

Using LAS LiDAR Data in AutoCAD Civil 3D

Overview: Use the following processes for accessing LiDAR data in an LAS format from the USDA GeoCue server and importing into AutoCAD Civil 3D. The coordinate system of the LAS data and the drawing needs to be known. (E.g. The Iowa NRCS template uses NAD 83 UTM Zone 15, International feet.)

Software: AutoCAD Civil 3D 2020, Civil 3D Workspace, NRCS C3D 2020 template, DotSoft LiDAR Tools

Notation Method

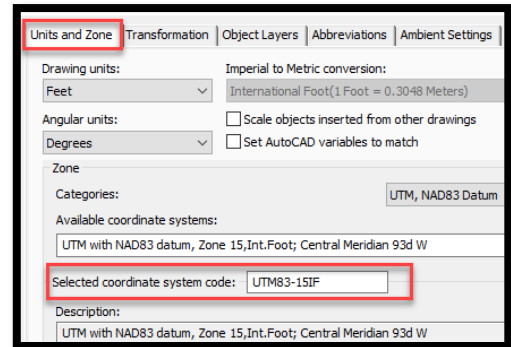
Button to Press *Displayed Text* **Icon** Action {Text to Enter} *Menu Item...*

- A. **Identify project location and extent of data needed for the area being worked on.**
- B. **Download LAS file from USDA GeoCue LiDAR server.**
- C. **Create the surface within Civil 3D using LAS/LAZ files.**

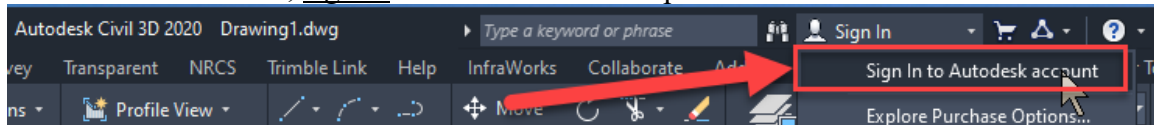
Prerequisites

Set/Verify the Coordinate System and Zone of the drawing

1. Toolspace>Settings... Right click on the current Drawing name...
2. Click *Edit Drawing Settings...* *Units and Zone* tab
3. Click into the *Selected coordinate system code* and input value
E.g. {UTM83-15IF} for IA.
4. Click **OK**



Within Civil 3D 2020, sign in to Autodesk at the top of window.



The Sign in screen allows the user to **Create Account** if you haven't done so yet.

A. Identify project location & extent of LiDAR data needed


Use Survey Points and/or Georeferenced Image to Locate Site

Optional: Insert GNSS survey points (See **Importing Survey Point Files** instructions)


1. Click *Geolocation... Online Map... Map Aerial...* (or whichever type of map you want to see.) The map should display in your entire drawing area.
2. Zoom to the location that you are working at.

Draw a boundary for the LiDAR Data limits

Use a geo-referenced image or points to help you place the boundary correctly.

3. Tool Palette>NRCS 11x17B... Click *Breaklines and Boundaries...Boundary Line...*
 Boundary Line (Ctrl + 3 to toggle Tool Palettes on/off)
4. While not snapping to survey points, click to draw a border around outside of the planned LiDAR boundary limit. (F3 toggles Osnaps on/off.) To close the line cleanly, type {C} and press Enter.

Export the proposed LiDAR boundary closed polyline as a Google KML file

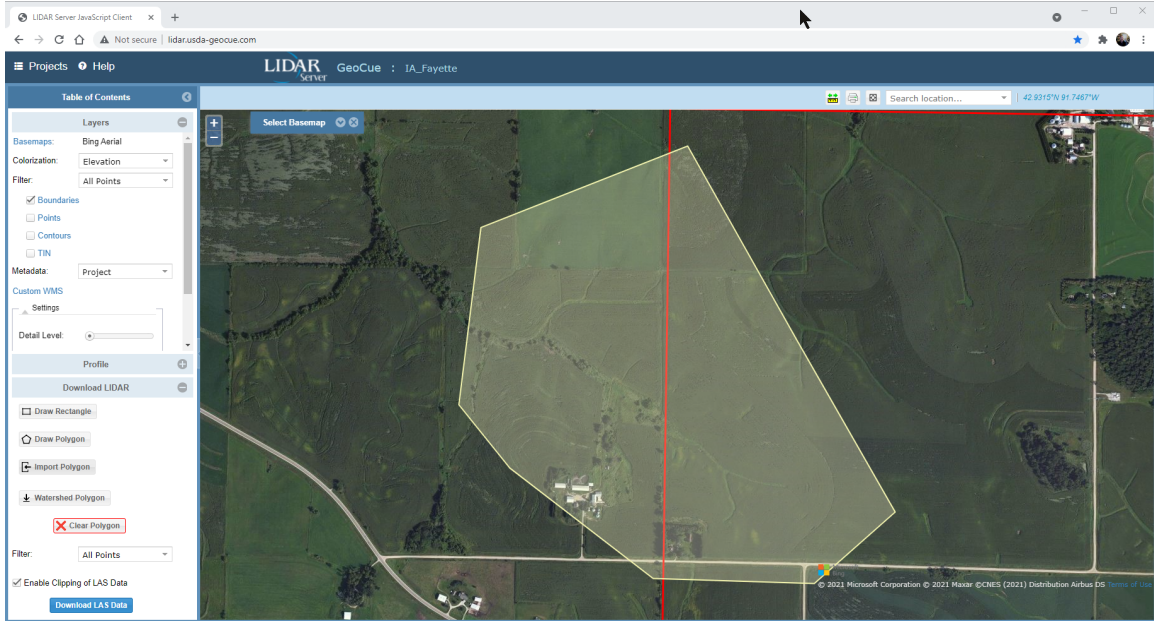
5. Type {Mapexport} Press Enter
6. Pulldown “File of Type” to *Google KML*
7. Browse to the location where you want to save the boundary file.
8. Input a filename for the KML E.g. {OpenRange LBoundary} Click OK
9. From the Selection Tab
 - a) Use *Select Manually* & click **Select Objects**  to pick the lines in CAD. When done selecting items press Enter.
10. From the Option Tab
 - a) Checkmark *Treat Closed Polyline as Polygons*
11. Click OK The processing screen will display the numbers of objects and will disappear once the file has been created.

B. Download LAS file from USDA GeoCue LiDAR server.

Identify and Download data from LIDAR Server

1. Using an Internet browser such as Microsoft Edge, Firefox, or Google Chrome browse to lidar.sc.egov.usda.gov
2. Select the Grid Index tab at the top to dialog to view available projects in a grid format.
3. Scroll down to the state and county e.g *IA – Fayette* and click **View Metadata** to note the details of the coordinate system and units of the data.
4. Close the metadata screen and click the title link for your data. The map of the area and the LiDAR tiles will appear.
5. Set *Colorization* options in *Table of Contents (TOC): Layers to Elevation*
6. Set *Filter* options in *Layers* to *All Points*
7. Select the *Download LIDAR+* section to expand it.
8. Click the **Import Polygon** function and browse to the Google **KML** file of your project boundary. E.g. *OpenRange LBoundary.kml* file. Click Open and the page will zoom in to the boundary.

LAS LiDAR Data into CAD




Verify that the area is within the red boundary of the GeoCue data. The data can extend into multiple grids.

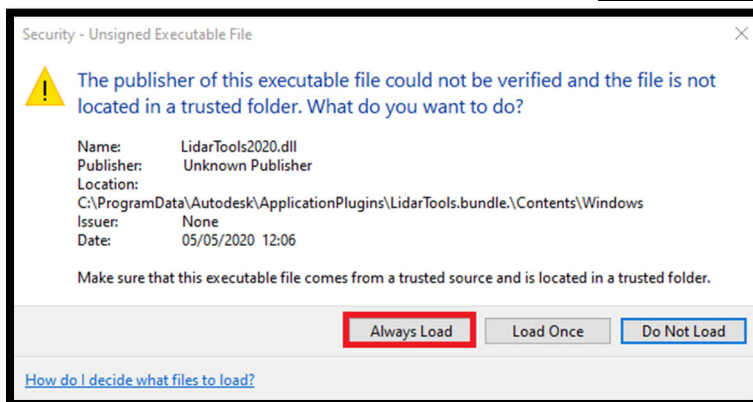
9. Set the *Filter* to *Ground* and checkmark *Enable Clipping of LAS Data*.
10. **Click Download LAS Data** to download the LAS data based on the loaded polygon extent. **Click Download.**
Note: Download times of 2 to 20 minutes are likely, depending on file size and connection.
11. If needed move the downloaded file from downloads into your project folder.

C. Create the surface within Civil 3D using LAS/LAZ files.

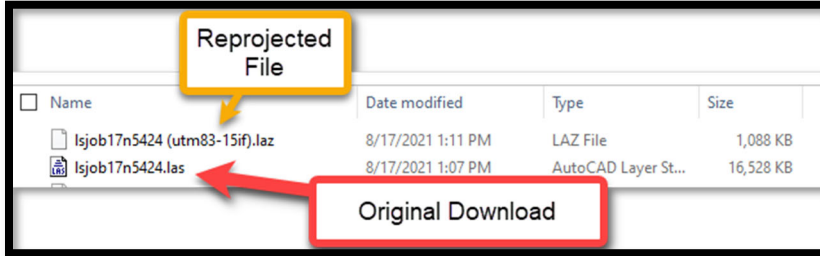
Civil 3D Steps

Reproject the LAS Data to the Correct Coordinate System (if needed)


1. Click Add ins... LiDAR Tools...  LiDAR Project...
Note: If you receive this security pop-up, click Always Load




2. Browse to the LAS file that was downloaded. E.g. *lsjob17n5424.las* Click **Open**
3. Input the Source File System code E.g. {UTM83-15} Press Enter
4. Using the value of the drawing coordinate system, input the Target File System code E.g. {UTM83-15IF} Press Enter
An LAZ file with the target code included will be created.



Place the Tile Limits of the LAZ/LAS Data into the Drawing

5. Click *Add ins... LiDAR Tools...*  *LiDAR Tiles...*
6. Browse to the LAZ/LAS file that was reprojected/downloaded.
E.g. *lsjob17n5424 (utm83-15if).laz* Click **Open**
7. At Point Cloud Class Counts Type {N} Press Enter
A boundary around the limits of the LiDAR Data will appear. Compare this to the Georeference map to make sure the coordinate systems are in sync.

Create the LiDAR Surface from the LAZ/LAS Data

8. Click *Add ins... LiDAR Tools...*  *Create LiDAR Tin...*
 9. Browse to the LAZ/LAS file that was reprojected/downloaded.
E.g. *lsjob17n5424 (utm83-15if).laz* Click **Open**
 10. At Classes Counts Type {2} Press Enter
 11. At First Corner click outside of lower left corner of tile rectangle
 12. At Other Corner click outside of upper right corner of tile rectangle.
Note: Patiently wait for the message to disappear below the command line.
A boundary of the LiDAR Surface will appear. The surface will appear in Toolspace with a name in the format of YYYYMMDDxxxxxxxx.
- Rename the surface:
13. Select the surface in the drawing. Right click... *Surface Properties... Information...*
 14. Input new name: {Ognd LiDAR LAS}. Click **Ok.**

Force contours to stay inside of the boundary

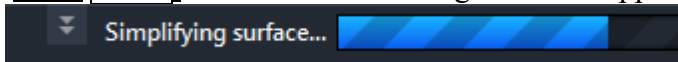
If a concave boundary was used contours that extend past the boundary can be eliminated.

15. Toolspace> Prospector... *Surfaces... Ognd LiDAR LAS... Definition...* Right click *Boundaries*
16. Click *Add*

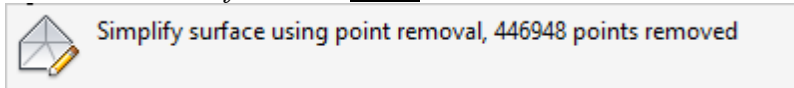
17. In the Add Boundaries Box set the Type to *Outer* and uncheckmark *Non-destructive breakline*.
18. Click **Ok** and select the previously drawn boundary line object.

Reduce the Data size of the LiDAR Surface

19. In Toolspace> Prospector... *Surfaces... OgnD LiDAR LAS... Definition...* Right-click *Edits*
20. Click *Simplify Surface*
21. Select Point Removal....(Notice the numbers of points in region) Click **Next**
22. Select Use existing surface border.... Click **Next**
23. Checkmark Percentage of points to remove....Try 90%
24. Checkmark Maximum change in elevation....Try 0.1
25. Click **Finish** and wait for the dialog box to disappear



26. To see the number of points removed: Toolspace> Prospector... *Surfaces... OgnD LiDAR LAS... Definition...* Click *Edits* ... and look at the description of the edit.



The information is also found on the *Surface Properties... Definition* tab.

Display the Contour lines in CAD

27. Toolspace> Prospector... *Surfaces...* Right click *OgnD LiDAR LAS...* Click *Surface Properties...*
28. Click the *Information* tab and Set the *Surface Style* to a no smoothing display that you want. E.g. *OgnD Contours (2 and 10) No Smoothing*
29. Click **OK**
30. If the display does not refresh type {rea} and Press **Enter**
31. If not all contours display while zooming in and out you can turn off Level of Detail by typing {LEVELOFDetailed} Press **Enter**.
32. If an image is present you may need to send it behind the contours. Select the image. Right-click *Display Order...Send to back...*
33. Review the contours.

Locking a Surface to Protect it **(Highly Recommended)**

Lock the surface model once you are satisfied with it.

34. In Toolspace> Prospector... *Surfaces...* Right click *OgnD LiDAR LAS...* Click *Lock...*

View Statistics about the LiDAR Surface

35. Toolspace> Prospector... *Surfaces...* Right click *Ognd LiDAR LAS...* Click *Surface Properties...*
36. Click the *Statistics* tab and expand the *General, Extended,* and *TIN* details
37. Click