

Welcome to CloudWorx 3.1 Tutorial

[CloudWorx](#) is the high-performance point cloud solution that enables you to load, render, analyze and extract information from high-definition surveying (HDS) 'point cloud' data in [AutoCAD](#)®.

The enhanced functions allow you to:

- View millions of points within your AutoCAD environment
- View proposed construction over existing conditions
- Model proposed construction over existing conditions to meet and exceed clearances and specifications
- Create maps using AutoCAD commands

For in-depth explanations and definitions on High Definition Surveying terms, please refer to the CloudWorx help files and user manuals. This tutorial assumes that you are familiar with AutoCAD.

Section I - CloudWorx 3.1 Basic: Civil / Survey Applications

CloudWorx 3.1 basic offers enhanced viewing functions to navigate through a point cloud. You will be working with the database **Civil_Survey.imp** and the drawing **Civil_Survey.dwg** delivered with this CD to see how different 3D views, sections and cut planes can be used to extract data. These files and databases can also be downloaded from the Leica HDS WEB site. For this Section, you will be working with a database that consists of a bridge roadway.

Section I. CloudWorx 3.1 Basic instructs how to:

- Configure and Add a Cyclone HDS database
- Load a ModelSpace View (3D point cloud)
- Hide Regions
- Clip Points to Slice
- Clip Points to Section
- Dimension bridge clearances

Configure Database

Databases to be configured exist on disk as files, with 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.

1. Copy the files **Civil_Survey.dwg** and **Civil_Survey.imp** from the *Cyclone* CD to your hard drive under **C:\Program Files\Leica Geosystems\Cyclone\Databases**.
2. Open the file **Civil_Survey.dwg**
3. Select **CloudWorx | Configure Databases...** See *Figure 1*.
4. Expand the Servers folder and highlight the existing server (by default this is your computer).
5. Click the **Databases...** button in the **Configure Databases** dialog.
6. Click the **Add...** button in the **Configure Databases on [Server Name]** dialog.
7. Click the "...” button next to the **Database Filename** field.
8. Browse to the location of the **Civil_Survey.imp** database file.
9. Click **Open** when the file **Civil_Survey.imp** has been located and highlighted.
10. Click **OK** in the **Add Database** dialog.
11. Click **Close** in **Configure Databases on [Server Name]** dialog.
12. Click **Close** in **Configure Databases** dialog.

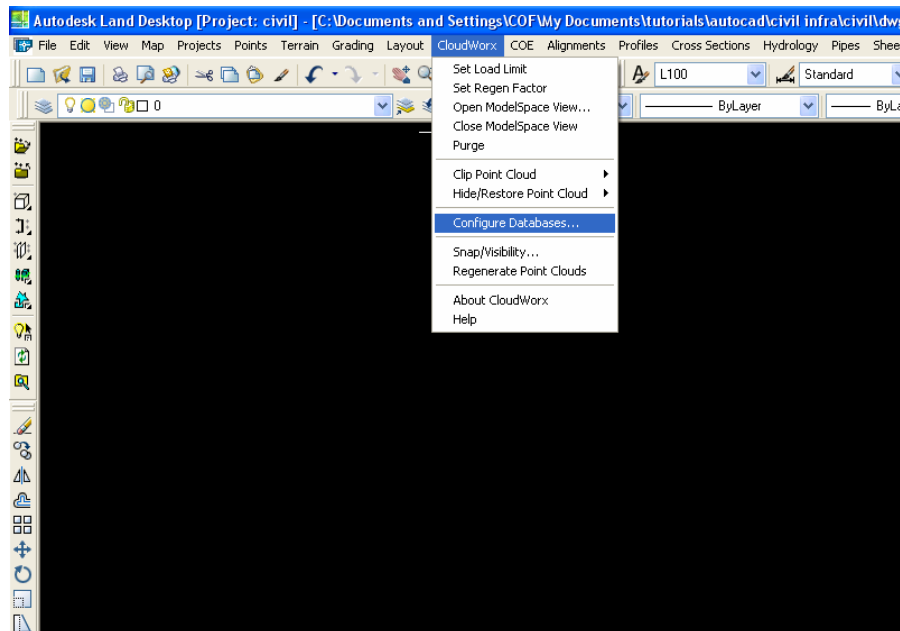



Figure 1. Configure Databases

Load ModelSpace View

Once a database is configured, the point cloud data in the database is available for loading.

1. Select **CloudWorx | Open ModelSpace View...** 
2. In the **Open ModelSpace View** dialog, click the "..." button.
3. In the **Select ModelSpace View** dialog, expand the Project hierarchy by clicking plus signs. The path for desired ModelSpace View is: **Civil_Survey\ModelSpace\ModelSpace View 1**. Highlight "ModelSpace View 1" and click **Open**
4. In the **Open ModelSpace View** dialog, set AutoCAD units to "meters".
5. Set **Coordinate System** to "(unsaved cs) (current)"
6. Click **OK** in the **Open ModelSpace View** dialog to load the point cloud. The command line will update during this process, displaying the number of points being loaded. Your screen should look like *Figure 2*.
7. Use **Pan** and **Zoom** commands to view the point cloud
8. If zoomed in, regenerate point clouds by typing **cwregen** at command prompt

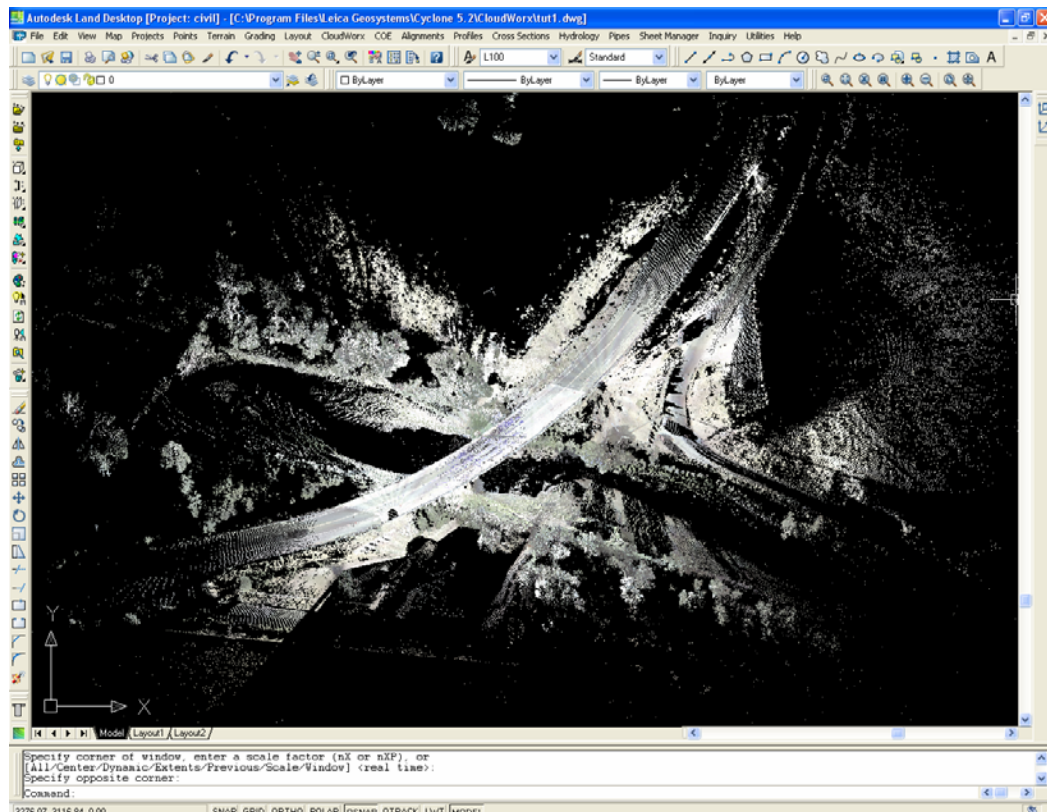


Figure 2. tut1.dwg (top view)

Hiding Regions

Here you will learn how to view and hide different areas of your point cloud.

1. Open **Civil_Survey.dwg** and open ModelSpace View from the previous exercise.
2. Select **Hide/Restore Points Cloud | Inside Fence** from pulldown or toolbar
3. Select **P** for "Polygon" at the command prompt.
4. Draw a polygon similar to *Figure 3*. Press the **Enter** key to accept the fence. Your screen should now look like *Figure 4*.

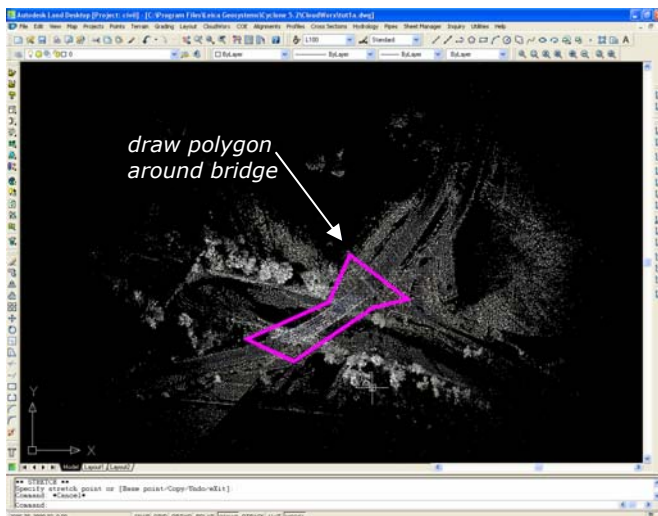


Figure 3. Polygon around work area

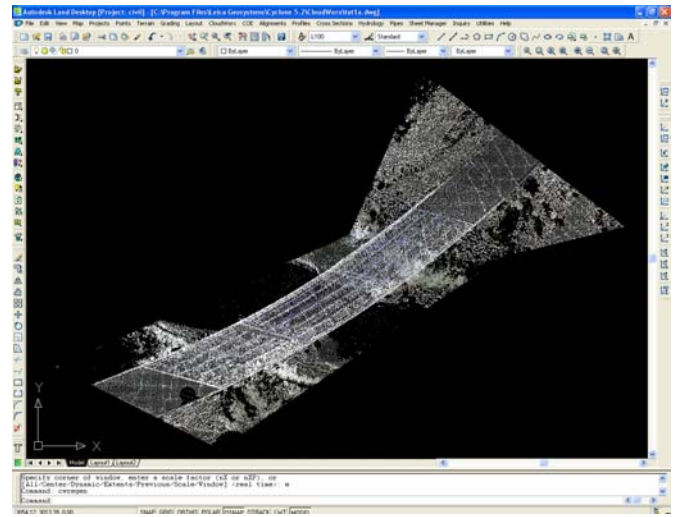


Figure 4. After zoom extents and cwregen

To view the original point cloud,

1. Select **Hide/Restore Point Cloud | Hide Regions Manager...**
2. Uncheck the **State** check box.
3. Click the **Ok** button.

Clip Points to Slice

Slices enable you to view point cloud sections in specific areas. For example, creating a slice through the middle of the bridge would generate a profile, allowing you to dimension elevations or model different proposed bridge routes to meet changed specifications.

In this tutorial, as may be the case for certain job, roads, bridges and other structures are not necessarily aligned with one of the coordinate axes. In order to use **Clip Points to Slice** and **Clip Points to Section** to their fullest capacity, AutoCAD coordinates can be temporarily aligned to the User Coordinate Systems (UCS). Creating additional viewports is also recommended. In this exercise, we will:

- Switch to user defined coordinates that are aligned with our bridge
- Create two different viewports
- **Clip Points to Slice**

Create viewports (AutoCAD commands)

1. Create two horizontal viewport using AutoCAD’s **View | Viewports | Named Viewports**
2. Click in the upper viewport to activate it.
3. Select **View | 3D View | Right**

Switch to user-defined coordinate system (AutoCAD commands)

1. Click in the lower viewport to activate it.
2. Set the “Tut1 Rotate” named UCS as the current UCS. Your two views should look like *Figure 5*.

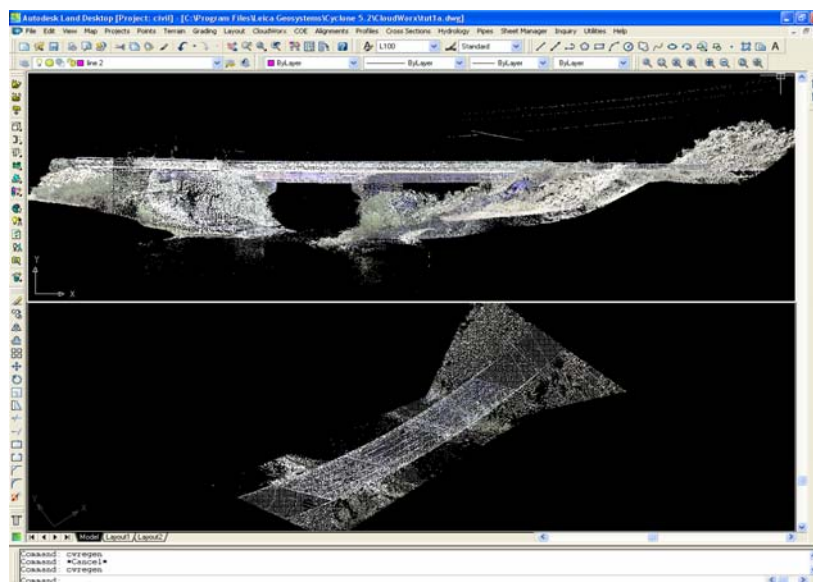


Figure 5. Front view (top); new UCS (bottom)

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You are now ready to Clip Points. In **Clip Point to Slice**, two parallel planes are defined. Only those points between these two planes are displayed.

1. Select **Clip Point Cloud | Slice | Y Axis**
2. Place the two clip planes as shown in *Figure 6*.

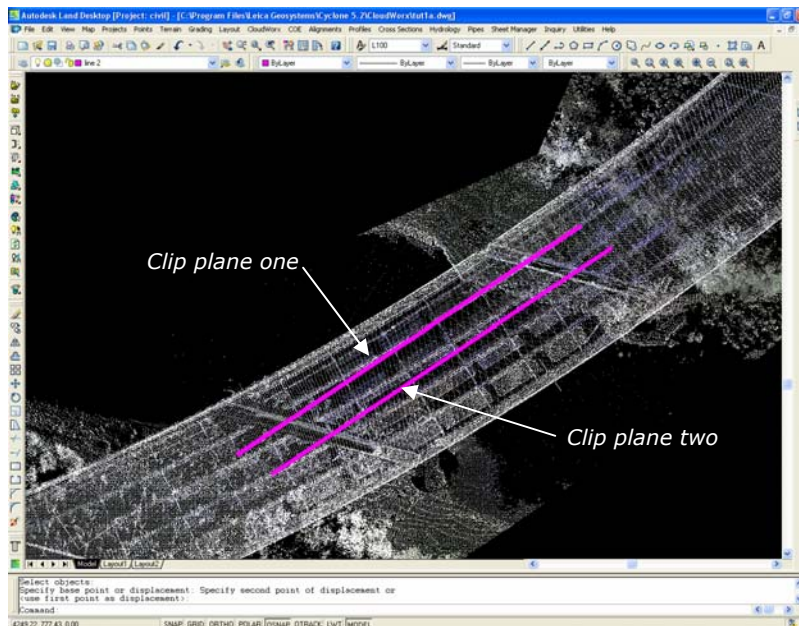


Figure 6. Clip Plane selection

3. Your viewports should now look similar to *Figure 7*.
4. Your viewports are now set up to dimension bridge clearances or elevations using AutoCAD dimensioning commands. See *Figure 8*.

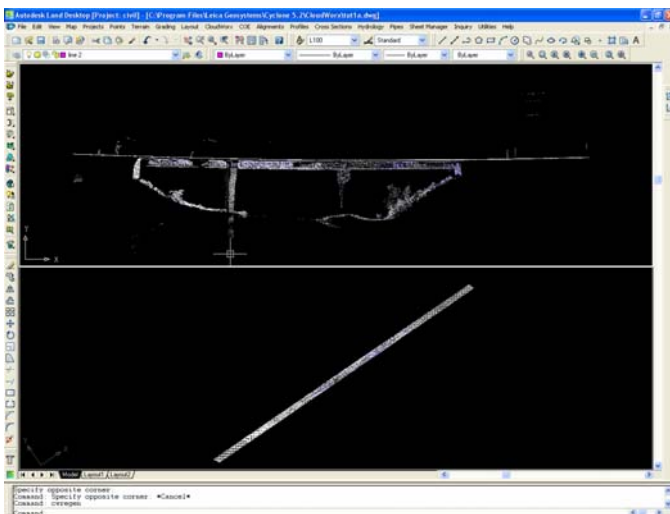


Figure 7. Clip plane views

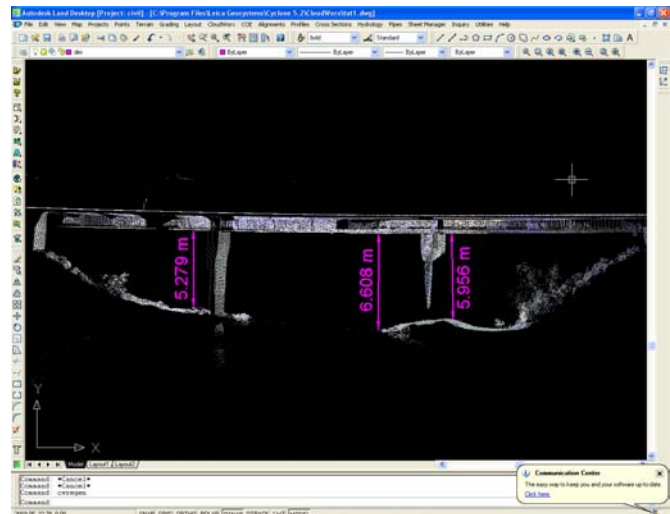


Figure 8. Bridge clearance dimensions

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Clip Points to Section

Similar to **Clip Points to Slice**, **Clip Points to Section** enables you to view point cloud sections in specific areas; your points, however, are viewed only on one side of defined plane. In this exercise, you will cut a road cross-section in order to dimension the sag low point of a powerline.

View the bridge work area again to start the next Exercise

1. Select **Clip Point Cloud | Cut Plane Manager**
2. Highlight "Original Cut Plane"
3. Under **Type**, select "."
4. Click on **Set Current**
5. Check the **Show** check box and uncheck the **CloudWorx CutPlane** check box.

At this point, the complete bridge area should be visible again. Your viewports should look like *Figure 5* again.

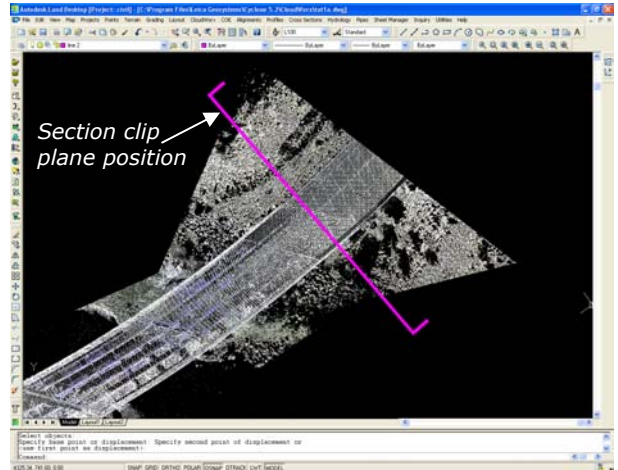


Figure 9. Section clip plane

6. Select **Clip Point Cloud | Section View | X Positive**
7. Select your section clip plane position, similar to *Figure 9*, resulting in a drawing similar to *Figure 10*.
8. Next, use AutCAD's **View | 3D Orbit** to position your view in cross-section. See *Figure 11*.
9. From this viewpoint, you can either dimension or list the clearance distances needed.

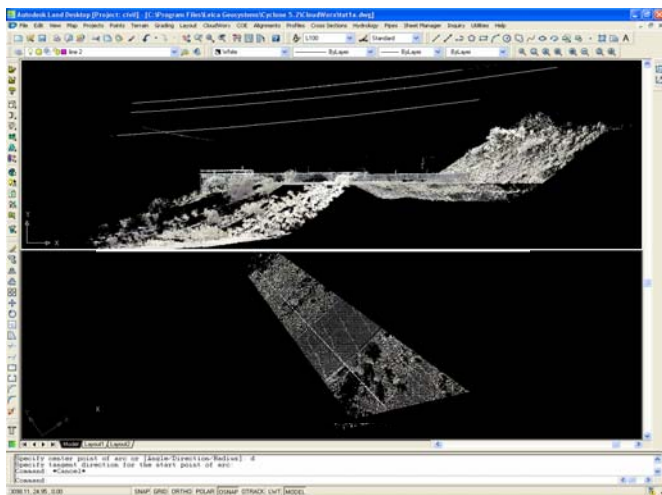


Figure 10. Clip Section results

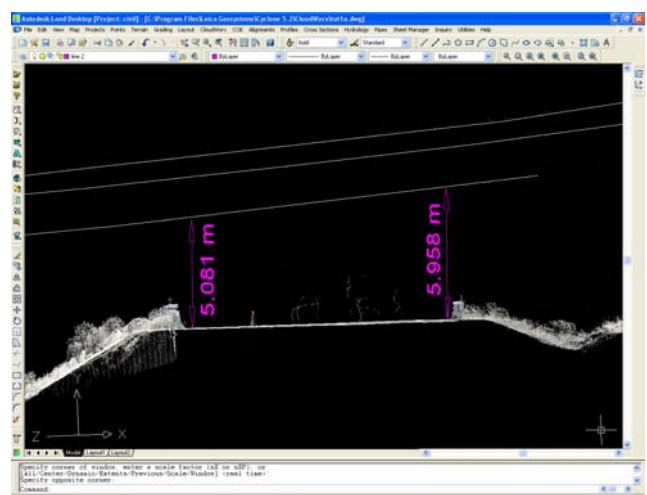


Figure 11. cross-section orbit view

These are some of the viewing and point cloud manipulation tools available in CloudWorx Basic – Section I. In CloudWorx Pro - Section II of these Tutorials, further point cloud viewing techniques as well as instructions on advanced Commands/*Cyclone* interaction are discussed.