



Autodesk  
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## Integrating Laser Scanning Data with AutoCAD® Civil 3D®

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CV210-3      Pete Kelsey (Autodesk), John Brown (METCO), and Joe Hedrick (Avatech) will show you how to integrate laser scanning data, aka point cloud data, into Civil 3D. A laser scanner will be in the classroom so you can see the actual field to finish process using Leica's Cyclone/CloudWorx and AutoCAD Civil 3D.

### **About the Speaker:**

Pete is a technical evangelist for Autodesk. He first used AutoCAD 15 years ago, quickly adapting it to his surveying and mapping duties for the U.S. Army and his geology studies at the University of Iowa. He worked for several civil engineering firms, helping them transition from manual to CAD drafting. In 1996, Pete became an independent consultant, providing technical services for customers all over the world, and in 2001, started his company K-TEK, which numbered 74 employees in seven countries worldwide. His desire to return to the customer realm led him to sign on with Autodesk in 2006.

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**NOTE: This document assumes that you have AutoCAD Civil 3D 2008 (with Service Pack 2 and Survey Link) and Leica Cyclone/CloudWorx installed**

### **Configure Database**

Databases (aka raw, point cloud data from Leica HDS scanners) have names ending in the **.imp** extension. Before beginning, ensure that you have write permission for this database (that it is not read-only). Configuring a database establishes a connection with the Cyclone database and point cloud engine.

**The first step is to open a database and set a limit box in Cyclone**

### **Start Leica Cyclone**

**Open a database (.imp file)**

**VIEWPOINT > STANDARD VIEWPOINTS > TOP**

This sets your view to plan view

**VIEW > SET LIMIT BOX BY CURSOR**

This will limit the view of the point cloud (the number of points it needs to display) and, in turn, speed up your work and make things easier to identify in the point cloud

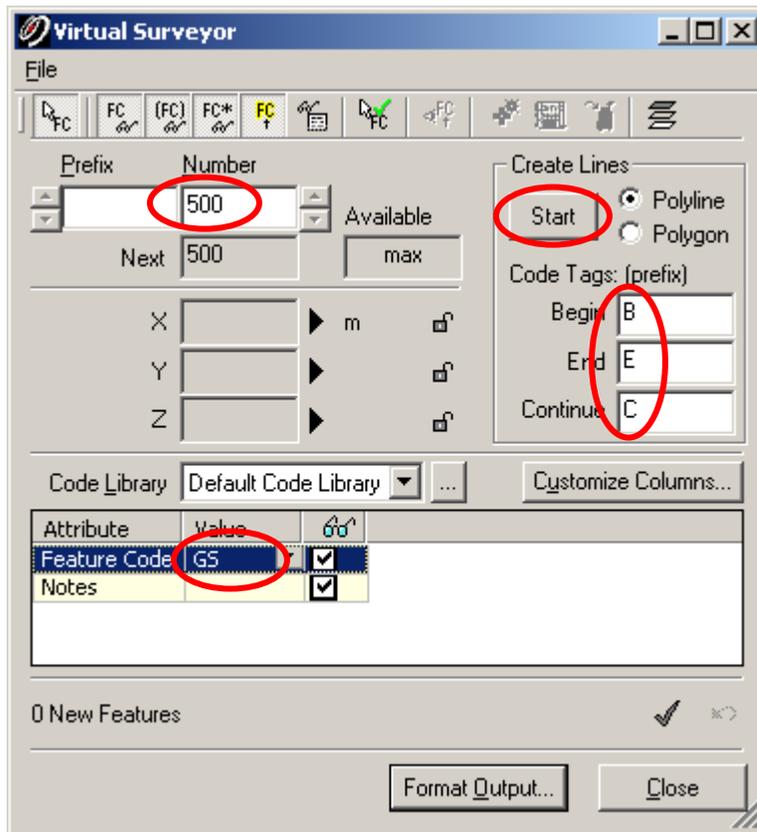
**TOOLS > REFERENCE PLANE> SHOW ACTIVE PLANE**

**TOOLS > ACTIVE PLANE> EDIT ACTIVE PLANE**

Edit Grid Size appropriately

The next step is to create polylines that will ultimately become FIGURES in Civil 3D

## TOOLS > VIRTUAL SURVEYOR



Select **SKIP** in the **OPEN EXISTING VIRTUAL SURVEYOR FILE** dialog box

**NOTE: Auto-add Feature toggle must be OFF. Virtual Surveyor is unable to create line work with Auto-add Feature toggle – ON.**

Set appropriate starting point number

Enter **B** for Begin, **E** for End and **C** for Continue in the **Code Tags (prefix)** cells

Pick in the **VALUE** cell to the immediate right of the **FEATURE CODE** attribute and enter in all of your features codes. (These should include your description keys and figure names from Civil 3D)

**NOTE: Enable the Multi Pick Mode**



## CREATING LINES

Click the START button in the Create Lines area, select the multi-pick tool and set points along the feature that you want depicted with a line, trying to stay as close to the Reference Plane separation as possible.

When finished, click the Add Features checkmark box to store these points. Once the Add Features checkmark is pressed, the line ends.

The first point that was set will have the prefix of "B " (e.g. "B CURB1") and the last point that was set will have the prefix "E " (e.g. "E CURB1").

To start a new line, press the START button in the Create Lines area and continue setting points.

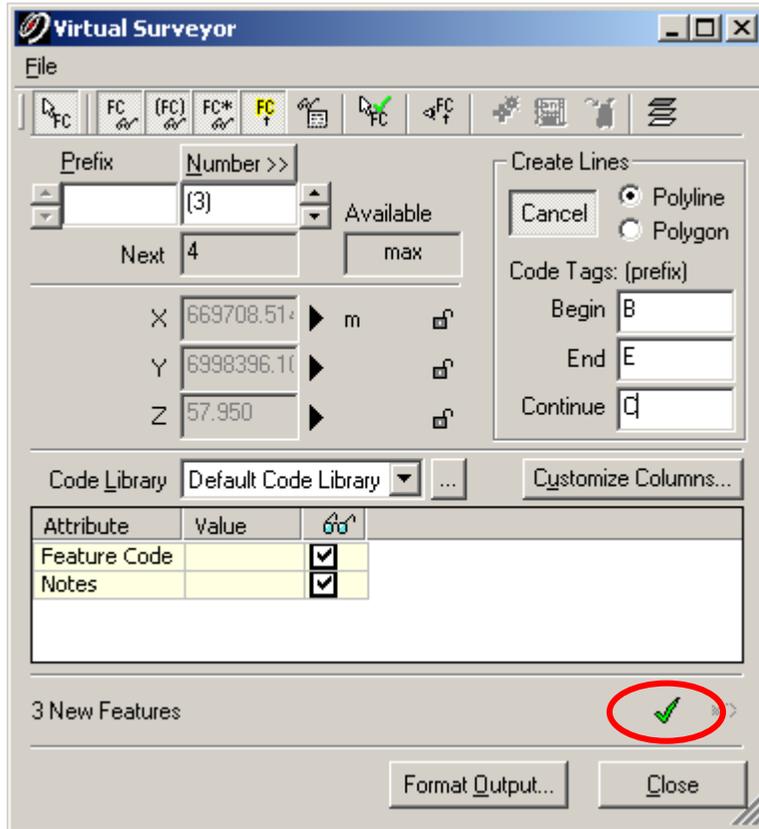
## CREATING CURVES

If you encounter a curve while setting points along the feature, special consideration needs to be applied. We create 3 point curves after all the points are set and exported. *(This will be explained a little later on.* In order to create curves, points need to be set at the beginning, mid-point or point-on-curve, and the endpoint of each curve, noting the point number of the beginning point of each curve. Select the **START** button in the Virtual Surveyor dialog box (leave the dialog box open for the duration of the exercise)

**PICK** the series of points that make up your polyline (i.e. edge of pavement, back of curb, tops / toes of slopes etc.)

**Note: to PAN / ZOOM transparently you must select the VIEW MODE. Remember, you must return to the MULTI PICK TOOL to resume creating points/polylines.**

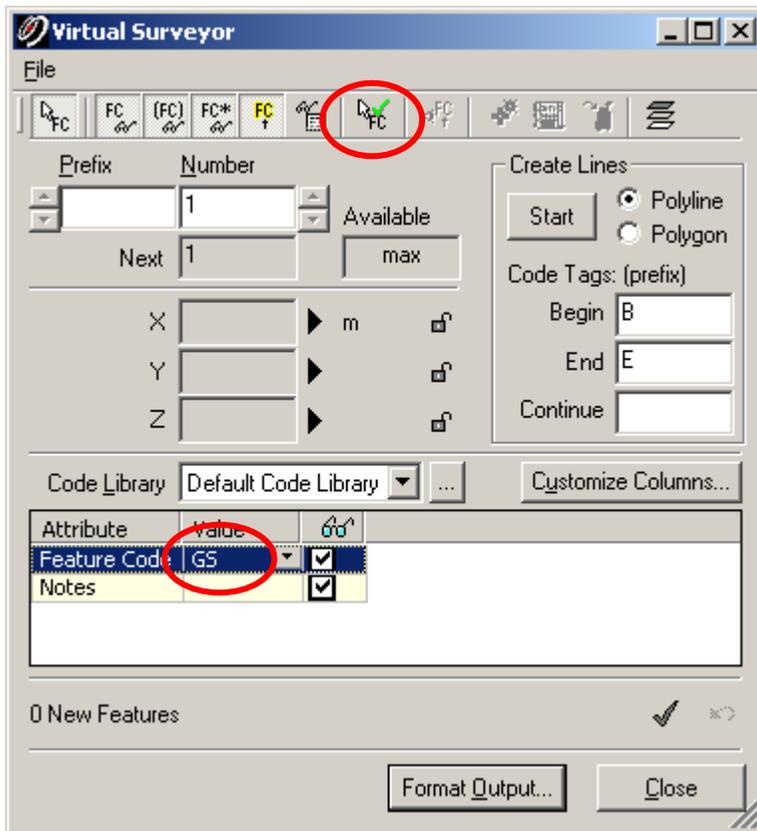
When you are finished creating your polyline **SELECT THE GREEN CHECK MARK SYMBOL** in the lower right hand corner of the virtual surveyor dialog box. This will "finish" the polyline and draw it.



The next step is to create points to be used as typical ground shots for terrain modeling in Civil 3D

With Virtual Surveyor still open create a new feature code called GS (for ground shot) and set it current

Toggle on the **Auto Add Features** button

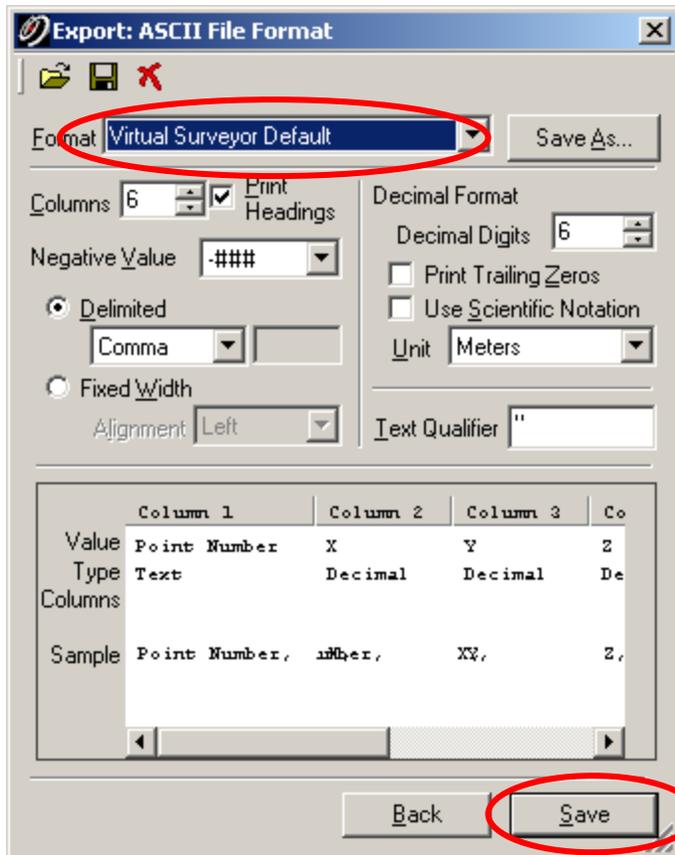


Pick all of the typical ground shots one after the other referencing your grid (reference plane)

When you are finished proceed to the next step – DO NOT CLOSE VIRTUAL SURVEYOR

The next step is to create an ASCII text file (.txt) that we will create an Autodesk fieldbook (.fbk) from the polylines and points we created in Virtual Surveyor

In Virtual Surveyor select the **FORMAT OUTPUT . . .** button



Select an existing or create a new ASCII text format to export to

Select the **SAVE** button. This will allow you to name, locate and save the text file (.txt)

**The next step is to create an Autodesk fieldbook (.fbk) from the ASCII text file using Survey Link**

In Civil 3D type **STARTSURVEYLINK** at the command line

In Survey Link select **CONVERSIONS > CONVERT FILE FORMAT**

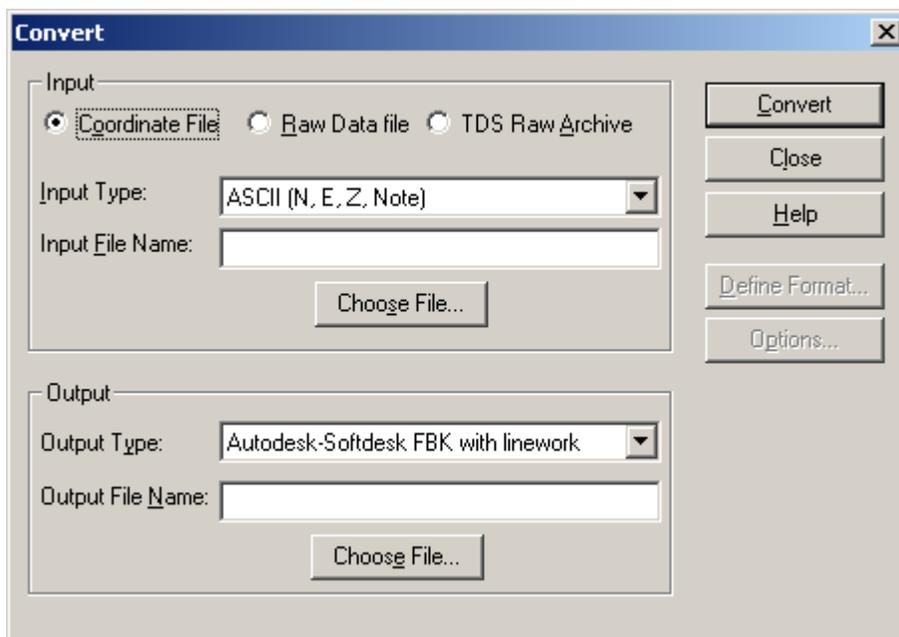
In the INPUT TYPE field set to **ASCII (N, E, Z, Note)**

Browse to and select the ASCII text file (.txt) that you created in Virtual Surveyor by selecting the **CHOOSE FILE** button

In the OUTPUT TYPE field select **Autodesk-Softdesk FBK with linework**

Select the **CHOOSE FILE** button to name and locate the fieldbook (.fbk) file that will be created.

Note: By default Civil 3D looks for FBK files in the survey database folder





## The next step is to import the Autodesk Fieldbook (.fbk) into Civil 3D

Launch Civil 3D and start a new DWG with an appropriate template (.dwt)

Select the **SURVEY** tab in Prospector, Right Click on **SURVEY DATABASE** and select **New Local Survey Database . . .**

Name the new Survey Database and pick **OK**

Right Click on the New Survey Database file and select **Edit Survey Database Settings . . .**

Make any appropriate changes (units, coordinate zone, etc.) to the Survey Database settings and pick **OK**

Right Click on Networks and select **New . . .**

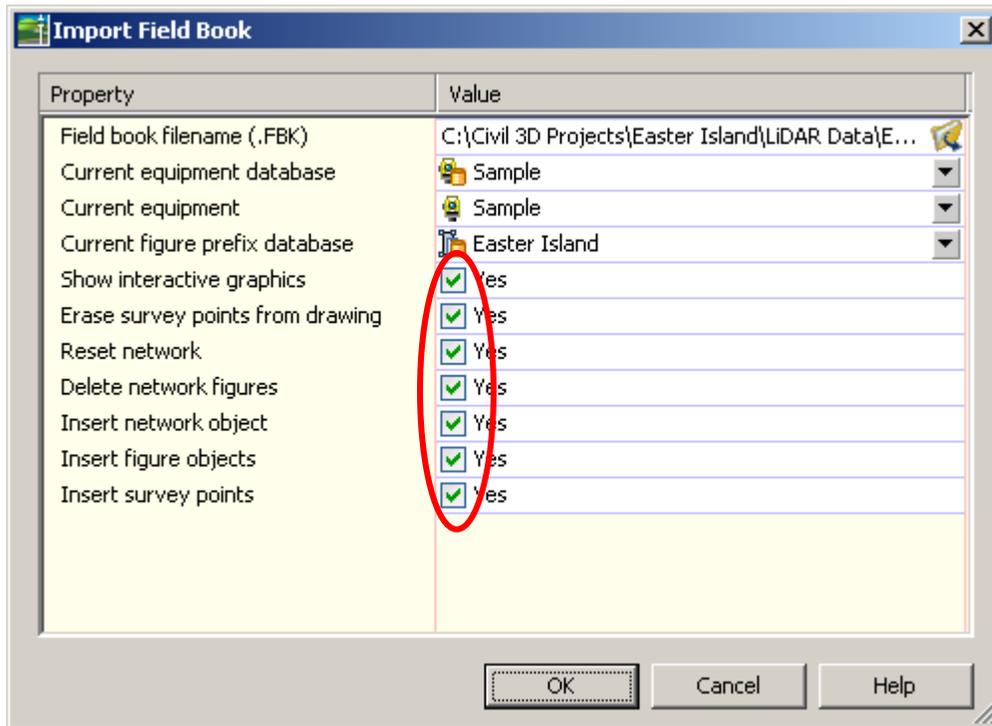
Name the Survey Network appropriately and pick **OK**

Right Click on **Figure Prefix Databases** and select **NEW . . .** to create a new Figure Prefix Database (if you have never used figures before in Civil 3D) (or) set the appropriate Figure Database current by right clicking on it and selecting **MAKE CURRENT . . .**

Right click on the new, named survey network and select **IMPORT FIELDBOOK . . .**

### **Path to and select the Fieldbook (.fbk) file to import into the Drawing**

Enable all of the settings in the Import Fieldbook dialog box (NOTE: You will likely not want to select all of these setting if you plan to import additional fieldbooks into the same drawing)





**The final step is to create a digital terrain model (DTM aka Surface) from the points and figures that were created from the fieldbook**

In the PROSPECTOR tab Right Click on Surfaces and select **CREATE SURFACE**

Name the surface appropriately and assign an appropriate surface style

In PROSPECTOR select the plus sign (+) to the left of **SURFACES**

In PROSPECTOR select the plus sign (+) to the left your new, named surface

In PROSPECTOR select the plus sign (+) to the left of **DEFINITION**

Right mouse click on Point Groups and select **ADD . . .**

Select the point groups called **ALL POINTS** and select **OK**

Select the **SURVEY** tab

Right mouse click on **FIGURES** (found “under” your named survey database file – select the plus sign (+) next to your survey database if you do not see it) and select **CREATE BREAKLINES . . .**

Select the appropriate surface (DTM) to add the breaklines to and pick **OK**

Pick **OK** again