Curbing Congestion in Amherst’s Crucial Corners: Final Portfolio

By Ian Schwarzenberg

END 350

Fall 2015

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Section 1:
Short Reflection Essay

The major goal of this project is to research the causes of traffic congestion on Amherst's roads, and to figure out a viable solution that will lessen congestion in the neighborhood. The vast majority of the scholars in the annotated bibliography came to their conclusions by researching what various cities and countries have done to lessen road congestion. Some scholars also conducted public surveys asking respondents what they would think if a possible solution was implemented in their areas. Most of the scholars produced strong arguments based off of their findings. However, there were notable instances of scholars forgetting to consider major facts about American culture that put their proposed solutions into question. Also, some scholars used mathematical models to demonstrate the potential effectiveness of their ideas. Many scholars that used mathematical models did not clearly demonstrate how their models related to their arguments.

Each scholar suggested in the literature review what they believe is the best solution for lessening traffic on roads. Many scholars suggested their own solutions, and they mostly agreed that one particular solution works the best. However, it was found that one solution will not work for Amherst, because that solution is mainly designed for places with lots of highways. The Amherst neighborhood is composed completely of streets, which makes that solution inapplicable to the neighborhood.

American Community Survey data from 2009-2013 was gathered and used in the census data policy memo to understand the background of the neighborhood's residents. This background was graphically analyzed to see how it can affect both current and future traffic conditions in the area. A solution was proposed based off this data that could help reduce congestion levels in the Amherst neighborhood.

US Census Tiger/Line® Shapefiles data was then gathered and used in the maps policy memo to understand general information about the neighborhood's properties, as well as traffic levels of the neighborhood's major roads. This data was analyzed by creating maps to see which parts of the neighborhood have properties that can cause significant congestion. A solution was proposed based off of this information that could help reduce congestion in the neighborhood.

Field visits were then made to the site to examine where traffic was building up in the neighborhood and why. An interview was made with a local resident to see what the residents believe is the biggest cause of congestion.

The information obtained from these field visits was then compiled into a poster, which illustrated the neighborhood's background, the area's current traffic conditions based off field observations, how the neighborhood's background affects congestion levels, a local resident's opinion on what the biggest cause of congestion in the area is, and the best solution for the neighborhood.

Much of the information obtained from the field observations was also compiled into a PowerPoint. The PowerPoint summarized: the neighborhood's background, findings from field observations, what some scholars suggested to combat traffic congestion, and the best solution that could lessen congestion in the Amherst neighborhood.

Throughout this course, I learned the importance of being empathetic to public opinion when considering implementing a plan. Before this course, I would often neglect to consider what people would think of an idea that I would consider to be good. When I interviewed an Amherst resident, I learned firsthand the importance of public input when it comes to urban planning. Before interviewing him, I viewed Amherst's congestion problem in a completely different way compared to how I viewed it after the interview.

As a result, talking to local residents greatly helped my project, and it completely changed the course of it. From the interview, I discovered that a big cause of congestion in Amherst is improperly synced traffic lights. When just looking at maps and graphs that show the neighborhood's background, it is impossible to tell how improperly synced traffic lights cause significant congestion in the area. This is something only local residents would know since they regularly drive on Amherst's streets.

Another important lesson I learned is the importance of observing an area in person. Before conducting field observations, the only way I knew the Amherst neighborhood was through graphs and maps. The maps demonstrated commercial properties located at the edges of the neighborhood where congestion can occur. During field observations, however, I noticed how many of those commercial properties do not cause much congestion in reality, and properties located just outside the neighborhood's boundaries are the big congestion creators. Those outside structures greatly affect congestion levels inside the neighborhood as a result. Since those outside structures did not show up on the maps, I would have never discovered this if I never conducted field observations.

The biggest lesson I learned that applies to my future career is the general process of planning to make an improvement to an area. This involves analyzing what experts have said about an issue that needs fixing in a specific area, thoroughly analyzing that area's background, seeing how that background affects the neighborhood's issue, and finally proposing a solution based off that information. I learned that this general formula is fundamental to urban planning, which will greatly apply to my future career.

I have always needed to improve my public speaking skills. A major lesson I learned during this course is that urban planners' ideas are practically meaningless if they don't know how to communicate them well to the public. I have learned that the only real way to get better at public speaking is through constant practice, and this course is giving me the opportunity to practice public speaking. This course is therefore helping me improve my public speaking skills.

Section 2:
Annotated Bibliography

Balaker, Theodore and Sam Staley. 2006. *The Road More Traveled: Why the Congestion Crisis matters more than you think, and what we can do about it* Lanham, MD: Rowman & Littlefield. Book

This book's aim is to see if the US has the resources to combat its rising levels of congestion. The authors show the need by analyzing present traffic conditions in the US. They identify the main causes of congestion, and suggest solutions. They also discuss what foreign governments have done to successfully reduce congestion in their countries, and how the US could implement similar programs. The authors conclude that America does have the resources to fight traffic congestion, it's just that it's spending its resources elsewhere, such as on foreign wars.

This book is a good resource because the authors explain everything in an easy-to-understand manner, unlike some other papers which were written in complex and confusing terms. This shows how the intended audience of this book is the common person, versus other scholars who wrote more for other academics.

The authors are very optimistic about America's ability to fight congestion, in contrast to some other scholars who hold more pessimistic views. This book suggests that congestion in this country is a solvable problem.

Brueckner, Jan K. 2007. "Urban growth boundaries: An effective second-best remedy for unpriced traffic congestion?" *Journal of Housing Economics* 16 (3–4):263-273. doi: http://dx.doi.org/10.1016/j.jhe.2007.05.001

The author Jan K. Brueckner's main argument is that limiting suburban sprawl and suburbs' boundaries will not help limit road congestion. Brueckner researches and analyzes what local suburban politicians have generally done to try to remedy congestion in their suburbs. Brueckner also uses mathematical models and graphs to illustrate the effects that different solutions would have on road congestion in the suburbs. Brueckner concludes that policies which limit suburbs from growing will do basically nothing to limit congestion, because he claims expanding suburban boundaries are not to blame for suburban congestion.

One strength of this paper is that it specifically focuses on congestion in America's suburbs, similar to what a couple other scholars have done. This will greatly help with analyzing any traffic problems that Amherst has.

Another strength is how Brueckner successfully employs mathematical models and graphs to reinforce his main argument. Unlike some other scholars, he gives clear explanations of how his models and graphs relate to and prove his main argument.

de Palma, André, and Robin Lindsey. 2011. "Traffic congestion pricing methodologies and technologies." *Transportation Research Part C* 19 (6):1377-1399. doi: 10.1016/j.trc.2011.02.010

The authors' main argument is that technology is the smartest way to efficiently and fairly conduct road pricing. The authors analyze the technology that foreign cities such as Stockholm, London and Singapore use to help run their road pricing systems. The authors also discuss statistics that show profits made by these systems, which they use to claim how technology makes the collection of these revenues more efficient. The authors conclude that many technologies in the US are suitable for use in road pricing systems, including technologies that are already in place that presently serve other uses.

A big strength with this paper is how the authors connect different statistics and facts into one concise and easy-to-understand argument. This is in contrast to some other scholars who also employ mathematical models and statistics, but do not use these to make as clear of an argument as these scholars do. The authors provide clear facts and statistics, further giving strength to their main argument.

Downs, Anthony. 1988. "The Real Problem with Suburban Anti-Growth Policies." *The Brookings Review* 6 (2):23-29. doi: 10.2307/20080026

The main goal of author Anthony Downs' paper is to find out how to limit traffic congestion specifically in the suburbs, and if limiting how much suburbs can grow can ease suburban congestion. Downs analyzes the general history of American suburbs to find the main causes of suburban traffic congestion, as well as how they fit into the bigger causes of urban sprawl. He concludes that limiting suburbs' growth boundaries alone will not reduce congestion in suburbs. He claims other factors such as local economic health and rates of car ownership collectively affect congestion levels more than limiting suburban expansion would.

A big strength of this paper is how it specifically focuses on congestion problems in the suburbs, in contrast to how most of the scholars focus on congestion in a more general range of areas. This paper will prove very valuable because it gives a background on congestion specifically in suburbs, which will help with analyzing traffic conditions in Amherst.

Another strength with this paper is how it also gives a general background of other issues suburbs deal with and how they affect congestion levels. In order to fully understand congestion in places like Amherst, other issues that can affect traffic levels must be fully understood as well.

Glaister, Stephen, and Daniel J. Graham. 2006. "Proper Pricing for Transport Infrastructure and the Case of Urban Road Congestion." *Urban Studies* 43 (8):1395-1418. doi: 10.1080/00420980600776475

The authors' main goal is to find a congestion pricing system that works for all of the UK. To find this, they do an in-depth analysis of London's current congestion pricing system, which the authors claim successfully reduces congestion. The authors conclude that a slightly modified version of London's system could work well throughout the UK. But, they also claim before the system gets implemented, Brits will have to be convinced of its benefits, especially the rural residents where there's less congestion compared to the cities.

The biggest shortcoming with this paper is the difficulty of introducing a national road pricing system in the US. First of all, the UK's federal government can do this because they have a unitary political system, versus in the US where this is mainly the state governments' matter. Secondly, there are many Americans who oppose a bigger, more powerful federal government. Implementing a national road pricing system in the US will be tough.

Kockelman, Kara M., and Jason D. Lemp. 2011. "Anticipating new-highway impacts: Opportunities for welfare analysis and credit-based congestion pricing." *Transportation Research Part A* 45 (8):825-838. doi: 10.1016/j.tra.2011.06.009

The authors' aim is to analyze congestion pricing systems, and the one that can generate the most profit for the government. They thoroughly analyze two possible systems: using toll booths that are common on American highways today, and using a system where drivers would pay to use roads with special credits.

The authors primarily use mathematical models and graphs to illustrate how much each system can earn a profit. They find not only will the profits completely fund highway and infrastructure maintenance, the profits will also generate extra money in the form of credits motorists can use. The authors use this to conclude that the credit system works best.

This paper is unique because the authors identify a solution to the congestion problem which benefits drivers by putting money back in their pockets. This paper is especially strong because it provides a solution which will be easy for the public to accept, because it will make the drivers save money.

Rhoads, Thomas A., and Jason F. Shogren. 2006. "Why do cities use supply side strategies to mitigate traffic congestion externalities?" *Economics Letters* 92 (2):214-219. doi: 10.1016/j.econlet.2006.02.007

The authors' aim is to find what strategies urban planners have generally used to fight congestion. The authors identify two strategies planners have used, which the authors then mathematically analyze to see which of the strategies is cheaper. The authors conclude that planners tend to prefer using cheaper, short-term fixes, despite whatever negative consequences these short-term solutions have.

One big strength is how just like scholar Brueckner, these scholars successfully explain the purpose of the mathematical models the authors use, and how it relates to the aim of the paper. The models clearly and precisely demonstrate where the authors get their conclusion from.

The only shortcoming of this paper is it seems to broadly generalize what all urban planners think. Even if planners really prefer cheap, short-term fixes sometimes, there must be urban planners who think in the long term and consider potential negative consequences.

Samuel, P. 1999. "Traffic congestion: A solvable problem." *Issues in Science and Technology* 15 (3):49-56

The author's main argument is that there are many cheap and effective ways to combat traffic congestion without having to build costly new roads. Samuel researches statistics about congestion, which he uses to find the causes of congestion in this country. Samuel then concludes by suggesting solutions to the congestion problem, which he proves to be successful by using examples of foreign countries where those solutions were used successfully.

Samuel wrote in a clear and easy-to-understand language, which makes the author’s points come across very clearly and convincingly. Samuel also do a good job of showing how the solutions he suggests are efficient and cheap, and are only going to get more efficient and cheap as newer and improved technology gets invented.

The only shortcoming with this paper is that it is written in 1999, before the advent of some technological innovations that have changed the world. As a result, there are probably more viable solutions to congestion the author could not mention. Despite this, he briefly acknowledges new technology is being invented faster and faster.

Schade, J., and M. Baum. 2007. "Reactance or acceptance? Reactions towards the introduction of road pricing." *Transportation Research Part A: Policy and Practice* 41 (1):41-48. doi: http://dx.doi.org/10.1016/j.tra.2006.05.008

The authors’ main goal is to see what makes people react the way they do when they hear congestion pricing might be implemented in their areas. The authors conduct a study where they ask drivers in Europe if they heard about congestion pricing systems being implemented near them, and if they knew anything about road pricing in general. The authors find that people who knew nothing about road pricing react very negatively. However, people that have previous knowledge about road pricing end up reacting more positively. The authors conclude that people's opinions of a system before it gets implemented will most likely not change after it gets implemented.

The biggest shortcoming with this paper is the authors' conclusion. It is difficult to make a fair conclusion based on the data the authors' data. It would not be surprising if people who are opposed to the implementation of the system before it gets implemented change their mind once they see the system's benefits after it gets implemented. Therefore, it is unfair for the authors to make a sweeping generalization that people will be too stubborn to change their opinions.

Schade, Jens, and Bernhard Schlag. 2003. "Acceptability of urban transport pricing strategies." *Transportation Research Part F: Traffic Psychology and Behaviour* 6 (1):45-61. doi: http://dx.doi.org/10.1016/S1369-8478(02)00046-3

The authors' aim is to see people's responses to the suggestion of congestion pricing being implemented in their areas, and possible ways to improve their reactions. The authors conduct a study where they poll motorists from different cities in Central Europe, and ask them how open they would be to a road pricing system being introduced in their areas. The authors find all the motorists to be very opposed to road pricing, and they use this to conclude that it will be very hard if not impossible to convince drivers to accept congestion pricing.

One notable shortcoming of this paper is its pessimism and refusal for the most part to fully consider ways to improve peoples' reactions to congestion pricing being introduced in their areas. For example, the authors could have tried told the people that the hypothetical system would be phased in, which might not anger people as much compared to if the people were told the system would be implemented in full immediately. The authors do not fully consider this, which ended up affecting the outcome.

Schuitema, Michael H. 2007. "Road pricing as a solution to the harms on traffic congestion." *Transportation Law Journal* 34 (1):81

The aim of author Michael H. Schuitema's paper is to find out what it will take to convince Americans to accept road pricing. Schuitema analyzes successful congestion pricing systems of major foreign cities. He then compares these cities' programs to similar ideas in the US that were never implemented. Schuitema finds that governments in the foreign cities dealt with public opposition right away, versus American governments which were reluctant to do so. Schuitema concludes that in order for road pricing systems to work here, local governments must immediately deal with public opposition, instead of ignoring them.

Schuitema successfully explains in depth the steps foreign cities took to address their citizens' worries about road pricing, and how those steps can be replicated here. In the past, planners used to make plans without much of the public's input, which has lead to lots of public opposition as a result. If planners deal with the public's worries and convince the public to accept the plans, there will be much less problems in implementing them.

Sheik Mohammed Ali, S., B. George, L. Vanajakshi, and J. Venkatraman. 2012. "A Multiple Inductive Loop Vehicle Detection System for Heterogeneous and Lane-Less Traffic." *IEEE Transactions on Instrumentation and Measurement* 61 (5):1353-1360. doi: 10.1109/TIM.2011.2175037.

The authors' main argument is that implementing devices called inductive loop traffic detectors at intersections is the best way to lessen congestion on streets. They explain how inductive loop traffic detectors are electromagnetic systems buried beneath the pavement at traffic lights. They explain how the inductive loop traffic detectors turn the lights green when a vehicle's tires make contact with them. They discuss how this technology is beneficial for syncing up traffic signals because they let cars go quickly at opportune times, cutting down on drivers' travel times as a result.

This paper is especially strong because it suggests a good solution that is designed for dealing with traffic on streets, unlike the other scholars who mainly discussed how to solve congestion on highways. Therefore, this paper brings a fresh perspective on how to deal with congestion compared to what other scholars have discussed. This paper will especially help with considering how to solve congestion in Amherst, because Amherst consists mainly of streets.

Sweet, Matthias. 2011. "Does Traffic Congestion Slow the Economy?" *Journal of Planning Literature* 26 (4):391-404. doi: 10.1177/0885412211409754

The author Matthias Sweet's aim is to investigate the belief that congestion can hurt an area's economy. He first discusses his own definition of congestion, which other scholars do not do for the most part. He looks at studies done of cities in the US and how their economies have slowed due to congestion, which made him conclude that congestion undoubtedly slows an area's economy down. This leads Sweet to propose guidelines which planners can use to deal with congestion in their areas.

This paper is very strong because Sweet compares his work to what others have said about the topic of his paper. This not only gives a good background of where his ideas come from, but how to compare it to what other scholars have said. This makes Sweet especially helpful for future analysis of what scholars have said about how to solve congestion, because it will give a good picture of how Sweet relates to what other experts have said about road congestion.

Teodorović, Dušan, and Mauro Dell'Orco. 2008. "Mitigating Traffic Congestion: Solving the Ride-Matching Problem by Bee Colony Optimization." *Transportation Planning and Technology* 31 (2):135-152. doi: 10.1080/03081060801948027

The authors' aim is to find out how to make the shortest, most efficient trip possible while carrying the most amount of people. They claim ridesharing is not that common because it is seen as too complicated, especially if the passengers live far away from each other and have different schedules.

The authors attempt to solve this problem by creating a mathematical model which compares the behavior of bees to that of humans. The authors discuss how both bees and humans are social and generally act unpredictably. They use this to equate how bees behave with how people behave when sharing rides. The authors conclude that the creation of models like these will help make ridesharing easier in the future.

The biggest shortcoming with this paper is how the authors do not come up with a clear conclusion as to what their model means for making ride sharing easier for people. The authors approach the problem from a purely mathematical standpoint, with little discussion of the standpoint of the average carpooler. This makes it hard to translate their models into a real world picture.

Viegas, José M. 2001. "Making urban road pricing acceptable and effective: searching for quality and equity in urban mobility." *Transport Policy* 8 (4):289-294. doi: 10.1016/S0967-070X(01)00024-5

The author Jose M. Viegas' goal is to see why people become opposed to the introduction of road pricing, and how to present road pricing positively. Viegas analyzes how road pricing has been presented by local politicians where it is not implemented. He also analyzes economists' claims about the efficiency of road pricing. Viegas discovers a divide between local politicians and economists, where he claims economists care more than local politicians about the efficiency of a plan. Viegas concludes that local politicians must show they will be accountable for the pricing system to eliminate fears of misuse of funds.

A major shortcoming of this paper is the conclusion. Although Viegas successfully explains his overarching question and how cities have dealt with it before, his conclusion does not fully take in to account other reasons why people would be opposed to road pricing. For example, someone may be opposed to road pricing because they do not see why they should start paying to use something that they've mostly used for free beforehand. Viegas does not explain how he would plan to mediate their fears.

Wachs, Martin. 2002. "Fighting traffic congestion with information technology." *Issues in Science and Technology* 19 (1):43-50

The author Martin Wachs' fundamental argument is that using information technology is a crucial tool to creating fair and efficient congestion pricing systems. To support his argument, he discusses statistics about the current severity of traffic congestion in the US, and how the implementation of information technology can positively change those statistics. Wachs concludes that putting devices in cars which facilitate the process of charging drivers for using roads is the best way to deal with traffic congestion.

The main shortcoming of this paper is how Wachs brushes over the problems of using this technology. He briefly mentions how using these technologies can invade peoples' privacy, but he does not suggest how to solve this problem. Americans have always been known to value their privacy, which is evidenced by recent events such as the controversy over the NSA's mass surveillance programs. Considering this level of opposition to privacy invasion, the implementation of this technology will be a hard sell to the public.

Section 3:
Literature Review

Despite traffic congestion being a severe problem in this country that is only continuing to get worse, scholars agree it is a fixable problem. Certain parts of the US have worse traffic congestion than others, based on factors unique to each area. Many discuss various solutions to deal with congestion, especially on highways, such as doing nothing in order to encourage people to use public transit (Balaker 2006, Samuel 1999, Sweet 2011), encouraging people to carpool (Teodorović and Dell'Orco 2008), building new highways (Downs 1988, Kockelman and Lemp 2011, Rhoads and Shogren 2006, Samuel 1999, Schuitema 2007, Sweet 2011), enacting urban growth boundaries (Brueckner 2007, Downs 1988), and instituting congestion pricing (Balaker 2006, de Palma and Lindsey 2011, Glaister and Graham 2006, Kockelman and Lemp 2011, Schade and Baum 2007, Schade and Schlag 2003, Schuitema 2007, Viegas 2001, Wachs 2002). However, many agree that instituting a method for congestion pricing is the best strategy. But, it is worth considering all possible solutions first.

One possible solution some scholars suggested is doing nothing at all, in order to encourage people to use public transit. If planners do not act, people would logically get discouraged from driving, and encouraged to use public transit more.

This do-nothing strategy appears to not work. Scholars agreed public transit in the US will have to be greatly strengthened first, and people will have to be convinced public transit would be a better option than driving (Balaker 2006, Samuel 1999, Sweet 2011).

However, scholars disagree about the extent to which people can be convinced to use new or strengthened public transit systems. Sweet argued a public ad campaign that stresses the efficiencies of a new or strengthened public transit system can convince people to drive less and use public transit more (Sweet 2011). Balaker (2006), Staley (2006) and Samuel (1999) argue on the other hand that it will be extremely hard to convince people to use public transit more, because public transit has more stops, making it less efficient than driving (Balaker 2006, Samuel 1999).

Overall, all three stress changing commuting behavior would involve making new transit lines, which can be expensive. Their main point is that it is difficult to convince people to drive less, since driving is widely consider to be more efficient and direct than public transit.

Teodorović and Dell'Orco (2008) suggest people should be encouraged to carpool. Encouraging more people to carpool could work, because more carpoolers decreases the amount of cars on the road by putting more people in each car.

Teodorović and Dell’Orco use mathematical models to try to create an efficient system in which people with different home locations and work schedules could collectively carpool from their homes to wherever they want to go, in a cheap and efficient manner (Teodorović and Dell'Orco 2008).

In short, their main argument is that it is possible to convince people to carpool rather than drive. However, in reality it would be hard to convince people with different work schedules and home locations to carpool more. Similar to public transit, carpooling would still be way less efficient then people individually driving.

Another solution some suggest is building completely new highways. This could make sense, because more highway capacity provides more room for cars, which would lessen congestion.

However, there is much agreement that this will not work. Most scholars report data on congestion before new highways are built. They argue not only would it be extremely expensive to build completely new highways, but it would cut through the fabric of urban areas (Downs

1988, Kockelman and Lemp 2011, Rhoads and Shogren 2006, Samuel 1999, Schuitema 2007, Sweet 2011).

Despite these arguments, Balaker and Staley (2006) slightly disagree, arguing how highways can be widened, and more crossovers between highways can be built. But, construction and maintenance costs of both ideas will be high (Balaker 2006).

Overall, the consensus in the literature is that building completely new highways should be avoided, due to the damage urban areas will sustain if new highways are built. It is commonly known how after World War II, many American cities expanded their highway systems, which caused much damage to cities, such as displacing longtime residents and aiding suburban growth. Readers were warned not to allow planners to repeat past mistakes.

Another idea suggested by Brueckner (2007) and Downs (1988) is to create policies that limit suburbs from growing too large through urban growth boundaries (Brueckner 2007, Downs 1988). If a municipality gets banned from expanding too much, people will not have to travel as far, which could make using public transit a more attractive option. This in turn would lessen congestion.

However, both agree this solution will not always work. Both argue condensing a municipality into a smaller area could increase congestion because there would be less room for wide roads in a smaller area, which would lead to less space for all cars (Brueckner 2007, Downs 1988).

In short, their main point is urban growth boundaries would not work in lessening traffic congestion. However, they did not discuss what would happen if the enactment of an urban growth boundary would convince less people to drive, which could make the amount of people owning cars decrease.

Finally, the idea that most scholars agree would be best is instituting a method for road pricing on well-used highways, and using new technology to facilitate congestion pricing. Many scholars suggest ideas as to how to design and implement such a system. Many agree an essential for any good road pricing system is to make drivers pay to use roads using new technology (Balaker 2006, de Palma and Lindsey 2011, Glaister and Graham 2006, Kockelman and Lemp 2011, Wachs 2002). Most also elaborate that the best system would electronically charge all drivers through tolls (de Palma and Lindsey 2011, Glaister and Graham 2006, Kockelman and Lemp 2011, Wachs 2002).

However, Balaker and Staley (2006) slightly disagree with the others, by suggesting only charging drivers to use express toll lanes, instead of charging them for whole roads. They also point how certain cities in the US have already started to successfully do this, such as Los Angeles (Balaker 2006). Also, scholars Lemp and Kockelman (2011) suggest a slightly different system than others. Their proposed system would involve drivers paying using credits. They mathematically prove that not only would money be put back in the drivers' pockets, but it would also generate surplus revenues to fully fund infrastructure maintenance (Kockelman and Lemp 2011).

Overall, these scholars' common argument is that the US should be using a road pricing system that makes drivers pay to use roads using new technology. Benefits include obtaining money to maintain America's infrastructure. Decaying infrastructure is a very well-known problem throughout the US, which makes scholars argue having a road pricing system like this can greatly help the US.

It is important to note public opposition to road pricing poses a big obstacle to instituting such a system. This is an issue any government must deal with when introducing a new road pricing system. There are obvious reasons why people would be opposed to the implementation of road pricing. For example, in an area where roads have long been free to drive on, local residents will naturally question why suddenly it will cost to use something they've long used for free.

The scholars agree one of the best ways to lessen opposition when introducing road pricing is to introduce it in phases. This way, instead of drivers having to deal with a new complicated system all at once, they can slowly get used to it in minor installments, which will make them accept it by the end of its implementation (Schade and Baum 2007, Schade and Schlag 2003, Schuitema 2007, Viegas 2001).

Contrary to others' arguments, scholar Schuitema (2007) also suggests another important way to lessen public opposition; deal with public opposition from the start of the planning process, instead of avoiding the public when planning the system. Schuitema notes the example of Trondheim, Norway, where the government avoided dealing with the public when planning a road pricing system there, which led to the system's demise (Schuitema 2007).

In short, the main argument of those scholars is that it is important to communicate clearly and immediately with the public when planning out a congestion pricing system, and to introduce it in phases. Otherwise, forgetting to do all of this when planning out a system will only lead to opposition, which will make it way harder to introduce congestion pricing to an area.

In conclusion, traffic congestion is definitely a growing problem in this country, and is only continuing to get worse. Some scholars proposing ideas for solving the problem, but pretty much all agreed road pricing is clearly one of the most effective ways to combat traffic congestion, especially on highways. Even though road pricing has its downsides, these downsides do not stop scholars from supporting using road pricing. Despite the increasing severity of traffic congestion on our roads, many agree traffic congestion can be lessened.

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Section 4:
Policy Memo Using Census Data

To: Chairperson Barry A. Weinstein

From: Ian Schwarzenberg

Date: November 18, 2015

Re: Future Traffic Congestion in Amherst

Executive Summary

Census data shows overall that the Amherst neighborhood does not really have a problem with traffic congestion at the moment. However, there are some conditions currently in place which could lead to traffic congestion increasing in the neighborhood in the future. The purpose of this memo is to use quantitative data taken from the Census's American Community Survey to show traffic congestion can become a problem in the neighborhood in the future, if measures are not taken to prevent it. A solution the neighborhood could use in the future to curb traffic congestion is by banning the parking of cars on the sides of roads from 7 am to 7 pm every weekday. Scholarly conversations were researched which discussed how to lessen traffic congestion, and data taken from the American Community Survey was analyzed and graphically presented to show congestion can become an issue for the neighborhood in the future. A possible solution for traffic congestion was devised based on the data.

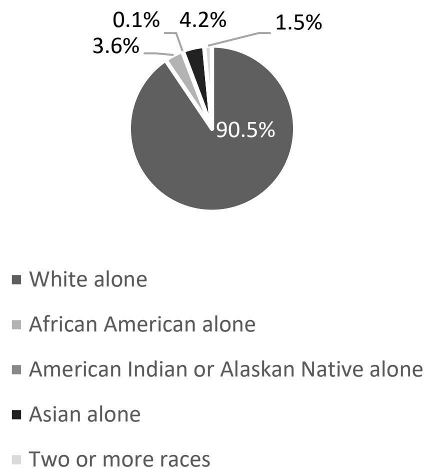
1. Objectives/Purpose

One major objective of this memo is to show the current of levels of traffic congestion in the Amherst neighborhood, and the potential of traffic congestion to become a problem for the neighborhood in the future. This is done by analyzing and graphically presenting census data which proves congestion could be a future problem. Another major purpose of this memo is to provide the neighborhood a solution which can lessen traffic congestion. The solution fits the specific conditions of the neighborhood, which are shown by the census data.

2. Findings and Analysis

To give a general background about the residents of the Amherst neighborhood, demographic data showed the residents were overwhelmingly white based on samples collected from 2009 to 2013, with 90.5% of the population being white. Asians made up 4.2% of the population, African Americans were 3.6%, multiracial people were 1.5%, and Native Americans were 0.1% (Figure 4-1).

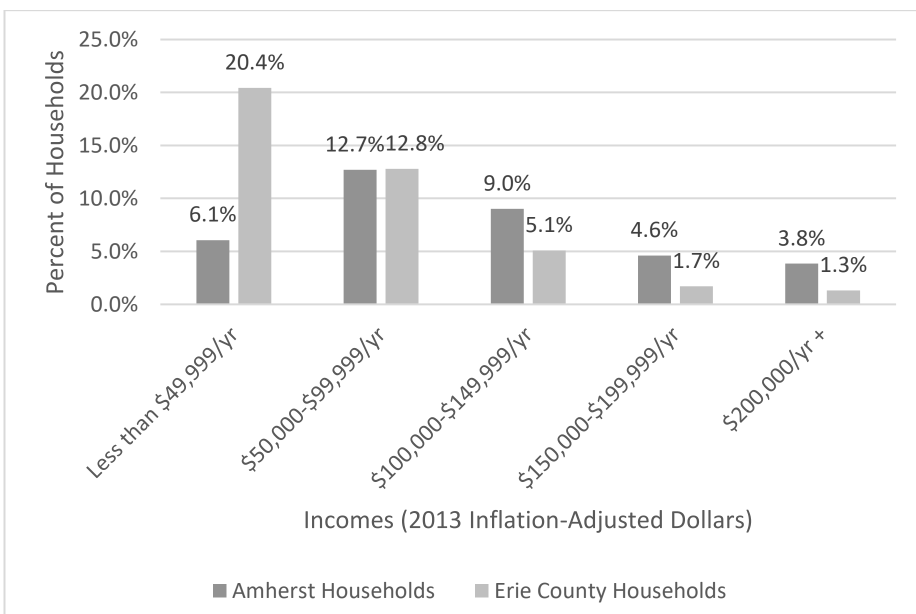
Figure 4-1. Major Racial Groups of the Amherst Neighborhood, 2013



Data Source: U.S. Census Bureau; 2009-2013 ACS 5 year estimates, Figure 4-1, generated by Ian Schwarzenberg using American FactFinder http://factfinder.census.gov; (data retrieved on September 29th, 2015)

The neighborhood is fairly diverse in terms of income levels. Compared to Erie County, the Amherst neighborhood has a smaller proportion of residents who earn less than $49,999 a year, a proportion equal to Erie County who earn $50,000-$99,999 a year, and a higher proportion who earn more than $100,000 a year (Figure 4-2). This makes the residents of the census tract fairly affluent compared to the rest of Erie County.

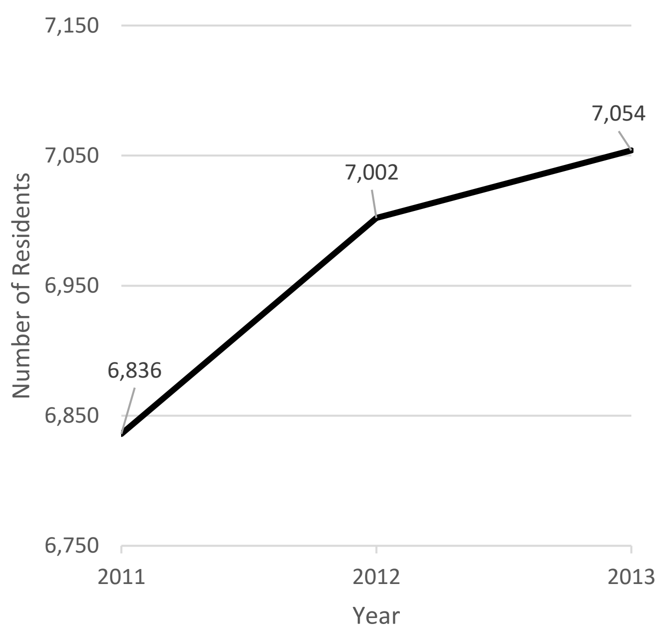
Figure 4-2. Median Amherst Neighborhood Household Incomes Compared to Erie County, 2013



Data Source: U.S. Census Bureau; 2009-2013 ACS 5 year estimates, Figure 4-2, generated by Ian Schwarzenberg using American FactFinder http://factfinder.census.gov; (data retrieved on September 29th, 2015)

The neighborhood had a population of 7,054 people in 2013. From 2011 to 2012, the population of the neighborhood rose 2.3%, and from 2012 to 2013, the population rose 0.7% (Figure 4-3).

Figure 4-3. Total Amherst Neighborhood Population, 2011-13

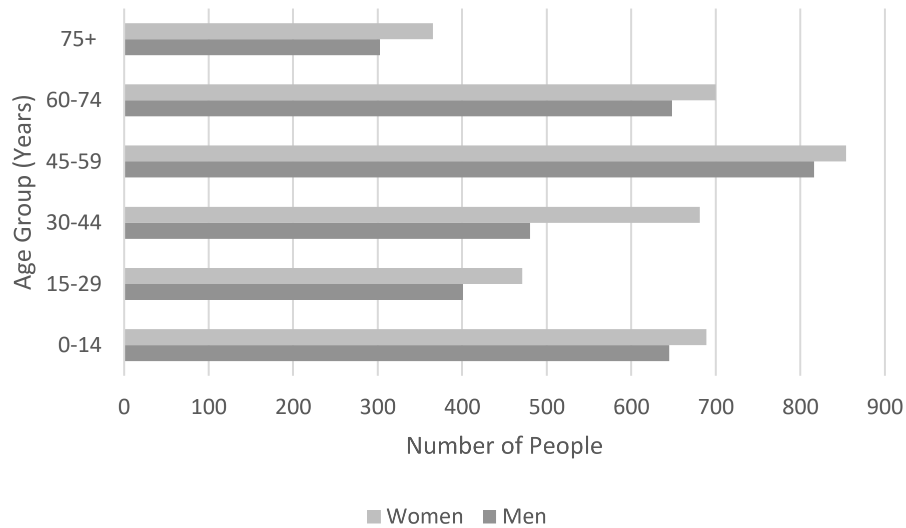


Data Source: U.S. Census Bureau; 2011-2013 ACS 5 year estimates, Figure 4-3, generated by Ian Schwarzenberg using American FactFinder http://factfinder.census.gov; (data retrieved on September 29th, 2015)

The neighborhood's population has been increasing only slightly in recent years. This is important to note, because as long as the neighborhood's population rises, more drivers could appear on the roads. If the amount of roads in the neighborhood is going to stay the same for years to come, and if no public transit improvements occur, the neighborhood's roads will gradually become more congested with new residents and their cars.

The residents of the neighborhood are also diverse when it comes to age and gender. As of 2013, there were two age groups that make up the biggest portions of the neighborhood population: Kids 14 years old and younger, and adults 45-59 years old (Figure 4-4).

Figure 4-4. Genders and Ages of the Amherst Neighborhood Residents, 2013



Data Source: U.S. Census Bureau; 2009-2013 ACS 5 year estimates, Figure 4-4, generated by Ian Schwarzenberg using American FactFinder http://factfinder.census.gov; (data retrieved on September 29th, 2015)

The sizable proportion of residents 14 years old and younger is important, because starting in 2015, the oldest people from this age group will start to turn 16, which is the legal age to drive in the area. This can gradually put more drivers on the neighborhood's roads, which will naturally create more congestion.

Just like most other suburban neighborhoods in the US, the vast majority residents of the neighborhood drive by themselves, especially to go from their houses to work and the other way around. For example, 3,011 employed residents drove alone to work in 2013, versus only 294 workers who carpooled, and a mere 51 who took public transit (Figure 4-5).

Few residents who take alternative modes of transportation to work. Only 294 residents carpool to work, 51 take public transit excluding taxis, none walk, and none take any other modes of transit (Figure 4-5). This makes sense because there are not too many alternatives for transportation in the neighborhood. It is widely known that some Niagara Frontier Transportation Authority (NFTA) bus routes traverse the town of the neighborhood, but it is generally seen that the bus still is not as efficient as a car, where the drivers control how fast they go, and how often they stop, unlike public transit. This makes driving the most attractive option for residents in suburbs, which means the solution to congestion should be focused around the car.

The majority of residents in the neighborhood do not have too long commutes to get to work. The majority take only 5-35 minutes to get from their house to work. However, the residents of the neighborhood have slightly longer commutes to work compared to residents of Williamsville (Figure 4-6), which has a small central business district.

The two biggest factors which can affect drivers' commute times to work and back are the congestion they encounter, and how far their workplaces are from their homes. There are some residents of Williamsville who take more than an hour to drive to work (Figure 4-6), which can be caused by those people working far away from their houses. Unlike Williamsville, the neighborhood does not have its own central business district, which further highlights how people from the neighborhood mostly have longer commutes to work than residents of Williamsville.

The vast majority of residents in the neighborhood leave their houses for work between 7 am and 9 am (Figure 4-7), which naturally creates a rush hour in the neighborhood at that time. The data implies this timeframe would be when congestion could be at the peak in the neighborhood, since this is the time when most people are leaving for work. This timeframe would undoubtedly be the perfect time to use a strategy to lessen congestion. However, the second rush hour of when residents are driving back to their houses from work is also important to consider, and would be another good time to use such a strategy.

Most households of the neighborhood have around 2 vehicles (Figure 4-8). This could mean that many houses in the neighborhood have built-in garages that can hold these vehicles. Garages and short driveways leading up to them are very well-known standards for suburban houses, making many suburban households capable of parking multiple vehicles in garages or driveways. This makes it likely that most if not all residents in the area own space off the street where they can park their cars. This can be good for lessening congestion on both roads in the neighborhood, by clearing well-travelled roads of parked cars which narrow those roads.

3. Policy Recommendations

In order to lessen future traffic congestion in the Amherst neighborhood, a new law should be enacted by the Town Board that bans parking next to the sidewalk on all streets in the neighborhood from 7 am to 7 pm every weekday. Service vehicles and the cars of visitors to homes and businesses should park in the driveways of the houses and businesses they're visiting during times when street parking is banned.

Since the majority of people in the neighborhood leave their houses to go to work from 7 am – 9 am (Figure 4-7), it makes sense to keep roads free of parked cars during that time. It also makes sense to end the no parking regulation around 7 pm, in order to make the streets clear for residents when they are driving back to their houses from work.

Residents could adapt well to this rule, since many suburban houses have room in a garage or a driveway to store cars. In case a resident does not have room to store cars in their garage, they can easily park cars in their driveway during times when parking on the side of the road is banned.

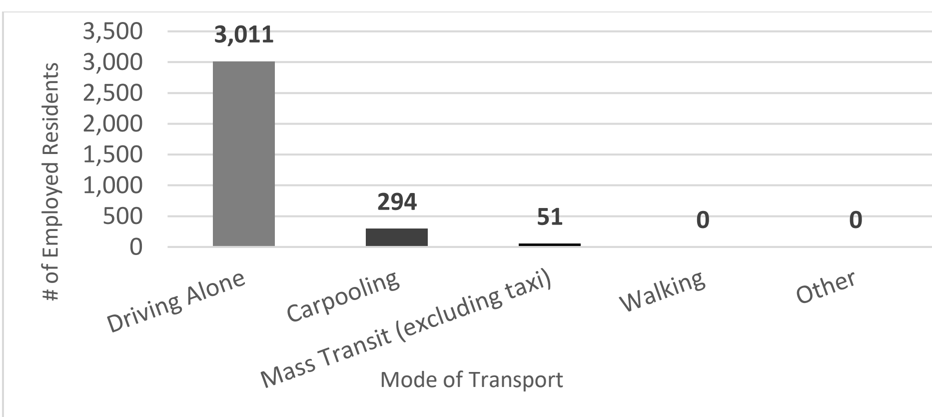
4. Appendices

4.1. Methods and Data Sources

American Community Survey census data was collected from 2009-2013, which contained information about details which can reveal both the current level of traffic congestion in the Amherst neighborhood, and the likelihood of it getting more severe in the future. The census data was then analyzed and presented in graphs for this memo. A possible solution to traffic congestion in the neighborhood was also devised based on both what census data said about the neighborhood residents, and the general consensus among scholars as to how to best lessen traffic congestion.

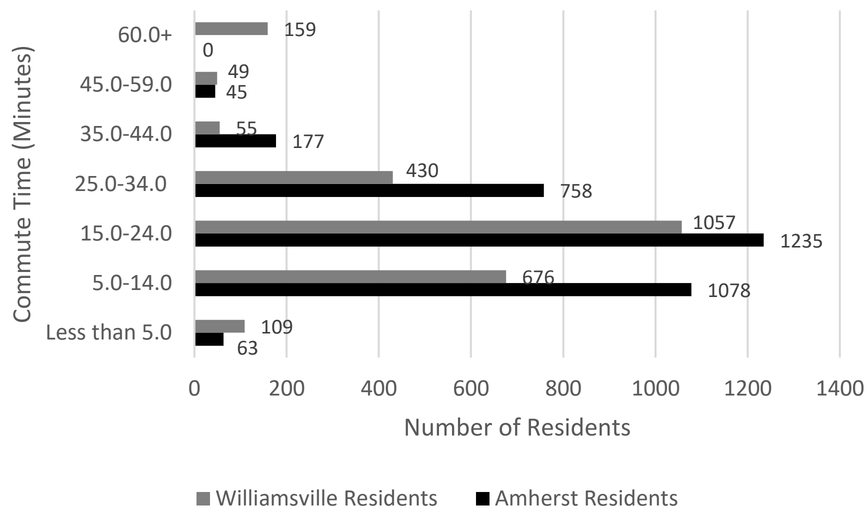
4.2. Supplementary Data

Figure 4-5. How Employed Residents of the Amherst Neighborhood Get to Work, 2013



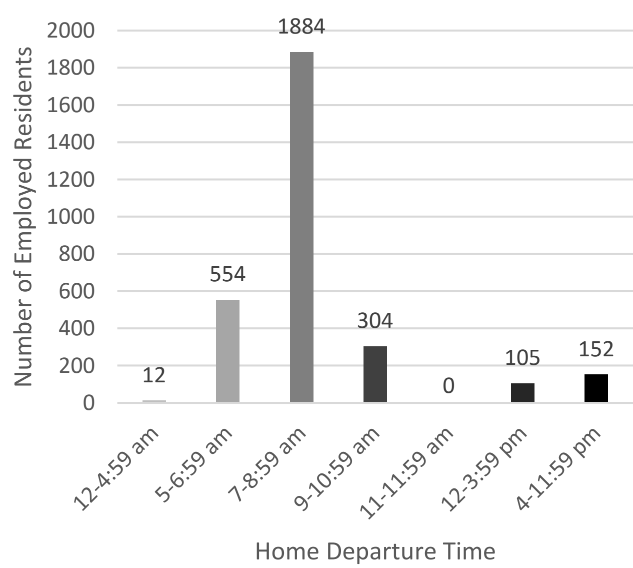
Data Source: U.S. Census Bureau; 2009-2013 ACS 5 year estimates, Figure 4-5, generated by Ian Schwarzenberg using American FactFinder http://factfinder.census.gov; (data retrieved on September 29th, 2015)

Figure 4-6. Commute Times of Amherst Residents vs. Williamsville Residents, 2013



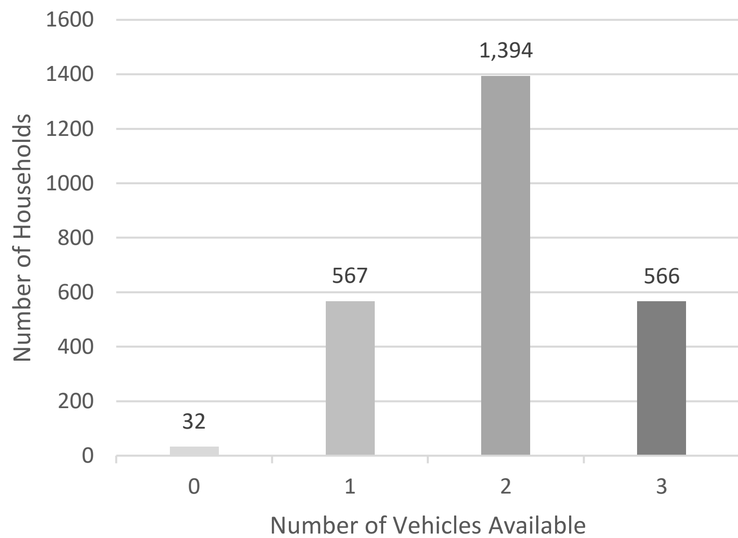
Data Source: U.S. Census Bureau; 2009-2013 ACS 5 year estimates, Figure 4-6, generated by Ian Schwarzenberg using American FactFinder http://factfinder.census.gov; (data retrieved on September 29th, 2015)

Figure 4-7. When the Amherst Neighborhood Residents Leave for Work to Drive Alone, 2013



Data Source: U.S. Census Bureau; 2009-2013 ACS 5 year estimates, Figure 4-7, generated by Ian Schwarzenberg using American FactFinder http://factfinder.census.gov; (data retrieved on September 29th, 2015)

Figure 4-8. Vehicles Available in Occupied Households of the Amherst Neighborhood, 2013



Data Source: U.S. Census Bureau; 2009-2013 ACS 5 year estimates, Figure 4-8, generated by Ian Schwarzenberg using American FactFinder http://factfinder.census.gov; (data retrieved on September 29th, 2015)

Section 5: Policy Memo Using Maps

To: Chairperson Barry A. Weinstein

From: Ian Schwarzenberg

Date: November 18, 2015

Re: Traffic Congestion in Amherst

Executive Summary

Before this memo, information was originally taken from the American Community Survey from 2009-2013 which contained general information about the Amherst neighborhood's residents and their commuting characteristics. For this memo, maps were compiled using data from 2014 Tiger/Line® Shapefiles from the US Census Bureau which show the boundaries of the neighborhood, the use and prices of its parcels, and its most used roads. These maps were then used to show how some of the neighborhood's characteristics can influence traffic congestion in the future. Using the data, a solution is proposed to ban the parking of cars on the sides of the neighborhood's most heavily travelled streets during rush hours every weekday.

5. Objectives/Purpose

The major purpose of this memo is to display certain characteristics of the Amherst neighborhood through maps, such as the purpose of each parcel of land, each parcel's property value, and which roads are driven on the most and least often.

Using these characteristics, the objective is to analyze and explain how these characteristics can affect congestion levels in the area. This information will then be used to suggest a solution that will help curb congestion in the area.

6. Findings and Analysis

The Amherst neighborhood's borders are marked by Stahl Road and Campbell Boulevard on the west, Dodge Road on the north, Hopkins Road on the east, West Klein Road on the south, and North Forest Road on the southwest. These are also the neighborhood's widest roads (Figure 5-1).

The majority of parcels in the neighborhood are occupied, but there are few vacant ones. The few vacant parcels that do exist are spread throughout all parts of the neighborhood, and tend to be very long, narrow and rectangular (Figure 5-2). This most likely means most of the vacant lots in the area are not sites where peoples' houses once stood.

The vast majority of the parcels in the neighborhood serve residential purposes. Despite this, there are also parcels that serve other purposes, such as commercial. Commercial parcels exist in the northwestern, northeastern and southeastern corners of the neighborhood. They are also all located at intersections of the neighborhood's major roads. There are other types of properties spread out throughout the neighborhood, such as parcels used for the benefit of the community, and parks (Figure 5-3).

The prices of the neighborhood's residential properties vary, with roughly half being worth less than $213,400, and the other half being worth between $213,401 and $1,045,225. Most properties along the neighborhood's major roads are worth less than $213,400. However, on North Forest Road, Stahl Road and Campbell Boulevard, there are some houses worth between $213,401 and $1,045,225 (Figure 5-4).

It is clear that a good amount of houses in this area are at the very least middle class. It is a well-known fact that many middle and upper class suburbs in the US contain houses with garages and driveways. Therefore, it is very likely that the houses located along the neighborhood's major roads contain garages and driveways. This gives residents who live on the area's major roads room to store their cars off the street, if any type of parking ban were to be enacted on their streets.

There are certain types of structures and parcels in the neighborhood that can affect traffic congestion in the neighborhood: structures that have to do with serving the community, recreation and entertainment, commerce, and residence (Figure 5-5). Examples of structures that serve the community include schools, where congestion can arise when school begins and ends each day. Congestion can also arise around recreation and entertainment sites, where big events such as sports games take place. Congestion can be caused in this instance by many residents driving to these games simultaneously. Commercial properties can undoubtedly cause congestion as well, since they are frequently busy with people driving to them from around the area to buy goods.

Residential properties can also cause traffic, but for a briefer time compared to other property types. For example, a big event happening at someone's house can temporarily create congestion on minor streets, when there are many cars driving down the same street headed towards the same house. All of this shows how there are certain types of structures present in the neighborhood which can cause congestion on both the neighborhood's major and minor roads.

Millersport Highway, North Forest Road and Hopkins Road are the most heavily trafficked streets in the neighborhood (Figure 5-6). Therefore, any structure that is located alongside these three roads has the potential to create the most congestion out of any other structure in the neighborhood.

This is especially true for structures that are not residential. There are big non-residential buildings located on these major roads, such as big commercial properties on Millersport Highway, and two big commercial buildings on Hopkins Road (Figure 5-5). If there are no cars parked on the sides of these roads during times when the roads are most used, congestion can be lessened by widening the space on the road drivers can use.

7. Policy Recommendation

It is clear that many residents of the Amherst neighborhood get around by car often. Therefore, in order to lessen future congestion in the neighborhood, any possible solution must be focused around the use of the car.

In order to lessen future congestion in the area, a new law should be made by the Town Board that bans parking next to the sidewalk on Millersport Highway, Hopkins Road and North Forest Road every weekday during rush hours. It makes sense during those times to keep the most travelled roads free of cars parked on the roadsides, which can cause congestion.

This could work well on roads such as North Forest Road, which is completely residential (Figure 5-3). If these houses have space where cars can be parked off the street, then this solution can work especially well for streets like these.

8. Appendices

8.1. Methods and Data Sources

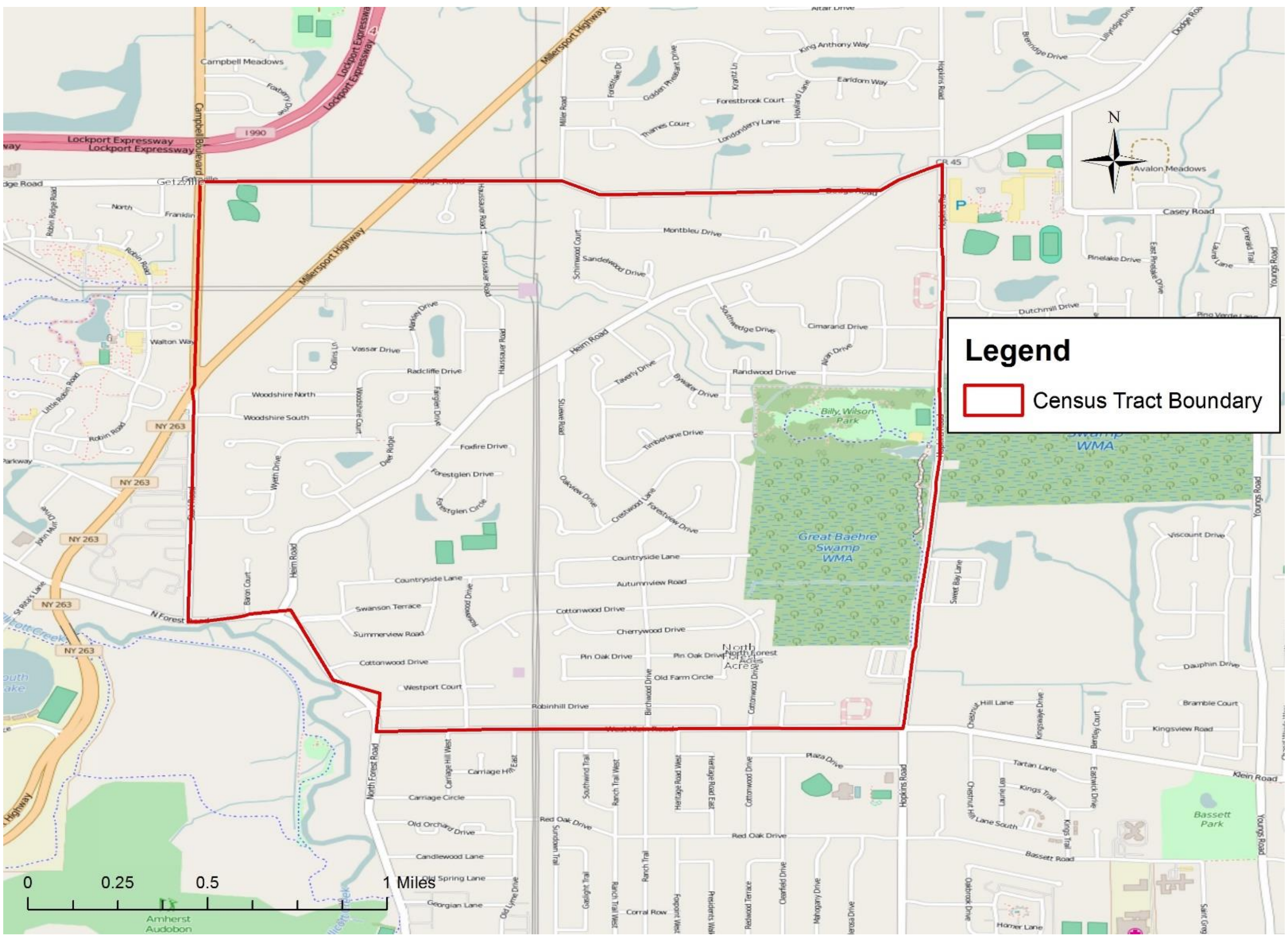
Before this memo, data containing information about the social background, economic background, and commuting characteristics of the Amherst neighborhood's residents was collected from the US Census Bureau using the American Community Survey from 2009-2013. That data was graphically analyzed using Excel to give a clear picture of what the neighborhood's residents are like, how they get around, and how all of that can affect congestion levels in the neighborhood.

For this memo, maps were created by collecting data from Tiger/Line® Shapefiles, produced by the US Census Bureau. The maps contained 2014 information about the neighborhood, such as its boundaries, the price and uses of its parcels, and which roads are used the most and least often. The Shapefiles were then downloaded and modified in ArcGIS to create the maps.

Then, a solution is proposed based on the data presented in the maps. All data showed how the neighborhood is designed for the use of the car, and how there are a group of heavily used streets which can benefit from having a type of parking ban which can reduce congestion.

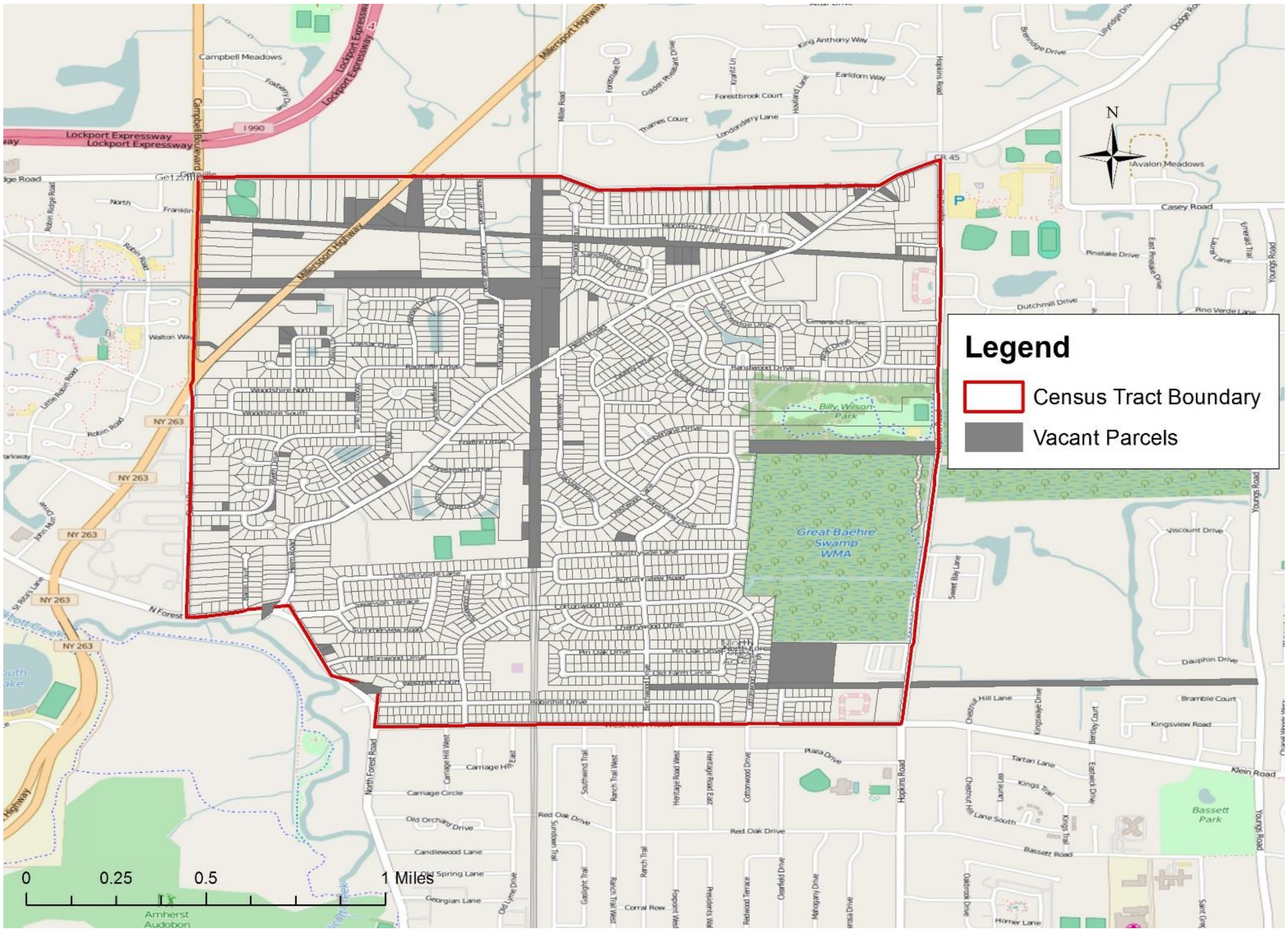
4.2 Supplementary Data

Figure 5-1. The Amherst Neighborhood Base Map



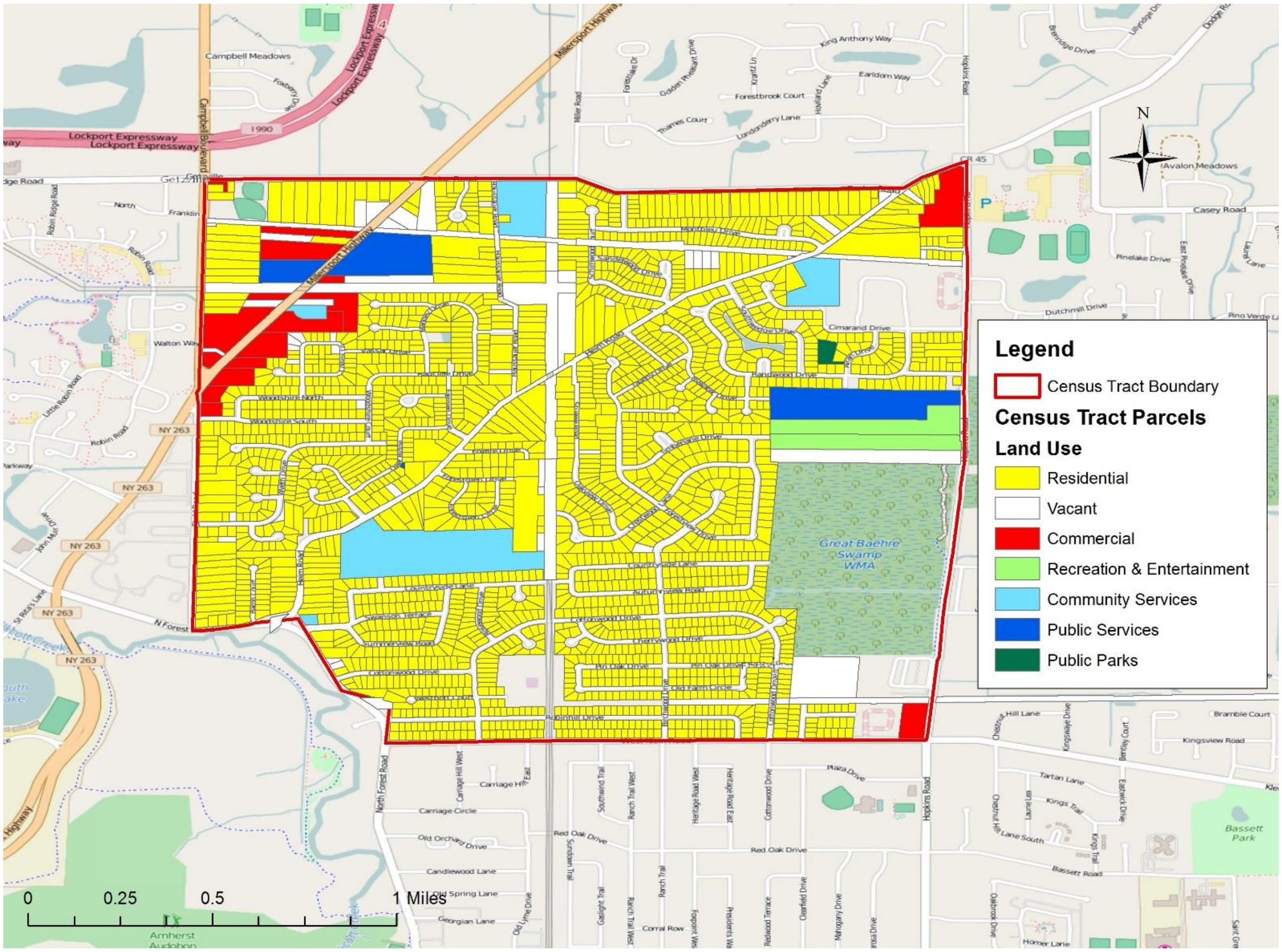
Data Source: US Census Bureau (2014), Erie County (2014)

Figure 5-2. Vacant Parcels in The Amherst Neighborhood



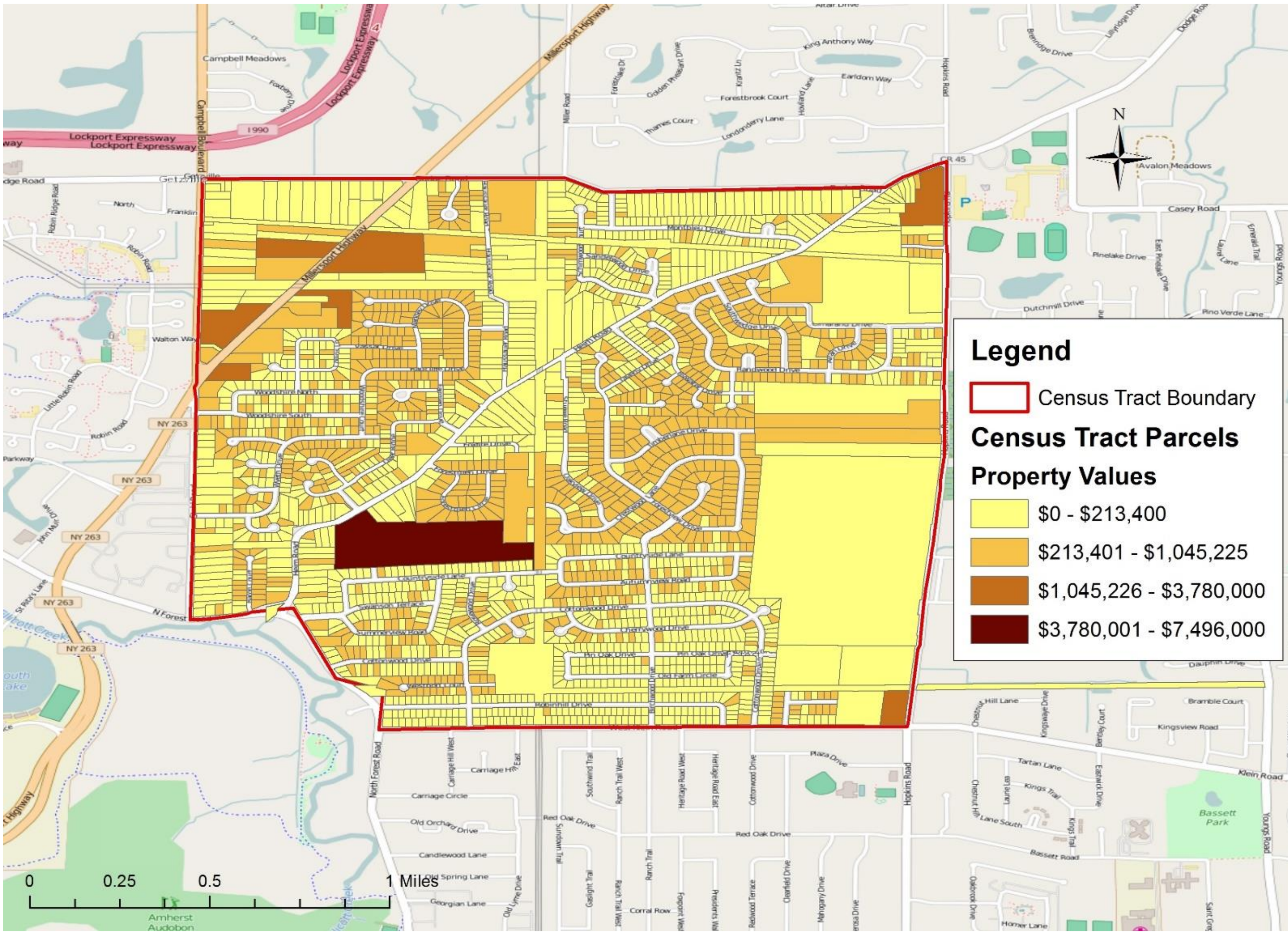
Data Source: US Census Bureau (2014), Erie County (2014)

Figure 5-3. Land Use in the Amherst Neighborhood



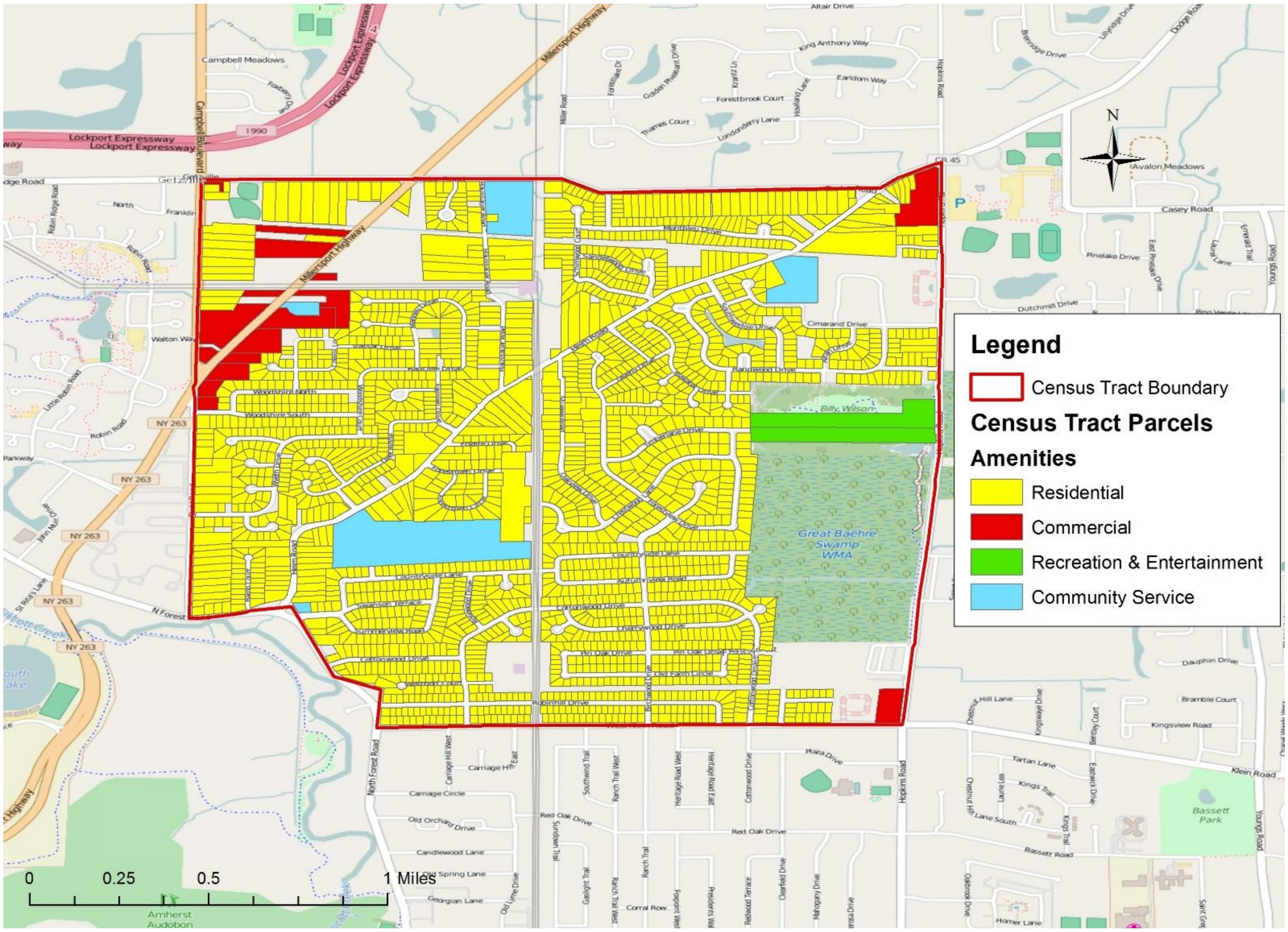
Data Source: US Census Bureau (2014), Erie County (2014)

Figure 5-4. Property Values of the Amherst Neighborhood's Parcels



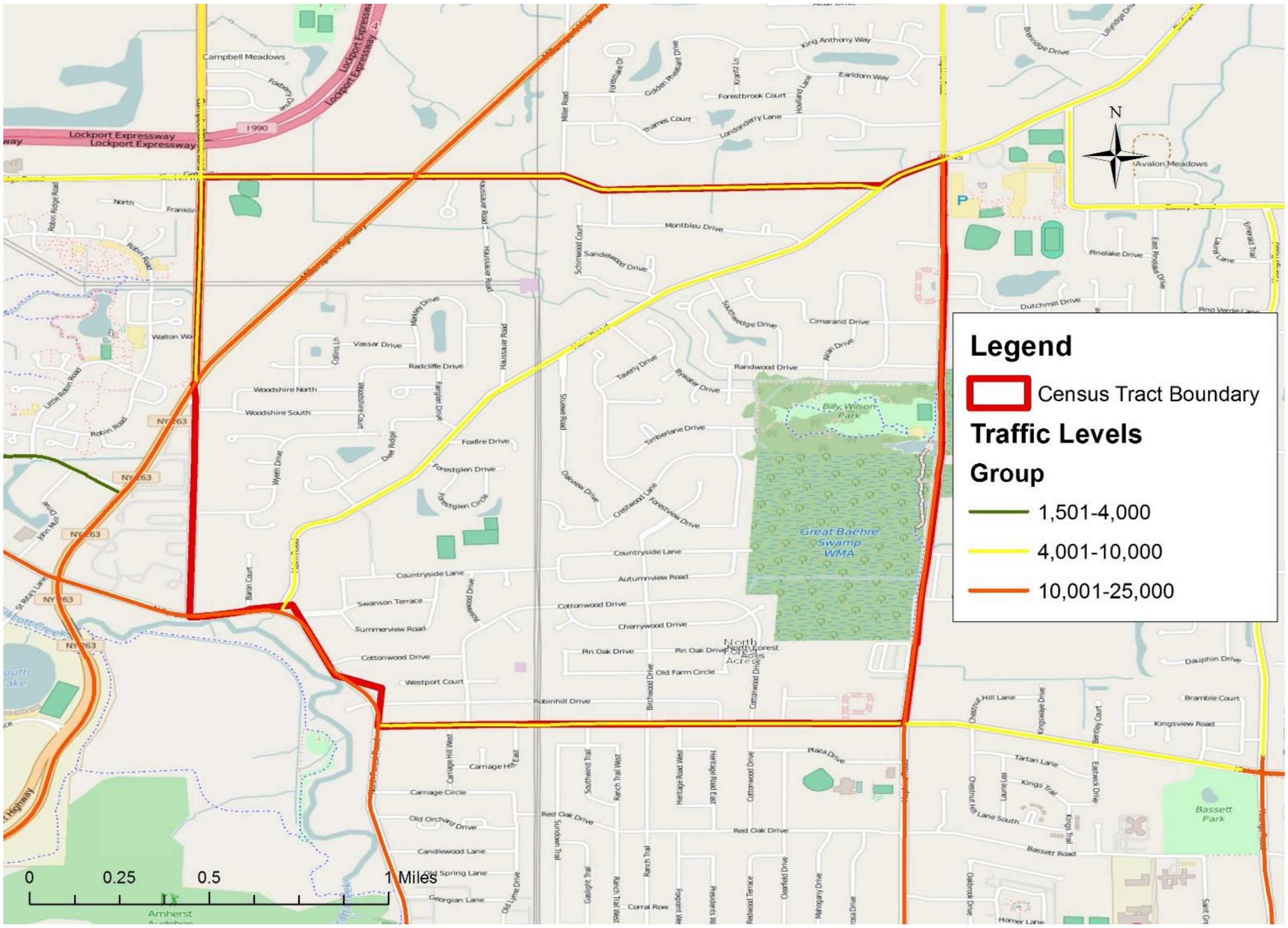
Data Source: US Census Bureau (2014), Erie County (2014)

Figure 5-5. Amenities in the Amherst Neighborhood that could Affect Congestion



Data Source: US Census Bureau (2014), Erie County (2014)

Figure 5-6. Most and Least Used Roads in the Amherst Neighborhood



Data Source: US Census Bureau (2014), Erie County (2014)

Section 6: Short Essay Using Qualitative Data

[TRAFFIC CONGESTION IN AMHERST]

[IAN SCHWARZENBERG]

[11/17/15]

[VERSION 2]

Curbing Congestion at Amherst's Crucial Corners

Abstract

Regular traffic in the Amherst neighborhood can happen at all of its major intersections due to the presence of eateries, shops, schools and other structures frequently used by residents. Even though these business do create congestion, traffic issues in the neighborhood are mostly caused by improperly timed traffic lights. The installment of devices known as inductive-loop traffic detectors beneath the roadways at the neighborhood's four busiest intersections will drastically reduce unnecessary delays caused by improperly timed traffic lights, without interfering in residents' lives.

Introduction

Congestion caused by many people going to the same business at once is a regular occurrence in communities across the world. If congestion were to be curbed by focusing on the businesses that cause it, this would involve convincing people to change their ways and driving habits. Past attempts by urban planners to try to change peoples' daily habits have not always been successful (Balaker 2006, Schade and Baum 2007, Schade and Schlag 2003, Schuitema 2007, Viegas 2001). This means the best solution to congestion in the Amherst neighborhood will have to involve interfering with drivers' lives as little as possible.

The first step in curbing congestion in the neighborhood is to identify where in the area congestion is most intense. Based on field observations, the four busiest intersections of the neighborhood were identified based on how much traffic was seen at those intersections, and how many businesses that were located near each intersection. They consist of the intersections between Millersport Highway and Campbell Boulevard, Campbell Boulevard and Dodge Road, Dodge and Hopkins Roads, and Hopkins and West Klein Roads. There is another less busy intersection of Heim and North Forest, but there is less congestion at this corner compared to the other four intersections (Figure 6-1).

The four busiest intersections are the best places to install the best solution, inductive-loop traffic detectors. The installment of these devices will not only reduce congestion, but will do it in a way that will not interfere with the residents' lives at all.

Research Methods

Various scholars' suggestions on how to lessen congestion were researched and analyzed to see what solutions could help, especially for suburbs (Balaker 2006, Brueckner 2007, de Palma and Lindsey 2011, Downs 1988, Glaister and Graham 2006, Kockelman and Lemp 2011, Rhoads and Shogren 2006, Samuel 1999, Schade and Baum 2007, Schade and Schlag 2003, Schuitema 2007, Sheik Mohammed Ali et al. 2012, Sweet 2011, Teodorović and Dell'Orco 2008, Viegas 2001, Wachs 2002).

Data was then gathered from the US Census Bureau, which contained information about the residents' socioeconomic backgrounds, their commuting characteristics, the Amherst neighborhood's boundaries, the use and prices of the land parcels, and the most used roads. A solution to congestion was suggested based on all this data.

Qualitative data was then gathered using field observations and interviews conducted during the mid to late afternoons of October 8, 2015 and October 15, 2015. On October 8, the observations were conducted mostly by car, and the remainder were by foot. The interview was conducted on October 8. All observations on October 15 were taken entirely by foot.

Findings

Some Causes of Congestion at the Busiest Intersections

Both Millersport and Campbell are state highways, making the intersection busy. It was observed at 2:45 PM on October 8 how there are 4 different eateries at the intersection, which all can cause congestion at meal times. There are also the 7/11 and Rite-Aid stores, which also cause traffic when residents simultaneously drive to these businesses to shop (Figure 6-1).

At Campbell and Dodge, it was observed at 3:15 PM on October 15 how there are three eateries at this intersection, which all cause congestion around eating times. The Amherst neighborhood Fire Company Station #1 on the northwest corner can also briefly cause traffic when many fire trucks leave simultaneously to fight a fire. There is also a baseball field on the northeast corner, which can cause congestion during game days. There is also a small shop called Ob's Paper Barn on the southeast corner, but this was observed to be so small that it cannot cause much traffic.

At Dodge and Hopkins, Williamsville North High School and Casey Middle School both cause significant congestion when school starts and ends. Major traffic here was observed around 2:30-3:30 PM on both October 8 and 15 when Williamsville North High School and Casey Middle School let out. High school students driving by themselves, parents and relatives driving their kids, and school buses all combined to create a traffic jam going northward (Figure 6-2). Also, there is a strip mall called Hopkins Square on the southwest corner. Hopkins Square contains two restaurants, which cause congestion around eating times. Some of the Hopkins Square shops such as Rite-Aid cause traffic when many people go there to shop. There is a Mobil Gas station on the northeast corner as well, which causes traffic when drivers coming from the schools and Hopkins Square go to get gas and shop at the corner store there. All of these factors combine to make this intersection one of the most congested in the area.

It was observed from 3:20-3:24 PM on October 8 that when Casey and Williamsville North let out, all the people associated with the schools turned south on Hopkins, which helped cause a jam at the intersection of Hopkins and West Klein (Figure 6-3). The red light at the intersection lasted a bit long, compared to the light on Hopkins and Dodge, which helped cause this jam too. This proves how improperly timed lights could be a cause of traffic in the area as well.

There is also a strip mall on the southwest corner, containing a Dash's Supermarket, six restaurants, a bar, and other businesses which all cause significant traffic. It was unclear if the strip mall caused the October 8 jam, but at 4:00 PM on October 15, there was another smaller jam. This time, it was partially caused by many cars going to and leaving from the strip mall. This proves how the strip mall can be a big contributor to congestion at this intersection.

An important find from the field observations was how structures located just outside the neighborhood's boundaries greatly affected congestion levels inside the neighborhood. This demonstrates the importance of outside factors on congestion levels inside the neighborhood.

Less Busy Intersections

The only school located within the Amherst neighborhood's boundaries is Heim Middle School, located at the intersection of Heim Road and Deer Ridge Crescent, just north of North Forest Road. It was observed on October 15 at 2:00 PM that many school buses and parents were driving in to the parking lot to pick up children being let out.

Throughout October 15, it was observed how there were much fewer cars on Heim Road compared to the neighborhood's major roads. Except for when Heim Middle School starts and ends each day, there are not many other structures on Heim Road that can cause congestion, since most structures along Heim are residential. It was also observed at 1:45 PM on October 15 how there was no congestion at all on the intersection of Heim and North Forest Roads, because almost all the structures there are residential too.

The only non-residential structure at this corner is the neighborhood Fire Company Station #2, which can cause some congestion during fires. There is also the Masjid Noor Mosque on Heim just southwest of Dodge Road, which causes traffic on days when worshippers go (Figure 6-4). Besides these two structures, most of the time there is rarely traffic at the intersection of Heim and North Forest, and anywhere on Heim in general.

Views from the Community

An interview was conducted on October 8 from around 3-3:10 PM with a resident who lives on Dodge Road named Tom. In his opinion, the biggest factor causing congestion in the Amherst neighborhood is improperly timed traffic lights. He explained how some red lights in the area turn green very quickly, while some take much longer, causing delays. He said this especially happens on Dodge at its intersections with Hopkins and Campbell, but it happens on the other major roads too[1].

[1] Tom, interviewed by Ian Schwarzenberg, October 8, 2015.

This proves how even though congestion in The neighborhood gets caused by many residents going to and/or coming from one place simultaneously, this is not the main cause of congestion in The neighborhood. Improperly timed lights are the main cause.

Traffic Light Timing Observations

Throughout October 8, it was observed that traffic lights were mostly in sync, except for at the corner of Hopkins and West Klein. Throughout October 15, however, it was observed many times at all four major intersections that every time a light would turn green, the cars waiting in the lead would immediately speed down the rest of the road to get to the next light as fast as possible. This caused chain reactions, where the rest of the drivers drove fast too in order to keep up with the cars ahead of them. This made all cars get to the next light way before it would turn green, causing back-ups. This is a big cause of the improperly timed traffic lights. Therefore, in order to lessen congestion in the neighborhood, a solution must be found to make green lights turn faster in the area.

Why Most Scholars' Ideas Will Not Work for The neighborhood

Many scholars suggested that the most practical solution to fight congestion is instituting road pricing (Balaker 2006, de Palma and Lindsey 2011, Glaister and Graham 2006, Kockelman and Lemp 2011, Wachs 2002, Schade and Baum 2007, Schade and Schlag 2003, Schuitema 2007, Viegas 2001). However, these scholars mainly discussed using this only for expressways. There are no expressways in the neighborhood, making this solution impractical for it.

Other solutions suggested included building new highways (Downs 1988, Kockelman and Lemp 2011, Rhoads and Shogren 2006, Samuel 1999, Schuitema 2007, Sweet 2011), encouraging people to carpool (Teodorović and Dell'Orco 2008), and doing nothing at all in order to discourage people from driving (Balaker 2006, Samuel 1999, Sweet 2011).

However, building highways would be incredibly expensive, very few residents carpool (Figure 6-5), and doing nothing would only hurt the majority of residents who drive.

Inductive-Loop Traffic Detectors

Inductive-loop traffic detectors are electromagnetic systems buried beneath the roadway at traffic lights which make traffic lights turn green faster. When a vehicle arrives at a light, the wheels touch the ILTD, which then sends a signal to the light to turn green (Sheik Mohammed Ali et al. 2012).

The biggest benefit is if a vehicle comes to a red light, and there's no one driving near them, the light will automatically turn green. This saves the driver time they would have wasted waiting at the red light, and would sync the lights as a result. Inductive-loop traffic detectors do not take into account a drivers' speed before getting to a light, because it turns a light green when they get there. This drastically reduces delays caused by slow lights, all without making drivers change their ways.

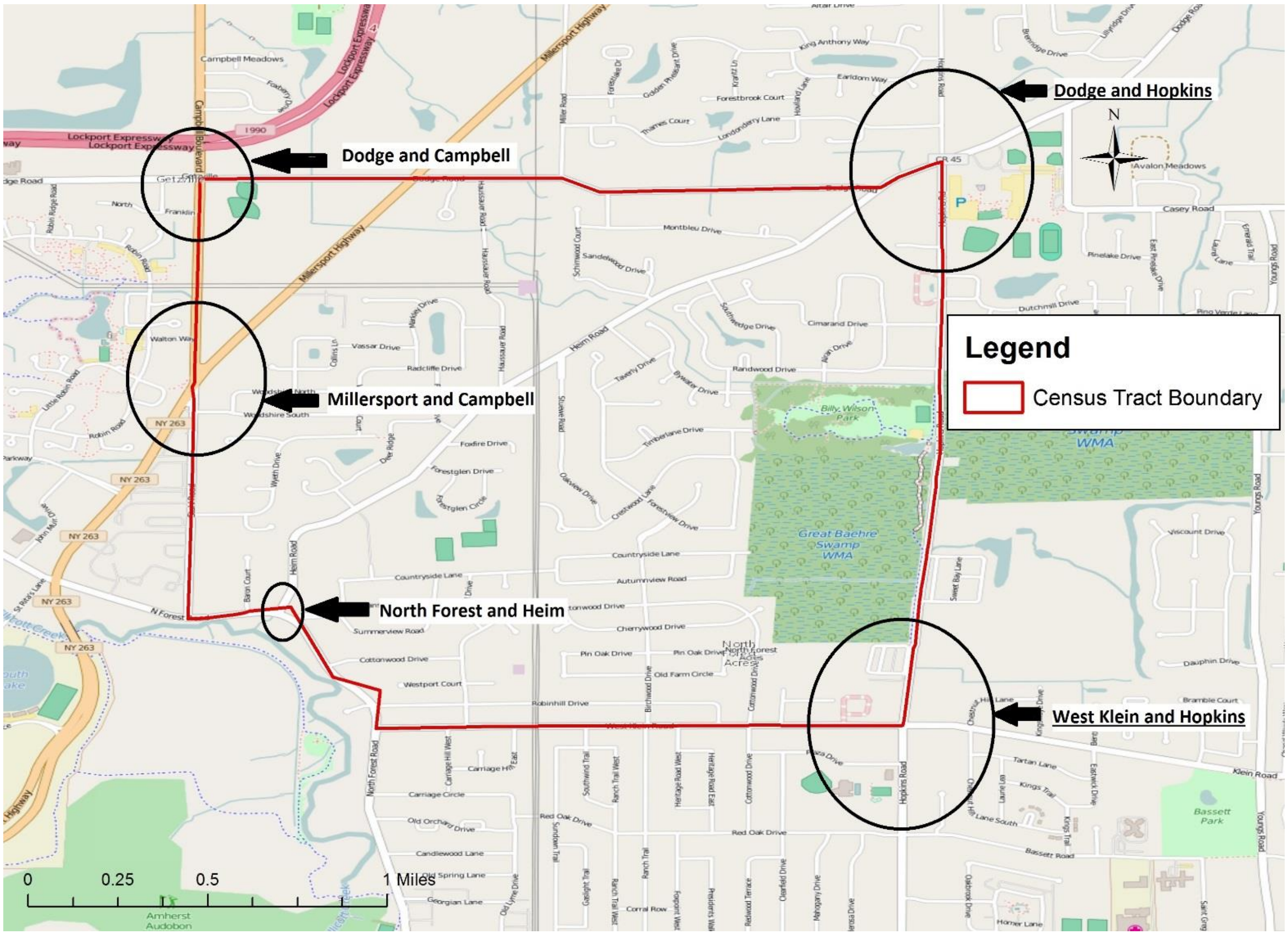
Conclusion

Frequent traffic in the Amherst neighborhood can happen at all of its major intersections due to the presence of various buildings frequented by residents. Despite this, the biggest factor affecting traffic levels in the neighborhood is improperly timed traffic lights. The installment of inductive-loop traffic detectors beneath the roadways at the neighborhood's four busiest intersections will alleviate these unnecessary delays, without interfering with local residents and their lives.

Based off of Tom's opinions and the field observations, it is clear that improperly timed traffic signals are one of the biggest factors causing congestion in the neighborhood. Therefore, introducing inductive-loop traffic detectors at the neighborhood's four busiest intersections will best solve traffic congestion.

Appendices

Figure 6-1. Busiest Intersections in the Amherst Neighborhood based on Field Observations



Data Source: US Census Bureau (2014), Erie County (2014).

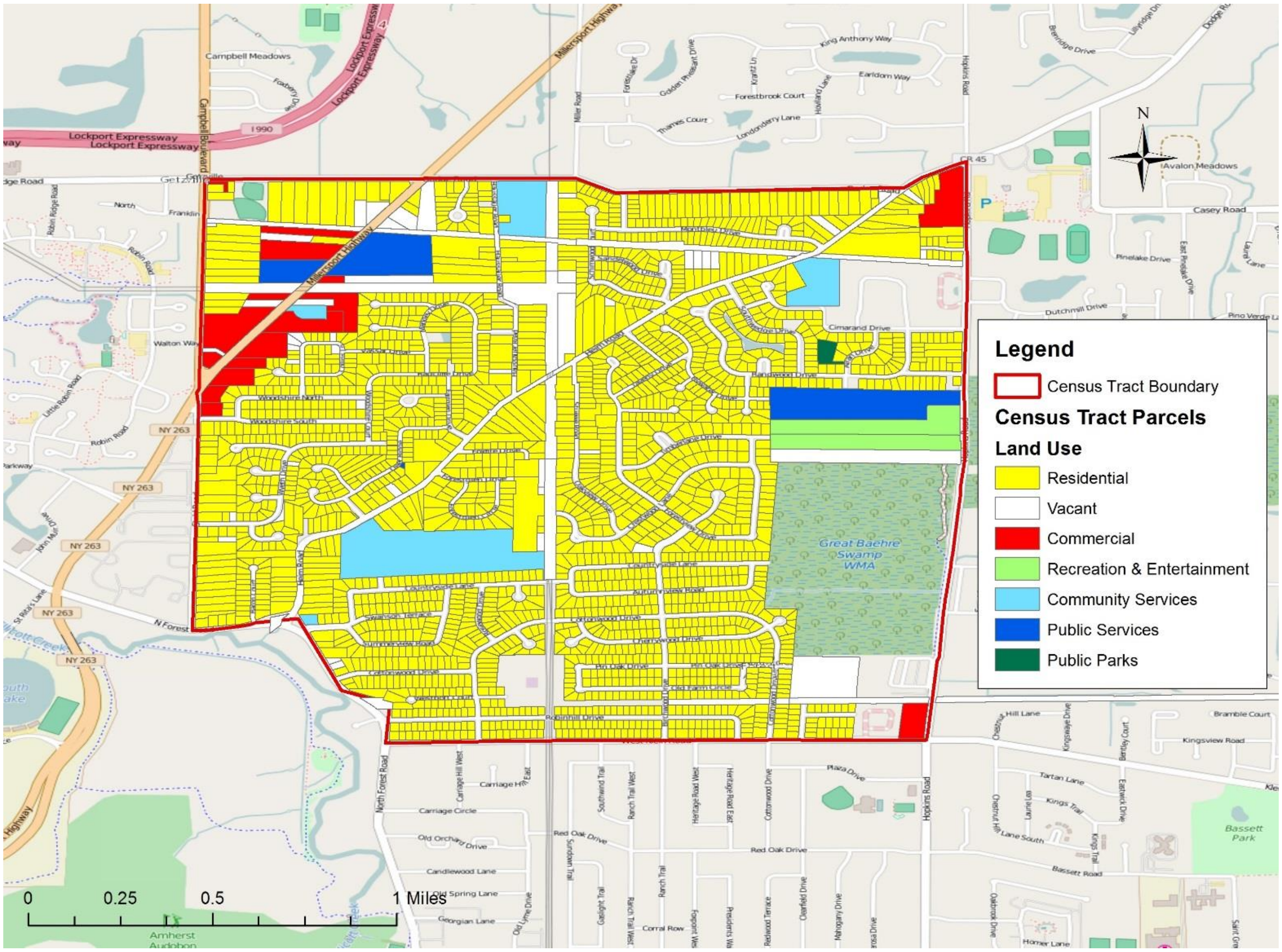
Figure 6-2. Traffic Jam at the Intersection of Dodge and Hopkins Roads, October 8, 2015

Image Source: Taken by Ian Schwarzenberg on Dodge Road at its intersection with Hopkins Road, on October 8, 2015.

Figure 6-3. Traffic Jam on Hopkins Road just north of West Klein Road, October 8, 2015

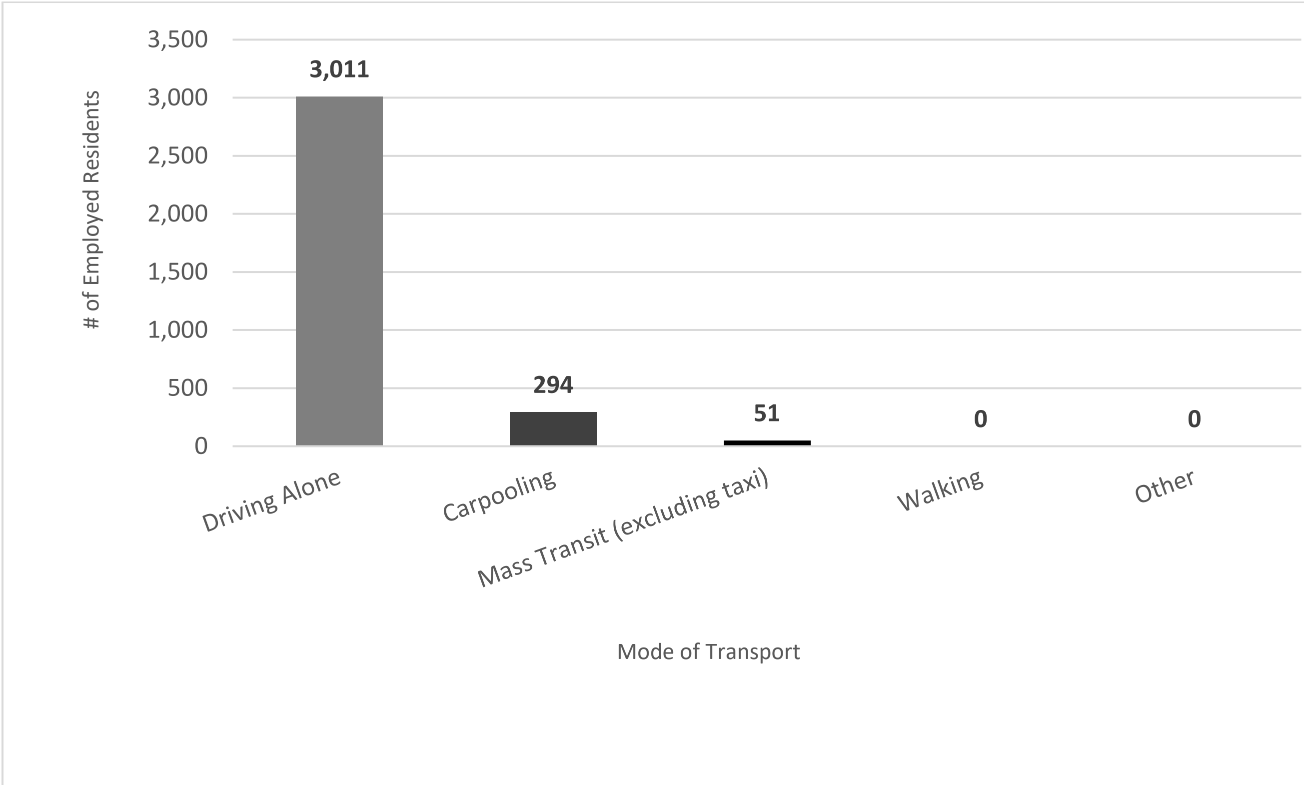
Image Source: Taken by Ian Schwarzenberg on Hopkins Road, just north of its intersection with West Klein Road, on October 8, 2015.

Figure 6-4. Land Use in the Amherst Neighborhood



Data Source: US Census Bureau (2014), Erie County (2014).

Figure 6-5. How Employed Amherst Neighborhood Residents Get to Work, 2013



Data Source: U.S. Census Bureau; 2009-2013 ACS 5 year estimates, Figure 6-5, generated by Ian Schwarzenberg using American FactFinder http://factfinder.census.gov; (data retrieved on September 29th, 2015)

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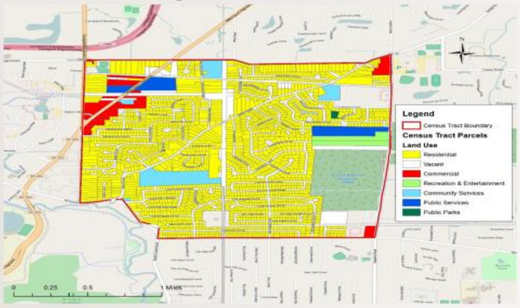
Section 7:
Poster Presentation

Curbing Congestion at Amherst's Crucial Corners

By Ian Schwarzenberg, END 350 Fall 2015

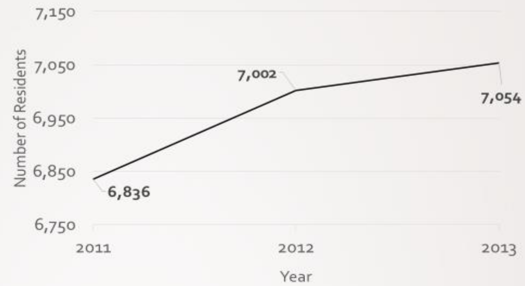
Amherst Background

Figure 7-1. Land Use



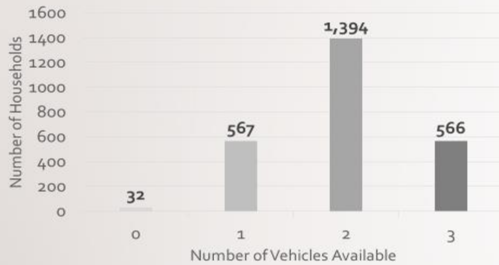
Data Source: US Census Bureau (2014), Erie County (2014)

Figure 7-2. Total Population, 2011-13



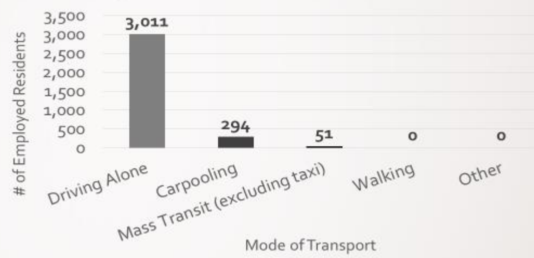
Data Source: U.S. Census Bureau; 2011-2013 ACS 5 year estimates, "Total Population, 2011-13", generated by Ian Schwarzenberg using American FactFinder http://factfinder.census.gov; (data retrieved on September 29th, 2015)

Figure 7-3.Vehicles Available in Each Household, 2013



Data Source: U.S. Census Bureau; 2009-2013 ACS 5 year estimates, "Vehicles Available in Each Household, 2013", generated by Ian Schwarzenberg using American FactFinder http://factfinder.census.gov; (data retrieved on September 29th, 2015)

Figure 7-4. How Residents Commute, 2013

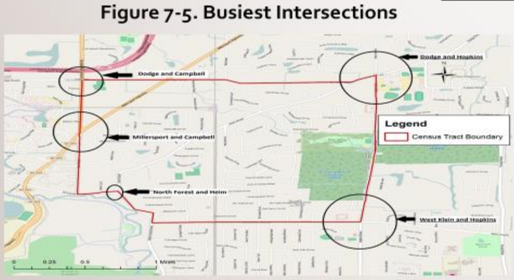


Data Source: U.S. Census Bureau; 2011-2013 ACS 5 year estimates, "How Residents Commute, 2013", generated by Ian Schwarzenberg using American FactFinder http://factfinder.census.gov; (data retrieved on September 29th, 2015)

- There are lots of commercial properties on Millersport and at major intersections, which can cause congestion
- Population is rising – this will gradually create more cars on Amherst's roads
- Most Amherst households own at least 1-3 vehicles – this will put a lot of cars on Amherst's roads
- Most residents drive alone when commuting

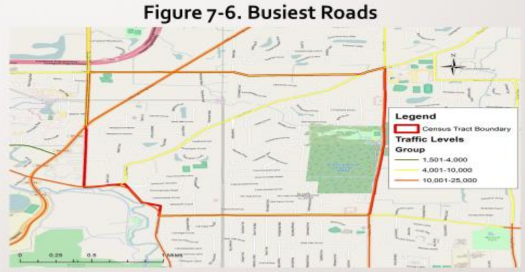
Traffic Conditions

Figure 7-5. Busiest Intersections



Data Source: US Census Bureau (2014), Erie County (2014).

Figure 7-6. Busiest Roads



Data Source: US Census Bureau (2014), Erie County (2014).

Figure 7-7. Jam at Hopkins and Dodge Rds.

Image Source: Taken by Ian Schwarzenberg at the corner of Dodge and Hopkins Roads, 10/8/15.

Figure 7-8. Jam at Hopkins and W. Klein Rds.

Image Source: Taken by Ian Schwarzenberg just north of the corner of W. Klein and Hopkins Roads, 10/8/15.

Takeaways

- "I'm always complaining to my wife how the lights aren't timed properly…" – Tom (interviewed by Ian Schwarzenberg, October 8, 2015)
- Best solution: Install inductive loop traffic detectors at the busiest intersections, which turn traffic lights green when a car arrives at a light (Sheik Mohammed Ali et al. 2012)

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Sheik Mohammed Ali, S., B. George, L. Vanajakshi, and J. Venkatraman. 2012. "A Multiple Inductive Loop Vehicle Detection System for Heterogeneous and Lane-Less Traffic." *IEEE Transactions on Instrumentation and Measurement* 61 (5):1353-1360. doi: 10.1109/TIM.2011.2175037.

Section 8: PowerPoint Presentation

Curbing Congestion at Amherst's Crucial Corners

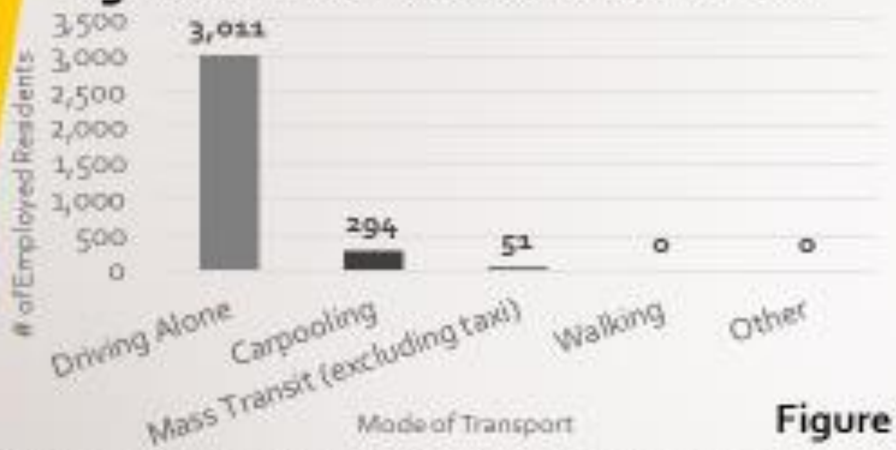
By Ian Schwarzenberg

END 350

Fall 2015

Neighborhood Background

Figure 8-1. How Residents Commute

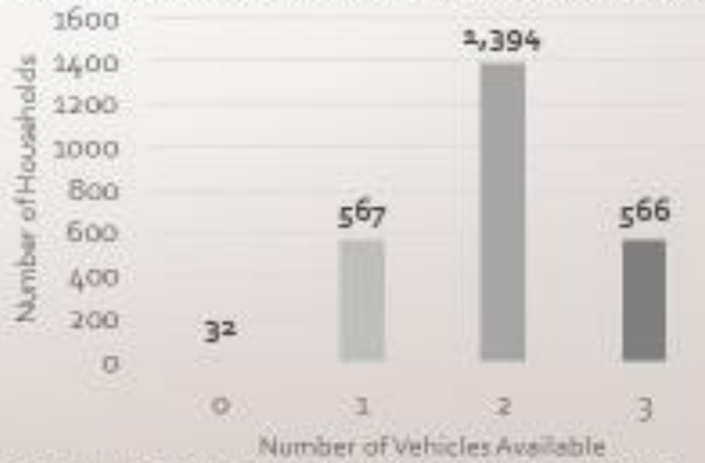


Data Source: U.S. Census Bureau; 2011-2013 ACS 5 year estimates, "How Residents Commute, 2013", generated by Ian Schwarzenberg using American FactFinder http://factfinder.census.gov; (data retrieved on September 29th, 2015)

- Most Amherst households own at least 1-3 vehicles
- This increases the amount of cars on the roads

- Most residents drive alone to get around
- This creates more cars on the neighborhood's roads, which leads to more frequent traffic jams

Figure 8-2. Vehicles Available in Each House



Data Source: U.S. Census Bureau; 2011-2013 ACS 5 year estimates, "Vehicles Available in Each House, 2013", generated by Ian Schwarzenberg using American FactFinder http://factfinder.census.gov; (data retrieved on September 29th, 2015)

Neighborhood Background – Busiest Roads and Intersections – Other Findings – Observed Traffic Jams – Some Scholars' Suggestions – Best Solution

Busiest Roads and Intersections

Figure 8-3. Busiest Roads

Data Source: US Census Bureau (2014), Erie County (2014).

- Busiest intersections:

1. Hopkins and Dodge Rds., Hopkins and W. Klein Rds. (Tied for Busiest)
2. Millersport Hwy. and Campbell Blvd.
3. Dodge Rd. and Campbell Blvd.
4. N. Forest and W. Klein Rds. (least busy)

- Millersport Highway, Hopkins Road and North Forest Road are the busiest streets
- Dodge Road and Campbell Boulevard are slightly less busy

Figure 8-4. Busiest Intersections

Data Source: US Census Bureau (2014), Erie County (2014).

Neighborhood Background – **Busiest Roads and Intersections** – Other Findings – Observed Traffic Jams – Some Scholars' Suggestions – Best Solution

Other Findings

- "I'm always complaining to my wife how the lights aren't timed properly…" – Tom (interviewed by Ian Schwarzenberg, October 8, 2015)
- Cars waiting at intersections sped when lights turned green, creating a domino effect
- Buildings just outside neighborhood's boundaries also caused congestion, such as schools and strip malls

Observed Traffic Jams

Figure 8-5. Jam at Hopkins and Dodge

Image Source: Taken by Ian Schwarzenberg at the corner of Dodge and Hopkins Roads, 10/8/15.

Figure 8-6. Jam at Hopkins and W. Klein

Image Source: Taken by Ian Schwarzenberg just north of the corner of W. Klein and Hopkins Roads, 10/8/15.

Neighborhood Background – Busiest Roads and Intersections – Other Findings – **Observed Traffic Jams** – Some Scholars' Suggestions – Best Solution

Some Scholars' Suggestions

- Most common solution suggested by scholars: Instituting road pricing (Balaker 2006, de Palma and Lindsey 2011, Glaister and Graham 2006, Kockelman and Lemp 2011, Schade and Baum 2007, Schade and Schlag 2003, Schuitema 2007, Viegas 2001, Wachs 2002)
- This will NOT work for Amherst because:

1. The neighborhood has no freeways
2. Residents will oppose it

Figure 8-7. Street Map

Data Source: US Census Bureau (2014), Erie County (2014)

Best Solution

Figure 8-8. Inductive-Loop Traffic Detector

Image Source: http://www.instructables.com/id/Trigger-GREEN-Traffic-Lights/

- The solution that WILL work: installing inductive-loop traffic detectors at Amherst's 4 busiest intersections
- Inductive-loop traffic detectors turn lights green when a vehicle's wheels touch it (Sheik Mohammed Ali et al. 2012)
- There's reason for residents to support this

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