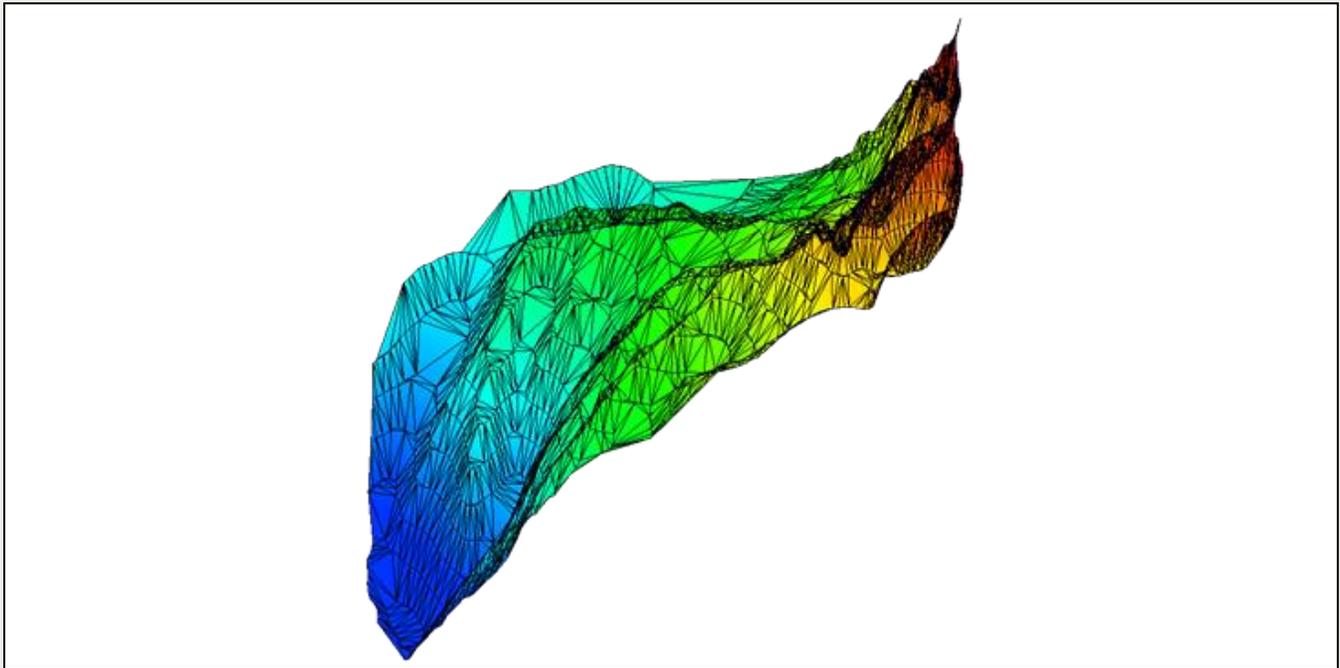*WMS 11.4 Tutorial*

Using CAD Data

Import, view, edit, convert, digitize, and export CAD data

Objectives

Learn to import CAD files, convert them to feature objects and TINS, and export TIN contours to a CAD file format.

Prerequisite Tutorials	Required Components	Time
• None	• WMS Core	• 15–25 minutes

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1   Introduction

Files created using computer-aided design (CAD) can be an excellent way to import elevation contours as well as detailed designs and layouts for a specific area.

This tutorial will demonstrate and discuss importing CAD data, converting CAD data to TINs and feature objects, and exporting project data to a CAD file.

2   Getting Started

Starting WMS new at the beginning of each tutorial is recommended. This resets the data, display options, and other WMS settings to their defaults. To do this:

1. If necessary, launch WMS.

2. If WMS is already running, press the **Ctrl-N** key combination, click on the ☐ **New** macro, or select the *File* | **New…** menu item to ensure that the program settings are restored to their default state.

3. A dialog may appear asking to save changes. Click the **Don't Save** button to clear all data.

The graphics window of WMS should refresh to show an empty space.

3   Importing a CAD File

CAD data can be found in multiple formats. WMS can import DWG, DXF, and DGN file formats. To import a CAD file, do the following:

1. Select the *File* **| Open…** menu item to bring up the *Open* dialog.

2. From the *Files of type* drop-down menu, select "All Files (*.*)".

3. Navigate to the *cad-wms* folder and select the "tmcontours.dwg" file.

4. Click the **OK** button to import the file into WMS and exit the *Open* dialog.

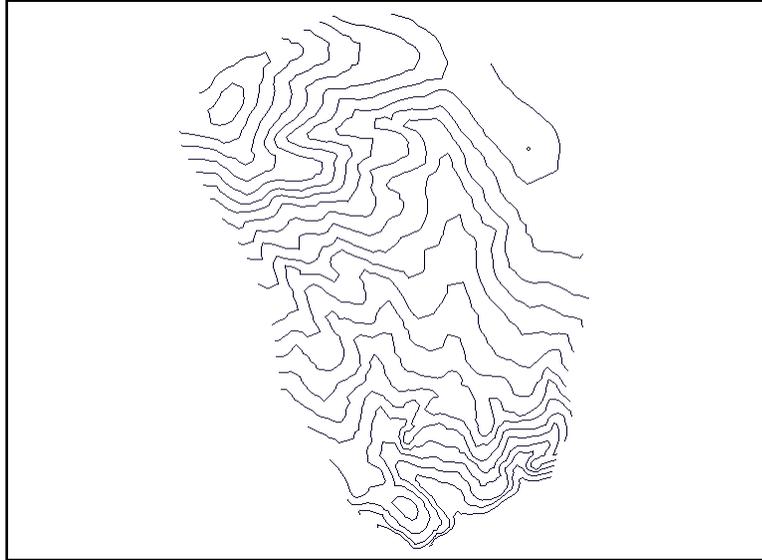This file was created in a CAD program and contains elevation contours for a small area, refer   Figure 1.

Figure 1:   Imported CAD contour file

4   Converting CAD Data to Feature Objects

Terrain data is often stored or processed in a CAD program in the form of contours or triangles. In either case, the 3D data points (*x,y,z*) can be converted from the CAD data in WMS.

The elevation contour data in this file should first be converted to arcs.

1. In the Project Explorer, under the " CAD Data" GIS Data folder, right-click on the " tmcontours.dwg" CAD item and select *Convert | Feature Objects…* context menu item to bring up the *CAD → Feature Objects* dialog.

2. On rows 1 (*0*) and 2 (*CAD layers_outletpls*) turn off the checkboxes, leaving the row 3 (*CAD layers_arcs)* checkbox turned on.

3. Click the **OK** button to close the *CAD → Feature Objects* dialog and bring up the *Clean Options* dialog.

4. Accept the defaults and click the **OK** button to close the *Clean Options* dialog and open the *Properties* dialog.

5. From the *Coverage type* drop-down, select "General".

6. For the *Coverage name,* enter "Feature CAD".

7. Click the **OK** button to close the *Coverage Properties* dialog and return to the Project Explorer.

A new " Feature CAD" map data coverage should appear in the Project Explorer.

4.1   Redistributing the Vertices

In order to maintain consistency across all of the arcs, it is recommended to redistribute the vertices after converting from a CAD file.

1. From the *Macro* bar, switch to the **Map** module.

2. Select the **Select Feature Arc** ⟋⟍ dynamic tool.

3. Select the *Edit | Select All* menu item to select all feature arcs.

4. Select the *Feature Objects | Redistribute…* menu item to bring up the *Redistribute Vertices* dialog.

5. In the *Arc Redistribution* section, from the *Specify* drop-down, select "Specified spacing".

6. For the *Average Spacing,* enter "20.00"**.**

7. Click the **OK** button to close the *Redistribute Vertices* dialog.

8. In the Graphics Window, click anywhere outside of the arcs to deselect them.

The arc vertices should now be redistributed, and the arcs can be converted to a TIN.

4.2   Converting the Coverage to a TIN

Now that the "🟢 Feature CAD" coverage has been created, convert it to a TIN.

1. Select the *Feature Objects | **Build Polygon*** menu item. If asked to use all arcs, click the **OK** button.

2. In the Project Explorer, right-click on the "🟢 Feature CAD" Map Data coverage and select the **Create TIN…** context menu item to bring up the *Create TIN Options* dialog.

3. Accept the defaults and click the **OK** button to close the *Create TIN Options* dialog.

A "⬡ New tin" terrain data coverage should appear in the Project Explorer.

4. Right-click on the "⬡ New tin" terrain data coverage and select the **Rename** context menu item.

5. For the name, enter "Feature CAD TIN".

6. Press the **Enter** key to set the new name.

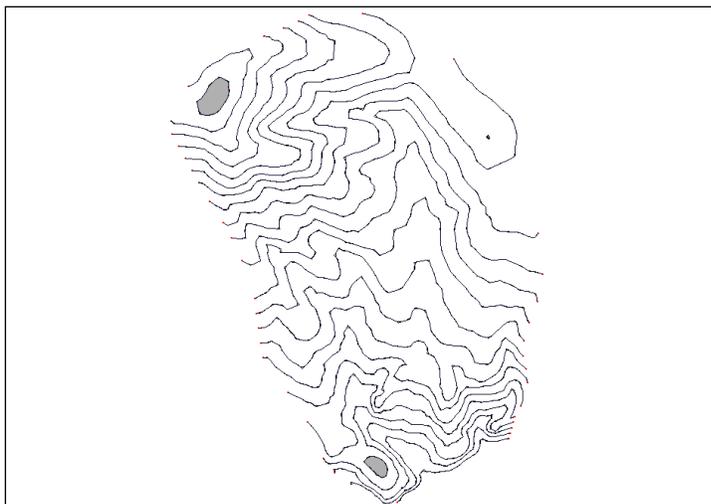The project should appear similar to   Figure 2.

Figure 2:   Coverage converted to a TIN

5   Converting Arcs to TIN Vertices

When redistributing the vertices, WMS interpolates elevations for any new vertices on the arc from existing arc vertices. Now that the vertices on the arcs have been redistributed to a more even spacing, convert the contours to a TIN.

1. From the *Macro* bar, switch to the **Map** module.

2. Select the *Feature Objects | Arcs → **TIN Vertices** menu item to create a "New tin" in the Project Explorer.

3. Right-click on "New tin" and select the *Triangles | **Triangulate** context menu item.

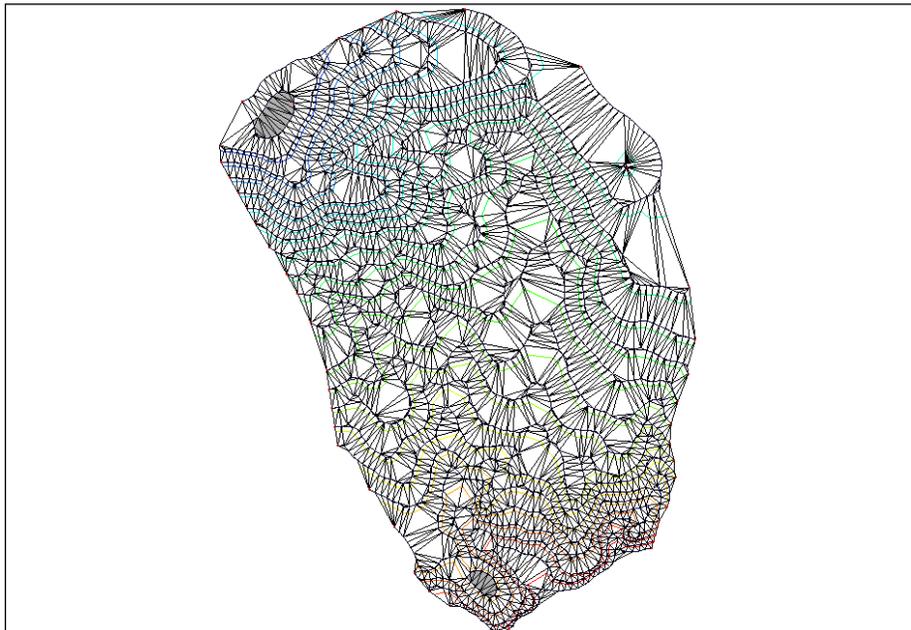WMS will create triangles throughout the TIN (Figure 3).

Figure 3:   Triangulated TIN

4. From the *Macro* bar, switch to the **Map Module**.

5. Select the *Feature Objects | **Delete** menu item to bring up a confirmation dialog.

6. Click the **OK** button to delete all of the original contour data.

7. Right-click on "New tin" and select the **Rename** context menu item.

8. For the name, enter "Feature CAD Triangles".

9. Press the **Enter** key to set the new name.

Before being used, the projections should be set or verified for any imported CAD data and any TINS or feature objects created from the CAD data if it was not set prior to conversion. For more information on setting projections, please see the "Projections / Coordinate Systems" tutorial.

6   Converting Directly to a TIN

CAD data can be converted to TINs in two ways: TIN points and TIN triangles.

Converting to either follows a similar process. Converting to TIN points requires CAD points in the CAD file. To convert to TIN triangles, CAD faces are required in the CAD file.

The method for converting to TIN points is demonstrated below.

6.1   Converting Directly to TIN Points

Converting to TIN points first allows for the opportunity to adjust the points prior to triangulating the TIN. This is useful because the vertices along each contour line might be at a random or undesirable spacing to generate a quality TIN.

1. In the Project Explorer, under the "🗎 CAD Data" GIS Data folder, right-click on the "🗎 tmcontours.dwg" CAD item and select the *Convert* | **CAD Points to TIN Points…** context menu item to bring up the *CAD → TIN* dialog.

2. Turn on only the "CAD layers_outletpts" and "CAD layers_arcs" check boxes.

3. For the *TIN name,* enter "CAD TIN POINTS".

4. Click the **OK** button to close the *CAD → TIN* dialog.

The "⬡ CAD TIN POINTS" coverage will now appear in the Project Explorer in the Terrain Data folder. The points defining the contour lines contain *x*, *y*, and *z* coordinates. Now triangulate them.

5. Right-click on "⬡ CAD TIN POINTS" and select the *Triangles* | **Triangulate** context menu item.

When the points are converted to TIN points and retriangulated, a 3D TIN surface is created (Figure 4). Feel free to turn on and off all three TINs to see the differences between them. Zoom in, rotate, and change the display or contour options as desired in order to better visualize the TIN.
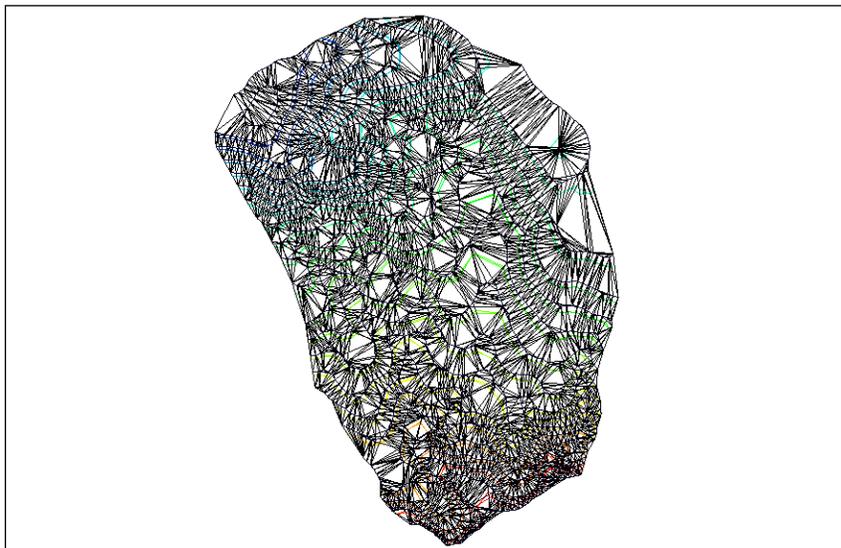

Figure 4:   The 3D TIN surface resulting from conversion from TIN points

7   Exporting Data to CAD

Visible data can be converted and saved as CAD data for use in CAD programs.

1. In the Project Explorer, right-click on the "🌐 GIS Data" folder and select the **Data → CAD** context menu item.

In the Project Explorer, a new "🔲 WMS Data" folder containing a set of layers should now be visible under the "🗐 CAD Data" folder. In order to view only the newly created CAD data, hide all other data in the Project Explorer.

2. In the Project Explorer, turn off the "🌐 Map Data" and "⊡ Terrain Data" folder check boxes.

3. Under the "🔲 WMS Data" folder, turn off the "🗐 0" and "🗐 CAD TIN POINTS_con" layer check boxes.

4. Select the *File | Save As…* menu item to bring up the *Save As* dialog.

5. From the *Save as type* drop-down, select "DWG Files (*.dwg)".

6. For the *File name,* enter "UsingTINs.dwg".

7. Click the **Save** button to export the DWG file and close the *Save As* dialog.

8   Conclusion

This concludes the "Using CAD Data" tutorial. The following topics were discussed and demonstrated:

- How to import CAD data.

- How to convert CAD data.

- How to export data to CAD.