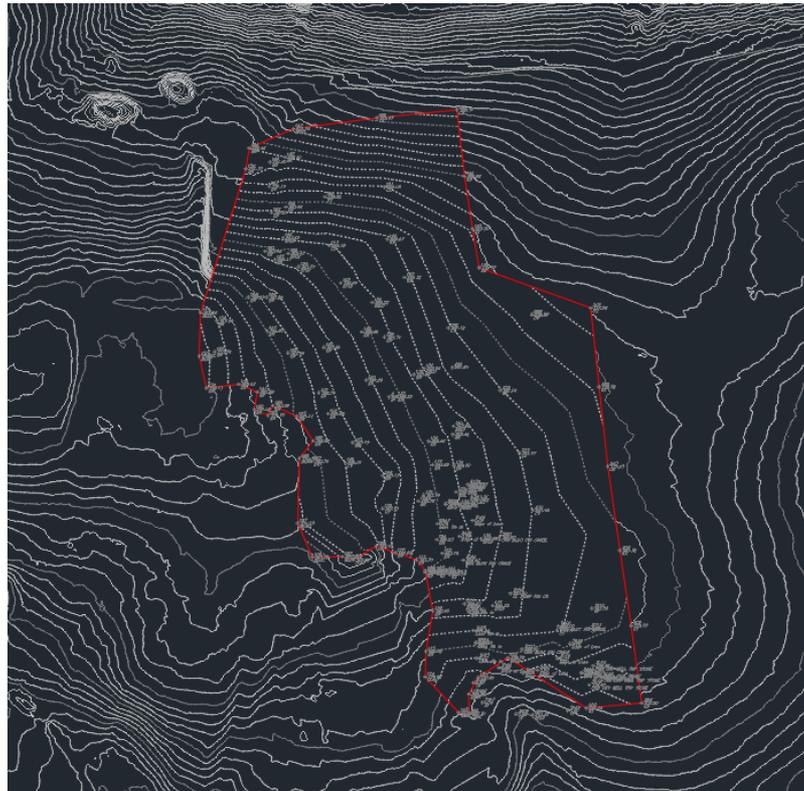


Red line indicates the surveyed area

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Showing LiDAR and Surveyed Surfaces

You can clip out your surveyed surface as shown by making a boundary and selecting “hide”



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Showing LiDAR and Surveyed Surfaces



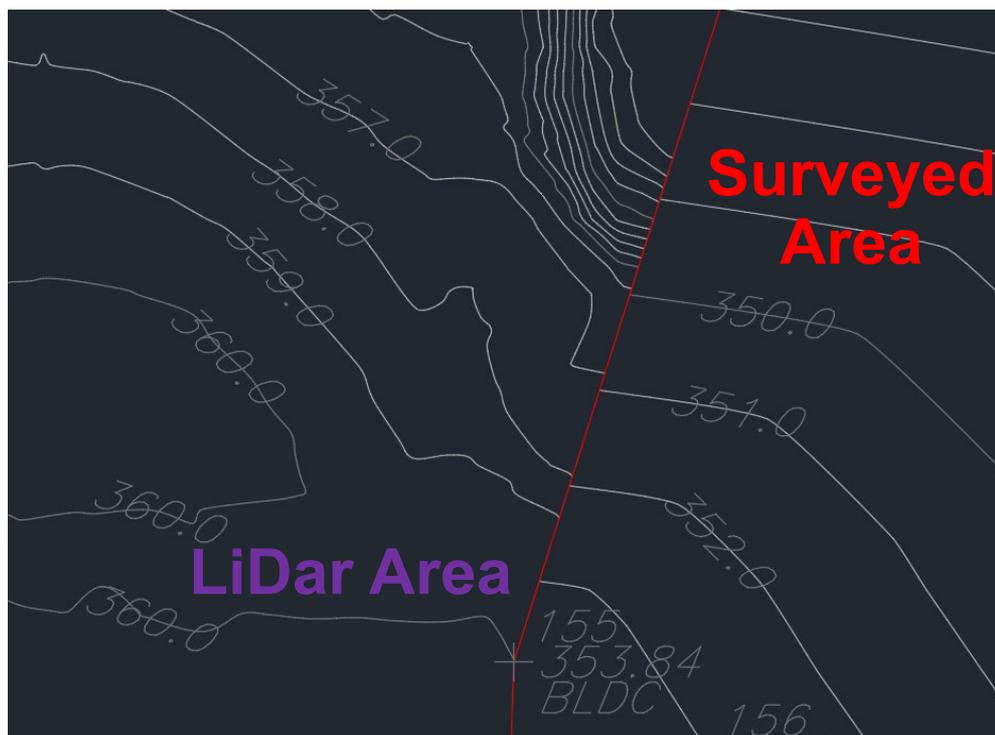
This shows the Surveyed Surface (Inside the red line) and the LiDAR Surface (Outside the red line) displayed together

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Adjusting LiDAR Surface Elevation

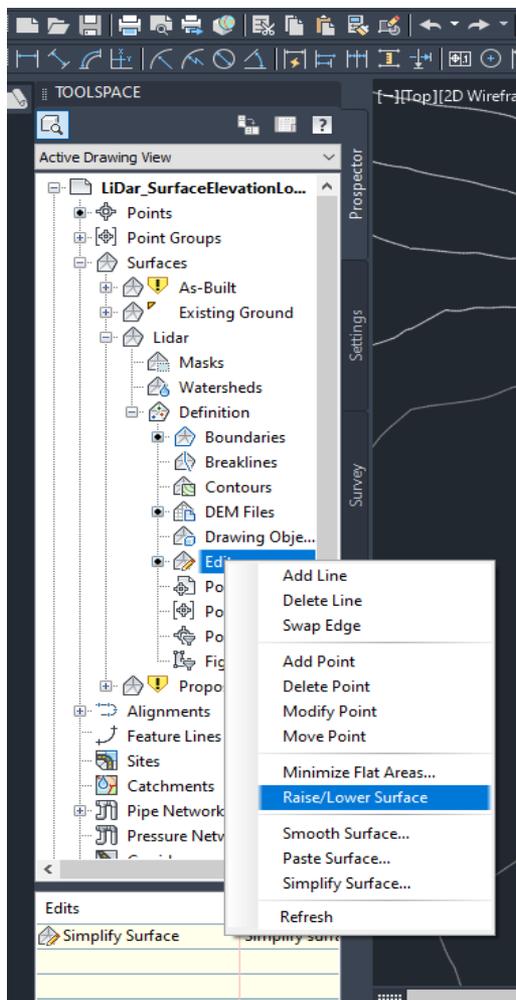
To adjust your LiDAR elevations to match your surveyed data you can “raise/lower” the LiDAR surface

Based on the survey data, we need to “Lower” the LiDAR surface about 6ft to match the surveyed elevations

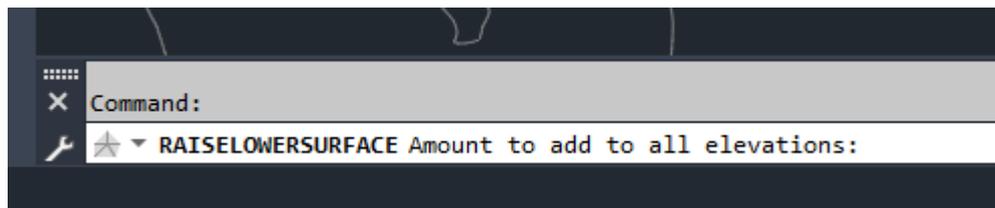


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Adjusting LiDAR Surface Elevation



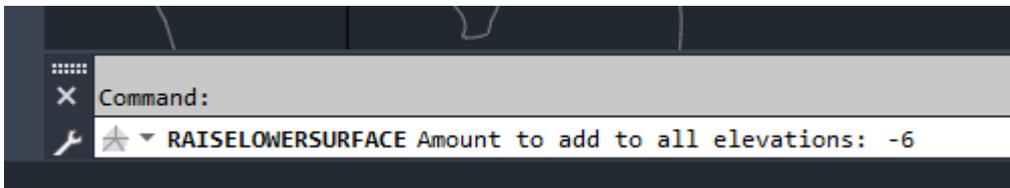
- Expand LiDar Surface
- Expand **<Definition>**
- Right click **<Edits>**
- Select **<Raise/Lower Surface>**



Type in the amount you need to raise or lower in feet (use “-” before the amount to lower the elevations)

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Adjusting LiDAR Surface Elevation



Enter in -6
Then **Enter**



Now the LiDAR elevations match closer to the surveyed points elevations

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Adjusting LiDAR Surface Elevation

Keep in mind that once you adjust the elevations of the LiDAR data to “match” your surveyed data, if you were to go out and complete a survey using GPS, those elevation **WILL NOT MATCH** to your adjusted elevations. You must “localize” the survey so the elevations will adjust to your original surveyed points.

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Things to Know

- If you have a question – ASK!
- There are always multiple ways to do the same thing – use the one(s) that work best for you
- Keep in mind the goal of what you are using AutoCAD/Civil 3D for
- Use help sources
- This program can be as simple or as complicated as you would like it to be
- Spend time using the program and, whenever possible, with other people who use the program

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Questions?

