W4 Exercise: Mapping travel time

OBJECTIVE. Gain ability to prepare accessibility maps based on road network impedance. Illustration to farmer's markets. Total: 40pts.

In this exercise, we will attempt to map the accessibility (as measured in travel time and distance) to farmer's markets across Mecklenburg County, NC, and by different modes of transportation.
We will be using the built-in network analysis functionality in ArcPro (ArcPro lets you use its own network, or your own network).

This exercise is not particularly hard, but you will enhance the final output by adding some cartographic information.

Step 1: Download the data

Download *meck.gdb* from CANVAS and unzip it into a directory of your liking. In ArcGIS Pro, open the *Catalog Pane* and inspect the contents of the geodatabase (Figure 1).

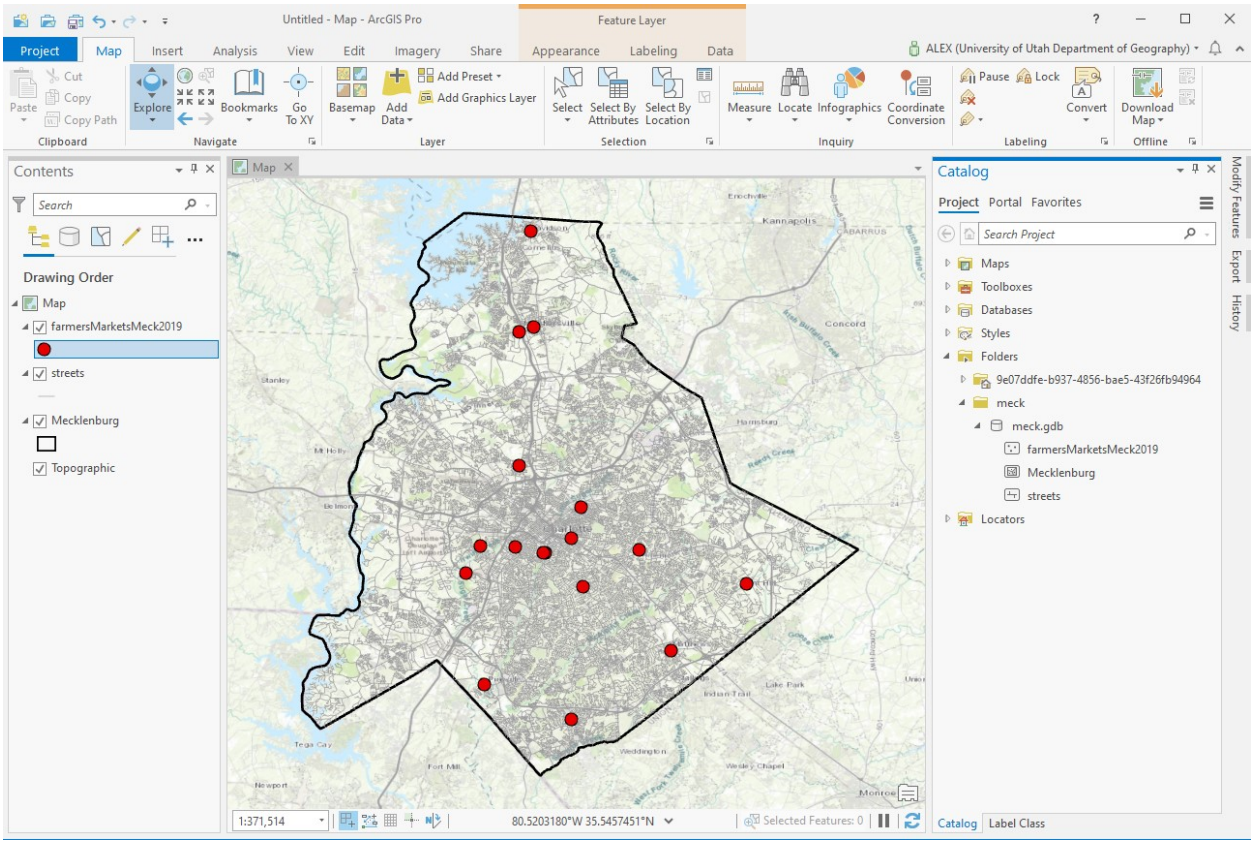

Figure 1

Step 2: Create a Feature Dataset

Access the context menu of *meck.gdb* by right-clicking it in the *Catalog Pane*. Navigate to *New* → *Feature Dataset* (Figure 2). In the following *Create Feature Dataset* tool dialog, enter "meck_fd" in the *Feature Dataset Name* box (Figure 3). Click *Run*.

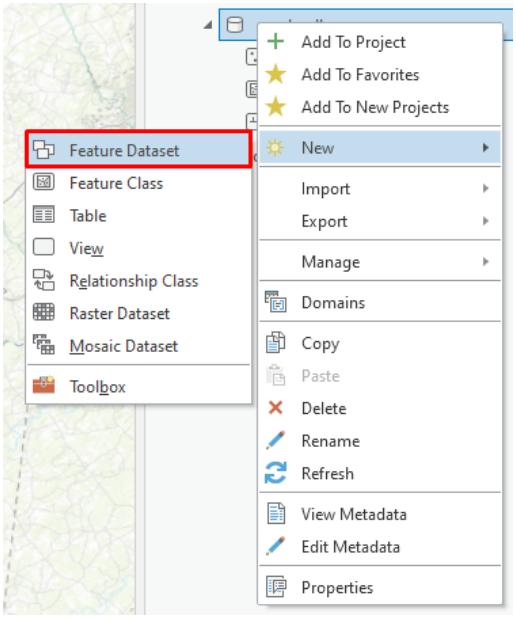

Figure 2

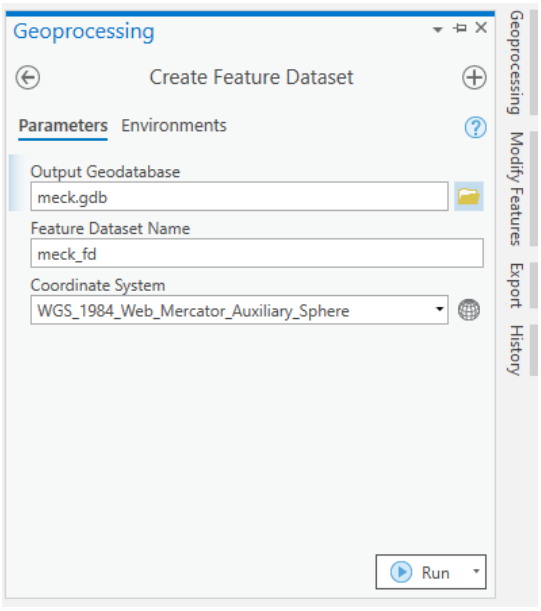

Figure 3

Step 3: Import data into the feature dataset

Access the context menu of *meck_fd* by right-clicking it and navigating to *Import* → *Feature Class(es)* (Figure 4). In the following *Feature Class to Geodatabase* tool dialog, choose the *streets* feature class under *Input Features* (Figure 5). Click *Run*.

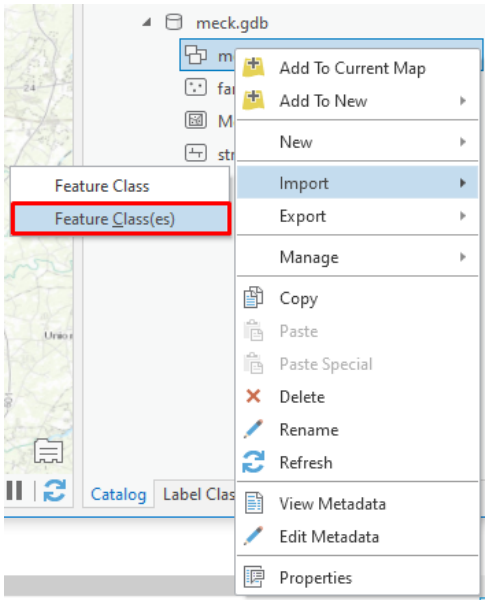

Figure 4

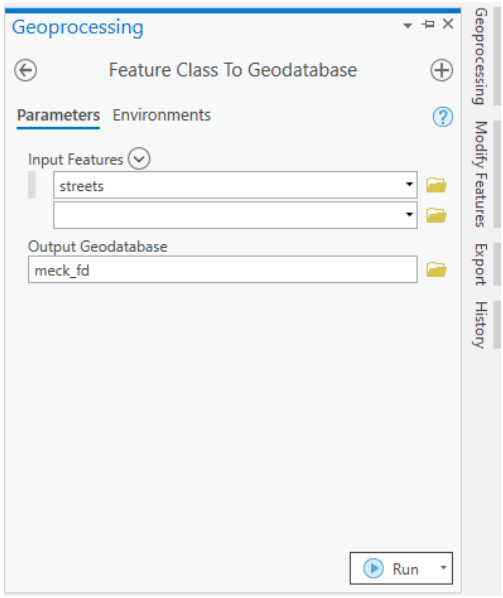

Figure 5

Step 4: Create network dataset

Again, access the context menu of *meck_fd* and navigate to *New* → *Network Dataset* (Figure 6). In the following *Create Network Dataset* dialog, enter "meck_net" under *Network Dataset Name*, check *streets_1* (ArcGIS Pro automatically renames the feature class to avoid naming conflicts) under *Source Feature Class*, and specify *No elevation* under *Elevation Model* (Figure 7). Click *Run*.

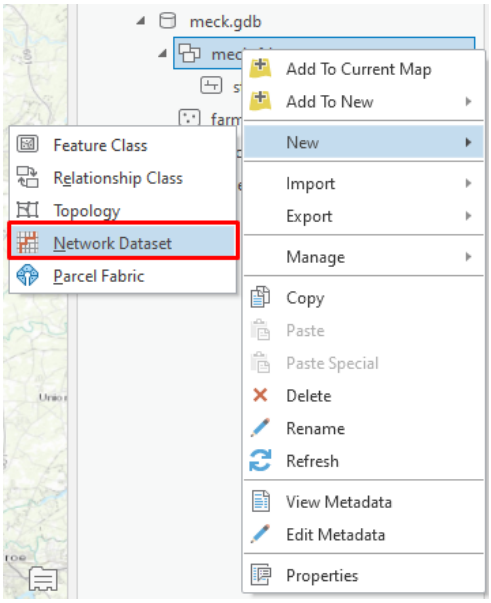

Figure 6

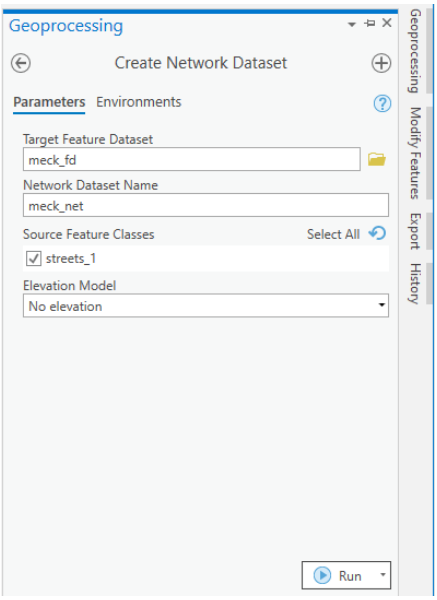

Figure 7

Step 5: Configure the network dataset

Time to specify the cost (or impedance) of moving across your network. Instead of distance, we will specify driving time as the cost, which is more realistic. Check your *Catalog Pane* to see *meck_net* appear under *meck_fd* in *meck.gdb*. Access the *Network Dataset Properties* by right clicking *meck_net* and navigating to *Properties* (Figure 8). Navigate to the Travel Attributes tab and change the Units to Minutes. In the *streets_1 (Along)* entry in the *Evaluators* table, press the X on the very right of the box of the *Value* column (Figure 9), which opens a dialog where you change the value in the *Result* box to *[MinuteTrv]* (Figure 10). This corresponds to the *MinuteTrv* column in the *streets* feature class attribute table. It was pre-calculated using the speed limit and length and quantifies the time needed to drive the corresponding road segment.

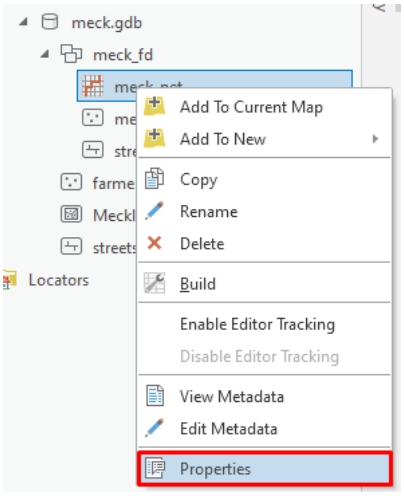

Figure 8

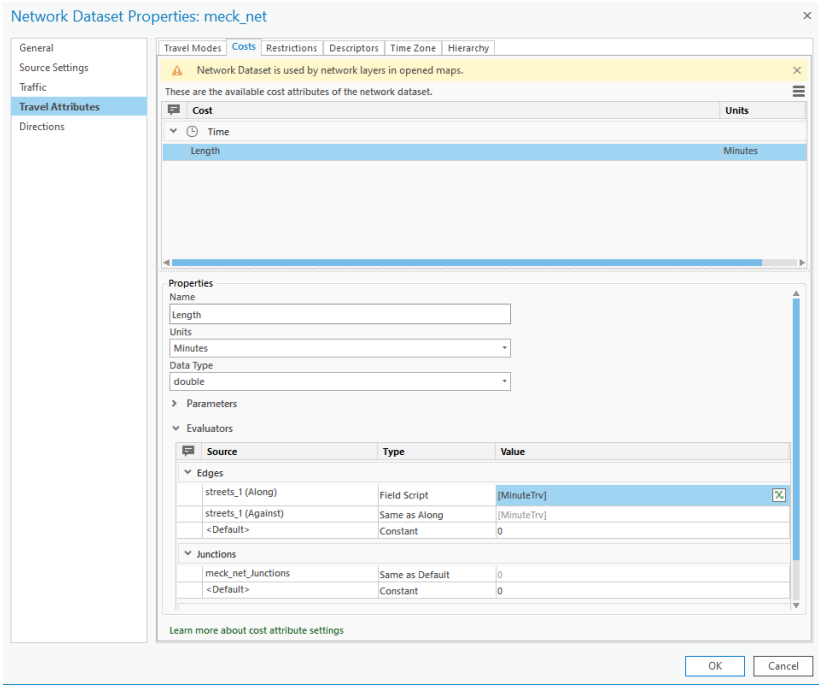

Figure 9

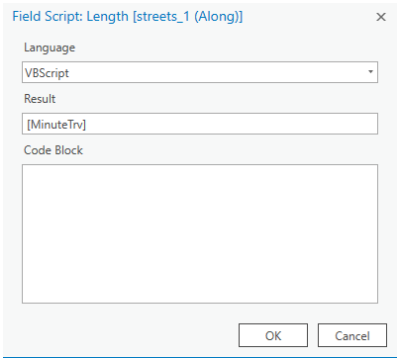

Figure 10

Step 6: Build the network

You need to build the network to execute the changes you applied to the network. Right-click *meck_net* and click *Build* (Figure 11). You now have a fully operational network at your disposal. You built it using the *streets* feature class that was provided to you on CANVAS. Note that alternatively, you could use ESRI's road network, which is available through a web connection, but consumes credits. To make sure you are using the the network you just built (*meck_net*) and not the costly ESRI network, navigate to the *Analysis* tab in the top ribbon in ArcGIS Pro, and click the *Network Analysis* button in the *Workflows* group (Figure 12). Take a look at the box that pops up: Under *Network Data Source*, you should see *meck_net*, and all of the buttons under *New Network Analysis Type* (*Service Area, Route, Closest Facility, …*) should be clickable (not greyed out, Figure 13). If it says "arcgis.com" instead, then you will be using ESRI's $$$ network. In that case, click *Data Source* and choose *meck_net* in the *Select Network Data Source* dialog (Figure 14).

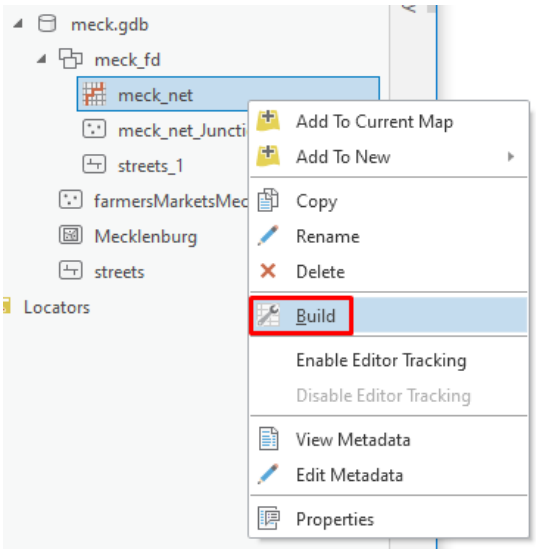

Figure 11

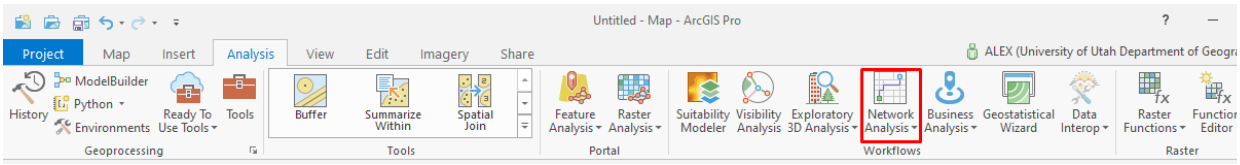

Figure 12

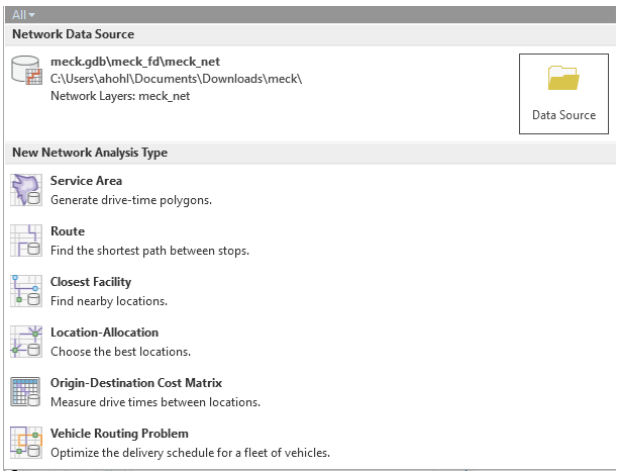

Figure 13

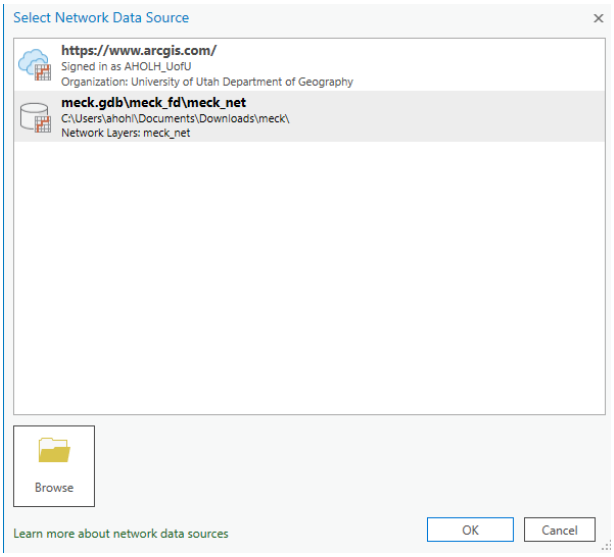

Figure 14

Step 7: Create Service Areas

Again, in the *Analysis* tab of the top ribbon of ArcGIS Pro, click *Network Analysis*, and select *Service Area* in the pop-up box (see Figure 13). Notice that the *Service Area* layer, together with its sub-layers (*Facilities, Polygons, Lines, …*) appears in the TOC. Also, the *Network Analyst Service Area* tab is now available in the top ribbon (Figure 15). In the *Network Analyst Service Area* tab, click *Import Facilities*. In the following *Add Locations* tool dialog, select *farmersMarketsMeck2019* under *Input Locations* and

check *Snap to Network* (Figure 16). Click *Run*. Now that your facilities are imported, choose *Dissolve* under *Output Geometry* of the *Service Area* tab (Figure 15). Finally, click *Run* to create your service areas.

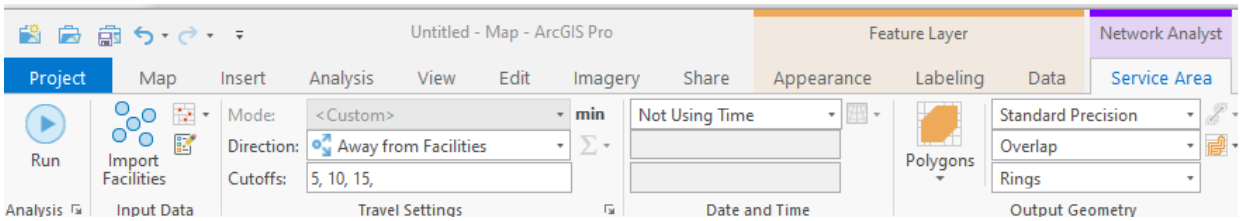

Figure 15

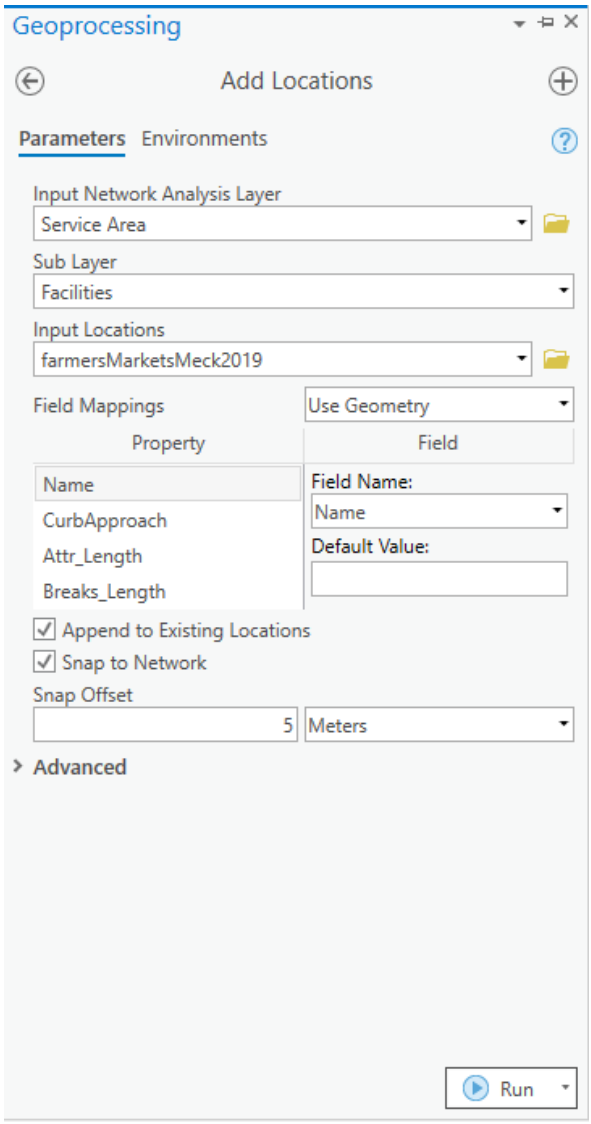

Figure 16

Step 8: Adjustments

You should see the service areas in your map. So far, you used the default cutoffs of 5, 10, and 15 minutes drivetime. Redo the analysis with your own set of cutoff values: In the *Network Analyst Service Area* tab, change enter the values of 4, 6, 10, 14 into the box next to *Cutoffs* in the *Travel Settings* group. Click *Run*, and see how your service areas changed. In addition, change the colors of your service areas by right clicking the *Polygons* sublayer of the *Service Area* layer in the TOC, and select *Symbology* in the context menu. Try out a couple of different color schemes and classes, export your map and submit it together with a paragraph describing the resulting spatial pattern.