

CES322263-L

A Practical Guide to GIS in AutoCAD Civil 3D (Part 1)

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Learning Objectives

- Learn how to import, view, edit, and label GIS data in AutoCAD Civil 3D
- Learn how to create a Surface in AutoCAD Civil 3D from GIS contours
- Learn how to create a Pipe Network from GIS Data
- Learn how to use the new ArcGIS Connector to access data from ArcGIS Online

Description

If you're a Civil 3D user being asked to provide data to your geographic information system (GIS) department, if you are being asked to use GIS data as background data for your designs, or if you think GIS is a four-letter word—this class will answer this all-too-common question: “Why should I care about GIS?” You'll learn to import GIS data not only as AutoCAD objects, but also directly as Civil 3D objects, like Surfaces and Pipe Networks that use the existing database information. We'll also explore the new ArcGIS Connector to access ArcGIS Online data in real time. Once that data is in Civil 3D we'll explore ways to use it with labeling tools and other display techniques. This popular class has won the award for Best Hands-on Lab at Autodesk University. Don't miss your chance to learn how the GIS tools in Civil 3D can make you more productive by automating common everyday tasks.

Speaker

Rick Ellis is the President of CADapult Software Solutions, Inc., where he provides training and consulting services to clients around the country, helping them get the most out of their design software investment. Rick specializes in Autodesk® Civil 3D®, AutoCAD® Map 3D, Autodesk® InfraWorks™, AutoCAD® Raster Design, and AutoCAD®. He is a member of the Autodesk Developer Network, and author of several critically acclaimed books on Autodesk Civil 3D, and AutoCAD Map 3D; including the Practical Guide series. Rick continues to use Autodesk Civil 3D on projects in a production environment, in addition to teaching classes to organizations both large and small around the country. This practical background and approach has made him a sought after instructor by organizations around the world.

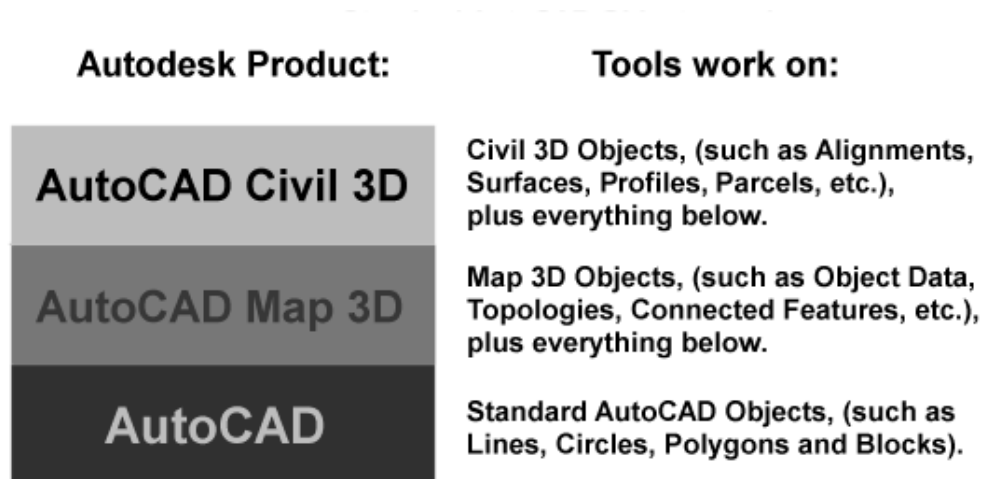
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Introduction to GIS in Civil 3D

In addition to all of the tools built into Civil 3D for the civil engineering workflow, the software also includes many powerful tools for creating, editing, importing, displaying and utilizing a wide range of GIS and mapping data. For instance, aerial and satellite imagery can be displayed, geometric data that includes corresponding tabular data can be attached to existing AutoCAD objects, such as lines representing pipes and polygons representing tax lots. Geometry with corresponding tabular data can also be attached to, or displayed in Civil 3D drawing files, from a variety of GIS sources, such as ESRI Shapefiles and Autodesk SDF.

Many of these additional tools can be used alone, or in various combinations, and are not necessarily limited to GIS and mapping projects, or even civil design projects. Unlike most Civil 3D workflow processes, these tasks are typically not linear. For instance, for any given project you may use different combinations of these tools or processes, in different sequences.

Autodesk Civil 3D is built on top of *AutoCAD Map 3D*, which is built on top of standard *AutoCAD*. Using the many tools found in *Civil 3D*, you can work with three types of objects: standard *AutoCAD* objects, (such as lines, arcs, circles, polylines and blocks); *Map 3D* objects, (such as *Object Data*, *Topologies* and connected *Features*); and Civil 3D objects, (such as alignments, profiles, parcels, surfaces, and pipe networks); and. These objects that are unique to the Map 3D tools in Civil 3D will be explained in the Lessons and exercises to follow.



I would encourage you to think of this as a toolbox that contains many related, yet separate tools. Each tool has its own function and purpose. As you learn and become proficient with these tools you become a skilled craftsman knowing what tool is best suited for each task you encounter during your project. I would encourage you not to limit yourself to simply the examples demonstrated here. Focus instead on the individual tools. There are many different applications for them and once you understand how to use these tools, not just blindly follow a series of predefined steps, then you will truly unlock the power and productivity that is available to you.

Using GIS Data from other Formats

There are three ways that you can bring GIS data into Civil 3D:

- Importing GIS Data as AutoCAD Objects
- Importing GIS Data as Civil 3D Objects
- Connecting to GIS Data

Importing GIS Data as AutoCAD Objects


Autodesk Civil 3D can import data from a variety of sources, allowing you to edit and use the geometry using AutoCAD while maintaining the attribute data that may have been created in a different program. Without the attribute data the file will only come into the drawing as drawing objects and not contain any attribute information. On large areas it would be a monumental task to manually modify every object to contain the desired information.

The ability to utilize data from other GIS programs inside of Civil 3D provides tremendous capabilities. Being able to use this data effectively requires a few simple steps. When requesting GIS data, be sure to get the information about the accuracy of the data and how it was created. This includes the coordinate system used, the definitions of the data fields, and the accuracy of the geometry.

Autodesk Civil 3D can import the following types:

- Autodesk SDF
- ESRI ArcInfo Coverage
- ESRI ArcInfo Export (E00)
- ESRI Shape file
- GML
- MapInfo MIF/MID
- MapInfo TAB
- Intergraph/MicroStation Design (dgn)
- OS (GB) MasterMap (GML 2)
- Spatial Data Transfer Standard (SDTS)
- Vector Product Format Coverage (VPF)

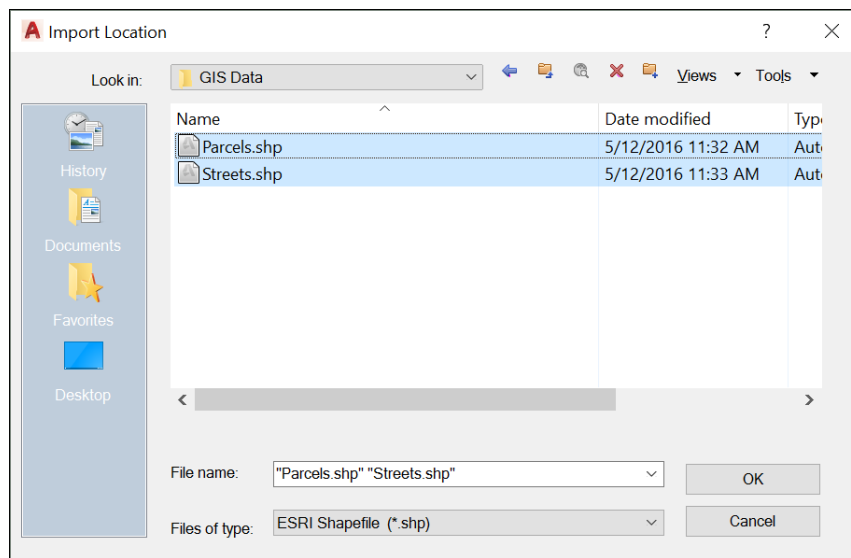
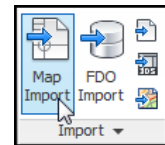
Step-by-Step

1. Start a new drawing using the ACAD.dwt template.
2. Click the Workspace button  on the status bar and set the current workspace to **Planning and Analysis**.



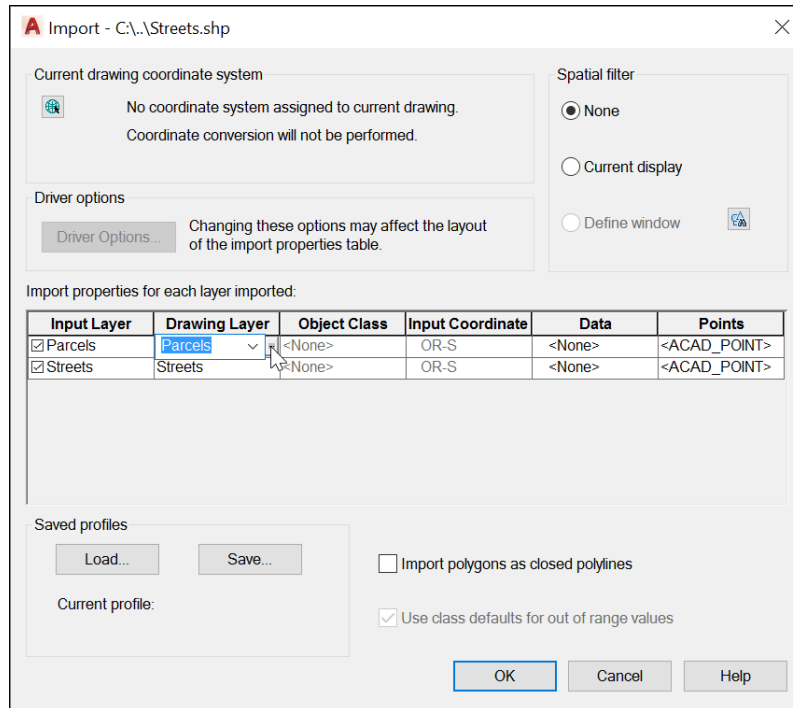
3. Select **Ribbon: Insert ⇒ Import ⇒ Map Import**.

The *Import Location* dialog box opens.



4. Browse to the dataset
5. Set the Files of type to **ESRI Shapefile (*.shp)**.
6. Select the files **Parcels.shp** and **Streets.shp**.
7. Click **<<OK>>** to continue.

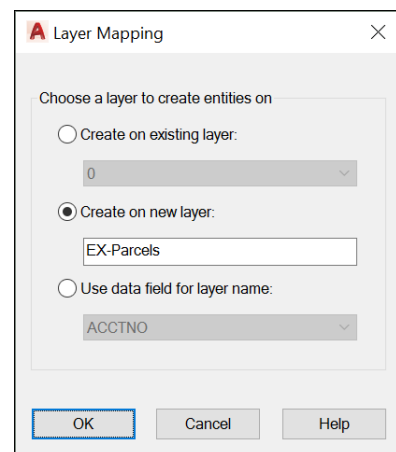
In the *Import* dialog box you can configure the *Layer*, *Coordinate Conversion*, and *Data* options that you wish to use to Import each of these two *Shapefiles* into *Civil 3D*.

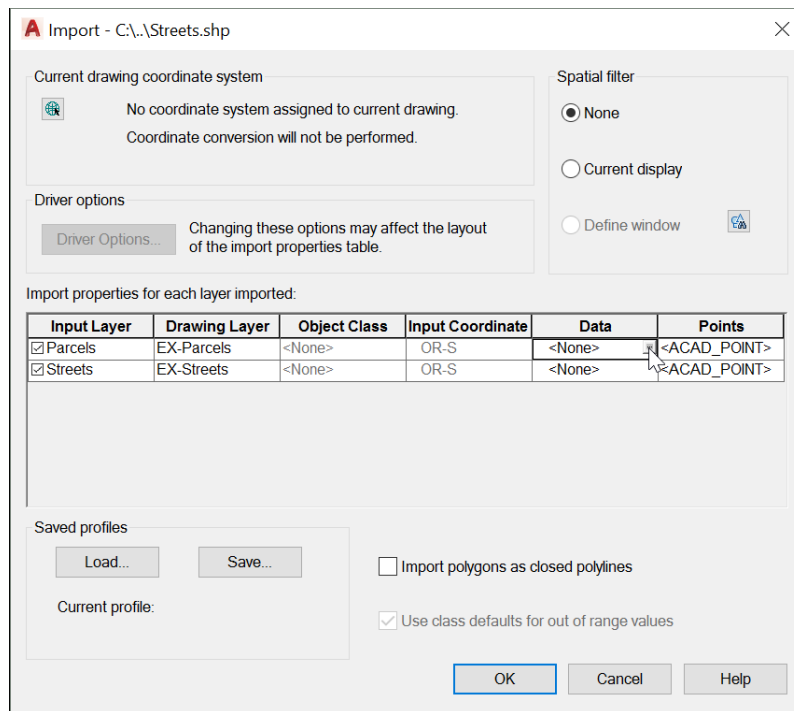


8. Click on the **Drawing Layer** field in the *Parcels* row to activate the **more <<...>>** button. Click this button to bring up the *Layer Mapping* dialog box.

Here you can choose to import the drawing objects onto an existing layer, create a new layer, or select a column of data from the file that you are importing to determine the layer names. This last option will allow you to do some basic thematic mapping during the import of the objects. For example, if you were importing parcel data and that data set had a column for zoning, you could have the import command create a new layer for each zoning type and place each parcel on the appropriate layer for its zoning designation. However, in this exercise you will simply import all of the parcels onto one layer.

9. Choose **Create on new layer** and name it **EX-Parcels**.
10. Click **<<OK>>**.
11. Repeat the process for the *Streets ShapeFile*, creating it on a new layer named **EX-Streets**.

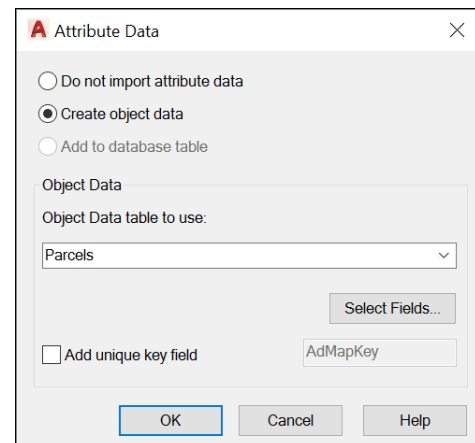




12. Back in the *Import* dialog box, click on the **Data** field in the *Parcels* row to activate the **more <<...>>** button.

13. Click the **more <<...>>** button to bring up the *Attribute Data* dialog box.

Here you will create *Object Data* from the shapefile's attribute data. You can enter the desired name for the *Object Data Table* and select the desired fields to import. This is the step that allows you to bring the intelligence of the GIS file along with the geometry into *AutoCAD*. By creating the object data table and populating it with the information provided in the shape file you will be able to click on a parcel and find the owner name, address, zoning, and any other information that was added by the GIS department. This will also allow you to edit the geometry and data from the GIS file in *AutoCAD* and then export it back to any of the supported GIS formats without losing any of the attached data. If you leave the *Data* option set to *None* or *Do not import attribute data*, then you will only import the geometry of the file and you will lose all of the attached information. The ability to convert the attribute data to object data is one reason the *Map Import* feature so powerful.

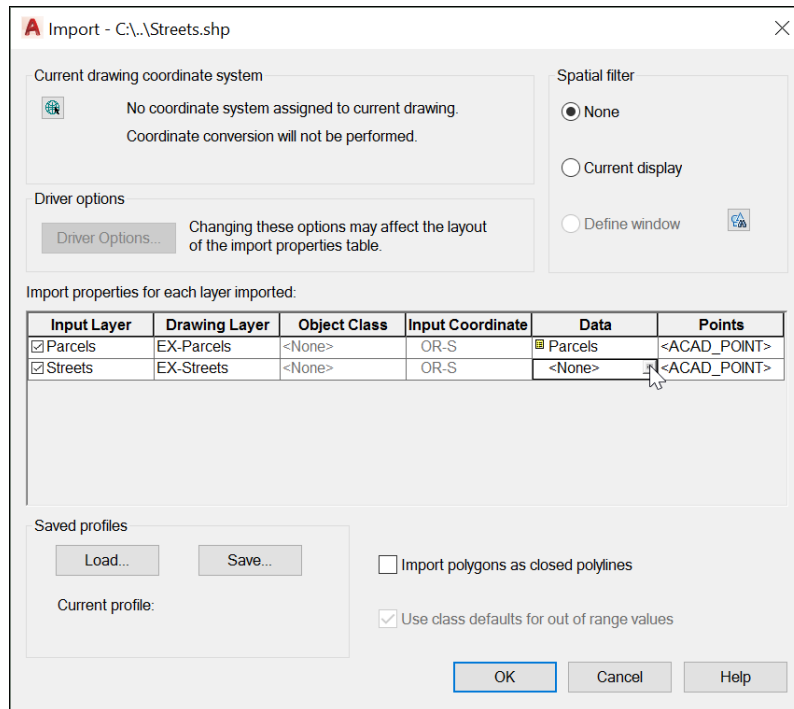


14. Choose **Create object data**.

15. Enter **Parcels** for the name of the **Object Data table to use**.

This will create a new *Object Data Table* in the drawing to store the parcel attribute data. You can name this *Object Data Table* anything you like, but it is recommended to keep the name simple and descriptive to avoid confusion. The name must be in alphanumeric characters with a maximum length of 25 characters. The name cannot contain spaces or symbols.

16. Click **<<OK>>** to return to the *Import* dialog box.



Import - C:\...\Streets.shp

Current drawing coordinate system
☐ No coordinate system assigned to current drawing.
 Coordinate conversion will not be performed.

Spatial filter
☒ None
☐ Current display
☐ Define window

Driver options
 Changing these options may affect the layout of the import properties table.

Import properties for each layer imported:

Input Layer	Drawing Layer	Object Class	Input Coordinate	Data	Points
<input checked="" type="checkbox"/> Parcels	EX-Parcels	<None>	OR-S	<input checked="" type="checkbox"/> Parcels	<ACAD_POINT>
<input checked="" type="checkbox"/> Streets	EX-Streets	<None>	OR-S	<None>	<ACAD_POINT>

Saved profiles

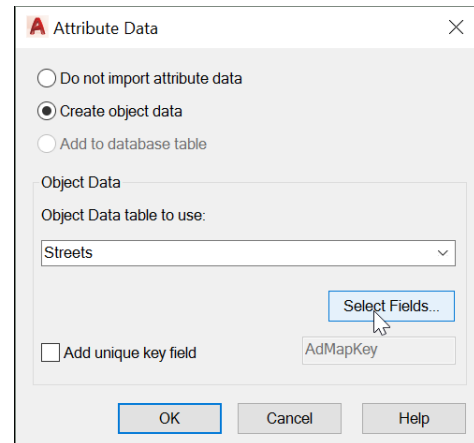
Current profile:

☐ Import polygons as closed polylines
☒ Use class defaults for out of range values

17. Click on the **Data** field in the *Streets* row to activate the **more <<...>>** button. Click this button to bring up the *Attribute Data* dialog box.

18. Choose **Create object data**.
19. Enter **Streets** for the name of the *Object Data table to use*.
20. This time, click the **<<Select Fields>>** button.

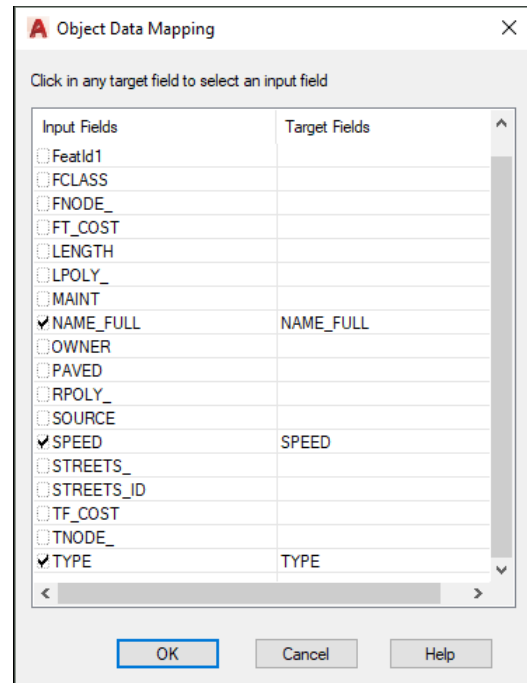
This will allow you to select only the attribute data you wish to import rather than the entire database.



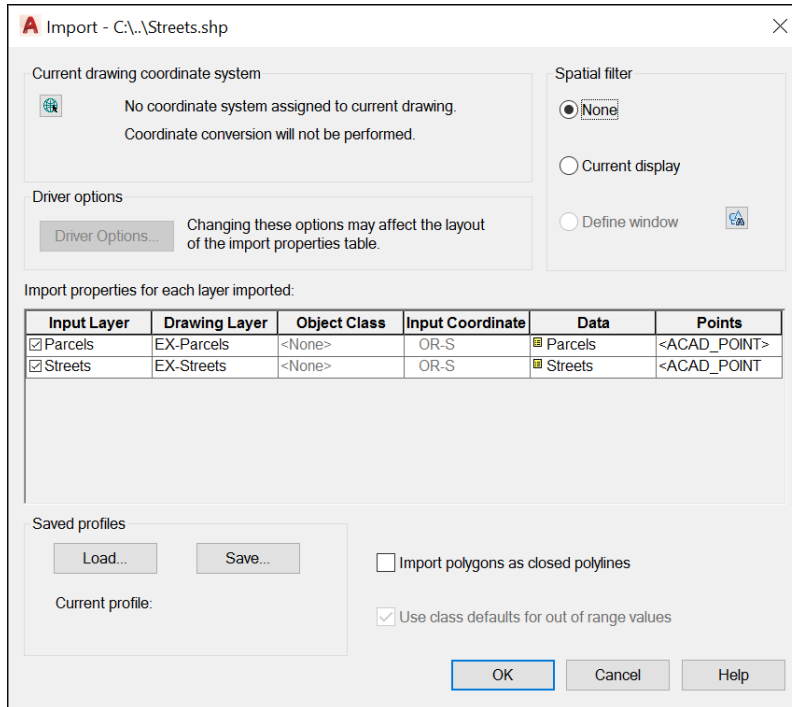
21. Deselect all fields except **NAME_FULL**, **SPEED**, and **TYPE**.

This option allows you to be selective about what information you import into *AutoCAD*. If you don't want to import all of the attached data, you have control over the columns of information that you import from the shape file.

22. Click **<<OK>>** to return to the *Import* dialog box.




The completed dialog box should look like the one below. If you have assigned a coordinate system to the drawing it will display at the top of the Import dialog box. You can also assign a coordinate system to the drawing at this time by selecting the *Assign Global Coordinate System* button. If a coordinate system has been assigned to the drawing the *Input Coordinate System* column will be activated. This allows you to assign a coordinate system to the files that you are importing. If the input coordinate system is different than the current drawing coordinate system the geometry will be converted to the current drawing coordinate system as it is imported.



Import - C:\...\Streets.shp


Current drawing coordinate system

 No coordinate system assigned to current drawing.
Coordinate conversion will not be performed.

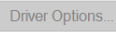
Spatial filter

☒ None



☐ Current display

☐ Define window 

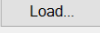
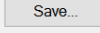
Driver options

 Changing these options may affect the layout of the import properties table.

Import properties for each layer imported:

Input Layer	Drawing Layer	Object Class	Input Coordinate	Data	Points
<input checked="" type="checkbox"/> Parcels	EX-Parcels	<None>	OR-S	 Parcels	<ACAD_POINT>
<input checked="" type="checkbox"/> Streets	EX-Streets	<None>	OR-S	 Streets	<ACAD_POINT>

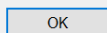
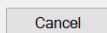
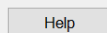
Saved profiles

Current profile:

☐ Import polygons as closed polylines

☒ Use class defaults for out of range values

23. Click <<**OK**>> to begin importing the data.

24. **Zoom to Extents** to view the imported objects.

Controlling the Display of Polygons

Notice that the polygons are all displayed with a solid hatch fill. This display option is a feature of the *MPOLYGON* object. To display just the edges of the polygons you need to set the polygon display mode.

1. At the command line enter:
Command: **POLYDISPLAY**
2. Type **E** to display only the edges of the polygons.
3. **Regen** to redisplay the Polygons.
4. Change the color of the layer **EX-Parcels** to **Yellow** and the later **EX-Streets** to **Red**.

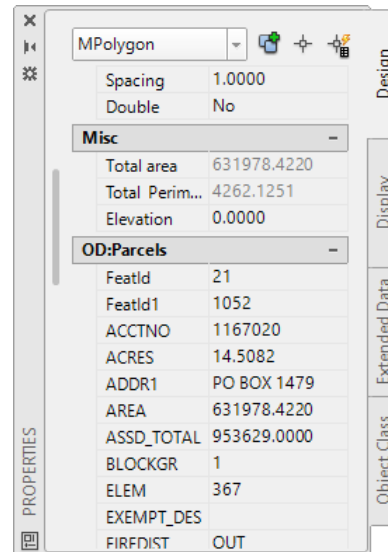


Viewing GIS Attributes in AutoCAD

When talking about GIS data the term *attributes* refers to any type of attached data, not just block attributes as in *AutoCAD* terminology. In *AutoCAD Map 3D*, attribute data can be object data, external database data, or block attributes. *Civil 3D* is built on and includes *AutoCAD Map 3D* which enables you to view and edit this attribute data, including attributes imported from GIS files, as well as attributes created as object data in *Map 3D*. To view the attributes imported above follow these steps.

1. Pick one of the new parcels, then right-click and select ⇒ **Properties**.
2. In the *Properties* palette, scroll to the bottom and notice the attribute data from the SHP file is now attached to the parcel.

You can view and edit any of the object data here as needed.



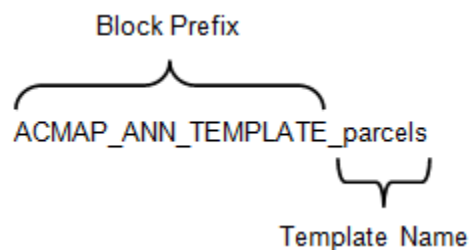
Labeling Objects with an Annotation Template

Several types of data can be used to drive an Annotation Template. These include:

- Object Data
- Linked data sources
- Object properties

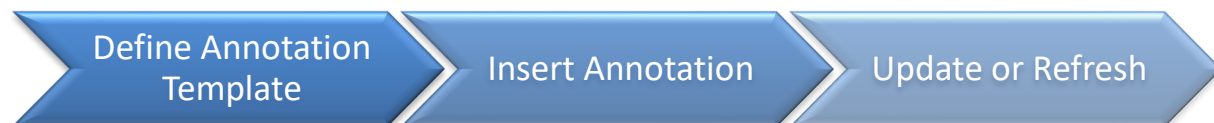
Any of the preceding data types and any combination of these can be used within a single Annotation Template, retrieving data from multiple sources of data into a single, or multiple lines of text to form part of the resulting label in the drawing.

Annotation Templates are blocks with attribute tags that generate the resulting text in the drawing. All annotation blocks are prefixed with `ACMAP_ANN_TEMPLATE` followed by the name of the annotation template.



Overall Process of Using Dynamic Annotation

There are three main steps in the overall use of Dynamic Annotation.



Define the Annotation Template

This step is a one-time setup that is saved in the drawing file. After you create an annotation template, you can always edit it. The initial setup is often an iterative process with some aspect of trial and error to get the desired behavior regarding text placement on the objects, spacing of labels, and so on.

Insert the Annotation

After creating the annotation template, you use it to perform the actual insertion of the annotation.

Update or Refresh Annotation

Each time you insert annotation, the current values of the attributes that are used to generate the annotation are evaluated. When changes are made to the source attributes, the annotation does not automatically update. To reevaluate changes made to source data that drives the annotation, you must perform a refresh. If changes have been made to the template, which might include changes to the attribute sources, font settings and so on, an update is required.

Step-by-Step

Creating an Annotation Template

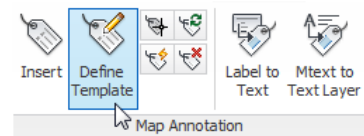
1. Continue working in the same drawing.

If you didn't finish the previous exercise you can open the drawing *Annotation.dwg*.

2. Freeze the layer **EX-Streets**.


You will only label the parcels in this exercise.

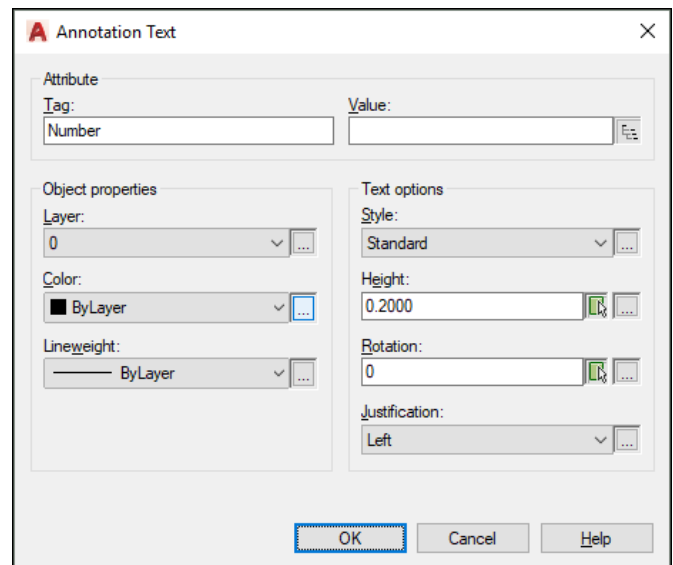
3. Select **Ribbon: Annotate ⇒ Map Annotation ⇒ Define Template** to launch the *Define Annotation Template* dialog box.



4. Click **<<New>>** in the *Annotation Template* section.
5. Name the annotation template **Parcel Number**, and then click **<<OK>>**.

The *AutoCAD Block Editor* opens and the *Ribbon* now displays the *Block Editor* tab.

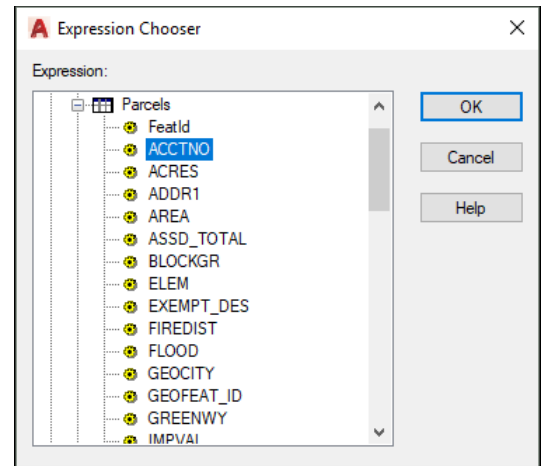
6. At the command line enter: Command: **MAPANNTTEXT**
7. When prompted to select annotation, press **Enter** to create new annotation and open the *Annotation Text* dialog box.
8. Enter **Number** for the **Tag**.
9. Click the **expression** button  to the right of the **Value** field to open the *Expression Chooser*.



10. Expand the **Object Data** table **Parcels**.

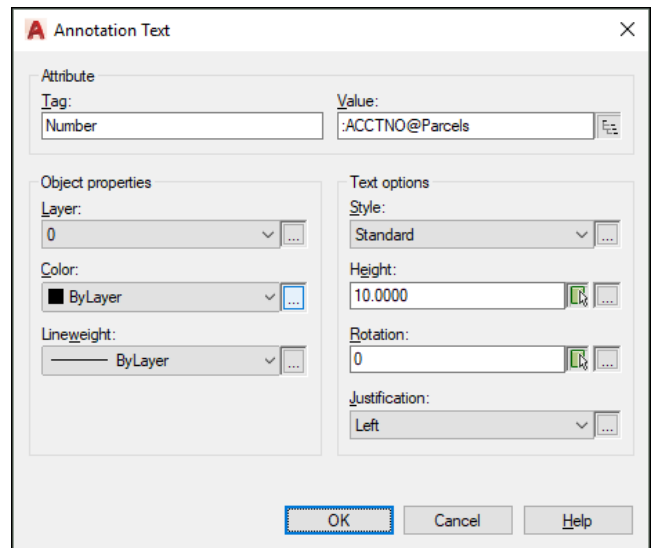
11. Select the field **ACCTNO**.

12. Click **<<OK>>** to return to the *Annotation Text* dialog box.



13. Enter **10** for **Height** in the **Text Options** section.

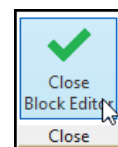
14. Click **<<OK>>**.



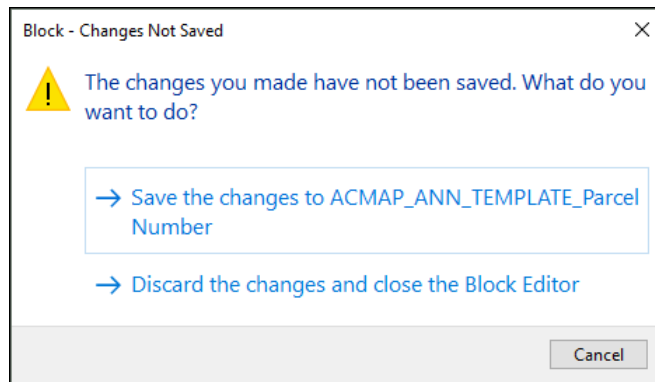
15. At the command line prompt Specify left point of text: enter **0,0** and press **Enter**.

The block is created at the origin, 0,0. You may need to zoom in to see it.

16. Select **Ribbon: Block Editor ⇒ Close ⇒ Close Block Editor**.



17. When prompted, save the changes to ACPMAP_ANN_TEMPLATE_Parcel.

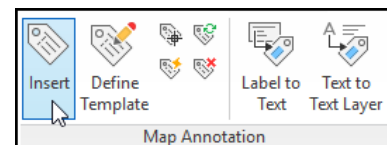


18. Click <<OK>> in the **Define Annotation Template** dialog box to save the template.

19. Save the drawing.

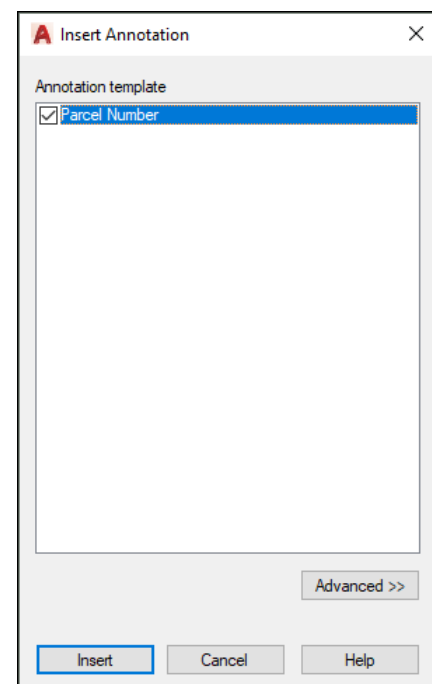
Annotating Objects

1. Select **Ribbon: Annotate ⇒ Map Annotation ⇒ Insert**.



2. Select the **Parcel Number Annotation template**.

3. Click <<Insert>>.



4. Zoom in and pick several parcels, then Enter to add the labels.


Importing GIS Data as Civil 3D Objects

There are two types of Civil 3D objects that can be created directly from GIS data.

- Surfaces
- Pipe Networks

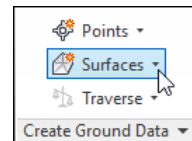
Step-by-Step

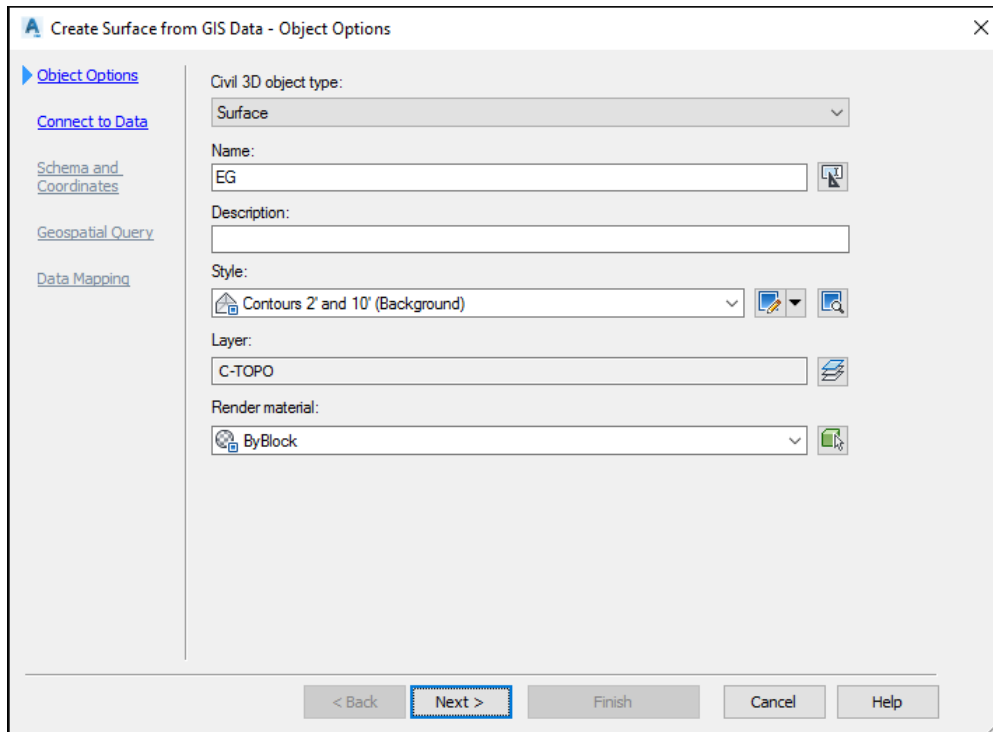
Creating a Surface from a Shapefile

1. Start a new drawing from the template `_Autodesk Civil 3D (Imperial) NCS.dwt`
2. Click the Workspace button  on the status bar and set the current workspace to **Civil 3D**.

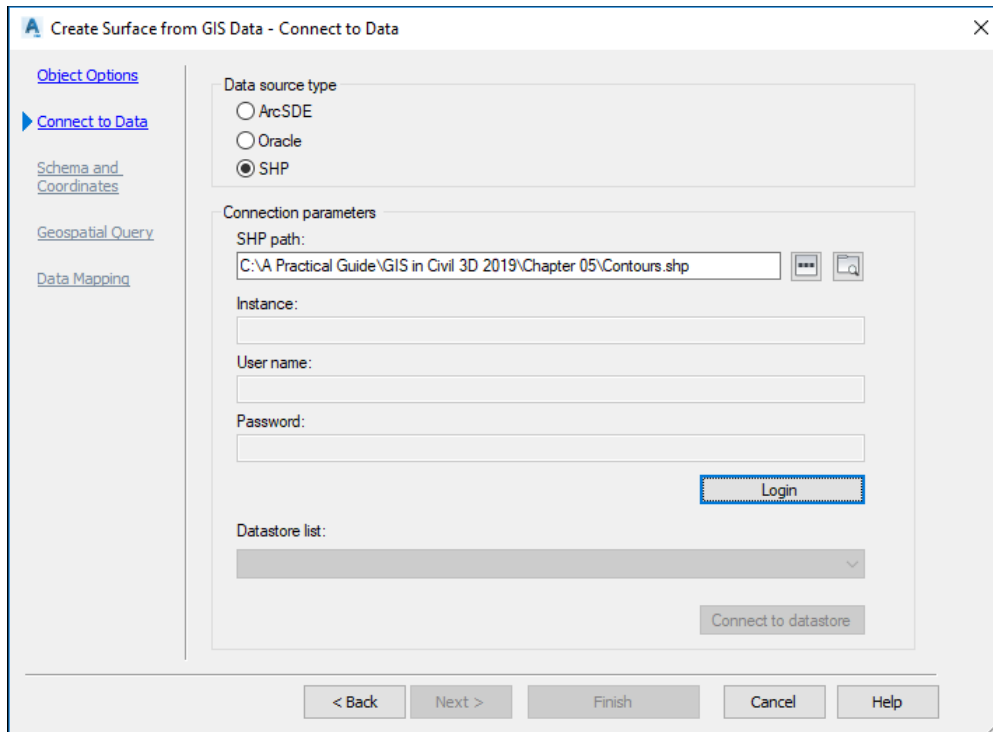


3. Start a new drawing from your template that contains Civil 3D styles.
4. Select **Ribbon: Home ⇒ Create Ground Data ⇒ Surfaces ⇒ Create Surface from GIS Data**.





5. Enter the **Name** and select the desired **Style**.
6. Click <<**Next**>>.



Create Surface from GIS Data - Connect to Data

[Object Options](#)
[Connect to Data](#)
[Schema and Coordinates](#)
[Geospatial Query](#)
[Data Mapping](#)

Data source type

☐ ArcSDE
☐ Oracle
☒ SHP

Connection parameters

SHP path:
C:\A Practical Guide\GIS in Civil 3D 2019\Chapter 05\Contours.shp

Instance:

User name:

Password:

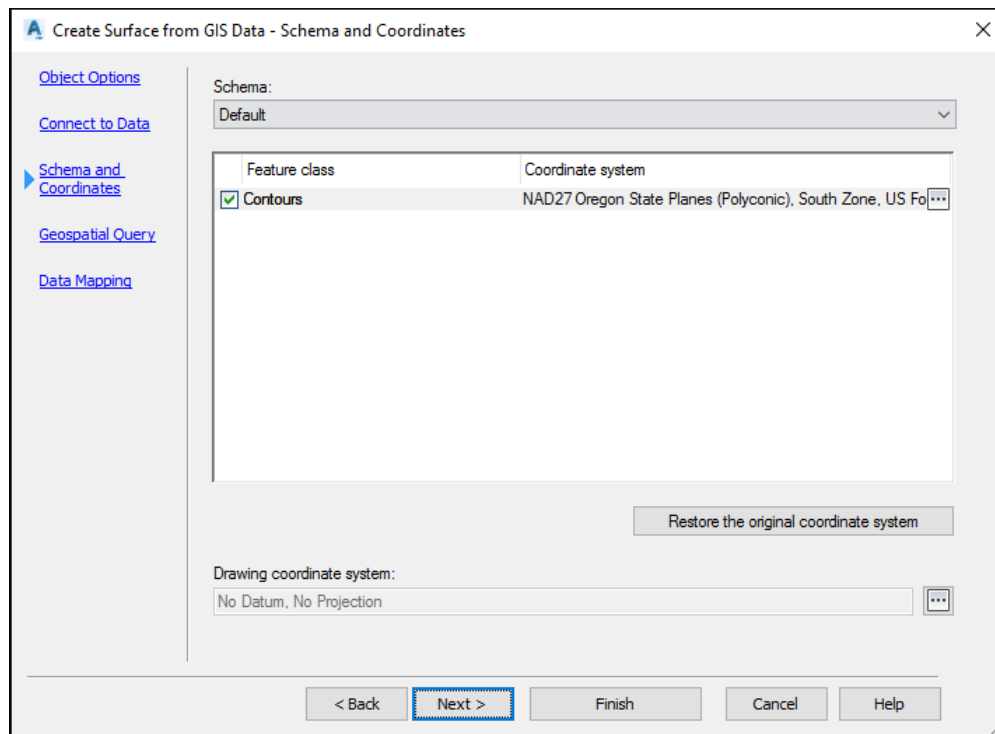
Login

Datastore list:

Connect to datastore

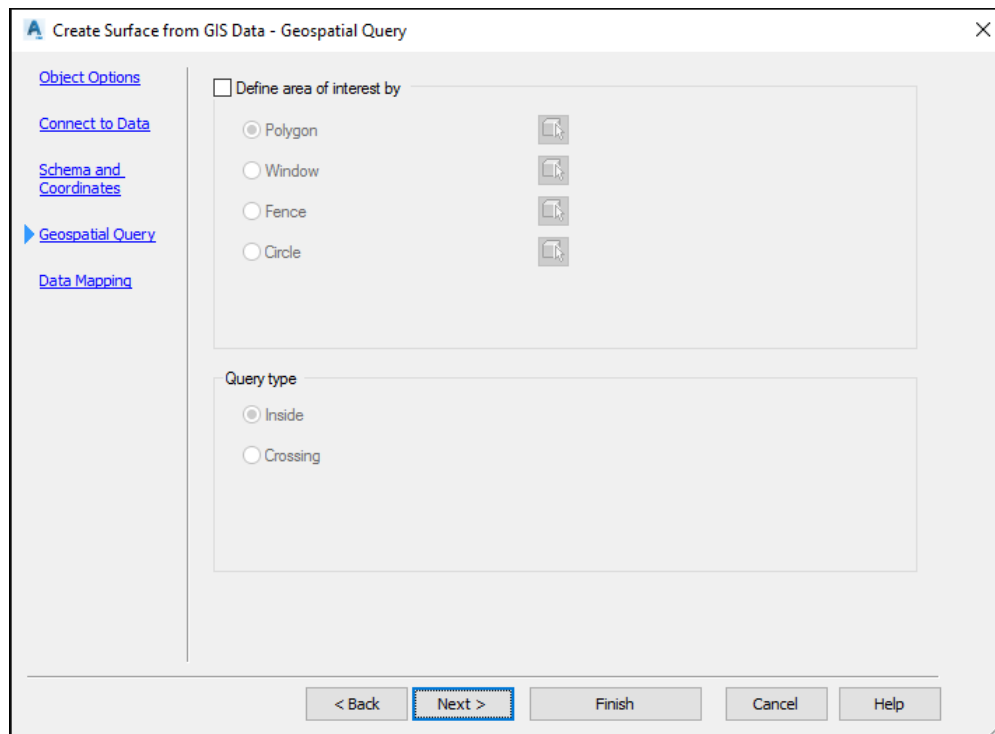
< Back Next > Finish Cancel Help

7. Set the **Data source type** to **SHP**.
8. Browse to the dataset and select the file Contours.shp.
9. Click <<**Login**>>.



10. **Enable** the check box beside the **desired Feature class**.

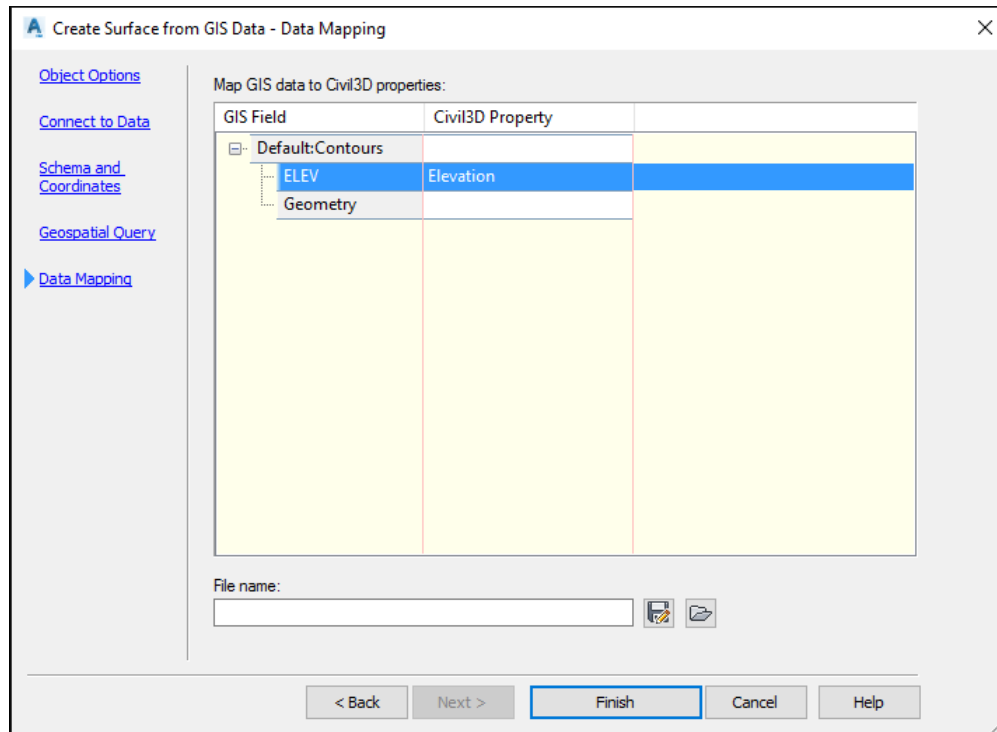
11. Click **<<Next>>**.



You have the option to define an area of interest if you want to limit the size of the data brought in to the drawing.

12. Disable the option to **Define area of interest**.

13. Click **<<Next>>**.



14. Set the *Civil 3D Property* for the *GIS Field* **ELEV** to the **elevation data field in the source file**.

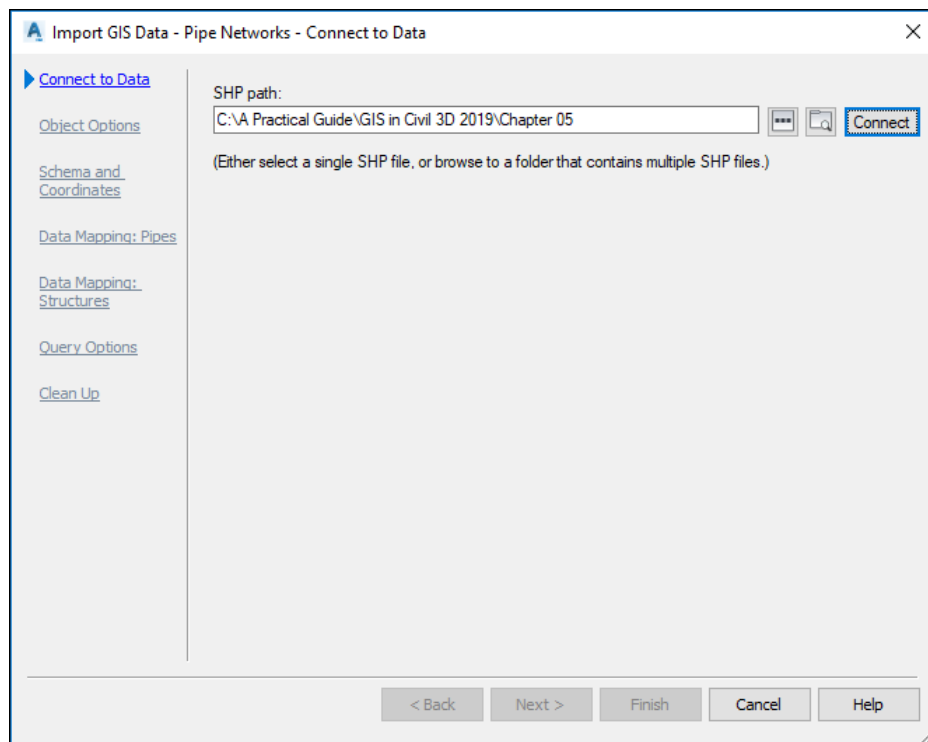
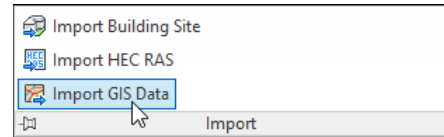
15. Click <<**Finish**>> to create the *Surface*.

You will get a warning in the *Event Viewer* if there are crossing breaklines in the data you are importing. If so, that point will be ignored and your surface should be fine. You can zoom in and examine that location if you want to explore it further.

16. **Zoom Extents** to view the new surface.

Creating a Pipe Network from a SHP

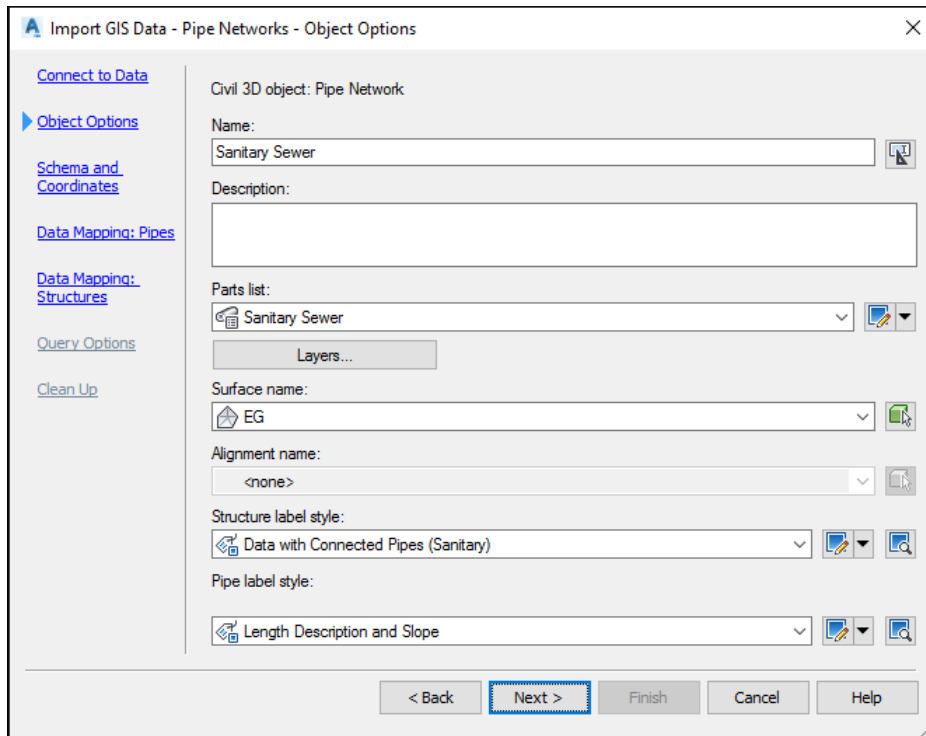
1. Continue working in the drawing from the previous exercise.
2. Expand the **Ribbon: Insert** tab **Import** panel.
3. Click **Import GIS Data**.



4. Click the folder button .

The pipes and structures will be contained in separate SHP files. By connecting to a folder rather than a specific file, then all of the SHP files in that folder will be available.

5. Browse to the folder containing the SHP files, and click **<<Open>>**.
6. Click **<<Connect>>** to connect to the folder, making all of the SHP files in that folder available.
7. Click **<<Next>>** to continue through the wizard.



Import GIS Data - Pipe Networks - Object Options

Connect to Data

Object Options

Schema and Coordinates

Data Mapping: Pipes

Data Mapping: Structures

Query Options

Clean Up

Civil 3D object: Pipe Network

Name: Sanitary Sewer

Description:

Parts list: Sanitary Sewer

Layers...

Surface name: EG

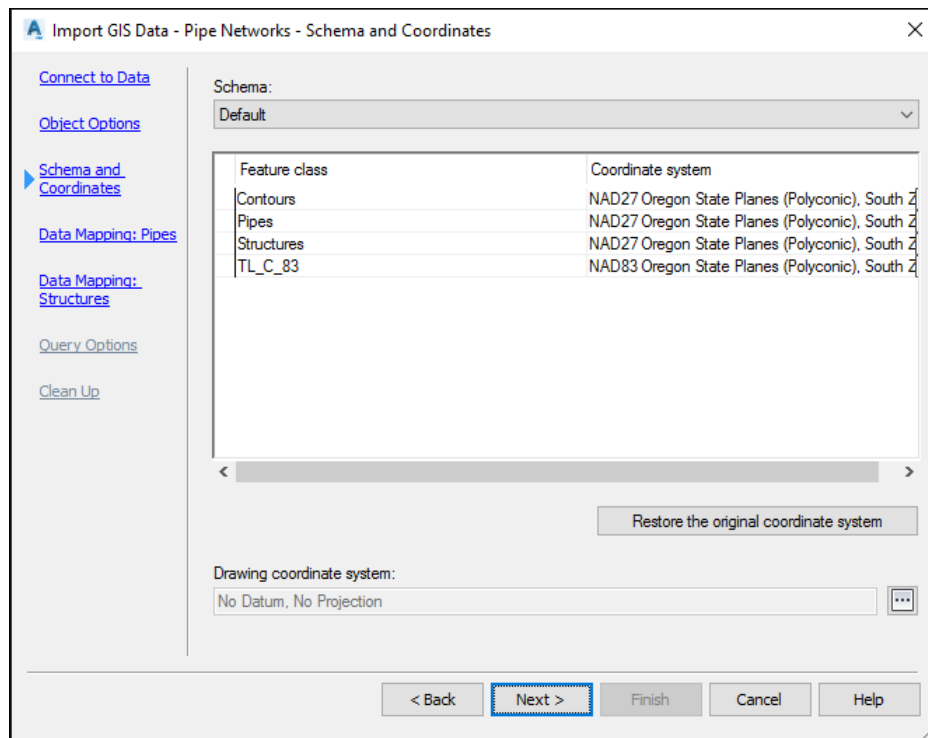
Alignment name: <none>

Structure label style: Data with Connected Pipes (Sanitary)

Pipe label style: Length Description and Slope

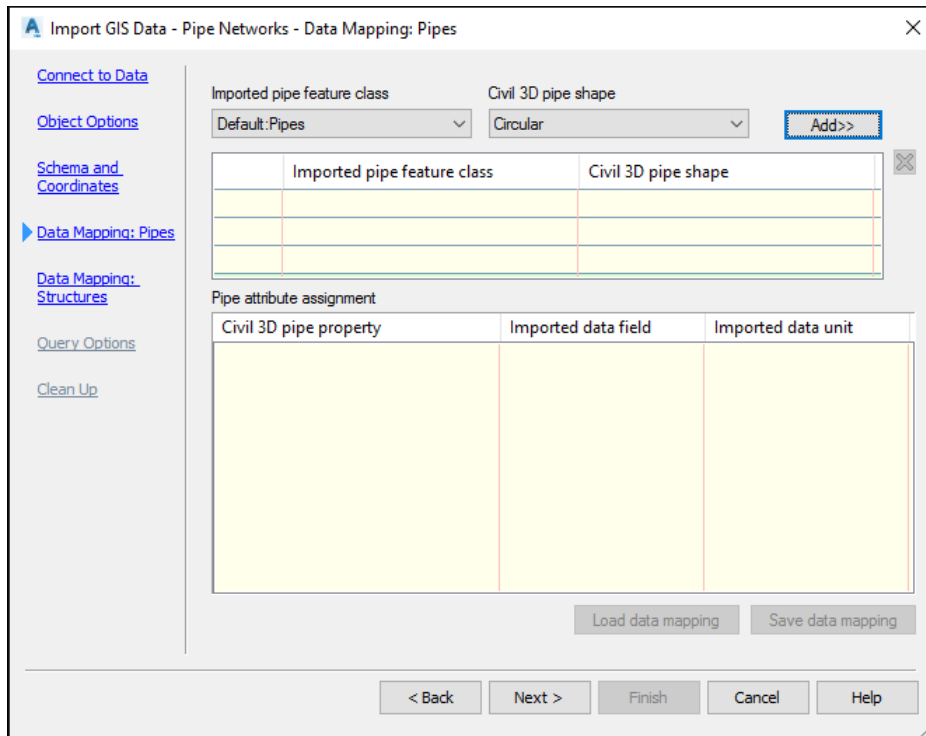
< Back Next > Finish Cancel Help

8. **Name** the new Pipe Network.
9. Set the **Parts list**.
10. Set the **Surface name**.
11. Set the **Structure label style**.
12. Set the **Pipe label style**.
13. Click **<<Next>>**.



On the *Schema and Coordinates* panel of the wizard you will see all the SHP files in the connected folder along with the coordinate systems they were created in.

14. Click **<<Next>>** to continue through the wizard.



Import GIS Data - Pipe Networks - Data Mapping: Pipes

[Connect to Data](#)
[Object Options](#)
[Schema and Coordinates](#)
▶ Data Mapping: Pipes
[Data Mapping: Structures](#)
[Query Options](#)
[Clean Up](#)

Imported pipe feature class: **Default:Pipes** Civil 3D pipe shape: **Circular** **Add>>**

Imported pipe feature class	Civil 3D pipe shape

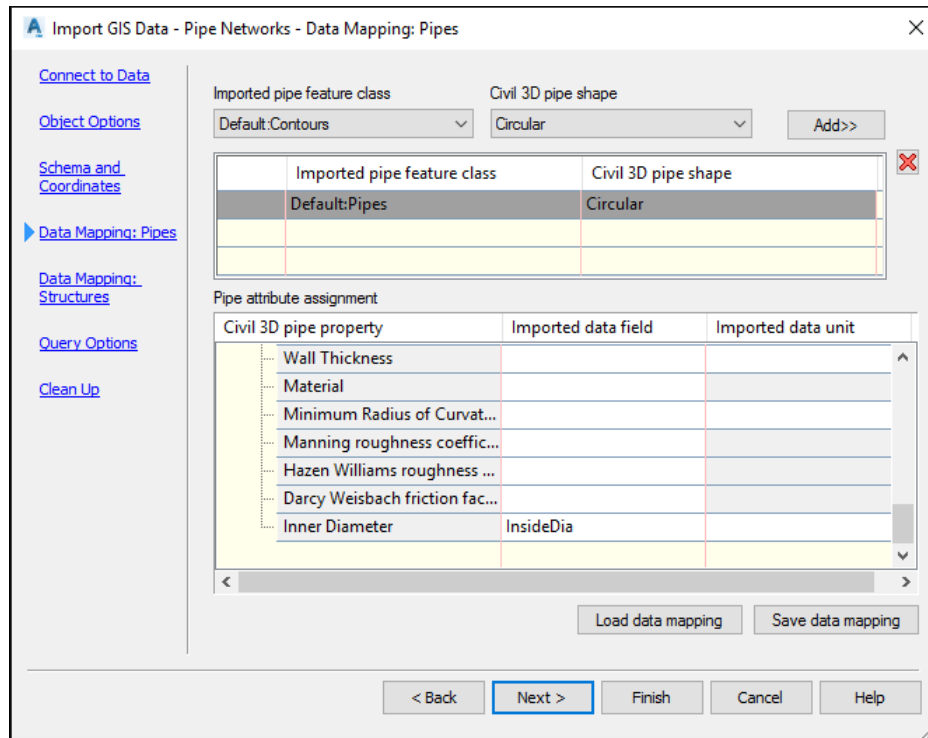
Pipe attribute assignment

Civil 3D pipe property	Imported data field	Imported data unit

Load data mapping **Save data mapping**

< Back **Next >** **Finish** **Cancel** **Help**

15. Set the **Imported pipe feature class** to **Default:Pipes** (the SHP file containing the **Pipe data**).
16. Confirm the **Civil 3D pipe shape** is set to **Circular**.
17. Click **<<Add>>**.



Import GIS Data - Pipe Networks - Data Mapping: Pipes

Connect to Data
Object Options
Schema and Coordinates
Data Mapping: Pipes
Data Mapping: Structures
Query Options
Clean Up

Imported pipe feature class: Default:Contours
Civil 3D pipe shape: Circular

Imported pipe feature class	Civil 3D pipe shape
Default:Pipes	Circular

Pipe attribute assignment

Civil 3D pipe property	Imported data field	Imported data unit
Wall Thickness		
Material		
Minimum Radius of Curvat...		
Manning roughness coeffic...		
Hazen Williams roughness ...		
Darcy Weisbach friction fac...		
Inner Diameter	InsideDia	

Load data mapping Save data mapping

< Back Next > Finish Cancel Help

18. Set the **Start Structure** to **StructStart**.

You may need to scroll through the list of *Civil 3D pipe properties* to the *Geometry* section.

19. Set the **End Structure** to **StructEnd**.

20. Set the **Start Invert Elevation** to **StartInvert**.

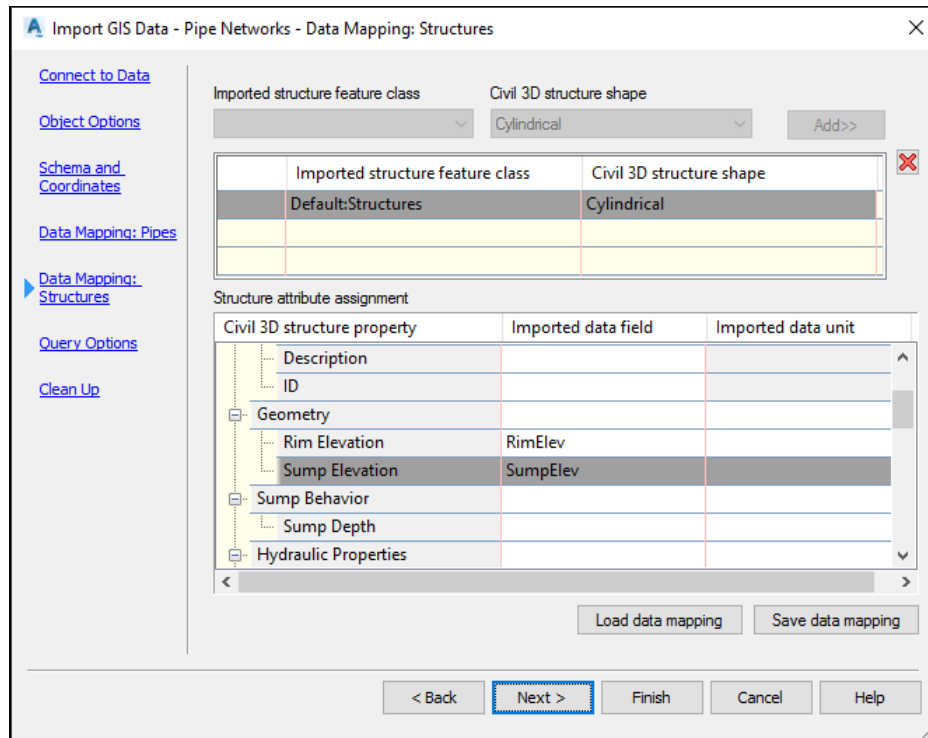
21. Set the **End Invert Elevation** to **EndInvert**.

22. Set the **Inner Diameter** to **InsideDia**.

You may need to scroll down the list of *Civil 3D pipe properties* to the *Part Data* section.

23. Click **<<Next>>**.

- Page 27



Import GIS Data - Pipe Networks - Data Mapping: Structures

Connect to Data
Object Options
Schema and Coordinates
Data Mapping: Pipes
Data Mapping: Structures
Query Options
Clean Up

Imported structure feature class: Civil 3D structure shape
Civil 3D structure shape: Cylindrical

Imported structure feature class	Civil 3D structure shape
Default:Structures	Cylindrical

Structure attribute assignment

Civil 3D structure property	Imported data field	Imported data unit
Description		
ID		
Geometry		
Rim Elevation	RimElev	
Sump Elevation	SumpElev	
Sump Behavior		
Sump Depth		
Hydraulic Properties		

Load data mapping Save data mapping

< Back Next > Finish Cancel Help

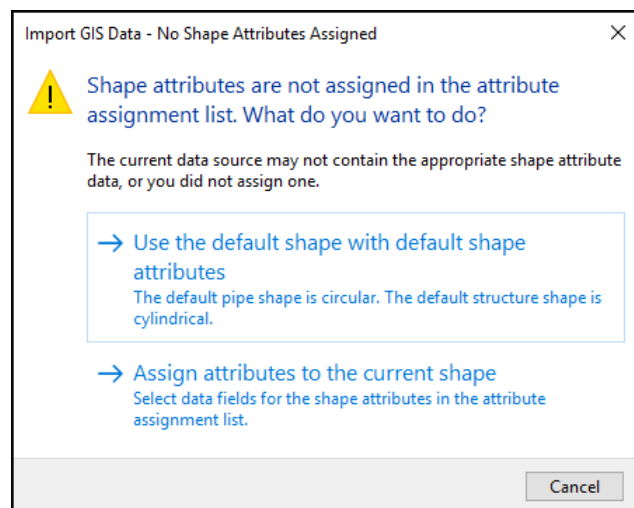
27. Set the **Rim Elevation** to **RimElev**.

28. Set the **Sump Elevation** to **SumpElev**.

29. Click **<<Next>>**.

You will now see the *No Shape Attributes Assigned* dialog box. This is because the SHP file that we are importing did not have any shape attributes for us to assign that could be matched with properties of the parts from the part list.

30. Click **Use the default shape with default shape attributes**.



Import GIS Data - No Shape Attributes Assigned

Shape attributes are not assigned in the attribute assignment list. What do you want to do?

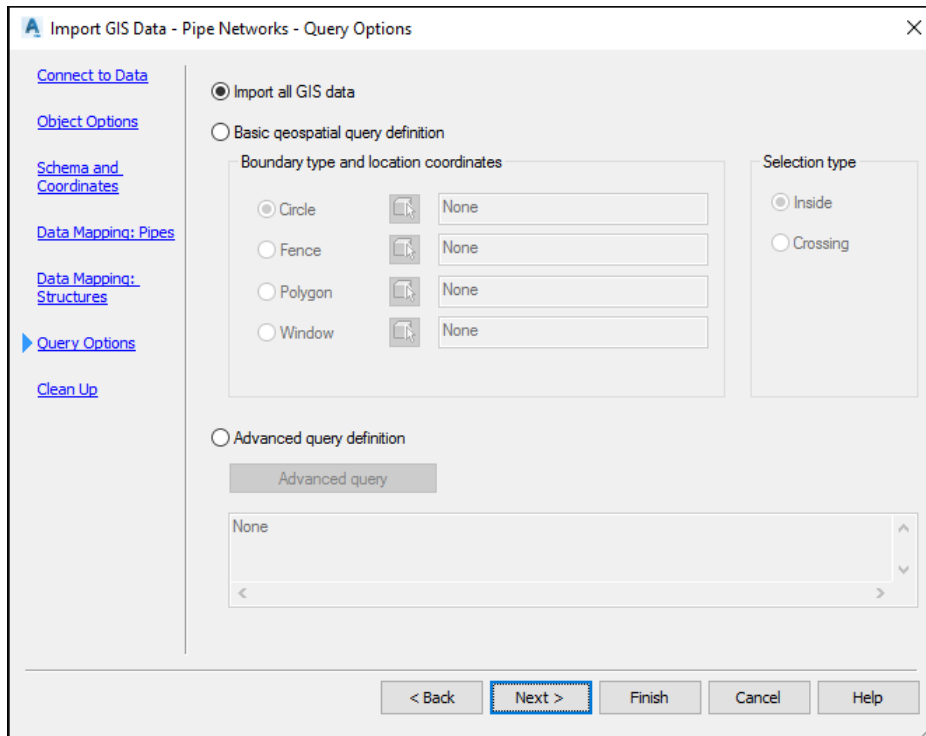
The current data source may not contain the appropriate shape attribute data, or you did not assign one.

→ Use the default shape with default shape attributes
The default pipe shape is circular. The default structure shape is cylindrical.

→ Assign attributes to the current shape
Select data fields for the shape attributes in the attribute assignment list.

Cancel

31. Back on the *Data Mapping: Structures* panel of the wizard click **<<Next>>** again.



Import GIS Data - Pipe Networks - Query Options

[Connect to Data](#)

[Object Options](#)

[Schema and Coordinates](#)

[Data Mapping: Pipes](#)

[Data Mapping: Structures](#)


▶ Query Options


[Clean Up](#)


☒ Import all GIS data


☐ Basic geospatial query definition

Boundary type and location coordinates

☒ Circle  None

☐ Fence  None

☐ Polygon  None

☐ Window  None

Selection type

☒ Inside

☐ Crossing

☐ Advanced query definition

Advanced query

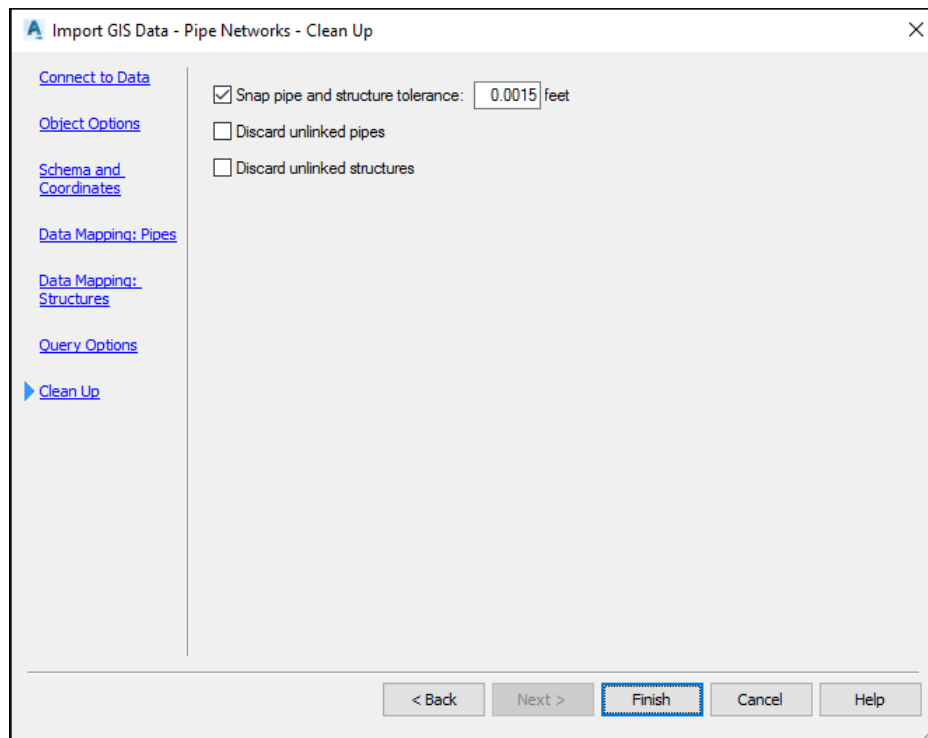
None

< Back **Next >** Finish Cancel Help

32. Confirm that **Import all GIS data** is selected.

If you are importing SHP files that encompass a large area you can be selective about how much of the data is imported here.

33. Click **<<Next>>**.



34. Enable the option to **Snap pipe and structure tolerance**.

35. Confirm the **tolerance** is set to **0.0015** feet.

36. Click **<<Finish>>**.

The pipes and structures are now imported and labeled, creating a new *Pipe Network*.

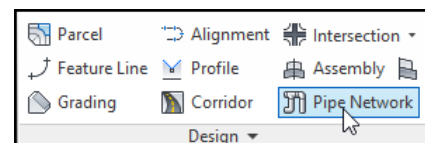
The *Event Viewer* opens to announce that the *Pipe Network* has been created.

37. Close the *Event Viewer*.

38. Zoom in and examine the new *Pipe Network*.

You may notice the *Invert In* and *Invert Out* elevations are backwards on each of the structures with the *Invert In* lower than the *Invert Out*. Next, you will reverse the pipe network to correct this issue.

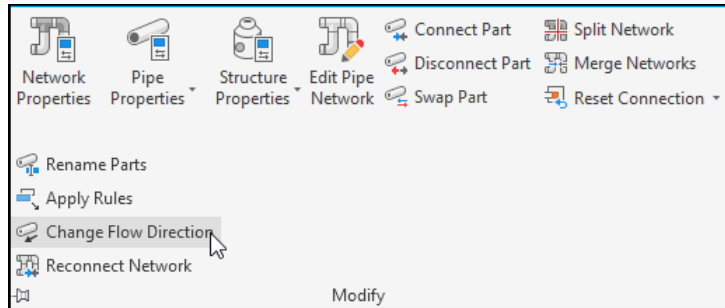
39. Select **Ribbon: Modify ⇒ Design ⇒ Pipe Network**.



The *Pipe Networks* tab is displayed.

40. Expand the **Ribbon: Pipe Networks** tab **Modify** panel.

41. Click **Change Flow Direction**.



42. Select **Structure (5)** as the **Upstream starting point**.

43. Then select **Structure (1)** as the **Downstream ending point**.

44. The entire network should now be highlighted. **Enter** to end the command and reverse the flow direction of the network.

45. **Regen** to update the labels.

46. Zoom in and examine the new pipe network.

Autodesk Connector for ArcGIS

The Autodesk Connector for ArcGIS can help you find cloud-based geospatial data from publicly available sources, and from secure organizational sources to which you may have access.

Autodesk Connector for ArcGIS Concepts

Esri ArcGIS Online is a cloud-based mapping and analysis solution used to store and share many types of GIS data.

You will need an Esri account to use this tool, and to complete this lesson. If you do not have an account check with your organization to see if they have an account to which you can be added as a user. You can also create an individual account and use their free trial period to access publicly available content, and to complete this lesson.

Adding ArcGIS Online Data to Maps

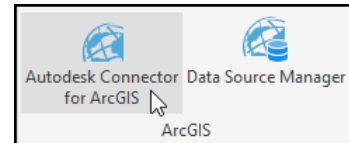
Once a connection has been established to an Esri account, you can limit your search to a geographic area on interest, then search categories for content. Once found, geospatial features and their attribute data can be added to your AutoCAD design project as Civil 3D alignments, feature lines, gravity pipes, parcels, points, or structures.

1. Open the drawing **ArcGIS Connector.dwg** from the dataset.

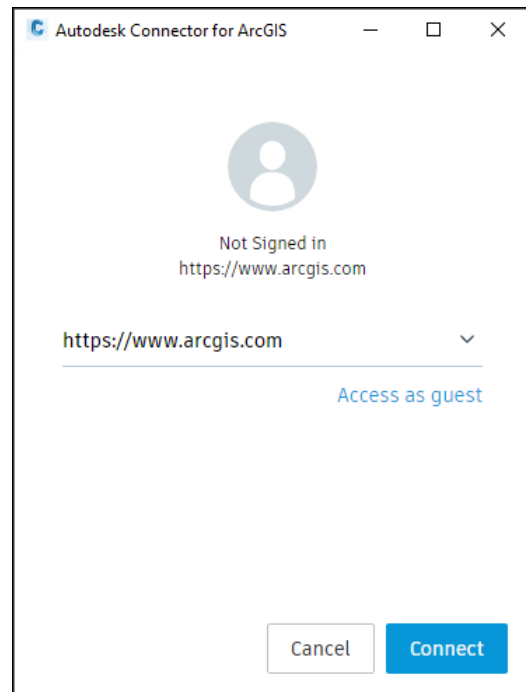
This drawing contains linework for the parcels and streets. It also has a coordinate system assigned to it.

2. Select **Ribbon: Insert ⇒ ArcGIS ⇒ Autodesk Connector for ArcGIS**.

The Autodesk Connector for ArcGIS window opens.



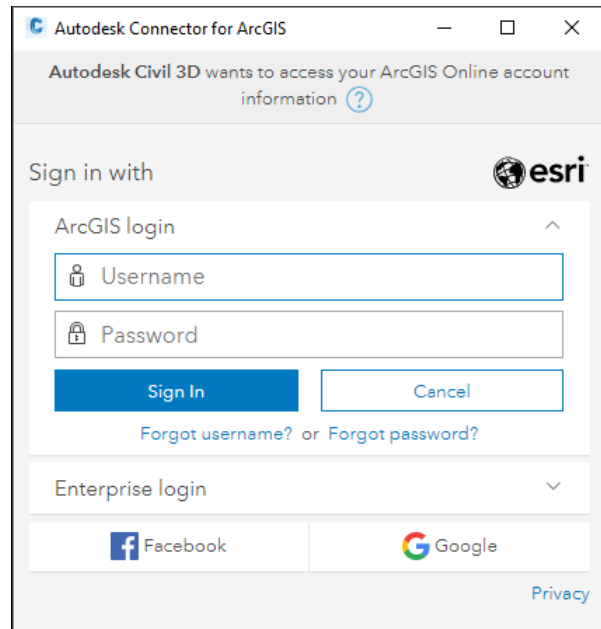
3. Click **<<Connect>>**.



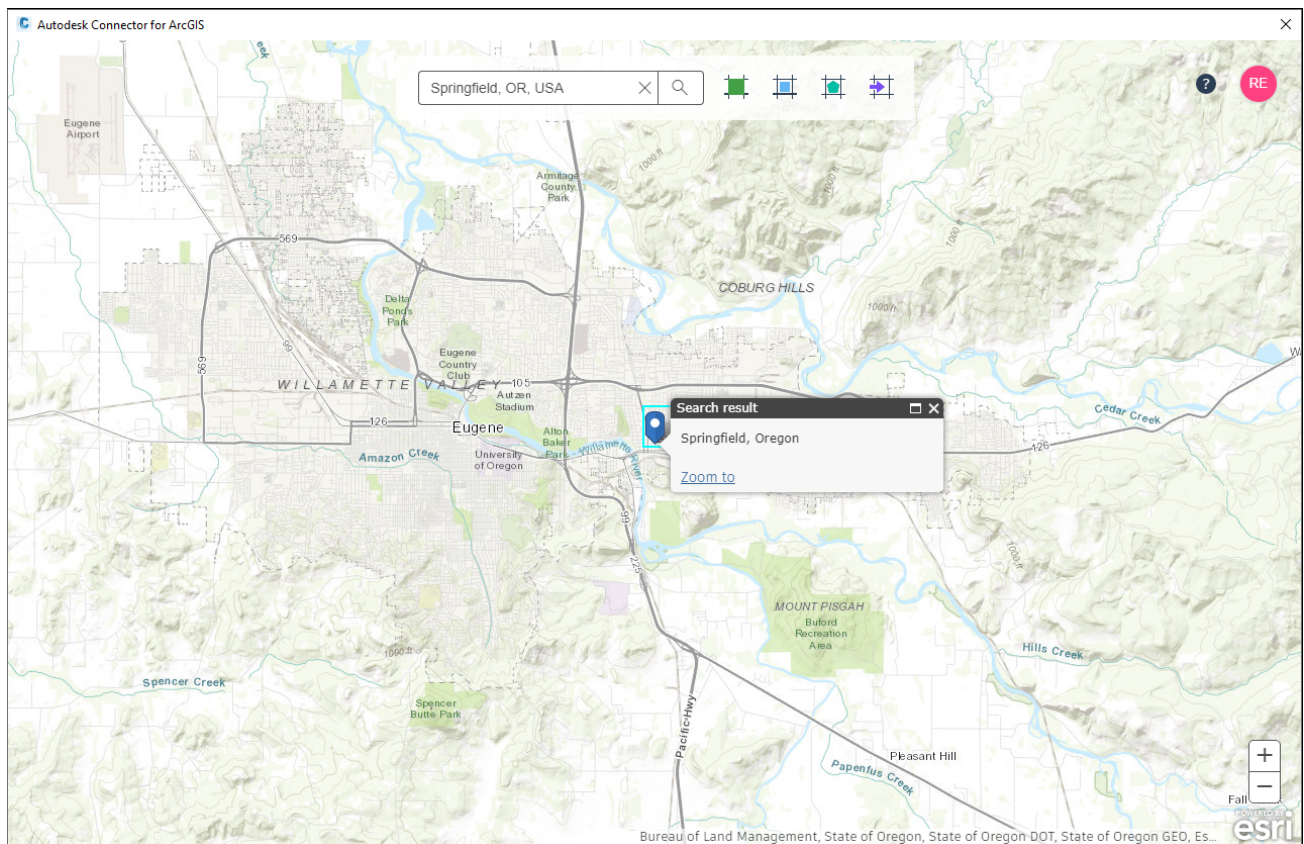
4. Enter your **Username** and **Password**.

If you do not have an account, you can create one with a free trial period. With a web browser visit: <https://goto.arcgis.com/production-esri-signup>.

5. Click <<**Sign In**>>.



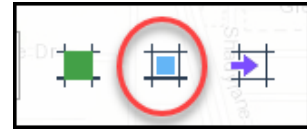
The Autodesk Connector for ArcGIS window opens.



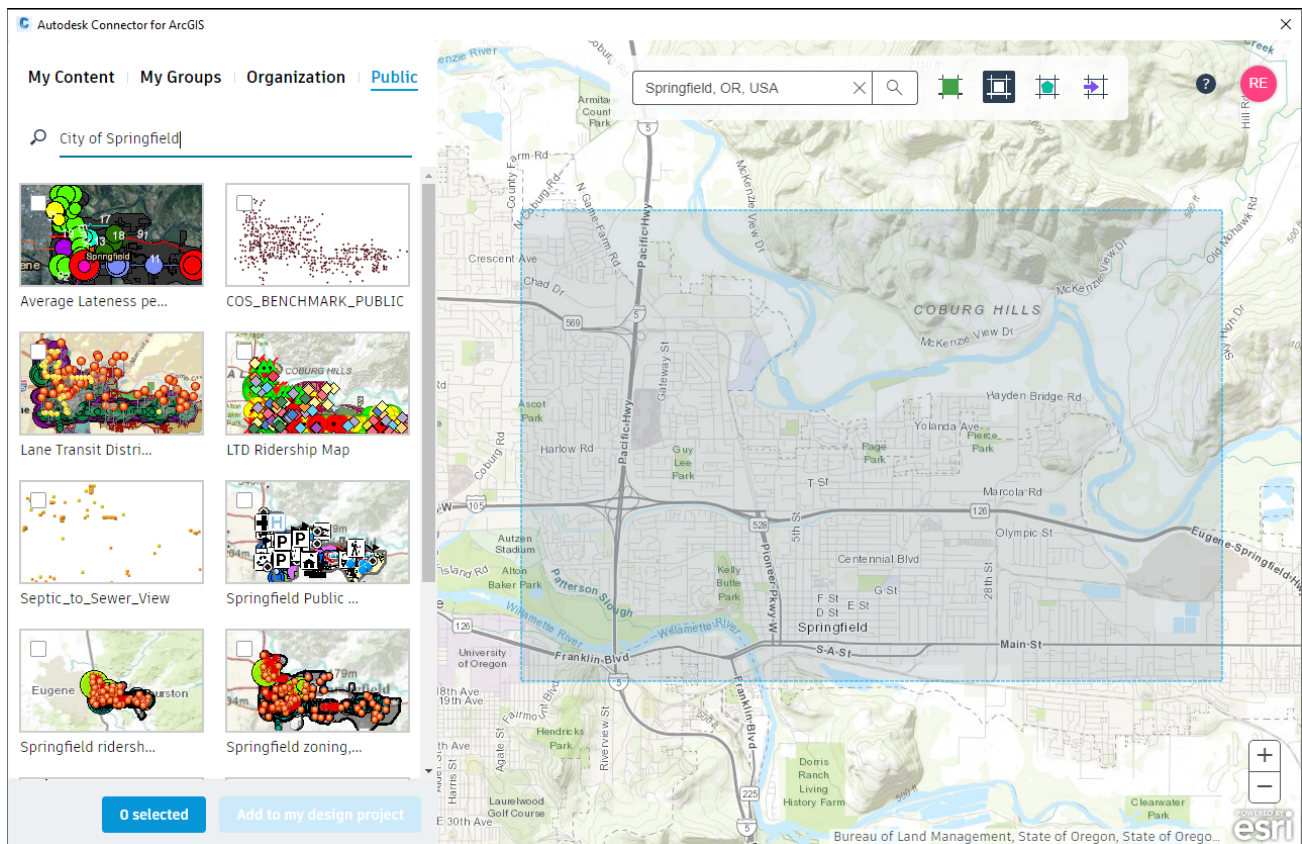
6. In the *Search by location* field, enter “**Springfield, OR, USA**”, and click the search tool

This zooms the base map to the general area of interest.

7. Zoom in and out using the wheel on your mouse and Pan by holding down the left mouse button.
8. Use draw rectangle tool to define a more specific Area of Interest (AOI).

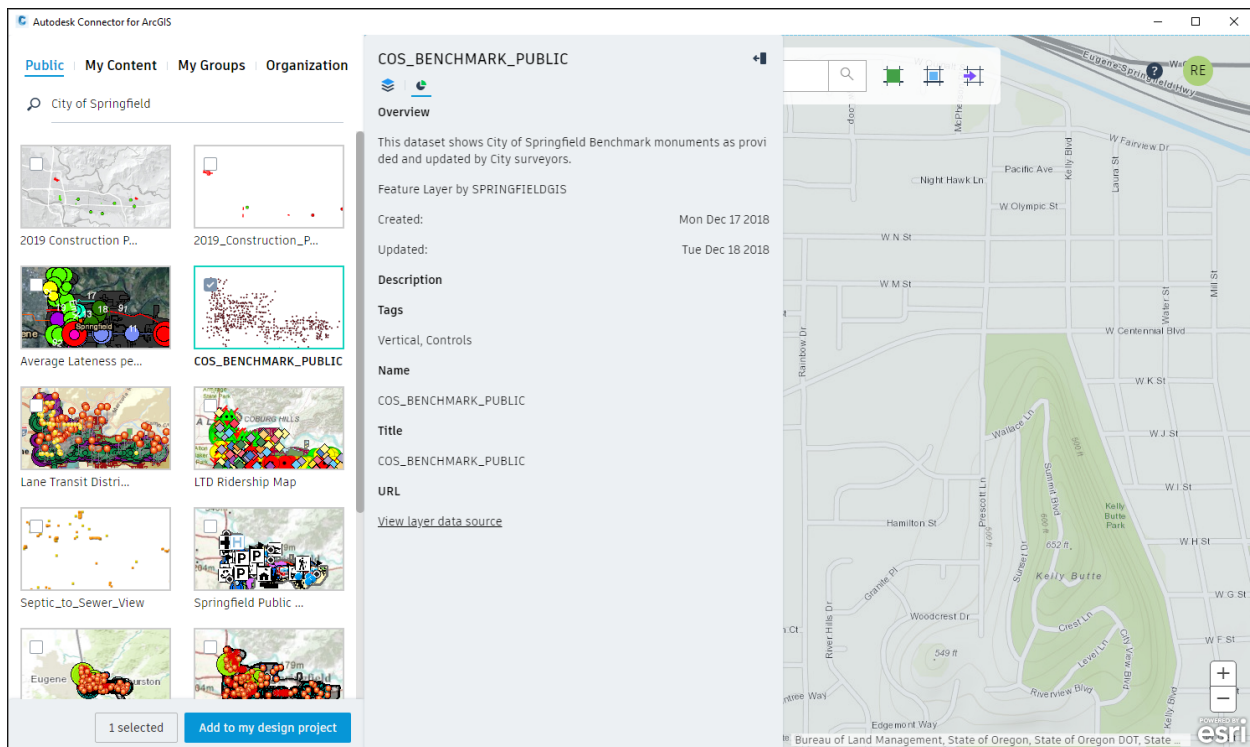


9. Define an area like the one shown below.



10. Select the <<Public>> category.
11. Enter "City of Springfield" in the search field, and press <<Enter>>.

Publicly available Maps matching these criteria (AOI and search terms) are displayed.



12. Select the map **COS_BENCHMARK_PUBLIC** by enabling the checkbox.

13. Click the **Overview** tool .

Overview information for that map is displayed.



15. Set the **Feature Type** for the layer to **COGO Points**.

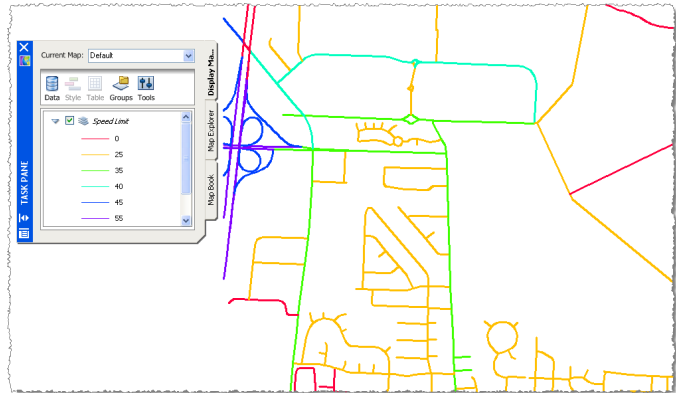
9) Points representing the benchmarks are now created in the drawing.

Connecting to GIS Data


Autodesk Civil 3D includes the option to use *FDO (Feature Data Objects)*, a technology that allows you to connect directly to GIS data, rather than import it, as we did in the example earlier. The process of connecting to GIS data is very different from importing it, and the resulting information that is created in your drawing is also different. For example, when you import GIS linear data, basic AutoCAD objects, like polylines, are created. When you connect to data, *Features* are created.

When you import data, you are copying the objects into *AutoCAD* with no link to the original data. However, when you connect to data, there is a link to the original data, similar to an XREF. This means that any changes made elsewhere to the original data can be updated in your drawing. You also have the option to directly edit the original data if you are connected to it, provided you have permission to do so.

Once you have learned how to use both methods, importing and connecting to GIS data, you can then decide when each method is best suited for your projects and tasks.

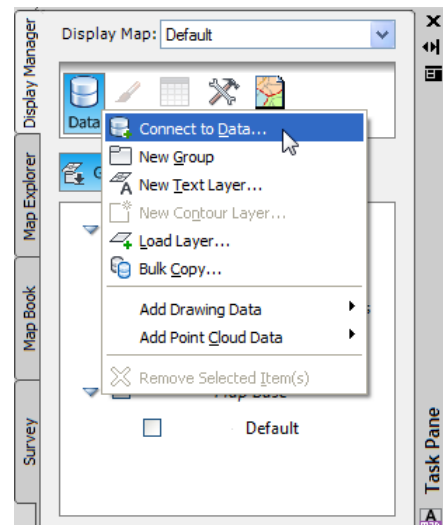


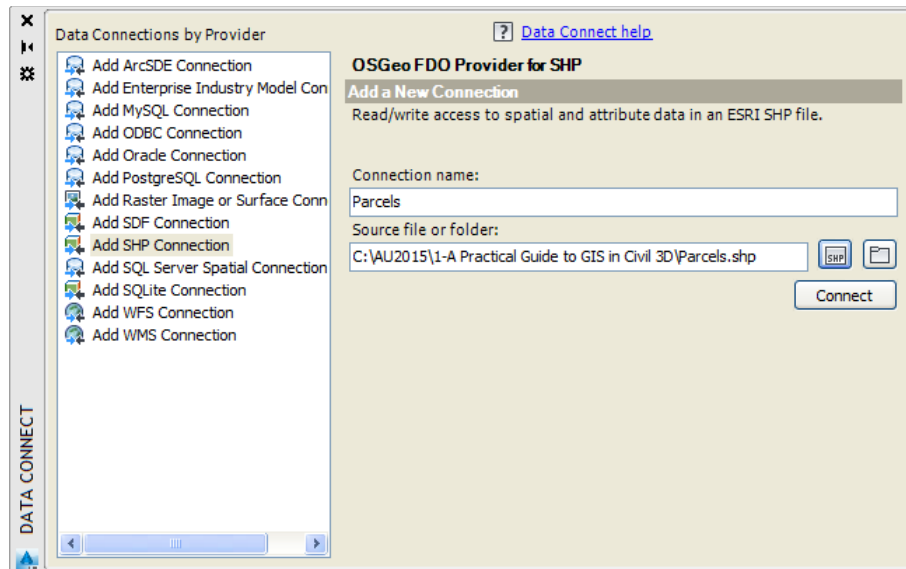
Step-by-Step


1. Start a new drawing from the template ACAD.dwt.
2. Click the Workspace button  on the status bar and set the current workspace to **Planning and Analysis**.

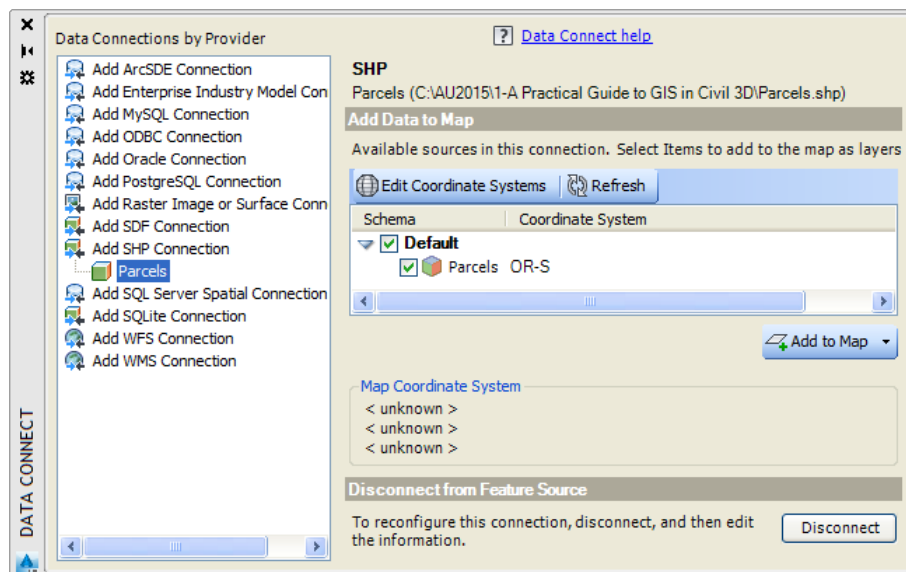


3. In the **Display Manager**, click the **Data** button, and then select ⇒ **Connect to Data...**





4. From the *Data Connections by Provider* list, select **Add SHP Connection**.
5. Change the *Connection name*: to **Parcels**.
6. Click the SHP button .
7. Browse to the dataset and select **Parcels.shp**.
8. Click **<<Connect>>**.

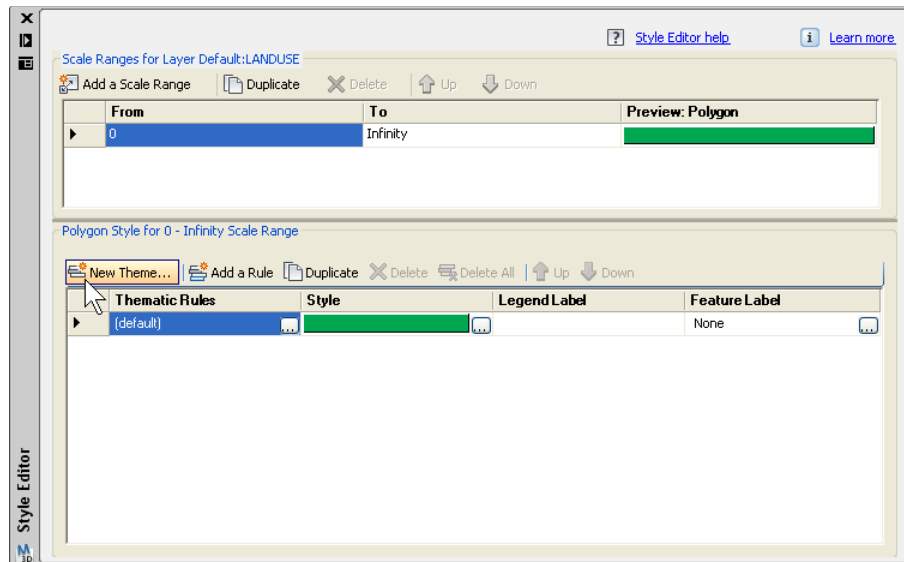


9. Once the connection is made click **<<Add to Map>>**.

Notice a new layer appears in the *Display Manager* and the *Features* appear in the drawing editor. Notice that all features are the same color. Next we will explore some basic display options with connected data.

10. In the *Task Pane* set to *Display Manager*, **right-click** the desired layer and select **Edit Style**.

The *Style Editor* opens, where you can modify a geospatial data layer's style properties. Rules can also be set up to display the layer based on certain data conditions, zoom/scale values, etc..

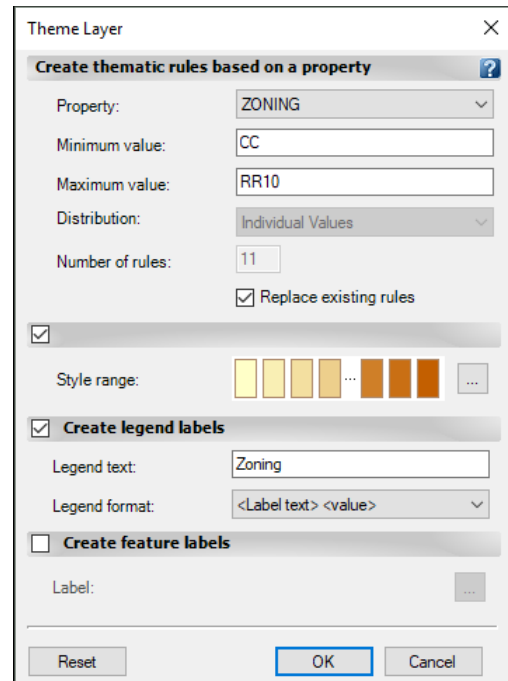


11. In the Style Editor palette, click **<<New Theme>>**.

This opens the *Theme Polygons* dialog box, where you create a theme, such as applying a different color value to each range of land values, resulting in a thematic map.

12. Set the **Property** to **ZONING**.
13. For **Legend Text**, enter **Zoning**.
14. Click **<<OK>>**.
15. Close the Style Editor.

The parcels in the drawing are themed.



Other useful GIS tools in Civil 3D

- Drawing Cleanup tools
 - Automate the process of cleaning many common geometry errors
- Thematic Mapping
- Dynamic North Arrows, Scale Bars and Legends
- Map Books

The material in this class is based on the book
A Practical Guide to GIS in Autodesk Civil 3D 2020.
 For more information go to www.cadapult-software.com/books