

GIS-Based Potential Site Suitability Analysis

---Locating future store for Whole Foods Market in City of Santa Monica

1. Abstract

With the global economy developing at a massive speed, it is unlikely for chain stores to expand business in the traditional way anymore. Product is no longer the promise to success of a business, in this highly competitive and post-mass production era we live in, efficient, accurate and effective operating mode has become equally or even more important. Accompanying with the fast developing trend, potential business site analysis has evolved from a choice of personal preferences to a rather scientific and comprehensive study that takes into account a vast range of social and economic factors, ensuring a relatively lower risk for expanding companies. In addition to that, Geographic Information System (GIS) has made all these analysis and management no longer abstract as they sound in theory. This project aims at illustrating how GIS serves as an effective tool in making business decisions by conducting a case site suitability study for Whole Food Market in city of Santa Monica.

2. Introduction

The brand of Whole Foods Market is well known for its quality, active role in environmental protection and promotion about Healthy lifestyle. Started at Austin, Texas, the company has now expanded to 12 geographic divisions around the world and California is one of the largest. In a recently conducted survey, Whole Food Market was ranked as the NO.1 organic supermarket in the U.S., affirming its effort for promoting “natural and organic food”. The reasons why Whole Food Market is selected as the business for this study are: 1) Whole Foods Market has a reasonable amount of existing stores in Santa Monica. It is not just a common supermarket like Target or Walmart, so not too many stores are already existed and the result for mapping would be more distinct.

2) Due to its clear and successful marketing, it is easier to pick out a competing brand supermarket that pursuit the same emphasis on healthy food. 3) Its branding for organic food and healthy lifestyle ensures a clear and comprehensive set of criteria concerning education background, transportation and demography for selecting the potential store location.

City of Santa Monica is a famous beach city as well as a tourist attraction. This 8-squar- mile of land is home to nearly 90,000 people. Relatively higher average income

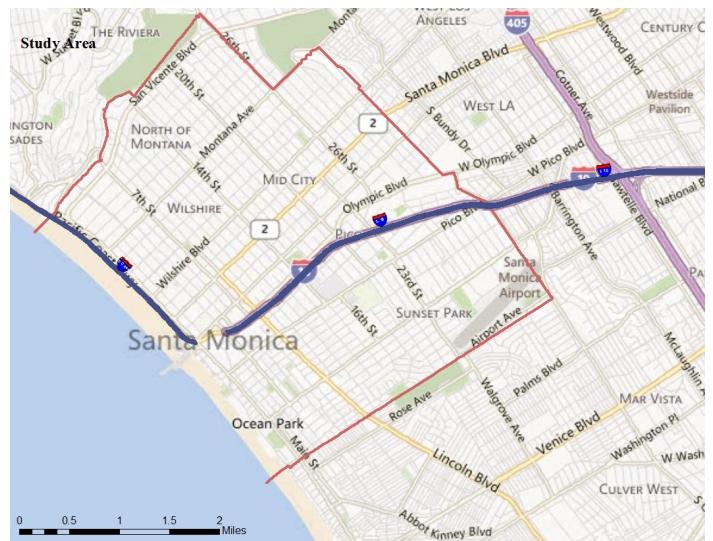


Figure 1: study area

level and education level within the Los Angeles County made this city a suitable site for our study. Existing Whole Food stores suggest people's acceptance of the brand and its product. The adoption of the sustainable city plan in 1994 and the overall caring atmosphere of the local community further reveal the promising potential of a future Whole Market Store.

3. Method

The study is divided into two parts. In the first part, GIS is adopted for laying out existing Whole Food Market locations and competing stores, processing the set of criteria in the study area and narrowing downing the potential area for future store. In the second part, property search will be carried out on Loopnet (<http://www.loopnet.com/>) selecting for property that meets the criteria such as square footage, parking space and etc.

● Criteria

When selecting a new business location, certain general standards would be taken into consideration, no matter what kind of business it is, such as urban setting, easy access from traffic, locating in commercial hub and the surrounding area at certain level of density. In addition to general standards, a specific set of criteria concerning targeting customers within certain income range, age group and race, store square footage requirement would be applied in the process of further narrowing down the potential area. Below is the set of criteria for retail expansion from the website of Whole Foods Market:

- 20,000 people or more in a 20-minute drive time
- 25,000-50,000 Square Feet
- Large number of college-educated residents
- Abundant parking available for our exclusive use
- Stand-alone preferred, would consider complementary
- Easy access from roadways, lighted intersection
- Excellent visibility, directly off of the street
- Must be located in a high traffic area (foot and/or vehicle)

Combining general standards with Whole-Food-specific factors, the whole set of criteria for the site suitability analysis can be categorized into two levels: macro-level, which will be taken into consideration in the GIS-based analysis and micro-level, which will applying to the selection of suitable property in the second part of the study. The whole set of criteria adopted for the study is shown below:

Level	Criteria	Data Source
Macro-level Criteria	≥20,000 people in a 20-minute drive time	Population layer
	Commercial Zone	Zoning layer
	High Traffic	Street layer
	Median household income	Median household income layer
	Number of college educated people	Education Layer
	Stand-alone	Existing location layer
Micro-level Criteria	25,000-50,000 Square Feet	Loopnet
	Visibility, Intersection	Loopnet

● Data Collection

Dataset	Format	Content	Source	Usage
Population by census tracts	Excel	Total population by census tracts	Census bureau: American Fact Finder	Examine density
Median household income by census tracts	Excel	Median household income by census tracts	Census bureau: American Fact Finder	Examine income level
Education Attainment by census tracts	Excel	Education level by census tracts	Census bureau: American Fact Finder	Examine total number of college educated people and above
City boundary	Shapefile	City boundary	City of Santa Monica: GIS and Map	Defining study area
Street row	Shapefile	Street shape	City of Santa Monica: GIS and Map	Shaping street network
Tigerline by county	Shapefile	Street lines	Census bureau	Geocoding addresses
Tigerline (Primary Road)	Shapefile	Street lines	Census bureau	Depicting freeway
Zoning map	Shapefile	Zoning	City of Santa Monica: GIS and Map	Locating commercial zones
Existing Whole Food Location	Excel	Store locations	Business Analyst	Locating existing locations

Trader Joe's location	Excel	Store locations	Business Analyst	Locating competing locations
Potential site location	Excel	Store locations	Loopnet	Locating potential site

● Data Processing

Dataset	Format	Method	Process	Resulting layer
Population by census tracts	Excel	Join data	<ul style="list-style-type: none"> ● Select only census tracts within boundary of Santa Monica and create a new layer ● Add field of “Geoid_Join” to the table of the census tracts layer, calculate the field with formula “1400000US & STFID” ● Join excel to the layer and show field of population 	Population layer
Median household income by census tracts	Excel	Join data	<ul style="list-style-type: none"> ● Select only census tracts within boundary of Santa Monica and create a new layer ● Add field of “Geoid_Join” to the table of the census tracts layer, calculate the field with formula “1400000US & STFID” ● Join excel to the layer and show field of median income of all household 	Median household income layer
Education Attainment by census tracts	Excel	Join data	<ul style="list-style-type: none"> ● Select only census tracts within boundary of Santa Monica and create a new layer ● Add field of “Geoid_Join” to the table of the census tracts layer, calculate the field with formula “1400000US & STFID” ● Join excel to the layer and show field of population ● Add a new field, add together number of people from some college to professional degree ● Show graduate legend of new field 	NO. of college educated people layer
Tigerline by county	Shapefile	Street lines	<ul style="list-style-type: none"> ● Select by streets only passing Santa Monica within the county range 	Street layer

			● Create new layer with selection	
Tigerline (Primary Road)	Shapefile	Street lines	<ul style="list-style-type: none"> ● Select only freeway within Santa Monica by type ● Create new layer with selection and change symbology ● Label features 	Highway layer
Zoning map	Shapefile	Zoning	City of Santa Monica: GIS and Map	Locating commercial zones
Existing Whole Food Location	Excel	Store	Geocode addresses using street layer as reference locations	Existing locations layer
Trader Joe's location	Excel	Store	Geocode addresses using street layer as reference locations	Existing competing store layer
Potential site location	Excel	Store	Geocode addresses using street layer as reference locations	Potential site layer
Potential site by overlaying two criterion	Excel & shapefile	Select by attributes	<ul style="list-style-type: none"> ● Join two sets of census data into one census shapefile ● Select area where both criterion are above the median level 	Overlaying education level with income level layer

● Data Analysis

■ First part: site suitability analysis

The study area is consisted of 19 census tracts within the area of 8-square-mile. Driving through the whole town would only cost less than 10 minutes. The total population of 90,000 indicates the area roughly meets the standard of more than 20,000 population within 20 minutes' drive listed on the website. After adding the street layer to the boundary, the result map shows a grid street system with two major freeways, I-10 and Pacific Coastal passing through, suggesting that Santa Monica is a well-circulated area where people can easily access to different places either by vehicle or by walking. The zoning map shows that the city has well-established commercial corridors, which would allow new businesses to adapt more easily.

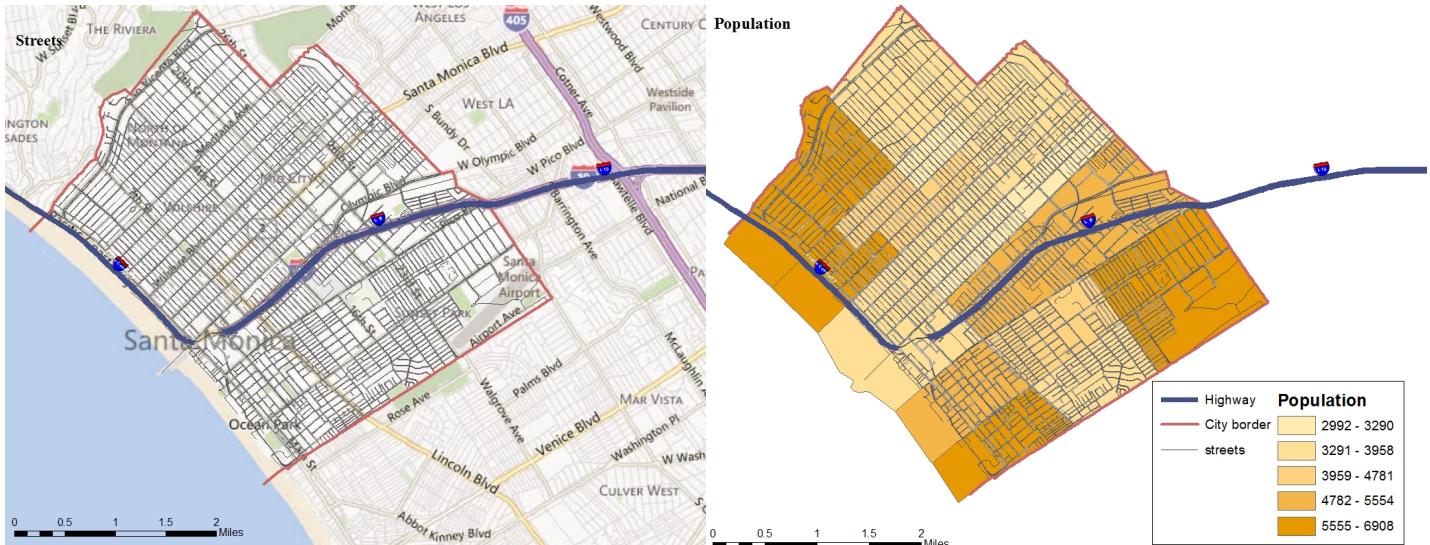
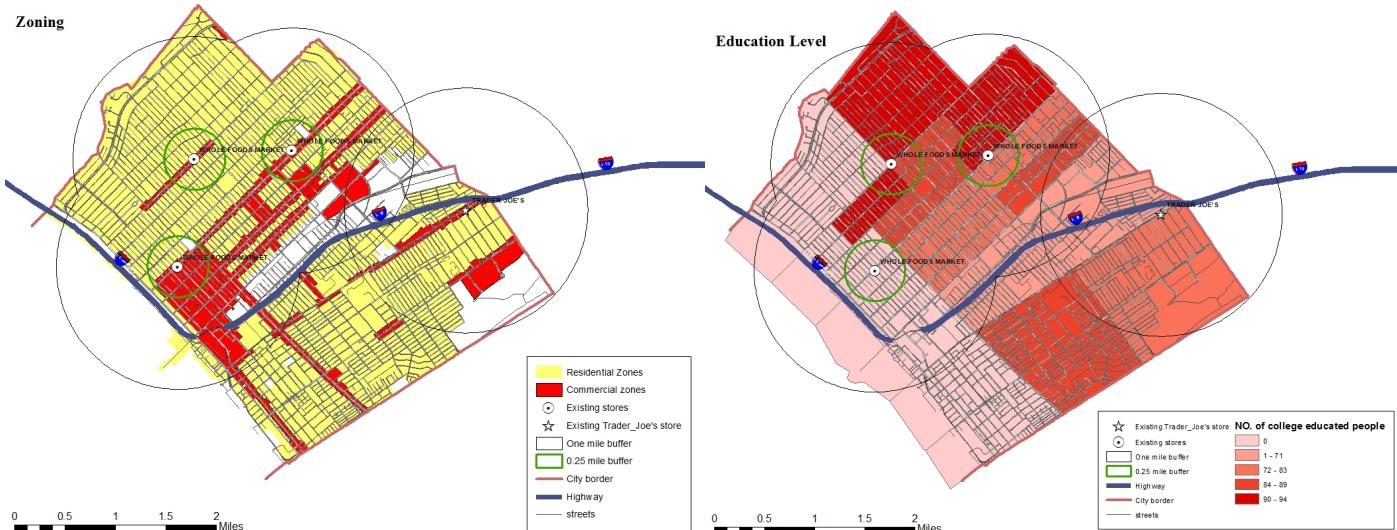


Figure 2&3: general analysis

■ Existing stores analysis

After general analysis of the suitability of the study area, store oriented analysis has been carried out to further analyze the pattern of Whole Food store chains. The set of criteria layers overlaying by existing stores has revealed some of the characteristics of the existing store location. All three of them are located in the developed commercial corridors surrounded by residential neighborhood. In addition to that, two of the existing stores are located in neighborhoods with above average median household income while the other one locating in downtown shopping area. Santa Monica can also be considered as highly educated city, more than half of people have receive some college or even higher education. Here the layer is showing the total number of people who has received college or higher education. We can notice that, adhering to its criteria, existing stores are located in above average census tracts.



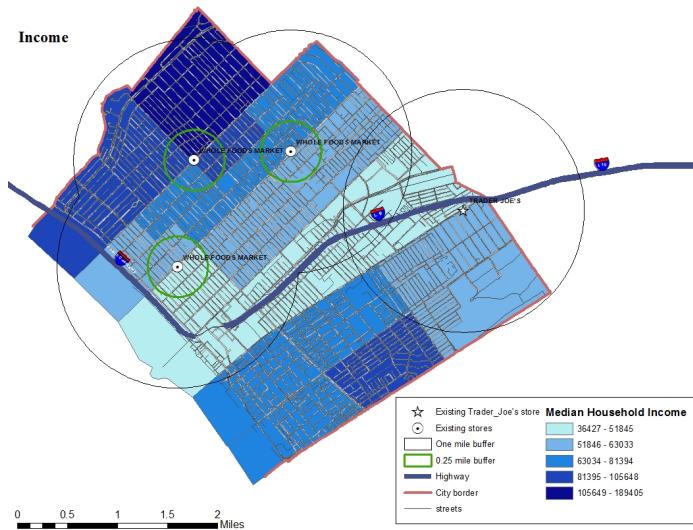


Figure 4&5&6: existing store analysis

◆ Narrowing down potential area

After examining the pattern of existing store, the next step is to narrow down the potential area for future site. . One competitor, Trader Joe's, also famous for its active promotion for healthy food has been selected to make sure that the future store stands out in the selected area as recommended. One-mile buffer has been added to all three stores and the only one Trader Joe's existed in the city to see which part of the site has been left out. To better view the visual effect of overlaying the income factor and education level factor, the transparency of these two layers are dimmed to 50%. As we can see from the map below, overlaying two factors result in a palate of purple color from light to intense. What we are looking for is an area that has been left out by the one-mile buffer and at the same time still meets the requirement of large number of college educated people and certain household income level. In addition to that, the future store should be located in commercial zone appointed by the government. As a result, the potential area has been narrowed down to the scattered neighborhood commercial zones in the left down part of the whole site.

To better view the selection on the map, an additional layer was created by overlaying the education level criteria with the median household income level criteria. Two sets of data were joined to the census tracts layer and a selection was made to choose only the areas where both the education criteria and the income criteria are above the median level among the five ranges. Now we can see very clear that in the area that has been left out by the buffer, only one census tract meets the requirement and only one neighborhood commercial zone has potential for future store.

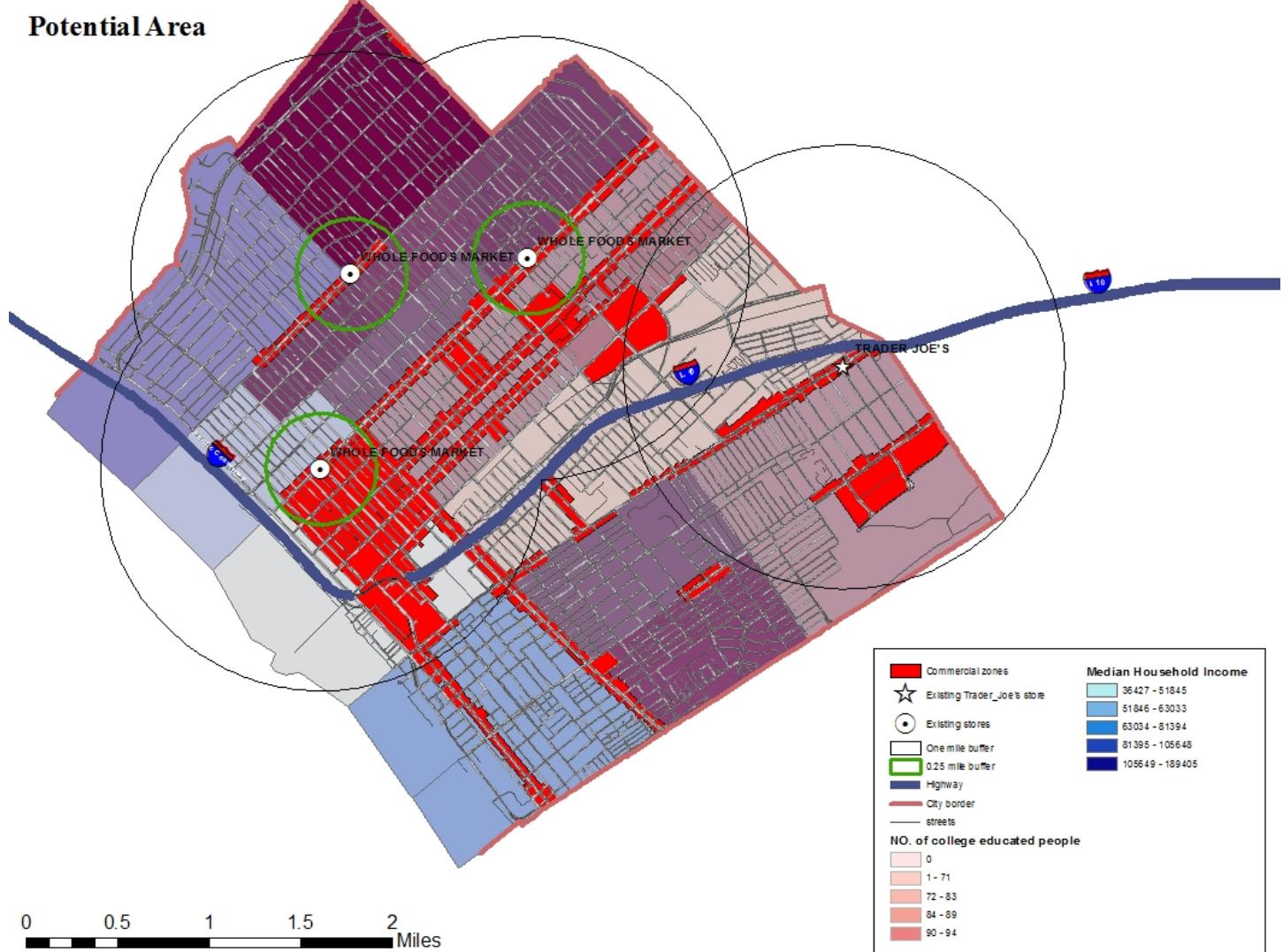
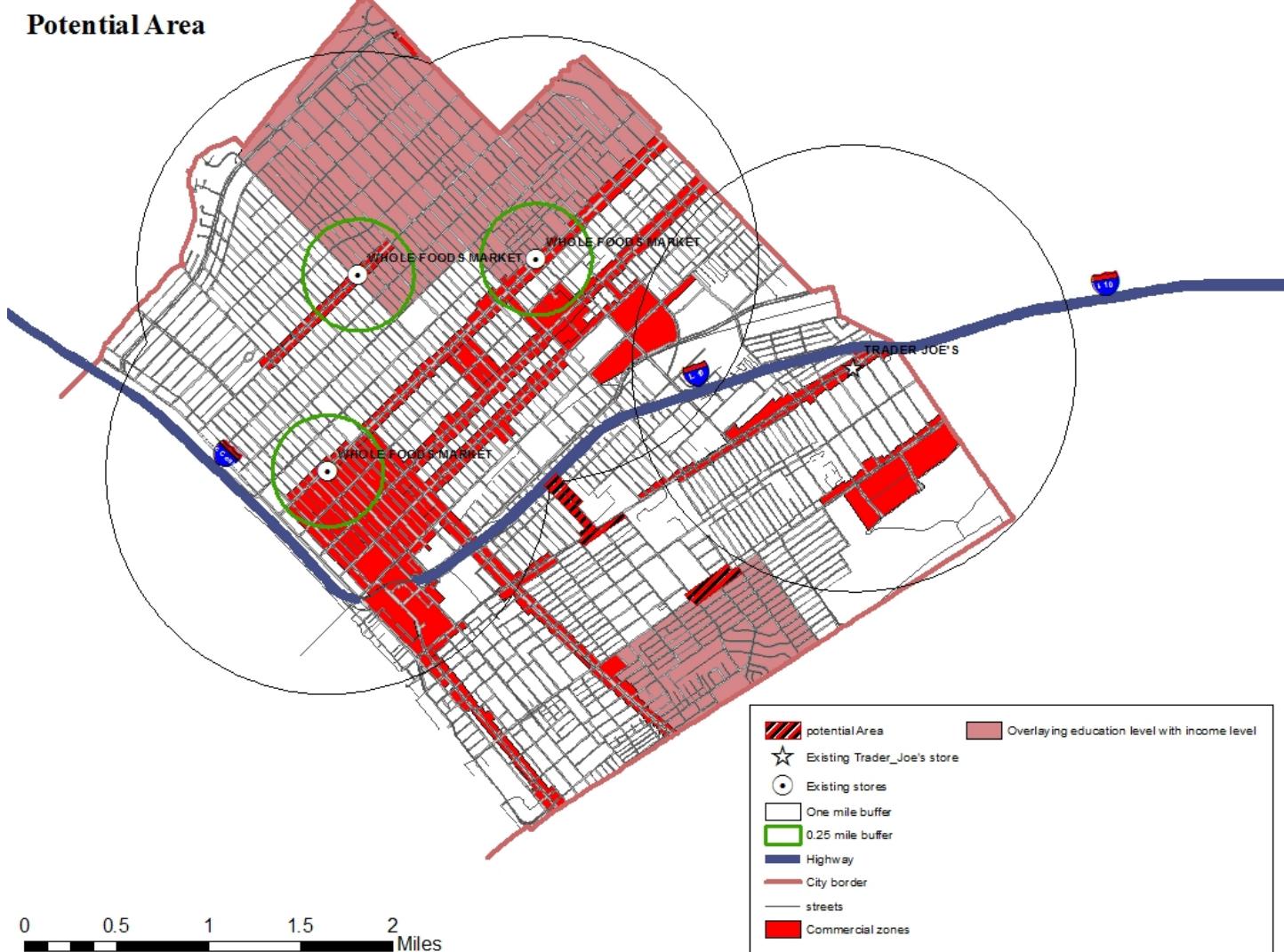
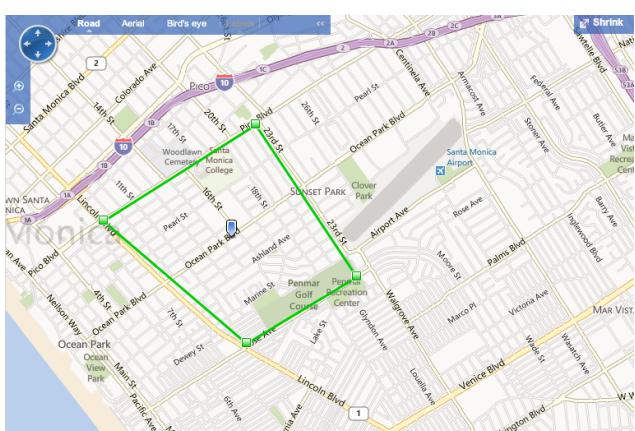


Figure 7&8: narrowing down to potential site



■ Second Part: Property searching

Searching on Loopnet, drawing a polygon to secure the area where previous analysis has chosen, we can find one property is available in the area. The description suggests that the available property meets the requirement of intersection, size and other micro-level criterion.



Highlights

- Absolute NNN investment
- Passive Investment opportunity for investors
- Highly desirable C6 Zoning on Wilshire Blvd corridor
- Located at signalized intersection of Wilshire Blvd & Chelsea Ave

Description

NO MANAGEMENT RESPONSIBILITY
* Absolute NNN investment
* Passive Investment opportunity for investors

* Extremely affluent trade area Average H.H incomes exceed \$99,000 within 1 mile
EXTREMELY RARE WILSHIRE BLVD TROPHY INVESTMENT

* Located at signalized intersection of Wilshire Blvd & Chelsea Ave

* High Traffic Counts -approximately 37,000 cars per day

* Densely Populated Area -461,620 people within 5 miles

* Situated directly across from Douglas Park

POTENTIAL FUTURE REDEVELOPMENT OPPORTUNITY

* Highly desirable C6 Zoning on Wilshire Blvd corridor

* Potential for up to 2.75 FAR and 60 Foot Height if Maximum Community Benefits are provided

Figure 9&10: Property Searching

4. Conclusion

From the case site suitability analysis, we have observed how GIS is effective in processing a wide range of data, conducting a comprehensive and effective study and converting abstract ideas into visual presentation. The case study is limited because limited access to data and limited boundary of the site. Settling on the purpose of showing GIS as a useful business analysis tool, the author only chose this site due to easy accessibility to data and maps, but not necessarily due to the result of an overall study of need and supply in the whole L.A. County. Also, lacking of financial requirement and previous performance of existing stores made this study focused more on general social criterion, but the whole methodology is still a valid one for assessing site suitability in real scenario, and more importantly, it still indicates that GIS is a useful tool for entrepreneurs and companies to carry out site suitability analysis to avoid risk and to develop more effective operating mode.

Of course, it is not sufficient to only using GIS when analyzing site suitability for future business location. GIS works better for pocessing data and exmaining general criteria at a macro level, such as education level, median household income, etc. When it comes to specific requirements for suitable business sites, such as available parking space, easy access from roadway and visibility from street, detailed on-site study will always be needed to further aseess the suitability of any potential location. However, using GIS as a tool to set a systemic analyzing foundation that leads to more effective and time efficient operating mechanism.

Potential Area

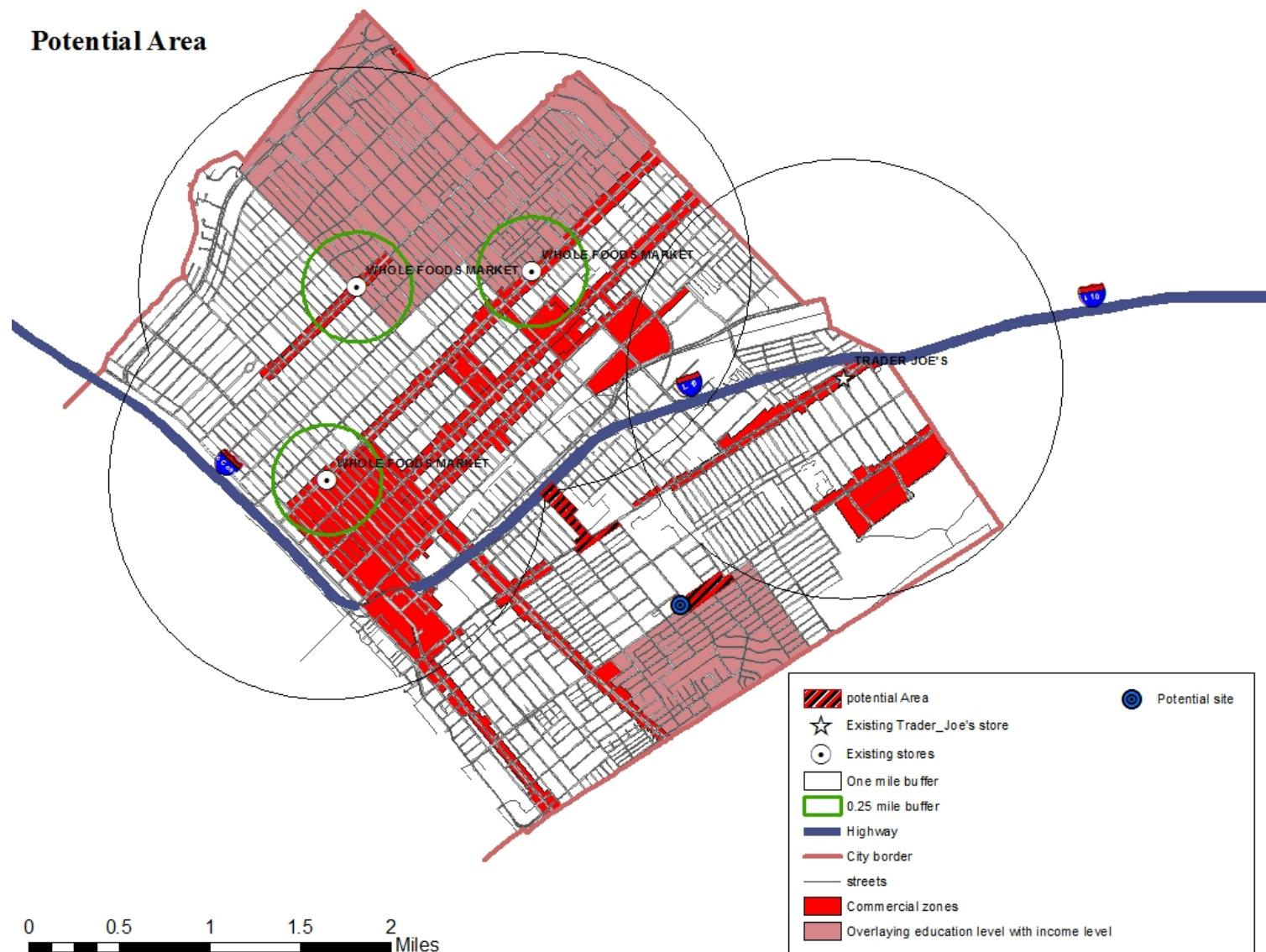
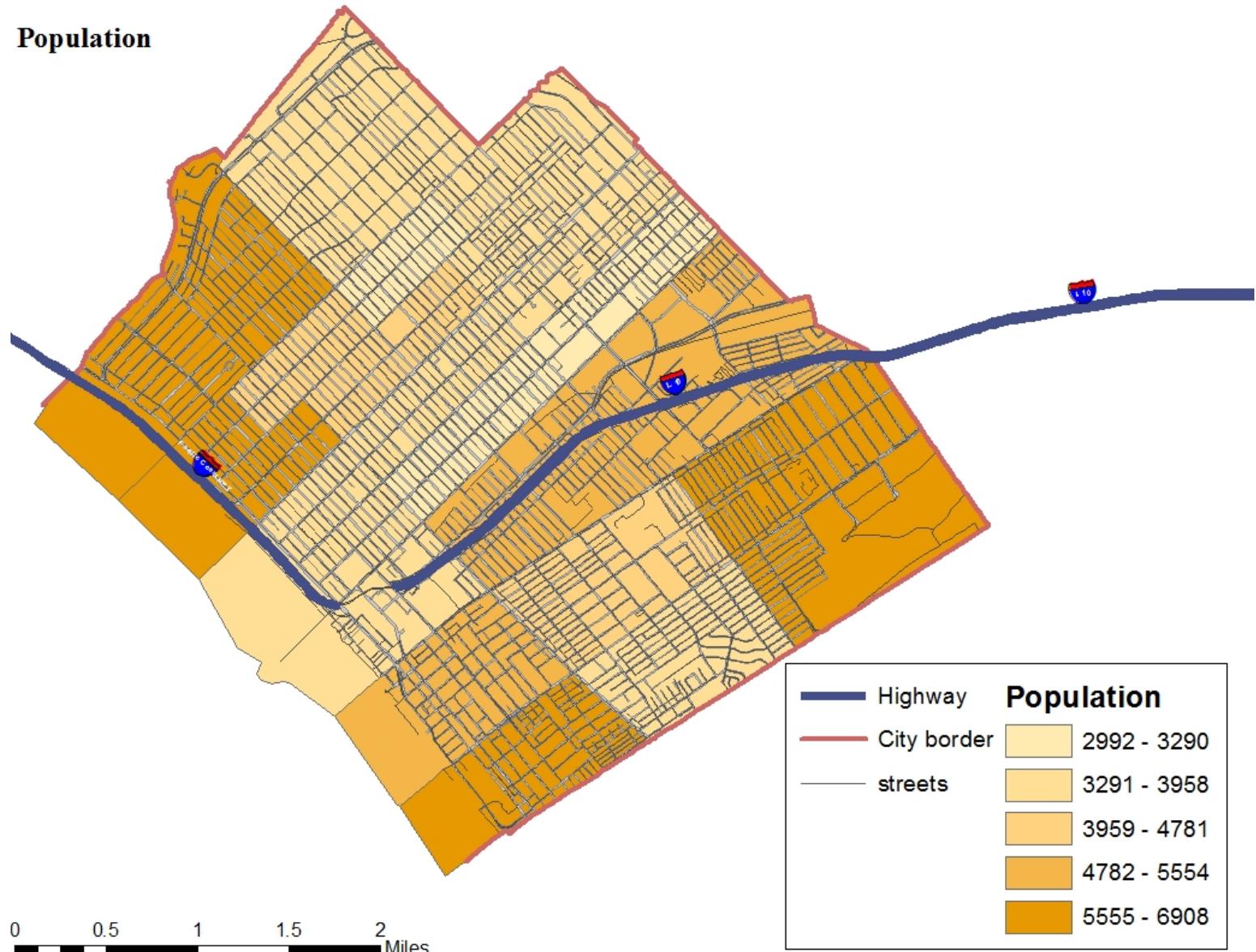


Figure 11: final result

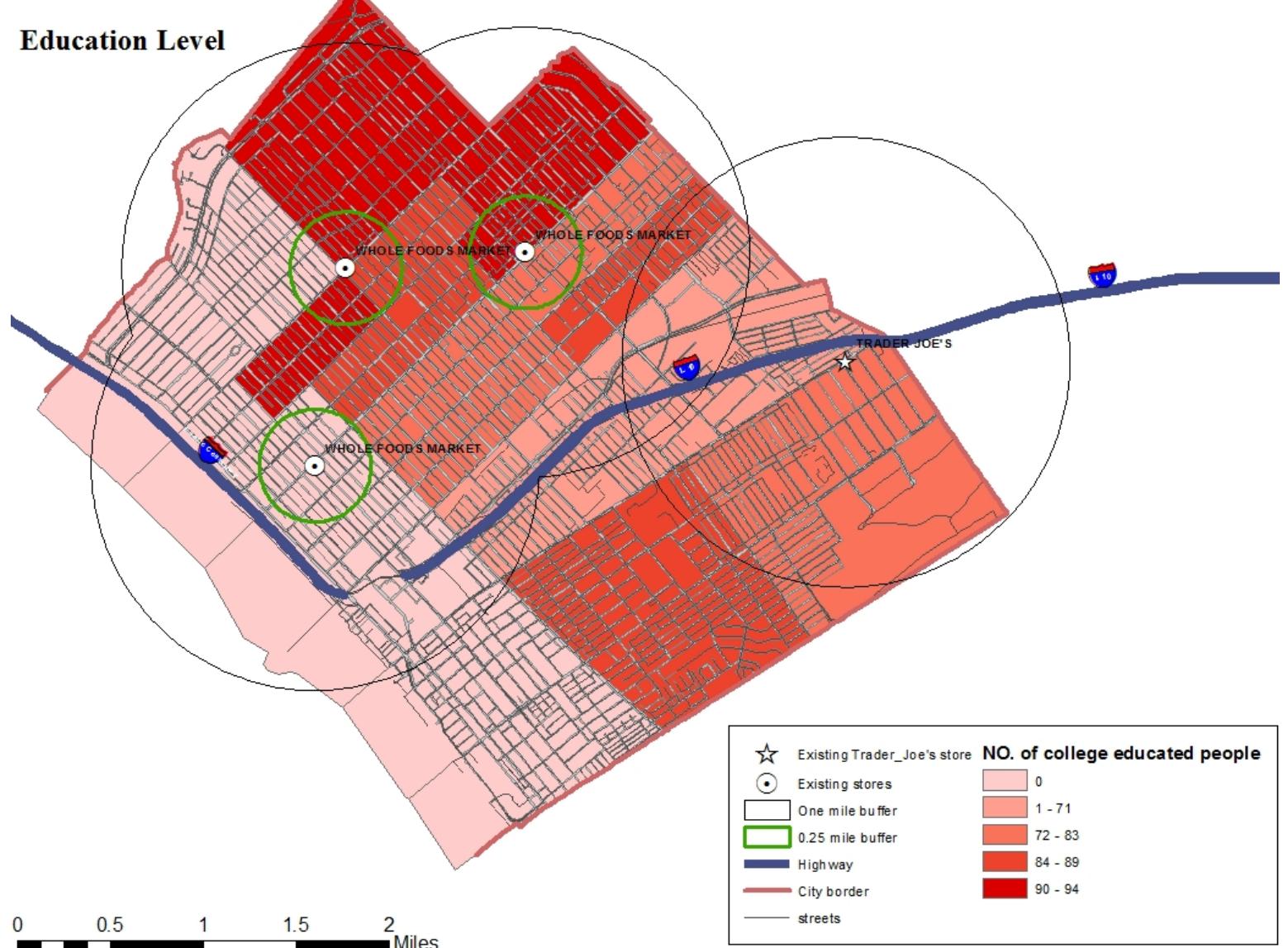
Appendix:

Population



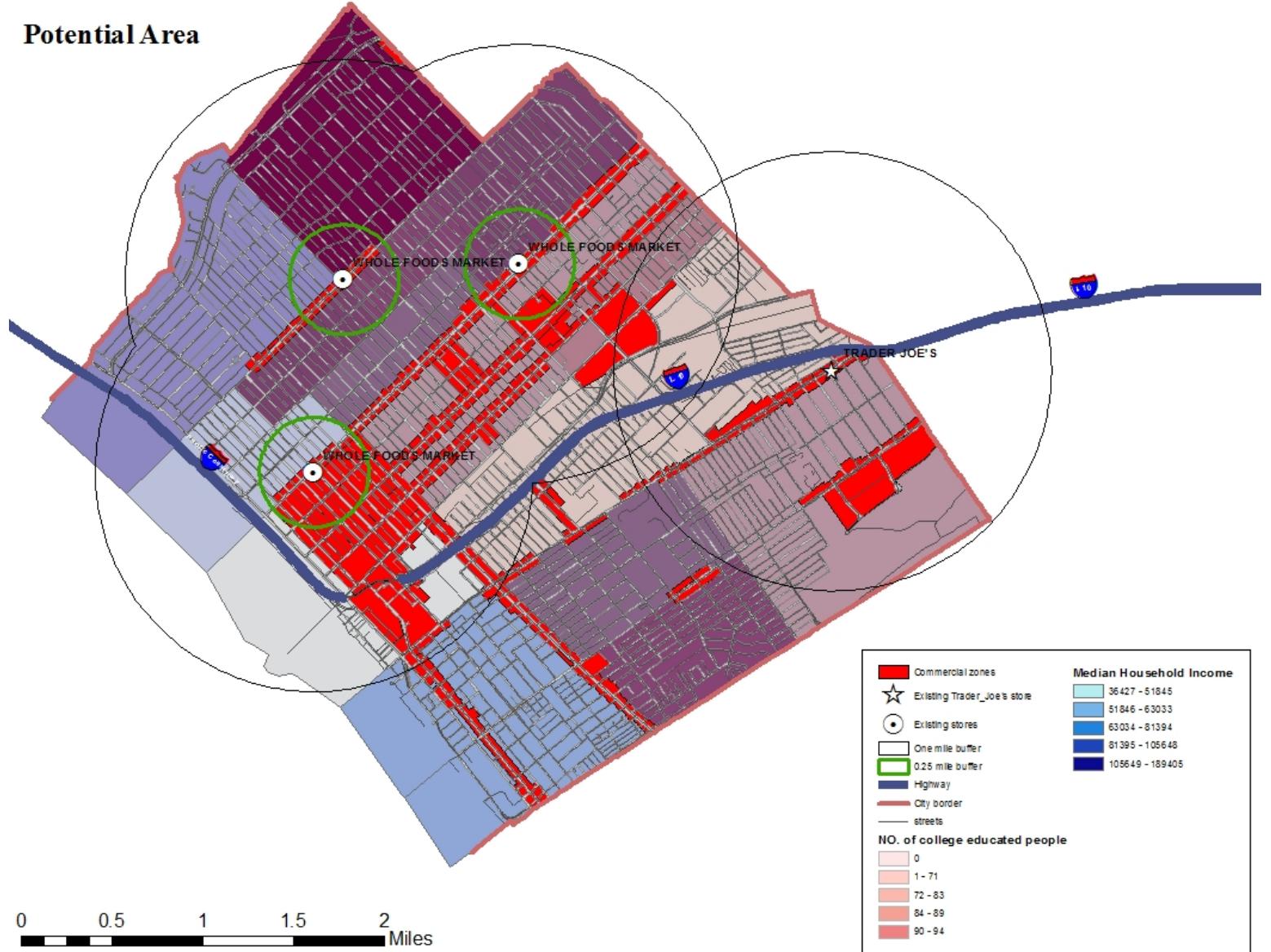
I: Zoning layer showing stores located in commercial zones

Education Level



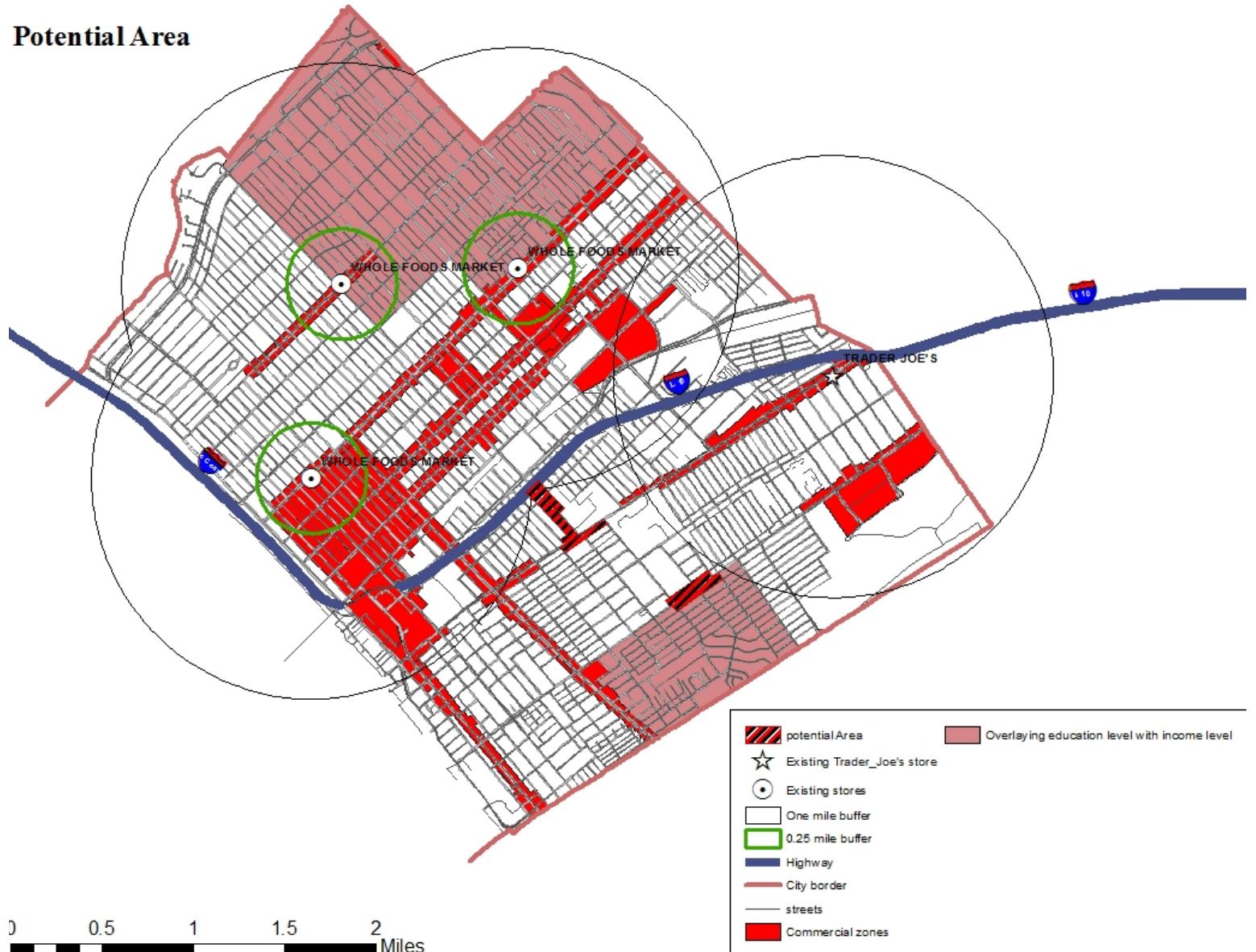
Education Level layer showing total number of college educated people and above in study area

Potential Area



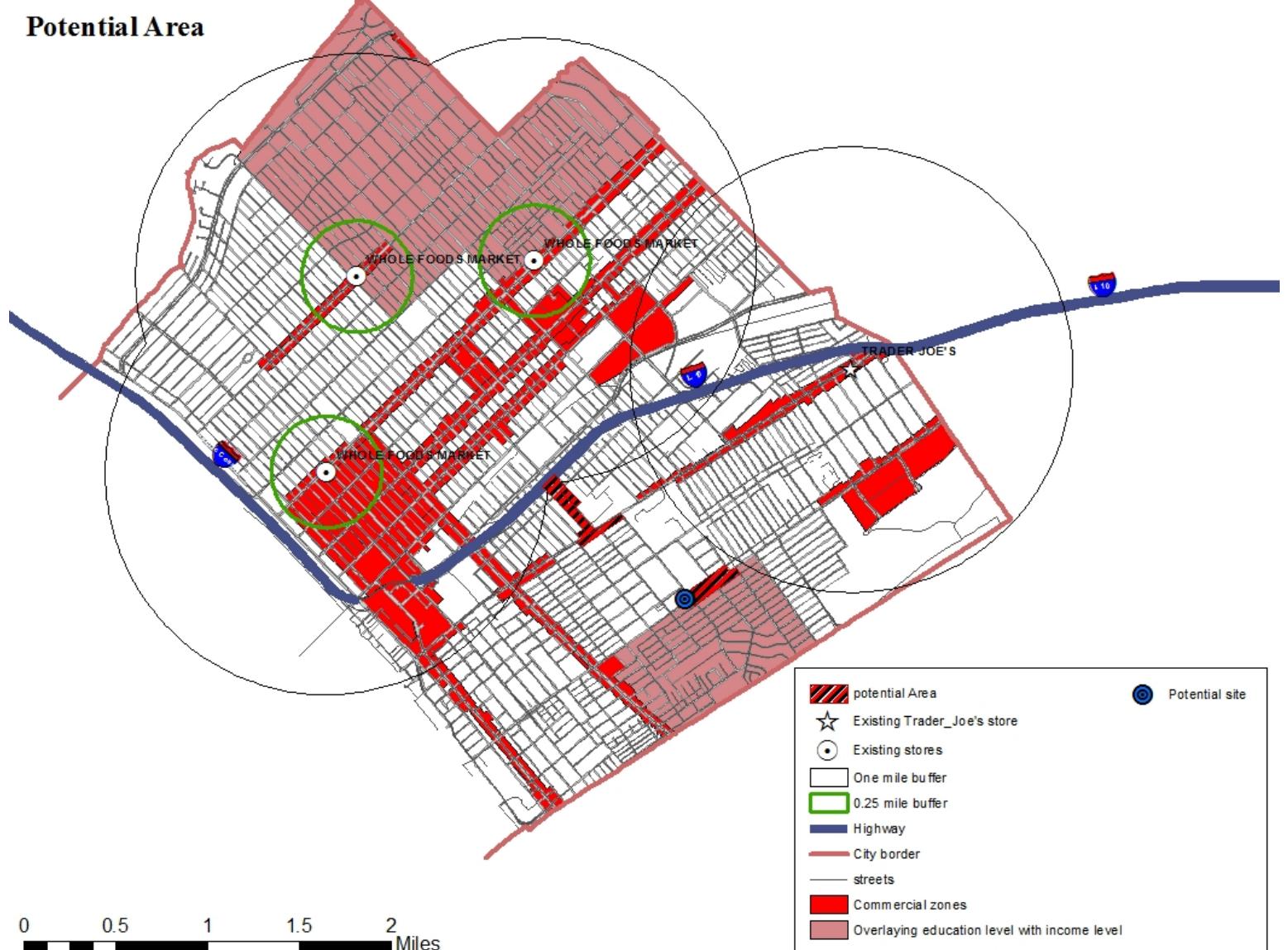
4: Income Layer showing overall median household income level in study area

Potential Area



Overlaying layer highlighting designated commercial zones in selected area

Potential Area



Final map showing chosen property within selected commercial area