Site Selection for Higher Density Affordable Rental Housing Development: Applying the Weighted Linear Combination (WLC) Method in the City of Los Angeles, California

by

Marisol Maciel-Cervantes

A Thesis Presented to the
Faculty of the USC Graduate School
University of Southern California
In Partial Fulfillment of the
Requirements for the Degree
Master of Science
(Geographic Information Science and Technology)

May 2017

Este trabajo académico se lo dedico a mis padres, cuyo trabajo arduo, dedicación, y sacrificio han permitido que yo pueda tener una vida mejor y así aprovechar las oportunidades que se me han presentado a lo largo de esta. Gracias por sus consejos, apoyo incondicional, y por motivarme a alcanzar mis metas.

Mamá y papá, ustedes son la luz de mi vida.

¡Los quiero mucho!

This academic work is dedicated to my parents, whose hard work, dedication, and sacrifice have enabled me to have a better life and thereby seize the opportunities that have been presented throughout it. Thank you for your advice, unconditional support, and motivating me to pursue my goals.

Mom and dad, you are the light of my life.

I love you!

Table of Contents

List of Figures

List of Tables

Acknowledgements

I am grateful to my committee chair, Dr. Laura C. Loyola, and committee members, Dr. Oda Katsuhiko and Dr. Robert O. Vos, for their patience, guidance, and feedback during the writing of this manuscript. I would also like to thank Jonathan P. Bell, Peter Enzminger, Ma'Ayn Johnson, Laura Krawczyk, and Matthew Glesne for their time in sharing their knowledge about affordable housing in the City of Los Angeles. Lastly, but not least, I wanted to extend my gratitude to all of those who took time out of their schedule to provide their input on factors that they considered important in the construction of higher density affordable rental housing developments. Without the help of all of you, this research would not have been possible.

List of Abbreviations

AB	Assembly Bill
ACS	American Community Survey
ADU	Affordable Dwelling Unit
AH	Affordable Housing
AHTF	Affordable Housing Trust Fund, City of Los Angeles
AMI	Area Median Income
APS	Alternative Planning Strategy
CA	Commercial Artcraft
CASSA	Computer Assisted Site Selection Algorithm
CDBG	Community Development Block Grant
CDE	Community Development Entities
CEQA	California Environmental Quality Act
COG	Councils of Governments
CPA	Community Plan Area
CRA	California Redevelopment Association
CRA/LA	Community Redevelopment Agency/Los Angeles
CRIA	Community Revitalization Investment Authority
CRL	Community Redevelopment Law
CTCAC	California Tax Credit Allocation Committee
DCP	Department of City Planning, City of Los Angeles
DOF	Department of Finance
EIFD	Enhanced Infrastructure Financing Districts

EIR	Environmental Impact Report
EPA	United States Environmental Protection Agency
FAR	Floor Area Ratio
FY	Fiscal Year
GHG	Greenhouse gases
GIS	Geographic Information System
GISci	Geographic Information Science
HACLA	Housing Authority of the City of Los Angeles
HCD	California Department of Housing and Community Development
HCIDLA	Los Angeles Housing and Community Investment Department, City of Los Angeles
HE	Housing Element
HOME	Home Ownership Made Easy Investment Partnerships Program
HUD	United States Department of Housing and Urban Development
IIG	Infill Infrastructure Grant Program
LADOT	Los Angeles Department of Transportation
LAHD	Los Angeles Housing Department
LAHSA	Los Angeles Homeless Services Authority
LAMC	Los Angeles Municipal Code
LAUSD	Los Angeles Unified School District
LIHTC	Low-Income Housing Tax Credit
LMIHF	Low and Moderate Income Housing Fund
MCE	Multiple-Criteria Evaluation

Metro	Los Angeles County Metropolitan Transportation Authority
MHFF	Municipal Housing Finance Fund
MPO	Metropolitan Planning Organization
NGF	New Generation Fund
NIMBY	Not in My Back Yard
NMTC	New Market Tax Credit
RAS	Residential Accessory Services
RDA	Redevelopment Agencies
RHNA	Regional Housing Needs Assessment
RPA	Regional Planning Agency
RSO	Rent Stabilization Ordinance
RTP	Regional Transportation Plan
SAA	Service Areas Analysis
SB	Senate Bill
SCAG	Southern California Association of Governments
SCS	Sustainable Communities Strategy
SSA	Site Suitability Analysis
SSI	Spatial Sciences Institute
TFAR	Transfer Floor Area Rights
TIF	Tax Increment Financing
TOD	Transit-Oriented Development
USC	University of Southern California
WLC	Weighted Linear Combination

Abstract

With an estimated 3,862,210 people currently residing in Los Angeles, this city is the second most populous metropolis in the United States. Like most major cities in the nation, Los Angeles faces an affordable housing crisis. Given the challenge, local government officials seek the best practices that will ensure that residents at all income levels have access to fair, safe, and affordable rental housing. However, existing land use and zoning regulations and location and availability of qualifying site amenities make it difficult for the City to achieve this goal.

This research investigates suitable sites for the construction of higher density affordable rental housing developments (55-218 dwelling units/acre) in the City of Los Angeles. It identifies and examines factors such as land use, zoning, cost of land, fair share, employment, and site amenities meant to maximize the effectiveness of affordable rental housing developments—defined as providing housing to very low-income, low-income, and moderate-income households. Furthermore, it explores how these variables limit the policymakers' abilities to move forward with these types of projects. Accordingly, a fair share analysis, service area analysis, and site suitability analysis of Los Angeles are performed to identify suitable sites for the construction of higher density affordable rental housing developments.

The site suitability analysis consists of six iterations that simulate the different perspectives that play a role in the production of higher density affordable rental housing developments. Results of the analysis indicate that existing land use and zoning regulations and the established criteria for qualifying California Tax Credit Allocation Committee (CTCAC) site amenities impact the production and location of these types of developments in the City of Los Angeles. The weighted linear combination method is applied to this analysis to show how Geographic Information Systems (GIS) technology and techniques best support housing policy.

Chapter 1 Introduction

Ensuring that people at all income levels have access to fair, safe, and affordable rental housing has been an ongoing challenge for decision-makers in the City of Los Angeles (the City). Accordingly, this research investigates suitable sites for the construction of higher density affordable rental housing developments (55-218 dwelling units/acre) in Los Angeles. It identifies and examines factors such as land use, zoning, cost of land, fair share, employment, and site amenities meant to maximize effectiveness of affordable rental housing developments—defined as providing housing to very low-income, low-income, and moderate-income households. Therefore, a fair share analysis, service area analysis, and site suitability analysis of the City are performed to identify suitable sites for higher density affordable rental housing developments. However, to more effectively guide housing policy and planning, it is important to provide the reader with an overview of the study and the reasons for it, while also examining present population characteristics of the study area via a demographic profile. As such, this chapter gives an overview of the project, the motivation for pursuing this research, information of the study area, and the demographics of Los Angeles.

High rates of housing cost burdens, low home ownership rates, and the loss of existing-low rent housing are some of the issues that Angelenos currently face. In fact, high housing costs and low household incomes are two contributing factors of why the City has long been considered one of the least affordable metropolises in the nation (Ray, Ong and Jimenez 2014). In 2014, 25.8 percent of renter households and 41.4 percent of owner households in Los Angeles allocated 30 to 49 percent of their income for housing costs; thereby experiencing a *cost burden* (U.S. Census Bureau 2014). Furthermore, 32.8 percent of renter households and 20.8 percent of

owner households paid 50 percent or more of their income for housing costs, indicating a *severe cost burden* (U.S. Census Bureau 2014).

Although Los Angeles is taking steps to preserve and rehabilitate existing affordable housing rental stock, it is necessary to also construct new affordable housing rental developments to meet the demand. It is estimated that 33 percent of the City's current affordable housing stock could convert to market rate over the next ten years (City of Los Angeles Department of City Planning 2013). Furthermore, it is projected that the population of the Los Angeles will grow by 4.6 percent by 2021 (City of Los Angeles Department of City Planning 2013). Therefore, it is not only imperative to build new affordable housing rental units but to do so at a higher density than currently zoned in some areas of the City (Quigley and Raphael 2004).

1.1 Project Overview

The objective of this study is to identify suitable sites for higher density affordable rental housing development in Los Angeles. For purposes of this research, *higher density* refers to the construction of 55 to 218 dwelling units per acre and *affordable rental housing* is defined as providing housing to very low-income (0 – 50% of AMI[1]), low-income (51% - 80% of AMI), and moderate-income (81% - 120% of AMI) households (California Department of Housing and Community Development 2010). Accordingly, this analysis makes use of GIS technology to identify best practices that support affordable housing policy and inform decision-makers. A site suitability analysis is performed to show vacant and underutilized land parcels that are acceptable sites for the construction of higher density affordable rental housing stock. The weighted linear combination (WLC) method is applied in the analysis and takes into account the

[1] AMI refers to Area Median Income.

following criteria: land use, zoning, cost of land, fair share, employment, public transit, public parks, public schools, public libraries, healthcare centers, grocery stores, and farmers' markets.

Two key policies in promoting the production of affordable housing developments are the Housing Element and the Regional Housing Needs Assessment (RHNA) Final Allocation Plan (Department of City Planning City of Los Angeles 2013; Southern California Association of Governments 2007; Southern California Association of Governments 2012). The Housing Element requires that local governments identify and plan for existing and future housing needs, which includes their RHNA share. RHNA is a mandatory process that quantifies housing need during a specific planning period and in which local jurisdictions must take into account the land use planning of their communities to better meet existing and future housing needs, this includes the allocation of affordable housing. Both the land use and zoning datasets enable the identification of sites that are suitable for the construction of affordable housing based on existing designations and regulations. The parcel data allows for the identification of specific sites for higher density affordable rental housing development.

Site amenities identified by the California Tax Credit Allocation Committee (CTCAC) help develop the criteria to identify potential sites for the construction of affordable housing. Demographic data such as race, ethnicity, total resident population, housing tenure, income, education, employment, and means of transportation provide a profile of the demographics of Los Angeles and help identify sectors of the population that would benefit from higher density affordable rental housing developments. Local ordinances, such as the Density Bonus and the Transfer of Floor Area Rights (TFAR), and previous research that promotes the construction of higher density housing (Myers and Gearin 2001) and higher density affordable rental housing (California Planning Roundtable, California Department of Housing & Community Development

1993) support setting the parameters for performing the site suitability analysis. Lastly, other site suitability analyses by Anderson (2011), Branz (2013), Way and Miller (2016), and Van Atta (2013) in affordable housing guided my research topic, particularly in defining the methodology for this study.

1.2 Motivation

Article 25 of the Universal Declaration of Human Rights has declared housing as a human right, yet cities such as Los Angeles increasingly find it challenging to provide housing for all segments of the housing market (United Nations General Assembly 1948). In Los Angeles, it is especially difficult to build rental housing that is affordable for very low-income, low-income, and moderate-income households. Despite the enactment of policies, processes, and programs that seek to better address the housing needs of various market segments—City of Los Angeles Housing Element 2013-2021 and the RHNA Final Allocation Plan—these have not been enough to meet the demand of affordable housing in places like Los Angeles. Two key events that constricted the production of affordable housing and contributed to the existing housing crisis in Los Angeles were the dissolution of redevelopment agencies and the economic crisis known as the “Great Recession” from 2007-2009.

Planning to meet the existing and projected housing needs for persons at all income levels has proved challenging, particularly from a financial standpoint. Cities like Los Angeles are among the most expensive areas for the construction of new housing. This reality makes it particularly difficult to incentivize the development of affordable housing in this metropolis, which is currently facing a housing crisis (City of Los Angeles Department of City Planning 2013). For instance, between 2000 and 2010, median gross rents in Los Angeles increased by 31 percent while median household incomes increased by 1.2 percent (City of Los Angeles

Department of City Planning 2013). The significant gap that exists between rent costs and income helps explain why 58.6 percent of renter households in Los Angeles are experiencing a cost burden or severe cost burden in their rents (U.S. Census Bureau 2014).

Given the high construction costs in Los Angeles, there are various proposals to bolster the stock of affordable rental housing. Some advocate the preservation and rehabilitation of existing affordable rental housing stock, while others champion higher density affordable rental housing developments (California Planning Roundtable, California Department of Housing & Community Development 1993). While it is necessary to preserve and rehabilitate existing affordable housing stock to better meet the existing needs in the area, it is also important to realize that this measure alone will not suffice to meet the current and future housing demands. When taking into account that Los Angeles is the second most populous metropolis, after New York City, in the United States and acquisition of land is among the highest priced in the nation, it is necessary to explore other options such as higher density development. Higher density affordable rental housing development will help to mitigate the housing crisis in Los Angeles.

While site suitability analyses have been performed for various counties and cities in the United States, one specific to Los Angeles was not found. The closest type of analyses for the City are an “Inventory and Maps of Parcels Available for Housing by Community Planning Area” found as Appendix H in the 2013-2021 Housing Element of the City of Los Angeles (City of Los Angeles Department of City Planning 2013) and a 1973 housing allocation statistical model entitled, “A Model for Subsidized Housing Location” (LeRoy 1973). Therefore, performing this type of analysis for Los Angeles is of critical importance for several reasons. First, higher density affordable rental housing is necessary in a geographic area whose population is projected to continue to grow. Second, the percentage of renters in Los Angeles is

significantly higher than that of owners, 62.9 percent versus 37.2 percent respectively (U.S. Census Bureau 2014). Third, in 2014, 58.6 percent of renters in the City experienced a cost burden or severe cost burden (U.S. Census Bureau 2014).

This analysis will serve as an alternative response to more effectively address the housing crisis in Los Angeles through the use of GIS techniques and technology. GIS technology has significantly advanced since the 1960s and professionals from other disciplines are increasingly finding it a valuable asset to better answer questions in their field of practice. For purposes of this thesis, making use of this technology is beneficial to the following sectors: spatial sciences, urban planning, real estate, City government officials, and the residents of Los Angeles.

1.3 Study Area

Los Angeles was founded in 1781 under the name *El Pueblo de Nuestra Señora la Reina de Los Ángeles de Porcincula* (Our Lady the Queen of the Angels of Porcincula) (Lambert n.d.). It is the city seat of the County of Los Angeles and the second most populous city in the United States with a population of 3,862,210 people (U.S. Census Bureau 2014). Los Angeles is comprised of 15 Council Districts and 37 community plan areas[2]. The metropolis has a land area of 468.67 square miles and a population density of 8,240.8 persons per square mile (U.S. Census Bureau 2014). The City sprawls across a broad coastal plain surrounded by a vast and varied geographic landscape that includes mountains and the Pacific Ocean. Its geographic coordinates are 34° 3’ 8.043” N, 118° 14’ 37.265” W (Figure 1).

[2] For purposes of this research, the Los Angeles International Airport and Port of Los Angeles Community Plans are not included in the analysis; therefore, only 35 community plan areas are analyzed.

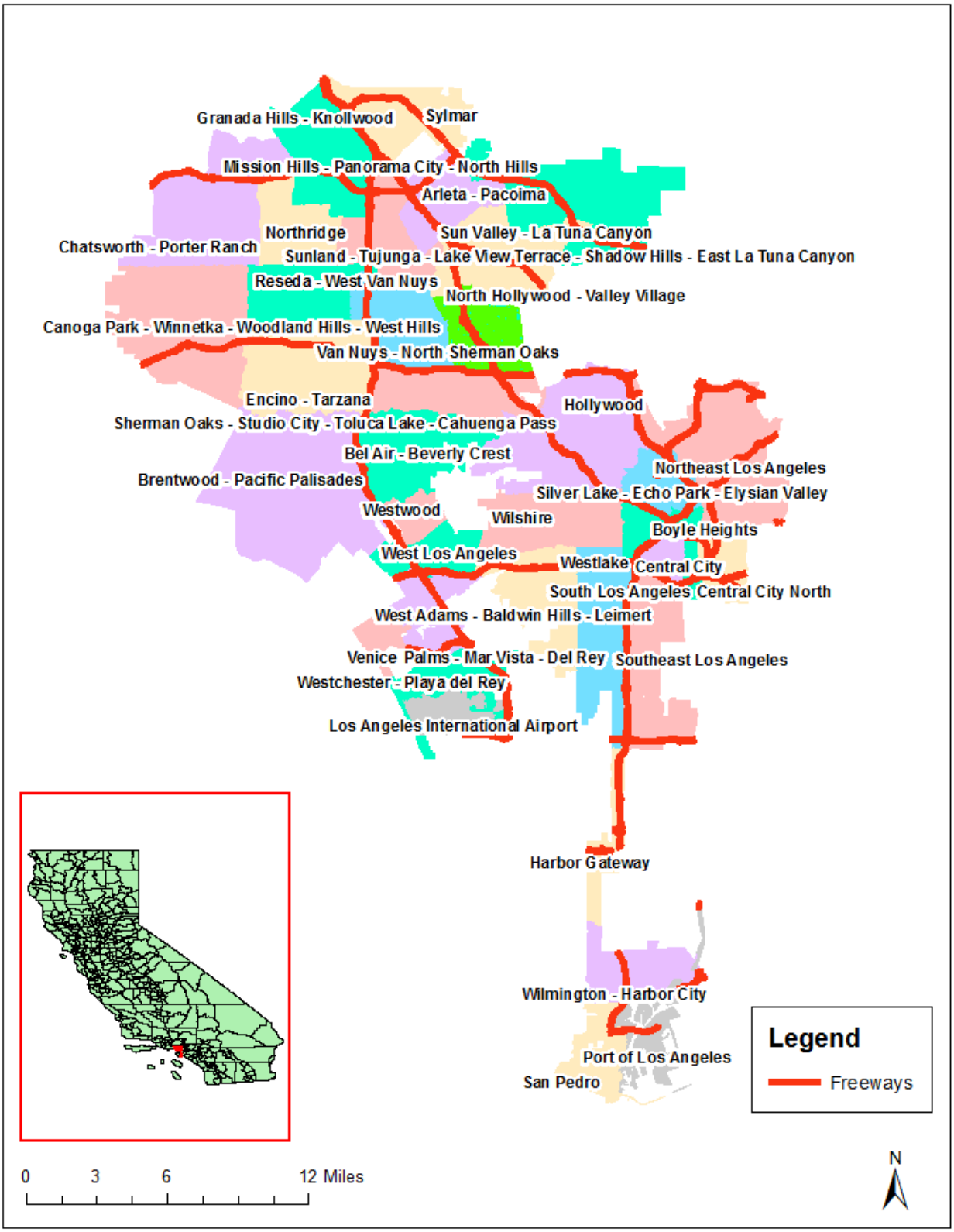

Figure 1 Study Area: Map of City of Los Angeles Community Planning Areas. *Source*: City of Los Angeles Department of City Planning, 2015

1.4 Demographics of City of Los Angeles

In order to have a better understanding of the current housing needs in the City, it is important to provide a demographic profile of this metropolis. Therefore, statistical information related to race and ethnicity, total resident population, housing tenure, income, education, employment, and means of transportation is provided in this section. These demographic indicators are meaningful to this research because they also play a direct or indirect role in the greater topic of affordable housing. Thus, by highlighting relevant data about the City's population and its housing needs, more effective and cost efficient housing policies, measures, and programs can be created to better address the housing crisis.

1.4.1. Race and Ethnicity and Population

According to the American Community Survey's (ACS) five-year estimates, in 2014 there were 3,862,210 people residing in Los Angeles (U.S. Census Bureau 2014). Of the total population, 48.6 percent is of Hispanic or Latino ethnicity; 28.5 percent is White; 8.9 percent is Black or African American; 11.4 percent is Asian; and, 2.8 percent are Native Americans, Pacific Islanders, other races, and those of mixed race (Figure 2) (U.S. Census Bureau 2014). Los Angeles experienced a slowdown in population growth between 2000 and 2010. Furthermore, demographic trends show a tendency toward a smaller household size and non-family composition (City of Los Angeles Department of City Planning 2013). In other words, it is believed that over the next decade there will be a great increase in married couples without children and singles. Nonetheless, it is projected that by 2021 the population growth in the City will be over 140,000, which represents a 4.6 percent growth rate from 2010 (City of Los Angeles Department of City Planning 2013).

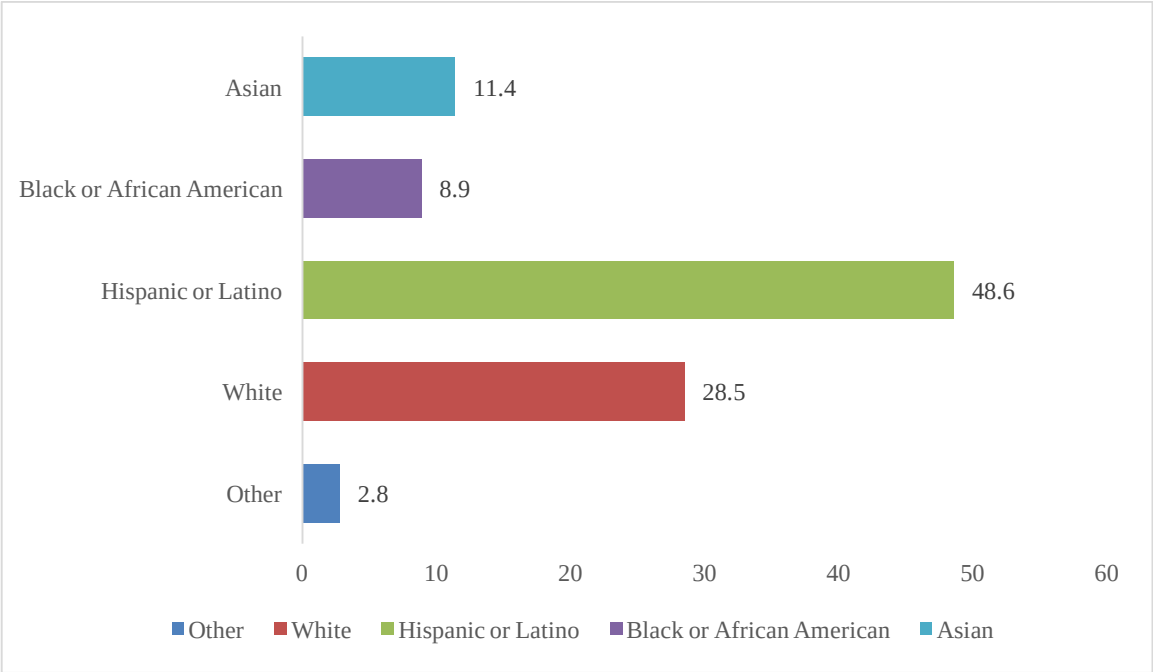

Figure 2 Racial and Ethnic Distribution in Los Angeles (Percentages).
Source: (U.S. Census Bureau 2014)

1.4.2. Housing Tenure

Demographic data also provide us with an insight to the renter population in Los Angeles. Figures from the ACS 2014 show that 37.2 percent of households were owner-occupied and 62.9 percent were renter-occupied (U.S. Census Bureau 2014). The ACS 2014 reports that the median gross rent was $1,214. Furthermore, figures from 2014 indicate that renters have lower incomes than owners, $36,036 vs. $83,767 (U.S. Census Bureau 2014). This reality makes it challenging for renters to afford housing costs.

ACS 2014 data reveal that there are 1,427,355 housing units in Los Angeles. Of these, 93.1 percent are occupied and 6.9 percent are vacant. Moreover, it shows that 44.9 percent of the total housing units are detached one dwelling unit, whereas 13.9 percent consist of 50 or more dwelling units. The median year in which housing units were built is 1960 (U.S. Census Bureau 2014).

In addition, demographic data show that the residents of Los Angeles are currently experiencing a cost burden or severe cost burden in their rents. In the City, 25.8 percent of household renters are currently paying 30 to 49 percent of their income for housing costs, while 32.8 percent pay 50 percent or more. On the other hand, 41.4 percent of household owners in Los Angeles allocate 30 to 49 percent of their income for housing and 20.8 percent pay 50 percent or more (Figure 3).

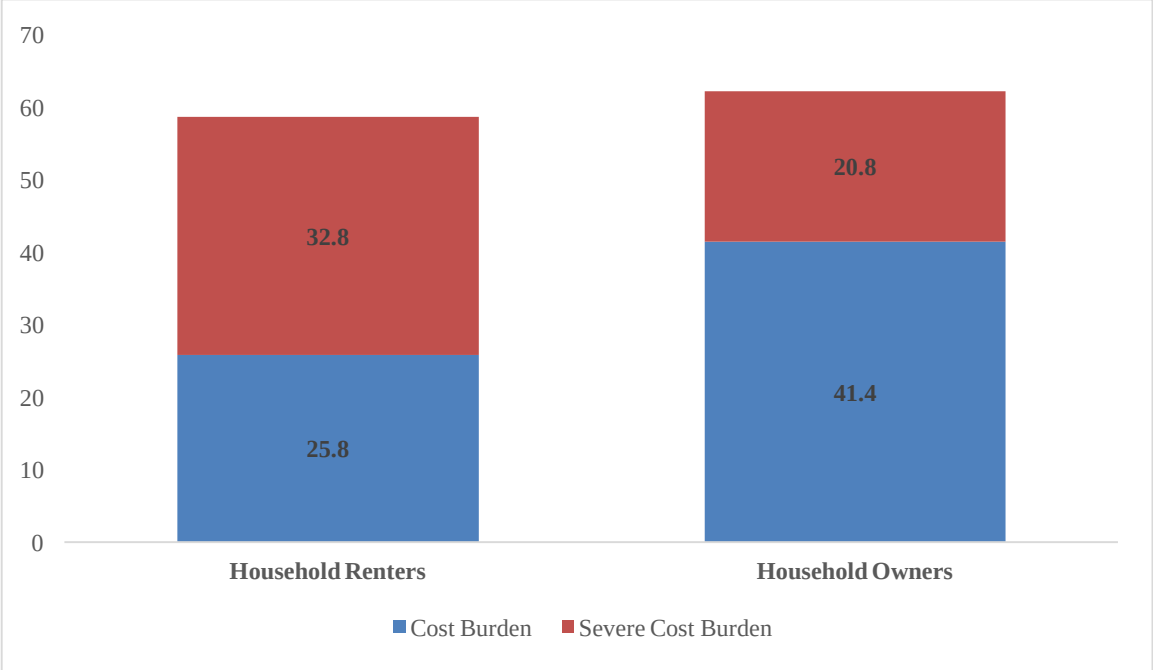

Figure 3 Household Renters and Household Owners Experiencing a Housing Cost Burden or Severe Cost Burden (Percentages). *Source*: (U.S. Census Bureau 2014)

1.4.3. Income

Building affordable housing developments is necessary in a metropolis that has proportionately more households at lower incomes. According to the ACS 2014, the median household income in Los Angeles was $49,682[3] (U.S. Census Bureau 2014). This means that the median household income in the City is less than the County ($55,870), the State of California ($61,489), and the country ($53,657) (Figure 4) (U.S. Census Bureau 2014).

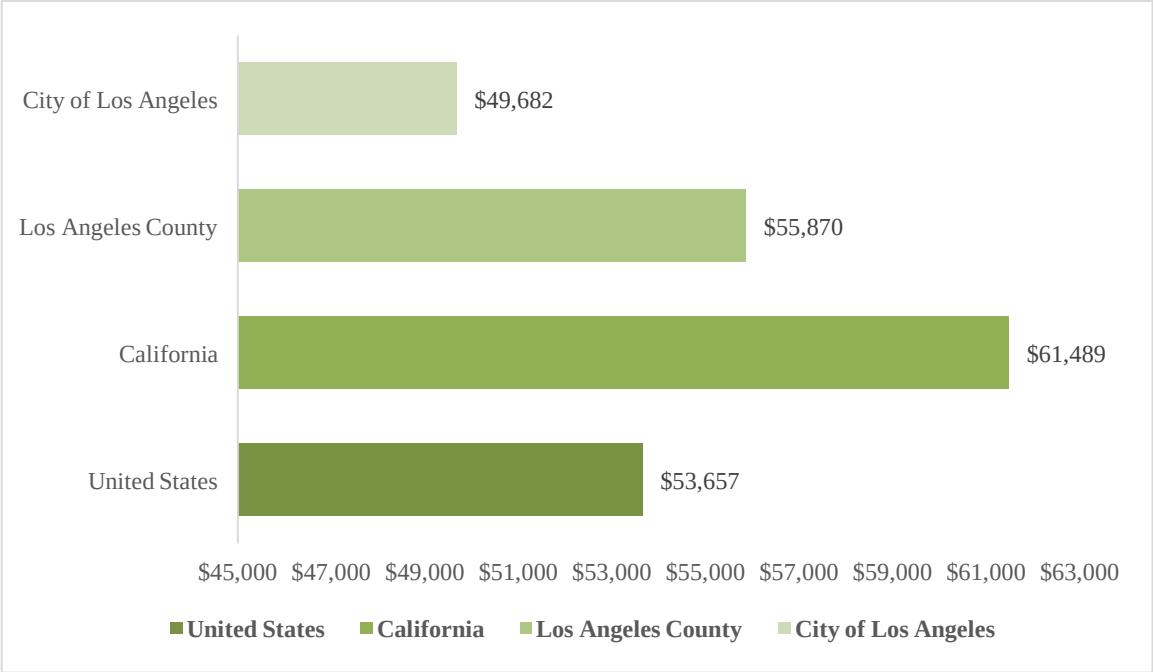

Figure 4 Median Household Income at City, County, State, and Country Level.
Source: (U.S. Census Bureau 2014)

Within Los Angeles, it is important to highlight the distribution of household incomes to have a better understanding of how accessible existing housing costs are to household income earners. ACS 2014 data indicate that 8.1 percent of households had a reported income of less than $10,000; 19 percent earned between $10,000 and $24,999; 23.2 percent earned between

[3] All dollar values have been adjusted to 2014 inflation dollars.

$25,000 and $49,999; 16.0 percent earned between $50,000 and $74,999; 10.6 percent earned between $75,000 and $99,999; 11.5 percent earned between $100,000 and $149,999; 5 percent earned between $150,000 and $199,999; and, 6.7 percent earned $200,000 or more (Figure 5). In addition, 18.2 percent of families lived below the poverty level in 2014 (U.S. Census Bureau 2014). Consequently, housing costs become unaffordable for most of these residents and thereby make it necessary to build affordable housing rental units.

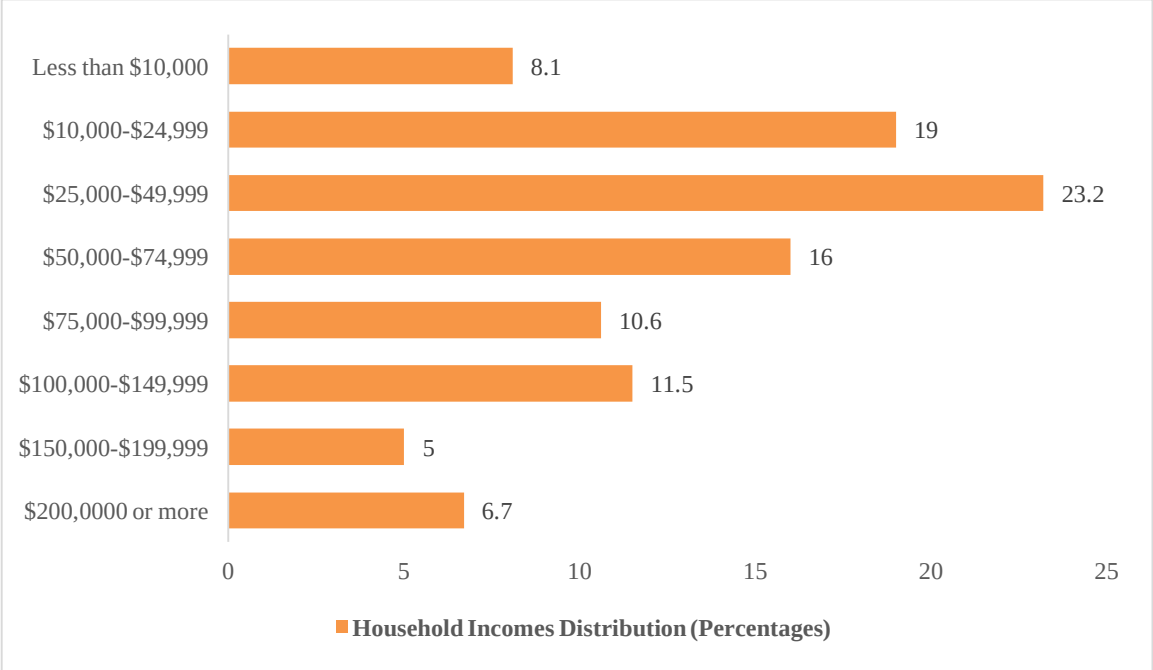

Figure 5 Household Income Distribution in the City of Los Angeles (Percentages). *Source*: (U.S. Census Bureau 2014)

It is also important to take into account the senior population, as it is a group that will continue to grow. Generally speaking, seniors tend to have lower incomes than the rest of the population. For instance, among seniors who are head of households, the reported median household income in 2014 was $36,809, which is significantly lower than the City median

household income of $49,682 (Figure 6) (U.S. Census Bureau 2014). Therefore, planning and building affordable housing will be necessary for this sector of the population.

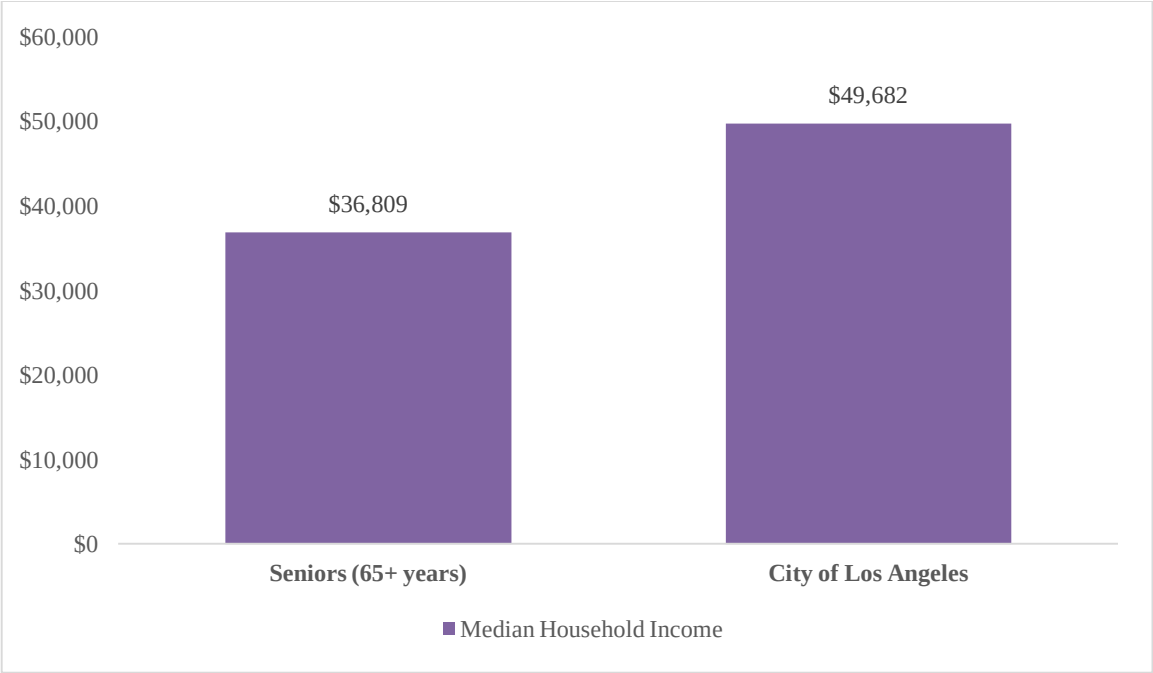

Figure 6 Medium Household Income Comparison between Seniors (65+ years) and Other City of Los Angeles Residents. *Source*: (U.S. Census Bureau 2014)

1.4.4. Education

Educational attainment is an important form of human capital investment, as it not only expands our knowledge base and productivity but also contributes to economic growth (Schultz 1960). The ACS 2014 data provides the following statistics for educational attainment for the population twenty-five years and older: less than high school (25.1 percent); high school graduate and its equivalent (19.5 percent); some college (24 percent); bachelor's degree (20.9 percent); master's degree (6.7 percent); professional school degree (2.7 percent); and, doctorate degree (1.3 percent) (Figure 7).

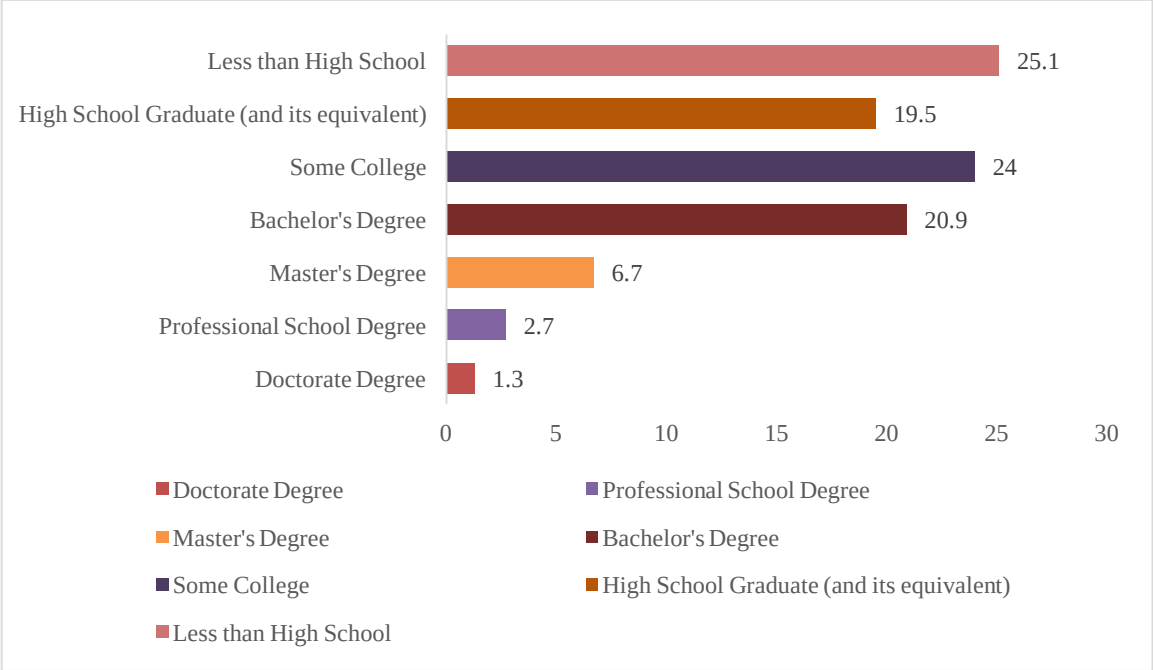

Figure 7 Educational Attainment for Population 25+ years (Percentages). *Source*: (U.S. Census Bureau 2014)

1.4.5. Employment

Employment is an important factor to take into account when determining housing needs, as one's occupation or profession will establish one's wage or salary. In the case of Los Angeles this is particularly important to point out as there has been an increase in low-wage service sector jobs[4] (City of Los Angeles Department of City Planning 2013). In fact, job opening projections show that most new jobs in the City will pay less than $23,000 annually (City of Los Angeles Department of City Planning 2013). ACS 2014 reports the following statistics for the five industries in Los Angeles in which the civilian population that is sixteen years and older is employed: management, business, science, and arts occupations (35.7 percent); service

[4] "A minimum wage worker earning $8.00 per hour would have to work 120 hours per week in order to make the monthly rental payment of $1,248 for a studio and still have money for groceries, transportation, and health care" (City of Los Angeles Department of City Planning 2013, 1-54).

occupations (21 percent); sales and office occupations (23.3 percent); natural resources, construction, and maintenance occupations (8 percent); and, production, transportation, and material moving occupations (12 percent) (Figure 8).

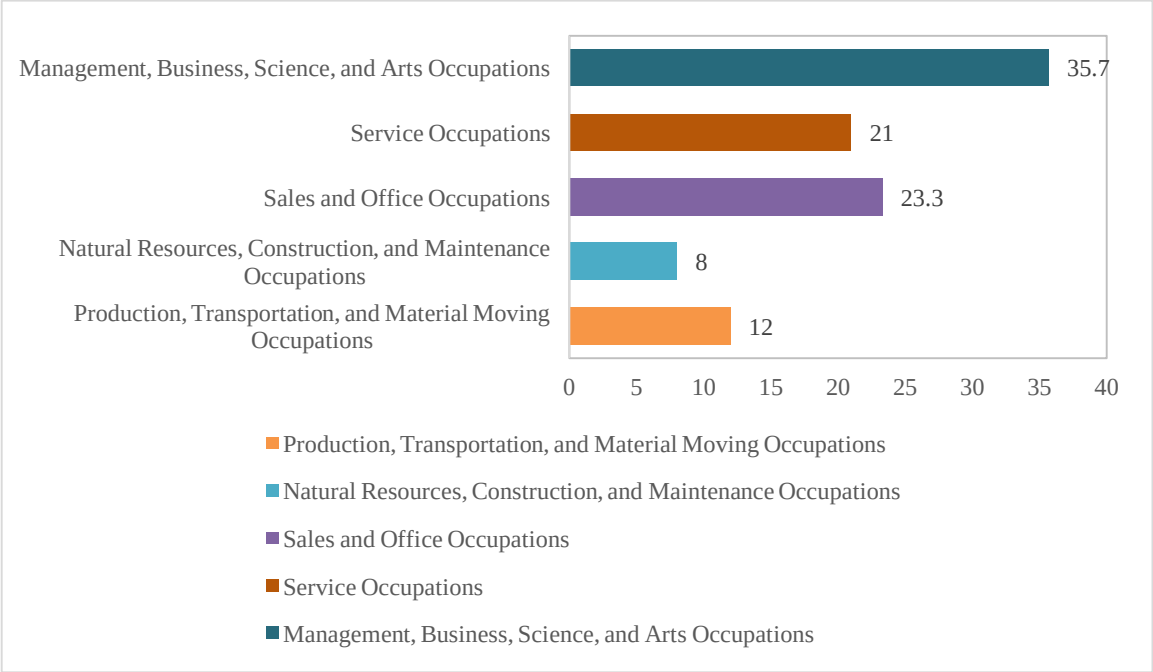

Figure 8 Civilian Population (16+ years) Employment by Industry in the City of Los Angeles (Percentages). *Source*: (U.S. Census Bureau 2014)

1.4.6. Means of Transportation

Los Angeles is a car-oriented metropolis that has made significant investments in recent decades to improve its public transit system. Due to the City's high car dependency, public transportation operating agencies such as the Los Angeles County Metropolitan Transportation Authority (Metro) and the Los Angeles Department of Transportation (LADOT) have formed partnerships with Los Angeles to improve and expand bus and rail services in Los Angeles. ACS 2014 data indicates that 67.3 percent of workers sixteen years and older drove alone; 9.8 percent carpooled; 11 percent used public transportation (includes taxicab); 0.3 percent used a

motorcycle; 1.1 percent used a bicycle; 3.6 percent walked; 1.3 percent used other means of transportation; and, 5.7 percent worked at home (Figure 9).

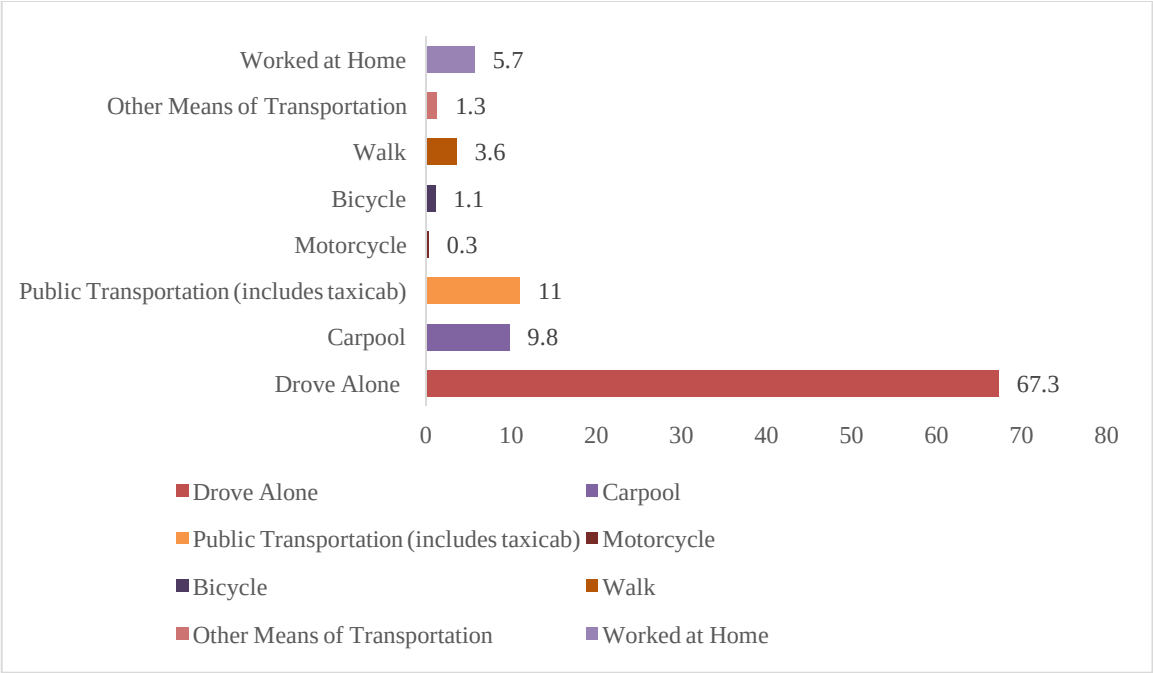

Figure 9 Means of Transportation for Workers 16+ Years in City of Los Angeles (Percentages). *Source*: (U.S. Census Bureau 2014)

From an environmentally sustainable perspective, reducing the travel time to work is a goal that Los Angeles seeks to achieve. One approach that the City has taken to achieve this objective is by expanding and improving its existing public transit system. ACS 2014 data show the travel time to work for workers sixteen years and older. For instance, 6.7 percent of workers had less than a 10-minute commute; 22.8 percent had between a 10 to 19-minute commute; 19.2 percent had between a 20 to 29-minute commute; 20.9 percent had between a 30 to 39-minute commute; 13.8 percent had between a 40 to 59-minute commute; 8.0 percent had between a 60 to 89-minute commute; 2.9 percent of workers had a more than 90-minute commute; and, 5.7 percent worked at home (Figure 10).

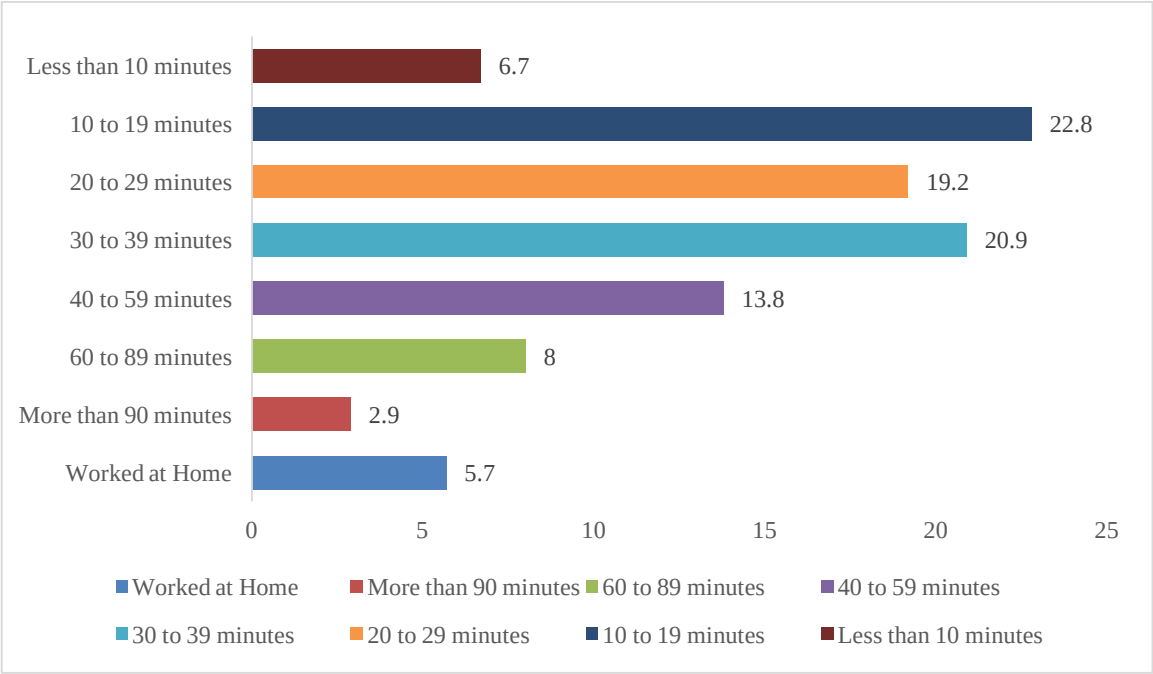

Figure 10 Travel Time for Workers in the City of Los Angeles 16+ Years (Percentages). *Source*: (U.S. Census Bureau 2014)

1.5 Methodological Overview

The purpose of this project is to investigate suitable sites for the construction of higher density affordable rental housing developments (55-218 dwelling units/acre) in Los Angeles. The following variables are analyzed: land use, zoning, cost of land, fair share, employment, public transit, public parks, public schools, public libraries, healthcare centers, grocery stores, and farmers' markets. Accordingly, a service area analysis of the site amenities is done to show a more accurate representation of distance from parcels to facilities. Then, six iterations of a site suitability analysis (SSA) are performed to show how GIS technology can be used to best support housing policy and better inform decision-makers. Specifically, the weighted linear combination (WLC) method is applied in the analysis.

1.5.1. Service Area Analysis

The service area analysis was selected for this project because it is a more accurate representation of distance than the buffer polygons method. The datasets are analyzed in ArcMap using the Network Analyst extension. Results of the service area analyses are subsequently included in the various iterations of the site suitability analysis. Data for the service area analysis were collected from ArcGIS Online, City of Los Angeles Department of City Planning, City of Los Angeles Department of Recreation and Parks, City of Los Angeles GeoHub, Los Angeles County GIS Data Portal, and the United States Environmental Protection Agency Smart Location Database.

1.5.2. Site Suitability Analysis

The site suitability analysis consists of six iterations to provide a more comprehensive analysis. These iterations take into account the following considerations: local regulations, fair share, impact of cost of land, site amenities, environmental sustainability, and jobs-housing balance. The site suitability analysis iterations include any one of the twelve variables—discussed in detail in chapters two and three—each of which will be assigned a weight and score. Data for this analysis were collected from ArcGIS Online, City of Los Angeles Department of City Planning, City of Los Angeles Department of Recreation and Parks, Los Angeles County GIS Data Portal, and the United States Environmental Protection Agency Smart Location Database. The datasets were analyzed in the ArcMap program from ArcGIS for Server.

1.6 Thesis Structure

This research paper is divided into five chapters. Chapter 1 provides the reader with an introduction, overview, motivation, and methodological overview of the project. In addition, the reader is presented with a brief summary of the study area and demographic information that is pertinent to the issue of higher density affordable rental housing. Chapter 2 discusses previous studies and work, while also providing background information that is relevant to this research. Chapter 3 details the methodology and data sources that were employed in this study. Chapter 4 examines the results of the fair share analysis, service area analyses, and the six iterations of the site suitability analysis. Finally, Chapter 5 communicates the findings and recommendations of the research and states the limitations of this project.

Chapter 2 Background and Literature Review

To better understand the relevance and significance of this study, it is necessary to provide background information and discuss previous literature on the topic. The chapter begins with a discussion of past work on site suitability analyses of affordable housing and how this research builds upon it. Next, redevelopment and existing financing tools are explored to highlight the importance that funding has in moving forward with the construction of higher density affordable rental housing developments. This is followed by an explanation of state and local regulations that either encourage or limit the production of higher density affordable rental housing developments in Los Angeles. The chapter ends with a brief examination of cost of land and site amenities, both of which directly or indirectly impact higher density affordable rental housing construction in Los Angeles.

2.1 Previous Research

Several variations of site suitability analysis for affordable housing development have been performed for different counties and cities in the United States. However, only one housing allocation statistical model for affordable housing and one inventory of available parcels for housing were found for Los Angeles. Specifically, these are a 1973 study model for subsidized housing location done by Adrian D. LeRoy from the City of Los Angeles Department of City Planning (LeRoy 1973) and an "Inventory and Maps of Parcels Available for Housing by Community Planning Area" found as Appendix H in the 2013-2021 Housing Element of the City of Los Angeles (City of Los Angeles Department of City Planning 2013). As such, this research builds upon these two studies and previous site suitability work related to affordable housing that are reviewed below.

The first study is a 1973 model created by Adrian D. LeRoy, which sought to plan for the allocation construction of new low-income and moderate-income subsidized housing in Los Angeles by summing raw data measured in different units and converting it to statistical z-scores (LeRoy 1973). At the time, the model—which looked at vacant and underutilized parcels—was considered a new approach to identify suitable areas for the construction of small affordable housing projects scattered throughout the City. LeRoy analyzes transportation (bus stops), job availability, physical environment (climate, air pollution, aircraft noise, and ambiance), education, relevant land cost, and density of existing subsidized housing to determine suitable sites for the construction of subsidized housing development. For each criterion, standard z-scores were calculated, assigned a weight, and then totaled. LeRoy also made use of the Computer Assisted Site Selection Algorithm (CASSA), developed by the City of Los Angeles Department of City Planning, to perform the analysis. Overall, the model gives planners the option to select one of the ten weighted options appropriate to different situations and serves as groundwork in establishing the criteria for this project.

The second work is a professional report written by Natalie Anderson for Abode Communities, a non-profit affordable housing developer based in Los Angeles (Anderson 2011). The primary objective of the report is to identify a selection of sites within Orange County, California, that are suitable for the development of affordable housing projects. Anderson makes use of ArcGIS and Google Maps to perform a site suitability analysis (SSA) of site amenities established by the California Tax Credit Allocation Committee (CTCAC), the committee responsible for awarding Low-Income Housing Tax Credits (LIHTC) to affordable housing developers and/or investors. She is able to identify five suitable sites for affordable housing developments located in the cities of Brea, Fullerton, Garden Grove, and Tustin. Accordingly,

the site amenities identified in Anderson's work, serve as a guide in establishing the site amenities variables for this study.

Lastly, a thesis written by Michael David Van Atta (2013) was reviewed. Van Atta (2013) investigates the site suitability of a suburban region, Fairfax County, Virginia, for low-income housing by making use of a GIS model. Specifically, he uses a multiple-criteria evaluation (MCE) model to analyze the following factors or location amenities: poverty, employment, schools, crime, medical care, shopping centers/grocery stores, public transportation, child care, and population density. Van Atta links GIS methodology with social policy and seeks to provide policymakers and planners with a tool to analyze the spatial distribution of critical location amenities and low-income housing development. For purposes of this research, Van Atta's thesis work serves as a basis in identifying both the variables to be analyzed and the methodology to be applied.

2.2 Dissolution of Redevelopment in California

For decades, redevelopment represented an opportunity for local governments and investors to form partnerships, identify sites, and obtain funding for the production, improvement and preservation of affordable housing. In 1945, the California Legislature passed the Community Redevelopment Act, intended to help local governments in eradicating the deterioration of communities through development, reconstruction, and rehabilitation of residential, commercial, industrial, and retail districts. In 1951, the Community Redevelopment Act was replaced with the Community Redevelopment Law (CRL), a mechanism meant to obtain funding from local property taxes to promote redevelopment in areas experiencing decay due to lack of investment and maintenance (County of Los Angeles Department of Auditor-Controller n.d.). Furthermore, the CRL established the control for Tax Increment Financing

(TIF), a method that provides public financing to fund redevelopment, infrastructure, and other community-improvement projects[5]. In addition, the CRL enabled the creation of redevelopment agencies (RDA) in the State of California, which were considered a separate legal entity with the capacity to exercise governmental functions. Per the CRL, the RDAs also had the following four powers: (1) ability to purchase private property, for redevelopment purposes, and/or for resale to another private person or organization; (2) capacity to make use of eminent domain (condemnation) to obtain private property; (3) power to collect property tax-increment to fund the redevelopment program, and (4) ability to issue tax increment bonds (County of Los Angeles Department of Auditor-Controller n.d.).

However, beginning in the mid-1970s, California Legislature began to implement measures intended not only to improve the management of redevelopment funds but also restrict the use of these. For instance, in 1976 state officials required that each RDA allocate a minimum of 20 percent of its annual tax-increment revenue into the Low and Moderate Income Housing Fund (LMIHF) and utilize it to increase, improve, and preserve affordable housing for very low-income, low-income, and moderate-income households[6] (County of Los Angeles Department of Auditor-Controller n.d.). In 1993, the Community Redevelopment Law Reform Act of 1993—or Assembly Bill (AB) 1290—was adopted. AB 1290 narrowed the definition of a *blighted area* or *deteriorated area* to "an area that is predominantly urbanized and where certain problems are so substantial that they constitute a serious physical and economic burden to a community that cannot be reversed by private or government actions absent redevelopment" (Blount, et al. 2014,

[5] TIF uses future property tax increases to subsidize current projects that are anticipated to increase property values in the surrounding area (County of Los Angeles Department of Auditor-Controller n.d.).

[6] Despite the mandate, by fiscal year 2009-2010 many RDAs had instead accumulated significant balances in their housing funds (Blount, et al. 2014).

2). The bill also limited the RDAs' capacity to subsidize or help auto dealerships, large volume retailers, and other sales tax generators.

In June 2011, in an effort to address the State of California's ongoing budget deficit, Governor Jerry Brown signed two bills that would end redevelopment or limit the finances of these entities. ABx1 26 immediately froze the RDAs' authority, mandated that RDAs be abolished, and delineated the process by which the RDAs would transfer their assets and liabilities to Successor Agencies and Successor Housing Agencies. ABx1 27 allowed for individual RDAs to avoid disintegration if they agreed to make annual payments to local school districts. However, the legality of these legislative bills was litigated in court.

In December 29, 2011, the California Supreme Court upheld the constitutionality of ABx1 26, while declaring ABx1 27 unconstitutional. ABx1 27 was declared unconstitutional because it violated Proposition 22, which prohibited the State from obligating RDAs to share money with other local agencies (Blount, et al. 2014). The decision meant the dissolution of 400 RDAs effective February 1, 2012. Accordingly, the successor agencies assumed the responsibilities previously fulfilled by RDAs. In Los Angeles, the City transferred CRA/LA's housing assets to the Los Angeles Housing and Community Investment Department (HCIDLA).

Although the RDAs' investment in affordable housing was minimal, it is anticipated that the closure of these agencies will negatively impact the housing industry. According to data by the California Department of Housing and Community Development (HCD), between the fiscal year (FY) 2001 and FY 2008, only eleven percent of the funds in the LMIHFs were used for housing (Blount, et al. 2014). In Los Angeles, the RDA built approximately 300 affordable housing units annually from 2000 to 2012, which represented about twenty percent of total affordable housing production in the City. Furthermore, the Housing Coalition and the California

Housing Consortium reported that 827 additional RDA housing units in Los Angeles, that were expected to be completed by 2016, would not receive funding (Blount, et al. 2014).

The dissolution of RDAs will also affect housing that is provided through the Low-Income Housing Tax Credit (LIHTC), Community Development Block Grant (CDBG), and the Home Ownership Made Easy Investment Partnerships (HOME) programs. It was customary for affordable housing developers to fill funding gaps in LIHTC or tax-exempt bond development[7]. For example, CTCAC reports that for the 2011 round of awards, sixty-two percent of all nine percent LIHTC applications awarded also used RDA financing. Furthermore, funding from the CDBG and HOME programs was frequently used to finance affordable housing development starting costs, while RDA financing was utilized to fill any financial gaps and guarantee the completion of the project. As such, it is estimated that the elimination of RDA funding for affordable housing developments will result in a statewide average annual loss of 4,500 to 6,500 new affordable units (Blount, et al. 2014).

2.3 Financing Tools

Despite the dissolution of redevelopment agencies and elimination of RDA funding, there are other financing tools that are available at the local, state, and federal level that enable the production, rehabilitation, and preservation of affordable rental housing developments. Appendix A lists and briefly describes some of the existing funding sources available in Los Angeles. In addition, the City is actively seeking and advocating for new funding opportunities as discussed in the objectives, policies, and implementation programs of the City's 2013-2021 Housing Element.

[7] RDA housing developments that are part of the RDA dissolution process will be funded via the Low and Moderate Income Housing Fund (LMIHF).

HOME and CDBG are two of the primary federal housing programs frequently used to build affordable rental housing developments. However, these and other mechanisms have experienced a significant reduction in funding, particularly after the Great Recession (2007 – 2009). For example, the CDBG grant in Los Angeles was reduced from $77.98 million in 2010 to about $52.67 million in 2012. Furthermore, the HOME entitlement grant was reduced from $43.44 million in 2009 to $21.35 million in 2012 (City of Los Angeles Department of City Planning 2013).

In June 2000, Los Angeles created the Affordable Housing Trust Fund (AHTF) to provide financing for affordable rental housing developments. Part of the revenue for the AHTF comes from the City's General Fund. Yet, between 2005 and 2012, no money from the General Fund was allocated to the AHTF. In 2013, though, the City Council and former Mayor Antonio Villaraigosa approved an $18 million commitment to the AHTF from the City of Los Angeles General Fund (Los Angeles Housing Department 2013).

However, the decrease in housing subsidies has also meant an increase in the use of tax-exempt revenue bonds for the preservation and development of affordable rental housing. In fact, issuing bonds has become one of the central programs to preserve affordable housing in Los Angeles at a low cost. Since 1982, the City has disbursed bonds for the construction of multi-family rental housing (City of Los Angeles Department of City Planning 2013). Moreover, tax-exempt revenue bonds are used for acquiring and preserving at-risk units.

Other financing mechanisms important to the development of affordable rental housing in Los Angeles include the LIHTC and the Los Angeles Housing and Community Investment Department (HCIDLA). Although the LIHTC is an important financing source for affordable housing developments in Los Angeles, the guidelines and priorities are set by CTCAC rather

than the City. Accordingly, Los Angeles works with developers of affordable rental housing projects to make sure that they meet the criteria established by the CTCAC. On the other hand, the HCIDLA intends to center its efforts on preservation, new production, and pre-development and acquisition financing to help meet the demand of affordable housing in the City (City of Los Angeles Department of City Planning 2013). HCIDLA's goal is to add 500 affordable housing units in Los Angeles annually.

2.4 Post-Redevelopment Bills

Upon the dissolution of redevelopment agencies, several measures were introduced in the California legislature that would enable the creation of districts or areas of redevelopment, development of affordable housing, and the collection of revenue to fund such projects. The proposed bills include AB 2144, SB 1151, and SB 1156. However, these measures were either vetoed or failed to pass the Assembly or Senate. Table 1 lists and briefly discusses the purpose of the unsuccessful bills.

Table 1 Measures that were Vetoed or Failed to Pass the Assembly or Senate

Proposed Measure	Purpose
AB 2144	Proposed housing development through a Redevelopment Property Tax Trust Fund.
SB 1151	Proposed the creation of new redevelopment agencies, which would have access to RDA assets with a focus on sustainable communities.
SB 1156	Proposed the formation of Sustainable Community Investment Areas and a tax-increment collection to support project construction.

Source: (Blount, et al. 2014)

However, the somber outlook to revive redevelopment in the State of California began to change with the passage of three new post-redevelopment bills that sought to create alternative

options to the dissolved redevelopment agencies, while also addressing some unfinished business from the former RDAs. The three bills are Senate Bill 628 (Beall), Assembly Bill 2, and Senate Bill 107. SB 628 enables the creation of Enhanced Infrastructure Financing Districts (EIFDs), AB 2 represents a new tool for local economic development and housing policy, and SB 107 seeks to clarify and simplify the dissolution process of former RDAs.

In September 2014, SB 628 was signed into law, a statute that allows cities and counties to create new governmental entities called Enhanced Infrastructure Financing Districts (EIFDs). The EIFDs may be used to finance infrastructure development and community revitalization projects—these include affordable rental housing developments—with the property tax-increment of consenting taxing agencies such as cities, counties, and special districts (Association of Bay Area Governments 2015). However, EIFDs cannot reduce from the funding that is made available for public schools. These districts represent a streamlined new tool to allocate current and anticipated tax revenue towards projects that prove beneficial to the district or surrounding community.

In September 2015, AB 2 was signed into law by Governor Brown, which authorizes the creation of a Community Revitalization Investment Authority (CRIA) at the local level. This agency would have the power to make use of property tax increment revenues of consenting local agencies (aside from schools) to finance community revitalization plans that promote employment opportunities, reduce high crime rates, repair deteriorated and inadequate infrastructure, and build affordable housing (League of California Cities 2015). The powers and responsibilities outlined in the measure resemble those of former redevelopment agencies but these have also been stiffened, as they include strict accountability criteria and increase the affordable housing set-aside to twenty-five percent. This means that at least twenty-five percent

of all tax increment revenues that are allocated to the CRIA must be set-aside into a separate LMIHF and used by the agency for the production, rehabilitation, and preservation of low-income and moderate-income housing. In addition, it gives the CRIA the power to make use of eminent domain.

In September 2015, SB 107 was also signed into law, adding additional requirements and deadlines for the dissolution of former RDAs. Furthermore, the measure seeks to resolve pending fiscal issues of the RDAs activities and obligations. Some key points of SB 107 are: targeting successor agencies that have outstanding payments due; mandating successor agencies to pay the balance in full or enter into a payment plan with the Department of Finance (DOF)[8]; litigation expenses must be paid out of the successor agency's administrative cost allowance; expanding the definition of *enforceable obligation* to include the repayment of federal grants or loans made to a city or county that loaned funds to a redevelopment agency; allowing 100 percent of the proceeds of bonds bought with the former redevelopment agency's low-income and moderate-income housing fund to be used; and, expanding the definition of *governmental purpose properties* to include public parking garages and lots (Best Best & Krieger Attorneys at Law 2015). SB 107 also clarifies that the DOF's actions in regards to the dissolution and reconciliation process for RDAs are exempt from the Administrative Procedures Act.

2.5 Senate Bill (SB) 375

Planning for communities in a more sustainable manner has become increasingly important in California. From a policy perspective, the State's legislature has taken steps to

[8] If a successor agency failed to pay the balance in full or enter into a payment plan by December 31, 2015, the successor agency would be prohibited from ever receiving a finding of completion. Without a finding of completion, a successor agency cannot adopt a long-range property management plan for the disposal of properties or take advantage of the abbreviated property disposition process in the new law (Best Best & Krieger Attorneys at Law 2015).

achieve this goal. In September 30, 2008, Senate Bill (SB) 375—authored by Senate President Pro Tem Darrell Steinberg—was signed into law (Cohen 2011). SB 375 seeks to decrease greenhouse gases (GHGs) from passenger vehicles and light duty trucks through the coordination of land use and transportation development patterns at the regional scale. It is hoped that adequate implementation of SB 375 will create communities that are more walkable, environmentally sustainable, healthy, and affordable.

Currently, regional planning agencies (RPA) and metropolitan planning organizations (MPO) in the state are required to create a Regional Transportation Plan (RTP) that specifies how transportation funds will be used. However, with the enactment of SB 375, the RTPs must now also include a new element known as the *Sustainable Communities Strategy* (SCS). For Los Angeles, the Southern California Association of Governments (SCAG) is the regional MPO that is tasked with creating a land use and transportation plan that will reduce and meet GHG emissions targets. Furthermore, the SCS must include a jobs and housing balance plan by taking into account the region's future growth. Accordingly, local governments are also required to show where housing will be built while also meeting their regional housing needs allocation or "fair share." Therefore, SB 375 modified the Housing Element law and extended the planning period of the Housing Element from five to eight years in order to align it with RTP deadlines (Housing California n.d.). In other words, one Housing Element will be completed every two RTP periods, which are four to five years each.

SB 375 also amended the California Environmental Quality Act (CEQA), which identifies and mitigates environmental impacts, to streamline the process for projects that help reduce the growth of GHG emissions. Therefore, changes were made for two types of proposed projects. First, projects that are residential or mixed use, are consistent with the SCS or approved

Alternative Planning Strategy (APS), and have included mitigated measures required by a previous Environmental Impact Report (EIR) will be excluded from the following three requirements: (1) analysis of GHG emissions for cars and light trucks; (2) analysis of cumulative impacts on the regional transportation network, and (3) analysis of lower density alternatives (Cohen 2011). Second, projects that are considered *Transit Priority Projects*, meaning that they are within half a mile of frequent transit and have a proposed density of at least twenty units per acre, will be eligible for additional CEQA streamlining.

Given the impact that the aforementioned legislative measures may have on the construction of affordable housing developments in Los Angeles, this research incorporates variables in several iterations of the site suitability analysis that take into account these bills. Accordingly, the variables of land use, zoning, cost of land, employment, and site amenities that may qualify proposed affordable housing projects for funding are analyzed. Furthermore, a site suitability analysis, consisting of six iterations is performed. These iterations reflect the different factors that are considered when seeking to build higher density affordable rental housing developments, these include funding, jobs-housing balance, and environmental sustainability.

2.6 Land Use

Land use refers to the activity that occurs on land and within the structures that are built on the land. It establishes the type for each of the land use designations, such as residential, commercial, and industrial uses (Los Angeles County Department of Regional Planning 2009). Furthermore, land use includes the overall maximum density for residential development and maximum intensity of development for commercial and industrial uses. For example, a low density residential land use designation is meant primarily for the construction of single family homes. In Los Angeles, land use is regulated and planned for by policy documents like the

General Plan Framework Element, the thirty-five community plans, and the forty-nine Specific Plans. These documents guide the distribution, general location, and extent of uses for the development of housing, business, industry, open space, and other uses of land.

2.6.1. City of Los Angeles General Plan Framework Element

Mandated by California law, the General Plan Framework Element (Framework Element) of Los Angeles is a policy document that defines long-term citywide growth policies that will be implemented though amendments and updates to the City's community plans, zoning ordinances, and other relevant programs. For example, the Framework Element shows the general distribution of downtown community centers, neighborhood districts, and mixed-use (housing and commercial) boulevards throughout Los Angeles. However, the specific land use designations are determined by community plans, specific plans, and Los Angeles Municipal Code (zoning regulations)—basic mechanisms intended to regulate the use and development of land (City of Los Angeles Department of City Planning 2001). Therefore, the Framework Element does not supersede the more detailed community plans and specific plans.

The main objectives of the policies in the Framework Element's Land Use chapter are to support the viability and growth of the city's residential neighborhoods and commercial districts. If growth occurs, the policies encourage development in a sustainable manner by creating higher-intensity commercial, mixed-use districts, centers, boulevards, and industrial districts near transportation corridors and transit stations (City of Los Angeles Department of City Planning 2001). Appendix B shows the land use standards and their common development characteristics, some of which are analyzed in this research. The land use standards are multi-family residential, neighborhood district, community center, region, downtown center, boulevard-mixed-use, general commercial, pedestrian overlay, industrial-light, and industrial-transit. Mixed-use

development can occur in one of three ways in Los Angeles: housing above commercial, housing side-by-side with commercial, and/or alternating blocks of housing and commercial. In addition, it should be noted that although industrial land use designations are not meant for the construction of housing, this option is increasingly being considered as it would help alleviate the existing housing crises—particularly in areas designated for light industrial use (City of Los Angeles Department of City Planning 2001).

As it relates to housing, the goal of the Framework Element is to have enough land for the development of an adequate supply of housing. Accordingly, the Framework Element proposes and promotes the application of the density bonus to incorporate housing with commercial uses. To this end, the Framework Element recommends the use of incentives in the following instances: distribution of affordable units throughout the City; construction of family-size units in multi-family developments; and, expediting the permit processing for affordable housing projects (City of Los Angeles Department of City Planning 2001). Another option is the use of infill development in areas where development of affordable housing is permissible.

In fact, the Framework Element also acknowledges that there are not enough vacant properties to meet the projected population growth; therefore, it proposes the use of infill development. The following are some of the recommended housing policy measures in this regard: (1) build new multi-family residential, commercial retail, and office developments in the City; (2) enable development opportunities along boulevards that are located near transit facilities that are underdeveloped or have limited commercial uses with structures that incorporate commercial, housing, and/or public service uses, and (3) focus mixed-use developments (commercial/residential) around urban transit stations (City of Los Angeles Department of City Planning 2001). Moreover, the City of Los Angeles and the Los Angeles

County Metropolitan Transportation Authority (Metro) came together to collaborate in the creation of policies that would support the construction of higher-density mixed-use projects within a quarter mile of rail and major bus transit facilities. Still, others have proposed the re-use of industrial land uses for residential purposes.

2.6.2. Community Plans

A Community Plan (CP), a policy document that is part of the General Plan Framework Element of the City of Los Angeles, serves as a guide to future development by promoting the arrangement of land uses, streets, and services within a specific community in a manner that will improve the economic, social, physical health, safety, welfare, and overall well-being of those who live and work in the community (City of Los Angeles Department of City Planning n.d.). In an effort to better coordinate development, each community plan contains goals, objectives, policies, and programs intended to meet the current and future needs of the community. However, the process must be inclusive, as the State of California requires citizen participation through public hearings, public workshops, and/or open houses. Furthermore, the City of Los Angeles Department of City Planning is required to develop a monitoring system and prepare periodic (every five years) reports on projected population growth.

There are currently thirty-five community plans (thirty-seven if one includes the Los Angeles International Airport and Port of Los Angeles CPAs) that form the Framework Element of Los Angeles General Plan. A majority of the plans are outdated, as they were last successfully updated anywhere between the years 1988 and 2004. However, the City of Los Angeles Department of City of Planning is currently working on updating the following nine community plans: Boyle Heights, Central City, Granada Hills, Hollywood, San Pedro, South Los Angeles, Southeast Los Angeles, Sylmar, and West Adams (City of Los Angeles Department of City

Planning n.d.). Each of the community plans can be grouped into one of the following three land use densities (dwelling units/net acre): Medium (29-55 units); High-Medium (55-109 units); or, High (109-218 units). Community plans that at present allow for a *high* land use density in their community are Central City, Westlake, and Westwood.

For purposes of this research, each of the community plans was reviewed for the following criteria: allows higher density housing, encourages affordable housing construction, promotes mixed-use development (residential/commercial), encourages housing near transit, and proposes housing in industrial areas. These five factors were identified by the author to show how existing land use policy promotes or limits the construction of higher density affordable rental housing developments in Los Angeles. While all thirty-five community plans support the construction of affordable housing, it was found that the following twelve community plans do not allow for higher density housing (maximum permitted land use density is "Medium"): Bel Air-Beverly Crest, Boyle Heights, Chatsworth-Porter Ranch, Encino-Tarzana, Granada Hills-Knollwood, Harbor Gateway, Northridge, Silver Lake-Echo Park-Elysian Valley, Southeast Los Angeles, Sun Valley-La Tuna Canyon, Sunland-Tujunga-Lake View Terrace-Shadow Hills-East La Tuna Canyon, and Wilmington-Harbor City. The Bel Air-Beverly Crest Community Plan does not encourage mixed-use development.

Additionally, the review of the community plans showed that the Bel Air-Beverly Crest, Central City, and Chatsworth-Porter Ranch community plans do not promote the construction of housing near transit. However, the Central City, Central City North, Sylmar, and Venice community plans propose that housing be built in industrial areas. In fact, the Venice Community Plan has designated some areas that include live/work artist studios and workshops as Commercial Artcraft (CA) and may be found in either residential or commercial areas. Lastly,

both the South Central Los Angeles[9] and Southeast Los Angeles community plans state in the text of the policy document that their communities do not seek to have new concentrations of low-income housing. More information about the findings of the aforementioned criteria for the thirty-five community plans can be found in Appendix C.

2.6.3. Assembly Bill 2522

Assembly Bill 2522 was recently amended to allow development that includes a percentage of affordable units that are on an infill site or an urbanized area, to be approved *by right*[10]—not subject to a conditional use permit or discretionary review. The amendments made to AB 2522 intend to provide a market-rate solution to affordable and workforce housing while also addressing the ongoing local opposition to affordable housing through the CEQA process. Under the amended version, cities and counties would be required to give by right approval to any market rate multi-family rental housing project that includes at least 20 percent low-income housing or 100 percent moderate-income housing (California Legislative Information 2016). Furthermore, the by right approval would be automatically applicable to proposed attached housing developments that have already been identified for housing in the city's or county's Housing Element, are located in urban areas, and are consistent with the General Plan, zoning, and design criteria. Two additional provisions to AB 2522 stipulate that attached housing developments must incorporate housing for very low-income, low-income, or moderate-income households and attached housing development must be in either an *urbanized area* or *infill site*. However, the analysis of the bill includes comments made by the staff in which it suggests to

[9] "South Central Los Angeles" is currently known as "South Los Angeles."
[10] *By right* means that a local government may not require a conditional use permit, planned unit development permit, other discretionary local government review, or classify as a "project" (for purposes of CEQA) an owner-occupied or multi-family residential development (California Legislative Information 2016).

committee members that they consider making the following two changes to the existing measure: exempting jurisdictions that have been successful in building affordable housing[11] and ensure that affordability housing covenants are created for a period of at least fifty-five years for very low-income and low-income households and a minimum of forty-five years for moderate-income households (California Legislative Information 2016).

2.7 Zoning

Zoning is the way that local city, county, or municipality governments control the physical development of land (i.e. land use) and the types of uses of individual properties. Zoning laws typically specify the areas in which residential, commercial, industrial, or recreational activities may take place; however, these classifications are not universal. Furthermore, zoning laws may also regulate the maximum height, allowable area, and required yards of a property or lot. It is common for communities to use letters of the alphabet to identify the use allowed in a given area, such as "C" for commercial, "M" for manufacturing, and "R" for residential. These letter symbols are followed by a number that specifies the level of use; for example, R-1 for a single-family home and R-3 for apartment complexes. Zoning laws are not permanent, as exceptions and/or amendments can be made.

In Los Angeles, a land use map is implemented through the City Zoning Code, Article 2 of the Los Angeles Municipal Code (LAMC). Both the LAMC and city zoning maps identify the specific types of land use and the development standards that apply to specific geographic areas and parcels for each of the thirty-five community plans. However, zoning laws have made it

[11] The proposal is to give local governments the option of opting out of the requirements of the bill if in the most recently completed RHNA cycle these have exceeded 60 percent of their total RHNA for all income levels and have exceeded 40 percent of the RHNA for very low-income and low-income levels combined (California Legislative Information 2016).

historically difficult and expensive for developers and investors to build higher density affordable rental housing because the zoning code was designed for a city of detached, single homes. Table 2 shows some of the zoning designations and respective uses allowed in Los Angeles—all of which are included in the site suitability analysis (SSA).

Table 2 City of Los Angeles Zoning Designations and Allowed Uses

Zoning Designation	Allowed Use
R-3	One unit per 800 square feet
RAS-3	One unit per 800 square feet
R-4	One unit per 400 square feet
RAS-4	One unit per 400 square feet
R-5	One unit per 200 square feet
CR	Limited commercial zoning; however, it can be treated as R-4 for residential uses.
C-1	Commercial zoning; however, it can be treated as R-3 for residential uses.
C-1.5	Commercial zoning; however, it can be treated as R-4 for residential uses.
C-2	Commercial zoning; however, it can be treated as R-4 for residential uses.
C-4	Commercial zoning; however, it can be treated as R-4 for residential uses.
C-5	Commercial zoning; however, it can be treated as R-4 for residential uses.
CM	Commercial manufacturing zoning; however, it can be treated as R-3 for residential uses.
MR-1	Restricted industrial zoning; however, it can be treated as R-4 for residential uses.
M-1	Limited industrial zoning; however, it can be treated as R-4 for residential uses.
MR-2	Restricted light industrial zoning; however, it can be treated as R-5 for residential uses.
M-2	Light industrial zoning; however, it can be treated as R-5 for residential uses.

Source: (City of Los Angeles Department of City Planning 2006)

2.7.1. Residential Accessory Services in the City of Los Angeles

Two Residential Accessory Services (RAS) zones—RAS 3 and RAS 4—were adopted by the Los Angeles Council in December 2002 to encourage mixed-use development along underutilized commercial and transit corridors. These two new zones were added in response to the demand to build multi-family housing in commercial zones. Both of these zones allow for the construction of 100 percent housing or building housing above ground floor commercial but at different densities. RAS-3 allows medium density housing, or up to 54 units to be built per acre. RAS-4 allows for the construction of up to 108 units per acre. In essence, RAS zones allow a greater floor area than commercial zones and higher height than otherwise allowed in a height district.

Several community plans of Los Angeles permit the use of RAS zones in their communities. In fact, less than three years after the new zones were adopted, the City received applications for more than 4,000 apartments and condominiums (City of Los Angeles Department of City Planning 2006). However, in an effort to not jeopardize the validity of the community plans, the City Council limited the residential density allowed in the RAS-3 and RAS-4 zones to correspond to the residential densities permitted in the R-3 and R-4 zones, respectively. Accordingly, City Council allowed RAS-3 and RAS-4 zones in community plans that permit R-4 and higher zoning but only allowed the RAS-3 zone in community plans that previously had R-3 as the highest zoning designation (City of Los Angeles Department of City Planning 2005). A request to have a zone change to RAS-3 or RAS-4 can be submitted by the property owner or the City. In both cases, public hearings and environmental review will take place.

2.8 Housing Element

Since 1969 State of California law requires that every city and county in California adopt a certified Housing Element as part of its General Plan. The Housing Element must be updated every five to six years and it must comply with statutory requirements and undergo a mandatory review from the HCD (Department of Housing and Community Development 2007). Furthermore, state housing law requires that the Regional Housing Needs Assessment (RHNA) be taken into account when updating the Housing Element and General Plan. RHNA is an assessment process in which factors such as employment, migration, growth, and building activity are considered, and will be discussed further in the next section.

The purpose of the Housing Element is for local governments to identify and plan for existing and future housing needs, which includes their RHNA share of the regional housing need. It analyzes population, household types, housing stock characteristics, and special needs. Moreover, the Housing Element takes into account the following five income categories when planning for existing and future housing needs: extremely low-income, very low-income, low-income, moderate-income, and above moderate-income (City of Los Angeles Department of City Planning 2013).

2.8.1. City of Los Angeles Housing Element 2013-2021

In December 2013, the City Council adopted the 2013-2021 Housing Element of the City of Los Angeles. Currently Los Angeles is under the eight-year Housing Element planning period. The City's Housing Element contains goals, objectives, policies, and implementation programs that seek to identify housing conditions, needs, and growth while also creating sustainable, mixed-income neighborhoods across Los Angeles (City of Los Angeles Department of City

Planning 2013). In essence, local government officials aim to relieve the existing housing problems that are negatively affecting Angelenos.

To meet the current and projected housing needs in the City, the following four goals have been identified in the 2013-2021 Housing Element: housing production and preservation that is safe, healthy, and affordable for all Angelenos; housing that promotes safe, livable, and sustainable neighborhoods; equal housing opportunity by preventing housing discrimination; and, prevent and end homeless. Furthermore, the 2013-2021 Housing Element contains objectives and policies intended to better meet these goals. Not only does the Housing Element contain objectives and policies that seek to produce new affordable housing rental units but also maintain and rehabilitate existing affordable housing rental stock. For purposes of this research, Appendix D lists objectives and policies that directly or indirectly promote the production of affordable rental housing developments, some of which allude to higher density affordable rental housing developments. Additionally, the 2013-2021 Housing Element contains implementation programs that will serve as mechanisms to better meet the established goals, objectives, and policies. Appendix E lists the implementation programs related to the production of affordable rental housing developments.

2.9 Regional Housing Needs Assessment (RHNA)

The Regional Housing Needs Assessment is a mandatory assessment process that quantifies housing need during a specific planning period. This is a process in which the HCD, regional council of governments (COGs), and local governments participate to determine existing and future housing needs for persons at all income levels. The housing need numbers assigned at the state, regional, and local level is known as the *RHNA Allocation* or *fair share* (City of Los Angeles Department of City Planning 2013). While the terms *RHNA Allocation* and

fair share are used interchangeably when referring to RHNA, for purposes of this study a distinction will be made between the two terms. *RHNA Allocation* will refer to the actual assessment process in which different stakeholders participate. On the other hand, *fair share* will refer to the variable that is analyzed in this study, which makes reference to the RHNA Allocation Plan but is calculated with reference to populations and is discussed in detail in the next chapter.

To determine the state-wide housing need, the HCD works with the regional councils of government to forecast growth in the respective COG regions. The growth projected is then converted into a Regional Housing Needs Assessment (RHNA) that consists of the total number of new units required to meet the growth needs (City of Los Angeles Department of City Planning 2013). Next, each COG develops a methodology to assign each jurisdiction its RHNA allocation number based on factors such as employment, migration, growth, and building activity (City of Los Angeles Department of City Planning 2013). SCAG is the regional COG for Southern California and Los Angeles and is thereby mandated by state law to determine housing need in the region.

RHNA does not encourage or promote growth; instead, it allows local governments to plan for projected growth so that the region can grow in a sustainable manner (Southern California Association of Governments 2016). Table 3 shows how the RHNA allocation for each jurisdiction is distributed among the four income categories, and the corresponding percent of area median income (AMI), to meet the planning for all income levels (California Department of Housing and Community Development 2010). In addition, the RHNA Plan should promote the following objectives: increase housing supply, mix of housing types, tenure, and affordability in an equitable manner; encourage infill development, socioeconomic equity, protection of

environmental and agricultural resources, and efficient development patterns; and, encourage and improve the relationship between jobs and housing (California Department of Housing and Community Development 2010).

Table 3 RHNA Allocation Distribution by Income Category and Corresponding Percent of AMI

Income Category	Percent of Area Median Income (AMI)
Very Low	0—50% of AMI
Low	51%—80% of AMI
Moderate	81—120% of AMI
Above Moderate	over 120% of AMI

For purposes of this analysis, reference was made to the 4th Cycle Final RHNA Allocation Plan, in which the total assigned RHNA allocation for Los Angeles was 1112,876 units. The 4th Cycle RHNA Allocation Plan covers the period from January 1, 2006 to June 30, 2014. The RHNA Allocation Plan was adopted by the SCAG Regional Council in July 12, 2007 and was transmitted to HCD in July 13, 2007. Table 4 shows the distribution among the four income categories to meet the housing planning at all income levels.

Table 4 4th Cycle RHNA Final Allocation Plan for City of Los Angeles

Income Category	RHNA Allocation
Very Low-Income	27,238
Low-Income	17,495
Moderate-Income	19,304
Above Moderate-Income	48,839

Source: (Southern California Association of Governments 2007)

2.10 Mello Act

In January 1982, the California Mello Act went into effect with the purpose to protect and increase the affordable housing stock in the state's coastal zone. The ordinance requires that

existing affordable housing units that will be removed or converted be replaced one-for-one with new affordable housing units. In addition, condominium conversions and for-sale housing projects that consist of five or more units must provide new affordable units (City of Los Angeles Department of City Planning 2006). The Mello Act also establishes the option of in-lieu fees.

In Los Angeles, the Mello Act applies to the following community plan areas: Brentwood-Pacific Palisades, Canoga Park-Winnetka-Woodland Hills-West Hills, Encino-Tarzana, Palms-Mar Vista-Del Rey, Los Angeles International Airport, Port of Los Angeles, San Pedro, Venice, Wilmington-Harbor City, Westchester-Playa del Rey, and West Los Angeles. However, a lawsuit was filed in 1993 against Los Angeles. In *Venice Town Council, Inc. v. City of Los Angeles*, the issue was raised as to whether or not Los Angeles was to require developers to replace residential units, or pay an in-lieu-fee, whenever an affordable housing unit was demolished or converted (Justia US Law 1996). A settlement agreement was reached in 2001, in which the City was required to adopt permanent policies that implemented the Mello Act. Therefore, as of 2006, staff from the City of Los Angeles Department of City Planning were proposing an interim ordinance, known as the *Interim Administrative Procedures*, that would replace the City's current Mello Act policy. Appendix F provides a comparison of some of the existing and proposed Mello Act policies for Los Angeles. Appendix F is provided as background and while not incorporated in the SSA as a variable, the SSA does analyze site suitability for higher density affordable rental housing developments in the City's coastal zone.

2.11 Density

Factors such as housing prices surpassing household incomes and inadequate housing production that meets the job and household growth, contribute to the current affordable housing

crisis that various cities in California—including Los Angeles—are experiencing. Accordingly, one solution to meet housing need is the construction of higher density affordable housing, to alleviate overcrowding and housing burden costs. However, opposition to higher density affordable housing makes it difficult to move forward with such projects. Much of the antagonism is due to existing misconceptions about higher density affordable housing. Among these are the following eight myths: (1) higher density housing is affordable housing and affordable housing is higher density; (2) higher density and affordable housing will cause too much traffic; (3) higher density housing strains public services and infrastructures; (4) people who live in higher density and affordable housing will not fit into the community; (5) affordable housing reduces property values; (6) residents of affordable housing move too often to be stable community members; (7) higher density and affordable housing undermine community character; and (8) higher density and affordable housing increase crime (California Planning Roundtable, California Department of Housing & Community Development 1993).

Yet, in a 1993 report by the California Planning Roundtable and the HCD, these misconceptions about higher density affordable housing are demystified. Among its findings, the report states that not all higher density housing is affordable to low-income families, people who live in affordable housing own fewer cars and drive less, and compact development offers greater efficiency in use of public services and infrastructure (California Planning Roundtable, California Department of Housing & Community Development 1993). In fact, the report notes that design and use of public spaces have a more significant negative or positive effect on crime than density or income. The report further elaborates on some of these facts. For instance, the California Planning Roundtable and the HCD found that low density neighborhoods tend to offer more expensive housing than higher density communities, higher density housing encourages

mixed-use development and more walkable communities, and higher density residential developments require less extensive infrastructure networks. Nevertheless, the report does note that higher density alone is not enough to ensure the affordability of housing and it is therefore necessary for local governments to offer other programs and incentives that will guarantee higher density units to be affordable.

One approach to meet housing needs through higher density development is through infill development. This process can be especially successful in areas that show promise but that have not been used to their maximum capacity. Furthermore, it is recommended that new developments have mixed-income units to better accommodate the different types of households.

2.11.1. California Affordable Housing Density Bonus Law

The California Density Bonus Law (Density Bonus) is a state mandate (found in California Government Code Sections 65915-65918), which means that cities, counties, and even charter cities must adopt and implement it into their local laws. This law is meant to provide a *density*[12] *bonus* and other incentives for developers who include affordable and/or senior housing units in their projects. These tools include up to a thirty-five percent increase in project densities, —depending on the amount of affordable housing provided—reduced parking requirements, reduced setbacks, minimum square footage requirements, and the ability to donate land. The Density Bonus may also serve as a mechanism to increase the allowable density without requiring local officials to make changes to the General Plan or zoning code. Two instances in which local governments must grant a density bonus and other incentives or concessions are to

[12] *Density* can be defined in two ways: (1) the number of housing dwelling units within the land area (square miles or acres); (2) or, population by land area or housing unit. While density is usually referred to in the development world as the former, the latter is also important because it shows the reality of density and there is also a direct relationship to overcrowding (Southern California Association of Non-Profit Housing n.d.).

housing projects in which at least five percent of the housing units are restricted to very low-income households and housing projects in which at least ten percent of the housing units are restricted to lower-income households (Goetz and Sakai 2015).

The law defines a *concession* or *incentive* as a reduction in site development standards, or a modification to the zoning code, or architectural design requirements, or approval of mixed-use zoning, or other regulatory incentives or concessions which result in a cost reduction (Goetz and Sakai 2015). The number of incentives or concession granted for a project is dependent on the percentage of affordable units in the project. Per state law, between one and three incentives or concessions may be granted for a project. Often, a developer finds the available incentives or concessions more valuable than the bonus density itself, as this could mean reduced parking requirements for their project; therefore, lower costs. In addition, the Density Bonus may also serve as a tool for density bonus projects to qualify for urban infill and affordable housing exemptions from CEQA.

Furthermore, the Density Bonus mandates that qualifying projects incorporate affordability covenants. Under the current state law, income and rent restriction must remain in effect for a minimum of fifty-five years. This means that rents must be restricted for very low-income units (rents may not exceed between thirty percent and fifty percent of the AMI) and for low-income units (rents may not exceed between thirty percent and sixty percent of the AMI) (Goetz and Sakai 2015). Hence, these types of covenants, serve as an additional tool to ensure the long term affordability of higher density affordable rental housing developments.

2.11.2. City of Los Angeles Density Bonus Ordinance

In order to comply with the California Density Bonus Law, Los Angeles amended its Municipal Code and in April 2008 adopted a local Density Bonus program. This means that the

City approves an increase in density over the allowed residential density for projects that include affordable housing or senior housing units. Housing development projects are defined as the construction of at least five dwelling units, addition of at least five dwelling units to an existing building(s), remodeling of a building that has at least five residential units, or a mixed-use development in which the residential floor area occupies at least fifty percent of the total floor area of the building(s) (City of Los Angeles Department of City Planning 2008). Furthermore, a density bonus of ten percent, fifteen percent, or twenty percent will be granted for housing development projects that allocate a certain percentage of the total units of the project for very low-income households or low-income households. The density bonus may be increased up to a maximum of thirty-five percent, depending on the percentage of affordable housing units that are included. It should be noted, that for purposes of calculating density bonus and restricted affordable units, any number that results in a fraction will be rounded up to the next whole number.

The Density Bonus Ordinance also stipulates other guidelines that are necessary to ensure the long-term affordability of these housing development projects while also noting some exceptions to the law. For instance, it indicates that the Los Angeles Housing Department (LAHD) is responsible for establishing the affordability restrictions on household income. Furthermore, the Density Bonus Ordinance establishes that a covenant of a minimum of fifty-five years must be recorded for senior citizen housing or any housing development project that qualifies for a density bonus and that contains housing for very low-income and low-income households. Covenants of at least ten years must be recorded for any housing development project that qualifies for a density bonus and that contains housing for moderate-income

households. It also points out that the Density Bonus Ordinance does not apply to any property that is located within the boundaries of a Certified Local Coastal Plan.

2.11.3. Transfer of Floor Area Rights Ordinance for Downtown Los Angeles

In May 2007, Los Angeles adopted the Transfer of Floor Area Rights, an ordinance that enables the City to sell rights to developers from the Convention Center to Downtown Los Angeles to build additional floor area within a project. The TFAR only applies to the Central City Community Plan and the City Center Redevelopment Project areas. Under this decree, developers may buy floor area left from the Convention Center development and transfer that density to a nearby site; thereby, increasing density by exceeding the floor area ratio (FAR) of 6:1 or 3:1—as set forth by the zoning (The Planning Report 2007). The ordinance also establishes separate procedures for transfers of less than 50,000 square feet and transfers of 50,000 square feet or greater. Nonetheless, all qualifying projects must still go through the planning process.

An additional benefit of the City's Transfer Floor Area Rights is that it creates a fund to promote smarter growth. This fund is known as the *Transfer of Floor Area Rights Public Benefit Payment Trust Fund* (Trust Fund). The Trust Fund is intended to serve a public purpose, such as: providing for affordable housing; public open space; historic preservation; recreational, cultural, community, and public facilities; job training and outreach programs; affordable child care; streetscape improvements; public arts programs; homeless services programs; or, public transportation improvements (City of Los Angeles Department of City Planning 2007). These funds benefit receiver projects that are within a two-mile radius, which include communities like South Los Angeles, Pico Union, and Boyle Heights (The Planning Report 2007). This housing-related policy is provided as background and can serve as an example of how housing policy can

help promote the construction of higher density affordable rental housing developments in Los Angeles.

2.11.4. City of Los Angeles Greater Downtown Housing Incentive Area

In September 2007, Los Angeles modified Ordinance No. 179,076 and thereby established the Greater Downtown Housing Incentive Area, which affects the Central City and Southeast Los Angeles CPAs, in which a Floor Area Bonus and other incentives are granted to projects that voluntarily include a certain percentage of affordable housing units. In order for a project to qualify for the bonus and incentives, it must set aside a specific percentage of the total number of dwelling units for very low-income households (five percent), low-income households (ten percent), moderate-income households (fifteen percent), or workforce income households (150 percent of AMI) (20 percent). Furthermore, the ordinance stipulates that any dwelling unit or guest room that is occupied by a household that is earning less than fifty percent of the AMI and that is demolished must be replaced on a one-for-one basis within the community plan area. Lastly, the ordinance sets forth that before a building permit can be issued, affordability covenants should be established for at least thirty years for all affordable units and filed with the LAHD.

2.12 Cost of Land

Los Angeles is among the most desirable locations in California and in the United States to live. However, the City also has one of the highest housing costs in the nation, making it one of the most expensive places to reside. According to a 2015 report from the Legislative Analyst's Office, the metropolitan area of Los Angeles is tied with Oakland and San Diego, as the fourth most expensive areas to live in California for renters (Taylor 2015). The steep housing costs are partly attributed to high land costs and low density. In fact, the highest costs of land are in

coastal areas[13]. To offset the effects of high-priced land it is recommended that higher density housing developments be built or that land use for affordable housing developments be provided at a discounted price or for free by local government officials. These alternatives would allow a developer to minimize or spread housing costs, which would result in lower rents for renters.

2.13 Site Amenities

As previously stated, LIHTC represents an important financing source for developers and investors seeking to build affordable rental housing in Los Angeles and California. The guidelines and priorities are established by CTCAC, based on California Code Regulations, title 4, div. 17, Ch. 1 § 10300 – 10337 (Anderson 2011; Westlaw 2016). CTCAC uses a point scoring system to determine if a qualifying project adheres to a series of required criteria to receive the tax credits. One of these criteria (§ 10325) grants points if the proposed development site is within a specific walking distance of certain community amenities. Therefore, given the importance that LIHTC funding has in moving forward with the construction of affordable rental housing developments, this project includes site amenities that are part of the CTCAC criteria. Accordingly, the following site amenities are analyzed in this research: public transit (bus and rail stops); public parks; public schools (elementary schools, middle schools, and high schools); public libraries; healthcare centers (hospitals and medical centers, health centers, and health clinics); grocery stores; and, farmers' markets.

Studies done by Ariel Branz for Suffolk County, Massachusetts (Branz 2013) and Indigo Way and Shawna Miller for southeast Portland, Oregon (Way and Miller 2016), have also incorporated site amenities into their site suitability analysis for affordable housing. In "Low-

[13] The report found that residential land in an average U.S. metro was valued at around $20,000 per acre, whereas in California's coastal metro it was valued at $150,000 per acre (Taylor 2015).

Income Family Housing: A Suitability Analysis in Suffolk County, MA," Branz includes the site amenities of grocery stores, health centers, open space, public schools, and public transit (bus stops and train stops), into her analysis to identify best locations for large-scale family housing developments. Branz applies a weighted raster addition model to perform the site suitability analysis. Way and Miller analyze the following site amenities: child care, grocery stores, hospitals, libraries, parks, public transit (light rail stops), and schools in "Site Suitability Analysis: Mid-Density Low-Income Housing for SE Portland," to identify sites for medium-density affordable housing. They apply the binary suitability analysis and weighted suitability analysis in their site suitability analysis. This research builds upon these two projects when identifying site amenities intended to maximize the effectiveness of affordable rental housing developments.

Chapter 3 Data Sources and Methods

In order to identify best practices and solutions to the existing shortage of affordable rental housing in Los Angeles, it is important to examine this issue from a broad lens and consider the different sectors that are directly or indirectly impacted by the regulations and processes that are currently in place. Accordingly, the site suitability analysis (SSA) consists of six iterations that take into account any number of factors that either promote or discourage affordable rental housing. The SSA intends to show areas in which current housing and housing-related policies aid in the production of higher density affordable rental housing and areas where there may need to be revisions of such policies because of the limitations that they pose to the construction of these types of developments. Hence, this research seeks to answer the following main question: How can GIS technology be used to better support housing and housing-related policy and inform decision-makers in identifying suitable sites for the construction of higher density affordable rental housing developments in Los Angeles? In order to answer this question, the analysis explores the following five sub-questions: (1) How does spatial analysis, which takes into account the needs and desires of different sectors, better support housing and housing-related policy and inform decision-makers in identifying suitable sites for higher density affordable rental housing? (2) What are the obstacles to building affordable rental housing at higher density that spatial analysis, and especially site suitability analysis, might be able to help overcome? (3) How do local regulations, such as land use and zoning, impact the construction of affordable rental housing at higher density, and especially how might site suitability analysis be able to help solve these impasses? (4) Does the cost of land serve as an obstacle in achieving the *fair share* of higher density affordable rental housing development in Los Angeles? (5) What results will a service areas analysis show for the following attributes: public transit, public parks,

public elementary schools, public middle schools, public high schools, public libraries, hospitals and medical centers, health centers, health clinics, grocery stores, and farmers' markets?

3.1 Project Objectives

This research investigates suitable sites for the construction of higher density affordable rental housing developments in Los Angeles. To achieve this, factors such as land use, zoning, cost of land, fair share, employment, and site amenities that maximize the effectiveness of increased density affordable rental housing developments are analyzed. Therefore, different iterations of a site suitability analysis are performed to show how GIS technology can be used to best support housing policy and better inform decision-makers. Specifically, the weighted linear combination (WLC) method is applied in the analysis (Van Atta 2013).

3.2 Research Design

This research centers on investigating suitable sites for building higher density affordable rental housing developments in Los Angeles. This study identifies, analyzes, and explains the following variables: land use, zoning, cost of land, fair share, employment, and site amenities that maximize the effectiveness of increased density affordable rental housing developments. The following site amenities are analyzed: public transit, public parks, public elementary schools, public middle schools, public high schools, public libraries, hospitals and medical centers, health centers, health clinics, grocery stores, and farmers' markets. To this end, the GIS weighted linear combination (WLC) model is applied to the SSA. Furthermore, to have a more inclusive analysis of the variables, six iterations of the SSA are performed. A projected coordinate system NAD 1983 State Plane California-Zone 5 is applied to all maps created in the analysis.

3.3 Data Sources

Performing a site suitability analysis for this study required obtaining datasets from various sources for the sixteen variables. The type of data varied from vector shapefiles to information found in PDF documents. Below, are the data sources for each variable.

3.3.1. City of Los Angeles Shapefile and Parcel Data

In order to successfully complete the SSA, it was decided that both a shapefile of Los Angeles and parcel data were needed. The shapefile of Los Angeles was obtained from the City of Los Angeles Department of City Planning website and the parcel dataset was obtained from the Los Angeles County GIS Data Portal. The shapefile of the City of Los Angeles is at the community plan area (CPA) level. The parcel data includes all parcels within Los Angeles and it is used to identify current vacant and underutilized parcels for the construction of higher density affordable rental housing developments. Two separate layers were created and then joined when performing the site suitability analysis.

3.3.2. Land Use and Zoning Variables

Although they are not currently defining factors when selecting a site for higher density affordable rental housing developments, land use and zoning regulations do impact the decision-making process. Therefore, these two attributes are analyzed to see how they enable or restrict the construction of higher density affordable rental housing development in the various communities of the City. Data related to land use and zoning were obtained from the City of Los Angeles Department of City Planning website. Two separate layers were created to show and analyze the land use and zoning designations respectively.

For purposes of this research, land use and zoning designations that allow for the construction of 55 to 218 units per net acre were selected. Initially, nineteen land use

designations were chosen to be analyzed; however, after some discussions with personnel from the City of Los Angeles Department of City Planning, it was decided that some of these designations could be grouped given their similarities. In the end, nine land use designations are analyzed. Table 5 shows the names of the original land use designations and their new land use designation group name. Table 6 lists and describes the nine land use designations analyzed.

Table 5 Original Land Use Designation Name and New Land Use Designation Group Name

Original Land Use Designation Name	New Land Use Designation Group Name
• Medium Residential • Limited Commercial-Mixed Medium Residential	Medium Residential
• High Medium Residential	High Medium Residential
• High Residential • Very High Residential	High Residential
• Neighborhood Commercial • Neighborhood Office Commercial	Neighborhood Commercial
• Community Commercial • Community Commercial-Mixed High Residential	Community Commercial
• General Commercial • Highway Oriented Commercial-High Medium Residential	General Commercial
• Regional Commercial • Regional Center Commercial • Regional Mixed Commercial	Regional Commercial
• Hybrid Industrial	Hybrid Industrial
• Light Industrial • Light Manufacturing • Limited Industrial • Light Manufacturing	Light Industrial

Table 6 Description of Land Use Designations to be Analyzed

Land Use Designation	Description
Medium Residential	29-55 dwelling units/net acre
High Medium Residential	55-109 dwelling units/net acre
High Residential	109-218 dwelling units/net acre

Neighborhood Commercial	• Retail commercial, small professional offices, personal services, food stores, eating and drinking establishments, telecommunication centers, small cultural facilities (generally, 5,000 square feet or less), and similar uses. • Existing neighborhood-serving uses should be retained (barber shops, beauty salons, laundries, shoe repair, convenience commercial, childcare, community meeting facilities, etc.). • Mixed-use structures integrating housing with commercial uses (includes density and other incentives) • Gasoline/automotive services which may also provide accessory uses such as retail, food stores, restaurants and/or take-out.
Community Commercial	• Same as Neighborhood Commercial with the following modifications: • Entertainment, larger cultural facilities (museums, libraries, etc.), and similar community-oriented uses characterized by high activity • Commercial overnight accommodations, small offices • Inclusion of bus or rail center (at station or intersection) • Inclusion of small parks and other community-oriented activity facilities
General Commercial	• Uses as permitted by existing zoning (generally, uses permitted in the C2 zone). • Modifications to be determined by the community plans. • Potential adjustment of density to reflect parcel size and configuration, intended functional role, and characteristics of surrounding uses determined through the community plan process.
Regional Commercial	• Corporate and professional offices, retail commercial (including malls), offices, personal services, eating and drinking establishments, telecommunications centers, entertainment, major cultural facilities (libraries, museums, etc.), commercial overnight accommodations, and similar uses. • Mixed-use structures integrating housing with commercial uses • Multi-family housing (independent or commercial) • Major transit hub

	• Inclusion of small parks and other community-oriented activity facilities • Gasoline/automotive services which may also provide accessory uses such as retail, food stores, restaurants and/or take out.
Hybrid Industrial	• Permits a range of uses for industrial areas that have had or envision limited introduction of live/work uses.
Light Industrial	• Industrial uses with potential for a low level of adverse impacts on surrounding land uses. • Increased range of commercial uses that support industrial uses (through zoning amendments). • Possible consideration for other uses where parcels will not support viable industrial uses (determined by community plan).

Source: City of Los Angeles Department of City Planning

See Table 2 (Chapter 2) for a list and description of the zoning designations that are analyzed in the site suitability analysis of this study.

Table 7 lists the General Plan land use designations, corresponding zoning designations, and equivalent density (units/net acre) that currently allow for housing construction. These land use categories were selected to be included in the SSA because they presently permit higher density rental housing. Furthermore, the table lists the corresponding zoning and residential density ranges. Again, emphasis was placed on density ranges of 55 to 218 units per net acre. Scoring for the final land use and zoning designations that are analyzed is based on existing density of housing allowed and appropriateness (i.e. proximity to commercial areas and transit hubs) of affordable housing in that parcel.

Table 7 Land Use and Zoning Designations

Land Use Designation	Corresponding Zoning	Density (Units/Net Acre)
Medium Residential	R3	29 – 55
High Medium Residential	R4	55 - 109
High Residential	R5	109 – 218

Neighborhood Commercial	C1, C1.5, CR, R3, RAS3, P	29 – 55
Community Commercial	C1.5, CR, C2, C4, R3, RAS3, R4, RAS4, P	29 – 109
General Commercial	C1.5, C2, CR, C4, RAS3, R4, RAS4, P	29 – 109
Regional Center	C1.5, CR, C2, C4, R4, RAS4, R5, P, PB	29 – 109
Hybrid Industrial	CM, P	29 – 109
Light Industrial	CM, MR1, MR2, M1, M2	29 – 218

Source: City of Los Angeles Department of City Planning

3.3.3. Cost of Land Variable

The cost of land in Los Angeles is an important factor to consider when selecting sites for the construction of higher density affordable rental housing in the City. Currently, the cost of land in some areas of the City is higher than average (City of Los Angeles Department of City Planning 2013). Therefore, building affordable rental housing developments in this metropolis is extra challenging, as developers must take this aspect into account when calculating construction costs of development. Consequently, the cost of land may determine the location of an affordable housing development.

Information pertaining to the cost of land is found in the parcel dataset, which was obtained from the Los Angeles County GIS Data Portal. Attention was given to the “LandValue” field, as it contains information about the price value for each of the parcels. The data found within the “LandValue” field was then classified into nine classes using the “Natural Breaks” (Jenks) method and entered as U.S. dollars units as part of a table.

3.3.4. Fair Share Variable

For purposes of this research, the *fair share* attribute was measured by taking into account the 4th Cycle Final RHNA Plan for the planning period January 1, 2006 to June 30, 2014. According to this Plan, the housing need number assigned for Los Angeles is 112,876, of which 64,037 pertain to very low-income, low-income, and moderate-income households. The point for including this variable is to show how the various communities of the City have met their *fair share* of affordable housing, as required by state law. In addition, a review of the "Annual Element Progress Report" for the years 2006 to 2013 was done to see how many new affordable housing units were built in Los Angeles during this planning period.

Therefore, the analysis for the *fair share* variable was done by community plan area (CPA) for the planning period 2006 – 2013. It uses the number of new construction rental units reported in the "Annual Element Progress Report" for the years 2006 to 2013. Furthermore, the analysis takes into account the population density by community plan area. Accordingly, the following formula was implemented to show *fair share*:

$$Eq.1: \frac{total\ new\ construction\ of\ affordable\ rental\ housing\ units\ by\ CPA}{population\ density\ by\ CPA}$$

3.3.5. Employment Variable

Proximity to jobs is an important factor to include in the site suitability analysis because it allows us to measure the number of jobs that are within Los Angeles and identify suitable sites for higher density affordable housing in areas that would benefit from the closeness of housing to jobs. This is especially critical in a metropolis where it is increasingly challenging to find affordable rental housing and consequently workers must move to more affordable communities, sometimes outside of the Los Angeles area. This decision is both costlier and environmentally

unsustainable in the long run. With this in mind, the variable *employment* is analyzed. Specifically, the attribute *D5br* from the employment dataset is included in the analysis as it summarizes the number of jobs that are within a 45-minute transit commute, distance decay weighted[14]. Criteria for this attribute was established according to the number of jobs by Census block group and dividing it into nine classes using the Natural Breaks (Jenks) classification method. The dataset was obtained from the United States Environmental Protection Agency (EPA) Smart Location Database.

3.3.6. Site Amenities Variables

Site amenities are essential to take into account when identifying sites for the production of higher density affordable rental housing. When identifying the site amenities, reference was made to the California Tax Credit Allocation Committee (CTCAC) four percent and nine percent applications, as these documents detail the points system criteria that applicants are required to meet to increase their chances to receive funding for affordable housing projects. Accordingly, the following site amenities are analyzed: public transit (bus stops and rail stations); public parks; public schools (elementary schools, middle schools, and high schools); public libraries; healthcare centers (hospitals and medical centers, health centers, and health clinics[15]); grocery stores; and, farmers' markets. In addition, the distance radius and distance intervals for each of these site amenities were established by referencing the CTCAC applications. The datasets pertaining to the different site amenities were obtained from the United States EPA Smart

[14] The transit commute includes walk network travel time and General Transit Feed Specification.

[15] For this variable only hospitals and medical centers, health centers, and health clinics were included in the analysis because this is the criteria that is established by the CTCAC. It reads as follows, "The site is within 1 mile…of a qualifying medical clinic with a physician, physician's assistant, or nurse practitioner onsite for a minimum of 40 hours each week, or hospital (not merely a private doctor's office)" (California Tax Credit Allocation Committee 2015).

Location Database, the City of Los Angeles Department of Recreation and Parks, and the Los Angeles County GIS Data Portal. A total of eleven layers were created in order to analyze the various site amenities.

The healthcare centers attributes of hospitals and medical centers, health centers, and health clinics were analyzed separately because of the types of services they offer to patients and their hours of operation. Hospitals and medical centers generally provide emergency and comprehensive hospital services twenty-four hours a day. Health centers usually provide primary care services to patients and their hours of operation are from Monday to Friday 8:30 am to 5:00 pm. Health clinics commonly provide health services and are open Monday to Friday 8:30 am to 5:00 pm.

3.3.7. Datasets

Details about the different datasets that are analyzed in this project are provided in this section. For instance, the City of Los Angeles by community plan area, parcel, land use, zoning, cost of land, employment, and public parks datasets are each vector polygon shapefiles. While the public transit, public schools, public libraries, healthcare centers, grocery stores, and farmers' markets datasets are each vector point shapefiles. Table 8 includes the name of each dataset and the source from where it was retrieved, the type of dataset that was acquired, and the date when the dataset was compiled.

Table 8 Detailed Description of Datasets

Dataset	Source	File Type	Date Compiled
City of Los Angeles by Community Plan Area Dataset	City of Los Angeles Department of City Planning	Vector polygon shapefile	January 2015
Parcel Dataset	Los Angeles County GIS Data Portal	Vector polygon shapefile	2015
City of Los Angeles Land Use Dataset	City of Los Angeles Department of City Planning	Vector polygon shapefile	May 2015
City of Los Angeles Zoning Dataset	City of Los Angeles Department of City Planning	Vector polygon shapefile	May 2015
Cost of Land Dataset	Los Angeles County GIS Data Portal	Vector polygon shapefile	2014
4th Cycle RHNA Allocation Plan	Southern California Association of Governments	PDF file	July 2007
New Construction of Affordable Housing Units (2006 – 2013)	City of Los Angeles Department of City Planning	PDF file and Excel worksheets	2006 – 2013
Employment Dataset	United States EPA Smart Location Database	Vector polygon shapefile	November 2013
Public Transit Dataset	United States EPA Smart Location Database	Vector point shapefile	February 2014
Public Parks Dataset	City of Los Angeles Dept. of Recreation and Parks	Vector polygon shapefile	March 2015
Public Schools Dataset	Los Angeles County GIS Data Portal	Vector point shapefile	January 2016
Public Libraries Dataset	Los Angeles County GIS Data Portal	Vector point shapefile	January 2016
Healthcare Centers Dataset	Los Angeles County GIS Data Portal	Vector point shapefile	January 2016

Grocery Stores Dataset	Jim Herries at Esri; InfoGroup; ArcGIS Online	Vector point shapefile	November 2014
Farmers' Markets Dataset	Los Angeles County GIS Data Portal	Vector point shapefile	January 2016
City of Los Angeles Streets Dataset	City of Los Angeles GeoHub	Vector line shapefile	February 2016

3.4 Methods

Outreach was done by sending out an email to several individuals who were identified as currently working in the affordable housing sector and/or having some knowledge in this area. In some instances, they forwarded the email to their contacts. Participants provided different responses, which were taken into account when creating the different iterations. In addition, a similar inquiry was posted on Facebook twice.

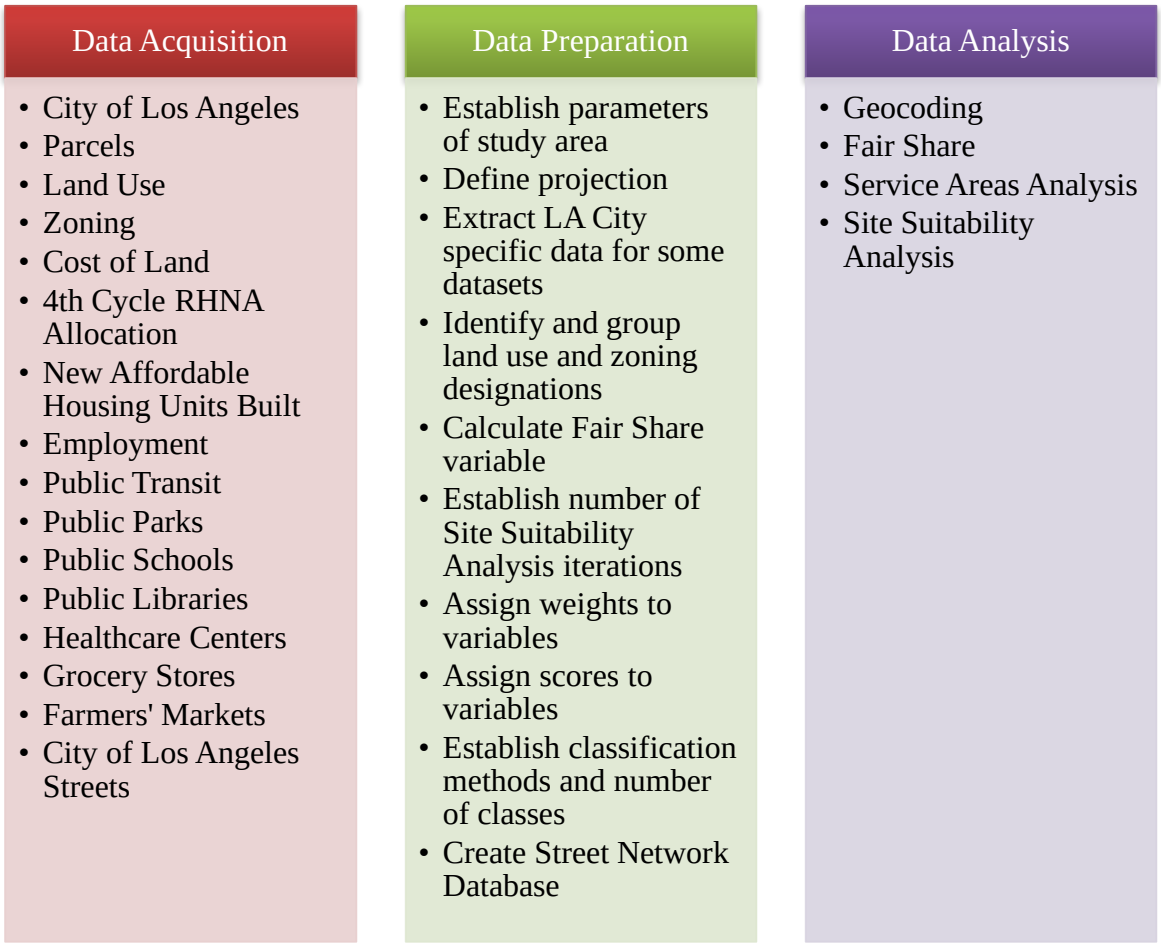

Figure 11 Summary of Workflow

3.4.1. Geocoding New Construction of Affordable Rental Housing Units

In order to see how communities of Los Angeles have met their *fair share* of affordable housing, it was important to map the construction of new affordable rental housing units by community plan area within the City. Therefore, the addresses of new multi-family affordable rental housing developments that had at least five units and were built from 2006 to 2013 were geocoded in ArcMap. A total of 265 of addresses were geocoded, some of which were revised and re-matched. The data presented in the layer of the map was then illustrated using a "graduated colors" scheme and the "Natural Breaks" (Jenks) method.

3.4.2. Fair Share Analysis

Once the addresses were geocoded, a fair share analysis was performed in ArcMap. The total number of new construction of affordable rental housing units was calculated by community plan area. The total value of new affordable rental housing units by community plan area was recorded in the "Total_Affo" field. To avoid the Modifiable Areal Unit Problem (MAUP), the data was normalized by population density by community plan area. The data presented in the layer of the map was then illustrated using a "graduated colors" scheme and the "Natural Breaks" (Jenks) method, with a classification of five classes.

3.4.3. Service Areas Analysis

To show a more accurate representation of distance for each of the site amenities identified, a service areas analysis was performed using the Network Analyst extension in ArcMap. This approach is an alternative to the geodesic (as the crow flies) buffers and a more precise depiction of distance. Although the results in both methods are shown as polygons, a service areas analysis does so by using walkable distance that is defined by the road network. While the buffer distance technique only creates a polygon around the designated feature of a given distance in every direction. Accordingly, an analysis in distance in miles for each of the following site amenities: public transit stops, public parks, public elementary schools, public middle schools, public high schools, public libraries, hospitals and medical centers, health centers, health clinics, grocery stores, and farmers' markets was done in increments of a quarter-mile. The distances range between 0.25 mile and 1.50 miles (California Tax Credit Allocation Committee 2015). A total of eleven layers were created in the service areas analysis.

Next, the service areas analysis polygons were added to the site suitability analysis. The polygons were then converted to shapefiles using the *Export Data* feature in ArcMap. This step was done in order to be able to perform the site suitability analysis.

In order to perform the service areas analysis, a network database was created in ArcCatalog using the streets line shapefile dataset. The Streets Network Database was then inputted into a blank map document in ArcMap. Default breaks were subsequently established as follows: 0.25 mile, 0.50 mile, 0.75 mile, 1 mile, 1.25 miles, and 1.50 miles—this depended on the site amenity analyzed. A total of 11,791 site amenities were analyzed. Table 9 shows the default breaks that were established for each site amenity.

Table 9 Default Breaks by Site Amenity

Site Amenity	Default Breaks
Public Transit	0.25 mile
	0.50 mile
	0.75 mile
	1 mile
Public Parks	0.25 mile
	0.50 mile
	0.75 mile
	1 mile
Public Elementary Schools	0.25 mile
	0.50 mile
	0.75 mile
	1 mile
Public Middle Schools	0.25 mile
	0.50 mile
	0.75 mile
	1 mile
Public High Schools	0.25 mile
	0.50 mile
	0.75 mile
	1 mile
	1.25 miles
	1.50 miles
Public Libraries	0.25 mile

	0.50 mile
	0.75 mile
	1 mile
Hospitals and Medical Centers	0.25 mile
	0.50 mile
	0.75 mile
	1 mile
Health Centers	0.25 mile
	0.50 mile
	0.75 mile
	1 mile
Health Clinics	0.25 mile
	0.50 mile
	0.75 mile
	1 mile
Grocery Stores	0.25 mile
	0.50 mile
	0.75 mile
	1 mile
	1.25 miles
	1.50 miles
Farmers' Markets	0.25 mile
	0.50 mile
	0.75 mile
	1 mile

Since the service areas analysis can only be performed using point shapefiles, the public parks polygon shapefile was converted to a point shapefile by using the *Feature to Point* tool. Furthermore, for the *public parks* service areas analysis, the initial selection of 510 facilities was reduced to 326 facilities, by using the SELECT BY ATTRIBUTE function. This was done because not all of the attributes found in the dataset were qualifying facilities by CTCAC standards. The following query was used: *"name" < 'Park'*. However, this also meant that the following parks were not located when performing the service area analysis: "Cahuenga Peak Phase I", "O' Melveny Park", "Anthony C. Beilenson Park", "Cheviot Hills Park", "Griffith Park Boys Camp", "Hansen Dam Recreation Area", "Hansen Dam Quarry Lake", "Decker Canyon Camp", and "La Tuna Canyon Park".

3.4.4. Natural Breaks (Jenks) Method

When establishing the criteria to perform the site suitability analysis, the Natural Breaks (Jenks) method was applied for some of the variables analyzed. Specifically, the Jenks method was selected for the following variables: cost of land, fair share, and employment. The decision was based on non-normally distributed data for each of these three attributes (Mitchell 1999). Moreover, in order to be consistent with the scoring scale, nine classes were chosen for these three variables.

3.5 Site Suitability Analysis

In order to determine the most suitable sites for the construction of higher density affordable rental housing development in Los Angeles, a site suitability analysis was performed. In an effort to obtain a more comprehensive understanding of this complex issue, and the different factors that must be taken into account, a total of six iterations were included in the SSA. The six iterations have been named as follows: (1) Iteration One: Comprehensive Analysis; (2) Iteration Two: Local Regulations; (3) Iteration Three: Impact of Cost of Land; (4) Iteration Four: CTCAC Amenities; (5) Iteration Five: Environmentally Sustainable, and (6) Iteration Six: Employment and Public Transit. Table 10 lists the variables analyzed in the site suitability analysis and specifies which variables are evaluated in each of the six iterations. Furthermore, for each of the sixteen attributes analyzed a weight of 0 – 100 and a score of 1 – 9 is given. Lastly, the *Weighted Sum* tool is used as part of the site suitability analysis.

Table 10 Variables Analyzed in Each of the Six Iterations of the Site Suitability Analysis

Variable	Iteration One	Iteration Two	Iteration Three	Iteration Four	Iteration Five	Iteration Six
Land Use	X				X	
Zoning	X					
Cost of Land	X	X				
Fair Share	X	X	X		X	
Employment	X	X	X		X	X
Public Transit	X	X	X	X	X	X
Public Parks	X	X	X	X		
Public Elementary Schools	X	X	X	X		
Public Middle Schools	X	X	X	X		
Public High Schools	X	X	X	X		
Public Libraries	X	X	X	X		
Hospitals and Medical Centers	X	X	X	X		
Health Centers	X	X	X	X		
Health Clinics	X	X	X	X		
Grocery Stores	X	X	X	X		
Farmers' Markets	X	X	X	X		

For purposes of this research, the weighted linear combination (WLC) was applied in the site suitability analysis. The WLC is an analytic method that stems from the multiple-criteria evaluation (MCE) process and can be used when analyzing several attributes. This method combines maps by applying a standardized score to each class of a certain attribute and a weight to the attribute (Al-Hanbali, Alsaaideh and Kondoh 2011). For this study, this means that the higher the score, the more suitable the area. Additionally, the greater the weight, the greater importance that the attribute carries in the analysis. The WLC is one of the most common used methods for SSA and was selected for this project because of the several attributes that were analyzed and the flexibility that it provides in selecting the optimal sites.

3.5.1. Assigning Weights

Employing the weighted linear combination (WLC) method to the site suitability analysis requires that each attribute be assigned a weight. As such, each of the sixteen attributes was given a weight of 0 – 100, were the higher the number the greater the importance that the variable had in the analysis (Malczewski 2000). Numerical values for the weights were based on information gathered from previous site suitability analyses, studies, and input provided by individuals who currently work in the affordable housing sector and/or have some knowledge in this area. In some instances, were respondents gave different weights to the same attribute, the values were averaged. Subsequently, each of the weights were normalized so that they sum to 1, as follows (Drobne and Lisec 2009):

$$Eq.2: w = \frac{w}{(w_1, w_2, \dots, w_j, \dots, w_n)}$$

3.5.2. Scoring

In addition, the weighted linear combination (WLC) method calls for each attribute to be scored. For purposes of this study, a score of 1 – 9 indicates whether or not a given parcel is suitable for the construction of higher density affordable rental housing. A score of 1 means that a given parcel has the lowest suitability for higher density affordable rental housing; whereas, a score of 9 denotes an ideal parcel for these types of developments.

3.5.3. Weighted Sum Tool

In order to implement the weighted linear combination and perform the site suitability analysis, the *Weighted Sum* tool was utilized. This tool was chosen because it allows for several raster files to be combined. In addition, some of the raster datasets inputted contained floating point numeric fields. In fact, when using this tool, fields can be of type short or long integer,

double, or float. Moreover, the weight values can be either a positive or negative decimal value and are not limited to a relative percentage, and the weight values do not need to be equivalent to 1.0 (Environmental Systems Research Institute, Inc. 2016). However, selecting the weighted sum tool also meant converting all vector datasets into raster datasets using the *Polygon to Raster* tool.

3.5.4. Iteration One: Comprehensive Analysis

This iteration is the most inclusive analysis because it analyzes all of the variables that were identified as important when selecting suitable sites for the construction of higher density affordable rental housing in Los Angeles. It takes into account factors that may either pose a challenge to or incentivize the production of higher density affordable rental housing developments. These are aspects that developers must consider when seeking approval from local government officials and/or the community and funding, all while making the proposed project financially feasible. The attributes that were analyzed are land use, zoning, cost of land, fair share, employment, and all site amenities. Table 11 shows the weight assigned to each of the sixteen attributes that are analyzed.

Table 11 Assigned Weights to Iteration One: Comprehensive Analysis

Attribute	**Criterion Weight**
Land Use (w_1)	70
Zoning (w_2)	60
Cost of Land (w_3)	95
Fair Share (w_4)	80
Employment (w_5)	80
Public Transit (w_6)	80
Public Parks (w_7)	70
Public Elementary Schools (w_8)	70
Public Middle Schools (w_9)	70
Public High Schools (w_{10})	70
Public Libraries (w_{11})	70

Hospitals and Medical Centers (w_{12})	75
Health Centers (w_{13})	75
Health Clinics (w_{14})	75
Grocery Stores (w_{15})	70
Farmers' Markets (w_{16})	70

The sixteen weights were then normalized as follows:

- $w_1 = 70/(70 + 60 + 95 + 80 + 80 + 80 + 70 + 70 + 70 + 70 + 70 +75 + 75 + 75 + 70 + 70) = 0.059$
- $w_2 = 60/(70 + 60 + 95 + 80 + 80 + 80 + 70 + 70 + 70 + 70 + 70 +75 + 75 + 75 + 70 + 70) = 0.051$
- $w_3 = 95/(70 + 60 + 95 + 80 + 80 + 80 + 70 + 70 + 70 + 70 + 70 +75 + 75 + 75 + 70 + 70) = 0.081$
- $w_4 = 80/(70 + 60 + 95 + 80 + 80 + 80 + 70 + 70 + 70 + 70 + 70 +75 + 75 + 75 + 70 + 70) = 0.068$
- $w_5 = 80/(70 + 60 + 95 + 80 + 80 + 80 + 70 + 70 + 70 + 70 + 70 +75 + 75 + 75 + 70 + 70) = 0.068$
- $w_6 = 80/(70 + 60 + 95 + 80 + 80 + 80 + 70 + 70 + 70 + 70 + 70 +75 + 75 + 75 + 70 + 70) = 0.068$
- $w_7 = 70/(70 + 60 + 95 + 80 + 80 + 80 + 70 + 70 + 70 + 70 + 70 +75 + 75 + 75 + 70 + 70) = 0.059$
- $w_8 = 70/(70 + 60 + 95 + 80 + 80 + 80 + 70 + 70 + 70 + 70 + 70 +75 + 75 + 75 + 70 + 70) = 0.059$
- $w_9 = 70/(70 + 60 + 95 + 80 + 80 + 80 + 70 + 70 + 70 + 70 + 70 +75 + 75 + 75 + 70 + 70) = 0.059$

- w_{10} = 70/(70 + 60 + 95 + 80 + 80 + 80 + 70 + 70 + 70 + 70 + 70 +75 + 75 + 75 + 70 + 70) = 0.059
- w_{11} = 70/(70 + 60 + 95 + 80 + 80 + 80 + 70 + 70 + 70 + 70 + 70 +75 + 75 + 75 + 70 + 70) = 0.059
- w_{12} = 75/(70 + 60 + 95 + 80 + 80 + 80 + 70 + 70 + 70 + 70 + 70 +75 + 75 + 75 + 70 + 70) = 0.064
- w_{13} = 75/(70 + 60 + 95 + 80 + 80 + 80 + 70 + 70 + 70 + 70 + 70 +75 + 75 + 75 + 70 + 70) = 0.064
- w_{14} = 75/(70 + 60 + 95 + 80 + 80 + 80 + 70 + 70 + 70 + 70 + 70 +75 + 75 + 75 + 70 + 70) = 0.064
- w_{15} = 70/(70 + 60 + 95 + 80 + 80 + 80 + 70 + 70 + 70 + 70 + 70 +75 + 75 + 75 + 70 + 70) = 0.059
- w_{16} = 70/(70 + 60 + 95 + 80 + 80 + 80 + 70 + 70 + 70 + 70 + 70 +75 + 75 + 75 + 70 + 70) = 0.059

3.5.5. Criteria, Scoring, and Weights for Iteration One: Comprehensive Analysis

Table 12 summarizes the categories, layers, criteria, scores, and assigned weights for each of the sixteen variables that were analyzed in the first iteration. Criteria for *land use* was established based on previously identified land uses that encourage the construction of higher density affordable rental housing, here a total of nine land use designations were included. Again, land use refers to the activity that occurs on land and within the structures that are built on the land. In addition, land use includes the overall maximum density for residential development and maximum intensity of development for commercial and industrial uses.

In the same manner, criteria for *zoning* was set based on zoning designations formerly selected and that promote the building of higher density affordable rental housing. For this variable, a total of sixteen zoning designations were added. Zoning is different from land use in that it is the way in which local city, county, or municipality governments control the physical development of land (i.e. land use) and the types of uses of individual properties. Zoning laws typically specify the areas in which residential, commercial, industrial, or recreational activities may take place.

The criteria for the *cost of land* was determined by applying the "Natural Breaks" (Jenks) method to the land values in Los Angeles, here a total of nine classes were included. Furthermore, criteria for the *fair share* variable was determined by making reference to the 4th Cycle RHNA Allocation for Los Angeles and adjusting it for the planning period of 2006-2013. The resulting values were then divided into nine classes to be consistent with the scoring scale used in this project. For purposes of this research, *cost of land* is not normalized for the size of the parcel; therefore, the land value price is for the entire parcel and not per square foot or per acre. Whereas the criteria for the *employment* variable was established by also employing the "Natural Breaks" (Jenks) method and creating nine classes. Lastly, criteria for the different site amenities was set based on distance in miles—in increments of a quarter-mile—and it ranges from 0.25 mile to 1.50 miles. It should be noted that when a raster did not have all of the CTCAC facilities within the largest distance analyzed, this was omitted from the analysis.

Scoring for each of the attributes that was analyzed is based on a linear scale of 1 to 9. A higher score was given to parcels that had the highest suitability for the construction of higher density affordable rental housing. Scoring for the land use and zoning designations that were analyzed was based on existing density of housing allowed and appropriateness (i.e. proximity to

areas designated as commercial and transit hubs) of affordable housing in that parcel. For example, the Regional Commercial land use designation was assigned a higher score (9) than High Medium Residential land use designation (5) because the former allows for the construction of higher density affordable rental housing in proximity to desirable site amenities such as grocery stores and public transit hubs, whereas the latter only allows for the construction of higher density affordable rental housing. In addition, each of the variables was assigned a weight on a scale of 0 to 100. Similar to scoring, a greater weight was given to those variables that were considered to be of greater importance than the other variables analyzed in the iteration.

Table 12 Criteria, Scoring, and Weights for Iteration One: Comprehensive Analysis

Category	Layer	Criteria	Score	Weight
Land Use	Land Use	Medium Residential	3	0.059
		High Medium Residential	5	
		High Residential	8	
		Neighborhood Commercial	4	
		Community Commercial	7	
		General Commercial	6	
		Regional Commercial	9	
		Hybrid Industrial	2	
		Light Industrial	1	
Zoning	Zoning	R-3	5	0.051
		RAS-3	7	
		R-4	6	
		RAS-4	8	
		R-5	9	
		CR	6	
		C-1	5	
		C-1.5	6	
		C-2	4	
		C-4	4	
		C-5	4	
		CM	3	
		MR-1	1	
		M-1	1	

		MR-2	2	
		M-2	2	
Cost of Land	Land Value	$0 – $64,091	9	0.081
		$64,092 – $132,167	8	
		$132,168 – $206,369	7	
		$206,370 – $565,466	6	
		$565,467 – $1,869,148	5	
		$1,869,149 – $5,162,618	4	
		$5,162,619 – $13,258,461	3	
		$13,258,462 – $31,806,002	2	
		$31,806,003 – $100,264,350	1	
Fair Share	Fair Share	0 – 0.0006	1	0.068
		0.0007 – 0.0012	2	
		0.0013 – 0.0039	3	
		0.0040 – 0.0097	4	
		0.0098 – 0.0132	5	
		0.0133 – 0.0163	6	
		0.0164 – 0.0261	7	
		0.0262 – 0.0447	8	
		0.0448 – 0.0620	9	
Employment	Employment	0 – 6,076 jobs	1	0.068
		6,077 – 13,952 jobs	2	
		13,953 – 21,970 jobs	3	
		21,971 – 31,635 jobs	4	
		31,636 – 42,813 jobs	5	
		42,814 – 56,444 jobs	6	
		56,445 – 73,788 jobs	7	
		73,789 – 101,376 jobs	8	
		101,377 – 159,226 jobs	9	
Public Transit	Public Transit	0.25 mile	9	0.068
		0.50 mile	6.75	
		0.75 mile	4.5	
		1 mile	2.25	
		> 1.0 mile	Omitted	
Public Parks	Public Parks	0.25 mile	9	0.059
		0.50 mile	6.75	
		0.75 mile	4.5	
		1 mile	2.25	
		> 1.0 mile	Omitted	
Public Schools	Elementary Schools	0.25 mile	9	0.059
		0.50 mile	6.75	
		0.75 mile	4.5	
		1 mile	2.25	
		> 1.0 mile	Omitted	
	Middle Schools	0.25 mile	9	0.059

Public Schools		0.50 mile	6.75	
		0.75 mile	4.5	
		1 mile	2.25	
		> 1.0 mile	Omitted	
Public Schools	High Schools	0.25 mile	9	0.059
		0.50 mile	7.5	
		0.75 mile	6	
		1 mile	4.5	
		1.25 miles	3	
		1.50 miles	1.5	
		> 1.50 miles	Omitted	
Public Libraries	Public Libraries	0.25 mile	9	0.059
		0.50 mile	6.75	
		0.75 mile	4.5	
		1 mile	2.25	
		> 1.0 mile	Omitted	
Healthcare Centers	Hospitals and Medical Centers	0.25 mile	9	0.064
		0.50 mile	6.75	
		0.75 mile	4.5	
		1 mile	2.25	
		> 1.0 mile	Omitted	
Healthcare Centers	Health Centers	0.25 mile	9	0.064
		0.50 mile	6.75	
		0.75 mile	4.5	
		1 mile	2.25	
		> 1.0 mile	Omitted	
Healthcare Centers	Health Clinics	0.25 mile	9	0.064
		0.50 mile	6.75	
		0.75 mile	4.5	
		1 mile	2.25	
		> 1.0 mile	Omitted	
Grocery Stores	Grocery Stores	0.25 mile	9	0.059
		0.50 mile	7.5	
		0.75 mile	6	
		1 mile	4.5	
		1.25 miles	3	
		1.50 miles	1.5	
		> 1.50 miles	Omitted	
Farmers' Markets	Farmers' Markets	0.25 mile	9	0.059
		0.50 mile	6.75	
		0.75 mile	4.5	
		1 mile	2.25	
		> 1.0 mile	Omitted	

3.5.6. Iteration Two: Local Regulations

Local regulations play an important role in the production affordable rental housing developments in Los Angeles. For instance, land use and zoning designations may restrict the construction of a higher density affordable rental housing development, as there may be a height limit requirement in the area of interest or the existing land use designation does not allow for the building of this type of residential developments. This version of the analysis assumes that there are no location and/or height restrictions. Therefore, this iteration excludes land use and zoning. Instead, the following attributes were analyzed: cost of land, fair share, employment, and all site amenities. Table 13 shows the weight assigned to each of the fourteen attributes that were analyzed.

Table 13 Assigned Weights to Iteration Two: Local Regulations

Attribute	**Criterion Weight**
Cost of Land (w_1)	95
Fair Share (w_2)	80
Employment (w_3)	80
Public Transit (w_4)	80
Public Parks (w_5)	70
Public Elementary Schools (w_6)	70
Public Middle Schools (w_7)	70
Public High Schools (w_8)	70
Public Libraries (w_9)	70
Hospitals and Medical Centers (w_{10})	75
Health Centers (w_{11})	75
Health Clinics (w_{12})	75
Grocery Stores (w_{13})	70
Farmers' Markets (w_{14})	70

The fourteen weights were then normalized as previously described (Eq. 2). See Table 14 for final weights.

3.5.7. Criteria, Scoring, and Weights for Iteration Two: Local Regulations

Table 14 summarizes the categories, layers, criteria, and assigned weights for each of the fourteen variables that were analyzed in the second iteration. The criteria established for each of the variables is the same as that set in the first iteration. Moreover, scoring for each of the attributes is the same as the one applied in Iteration One of the analysis. However, the weight assigned to each variable is different from the first iteration. Nonetheless, the application of it remains the same, meaning that a greater weight was given to those variables that were considered to be of greater importance than the other variables analyzed in the iteration.

Table 14 Criteria, Scoring, and Weights for Iteration Two: Local Regulations

Category	Layer	Criteria	Weight
Cost of Land	Land Value	$0 – $64,091	0.090
		$64,092 – $132,167	
		$132,168 – $206,369	
		$206,370 – $565,466	
		$565,467 – $1,869,148	
		$1,869,149 – $5,162,618	
		$5,162,619 – $13,258,461	
		$13,258,462 – $31,806,002	
		$31,806,003 – $100,264,350	
Fair Share	Fair Share	0 – 0.0006	0.076
		0.0007 – 0.0012	
		0.0013 – 0.0039	
		0.0040 – 0.0097	
		0.0098 – 0.0132	
		0.0133 – 0.0163	
		0.0164 – 0.0261	
		0.0262 – 0.0447	
		0.0448 – 0.0620	
Employment	Employment	0 – 6,076 jobs	0.076
		6,077 – 13,952 jobs	
		13,953 – 21,970 jobs	
		21,971 – 31,635 jobs	
		31,636 – 42,813 jobs	
		42,814 – 56,444 jobs	
		56,445 – 73,788 jobs	

		73,789 – 101,376 jobs	
		101,377 – 159,226 jobs	
Public Transit	Public Transit	0.25 mile	0.076
		0.50 mile	
		0.75 mile	
		1 mile	
Public Parks	Public Parks	0.25 mile	0.067
		0.50 mile	
		0.75 mile	
		1 mile	
Public Schools	Elementary Schools	0.25 mile	0.067
		0.50 mile	
		0.75 mile	
		1 mile	
Public Schools	Middle Schools	0.25 mile	0.067
		0.50 mile	
		0.75 mile	
		1 mile	
Public Schools	High Schools	0.25 mile	0.067
		0.50 mile	
		0.75 mile	
		1 mile	
		1.25 miles	
		1.50 miles	
Public Libraries	Public Libraries	0.25 mile	0.067
		0.50 mile	
		0.75 mile	
		1 mile	
Healthcare Centers	Hospitals and Medical Centers	0.25 mile	0.071
		0.50 mile	
		0.75 mile	
		1 mile	
Healthcare Centers	Health Centers	0.25 mile	0.071
		0.50 mile	
		0.75 mile	
		1 mile	
Healthcare Centers	Health Clinics	0.25 mile	0.071
		0.50 mile	
		0.75 mile	
		1 mile	
Grocery Stores	Grocery Stores	0.25 mile	0.067
		0.50 mile	
		0.75 mile	
		1 mile	
		1.25 miles	

		1.50 miles	
Farmers' Markets	Farmers' Markets	0.25 mile	0.067
		0.50 mile	
		0.75 mile	
		1 mile	

3.5.8. Iteration Three: Impact of Cost of Land

Often a developer seeking a site to build higher density affordable rental housing must consider the cost of land. This is a consideration that is especially important to account for in proposed affordable housing developments. If the cost of the site is high, this may prompt the developer to explore other areas that are more affordable. The third iteration builds on the second iteration by excluding the *cost of land* and thereby assumes that cost is not a factor when deciding on the location of higher density affordable rental housing developments. For purposes of this iteration, the following attributes were analyzed: fair share, employment, and all site amenities. Table 15 shows the weight assigned to each of the thirteen attributes that were analyzed.

Table 15 Assigned Weights to Iteration Three: Impact of Cost of Land

Attribute	Criterion Weight
Fair Share (w_1)	80
Employment (w_2)	80
Public Transit (w_3)	80
Public Parks (w_4)	70
Public Elementary Schools (w_5)	70
Public Middle Schools (w_6)	70
Public High Schools (w_7)	70
Public Libraries (w_8)	70
Hospitals and Medical Centers (w_9)	75
Health Centers (w_{10})	75
Health Clinics (w_{11})	75
Grocery Stores (w_{12})	70
Farmers' Markets (w_{13})	70

The thirteen weights were then normalized as previously described (Eq. 2). See Table 16 for final weights.

3.5.9. Criteria, Scoring, and Weights for Iteration Three: Impact of Cost of Land

Table 16 summarizes the categories, layers, criteria, and assigned weights for each of the thirteen variables that were analyzed in the third iteration. The criteria established for each of the variables is the same as that set in the first iteration. Furthermore, scoring for each of the attributes is the same as the one applied in Iteration One of the analysis. However, the weight assigned to each variable is different from the previous iterations. Nonetheless, the application of it remains the same.

Table 16 Criteria, Scoring, and Weights for Iteration Three: Impact of Cost of Land Variable

Category	Layer	Criteria	Weight
Fair Share	Fair Share	0 – 0.0006	0.084
		0.0007 – 0.0012	
		0.0013 – 0.0039	
		0.0040 – 0.0097	
		0.0098 – 0.0132	
		0.0133 – 0.0163	
		0.0164 – 0.0261	
		0.0262 – 0.0447	
		0.0448 – 0.0620	
Employment	Employment	0 – 6,076 jobs	0.084
		6,077 – 13,952 jobs	
		13,953 – 21,970 jobs	
		21,971 – 31,635 jobs	
		31,636 – 42,813 jobs	
		42,814 – 56,444 jobs	
		56,445 – 73,788 jobs	
		73,789 – 101,376 jobs	
		101,377 – 159,226 jobs	
Public Transit	Public Transit	0.25 mile	0.084
		0.50 mile	
		0.75 mile	
		1 mile	

Public Parks	Public Parks	0.25 mile	0.073
		0.50 mile	
		0.75 mile	
		1 mile	
Public Schools	Elementary Schools	0.25 mile	0.073
		0.50 mile	
		0.75 mile	
		1 mile	
Public Schools	Middle Schools	0.25 mile	0.073
		0.50 mile	
		0.75 mile	
		1 mile	
Public Schools	High Schools	0.25 mile	0.073
		0.50 mile	
		0.75 mile	
		1 mile	
		1.25 miles	
		1.50 miles	
Public Libraries	Public Libraries	0.25 mile	0.073
		0.50 mile	
		0.75 mile	
		1 mile	
Healthcare Centers	Hospitals and Medical Centers	0.25 mile	0.079
		0.50 mile	
		0.75 mile	
		1 mile	
Healthcare Centers	Health Centers	0.25 mile	0.079
		0.50 mile	
		0.75 mile	
		1 mile	
Healthcare Centers	Health Clinics	0.25 mile	0.079
		0.50 mile	
		0.75 mile	
		1 mile	
Grocery Stores	Grocery Stores	0.25 mile	0.073
		0.50 mile	
		0.75 mile	
		1 mile	
		1.25 miles	
		1.50 miles	
Farmers' Markets	Farmers' Markets	0.25 mile	0.073
		0.50 mile	
		0.75 mile	
		1 mile	

3.5.10. Iteration Four: CTCAC Amenities

One of the main challenges that developers and/or investors face when selecting a site for the construction of higher density affordable rental housing is funding. In the state of California developers and/or investors have the option to apply for tax credits—known as the Low-Income Housing Tax Credit (LIHTC)—that are made available by the California Tax Credit Allocation Committee (CTCAC). However, to qualify, the developer and/or investor must take into account specific site amenities that are part of a points system (California Tax Credit Allocation Committee 2015). The more points the developer and/or investor obtains, the greater the likelihood of obtaining the tax credits. As such, this fourth iteration takes into account only the listed amenities and analyzes the following attributes: public transit, public parks, public elementary schools, public middle schools, public high schools, public libraries, hospitals and medical centers, health centers, health clinics, grocery stores, and farmers' markets. Table 17 shows the weight assigned to each of the eleven attributes that were analyzed.

Table 17 Assigned Weights to Iteration Four: CTCAC Amenities

Attribute	Criterion Weight
Public Transit (w_1)	80
Public Parks (w_2)	70
Public Elementary Schools (w_3)	70
Public Middle Schools (w_4)	70
Public High Schools (w_5)	70
Public Libraries (w_6)	70
Hospitals and Medical Centers (w_7)	75
Health Centers (w_8)	75
Health Clinics (w_9)	75
Grocery Stores (w_{10})	70
Farmers' Markets (w_{11})	70

The eleven weights were then normalized as previously described (Eq. 2). See Table 18 for final weights.

3.5.11. Criteria, Scoring, and Weights for Iteration Four: CTCAC Amenities

Table 18 summarizes the categories, layers, criteria, and assigned weights for each of the eleven variables that were analyzed in the fourth iteration. The criteria and scoring set for each of the attributes is the same as the one applied in Iteration One of the analysis. However, the weight assigned to each variable is different from the previous three iterations. Yet, the application of it remains the same, meaning that a greater weight was given to those variables that were considered to be of greater importance than the other variables analyzed in the iteration.

Table 18 Criteria, Scoring, and Weights for Iteration Four: CTCAC Amenities

Category	Layer	Criteria	Weight
Public Transit	Public Transit	0.25 mile	0.101
		0.50 mile	
		0.75 mile	
		1 mile	
Public Parks	Public Parks	0.25 mile	0.088
		0.50 mile	
		0.75 mile	
		1 mile	
Public Schools	Elementary Schools	0.25 mile	0.088
		0.50 mile	
		0.75 mile	
		1 mile	
Public Schools	Middle Schools	0.25 mile	0.088
		0.50 mile	
		0.75 mile	
		1 mile	
Public Schools	High Schools	0.25 mile	0.088
		0.50 mile	
		0.75 mile	
		1 mile	
		1.25 miles	
		1.50 miles	
Public Libraries	Public Libraries	0.25 mile	0.088
		0.50 mile	
		0.75 mile	
		1 mile	
Healthcare Centers		0.25 mile	0.094

	Hospitals and Medical Centers	0.50 mile	
		0.75 mile	
		1 mile	
Healthcare Centers	Health Centers	0.25 mile	0.094
		0.50 mile	
		0.75 mile	
		1 mile	
Healthcare Centers	Health Clinics	0.25 mile	0.094
		0.50 mile	
		0.75 mile	
		1 mile	
Grocery Stores	Grocery Stores	0.25 mile	0.088
		0.50 mile	
		0.75 mile	
		1 mile	
		1.25 miles	
		1.50 miles	
Farmers' Markets	Farmers' Markets	0.25 mile	0.088
		0.50 mile	
		0.75 mile	
		1 mile	

3.5.12. Iteration Five: Environmentally Sustainable

Planning for communities in a sustainable manner has become increasingly important throughout the state of California, and housing is no exception to this goal. Accordingly, in September 30, 2008 Senate Bill (SB) 375—authored by Senate Pro Tem Darrell Steinberg—was signed into law. SB 375 intends to coordinate planning for land use and transportation at a regional scale by also taking into account housing need and anticipated job growth. This legislative policy seeks to create more sustainable communities throughout California by requiring regional planning agencies, such as SCAG, to devise a Sustainable Communities Strategy (SCS) as part of their existing Regional Transportation Plan (RTP). It is hoped that the SCS will reduce the greenhouse gases (GHG) and have more walkable and efficient communities. Therefore, this fifth iteration analyzes the following attributes: land use, fair share, employment, and public transit, and depicts how these factors currently promote or discourage

sustainability efforts within Los Angeles. Table 19 shows the weight assigned to each of the four attributes that are analyzed.

Table 19 Assigned Weights to Iteration Five: Environmentally Sustainable

Attribute	Criterion Weight
Land Use (w_1)	90
Fair Share (w_2)	80
Employment (w_3)	80
Public Transit (w_4)	90

The four weights were then normalized as follows:

- $w_1 = 90/(90 + 80 + 80 + 90) = 0.265$
- $w_2 = 80/(90 + 80 + 80 + 90) = 0.235$
- $w_3 = 80/(90 + 80 + 80 + 90) = 0.235$
- $w_4 = 90/(90 + 80 + 80 + 90) = 0.265$

3.5.13. Criteria, Scoring, and Weights for Iteration Five: Environmentally Sustainable

Table 20 summarizes the categories, layers, criteria, and assigned weights for each of the four variables that were analyzed in the fifth iteration. The criteria and scoring established for each of the attributes is the same as the one applied in Iteration One of the analysis. However, the weight assigned to each variable is different from the previous four iterations. Nonetheless, the application of it remains the same.

Table 20 Criteria, Scoring, and Weights for Iteration Five: Environmentally Sustainable

Category	Layer	Criteria	Weight
Land Use	Land Use	Medium Residential	0.265
		High Medium Residential	
		High Residential	
		Neighborhood Commercial	
		Community Commercial	
		General Commercial	

		Regional Center	
		Hybrid Industrial	
		Light Industrial	
Fair Share	Fair Share	0 – 0.0006	0.235
		0.0007 – 0.0012	
		0.0013 – 0.0039	
		0.0040 – 0.0097	
		0.0098 – 0.0132	
		0.0133 – 0.0163	
		0.0164 – 0.0261	
		0.0262 – 0.0447	
		0.0448 – 0.0620	
Employment	Employment	0 – 6,076 jobs	0.235
		6,077 – 13,952 jobs	
		13,953 – 21,970 jobs	
		21,971 – 31,635 jobs	
		31,636 – 42,813 jobs	
		42,814 – 56,444 jobs	
		56,445 – 73,788 jobs	
		73,789 – 101,376 jobs	
		101,377 – 159,226 jobs	
Public Transit	Public Transit	0.25 mile	0.265
		0.50 mile	
		0.75 mile	
		1 mile	

3.5.14. Iteration Six: Employment and Public Transit

There are housing advocates that support a model in which affordable housing be built in proximity to jobs. They argue that a *jobs-housing balance* is both environmentally sustainable and cost-effective. Among the benefits attributed to a jobs-housing balance are: (1) reduced driving and congestions; (2) fewer air pollution emissions; (3) lower costs to businesses and commuters; (4) lower public spending on facilities and services; (5) greater family stability, and (6) higher quality of life (California Planning Roundtable 2008). Accordingly, this sixth iteration analyzes the following two attributes: employment and public transit, and depicts how these two variables at present allow or limit the jobs-housing balance in Los Angeles. Table 21 shows the weight assigned to each of the two attributes that were analyzed.

Table 21 Assigned Weights to Iteration Six: Employment and Public Transit

Attribute	Criterion Weight
Employment (w_1)	80
Public Transit (w_2)	90

The two weights were then normalized as follows:

- $w_1 = 80/(80 + 90) = 0.471$
- $w_2 = 90/(80 + 90) = 0.529$

3.5.15. Criteria, Scoring, and Weights for Iteration Six: Employment and Public Transit

Table 22 summarizes the categories, layers, criteria, and assigned weights for each of the two variables that were analyzed in the sixth iteration. The criteria and scoring established for each of the attributes is the same as the one applied in Iteration One of the analysis. However, the weight given to each variable is different from the previous five iterations. Nonetheless the application of it remains the same, meaning that a greater weight is assigned to those variables that are considered to be of greater importance than the other variable analyzed in the iteration.

Table 22 Criteria, Scoring, and Weights for Iteration Six: Employment and Public Transit

Category	Layer	Criteria	Weight
Employment	Employment	0 – 6,076 jobs	0.471
		6,077 – 13,952 jobs	
		13,953 – 21,970 jobs	
		21,971 – 31,635 jobs	
		31,636 – 42,813 jobs	
		42,814 – 56,444 jobs	
		56,445 – 73,788 jobs	
		73,789 – 101,376 jobs	
		101,377 – 159,226 jobs	
Public Transit	Public Transit	0.25 mile	0.529
		0.50 mile	
		0.75 mile	
		1 mile	

3.6 Site Suitability Analysis Models

To perform the site suitability analysis for this study, a total of six models were constructed using ModelBuilder. Specifically, a model was created for each of the six iterations previously identified in this project. Given that this is a weighted site suitability analysis with several raster datasets and floating point numeric fields, the weighted sum tool was chosen for this analysis. Accordingly, Figure 12 shows the model built for Iteration One of the site suitability analysis. Figures similar to Figure 12 showing the models built for Iteration Two to Iteration Six are illustrated in Appendix G. Each model shows the variables analyzed for that specific iteration as inputs, the weighted sum tool, and the results as an output.

3.6.1. Iteration One: Comprehensive Analysis Model

One map was created for Iteration One of the site suitability analysis. The map shows the results for all of the sixteen attributes that were analyzed in this study, these being: land use, zoning, cost of land, fair share, employment, public transit, public parks, public elementary schools, public middle schools, public high schools, public libraries, hospitals and medical centers, health centers, health clinics, grocery stores, and farmers' markets. These variables may either encourage or deter the production of higher density affordable rental housing developments.

Figure 12 depicts the model created for Iteration One of the site suitability analysis. The model shows all of the sixteen attributes as inputs in the model (shown in blue color). Furthermore, it illustrates the weighted sum tool (shown in gold color), which is used to perform this analysis. Lastly, the model depicts the results as the output in the model (shown in green color).

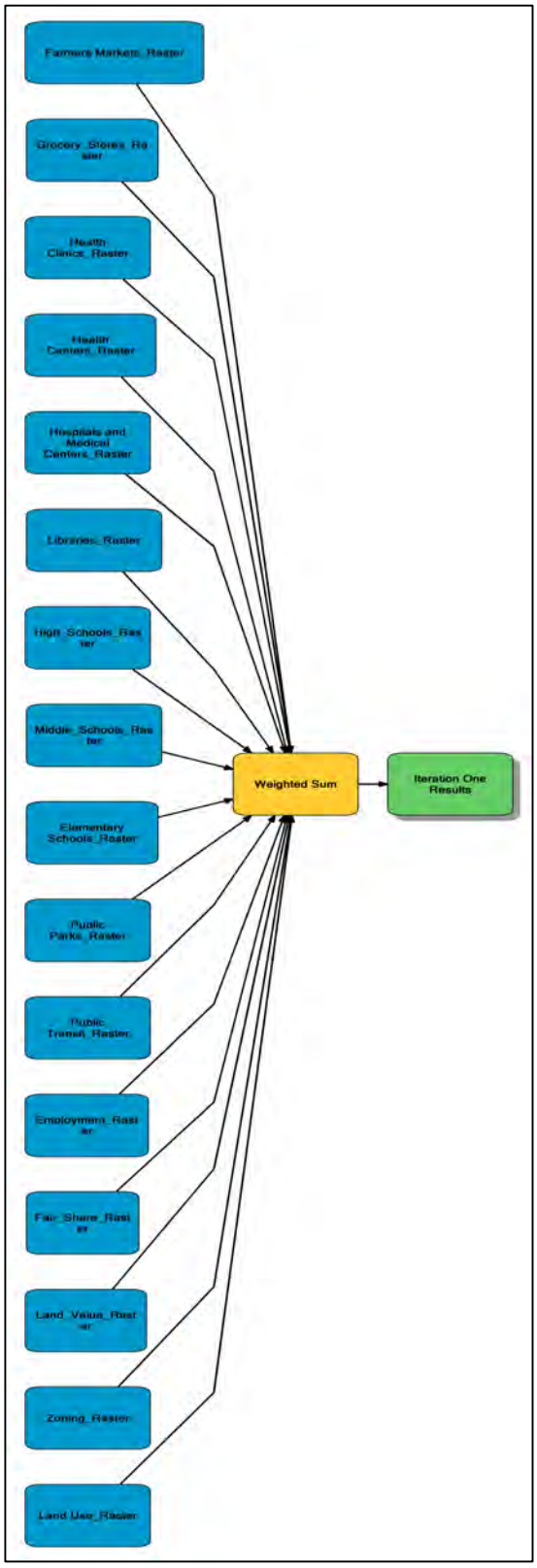

Figure 12 Model for Iteration One of Site Suitability Analysis

3.7 Maps and Visualizations

Maps and infographics not only provide a visual perspective to any research work but are also are a great mechanism to show information that is deemed important. In fact, these tools can help tell a story, giving the research work a richer context. Therefore, the following attribute maps were created, using the linear combination (WLC) model, to show the research findings:

- **Fair Share Maps:** Four choropleth maps that illustrate the new construction of multi-family affordable rental housing units in Los Angeles for the 2006 – 2013 planning period. The data shows by CPA, the total number of new affordable rental housing units built during the specified planning period and it is normalized by population density by CPA. These maps depict how the community plan areas of the City have met their *fair share*. Furthermore, it helps identify any neighborhoods where there may currently be a concentration of affordable rental housing. Conversely, the maps also illustrate areas where during the period of study there was few or no activity of new construction of affordable rental housing.
- **Service Areas Analysis Maps:** Eleven service areas analysis maps that show the distance from facilities for the site amenities identified in this research. Service areas analysis maps were created for Los Angeles and specific community plan areas.
- **Site Suitability Analysis Maps:** Six choropleth maps that depict site suitability for the construction of higher density affordable rental housing in Los Angeles. Analysis is based on a scoring scale from 1 to 9 and a weight of 0 – 100 that is applied to each of the variables analyzed. A total of six iterations are performed as part of the site suitability analysis. The results of this analysis are shown by community plan area.

Chapter 4 Results

Below are the findings of the fair share, service areas, and site suitability analyses that were performed for Los Angeles. The fair share results show that the community plan areas (CPAs) of Northeast Los Angeles, Hollywood, Sun Valley-La Tuna Canyon, Wilmington-Harbor City, and Boyle Heights were more proactive in the construction of new affordable rental housing units during the 2006 – 2013 period, whereas the CPAs of Granada Hills-Knollwood, Northridge, Harbor Gateway, Bel Air-Beverly Crest, and Westwood were not. Furthermore, the service areas analysis illustrates that CPAs such as Central City, Central City North, Hollywood, Northeast Los Angeles, Silver Lake-Echo Park-Elysian Valley, South Los Angeles, Southeast Los Angeles, Westlake, and Wilshire are more likely to qualify for CTCAC funding to build affordable housing because they have the necessary site amenities to meet the established criteria, while other CPAs like Bel Air-Beverly Crest, Brentwood-Pacific Palisades, Chatsworth-Porter Ranch, Encino-Tarzana, Granada Hills-Knollwood, and Sherman Oaks-Studio City-Toluca Lake-Cahuenga Pass have a limited number or lack them. Lastly, the six iterations of the site suitability analysis provide different scoring results and perspectives, depending on the attributes analyzed. However, it was repeatedly found that the CPAs of Central City, Hollywood, Northeast Los Angeles, Silver Lake-Echo Park-Elysian Valley, South Los Angeles, Southeast Los Angeles, West Adams-Baldwin Hills-Leimert, Westlake, and Wilshire have the most suitable sites for the construction of higher density affordable rental housing.

4.1 Fair Share Analysis

Figure 13 illustrates the results by community plan area of the fair share analysis that was performed for Los Angeles. The results of the analysis show that some community plan areas produced more new affordable rental housing units than others during the 2006 – 2013 planning

period. Specifically, the fair share results show the total number of new affordable rental units that were built during the planning period. These values were normalized by the population density for each CPA.

In an effort to make it easier for the reader to view the results, the CPAs were broken down into three separate maps. Figure 48 (found in Appendix H) shows the results for the CPAs located in the North Area of Los Angeles, Figure 49 (found in Appendix H) illustrates the results of the CPAs within the Central Area of Los Angeles, and Figure 50 (found in Appendix H) depicts the results of those CPAs that are in the South Area of Los Angeles.

Accordingly, it was found that in the North Area of Los Angeles, the CPAs of Reseda-West Van Nuys and Sun Valley-La Tuna Canyon built a higher number of new affordable rental housing stock relative to their population density during the 2006 – 2013. On the other hand, during the same planning period, the following CPAs built a low number of new affordable rental housing units relative to their population density: Encino-Tarzana, Granada Hills-Knollwood, Northridge, and Sherman Oaks-Studio City-Toluca Lake-Cahuenga Pass. In the Central Area of Los Angeles, the results show that the community plan area of Northeast Los Angeles produced the greatest number of new affordable rental housing units in the Central Area of Los Angeles, followed by the Hollywood and Boyle Heights CPAs. In fact, Northeast Los Angeles is the CPA in the City with the highest number of new affordable rental housing units built. Conversely, the following CPAs produced a low number of new affordable rental housing stock during the 2006 – 2013 planning period: Bel Air-Beverly Crest, Brentwood-Pacific Palisades, Venice, Westchester-Playa del Rey, and Westwood. It should be noted that most of these CPAs are coastal and/or more affluent communities than other CPAs in Los Angeles.

The South Area of Los Angeles is comprised of only three CPAs, these being: Harbor Gateway, San Pedro, and Wilmington-Harbor City. Of the three CPAs, the Wilmington-Harbor City CPA built the highest number of new affordable rental housing units. Whereas the Harbor Gateway community plan area had the lowest relative number of new affordable rental housing stock construction.

In addition, a table showing the rank for each of the thirty-five community plan areas was created. Appendix I lists the total number of new affordable rental housing units, normalized by population density, that were built within each CPA during the 2006 – 2013 planning period. Moreover, the table provides information pertaining to the total area in square miles for each CPA, the total population by CPA, total population density by CPA, and total number of new affordable units by CPA. As such, the five CPAs that took a more proactive role in the construction of new affordable rental housing units during the 2006 – 2013 planning period are: Northeast Los Angeles, Hollywood, Sun Valley-La Tuna Canyon, Wilmington-Harbor City, and Boyle Heights. On the other hand, the five CPAs that built very few or no affordable rental housing units during the same period are: Granada Hills-Knollwood, Northridge, Harbor Gateway, Bel Air-Beverly Crest, and Westwood.

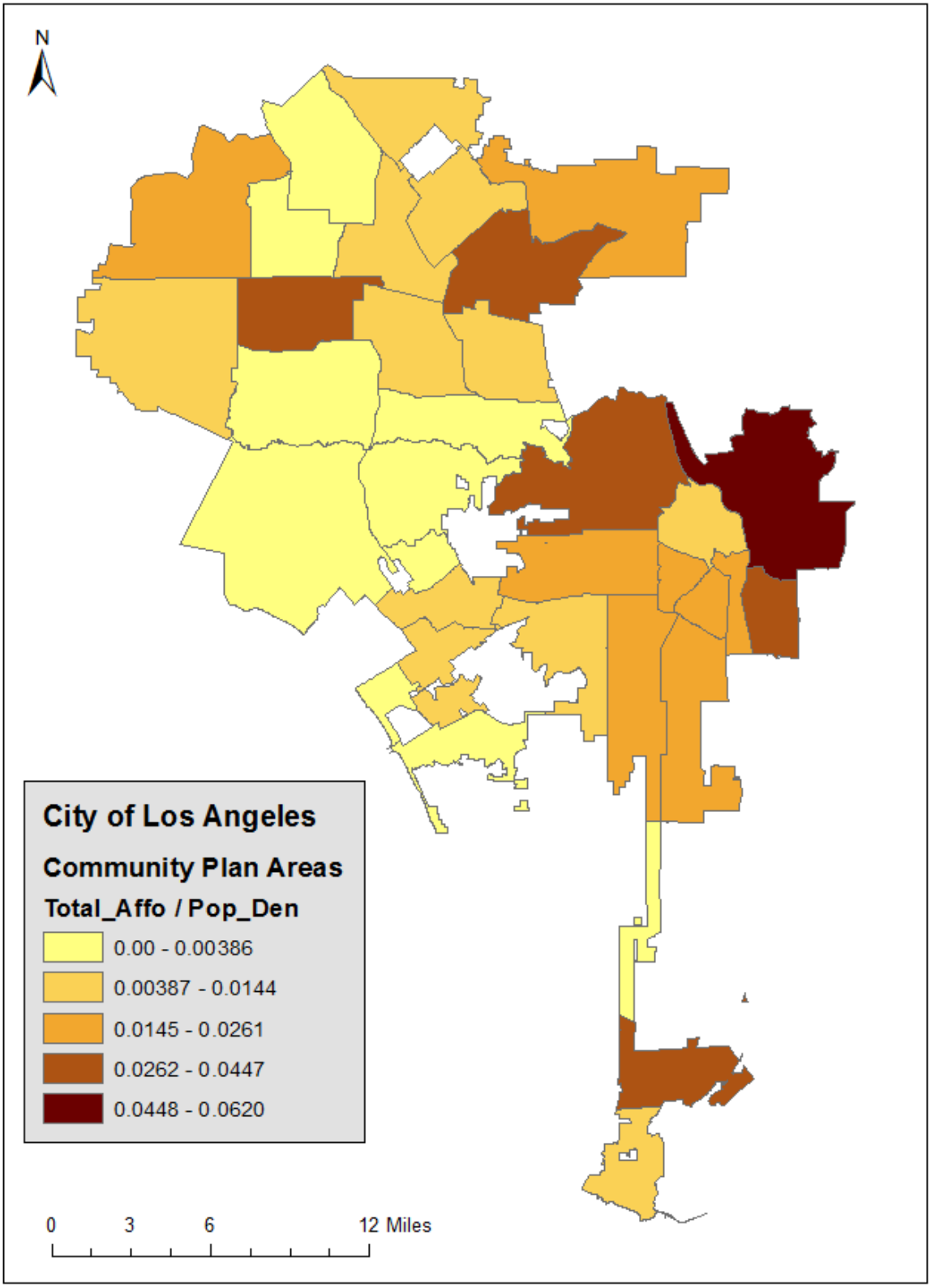

Figure 13 Fair Share of Affordable Housing by Community Plan Area (CPA), Los Angeles

4.2 Service Areas Analysis

Figures 14 to 36 show the results of the service areas analysis (SAA) that was performed for the following site amenities: public transit stops (bus stops and rail stations), public parks, public elementary schools, public middle schools, public high schools, public libraries, hospitals and medical centers, health centers, health clinics, grocery stores, and farmers' markets for Los Angeles. These maps depict the SAA results with the following default distance intervals: 0.25 mile, 0.50 mile, 0.75 mile, 1 mile, 1.25 miles, and 1.50 miles. However, the default breaks of 1.25 miles and 1.50 miles were only applied for the *public high schools* and *grocery stores* amenities—this per the guidelines established in the CTCAC applications. The overall SAA refers to these twenty-three figures and figures found in Appendixes J to N.

4.2.1. Service Areas Analysis of Public Transit Stops

Figure 14 to Figure 16 illustrate the results of the SAA that was performed for public transit stops, specifically bus stops and rail stations. Figure 14 is a map of Los Angeles, in which the SAA results of the 8,642 public transit facilities that were analyzed are shown. Next, Figure 15 is a map of the Bel Air-Beverly Crest CPA that depicts an example in which the SAA results show no site amenities located within the area and the majority of the CPA is not covered by any service area. On the other hand, Figure 16 is a map of the San Pedro CPA and the 154 public transit facilities in the San Pedro CPA; here, the service areas cover the entire CPA. For each of these maps, the results are shown in distance in miles with the following default breaks: 0.25 mile, 0.50 mile, 0.75 mile, and 1 mile.

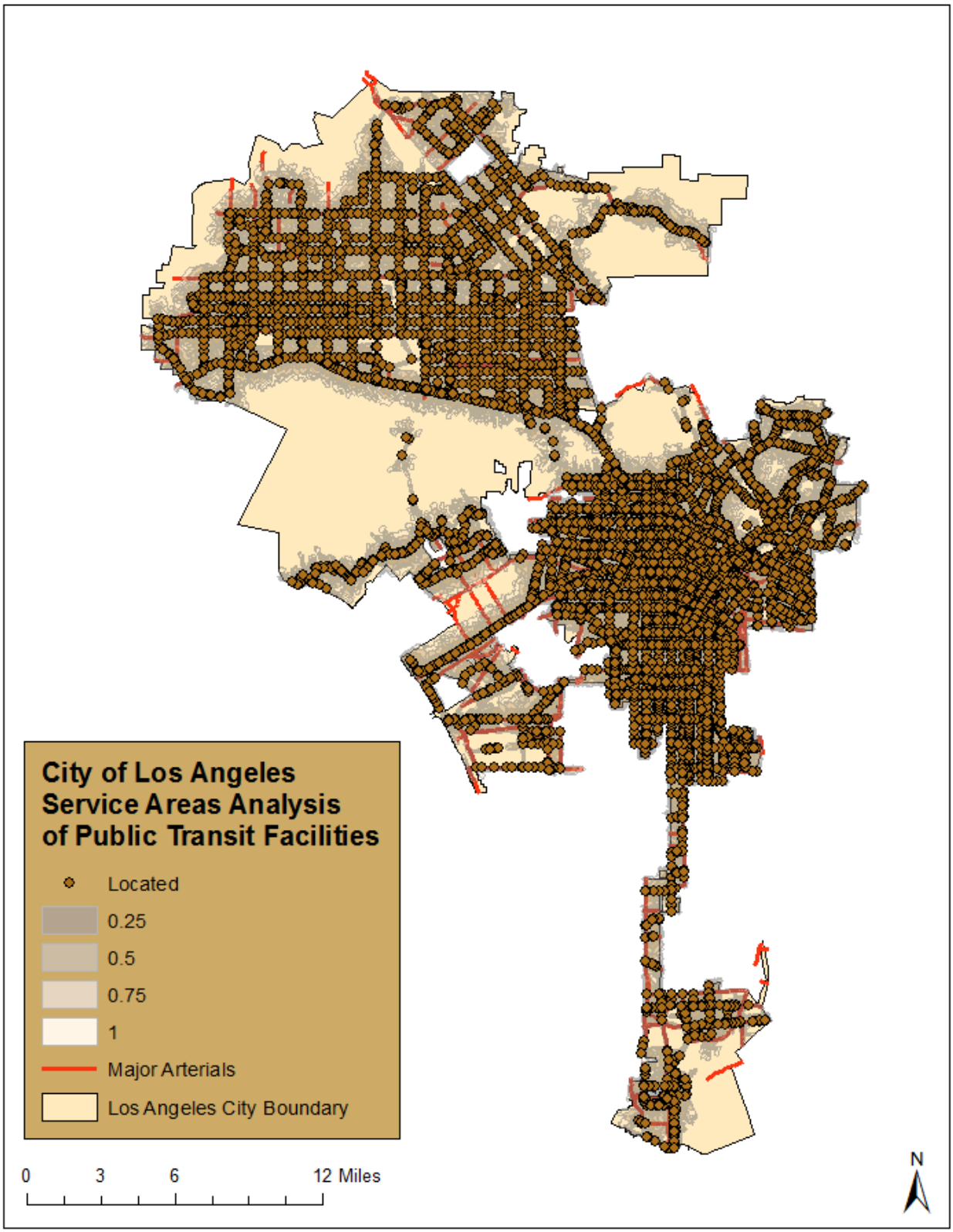

Figure 14 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Public Transit Stops, City of Los Angeles

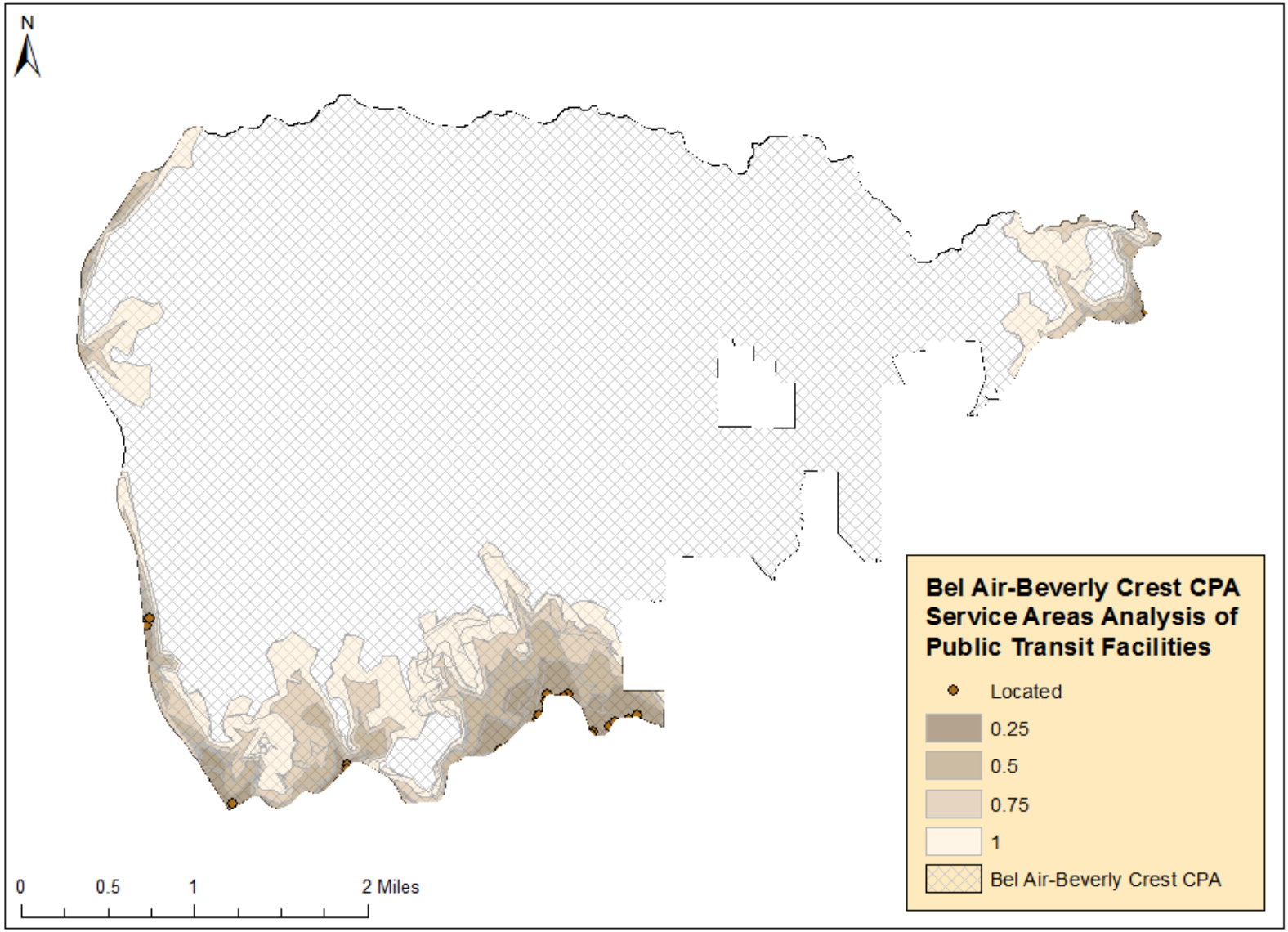

Figure 15 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Public Transit Stops in Bel Air-Beverly Crest CPA

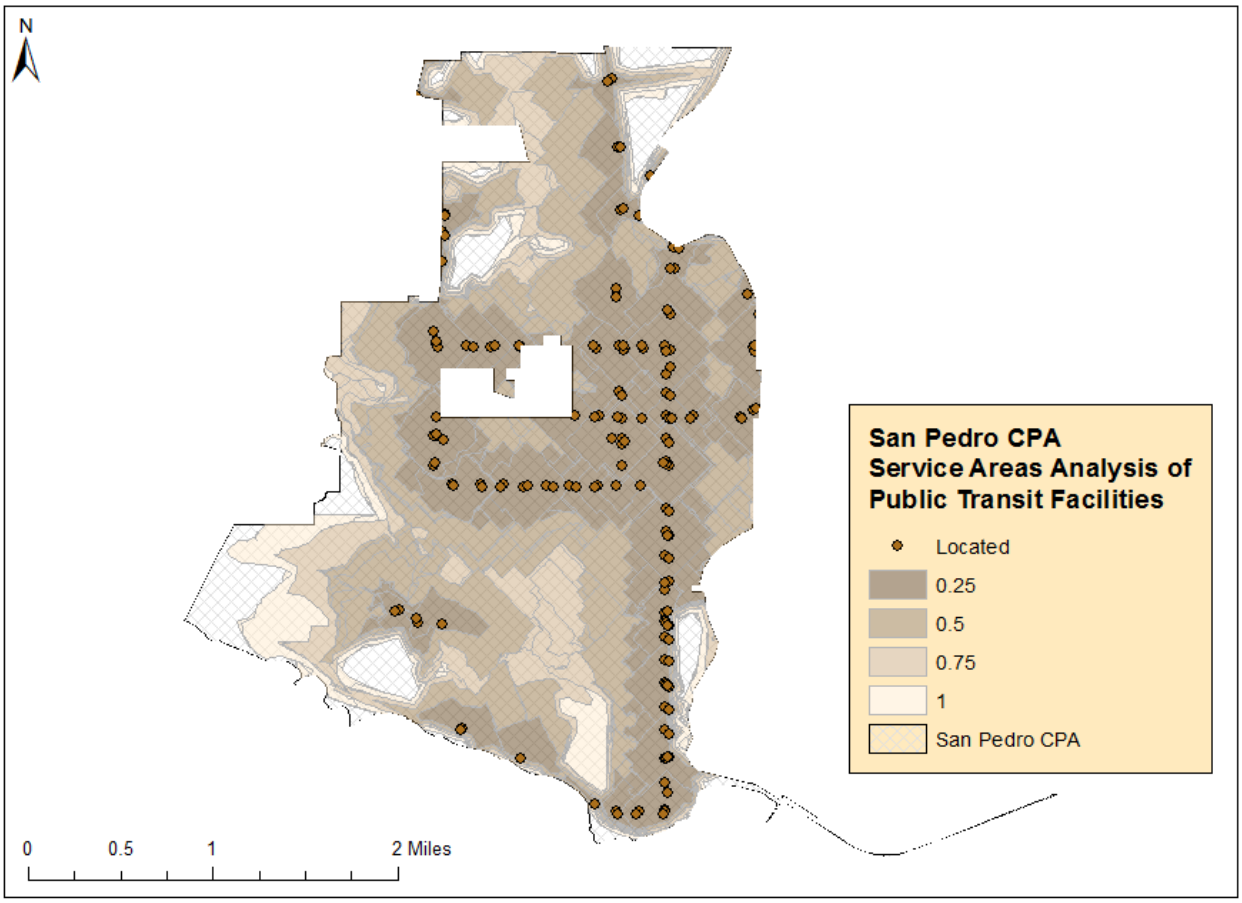

Figure 16 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Public Transit Stops in San Pedro CPA

4.2.2. Service Areas Analysis of Public Parks

Next, a service areas analysis of public parks was performed, were the following default distance intervals were set: 0.25 mile, 0.50 mile, 0.75 mile, and 1 mile. Figures 17 to 19 depict the results of the SAA that was done for the public parks facilities. Figure 17 shows the results of the 326 public parks facilities that were analyzed for all of Los Angeles. The map also includes the nine facilities that were *unlocated* (not located) when performing the SAA analysis, these are shown in a violet shade.

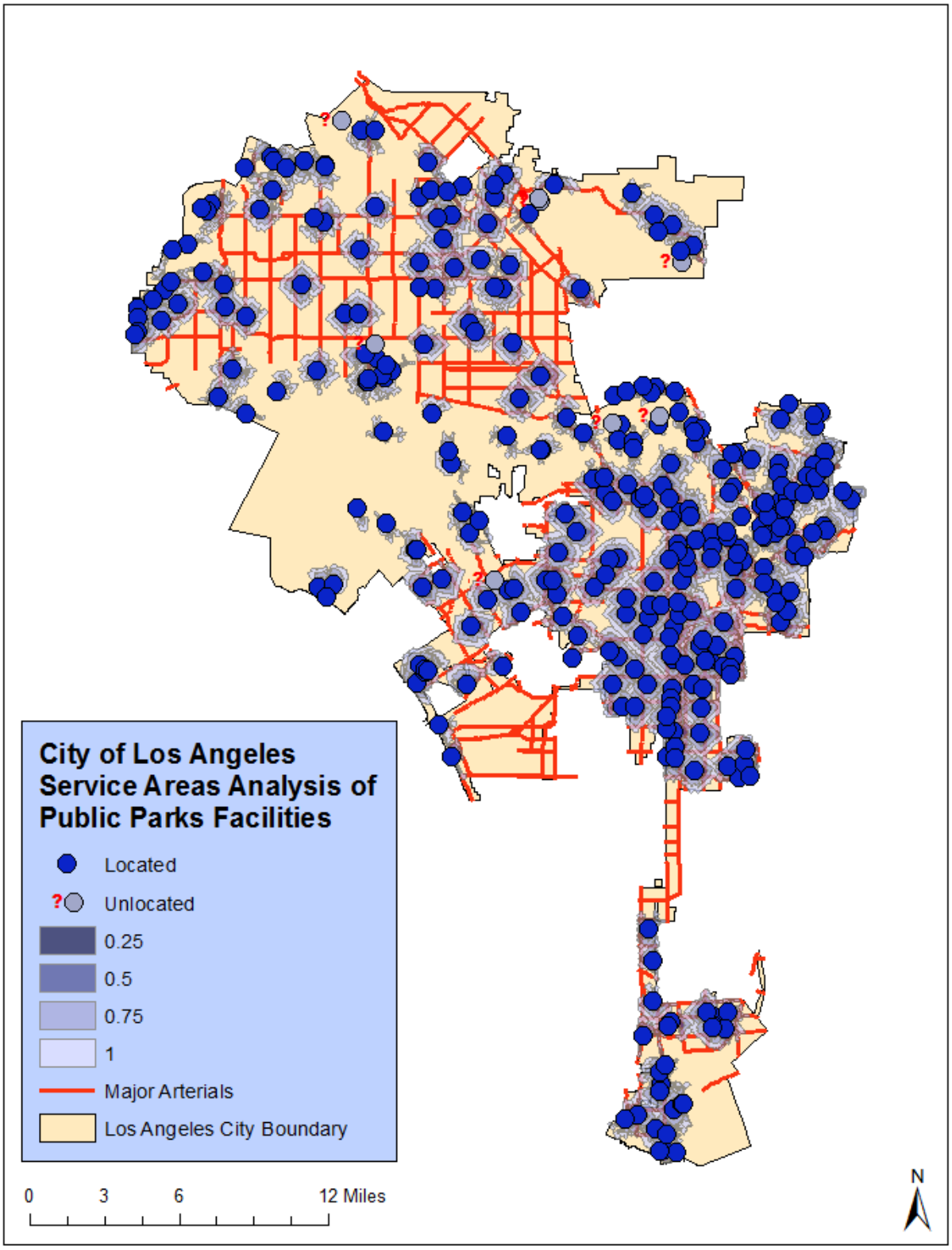

Figure 17 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Public Parks, City of Los Angeles

Figure 18 is a map of the Brentwood-Pacific Palisades CPA, which illustrates the SAA results of five public parks. This specific map is an example of an area in which the public parks are more scattered when compared to other CPAs of the City. Lastly, Figure 19 is a map of the Southeast Los Angeles CPA, which shows the SAA results of twenty-three public parks facilities. This map is an example of a CPA in which the service areas cover all of the land area analyzed.

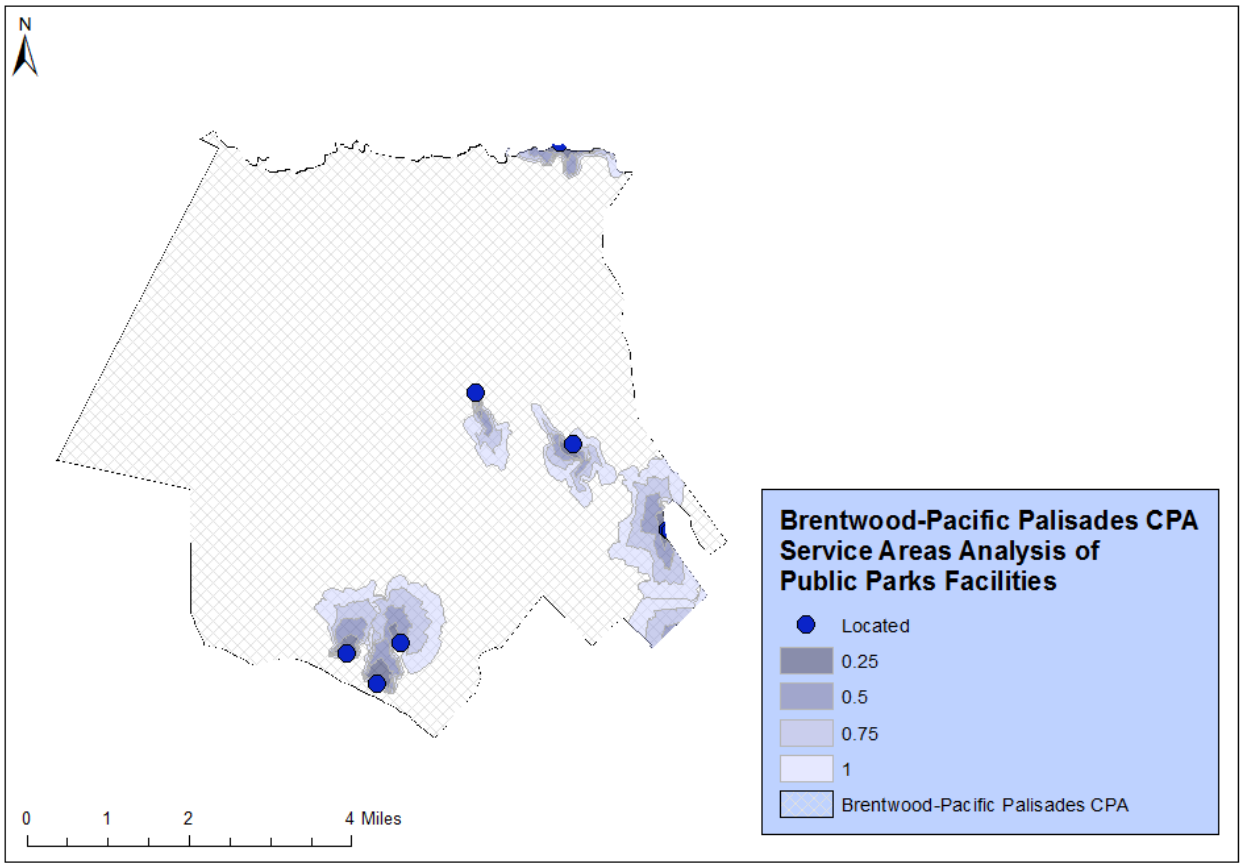

Figure 18 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Public Parks in Brentwood-Pacific Palisades CPA

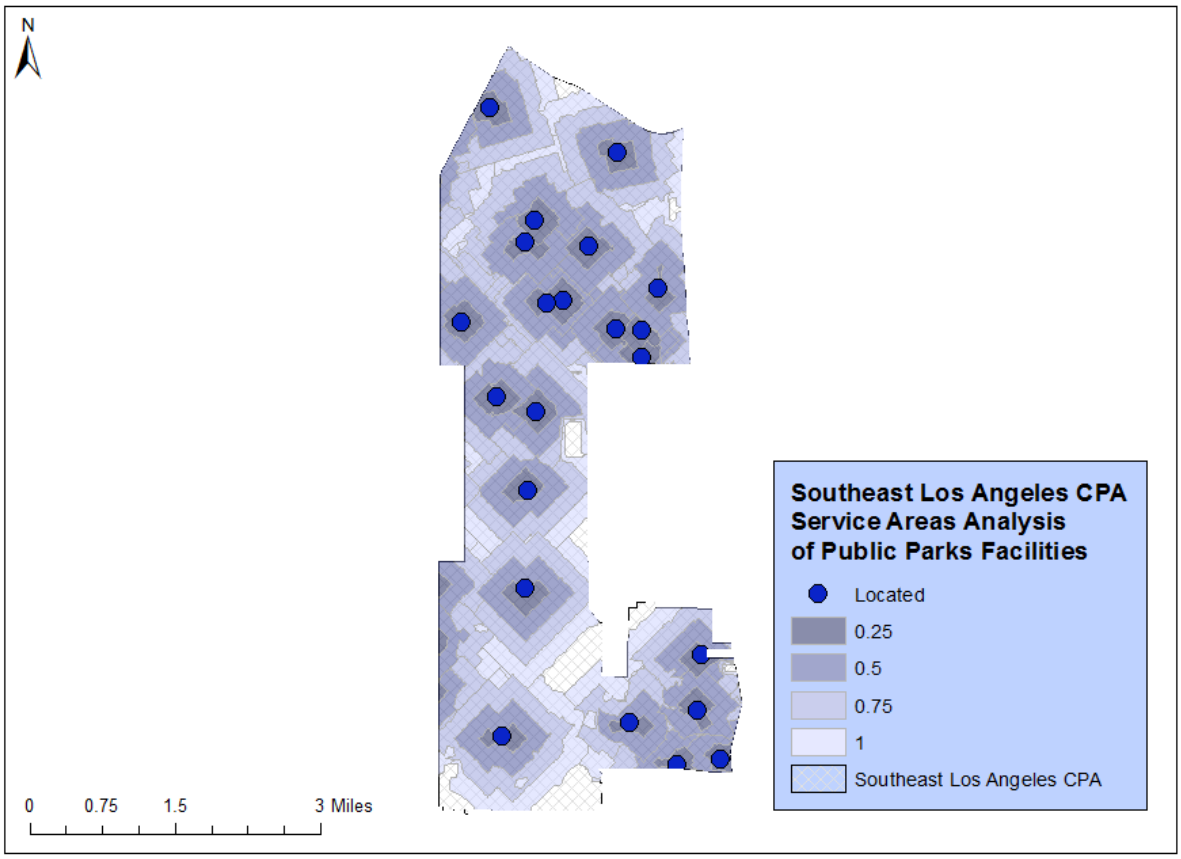

Figure 19 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Public Parks in Southeast Los Angeles CPA

4.2.3. Service Areas Analysis of Public Elementary Schools

Figures 20 through 22 illustrate the results of the SAA that was done for public elementary schools. Figure 20 shows the SAA results of the 370 public elementary school facilities that were analyzed for all of Los Angeles. Figure 21 provides a closer look of the SAA results of four public elementary school facilities found in the Chatsworth-Porter Ranch CPA. Again, this particular map is an example of SAA results that are more spread out when compared to other CPAs in the City. Next, Figure 22 is a map of the Mission Hills-Panorama City-North Hills CPA, which illustrates the service areas of sixteen public elementary schools that were analyzed. For each of these maps, the results are shown in distance miles with the following default breaks: 0.25 mile, 0.50 mile, 0.75 mile, and 1 mile.

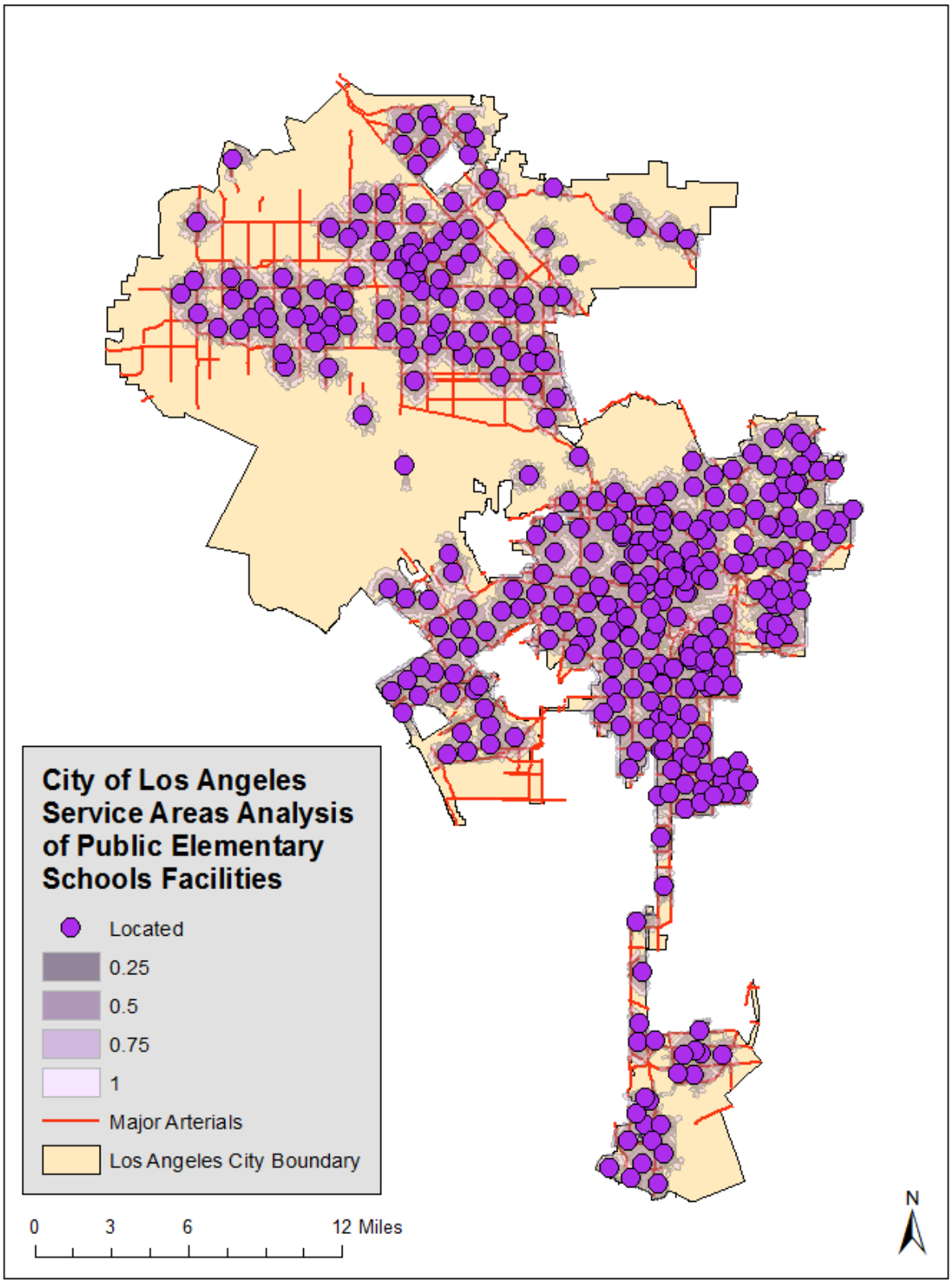

Figure 20 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Public Elementary Schools, City of Los Angeles

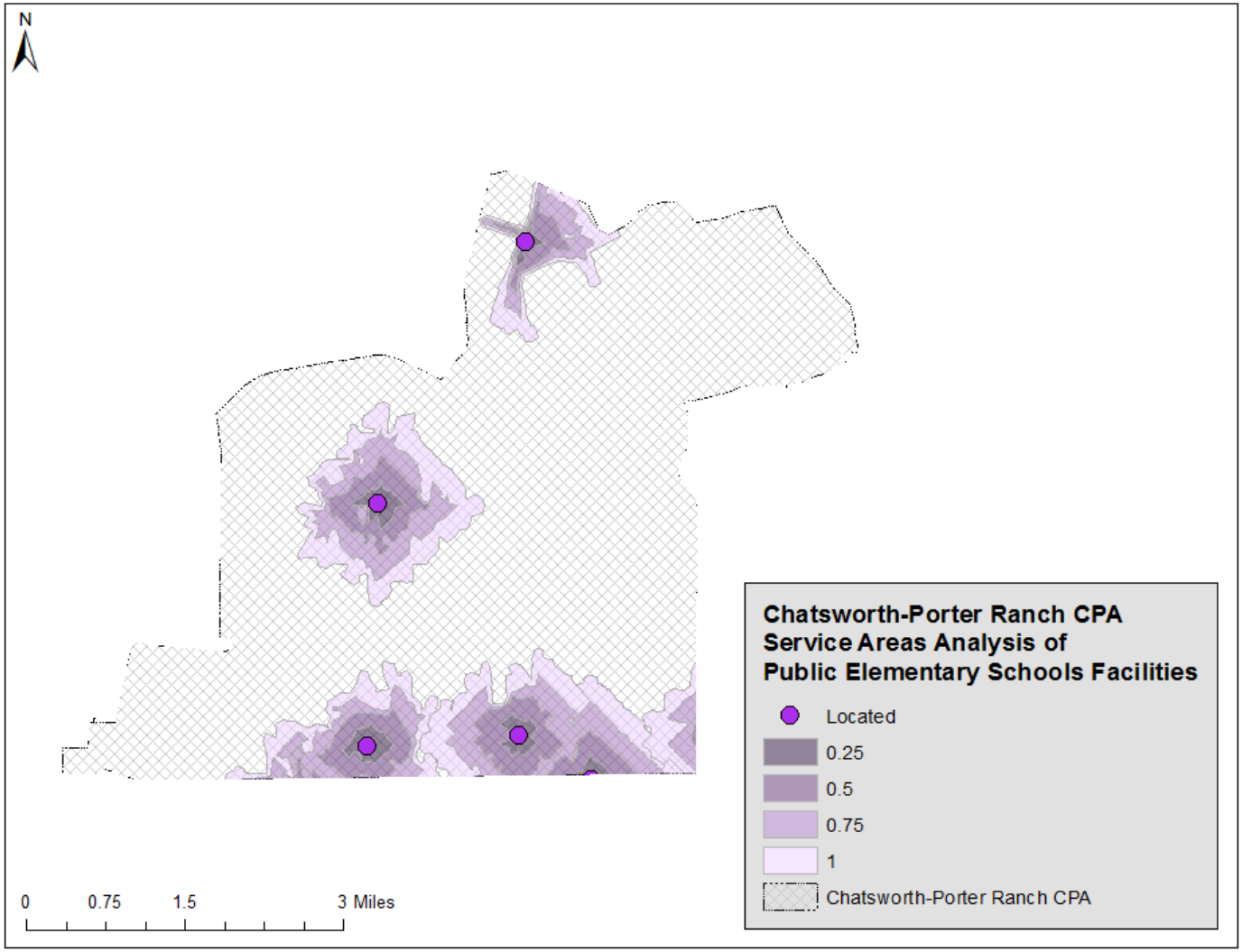

Figure 21 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Public Elementary Schools in Chatsworth-Porter Ranch CPA

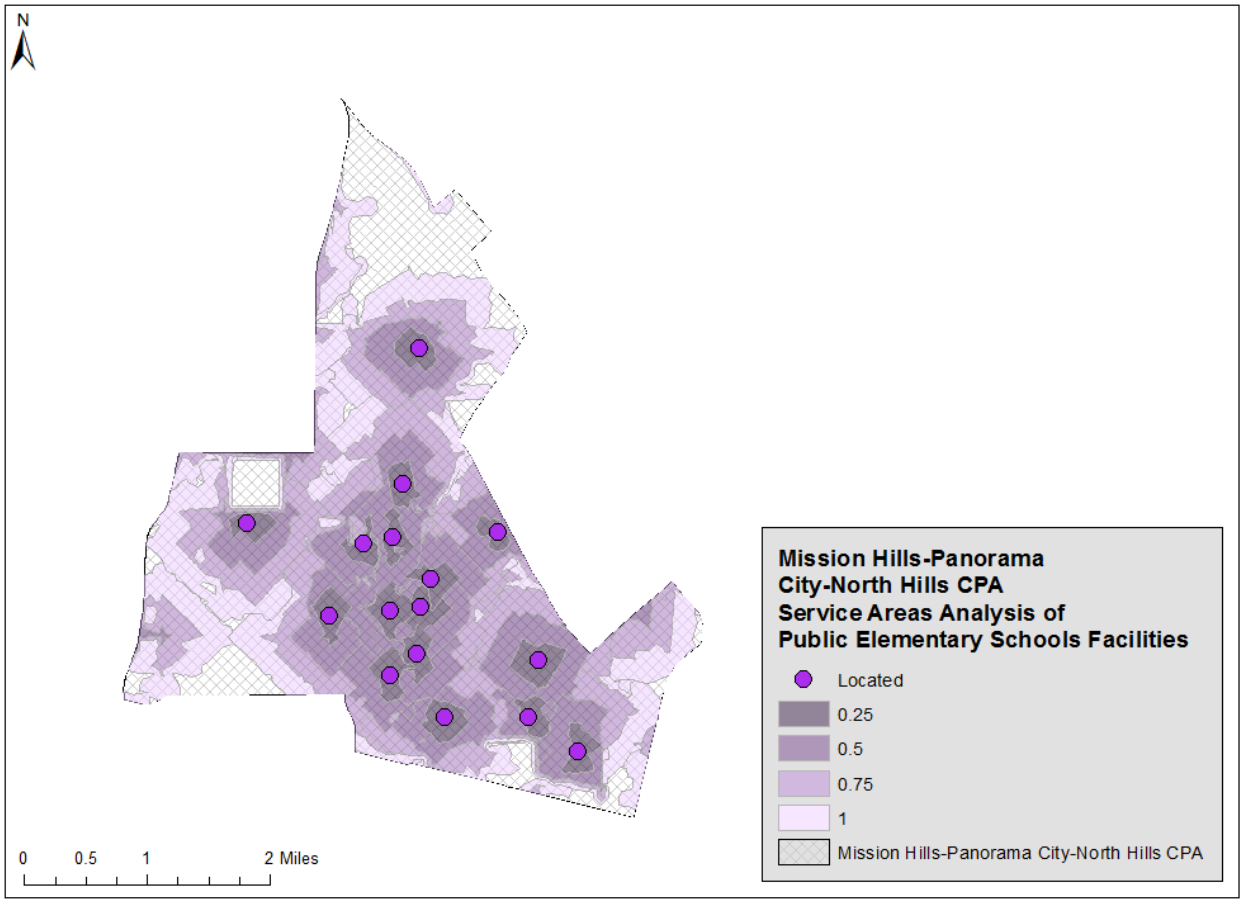

Figure 22 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Public Elementary Schools in Mission Hills-Panorama City-North Hills CPA

4.2.4. Service Areas Analysis of Public Middle Schools

Figure 23 to Figure 25 show the results of the SAA that was performed for public middle schools. Figure 23 illustrates the SAA results for all sixty-two public middle school facilities in Los Angeles. Next, Figure 24 is a map of the Sunland-Tujunga-Lake View Terrace-Shadow Hills-East La Tuna Canyon CPA depicting the service area of the one middle school facility that was located within the land area. Figure 25 is a map of the Northeast Los Angeles CPA showing the SAA results of the five middle school facilities located in the area. For each of these maps, the results are shown in distance miles with the following default breaks: 0.25 mile, 0.50 mile, 0.75 mile, and 1 mile.

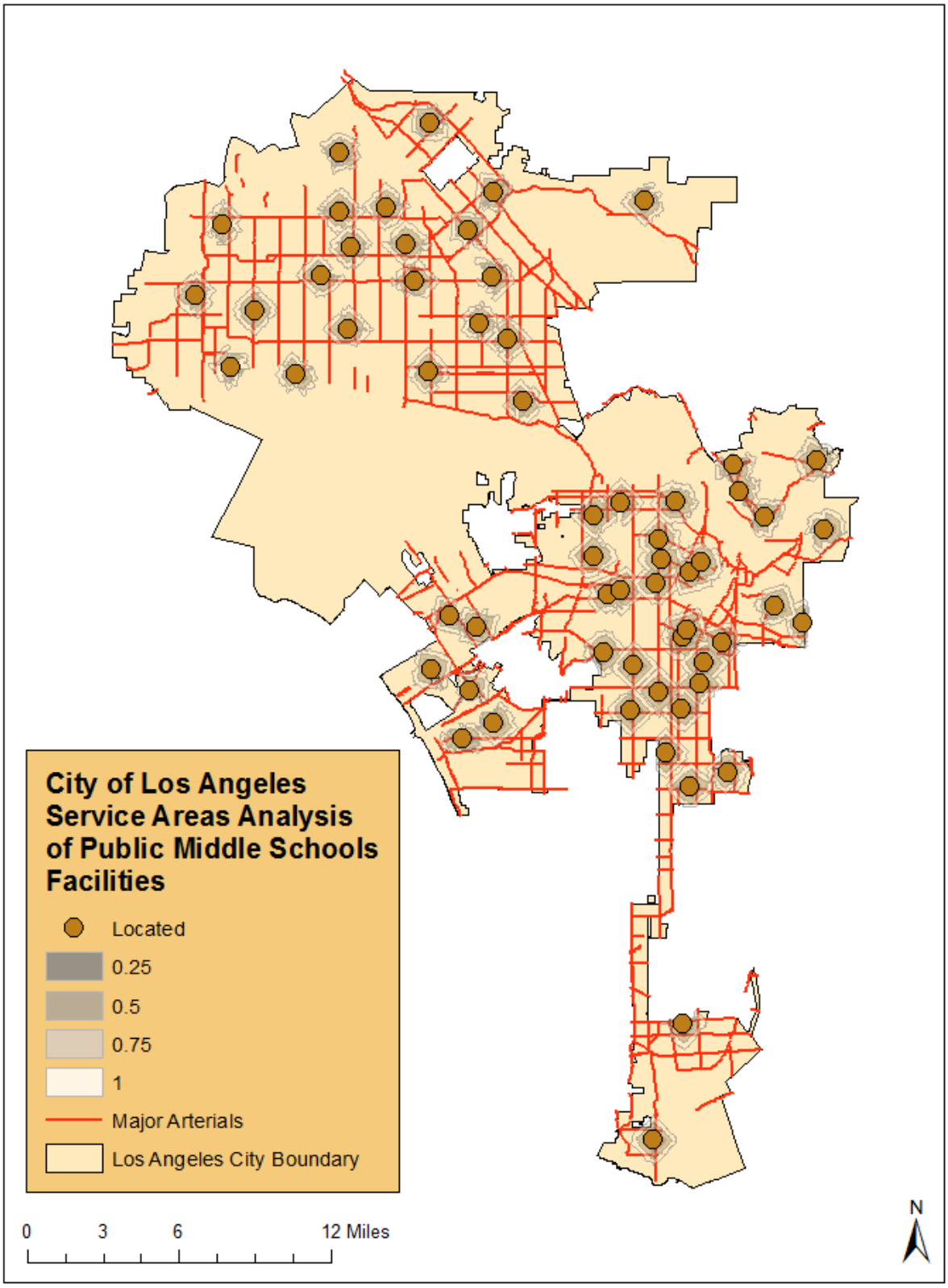

Figure 23 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Public Middle Schools, City of Los Angeles

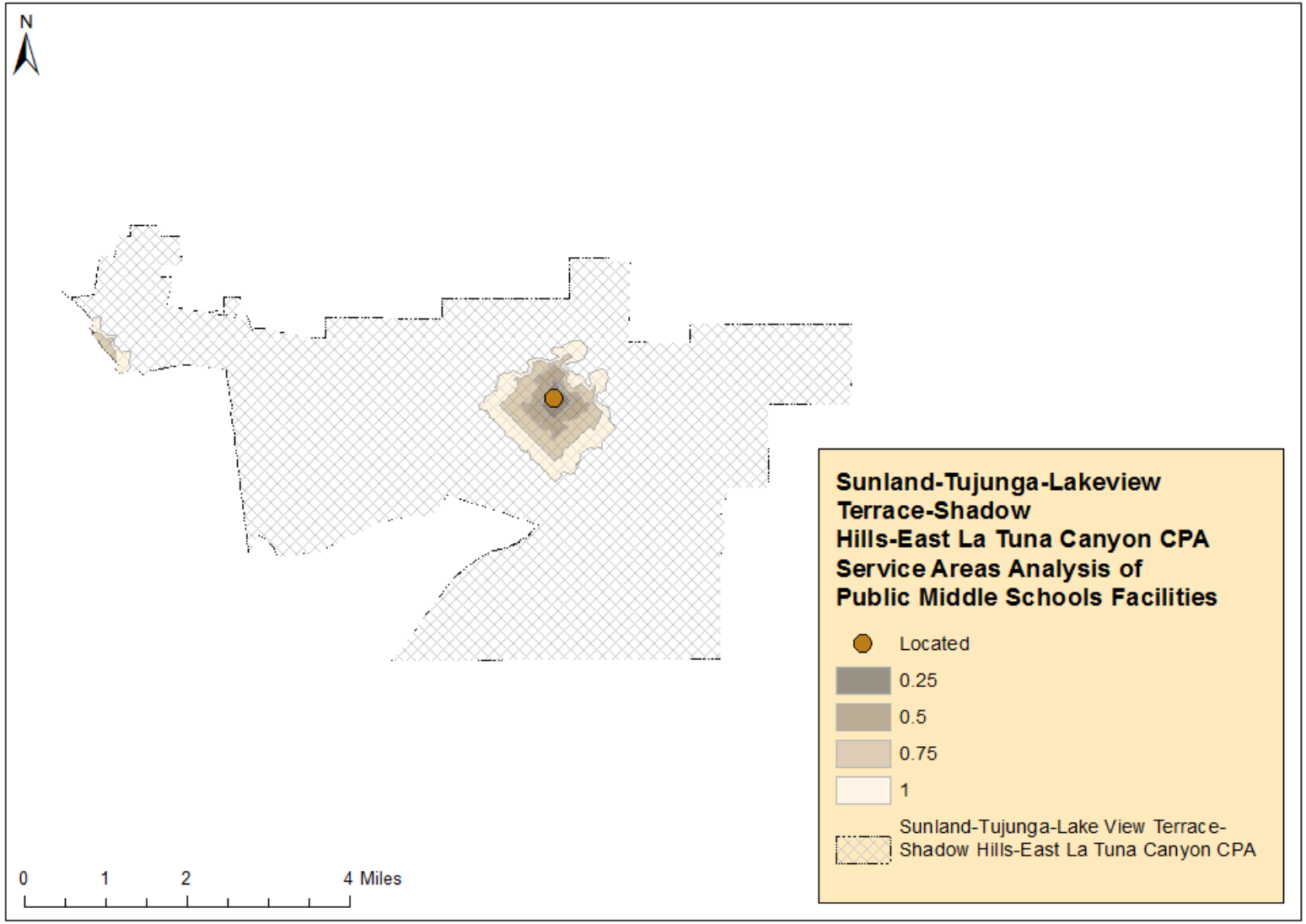

Figure 24 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Public Middle Schools in Sunland-Tujunga-Lake View Terrace-Shadow Hills-East La Tuna Canyon CPA

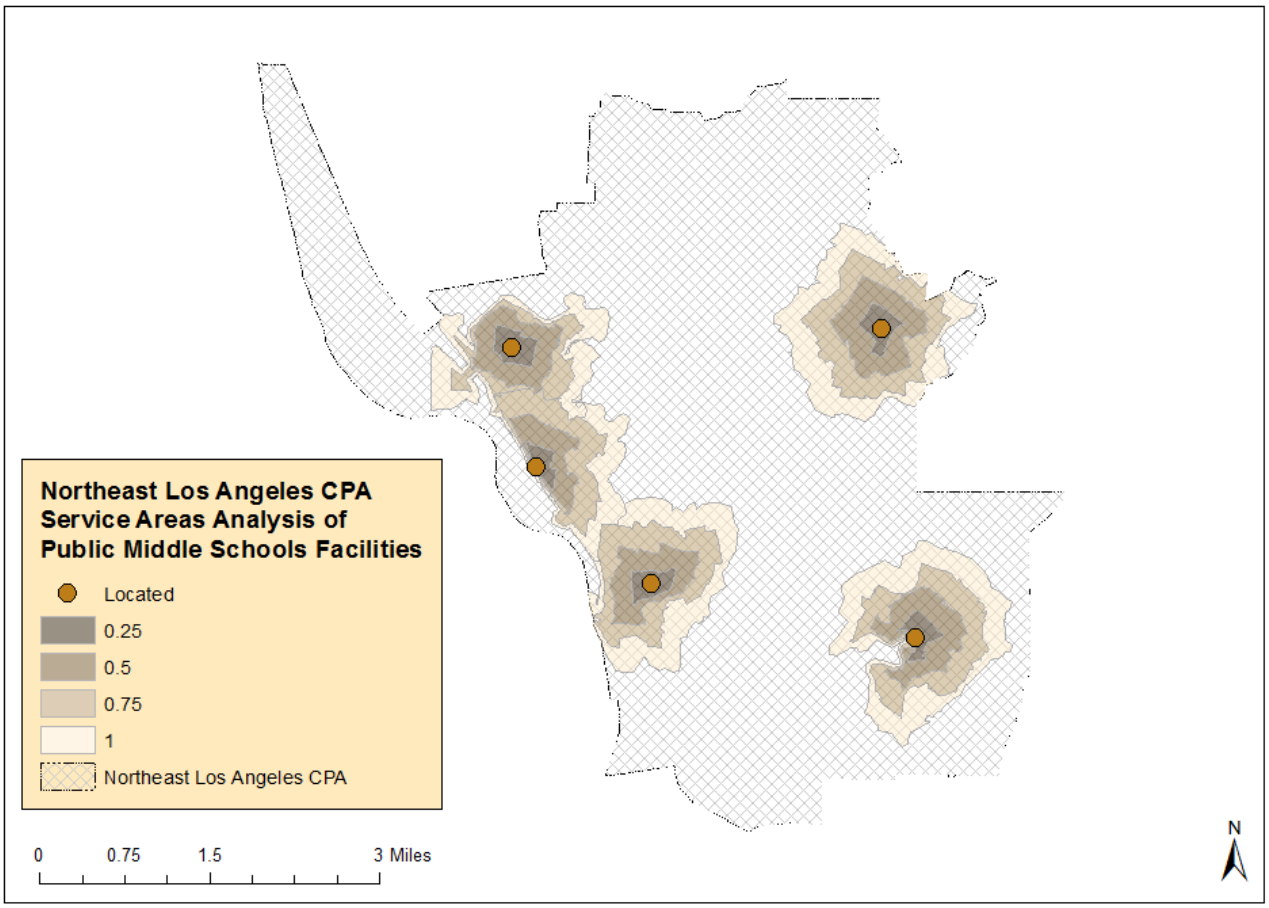

Figure 25 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Public Middle Schools in Northeast Los Angeles CPA

4.2.5. Service Areas Analysis of Public High Schools

Public high schools were the last group of public schools that were analyzed using the SAA, Figures 26 to 28 illustrate the results of this analysis. Figure 26 shows the SAA results of all 149 public high school facilities in Los Angeles. Figure 27 is a map of the Brentwood-Pacific Palisades CPA, which shows the minimal service areas of the public high school facilities for this CPA. Lastly, Figure 28 is a map of the Westlake CPA, illustrating the SAA results of six public high school facilities found in the area. The results are shown in distance miles with the following default breaks: 0.25 mile, 0.50 mile, 0.75 mile, 1 mile, 1.25 miles, and 1.50 miles.

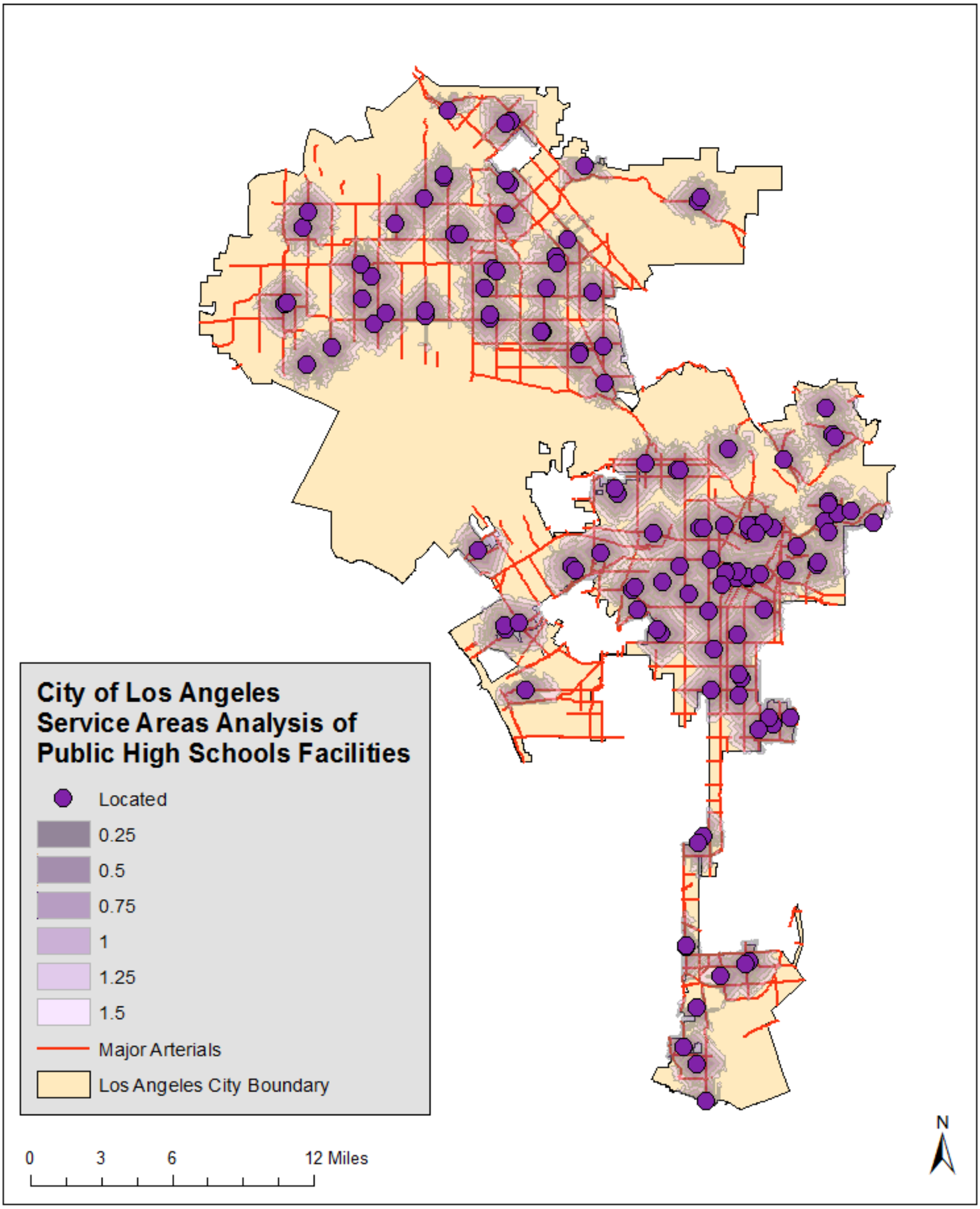

Figure 26 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, 1 mi, 1.25 miles, and 1.50 miles of Public High Schools, City of Los Angeles

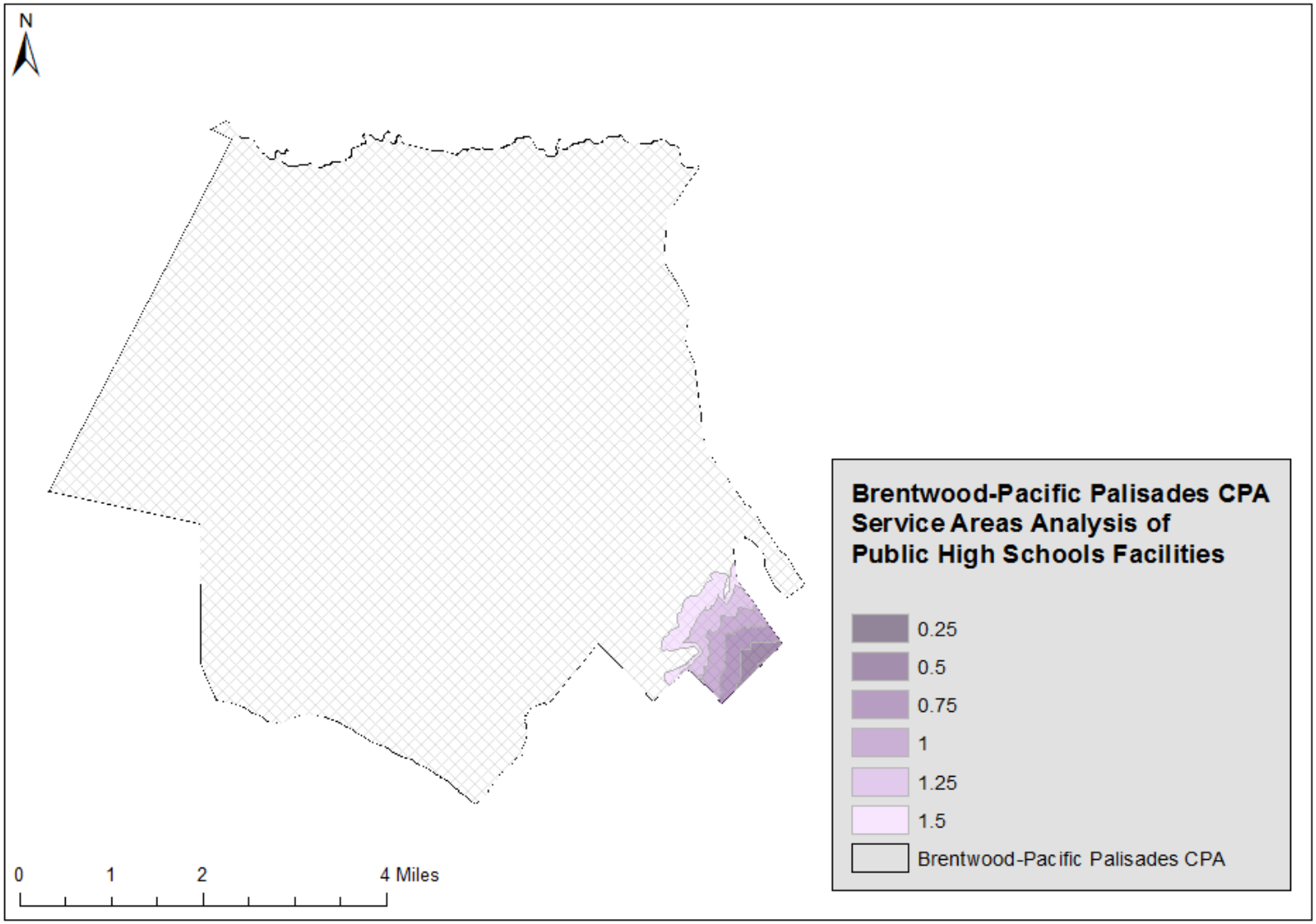

Figure 27 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, 1 mi, 1.25 miles, and 1.50 miles of Public High Schools in Brentwood-Pacific Palisades CPA

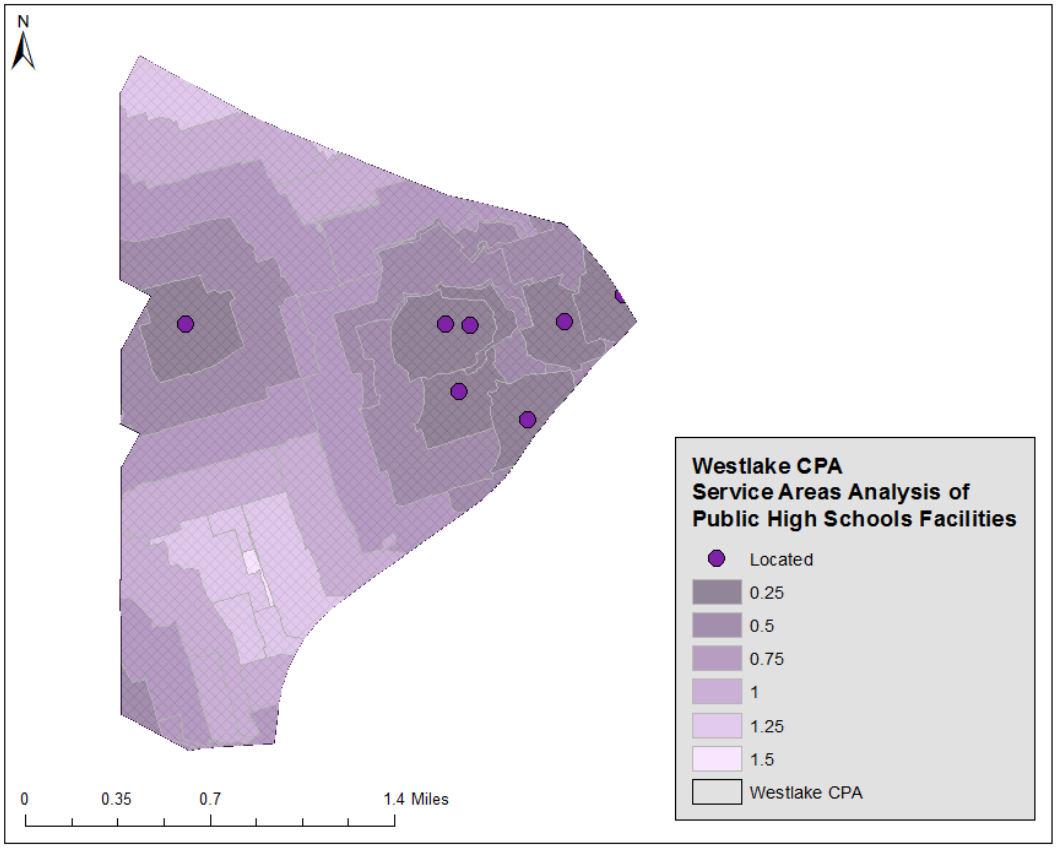

Figure 28 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, 1 mi, 1.25 miles, and 1.50 miles of Public High Schools in Westlake CPA

4.2.6. Service Areas Analysis of Public Libraries

A service areas analysis of public libraries was also performed, Figure 29 and figures found in Appendix J depict the results of this analysis. Figure 29 shows the SAA results of all eighty-two public library facilities that were analyzed in Los Angeles. Next, Figure 51 (found in Appendix J) is a map of the Harbor City-Wilmington CPA, which shows the service areas of the two public libraries located in the area. Figure 52 (found in Appendix J) is a map of the Wilshire CPA, which depicts the SAA results of nine public library facilities, eleven service areas if you count the two that extend into that CPA from the east and north. For each of these maps, the results are shown in distance miles with the following default breaks: 0.25 mile, 0.50 mile, 0.75 mile, and 1 mile.

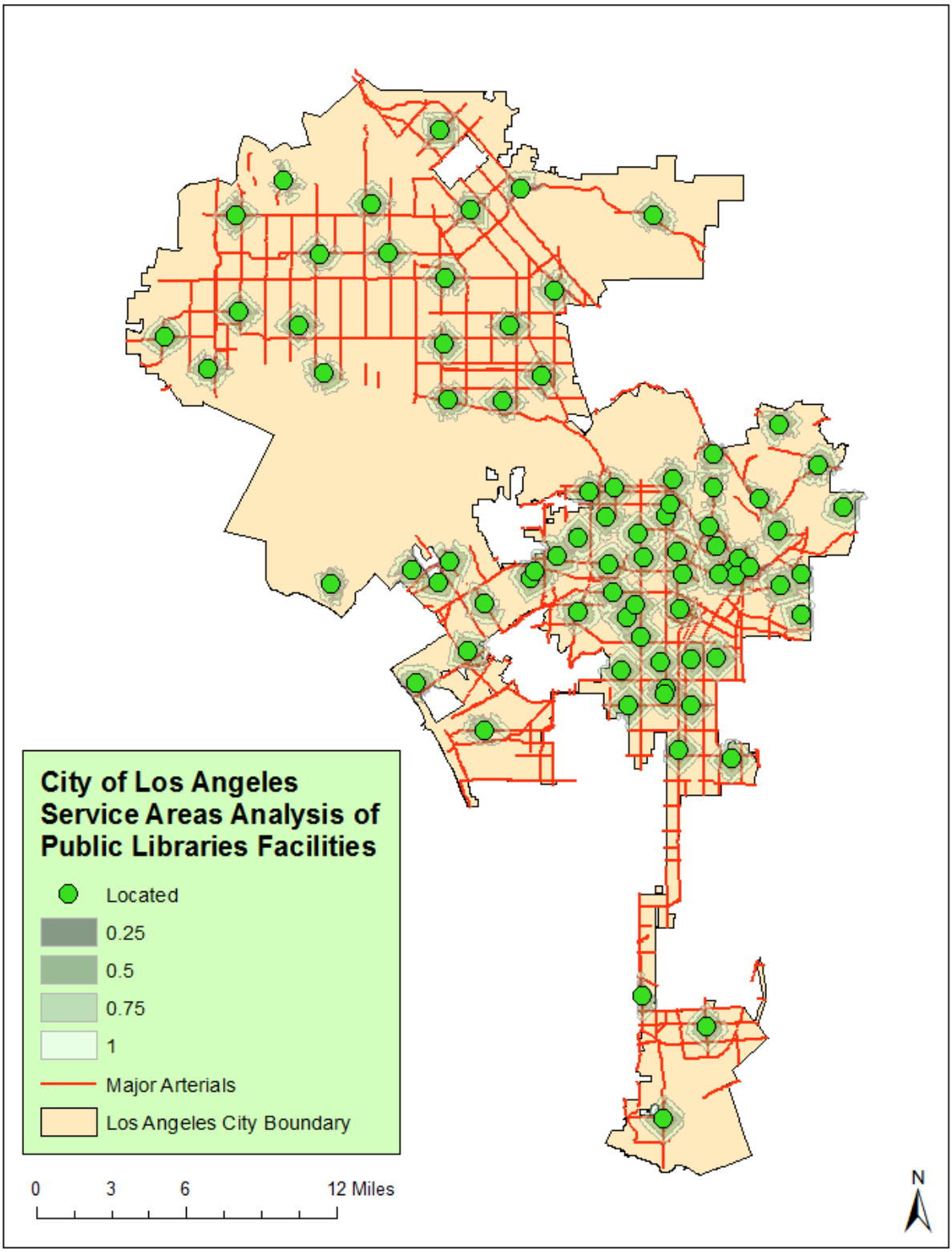

Figure 29 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Public Libraries, City of Los Angeles

4.2.7. Service Areas Analysis of Hospitals and Medical Centers

Figure 30 and figures found in Appendix K show the results of the service areas analysis that was done for hospitals and medical center facilities, as part of the healthcare centers variable. Figure 30 is a map of Los Angeles illustrating the SAA results of the 117 hospitals and medical center facilities that were analyzed. Next, Figure 53 (found in Appendix K) is a map of the Harbor Gateway CPA, which shows the service area for the one hospital in the area. Lastly, Figure 54 (found in Appendix K) illustrates the SAA results of three hospitals and/or medical centers found within the Boyle Heights CPA. All of the results are shown in distance miles with the following default breaks: 0.25 mile, 0.50 mile, 0.75 mile, and 1 mile.

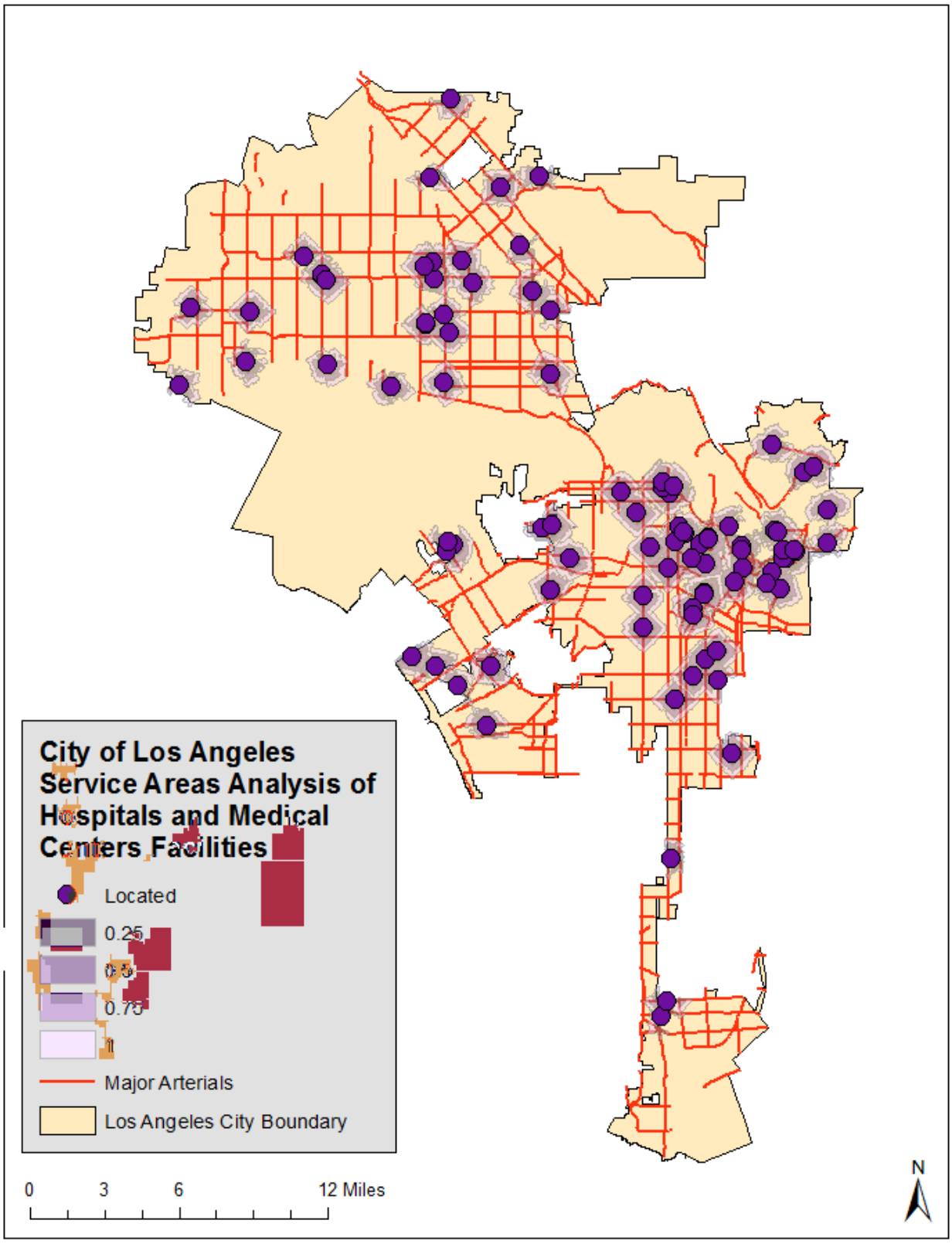

Figure 30 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Hospitals and Medical Centers, City of Los Angeles

4.2.8. Service Areas Analysis of Health Centers

Next, Figure 31 and figures found in Appendix L illustrate the SAA results for the health centers that were analyzed, as part of the healthcare centers variable. Health centers differ from hospitals and medical centers, and health clinics in the types of services offered and the hours of operation. Health centers usually provide primary care services to patients and their hours of operation are from Monday to Friday 8:30 am to 5:00 pm. On the other hand, hospitals and medical centers generally provide emergency and comprehensive hospital services twenty-four hours a day. Health clinics commonly provide health services and are open Monday to Friday 8:30 am to 5:00 pm.

Figure 31 is a City of Los Angeles map that depicts the 103 health center facilities that were analyzed. Figure 55 (found in Appendix L) provides a view by CPA, specifically the service area for one health center that was located in the Sherman Oaks-Studio City-Toluca Lake-Cahuenga Pass CPA. On the other hand, Figure 56 (found in Appendix L) shows the SAA results for five health center facilities that were identified within the Arleta-Pacoima CPA. The results for each of the maps are shown in distance miles with the following default breaks: 0.25 mile, 0.50 mile, 0.75 mile, and 1 mile.

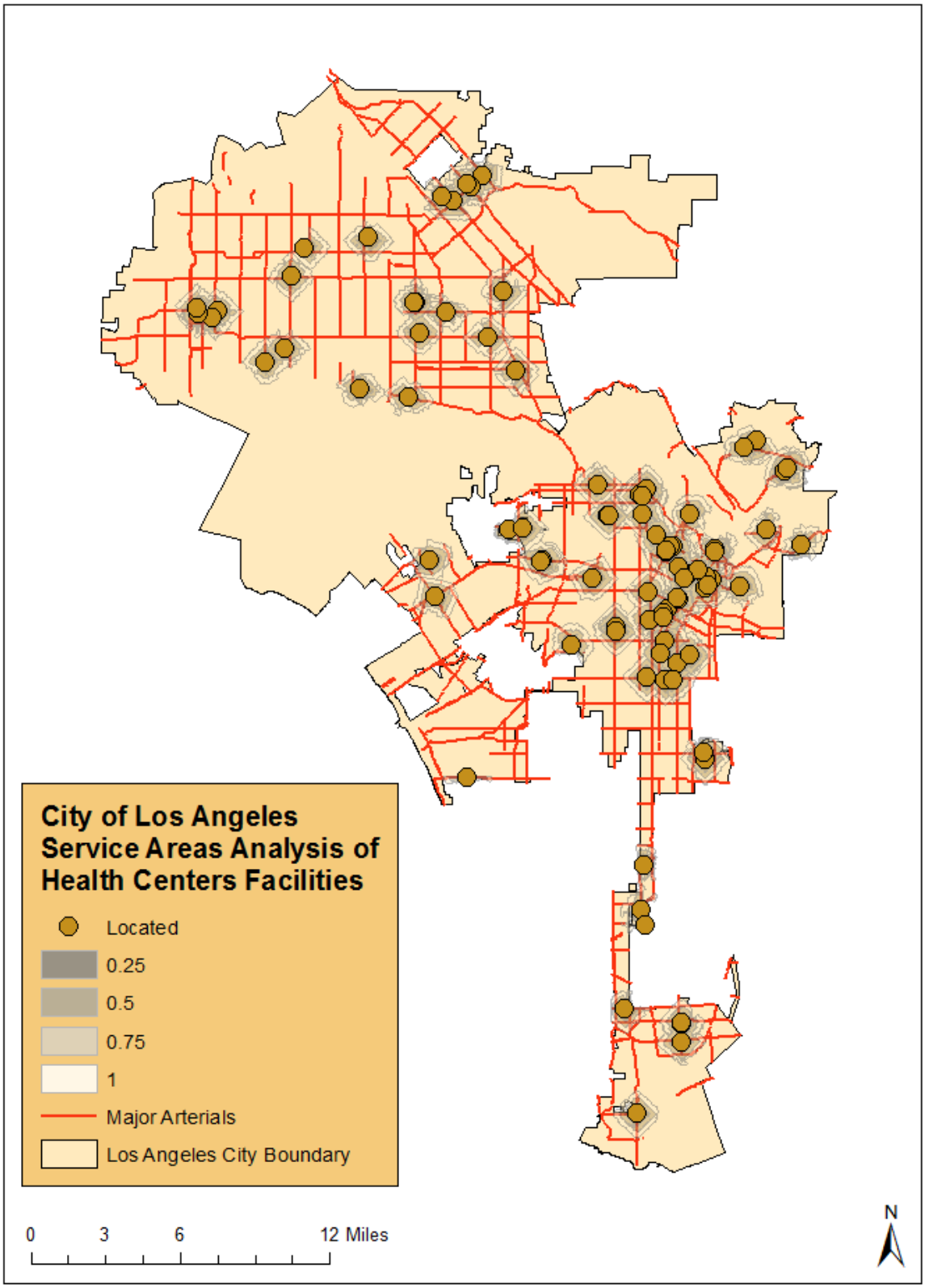

Figure 31 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Health Centers, City of Los Angeles

4.2.9. Service Areas Analysis of Health Clinics

Health clinics were the last type of healthcare center facilities for which a SAA was done, Figure 32 and figures found in Appendix M depict the results of this analysis. Figure 32 is a map of Los Angeles that shows the SAA results for the 149 facilities that were analyzed. Figure 57 (found in Appendix M) shows the service area for the one health clinic located in the Reseda-West Van Nuys CPA. Lastly, Figure 58 (found in Appendix M) shows the SAA results for twelve health clinic facilities that were found in the Central City CPA. The results are shown in distance miles with the following default breaks: 0.25 mile, 0.50 mile, 0.75 mile, and 1 mile.

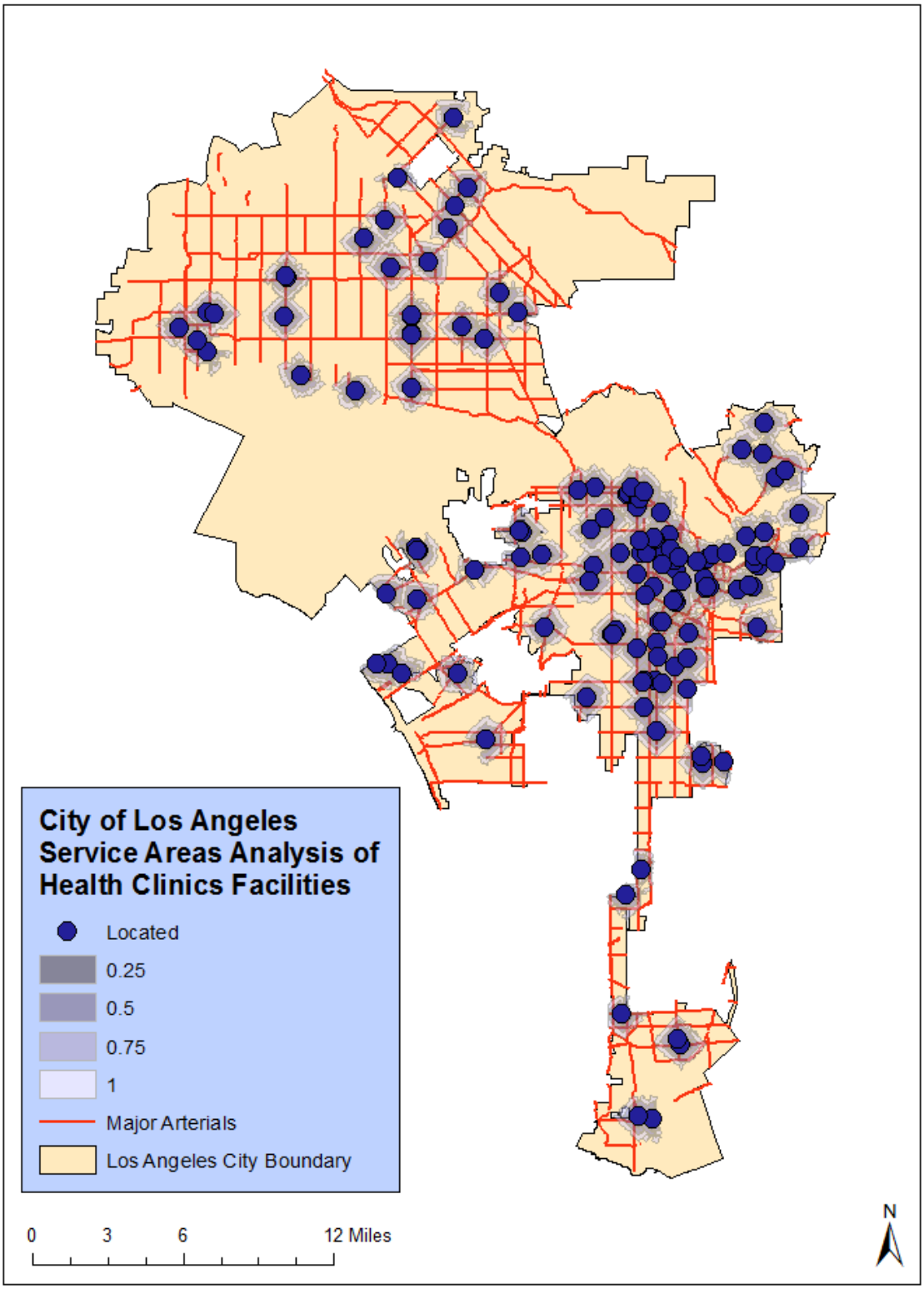

Figure 32 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Health Clinics, City of Los Angeles

4.2.10. Service Areas Analysis of Grocery Stores

The next site amenity for which a SAA was performed is grocery stores; Figure 33 to Figure 35 show the results of this analysis. Figure 33 is a map of Los Angeles showing the 1,729 grocery store facilities that were analyzed. Figure 34 illustrates the service areas for the three grocery store facilities located in the Bel Air-Beverly Crest CPA. Figure 35 is a map of the North Hollywood-Valley Village CPA, which depict the SAA results of forty-four grocery stores that were found within the area. For each of the maps, the results are shown in distance miles with the following default breaks: 0.25 mile, 0.50 mile, 0.75 mile, 1 mile, 1.25 miles, and 1.50 miles.

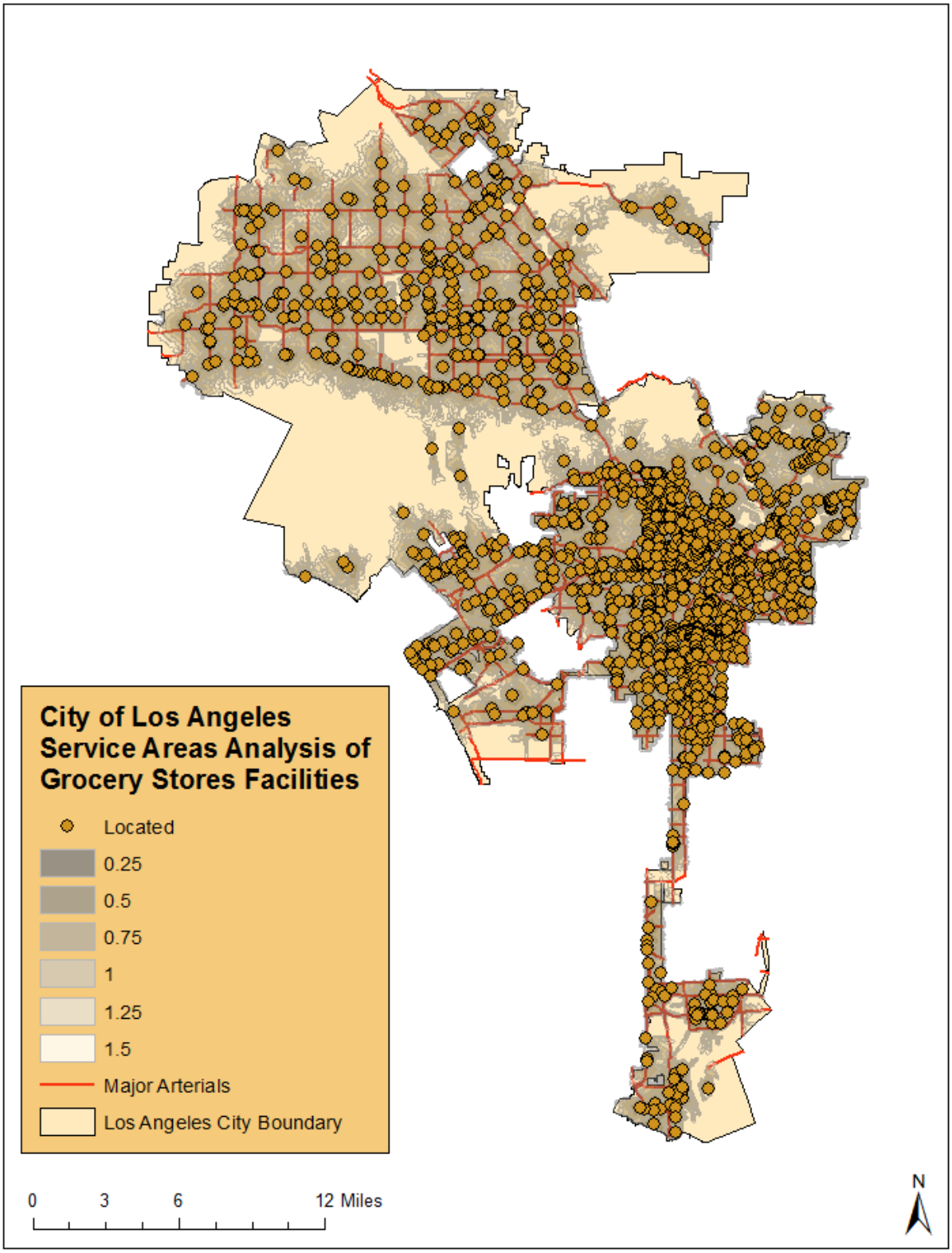

Figure 33 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, 1 mi, 1.25 miles, and 1.50 miles of Grocery Stores, City of Los Angeles

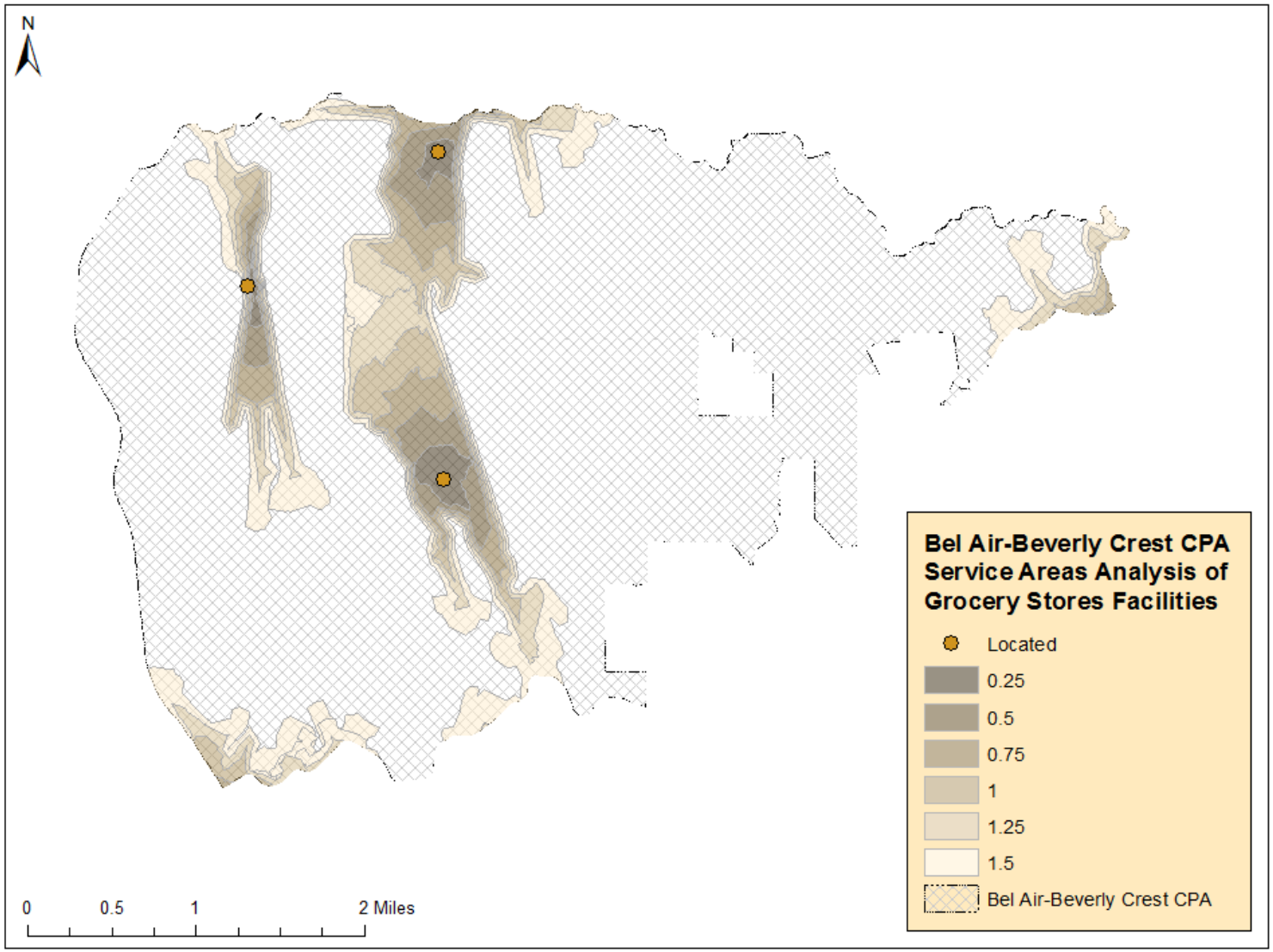

Figure 34 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, 1 mi, 1.25 miles, and 1.50 miles of Grocery Stores in Bel Air-Beverly Crest CPA

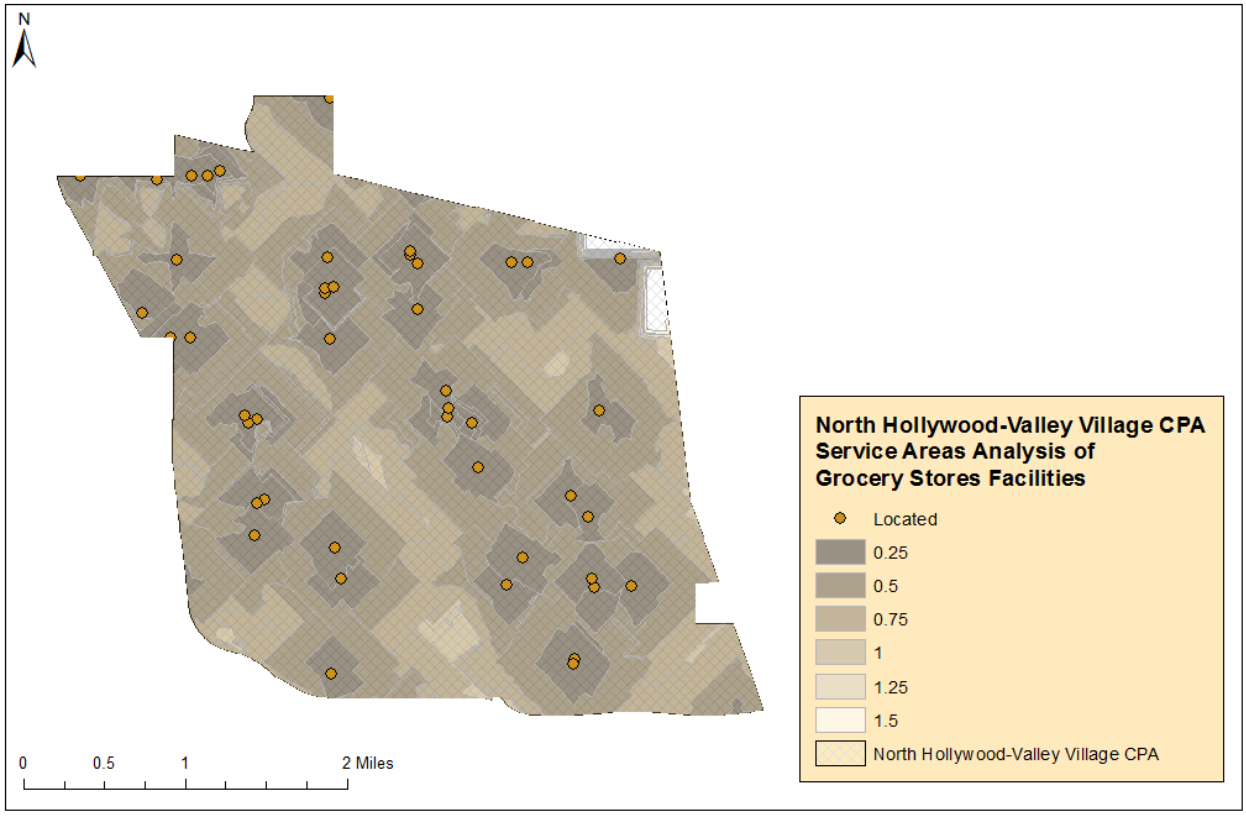

Figure 35 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, 1 mi, 1.25 miles, and 1.50 miles of Grocery Stores in North Hollywood-Valley Village CPA

4.2.11. Service Areas Analysis of Farmers' Markets

The last site amenity analyzed as part of the SAA was farmers' markets and Figure 36 and figures found in Appendix N illustrate the results. Figure 36 is a City of Los Angeles map depicting the SAA results for the sixty-two farmers' markets facilities. Figure 59 (found in Appendix N) shows the SAA results for one farmers' market found in the Reseda-West Van Nuys CPA. The last figure of the SAA, Figure 60 (found in Appendix N), illustrates the SAA results of two farmers' markets analyzed in the Westwood CPA. The results are shown in distance miles with the following default breaks: 0.25 mile, 0.50 mile, 0.75 mile, and 1 mile.

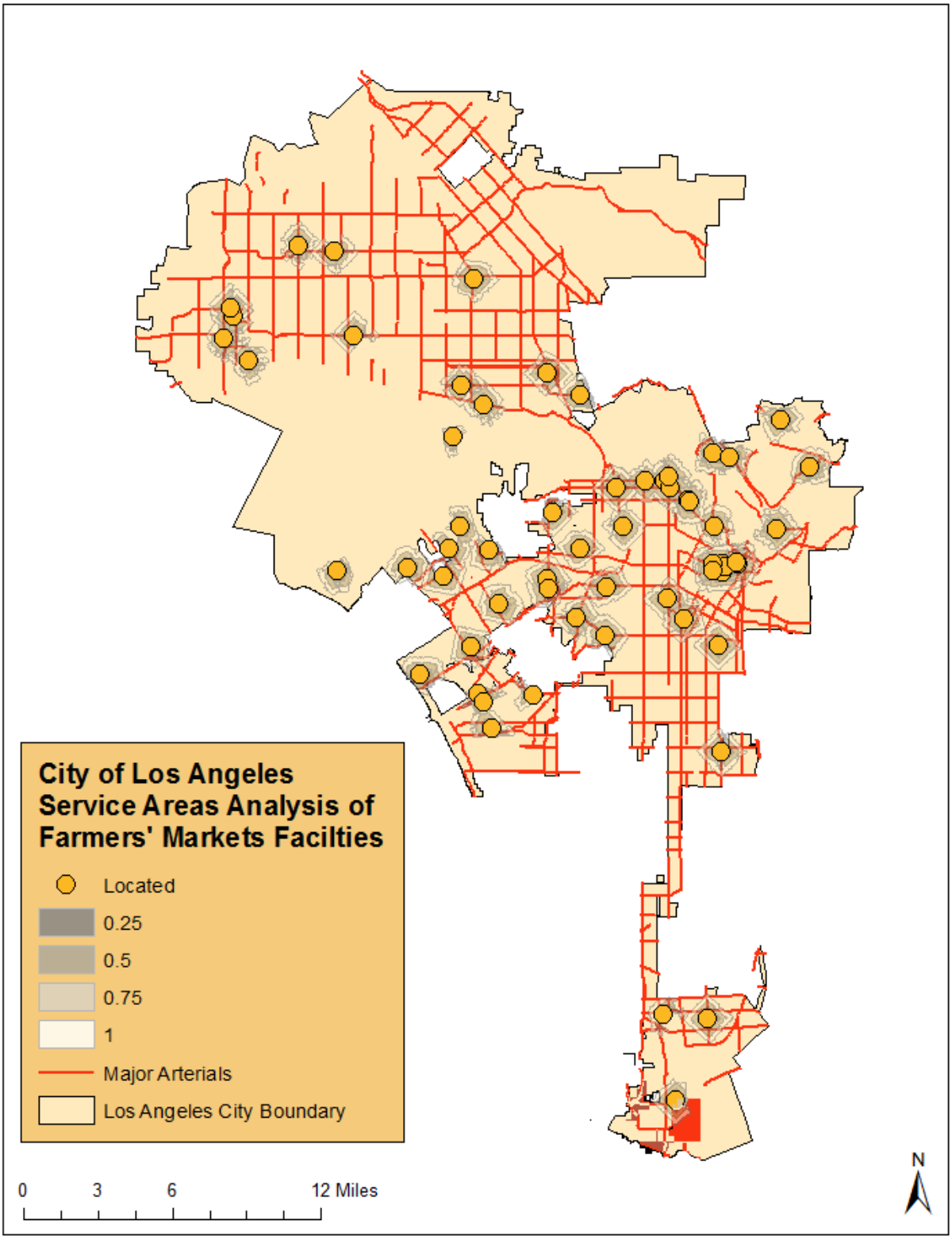

Figure 36 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Farmers' Markets, City of Los Angeles

4.3 Site Suitability Analysis

A site suitability analysis (SSA) was performed for the following attributes: land use, zoning, cost of land, fair share, employment, public transit (bus stops and rail stations), public parks, public elementary schools, public middle schools, public high schools, public libraries, hospitals and medical centers, health centers, health clinics, grocery stores, and farmers' markets for Los Angeles, results are depicted in Figure 37 to Figure 42 and figures found in Appendix O. In an effort to account for the different factors that must be considered when planning for the construction of higher density affordable rental housing developments, a total of six iterations for the SSA were done. Therefore, in any one of these iterations two or more of the aforementioned variables are analyzed. The results are illustrated by score, in which a score of one (1) depicts sites with the *lowest suitability*, whereas a score of nine (9) shows sites with the *highest suitability*.

4.3.1. Iteration One: Comprehensive Analysis

Figure 37 and Figure 61 show the results of the SSA that was performed as part of Iteration One. This iteration is a comprehensive analysis in which all of the variables identified in this research are analyzed. The resultant scores range from 3 to 7, in which a score of 3 refers to *low suitability* and a score of 7 equates to *high suitability*.

Figure 37 is a map of Los Angeles depicting the site suitability analysis results by score. The results for iteration one show a suitability score between 3 and 7. Next, Figure 61 (found in Appendix O) is a map that provides a closer look of those community plan areas with suitable sites for affordable housing: Central City, Hollywood, Northeast Los Angeles, Silver Lake-Echo Park-Elysian Valley, South Los Angeles, Southeast Los Angeles, West Adams-Baldwin Hills-

Leimert, Westlake, and Wilshire. On the other hand, the remaining twenty-six CPAs did not have any areas that scored as suitable sites.

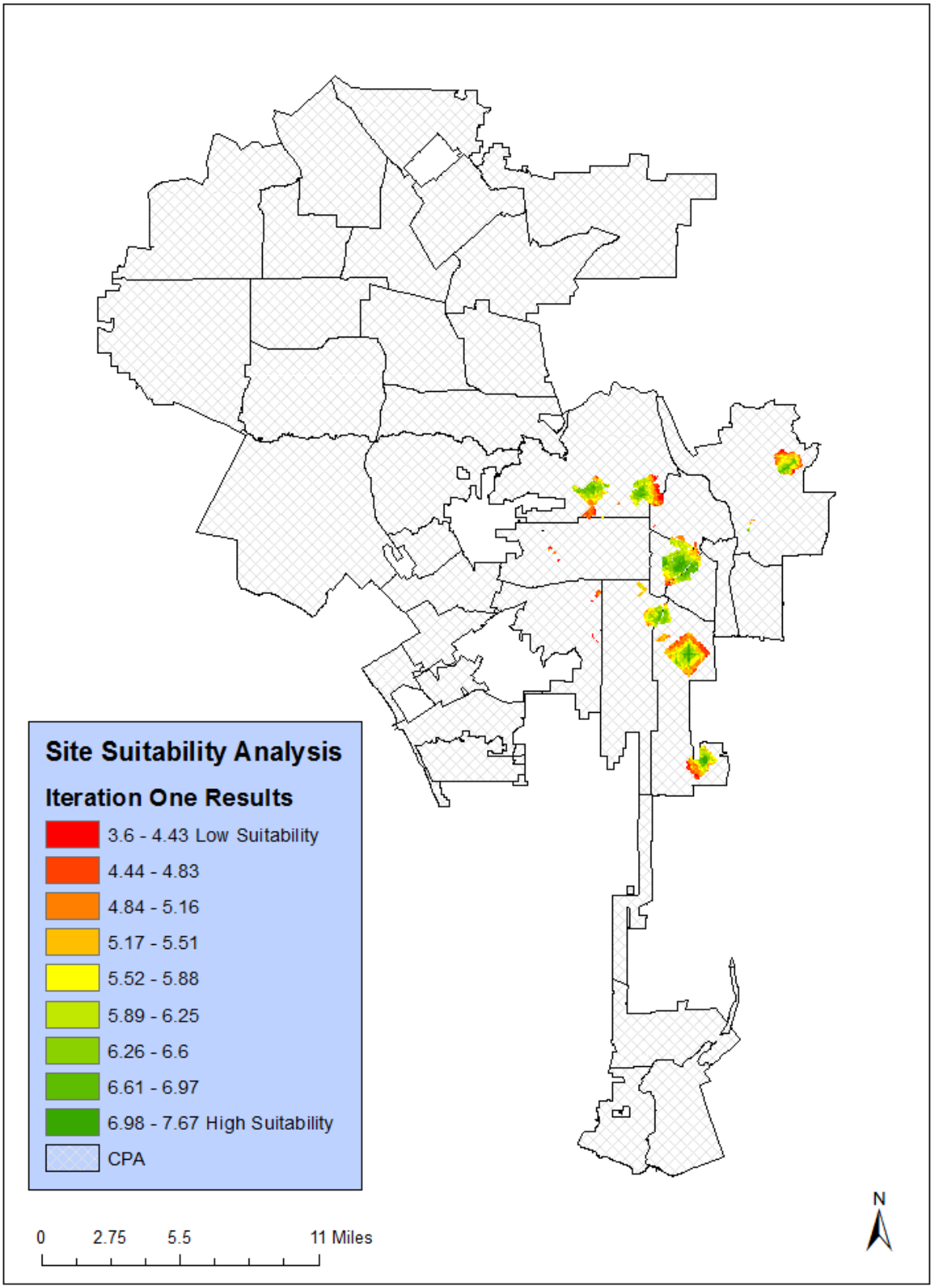

Figure 37 Site Suitability Analysis for Iteration One: Comprehensive Analysis

4.3.2. Iteration Two: Local Regulations

Figure 38 and Figure 62 (Appendix O) illustrate the results of the site suitability analysis that was done for Iteration Two. This iteration does not take into account local regulations like land use and zoning laws. Accordingly, the following attributes were analyzed: cost of land, fair share, employment, public transit, public parks, public elementary schools, public middle schools, public high schools, public libraries, hospitals and medical centers, health centers, health clinics, grocery stores, and farmers' markets. The resultant scores range for this iteration is from 4 to 8, in which a score of 4 refers to *moderately low suitability* and a score of 8 denotes *very high suitability*.

Figure 38 is a map of Los Angeles depicting the site suitability analysis results by score. The results for Iteration Two show a suitability score between 4 and 8. Figure 62 is a map that provides a closer look of those community plan areas with a SSA score: Central City, Hollywood, Northeast Los Angeles, Silver Lake-Echo Park-Elysian Valley, South Los Angeles, Southeast Los Angeles, West Adams-Baldwin Hills-Leimert, Westlake, and Wilshire. Again, the remaining CPAs that were analyzed do not have any areas that yielded suitable sites.

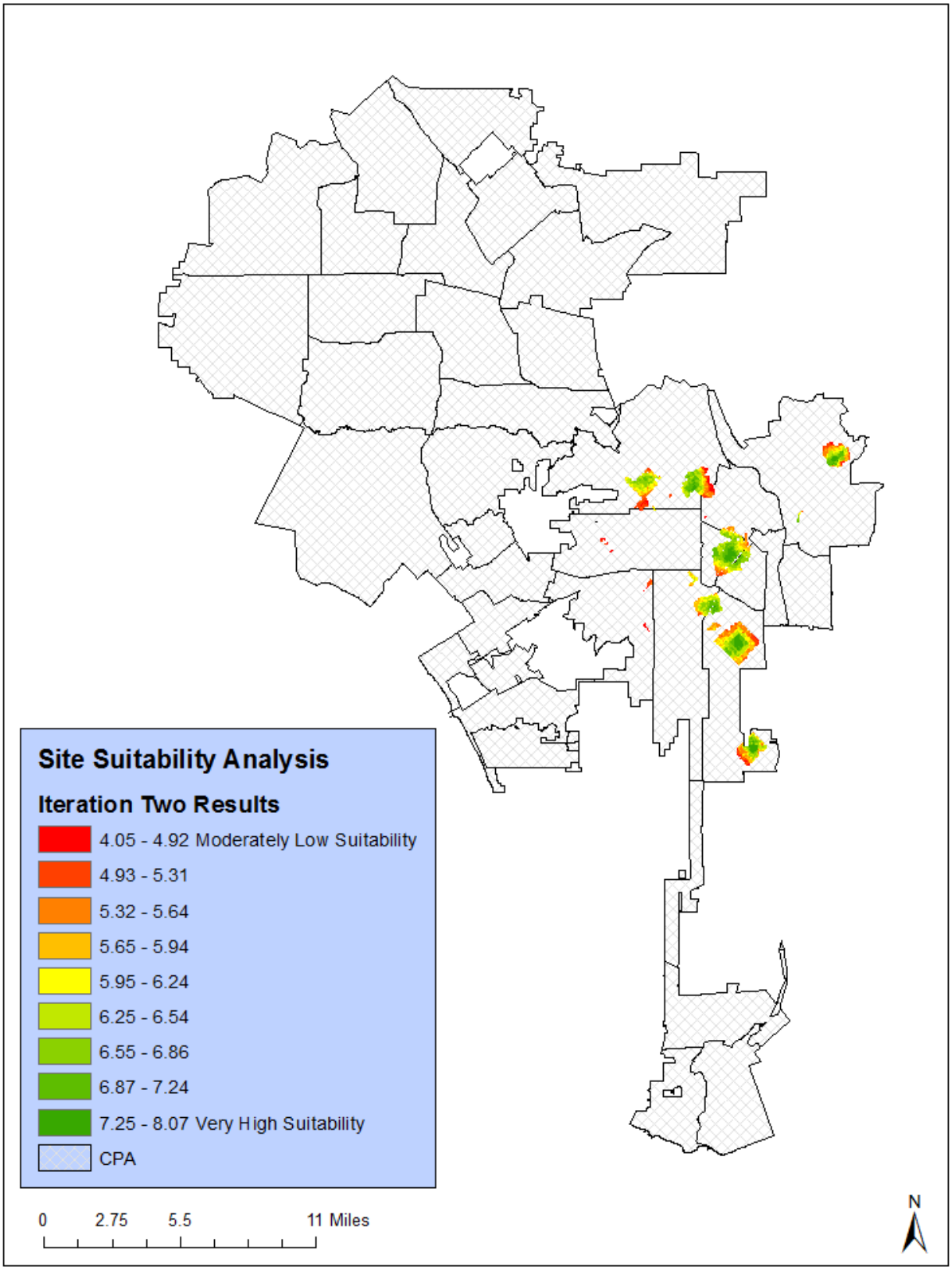

Figure 38 Site Suitability Analysis for Iteration Two: Local Regulations

4.3.3. Iteration Three: Impact of Cost of Land

This iteration explores the implications of land value when selecting a site for the construction of higher density affordable rental housing and therefore excludes it from the analysis. As such, the following attributes are analyzed: fair share, employment, public transit, public parks, public elementary schools, public middle schools, public high schools, public libraries, hospitals and medical centers, health centers, health clinics, grocery stores, and farmers' markets. The results show a score range from 3 to 8 (Figures 39 and 63), in which a score of 3 refers to *low suitability* and a score of 8 indicates *very high suitability*.

Figure 39 is a map of Los Angeles illustrating the site suitability analysis results by score. The results for iteration three show a suitability score between 3 and 8. The following CPAs had suitable sites with said score range: Central City, Hollywood, Northeast Los Angeles, Silver Lake-Echo Park-Elysian Valley, South Los Angeles, Southeast Los Angeles, West Adams-Baldwin Hills-Leimert, Westlake, and Wilshire (Figure 63 found in Appendix O). As in the previous iterations, the other twenty-six CPAs that were analyzed do not have any suitable site for affordable housing as per this analysis.

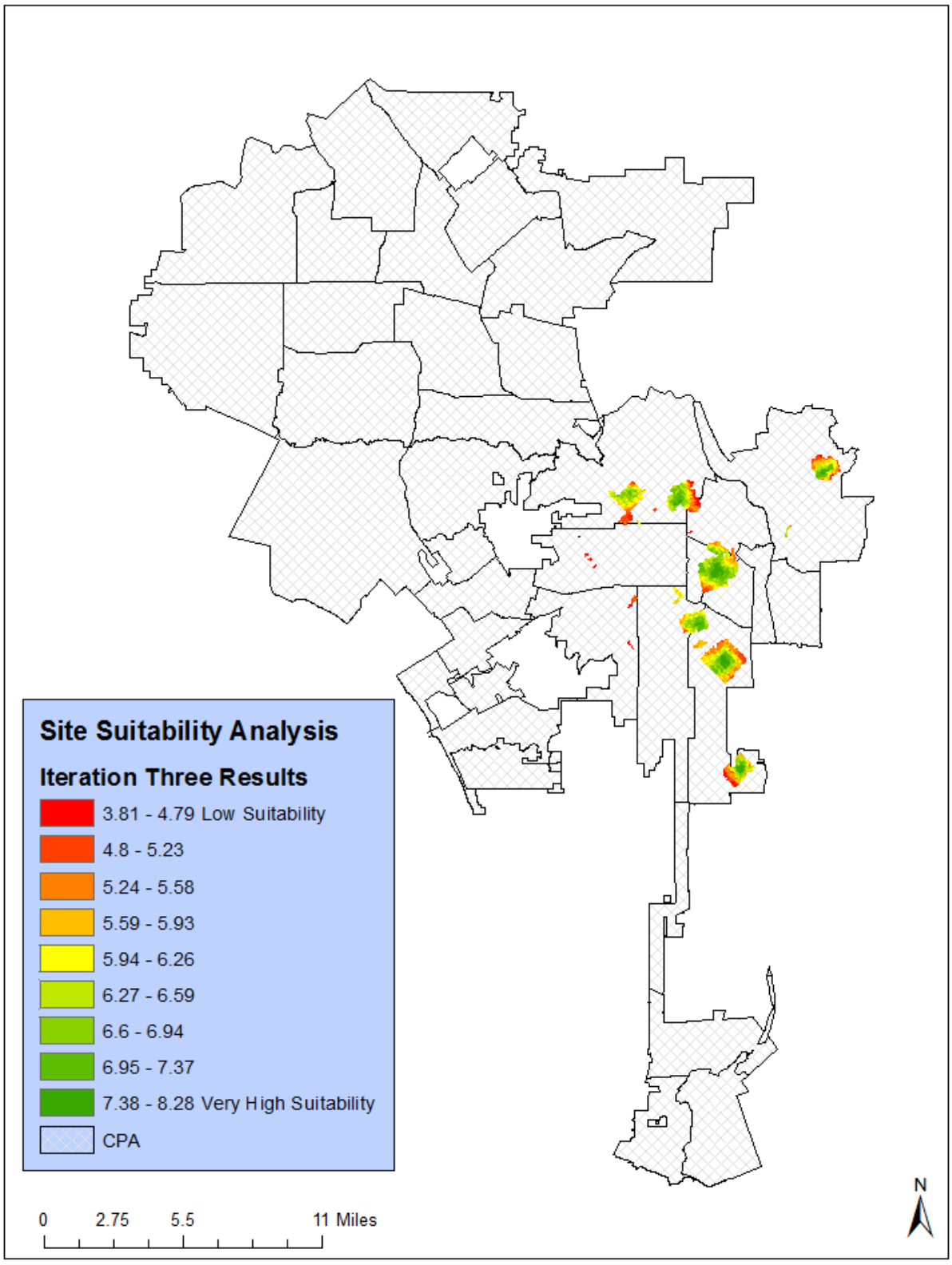

Figure 39 Site Suitability Analysis for Iteration Three: Impact of Cost of Land

4.3.4. Iteration Four: CTCAC Amenities

This iteration only analyzes site amenities that are taken into account by the California Tax Credit Allocation Committee when awarding LIHTC for suitable sites that meet the established criteria for the construction of affordable housing: public transit, public parks, public elementary schools, public middle schools, public high schools, public libraries, hospitals and medical centers, health centers, health clinics, grocery stores, and farmers' markets. The results of this iteration show a score range from 3 to 8 (Figure 40 and Figure 64), in which a score of 3 refers to *low suitability* and a score of 8 denotes *very high suitability*.

Figure 40 is a map of Los Angeles depicting the site suitability analysis results by score. The results for iteration four show a suitability score between 3 and 8. Figure 64 (found in Appendix O) provides a closer look of those community plan areas with suitable sites: Central City, Hollywood, Northeast Los Angeles, Silver Lake-Echo Park-Elysian Valley, South Los Angeles, Southeast Los Angeles, West Adams-Baldwin Hills-Leimert, Westlake, and Wilshire. On the other hand, the remaining CPAs that were analyzed do not have suitable sites.

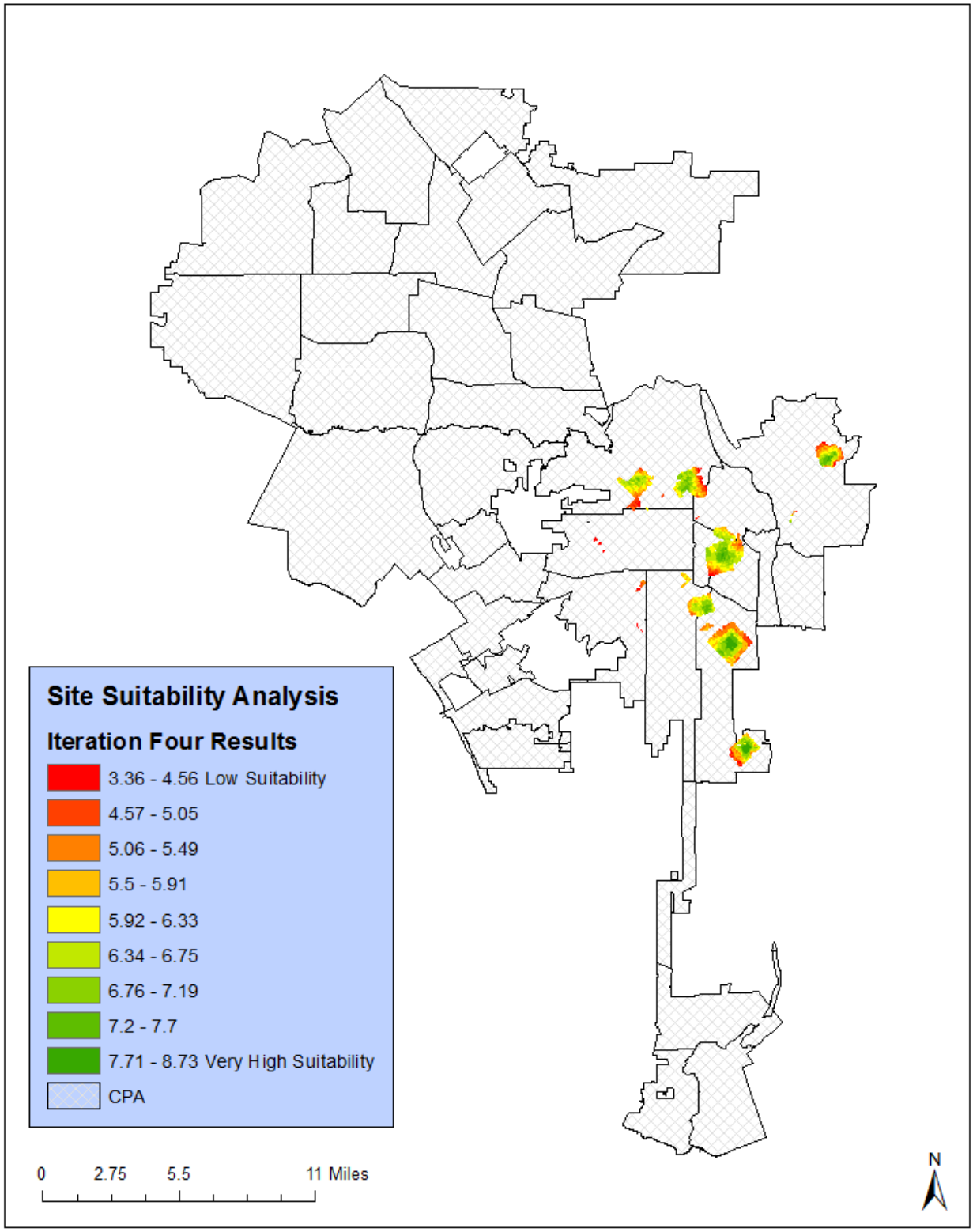

Figure 40 Site Suitability Analysis for Iteration Four: CTCAC Amenities

4.3.5. Iteration Five: Environmental Sustainability

Iteration Five selects sites for higher density affordable rental housing in an environmentally sustainable manner. Accordingly, only the following attributes are analyzed: land use, fair share, employment, and public transit. The results show a score range from 1 to 8 (Figure 41 and Figures 65 through 67), in which a score of 1 refers to *lowest suitability* and a score of 8 indicates *very high suitability*.

This is also the first iteration in which the site suitability results expand beyond the CPAs found within the central area of Los Angeles (Figure 41)—as depicted in the previous four SSA iterations. While the vast majority of CPAs in the north area of Los Angeles are found to have a score between 1 (*lowest suitability*) and 4 (*moderately low suitability*), the following CPAs in the north area of Los Angeles had sites that scored between 5 (*moderate suitability*) and 8 (*very high suitability*): Canoga Park-Winnetka-Woodland Hills-West Hills, Chatsworth-Porter Ranch, Encino-Tarzana, North Hollywood-Valley Village, Reseda-West Van Nuys, Sun Valley-La Tuna Canyon, Sunland-Tujunga-Lake View Terrace-Shadow Hills-East La Tuna Canyon, and Van Nuys-North Sherman Oaks (Figure 65 found in Appendix O).

Most of the sites that had a higher suitability score are located in the central area of Los Angeles (Figure 66 found in Appendix O). Among the CPAs with a score of 6 to 8 are: Boyle Heights, Central City, Central City North, Hollywood, Northeast Los Angeles, Silver Lake-Echo Park-Elysian Valley, South Los Angeles, Southeast Los Angeles, West Los Angeles, and Wilshire. Lastly, Figure 67 (found in Appendix O) illustrates the suitability scoring of the CPAs found within the south area of the City. Of the three CPAs, the Wilmington-Harbor City and San Pedro CPAs showed sites with scores ranging from 5 to 8.

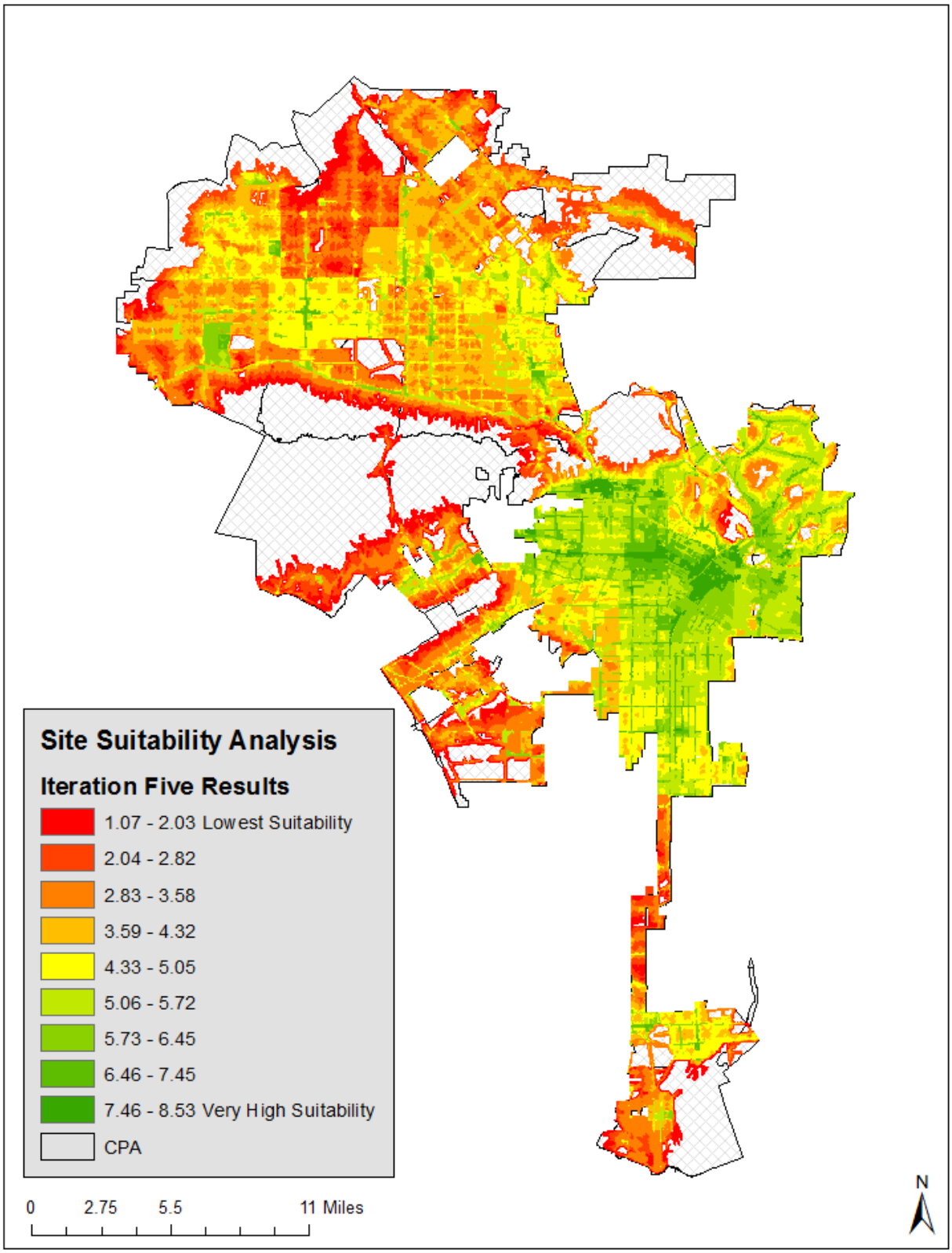

Figure 41 Site Suitability Analysis for Iteration Five: Environmental Sustainability

4.3.6. Iteration Six: Employment and Public Transit

The sixth—and final—iteration is the most flexible scenario of all of the six iterations, as it only takes into account the *employment* and *public transit* variables. The results of this iteration show a suitability score range from 1 to 9 (Figure 42 and Figures 68 through 70). A score of 1 refers to *lowest suitability*, whereas a score of 9 denotes *highest suitability*.

Similar to Iteration Five, the SSA results generate a greater coverage of Los Angeles. In fact, there are more CPAs which scored 5 and higher (Figure 42). In the north area of Los Angeles, all of the CPAs have sites with a score of at least a 5, which indicates *moderate suitability*. However, sites with a suitability score of 6 (*moderately high suitability*) to 9 (*highest suitability*) were found in the following CPAs: Canoga Park-Winnetka-Woodland Hills-West Hills, Mission Hills-Panorama City-North Hills, North Hollywood-Valley Village, Sherman Oaks-Studio City-Toluca Lake-Cahuenga Pass, Sun Valley-La Tuna Canyon, and Van Nuys-North Sherman Oaks (Figure 68 found in Appendix O). Yet, within these CPAs there were also sites with scores between 1 (*lowest suitability*) and 3 (*low suitability*), especially the outer areas of this extent of the City.

Furthermore, several of the sites with a suitability score of 6 (*moderately high suitability*) to 9 (*highest suitability*) are found in the central area of the City (Figure 69 found in Appendix O). Among the CPAs with such sites are the following: Boyle Heights, Central City, Central City North, Hollywood, Northeast Los Angeles, Silver Lake-Echo Park-Elysian Valley, South Los Angeles, Southeast Los Angeles, West Adams-Baldwin Hills-Leimert, West Los Angeles, Westchester-Playa del Rey, Westlake, and Wilshire. On the other hand, sites which scored a 1 (*lowest suitability*) or 2 (*very low suitability*) were found in the following CPAs: Bel Air-Beverly Crest, Brentwood-Pacific Palisades, Hollywood, and Venice.

Out of the three CPAs in the south area of the City, Harbor Gateway was found to have the most sites with a suitability score of 6 (*moderately high suitability*) or 7 (*high suitability*) (Figure 70 found in Appendix O). The Wilmington-Harbor City and San Pedro CPAs had sites with suitability scores of 5 (*moderate suitability*) to 6 (*moderately high suitability*). However, in the San Pedro CPA, sites that scored between 1 (*lowest suitability*) and 3 (*low suitability*) were also identified.

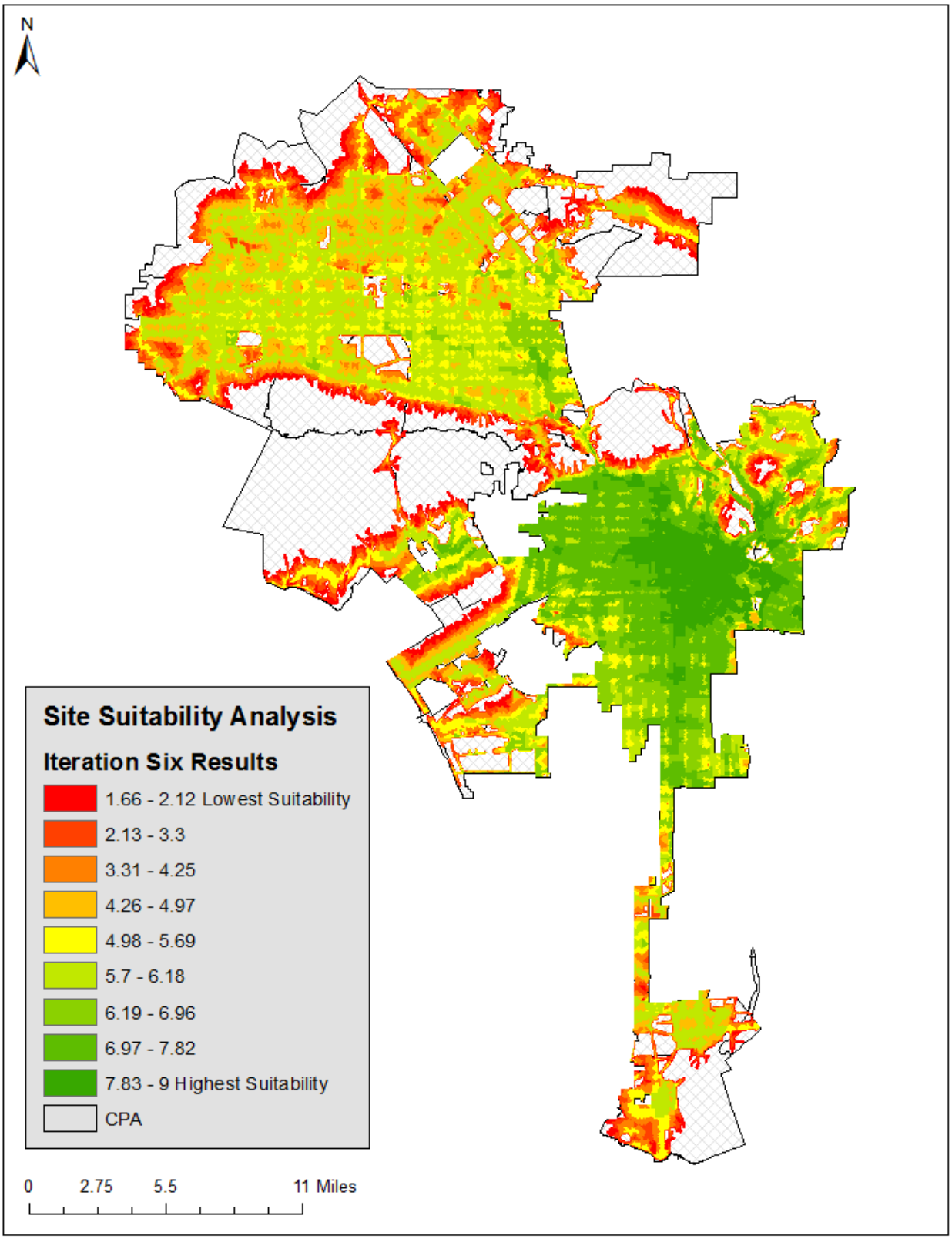

Figure 42 Site Suitability Analysis for Iteration Six: Employment and Transportation

Chapter 5 Conclusions and Discussion

Providing safe and accessible housing to every individual is a human right, yet a challenge that several cities in this country face. Los Angeles is no exception to this reality, as it is among the most expensive places for rental housing in the nation. Accordingly, this research explores the topic of affordable housing by making use of GIS technology to perform several spatial analyses with the purpose of identifying suitable sites for the construction of higher density affordable rental housing and best support housing and housing-related policy in Los Angeles. Therefore, in this study a fair share analysis, service areas analysis, and six iterations of a site suitability analysis are performed.

The results of the fair share analysis show that during the 2006 – 2013 planning period, the following CPAs were more diligent in the construction of new affordable rental housing units: Northeast Los Angeles, Hollywood, Sun-Valley-La Tuna Canyon, Wilmington-Harbor-City, and Boyle Heights; while the CPAs of Granada Hills-Knollwood, Northridge, Harbor Gateway, Bel Air-Beverly Crest, and Westwood built few or no affordable rental housing units during the same planning period. Next, the service areas analysis illustrates that the CPAs of Central City, Central City North, Hollywood, Northeast Los Angeles, Silver Lake-Echo Park-Elysian Valley, South Los Angeles, Southeast Los Angeles, Westlake, and Wilshire are more likely to qualify for CTCAC funding to build new affordable rental housing because they have the necessary site amenities to meet the established criteria by the California Tax Credit Allocation Committee. On the other hand, sites proposed in the CPAs of Bel Air-Beverly Crest, Brentwood-Pacific Palisades, Chatsworth-Porter Ranch, Encino-Tarzana, Granada Hills-Knollwood, and Sherman Oaks-Studio City-Toluca Lake-Cahuenga Pass may find it more difficult—if not impossible—to obtain CTCAC financing since they have a limited number or

lack site amenities needed to qualify. Finally, while the six iterations of the site suitability analysis provide different scoring results and perspectives, there were some consistencies found. For example, it was repeatedly shown that the CPAs of Central City, Hollywood, Northeast Los Angeles, Silver Lake-Echo Park-Elysian Valley, South Los Angeles, Southeast Los Angeles, West Adams-Baldwin Hills-Leimert, Westlake, and Wilshire have the most suitable sites for the construction of higher density affordable rental housing developments.

Notwithstanding, the results of the different analyses performed indicate that the established criteria for qualifying CTCAC site amenities impact the geographical location of new higher density affordable rental housing developments in Los Angeles. However, it should be noted that for purposes of this study, the site amenities analyzed as part of the suitability analysis were under an all or nothing point system approach. Yet, the current CTCAC applications point system is not based on an all or nothing criteria. Instead, a specific number of points is granted for qualifying site amenities and it is the developers and/or investors goal to obtain a minimum of fifteen points to be considered for the low-income housing tax credits.

Nevertheless, it is recommended that the City revise its zoning code and its land use regulations, as part of its long-range policy planning. Not only should these policy planning modifications be done for residential uses, to allow for the construction of higher density housing developments, but also to accommodate the construction of site amenities designated as commercial, industrial and/or manufacturing, and open space. These changes would qualify more sites in CPAs outside of the central area of the City for the construction of higher density affordable rental housing and site amenities. Particular attention should be given to those CPAs located in the north and south areas of Los Angeles, were the results of Iteration Five and Iteration Six of the site suitability analyses indicate that there is opportunity to build higher

density affordable rental housing given the appropriate planning policies. These planning policy updates are necessary in a metropolis that is the second most populated in the nation but whose current land use and zoning regulations are not consistent with the City's present urbanization and housing need.

However, like in any research that is undertaken, limitations also exist. For instance, for purposes of this research, the California Environmental Quality Act (CEQA) is not taken into account when performing the site suitability analysis. This despite the important role that CEQA plays in the construction of affordable housing developments—especially for development that takes place along the coastal zones. Furthermore, the following topographical features are not analyzed in the SSA: areas requiring less land clearing; soils that support housing construction; slopes; distance from streams; and distance from roads.

Other considerations that are not examined pertain to location, existing affordable housing stock, and area of parcels. This project does not consider the geographical location of existing affordable rental housing developments that were not built during the 2006-2013 planning period. Moreover, this study does not include in its analysis properties that may be converted to affordable rental housing or existing affordable rental housing developments that can be restored. Lastly, the research does not account for the area of parcels or that it is possible to buy neighboring parcels for the construction of higher density affordable rental housing developments.

5.1 Fair Share

Initially, this study attempted to include the variable *political support* as part of the site suitability analysis, as it was found that it is a factor of critical importance to move forward with the construction of an affordable rental housing project. However, it was difficult to find a

quantifiable measure for it—as this is a qualitative indicator. In fact, during various conversations with urban planners that work with the City and County of Los Angeles, they all agreed that it would be challenging to find an accurate quantifying measure for political support. This predicament is reiterated in the research done by LeRoy (1973). Suggestions were made by urban planners to analyze existing local zoning regulations, elected officials' voting records, number of projects that fitted the criteria established for this research, surveys of stakeholders, and existing affordable housing developments in Los Angeles as indicators. Ultimately, it was decided that analyzing *fair share* would be a more adequate variable for this research given the complexity of quantitatively measuring the other suggested variables and the time constraints of this project.

5.1.1. Fair Share Analysis Recommendations

The fair share analysis performed in this study, provides mixed results in terms of construction of new affordable housing rental units during the 2006 to 2013 planning period. As was discussed in the previous chapter, certain CPAs built few or no new affordable rental housing units during the specified planning period. Among these are: Granada Hills-Knollwood, Northridge, Harbor Gateway, Bel Air-Beverly Crest, and Westwood. Conversely, the CPAs of Northeast Los Angeles, Hollywood, Sun Valley-La Tuna Canyon, Wilmington-Harbor City, and Boyle Heights were proactive in the construction of new affordable rental housing units. The higher activity of new construction of affordable rental units in these CPAs may be due in part to the adoption of local housing and housing-related policies that promote the construction of affordable housing stock. While those CPAs where there was low or no construction of affordable rental housing may be a result of inexistent local housing and housing-related policies that encourage affordable rental housing development construction. Thus, it is recommended that

those community plan areas in which there is currently a dearth or lack of affordable housing stock explore and enact housing and housing-related policies that would facilitate the construction of these types of developments in their communities.

Furthermore, during the background and literature review phase of this research, it was uncovered that currently Los Angeles does not break down its RHNA Allocation number by community plan area. This may be problematic, as it does not obligate all communities to help meet the RHNA Allocation and thereby meet their fair share. This may also lead to a concentration of affordable housing in some community plan areas of Los Angeles. Therefore, it is recommended that the City further break down its RHNA Allocation by CPA so that all CPAs meet their fair share. One approach to achieve this would be to include *population density* by CPA as part of its formula when calculating the RHNA Allocation by CPA.

It was also found during the background and literature review of this study that several existing affordable rental housing units are at risk of turning into market rate housing within the next ten years. Accordingly, it is imperative to preserve these units as affordable rental housing. Doing so would help alleviate the affordable housing crisis in Los Angeles. Moreover, preserving these units would be a more economically feasible option than building new affordable housing units.

Lastly, it is recommended that further research be done on how *political support*, or lack of it, impacts the construction of affordable housing in Los Angeles. As previously stated, it was challenging to include this factor in this project for two reasons: (1) time constraints, and (2) political support is a qualitative measure and not a quantitative measure. Yet, the investigation of this variable is of critical importance for it is political support that determines whether or not an affordable housing project will move forward. It will shed light on the role that political support

plays in the approval process of proposed affordable rental housing developments and better inform housing and housing-related policy in Los Angeles.

5.1.2. Fair Share Analysis Limitations

For purposes of this research, the final fair share number for each community plan area refers specifically to the construction of new affordable rental housing units that were built between the 2006 to 2013 planning period. The projects include housing developments that had at least five units. Therefore, not all the projects included in the final fair share count are higher density housing developments. Furthermore, the fair share value does not include any of the following types of developments: affordable housing units that may have been rehabilitated or converted; affordable housing ownership units; or, existing units that may have become part of an affordability housing covenant between the specified planning period.

5.2 Service Areas Analysis

For purposes of this research, a service areas analysis was performed in lieu of a buffer analysis, as the former is a more accurate representation of distance. While both methods create polygons, a service areas analysis does so by using walkable distance that is defined by the road network; whereas, a buffer distance only creates a polygon around the designated feature/facility of a certain distance in every direction. Accordingly, the following site amenities were analyzed as part of the service areas analysis: public transit stops (bus stops and rail stations), public parks, public elementary schools, public middle schools, public high schools, public libraries, hospitals and medical centers, health centers, health clinics, grocery stores, and farmers' markets. However, the SAA results show that some community plan areas in Los Angeles lack or have very limited amenities. For instance, it was found that the following CPAs lacked four or more of the site amenities analyzed: Bel Air-Beverly Crest (lacked seven amenities); Brentwood-Pacific

Palisades (lacked five amenities); Chatsworth-Porter Ranch (lacked four amenities); Granada Hills-Knollwood (lacked four amenities); and, Harbor Gateway (lacked four amenities).

In the case of the Bel Air-Beverly Crest, there were no public transit facilities located inside the CPA. This is problematic because this is the amenity with the highest point value in the CTCAC application. Up to seven points out of the minimum fifteen-point requirement can be earned by including this site amenity alone. The lack of this amenity, along with six other ones makes it very difficult—if not impossible—for a developer or investor to obtain LIHTC for any proposed affordable housing development in this CPA. The lack or limited number of CTCAC qualifying amenities in a community plan area exemplifies how communities can actually deter affordable housing construction in their neighborhoods without the need of political opposition.

5.2.1. Service Areas Analysis Recommendations

The California Tax Credit Allocation Committee may want to consider replacing the existing buffer method requirement—that applicants who seek Low-Income Housing Tax Credit are asked to use—with the service areas analysis approach. The SAA is a more accurate representation of distance than the geodesic (as the crow flies) buffers, as it creates buffers utilizing a walkable distance that is defined by the road network. Alternatively, CTCAC may opt to incorporate the SAA as an alternative to the buffer approach. Another option that CTCAC may want to contemplate, is to create some type of pilot program that would allow applicants to make use of the service areas analysis technique rather than the buffer analysis when submitting their application for review.

Moreover, community plan areas that currently lack site amenities—that would otherwise qualify proposed affordable rental housing projects in the area—should be encouraged to add these amenities. The absence of site amenities makes it challenging for developers and/or

investors to obtain financing for these types of developments. In addition, it makes affordable rental housing inaccessible in such communities and places the burden to meet the housing needs on other CPAs. Furthermore, if necessary, local land use and zoning regulations should be modified to allow for the construction of qualifying site amenities to help these CPAs meet their fair share.

5.2.2. Service Areas Analysis Limitations

While the service areas analysis is a more accurate representation of distance than the use of buffers, there are some considerations that must be accounted for—given the criteria established for purposes of this study. First, although a facility for any of the site amenities analyzed may not be found within the boundaries of a community plan area, there may be one in the neighboring City to which residents have access to but was not included in the analysis because it is outside of Los Angeles boundary. Second, Figure 27 is a map of the service areas analysis that was done for public high schools for the Brentwood-Pacific Palisades CPA. It shows that there are no public high schools located within these two CPAs; however, it does not account for the existence of private high schools located within the boundaries of these CPAs. Private high schools—or any other type of private facility—are not analyzed in this study and it is therefore a limitation of this research.

5.3 Site Suitability Analysis

In an effort to obtain a comprehensive perspective of the many factors that must be taken into account when proposing the construction of a higher density affordable rental housing development, six iterations of the site suitability analysis are performed for this project. Therefore, depending on the variables analyzed, the results generated in any one of the six iterations will provide a unique yet important insight to this research topic. For instance, the

results for Iteration One to Iteration Four were consistent, despite the exclusion of some attributes. While the last two iterations serve as promising indicators that can help guide housing and housing-related policy changes to make affordable rental housing more accessible to people from different economic backgrounds.

5.3.1. Conclusions and Discussion for Iteration One to Iteration Four

The results for Iteration One to Iteration Four repeatedly show the same geographical locations of site suitability for the construction of higher density affordable rental housing developments. The following CPAs are a constant outcome when performing the SSA in the first four iterations: Central City, Hollywood, Northeast Los Angeles, Silver Lake-Echo Park-Elysian Valley, South Los Angeles, Southeast Los Angeles, West Adams-Baldwin Hills-Leimert, Westlake, and Wilshire. The only variation found in these first four iterations is the scoring scale. Below, Table 23 shows the results of the suitability scores for Iteration One to Iteration Four.

Table 23 Suitability Score Range for Iteration One to Iteration Four

Iteration	Suitability Scores Range	Utility Scale
Iteration One	3.60 – 7.67	Low Suitability – High Suitability
Iteration Two	4.05 – 8.07	Moderately Low Suitability – Very High Suitability
Iteration Three	3.81 – 8.28	Low Suitability – Very High Suitability
Iteration Four	3.36 – 8.73	Moderately Low Suitability – Very High Suitability

The scoring results for the first four iterations indicate that land use, zoning, cost of land, and site amenities play an important role in the site suitability of higher density affordable rental housing developments. For instance, Iteration One—which includes all of the variables that were to be analyzed in this study—has the lowest site suitability scores of the first four iterations.

While Iteration Four—which only analyzes site amenities—has the highest suitability scores of the first four iterations.

5.3.2. Iteration One to Iteration Four Recommendations

When looking specifically at the scoring scale for each of the first four iterations, one can deduce that land use, zoning, cost of land, and site amenities play an important role in identifying suitable sites for the construction of higher density affordable rental housing in Los Angeles. Thus, the recommendation that revisions be made to the existing land use and zoning regulations is reiterated. Land use and zoning changes should be made to residential uses, by identifying and classifying land use and zoning areas that would enable the building of higher density housing developments. Moreover, the same should be done to accommodate the construction of site amenities designated as commercial, industrial/manufacturing, and open space. Doing so, would facilitate the addition of qualifying amenities in those CPAs where there is currently a dearth or lack of these amenities and increase the number of qualifying sites for the construction of affordable housing within the City. Also, proximity to site amenities is of vital importance to those who seek to obtain LIHTC to fund affordable housing developments.

Based on the site suitability analysis performed, the California Tax Credit Allocation Committee may want to consider revising their existing four percent and nine percent applications criteria. The current standards limit the number of communities to which affordable housing can be built within Los Angeles. This is problematic because it can lead to a concentration of affordable housing in certain CPAs of the City. Perhaps the CTCAC may want to consider expanding the allowable distance in miles for some of the site amenities, this to include other sites that would be suitable for the construction of affordable rental housing. Although this recommendation is contradictory to the recommendation made about the CTAC

adopting the service area analysis method in its application process, both of these are necessary measures to facilitate the construction of affordable housing.

Lastly, it is recommended that a permanent local ordinance of the California Mello Act be enacted for Los Angeles. At present, an interim ordinance of the 1982 California Mello Act governs the supply of affordable housing in the City's Coastal Zone. The implementation of a permanent ordinance would establish durable guidelines that allow for the construction of affordable housing in the coastal areas and adjacent communities of Los Angeles. Local city officials may also want to consider incorporating some of the recommendations made in 2006 by the City of Los*f* Angeles Department of City Planning (Appendix F) when drafting the permanent ordinance.

5.3.3. Iteration One to Iteration Four Limitations

Although the majority of the site amenities listed in the CTCAC applications are included in the study, there are some exclusions made in this study. Specifically, this project does not include *pharmacies, population specific oriented facilities*, *senior center or facility*, or *in-unit high speed internet services*, which are also qualifying site amenities to obtain LIHTC. In addition, the CTCAC point system for their applications is not all-or-nothing as Iteration Four shows, instead points are allotted for each site amenity independently. Accordingly, there are many ways in which the site amenities can be grouped to meet the minimum fifteen-point requirement to qualify for the tax credits. As such, Iteration Four—which focuses only on analyzing the identified site amenities—is one of many possibilities.

Another caveat of this research pertains to long range policy planning. The City of Los Angeles Department of City Planning is currently bringing up to date land use plans for several community plan areas. At present the following CPAs are being updated: Boyle Heights, Central

City, Granada Hills, Hollywood, San Pedro, South Los Angeles, Southeast Los Angeles, Sylmar, and West Adams. The Department of City Planning also intends to start the process of updating other community plans in the near future. Any proposed changes in the land use and/or zoning designations of these CPAs is not reflected in this project.

5.3.4. Conclusions and Discussion for Iteration Five

Iteration Five of the site suitability analysis is the first iteration in which the results expand beyond those community plan areas that repeatedly appeared in the first four iterations of this analysis, and in fact cover most of Los Angeles. It is also in this iteration in which we first see that the suitability score range extends to scores from one to eight, rather than from three to eight. Therefore, while more sites are identified, they are of low suitability. For this iteration, land use, fair share, employment, and public transit are analyzed. The results reinforce the outcomes of the previous four iterations by showing that there are several CPAs located in the central area of the City in which suitable sites for the construction of higher density affordable rental housing may be found. Specifically, the CPAs of Central City, Hollywood, Northeast Los Angeles, Silver Lake-Echo Park-Elysian Valley, South Los Angeles, Southeast Los Angeles, West Adams-Baldwin Hills-Leimert, Westlake, and Wilshire. In addition, this iteration shows that the CPAs of Boyle Heights, Central City North, Palms-Mar Vista-Del Rey, Westchester-Playa del Rey, West Los Angeles, and Westwood have sites that are suitable for the building of these types of developments.

However, opportunities for the construction of higher density affordable rental housing exist in other community plan areas of Los Angeles. In the north area of Los Angeles, the results indicate that the following CPAs have suitable sites: Canoga Park-Winnetka-Woodland Hills-West Hills, Chatsworth-Porter Ranch, Encino-Tarzana, Mission Hills-Panorama City-North

Hills, North Hollywood-Valley Village, Sherman Oaks-Studio City-Toluca Lake-Cahuenga Pass, Sun Valley-La Tuna Canyon, Reseda-West Van Nuys, Sylmar, and Van Nuys-North Sherman Oaks. Whereas in the south area of the City, the results show that the CPAs of San Pedro and Wilmington-Harbor City have suitable sites for the building of these types of developments. Thus, based on the attributes analyzed in this iteration of the SSA, promise exists in other CPAs outside of the central area of Los Angeles.

5.3.5. Iteration Five Recommendations

Los Angeles may want to consider using the results of Iteration Five as reference when writing housing and housing-related policies. This iteration not only helps support the results of Iteration One to Iteration Four but also shows other sites that may be promising locations for the construction of higher density affordable rental housing developments. For example, the outcomes of Iteration Five may be beneficial to local city officials who are currently updating the land use plans of the City's community plan areas. Furthermore, the results of Iteration Five can serve as a guide in the writing of other housing-related ordinances that would encourage the construction of these types of developments

5.3.6. Iteration Five Limitations

As aforementioned, one of the variables that was analyzed in this iteration is land use. However, land use data that contains information of only existing land use designations covering the thirty-five CPAs is used in the site suitability analysis. Therefore, it does not account for any land use designation changes that may currently be proposed by the City of Los Angeles Department of City Planning in any of the CPAs that are being updated. As such, this is a limitation of this project.

5.3.7. Conclusions and Discussion for Iteration Six

The results of Iteration Six provide the most encouraging perspective when identifying suitable sites for higher density affordable rental housing construction in Los Angeles. For purposes of this iteration only the *employment* and *public transit* variables were analyzed. Once again, the results show that the CPAs found in the central area of Los Angeles have the greatest number of sites with the highest suitability to build higher density affordable rental housing. However, the difference, when compared to Iteration Five, is that the suitability of the sites found in this area increases to a scoring scale range between seven and nine. Furthermore, the coverage of suitable sites extends in the following CPAs: Boyle Heights, Central City, Central City North, Hollywood, Northeast Los Angeles, Silver Lake-Echo Park-Elysian Valley, South Los Angeles, Southeast Los Angeles, West Adams-Baldwin Hills-Leimert, Westlake, Westwood, and Wilshire.

Moreover, the results of Iteration Six show that higher density affordable housing developments can also be built in the north area and south area of Los Angeles. The results show that in the north area, the North Hollywood-Valley Village and Sun Valley-La Tuna Canyon CPAs have sites with a suitability score between six and nine. In addition, the number of suitable sites with a suitability score between five and six dramatically increases in this area of the City, covering most of the north area of Los Angeles. In the same manner, the results show that the CPAs located in the south area of Los Angeles have a significant number of suitable sites with a score between five and seven. In fact, for the first time in the site suitability analysis iterations, one can see that the Harbor Gateway CPA has suitable sites for the construction of higher density affordable rental housing.

5.3.8. Iteration Six Recommendations

In addition to having the City of Los Angeles Department of City Planning look at this research, Metro may want to do the same with the purpose of identifying sites where higher density affordable rental housing can be built. Currently, Metro owns parcels that can serve as sites for the construction of affordable rental housing. Furthermore, Metro can become an active participant in the writing and enactment of housing and housing-related policies that would benefit Angelenos. Lastly, Metro has the opportunity to form partnerships with developers and investors that seek to build higher density affordable rental housing developments.

5.3.9. Iteration Six Limitations

This research does not take into account any public transit projects that are either under construction or are being proposed by the Los Angeles County Metropolitan Transportation Authority. For instance, Metro is currently studying the possibility of adding a Bus Rapid Transit (BRT) in the Vermont and North Hollywood to Pasadena corridors. Furthermore, the following projects are in the construction phase: the Metro Regional Connector, the Crenshaw/LAX Transit Line, and the Metro Purple Line Subway Extension—to name a few.

5.4 Additional Recommendations for Future Research

Although limitations exist in this study, time constraints did not allow for these to be included in this research. Nonetheless, these may serve as a gate for future research. In fact, additional recommendations that are not within the scope of this project, but are concerns that should be further explored pertain to investment and gentrification. Based on the results from the various iterations that were performed of the site suitability analysis, it is necessary for there to be more interest and investment in CPAs like Boyle Heights, South Los Angeles, and Southeast

Los Angeles. There is currently a lack of investment in these communities despite that there is promise within them for the construction of affordable housing and creating economically sustainable and vibrant spaces. However, there should also be a balance when investing in these communities. Specifically, there should be caution for the possibility of gentrification, as said investments may result in the displacement of lower income residents.

In addition, further research should be done on mixed-income housing in Los Angeles. Specifically, a site suitability analysis exploring suitable sites for the construction of mixed-income housing may want to be performed. This would not only better inform housing and housing-related policies, but would also create more diverse and sustainable communities, and avoid concentrations of affordable housing developments in any given CPA. This approach would also help mitigate the possibility of certain communities undergoing gentrification. In fact, this study may serve as guide in said research and/or implementation of these type of housing and housing-related policies.

One last recommendation would be to perform a site suitability analysis in which the criteria for the site amenities analyzed allows for a broken-up point system or partial credit point system. As previously indicated, a limitation of this research is that the site amenities analyzed in the site suitability analysis were under an all or nothing approach. However, the current CTCAC applications do not establish an all or nothing point system, as partial points can be obtained for qualifying site amenities.

5.5 Conclusion

This study sparked from a vision to make housing more accessible to Angelenos from different economic backgrounds. Unfortunately, rental rates in Los Angeles continue to rise and it is increasingly becoming difficult to find affordable housing in the City. Complicating the

situation are the existing land use and zoning regulations that limit the construction of these types of developments in most of Los Angeles. In addition, the dearth or lack of site amenities in some of the community plan areas, make it challenging to obtain funding for the construction of higher density affordable rental housing developments in these neighborhoods. Therefore, it is hoped that the results of this research will serve as a catalyst for change in housing and housing-related policies at the local, state, and federal level.

References

Al-Hanbali, Ahmad, Bayan Alsaaideh, and Akihiko Kondoh. 2011. "Using GIS-Based Weighted Linear Combination Analysis and Remote Sensing Techniques to Select Optimum Solid Waste Disposal Sites within Mafraq City, Jordan." *Journal of Geographic Information System* 267-278.

Anderson, Natalie. 2011. *Site Selection for Affordable Housing Development: An Analysis of Housing Element Suitable Sites Inventories from Orange County, California.* Master of Urban Planning and Regional Planning Professional Report, Irvine: University of California, Irvine.

Association of Bay Area Governments. 2015. "SB 628 (Beall) Enhanced Infrastructure Financing District (EIFD)." *Association of Bay Area Governments.* Accessed May 5, 2016. http://abag.ca.gov/events/ga/2015/SB628.pdf.

Best Best & Krieger Attorneys at Law. 2015. *SB 107 Brings Significant Changes to Redevelopment Dissolution Law.* October 8. Accessed May 6, 2016. http://www.bbklaw.com/?t=40&an=45321.

Blount, Casey, Wendy Ip, Ikuo Nakano, and Elaine Ng. 2014. *Redevelopment Agencies in California: History, Benefits, Excesses, and Closure.* Working Paper, Washington, DC: U.S. Department of Housing and Urban Development.

Branz, Ariel. 2013. "Low-Income Family Housing: A Suitability Analysis in Suffolk County, MA." *Tufts University.* December 12. https://sites.tufts.edu/gis/files/2014/11/Branz_Ariel.pdf.

California Department of Housing and Community Development. 2010. *Regional Housing Needs Assessment (RHNA).* May 6. Accessed April 7, 2016. http://www.hcd.ca.gov/housing-policy-development/housing-element/hn_phn_regional.php.

California Legislative Information. 2016. "Bill Analysis of AB 2522 Land Use: Attached Housing Developments." *California Legislative Information.* April 5. Accessed May 16, 2016. https://leginfo.legislature.ca.gov/faces/billAnalysisClient.xhtml?bill_id=201520160AB2522.

California Planning Roundtable. 2008. "Deconstructing Jobs-Housing Balance." *California Planning Roundtable.* Accessed October 1, 2016. http://www.cproundtable.org/media/uploads/pub_files/CPR-Jobs-Housing.pdf.

California Planning Roundtable, California Department of Housing & Community Development. 1993. "Myths and Facts About Affordable & High Density Housing." *California Department of Housing and Community Development.* September. Accessed May 25, 2016. http://www.hcd.ca.gov/housing-policy-development/mythsnfacts.pdf.

California Tax Credit Allocation Committee. 2015. "Electronic California Tax Credit Allocation Committee (TCAC) Application." Sacramento: Office of the State Treasurer.

City of Los Angeles Department of City Planning. 2013. "City of Los Angeles Housing Element 2013 - 2021." *City of Los Angeles Department of City Planning.* December 3. Accessed January 29, 2016. https://sites.google.com/site/lahousingelement/.

—. 2013. "City of Los Angeles Housing Element 2013 - 2021." *City of Los Angeles Department of City Planning.* December 3. Accessed January 29, 2016. https://sites.google.com/site/lahousingelement/.

—. n.d. *Community Plans in Progress.* Accessed May 25, 2016. http://planning.lacity.org/cpu/ComPlanUpdate.html.

—. 2008. "Density Bonus Ordinance." *City of Los Angeles Department of City Planning.* March. Accessed May 25, 2016. http://planning.lacity.org/PolicyInitiatives/Housing/DB_Ord.pdf.

—. 2001. *Framework Element Executive Summary.* August 8. Accessed April 6, 2016. http://cityplanning.lacity.org/cwd/framwk/chapters/00/00.htm.

—. 2001. *Framework Element Housing: Introduction and Summary of Issues.* August 8. Accessed April 5, 2016. http://cityplanning.lacity.org/cwd/framwk/chapters/04/04.htm.

—. n.d. *General Community Plans.* Accessed May 23, 2016. http://cityplanning.lacity.org/.

—. 2013. *Housing Element.* December 3. Accessed March 31, 2016. http://cityplanning.lacity.org/HousingInitiatives/HousingElement/TOCHousingElement.htm.

—. 2013. "Inventory and Maps of Parcels Available for Housing by Community Planning Area." *City of Los Angeles Department of City Planning.* December 3. Accessed January 26, 2016. http://planning.lacity.org/HousingInitiatives/HousingElement/Text/H.pdf.

—. n.d. *Land Use Standards and Typical Development Characteristics.* Accessed April 15, 2016. http://planning.lacity.org/cwd/framwk/chapters/03/tab31.htm.

—. 2006. "Mello Act Recommendation Staff Report." *City of Los Angeles Department of City Planning.* November 9. Accessed June 15, 2016. http://cityplanning.lacity.org/Code_Studies/Housing/mello_staff_report.pdf.

—. 2005. "RAS Interpretation to Community Plan Footnotes Director's Interpretation." *Central City Community Plan.* April 21. Accessed May 20, 2016. http://planning.lacity.org/complan/pdf/CCYCPTXT.PDF.

—. 2006. "RAS Mixed Use Zones: RAS3 and RAS4." *City of Los Angeles Department of City Planning.* January. Accessed May 25, 2016. http://cityplanning.lacity.org/PolicyInitiatives/Housing/RAS/brochure1.pdf.

—. 2007. "Transfer of Floor Area Rights-City Community Plan and City Center Redevelopment Project Areas." *City of Los Angeles Department of City Planning.* May 20. Accessed May 15, 2016. http://cityplanning.lacity.org/Code_Studies/CBDRedevelopPlan/TFAR%20Ordinance%20Draft%20-%204-26-10.pdf.

Cohen, Stuart. 2011. "SB 375 Fact Sheet." *Climate Plan.* October. Accessed April 10, 2016. http://www.climateplan.org/wp-content/uploads/2011/03/TransForm-SB-375-4-page-Statewide-Oct-2011.pdf.

County of Los Angeles Department of Auditor-Controller. n.d. *Redevelopment Agency History.* Accessed February 3, 2016. http://auditor.lacounty.gov/wps/portal/ac?1dmy&page=dept.lac.ac.home.detail.hidden&urile=wcm%3apath%3a/auditor-controller+content/auditor-controller+site/home/home+detail/redevelopment+agency+history.

Department of Housing and Community Development. 2007. "State Housing Element Law." *Department of Housing and Community Development.* December 26. Accessed March 30, 2016. http://www.hcd.ca.gov/housing-policy-development/housing-resource-center/plan/he/heoverview.pdf.

Drobne, Samo, and Anka Lisec. 2009. "Multi-attribute Decision Analysis in GIS: Weighted Linear Combination and Ordered Weighted Averaging." *Informatica* 33 (4): 459-474.

Environmental Systems Research Institute, Inc. 2016. *Weighed Sum.* Accessed October 23, 2016. http://pro.arcgis.com/en/pro-app/tool-reference/spatial-analyst/weighted-sum.htm.

Goetz, Jon E, and Tom Sakai. 2015. "Maximizing Density Through Affordability: A Developer's Guide to the California Density Bonus Law." *Kronick, Moskovitz, Tiedemann, and Girard.* January 1. Accessed April 29, 2016. http://www.kmtg.com/sites/default/files/files/Density%20Bonus%20Law_2015_Web%20Version.pdf.

Housing California. n.d. "Linking Transportation and Land Use Planning: A Summary of Senate Bill 375." *Climate Plan.* Accessed April 10, 2016. http://www.climateplan.org/wp-content/uploads/2011/03/HousingCA_SB375_fact_sheet.pdf.

Justia US Law. 1996. "Venice Town Council, Inc. v. City of Los Angeles (1996)." *Justia US Law.* July 31. Accessed October 3, 2016. http://law.justia.com/cases/california/court-of-appeal/4th/47/1547.html.

Lambert, Tim. n.d. *A Short History of Los Angeles, California.* Accessed June 1, 2016. http://www.localhistories.org/losangeles.html.

League of California Cities. 2015. "Efforts to Continue with AB 2 (Alejo & Garcia) to Re-Establish the RDA Tool." *League of California Cities.* April 10. Accessed April 15, 2016. http://www.cacities.org/Top/News/News-Articles/2015/April/Efforts-Continue-With-AB-2-(Alejo-Garcia)-to-Re-Es.

LeRoy, Adrian D. 1973. *A Model for Subsidized Housing Location.* Study, City of Los Angeles Department of City Planning, Los Angeles: City of Los Angeles Department of City Planning, 1-72.

Los Angeles County Department of Regional Planning. 2009. *Land Use and Zoning.* Accessed March 9, 2016. http://planning.lacounty.gov/luz.

Los Angeles Housing Department. 2013. "Los Angeles Housing Department (LAHD) Request for Approval to Issue Letters of Commitment for Round 1 of the 2013 Affordable Housing Trust Fund (AHTF) Notice of Funding Availability (NOFA) and Call for Projects; and, Various Actions Related to the AHTF." *City of Los Angeles Office of the City Clerk.* June 20. Accessed May 4, 2016. http://clkrep.lacity.org/onlinedocs/2013/13-0303_rpt_lahd_06-20-13.pdf.

Malczewski, Jacek. 2000. "On the Use of Weighted Linear Combination Method in GIS: Common and Best Practice Approaches." *Transactions in GIS* 5-22.

Mitchell, Andy. 1999. *The Esri Guide to GIS Analysis Volume 1: Geographic Patterns & Relationships.* Vol. 1. 3 vols. Redlands, California: ESRI Press.

Myers, Dowell, and Elizabeth Gearin. 2001. "Current Preferences and Future Demand for Denser Residential Environments." *Housing Policy Debate* 633-659.

Quigley, John M, and Steven Raphael. 2004. "Is Housing Unnaffordable? Why Isn't It More Affordable?" *Berkeley Program on Housing and Urban Policy.* Accessed October 26, 2016. http://urbanpolicy.berkeley.edu/pdf/QRJEP04PB.pdf.

Ray, Rosalie, Paul Ong, and Silvia Jimenez. 2014. "Impacts of the Widening Divide: Los Angeles at the Forefront of the Rent Burden Crisis." *Center for the Study of Inequality UCLA Luskin School of Public Affairs.* September. Accessed March 13, 2016. http://www.anderson.ucla.edu/Documents/areas/ctr/ziman/2014-08WPrev.pdf.

Schultz, Theodore W. 1960. "Capital Formation by Education." *Journal of Political Economy* (The University of Chicago Press) 68 (6): 571-583.

Southern California Association of Governments. 2007. "Final Regional Housing Need Allocation Plan-Planning Period (January 1, 2006 - June 30, 2014) for Jurisdictions within the Six-County SCAG Region (approved by the SCAG Regional Council on July 12, 2007)." *Housing and Land Use Resources and Links.* July 12. Accessed July 13, 2016. http://www.scag.ca.gov/programs/Pages/HLURL.aspx.

—. 2016. *RHNA & Housing.* Accessed April 7, 2016. http://www.scag.ca.gov/programs/pages/housing.aspx.

Taylor, Mac. 2015. "California's High Housing Costs Causes and Consequences." *Legislative Analyst's Office.* March 17. Accessed June 1, 2016. http://www.lao.ca.gov/reports/2015/finance/housing-costs/housing-costs.pdf.

The Planning Report. 2007. *City of L.A. Approves TFAR Ordinance to Let High Rises Rise.* April 19. Accessed May 31, 2016. http://www.planningreport.com/2007/04/19/city-la-approves-tfar-ordinance-let-high-rises-rise.

U.S. Census Bureau. 2014. *Social Explorer Tables: ACS 2014 (5-Year Estimates).* Demographics, Social Explorer, Social Explorer. Accessed January 29, 2016. https://sites.google.com/site/lahousingelement/.

United Nations General Assembly. 1948. "United Nations." *The Universal Declaration of Human Rights.* December 10. Accessed February 17, 2016. http://www.un.org/en/universal-declaration-human-rights/.

Van Atta, Michael David. 2013. *Constricted Urban Planning: Investigating the Site and Suitability of Low-Income Housing in Fairfax County, Virginia.* Master of Science in Geography Thesis, Blacksburg, VA: Virginia Polytechnic Institute and State University.

Way, Indigo, and Shawna Miller. 2016. "Site Suitability Analysis: Mid-Density Low-Income Housing for SE Portland." *Portland State University.* March 15. Accessed November 7, 2016. http://web.pdx.edu/~jduh/courses/geog492w16/Projects/13_Miller_Way_GIS2_Poster_Project.pdf.

Appendix A: Existing Financing Tools for Affordable Housing Development in City of Los Angeles

Financing Tool	Description
Affordable Housing Trust Fund (AHTF)	Mechanism that provides long-term loans for new construction or rehabilitation of affordable rental housing for low and very-low income households[16].
Community Development Block Grant (CDBG)	This grant program has three primary objectives: benefit those with low- and moderate-income; aid in preventing neighborhood deterioration; and, meet other urgent community development needs due to natural disasters or other emergencies[17].
Developer Fees	Fees that are assessed to developers who seek to build affordable rental housing developments in Los Angeles. The fees vary depending on the permit(s) and/or service(s) that are necessary for the proposed project[18].
General Fund	Primary operating fund of Los Angeles. Revenue sources include taxes, licenses, permits, fees, fines, charges for services, intergovernmental revenues, special assessments, and interest income. The 2015-2016 proposed budget report seeks to make use of General Fund revenue for the acquisition, development, construction, rehabilitation, and preservation of affordable housing[19].
Home Ownership Made Easy Investment Partnerships Programs (HOME)	Grants are available to fund a variety of activities, including the construction, purchase, and/or rehabilitation of affordable rental housing. HOME is considered the largest development grant to state and local governments that is designed exclusively to create affordable housing for low-income households[20].
Infill Infrastructure Grant Program (IIG)	The grant program is funded by Proposition 1C, also known as the Housing and Emergency Shelter Trust Fund Act of 2006. The primary objective of the program is to

[16] For more information go to the Los Angeles Housing and Community Investment Department website: http://hcidla.lacity.org/Affordable-Housing-Trust-Fund-pipeline
[17] For more information go to the U.S. Department of Housing and Urban Development website: http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs
[18] For more information go to the City of Los Angeles Department of Public Works Bureau of Engineering's Standard Fee List at: http://eng.lacity.org/StdFeeList/StdFeeList.pdf
[19] For more information read the *City of Los Angeles Fiscal Year 2015-16 Budget* at http://cao.lacity.org/budget15-16/2015-16Proposed_Budget.pdf
[20] For more information go to the U.S. Department of Housing and Urban Development website: http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/affordablehousing/programs/home/

	promote infill development by providing grants for infrastructure improvements necessary for specific residential or mixed-use infill development projects[21].
Los Angeles Supportive Housing Loan Fund	The fund provides acquisition and pre-development funding for projects that meet the requirements of the City of Los Angeles Permanent Supportive Housing Program[22].
Los Angeles Unified School District (LAUSD)	LAUSD currently owns land throughout Los Angeles. Project-based partnerships can be formed to build affordable housing units in vacant sites, older school sites, and/or other public facilities[23].
Low-Income Housing Tax Credit (LIHTC)	The LIHTC program give State and local LIHTC-allocating agencies the authority to annually issue tax credits for the acquisition, rehabilitation, or new construction of rental housing targeted to low-income households[24].
Metro Grants	The transit-oriented development (TOD) Planning Grant program provides funding for projects that maximize access to public transit through mixed-use residential and commercial developments[25].
National Housing Trust Fund (NHTF)	This fund is intended to provide funding to the production, preservation, and rehabilitation of rental housing for extremely low very-low income households[26].
New Generation Fund (NGF)	The NGF provides financing for acquisition and predevelopment to developers who seek to purchase vacant land for development and/or purchase and preserve at-risk affordable housing in Los Angeles[27].
New Market Tax Credit Program (NMTC)	The NMTC program aims to attract private capital in low-income committees by allowing individual and corporate investors to receive a tax credit against their federal income tax in return for making equity investments in specialized

[21] For more information about the Infill Infrastructure Grant program go to: http://www.hcd.ca.gov/financial-assistance/infill-infrastructure-grant-program/docs/iig-round-4-guidelines.pdf

[22] For more information go to the Corporation for Supportive Housing's website: http://www.csh.org/csh-solutions/lending/external-loan-funds/

[23] For more information about affordable housing projects in which LAUSD has collaborated go to: http://www.laschoolboard.org/sites/default/files/05-22-14BFAFacilitiesAffordable%20Housing%20Update_0.pdf

[24] For more information go to the U.S. Department of Housing and Urban Development website: https://www.huduser.gov/portal/datasets/lihtc.html

[25] For more information go to Metro's Transit Supportive Planning website: https://www.metro.net/projects/tod/

[26] For more information go to the National Low Income Housing Coalition website: http://nlihc.org/issues/nhtf

[27] For more information go to the New Generation Fund LLC website: http://newgenerationfund.com/

	financial intermediaries known as Community Development Entities (CDEs). The credit totals to 39 percent of the original investment amount and is claimed over a period of seven years[28].
Public/Private Lenders	Public/private lenders provide funding to developers and investors, which usually consists of loans, who invest in the construction, rehabilitation, and preservation of affordable rental housing.
SCAG Grants Database	The database provides information on grant opportunities offered by different agencies[29].

[28] For more information go to the U.S. Department of Treasury's New Market Tax Credit Program webpage: https://www.cdfifund.gov/programs-training/Programs/new-markets-tax-credit/Pages/default.aspx

[29] For more information go to the SCAG Grants Database webpage: https://www.scag.ca.gov/opportunities/Pages/Grants.aspx

Appendix B: Land Use Standards and Typical Development Characteristics

Category	Typical Characteristics
Multi-Family Residential	• Multi-family dwelling units • Supporting uses (parks, schools, community centers, etc.) • High Medium: 56-109 dwelling units/net acre • High: 110-218 dwelling units/net acre • Densities may be adjusted to achieve neighborhood stability and quality of life.
Neighborhood District	• Retail commercial, small professional offices, personal services, food stores, eating and drinking establishments, telecommunications centers, small cultural facilities (generally 5,000 square feet or less), and similar uses. • Uses that occupy a building footprint generally exceeding 25,000 square feet, when they meet development standards (grocery stores are exempt). • Mixed-use structures integrating housing with commercial uses (includes density and other incentives). • A focal point for surrounding residential neighborhoods and containing a diversity of land uses to encourage walking to and from adjacent neighborhoods, Neighborhood Districts are generally at a floor area ratio of 1.5:1 or less, characterized by one- to two-story buildings, pedestrian-oriented, and may be served by a local shuttle service.
Community Center	• Same as Neighborhood District with some modifications, some of these being: • Entertainment, larger cultural facilities (museums, libraries, etc.), and similar community-oriented uses characterized by high activity; • Inclusion of bus or rail center (at station or intersection); • Inclusion of small parks and other community-oriented activity facilities; • A focal point for surrounding residential neighborhoods and containing a diversity of uses, Community Centers generally range from floor area ratios of 1.5:1 to 3.0:1, characterized by two- to six-story buildings, e.g., some will be two-story Centers, some four- or six-story Centers depending on the character of the surrounding area.
Region	• Corporate and professional offices, retail commercial (including malls), offices, personal services, eating and drinking establishments, telecommunications centers, entertainment, major cultural facilities (libraries,

	museums, etc.), commercial overnight accommodations, and similar uses. • Mixed-use structures integrating housing with commercial uses. • Multi-family housing (independent of commercial) • Major transit hub • Inclusion of small parks and other community-oriented activity facilities. • A focal point of regional commerce, identity and activity. Regional Centers generally will fall within the range of floor area ratios from 1.5:1 to 6.0:1, characterized by six to 20-stories (or higher) buildings. Some will only be commercially oriented; others will contain a mix of residential and commercial uses.
Downtown Center	• Uses as recommended by the Downtown Strategic Plan. • An international center for finance and trade that serves the population of five-county metropolitan region. Downtown is the largest government center in the region and the location for major cultural and entertainment facilities, hotels, professional offices, corporate headquarters, financial institutions, high-rise residential towers, regional transportation facilities and the Convention Center. The Downtown Center is generally characterized by a floor area ratio up to 13:1 and high rise buildings.
Boulevard-Mixed-Use	• Uses permitted in Community Center-Mixed Use. • Areas may be differentiated into smaller districts (e.g., commercial uses may be clustered at intersections, abutted by mixed-use, and intervening areas developed for multi-family housing). Uses within each area may be determined by the community plans. • A linear district that connects the city's neighborhood districts and community, regional and downtown centers, mixed-use boulevards generally will fall within a range of floor area ratios from 1.5:1 up to 4:1, characterized by one- to two-story commercial structures, up to three- to six-story mixed-use buildings between centers and higher buildings within centers. Mixed-use boulevards generally consist of three types: housing and commercial integrated in a single structure; in structures side-by-side, or on a block-by-block basis.
General Commercial	• Uses as permitted by existing zoning (generally, uses permitted in the C2 zone). • Modifications to be determined by the community plans.

	• Potential adjustment of density to reflect parcel size and configuration, intended functional role, and characteristics of surrounding uses determined through the community plan process.
Pedestrian Overlay	• Uses permitted in underlying zone provided that they conform with the requirements found in Chapter 5: Urban Form and Neighborhood Design of the Framework Element.
Industrial-Light	• Industrial uses with potential for a low level of adverse impacts on surrounding land uses. • Increased range of commercial uses that support industrial uses (through zoning amendments). • Possible consideration for other uses where parcels will not support viable industrial uses (determined by community plan).
Industrial-Transit	• Industrial uses with higher levels of employment that would benefit from proximity to transit. • Increased range of commercial uses that support industrial uses (through zoning amendments).

Source: (City of Los Angeles Department of City Planning n.d.)

Appendix C: City of Los Angeles Community Plans

Community Plan	Year Adopted	Maximum Land Use Density (dwelling units/net acre)	Allows Higher Density Housing	Encourages Affordable Housing Construction	Promotes Mixed-Use Development (residential/commercial)	Encourages Housing Near Transit	Proposes Housing in Industrial Areas
Arleta-Pacoima	1996	High-Medium (55-109 units)	●	●	●	●	
Bel Air-Beverly Crest	1996	Medium (29-55 units)		●			
Boyle Heights	1998	Medium[30] (29-55 units)	●	●	●	●	
Brentwood-Pacific Palisades	1998	High-Medium (55-109 units)	●	●	●	●	
Canoga Park-Winnetka-Woodland Hills-West Hills	1999	High-Medium (55-109 units)	●	●	●	●	
Central City	Unknown	High (109-218 units)	●	●	●		●
Central City North	2000	High-Medium (55-109 units)	●	●	●	●	●
Chatsworth-Porter Ranch	1993	Medium (24-40 units)		●	●		
Encino-Tarzana	1998	Medium (29-55 units)		●	●	●	
Granada Hills-Knollwood	1996	Medium (29-55 units)		●	●	●	
Harbor Gateway	1995	Medium (29-55 units)		●	●	●	
Hollywood	2014	High-Medium (60-80 units)	●	●	●	●	

[30] The text in the Boyle Heights Community Plan also states that the land use intensity in some areas may be increased to High-Medium (55-109 units) but in limited instances.

Community Plan	Year Adopted	Maximum Land Use Density (dwelling units/net acre)	Allows Higher Density Housing	Encourages Affordable Housing Construction	Promotes Mixed-Use Development (residential/commercial)	Encourages Housing Near Transit	Proposes Housing in Industrial Areas
Mission Hills-Panorama City-North Hills	1999	High-Medium (55-109 units)	●	●	●	●	
North Hollywood-Valley Village	1996	High-Medium (55-109 units)	●	●	●	●	
Northeast Los Angeles	1999	High-Medium (55-109 units)	●	●	●	●	
Northridge	1998	Medium (29-55 units)		●	●	●	
Palms-Mar Vista-Del Rey	1997	High-Medium (55-109 units)	●	●	●	●	
Reseda-West Van Nuys	1999	High-Medium (55-109 units)	●	●	●	●	
San Pedro	1999	High-Medium (55-109 units)	●	●	●	●	
Sherman Oaks-Studio City-Toluca Lake-Cahuenga Pass	1998	High-Medium (55-109 units)	●	●	●	●	
Silver Lake-Echo Park-Elysian Valley	2004	Medium (20-55 units)		●	●	●	
South Central/South Los Angeles	2000	High-Medium (55-109 units)	●	●	●	●	
Southeast Los Angeles	2000	Medium (29-55 units)		●	●	●	
Sun Valley-La Tuna Canyon	1999	Medium (30-55 units)		●	●	●	
Sunland-Tujunga-Lake View Terrace-Shadow Hills-East La Tuna Canyon	1997	Medium (29-55 units)		●	●	●	

Community Plan	Year Adopted	Maximum Land Use Density (dwelling units/net acre)	Allows Higher Density Housing	Encourages Affordable Housing Construction	Promotes Mixed-Use Development (residential/commercial)	Encourages Housing Near Transit	Proposes Housing in Industrial Areas
Sylmar	1997	High-Medium (56-109 units)	●	●	●	●	●
Van Nuys-North Sherman Oaks	1998	High-Medium (55-109 units)	●	●	●	●	
Venice	2000	High-Medium (55-109 units)	●	●	●	●	●
West Adams-Baldwin Hills-Leimert	1998	High-Medium (55-109 units)	●	●	●	●	
West Los Angeles	1999	High-Medium (55-109 units)	●	●	●	●	
Westchester-Playa del Rey	2004	High-Medium (55-109 units)	●	●	●	●	
Westlake	1997	High (109-218 units)	●	●	●	●	
Westwood	1999	High (109-218 units)	●	●	●	●	
Wilmington-Harbor City	1999	Medium (29-55 units)		●	●	●	
Wilshire	2001	High-Medium (55-109 units)	●	●	●	●	

Source: Community Plans from the City of Los Angeles Department of City Planning

Appendix D: 2013-2021 Housing Element Objectives and Policies that Seek to Meet Affordable Housing Needs

Objective/Policy	Summary	Page
Objective 1.1	• Produce adequate supply of rental housing.	6-6
Policy 1.1.2	• Expand affordable rental housing for all income groups.	6-6
Policy 1.1.3	• Facilitate new construction and preservation of different housing types.	6-6
Policy 1.1.4	• Expand opportunities for residential development in designated Centers, Transit Oriented Districts, and Mixed-Use Boulevards.	6-6
Policy 1.1.5	• Create financing mechanisms for the production of new affordable housing developments.	6-6
Objective 1.3	• Forecast and plan for evolving housing needs as it relates to production and preservation needs.	6-7
Policy 1.3.5	• Ensure that there is enough land use and density for affordable housing developments to meet the projected housing needs.	6-8
Objective 1.4	• Reduce regulatory and procedural barriers to the production and preservation of housing at all income levels and needs.	6-8
Policy 1.4.1 **Policy 1.4.2**	• Streamline processes related to affordable housing developments.	6-8
Objective 2.2	• Promote sustainable neighborhoods that have mixed-income housing, jobs, amenities, services, and transit.	6-9
Policy 2.2.1	• Integrate housing with other compatible land uses.	6-9
Policy 2.2.2	• Provide incentives to build multi-family housing near transit and centers.	6-9
Objective 2.5	• Promote a more equitable distribution of affordable housing opportunities throughout the City.	6-10
Policy 2.5.1	• Target housing resources, policies and incentives to include affordable housing in mixed-use developments, Transit Oriented Districts (TOD), and designated Centers.	6-9
Policy 2.5.2	• Encourage the construction of new affordable housing units.	6-9

Source: (City of Los Angeles Department of City Planning 2013)

Appendix E: 2013-2021 Housing Element Implementation Programs that Seek to Meet Affordable Housing Needs

Implementation Program (IP) No.	Summary	Page
IP 5	• Facilitate predevelopment and/or acquisition financing for the development of approximately 500 affordable housing units annually through the New Generation Fund (NGF) and the Corporation Supportive Housing (CSH) funds.	6-17, 6-18
IP 6	• Add 500 affordable housing units annually in City of Los Angeles. 70 percent of it will be mix housing targeting large families and seniors. The addition of new units will be either via new construction, acquisition, or rehabilitation. Funding sources include tax credit proceeds, HOME, CDBG, former CRA assets, City-owned land and other intermittent resources.	6-18
IP 8	• A land use program to increase the production of affordable housing, particularly those that receive benefits from the City.	6-19
IP 13	• Explore the redevelopment of brownfield industrial and commercial sites for the construction of housing and/or mixed used development. Support funding of sites that are close to public transit, public facilities, and amenities.	6-21
IP 14	• Explore the possibility of redevelopment of older school sites and other public facilities for the addition of affordable housing. Establish a project-based partnership with LAUSD.	6-22
IP 15	• Advocate for housing funds.	6-22, 6-23
IP 16	• Identify new policies and programs that will increase the production of affordable housing. This includes creating a permanent funding source for the Affordable Housing Trust Fund (AHTF).	6-23
IP 17	• Assess a Public Benefit Fee on all projects in the Downtown Area that use Transfer Floor Area Rights (TFAR).	6-23, 6-24
IP 27	• Discourage the demolition and condo conversion of stable affordable rental housing that is subject to the RSO. Encourage the replacement of demolished affordable housing stock with new affordable housing developments.	6-28
IP 45	• Rent foreclosed properties to qualified renters.	6-36, 6-37
IP 52	• Monitor the development of sites by community plan and provide incentives to encourage the development of housing within that area.	6-39, 6-40
IP 54	• Monitor and update the Density Bonus Program. In particular, examine strategies to increase the production of	6-40, 6-41

	affordable housing units and facilitate the use of density bonus at Transit Stops/Major Employment Centers, encourage more large family and senior units, and transfer unused density bonus rights.	
IP 57	• During the update of each community plan, identify and implement measures that allow for the designation of appropriate locations and densities to build housing for people at all income levels.	6-42
IP 59	• Create and one- and five-year Consolidated Plans to create decent housing.	6-42, 6-43
IP 67	• Amend the Zoning Code to facilitate the construction of non-conventional housing. This implementation program could have added terminology to allow for the construction of high density affordable housing developments.	6-47
IP 70	• Make use of zoning and neighborhood implementation tools for mixed-use development. These include: Residential Accessory Services (RAS) zones, Community Plan Implementation Overlay districts (CPIOs), ground floor commercial requirements, Mixed-Use Overlay Districts, and amend the zoning code to allow for more mixed use and infill development	6-48
IP 71	• Give “trip credits” for affordable housing developments that are near public transit.	6-49
IP 72	• Conduct studies to identify housing opportunities for the neighborhoods around rail and bus rapid transit stops in the City.	6-49
IP 73	• Update community plans and Transit Neighborhood Plans by establishing appropriate land uses, densities, and mixes of housing types and levels of affordability in areas served by public transit	6-50
IP 76	• Exempt high-density transit-oriented residential projects from the Traffic Impact Assessment fees in areas where jobs are abundant and lack housing.	6-51
IP 98	• Provide a density bonus of up to 35 percent over the allowable density and reduced parking requirements for residential developments that include very low-income, low-income, and/or moderate-income households. Provide any additional incentives and concessions to promote the production of higher density affordable housing developments. Modify density bonus incentives and the Affordable Housing Incentives Program Guidelines (AHIPG) as necessary to better meet the goals of the City.	6-60, 6-61
IP 99	• Provide incentives for residential developments in Downtown Los Angeles that include very low-income, low-income, moderate-income, or workforce housing. Also, require one-for-one replacement of all converted or	6-61, 6-62

	demolished units serving households earning up to 50 percent of the area median income in Downtown Los Angeles.	
IP 100	• Pursuant to the "Mello Act," build affordable housing in the City's Coastal Zone by establishing set aside and replacement requirements. Furthermore, amend the Zoning Code and the Affordable Housing Incentives Program Guidelines to facilitate such development. Create covenants to ensure supply of the required affordable housing units	6-62,

Source: (City of Los Angeles Department of City Planning 2013)

Appendix F: Comparison of Existing and Proposed Mello Act Policies

Policy	Existing	Proposed
In-lieu fees	Not allowed at all.	Allowed by-right.
Methods approved to provide affordable units	– New construction from the ground up. – Adaptive reuse of non-residential buildings.	– New construction from the ground up. – Adaptive reuse of non-residential buildings. – Purchase and rehabilitation of vacant residential buildings. – Purchase of existing market-rate units, including units under construction.
Affordability Covenants	30 years	55 years
Unit Size	– Comparable for affordable units in mixed-income buildings. – Affordable units that are in 100 percent affordable projects must comply with the Housing Department's standards.	Reduced unit sizes that are consistent with the state's administration of the Low-Income Housing Tax Credit Program.
Appeal Standard	Economic, environmental, social, and technical feasibility.	Violation of state or federal law or state or federal constitutions.
Replacement Standard	One-for-one replacement is required.	One-for-one replacement is required.
Exemptions	– Single-family home that is owner-occupied. – Unit that is vacant for more than a year. – Unit that is a building that the government has declared a public nuisance. – Depending on existing and proposed uses, additional exemptions may be granted based on a decision-maker's finding of infeasibility.	– Any owner-occupied dwelling unit, with the exception of a mobile home or a mobile home lot. – Unit that is vacant for more than a year. – Unit that is a building that the government has declared a public nuisance.

Location	– The replacement units must be located in the Coastal Zone. – On appeal and the appellate body's finding that location inside Coastal Zone is infeasible, replacement units may be located within three miles of the Coastal Zone's inland boundary. – The appellate body may require the replacements units to be located in a defined geographic area. – Replacement units must always be located in Los Angeles.	– The replacement units may be located in the Coastal Zone or within three miles of its inland boundary. – The initial decision-maker or appellate body may require the replacement units to be located in a defined geographic area. – Replacement units must always be located in Los Angeles.
Affordability Standard	The replacement unit may be offered at any level of affordability (i.e. a moderate-income unit may replace a very low income unit.)	The replacement unit must be offered at the same level of affordability (i.e., very low-income unit may only replace a very low income unit.)
10+ Unit Projects	– New for-sale and rental housing projects must set aside 10 percent of all units for very low-income households or 20 percent of all units for low-income households. – Exemption: condominium conversions.	– New for-sale housing projects and condominium conversions must set aside 10 percent of all units for very low-income households or pay a substantial in-lieu fee. – Exemption: new rental housing projects.

Source: (City of Los Angeles Department of City Planning 2006)

Appendix G: Site Suitability Analysis Models

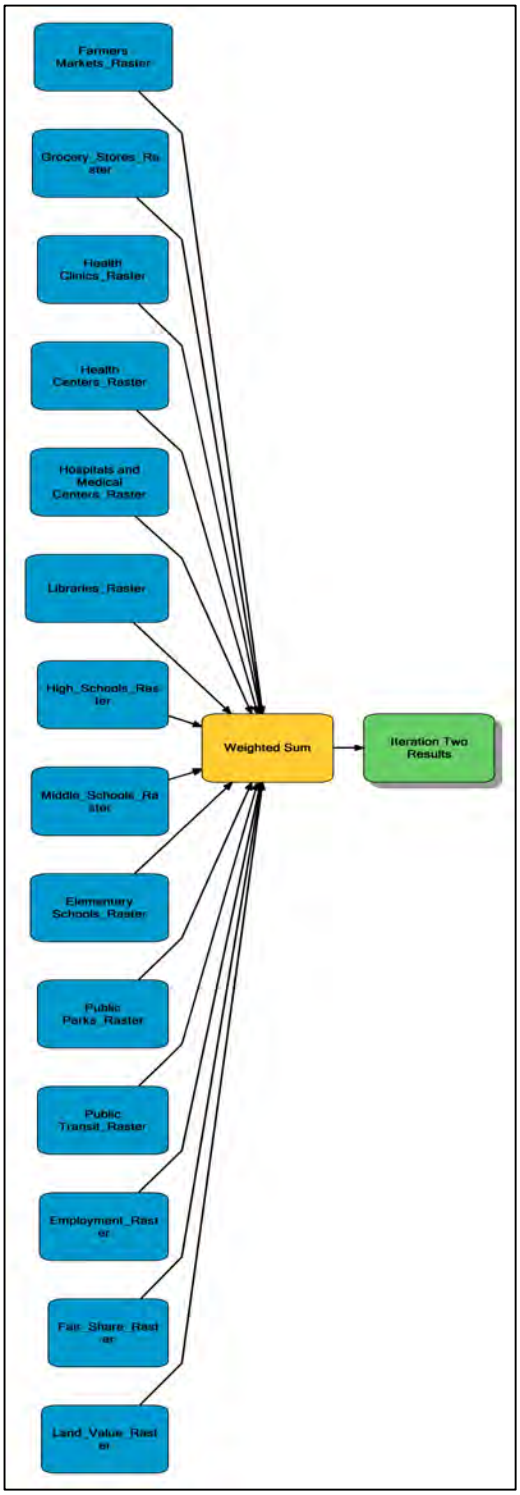

Figure 43 Model for Iteration Two of Site Suitability Analysis

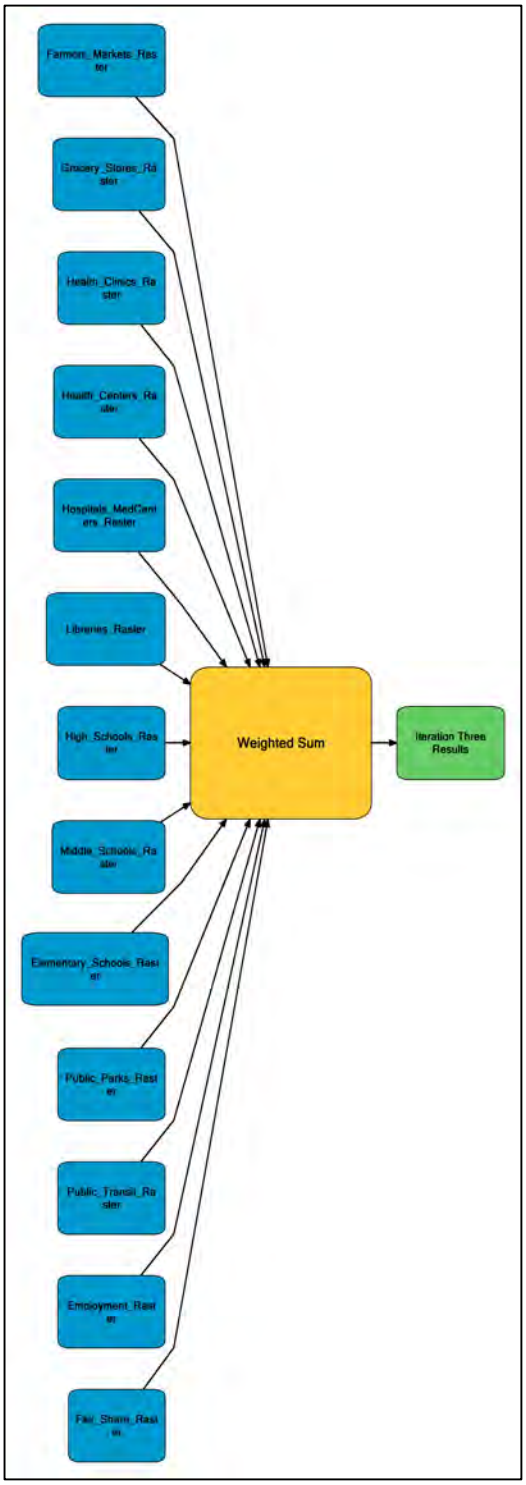

Figure 44 Model for Iteration Three of Site Suitability Analysis

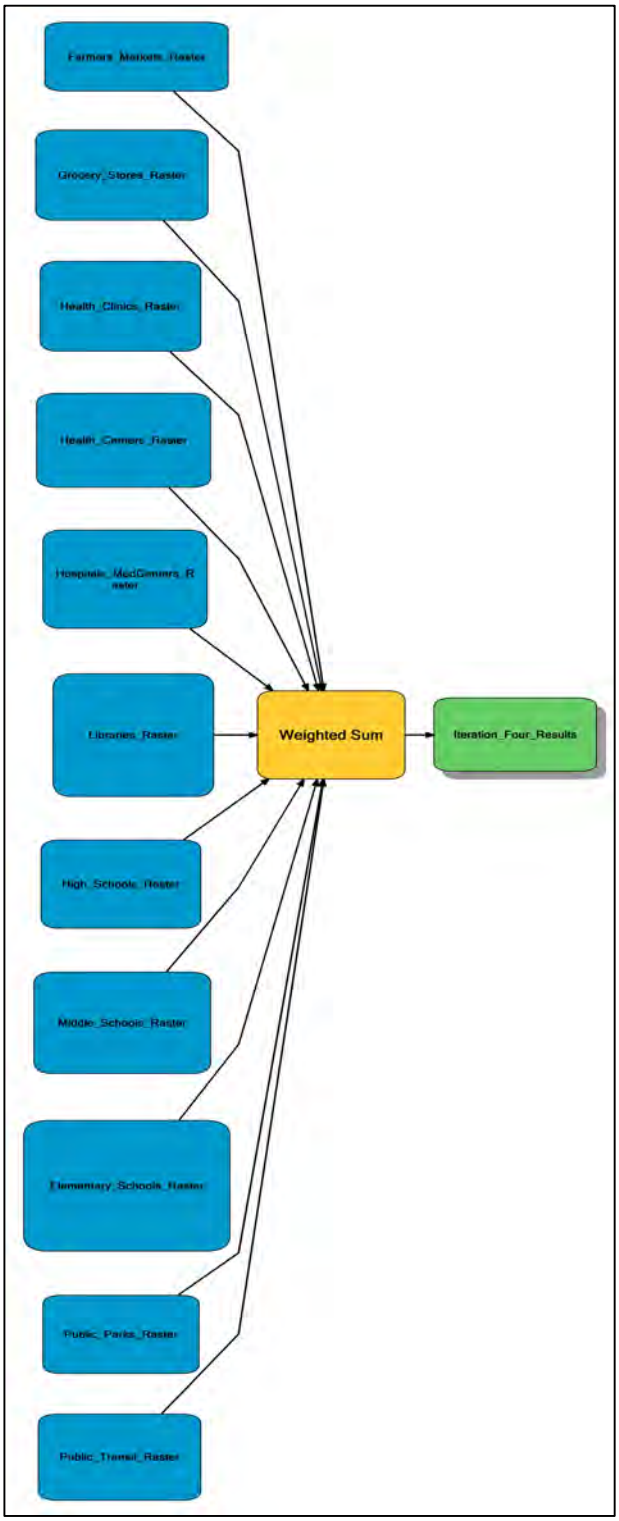

Figure 45 Model for Iteration Four of
Site Suitability Analysis

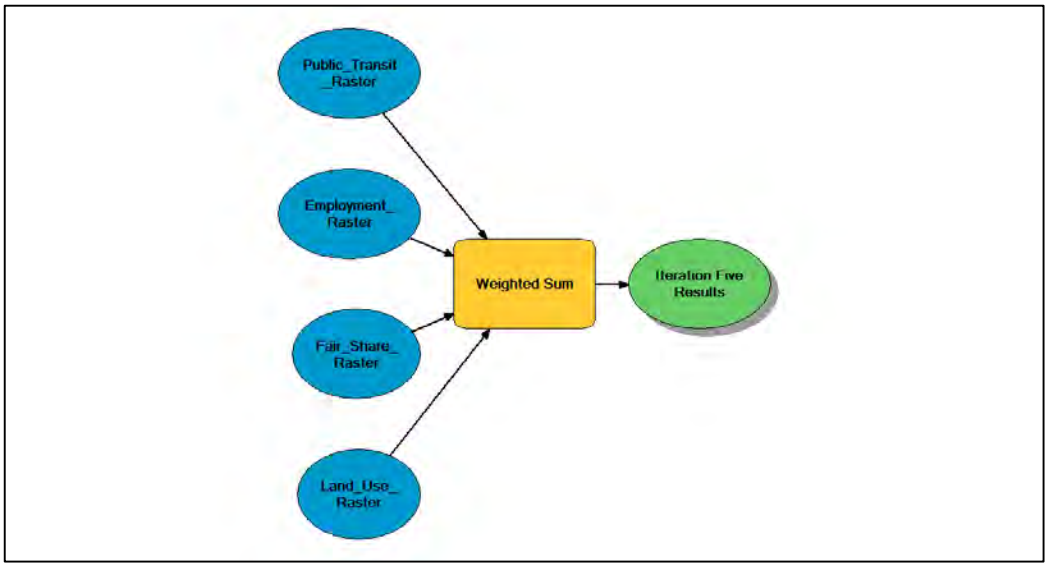

Figure 46 Model for Iteration Five of Site Suitability Analysis

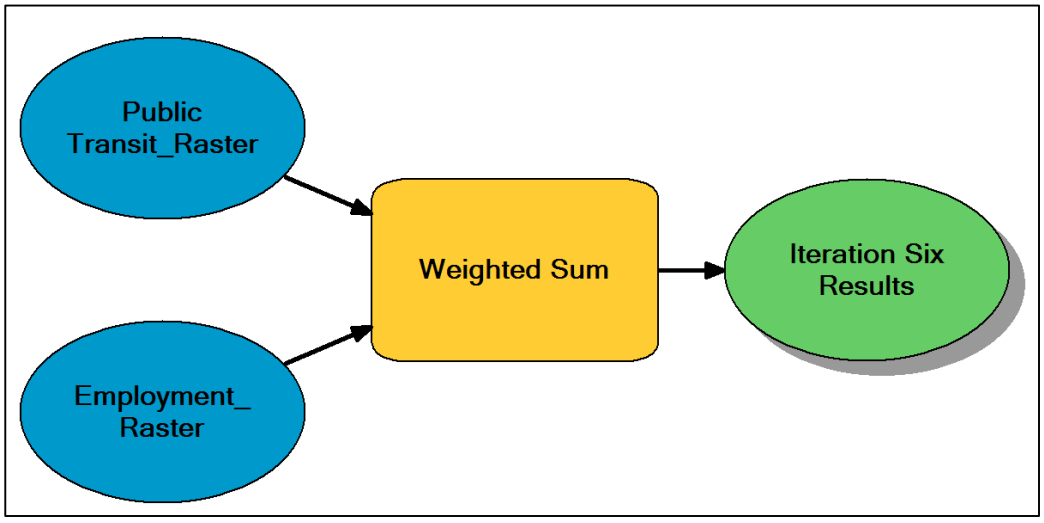

Figure 47 Model for Iteration Six of Site Suitability Analysis

Appendix H: Fair Share Analysis (Zoomed-In Area Figures)

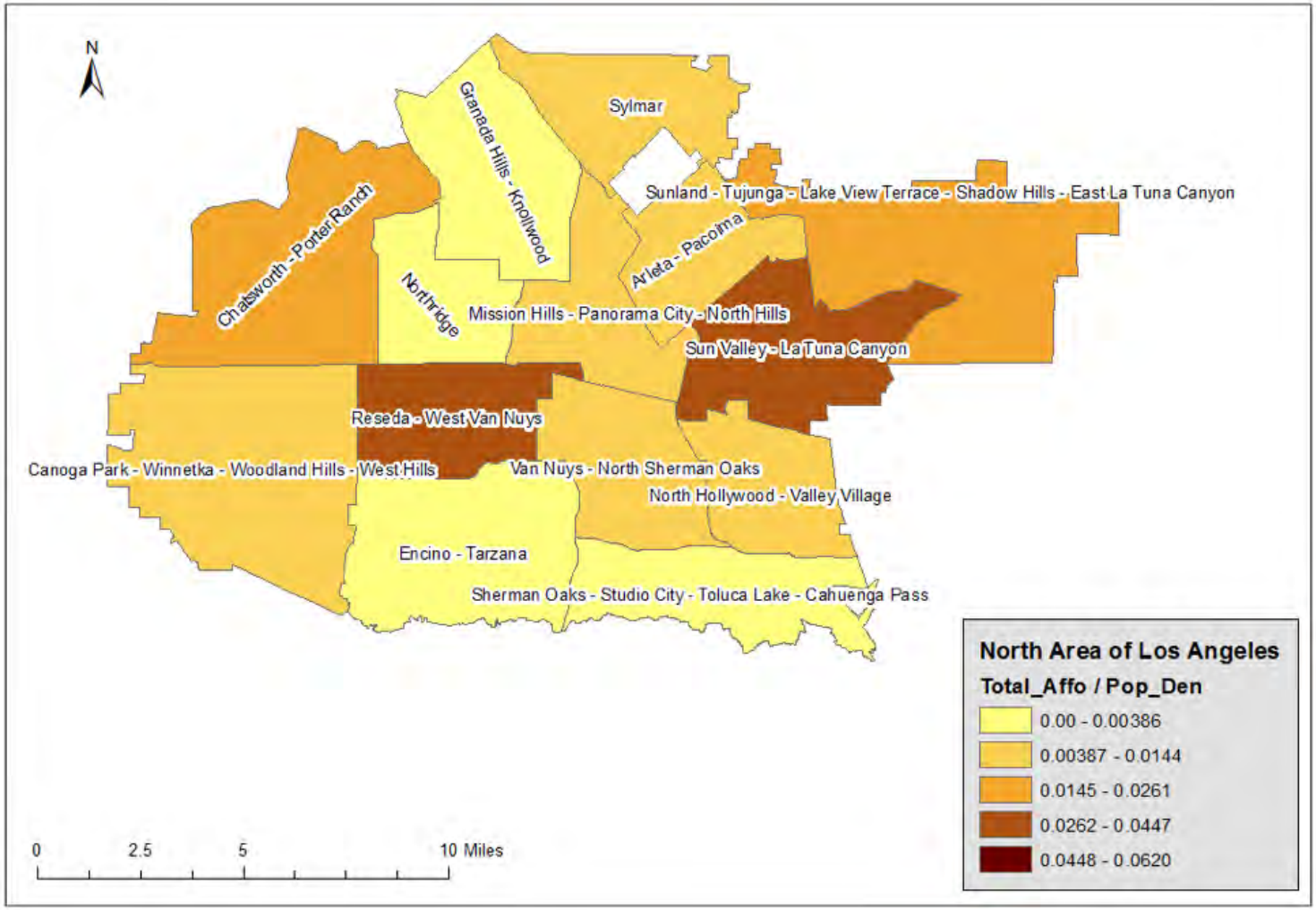

Figure 48 Fair Share of Affordable Housing by CPA, North Area of LA

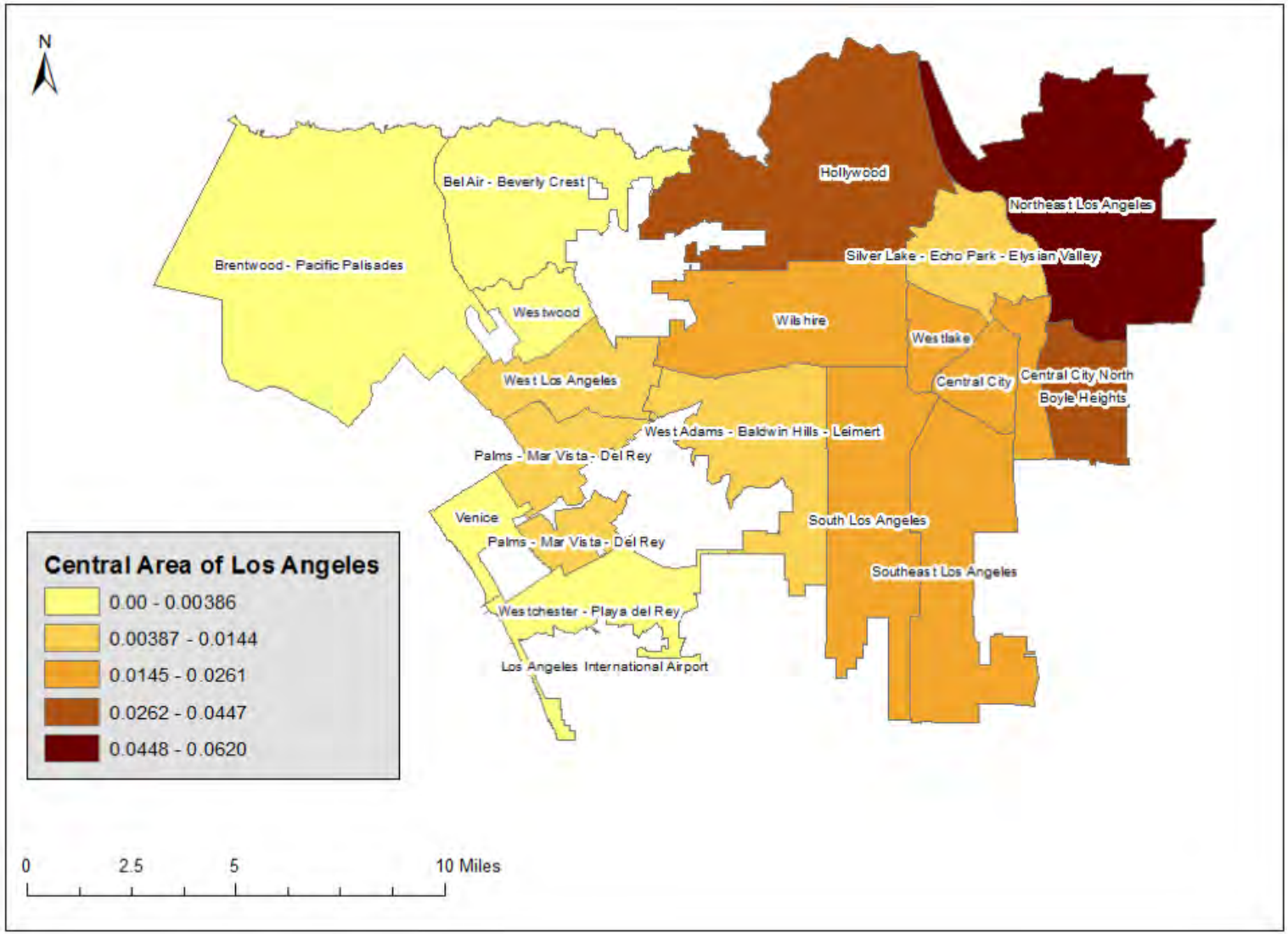

Figure 49 Fair Share of Affordable Housing by CPA, Central Area of LA

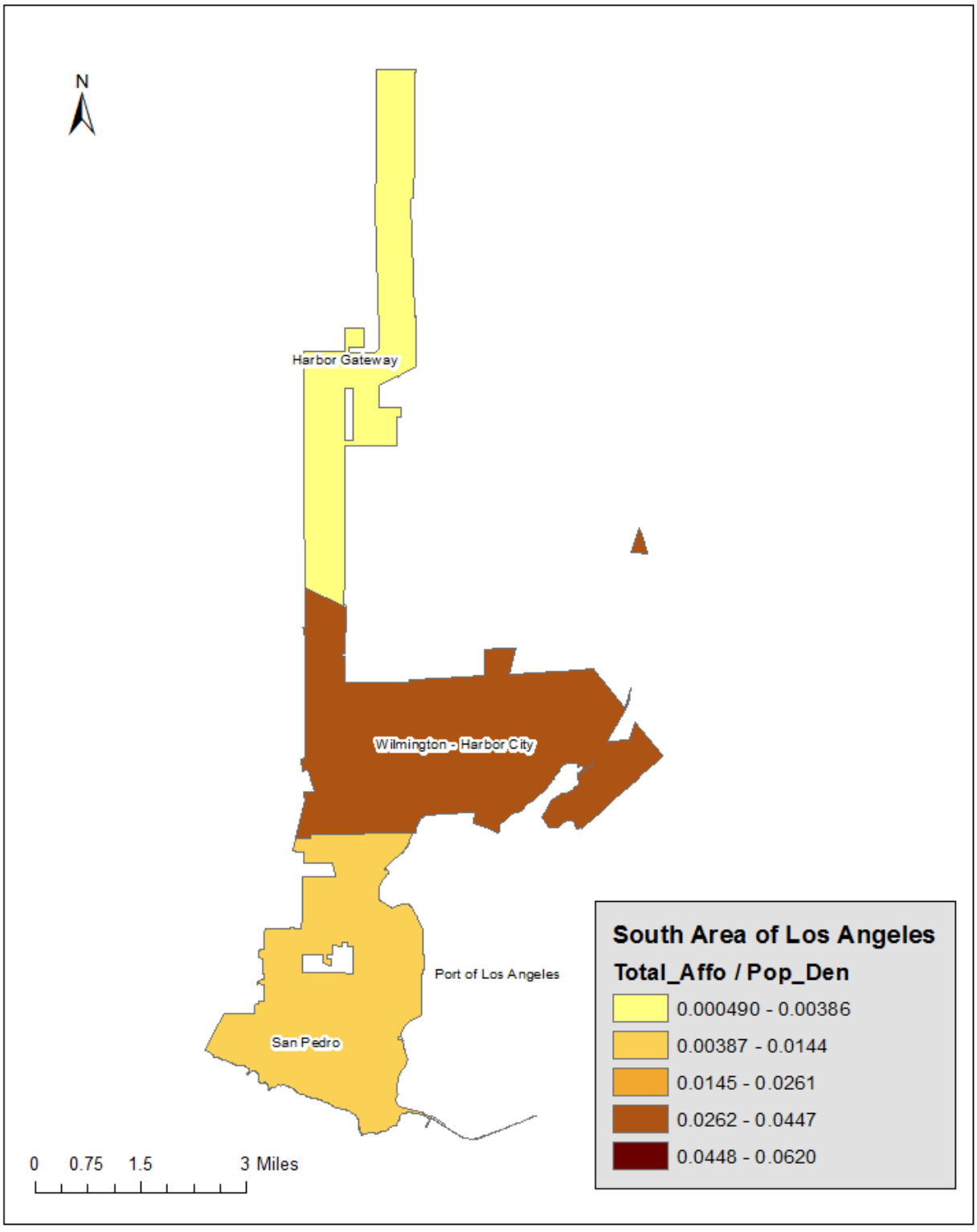

Figure 50 Fair Share of Affordable Housing by CPA, South Area of LA

Appendix I: Fair Share Ranking by Community Plan Area (2006-2013)

Rank	Community Plan Area	Area (sq. mi)	Total Population	Population Density	Total New Affordable Units	New Units by Population Density
1	**Northeast Los Angeles**	24.21	244,648	10,105	627	0.06205
2	**Hollywood**	25	207,703	8,308	371	0.04466
3	**Sun Valley-La Tuna Canyon**	20.09	90,332	4,496	180	0.04003
4	**Wilmington-Harbor City**	11.4	76,993	6,754	212	0.03139
5	**Boyle Heights**	6.67	84,403	12,654	393	0.03106
6	**Reseda-West Van Nuys**	12.08	109,991	9,105	271	0.02976
7	**Central City**	3.02	44,507	14,737	384	0.02606
8	**Wilshire**	13.97	290,247	20,776	489	0.02354
9	**Chatsworth-Porter Ranch**	25.69	101,016	3,932	88	0.02238
10	**Westlake**	3.17	116,182	36,650	759	0.02071
11	**Central City North**	2.57	23,484	9,138	180	0.01970
12	**Southeast Los Angeles**	15.72	288,991	18,384	349	0.01898
13	**South Los Angeles**	15.41	277,892	18,033	333	0.01847
14	**Sunland-Tujunga-Lake View Terrace-Shadow Hills-East La Tuna Canyon**	21.93	63,231	2,883	47	0.01630
15	**Mission Hills-Panorama City-North Hills**	11.69	144,668	12,375	178	0.01438
16	**Arleta-Pacoima**	10.53	108,280	10,283	136	0.01323
17	**North Hollywood-Valley Village**	10.64	142,637	13,406	173	0.01290
18	**Palms-Mar Vista-Del Rey**	9.02	114,647	12,710	148	0.01164
19	**Sylmar**	12.84	81,941	6,382	71	0.01113
20	**Van Nuys-North Sherman Oaks**	12.89	161,840	12,555	122	0.00972

Rank	Community Plan Area	Area (sq. mi)	Total Population	Population Density	Total New Affordable Units	New Units by Population Density
21	**West Adams-Baldwin Hills-Leimert**	13.61	177,892	13,071	119	0.00910
22	**Canoga Park-Winnetka-Woodland Hills-West Hills**	28.25	182,527	6,461	57	0.00882
23	**West Los Angeles**	7.06	77,215	10,937	90	0.00823
24	**San Pedro**	11.4	78,453	6,882	53	0.00770
25	**Silver Lake-Echo Park-Elysian Valley**	7.26	73,357	10,104	73	0.00722
26	**Brentwood-Pacific Palisades**	37.88	58,894	1,555	6	0.00386
27	**Sherman Oaks-Studio City-Toluca Lake-Cahuenga Pass**	13.59	80,725	5,940	16	0.00269
28	**Encino-Tarzana**	20.52	74,765	3,644	9	0.00247
29	**Venice**	3.21	39,884	12,425	28	0.00225
30	**Westchester-Playa del Rey**	13.77	55,403	4,023	5	0.00124
31	**Westwood**	3.9	55,115	14,132	17	0.00120
32	**Bel Air-Beverly Crest**	15.42	25,688	1,666	1	0.00060
33	**Harbor Gateway**	5.01	40,875	8,159	4	0.00049
34	**Northridge**	10.13	66,820	6,596	0	0
35	**Granada Hills-Knollwood**	18.07	63,530	3,516	0	0

Source: Annual Element Progress Reports (2006 – 2013) from the City of Los Angeles Department of City Planning and the 2014 Growth & Infrastructure Report from the City of Los Angeles Department of City Planning

Appendix J: Service Areas Analysis of Public Libraries Facilities

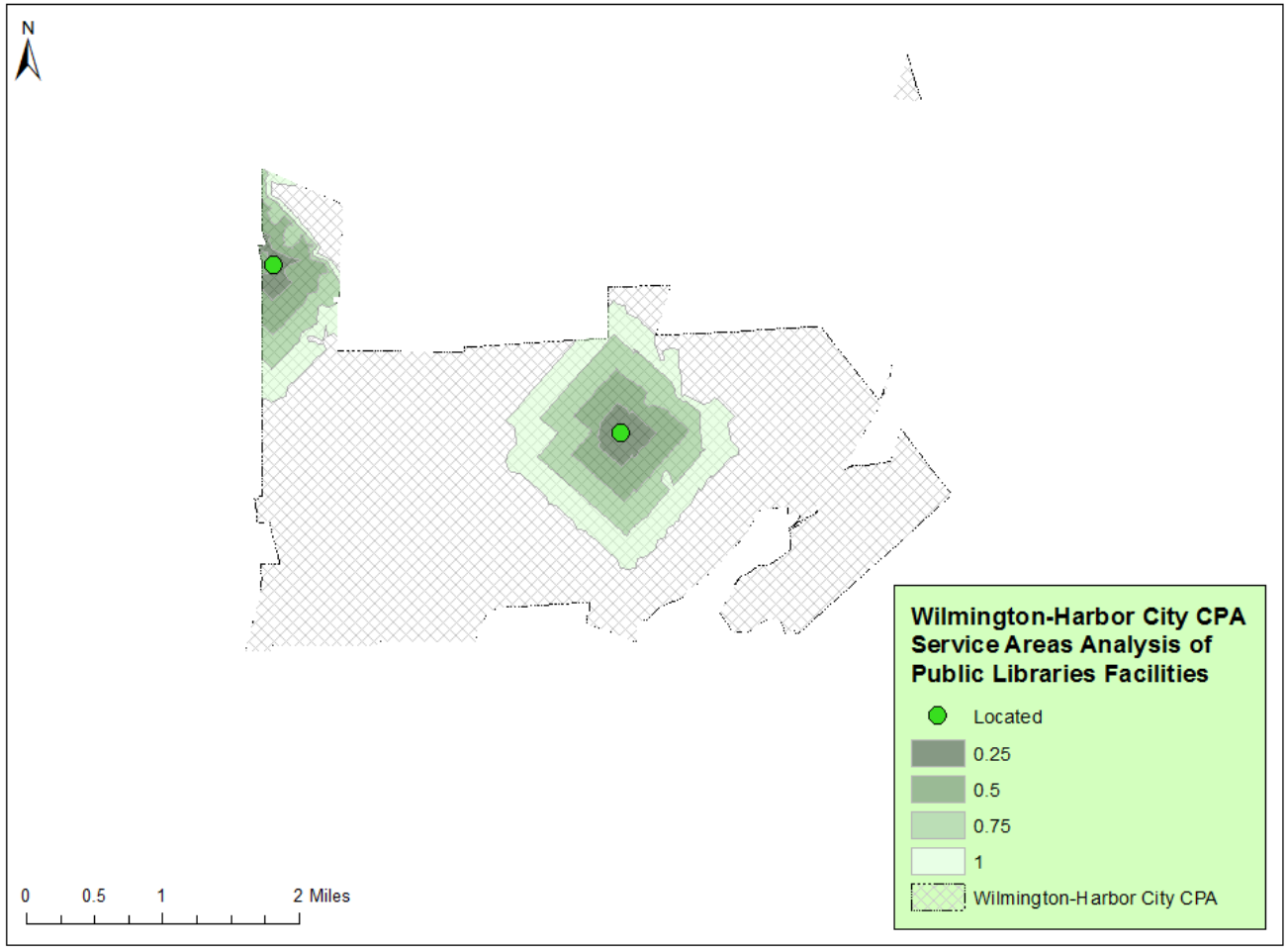

Figure 51 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Public Libraries in Wilmington-Harbor City CPA

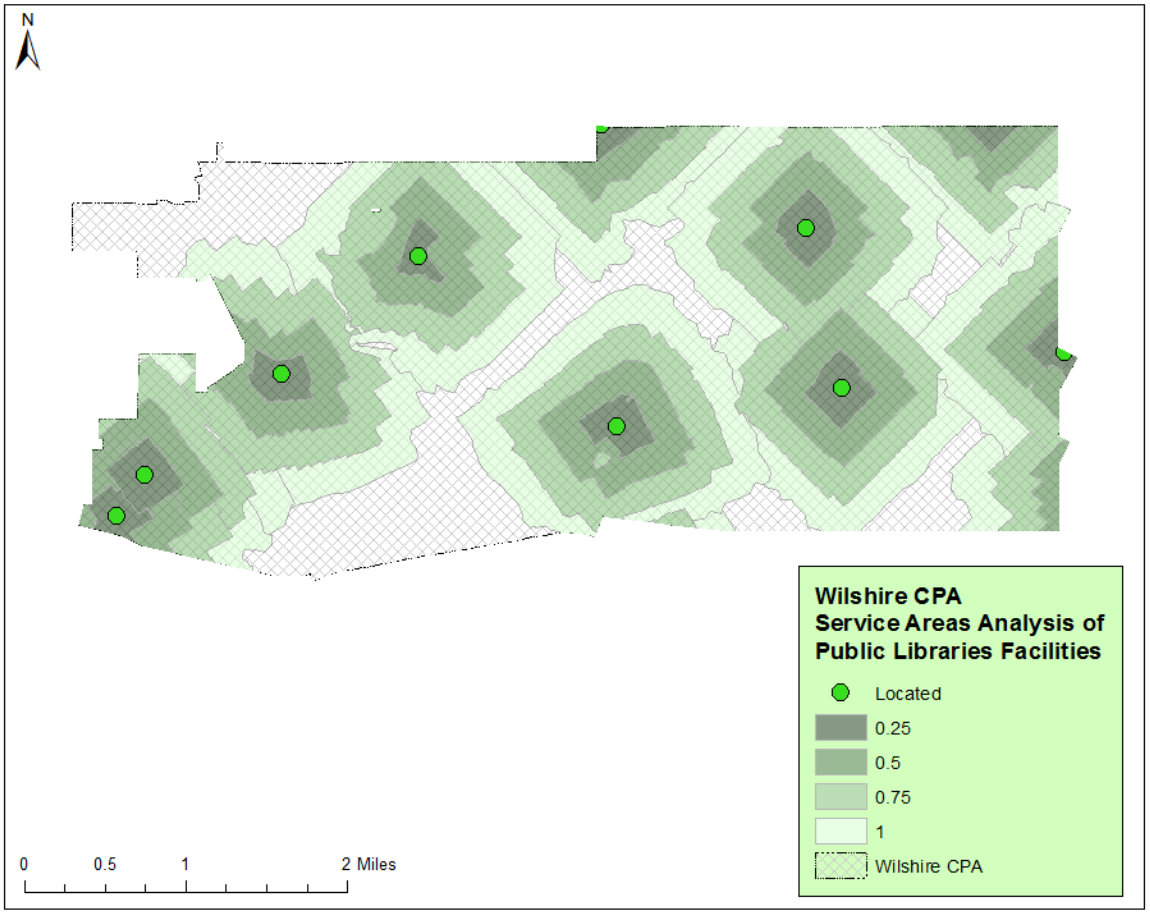

Figure 52 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Public Libraries in Wilshire CPA

Appendix K: Service Areas Analysis of Hospitals and Medical Centers Facilities

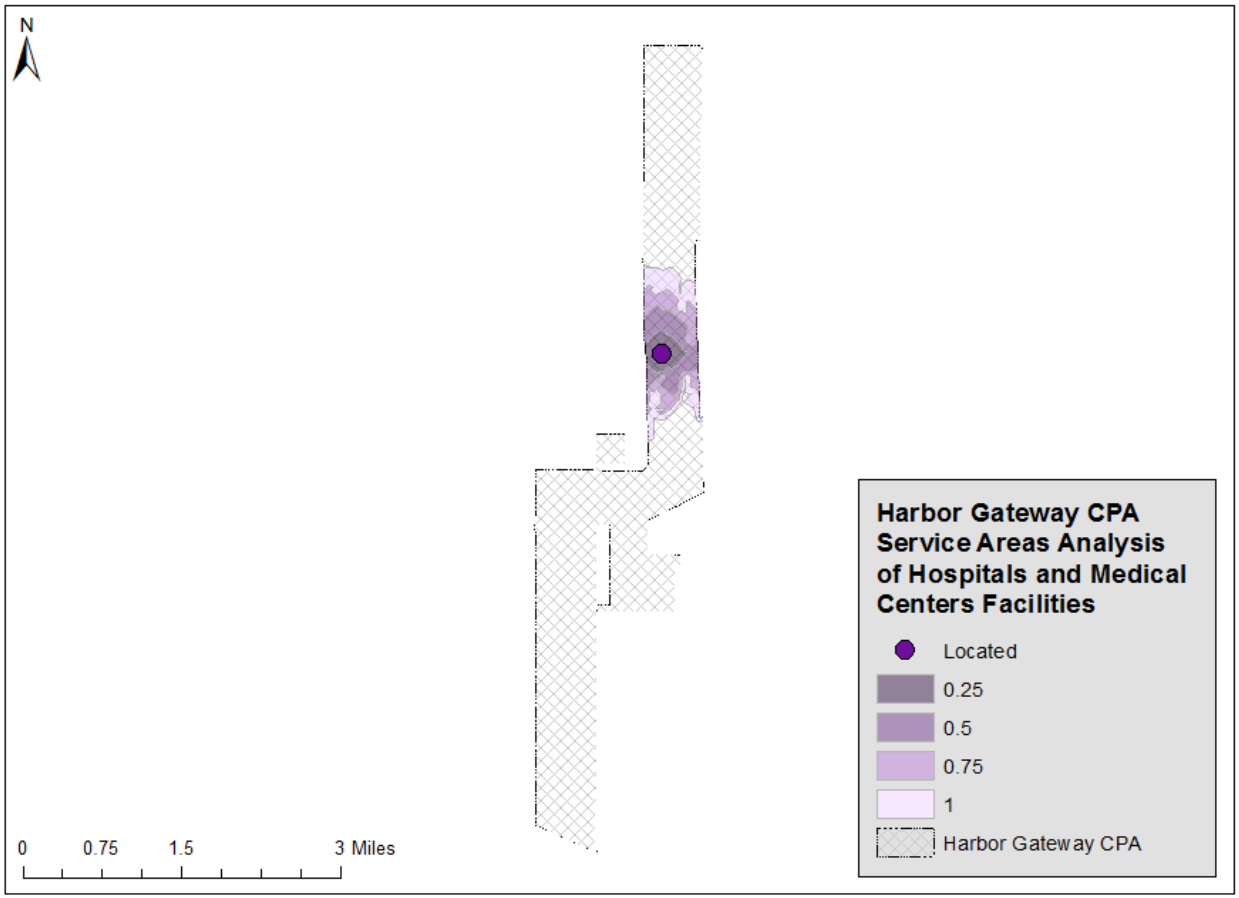

Figure 53 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Hospitals and Medical Centers in Harbor Gateway CPA

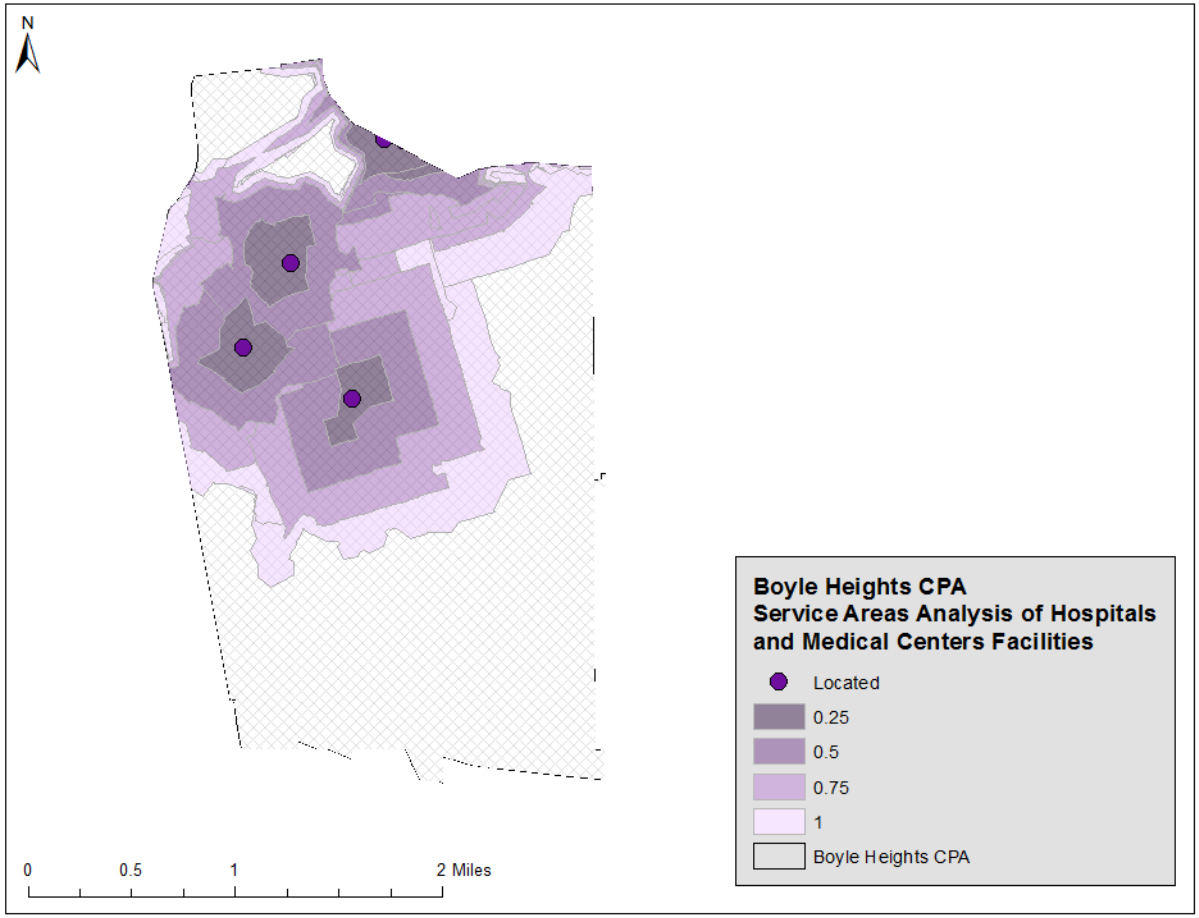

Figure 54 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Hospitals and Medical Centers in Boyle Heights CPA

Appendix L: Service Areas Analysis of Health Centers Facilities

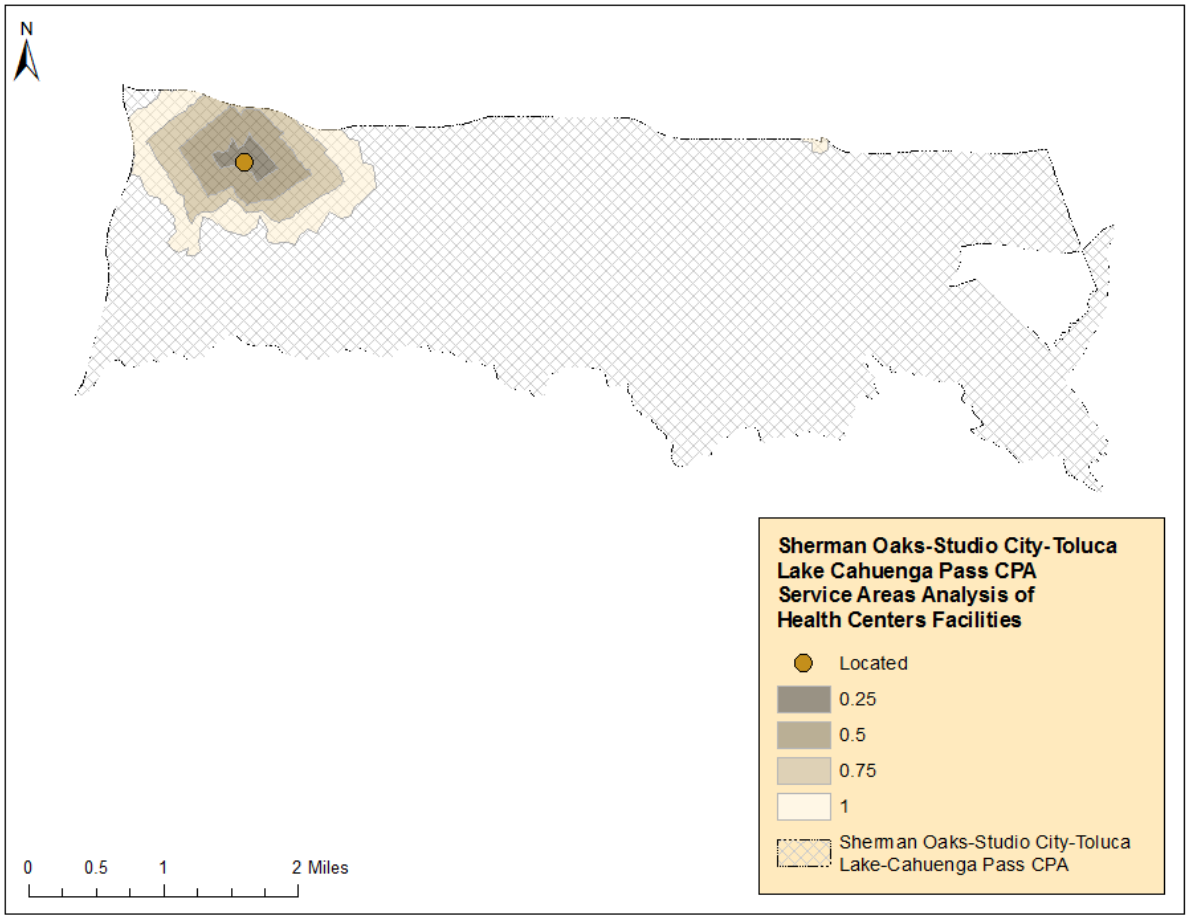

Figure 55 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Health Centers in Sherman Oaks-Studio City-Toluca Lake-Cahuenga Pass CPA

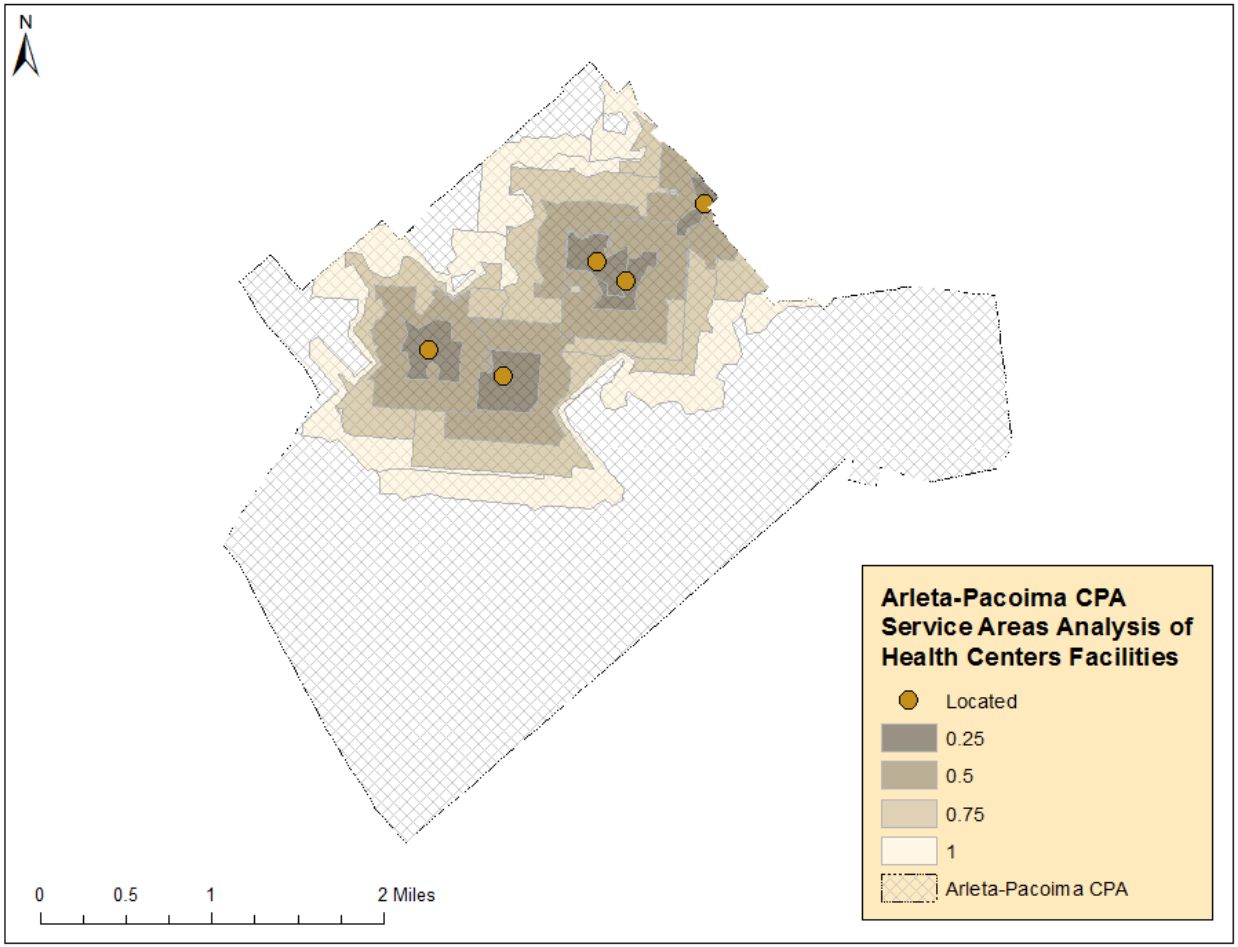

Figure 56 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Health Centers in Arleta-Pacoima CPA

Appendix M: Service Areas Analysis of Health Clinics Facilities

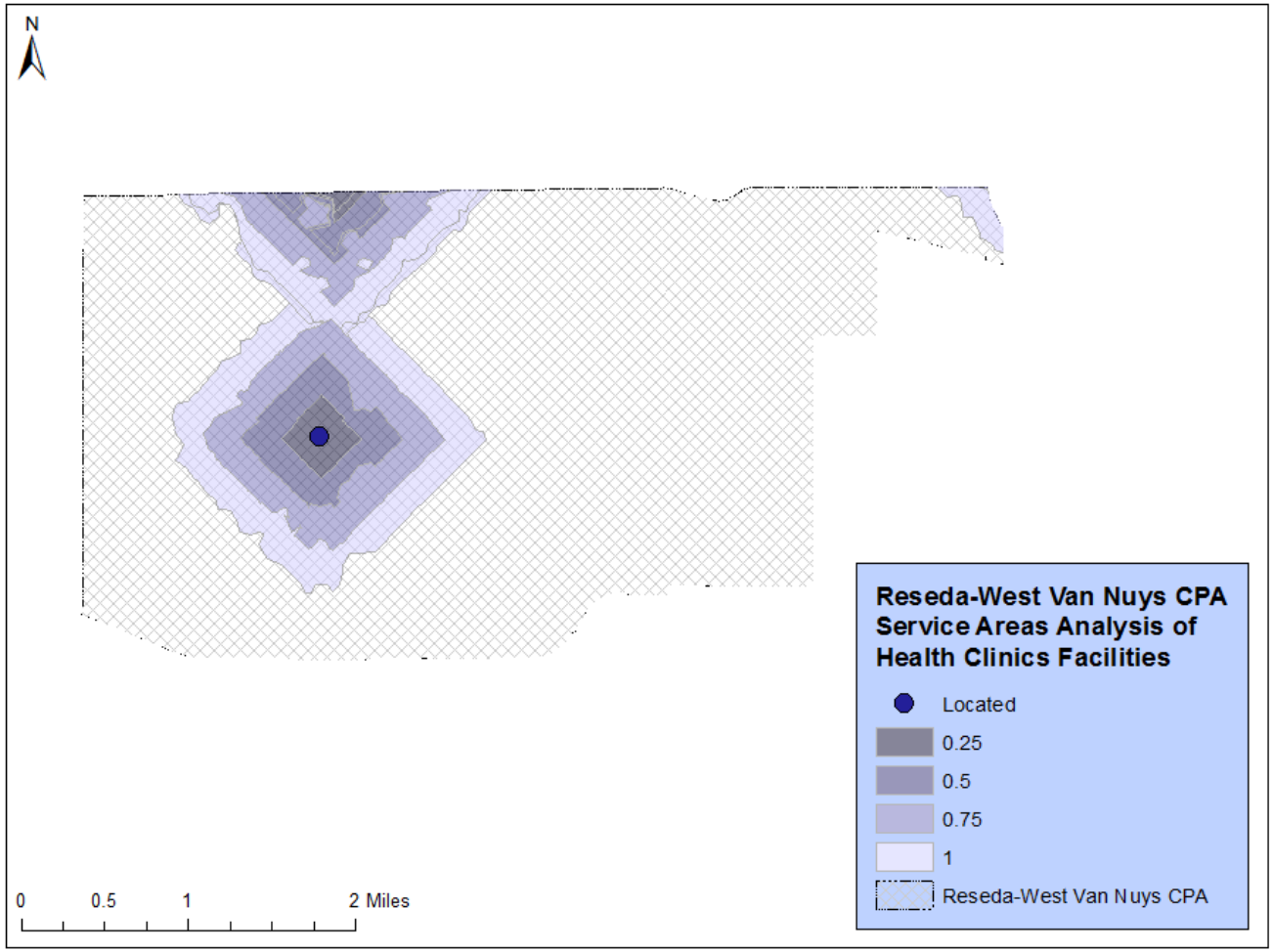

Figure 57 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Health Clinics in Reseda-West Van Nuys CPA

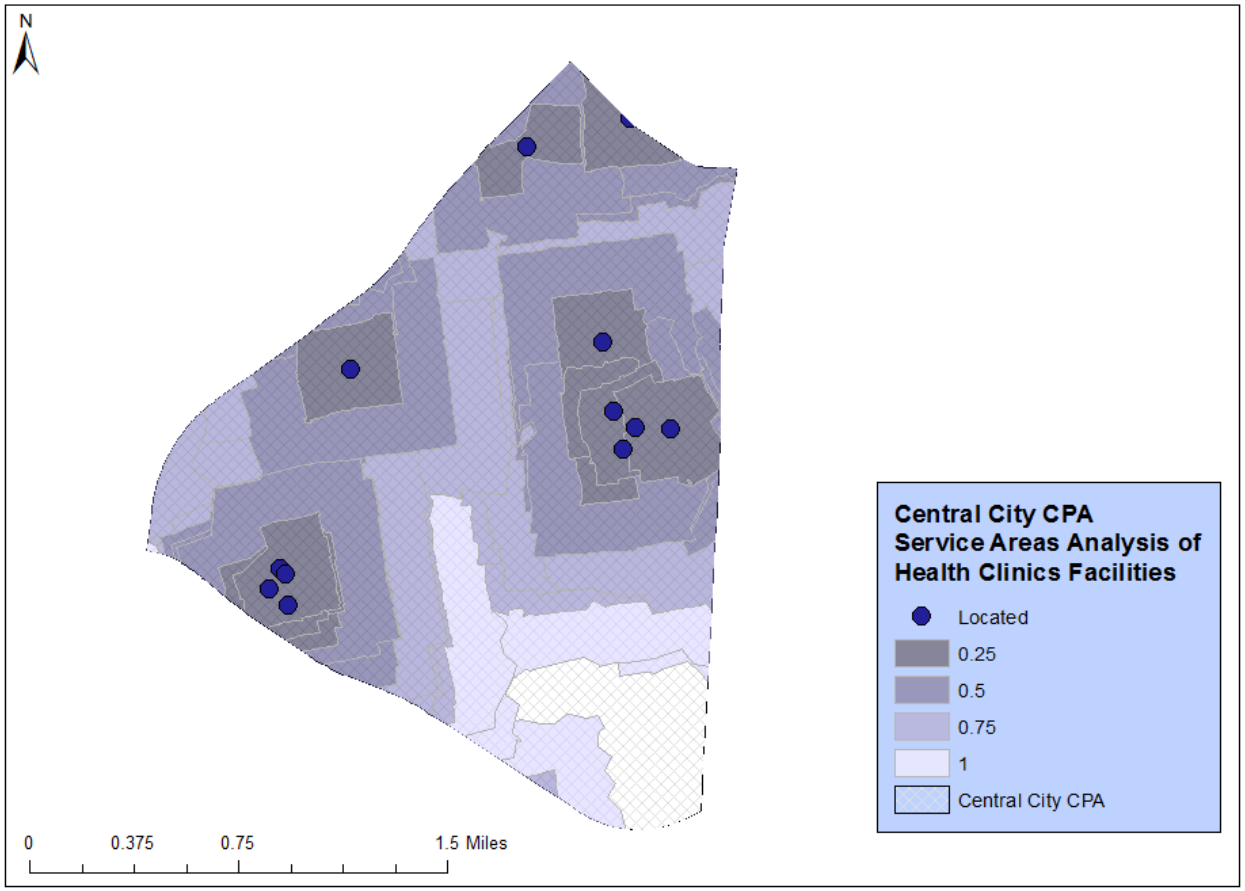

Figure 58 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Health Clinics in Central City CPA

Appendix N: Service Areas Analysis of Farmers' Markets Facilities

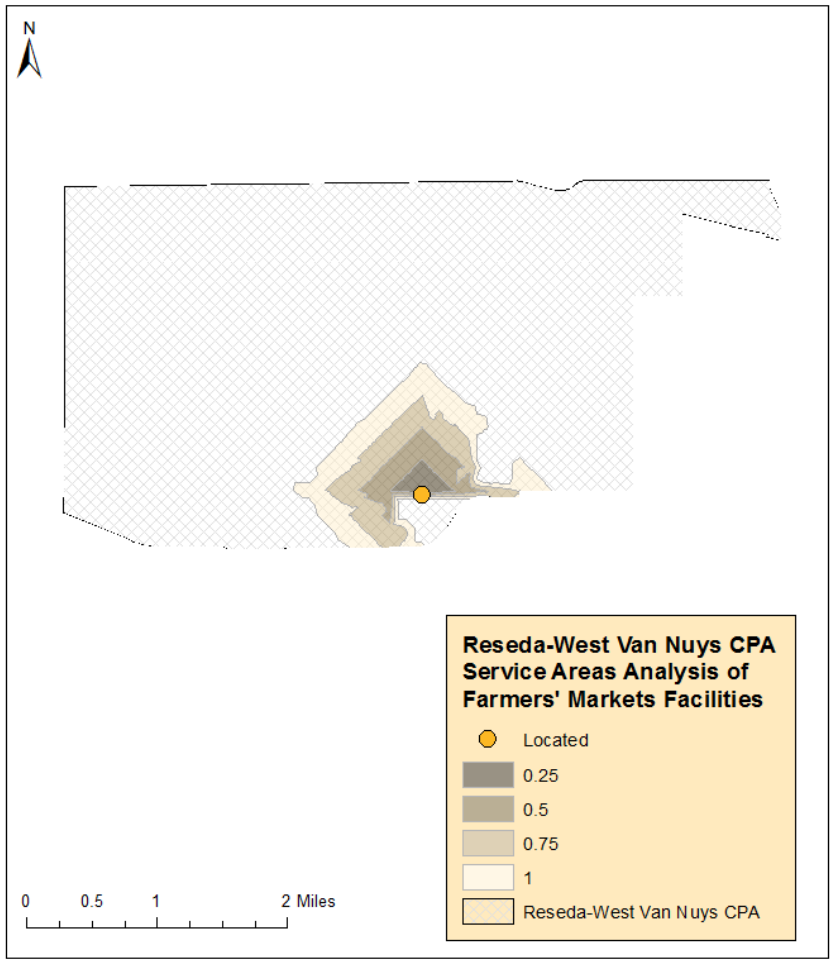

Figure 59 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Farmers' Markets in Reseda-West Van Nuys CPA

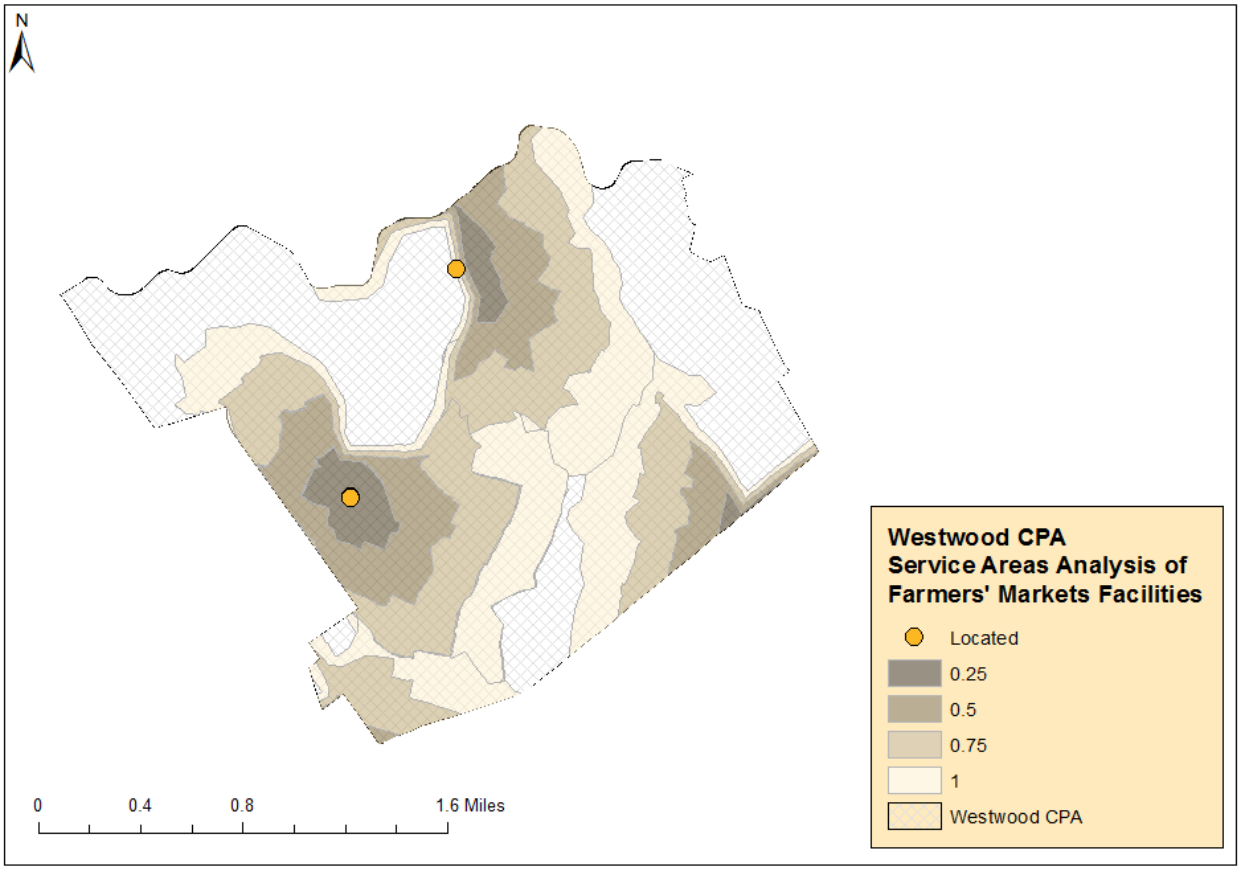

Figure 60 Service Areas within 0.25 mi, 0.50 mi, 0.75 mi, and 1 mile of Farmers' Markets in Westwood CPA

Appendix O: Site Suitability Analysis Results (Zoomed-In Area Figures)

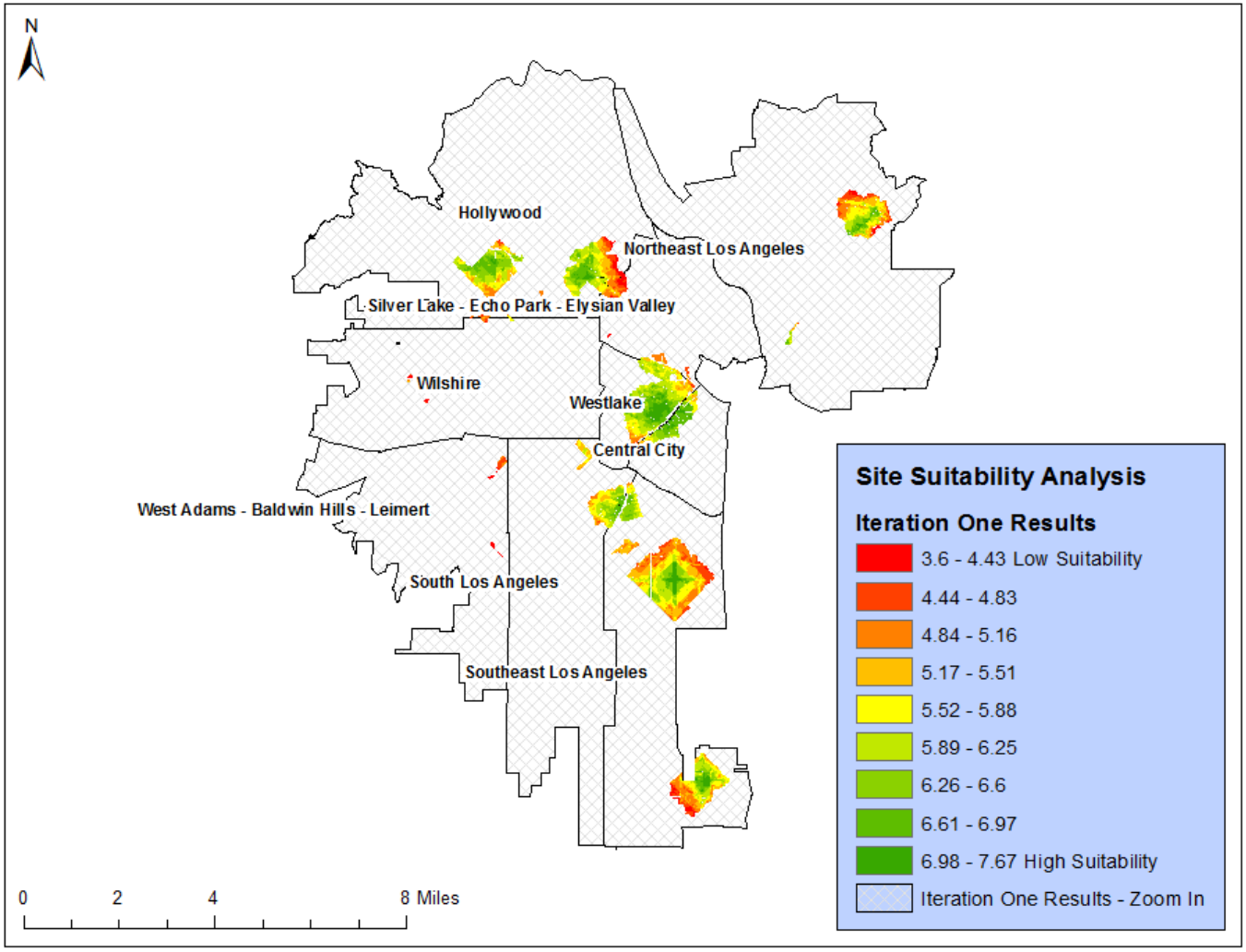

Figure 61 Site Suitability Analysis for Iteration One in Central Area of Los Angeles

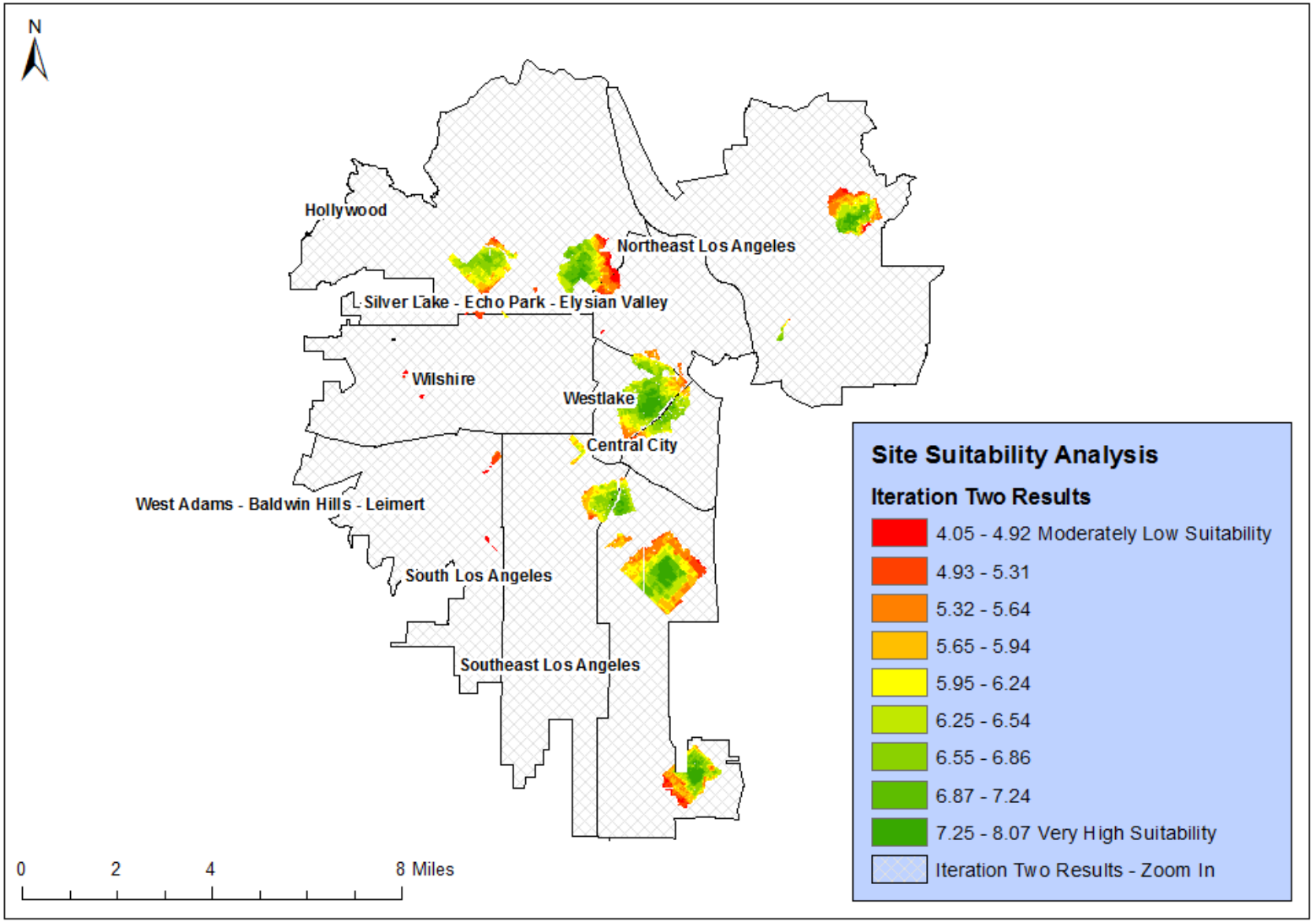

Figure 62 Site Suitability Analysis for Iteration Two in Central Area of Los Angeles

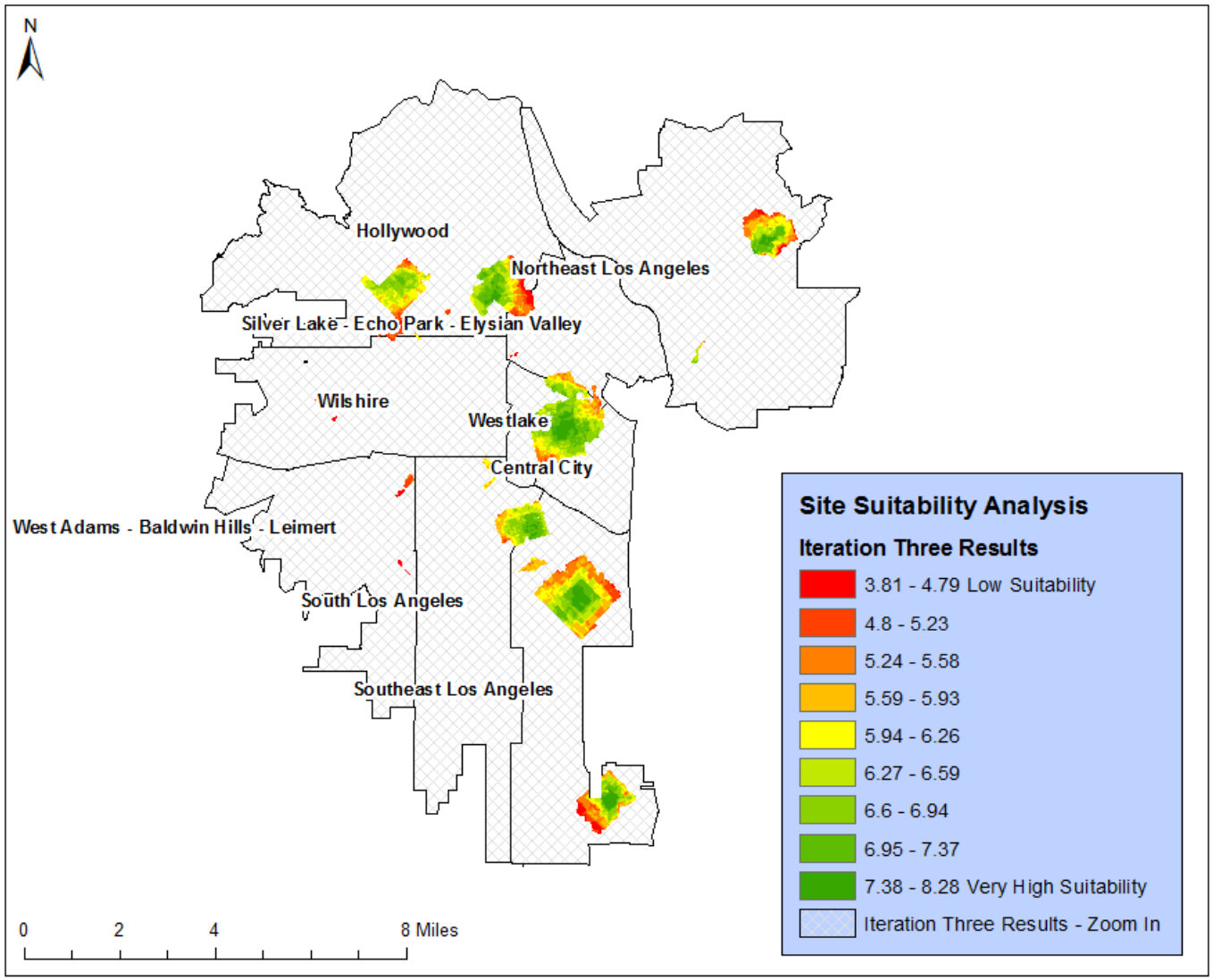

Figure 63 Site Suitability Analysis for Iteration Three in Central Area of Los Angeles

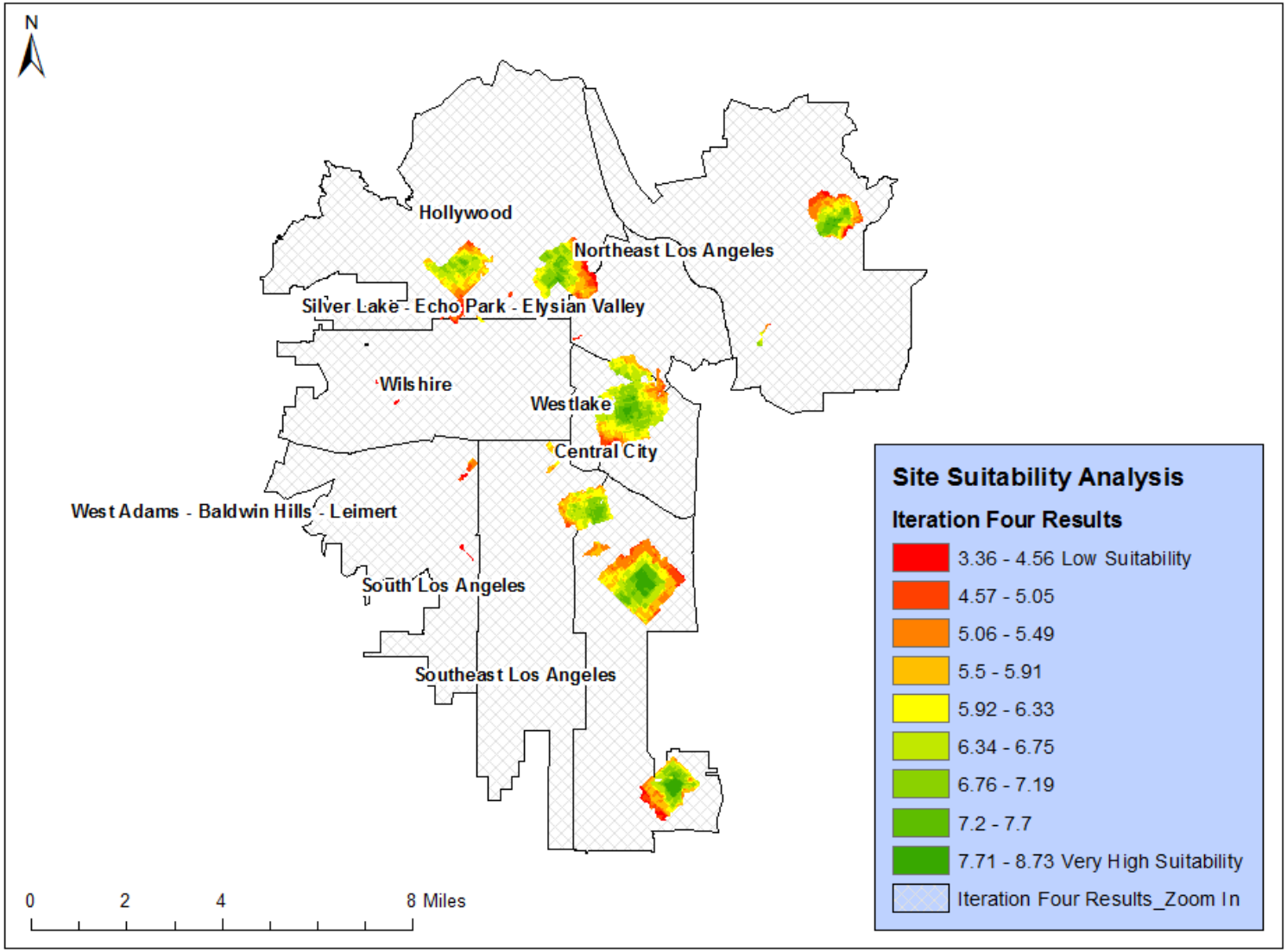

Figure 64 Site Suitability Analysis for Iteration Four in Central Area of Los Angeles

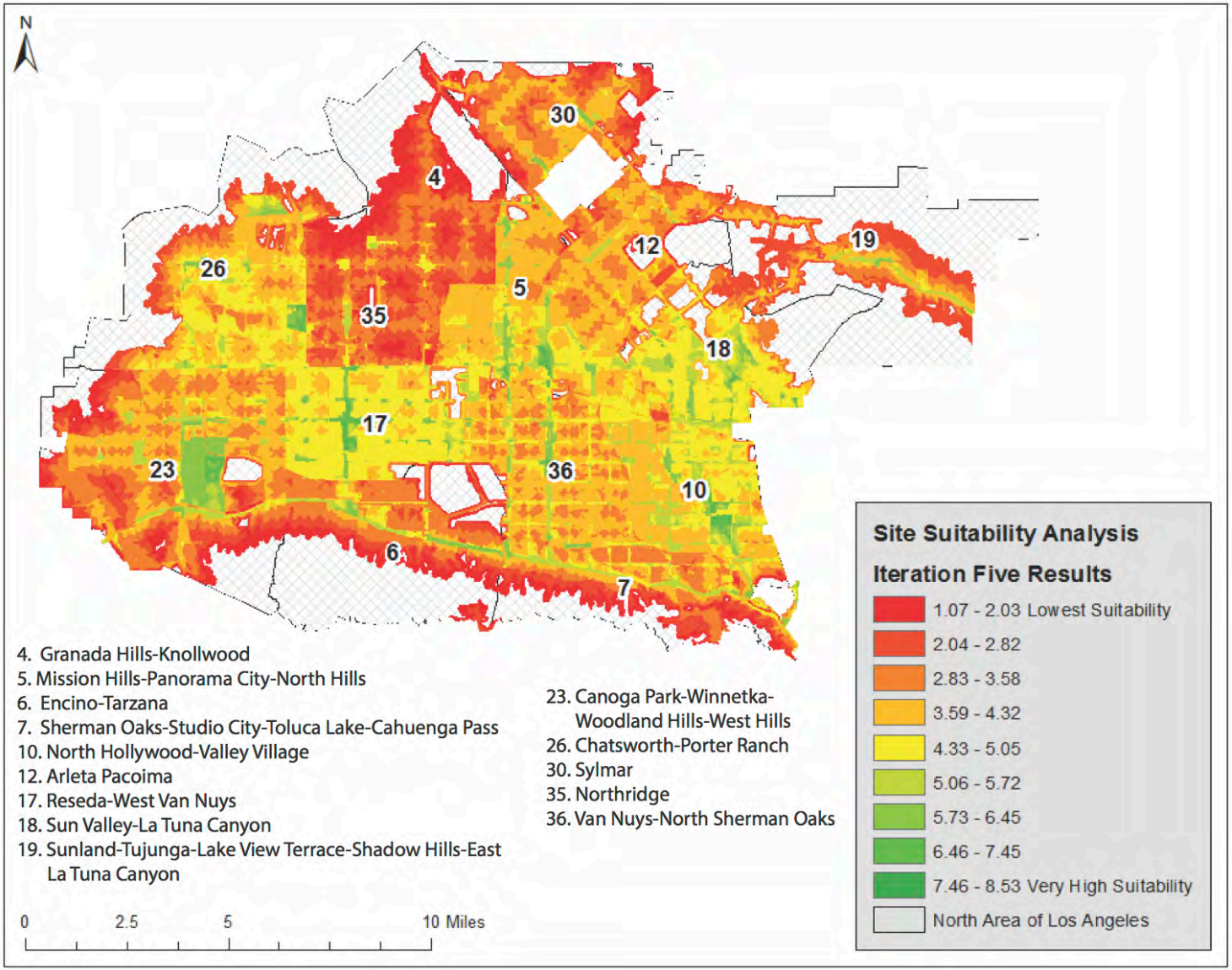

Figure 65 Site Suitability Analysis for Iteration Five, North Area of LA

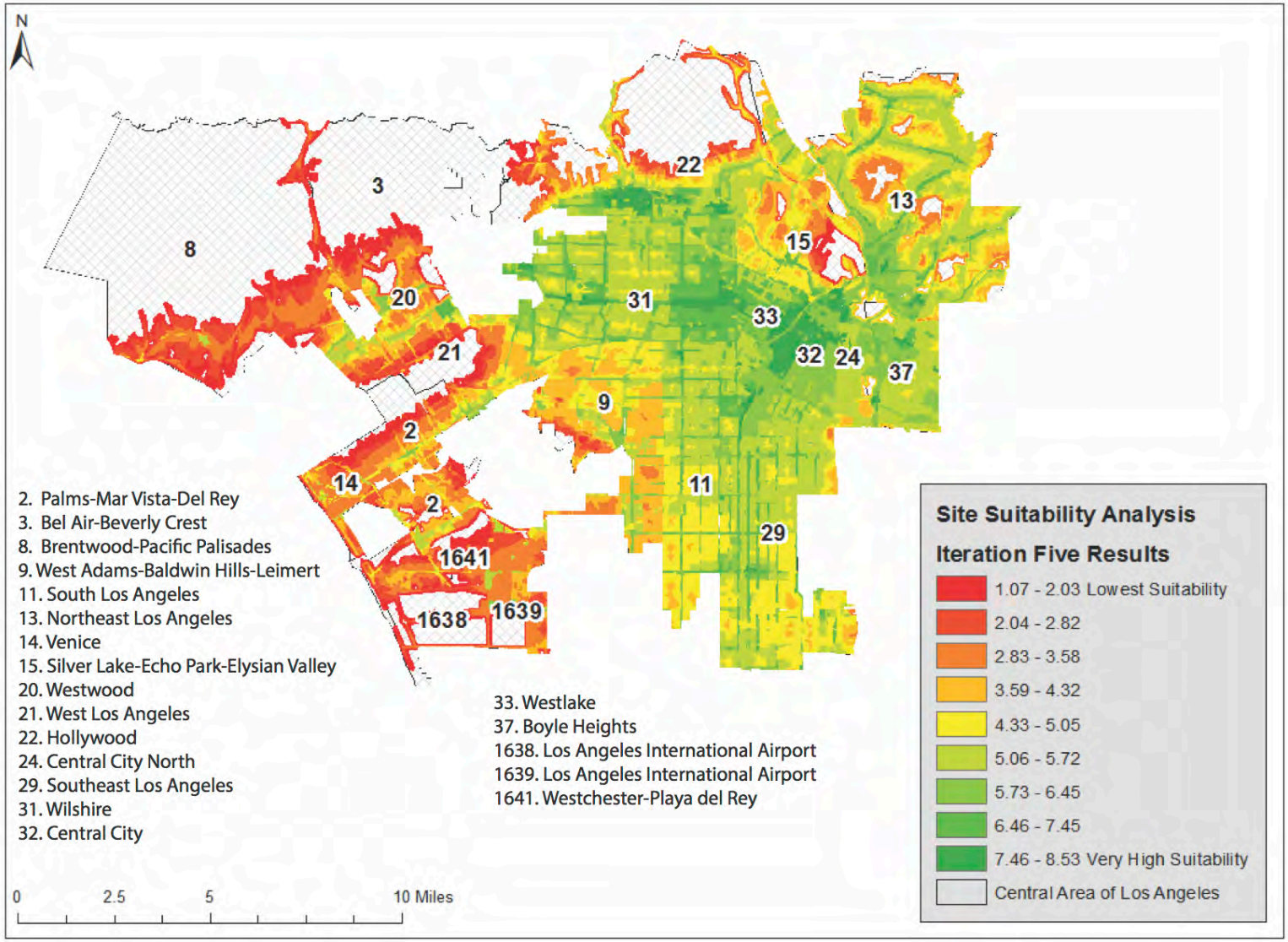

Figure 66 Site Suitability Analysis for Iteration Five, Central Area of LA

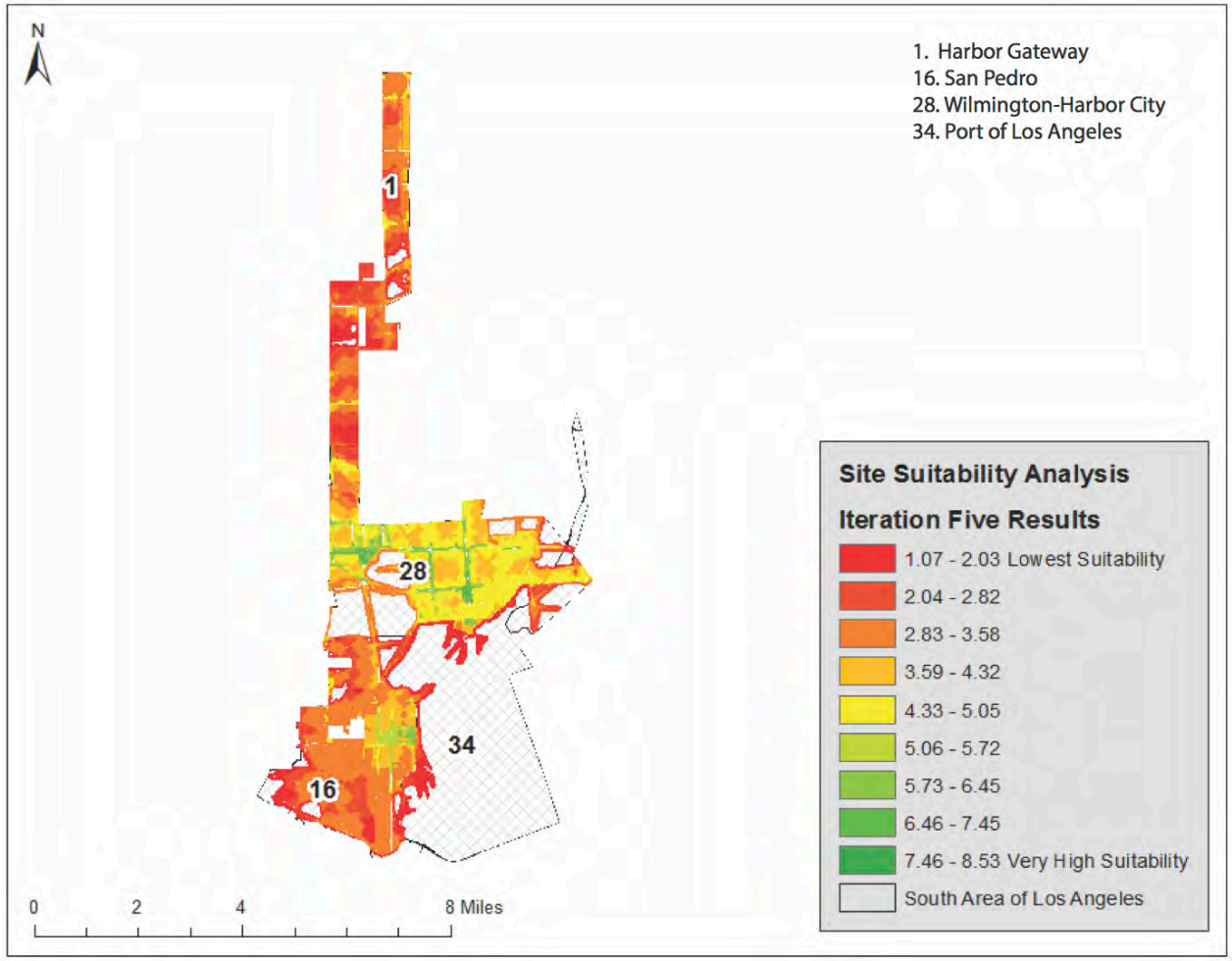

Figure 67 Site Suitability Analysis for Iteration Five, South Area of LA

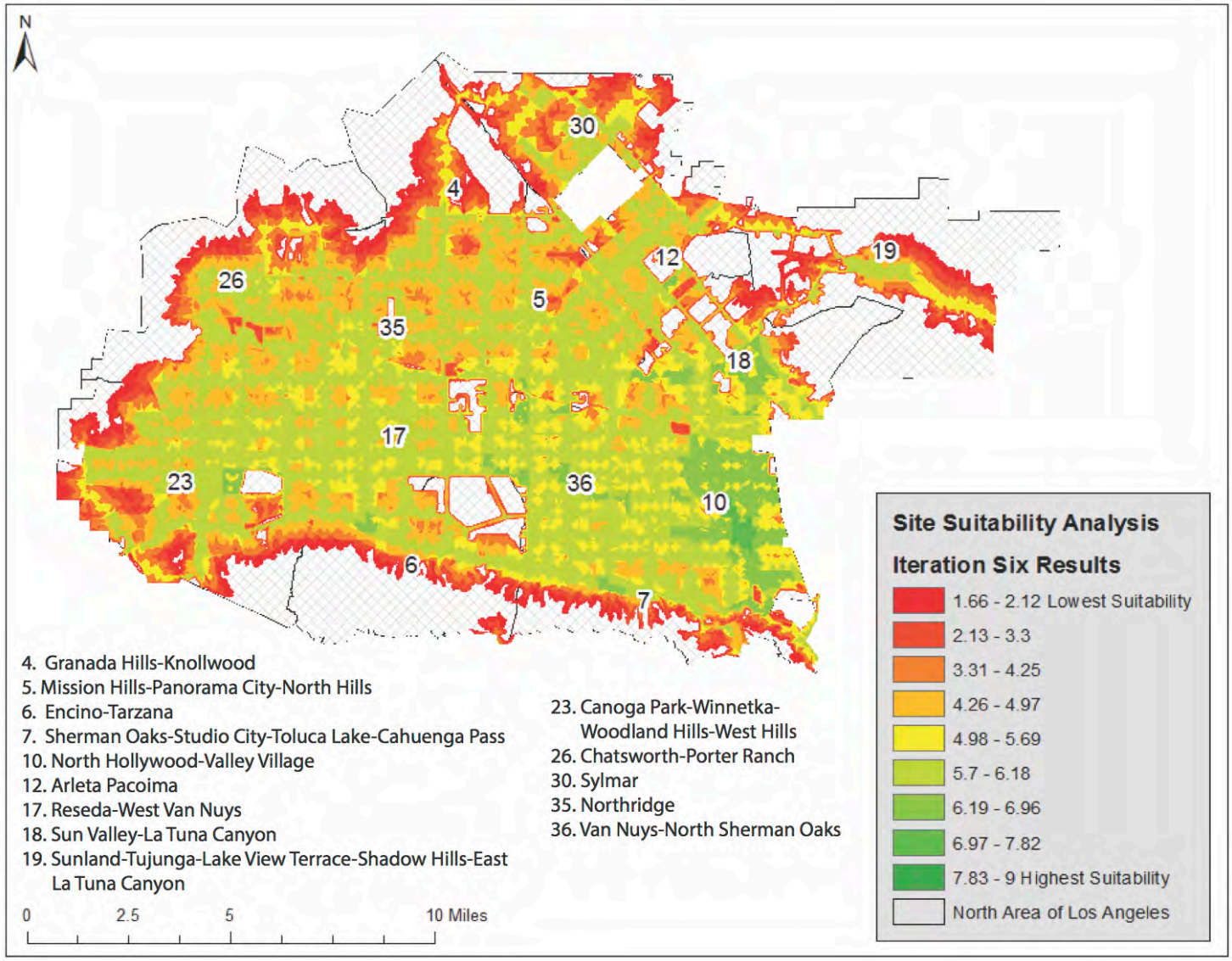

Figure 68 Site Suitability Analysis for Iteration Six, North Area of LA

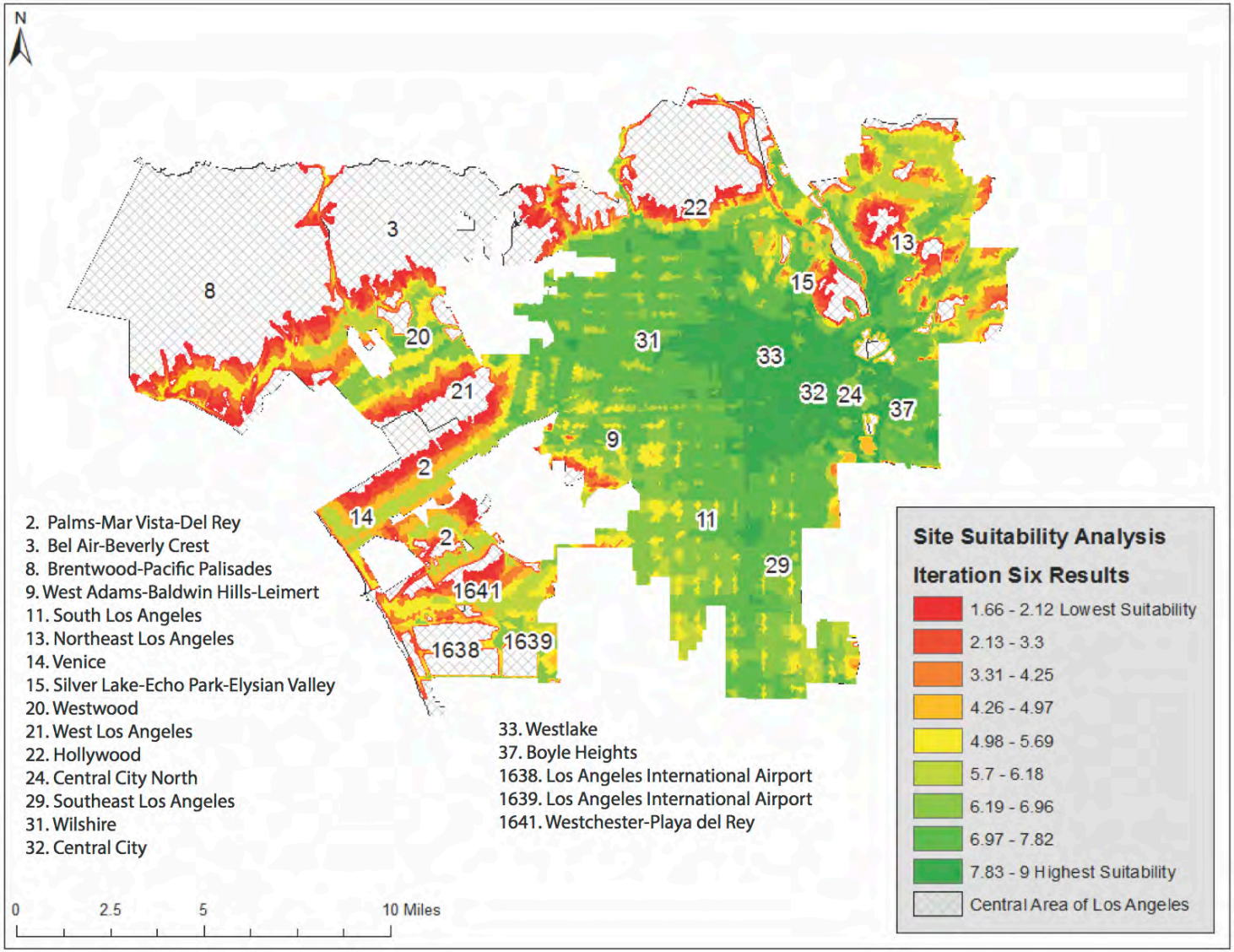

Figure 69 Site Suitability Analysis for Iteration Six, Central Area of LA

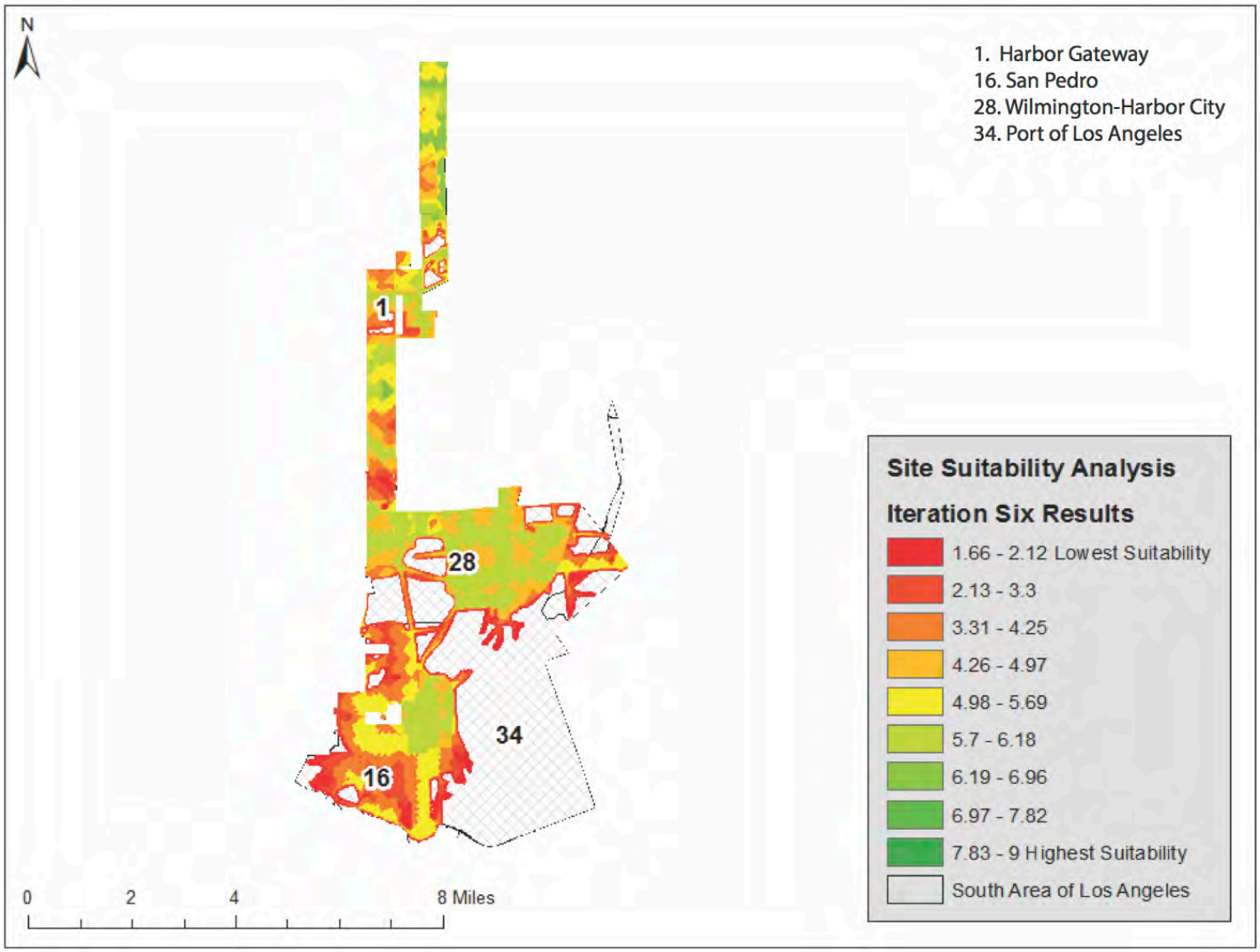

Figure 70 Site Suitability Analysis for Iteration Six, South Area of LA