

This week we will look at business location, focusing specifically on using GIS to identify the characteristics of the market areas of existing businesses.

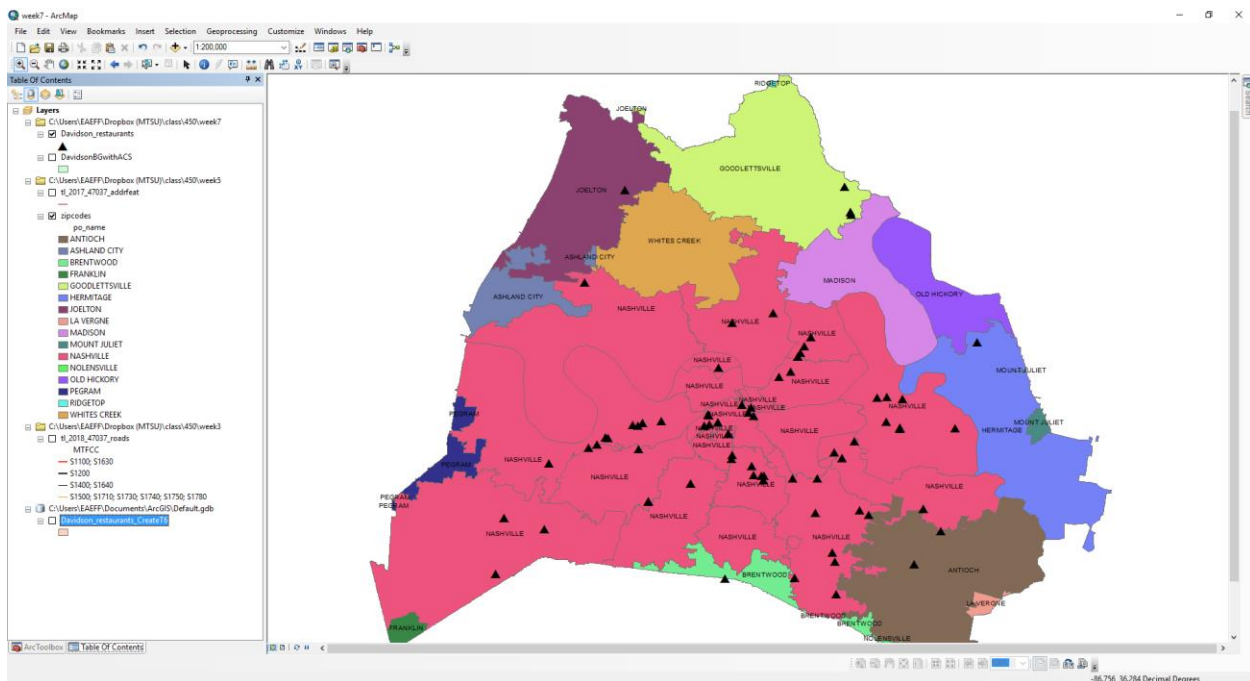
The shapefile *S:\teff\450\GIS\week7\Davidson_restaurants.shp* provides location and other information on 778 restaurants. The data were scraped from the Metro-Nashville restaurant inspection department. The field *sc* reports the most recent published score. The field *genre* reports the restaurant category.

The shapefile *S:\teff\450\GIS\week7\DavidsonBGwithACS.shp* is the block group shapefile with data added from the ACS. Variable descriptions are given in the excel workbook *S:\teff\450\GIS\week7/bgDavidsonCuyahoga.xls*.

The file *S:\teff\450\GIS\week7\zipcodes.shp* is a shapefile showing zipcode boundaries for Davidson County.

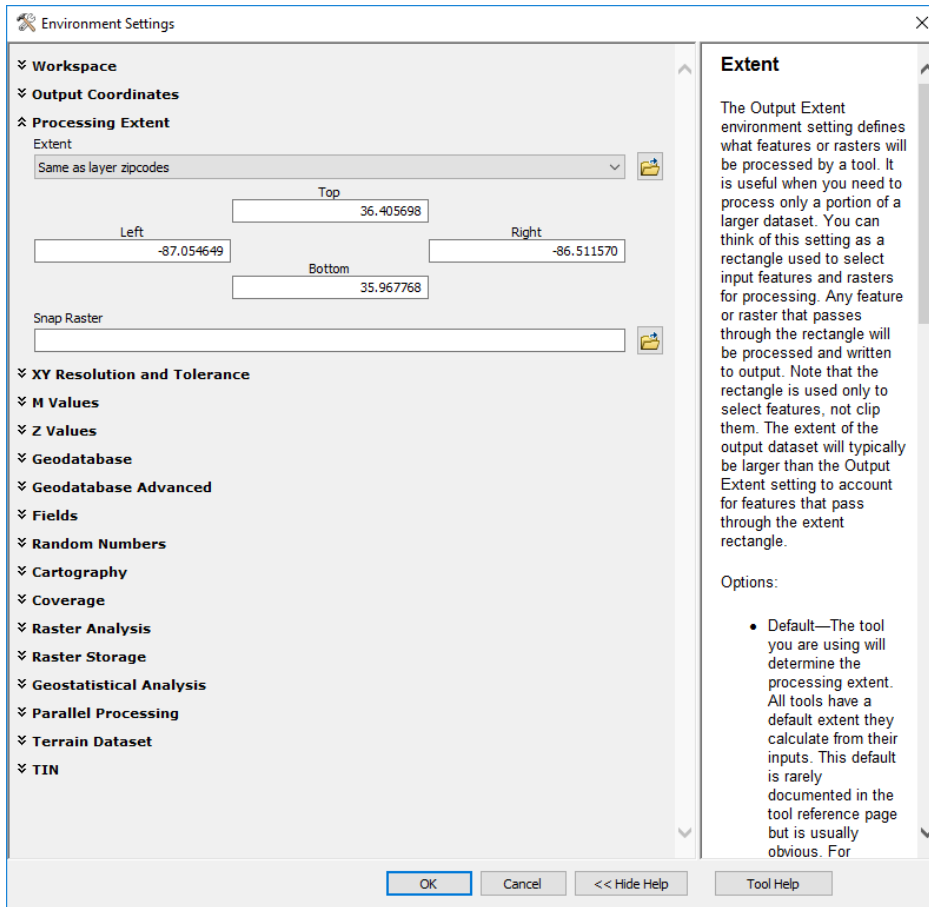
The file *S:\teff\450\GIS\week7\tl_2018_47037_roads.shp* is a shapefile showing all roads in Davidson County.

Bring the shapefiles into the ArcMap *ToC*. Select only the restaurants with *genre* of “mexican”.

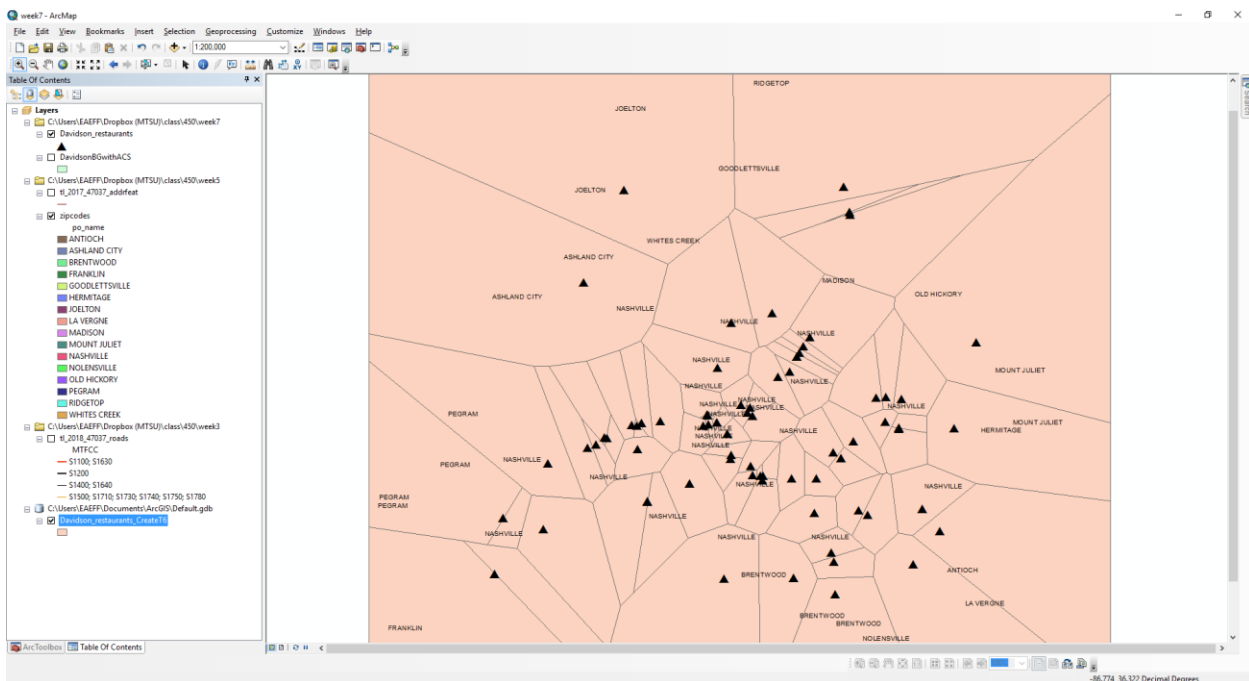


We will partition the map into polygons, with only one restaurant inside the polygon. Any location within a polygon is closer to that specific Mexican restaurant than to any other Mexican restaurant. This is one way to assign market areas to a bricks and mortar business.

Go to ArcToolbox. Click through this sequence: *Analysis Tools > Proximity > Create Thiessen Polygons*. For *Input Features* use your restaurant layer. Accept the default for the *Output Feature Class*. Select *ALL* for *Output Fields*. At the bottom, click the *Environment* button, and then click the *Processing Extent* link. Set the extent to be the same as the zipcodes layer.

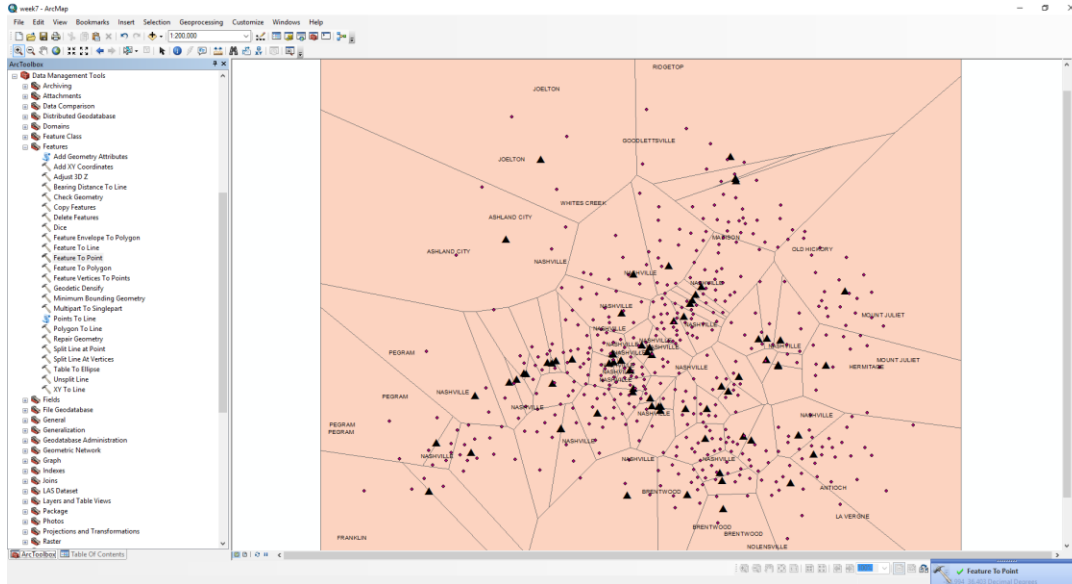


You should now have a layer consisting of Thiessen polygons for each Mexican restaurant.

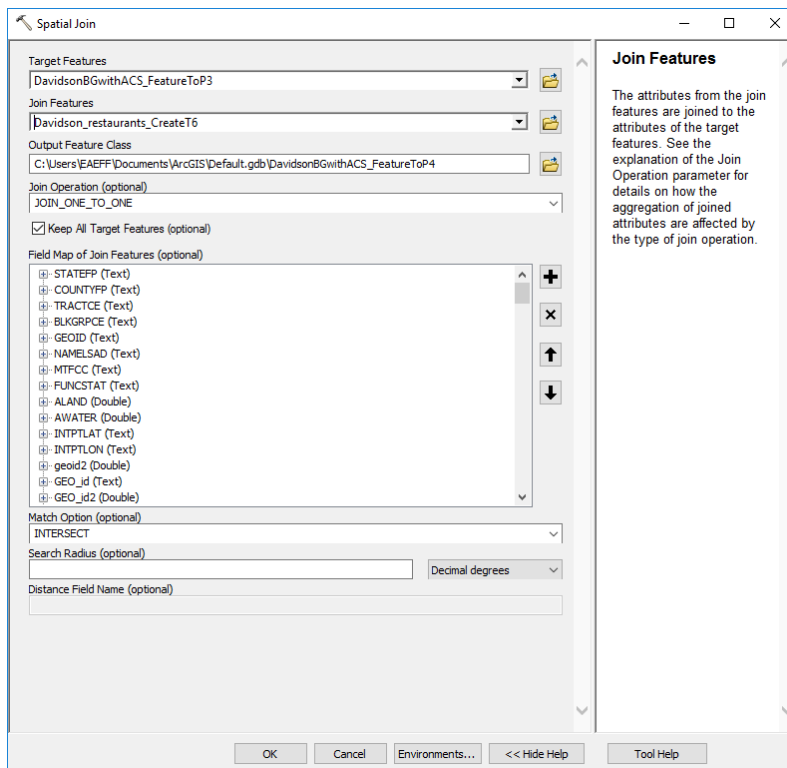


Next, we will try to find out some demographic information about each of these market areas. This involves three steps.

First, we will turn the block group shapefile into a point theme, where the point represents the center of the block group. Go to ArcToolbox. Click through this sequence: *Data Management Tools > Features > Feature to Point*. Use *DavidsonBGwithACS* as your input feature. You should get a sprinkle of points across the view.



Second, we will do a spatial join to add information to the attribute table of the block group points—information that comes from the Thiessen polygon that they overlay. Go to ArcToolbox. Click through this sequence: *Analysis Tools > Overlay > Spatial Join*. For *Target Features* pick your block group points. For *Join Features* pick the Thiessen Polygon layer. Choose to keep all Target Features. For *Match Option* try CLOSEST.

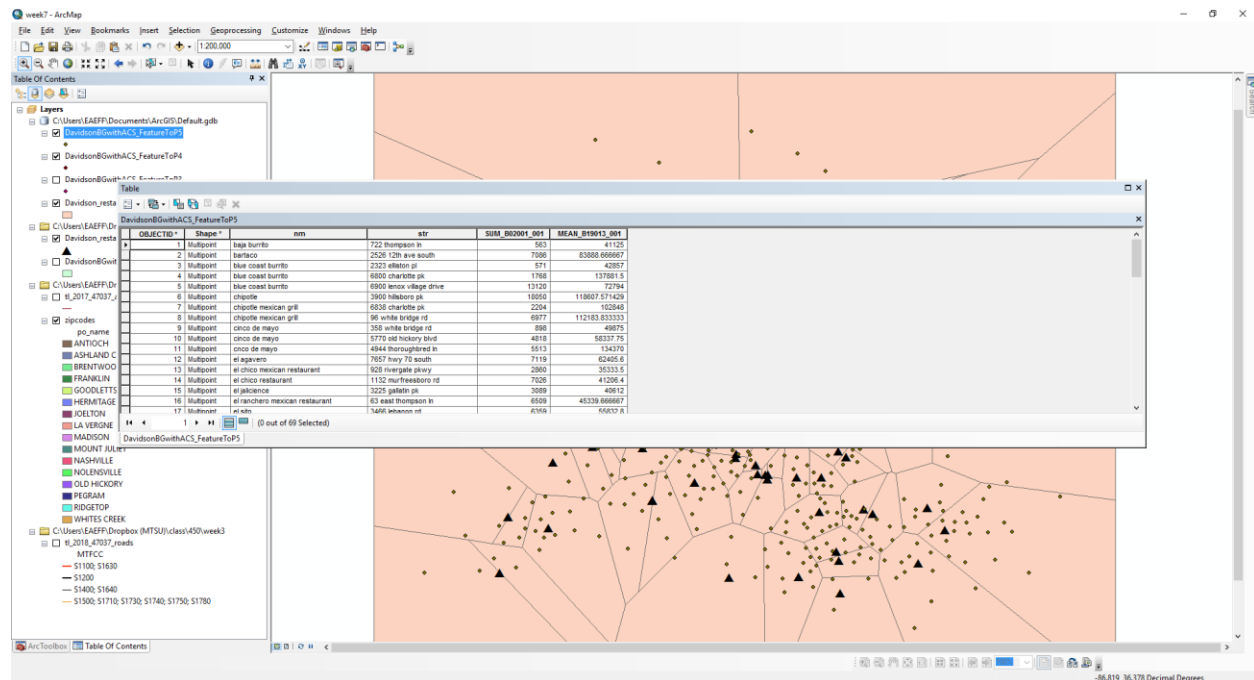


Third, we will “dissolve” the block group point theme so that the ID for each point becomes the ID acquired from the Thiessen polygon. Go to the ArcMap menu, and click on *Geoprocessing*, then on *Dissolve*. For *Input Features* use the name of the spatially joined block group points layer. For *Dissolve Fields* check the boxes for *nm* and *str*.

The *Statistics Fields* is important: it is here that we select the data that will characterize the market area for each Mexican restaurant. We will only use two variables, though you may like to try more.

- B02001_001 (Total number of persons in each block group) –use SUM as the statistic type in order to find the total number of persons in each market area.
- B19013_001 (Median Household Income) –use MEAN as the statistic type in order to find the (unweighted) mean for median household income in each market area.

The attribute table for the dissolved point theme now contains the statistics we selected for each of the Thiessen polygons.



If we wished to open a Mexican restaurant, we could use this information to identify a market area containing many people, and with relatively high income.

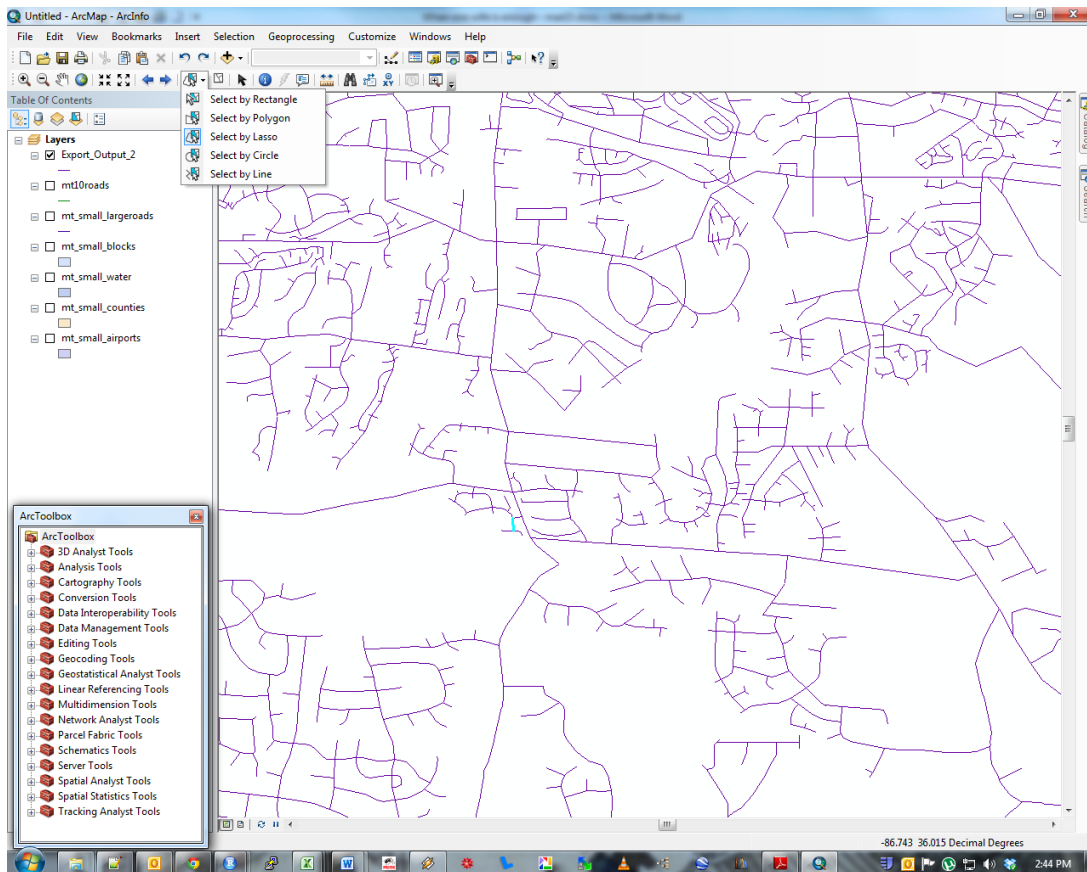
Finding market area characteristics for a business in the Nashville area.

Open ArcGIS. Click on the ‘+’ icon to bring in the following layers from *S:\teff\450\arcview*: *mt_small_blocks.shp*, *mt_small_water.shp*, *mt_small_counties.shp*, *mt_small_airports.shp*, and *mt_small_largeroads.shp*. Then, bring in the layer *mt10roads2010.shp* from the directory *S:\teff\450\arcview\MT10roads*. Copy *mt10roads2010.shp* and *mt_small_blocks.shp* to your “My Documents” directory (copy as “shapefile” format), and add your copies to the view.

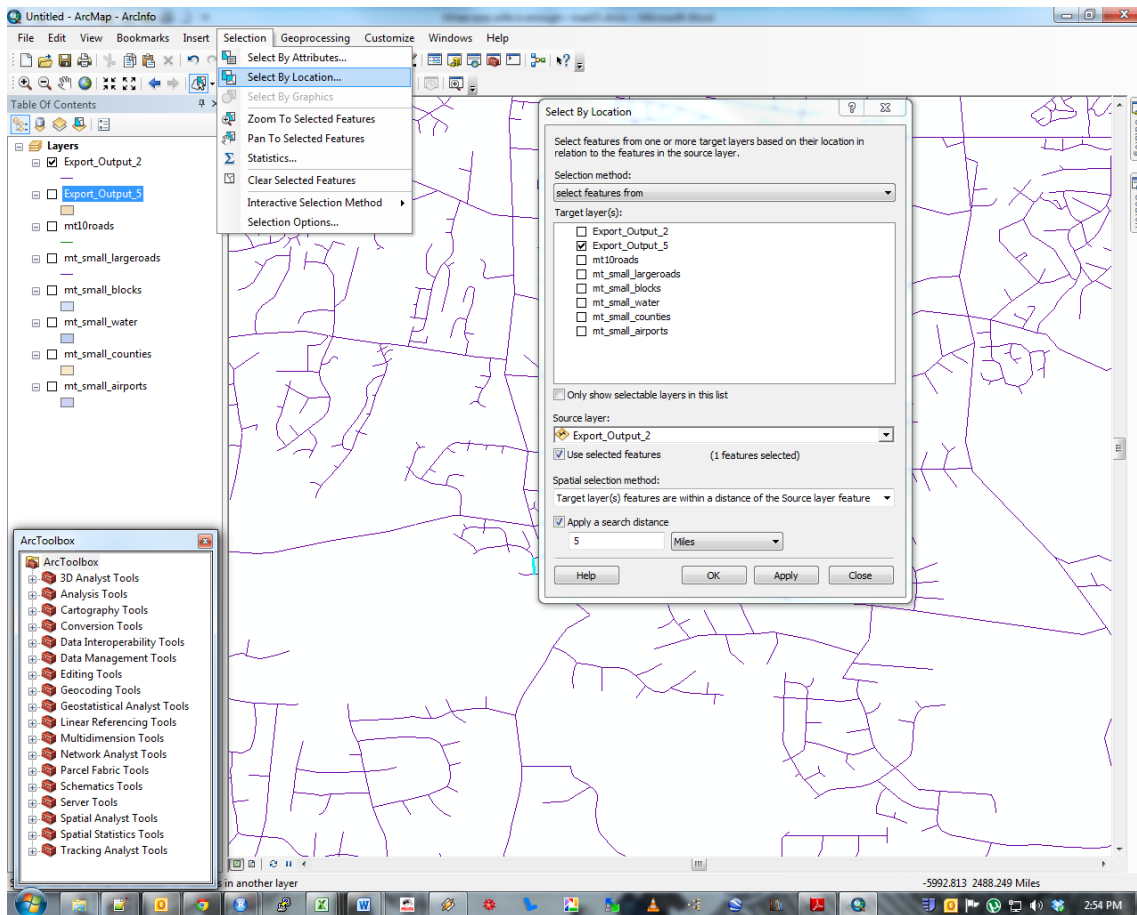
Your task is to produce one or two maps, as well as one or two tables or charts that will make up part of a business plan that you intend to present to a banker. In the maps you need to show the market area for your business, and in the tables you need to show figures for the number of persons or households in the relevant demographic for your market area. Since you need to convince the banker to lend you money, you will do your best to prepare meaningful maps and tables.

First, identify the location for your proposed business, using the street data (the file you created from *mt10roads2010.shp*). Zoom in close enough to see the location and some of the surrounding streets. Next, click on the icon for “select features” (a white arrow next to a rectangle half-white and half-blue), and click on “select by circle” in the drop-down menu. Then “circle” the street segment in front of your proposed location. That segment of street should now be bright blue. If other layers have also turned blue, right click on them in the Table of Contents, click “Selection”, and then click “Clear Selected Features”.

Click on “View” on the top menu, then click on “Data Frame Properties” at the bottom of the drop-down box. A dialog box appears: in the box for “Map”, enter “Decimal Degrees”; in the box for “Display”, enter “Miles”. Click “OK”.

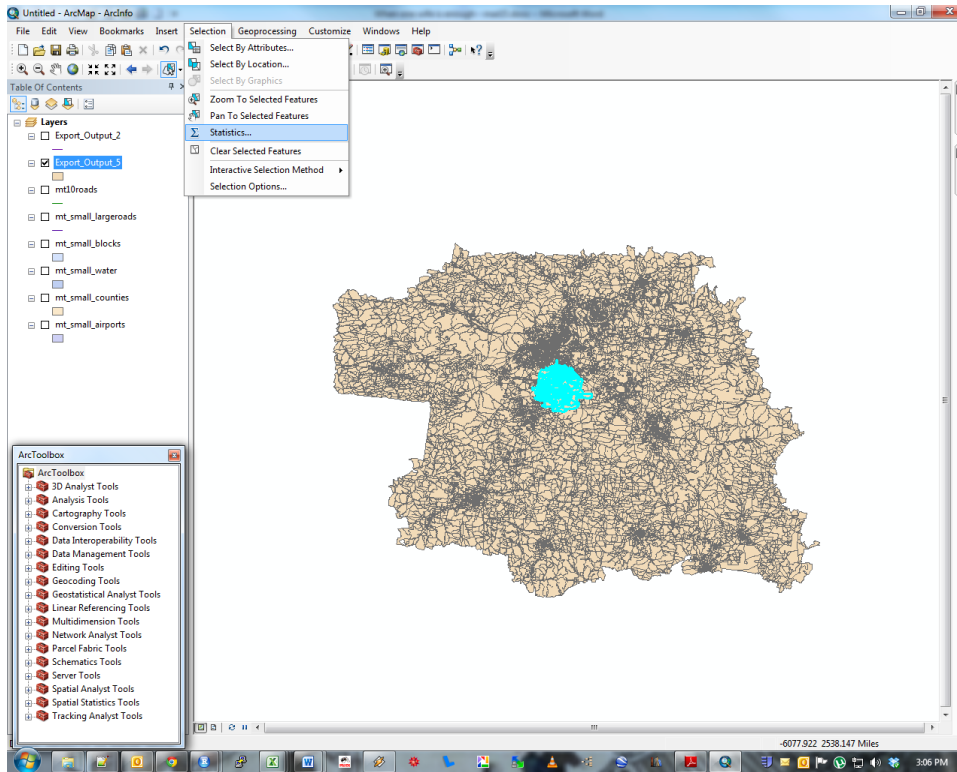


Now, go to “Selection” on the top menu bar, and click “select by location” in the drop-down menu.

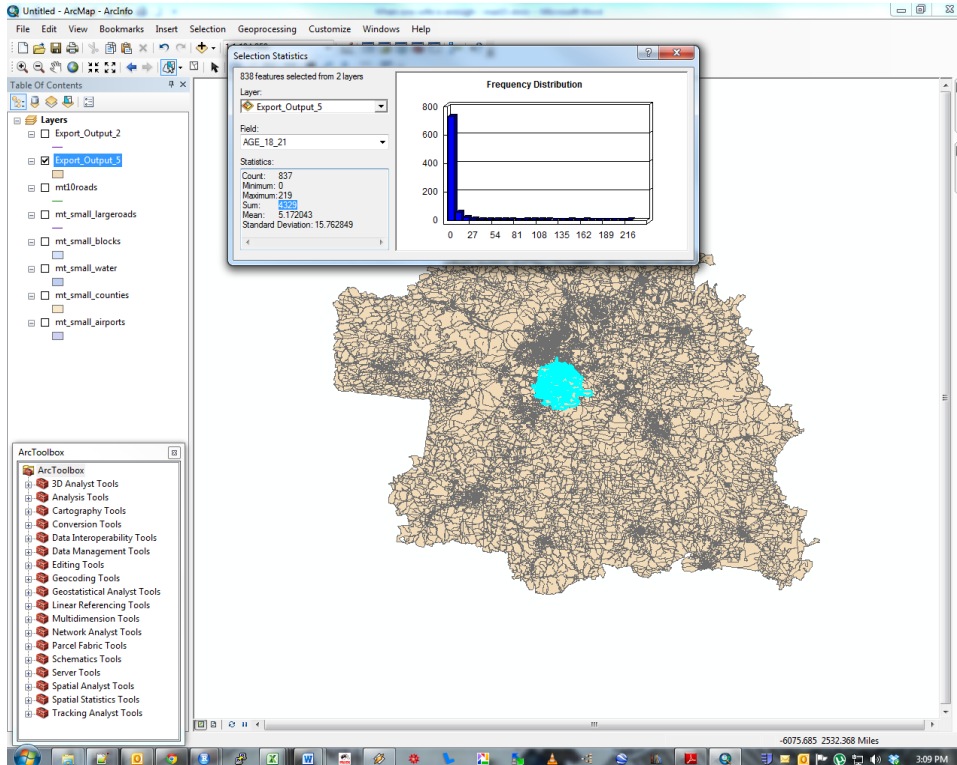


In the dialog box that appears, the first drop-down box should say “select features from”, and in the second box (titled “Target layer”) you should check the layer you made from *mt_small_blocks.shp*. The third box (titled “Source layer”) should have the name of the street map layer containing your selected street segment. Make sure the “Use selected features” box is checked. The “spatial selection method” box should say “Target layer features are within a distance of the Source layer feature.” Place a radius that you think is reasonable for your market area for the search distance. Click “OK”.

Click on the “Full extent” icon (a blue and green globe) to zoom out and see the entire view. You should be able to see if you picked a reasonable market area and if the selection procedure worked properly.



Now click again on “Selection” on the top menu bar and click “Statistics” on the drop down menu. A new dialog box appears, that will allow you to learn some statistics about the area you just selected.



An important rule about tables is that all the information should be relevant and meaningful. For example, the *Mean* value for AGE_18_21 in the figure above is not meaningful—the figure just tells one the average

number of young adults per census block in the area, which will not correlate well with expected revenue. The *Sum* figure, on the other hand, is relevant, since it tells the total number of young adults within the selected area—a figure that is likely to correspond well with expected sales (at least for a retail business selling goods to young adults).

Assignment for next Monday. This assignment is *individual* work, not group work. Prepare a one page proposal for a new business—make copies (20) to hand out to the class. You will have about five to seven minutes to make a pitch to the class for your business (best to do this with PowerPoint). Use ArcGIS to show the exact location of your business and to produce some information about its market area. You should also try to find some other information. For example, Google Maps street view would give you a picture of the site, and traffic count data can be found at <https://www.tn.gov/tdot/driver-how-do-i/look-at-or-order-state-maps/maps/traffic-maps.html>.

At the end of class, we will vote to select the winning proposal.

Variables in s:/TEFF/450/arcview/MTblocks2010.shp

Variable	Description
HD01_S01	Number; HOUSEHOLD POPULATION - Occupied housing units
HD01_S02	Number; HOUSEHOLD POPULATION - Occupied housing units - Owner-occupied housing units
HD01_S03	Number; HOUSEHOLD POPULATION - Occupied housing units - Owner-occupied housing units - Population in owner-occupied housing units
HD01_S04	Number; HOUSEHOLD POPULATION - Occupied housing units - Owner-occupied housing units - Average household size of owner-occupied units
HD01_S05	Number; HOUSEHOLD POPULATION - Occupied housing units - Renter-occupied housing units
HD01_S06	Number; HOUSEHOLD POPULATION - Occupied housing units - Renter-occupied housing units - Population in renter-occupied housing units
HD01_S07	Number; HOUSEHOLD POPULATION - Occupied housing units - Renter-occupied housing units - Average household size of renter-occupied units
HD01_S08	Number; HOUSEHOLD TYPE - Owner-occupied housing units
HD01_S09	Number; HOUSEHOLD TYPE - Owner-occupied housing units - Family households [1]
HD01_S10	Number; HOUSEHOLD TYPE - Owner-occupied housing units - Family households [1] - Householder 15 to 64 years
HD01_S11	Number; HOUSEHOLD TYPE - Owner-occupied housing units - Family households [1] - Householder 65 years and over
HD01_S12	Number; HOUSEHOLD TYPE - Owner-occupied housing units - Family households [1] - Husband-wife family
HD01_S13	Number; HOUSEHOLD TYPE - Owner-occupied housing units - Family households [1] - Male householder, no wife present
HD01_S14	Number; HOUSEHOLD TYPE - Owner-occupied housing units - Family households [1] - Female householder, no husband present
HD01_S15	Number; HOUSEHOLD TYPE - Owner-occupied housing units - Nonfamily households [2]
HD01_S16	Number; HOUSEHOLD TYPE - Owner-occupied housing units - Nonfamily households [2] - Householder 15 to 64 years
HD01_S17	Number; HOUSEHOLD TYPE - Owner-occupied housing units - Nonfamily households [2] - Householder 65 years and over
HD01_S18	Number; HOUSEHOLD TYPE - Owner-occupied housing units - Nonfamily households [2] - Male householder
HD01_S19	Number; HOUSEHOLD TYPE - Owner-occupied housing units - Nonfamily households [2] - Male householder - Living alone
HD01_S20	Number; HOUSEHOLD TYPE - Owner-occupied housing units - Nonfamily households [2] - Male householder - Living alone - 65 years and over
HD01_S21	Number; HOUSEHOLD TYPE - Owner-occupied housing units - Nonfamily households [2] - Male householder - Living with others
HD01_S22	Number; HOUSEHOLD TYPE - Owner-occupied housing units - Nonfamily households [2] - Female householder

Variable	Description
HD01_S23	Number; HOUSEHOLD TYPE - Owner-occupied housing units - Nonfamily households [2] - Female householder - Living alone
HD01_S24	Number; HOUSEHOLD TYPE - Owner-occupied housing units - Nonfamily households [2] - Female householder - Living alone - 65 years and over
HD01_S25	Number; HOUSEHOLD TYPE - Owner-occupied housing units - Nonfamily households [2] - Female householder - Living with others
HD01_S26	Number; HOUSEHOLD TYPE - Renter-occupied housing units
HD01_S27	Number; HOUSEHOLD TYPE - Renter-occupied housing units - Family households [1]
HD01_S28	Number; HOUSEHOLD TYPE - Renter-occupied housing units - Family households [1] - Householder 15 to 64 years
HD01_S29	Number; HOUSEHOLD TYPE - Renter-occupied housing units - Family households [1] - Householder 65 years and over
HD01_S30	Number; HOUSEHOLD TYPE - Renter-occupied housing units - Family households [1] - Husband-wife family
HD01_S31	Number; HOUSEHOLD TYPE - Renter-occupied housing units - Family households [1] - Male householder, no wife present
HD01_S32	Number; HOUSEHOLD TYPE - Renter-occupied housing units - Family households [1] - Female householder, no husband present
HD01_S33	Number; HOUSEHOLD TYPE - Renter-occupied housing units - Nonfamily households [2]
HD01_S34	Number; HOUSEHOLD TYPE - Renter-occupied housing units - Nonfamily households [2] - Householder 15 to 64 years
HD01_S35	Number; HOUSEHOLD TYPE - Renter-occupied housing units - Nonfamily households [2] - Householder 65 years and over
HD01_S36	Number; HOUSEHOLD TYPE - Renter-occupied housing units - Nonfamily households [2] - Male householder
HD01_S37	Number; HOUSEHOLD TYPE - Renter-occupied housing units - Nonfamily households [2] - Male householder - Living alone
HD01_S38	Number; HOUSEHOLD TYPE - Renter-occupied housing units - Nonfamily households [2] - Male householder - Living alone - 65 years and over
HD01_S39	Number; HOUSEHOLD TYPE - Renter-occupied housing units - Nonfamily households [2] - Male householder - Living with others
HD01_S40	Number; HOUSEHOLD TYPE - Renter-occupied housing units - Nonfamily households [2] - Female householder
HD01_S41	Number; HOUSEHOLD TYPE - Renter-occupied housing units - Nonfamily households [2] - Female householder - Living alone
HD01_S42	Number; HOUSEHOLD TYPE - Renter-occupied housing units - Nonfamily households [2] - Female householder - Living alone - 65 years and over
HD01_S43	Number; HOUSEHOLD TYPE - Renter-occupied housing units - Nonfamily households [2] - Female householder - Living with others
D001	Total Persons:
D002	Male Persons:
D003	Male Persons: - Under 5 years
D004	Male Persons: - 5 to 9 years
D005	Male Persons: - 10 to 14 years
D006	Male Persons: - 15 to 17 years
D007	Male Persons: - 18 and 19 years
D008	Male Persons: - 20 years
D009	Male Persons: - 21 years
D010	Male Persons: - 22 to 24 years
D011	Male Persons: - 25 to 29 years
D012	Male Persons: - 30 to 34 years
D013	Male Persons: - 35 to 39 years
D014	Male Persons: - 40 to 44 years
D015	Male Persons: - 45 to 49 years

Variable	Description
D016	Male Persons: - 50 to 54 years
D017	Male Persons: - 55 to 59 years
D018	Male Persons: - 60 and 61 years
D019	Male Persons: - 62 to 64 years
D020	Male Persons: - 65 and 66 years
D021	Male Persons: - 67 to 69 years
D022	Male Persons: - 70 to 74 years
D023	Male Persons: - 75 to 79 years
D024	Male Persons: - 80 to 84 years
D025	Male Persons: - 85 years and over
D026	Female Persons:
D027	Female Persons: - Under 5 years
D028	Female Persons: - 5 to 9 years
D029	Female Persons: - 10 to 14 years
D030	Female Persons: - 15 to 17 years
D031	Female Persons: - 18 and 19 years
D032	Female Persons: - 20 years
D033	Female Persons: - 21 years
D034	Female Persons: - 22 to 24 years
D035	Female Persons: - 25 to 29 years
D036	Female Persons: - 30 to 34 years
D037	Female Persons: - 35 to 39 years
D038	Female Persons: - 40 to 44 years
D039	Female Persons: - 45 to 49 years
D040	Female Persons: - 50 to 54 years
D041	Female Persons: - 55 to 59 years
D042	Female Persons: - 60 and 61 years
D043	Female Persons: - 62 to 64 years
D044	Female Persons: - 65 and 66 years
D045	Female Persons: - 67 to 69 years
D046	Female Persons: - 70 to 74 years
D047	Female Persons: - 75 to 79 years
D048	Female Persons: - 80 to 84 years
D049	Female Persons: - 85 years and over
