Transportation Costs: A Case Study in the City of Lancaster, CA

By

Trevin W. Barber B.A.

A Thesis Submitted to the Department of Public Policy & Administration
California State University Bakersfield
In Partial Fulfillment for the Degree of
Masters of Public Administration
Summer 2012
Transportation Costs: A Case Study in the City of Lancaster, CA

By

Trevin W. Barber B.A.

This thesis or project has been accepted on behalf of the Department of Public Policy & Administration by their supervisory committee:

B.J. Moore Ph.D.

Jinping Sun Ph.D.

Date

10/9/2012

10/10/2012
Executive Summary

Infrastructure financing has become a major problem for American cities. The American Society of Civil Engineers estimates that current level of underinvestment in U.S. infrastructure will end up costing each family in the country about $10,600 between 2010 and 2020. One of the causes of this problem is low-density suburban sprawl. Indifference toward expanding residential development outside of existing urban zones has lead to rapid expansions of exurbs. The net effect is a decrease in the road miles per capita and an increase in costs. Sprawl and its financial affects are evident in many cities and suburbs today, such as the City of Lancaster.

Twenty years ago the City of Lancaster was a small community that primarily served the aerospace and agricultural industries. Over the previous decades the City of Lancaster has diversified by accommodating residents that work in the LA Basin and Bakersfield. Lancaster is now a bedrock community with ample low-density suburban neighborhoods. This shift in land use is taxing the general fund through street maintenance. To date the City of Lancaster does not measure the impact of sprawl on the cost of road maintenance in planning or budget documents. This research reports on the costs associated with certain patterns of neighborhoods to conclude on what is the cheapest pattern for roads and provides recommendations for transforming Lancaster into a City with cheaper roads.

Land patterns that integrate multi-story buildings and shared-wall-dwelling units use on average one half the road miles per capita than the typical low-density suburban neighborhood in Lancaster. Compact and high-density neighborhoods can reduce the road maintenance cost of the governing municipality by a factor of 2:1. This study finds that The City of Lancaster is comprised of mostly “Urban Residential” Zones, 65%. Households within the City pay on average $1,334.32 per lane mile for neighborhood roads. By Changing the General Plan to focus
on mix-use and multiple residential dwelling units that average could drop to $618.14, a 54% decrease.

Given these findings, it is recommended that Lancaster expand the boundaries of the Downtown Specific plan, and incorporate features of that plan in other areas, in order to encourage the transformation of the city into a more traditional city.
# Table of Contents

Executive Summary ........................................................................................................................................... i
Table of Contents ........................................................................................................................................ iii
List of Tables .................................................................................................................................................... v

Chapter 1 Background ........................................................................................................................................ 1
  Problem Statement ........................................................................................................................................ 6
  Purpose of Study ......................................................................................................................................... 6
    Primary research question ...................................................................................................................... 7
  Importance of Study ................................................................................................................................. 7

Chapter 2 Review of Literature ..................................................................................................................... 9
  Public Budgeting Theory ......................................................................................................................... 9
  Sprawl Theory and Definition ................................................................................................................. 10
  Planning Theory ....................................................................................................................................... 12
  What Causes Sprawl? ............................................................................................................................... 14
  How to develop medium-density traditional communities ........................................................................... 17

Chapter 3 Methods ......................................................................................................................................... 20
  Defining Sprawl ....................................................................................................................................... 20
  Data Collection ....................................................................................................................................... 21
  Data Analysis ........................................................................................................................................... 23
  IRB Authorization ..................................................................................................................................... 24
  Limitations of the Research ......................................................................................................................... 24

Chapter 4 Findings .......................................................................................................................................... 26
  City Plan ................................................................................................................................................... 26
  Maintenance Costs ..................................................................................................................................... 32
  Land use and Cost ....................................................................................................................................... 34

Chapter 5 Summary ...................................................................................................................................... 36
  Form Alternatives ...................................................................................................................................... 37
  Privatization Alternatives ......................................................................................................................... 37
  Urban Growth Boundary & Concurrency Requirements .............................................................................. 38
List of Tables

Figure 1: City of Lancaster City Plan Analysis ................................................................. 26
Figure 2: Box Store Aerial .............................................................................................. 28
Figure 3: General Plan .................................................................................................... 28
Figure 4: Land Use Analysis .......................................................................................... 30
Figure 5: Urban Residential Sample .............................................................................. 29
Figure 6: Neighborhood Plan Statistics ......................................................................... 30
Figure 7: Neighborhood Aerial #3 ................................................................................ 31
Figure 8: Neighborhood Aerial #4 ................................................................................ 31
Figure 9: Direct Maintenance Costs ............................................................................. 33
Figure 10: Neighborhood Cost Statistics ...................................................................... 34
The creation of the affordable automobile allowed the majority of the United States population access to personal transportation and incredible mobility. Today, the U.S. is the most mobile country with each citizen traveling 20,000 miles (Center for Sustainable Systems, 2011) a year with 68% of people living outside of city centers (PewResearchCenter Publications, 2009). The introduction of high mobility into the American economy produced many benefits including an increase in economic efficiency as measured by the G.D.P. (Google). In addition per capita income has increased by seven times since the introduction of mass production of the automobile and although there have been other technological innovations that have contributed to this increase, the use of the combustion engine is largely to blame (Center for Automotive Research, 2010).

Increased per capita income and access to personal transportation encouraged development of single-family residential homes outside of the urban core. Before the affordable automobile, low-moderate income earners had to live within walking distance of work. The automobile made it possible for low-income workers to purchase cheap land outside the city and then drive to work and other necessary destinations such as grocery stores and hospitals. Essentially the affordable automobile broke down market barriers for low-moderate income earners allowing the majority of the population the option to live in single-family homes, provided there was a public road.

The automobile is important to land use development because the automobile gave residents the ability to pick where they wanted to live. In the 1920’s only 40% of the population owned their own home; today it is around 60%. Consumers fled the urban centers for some elbow room, fresh air, and cheap land in rural areas or non-urban areas. This is a significant shift
to note because it means that the majority shifted from not having cars to having cars. This swing in the consumer demographics had an impact on land use patterns in that it encouraged sprawled development. The migration from urban to suburban living decompressed cities and turned them over to blight.

Today, older suburbs are the new urban core. Suburbs are increasingly crowded, congested and decaying just like the urban cities were 50 years ago. Suburbs have spawned their own suburbs (exurbs) as residents continue to move to escape the decay, congestion, and increasing housing prices found in urban and suburban centers (Guide to California Planning Third Edition) (Jaffe, 2012). Recent demographic research by the Urban Institute shows that Exurbs are booming in population. Although the U.S. only experienced a 10% population growth between 2000 and 2012, the exurban population grew by more than 60%, from about 16 million to almost 26 million (Urban Institute, 2012).

This phenomenon of continued expansion is well documented and examples are easy to come by. It is common knowledge that cities in California are well known for suburban sprawl; in fact, Los Angeles was one of the world’s first low-density urban areas (Wikipedia). The City of Lancaster is a prime example. Located 45 minutes from downtown LA, Lancaster primarily consists of single-family residential homes with almost 65% of city land dedicated to this use (COL, 2012). Lancaster is the eighth-largest city in Los Angeles County. For most of its existence it has had a small population; however it now is arguably the largest “desert city” in California. With 94.2 square miles (243.9 km²) of land in its incorporated boundaries, the city is in the top 150 largest cities in the United States in geographic area (List of United States cities by area).
The cost of living in Lancaster is much lower than the cost of living in the Los Angeles, Riverside, and Orange County areas, with the median housing price at $130,000 in 2010 as compared to $385,000 in Santa Clarita and $349,000 in the City of Los Angeles. Due to population growth and high prices in metropolitan areas many people moved from urban areas to the City of Lancaster during the 2000’s.

Over the last 25 years this city has consistently been ranked in the top 25 fastest growing cities in the United States (based on percentage change). In January 2010 the population was estimated at nearly 156,633 according to the Federal Census. Between 2000 and 2010 the City of Lancaster grew by 34% (US Census Bureau). During this time the City of Lancaster had tremendous trouble in accommodating this quick growth without a significant decline in quality of life and services provided. Major problems experienced included urban sprawl, leapfrog development, increases in crime, drainage problems, and land degradation. The City was eager to expand and allowed cheap low-density housing to be developed in large subdivisions far away from general services such as hospitals, fire stations, police stations, and commerce (COL, 2012). There was a short term benefit for the local economy through an increase in spending in the construction and real estate markets. The City had higher sales tax revenues and developer impact fees, which were used, impart, to offset road maintenance (Finance Department, City of Lancaster). The speed with which growth happened and the wealth that was created encouraged city leaders to underestimate the problems associated with sprawl.

For a period low-density development patterns seemed sustainable by city leaders but after the great recession city leaders had a different understanding of the situation (Bozigian, Lawson, & Caudle, 2012). When the housing market crashed across the U.S. in the mid 2000s Lancaster was drastically affected. There was a 9.3% vacancy rate (US Census Bureau) and
construction came to a halt as revealed by the drop in building permits from a peak of over 1,000 in 2006 to a low of 100 in 2008 (City of Lancaster Building and Safety). The factors affected the economy of the city and eventually lead to a 17.6% unemployment rate in 2010 (Employment Development Department, 2012). This crash is important to note because if consumer spending decreases city revenue decreases as well. Therefore, when the short-term benefits from development fees and housing boom related consumer spending ended, the City was left with shrinking sales tax dollars. Sales taxes revenue went from a high of 20.5 Million in 2006 to a low of 13 Million in 2009 (The Greater Antelope Valley Economic Alliance). While sales tax revenues declined, road maintenance costs increased, as indicated by the “The Engineering Newsrecord Construction Cost Index.” These facts indicate that City’s like Lancaster cannot rely on housing growth to sustain revenue streams to offset the high cost of a sprawled road system. However, the city of Lancaster is not the only city experiencing problems caused by sprawling infrastructure.

The former mayor of Ventura recently made remarks at the Global Public Square and published an article arguing that low-density development is tied to recent bankruptcies such as Stockton and San Bernardino. The excerpt below clearly and succinctly explains the problem with sprawl today.

“When sprawling new development happens, it’s easy to mistake that for prosperity. New buildings and wide roads look great when they first meet the eye. But over time, distant development costs more, gradually bleeding taxpayers and putting the hurt on municipal budgets. Think about it. Every time a new, spread-out subdivision is built far away from existing infrastructure, somebody has to pay for a bunch of roads that serve a small number of residents. And sewer and water lines too. And fire trucks that must travel farther to serve fewer people. And police cars. And ambulances. And school buses. And dial-a-ride buses. And – in many parts of the country snowplows.

The cost is enormous. One study in Charlotte, North Carolina, found that a fire station in a low-density neighborhood serves one-quarter the number of households and at four times the cost of an otherwise identical fire station in a less spread out neighborhood. (Fulton, The cost of America’s inefficient sprawl, 2012)
This quote is very revealing of the extent of the sprawl problem. All across the U.S. cities are realizing the difficulty of maintaining low-density cities (Burchell, Downs, McCann, & Mukherj, 2005), but it is not just modern cities that have faced this problem.

In a recent study on the 15th century rise and fall of the Cambodian city-state Angkor Wat, Roland Fletcher, a professor of architecture at the University of Sydney in Australia, and team finds that there is a high correlation between extensive low-density suburbanization and subsequent metropolitan collapse. Angkor Watt developed a low-density suburban city using a canal system during a period of mild weather. As time continued, climate change began to degrade the quality of the canal system thus breaking down the entire metropolitan system. The history of low-density cities does not prove that low-density transportations systems are adequately sustainable and therefore it follows that cities like Lancaster will face problems like that of the city of Ankgor Watt (Blakely, 2012).

This is a very important lesson for the City of Lancaster. The days of easy money are over and the city is going to experience the cost of sprawl without any of the short-term benefits. Had city leaders pursued stricter architectural and zoning guidelines that align with traditional development patterns, the city would have been better protected against economic recessions. Investing in a sprawl land use pattern has backfired; sprawl did not produce the economic development expected. Going forward, population is expected to increase by 37% in LA County over the next 40 years. (State of California, Department of Finance, 2012) A significant portion of this increase will be located in suburban and exurban areas like the City of Lancaster (Urban Institute, 2012). Therefore the City can expect population to increase between 45 and 55%. Where will these people live? According to Anthony Flint there is little question that this growth will be sprawl (Flint, 2006). That means more sprawl and more road maintenance costs. The
timing for Lancaster to plan for mixed-use and traditional development is now before more
growth turns into more sprawl.

**Problem Statement**

To date the City of Lancaster does not measure the impact of sprawl on the cost of road
maintenance in planning or budget documents. There is a cost for low-density residential growth.
The cost of low-density growth is equivalent to the cost of infrastructure maintenance necessary
to serve new populations. In addition there is an artificial market incentive to grow in the
periphery of a city and build on new land instead of developed land. The combination of these
two factors is causing a high demand on city services. Suburban cities like Lancaster are planned
to encourage sprawl and will eventually experience a decrease in city services under the liability
of street maintenance and other municipal services: sewer, water, gas, etc. (Burchell, Downs,
McCann, & Mukherj, 2005). It is feasible that single-family residential growth can outpace
revenue for services and lead to municipal bankruptcy, as the City of Stockton is now famous
for. Could it happen to the City of Lancaster?

The idea of municipal bankruptcy is alarming and if it is true that unchecked growth can
cause insolvency then public administration professionals need to take urban growth more
seriously.

**Purpose of Study**

The purpose of this study is to provide a comparative analysis with regard to the cost of
road service in certain neighborhoods within the City of Lancaster in order to ascertain the extent
to which sprawl can affect the City of Lancaster’s financial standing. In order to analyze the cost
of roads in certain neighborhoods in the City of Lancaster this study asked the question:
**Primary research question:** To what extent do low-density neighborhoods cost the City of Lancaster in road maintenance compared to high-density neighborhoods?

This research is a secondary analysis of existing survey data. To analyze the costs of supporting a sprawled land use pattern, available documents such as the Comprehensive Annual Financial Review, Budget Documents, and various other city documents including internal memos were reviewed. Benefits of this analysis include a better understanding of the costs of transportation infrastructure in the city of Lancaster. This study will provide necessary information pertinent to budget planning and creating the general plan.

**Importance of Study**

The great recession caused many city leaders to rethink how they do business (Bozigian, Lawson, & Caudle, 2012). Whether they are considering contracting out services, bringing services in house, stopping services, the reason for changing the city’s business model is to adapt to new circumstances (Bozigian, Lawson, & Caudle, 2012). The resources that fueled growth and development during the mid 2000s are no longer available. Cities no longer have ample development fees to offset their cost of doing business. Cities have to find ways to be more efficient if they want to be able to stay solvent let alone compete with other cities for wealth.

Transportation is a vital part of everyday living. If a government cannot afford to maintain service levels, i.e. road maintenance, then the economic base that the city governs over will be significantly disturbed. High access to transportation is a key generator of economic activity and if lost would interrupt commerce such as retail, food delivery, and trade. Not to mention, the City of Lancaster’s roads support a commuter population. Therefore the community of Lancaster needs a General Plan that reflects the reality of transportation costs.
Government services are unique in that citizens hold unusually high expectations. Citizens will not stand for interruptions in service. Potholes are one of the most visible signs of service inadequacy and allowing them to exist is exemplar of political suicide. Therefore politicians and government leaders need to be concerned with preserving the public trust and meeting citizen expectations in road service.

The following chapter provides a brief history of suburban expansion, more detail as to what is meant by “sprawl,” and how it can be physically indentified in cities. It will also explore the various theories related to the cause of sprawl, the economics of sprawl and land use alternatives. Following the Literature Review will be the methods and then the findings of the land use study and cost of roads.
Chapter 2 Review of Literature

The Review of Literature chapter provides a discussion of the theoretical frameworks considered in the development of this research. Also, this research draws on the work of other scholars and thus this chapter provides a review of those resources. This chapter will follow with a thorough discussion of sprawl, what it is, and how it can be identified. The discussion will then continue into a history of ideas in city planning and provide a base for understanding the modern city planning profession. The chapter will then progress to what causes sprawl which will focus on the planning profession as a cause and a brief tour of sprawl economics. The chapter will conclude with traditional development patterns and how to implement them.

Public Budgeting Theory

This research sought to provide information for policy makers through a comparative cost analysis. The researcher did so with a certain understanding of public budgeting that aligns with the economist viewpoint of public budgeting as theorized by Smith and Lynch. Consider this quote from their work “the economist views budgeting as a matter of allocating resources in terms of opportunity cost where allocating resources to one consumer takes resources away from another consumer.” The role of the economist, therefore, is to provide decision makers with the best possible information (Smith, 2004). This perspective of budgeting is the lens in which validates the importance of this research and provides a purpose to continue such research. It is vastly important that good information is developed and researched in order for policy makers to make good decisions for the good of the public.

This research also builds on the theoretical concepts developed by Richard A. Musgrave known as the “Father of Public Finance” who identified the three roles of government in the
economy: allocation of resources, distribution of goods and services, and economy stabilization (Musgrave, 1989). By his work it is understandable that there is public benefit in determining the highest and best use of resources available and the allocation of those resources for road maintenance. Deriving the best way to plan a city to maximize resources available is a valuable pursuit for research and government officials.

**Sprawl Theory and Definition**

Exponential growth of Suburbia was first noticed in the Early 1900’s in the U.S. and especially after the World War II (SUN, 2007). Originally sprawl was used to describe housing developments that outpaced population growth. Sprawl is now generally used to describe any type of expansive development that is inefficient in its use of resources, aesthetically displeasing with no apparent master form/architecture plan, or a corridor with an obvious lack of investment in the public-right-of-way (Ewing, 1994). It might be easier to understand Sprawl as the antithesis of Land Use Planning. The American Planning Association states that the goal of Land Use Planning is to further the welfare of people and their communities by creating convenient, equitable, healthful, efficient, and attractive environments for present and future generations.

Sprawl, although a catch-all phrase because of its multifaceted and complex dimensions, can be identified within in a community by three aspects: spatial patterns, root causes, and consequences (Burchell R. S., 1998). Spatial patterns of sprawl isolate different sectors of a community. As Lee Corbusier points out in *The Radiant City*:

“The Cities will be part of the country; I shall live 30 miles from my office in one direction, under a pine tree; my secretary will live 30 miles away from it too, in the other direction, under another pine tree. We shall both have our own car”
This quote is revealing of the type of lifestyle that typifies suburban sprawl and the spatial patterns that define sprawl. Spatial patterns of sprawl are characterized by residential divisions that exist in separate geographic zones than commercial. As for root causes, this type of pattern is not organic and is in fact caused by legislation and government planning. For instance, it is currently against the law to have anything but single-family residential development in most of the city of Lancaster (Appendix A) (COL, 2012).

The consequence of sprawl refers to the negative externalities experienced after creating sprawl. Lee Freeman documents the literature regarding the social costs of Sprawl and sums it by “sprawl reduces social capital primarily because it reduces opportunities for spontaneous social interaction” (Freeman, 2001). This is important because it means that people have a decreased chance to interact, mingle, discuss, or debate current issues which ultimately lowers the quality of life and the efficacy of the planned environment. This was an unintended policy outcome of planning for low-density.

Low-density cities were conceived in order to escape the urban setting. Freeman states that, “Crowding may lead individuals to feel as though they have less control over their interactions with others and to cope by psychological and physical withdrawal” (Freeman, 2001). Essentially, the idea was that the urban environment causes stress and therefore people withdraw from society but creating a low-density city can solve that problem. What was missing from the policy decision was an analysis on the impact on the costs that would be added to infrastructure maintenance. Ironically, low-density housing also reduces the need to converge because everyone has their own individual park in their own back yard and people use metal boxes to transport themselves, thereby reducing the chances of random social interaction. Therefore it is not necessarily just low-density that has caused a decrease in social capital, as New Urbanisms
would argue, because there is evidence that high-density also causes social isolation. Research suggests that the high-density and low-density have flaws in the way that they encourage citizens to withdraw. Therefore, an ideal city plan would have to strike a balance with a mix of uses to create medium density. Please consider this brief review of various different theories regarding urban planning.

**Planning Theory**

New Urbanism is the most well known for speaking against sprawl and low-density environments. The organizing body for New Urbanism is the Congress for the New Urbanism, founded in 1993. Its foundational text is the Charter of the New Urbanism, which states:

“We advocate the restructuring of public policy and development practices to support the following principles: neighborhoods should be diverse in use and population; communities should be designed for the pedestrian and transit as well as the car; cities and towns should be shaped by physically defined and universally accessible public spaces and community institutions; urban places should be framed by architecture and landscape design that celebrate local history, climate, ecology, and building practice.”

New Urbanism is a primary source for policy strategies used to combat sprawl. Many of the Congress for New Urbanisms ideas have found their way into this research such as stricter architectural guidelines and sue of high density development as a means of re-shaping a cities space.

Architectural determinism is a branch of urban design that falls under the broader theories of environmental determinism. In this theory of land use planning incorporating nature into urban design is the answer to some of the prominent problems found in cities, such as crime and health issues to name a couple. Therefore, parks and green space landscaping is the first thing to be planned and everything else should be planned around them. No vendors and no
commercial activity would be mixed with parks. These areas would be organic in form but not natural. Olmstead’s park design sets the standard of this kind of park design. One principle of importance is safety and separation of uses. It is from this theory that many planning departments build their general plan and is one of the factors for why there is segregation of uses. Needs a citation

The Garden city movement was British influence. Cities would be built with the center as the ‘town’ then proceeding outward there is country then there is town-country. An expanding city would build into the plan green belts around the town to create country and suburbs would be built on the outskirts of the green belt. Greenbelt would typically be filled with agriculture. Typically in American cities there is suburban development but no green belt. Because there is no green belt people move to the new development around the periphery because they want to attain that country feel. Unfortunately they will never get that country lifestyle because cities are not building or maintaining green belts. Needs citation

In “Suburban Nation” the author argue that cities can either be planned for sprawl or traditional neighborhoods. The authors provide five components of a city that reveal whether or not the city is sprawling: housing subdivision; shopping centers; office parks, civic institutions; and roadways (Andres Duany, 2000). In a sprawled city housing will be provided through housing “tracts,” “pods” or “clusters” geographically separated from any other type of use. Shopping centers will have a sea of parking between the road and the building, which is typically a single story box. The office parks are made of box shaped buildings, located in large parking lots and nearby highways. Civic institutions such as government buildings and schools are relatively unadorned and located nowhere in particular. They do not act as the city centers that they would in the traditional neighborhood. Children typically do not walk to schools and the
dispersion of homes makes bussing impractical thereby making children dependent on automobiles. Roadways are the arteries for the sprawled community transporting citizens between the other four components of the city. Residents spend an unprecedented amount of time transporting themselves between the different components on hundreds of road miles.

However necessary it is to examine land use patterns it is always necessary to understand the cause. Therefore, please consider the following piece on the cause of sprawl.

**What Causes Sprawl?**

In general sprawl is legislated. In most cities on the west coast, the municipal level of city government has near autonomy in land use planning. The east coast typically has smaller and denser cities making it more feasible to implement regional planning by counties or states. Local governments typically have a planning commission comprised of local citizens. The Planning commission oversees the actions of a Planning or community development department. The department is run by bureaucrats hired by the city administration office. Planning bureaucrats or planners typically have professional degrees and certificates in urban planning or some subset such as environmental planning or transportation (Fulton & Shigley, Guide to California Planning Third Edition, 2005). The planning department will either develop a Master Plan or General Plan in house or via a consultant firm. The General Plan designates permitted uses of land based on mapped zones which separates one set of land uses form another, typically categorized as R=Residential UR= Urban Residential  C=Commercial H=Heavy Industrial Li=Light Industrial. Zoning also has sub sets such as R7000 or R5000. This denotes the exact size of the lots. For instance R7000 must have residential lots of 7,000 square feet. This type of zoning protects residents from inappropriate neighboring uses such as a slaughter house but
prohibits appropriate mix-use such as residential and general retail use (Fulton & Shigley, Guide to California Planning Third Edition, 2005).

In America the industrial age made it difficult to keep production local and cities traditional. A cobbler could no longer employ people from his own little town; he has to mechanize and industrialize to compete, which requires more than a downtown shop with a house on top, which is a traditional style. This is further reasoning as to why traditional land use patterns are rare in newer cities such as those in the US, specifically near the west coast (Fulton & Shigley, Guide to California Planning Third Edition, 2005).

This phenomenon of continual expansion or sprawl is encouraged by the funding mechanisms that are common place in American infrastructure projects. There are 3 general ways that American municipalities finance infrastructure as identified by the non-profit organization Strong Towns:

1-Intergovernmental Transfers or Subsidies: These can be earmarks or grant funding from a higher level of government, i.e. state or federal. Often this type of funding lacks economic sense because it is driven by political will instead of economic efficiency; roads and highways are built that might never bring a return on investment (increased commerce or property taxes enough to offset the capital and future maintenance costs of the program).

2-Debt is increasingly becoming an unviable option for municipalities because of the downgrading of municipal credit scores across the U.S. just after the great recession. Essentially, because property taxes and sales taxes dipped so low the market was skeptical of cities ability to pay off existing debt.

3-Taxes/Assessments: A sure and tried method of paying for the upfront capital, maintenance and replacement of roads, taxes and assessments currently do not provide enough to
pay for roads and they are the hardest to acquire. The U.S. population has a widespread and deep-seated resentment towards taxes and because of the structure of government where power is placed in the hands of representatives elected by the people it is very difficult to find the political will to raise taxes for roads, especially for roads that have traditionally cost U.S. citizens so little through taxes.

With these financing structures in mind it is no wonder that America has found itself in a “Growth Ponzi Scheme” (Strong Towns). Whether it is the municipality or the developer that fronts the cost of infrastructure, the catch is always that the public assumes the long-term maintenance liability. This gives local governments a short-term revenue boost in exchange for greater long-term liabilities. The cycle demands ever-increasing growth rates to maintain the expanded infrastructure systems, a pattern that cannot be sustained. The American Society of Civil Engineers estimates that current level of underinvestment in U.S. infrastructure will end up costing each family in the country about $10,600 between 2010 and 2020. Therefore, there is indeed an issue with financing transportation that has been in part caused by the expansion and development of single-family housing.

In addition there are general market forces that propel consumers towards the suburban fringes. Research and technological innovations have led the way to a higher standard of living, including major increase in crop production, longer life expectancies, and lower infant mortality and death rates (US Census Bureau). The economic and political environment has led to exponential population growth, including high rates of immigration (US Census Bureau).

The unhindered increase in population experienced over the past century coupled with economic development has lead to increased demand for land. As demand increases the price people are willing to pay for land also increases, resulting in a shift in market equilibrium so that
more land is sold and developed. This is a problem because as the price for residential land increases alternative uses get pushed aside.

For instance, consider Tanaka Farms LLC, one of the many old farms in LA and Orange County. One hundred years ago Orange County was primarily an agricultural town, like most of CA, but after years of population growth in Orange County this farm has been grandfathered into the center of a major urban center, Irvine Spectrum.

As the price of land goes up farmers are encouraged to sell their land to developers because of the high cash buy-out. The money received from developing residential is incredible. For example, in 2012 the average house in Orange County cost $281,163 while 25 acres of farmland only cost $3 million, in other words farm land is worth approximately $\frac{1}{7}$ what residential is worth. Considering Rational Choice Theory, a Homo-Economicus would indeed sell this land at the residential rate and retire. The net effect of using more land for housing is that the urban boundary will continue to be pushed further and further away from the city center, thus requiring more roads and hopefully more revenue. However this trend can be reversed by planning a city to accommodate housing that uses less land per residential unit, such as town houses, condos, and mix-use multistory buildings.

**How to develop medium-density traditional communities**

Building a community for medium density and walk-ability is accomplished through following traditional patterns of development, as noted in “Suburban Nation”: the center; the five-minute walk; the street network; narrow versatile streets; mixed use; and special sites for special buildings (Andres Duany, 2000).

Every city needs a focus, a place to gather and meet one another. The original colonies in the US and older European towns would have a church in the center of their community. This is
important to note because city planning before the automobile was planned around human interaction not automobiles. It is important for the center to be clear and accessible. If the center is accessible physically then it allows citizens to participate in civilized life, i.e. commerce, democratic governance, religious and cultural activities, etc (Gladwell, 2012).

In order to avoid the costs associated with automobile based sprawl citizens need to be able to access everything they would need for daily life within a five-minute walk. On a typical day a resident needs access to all three of the primary places: 1) Home 2) Work 3) Social activity. A person who lives in a traditionally planned community can adjust his or her path minutely to and from primary places on a daily basis. Street intersections should be frequent enough to provide the drivers and pedestrians with choice. This is in direct contrast to many planned arterial roads and freeways that can take an individual many miles before intersections.

City life and citizen interactions should be lived on the streets and not always in buildings. The more people that are on the streets the more people will be engaged with others in community. Because there are so many intersections and connecting streets, streets can be smaller with fewer lanes and accommodate a verity of different travel. In addition because the streets are smaller speed limits will be lower and pedestrians and citizens can enjoy their community life on sidewalks just as previously mentioned. This environment can be enhanced because there is more space for pedestrian improvements. Buildings can be closer to the streets and trees that provide shade can be located along the street. All of these aspects not only increase the quality of life but also decrease the quantity of roads and thus the total cost of road maintenance.

In contrast to the suburban sprawl’s single-use zoning, a traditional and pedestrian friendly city will encourage mix-use zoning. This is important because if large areas of land are
dedicated to a particular use it makes it difficult to walk from a residential plot to a commercial plot, for instance if someone needed to go to the grocery store, or work. Allowing people to live where they work is necessary in establishing a livable community that is not dependant on automobiles.

The last point for a traditional community is special sites for special buildings. Whatever the center of the community is, church, temple, courthouse, city hall, etc, it needs to look special so that citizens know that this is the city center that represents the identity of the community. This should also be done for sub-centers or other buildings that have special uses. Schools, farmers’ markets, places of worship, and other premier buildings should be located in a position of prominence. This can be done by locating them at the end of a T intersection, encouraging more elaborate building structure, or placing signs that direct people to these sites. These rules encourage the development of traditional communities.

So far in this analysis the introduction gave a history of the problems associated with low-density city plans and provided a summary of the history of those problems in Lancaster. The next chapter will discuss the methods used in uncovering the sprawl pattern of development in Lancaster as well as the methods for the cursory analysis on the cost of roads.
Chapter 3 Methods

The present analysis sought to categorize neighborhood land use patterns in the City of Lancaster and ascertain as to whether or not these patterns are financially disadvantageous to the City's general budget and to what extent.

Defining Sprawl

Defining sprawl has been a challenge to many researchers because of its multi-faceted dimensions and its nebulous features that take on different characteristics in each community. The term sprawl is used generically and is a relative concept. Justice Potter Stewart would say “I know it when I see it.” In light of sprawl's imprecise definition the rubric postulated by Suburban Nation was applied to this analysis because it is effective at taking a large idea and putting it into a box, a.k.a a theory, so that it can be measured and better understood. The rubric consists of spatial dimensions, root causes, and consequences. Aerial photography and the City of Lancaster’s general plan were used to compare land use patterns using the rubric. The policy research on this matter was conducted by reviewing the general plan laws and identifying the ones allowed or mandated this pattern of development.

Again, however relative ‘sprawl’ may be, it was important to acquire an absolute dimension to it. Therefore, this researcher needed to gather statistics on the land use patterns. This researcher used parcels as the smallest unit because the general plan uses parcels as the smallest unit. Using the acreage and square feet (SF) assigned to each parcel by the Los Angeles County Assessor, as marked on publicly available parcel data; this researcher calculated the percentage of the total for each specified use in the general plan. For example this researcher
calculated the SF of “Commercially Planned Development (CPD)” per total SF in the City. This was helpful in providing an absolute dimension to the land use pattern study.

Data Collection

This research is both a primary and secondary analysis of existing survey data. Gathering publicly available data and conducting repeatable mathematical calculations in the form of a cost analysis was the majority of research efforts, however developing the neighborhood profiles was a unique endeavor that required new data. The analysis was comprehensive of the General Plan, the budget documents for the city of Lancaster, current economic and demographic statistics, and various city documents. Policy research was conducted to find growth management policies and strategies for this study. This analysis did not conduct its own surveys for information regarding planning policy but relied on pre-existing surveys such as those conducted by Foulten and other renowned Planning scholars. This researcher also acquired data from Lancaster’s city hall such as total city lane miles, number of households and population. This researcher acquired lane miles from local Public Works Department and the population demographics from the Federal Census Bureau and the CA Department of Finance. The researcher synthesized the data to get new data points such as lane miles per capita.

In order to get an accurate picture of how many lane miles were being spent per resident, comparing several neighborhoods was necessary. The sample size consisted of 8 randomly selected neighborhoods representing half mile by half mile blocks. After selection the researcher verified that there was at least one sample representing the different areas of the City, West, Central, and East, to ensure that each area would be represented. This is important because the different areas of the city were developed at different time periods representing architectural and planning differences. Neighborhoods were also cleared based on their fullness of the half mile
by half mile block. Admittedly there were some minor discrepancies in the precision of filling
the half mile square block, however given the scale of these discrepancies this analysis
considered them as outliers. For instance, on Profile #1 25th St west is curvy instead of straight,
this would make the calculations of housing units and road line miles vary in comparison to
neighborhoods with straight perimeters. Also some profiles such as #2 and, #7, #8 had a singular
large open space or residence that skews the ability to compare because the open spaces reduce
the number of housing units served. Again, because of the nuances found in each scenario it was
necessary to consider these as outliers in order to continue with the analysis.

Neighborhood profiles were compared considering lane miles used per primary user. A
primary user is defined by someone who lives in the neighborhood. This is important because if
the analysis did not separate primary users from secondary users the roads that lead to the
neighborhoods would have to be considered in the maintenance and upkeep of the neighborhood.
However, the analysis needed to focus on the maintenance associated with the development
within the neighborhood block in order break down the transportation system into the smallest
blocks possible. Furthermore, arterial roads or collector roads that lead into the neighborhood are
used by more than just the primary resident and are therefore serving a greater population. It is
very conceivable that these larger roads lead out of the city and bring in travelers from outside
the city to spend money on shopping centers and other primary uses. Therefore gathering data in
regards to the roads inside the neighborhoods and the number of primary residents that use those
roads serves the purposes of this study with more accuracy.

Aerial imaging software was used to automatically calculate linear road feet and that was
multiplied by 5280 in order to get miles. The number of primary units was derived by counting
using a pyramid tech clicker and a ball point pen to cross out those counted. This method was the
Data Analysis

The core of this study focuses on the comparison of land use statistics between neighborhood profiles. This is the best method available because it compares apples with apples. Analyzing the city as a whole is a complex endeavor that can leave as many questions as answers. For instance comparing transportation networks in commercial or industrial zones is unfruitful because these zones are a part of arterial roads and major corridors. Those roads and corridors are used for more than just commercial or industrial uses. They are used for hauling goods, transporting commuters, and travelers. Therefore, those roads serve multiple purposes. This is unlike the roads of neighborhoods which are secluded and used by the residents. The broader the transportation system studied the more nuanced use and thus the more assumptions about the users are implied and thus the less accurate the study becomes. In contrast narrowing the study to specific neighborhoods allows the researcher to focus very precisely on residential development, of which is the majority of the city. In short the research opted to understand 65% percent of the city with precision and leave the rest of the city to future research.

Next, the analysis considered compiled information regarding financing. This researcher acquired data by reviewing municipal budget documents and discussing budgeted amounts with staff. This researcher than calculated the costs in total figures, per capita, and other matrices’. This researcher also used the Engineering News-Record Construction Cost Index to acquire data on the typical costs of road maintenance. A more recent news release regarding the RE-HEAT program was considered in developing costs of road maintenance (Currier, 12).
IRB Authorization

The International Review Board has waived review of this research because an ethical evaluation would not be applicable to this study for the reasons that it does not involve humans.

Limitations of the Research

Limitations for this project primarily consist of lack of time, resources, and data. The study was conducted over an 8 week period and the findings will suffer because of this constraint. If there was more time then the analysis could be expanded to consider more policy alternatives. In addition, this analysis was conducted with publicly available data. If there was a possibility to acquire unique data such as more accurate and timely traffic counts then the research would be able to benefit by having more accurate data. Also when considering the use of inter neighborhood roads it is feasible that residents outside of the neighborhood would use them if lost or for possible shortcuts or to visit a primary resident, this is important to mention because it is another variable that is not included in this research due to lack of resources. In addition the findings from the eight neighborhoods may not be generalized to other neighborhoods and or the city because no neighborhood is identical.

In addition, this project lacks a proper analysis on some of the benefits of a spread out transportation system and does not consider questions such as “are there any benefits such as more sales tax form larger gas consumption?” Nor does it provide a cost associated with decreasing the gas consumed by reducing low-density development in the periphery. The reason is because this researcher does not have adequate resources to continue the investigation into this matter. In addition the point of this research is to consider the costs associated with maintaining streets within the city of Lancaster. Modeling transportation patterns would expand the scope of
this research beyond the intended limits. Again, these were not considered because of lack of resources and time.
Chapter 4 Findings

This chapter details the findings of the data collection and analysis. It starts with stating the analysis of city wide development patterns. The chapter continues with findings of instances of sprawl. The chapter then progress to a description of the neighborhood profiles. The chapter concludes with the findings from the analysis that reveals what type of neighborhoods produce the least amount of road maintenance burden for the city of Lancaster.

City Plan

The City was analyzed based on the Sprawl Rubric by reviewing aerial maps and identifying patterns. The city is planned so that citizens live in the perimeter of the city and drivers feed into the freeway and city centers. Considering the photo below, the City can be broken down into 3 general sections. The West side of the city is on the west side of the 14 Freeway. The East side of the City is on the east side of Sierra Highway. Everything in between is central Lancaster.

Figure 1: City of Lancaster City Plan Analysis
The arterial roads are highlighted in yellow and commercial areas in red. The first thing noticed by the aerial is that the city transportation system is built for commuters. Residents in commute are funneled to the 14 Freeway or Sierra Highway with the major East-West avenues I, J, K, and L. The freeway and highway take commuters north to Edwards Air force base or South to the LA Basin. Because of the predominance of commuters the entire community revolves around the freeway, and this land use pattern is evident in the aerial photography. Most commercial activity is around the freeway or the four major avenues. Commercial areas were planned to encourage people to shop between their home and work route. Retailers enjoy this because roads with high traffic counts increase shopping propensity and thus sales.

Big Box stores line the freeway and a sea of parking is ready to accept eager buyers, this is very representative of sprawl. Looking at the aerial photography in terms of the Sprawl Rubric it is clear that the City of Lancaster is indeed a sprawled community. Again, the Sprawl Rubric measures a sprawl based on spatial patterns, root causes, and consequences.

Spatial Patterns: Land uses are completely segregated; in fact there is little opportunity for pedestrians to walk to grocery stores, even if they lived right behind it. This is mainly due to the fact that shopping centers were built to cater to those that commute, not pedestrians. Consider photo two on the next page. In this aerial photograph, provided by Google Earth, there are three general goods stores on the right and a major residential subdivision on the left. Although close to the city center, there are identical subdivisions across the whole city, and thus this subdivision has very little significance in terms of architectural/urban design. The automobile dependency is so profound that even though the square of single-family residential is directly next to grocery stores the residents do not walk there, they drive. There are few good reasons for this: the streets
that runs North-South between the neighborhood and the grocery stores has a posted speed limit of 50 MPH, the street has no pedestrian walkways or crosswalks except at the North and South intersection (a ½ mile apart), the neighborhood has limited exits that increase walk-time and the supermarket faces the freeway, which means pedestrians must walk past the uninviting back sides of the building where trucks deliver goods to the stores, not to mention the entrance is just that much farther away.

Root Causes: Furthermore, this pattern of development was legislated by the City of Lancaster’s General Plan and zoning ordinances. Below is an image of the city’s general plan. Although cryptic at first it is very easy to decipher.
The Green represents non-urban residential, yellow: urban residential (suburban housing tracts), Gray: Industrial, Red: commercial and pink Mix Use. Viewing the General Plan is important because it reveals the type of City that the community leaders wanted. According to this plan the city will be a sprawled community. By analyzing the city in 1 mile by 1 mile blocks the most typical land use pattern is such: A block of residential with a small commercial area in a corner intersection. Again the yellow is residential and the red is commercial. If viewing the general plan on the previous page this development pattern is throughout the whole city: giant yellow blocks with a small red block. This is why the city of Lancaster has grocery stores that can only be driven to; this is the cause.

Consequences: The last criterion is not a measurement of sprawl but a descriptor of sprawl. According to the previous metrics and observations the City is conclusively sprawled. The consequences of sprawl are the factors that the City could have. Therefore the City of Lancaster is subject to many of the problems of sprawl: Auto dependency; increased pollution and consumption of non-renewable resources responsible for global warming; significant decrease in unstructured social encounter, a significant contributor to social capital; decrease in opportunities for physical activity; decrease in land quality. Given the spatial dimensions of the land patterns it is feasible to conclude that there is a significant decrease in quality of life for those within the City of Lancaster who are without automobile.

Continuing the general plan analysis this research found that the majority of the land use is planned to be urban residential with almost 65% of land devoted to it. Here is a picture of what is meant by Urban residential.

Figure 4: Urban Residential Sample
The term urban denotes an area characterized by high density and artificial scenery\(^1\). The term “urban” seems out of place. The terms suburban residential might be more accurate as to the type of structure that is being used in these zoning areas. For this type of use it is important to consider the consequences of this on the transportation system; frontage of this lot consumes more road space than would a town house, condo, or any smaller dwelling unit, which means more infrastructure costs.

It is at this point that the analysis will start discussing data on the road systems within the City by review of the neighborhood profiles. After collecting data on 8 different neighborhoods the below chart was created and reveals the liability of road maintenance for each neighborhood.

<table>
<thead>
<tr>
<th>Neighborhood #</th>
<th>Number of Housing Units</th>
<th>Square Miles</th>
<th>Housing Units Per Square Mile</th>
<th>Average Population per household</th>
<th>Number of Neighborhood Primary User</th>
<th>Lane Miles</th>
<th>Lane Miles Per Primary User</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>640</td>
<td>0.5</td>
<td>320</td>
<td>3.04</td>
<td>1945.6</td>
<td>10.09</td>
<td>0.0052</td>
</tr>
<tr>
<td>2</td>
<td>578</td>
<td>0.5</td>
<td>289</td>
<td>3.04</td>
<td>1757.12</td>
<td>8.70</td>
<td>0.0050</td>
</tr>
<tr>
<td>3</td>
<td>258</td>
<td>0.5</td>
<td>129</td>
<td>3.04</td>
<td>784.32</td>
<td>3.00</td>
<td>0.0038</td>
</tr>
<tr>
<td>4</td>
<td>394</td>
<td>0.5</td>
<td>197</td>
<td>3.04</td>
<td>1197.76</td>
<td>7.42</td>
<td>0.0062</td>
</tr>
<tr>
<td>4 w/ Apartments</td>
<td>909</td>
<td>0.5</td>
<td>454.5</td>
<td>3.04</td>
<td>2763.36</td>
<td>7.42</td>
<td>0.0027</td>
</tr>
<tr>
<td>5</td>
<td>574</td>
<td>0.5</td>
<td>287</td>
<td>3.04</td>
<td>1744.96</td>
<td>10.67</td>
<td>0.0061</td>
</tr>
<tr>
<td>6</td>
<td>659</td>
<td>0.5</td>
<td>329.5</td>
<td>3.04</td>
<td>2003.36</td>
<td>10.48</td>
<td>0.0052</td>
</tr>
<tr>
<td>7</td>
<td>551</td>
<td>0.5</td>
<td>275.5</td>
<td>3.04</td>
<td>1675.04</td>
<td>8.60</td>
<td>0.0051</td>
</tr>
<tr>
<td>8</td>
<td>111</td>
<td>0.5</td>
<td>55.5</td>
<td>3.04</td>
<td>337.44</td>
<td>3.29</td>
<td>0.0098</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>235.3125</td>
<td>7.7808</td>
<td>0.0058</td>
</tr>
<tr>
<td>Mean w/ Apartments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>259.6667</td>
<td>7.7410</td>
<td>0.0055</td>
</tr>
</tbody>
</table>

\(^1\) http://en.wikipedia.org/wiki/Urban_area
The colors on the chart are a color gradient that represent the value of the cell, the more green the lower the number. Housing Units per Square Mile and Lane Miles per Primary Users are the two main variables. These are important because they represent the amount of resources consumed in the development. The more square miles used the longer the arterial roadways have to be to reach that neighborhood, which means more costs for the city of Lancaster in maintaining streets. In this chart the development pattern that used the least amount of roadway was Neighborhood Profile number 4. In second is neighborhood number 3. However, because of its high use of square miles, this low-density development is not the ideal scenario. The ideal scenario is one that takes advantage of a variety of housing units. Scenario number four with consideration of the neighborhood apartment units is ideal because it maximizes the amount of square miles used and also reduces the roadway maintenance liability for the city of Lancaster. Also a particularly interesting finding is that there is an additional advantage to the apartment units to the city’s general fund. That is that they maintain their own roads and driveways.

Figure 7: Neighborhood Aerial #3

Figure 8: Neighborhood Aerial #4
Although there are roads inside of the three apartment complex, found in the top left area of this photo, the city does not have to maintain them. This is a big added benefit to allowing multi-residential apartment units. Possible negative consequences include the development of rental units. If the development consists of mainly renter occupied units the city runs the risk of subjecting the neighborhood to the demographics associated with rental units, i.e. increase in crime, transience, diminished property values, and decreased educational attainment, or to put it simply a decrease in quality of life.

**Maintenance Costs**

There are various ways to consider the costs of maintaining roads, this analysis discusses two and uses one. The first way to look at costs would be to look at the whole budget. The City of Lancaster’s Public Works department pays for the maintenance of everything within the right-of-way that is under their jurisdiction. Therefore, for a very raw sense of how much it costs to maintain the city right-of-way, the public works budget could be divided by the lane miles across the city. This would be interesting because it would give a comprehensive picture of the costs. Although, often times the budgeted amount that is spent may not be enough or does not accurately represent what this analysis is looking for. The focus of this analysis is the costs of roadways in residential areas, which would exclude some of the projects in commercial areas. Therefore this analysis needs a method with more accuracy.

The City of Lancaster’s budget document does not have specific details as to what is spent on roadway maintenance, it was only through staff interviews and staff reports that the researcher compiled specific costs that pertain to road maintenance. According to city data there are 623 center line miles and 1410 lane miles (each lane is 14’ wide) within the City of Lancaster, not including bike or pedestrian lanes. There are 49,659 housing units. And the
population is 157,795. The following figures do not include the indirect costs (Admin, overhead, ect.). Because of the large scale of the public works department and the multiple jobs and roles played by each employee it would be difficult to segregate out how much is spent on road maintenance. Therefore a cursory analysis that focuses on the direct costs must be sufficient. The chart below is representative of maintenance costs for a 20 year life cycle where around 75 lane miles are maintained a year.

**Figure 9: Direct Maintenance Costs**

**Direct Maintenance Costs**

By FY 12-13 Line Items

<table>
<thead>
<tr>
<th>Line Item</th>
<th>Amount Budgeted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Tools (208)</td>
<td>$26,200.00</td>
</tr>
<tr>
<td>Vehicle Ops (207)</td>
<td>$136,850.00</td>
</tr>
<tr>
<td>Fuel (217)</td>
<td>$183,120.00</td>
</tr>
<tr>
<td>Landscaping (264)*</td>
<td>$159,370.00</td>
</tr>
<tr>
<td>Landscape Supplies</td>
<td>$25,000.00</td>
</tr>
<tr>
<td>Tree Trimming (267)*</td>
<td>$110,000.00</td>
</tr>
<tr>
<td>Underground Service Alert (301)*</td>
<td>$2,500.00</td>
</tr>
<tr>
<td>Herbicide/fertilizer (408)</td>
<td>$35,100.00</td>
</tr>
<tr>
<td>Materials (410)</td>
<td>$299,445.00</td>
</tr>
<tr>
<td>Street Sweeping (450)*</td>
<td>$410,600.00</td>
</tr>
<tr>
<td>Regulatory Signs (455)</td>
<td>$106,600.00</td>
</tr>
<tr>
<td>Roadside Repair (457)*</td>
<td>$11,000.00</td>
</tr>
<tr>
<td>Graffiti (502)</td>
<td>$78,500.00</td>
</tr>
<tr>
<td>Rental Equipment (612)</td>
<td>$1,500.00</td>
</tr>
<tr>
<td>Utilities (652/654)</td>
<td>$98,700.00</td>
</tr>
<tr>
<td>Markings (454)</td>
<td>$114,000.00</td>
</tr>
<tr>
<td>Signals (652)</td>
<td>$62,000.00</td>
</tr>
<tr>
<td>Signal power (652)</td>
<td>$125,750.00</td>
</tr>
<tr>
<td>Street Light Power (660)</td>
<td>$3,339,000.00</td>
</tr>
<tr>
<td>Street light Fixtures (665)</td>
<td>$11,250.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$5,336,485.00</strong></td>
</tr>
</tbody>
</table>
Lane Miles within the city: 1410
Lane Miles per Year (1410/20): 70.5
Maintenance cost per lane mile: $75,694.82

An ideal community would be planned to maximize the best use of land. This ideal type includes maximizing or reaching an adequate ratio between lane miles and population and or dwelling units. The City of Lancaster can only afford the lane-miles allowed by gas-taxes. Gas-taxes are allocated by population and therefore are fixed and not flexible, so then the need to maximize the ratio between lane miles and dwelling units is imperative.

Land use and Cost

By applying the cost structures to the land use patterns the following information is revealed.

<table>
<thead>
<tr>
<th>Neighborhood</th>
<th>Number of Housing Units</th>
<th>Square Miles</th>
<th>Housing Units Per Square Mile</th>
<th>Average Population per household</th>
<th>Number of Neighborhood Primary User</th>
<th>Lane Miles</th>
<th>Lane Miles Per Primary User</th>
<th>Maintenance cost per lane mile</th>
<th>Total Maintenance Cost</th>
<th>Maintenance Cost per Household</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>640</td>
<td>0.5</td>
<td>320</td>
<td>3.04</td>
<td>1945.6</td>
<td>0.0052</td>
<td>75,694.82</td>
<td>$75,694.82</td>
<td>$763,426.73</td>
<td>$1,192.85</td>
</tr>
<tr>
<td>2</td>
<td>578</td>
<td>0.5</td>
<td>289</td>
<td>3.04</td>
<td>1757.12</td>
<td>0.0050</td>
<td>75,694.82</td>
<td>$75,694.82</td>
<td>$658,441.74</td>
<td>$1,139.17</td>
</tr>
<tr>
<td>3</td>
<td>258</td>
<td>0.5</td>
<td>129</td>
<td>3.04</td>
<td>784.32</td>
<td>0.0038</td>
<td>75,694.82</td>
<td>$75,694.82</td>
<td>$227,084.47</td>
<td>$880.17</td>
</tr>
<tr>
<td>4</td>
<td>394</td>
<td>0.5</td>
<td>197</td>
<td>3.04</td>
<td>1197.76</td>
<td>0.0062</td>
<td>75,694.82</td>
<td>$75,694.82</td>
<td>$561,886.40</td>
<td>$1,426.11</td>
</tr>
<tr>
<td>4 w/ Apartments</td>
<td>909</td>
<td>0.5</td>
<td>454.5</td>
<td>3.04</td>
<td>2763.36</td>
<td>0.0027</td>
<td>75,694.82</td>
<td>$75,694.82</td>
<td>$561,886.40</td>
<td>$618.14</td>
</tr>
<tr>
<td>5</td>
<td>574</td>
<td>0.5</td>
<td>287</td>
<td>3.04</td>
<td>1744.96</td>
<td>0.0061</td>
<td>75,694.82</td>
<td>$75,694.82</td>
<td>$807,893.14</td>
<td>$1,407.48</td>
</tr>
<tr>
<td>6</td>
<td>659</td>
<td>0.5</td>
<td>329.5</td>
<td>3.04</td>
<td>2003.36</td>
<td>0.0052</td>
<td>75,694.82</td>
<td>$75,694.82</td>
<td>$792,916.17</td>
<td>$1,203.21</td>
</tr>
<tr>
<td>7</td>
<td>551</td>
<td>0.5</td>
<td>275.5</td>
<td>3.04</td>
<td>1675.04</td>
<td>0.0051</td>
<td>75,694.82</td>
<td>$75,694.82</td>
<td>$650,959.71</td>
<td>$1,181.42</td>
</tr>
<tr>
<td>8</td>
<td>111</td>
<td>0.5</td>
<td>55.5</td>
<td>3.04</td>
<td>337.44</td>
<td>0.0098</td>
<td>75,694.82</td>
<td>$75,694.82</td>
<td>$249,101.91</td>
<td>$2,244.16</td>
</tr>
</tbody>
</table>

Mean: 235.3125 7.7808 0.0058
Mean w/ Apartments: 259.6667 7.7410 0.0055

After compiling the data, the above chart shows the total maintenance cost and cost per household per neighborhood profile. Interestingly enough, although neighborhood number three is one of the lowest numbers of primary users, the plan reveals its utility as the second cheapest. Upon further evaluation it appears that the efficiency gains were made up in the
proximity of the houses. Lots were narrow and close, thus utilizing less road space for each unit. The measurement of how close they were relative to other housing developments is for another study. Regardless, land use pattern number four with apartments demonstrates the cost difference associated with incorporating multi-family residential.
Chapter 5 Summary

The City of Lancaster is comprised of mostly “Urban Residential” Zones, 65%. Given the data found in Figure 10, the households in the City pay on average $1,334.32 per lane mile for neighborhood roads. By Changing the General Plan to focus on mix-use and multiple residential dwelling units the that average could drop to $618.14, a 54% decrease.

At first glance there seems to be an easy solution, avoid low-density housing with planning laws. However, the problem is more complex because low-density housing has benefits. Low-density development and expansion outside city centers is cheap and thus, provides the option of home ownership to a wider variety of citizens then does urban centers. Home ownership is good for many reasons. One of which is that children in families that own their own homes do significantly better in school than children in families that rent and that effect is most pronounced in low-income households (Janice Lectures). Home ownership is also beneficial because it establishes a line of credit so if a family wants to start a business they can get it in the form of a home equity loan. Therefore, planning policy in this case is an equity issue and we have to consider policy alternatives more closely in order to avoid diminishing social equity between higher income groups that can afford housing and lower income groups that rely on cheap land outside the city. This research has found the extent to which land patterns affect the general budget. The following discussion will consider the various different alternatives there are in dealing with road maintenance liability and loosely compare the costs and benefits of each.
Form Alternatives

Price is a factor in encouraging growth as previously discussed but it is also because of preferences. Citizens no longer like the way neighborhoods are planned or how they look (Badger, 2012). Neighborhoods look old and decayed and people simply do not want to live there. Citizens do not want to live in dilapidated single-family subdivisions with poor roads; they want to live in useable neighborhoods that are well kept, clean, beautiful, aesthetically pleasing and contribute to a balanced lifestyle.

This can be addressed by refocusing planning guidelines on form instead of building requirements. Take for example the city of Santa Barbara. The sense of place developed by their form guidelines in their zoning ordinances is a spectacular example of how cities can keep city centers alive and cost effective.

Privatization Alternatives

With a growing consensus that the United States does not adequately invest in its roads and bridges, many states are considering leasing their roads to private companies, or letting private companies build new roads. Essentially the state or municipality leases the road or the right-of-way to a private firm. The private firm is responsible for road maintenance and is allowed to charge a toll. This is an adequate means of getting the liability of road maintenance off of the public books but it may diminish public control over transportation decisions. This alternative also introduces a monopoly in the system which could negatively impact the market and disproportionately affect the poor and working class that rely on road service as a public good.
Urban Growth Boundary & Concurrency Requirements

As previously discussed home ownership provides many benefits for a population and many people want to live in low-density housing. It is the role of government to provide services for the citizens. When the government cannot afford those services then the government has to be creative. It is not fair to prohibit building houses simply because previous financing mechanisms have failed. Development boundary lines should be used sparingly if at all because there other means to address problems associated with growth. One idea that needs to be implemented while developing new financing mechanisms is concurrency requirements so that the infrastructure liability does not grow beyond revenue sources.

Public Transportation

More public transportation is not the answer. Automobile transit cost per passenger mile is roughly $.20 per person while all other forms are between three and 8 times more expensive, i.e. commuter rail cost $.60, subway/elevated $.80, bus $1.00, light rail $1.80. In the long run it would be cheaper to equip everyone with a car than provide subsidized public transportation.

Conclusion

In a capitalist economy citizens are encouraged to act out of self interest in order to produce value for the common good. However, good this is for society it can sometimes lead to a problem for the commons. There is not one economic system that can balance both liberty and equity; these values are contradictory and a society can only pursue a balancing act but never the fulfillment of either. With this in mind it is important to consider the role of government in balancing both. If an economic system is influencing the market to increase the costs of road maintenance and thus burden the general fund then it is necessary for government to intervene and provide solutions for sustainable future growth. The conclusion drawn from this analysis is
that the City of Lancaster can benefit from incorporating more traditional development patterns into the city’s general plan.

**Recommendations:**

1.) Focus on form and relax building codes in urban areas in order to encourage land recycling.

2.) Implement a hybrid plan of concurrency requirements and user fees to offset the cost of new infrastructure.

3.) Do not prohibit the growth of communities or access to owner-occupied residential housing through numerical caps or boundaries.

**Further Study**

Going forward more research can be done in regards to how to implement some of these findings. Understanding the extent to which low-density neighborhoods affect the city’s general fund is one thing and understanding how to mold a pre-existing low-density city into a traditional neighborhood is another. Does the city demolish housing? Does the city provide grants to developers for certain types of development? Is the economy going to rebound and allow the conversation of growth to become relevant again? There are so many questions that need answering in order to continue the study of sprawl in the City of Lancaster, any of which would be the perfect topic for future master’s theses and doctorate studies.
Works Cited


Sectional of a Street & the Public-Right-of-Way

Each street varies from one to another. The Merriam Webster’s dictionary has a perfect image of what a typical street looks like with all functional parts (Merriam Webster).

The modern day street has many uses and is more complex than meets the eye. While looking at the figure everything between private buildings on the left and the green space on the right is called the public-right-of-way. Within the right-of-way there are many structures that either the local municipality or utility company maintains. Please consider this list as it is important to understand exactly what is being maintained within a road.
**Roadway:** Surface upon which vehicles drive.

**Roadway Striping:** the paining of stop lines and lane breaks

**Median strip:** A strip separating traffic lanes that go in opposite directions; also called a center divider.

**Curb:** Masonry construction bordering the roadway and built above it to control water flow.

**Sidewalk:** Pedestrian walkway bordering a street.

**Street light:** Automated device used to illuminate a public thoroughfare.

**Fire hydrant:** A pipe connected to a water main; firefighters attach their hoses to it to supply their trucks.

**Barrier:** Movable fence placed across the roadway, sidewalk or elsewhere to redirect traffic.

**Bus shelter:** Covered shelter for public transit users.

**Bus stop:** Area where buses stop to let passengers on and off.

**Pedestrian crossing:** Lane that is reserved for pedestrian traffic as indicated by stripes painted on the roadway at intersections.

**Traffic light:** Automated lighting device that controls traffic at some intersections.

**Manhole:** Hole with a removable cover for accessing the water mains.

**Storm drain:** Conduit connecting a building’s downspout to the sewer.

**Sewer:** Pipe that collects wastewater and runoff and conveys them to the main sewer.

**Main sewer:** Large-diameter pipe that collects wastewater and sewer runoff and conveys them to a treatment plant.

**Water main:** Pipe that conveys drinking water to buildings and residences.

**Service main:** Extremely high-flow pipe linked to smaller distribution pipes with far smaller volumes of flow.

**Gas main:** Pipe that conveys gas to buildings and houses.

**Electricity lines:** Cable linking an electrical power station to its users.

**Telephone/Internet cables:** Cable linking a telephone exchange to its users.

The longer the roadway the more amenities are constructed such as street lights and medians. Therefore, even though the roadway by itself might be costly to maintain, one must consider the additional costs of all the amenities that go with it. For the City of Lancaster franchise agreements have been made with local utility companies to maintain the electric lines and or poles, street lights, water mains, gas mains, and telephone/internet lines and or poles. Therefore, those amenities do not have a direct affect on the City’s General fund with exception of certain street lights. The city pays for the lighting of the street lights within certain community facility districts. Therefore, the City’s is responsible for maintaining roadways, striping, medians, curbs, sidewalks, pedestrian crossings, bus stops, traffic lights, manholes and sewer lines. Because of the small scope of these lighting and sewer districts they will be left out of the analysis because they are too much of an outlier to factor into the cost of maintaining roads. Also bus stops will be left out of the discussion because there are too few in the city to affect the repair of bus stops in the areas considered in this analysis.
IRB Authorization Letter

CSU Bakersfield
Office of the Grants, Research, and Sponsored Programs (GRaSP)

Institutional Review Board for Human Subjects Research

Date: 11 July 2012
To: Trevin Wallace Barber, PPA Student
cc: Paul Newberry, IRB Chair
     B. J. Moore, Public Policy and Administration
From: Steve Suter, Research Ethics Review Coordinator

Subject: Protocol 12-89: Not Human Subjects Research

Thank you for bringing your protocol, “Transportation Costs: A Case Study in the City of Lancaster, CA”, to the attention of the IRB/HSR. On the form, “Is My Project Human Subjects Research?” received on July 11th, 2012, you indicated the following:

I want to interview, survey, systematically observe, or collect other data from human subjects, for example, students in the educational setting. NO

I want to access data about specific persons that have already been collected by others [such as test scores or demographic information]. Those data can be linked to specific persons [regardless of whether I will link data and persons in my research or reveal anyone’s identities]. NO

Given this, your proposed project will not constitute human subjects research. Therefore, it does not fall within the purview of the CSUB IRB/HSR. Good luck with your project.

If you have any questions, or there are any changes that might bring these activities within the purview of the IRB/HSR, please notify me immediately at 654-2373. Thank you.

Steve Suter, University Research Ethics Review Coordinator