

Chapter 7

A Quick Tour of ArcGIS Pro



Skills you will learn: This tutorial is intended to get you going using ArcGIS Pro, a new desktop application that is part of ArcGIS Desktop. A separate tutorial gives a basic overview of ArcMap, the traditional desktop product from Esri.

This tutorial assumes you have installed ArcGIS Pro on your computer and that you are using version 1, which as of the writing of this tutorial is in version 1.3. Illustrations in this tutorial depict functionality in ArcGIS Pro 1.3 except where the version current as of August 2017, version 2.0, differs markedly.

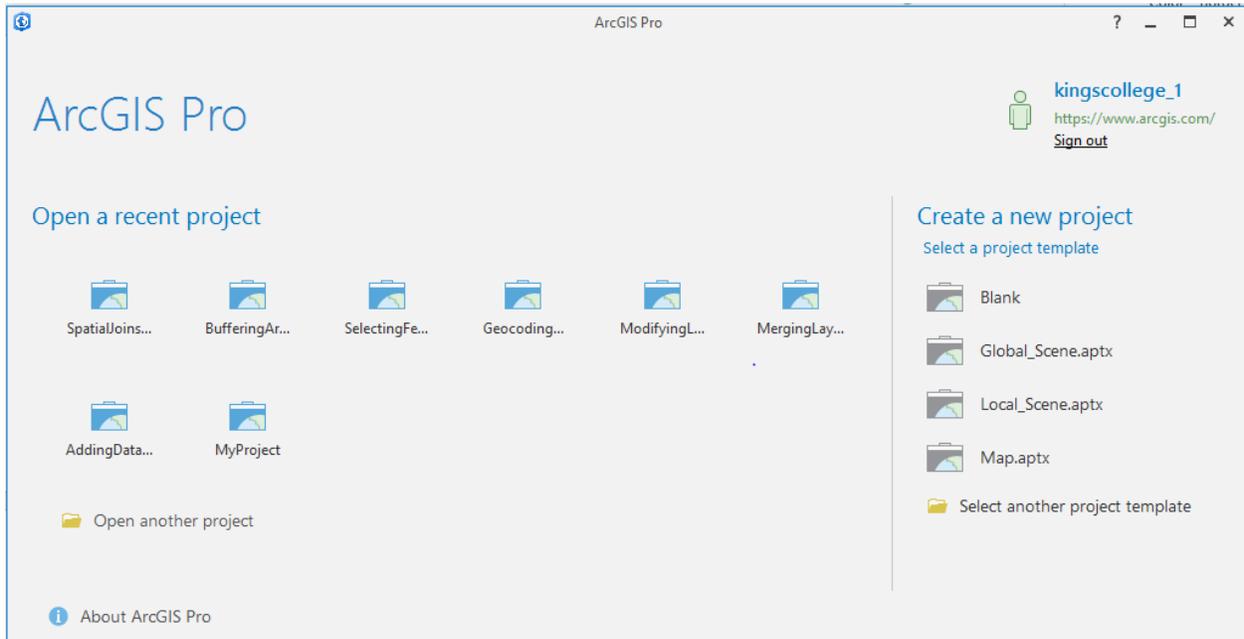
Throughout this tutorial, we will use a shapefile of Toronto electoral wards available from the City of Toronto's open data website at <http://www1.toronto.ca/wps/portal/contentonly?vgnextoid=b1533f0aacaaa210VgnVCM1000006cd60f89RCRD>. We used the 2010 ward map, with the NAD27 datum.

Getting started, the basics

ArcGIS Pro is a sophisticated and powerful application recently developed by Esri, which may in time replace ArcMap as the company's main desktop GIS offering. ArcGIS Pro has a modernized user interface that uses the concept of ribbons first developed by Microsoft for its Office suite. It is also a 64-bit application, which offers significant potential speed increases. The purpose of this tutorial is to provide you with a roadmap to the most important features.

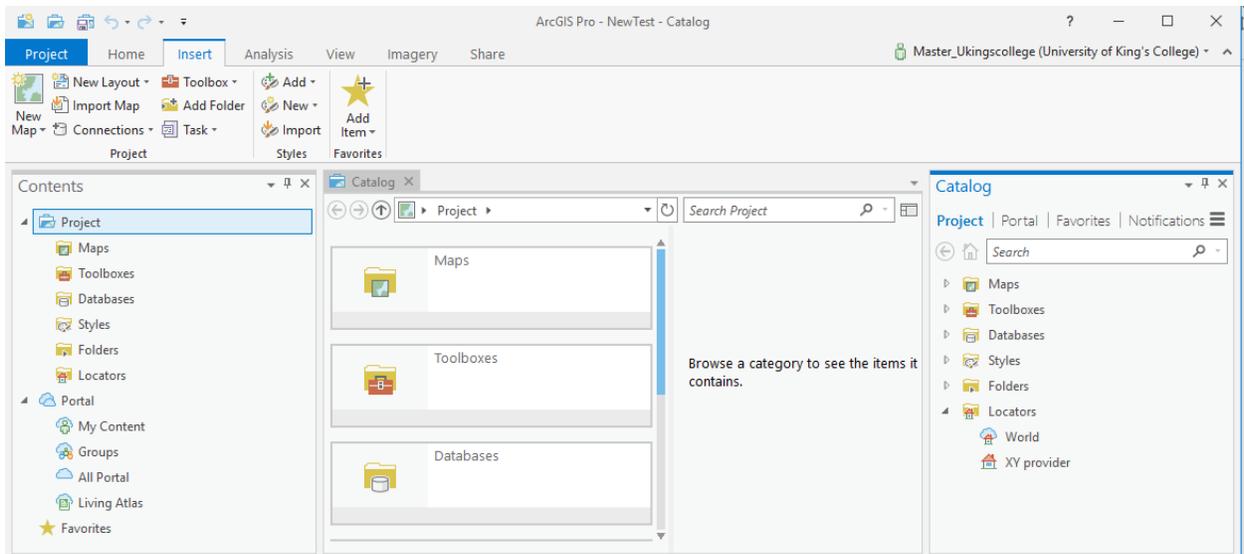
Chapter 7 of *The Data Journalist* provides an introduction to how journalists use GIS programs, as well as important theoretical background for using any GIS, and it should be read prior to working with this and the other tutorials.

When you first open ArcGIS Pro—assuming you have left the default options in place-- you will be presented with this opening screen.



ArcGIS Pro organizes work into projects. Each project is a self-contained workspace that can contain one or more maps. While ArcGIS Pro has capabilities that extend beyond creating 2D maps, we will not be covering those additional capabilities in this tutorial. We will focus on the analytical capabilities most often used by journalists.

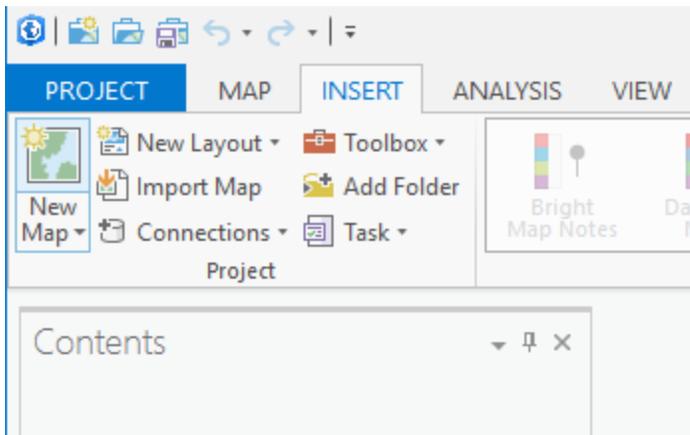
The easiest way to start a new project is to click on the Blank project template, seen under Create a new project, to the right side of the screen. A screen similar to this will open.



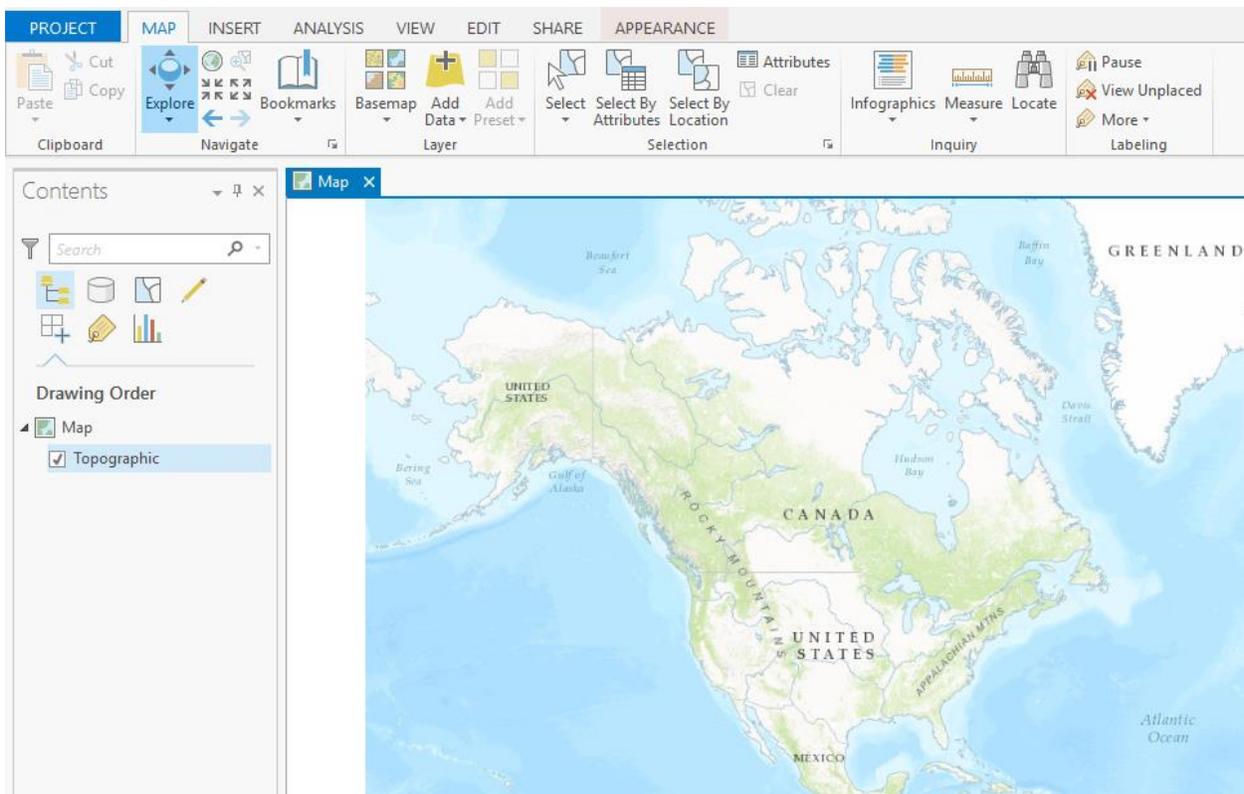
At first, your project will not have any content. If you like, you can close or hide the catalogue pane, seen on the right in the image above. It's like an advanced file manager application and keeps track of various files and components used in the ArcGIS Pro environment.

A project can contain one or more maps. Your first step will probably be to add a new map. This is, after all, a mapping program.

On the Insert ribbon, the leftmost icon is the New Map button.



Clicking on this button will create a new map, and if you are connected to the Internet, will add a base layer downloaded from ArcGIS Online.

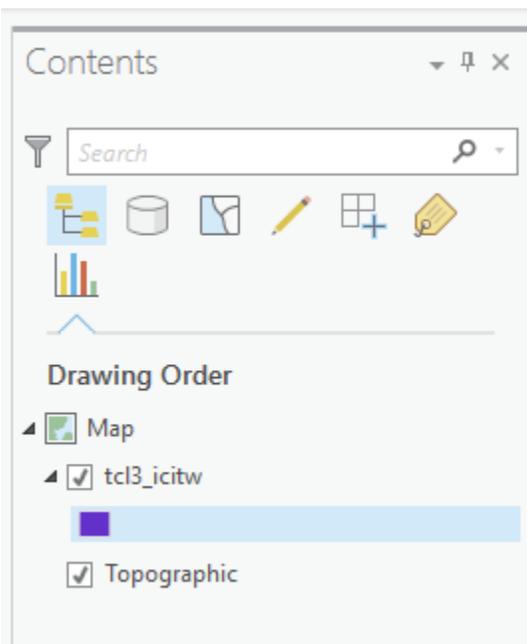


The map

In ArcGIS Pro, all of the information about how a map is put together is stored in the map, and the map in turn in the project. A map doesn't contain the actual data, but instead contains references to the various layers and datasets that go together to make the map. The layers may be Esri shapefiles or feature classes stored in geodatabases. Datasets may be .csv files, Excel files or in relational databases if open database connectivity (ODBC) is used. Unlike in ArcMap, you can't connect to data in a Microsoft Access database as the two software platforms are incompatible. If you want to work with data from Access, you should use ArcMap, which can connect to an Access database using Object Linking and Embedding (OLE), or first convert data to a compatible format such as .csv, .xls, or .xlsx.

Each map will appear in its own tab, and each map has an associated Contents pane that appears in the default configuration to the left of the screen.

The Contents pane is a list of all of the layers that make up your map. It has seven different views, three of which we will discuss here, Drawing Order, Data Source, and Selection. These three layers allow you to display your layers in the Contents pane by the order they are drawn in the map, from top to bottom, by their source (location on your hard drive or in a geodatabase), and by whether they are selectable. You can make layers visible or invisible by clicking on the checkmark beside the layer's name in the drawing order and source views. Here, we see the drawing order view.



Like other panes, the contents pane can be moved to either side of the map, or the top or bottom of the frame, and either can also be pinned to the side of the frame, or allowed to float freely.

Adding data to the map

We can begin a new analysis in ArcGIS Pro by adding one or more datasets to our map. We'll discuss adding map layers first.

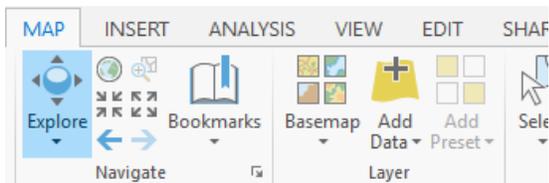
ArcGIS Pro can directly open shapefiles, feature classes contained in file geodatabases, and ArcMap layer files. As discussed a little later in this tutorial, each ArcGIS Pro project has a default geodatabase associated with it, making it easy to use a geodatabase to store any new layers you create as part of your workflow. You can, as in ArcMap, save output layers to the shapefile format.

Shapefiles are a very common format, so if you plan to share your data with others who may not be using an Esri product, a shapefile can be a preferred format. You can also upload shapefiles to ArcGIS Online so long as they have no more than 1,000 features.

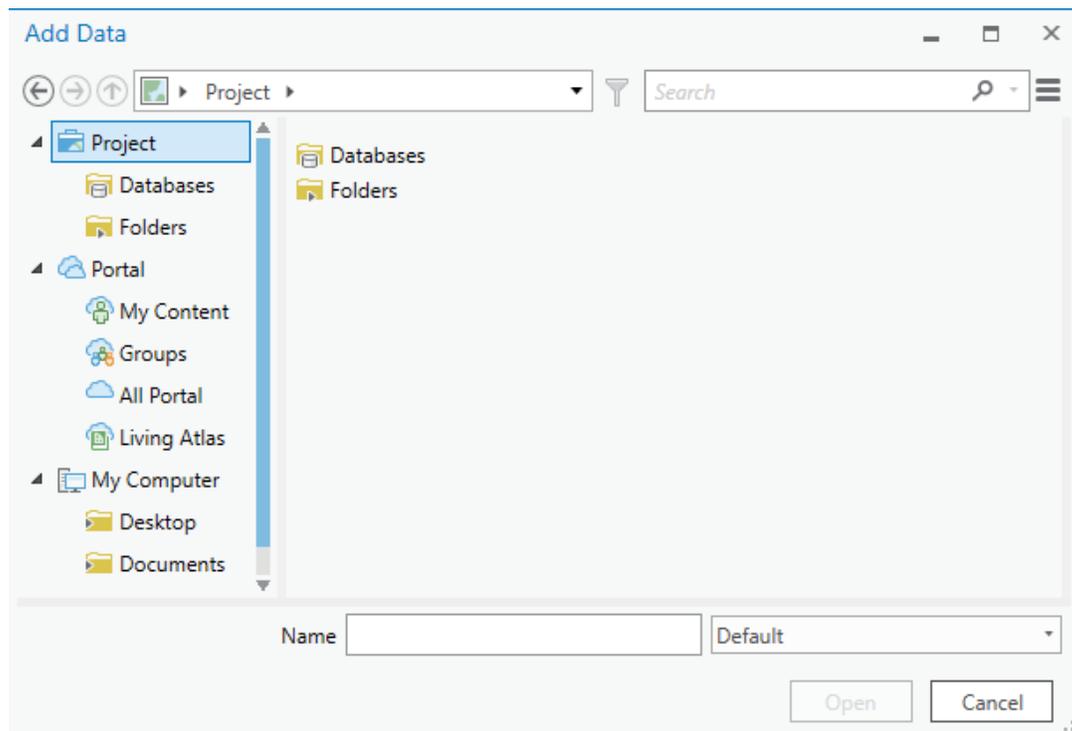
See chapter 6 of *The Data Journalist* for a discussion of different map data formats.

ArcGIS Pro can also convert layers formats such as KML and JSON.

If you are adding a shapefile, feature class from a geodatabase, or a layer file, click on the Add Data icon in the Layer area of the Map ribbon.



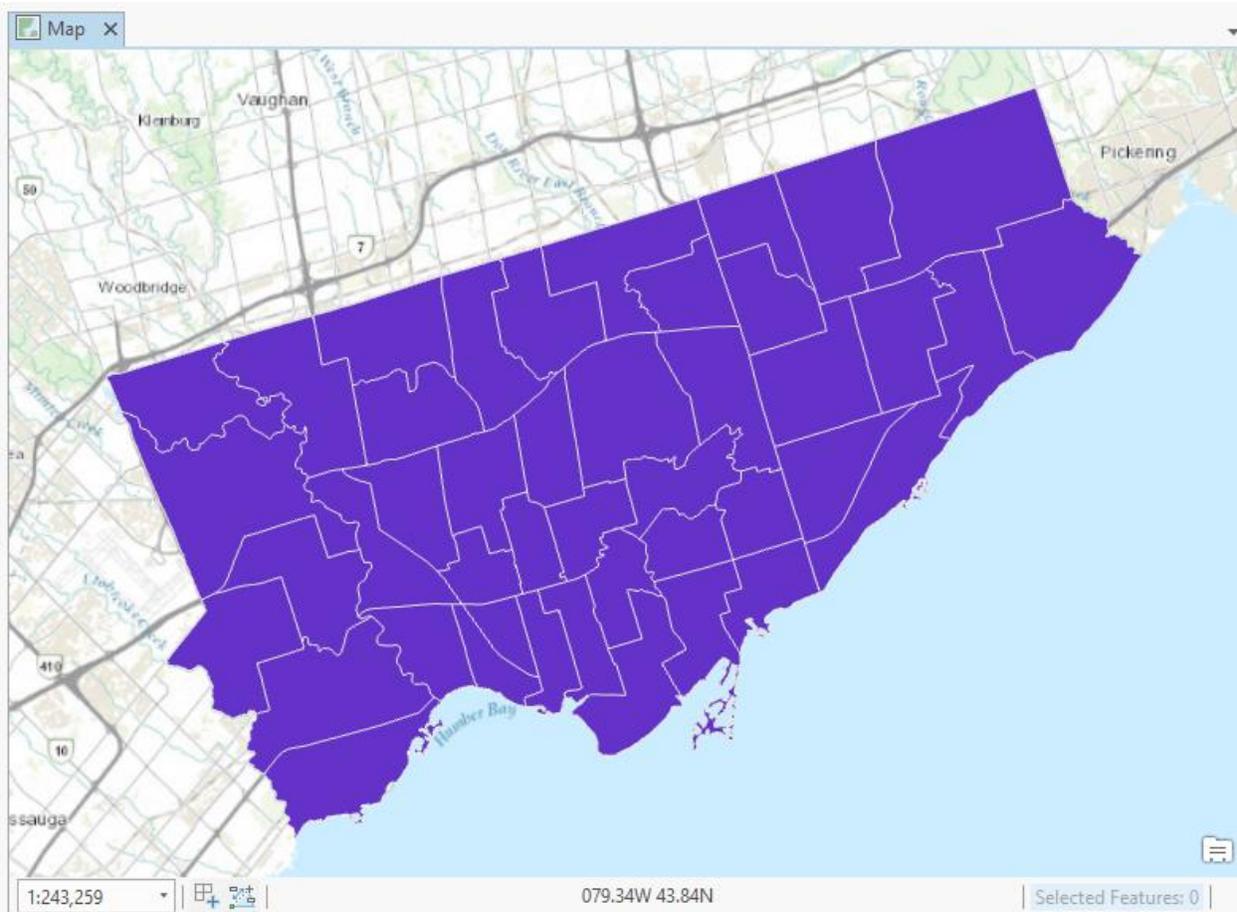
This will open the add data dialogue.



From here, you can navigate to the folder that contains your data and add it to your map.

Tip: You can also click on Folders to open folders to which you have already established a connection. To add a connection, click Add Folder in the Project area of the Insert ribbon and navigate to the folder you wish to add.

Here we see the map with a layer of Toronto, Ontario municipal election boundaries added. The shapefile was downloaded from the city's open data site.



Adding non-geographic datasets

You are not limited to adding map layers to your map. You can also add non-geographic data, often as a first step to joining the data with a geographic layer as described in the tutorial **Joining Maps to Other Datasets in ArcGIS Pro**.

The task of adding non-geographic data is so common that delimited text files (see chapter 2 of *The Data Journalist* for a discussion of various data formats) are a native file type that can be added directly to a map. Any file with a .csv or .txt extension will be assumed to be a comma-delimited file,

while any file with a .tab extension will be assumed to be a tab-delimited file. The most recent versions can also work with Excel format files.

To add a non-geographic file to the map document, simply click on the Add Data button, and navigate to the folder containing the file. It will then be added to the table of contents.

ArcGIS Pro uses its own set of rules to determine the field types for the columns in the delimited text file. Normally, this works fine. Columns that are obviously numbers will be imported as number types, while text fields will be imported as text types. Occasionally, however you will need to import a text file that has fields with ambiguous data. For example, Canada's national statistical agency, Statistics Canada, identifies some urban census tracts with numbers that have trailing 0s after a decimal place, a such as 20400078.00. ArcMap interprets these columns as being number columns, and strips off the trailing 0s. This is a problem because if one is joining the data in the census file with a map of census tracts, the trailing 0s need to be intact to make the join properly.

Fortunately, there is an easy fix. If you have such a file, create another text file and call it schema.ini. Place it in the same folder as the text file you want to import. In the schema.ini file, you need to two lines. The first identifies the file to be imported, and the second sets the field in question to be imported using the data type you want.

For example, consider this csv file with two fields:

```
ID, Population
2345.00, 1246
678.00, 2129
453.12, 1047
```

ArcMap would normally interpret the ID column as a number type, as well as the Population column. For the population column, this is correct, but the ID column needs to be imported as text, because the trailing 0s are an integral part of the ID field value.

To fix this, created a schema.ini file containing this:

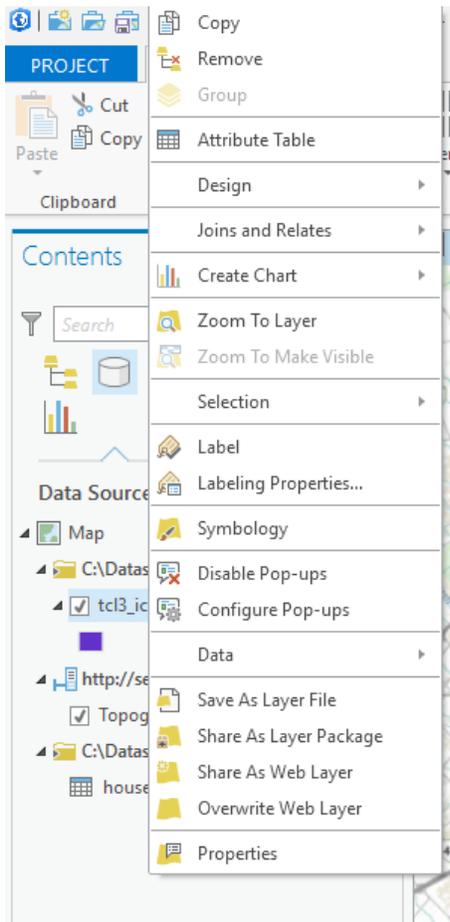
```
[test.csv]
Col1= ID Text
```

This would tell ArcGIS Pro to import column 1, which has the name ID, as a text field. To control how more than one column is imported, just add additional column instructions, each one on a new line.

Once you have some data added to the map, you can begin to work with it.

The layer menu

Once the layer has been added to the map, its name will appear in the Contents frame. In the drawing order and data source tabs, if you right click on the name of the layer, a new menu will open, as seen here. An enhanced version of the same menu appears when you click on the List by Selection tab.



There are a number of key choices in this menu that are at the centre of most workflows in ArcGIS Pro. Some of these lead to further submenus, which we will discuss as we get to them.

Copy allows you to copy the layer to the clipboard and then paste an identical copy into this or another map, while **remove** does exactly what it suggests, removing the layer from the map.

If you click on **Attribute Table**, you will be able to see the underlying attribute table for the map layer. See Chapter 7 of *The Data Journalist* for a full discussion of attribute tables and the nature of map layers as data tables.

This is what the attribute table of the Toronto election wards map looks like when opened.

tcl3_icitw

Field: New Delete Calculate Selection: Zoom To Switch Clear Delete

FID	Shape	GEO_ID	CREATE_ID	NAME	SCODE_NAME	LCODE_NAME	TYPE_DESC	TYPE_CODE	OB
0	Polygon	14630026	63519	Scarborough-Rouge...	41	EA41	Ward	CITW	
1	Polygon	14630028	63519	Scarborough East (44)	44	EA44	Ward	CITW	
2	Polygon	14630024	63519	Scarborough-Rouge...	42	EA42	Ward	CITW	
3	Polygon	14630027	63519	Scarborough-Aginco...	39	EA39	Ward	CITW	
4	Polygon	14630035	63519	Willowdale (24)	24	NO24	Ward	CITW	
5	Polygon	14630029	63519	Scarborough-Aginco...	40	EA40	Ward	CITW	
6	Polygon	14630036	63519	Don Valley East (33)	33	NO33	Ward	CITW	
7	Polygon	14630037	63519	Willowdale (23)	23	NO23	Ward	CITW	
8	Polygon	14630039	63519	York West (8)	08	NO08	Ward	CITW	
9	Polygon	14630031	63519	Scarborough Centre...	38	EA38	Ward	CITW	
10	Polygon	14630040	63519	York West (7)	07	WE07	Ward	CITW	
11	Polygon	14630041	63519	Don Valley East (34)	34	NO34	Ward	CITW	
12	Polygon	14630010	63519	Don Valley West (25)	25	NO25	Ward	CITW	
13	Polygon	14630030	63519	Scarborough East (43)	43	EA43	Ward	CITW	

0 of 44 selected

100 %

We'll return to attribute tables later.

Back in the layer menu, the **Joins and Relates** option is used to create joins and relations between tables, including between geographic and non-geographic data. This functionality is explained in two additional tutorials, **Joining Maps to Other Datasets in ArcGIS Pro** and **Spatial Joins in ArcGIS Desktop Pro**.

The **Selection** menu item is covered in the tutorial **Selecting by Attributes and Location in ArcGIS Pro**. It allows you to work with selections on the map and/or the attribute table.

The **Label** item toggles text labels on and off. The text displayed, and its format, can be controlled by going to the Labeling ribbon, visible whenever you have clicked on the name of a map layer in the Contents pane.

ArcGIS Pro - QuickTourPro - Map

FEATURE LAYER

PROJECT MAP INSERT ANALYSIS VIEW EDIT SHARE APPEARANCE LABELING DATA

Class: Class 1

Label: Label Features In This Class

Field: NAME

Layer: Label Class

Visibility Range: In Beyond, Out Beyond, Clear Limits

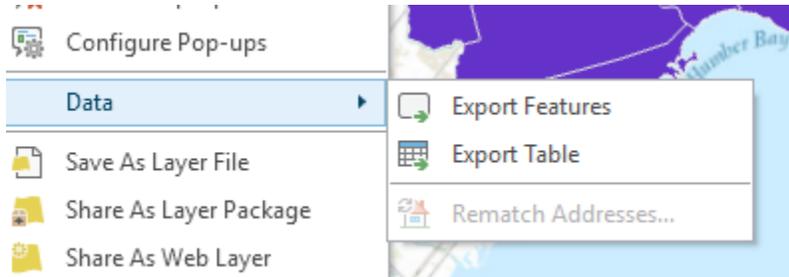
Text Symbol: Boundary, Landform/P..., Landmark/POI

Font: Tahoma, Size: 10, Style: Regular

Basic Polygon

The **Symbology** menu item allows you to control how the map is styled, such as creating a choropleth map. See the tutorial **Making Choropleth Maps in ArcGIS Pro**.

Clicking **Data** opens a submenu in which you can initiate an export of the map data in the layer, either the map features or just the attribute table.

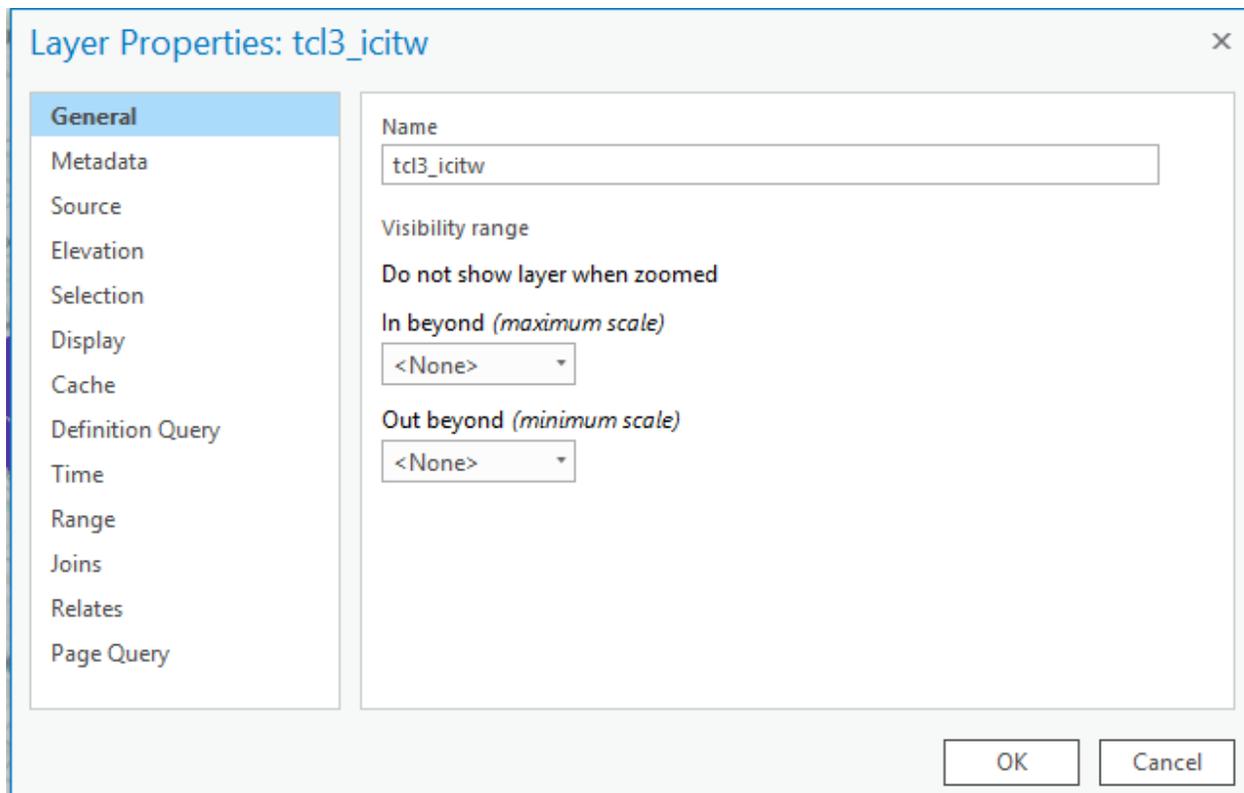


Once exported, the new layer or data table can be added to the map, at your option.

The greyed out choice, Rematch Addresses, becomes active when a map layer was created through geocoding. See the tutorial **Geocoding in ArcGIS Pro**.

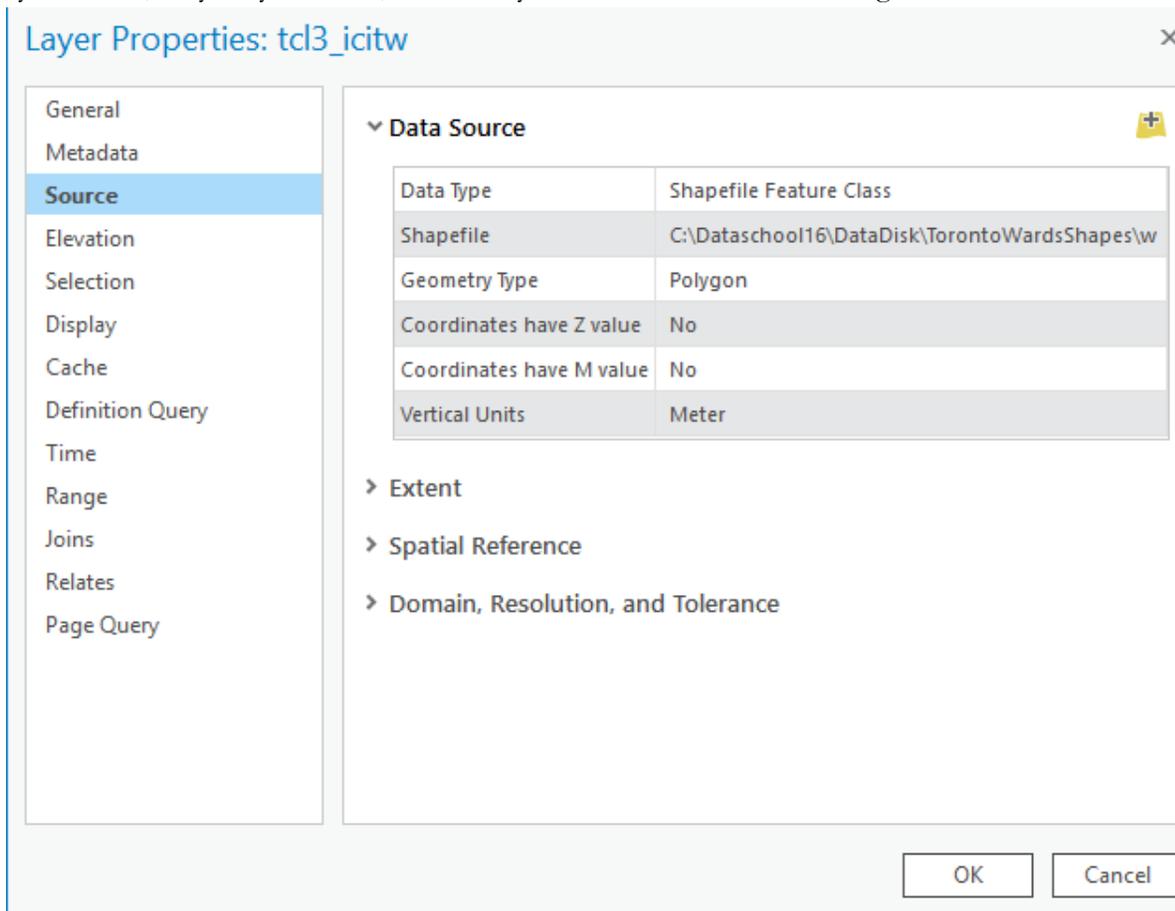
The **Save as Layer File** menu option will save the layer to a layer file in ArcGIS Pro. This is often used after making a selection, as discussed in the tutorial **Selecting by Attributes and Location in ArcGIS Pro**.

The last menu item, **Properties**, opens the properties dialogue for the layer.



The **General** tab allows control of basic properties, such as the name of the layer (the name only applies within the map; the original name of the layer is not altered) and whether the layer is visible at all zoom levels, or only at some.

The **Source** tab provides important metadata, such as the location of the file in your computer's file system, the type of feature (point, line, polygon), the projected coordinate system, projection, and unit of linear measure of the layer, and the geographic coordinate system, datum, spheroid and unit of angular measure of the layer, and other information. A quick glance at this data can help you determine if, for example, the map layer is unprojected. Please see the discussion of coordinate systems in Chapter 7 of *The Data Journalist* for a more complete explanation of what coordinate systems are, why they are used, and what you must consider when using them.

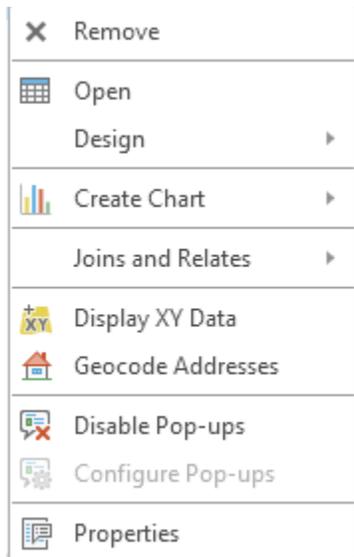


The **Selection** tab allows you to control how selected features will be highlighted on the map layer.

The **Joins** tab shows any current joins that exist for the layer, and the **Relates** tab does the same for relates. See the tutorial **Joining Maps to Other Datasets in ArcGIS Pro**.

Menu for non-geographic tables

When you add a non-geographic file to the map, you can right click the file name to see a more limited menu of options than is available for a map layer file.

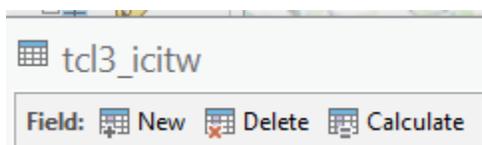


The three most important menu items are **Geocode Addresses**, used to access the geocoding routine for turning non-geographic data, such as addresses, into geographic data for display on the map, **Joins and Relates**, and **Display XY Data**, which is used to display points represented in a non-geographic data file as latitudes and longitudes or as Cartesian coordinates. See Chapter 7 of *The Data Journalist* for a discussion of these concepts. Procedures for geocoding and adding XY data are found in the tutorial **Geocoding in ArcGIS Pro**.

Working with attribute tables

A GIS program is a sophisticated database application, and there are various ways to work with a map layer's attribute table.

At the upper left of the attribute table, you can make basic changes to the table structure.



Here you can add a new field to the table, delete an existing field or create an expression to calculate a new value in a field.

If you select some of the fields in the table, either manually or using one of the ArcGIS Pro selection tools, several icons become available for working with the selection. They are highlighted in this image.

FID	Shape	GEO_ID	CREATE_ID	NAME	SCODE_NAME	LCODE_NAME
0	Polygon	14630026	63519	Scarborough-Rouge...	41	EA41
1	Polygon	14630028	63519	Scarborough East (44)	44	EA44
2	Polygon	14630024	63519	Scarborough-Rouge...	42	EA42
3	Polygon	14630027	63519	Scarborough-Aginco...	39	EA39
4	Polygon	14630035	63519	Willowdale (24)	24	NO24
5	Polygon	14630029	63519	Scarborough-Aginco...	40	EA40
6	Polygon	14630036	63519	Don Valley East (33)	33	NO33
7	Polygon	14630037	63519	Willowdale (23)	23	NO23

The Zoom To icon will cause the map to shift its focus and zoom to the selected features. Switch will cause the selected and non-selected features to be exchanged. Clear will clear the selected features and Delete will delete them from the map and attribute table.

In the upper right corner of the table is a small accordion menu. Clicking on it brings up a number of additional choices.

ODE_NAME	TY
.1	Ward
4	Ward
2	Ward
9	Ward
24	Ward

If you click on Show Field Aliases, any aliases, which are alternative names for fields, will be displayed in the attribute table. You can set the aliases and view the table structure by clicking on Fields View.

Visible	Read Only	Field Name	Alias	Data Type	Allow NULL	Highlight	Number Format	Default	Precision
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	FID	FID	Object ID	<input type="checkbox"/>	<input type="checkbox"/>	Numeric		0
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Shape	Shape	Geometry	<input type="checkbox"/>	<input type="checkbox"/>			0
<input checked="" type="checkbox"/>	<input type="checkbox"/>	GEO_ID	GEO_ID	Long	<input type="checkbox"/>	<input type="checkbox"/>	Numeric		9
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CREATE_ID	CREATE_ID	Long	<input type="checkbox"/>	<input type="checkbox"/>	Numeric		9
<input checked="" type="checkbox"/>	<input type="checkbox"/>	NAME	NAME	Text	<input type="checkbox"/>	<input type="checkbox"/>			0
<input checked="" type="checkbox"/>	<input type="checkbox"/>	SCODE_NAME	SCODE_NAME	Text	<input type="checkbox"/>	<input type="checkbox"/>			0
<input checked="" type="checkbox"/>	<input type="checkbox"/>	LCODE_NAME	LCODE_NAME	Text	<input type="checkbox"/>	<input type="checkbox"/>			0
<input checked="" type="checkbox"/>	<input type="checkbox"/>	TYPE_DESC	TYPE_DESC	Text	<input type="checkbox"/>	<input type="checkbox"/>			0
<input checked="" type="checkbox"/>	<input type="checkbox"/>	TYPE_CODE	TYPE_CODE	Text	<input type="checkbox"/>	<input type="checkbox"/>			0
<input checked="" type="checkbox"/>	<input type="checkbox"/>	OBJECTID	OBJECTID	Long	<input type="checkbox"/>	<input type="checkbox"/>	Numeric		9
<input checked="" type="checkbox"/>	<input type="checkbox"/>	SHAPE_AREA	SHAPE_AREA	Double	<input type="checkbox"/>	<input type="checkbox"/>	Numeric		0
<input checked="" type="checkbox"/>	<input type="checkbox"/>	SHAPE_LEN	SHAPE_LEN	Double	<input type="checkbox"/>	<input type="checkbox"/>	Numeric		0
<input checked="" type="checkbox"/>	<input type="checkbox"/>	MyNewField	MyNewField	Text	<input type="checkbox"/>	<input type="checkbox"/>			0

Click here to add a new field.

Choosing Joins and Relates allows you to join tables or create table relates. See the tutorial **Joining Maps to Other Datasets in ArcGIS Pro**.

ArcGIS Pro Ribbons

As discussed earlier in this tutorial, ArcGIS Pro organizes many of its features into ribbons similar to those used in Microsoft’s Office suite. The ribbons are a blending of the menus and toolbars that are the more conventional approach to user interfaces. We’ll walk through the key ribbons. Here, you can see the default ribbon headers. In addition to these, there are context-sensitive ribbons that become available in certain instances, such as when the user clicks on the name of a map layer in the Contents pane.

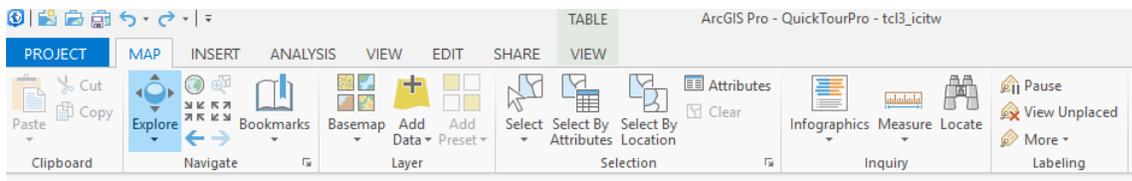


We’ll begin with the **Map ribbon**.

We have already seen the Add Data icon, but there is much more available on this key ArcGIS Pro ribbon.

In the Navigate area, the Explore icon activates a tool that permits navigation of the map. When activated, you can use the tool to drag the map across the screen so you can pan back and forth. If you hold the shift key, the cursor will become a small magnifying glass with a plus (+) sign in the middle. If you trace a rectangle on the screen by dragging, the map will zoom to approximately the area you define.

The small globe icon allows you to quickly zoom out to the full extent of the map, the icons with four inward or outward pointing arrows permit you to zoom in and out of the centre of the map, and the left or right facing arrows are used to go back and forth between previously selected zoom levels.

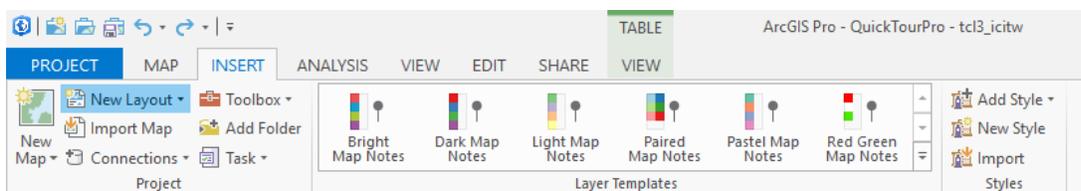


In the layer area, the Basemap icon allows you to change the basemap layer downloaded from ArcGIS Online. The Add Data icon was discussed earlier in this tutorial.

The Selection area provides a variety of tools for selecting features on the map as described in the tutorial **Selecting by Attributes and Location in ArcGIS Pro**.

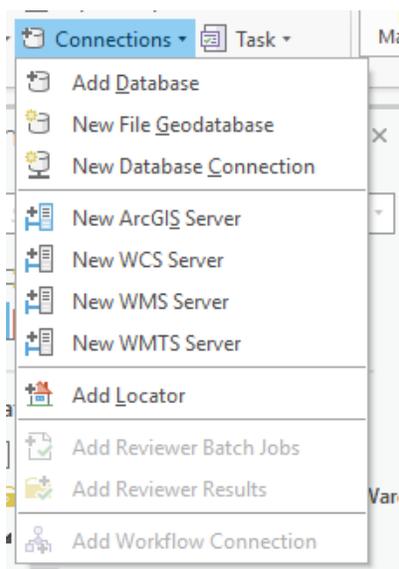
In the Inquiry area, the Measure icon can be used to measure from one point on a map to another. Click on the first location, then drag across and click on a second location, and ArcGIS Pro will give you the distance in the units of measurement of the map. The Locate icon allows you to find a location on the map using x/y coordinates or using an address locator (for a discussion of address locators, see the tutorial **Geocoding in ArcGIS Pro**). Note, that if you use one of Esri's online geocoding services, you will use service credits on your ArcGIS Online account.

The **Insert Ribbon** is where you can create a new map in your project. It will open in a new tab. You can also import an existing map, including an ArcMap map document (mxd document).



By clicking **Add Folder**, you can add a connection to a local or network folder, so files are easily added to your map.

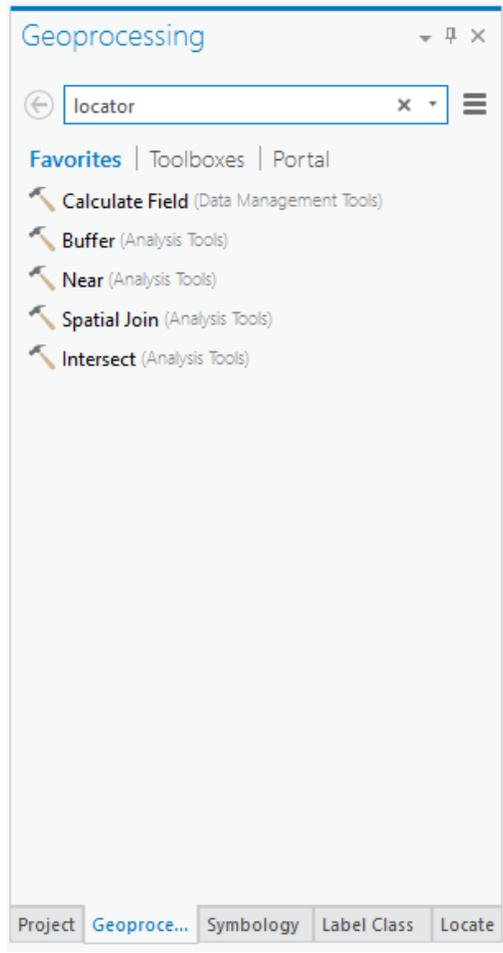
The **Connections** dropdown menu permits you to add an existing file geodatabase to your project, create a new file geodatabase, or create a connection to a database. You can also add an existing address locator to your project. For a discussion of address locators see the tutorial **Geocoding in ArcGIS Pro**.



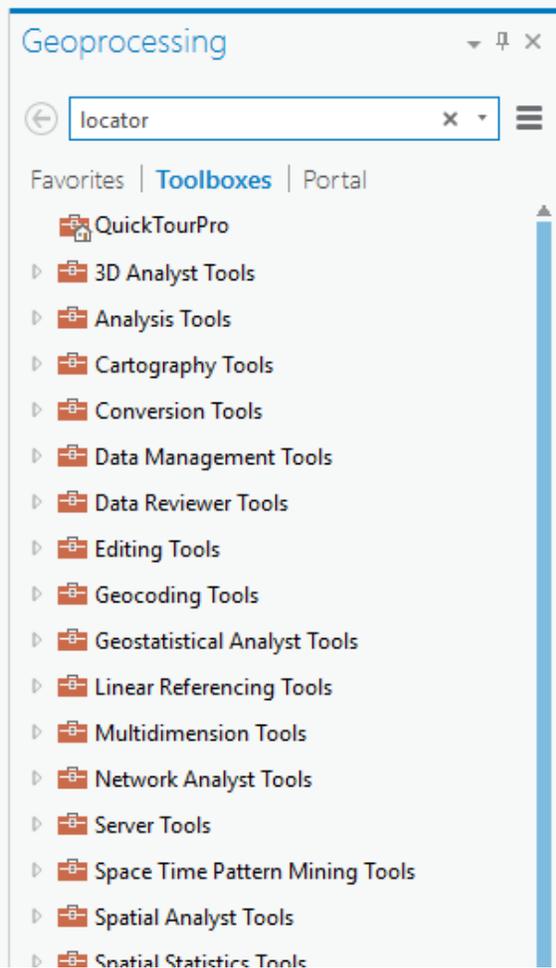
The **Analysis ribbon** allows access to many of the most important analysis tools used by journalists.



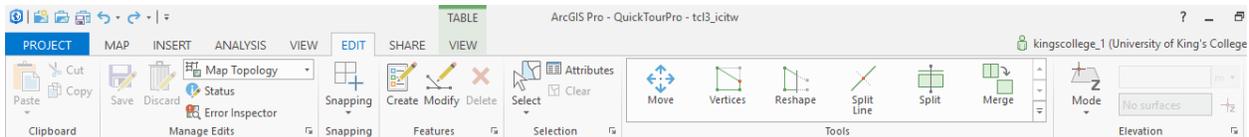
Clicking on the Tools icon opens the geoprocessing pane.



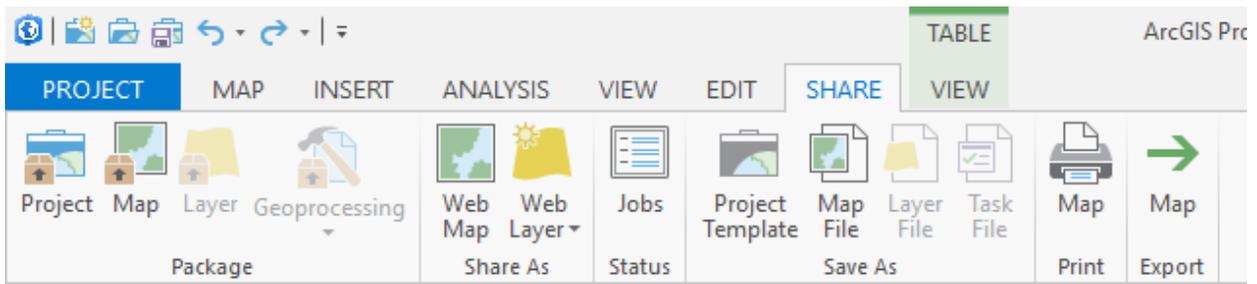
The Favourites tab provides access to commonly used tools. The Toolboxes tab provides access to all of the available ArcGIS Pro tools.



The **Edit ribbon** provides access to a variety of tools for creating and modifying map features.



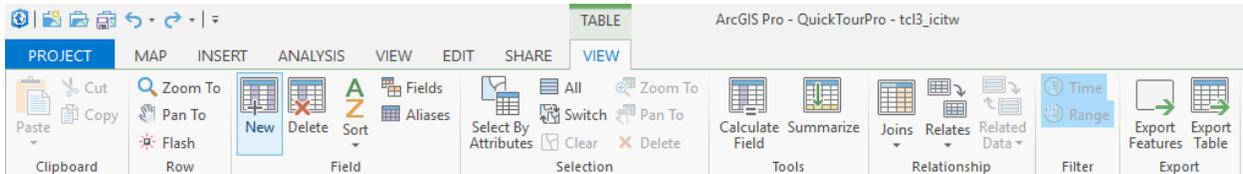
The **Share ribbon** provides access to a number of ways to share your map, either online or as a file. You can also export the map to a number of static formats, including .jpg, PDF, and .eps.



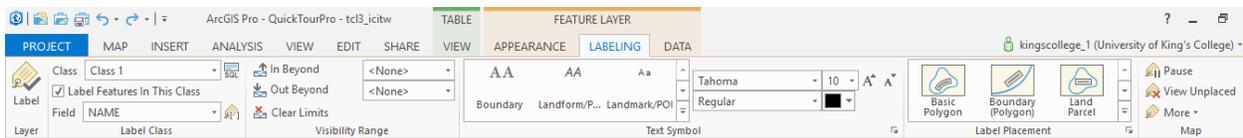
Context sensitive ribbons

There are certain ribbons that become available in certain contexts.

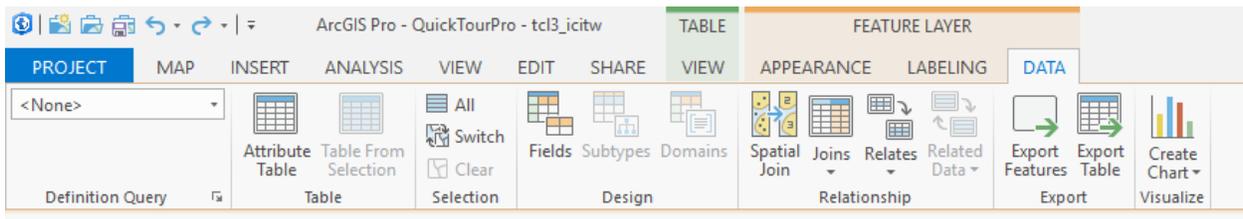
The **Table View** ribbon provides access to a variety of tools for working with layer attribute tables and data tables, including to export map layers and attribute tables to external files.



The **Labeling** ribbon is available whenever you click on a map layer in the Contents pane. With it you can control how labels appear on the map.



The **Data** ribbon is available when you select map layers and data tables in the Contents pane. It includes tools for viewing attributes, creating joins, and exporting features and attribute data.



File geodatabases

The various analysis methods and tools that produce new map files as their output, including spatial joins, buffering, geocoding, and exporting map tables, can produce new shapefiles. In most cases, this will be perfectly sufficient. However, there may be times, such as when you geocode hundreds of thousands or more points, when the technical limits of a shapefile will be reached. In these cases, you will need to save your output to a file geodatabase. In addition, if you prefer, you can use a file geodatabase as part of your routine workflow.

A file geodatabase is a newer type of storage available in ArcGIS Pro that stores layers and data tables in a special type of database, not dissimilar in concept to a database in Microsoft Access or MySQL.

A default file geodatabase is automatically created for each project. You can also create a new file geodatabase using the Connections dropdown menu on the Insert ribbon.

File geodatabases have effectively limitless capacity, as you will more likely be limited by the file size constraints of your operating system or hard drive than you will by the limitations of the file

geodatabase itself. As an example, a single feature class can be up to 1 terabyte in size, and with additional settings, can be a quarter of a petabyte. Few computers being used by journalists will have hard drives of more than a few terabytes. Solid state drives common on today's laptops rarely exceed 1 TB in size. The article found at <http://www.esri.com/news/arcuser/0309/files/9reasons.pdf> provides useful background on the benefits of using file geodatabases.

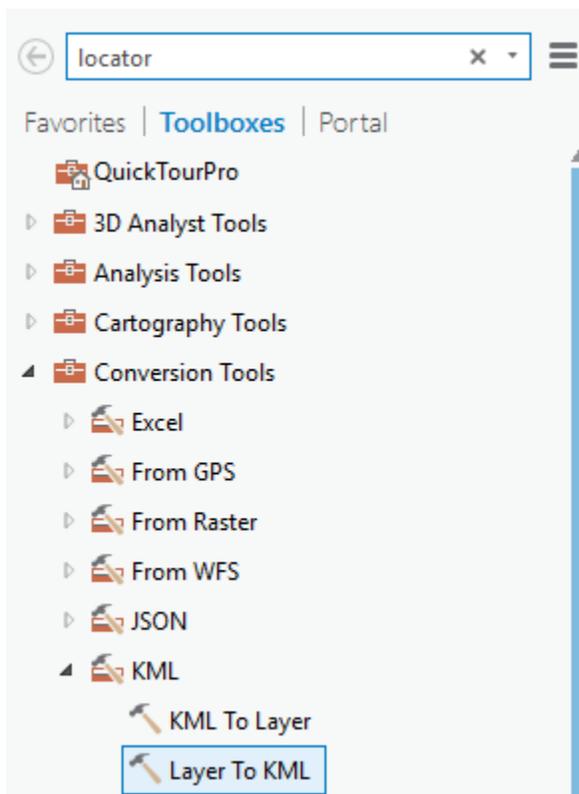
File geodatabases created using ArcMap can be used in ArcGIS Pro.

Converting a map layer to a KML file

You can export the geographic information in a shapefile or feature class in a file geodatabase to the kml format for use in online mapping services such as Google Fusion tables, as long as it is not a very large file. Generally, a polygon file representing an urban area will be small enough to upload to Fusion Tables (as a kml) as will a file of a few hundred points.

To begin this process, make sure the map layer you wish to export is open in your project.

Click on the red toolbox icon on the Analysis ribbon, then navigate to open the ArcToolbox. Navigate to Conversion Tools> KML>Layer to KML.



The Layer to KML pane will open, and you can choose the layer to be converted, and the name for the resulting KML file.

Finally, enter a scale for the output file; 10,000 will work fine. Click Run, and the conversion will proceed. The file will be exported as a compressed KML file, with the KMZ extension.

To convert the kmz file to a kml, go to your windows file explorer or Mac Finder, find the kmz file you just created, and add an extra extension of .zip to the file name. This will trick Windows or OS X/macOS into letting you use the extract function/open function to extract the kml file. Once extracted, rename it to reflect its contents, and it will be available to upload to Fusion Tables. Once uploaded, you can, for example, merge it with another Fusion Table to make a thematic map using buckets.