Exercise 3: Creating a Geodatabase

Introduction:
A database (DB) is an organized collection of data, that we can visualize as being a group of tables. An example of a simple database can be seen below:

Student Table

StudentID	Name	Major
3421	Jones	SIS
8725	Dow	BIO
…		

Registration Table

Student_ID	CRN	Grade
3421	333	A
3421	222	C
8725	555	B
8725	666	B-
8725	777	C+

Course Table

CRN	Title	Instructor
333	Aaaaaa	Holden
222	Bbbbbb	Taylor
555	Bbbbbb	Taylor
666	Cccccc	Allen
777	Dddddd	Kemp

Instructor Table

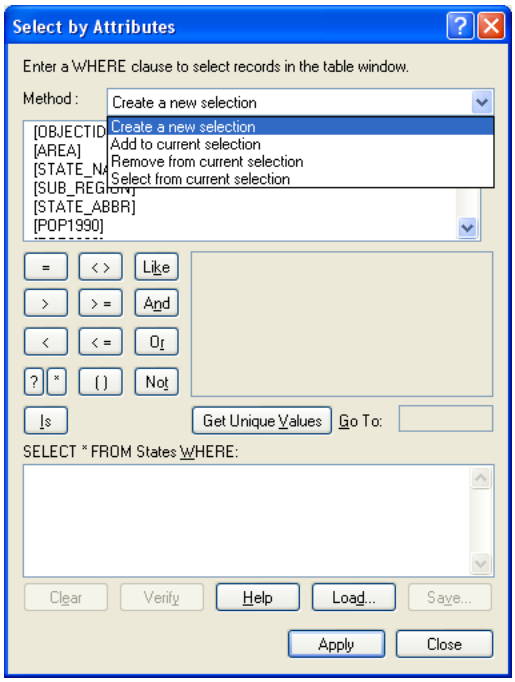
Instructor	Instructor _Office
Holden	127 Bd
Taylor	222 M
Taylor	222 M
Allen	351 B
Kemp	317 Nv

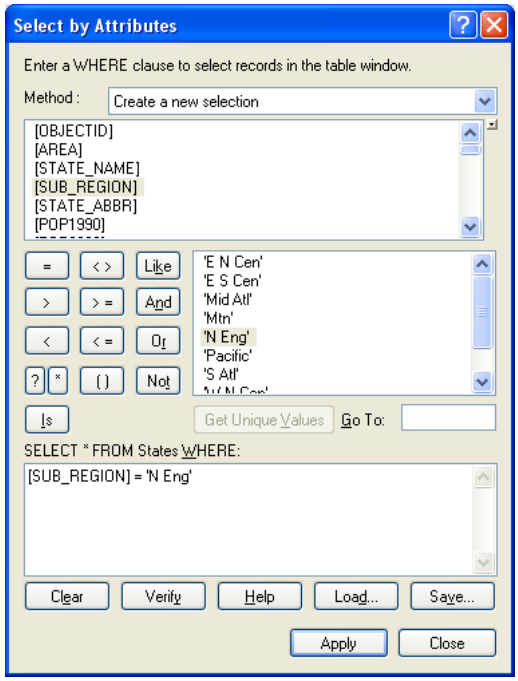
Some important database concepts/terminology :

- Each table contains the data for a single entity, such as information about students.
- Each instance of an entity is a row/record/tuple in a table. This is a specific instance of the entity. Each row is a specific student.
- Columns contain attributes/fields that describe the entity.
  - Attributes must be from the same domain (text, integer, date).
  - An attribute may have a range (e.g.; $0 \leq$ integers ≤ 100)
  - Column order has no significance.
- Tables are related through keys.
- Each table must have a primary key, one or more attributes that uniquely identify a row in the table. In the above example the primary key for each table is underlined.

We usually manage a database with a database management system (DBMS). A DBMS provides you with the software tools you need to organize that data in a flexible manner. It includes tools to add,

modify or delete data from the database, ask questions (or queries) about the data stored in the database and produce reports summarizing selected contents. Questions or queries can be made of one table or several tables at the same time. Queries are made using SQL (Structured Query Language), however in many systems this is facilitated through icons, menus or dialog boxes. ArcGIS uses a dialog box. First you select the table you are querying, then the method; i.e. what do you want to do; create a new query, add to an existing query, delete from an existing query, or select from an existing query. Next you select the column name and the specific value for which you are searching. In the example below, we are making a new selection from the States Table. The column is Sub_Region, and we are looking for the sub_region that is New England.





The SQL statement in the dialog box is "SELECT *from States Where Sub_Region = N Eng". Here the asterisk (*) is a "wildcard" which means select all of the information in the table for the sub-region. Queries can be made more complex, by using AND, OR, NOT , various arithmetic and logical operations. Some of these complex queries will be examined in the exercise on table.

A geodatabase links the spatial (location) data to the attribute (descriptive) data. In ArcGIS, this creates an interaction between the map and the database. If an object is highlighted on the map, its descriptive information is highlighted in the table. ArcGIS provides three types of geodatabases: a personal geodatabase for a single user, a file geodatabase for small work groups, and an enterprise geodatabase for many users. We are going to create a personal geodatabase for the city of Bangor. You will be able to use this geodatabase for exercises 7 and 8.

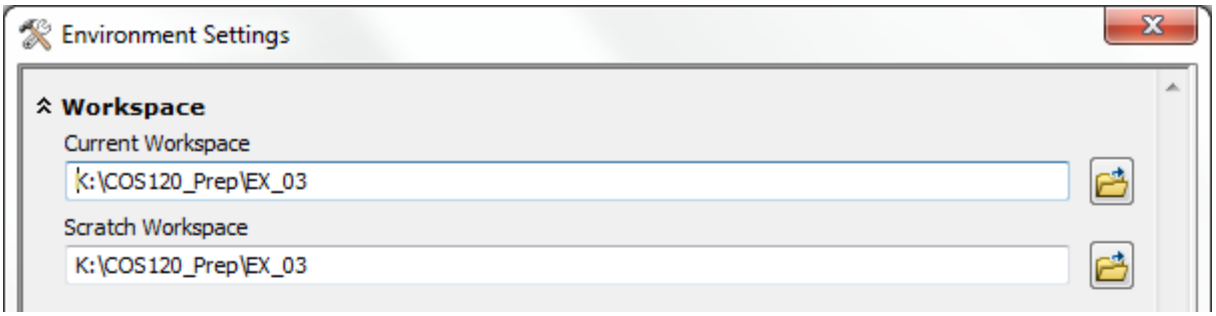
Procedure:

1. Download and extract the Ex_03 data.
2. Open ArcCatalog and connect to your COS120, Exercise 3 folder.
   a. Right-click on the folder.

b. Select New > Personal Geodatabase .
c. Name it Bangor_ME.
d. Right-click on the DB symbol, and select New > Feature Dataset.
d. Name the Feature Dataset Bangor.
   i. Click Next.
   ii. Select a projected coordinate system > UTM > NAD 1983 > Zone 19N.
   iii. Click Next > >Finish.

NOTE: " A feature dataset is a collection of related feature classes that share a common coordinate system. Feature datasets are used to spatially or thematically integrate related feature classes. Their primary purpose is for organizing related feature classes into a common dataset for building a topology, a network dataset, a terrain dataset, or a geometric network." ArcGIS Desktop Help http://webhelp.esri.com/arcgisdesktop/9.2/index.cfm?TopicName=An_overview_of_working_with_feature_datasets.

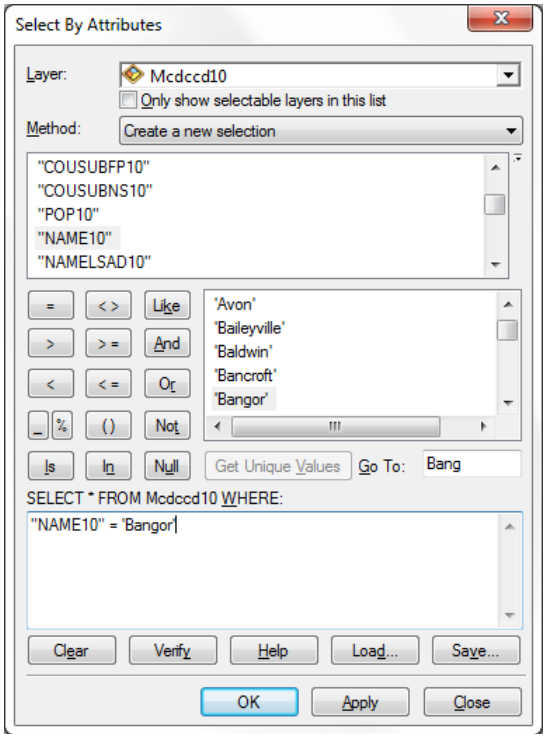
3. Close ArcCatalog and open ArcMap to a new blank map.
4. Save your map as Bangor.
5. From the Geoprocessing menu, select Environments and set your Workspace and Scratch workspace to your Ex_03 folder and click OK.



6. Add the following shapefiles to your map:
   a. Mcdccd10.shp
   b. Parcels.shp
   c. Ng911rdss.shp
7. From the Selection menu, choose Select by Attributes.
   a. Make the Layer: Mcdccd10.
   b. Method: Create a new selection
   c. Field: Name10
   d. Query: "NAME10" = 'Bangor'
   e. Click OK.

NOTE: Create the query by selecting items from the dialog box.

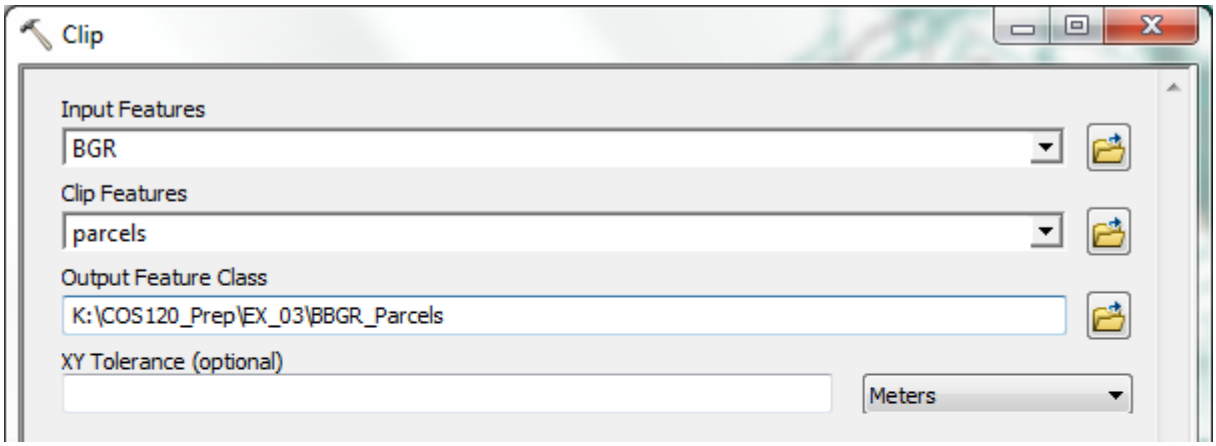
Bangor should now be highlighted on your map.



8. Right-click on Mcdccd10 in the TOC and select Data > Export Data, and save the selected polygon to your Feature Dataset as BGR.
9. Right-click on Mcdccd10 and select Remove.
10. From the Geoprocessing menu select Clip.

The clip operation allows one feature to act as a "cookie cutter" on another feature. We are going to use BGR to clip each of the other shapefiles, storing the result in the Feature Dataset.

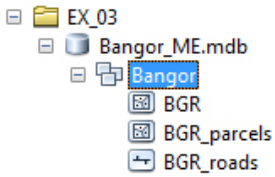
a. First we will clip the Parcels.shp and store the result in the Feature Dataset as BGR_parcels.



i. Click OK.
ii. You can see that it is being processed by watching the message in the lower right corner of the screen. If the process completes successfully a box will appear with a checkmark. If unsuccessful an error message will appear.
iii. Remove Parcels from your map.

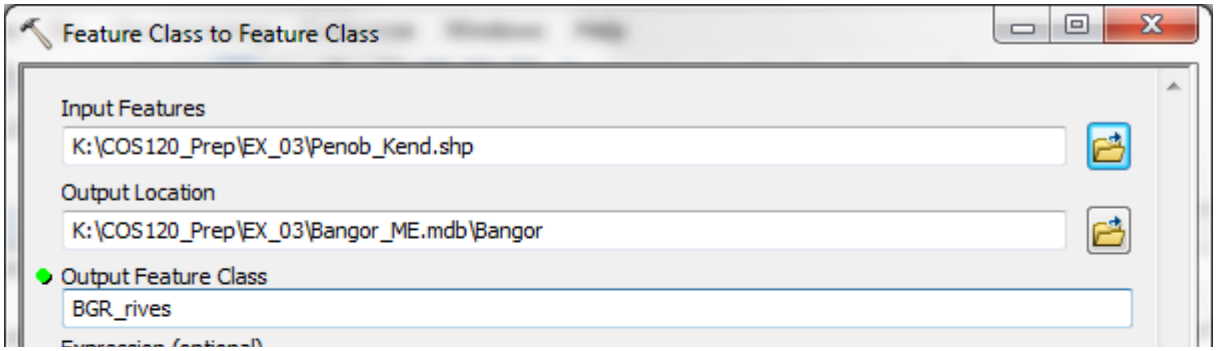
b. Clip ng911rdss, saving the result in your feature data set as BGR_roads and remove ng911rdss.
c. Your map should now have only the three BGR files and should only show Bangor features.

11. Save your project . Close ArcMap and open ArcCatalog. Your Feature Dataset should now contain 3 files:

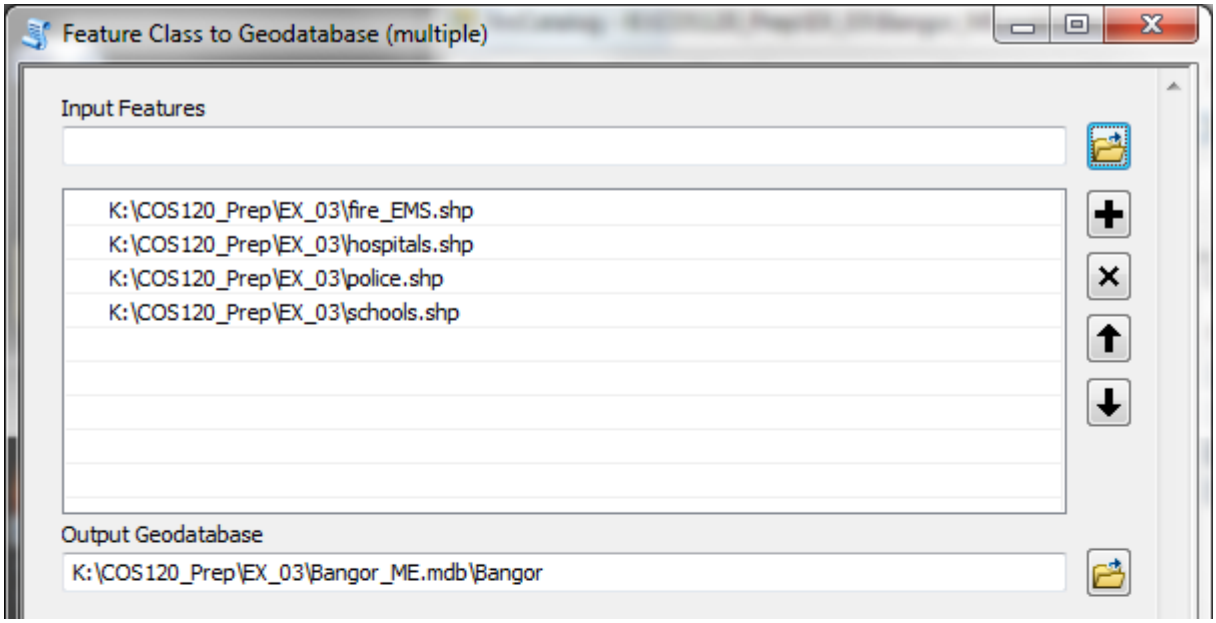


There are other ways of getting files into your geodatabase. We may already have a shapefile that matches the characteristics of our Feature Dataset, so it needs no processing before importing it.

12. Right-click on your Feature Dataset and select Import > Feature Class (single).
    a. The Input feature is Penob_Kend.shp
    b. Be sure you are saving it in your Feature Dataset.
    c. The Output feature is BGR_rivers.
    d. Click OK.



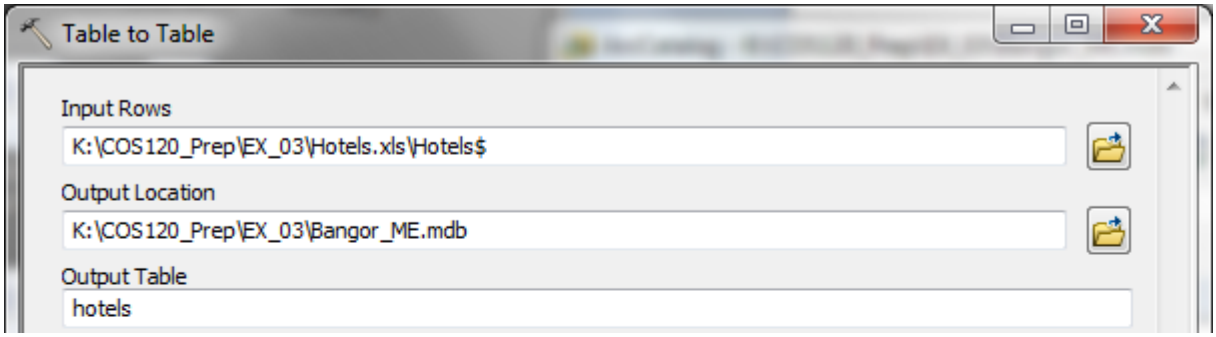
13. Right-click on your Feature Dataset and select Import > Feature Class (multiple) and import and add the following files to your Feature Dataset:
    a. Hospitals
    b. Schools
    c. Fire stations
    d. Police stations



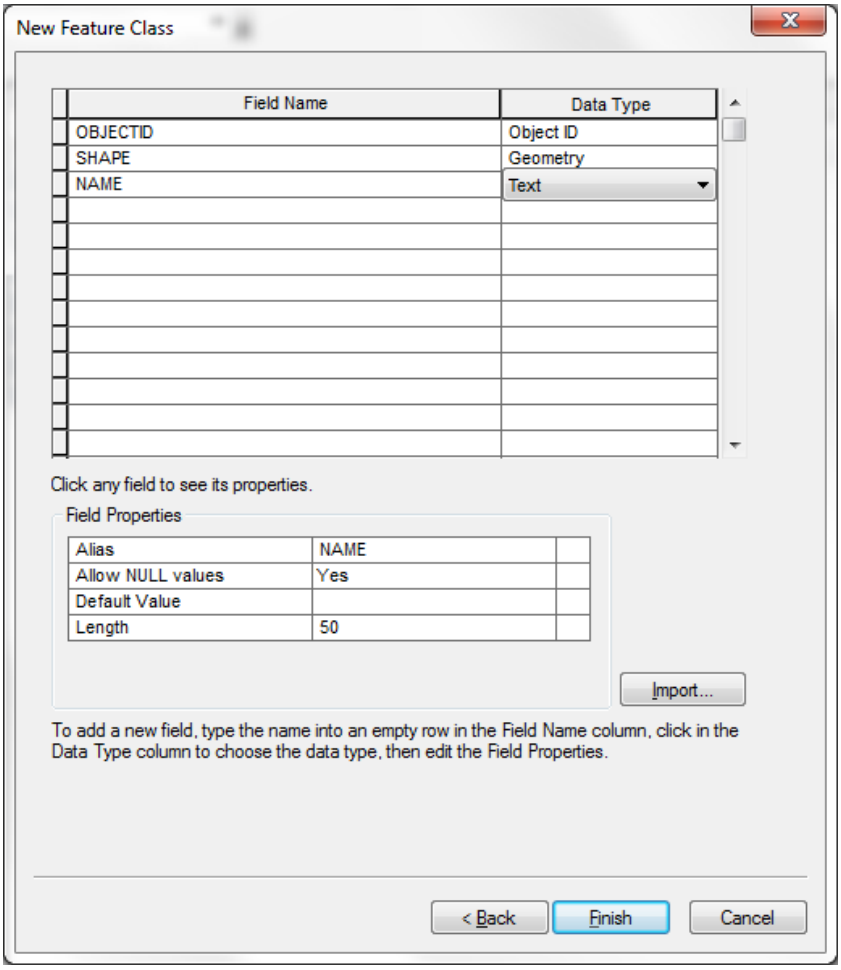
    e. Click OK.

Only shapefiles can become features and are able to be stored in our Feature Dataset, but we can store tables, images and rasters outside of our Feature Dataset, but inside our database. We will add an Excel table of local hotels to the database.

14. Right-click on the database and select Import > Table (single).
    a. Browse to Hotels.xls in your Ex_03 folder and click Add.
    b. Select Hotels$ and click Add.
    c. Name the Output table hotels and click OK.

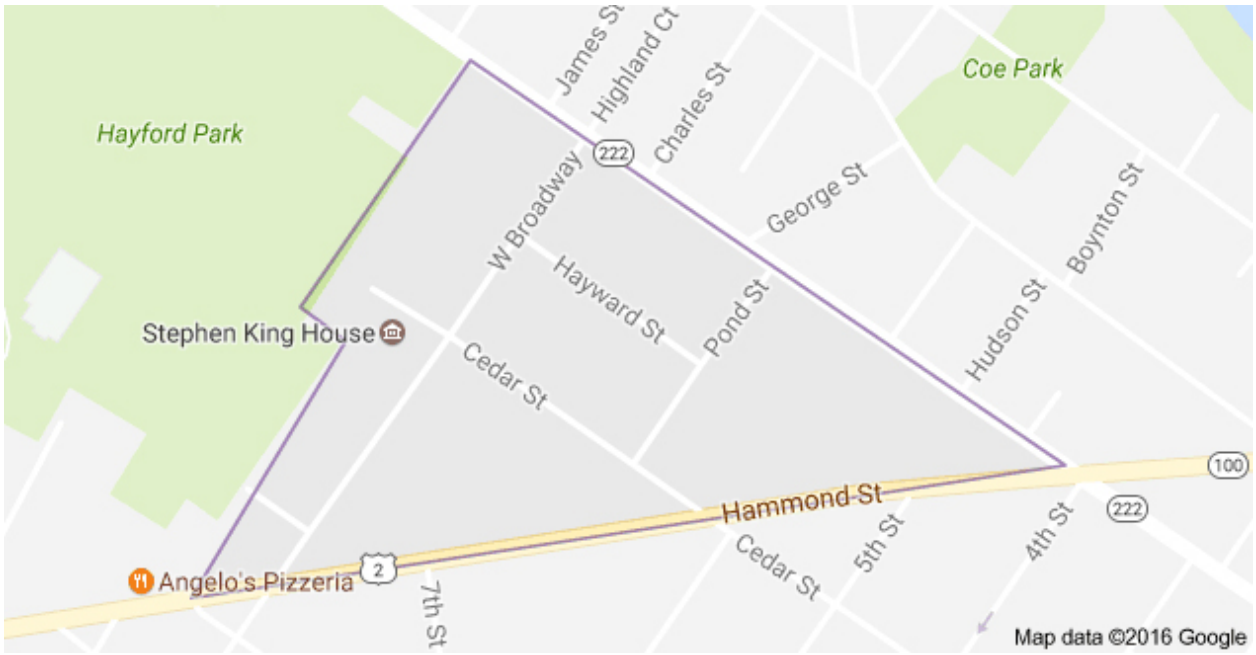


15. We can also create new features.
    a. Right-click on your Feature Dataset and create a new **polygon** Feature Class called Neighborhoods and click Next.
    b. In the New Feature Class dialog box add NAME, type Text and click Finish. This creates a place holder for the file we will be creating.



16. Close ArcCatalog and open ArcMap to Bangor.mxd.

The City of Bangor lists 13 distinct neighborhoods and 4 subdivisions. We will create only one , the Whitney Park Historic District. the others would be done in the same way. The Whitney Park Historic District, consists of the section of West Broadway between Union and Hammond Streets, and Cedar Street down to Hammond Street. It is home to large mansions including the home of Stephen King. http://bangorlocal.bgrweb.com/bangor-maine-neighborhoods/west-broadway-whitney-park/



17. Uncheck all features except BGR, BGR_roads and BGR_rivers.
18. Add Neighborhoods to your project.
19. From the Selection menu, choose Select by Attributes.
    a. The layer is BGR_roads.
    b. Method: Create a new selection.
    c. Create the following query:

[STREETNAME] = 'Hammond' OR [STREETNAME] = 'Union' OR [RDNAME] = 'W Broadway'

    d. Click OK.
20. Zoom into the triangle formed by the three streets.
21. Click on the Editor icon on the toolbar.

    a. From the Editor drop down menu, select Start Editing.
    b. If shown a list of locations, select your Bangor database.
    c. On the editor toolbar select the last icon on the right (Create Feature), opening a new panel on the right of your screen.
    d. Click on Neighborhoods and select the polygon construction tool.
        i. Start at little above the upper vertex of the triangle (on Union Street), and click to set a vertex.
        ii. Go to the intersection of Union and Hammond and click to set a second vertex.

iii. Follow along Hammond Street clicking multiple times along the road to maintain the shape of the road. Continue to the next intersection and set a vertex.
iv. Go to the next road and set a vertex.
v. Go up so that you are about the level of your starting point, right-click and select Finish Sketch.
vi. If you are satisfied with your result, from the editor drop down menu select Save Edits. If you are not satisfied, you can delete your sketch and start again.

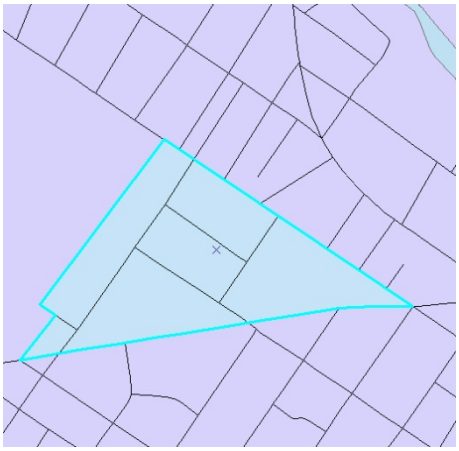


Figure 1: Finished Sketch

22. Open the Neighborhoods attribute table and in the column labeled Name, enter Whitney Park.
23. Again save your edits > Stop Editing.

For the time being, you have completed your Bangor_ME database. You will be able to add to it and use in future exercises.