



# ArcGIS Pro: Loading and Manipulating Data

**Presented By:**

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Map and Data Library

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# Agenda

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## Introduction

# The Map and Data Library

- Access data collections
- Workshops and training
- One-on-one consults
- Appointment-only until summer 2025

<https://mdl.library.utoronto.ca/>  
[mdl@library.utoronto.ca](mailto:mdl@library.utoronto.ca)  
[416-978-5589](tel:416-978-5589)

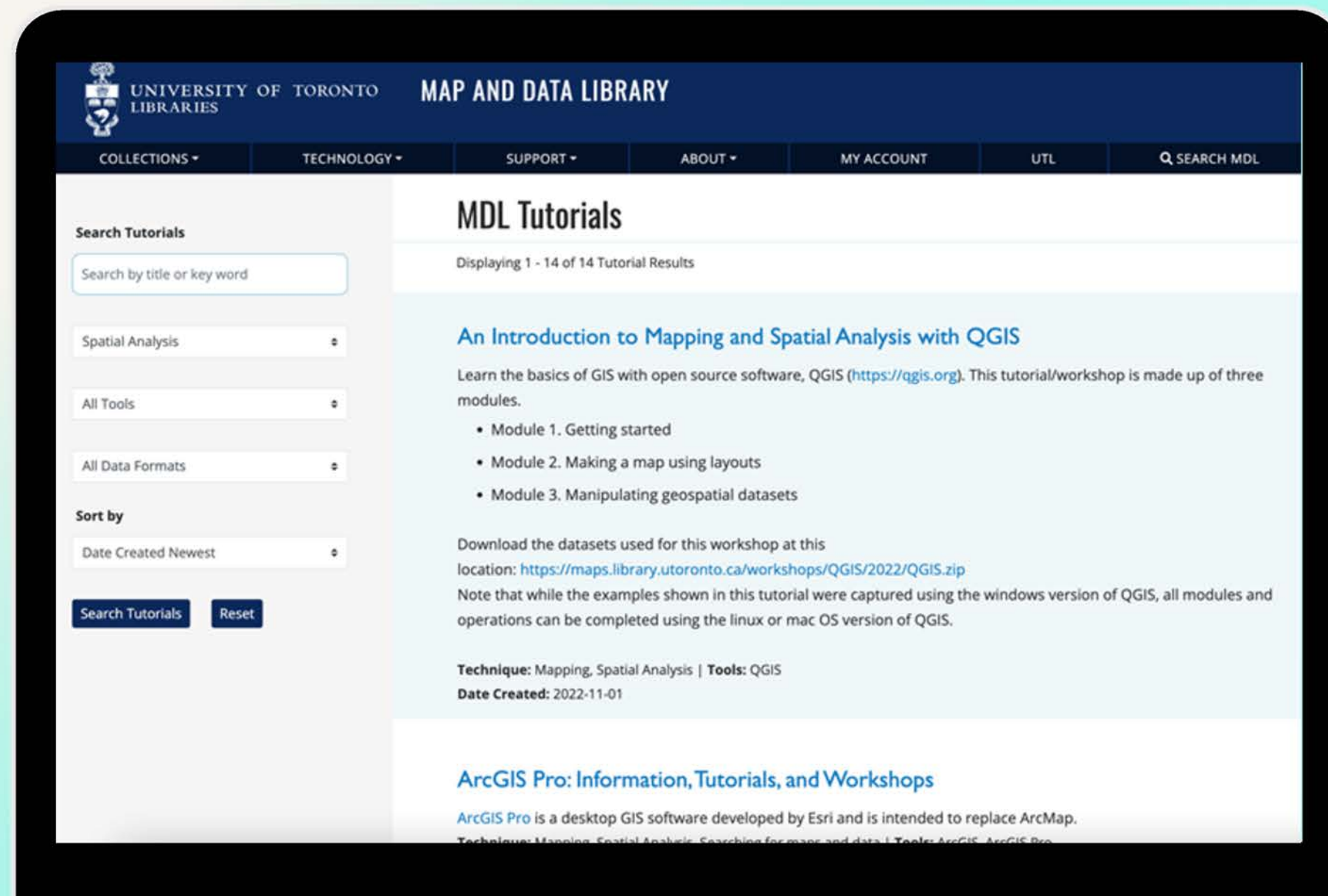
11am - 5pm, Monday - Friday

# Map and Data Library

## Tutorials and Workshops

<https://mdl.library.utoronto.ca/support/tutorials>

<https://mdl.library.utoronto.ca/support/workshops-and-training>





LibrarySearch MDLSearch

Search Map and Data Library website

lidar

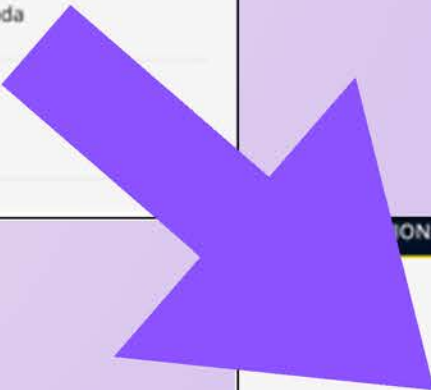
**Geospatial data**  
Scholars GeoPortal | Geospatial data | Remote sensing | Air photos

**Numeric data**  
MDL Data Collection on Borealis | Microdata | Statistics | Census of Canada

**Maps and atlases**  
Scanned Maps | Fire insurance plans | Rare maps | Topographic maps

# Map and Data Library

## Search for data



MDL collection search results

lidar

or find "lidar" in LibrarySearch

Geospatial data MDL web page Statistics Tutorial

**Geospatial data**

- [Toronto Lidar 2015](#)  
... Toronto **Lidar** 2015 The **Lidar** data was collected between April 20, 2014 ...
- [Toronto Lidar Data - 2008](#)  
... Toronto **Lidar** Data - 2008 Please note that a license ... / External HD [4] / FTP (enquire) Format **LIDAR** Restrictions FACULTY STAFF STUDENTS ...
- [York Lidar Data 2019](#)  
... York **Lidar** Data 2019 Creator Airborne Imaging ... to use Citation Medium M:\data\private\toronto\lidar\AirborneImaging2019\York2019\webdata

**Statistics**

- [Ozone data for the world](#)  
... ozonesondes, Umkehr N and retrieved values, **lidar** and surface ozone. Distributor Environment ...

[More Statistics results](#)

# Scholars Geoportal

The screenshot displays the Scholars Geoportal interface. At the top, there is a navigation bar with 'Share', 'Print', 'Export', 'Data Table', 'Base Maps', 'Contact', and 'Français'. Below this is a search bar with 'parks' entered and a dropdown menu set to 'Anywhere'. A 'Search' button is visible. The left sidebar contains a 'Refine' section with 'Topics' and a list of categories such as 'Environment and conservation (16)', 'Census and administrative boundaries (12)', and 'Inland water resources (4)'. The main content area shows search results for 'parks', listing several data layers with their respective producers and publication dates. The map on the right shows the Great Lakes region of Ontario, Canada, with green dots representing parks. An inset map shows the location of the main map area within the Great Lakes basin.

**Scholars GeoPortal**

Search: parks | Map (1) | Download

Data  Place or address

Anywhere

Downloadable content only

Back To Browse

Found 96 results showing results 1 to 10

Sort by: Relevance

**Refine:**

**Topics**

- Environment and conservation (16)
- Census and administrative boundaries (12)
- Imagery, base maps, and land cover (10)
- Land use and planning (8)
- Cultural, society, and demographic (5)
- Inland water resources (4)
- Transportation networks (4)
- Biologic and ecologic (3)
- Utility and communication networks (3)
- Locations and geodetic networks (2)
- Agriculture and farming (1)
- Facilities and structures (1)

**Keywords**

**Park Sports Field Region**  
Add - 1/7 Details  
Producer: DMTI Spatial Inc.  
Date published: 2015-04-01 (publication), 2021-09-15 (revision)  
Type of data layer: Vector

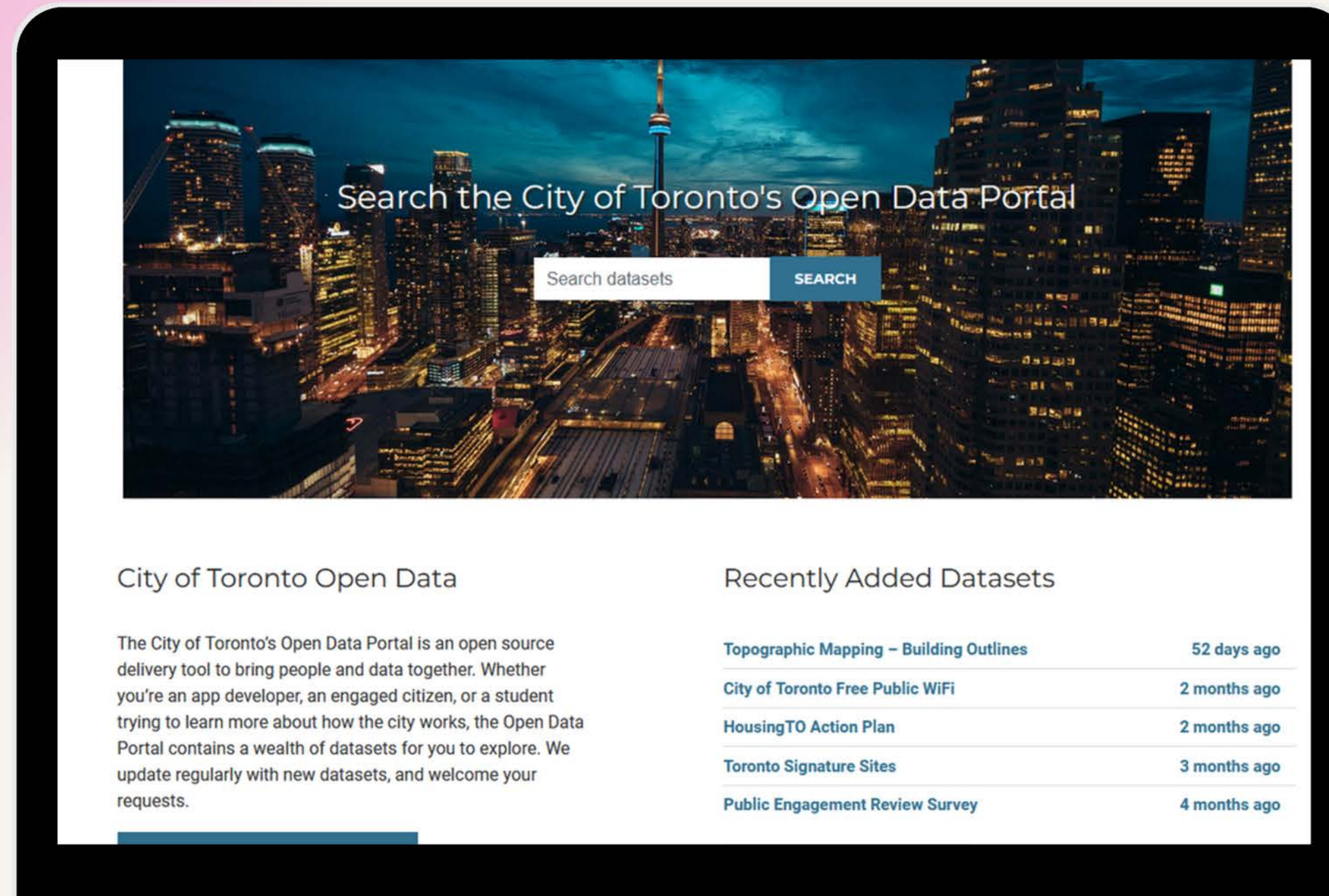
**Park Sports Field Point**  
Add - 0/7 Details  
Producer: DMTI Spatial Inc.  
Date published: 2015-04-01 (publication), 2021-09-15 (revision)  
Type of data layer: Vector

**Federal Protected Area**  
Add Details  
Producer: Ontario Ministry of Natural Resources  
Date published: 2008-07-09 (creation), 2008-07-09 (revision)  
Type of data layer: Vector

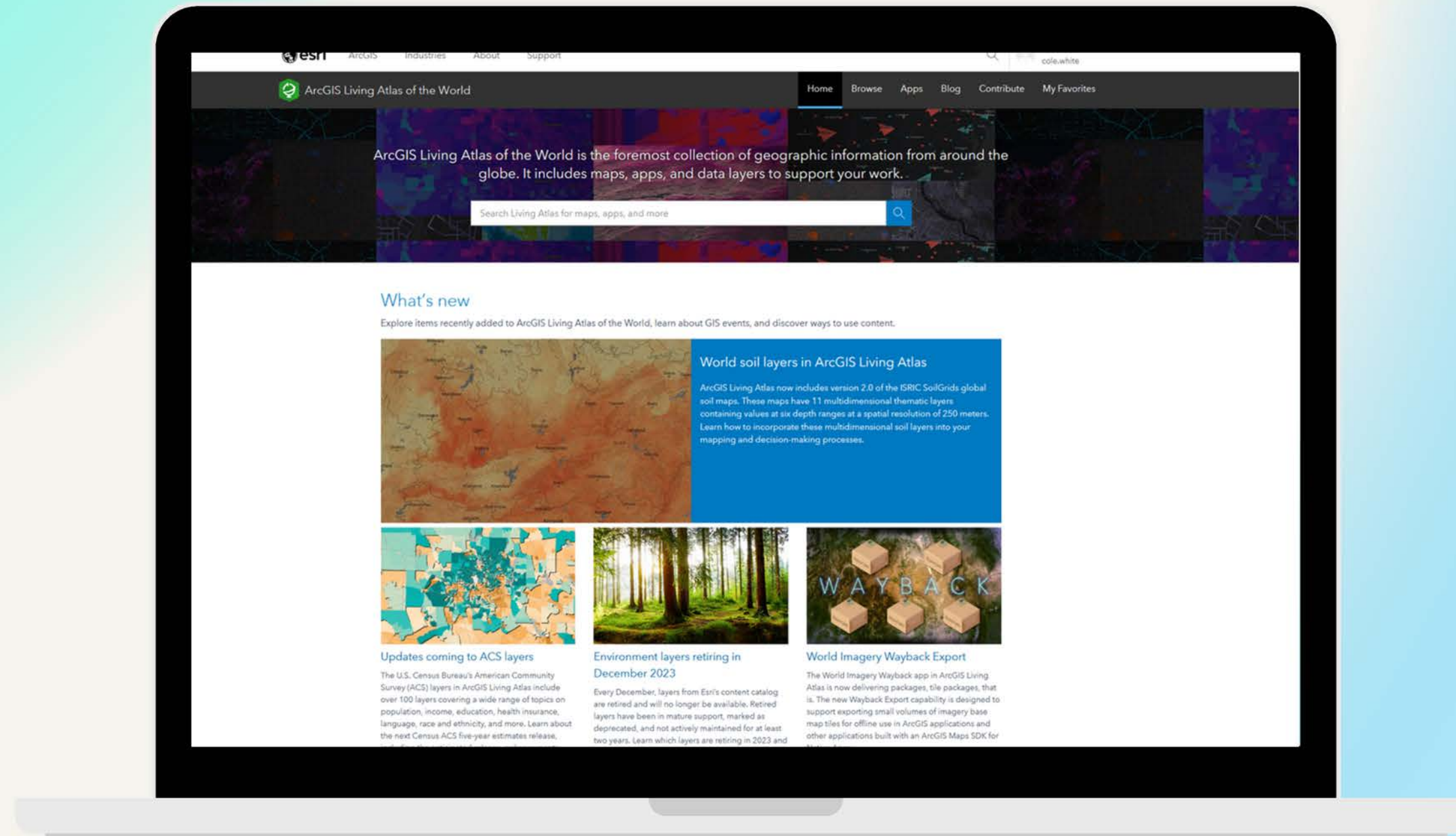
**Municipal Park**  
Add Details  
Producer: Ontario Ministry of Natural Resources  
Date published: 2000-01-01 (creation), 2000-01-01 (revision)  
Type of data layer: Vector

**Canadian Heritage River System**  
Add Details  
Producer: Ontario Ministry of Natural Resources  
Date published: 1986-01-02 (creation), 2004-01-05 (revision)

# Open data



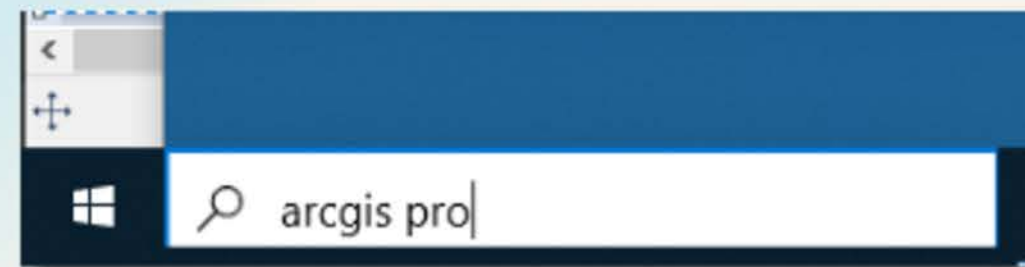
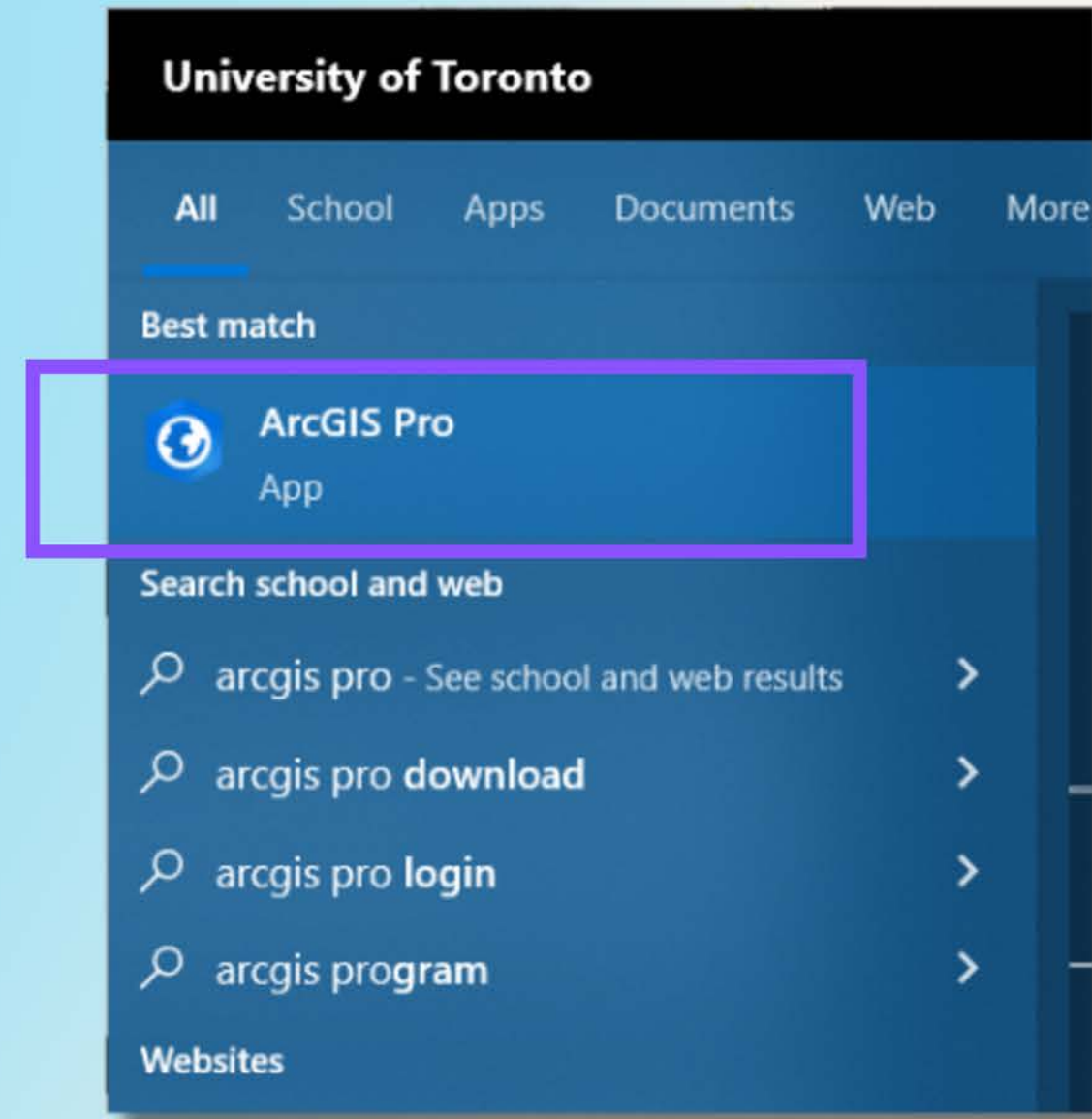
# ArcGIS Online and Living Atlas



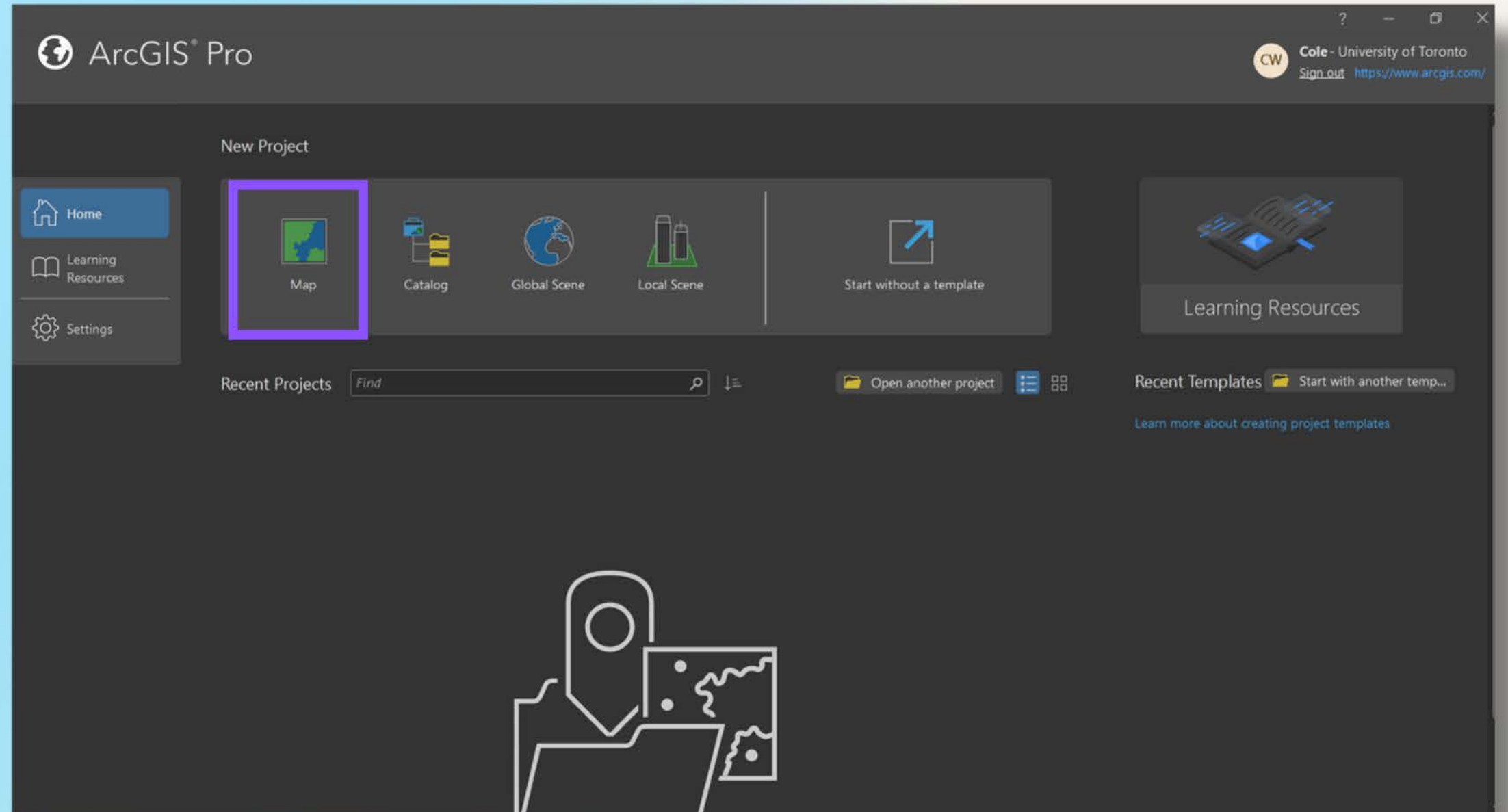


# Creating a New Project

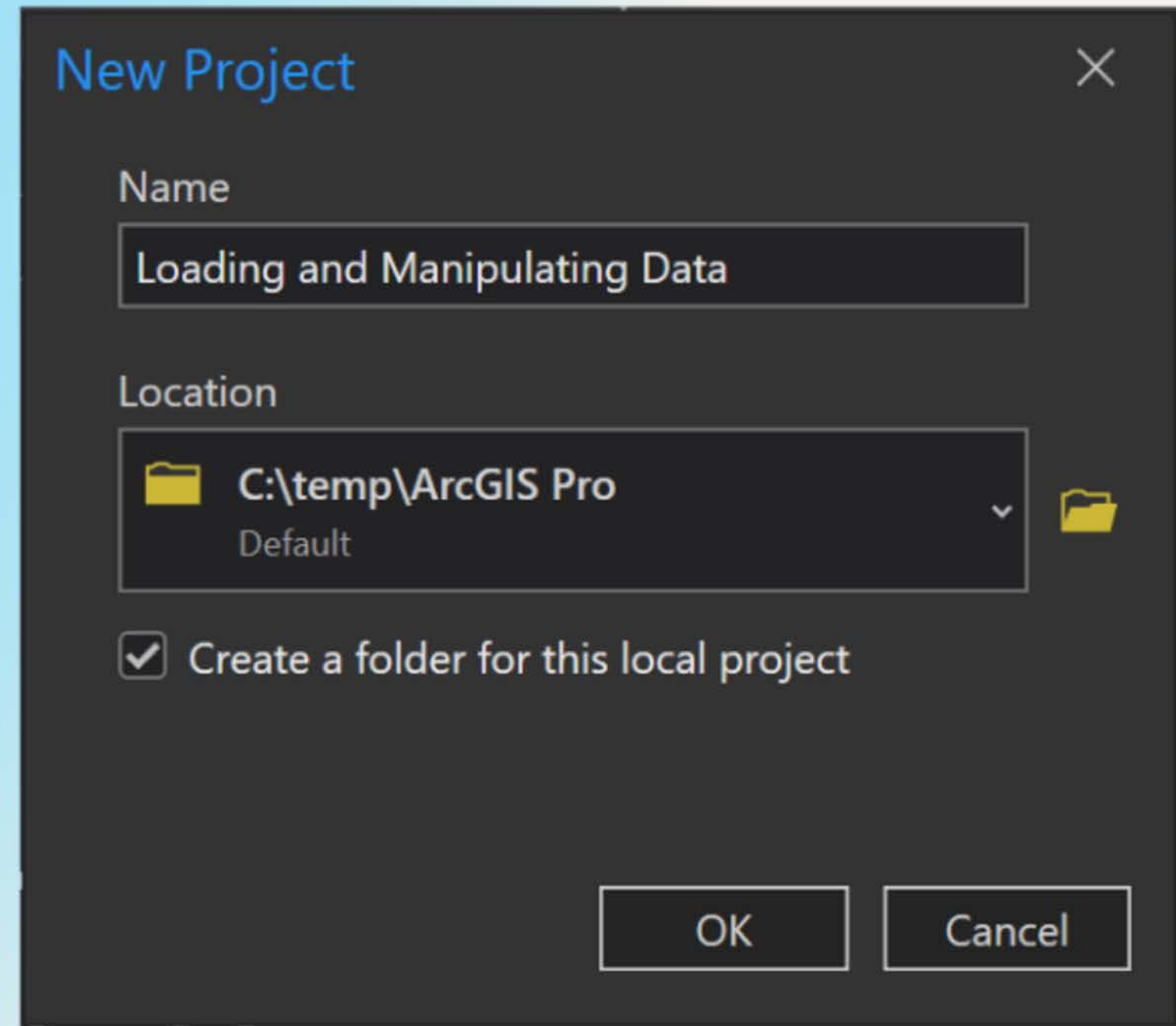
- Launch Pro from the Windows Start Menu



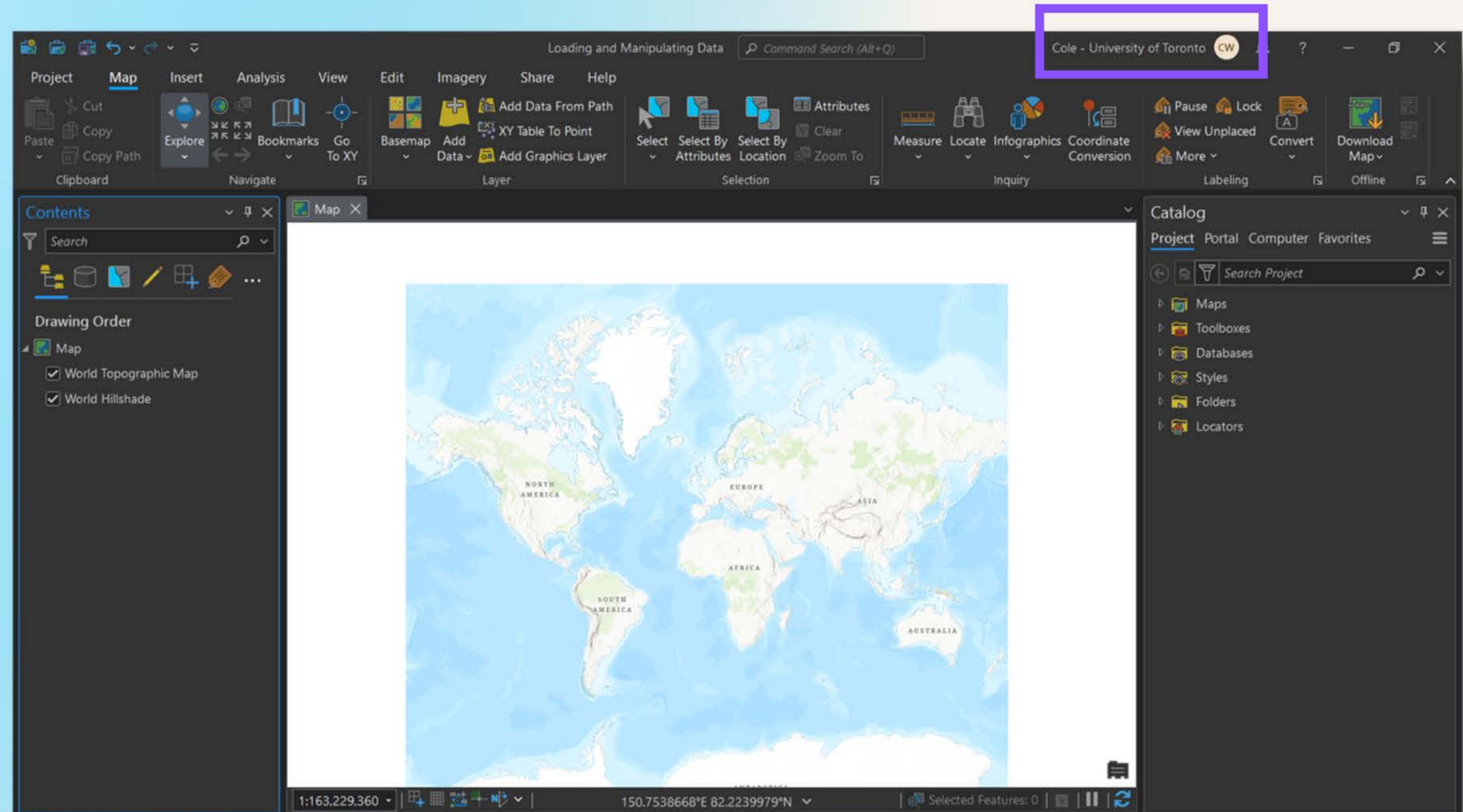
- From the intro screen, create a new project using the **Map** template.



- Give your new project a name.
- Choose a location on your filesystem to save the project.
- Check the box to create a new folder for the project.
- Click **OK**.



- A new project containing a **map view** will open.
- The map will be empty except for a default **basemap**.
- Make sure you're signed in with your U of T credentials.



# Working with Vector Data:

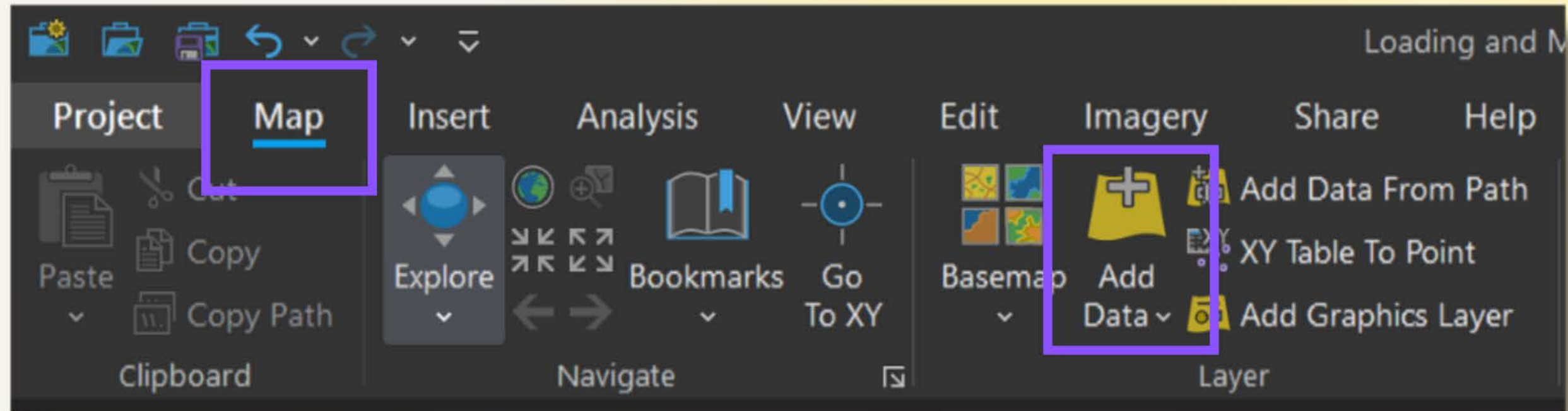
## Add a data layer from a shapefile

**Shapefile (.shp)** - a very common GIS vector file format.

- **Other GIS-compatible vector formats:**
  - **.dwg, .dxf** - CAD drawings (*survey plans often use this format*)
  - **.kml, .kmz** - Google Earth file
  - **.geojson** - GeoJSON (*often used in web mapping*)



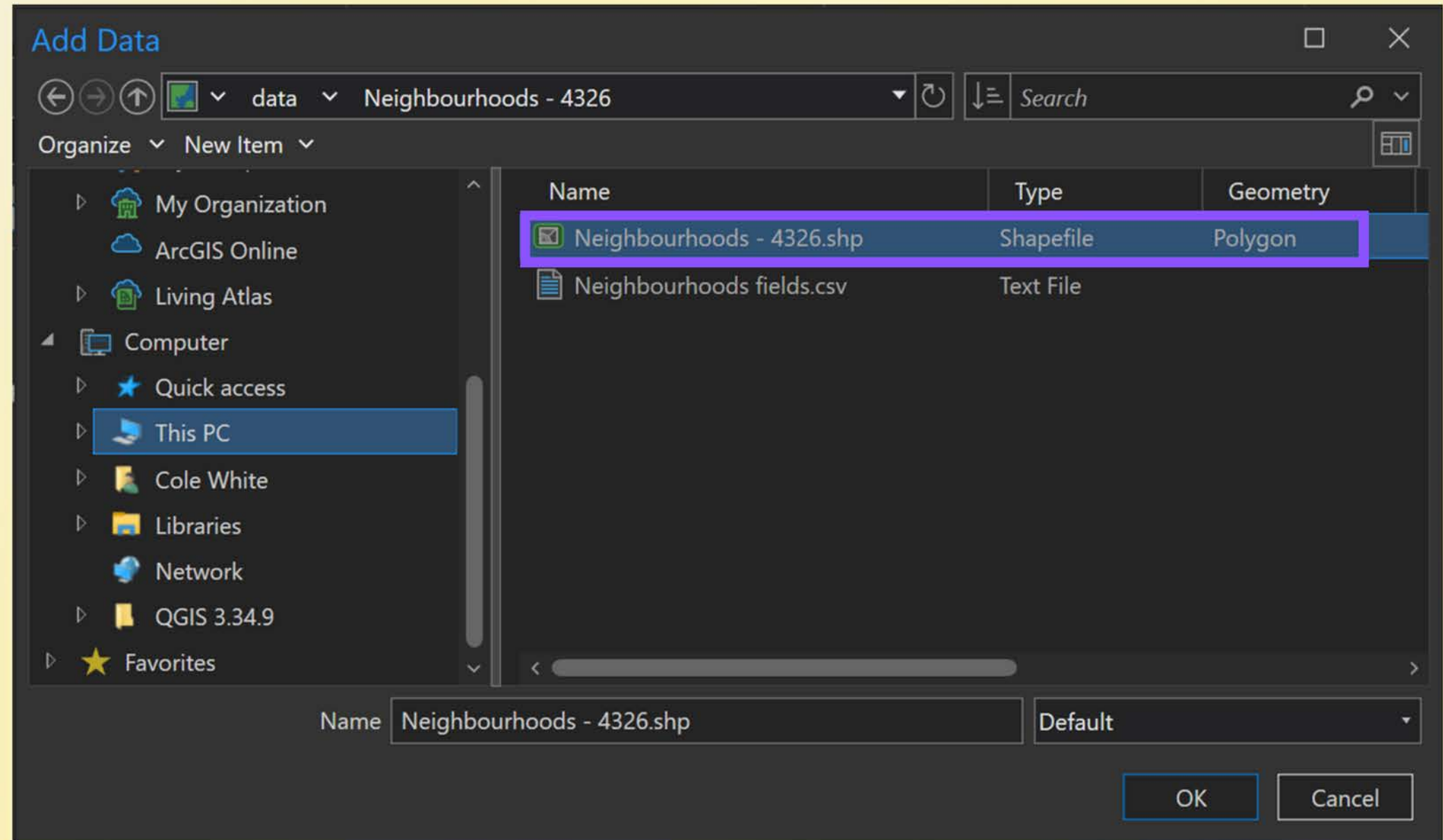
# Add a data layer from a shapefile



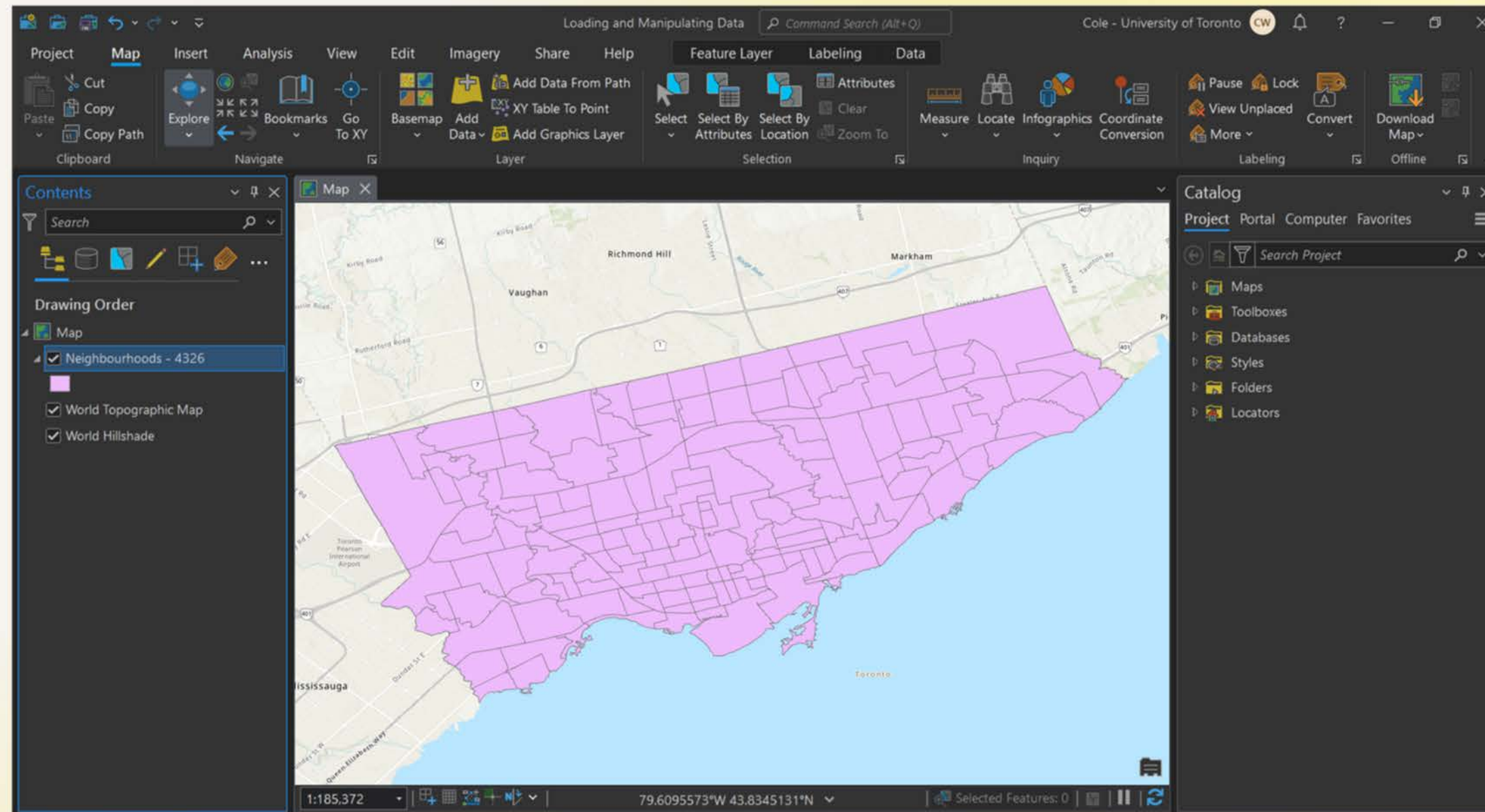
- From the **Map** tab, click the **Add Data** button.

# Add a data layer from a shapefile

- Navigate to the location where you've saved the sample data.
- Select **Neighbourhoods - 4326.shp** and click **OK**.



# Add a data layer from a shapefile

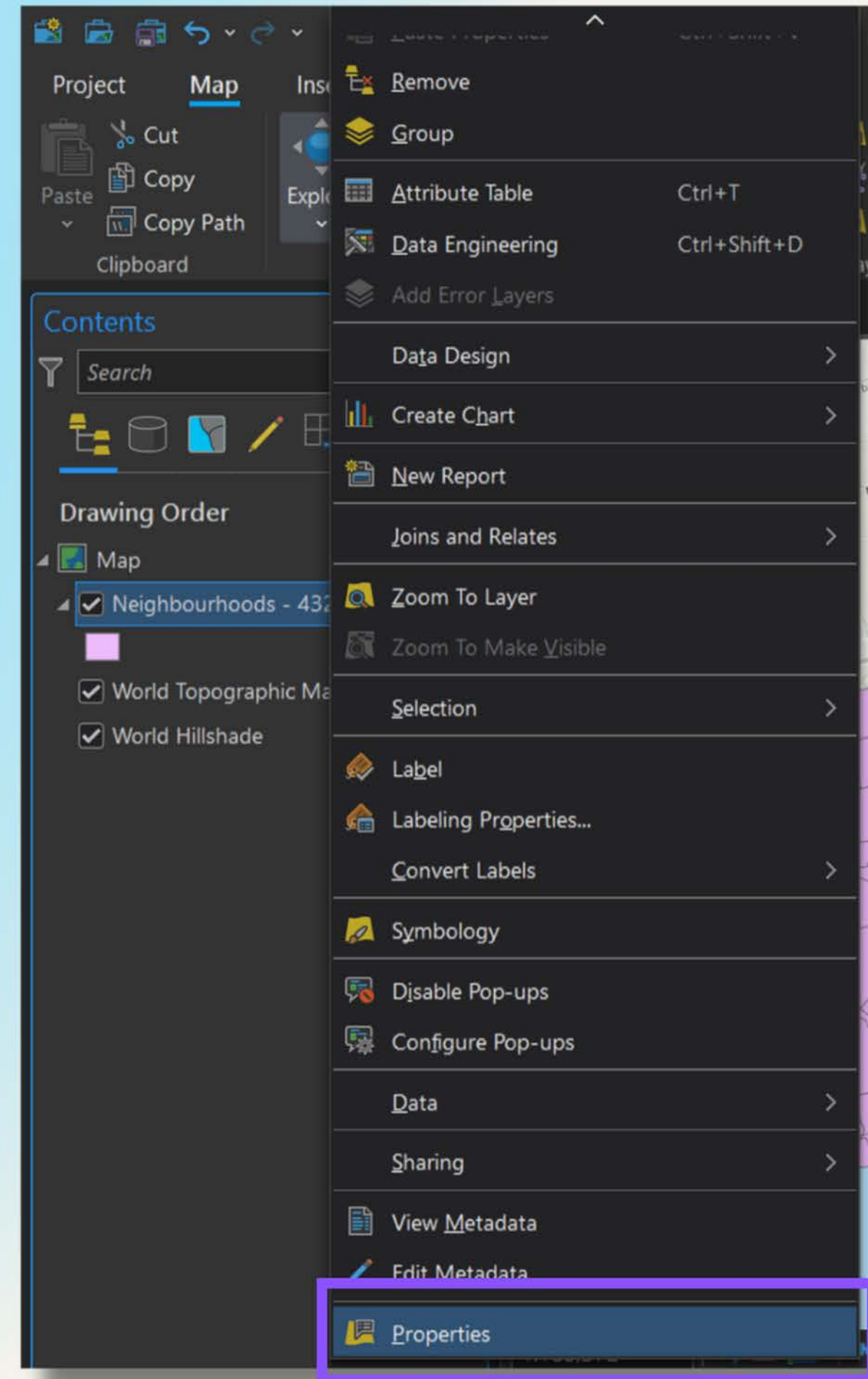


- The layer will be added to your map view.
  - **Note:** This dataset was acquired from the City's open data portal website: <https://open.toronto.ca/dataset/neighbourhoods/>



# Projections

- Right-click the Neighbourhoods layer and select **Properties** from the contextual menu. (Or, double-click the layer name.)



# Projections

- Click on the **Source** tab.
- Take a look at the information in the **Spatial Reference** section.
- Note that this layer uses the **WGS 1984** geographic coordinate system.
- Click **OK**.

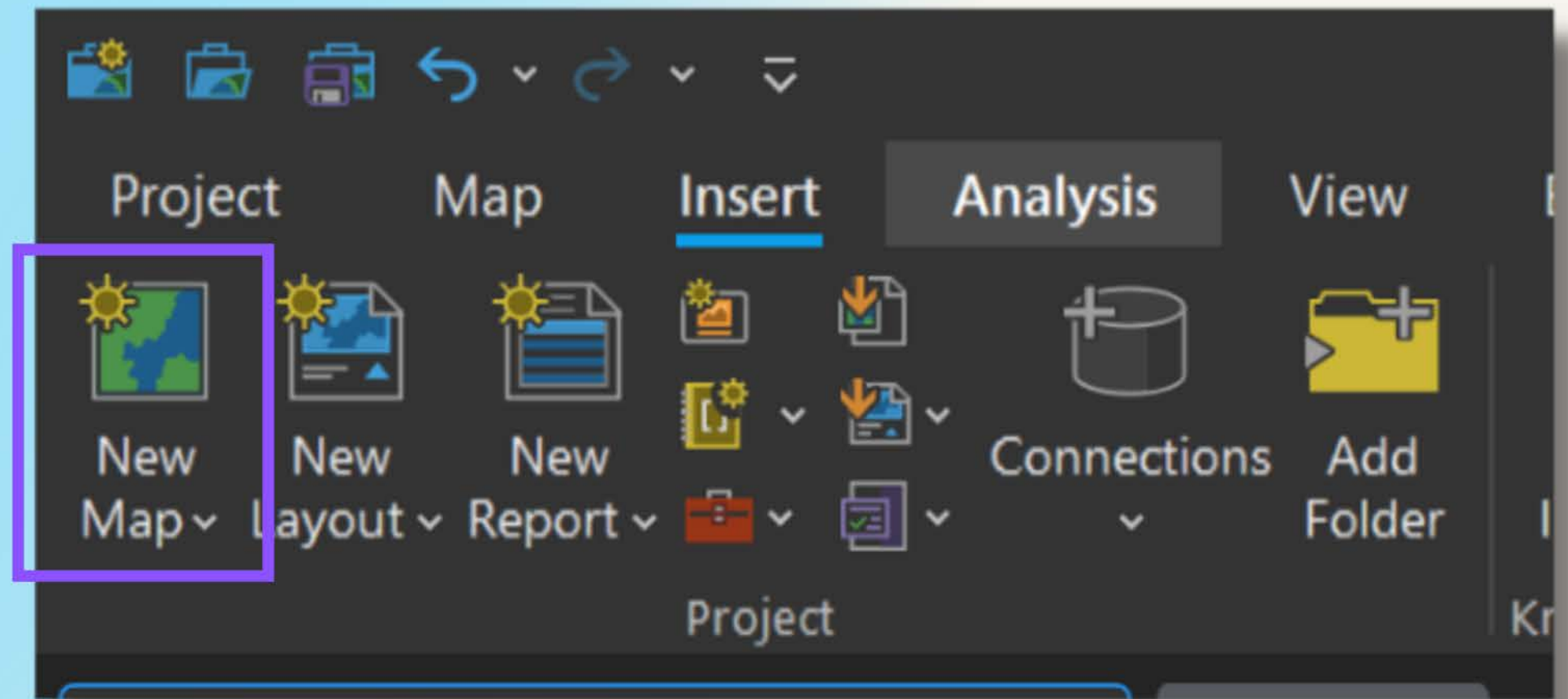
The screenshot shows the 'Layer Properties: Neighbourhoods - 4326' dialog box. The 'Source' tab is selected, and the 'Spatial Reference' section is expanded. The 'Data Source' section shows the layer is a Shapefile Feature Class located at 'U:\STAFF\ColeWhite\workshops\ProLoadingAndManipulatingData\'. The 'Spatial Reference' section shows the Geographic Coordinate System is 'WGS 1984' with a WKID of 4326 and Authority of EPSG. Other details include an Angular Unit of Degree (0.0174532925199433), Prime Meridian of Greenwich (0.0), Datum of D WGS 1984, Spheroid of WGS 1984, Semimajor Axis of 6378137.0, Semiminor Axis of 6356752.314245179, and Inverse Flattening of 298.257223563. The 'OK', 'Cancel', and 'Apply' buttons are visible at the bottom.

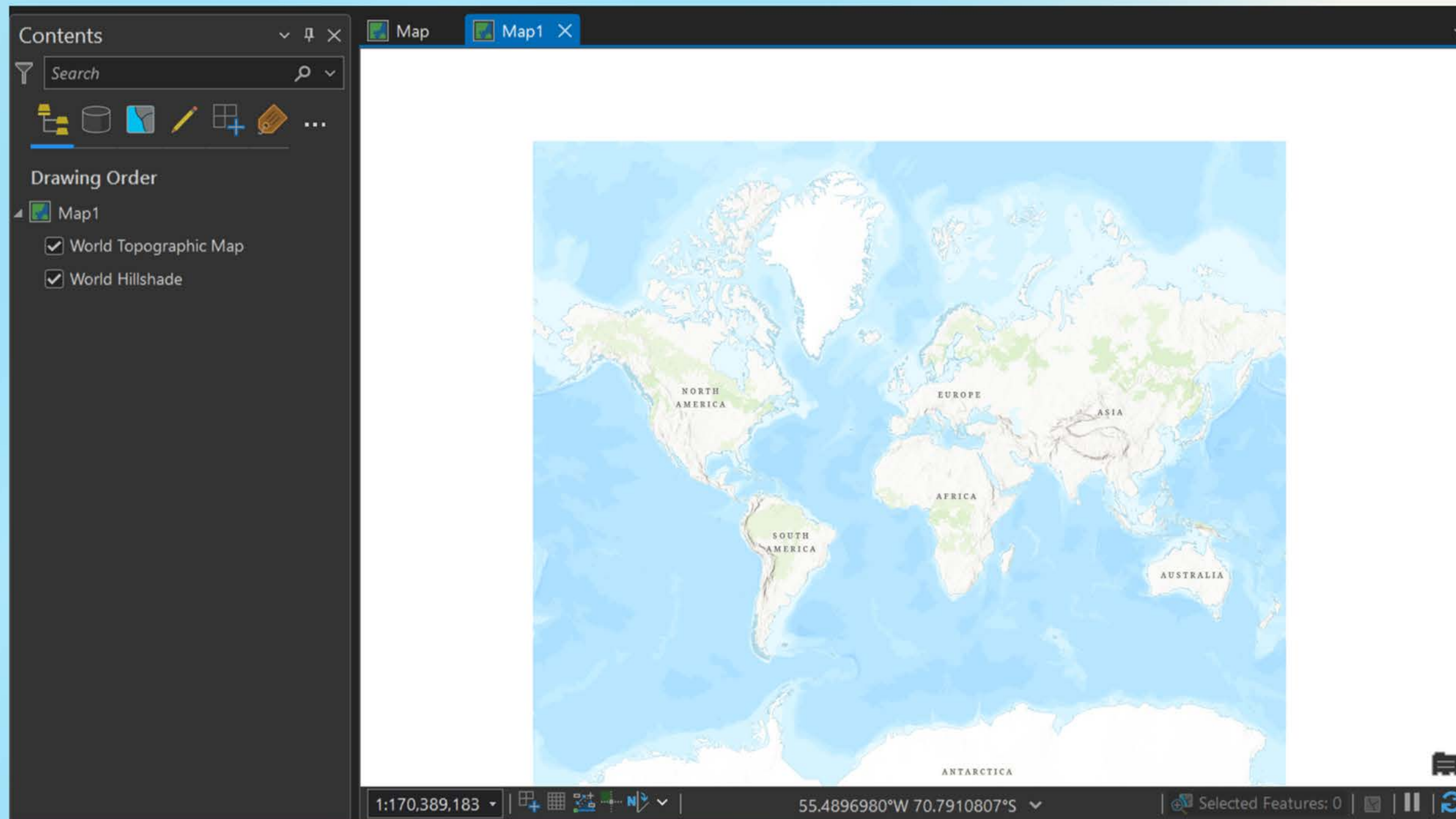
Data Source	
Data Type	Shapefile Feature Class
Shapefile	U:\STAFF\ColeWhite\workshops\ProLoadingAndManipulatingData\
Geometry Type	Polygon
Coordinates have Z value	No
Coordinates have M value	No

Spatial Reference	
Geographic Coordinate System	WGS 1984
WKID	4326
Authority	EPSG
Angular Unit	Degree (0.0174532925199433)
Prime Meridian	Greenwich (0.0)
Datum	D WGS 1984
Spheroid	WGS 1984
Semimajor Axis	6378137.0
Semiminor Axis	6356752.314245179
Inverse Flattening	298.257223563

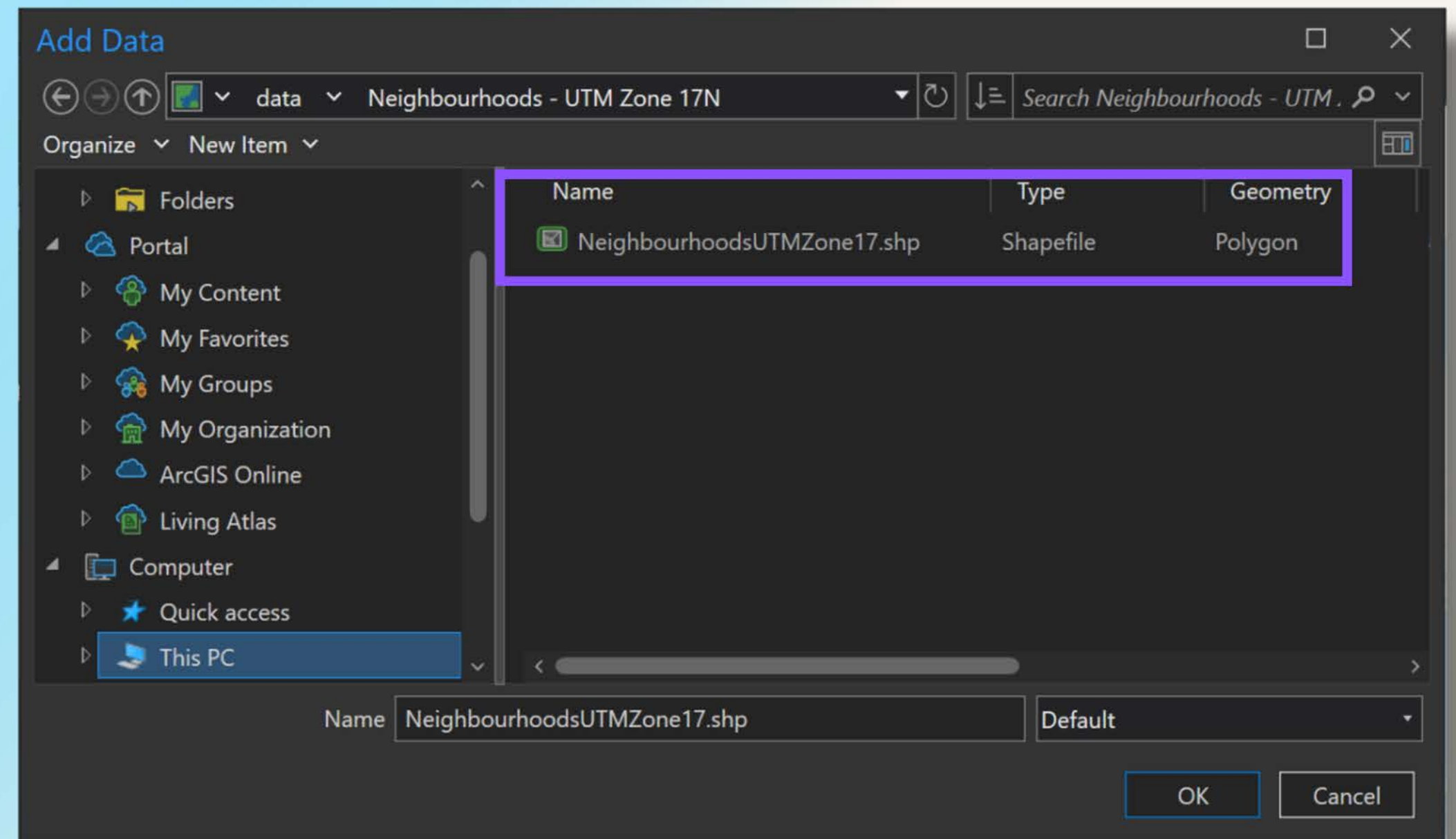
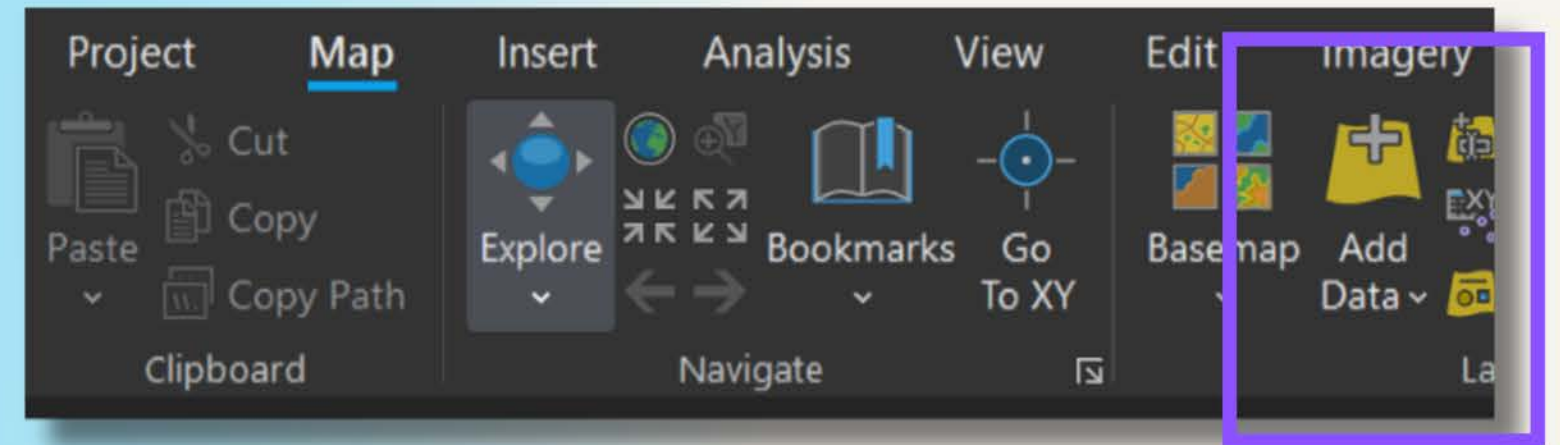
- From the Insert tab on the Pro Ribbon, click **New Map**.

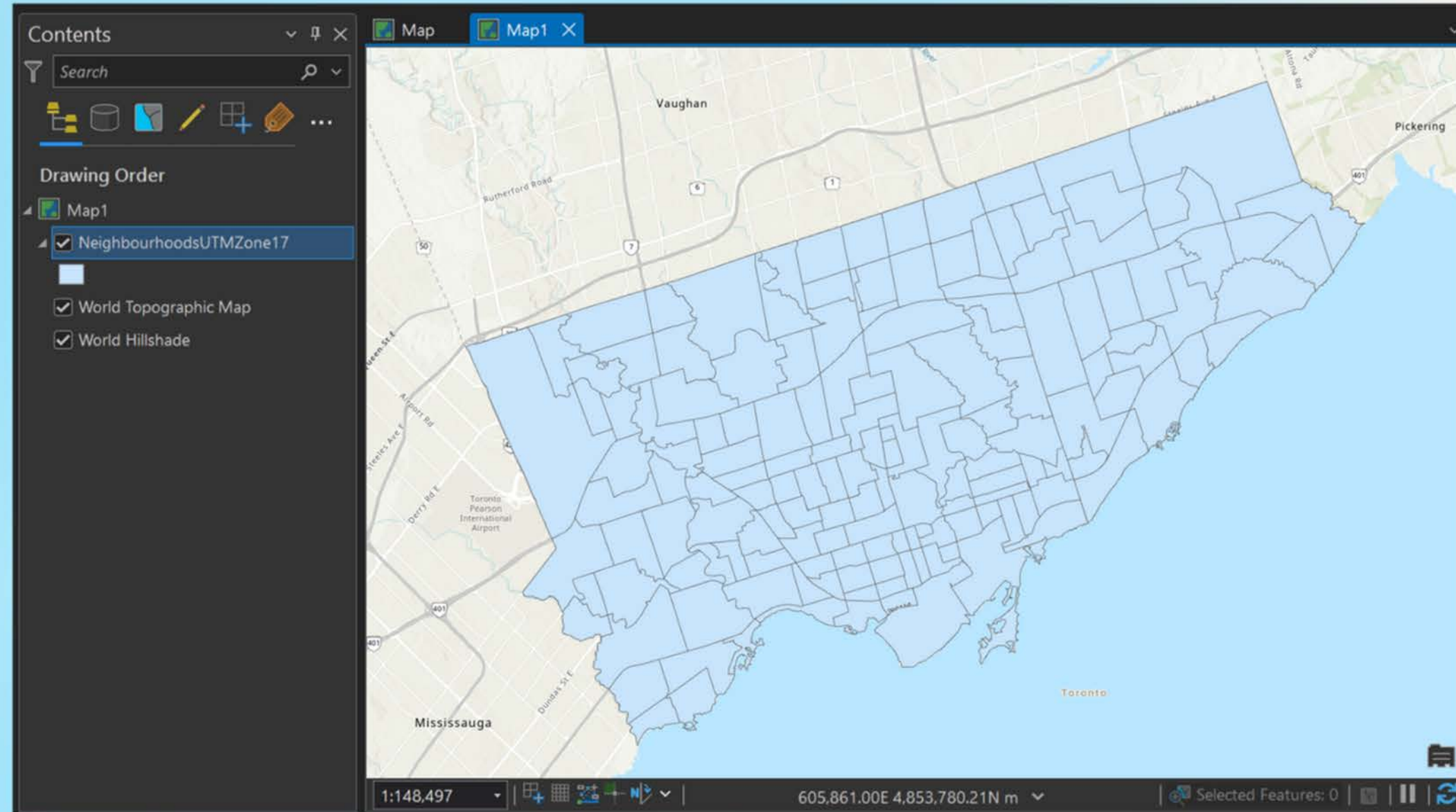




- A new, blank map will be added to your project.

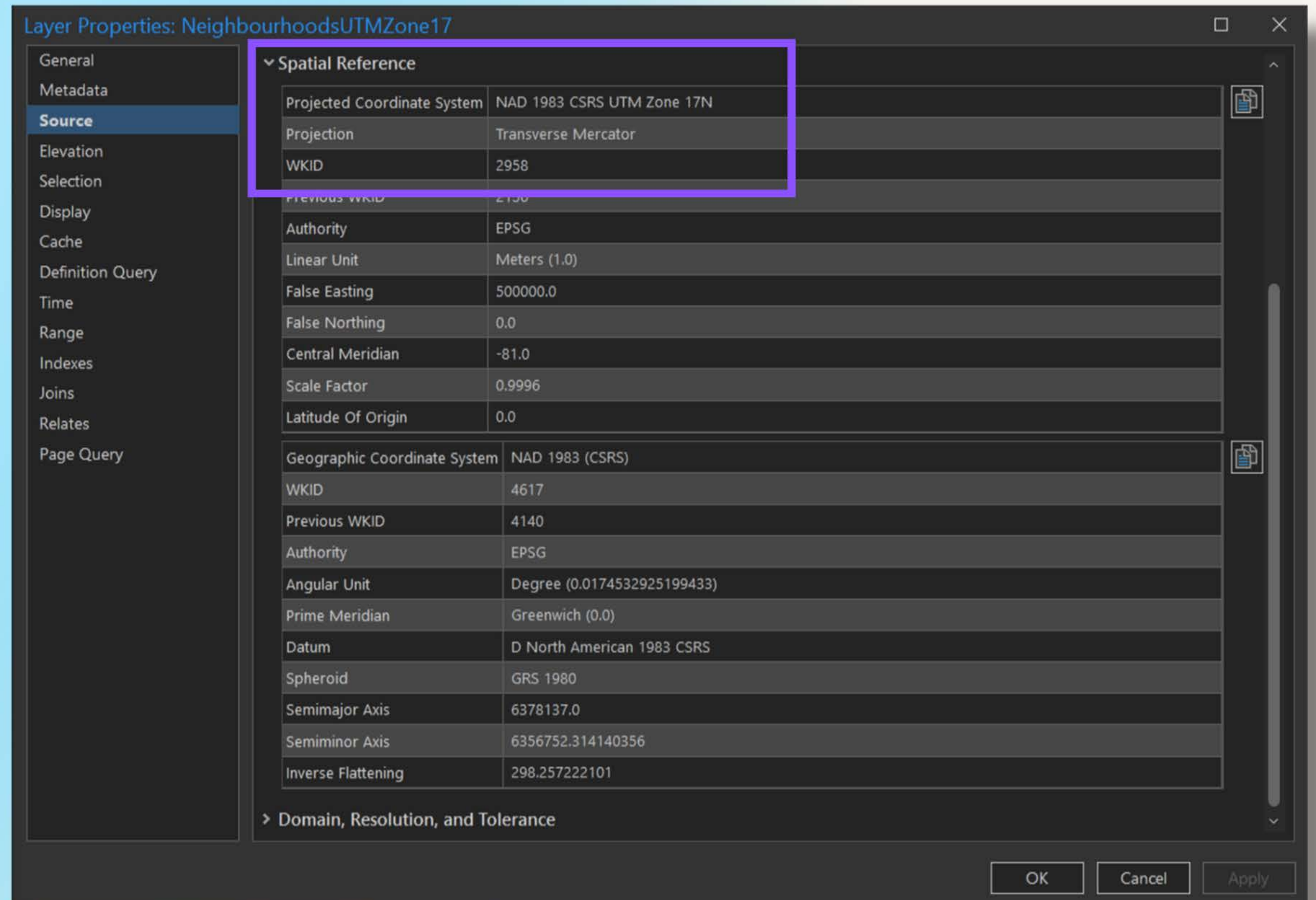
- Click the **Add Data** button.
- Navigate to and open **NeighbourhoodsUTM Zone17.shp**





- A second version of the **Neighbourhoods** layer will be added to your new map.

- Open the **Properties** pane for this version of the Neighbourhoods layer.
- Note the **Spatial Reference** details.
- Click **OK**.



Layer Properties: NeighbourhoodsUTMZone17

General  
Metadata  
**Source**  
Elevation  
Selection  
Display  
Cache  
Definition Query  
Time  
Range  
Indexes  
Joins  
Relates  
Page Query

▼ Spatial Reference

Projected Coordinate System	NAD 1983 CSRS UTM Zone 17N
Projection	Transverse Mercator
WKID	2958
Previous WKID	2150
Authority	EPSG
Linear Unit	Meters (1.0)
False Easting	500000.0
False Northing	0.0
Central Meridian	-81.0
Scale Factor	0.9996
Latitude Of Origin	0.0

Geographic Coordinate System: NAD 1983 (CSRS)

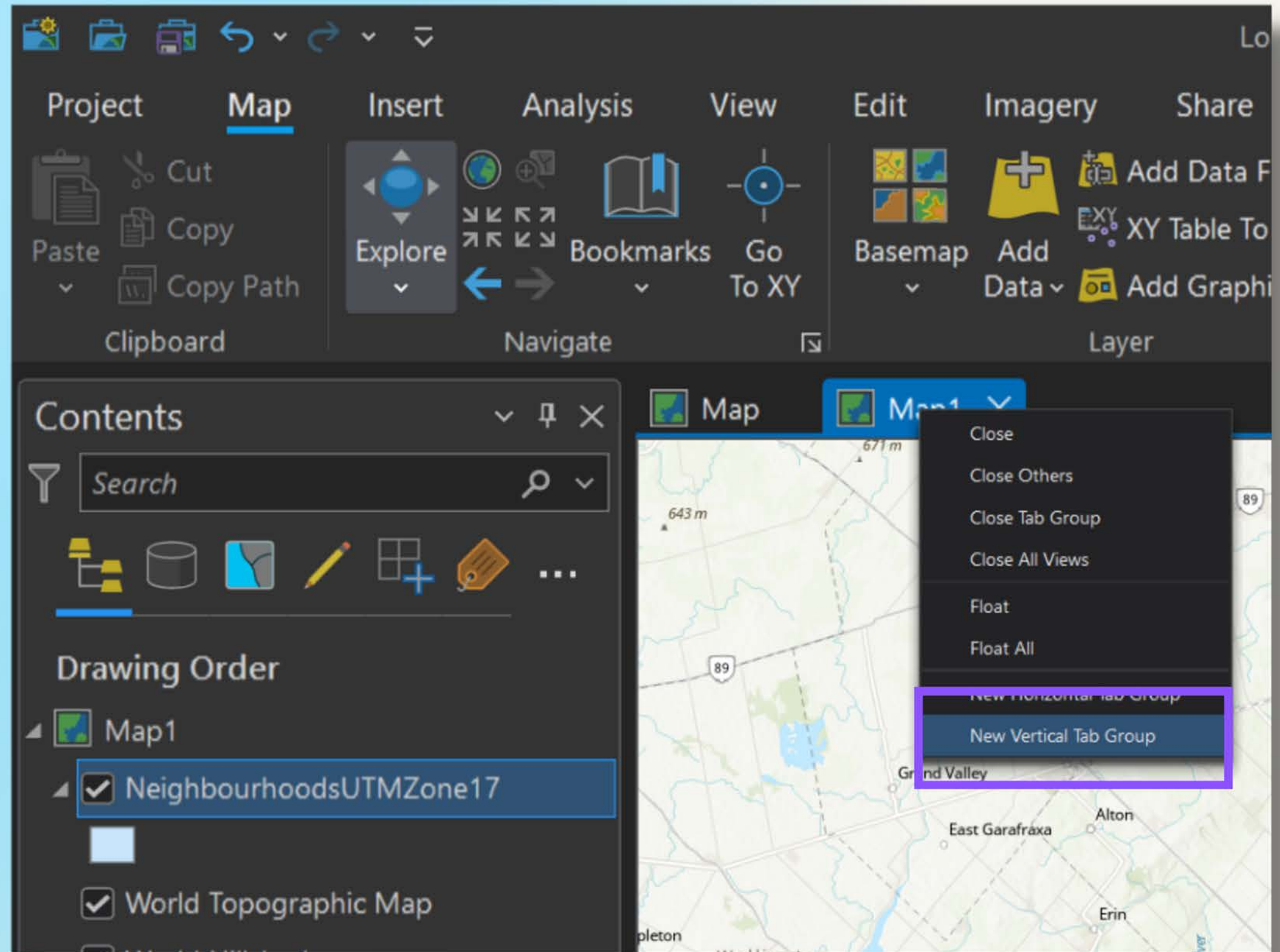
WKID	4617
Previous WKID	4140
Authority	EPSG
Angular Unit	Degree (0.0174532925199433)
Prime Meridian	Greenwich (0.0)
Datum	D North American 1983 CSRS
Spheroid	GRS 1980
Semimajor Axis	6378137.0
Semiminor Axis	6356752.314140356
Inverse Flattening	298.257222101

> Domain, Resolution, and Tolerance

OK Cancel Apply

# Projections

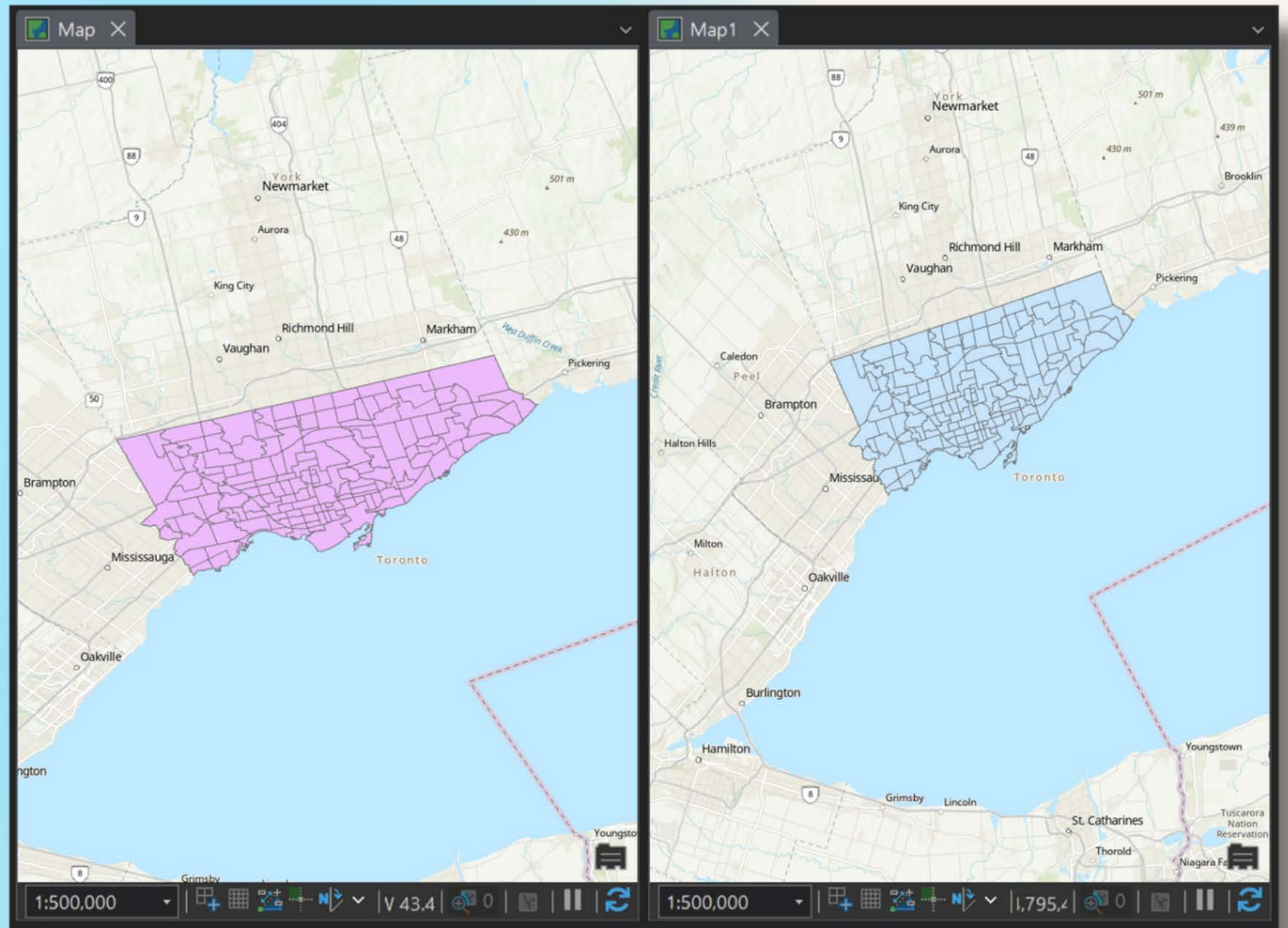
- Right-click the **Map1** tab.
- Select **New Vertical Tab Group**.





# Projections

- Compare the two map views side by side
- Note that the shape of the neighbourhoods layer is quite different between the two maps.
- This is due to two different **spatial reference systems** being used.

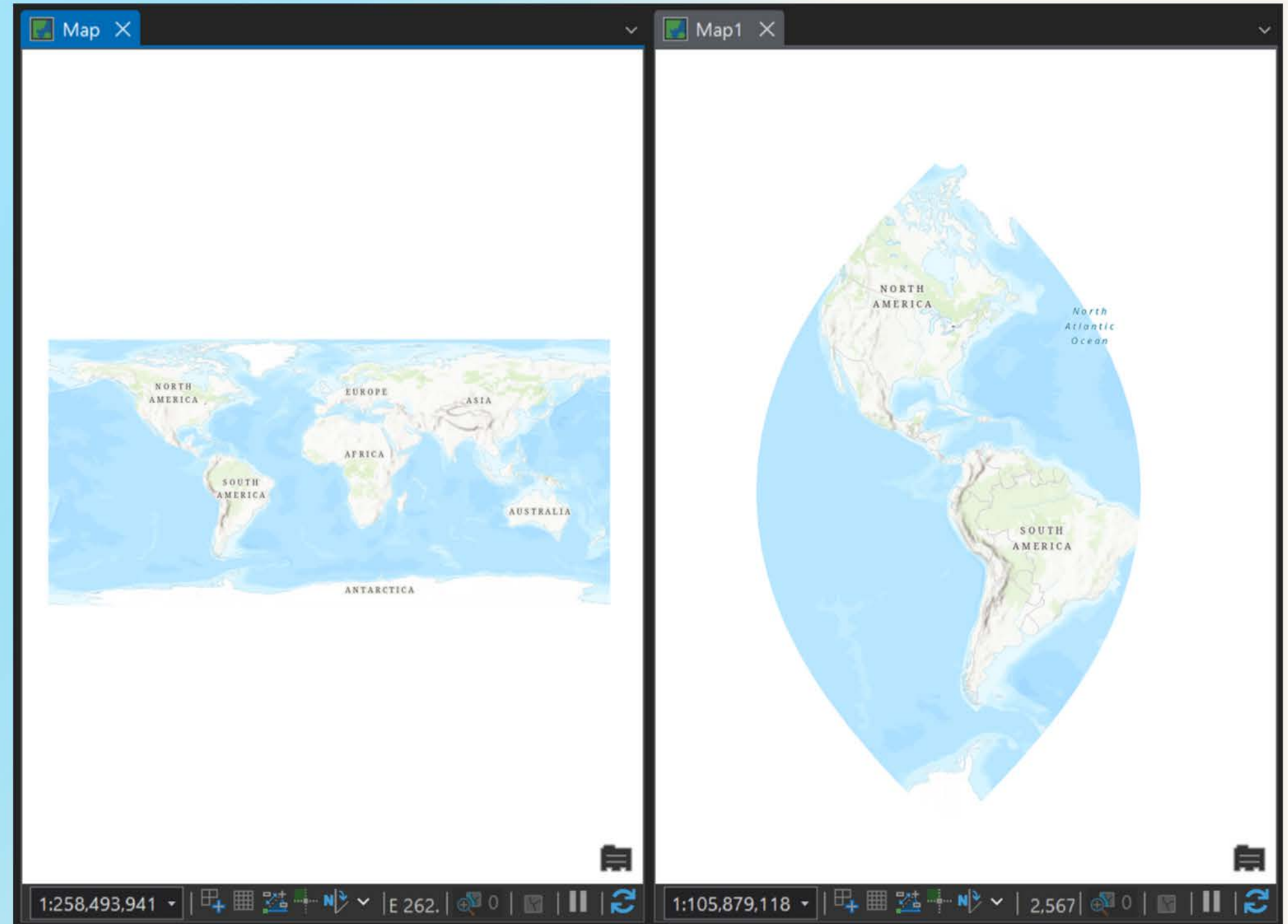


WGS84 Geographic  
Coordinate System

Universal Transverse  
Mercator (UTM) Zone  
17N Projection

# Projections

- **Zoom out** to view the entire world on each map view.



**WGS84 Geographic  
Coordinate System**

**Universal Transverse  
Mercator (UTM) Zone  
17N Projection**

## World Geodetic System 1984 (WGS84)

- **Scope:** Worldwide
- **Units:** Degrees (latitude and longitude)

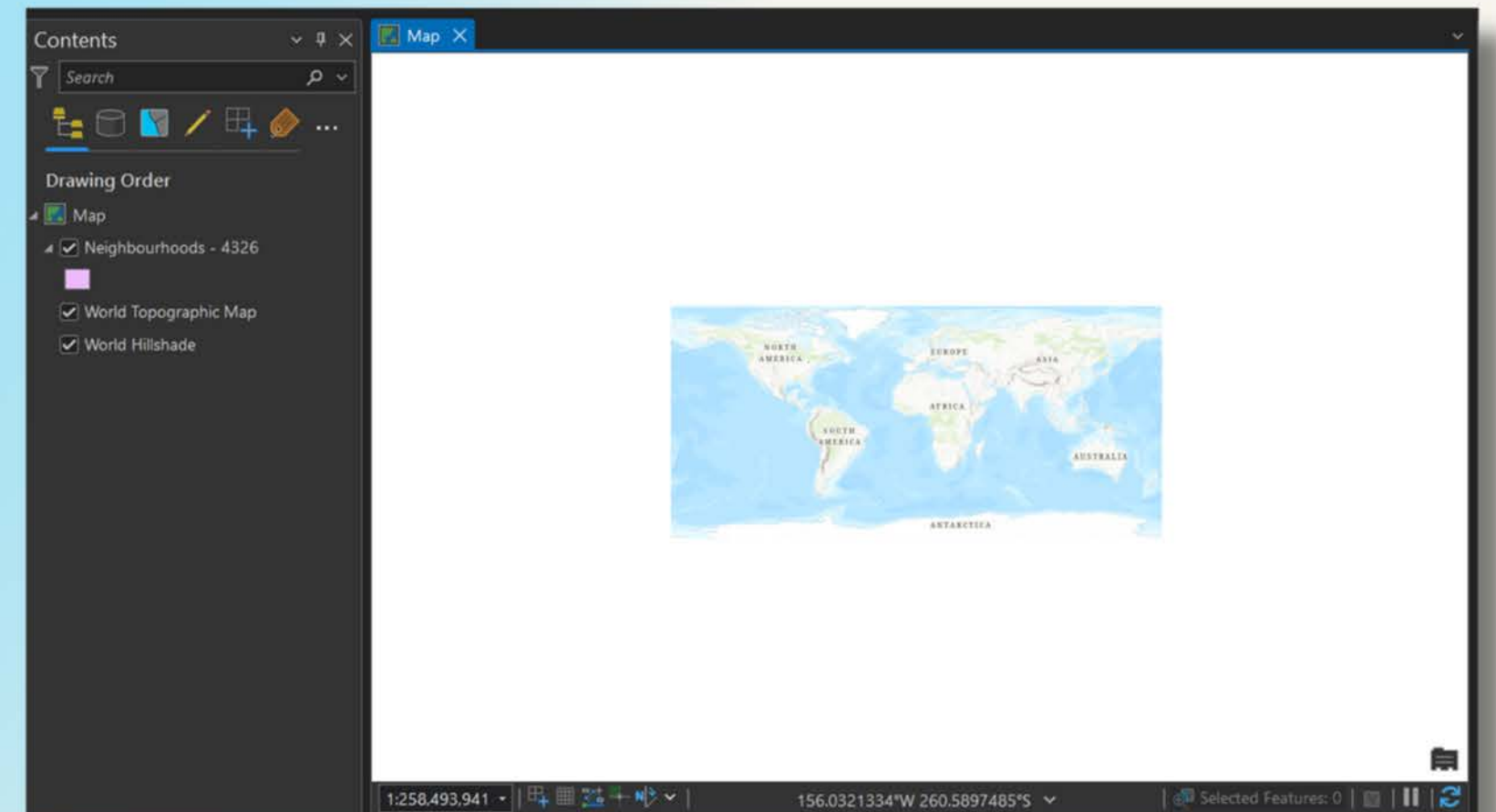
## NAD83 CSRS UTM Zone 17

- **Scope:** Centered on -81 degrees longitude
  - Allows Southern Ontario to be mapped quite accurately on a flat surface
- **Units:** Metres

*More information: <https://gisgeography.com/map-projections/>*

# Projections

- To maintain spatial consistency and accuracy, as well as avoid potential data issues, it's best for all layers within a map to use the same spatial reference.
- Data can be **reprojected** using ArcGIS Pro's geoprocessing tools if necessary.
- **Close the Map1 tab.** We will continue working with the WGS84 map.

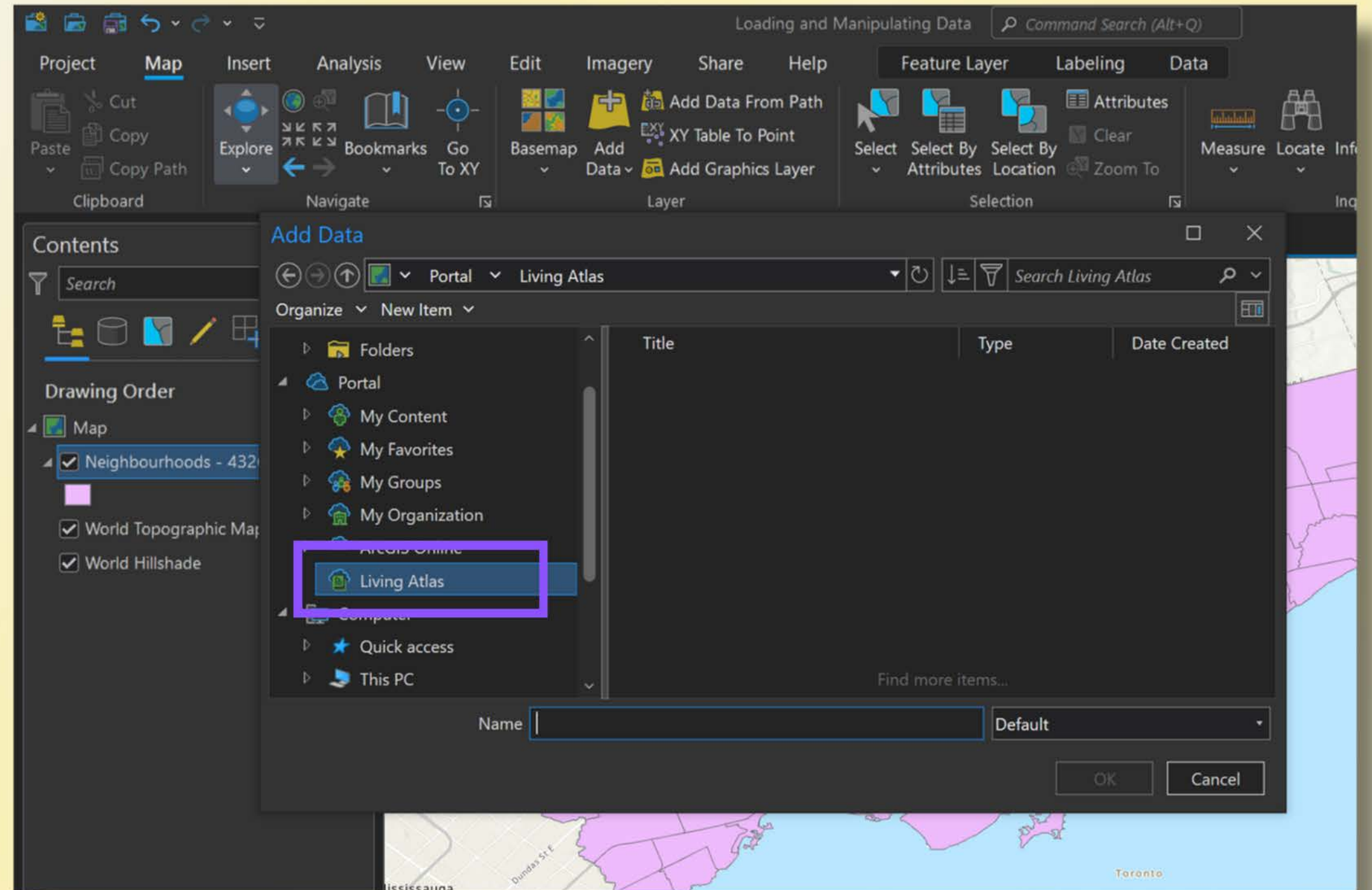


# Add data from Living Atlas or ArcGIS Online

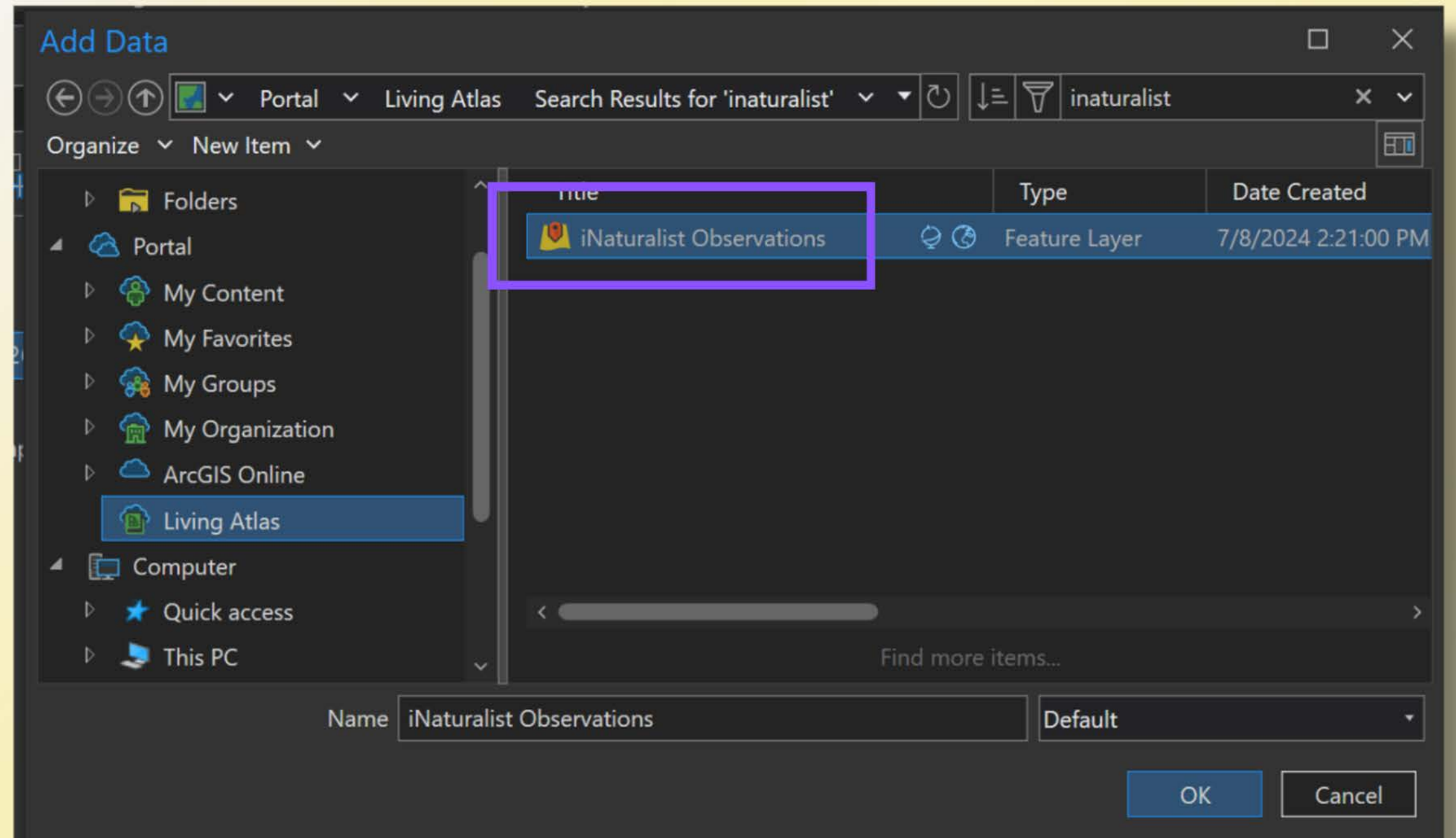
- **Living Atlas** is a curated selection of authoritative spatial datasets provided by Esri via the **ArcGIS Online** platform.
- Living Atlas content can be added to ArcGIS Pro maps as **Web Services** (more info about those later).



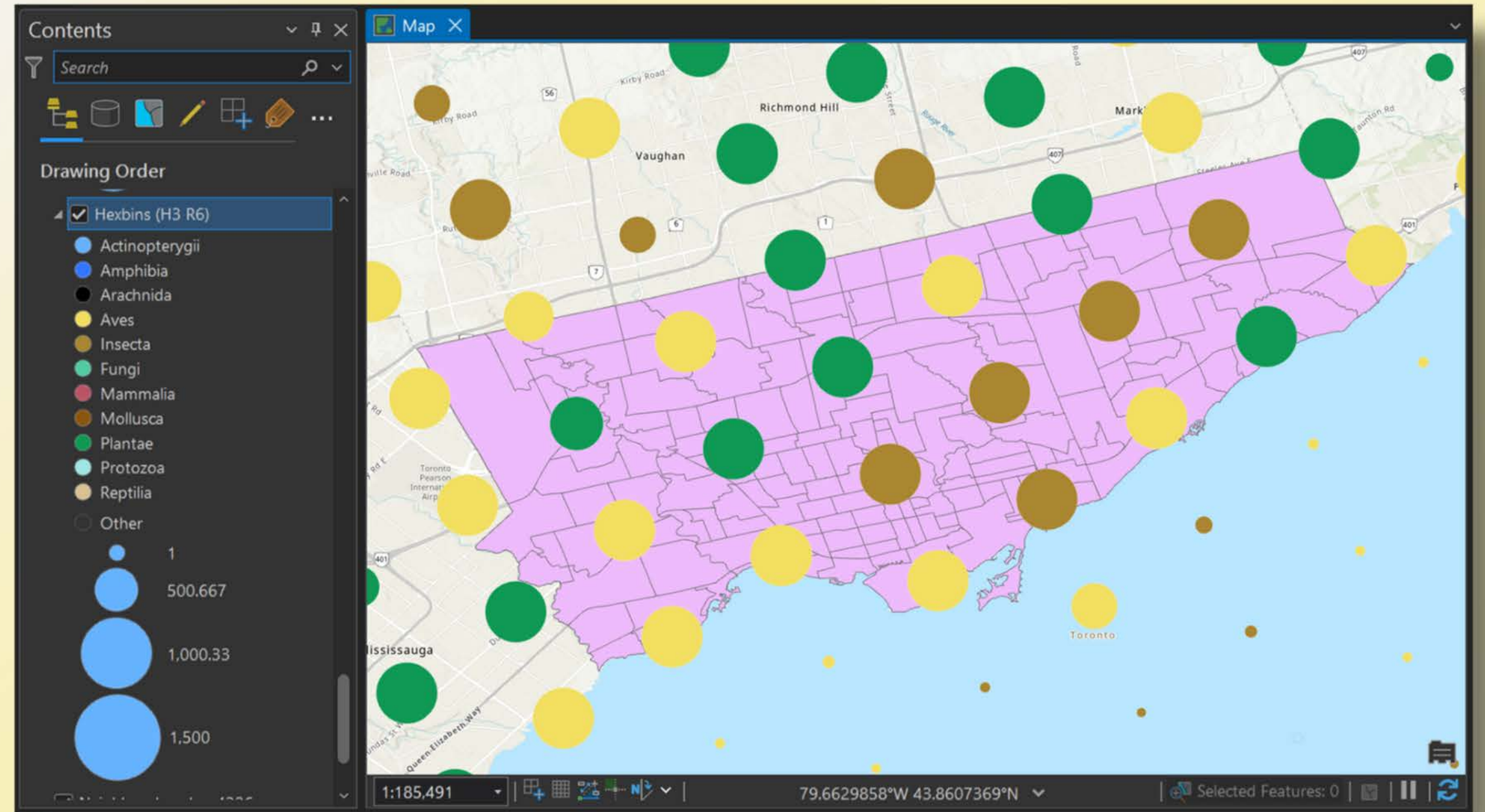
- Click the **Add Data Button**.
- Select the **Living Atlas** tab.



- Type **iNaturalist** in the search box and press Enter.
- Select the **iNaturalist Observations** Feature Layer and Click **OK**.

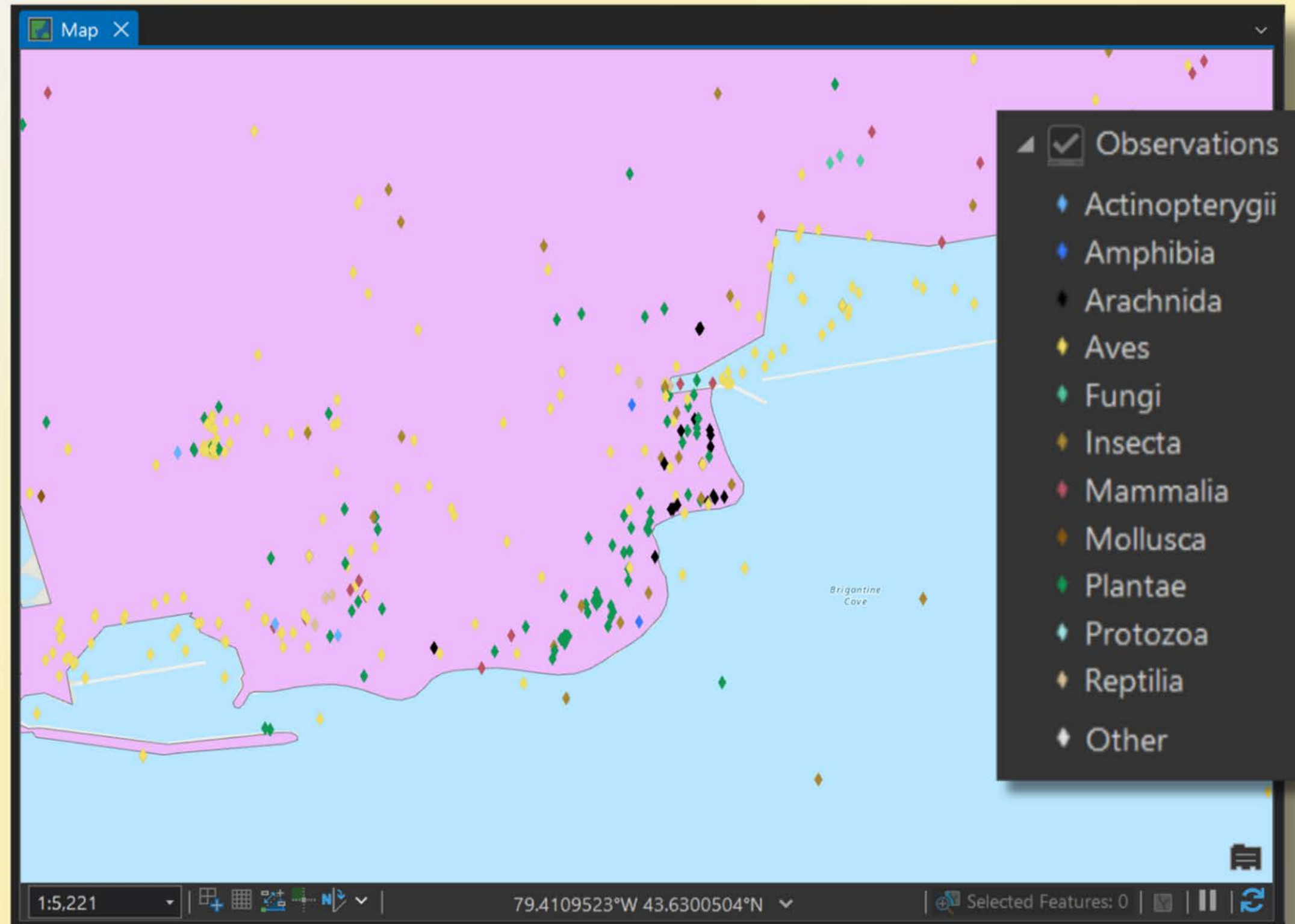


- This dataset contains crowdsourced wildlife observations.
- When zoomed out, the individual observations are **aggregated** into bins denoting the number of observations per area.



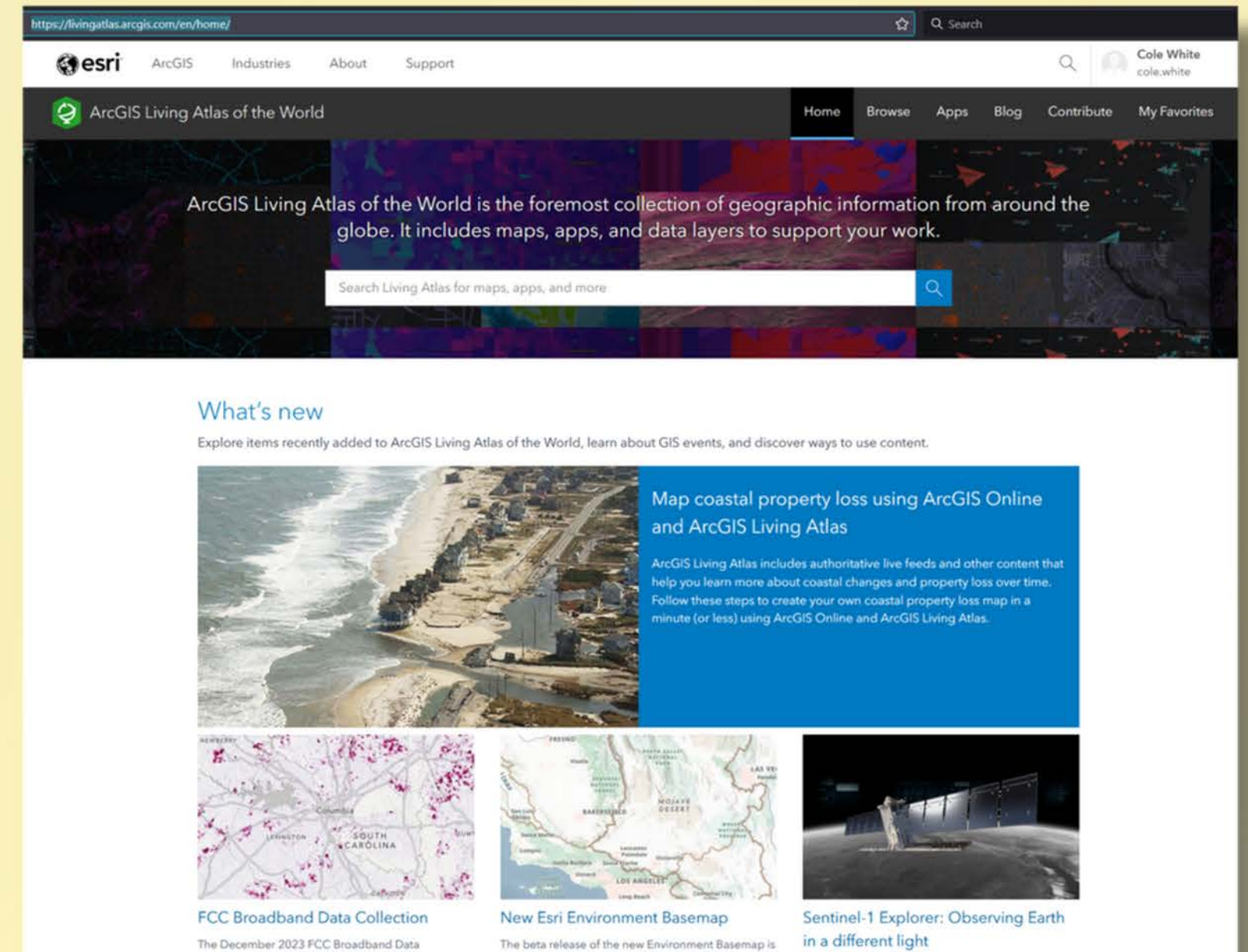


- Zoom in to display individual observation points.
- Note that the points have been symbolized by **category** (taxonomic class)



Visit the Living Atlas website to browse other available datasets:

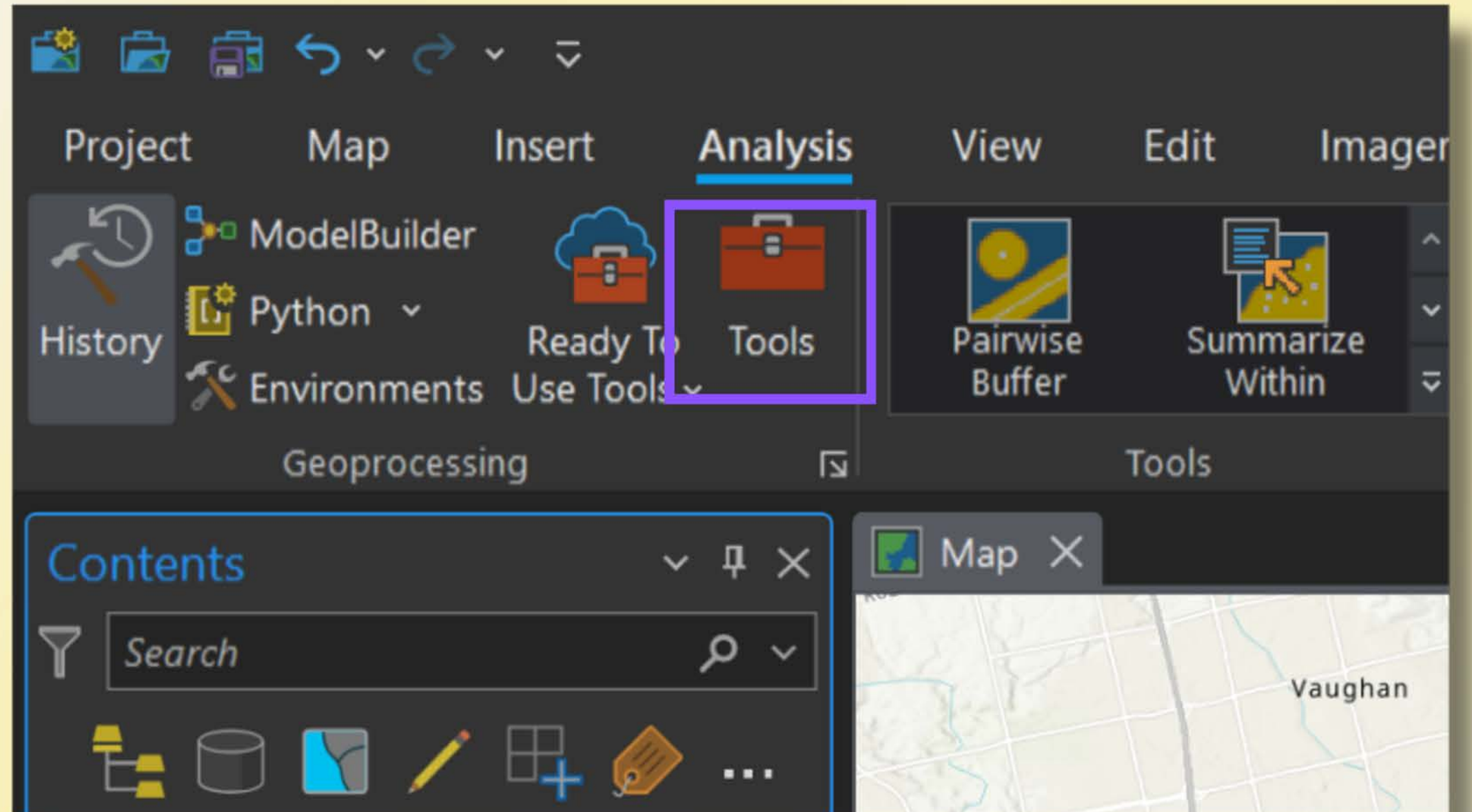
<https://livingatlas.arcgis.com/en/home/>



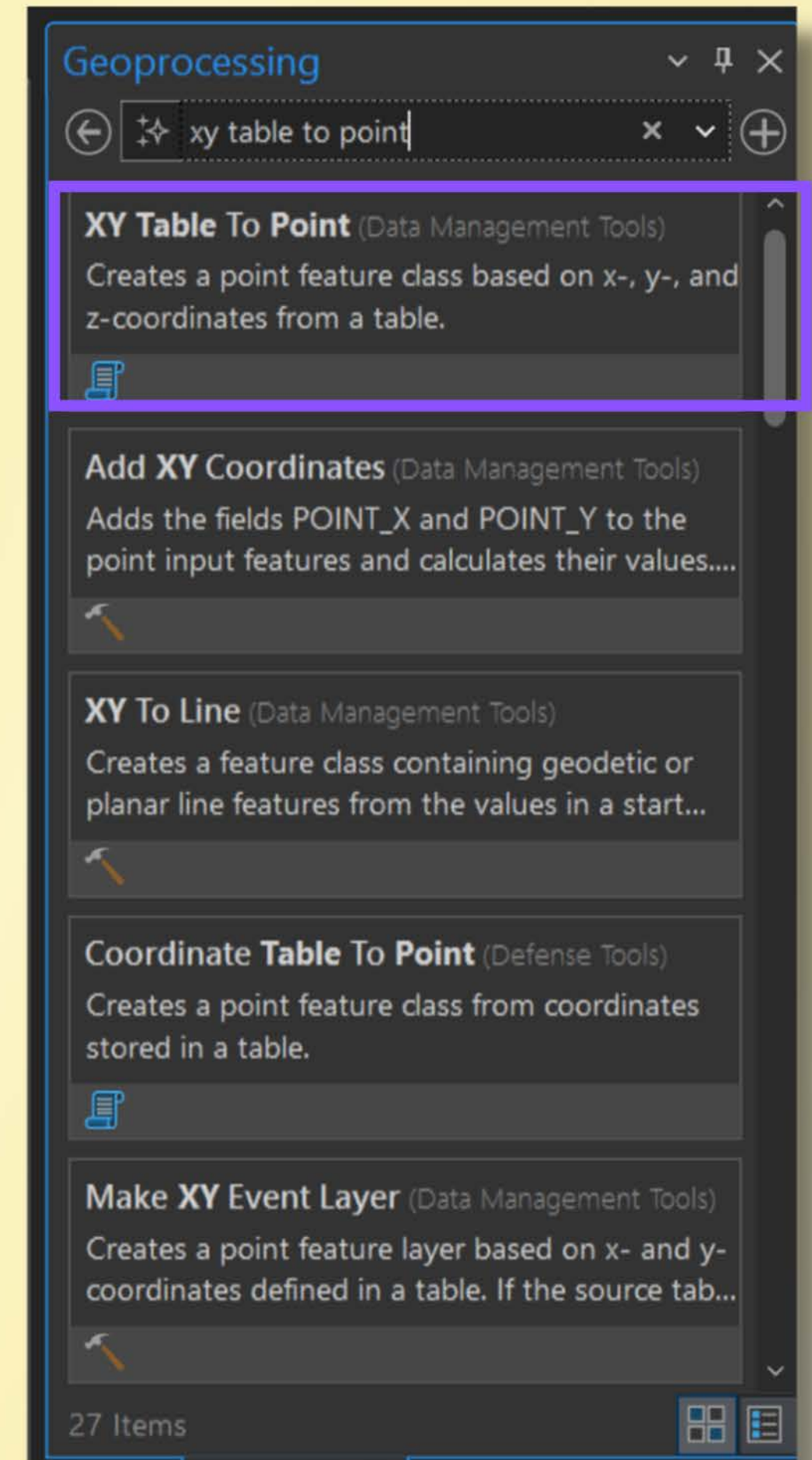




- From Pro's **Analysis** tab, click **Tools**.

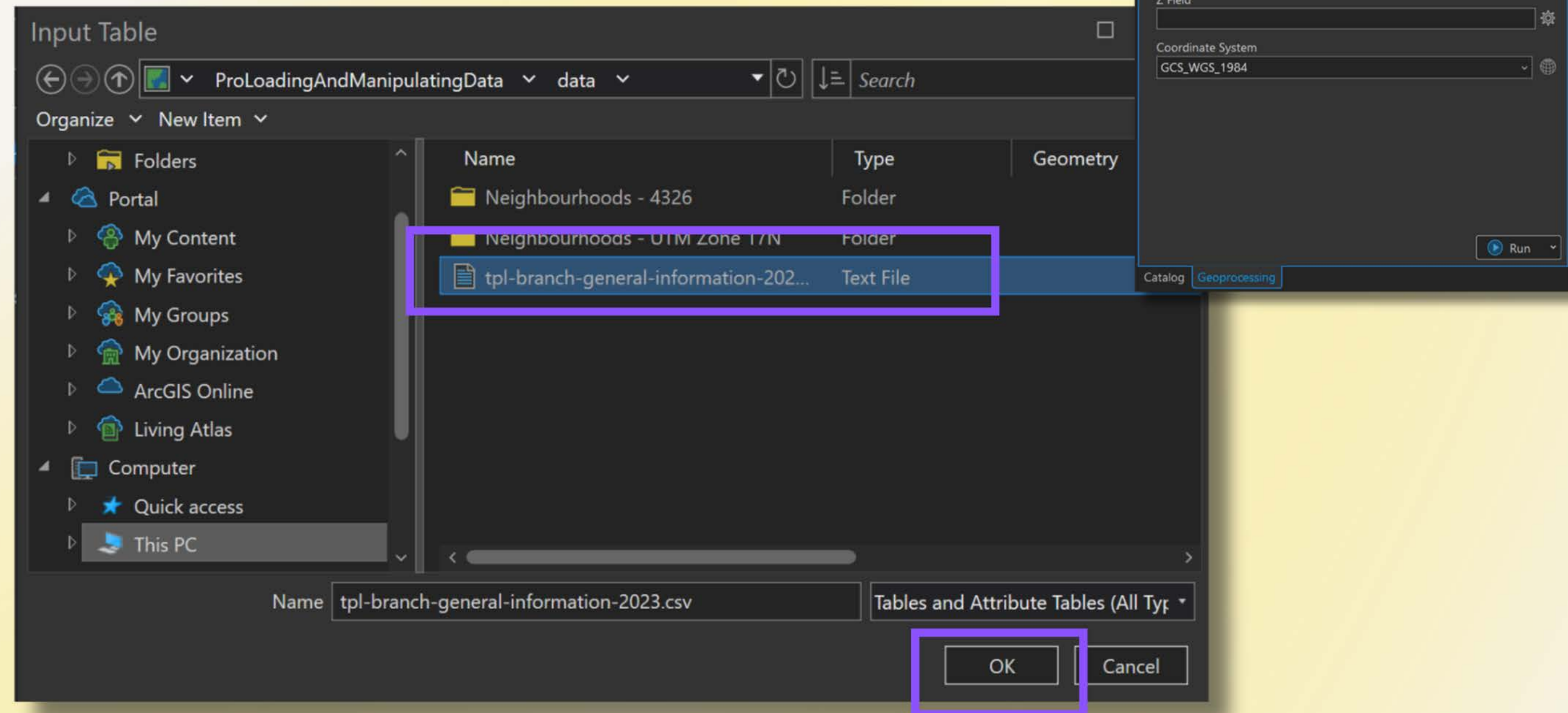


- The **Geoprocessing** pane will open.
- In the search bar, start typing '**xy table to point**'.
- Click the first search result to open the tool.

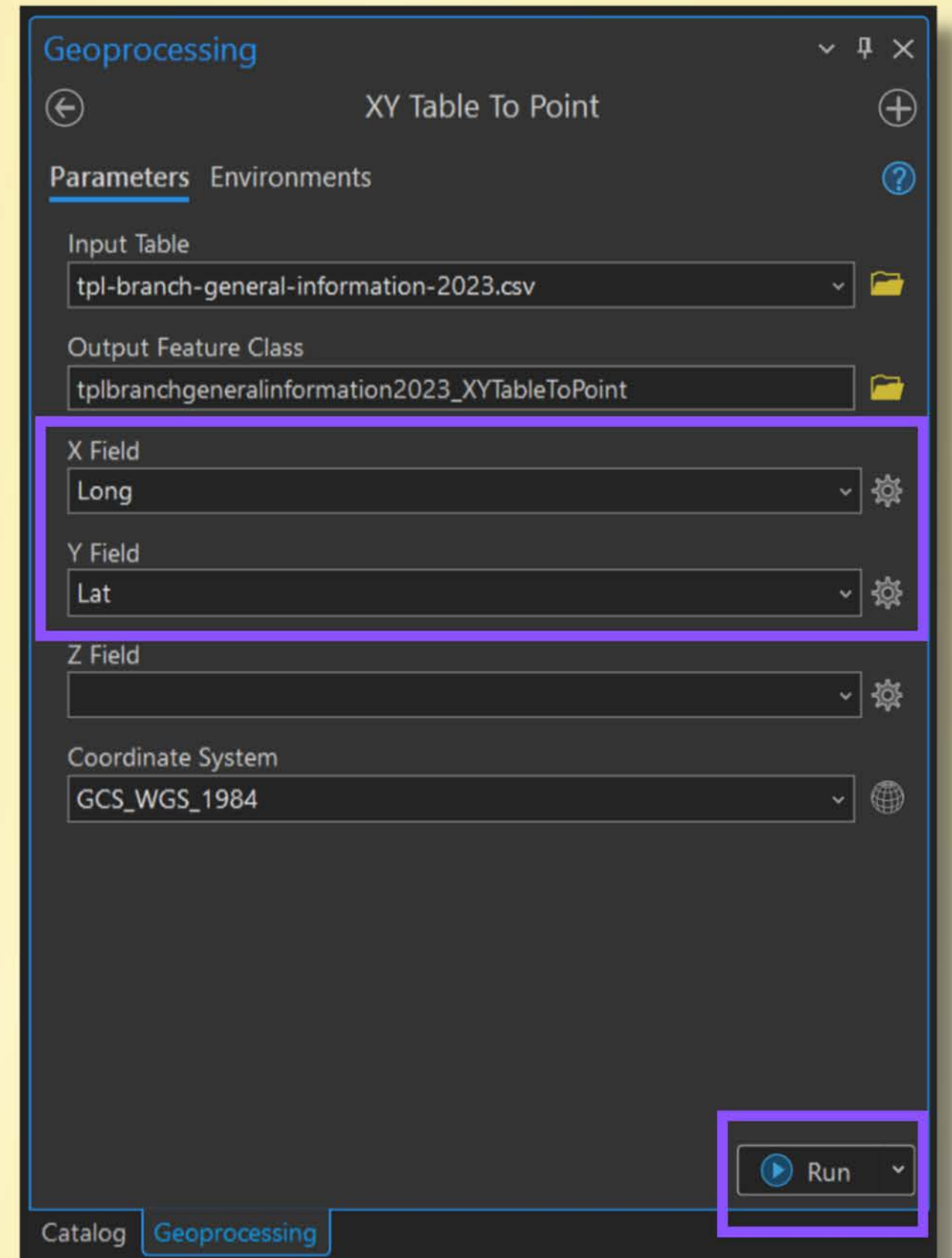


- Click the **folder icon** next to the **Input Table** input box.

- Navigate to the CSV file. Select the file and click **OK**.

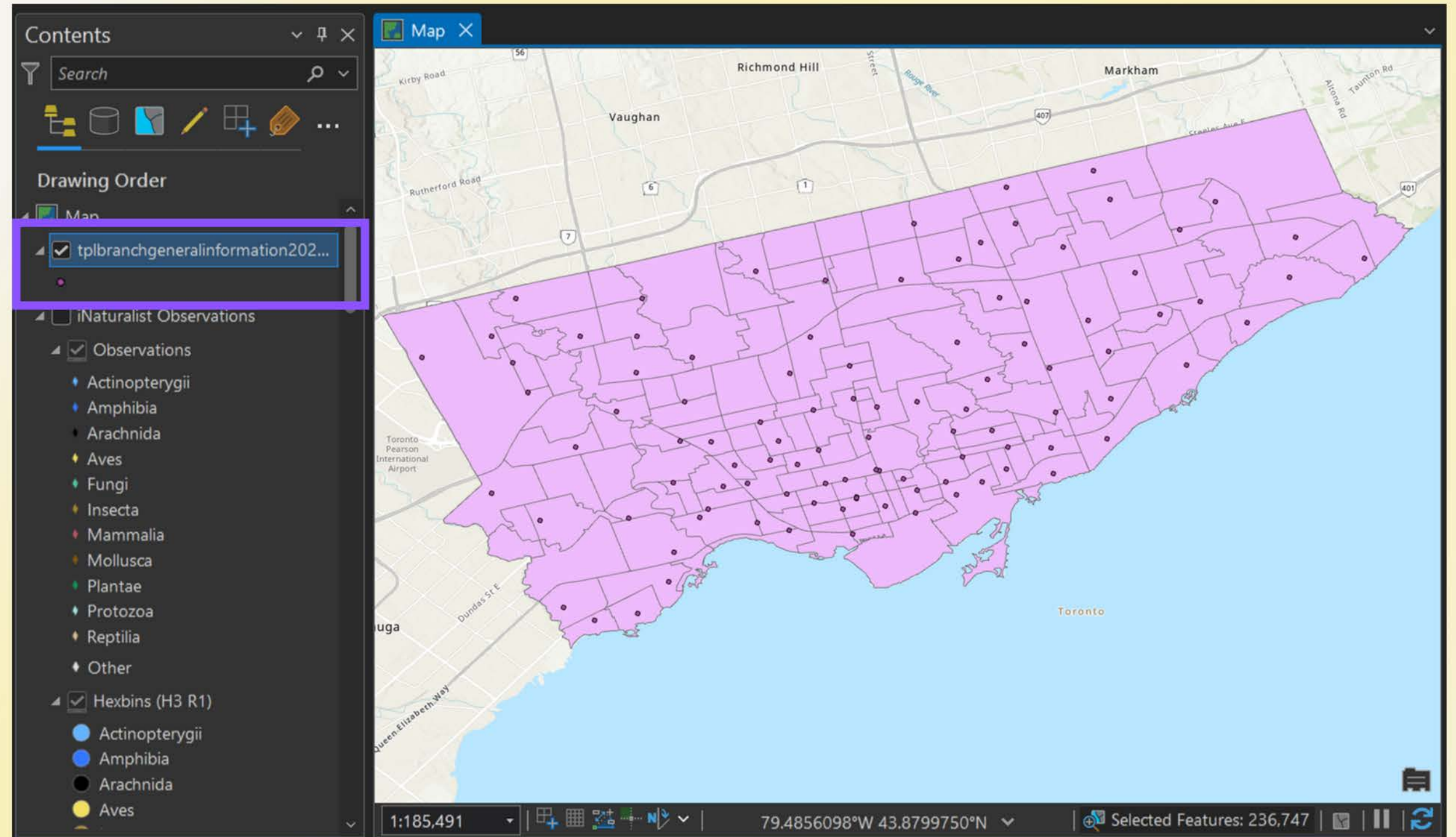


- Select **Long** from the **X Field** dropdown and **Lat** for the **Y Field** dropdown (if these don't automatically populate).
- Click **Run**.





- A new layer showing library locations has been added to the map.

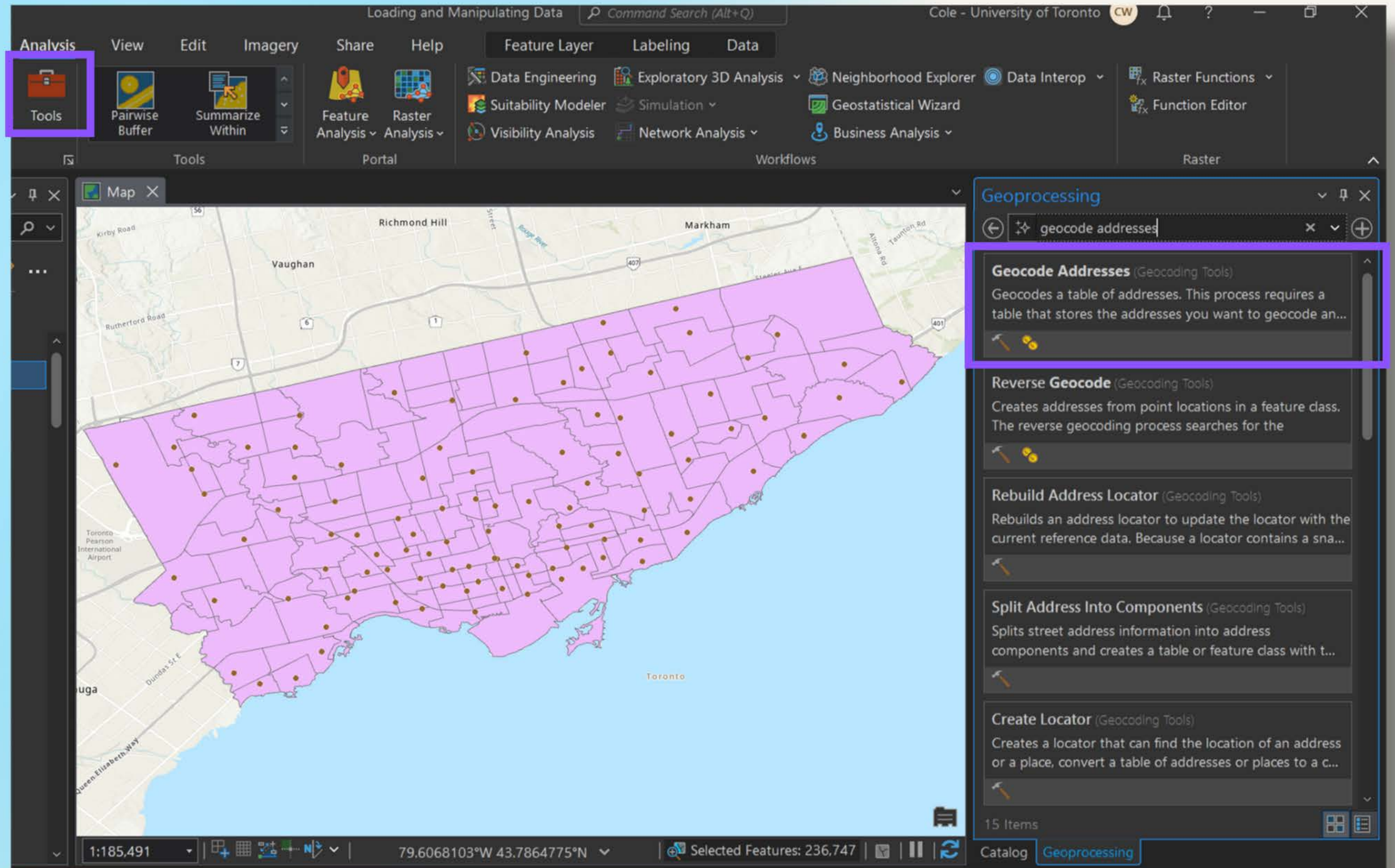


# Add data from a spreadsheet: Geocoding

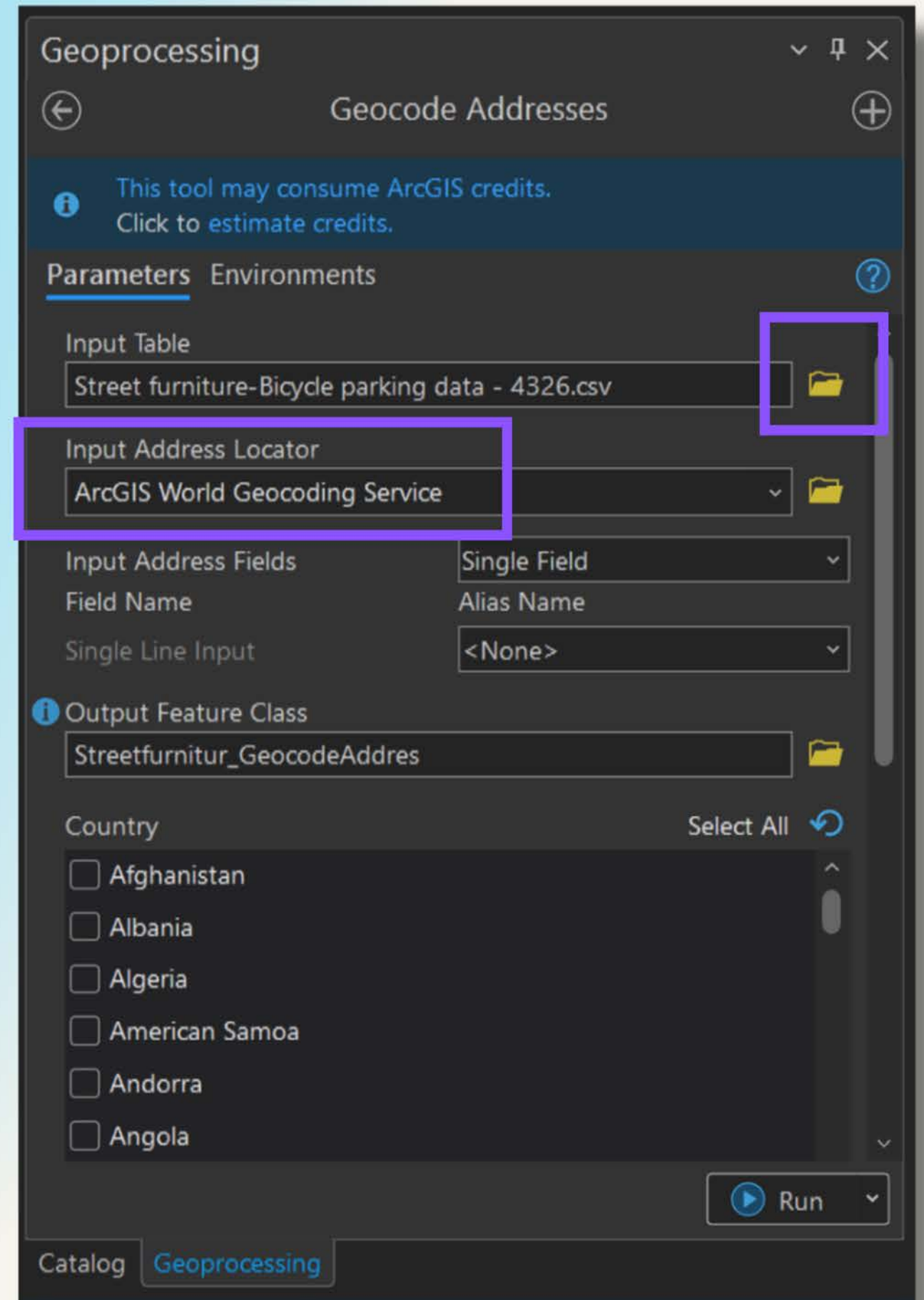
- Review the **Street furniture-Bicycle parking data - 4326.csv** file from the sample data in Excel.
- Note that this dataset contains no lat/long information; however, it **does** include **columns with street address** information.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	_id	OBJECTID	ID	ADDRESSN	ADDRESSST	FRONTING	SIDE	FROMSTRE	DIRECTION	SITEID	WARD	BIA	ASSETTYPE	STATUS	SDE_STATE_ID
2	1	5	BP-05830	4841-4881	Yonge St	None	None	Harlandale	None	None	18	Willowdale	Ring	Existing	
3	2	34	BP-03500	8	Kensington	None	None	Kensington	None	None	11	Kensington	Ring	Existing	
4	3	41	BP-11900	8	Assiniboine	None	None	Nelson Rd	None	None	7	None	Rack	Existing	
5	4	60	BP-15510	46	Wellesley S	None	None	Wellesley S	None	None	13	None	Ring	Temporarily Removed	
6	5	171	BP-15330	911	Davenport	None	None	Davenport	None	None	12	None	None	Existing	
7	6	175	BP-08910	20	Lombard S	None	None	Lombard S	None	None	13	Old Town T	None	Existing	
8	7	202	BP-14800	359	King St E	None	None	Derby St	None	None	13	Old Town T	Ring	Existing	
9	8	249	BP-13380	145	Queens Qu	None	None	York St	None	None	10	The Waterf	None	Existing	
10	9	251	BP-12070	1960	Queen St E	None	None	Kenilworth	None	None	19	The Beach	Ring	Existing	
11	10	276	BP-15960	87	Avenue Rd	Avenue Rd	East	Elgin Ave	North	None	11	None	Ring	Existing	
12	11	299	BP-05200	522	University	None	None	Elm St	None	None	11	None	Ring	Existing	
13	12	341	BP-03930	50	Blue Jays W	None	None	Mercer St	None	None	10	Toronto Dc	Ring	Temporarily Removed	
14	13	356	BP-05920	1313	Bloor St W	None	None	St Helens A	None	None	9	Bloordale V	Ring	Temporarily Removed	
15	14	417	BP-08040	145	Queens Qu	None	None	York St	None	None	10	The Waterf	None	Existing	
16	15	418	BP-07760	162	Mc Caul St	None	None	Mc Caul St	None	None	11	None	Ring	Existing	

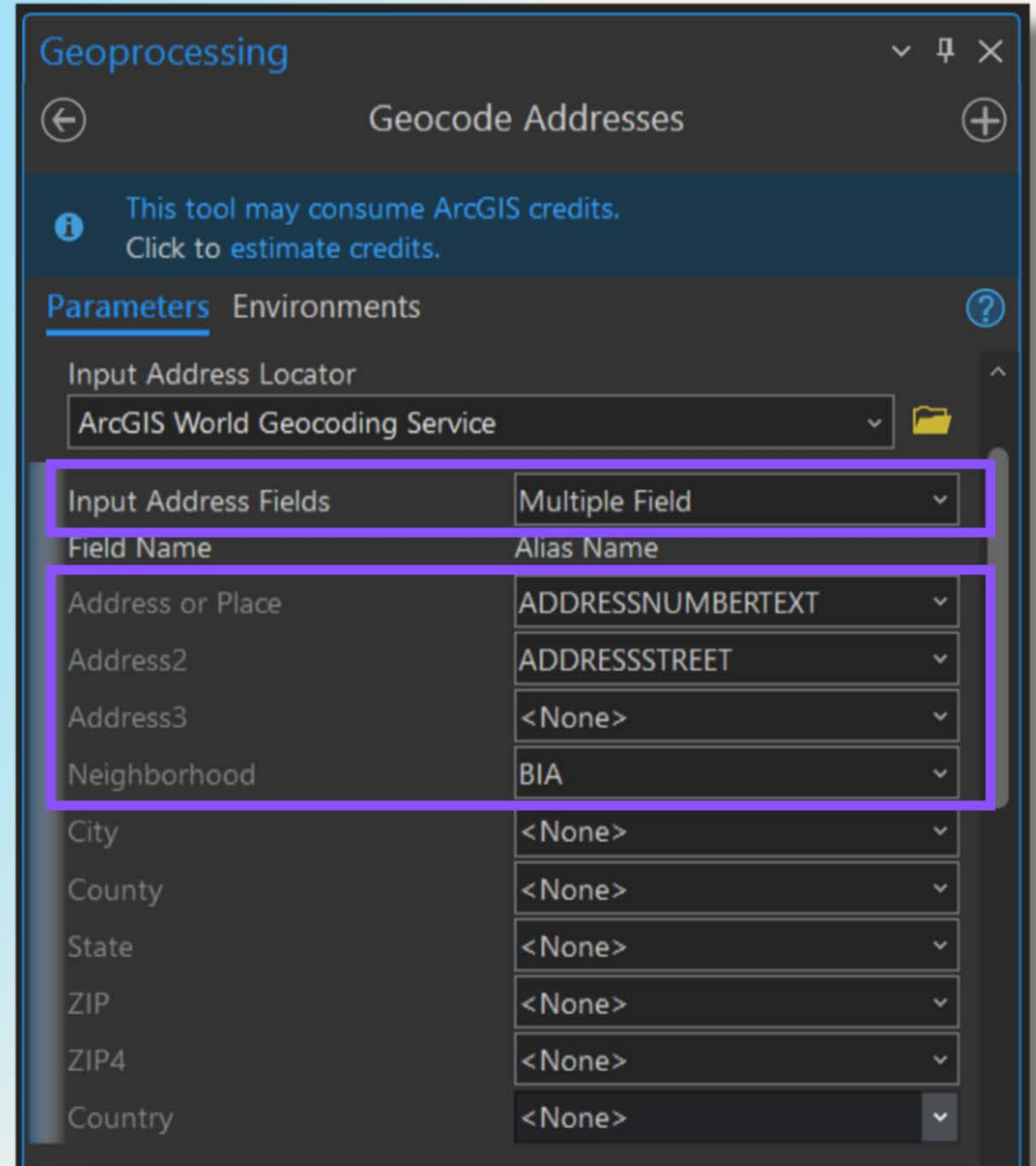
- Open the **Geoprocessing** pane by clicking the **Tools** button (**Analysis** tab)
- Search for and open the **Geocode Addresses** tool



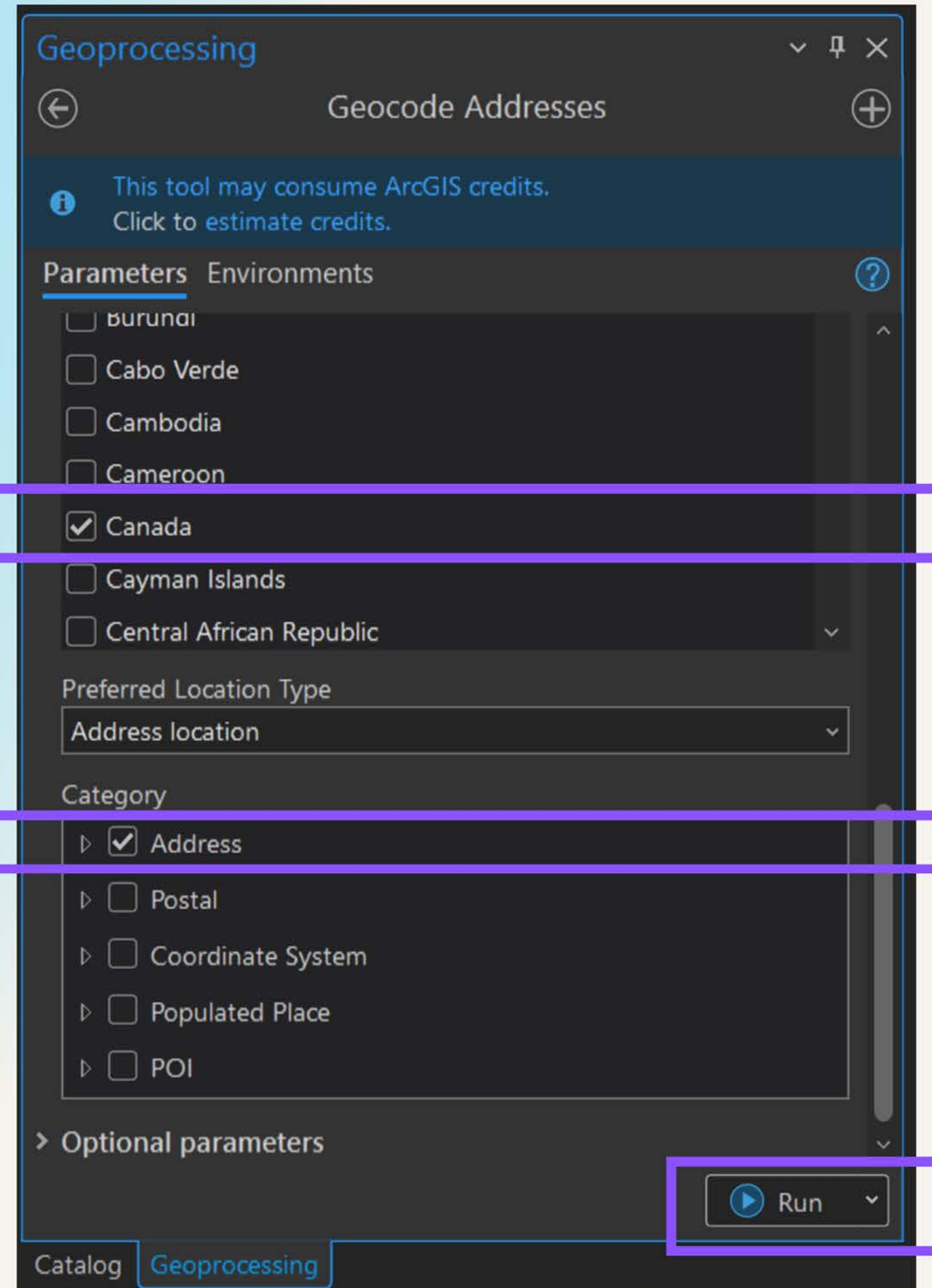
- Provide the **Input Table** parameter by clicking the **folder icon** and navigating to the bicycle parking csv file.
- For the **Input Address Locator** parameter, select **ArcGIS World Geocoding Service** from the dropdown.



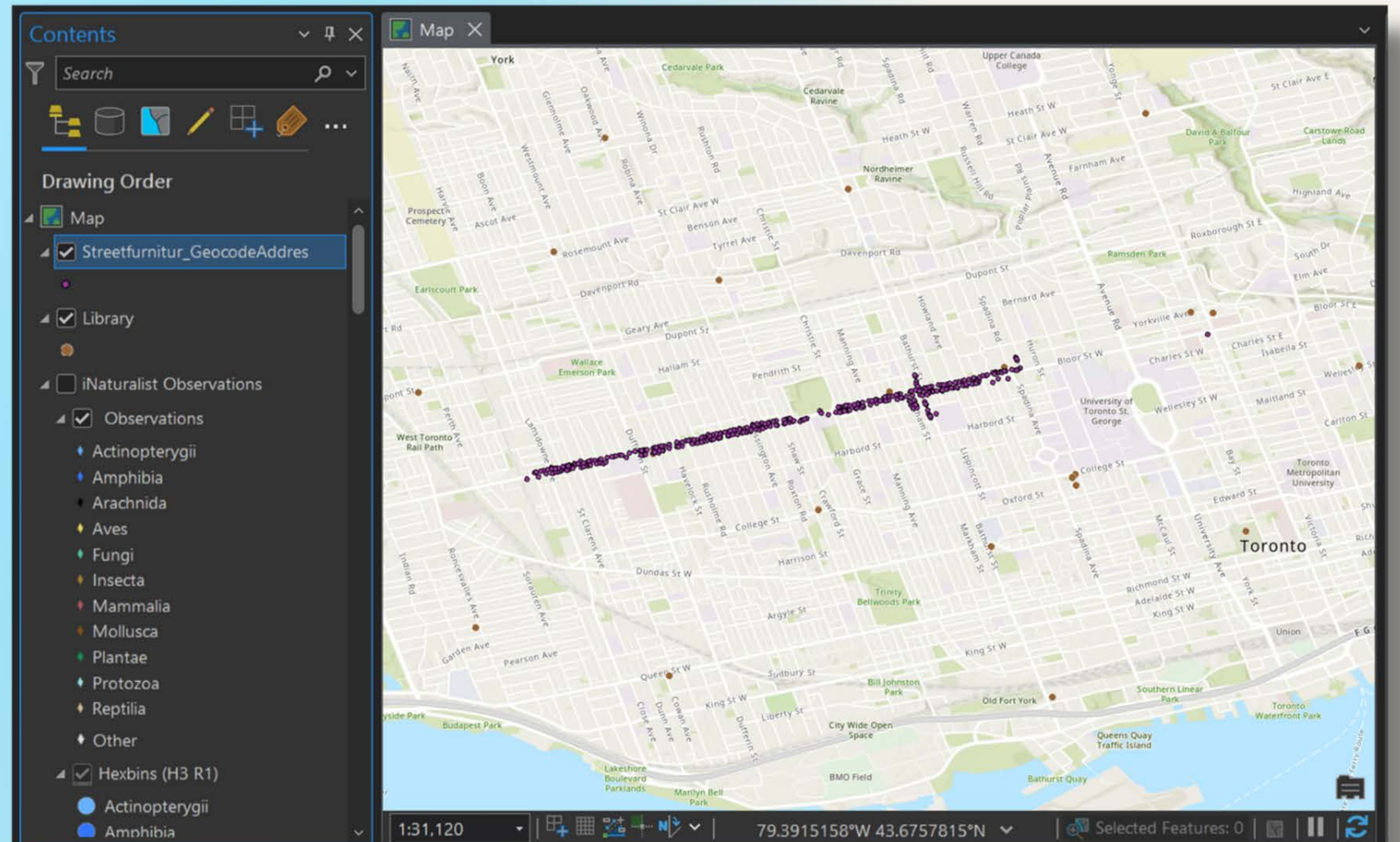
- Select **Multiple Field** for the **Input Address Fields** parameter.
- Referring to the names of the spreadsheet columns, provide values for the **Address or Place**, **Address2**, and **Neighborhood** parameters.



- Check **Canada** for the **Country**.
- Leave the **Preferred Location Type** as **Address location**.
- Select **Address** for the **Category**.
- Click **Run**.



- Result: the software will attempt to look up locations for each address provided.



# Add data from a spreadsheet: Attribute Join

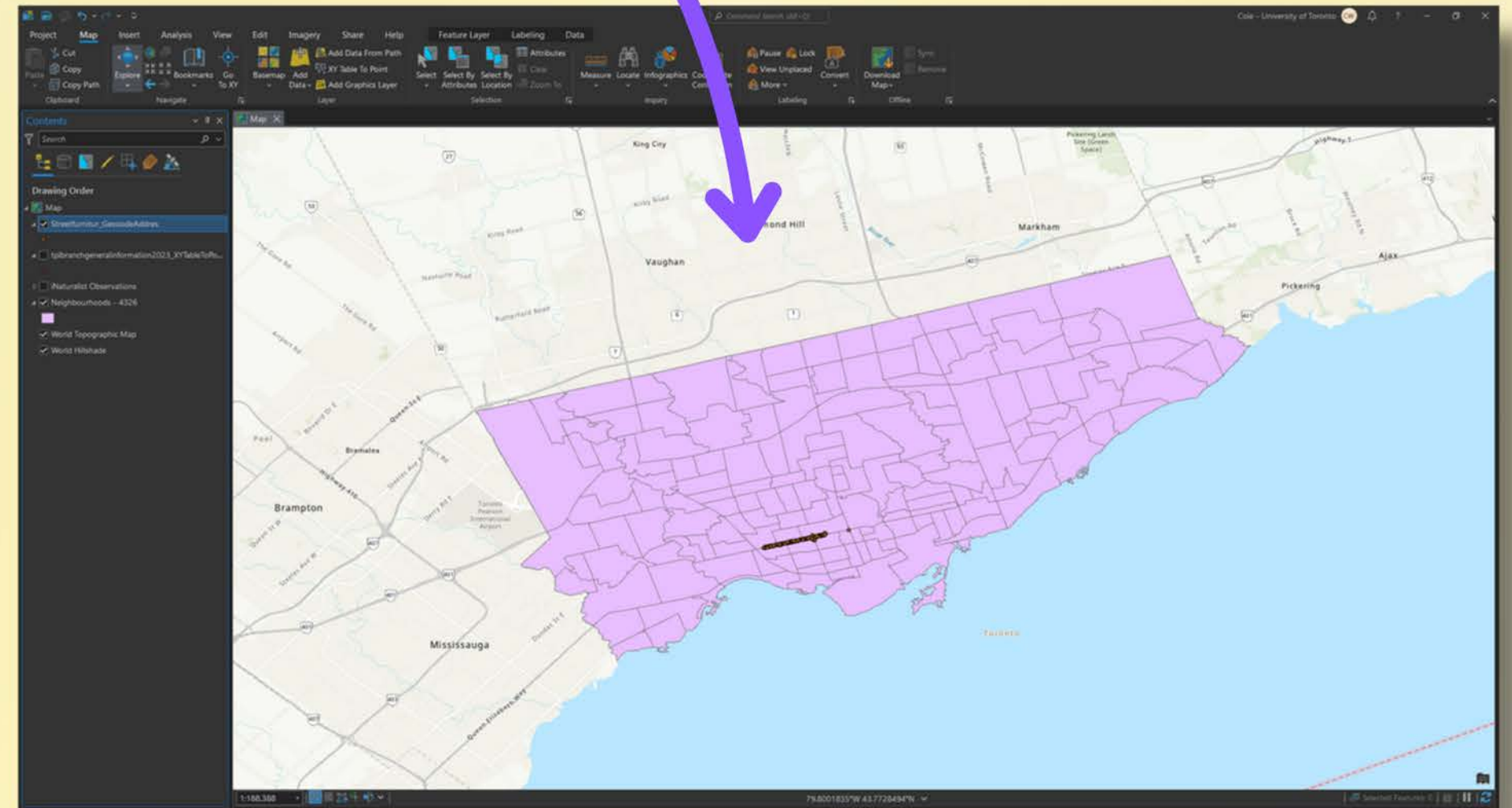
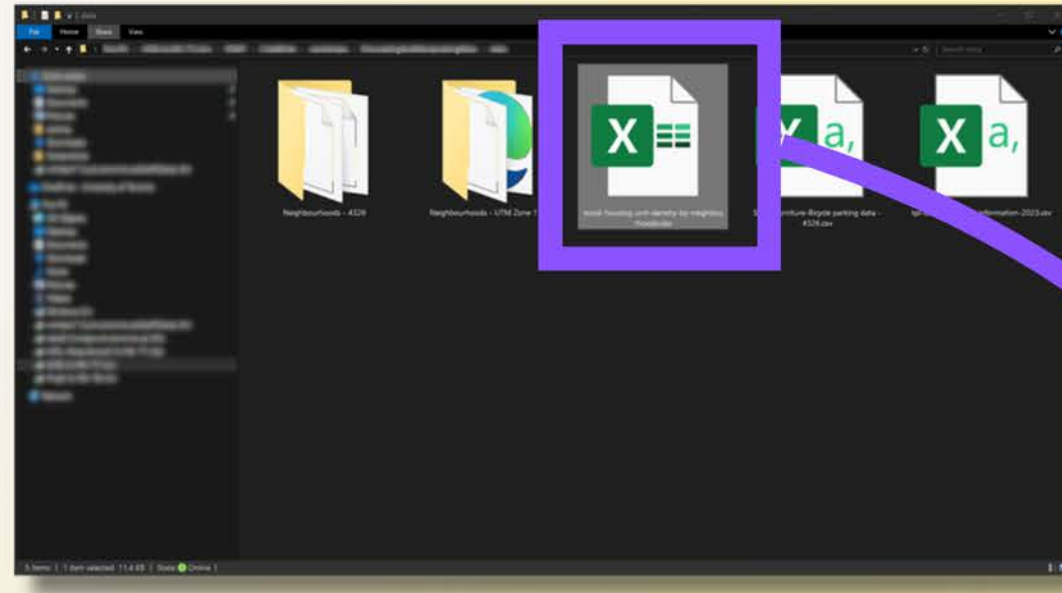
- Review the **socialhousing.csv** file in the sample data folder.
- This dataset details social housing unit density exist **per Toronto neighbourhood**. Neighbourhoods are identified by a **unique ID number**.
- It also lists how many of these units are geared-to-income (RGI).

	A	B	C	D
1	Neighbourhood	Units	RGI	
2	001	950	411	
3	002	1288	1181	
4	003	372	180	
5	004	308	299	
6	005	358	358	
7	006	553	401	
8	007	762	511	
9	008	688	390	
10	013	200	198	
11	014	1240	1178	
12	016	129	80	
13	017	879	779	
14	018	1010	753	
15	019	106	73	
16	020	77	39	
17	021	133	114	
18	022	223	160	



# Add data from a spreadsheet: Attribute Join

- Add the **socialhousing.csv** file to the map.
- Use the **Add Data** button, or simply **drag and drop** the file from Windows Explorer into the map view.



# Add data from a spreadsheet: Attribute Join

- Recall that the Neighbourhoods layer also contains an ID for each neighbourhood in its attribute table.
- We can **join** the housing data to the neighbourhood polygons by matching these IDs.

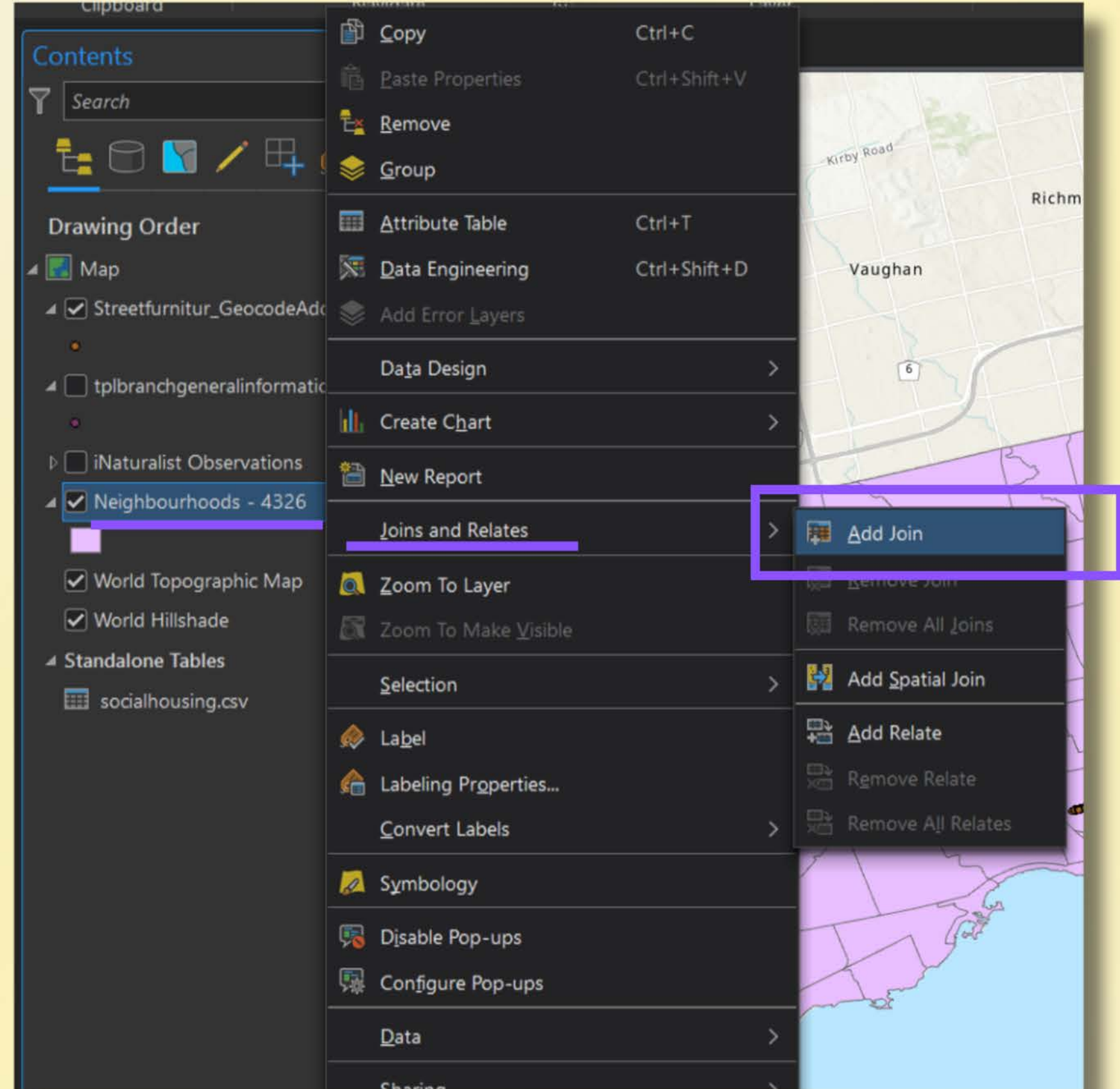
The image shows two data tables side-by-side in a software interface. The left table is from a CSV file named 'socialhousing.csv' and has columns: Neighbourhood, Units, and RGI. The right table is from a shapefile named 'Neighbourhoods - 4326' and has columns: FID, Shape, \_id1, AREA\_ID2, AREA\_AT3, PARENT\_4, AREA\_SH5, AREA\_LO6, and AREA\_NA7. A purple box highlights the 'Neighbourhood' column in the CSV and the '\_id1' column in the shapefile, indicating they are being matched for the join.

Neighbourhood	Units	RGI
1	950	411
2	1288	1181
3	372	180
4	308	299
5	358	358
6	553	401
7	762	511
8	688	390
13	200	198
14	1240	1178
16	129	80

FID	Shape	_id1	AREA_ID2	AREA_AT3	PARENT_4	AREA_SH5	AREA_LO6	AREA_NA7
1	Polygon	1	2502366	26022881	0	174	174	South Eglinton-Davisville
2	Polygon	2	2502365	26022880	0	173	173	North Toronto
3	Polygon	3	2502364	26022879	0	172	172	Dovercourt Village
4	Polygon	4	2502363	26022878	0	171	171	Junction-Wallace Emer...
5	Polygon	5	2502362	26022877	0	170	170	Yonge-Bay Corridor
6	Polygon	6	2502361	26022876	0	169	169	Bay-Cloverhill
7	Polygon	7	2502360	26022875	0	156	156	Bendale-Glen Andrew
8	Polygon	8	2502359	26022874	0	155	155	Downsview
9	Polygon	9	2502358	26022873	0	154	154	Oakdale-Beverley Heig...
10	Polygon	10	2502357	26022872	0	153	153	Avondale
11	Polygon	11	2502356	26022871	0	152	152	East Willowdale

# Add data from a spreadsheet: Attribute Join

- Right-click the **Neighbourhoods** layer in the Contents pane.
- Choose **Joins and Relates -> Add Join**



# Add data from a spreadsheet: Attribute Join

Specify the following:

- Input Table: **Neighbourhoods - 4326**
- Input Field: **\_id1**
- Join Table: **socialhousing.csv**
- Join Field: **Neighbourhood**

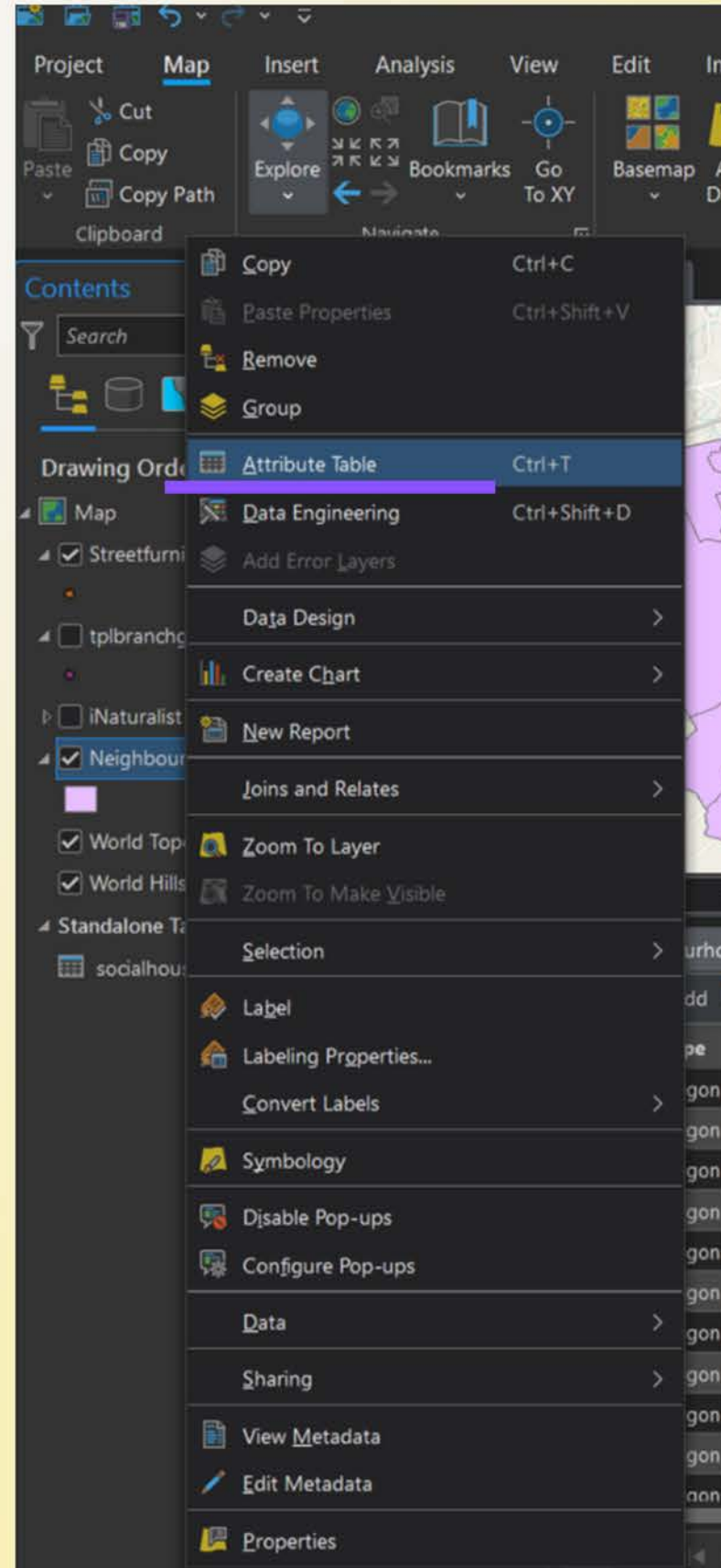
Click **OK**.

The screenshot shows the 'Add Join' dialog box with the following configuration:

- Input Table:** Neighbourhoods - 4326
- Input Field:** \_id1
- Join Table:** socialhousing.csv
- Join Field:** Neighbourhood
- Keep all input records
- Index join fields
- Join Operation:** (empty dropdown)
- Buttons:** Validate Join, OK (highlighted)

# Add data from a spreadsheet: Attribute Join

- Open the Neighbourhoods layer's attribute table.
- Scroll to the far right.
- **Data from the csv has successfully been joined to the polygon layer.**

A screenshot of the 'Neighbourhoods - 4326' attribute table in ArcGIS Pro. The table is displayed in a window titled 'Neighbourhoods - 4326 - aprx - ArcGIS Pro'. The table has six columns: CLASSIF9, CLASSIF10, OBJECTID, Neighbourhood, Units, and RGI. The data is as follows:

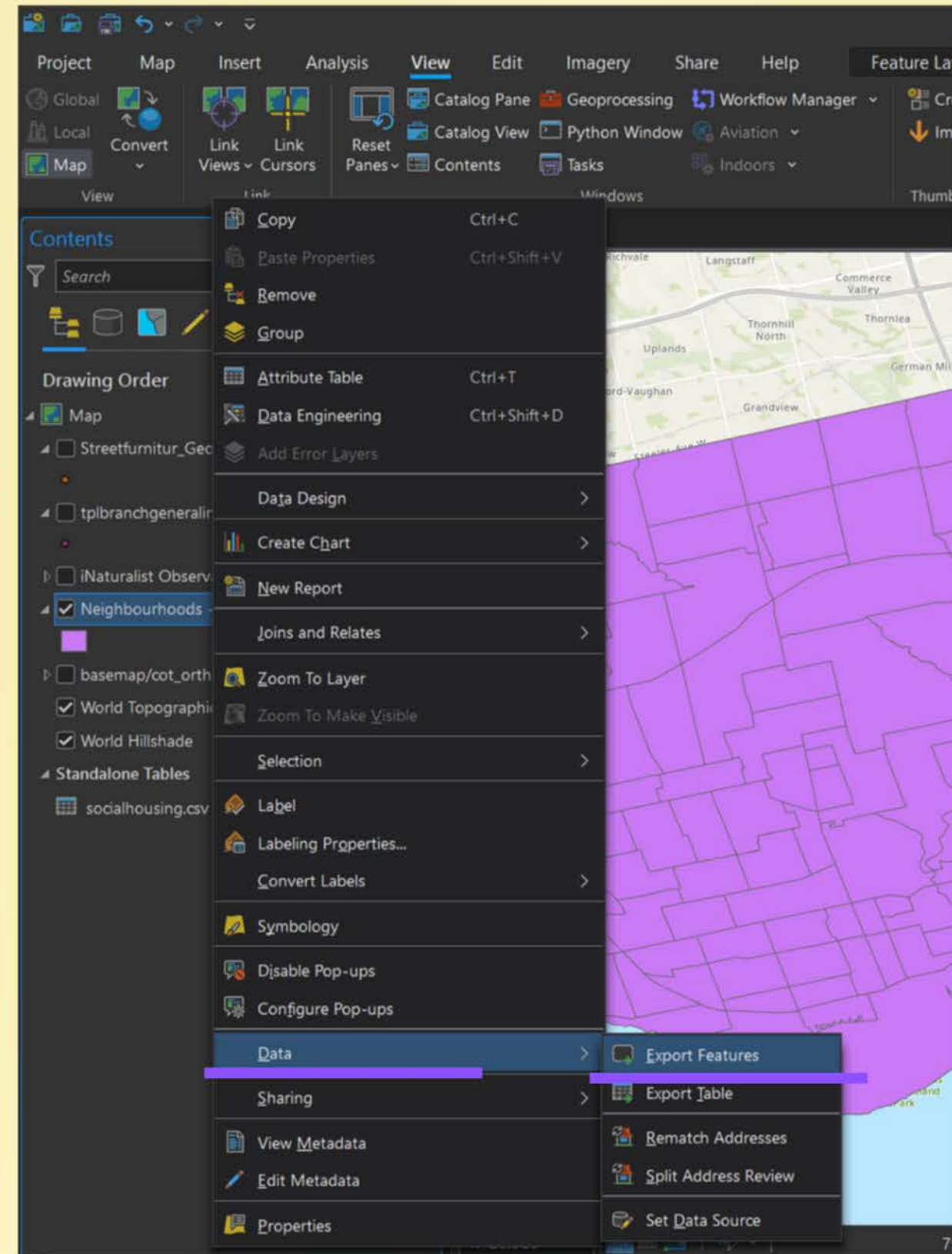
	CLASSIF9	CLASSIF10	OBJECTID	Neighbourhood	Units	RGI	
1	n-Davisvil...	Not an NIA or Emergen...	NA	1782473	1	950	411
2	o (173)	Not an NIA or Emergen...	NA	1782475	2	1288	1181
3	illage (172)	Not an NIA or Emergen...	NA	1782476	3	372	180
4	ace Emer...	Not an NIA or Emergen...	NA	1782478	4	308	299
5	orridor (1...	Not an NIA or Emergen...	NA	1782480	5	358	358
6	(169)	Not an NIA or Emergen...	NA	1782481	6	553	401
7	Andrew (...)	Not an NIA or Emergen...	NA	1782483	7	762	511
8	55)	Neighbourhood Impro...	NIA	1782484	8	688	390
9	rley Heig...	Neighbourhood Impro...	NIA	1782486	<Null>	<Null>	<Null>

**Joined data!**

# Add data from a spreadsheet: Attribute Join

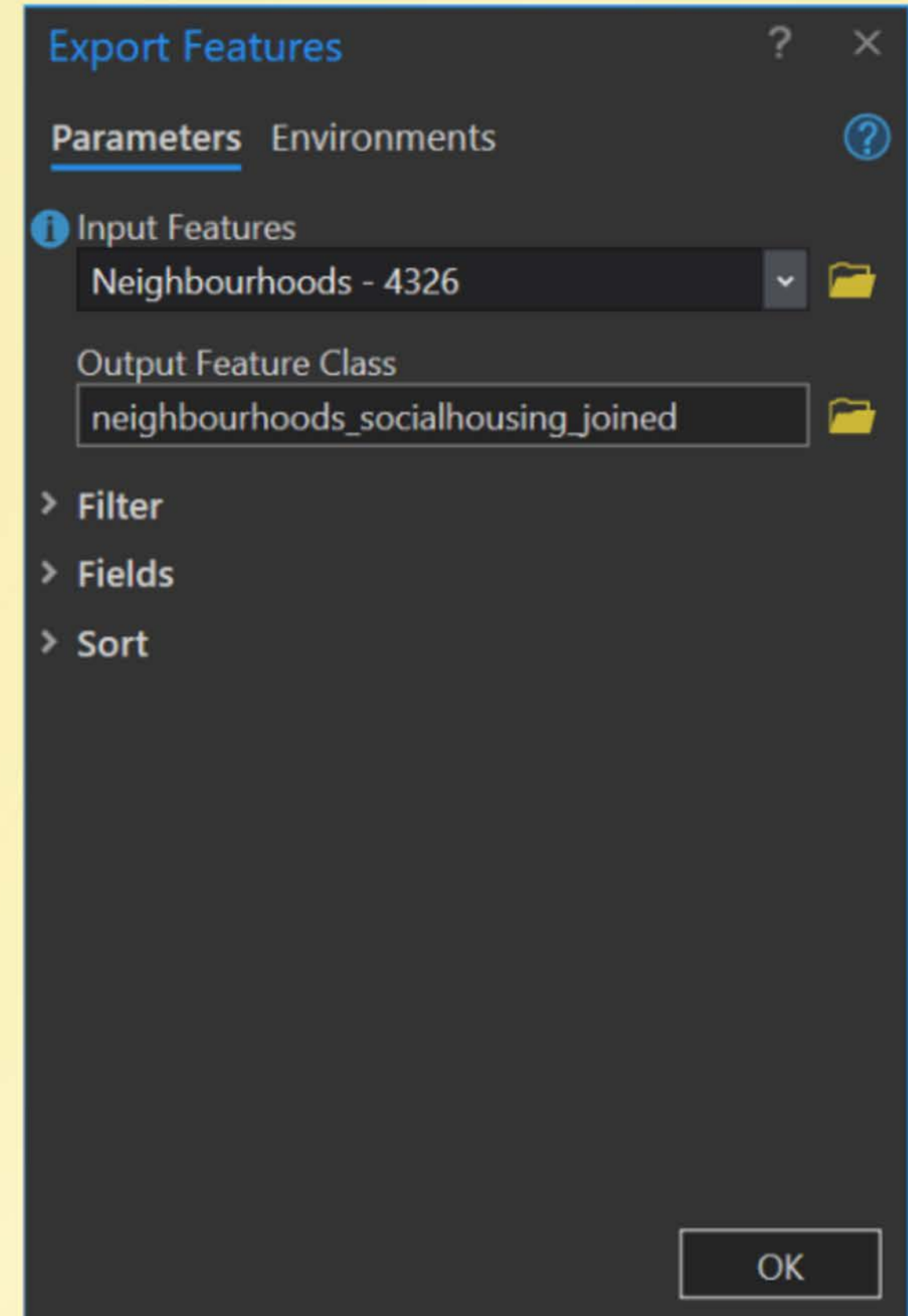
Export the layer to save a permanently-joined version of the data

- Right-click the layer name in the Contents pane
- From the menu, choose **Data -> Export Features**



# Add data from a spreadsheet: Attribute Join

- The output layer will be saved in the project geodatabase by default.



# Add data from a Web Service

Web services allow data to be shared from the internet.

To add a web service layer to Pro:

- Visit <https://open.toronto.ca/dataset/web-map-services/>
- Expand the **Download Data** section
- Click the **Visit Page** button next to the **Orthorectified Aerial Imagery - Most current year** item

Aerial LiDAR - Hillshade

A hillshade is a hypothetical illumination of a surface by determining illumination values for each cell in a raster. It is calculated by setting a position for a hypothetical light source and calculating the illumination values of each cell in relation to neighboring cells. It can be used to greatly enhance the visualization of a surface for analysis or graphical display, especially when using transparency. The City of Toronto publishes hillshades in both bare earth (no above-ground features included), and full-feature. Bare Earth Full Feature

DATA PREVIEW

Not available for this dataset

DATA FEATURES

DATA QUALITY

DOWNLOAD DATA

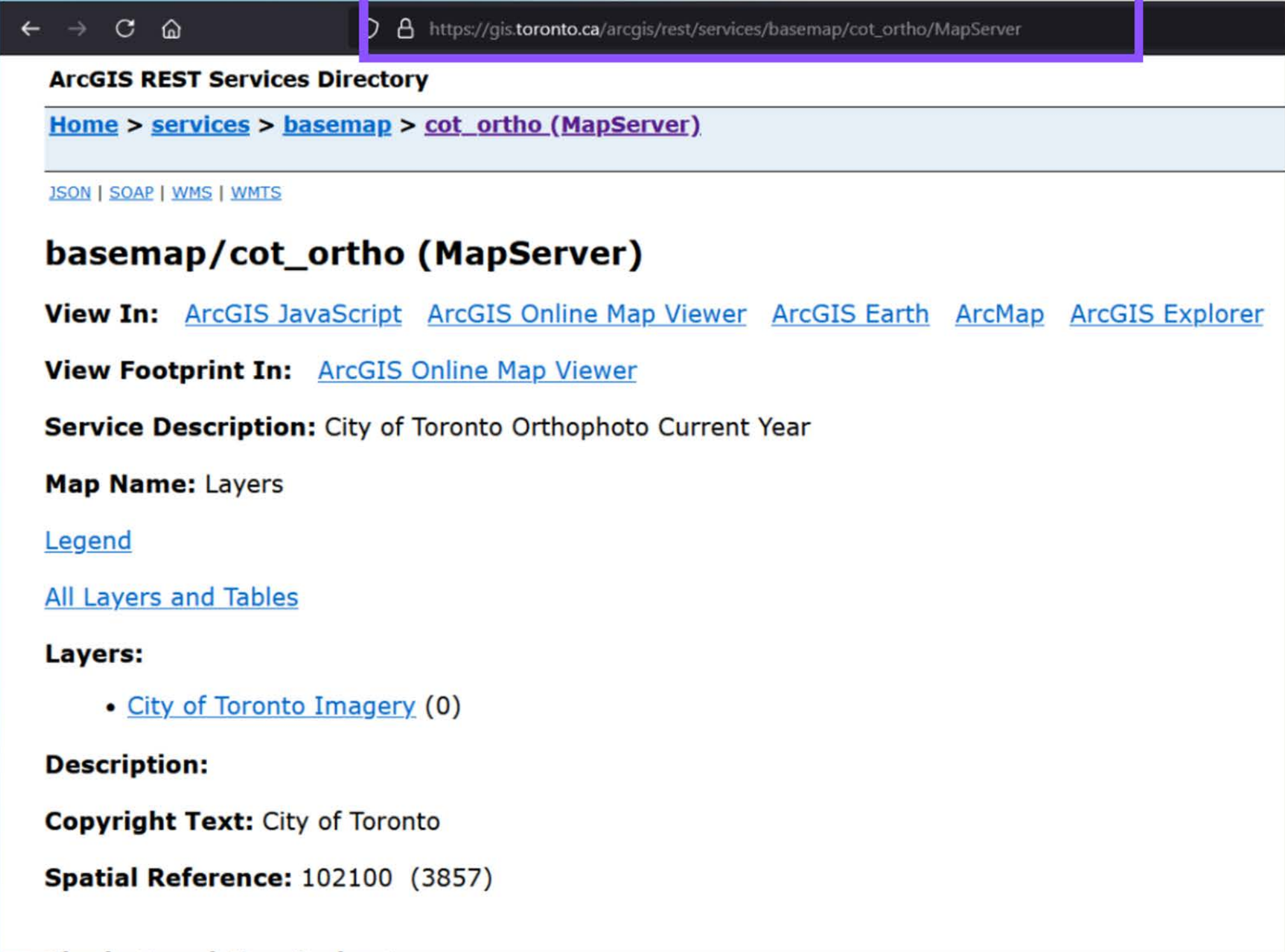
File	Format	Data
Orthorectified Aerial Imagery - Most current year	web	VISIT PAGE
Orthorectified Aerial Imagery - 2022	web	VISIT PAGE
Orthorectified Aerial Imagery - 2021	web	VISIT PAGE
Orthorectified Aerial Imagery - 2020	web	VISIT PAGE
Orthorectified Aerial Imagery - 2018	web	VISIT PAGE



# Add data from a Web Service

- Copy the URL (Ctrl + C)

[https://gis.toronto.ca/arcgis/rest/services/basemap/cot\\_ortho/MapServer](https://gis.toronto.ca/arcgis/rest/services/basemap/cot_ortho/MapServer)

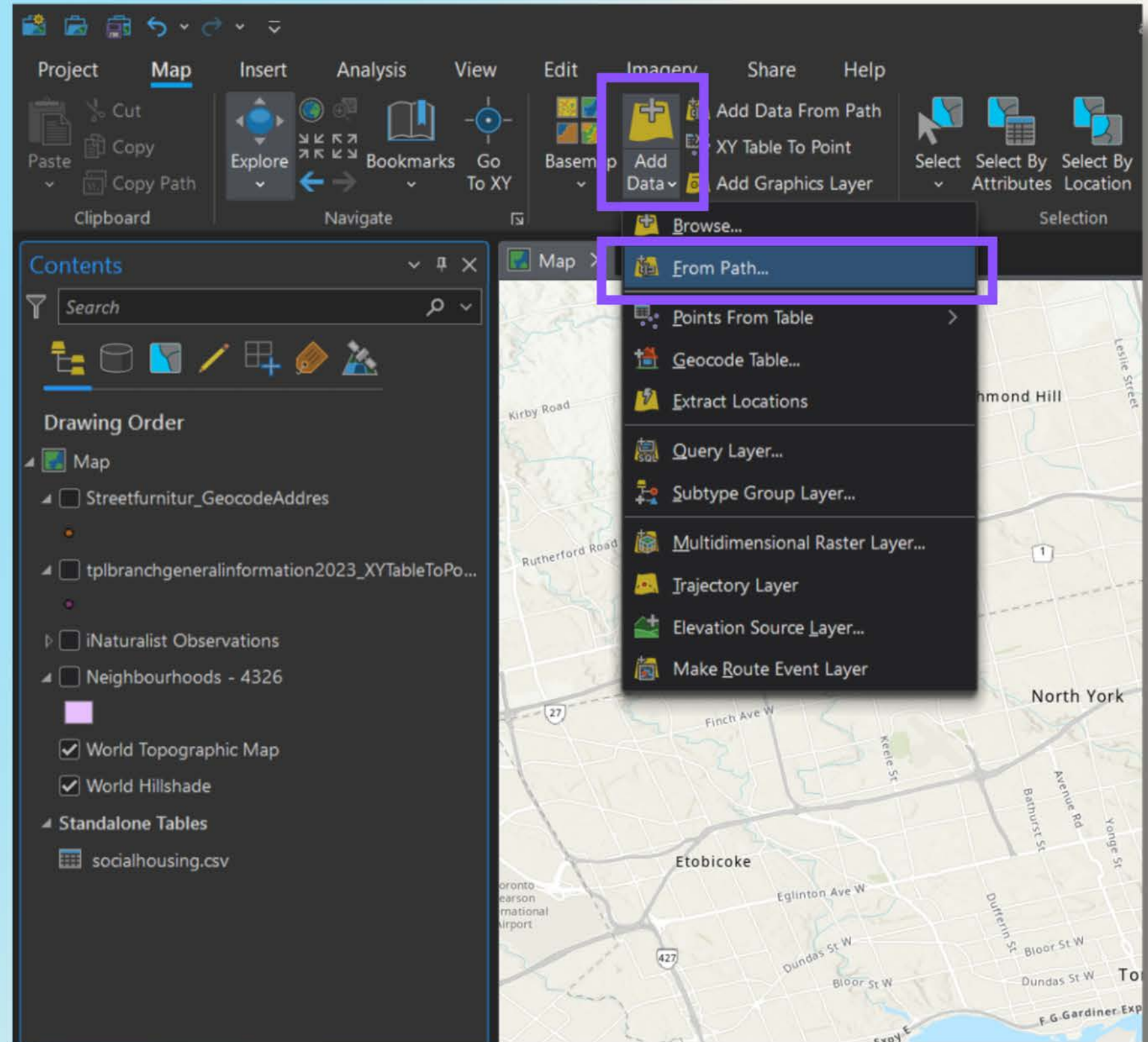


The screenshot shows a web browser window displaying the ArcGIS REST Services Directory. The address bar shows the URL [https://gis.toronto.ca/arcgis/rest/services/basemap/cot\\_ortho/MapServer](https://gis.toronto.ca/arcgis/rest/services/basemap/cot_ortho/MapServer), which is highlighted with a purple box. The page content includes the following information:

- ArcGIS REST Services Directory**
- Home > [services](#) > [basemap](#) > [cot\\_ortho \(MapServer\)](#)
- [JSON](#) | [SOAP](#) | [WMS](#) | [WMTS](#)
- basemap/cot\_ortho (MapServer)**
- View In:** [ArcGIS JavaScript](#) [ArcGIS Online Map Viewer](#) [ArcGIS Earth](#) [ArcMap](#) [ArcGIS Explorer](#)
- View Footprint In:** [ArcGIS Online Map Viewer](#)
- Service Description:** City of Toronto Orthophoto Current Year
- Map Name:** Layers
- [Legend](#)
- [All Layers and Tables](#)
- Layers:**
  - [City of Toronto Imagery](#) (0)
- Description:**
- Copyright Text:** City of Toronto
- Spatial Reference:** 102100 (3857)

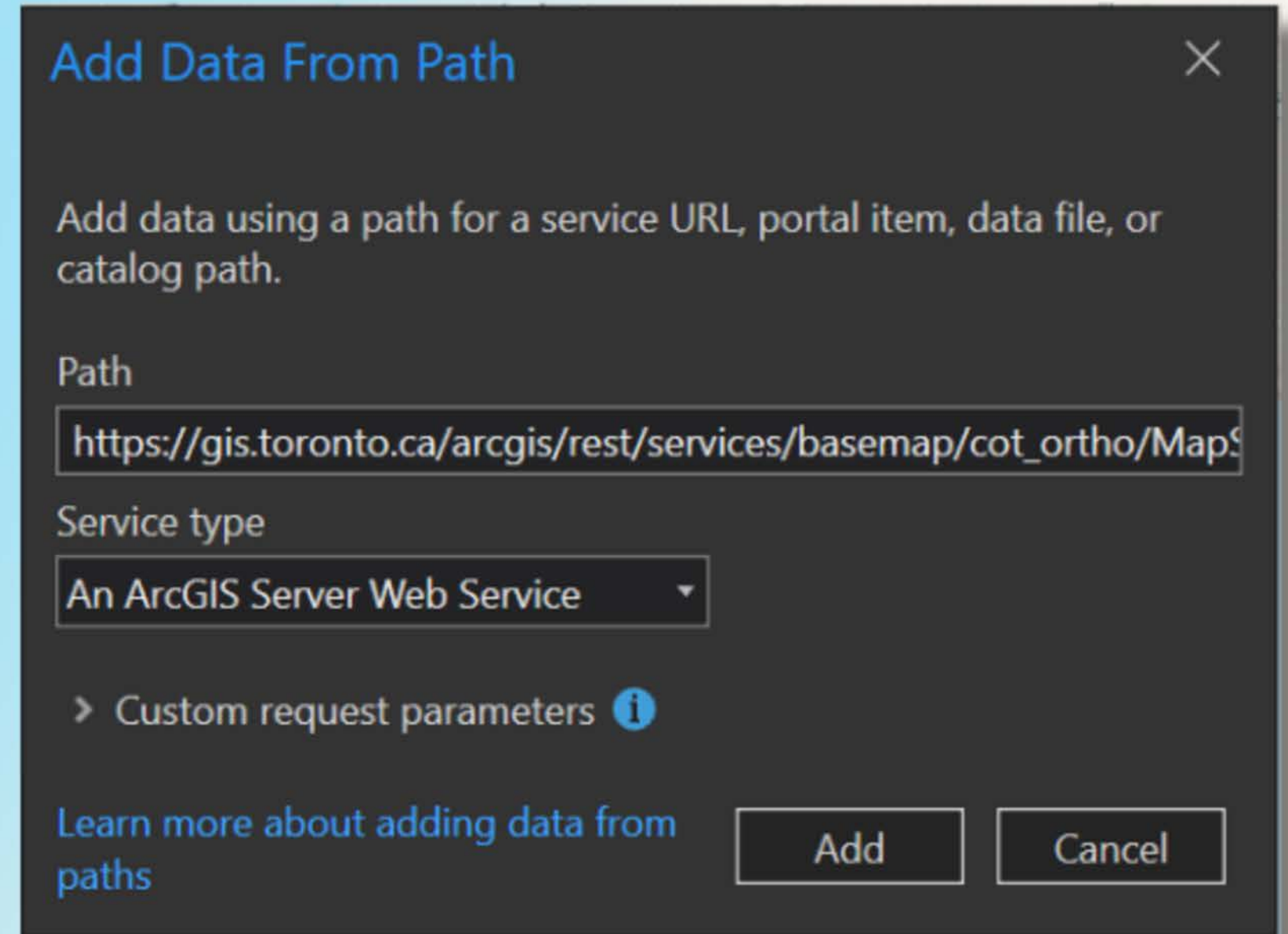
# Add data from a Web Service

- In Pro, click the **Add Data** button (Map tab)
- Select **From Path...**



# Add data from a Web Service

- Paste in the web service URL.
- Click Add.



**Add Data From Path** ✕

Add data using a path for a service URL, portal item, data file, or catalog path.

Path

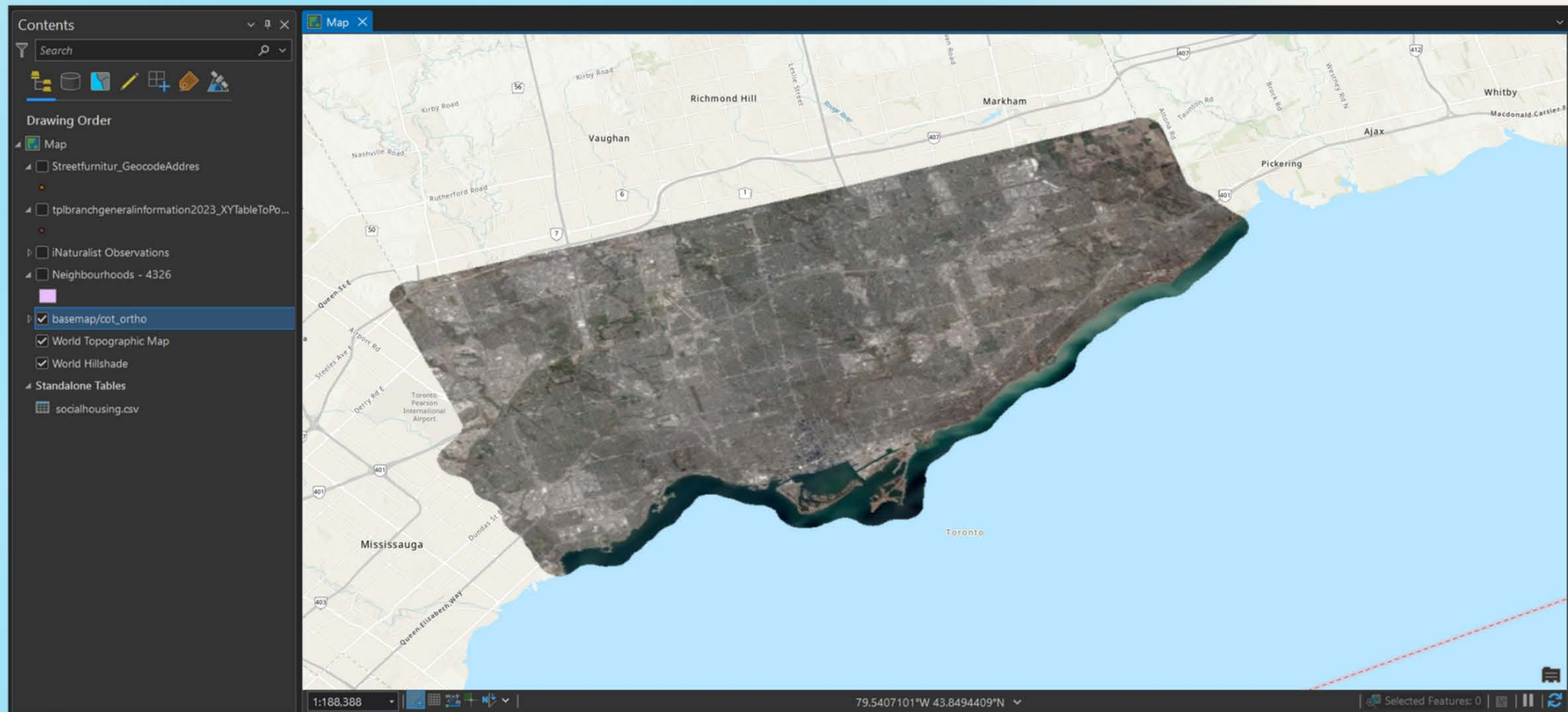
Service type

> Custom request parameters ⓘ

[Learn more about adding data from paths](#)

# Add data from a Web Service

- Result:



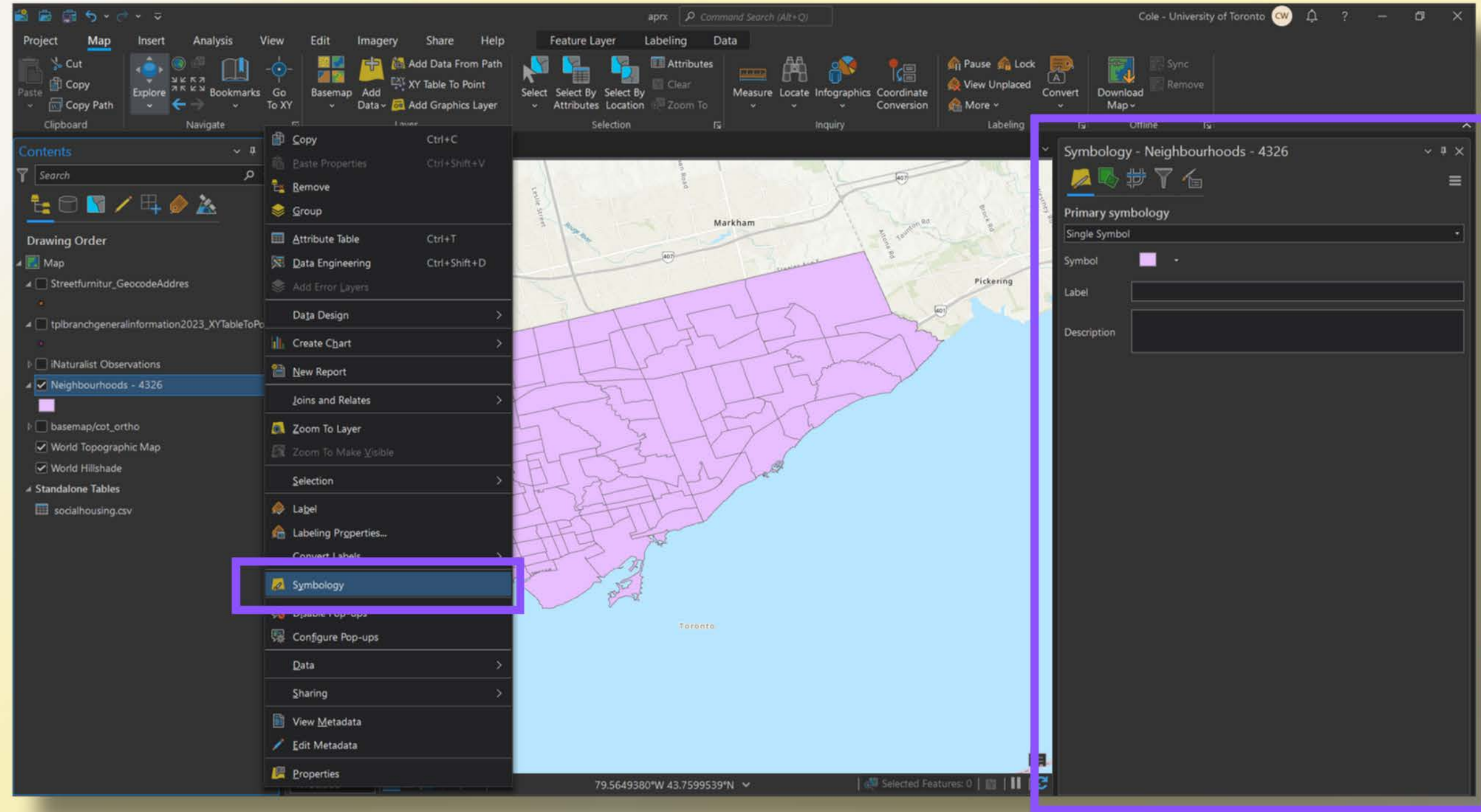
# Symbology in ArcGIS Pro

- Symbology involves the use of symbols to represent geographic features (and their attributes) on the map
- Effective symbology makes it easier for viewers to understand complex information.

# Symbology in ArcGIS Pro

Access Pro's symbology options:

- Right-click on the **neighbourhoods\_social\_housing\_joined** layer in the Contents Pane
- Select **Symbology** from the pop-up menu
- The **Symbology Pane** will appear.

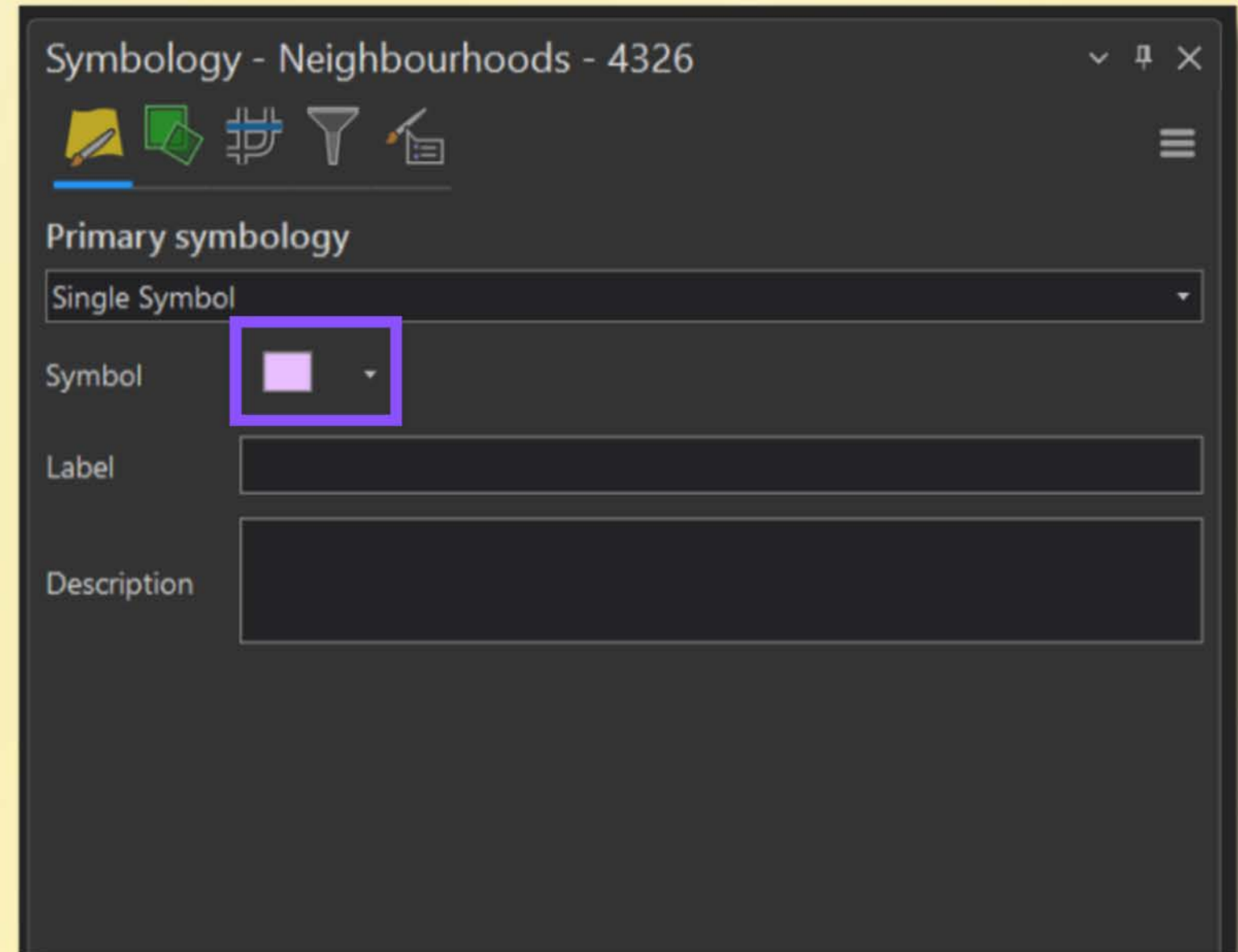


# Symbology in ArcGIS Pro

## Types of Symbology: Single Symbol

**Single Symbol:** All features in a layer are represented with the same symbol. Ideal for displaying features of the same type.

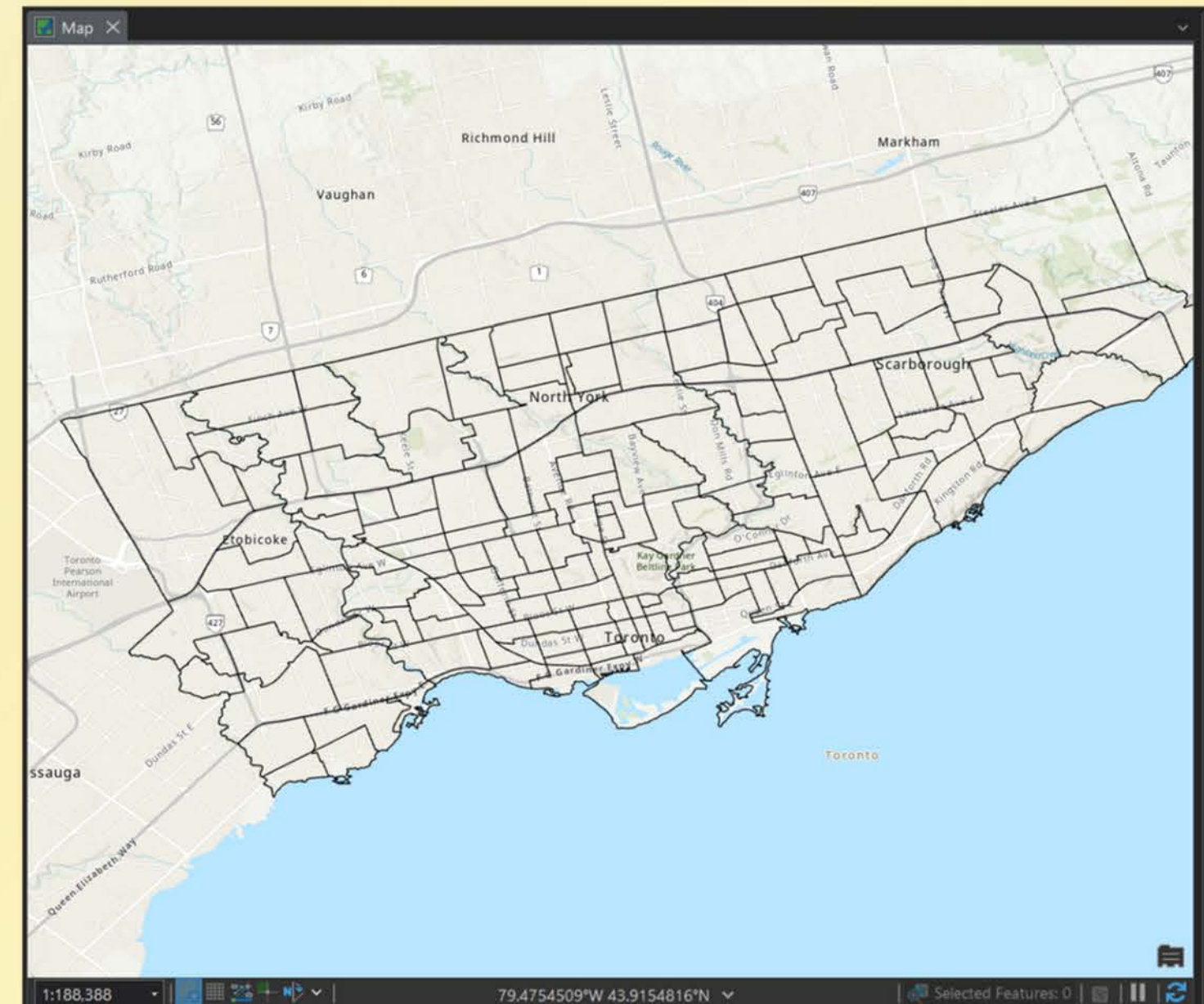
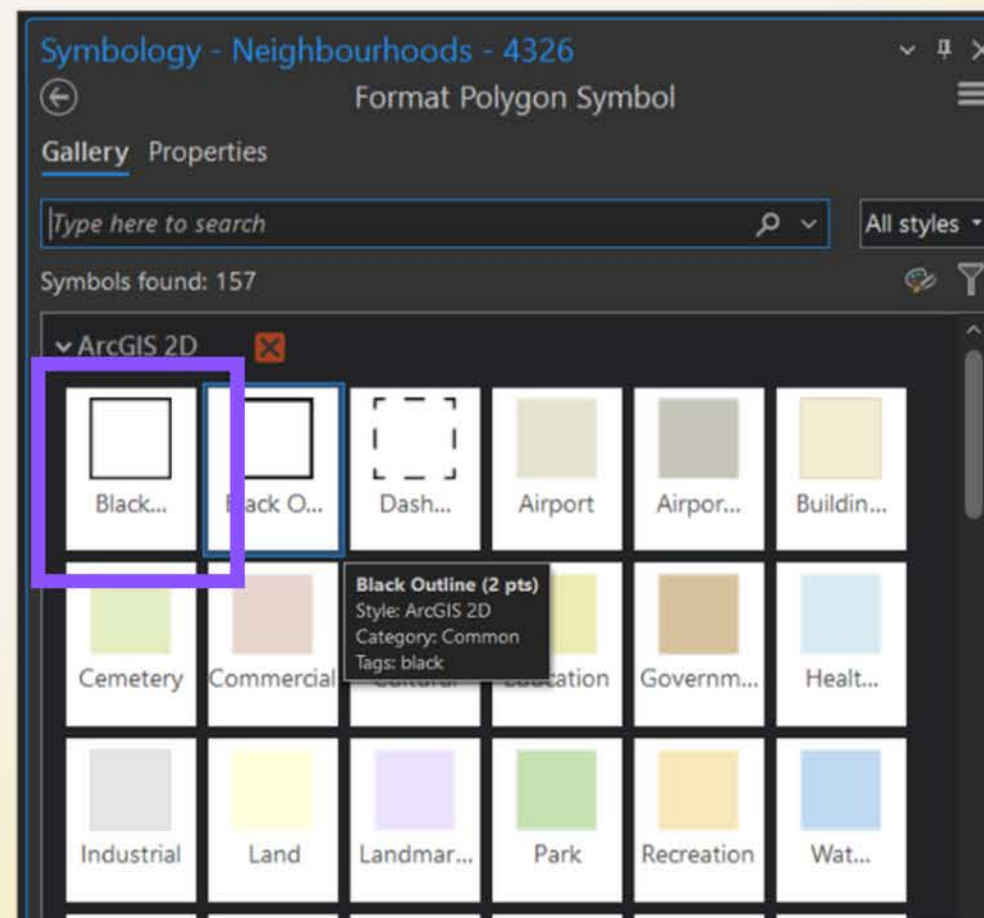
- The Neighbourhoods layer has this symbology style by default.
- To customize the symbology, click the symbol swatch on the Symbology pane.



# Symbology in ArcGIS Pro

## Types of Symbology: Single Symbol

- Choose **Black Outline** from the Gallery.

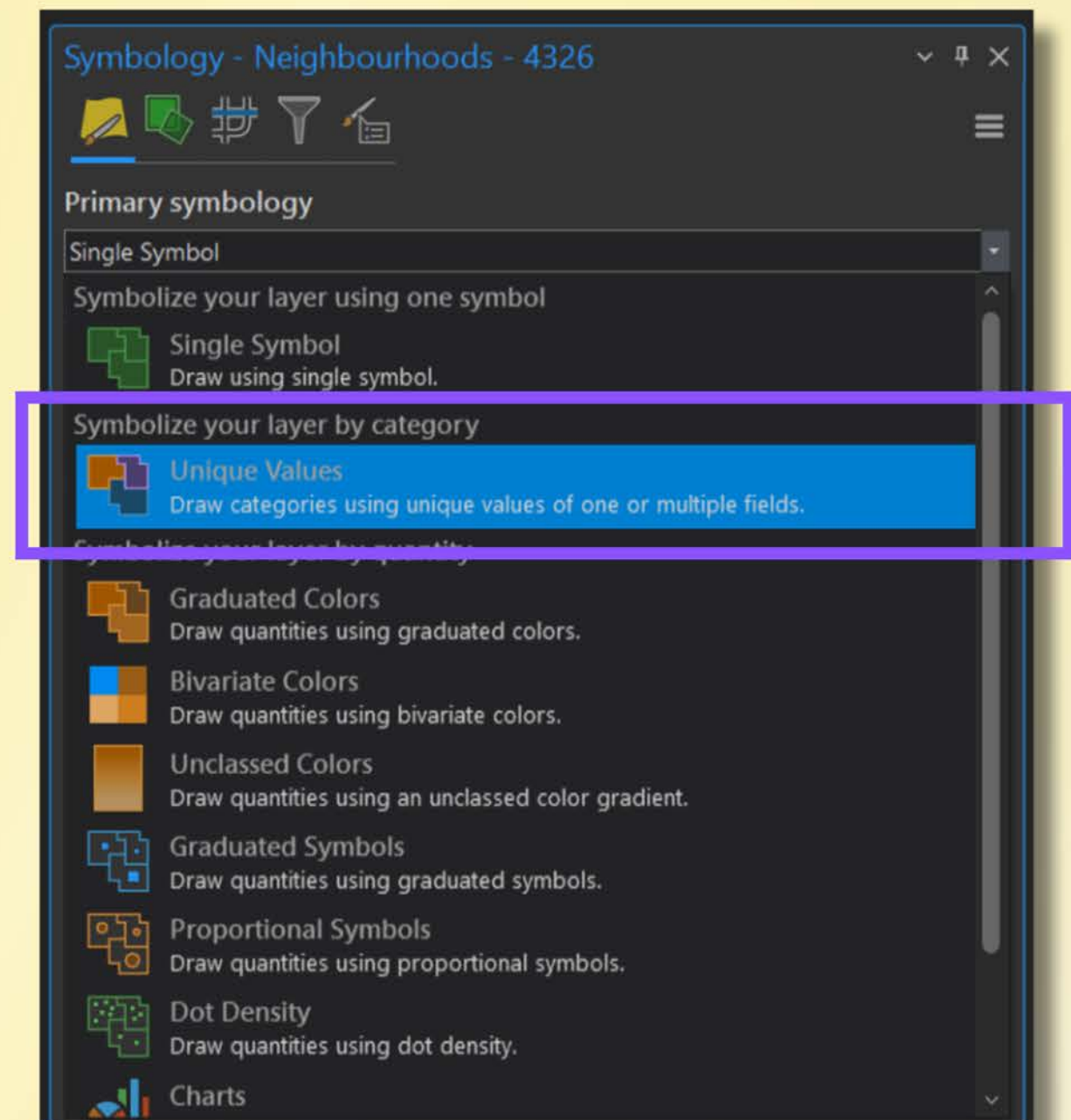
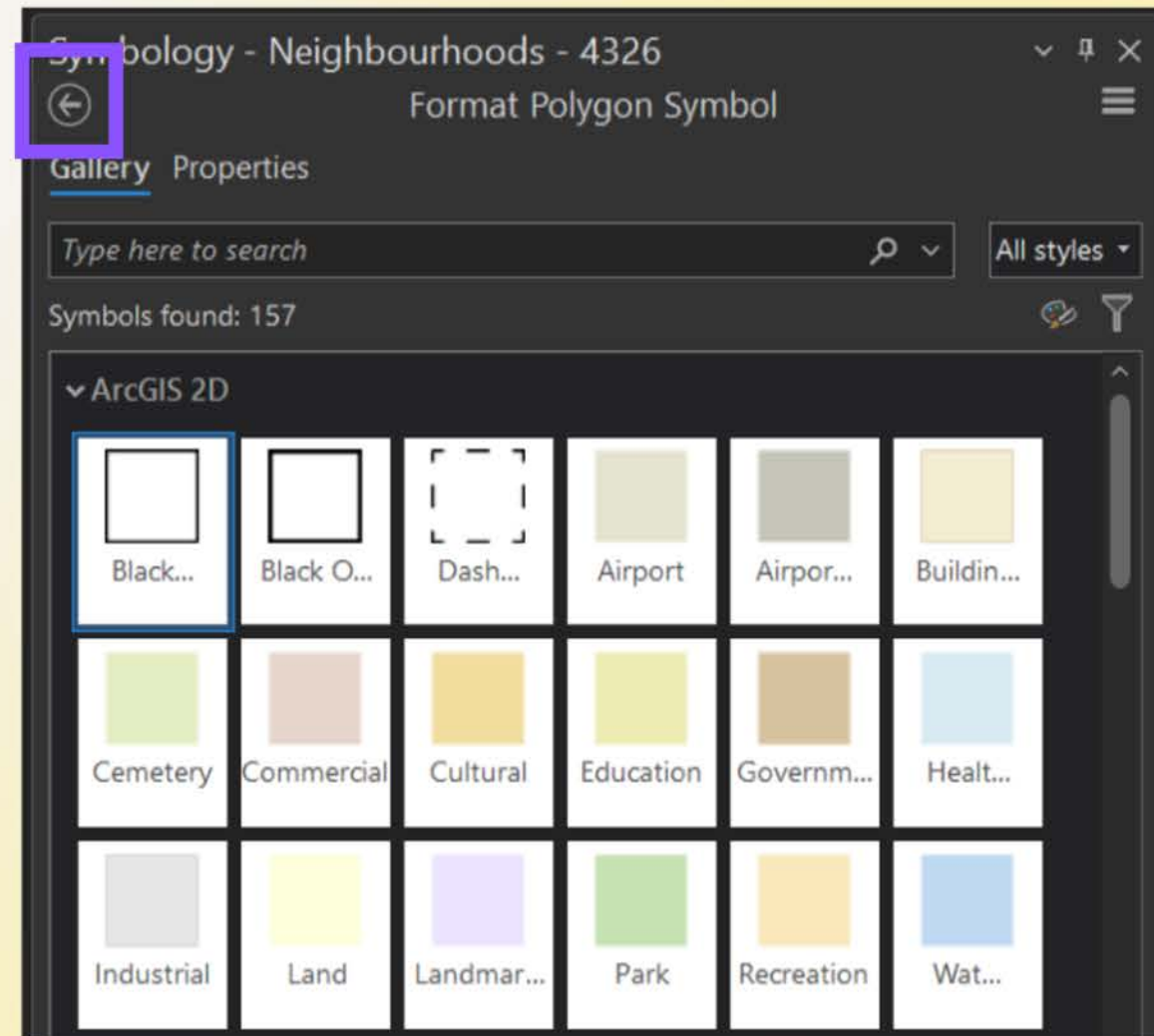




# Symbology in ArcGIS Pro

## Types of Symbology: Unique Values

- Click the Back button to return to the main symbology options for the Neighbourhoods layer
- Choose **Unique Values** from the Primary symbology dropdown

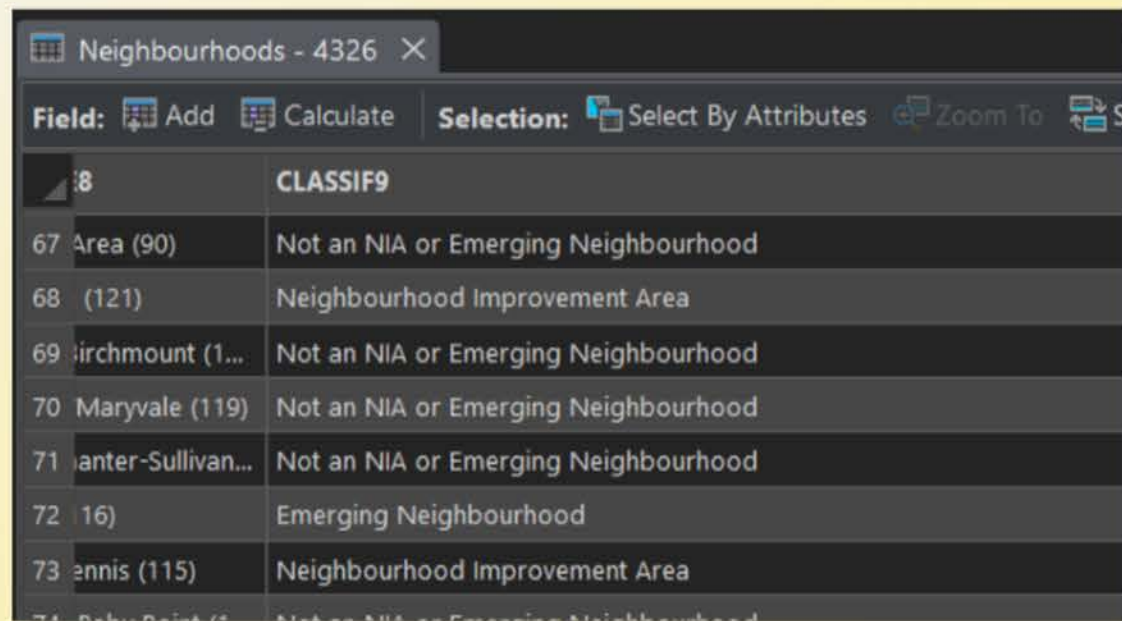


# Symbology in ArcGIS Pro

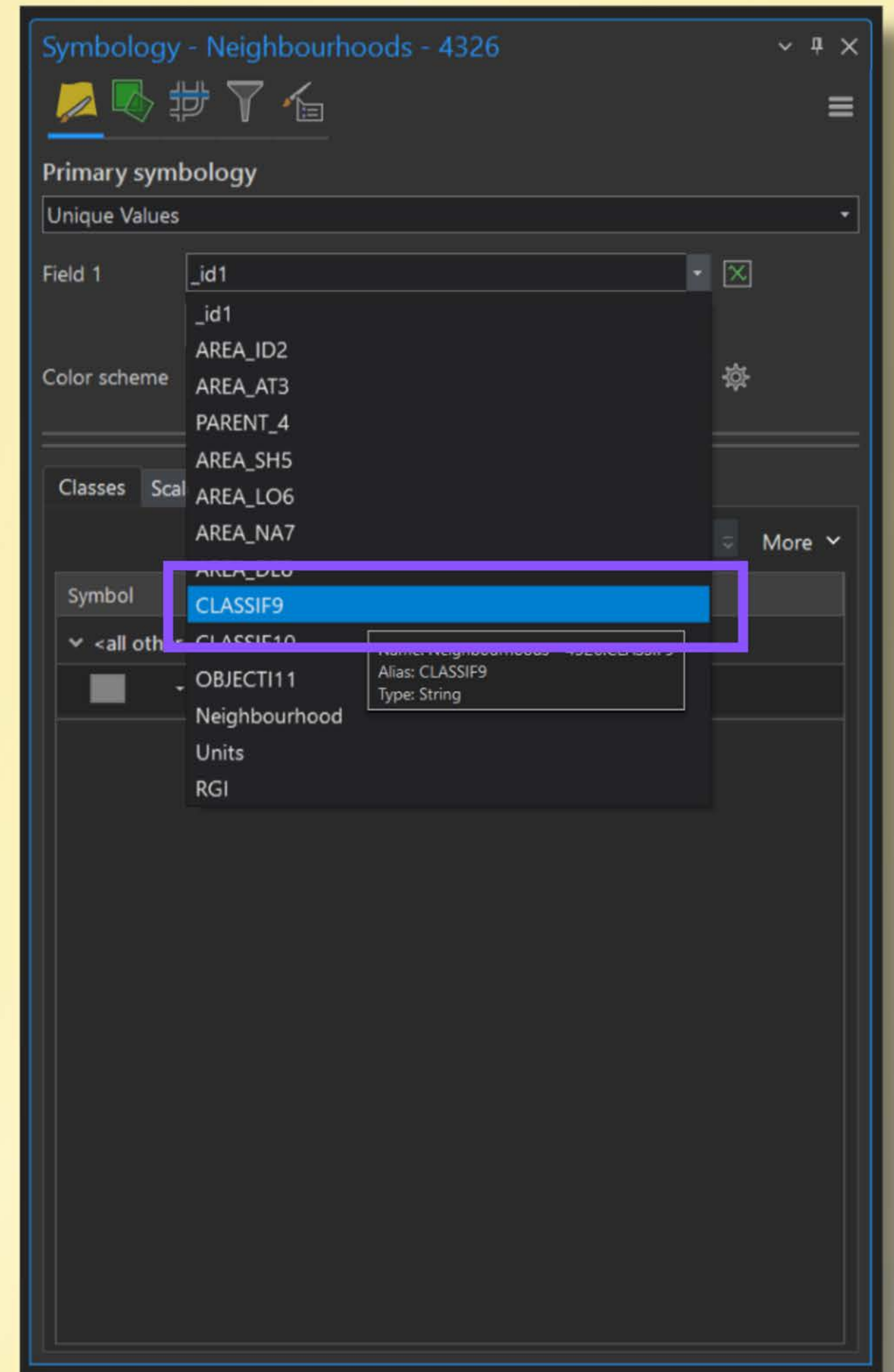
## Types of Symbology: Unique Values

- Choose **CLASSIF9** from the **Field 1** dropdown menu.

*Note: This field is not very well-named, but a review of the attribute table shows that it specifies each neighbourhood's Emerging Area or NIA status.*



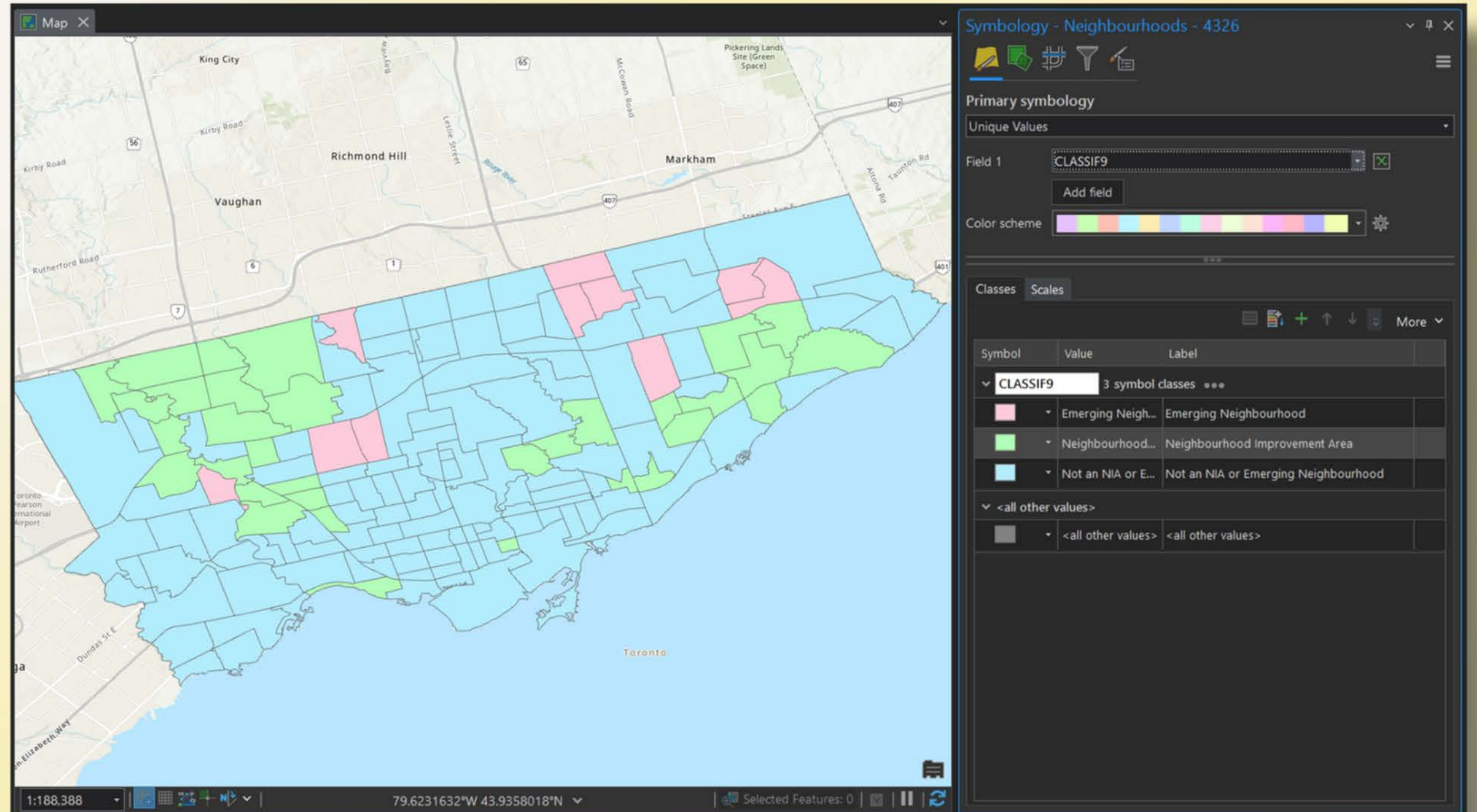
ID	CLASSIF9
67 Area (90)	Not an NIA or Emerging Neighbourhood
68 (121)	Neighbourhood Improvement Area
69 Birchmount (1...	Not an NIA or Emerging Neighbourhood
70 Maryvale (119)	Not an NIA or Emerging Neighbourhood
71 Lanter-Sullivan...	Not an NIA or Emerging Neighbourhood
72 (16)	Emerging Neighbourhood
73 Dennis (115)	Neighbourhood Improvement Area
74 Oak Point (1...	Not an NIA or Emerging Neighbourhood



# Symbology in ArcGIS Pro

## Types of Symbology: Unique Values

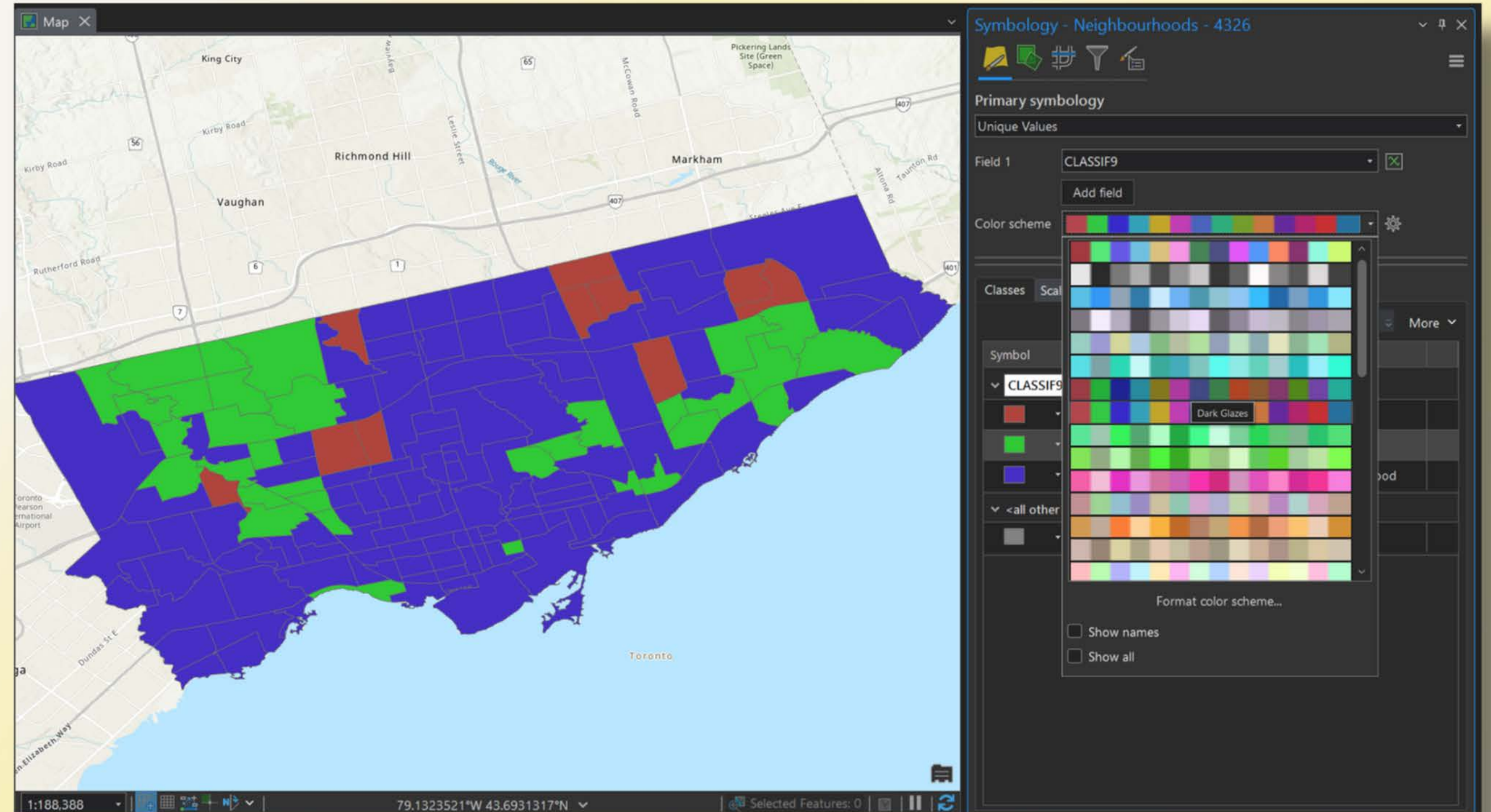
- Each polygon is now styled to reflect the attribute value in the CLASSIF9 field.



# Symbology in ArcGIS Pro

## Types of Symbology: Unique Values

- Various colour schemes can be selected from the **Color scheme** dropdown.

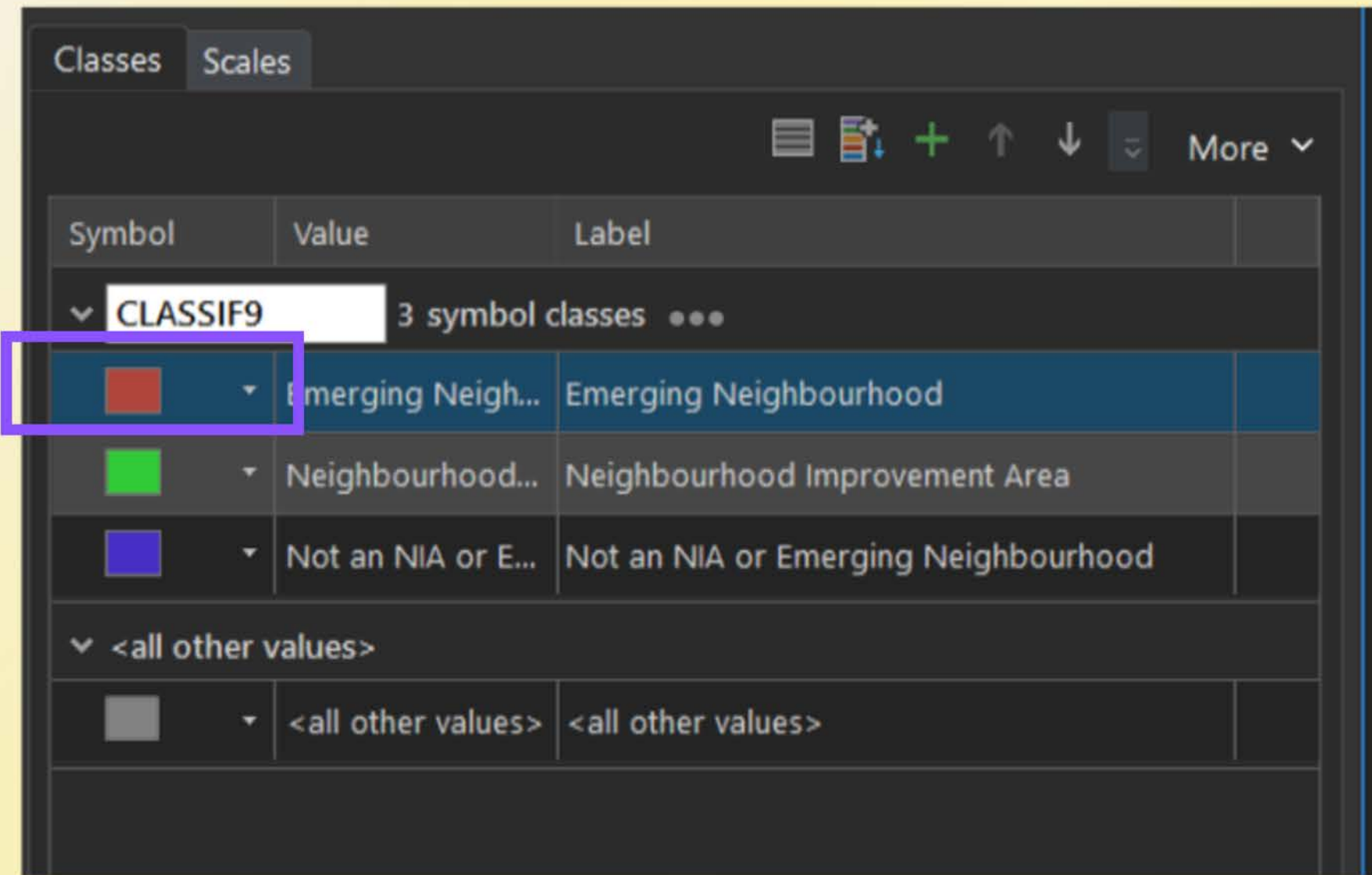


# Symbology in ArcGIS Pro

## Types of Symbology: Unique Values

Customize individual symbols:

- Click the swatch next to the Emerging Neighbourhood category.

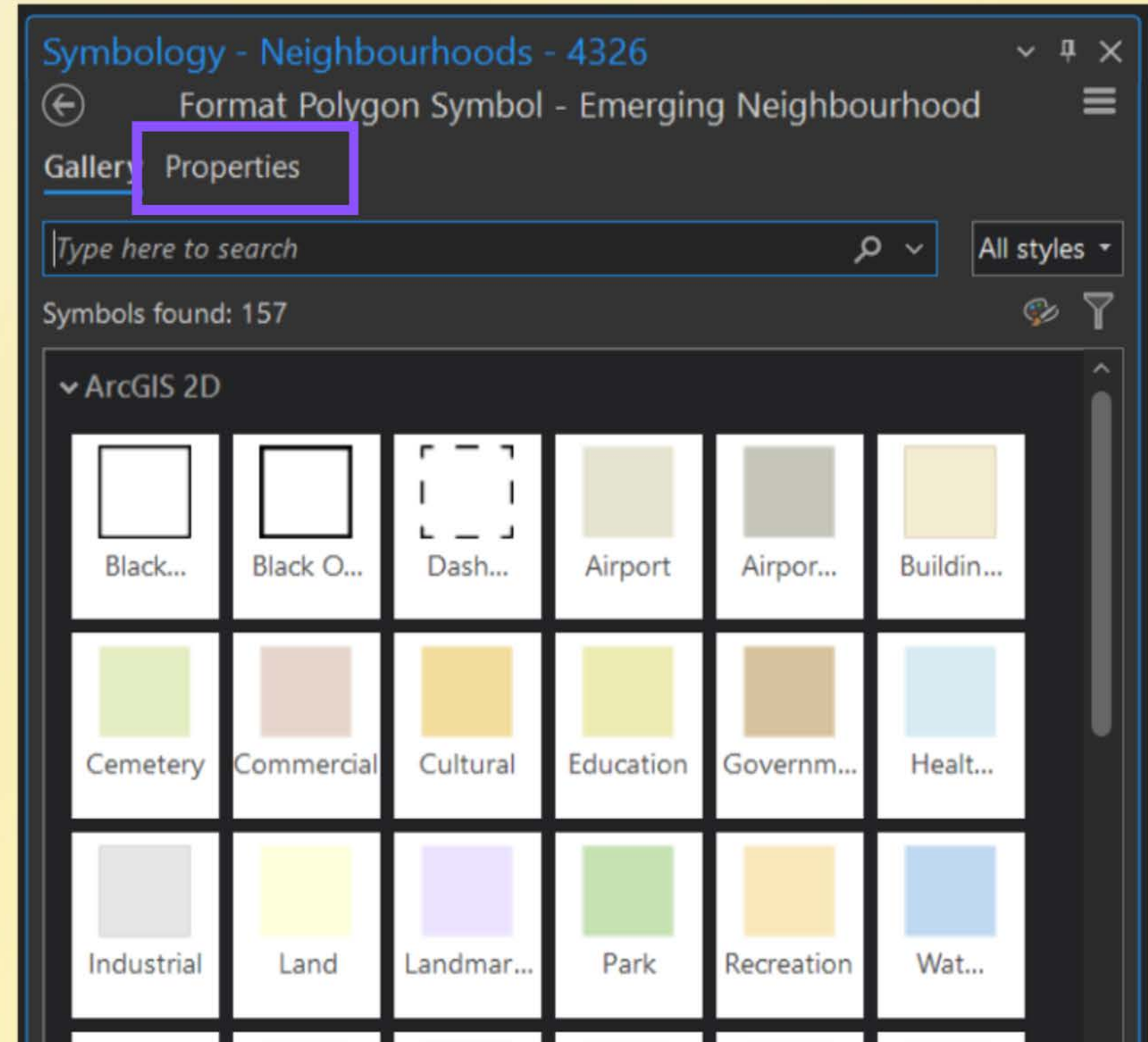


# Symbology in ArcGIS Pro

## Types of Symbology: Unique Values

Customize individual symbols:

- Click **Properties**.

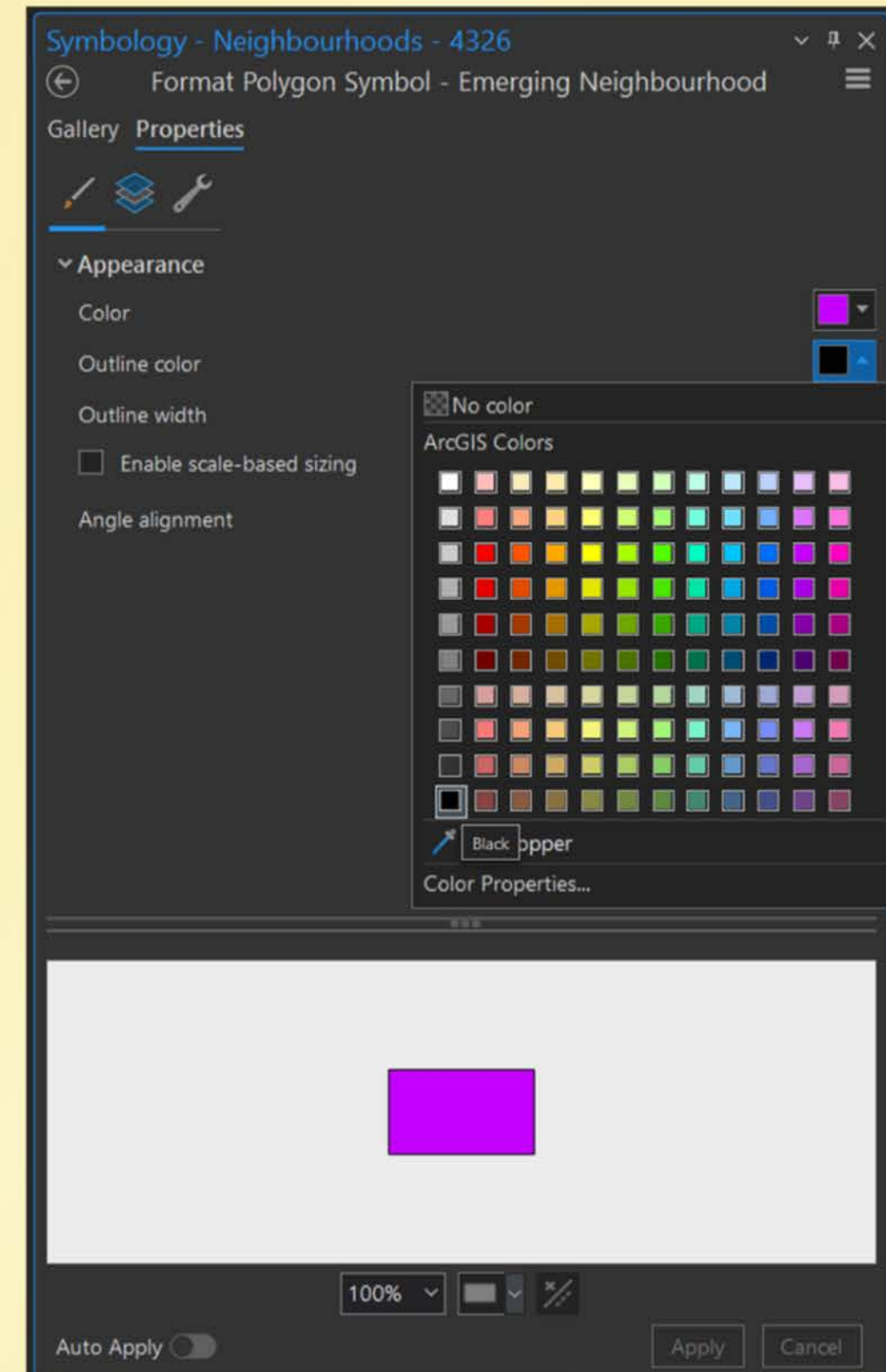


# Symbology in ArcGIS Pro

## Types of Symbology: Unique Values

Customize individual symbols:

- Adjust the **Fill Color**, **Outline Color**, and **Outline Width** settings.



# Symbology in ArcGIS Pro

## Types of Symbology: Graduated Symbols

- Return to the primary symbology view and select **Graduated Symbols**.
- Choose **RGI** for the field.

The screenshot shows the Symbology pane for a layer named 'neighbourhoods\_socialhousing\_joined'. The primary symbology is set to 'Graduated Symbols'. The field is 'RGI', and the method is 'Natural Breaks (Jenks)'. There are 5 classes, with a minimum size of 4 pt and a maximum size of 18 pt. The 'Background' template is selected. The 'Draw graduated symbols above all layers' checkbox is checked.

The 'Classes' tab is active, showing a table with 5 rows:

Symbol	Upper value	Label
•	≤ 247	0 - 247
•	≤ 611	248 - 611
•	≤ 1145	612 - 1145
•	≤ 1926	1146 - 1926
•	≤ 2926	1927 - 2926



# Symbology in ArcGIS Pro

## Types of Symbology: Graduated Symbols

- Click the symbol to change the template

Symbology - neighbourhoods\_socialhousing\_joined

Primary symbology

Graduated Symbols


Field: RGI

Normalization: <None>

Method: Natural Breaks (Jenks)

Classes: 5

Minimum size: 4 pt, Maximum size: 18 pt

Template:  Background

Draw graduated symbols above all layers

Classes Histogram

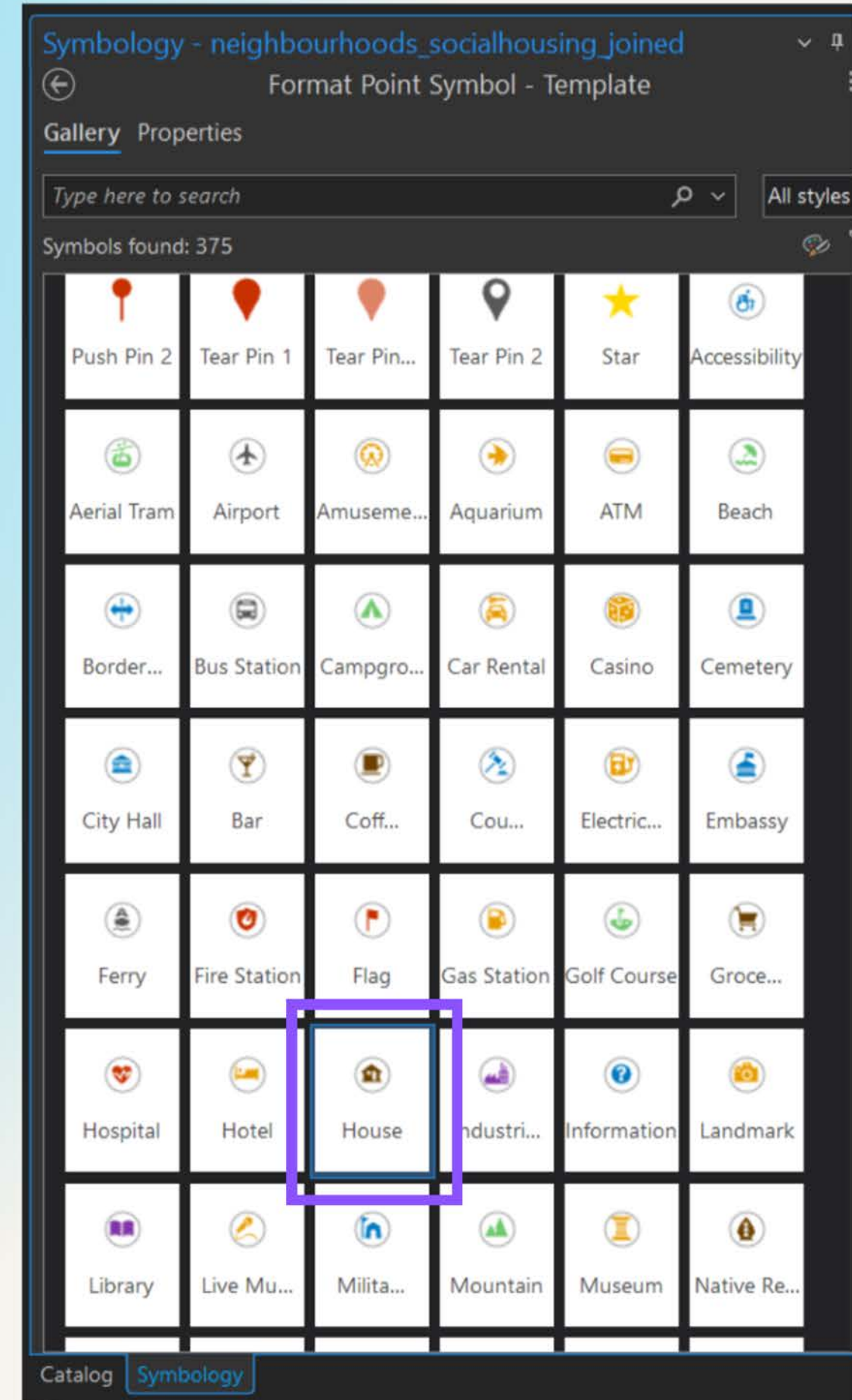
Symbol	Upper value	Label
•	≤ 247	0 - 247
•	≤ 611	248 - 611
•	≤ 1145	612 - 1145
•	≤ 1926	1146 - 1926
•	≤ 2926	1927 - 2926

Catalog Symbology

# Symbology in ArcGIS Pro

## Types of Symbology: Graduated Symbols

- Choose a symbol from the Gallery.



# Symbology in ArcGIS Pro

## Types of Symbology: Graduated Symbols

- Adjust Minimum and Maximum symbol sizes.
- Result: Attribute information is visualized by symbol size.

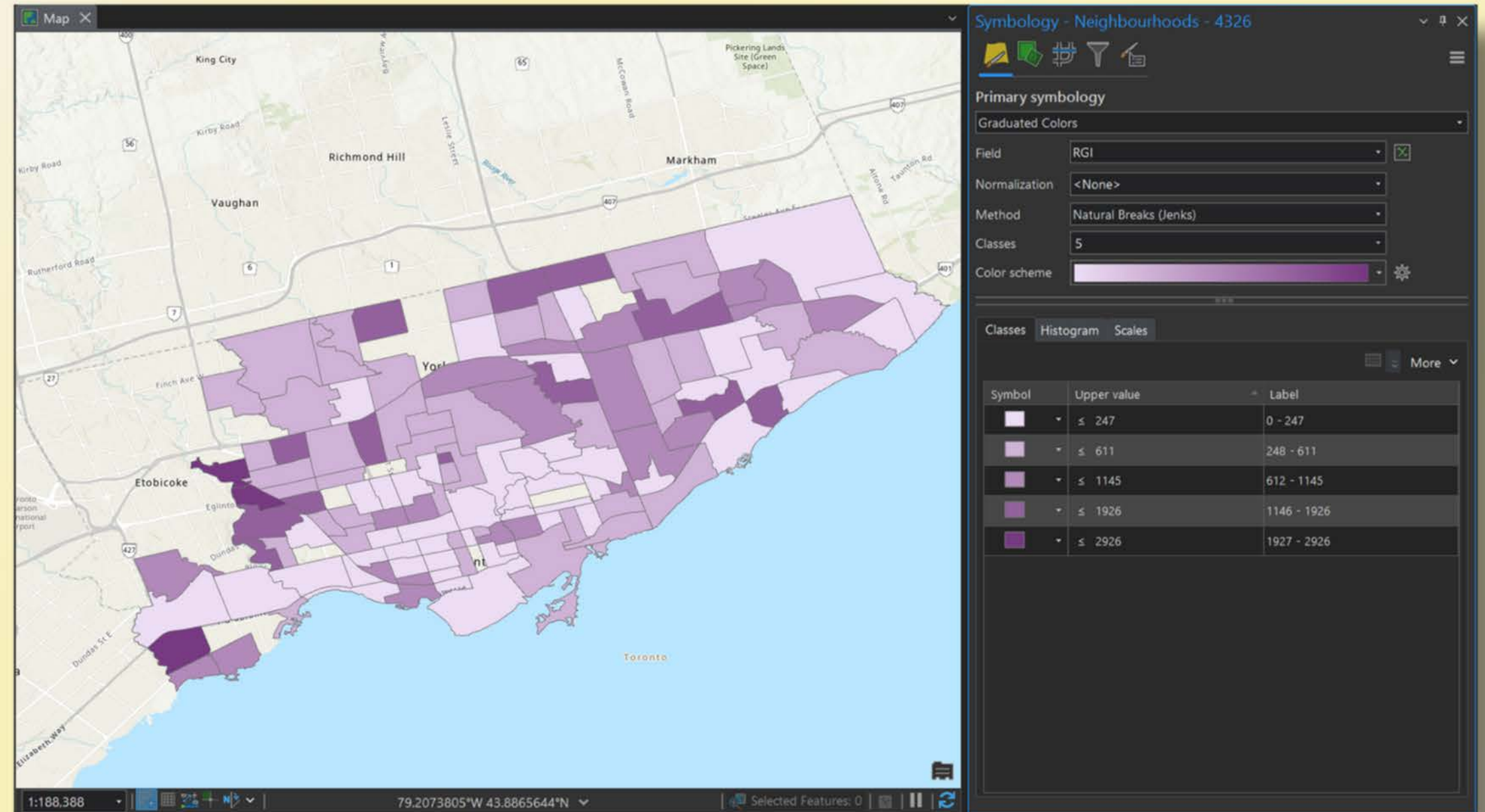
The screenshot displays the ArcGIS Pro interface. The main map window shows a map of the Greater Toronto Area with numerous house-shaped symbols. The size of each symbol varies, representing the value of the 'RGI' attribute for each social housing location. The symbology panel on the right is titled 'Symbology - neighbourhoods\_socialhousing\_joined'. It shows 'Graduated Symbols' as the primary symbology type. The field is set to 'RGI', and the method is 'Natural Breaks (Jenks)'. There are 5 classes defined. The minimum size is 20 pt and the maximum size is 60 pt. The 'Classes' tab is active, showing a histogram with 5 classes and their corresponding symbol sizes.

Symbol	Upper value	Label
	≤ 247	0 - 247
	≤ 611	248 - 611
	≤ 1145	612 - 1145
	≤ 1926	1146 - 1926

# Symbology in ArcGIS Pro

## Types of Symbology: Graduated Colours

- Return to the primary symbology view and select **Graduated Colors**.
- Choose **RGI** for the field.
- Choose a **colour ramp**.
- The map symbology now communicates information re: the quantity of rent geared to income housing per neighbourhood.



# Filter Data using Definition Queries

- Open the **Attribute Table** of the libraries layer:
  - Right-click the layer name and select **Show Attribute Table**, or select the layer name and press **Ctrl + t**.
- Note that some records have **<Null>** for their address

OBJECTID *	Shape *	_id	BranchCode	PhysicalBranch	BranchName	Address	PostalCode	Website	Te
1	Point	1	AB	1	Albion	1515 Albion Road, Tor...	M9V 1B2	https://www.tpl.ca/albion	41
2	Point	2	ACD	1	Albert Campbell	496 Birchmount Road,...	M1K 1N8	https://www.tpl.ca/albert	41
3	Point	3	AD	1	Alderwood	2 Orianna Drive, Toron...	M8W 4Y1	https://www.tpl.ca/alderw	41
4	Point	4	AG	1	Agincourt	155 Bonis Avenue, Tor...	M1T 3W6	https://www.tpl.ca/agincc	41
5	Point	5	AH	1	Armour Heights	2140 Avenue Road, To...	M5M 4M7	https://www.tpl.ca/armou	41
6	Point	6	AL	0	Answerline	<Null>	<Null>	https://www.tpl.ca/contact	41
7	Point	7	AN	1	Annette Street	145 Annette Street, Tor...	M6P 1B2	https://www.tpl.ca/annett	41
8	Point	8	AP	1	Amesbury Park	1565 Lawrence Avenue...	M6L 1A8	https://www.tpl.ca/amest	41
9	Point	9	BB	1	Brookbanks	210 Brookbanks Drive,...	M3A 2T8	https://www.tpl.ca/brook	41
10	Point	10	BC	1	Black Creek	North York Sheridan M...	M3L 1B2	https://www.tpl.ca/blackc	41
11	Point	11	BD	1	Bendale	1515 Danforth Road, T...	M1J 1H5	https://www.tpl.ca/benda	41
12	Point	12	BE	1	Beaches	2161 Queen Street Eas...	M4L 1J1	https://www.tpl.ca/beach	41
13	Point	13	BF	1	Barbara Frum	20 Covington Road, To...	M6A 3C1	https://www.tpl.ca/barba	41
14	Point	14	BKONE	0	Bookmobile One	<Null>	<Null>	https://www.tpl.ca/bookn	<t
15	Point	15	BKTWO	0	Bookmobile Two	<Null>	<Null>	https://www.tpl.ca/bookn	<t
16	Point	16	BL	1	Bloor/Gladstone	1101 Bloor Street West...	M6H 1M7	https://www.tpl.ca/bloor	41
17	Point	17	BR	1	Brentwood	36 Brentwood Road N...	M8X 2B5	https://www.tpl.ca/brentv	41
18	Point	18	BRW	1	Bridlewood	Bridlewood Mall, 157A...	M1W 2S8	https://www.tpl.ca/bridle	41

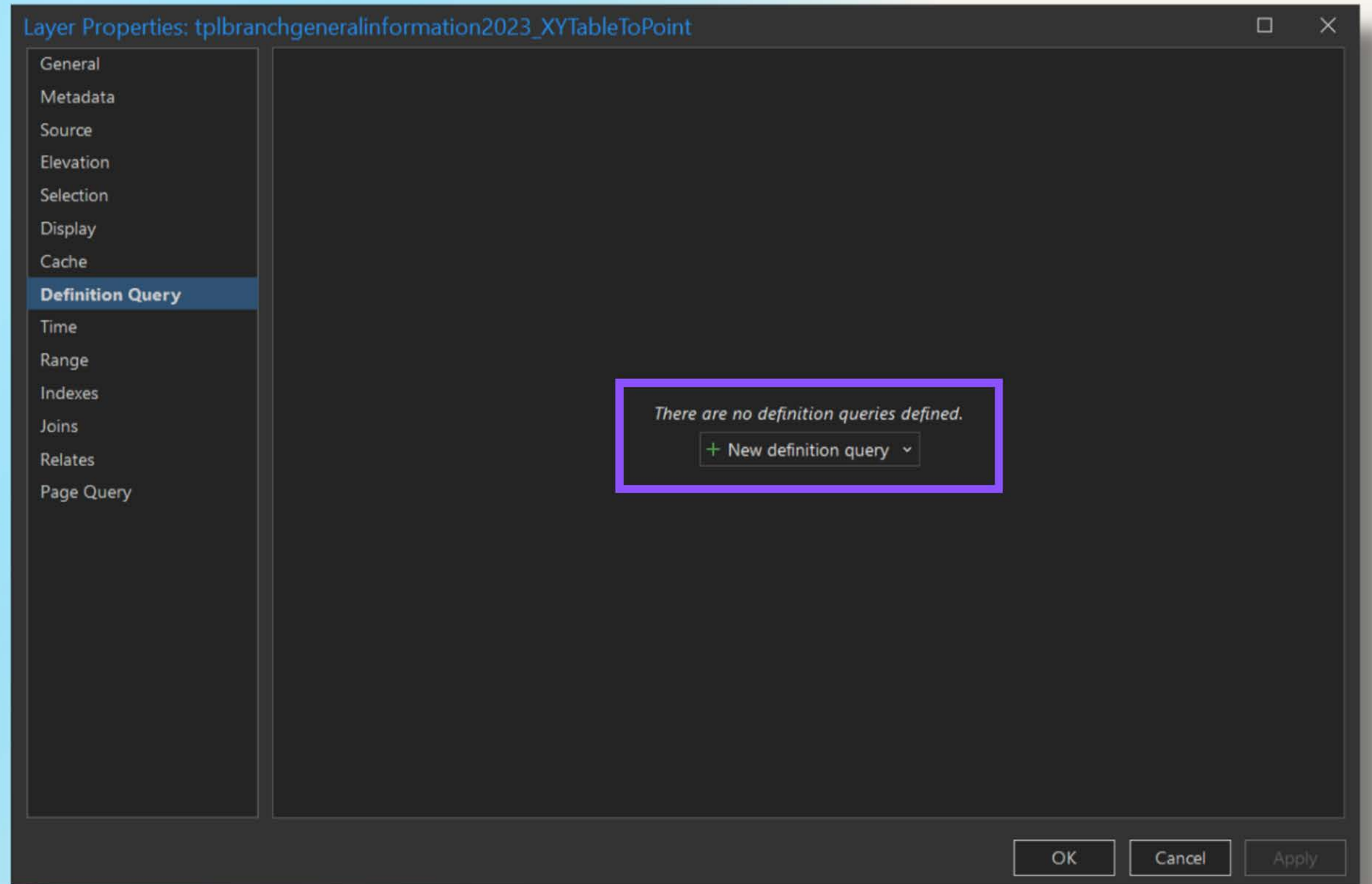
# Filter Data using Definition Queries

- These records also lack latitude and longitude information, and are not displayed anywhere on the map
- Let's filter out these layers to exclude them from further analysis

	cyProgram	Workstations	ServiceTier	Lat	Long	NBHDNo	NBHDName	TPLNIA	WardNo	WardName	PresentSiteYear
1	1	38	DL	43.739826	-79.584096	2	Mount Olive-Silverston...	1	1	Etobicoke North	2017
2	0	36	DL	43.708019	-79.269252	120	Clairlea-Birchmount	1	20	Scarborough Southwest	1971
3	0	7	NL	43.601944	-79.547252	20	Alderwood	0	3	Etobicoke-Lakeshore	1999
4	0	42	DL	43.785167	-79.29343	118	Tam O'Shanter-Sullivan	0	22	Scarborough-Agincourt	1991
5	0	5	NL	43.739337	-79.421889	39	Bedford Park-Nortown	0	8	Eglinton-Lawrence	1982
6	<Null>	<Null>	RR	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
7	0	11	NL	43.663359	-79.466348	90	Junction Area	0	4	Parkdale-High Park	1908
8	0	6	NL	43.706456	-79.485726	30	Brookhaven-Amesbury	1	5	York South-Weston	1967
9	0	9	NL	43.759507	-79.325904	150	Fenside-Parkwoods	0	16	Don Valley East	1968
10	0	7	NL	43.721219	-79.510467	26	Downsview-Roding-CFB	1	7	Humber River-Black Cr...	2002
11	0	9	NL	43.751063	-79.244052	157	Bendale South	1	21	Scarborough Centre	1961
12	0	12	NL	43.67013	-79.298526	63	The Beaches	0	19	Beaches-East York	1914
13	1	30	DL	43.720752	-79.432215	32	Englemount-Lawrence	0	8	Eglinton-Lawrence	1992
14	<Null>	<Null>	NL	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
15	<Null>	<Null>	NL	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
16	0	36	DL	43.659878	-79.434022	83	Dufferin Grove	0	9	Davenport	1913
17	0	33	DL	43.647448	-79.514259	15	Kingsway South	0	3	Etobicoke-Lakeshore	1955
18	0	7	NL	43.797144	-79.31777	147	L'Amoreaux West	0	22	Scarborough-Agincourt	1992

# Filter Data using Definition Queries

- Open the layer's Properties and select the **Definition Query** tab.
- Definition queries allow you to display only the subset of data that meets the conditions you set.
- Click **New Definition Query**.

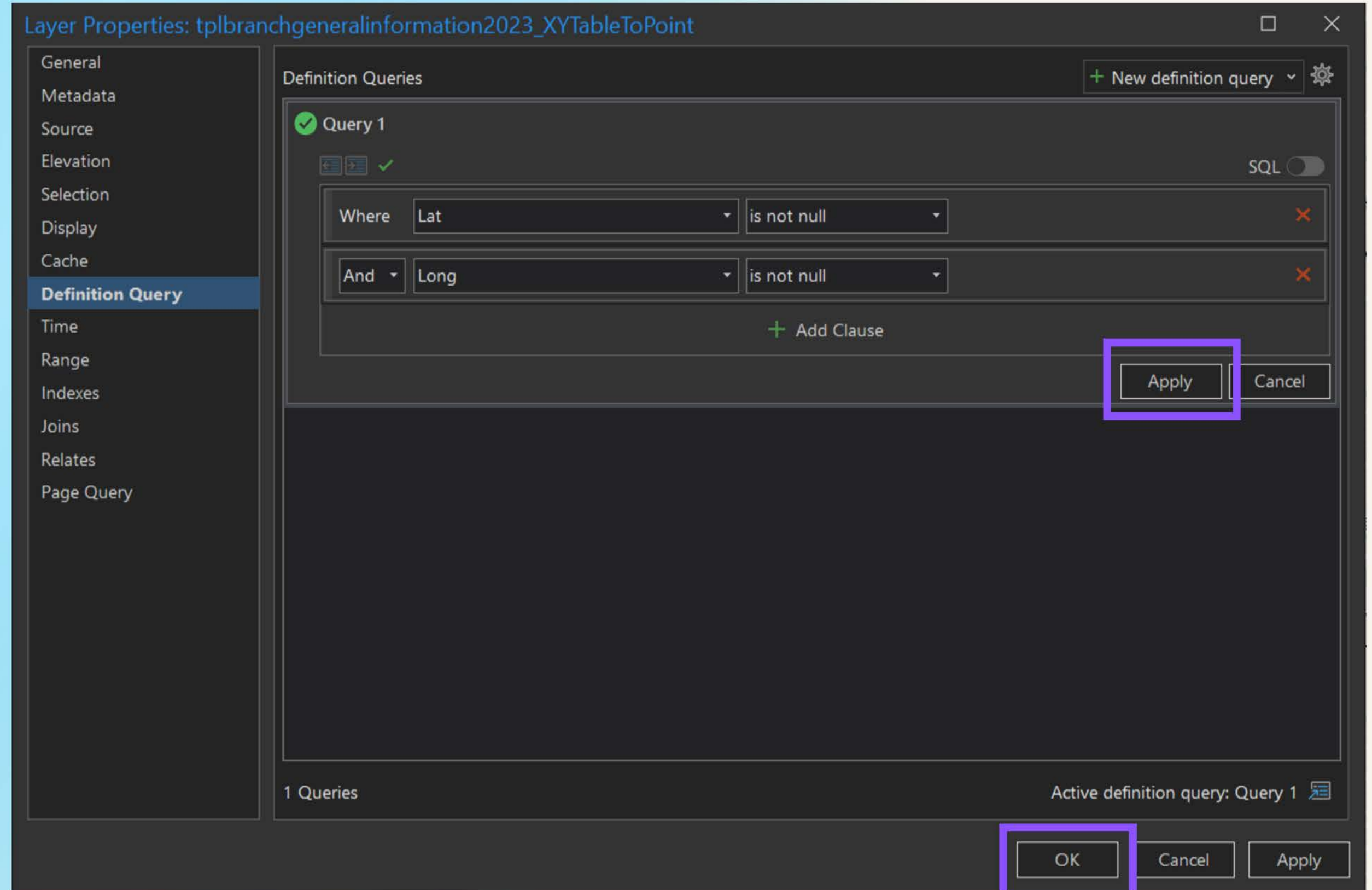


# Filter Data using Definition Queries

- Create the query:  
**where Lat is not null And Long is not null**

- Click **Apply**.

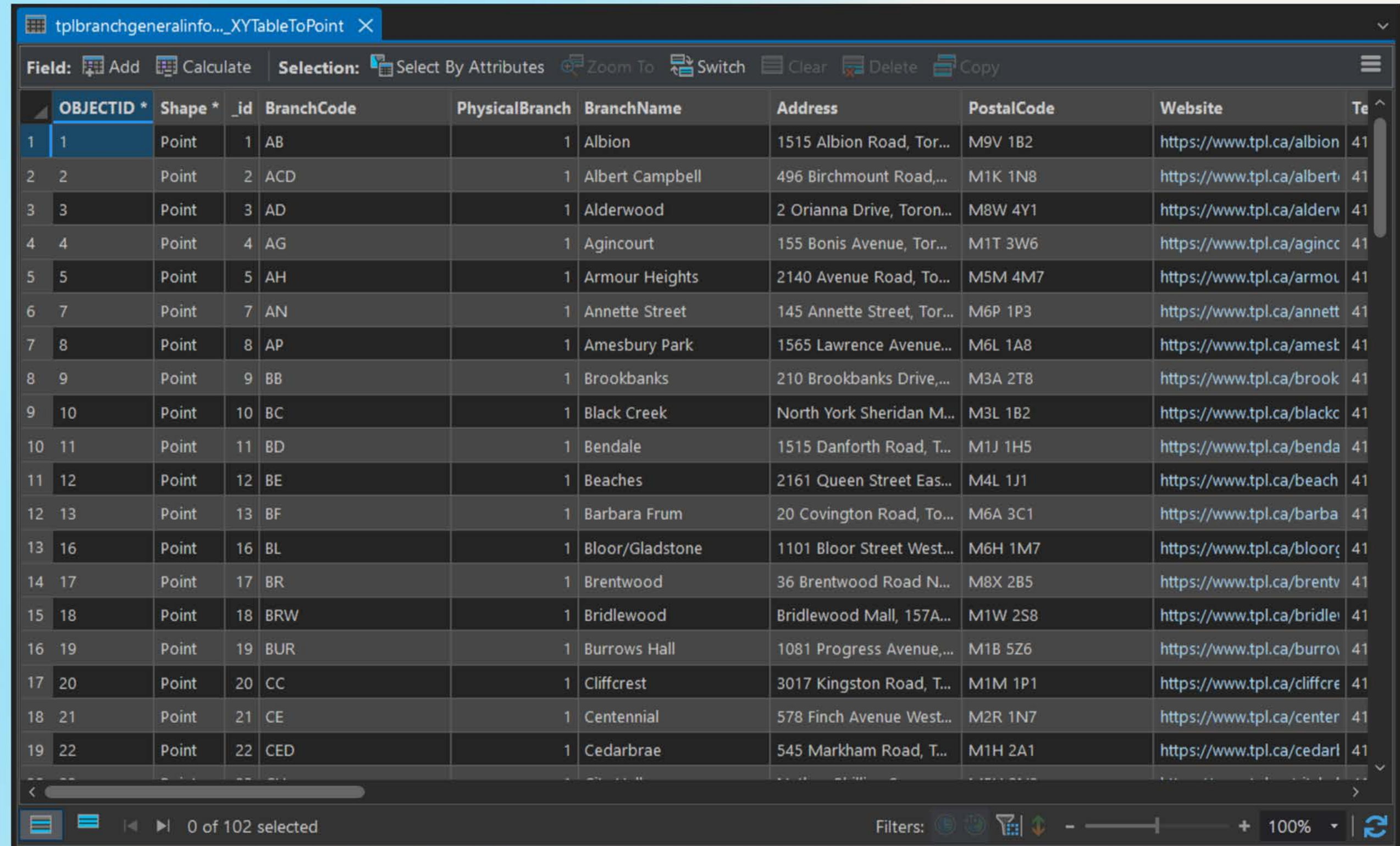
- Click **OK**.





# Filter Data using Definition Queries

- Only the records that are associated with a physical location remain



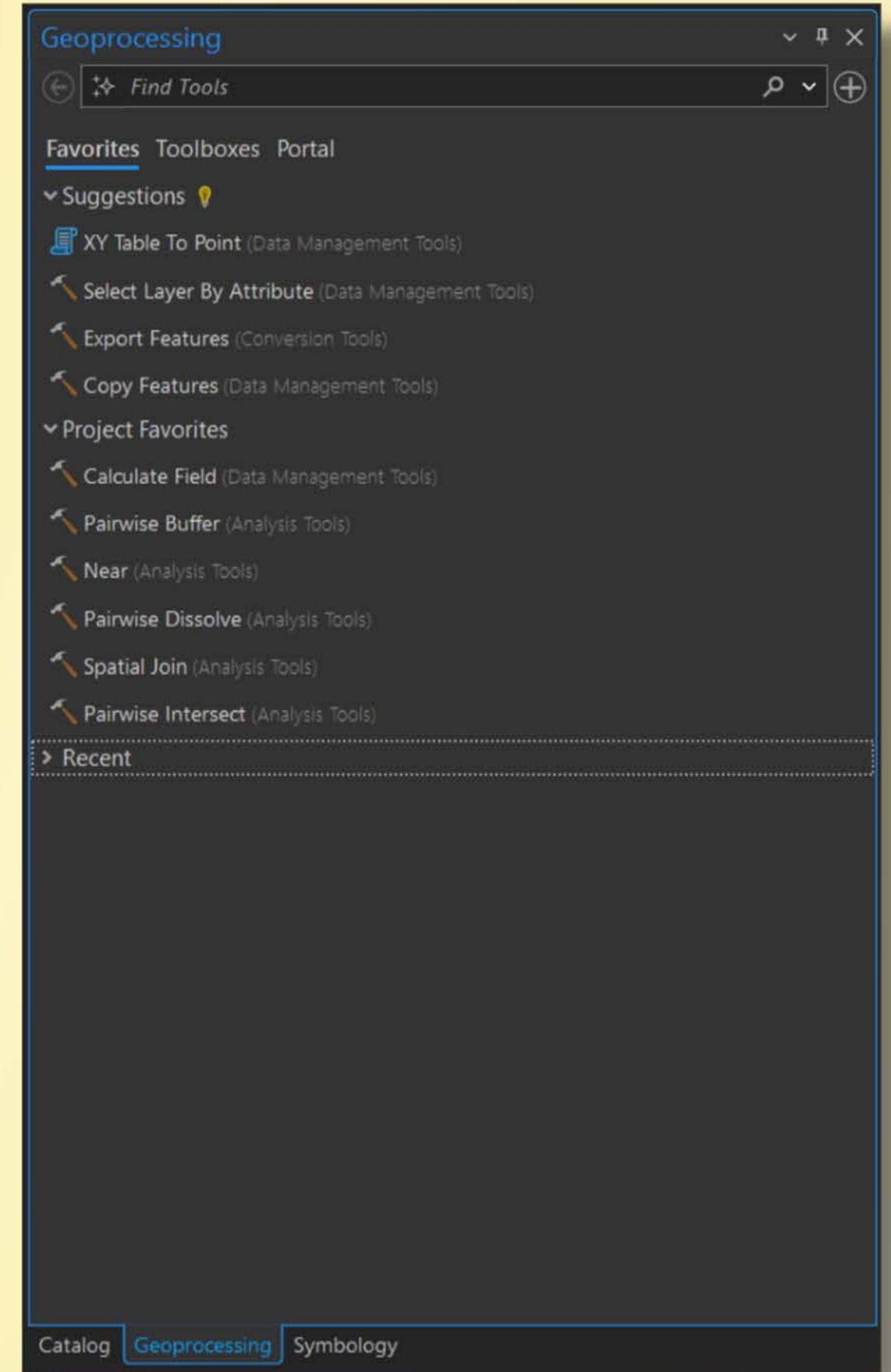
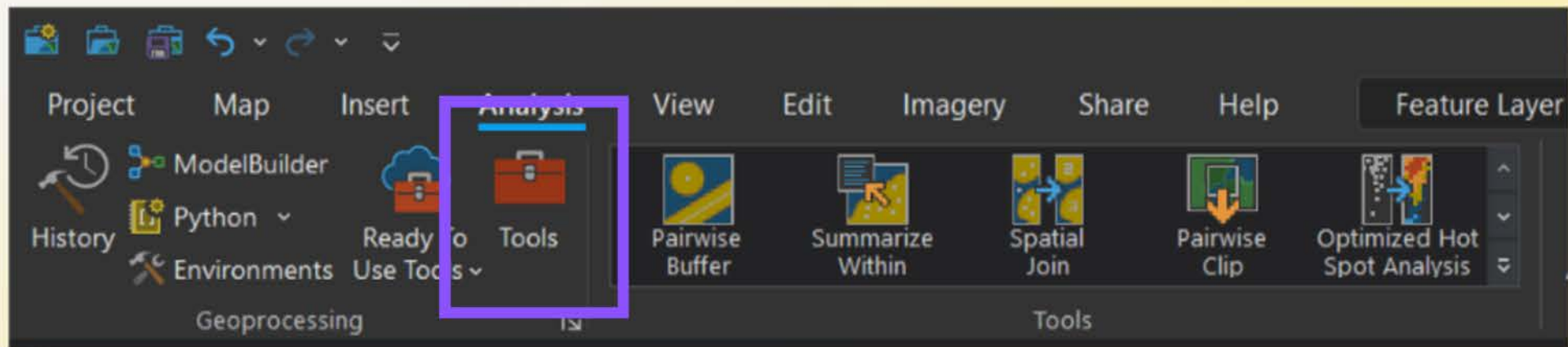
OBJECTID *	Shape *	_id	BranchCode	PhysicalBranch	BranchName	Address	PostalCode	Website	Te
1	Point	1	AB	1	Albion	1515 Albion Road, Tor...	M9V 1B2	<a href="https://www.tpl.ca/albion">https://www.tpl.ca/albion</a>	41
2	Point	2	ACD	1	Albert Campbell	496 Birchmount Road,...	M1K 1N8	<a href="https://www.tpl.ca/albert">https://www.tpl.ca/albert</a>	41
3	Point	3	AD	1	Alderwood	2 Orianna Drive, Toron...	M8W 4Y1	<a href="https://www.tpl.ca/alderw">https://www.tpl.ca/alderw</a>	41
4	Point	4	AG	1	Agincourt	155 Bonis Avenue, Tor...	M1T 3W6	<a href="https://www.tpl.ca/agincc">https://www.tpl.ca/agincc</a>	41
5	Point	5	AH	1	Armour Heights	2140 Avenue Road, To...	M5M 4M7	<a href="https://www.tpl.ca/armou">https://www.tpl.ca/armou</a>	41
6	Point	7	AN	1	Annette Street	145 Annette Street, Tor...	M6P 1P3	<a href="https://www.tpl.ca/annett">https://www.tpl.ca/annett</a>	41
7	Point	8	AP	1	Amesbury Park	1565 Lawrence Avenue...	M6L 1A8	<a href="https://www.tpl.ca/amesk">https://www.tpl.ca/amesk</a>	41
8	Point	9	BB	1	Brookbanks	210 Brookbanks Drive,...	M3A 2T8	<a href="https://www.tpl.ca/brook">https://www.tpl.ca/brook</a>	41
9	Point	10	BC	1	Black Creek	North York Sheridan M...	M3L 1B2	<a href="https://www.tpl.ca/blackc">https://www.tpl.ca/blackc</a>	41
10	Point	11	BD	1	Bendale	1515 Danforth Road, T...	M1J 1H5	<a href="https://www.tpl.ca/benda">https://www.tpl.ca/benda</a>	41
11	Point	12	BE	1	Beaches	2161 Queen Street Eas...	M4L 1J1	<a href="https://www.tpl.ca/beach">https://www.tpl.ca/beach</a>	41
12	Point	13	BF	1	Barbara Frum	20 Covington Road, To...	M6A 3C1	<a href="https://www.tpl.ca/barba">https://www.tpl.ca/barba</a>	41
13	Point	16	BL	1	Bloor/Gladstone	1101 Bloor Street West...	M6H 1M7	<a href="https://www.tpl.ca/bloorc">https://www.tpl.ca/bloorc</a>	41
14	Point	17	BR	1	Brentwood	36 Brentwood Road N...	M8X 2B5	<a href="https://www.tpl.ca/brentv">https://www.tpl.ca/brentv</a>	41
15	Point	18	BRW	1	Bridlewood	Bridlewood Mall, 157A...	M1W 2S8	<a href="https://www.tpl.ca/bridle">https://www.tpl.ca/bridle</a>	41
16	Point	19	BUR	1	Burrows Hall	1081 Progress Avenue,...	M1B 5Z6	<a href="https://www.tpl.ca/burro">https://www.tpl.ca/burro</a>	41
17	Point	20	CC	1	Cliffcrest	3017 Kingston Road, T...	M1M 1P1	<a href="https://www.tpl.ca/cliffcre">https://www.tpl.ca/cliffcre</a>	41
18	Point	21	CE	1	Centennial	578 Finch Avenue West...	M2R 1N7	<a href="https://www.tpl.ca/center">https://www.tpl.ca/center</a>	41
19	Point	22	CED	1	Cedarbrae	545 Markham Road, T...	M1H 2A1	<a href="https://www.tpl.ca/cedarl">https://www.tpl.ca/cedarl</a>	41

# Geoprocessing

- **Geoprocessing tools** allow users to transform spatial layers and related data
- Typically accept input layer(s) along with other parameters, and output a new layer.
- ArcGIS Pro includes hundreds of geoprocessing tools

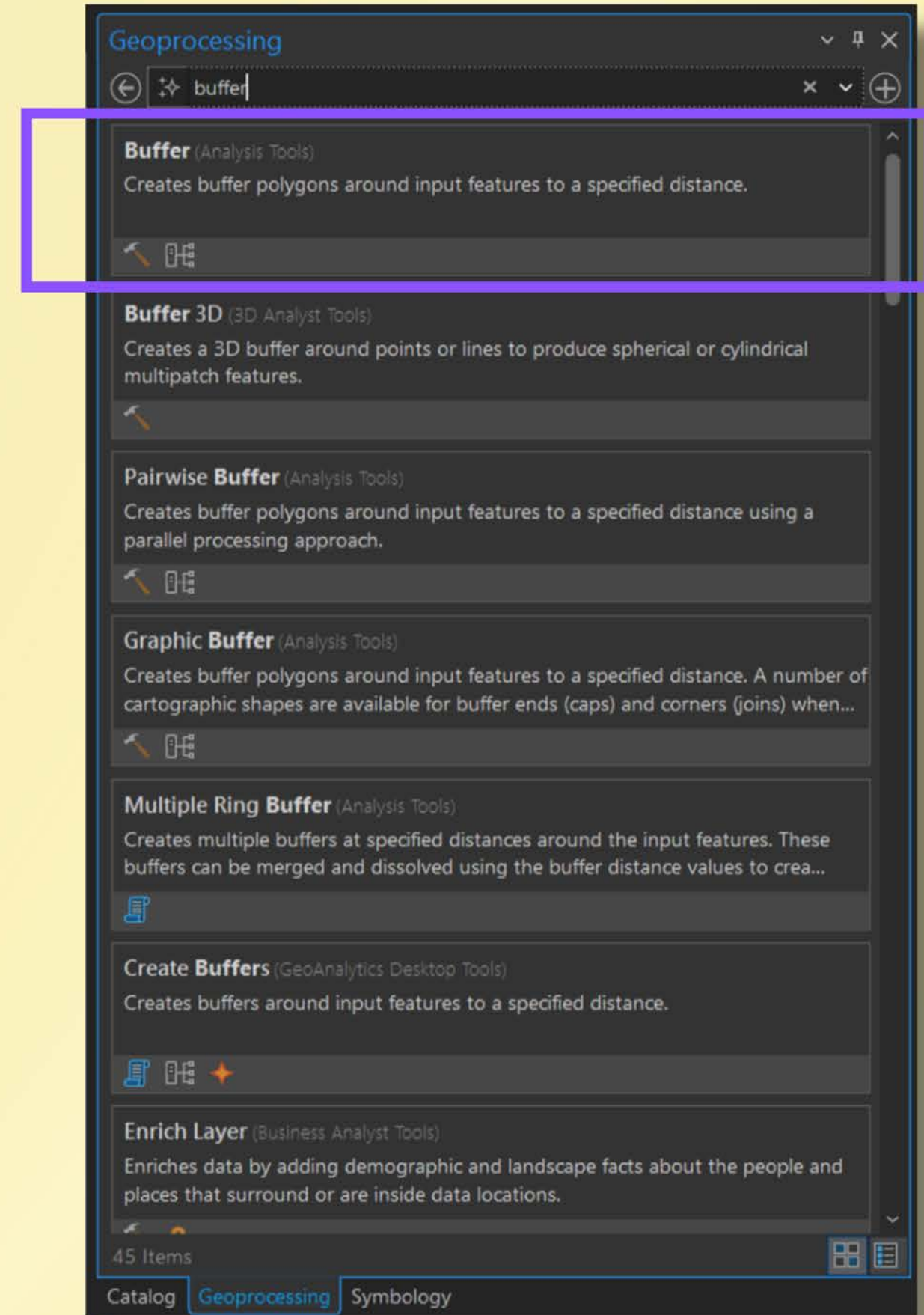
# Geoprocessing Example: Buffer

- From the Analysis Tab/  
Geoprocessing group, click  
the **Tools** button.
- The Geoprocessing Pane will  
appear.



# Geoprocessing Example: Buffer

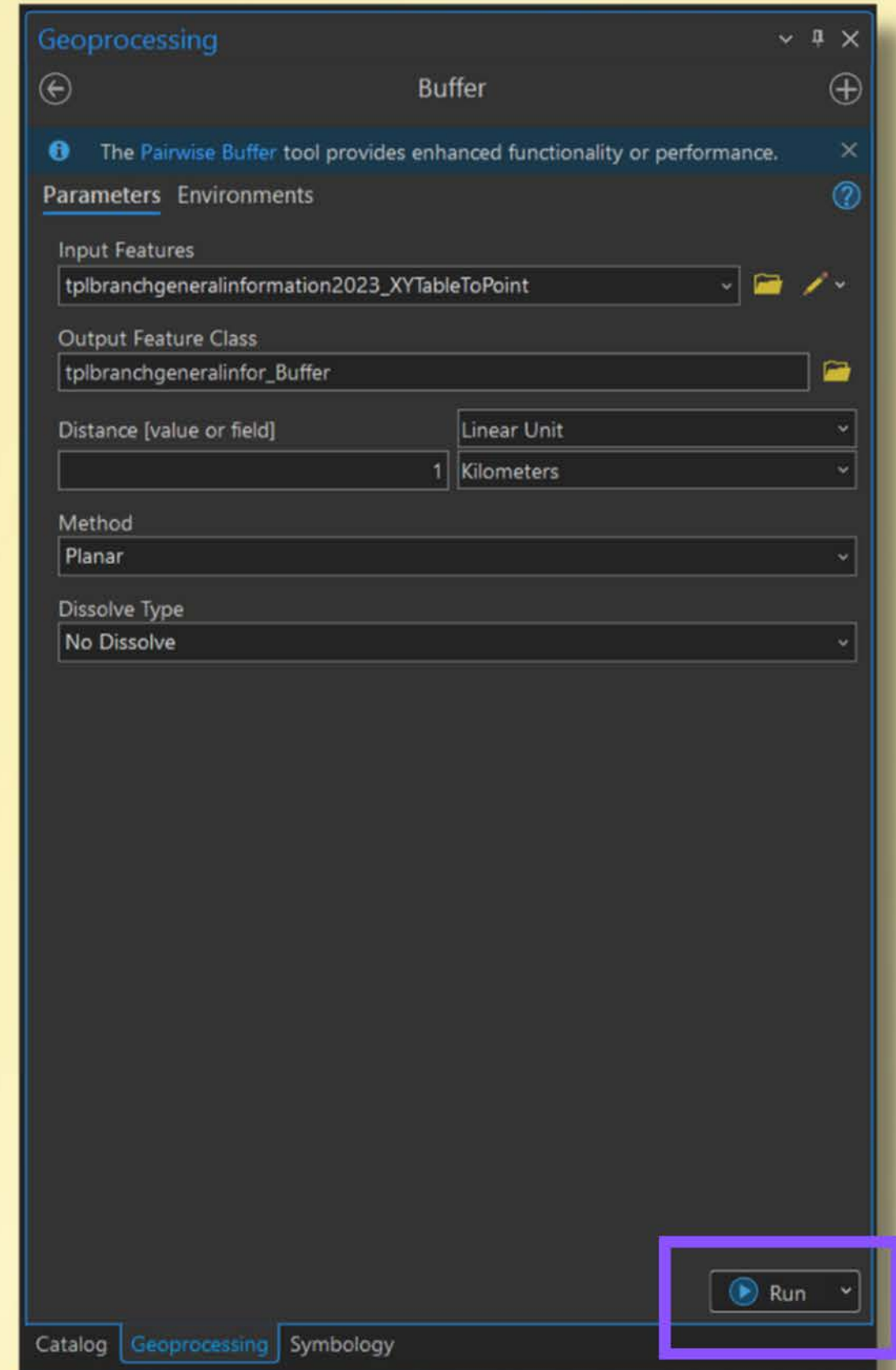
- Search for **Buffer** and click the first result.



# Geoprocessing Example: Buffer

## Parameters:

- Input Features: **Libraries**
- Distance: **1 kilometre**
- Click **Run**.



# Geoprocessing Example: Buffer

Result:

The screenshot displays the ArcGIS Desktop interface with the Buffer tool applied to a point dataset. The map shows a grid of blue circular buffers centered on red points, covering the areas of Vaughan, North York, Scarborough, and Toronto. The Geoprocessing pane on the right shows the following configuration:

- Tool:** Buffer
- Input Features:** `tplbranchgeneralinformation2023_XYTableToPoint`
- Output Feature Class:** `tplbranchgeneralinfor_Buffer`
- Distance [value or field]:** 1
- Linear Unit:** Kilometers
- Method:** Planar
- Dissolve Type:** No Dissolve

A status bar at the bottom of the Geoprocessing pane indicates: "Buffer completed with warnings. View Details Open History Suggestions". The Contents pane on the left shows the following layers:

- Map
- Streetfurnitur\_GeocodeAddress
- `tplbranchgeneralinformation2023_XYTableToPo...`
- `tplbranchgeneralinfor_Buffer`
- `neighbourhoods_socialhousing_joined`
- iNaturalist Observations
- basemap/cot\_ortho
- World Topographic Map
- World Hillshade
- Standalone Tables
- `socialhousing.csv`

The map scale is 1:120,569, and the coordinates are 79.2990715°W 43.7143272°N. The status bar also shows "Selected Features: 0".

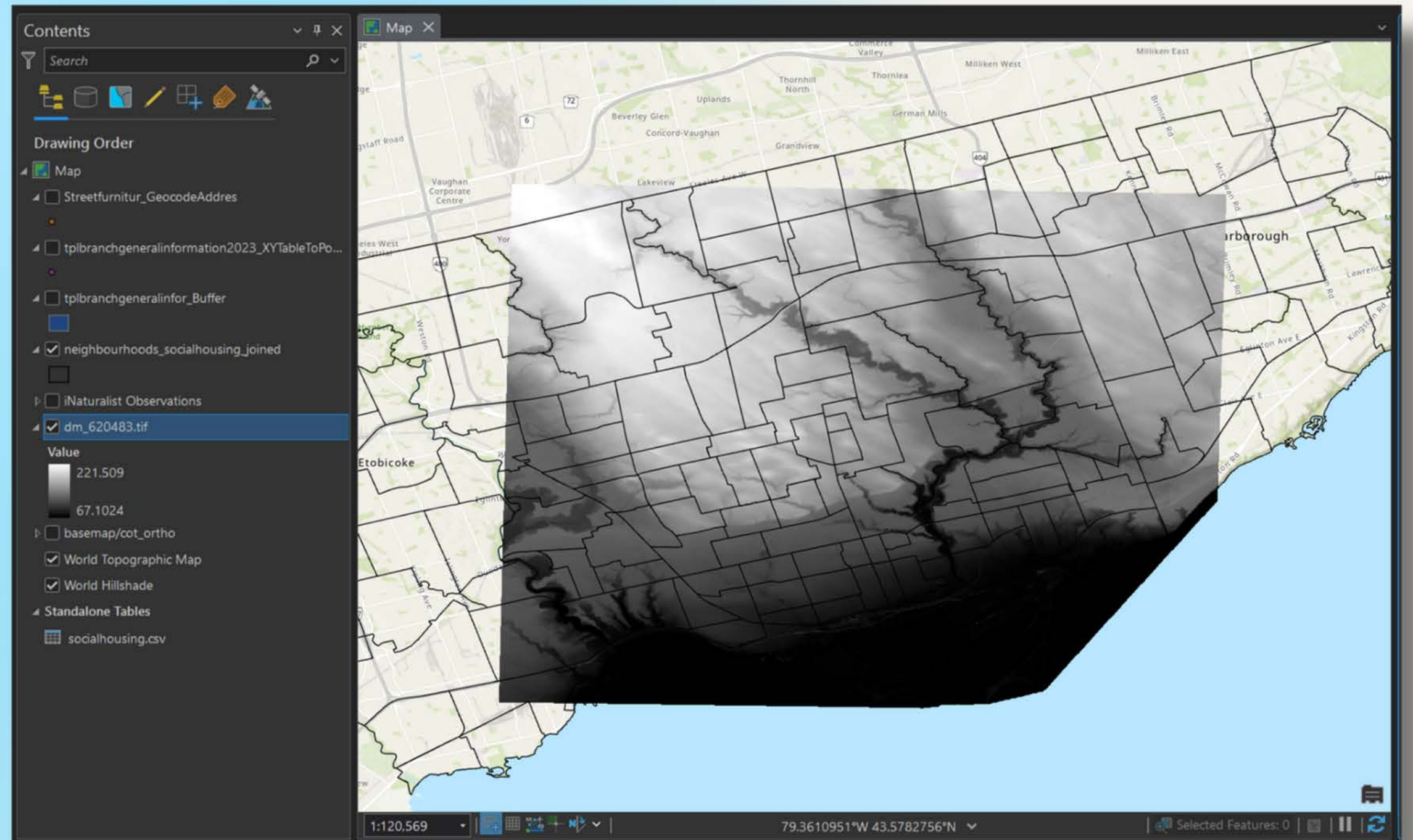
# Working with Raster Data

## Raster data

- Geographic information expressed as a grid of pixels (also called 'cells').
- Each pixel represents a specific value, such as elevation, temperature, or land cover class.
- Common file formats:
  - **TIFF/GeoTIFF** - Very common in desktop publishing and GIS
  - **Esri Grid** - Proprietary ArcGIS format
  - **NetCDF** - Multidimensional raster data

# Working with Raster Data

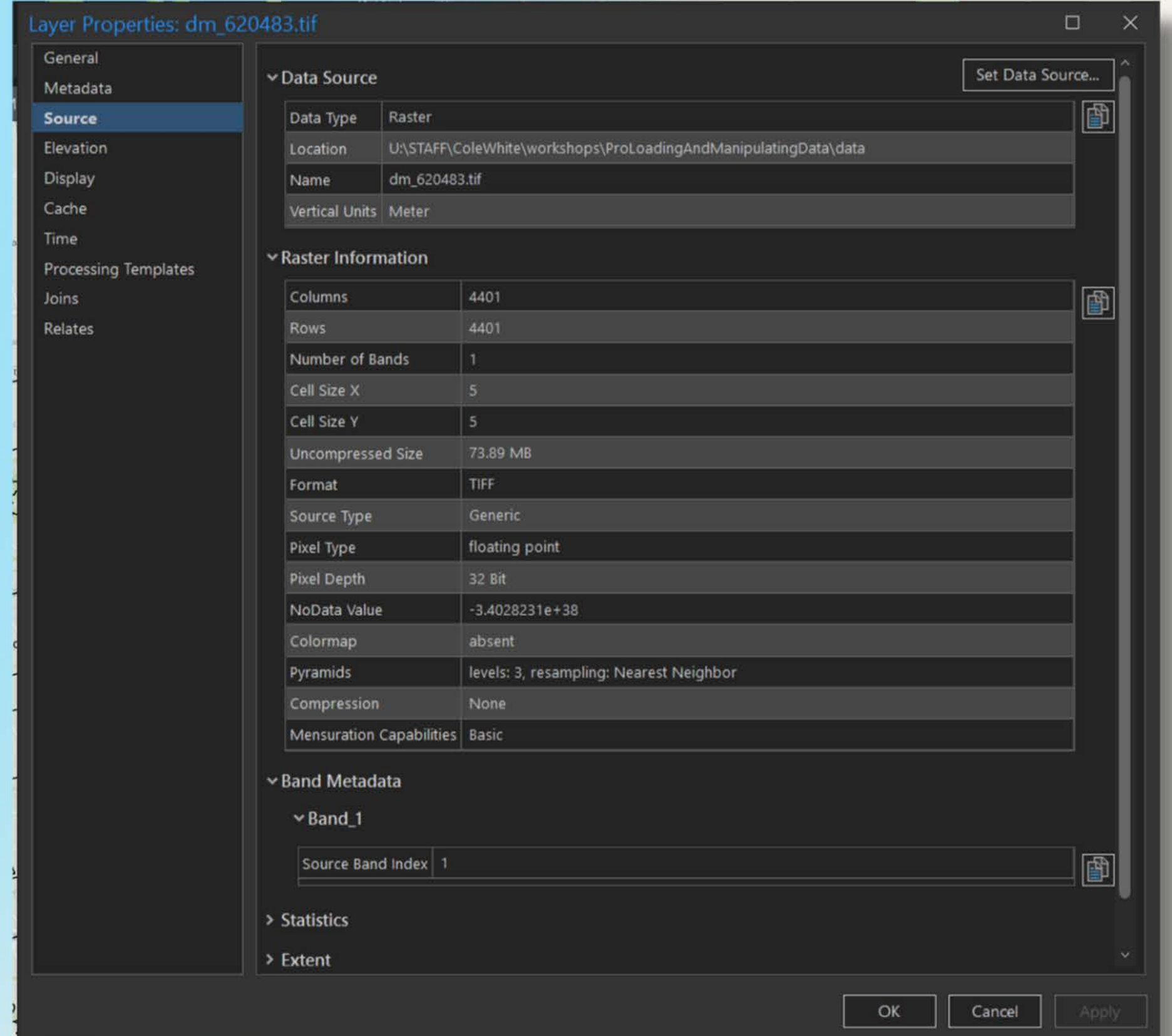
- Add the **dm\_620483.tif** file from the workshop data to the map
- Double click on the layer name in the Contents pane to view the layer's properties.





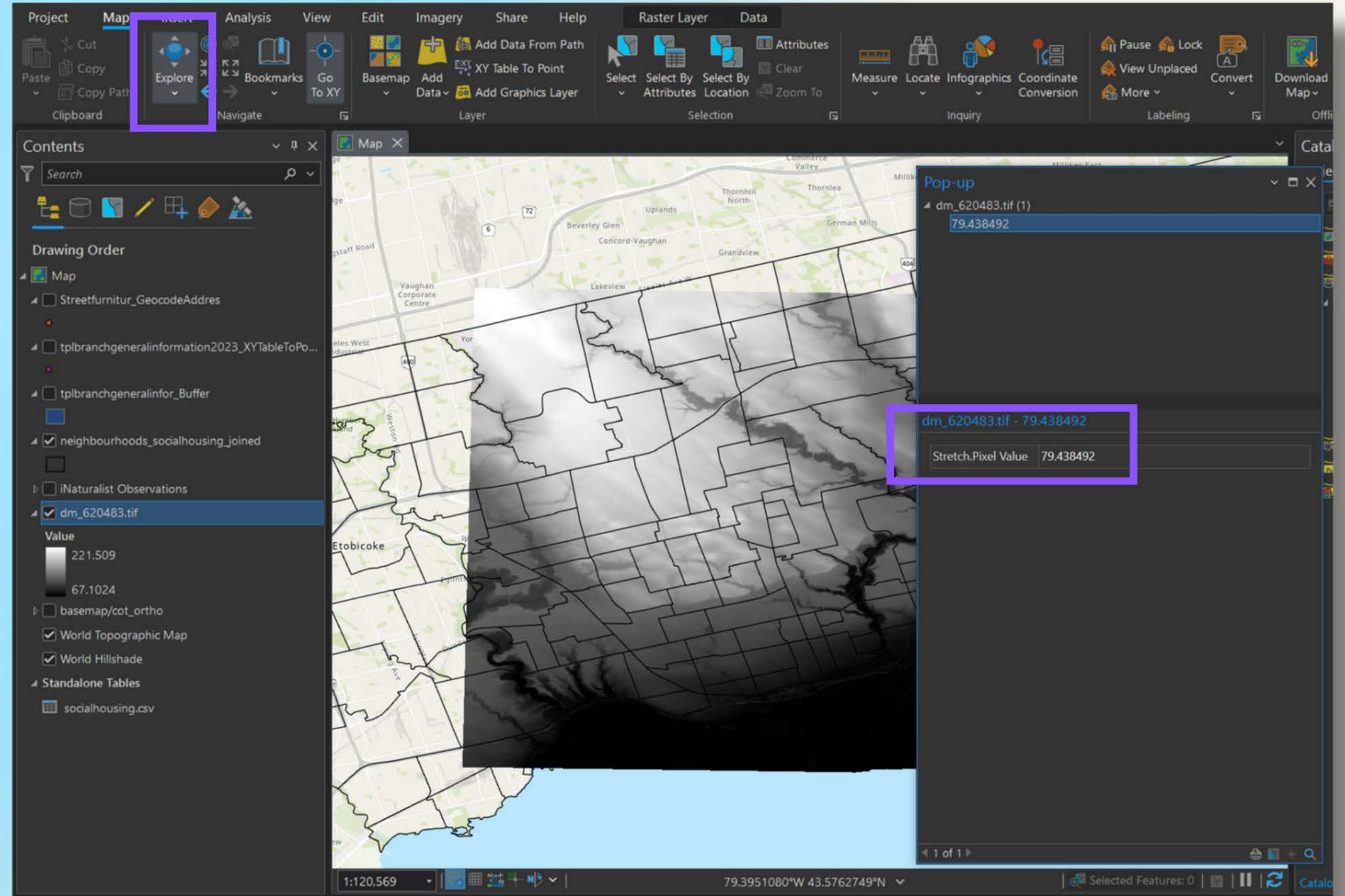
# Working with Raster Data

- Note the number of **columns** and **rows**, number of **bands**, **cell size**, and **spatial reference**.



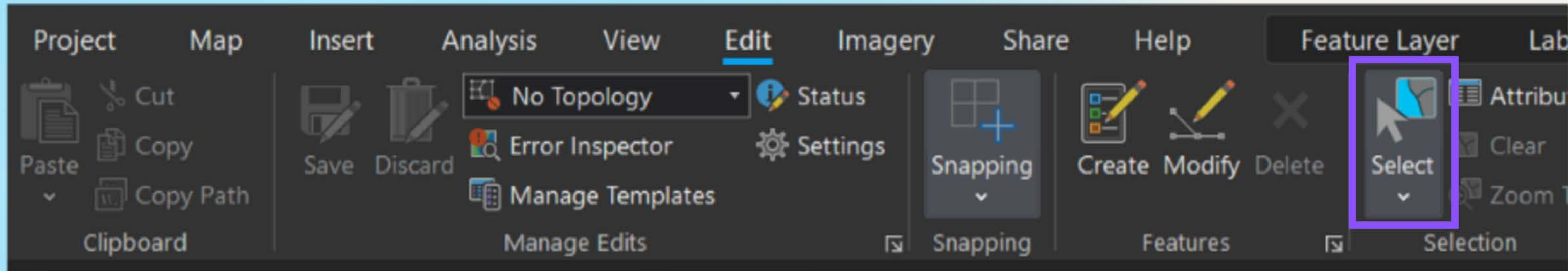
# Working with Raster Data

- The **Explore** tool can be used to query pixel (elevation) values



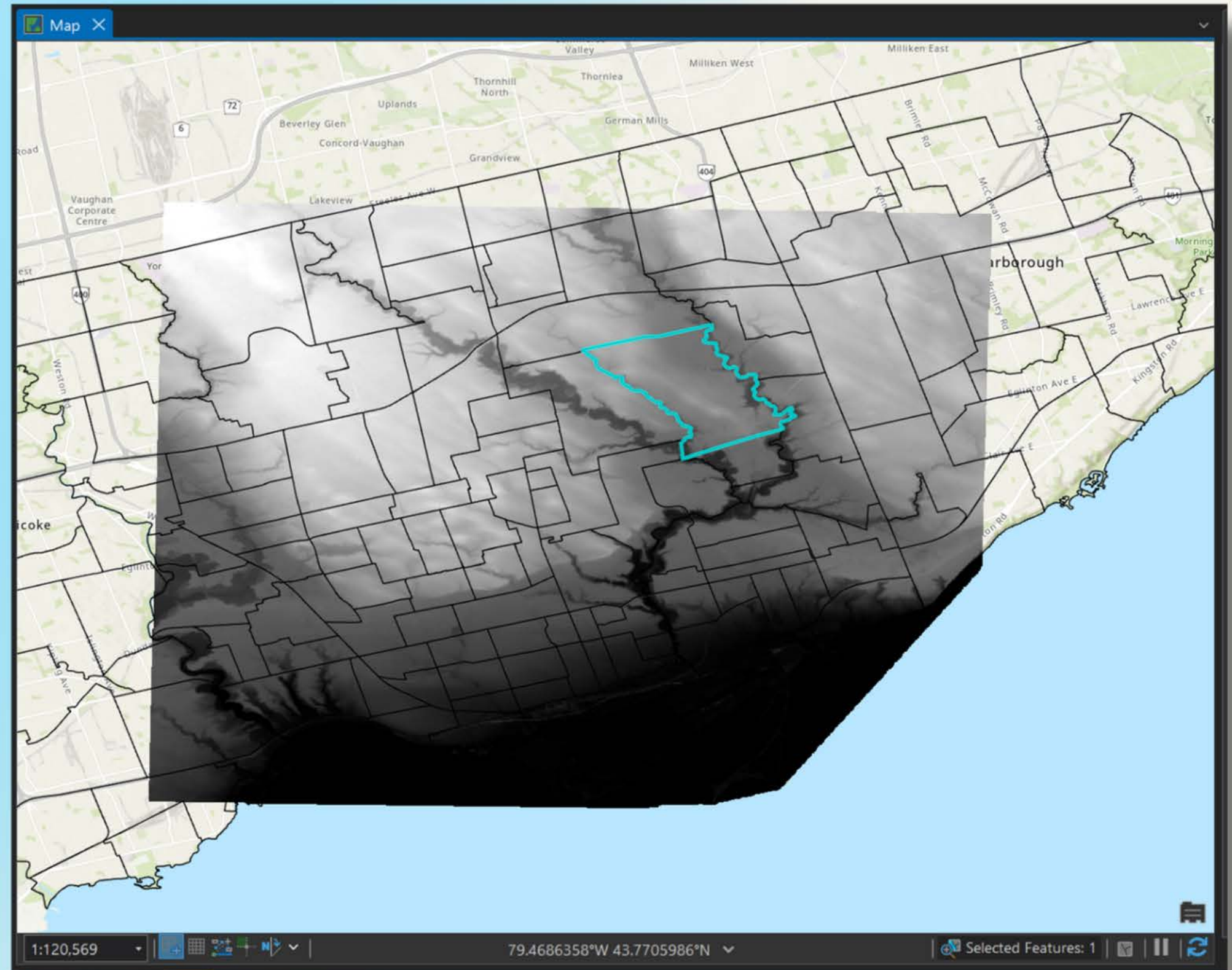
# Working with Raster Data: Geoprocessing

- From the Edit tab/Selection group, choose the **Select** tool.



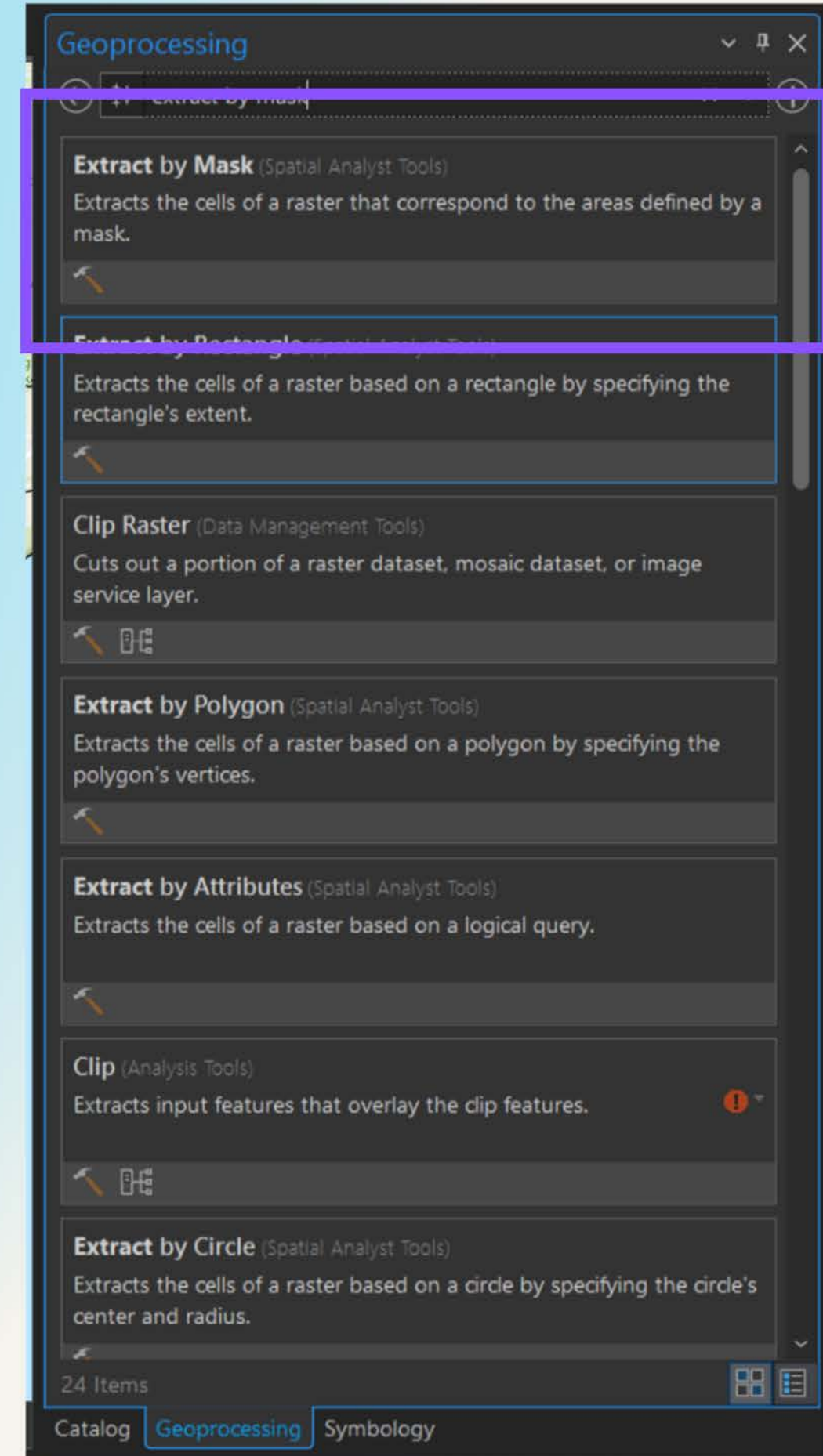
# Working with Raster Data: Geoprocessing

- Click within the map view to select one of the neighbourhood polygons.



# Working with Raster Data: Geoprocessing

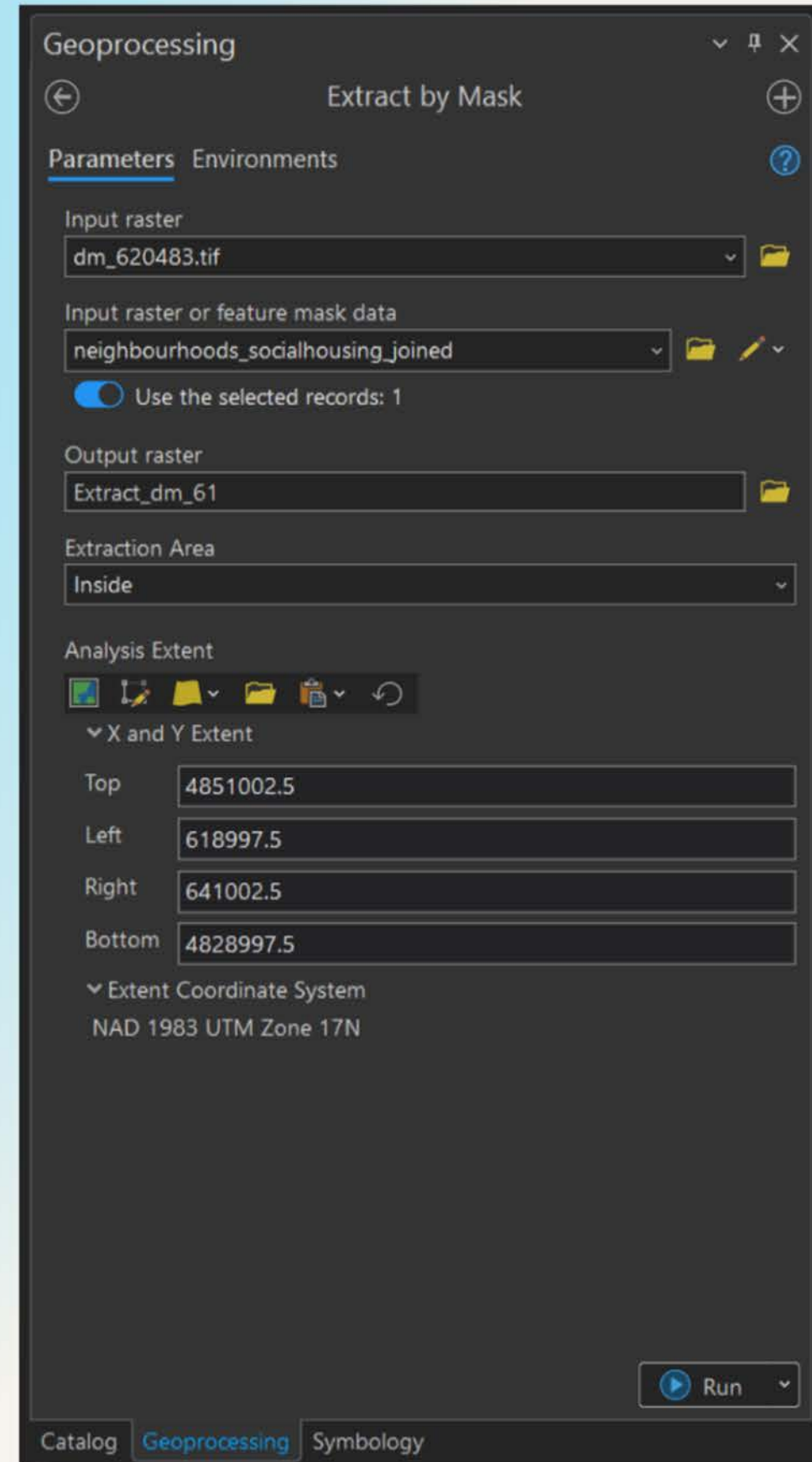
- From the **Geoprocessing** pane, open the **Extract by Mask** tool.



# Working with Raster Data: Geoprocessing

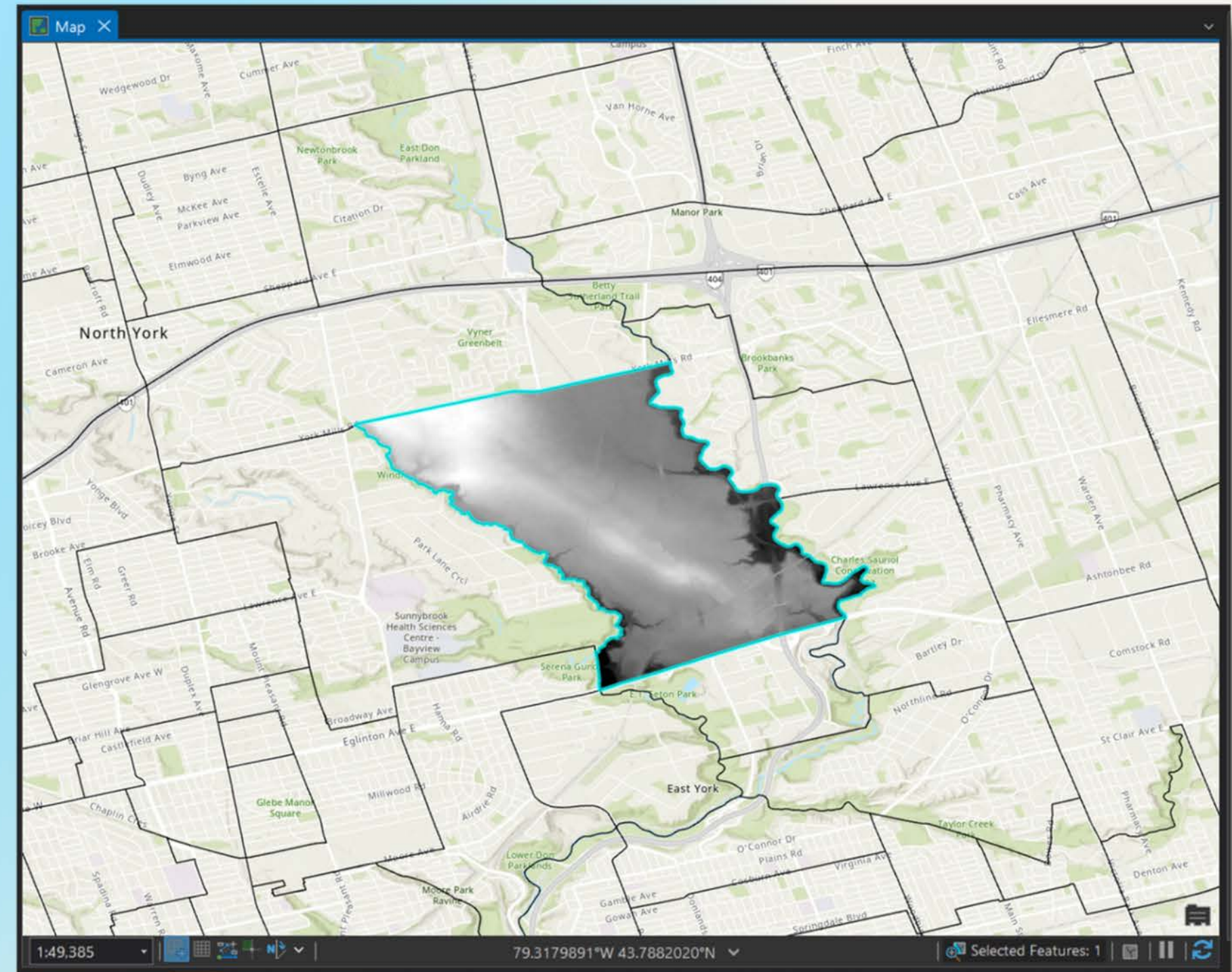
## Input Parameters:

- Input raster: DEM
- Input raster or feature mask data: The neighbourhoods layer
- Note that the tool honours the layer selection
- Click Run.



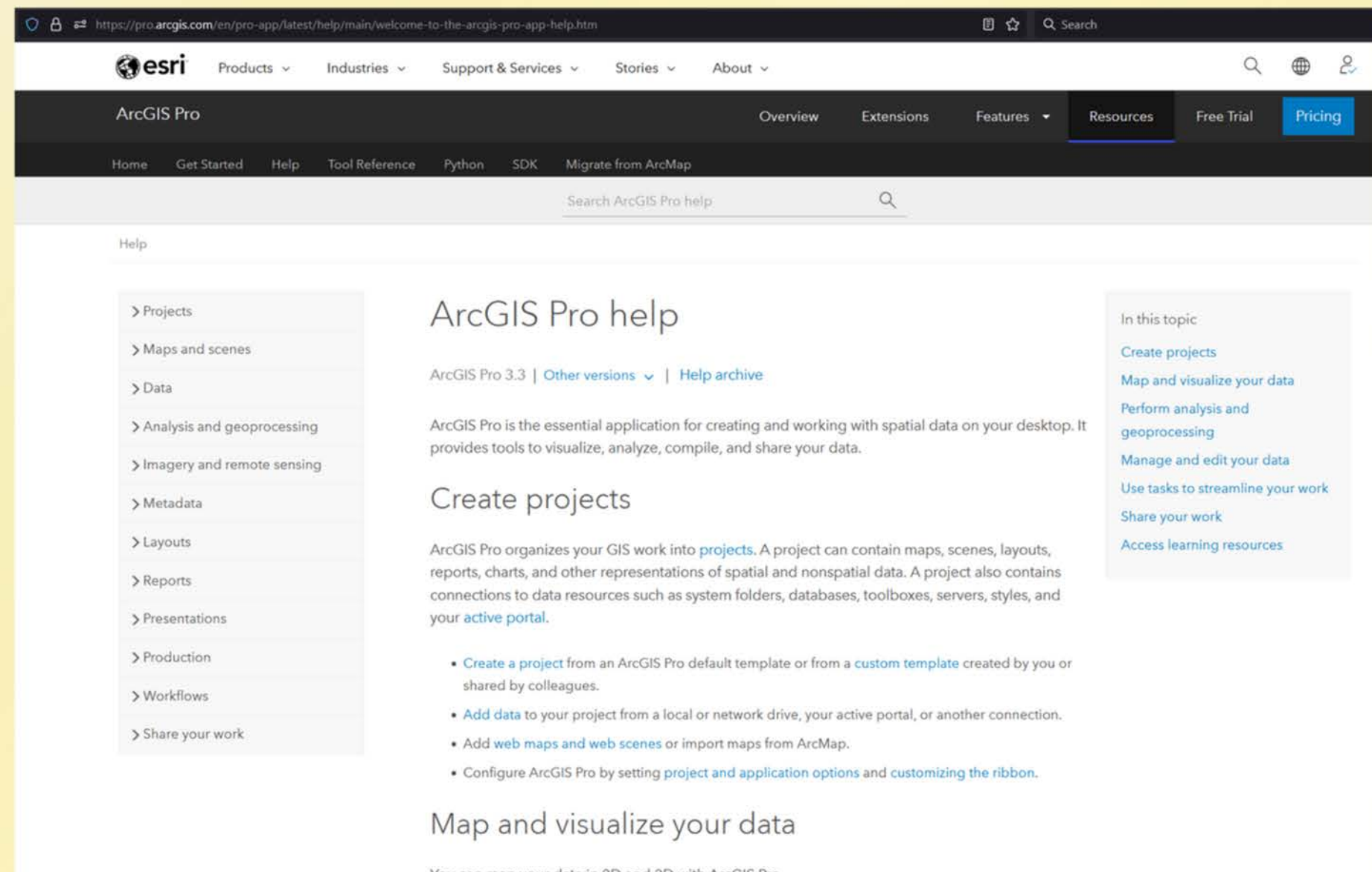
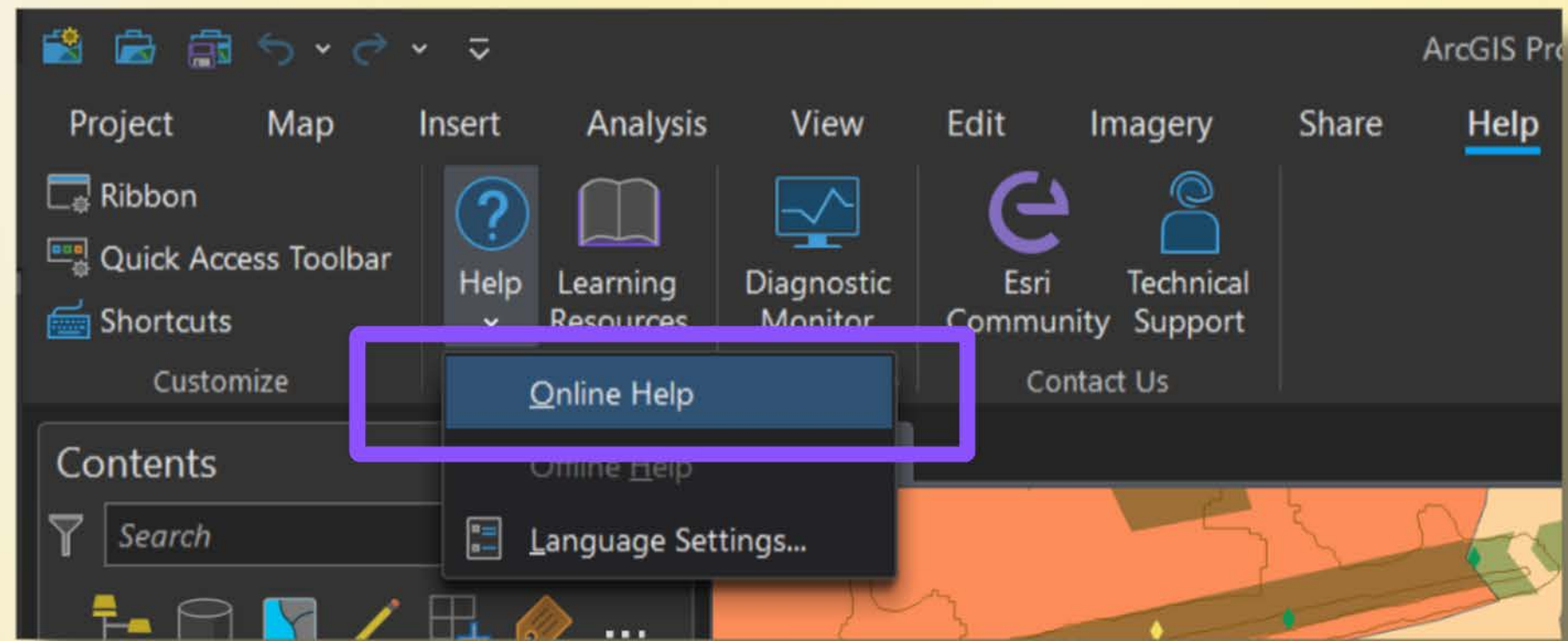
# Working with Raster Data: Geoprocessing

Result:



# Getting Help

- From the **Help** tab in Pro, choose **Help** -> **Online Help**
- A website will be launched where you can access detailed documentation for the latest version of Pro.





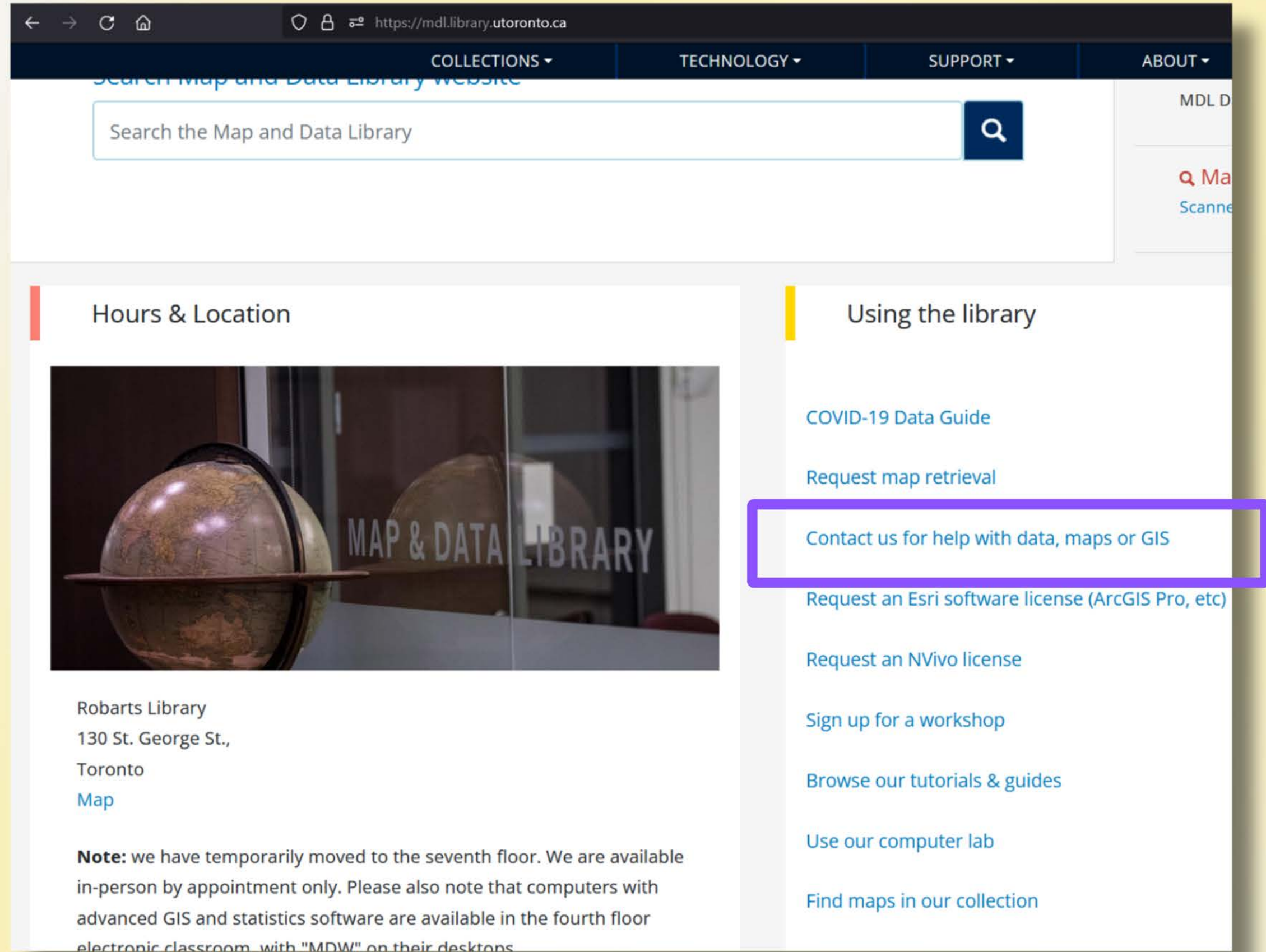
# Getting Help

- Visit <https://www.esri.com/training/> and log in with your UTORid.
- The **Course Catalog** contains many helpful, beginner-friendly tutorials.

The screenshot shows the Esri Academy Course Catalog page. At the top, there is a navigation bar with the Esri logo and links for Products, Industries, Support & Services, Stories, and About. Below this is a secondary navigation bar with links for Esri Academy, About, Catalog (which is highlighted), Certification, My Academy, and Help. Underneath, there are more specific links for Course Catalog, Courses by Schedule, Courses by Location, New and Retired Training, and Learning Plans. The main heading is "Explore Our Courses". Below the heading is a search bar labeled "Search Courses" with a search icon and a "Search Tips" link. A "Browse by Topic" section follows, featuring nine topic-based icons: Getting Started, ArcGIS Products, Data Management, Mapping, Spatial Analysis & Data Science, Field Operations, Scripting & Development, Imagery & Remote Sensing, and 3D Visualization & Analytics. Below the topics, there are filters for FORMATS (Viewing All), PRODUCTS (Viewing All), Maintenance Subscription (checkbox), and Free (checkbox). There are also SORT (Recently Added) and VIEW (grid and list icons) options. The page shows "Viewing Results: 500". Three course cards are visible, each with a "NEW" badge in the top right corner. The first card is for "Using ArcGIS AllSource for Geospatial Intelligence Analysis", an INSTRUCTOR-LED course lasting 2 Days (16 Hours). The second card is for "Esri ArcGIS Pro Foundation Certification 2025", a LEARNING PLAN course added by Esri Technical Certification on August 13, 2024. The third card is for "Esri ArcGIS Pro Associate Certification 2025", also a LEARNING PLAN course added by Esri Technical Certification on August 13, 2024.

# Getting Help

- Contact the Map and Data Library



The screenshot shows the website for the Map and Data Library at the University of Toronto. The browser address bar displays <https://mdl.library.utoronto.ca>. The navigation menu includes [COLLECTIONS](#), [TECHNOLOGY](#), [SUPPORT](#), and [ABOUT](#). A search bar is present with the placeholder text "Search the Map and Data Library".

The main content area is divided into two columns. The left column is titled "Hours & Location" and features a photograph of a globe in a library setting with "MAP & DATA LIBRARY" visible on a glass partition. Below the image, the text reads: "Robarts Library, 130 St. George St., Toronto" followed by a [Map](#) link. A **Note** states: "we have temporarily moved to the seventh floor. We are available in-person by appointment only. Please also note that computers with advanced GIS and statistics software are available in the fourth floor electronic classroom, with 'MDW' on their desktops."

The right column is titled "Using the library" and lists several services: [COVID-19 Data Guide](#), [Request map retrieval](#), [Contact us for help with data, maps or GIS](#) (highlighted with a purple box), [Request an Esri software license \(ArcGIS Pro, etc\)](#), [Request an NVivo license](#), [Sign up for a workshop](#), [Browse our tutorials & guides](#), [Use our computer lab](#), and [Find maps in our collection](#).

# Next Steps

- Layout creation
- Analysis  
**Upcoming workshop:**  
**<https://libcal.library.utoronto.ca/event/3836941>**
- Working with raster data
- Automation
- Artificial Intelligence/Machine Learning



**Thank you!**