

Introduction

The data preparation and spatial analyses performed through this assignment will be applied to narrow the initial selection of potential sites for locating an AD facility in Boston.

Question: How can applying criteria important to siting an AD facility narrow the selection of suitable sites?

Coordinate System

Since this project is based in the city of Boston, the most appropriate coordinate system is:

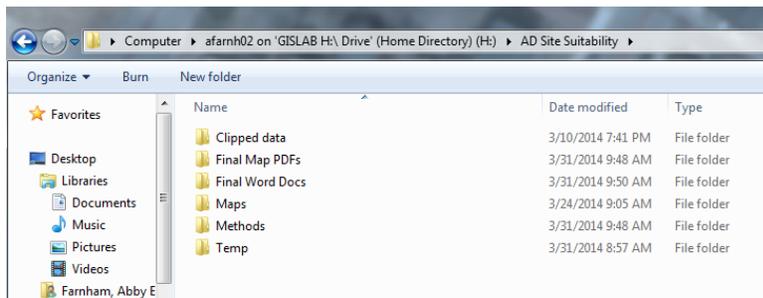
Name: NAD_1983_StatePlane_Massachusetts_Mainland_FIPS_2001_Feet

Projection: Lambert_Conformal_Conic

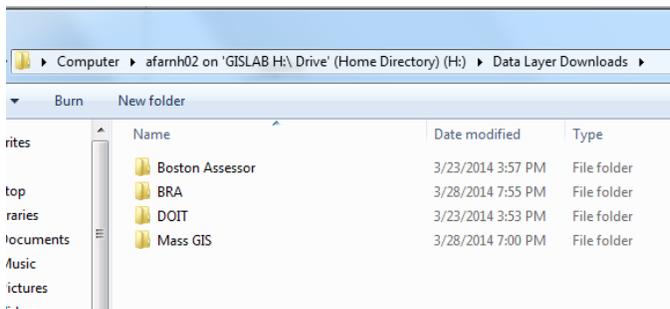
Linear Unit: Foot_US

Folder Structure

Specific project documents and data that have resulted from analysis:



Data downloads are in separate folder organized by data source:



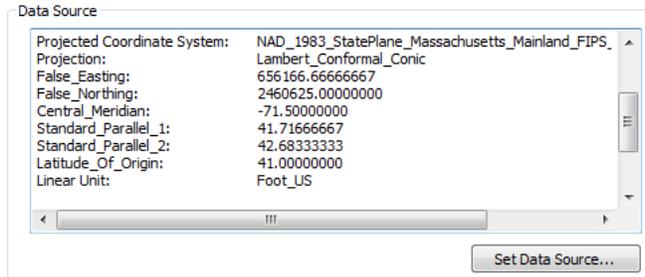
Data Layers

Boston Neighborhoods

Source: BRA

Original layer name: Bos_neighborhoods_new

Preprocessing: Since this is City data, it was already properly projected. Select by attribute was used to select the Boston neighborhoods that complete the study area: Roxbury, Dorchester, Mattapan and Hyde Park. This was used as the 'Source Layer' in select by location queries for all other data layers in order to reduce the data sets to the study area.



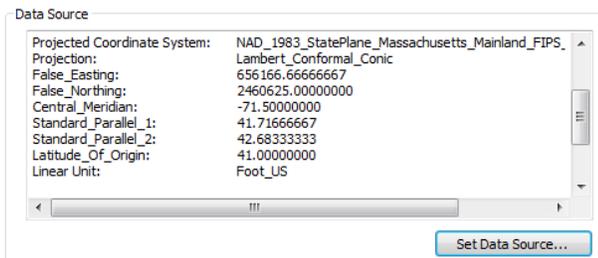
SHAPE_area	SHAPE_len	Area_Acres
91844545.3864	49488.800485	2108.469072
127509244.028	66861.244955	2927.221168
58897168.6983	42005.773707	1352.098354
203114216.708	104344.034005	4662.879457

Zoning Sub-districts

Source: Boston Redevelopment Authority (BRA), received via email from BRA

Original layer name: Zoning_subdistricts

Preprocessing: Since this is City data, it was already properly projected. Select by attribute was used to select for zoning sub-districts that allow for industrial use. This query was informed by the BRA. The resulting sub-districts that allow for industrial use were then reduced to those that *intersect* with the study area. Selecting for those sub-districts that fall *within* the study area was not an optimal approach because the boundaries of the polygons do not line up and some sub-districts that have just a portion of their polygon falling outside the study area would have been excluded.



LABEL	Shape_area	Shape_len	Area_Acres
<Null>	46344.351416	955.308557	1.063924
<Null>	93906.362494	1609.998895	2.155802
<Null>	5393406.1882	12962.868239	123.816064
<Null>	407132.691142	4130.495499	9.346518
<Null>	187026.897371	1955.28315	4.293564
<Null>	1343676.49937	6165.991348	30.846691
<Null>	746441.689083	3878.857654	17.136012
<Null>	2645043.42624	7832.567714	60.722085
<Null>	204003.572126	2065.247688	4.706024

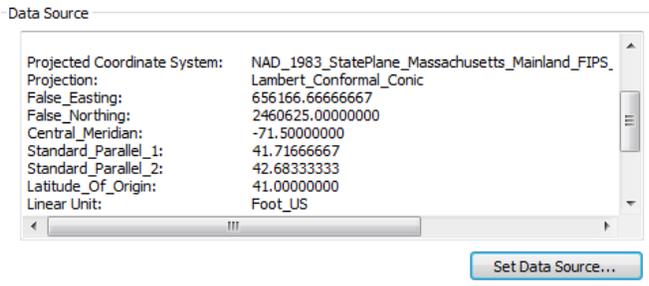
(1 out of 35 Selected)

Parcels

Source: Boston Assessing Dept., Tufts GIS Data Server

Original layer name: boston_parcels_FY09_modified

Preprocessing: Since this is City data, it was already properly projected. Select by location was used to select for parcels that *intersect* with the study area, for the same reasons mentioned above.



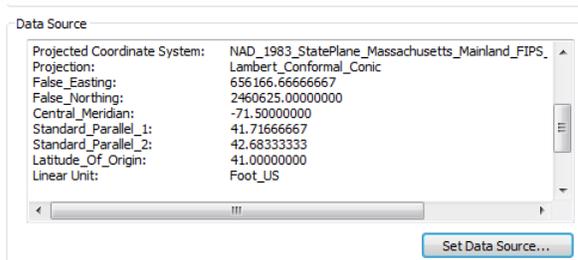
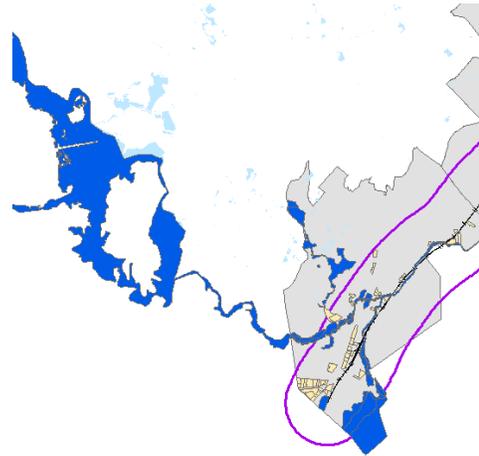
CM_HALFBA	CM_FIREPL	Area_Sqft	Area_Acres
0	0	51835.976478	1.189995
0	0	77590.2389	1.781234
0	0	205091.045492	4.708261
0	0	57899.436029	1.329193
0	0	38870.918236	0.892357
0	0	120896.950248	2.775423
0	0	57908.149322	1.329394
0	0	66657.788065	1.530258
0	0	35359.131409	0.811737
0	0	70689.385058	1.622352
0	0	54799.873119	1.258037
0	0	37888.256939	0.869798
0	0	73805.336044	1.694344
0	0	87173.354602	2.001233
0	0	133312.501288	3.060446
0	0	34276.881885	0.786892
0	0	43384.30818	0.995971

Flood Zones

Source: MassGIS, FEMA National Flood Hazard

Original layer name: FEMA_NFHL_POLY

Preprocessing: The data layer was initially in the correct projected coordinate system and projection, but the linear unit needed to be changed from METERS to FEET. Select by location was also used on this layer to select for flood zones that are *within* the study area, but this excluded necessary zones that drifted in and out of the neighborhoods study area (nature doesn't follow our political boundaries?!). So again zones were selected that *intersect* with the study area; however, this is also not ideal as one zone that intersected with the boundary travelled very far out of the study area as shown below.



SHAPE_AREA	SHAPE_LEN	Area_Acres
466651.692616	11781.861373	115.312145
113900.961226	4837.682191	28.14654
11116.795644	1148.014166	2.74702
52370.525068	1410.359687	12.941039
381552.780252	3907.240454	94.283745
16323.716166	1255.395575	4.039678
88222.865596	2141.271944	21.800345
6569.108193	407.19021	1.623262
601.657145	184.587838	0.470763

(1 out of 70 Selected)

Railroads

Source: MassGIS

Original layer name: TRAINS_ARC

Preprocessing: Initially I tried using the City of Boston’s ‘RAIL’ layer, but the data was only for active railroads, and my purpose for using the rail data was to create a buffer around the proposed Fairmont Corridor, which is not fully active so the necessary data was incomplete. The MassGIS layer had the full commuter rail that the Fairmont Corridor follows. Like the flood zone data layer, this MassGIS layer needed to be projected into FEET. Select by attribute was used to select for the Fairmont Corridor line, which through the ‘identify’ tool I learned it is called the ‘Dorchester Branch’ in MassGIS. This branch extends north beyond the study area, and also travels outside of the area slightly in other locations, so again I was not able to select by location for *within* the study area.

Data Source

Projected Coordinate System: NAD_1983_StatePlane_Massachusetts_Mainland_FIPS_...
 Projection: Lambert_Conformal_Conic
 False_Easting: 656166.66666667
 False_Northing: 2460625.00000000
 Central_Meridian: -71.50000000
 Standard_Parallel_1: 41.71666667
 Standard_Parallel_2: 42.68333333
 Latitude_Of_Origin: 41.00000000
 Linear Unit: Foot_US

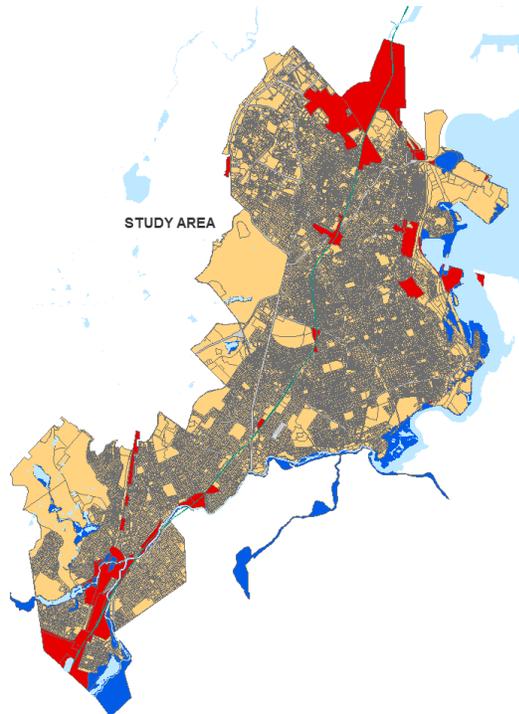
Set Data Source...

ASSET	ASSET_ID	SHAPE_Leng	Length_FT
	0	246.343903	808.21329
	0	43.52611	142.801914
	0	171.187571	561.63789
	0	587.752189	1928.316973
	0	443.072971	1453.648571
	0	87.852146	288.22825
	0	68.724445	225.473448
	0	63.96829	209.869298
	0	180.972468	593.740505
	0	269.558609	884.376868
	0	283.610291	930.478097
	0	536.809658	1761.183019
	0	504.555294	1655.361825

**I initially avoided the ‘Clip’ tool since I did not want to cut parcels or sub-districts off, but this tool could have made some of my problems with reducing the other layers easier, without having affected accuracy of data.

Reduced study area:

- Layers
- Hydro City of Boston
- Railroad_Dorchesterbranch_clipped
- Flood_zone_clipped
- Industrial_zoned_subdistricts_clipped
- Boston_parcels_09_clipped
- Boston_neighborhoods_clipped



Spatial Analysis Tools

Select by Location

- Select for parcels completely within flood zones, switch selection to get those parcels not completely in flood zone – problematic because some parcels that have all but a tiny portion in flood zone weren't selected this way when they should be excluded
- Select again for parcels that intersect flood zones, switch selection – also not perfect approach, as some parcels were excluded that only had a tiny portion in a flood zone, and may still have been suitable
- Select from current selection for parcels that intersect with industrial sub-districts – again *intersect* was used over *within* because the polygon boundaries do not perfectly match
- Select from current selection for parcels that intersect with a railroad (expanded rails to include others in addition to Dorchester Branch) in an attempt to eliminate the long sliver parcels that frequent the border of the rails – this was somewhat effective; mostly the slivers were selected, though a few larger potentially-suitable parcels were also selected

Select by Attribute

- Select from current selection above for "LU" = 'C' OR "LU" = 'CL' OR "LU" = 'E' OR "LU" = 'EA' OR "LU" = 'I' OR "LU" = 'XX' to eliminate any parcels currently being used for residential or condo purposes
- Create new layer from selected features = 859 parcels
- Select for parcels with area greater than or equal to .75 acres (a predetermined metric researched by Field Project member as minimum parcel size needed for AD facility)
- Create new layer from selected features = 126 parcels
 - This step strictly eliminates parcels that don't meet minimum size threshold, but another approach must be taken with the same size metric to select for parcels with a minimum amount of .75 acres of undeveloped land, through applying the 'Building Footprint' layer and then using the *erase* tool and calculating the remaining area

Buffer

- Buffer around Dorchester Branch railroad – The Fairmont Indigo Planning Initiative defines the Fairmont Corridor as a .5 mile radius from each transit station. A .5 mile buffer was calculated for the entire railway, which is not the same analysis as from each station, but since some of the stations are still being built I was unsure if we had access to that data.
- Since political and economic support for siting an AD facility for our Field Project partner, CERO, may be more likely to be available for sites located within this developing area, we may score or rank sites higher that fall within this buffer.

Summarize

- The LU (Land Use) field of the parcel data layer was used to summarize LU by acres of land. This shows the acres of each type of land use. As shown in the screen shot below, the Exempt, or publicly-owned land makes up the most acreage of land uses. Interestingly there are more Industrial parcels, but they must not be as large in area.

OID	LU	Count_LU	Sum_Area_Acres
0	C	30	53.104729
1	CL	8	25.976623
2	E	69	441.64197
3	EA	5	9.721118
4	I	72	186.089633

The narrowed site selection is below, showing the 'Fairmont Corridor' and the sites that would be more attractive if a higher score is given to those that fall within this area.

