# AC 2007-488: STUDENT-ASSISTED COMMUNITY RELATED RESEARCH PROJECT ? A CASE STUDY ON ROUTE 110 TRAFFIC ISSUES

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# Student Assisted Community Related Research Project – A Case Study on Route 110 Traffic Issues

## Introduction

Community research projects are one of the ways to introduce applied research to the undergraduate construction management students. New York State Route 110 is a major north-south artery located in western Suffolk County within one to three miles of the border with Nassau County. The Route 110 corridor is a major employment area, containing numerous large office buildings, light industrial development, large retail centers, many service businesses, airport, along with single family homes and other types of housing. The Route 110 Redevelopment Corporation is a non-profit organization comprised of leaders from local business, governments, and civic organization. Its mission is to help sustainable development of Route 110 corridor. The corporation entered in to a contract with the department of architecture and construction management of SUNY Farmingdale to study the traffic and sewer issues of the corridor. The department took this undertaking to involve the undergraduates in community related research project. The paper describes study done by the students and faculty members

### Description Of The Overall Corridor

New York State Route 110 (designated NY110) is one of a series of major north-south arterials in Nassau and Suffolk Counties. All of these feed north and south from Long Island's only Interstate Route, The Long Island Expressway (designated NY495). Other arterials in Nassau County are NY106 and NY107. Both of these are mostly commercial in character. In Suffolk County some arterials are NY112 and NY231. NY112 is predominantly industrial while NY231 is predominantly commercial. Of all of these north-south arterials, NY110 is by far one of the most important business corridors and one of the most developed. Also, one of the most varied corridors. Its location has allowed it to grow in a unique way since it is located within Suffolk County near the Nassau County border varying from one to three miles from that border. Although this corridor runs from Amityville on the south to Halesite on the north, this particular corridor study does not address this full length but just the section between Farmingdale Road (NY109) on the south and Jericho Turnpike (NY25) on the north (about 7.5 miles).

The corridor north and south of this study are again different in character but a subject for another study. The length of road from NY109 to NY25 varies in character between office buildings, commercial space, shopping areas, light industry and even single family dwellings. This is a densely populated area of varying types of employment and as such, has varying traffic patterns at different points on the corridor or different times of the day and year. For example, the north most section houses the Walt Whitman Mall and its traffic is very seasonal depending

on the retail cycle. This corridor has a university, with its unique traffic patterns, an airport, an elevated Long Island Railroad crossing, a major LIPA power line easement and even the world class Walt Whitman Museum. The northern terminus of this study will be NY25 in the Town of Huntington in the Incorporated Village of South Huntington. Just north of the northern terminus the road changes from two lanes to one lane in each direction and although this is outside the study, it affects the study in that our traffic is "backed-up" by this merge just outside the northern terminus. The southern terminus will be at NY109 in the Town of Babylon in the Incorporated Village of East Farmingdale. The road just south of our terminus continues for a sufficient length as a three lane road so as to have minimal or no affect on out study. Because of the diversity in character, we have chosen to break the corridor into three parts designated North, Central and South.

Existing Studies

There have been several earlier planning studies written for the NY110 corridor. They are mentioned here to show some overlap of thinking between these studies and ours and to show the variety and range of proposed solutions. In August 2001, the Suffolk County Department of Planning did an "Overview of Existing Conditions in the Route 110 Corridor", 2001[1] which listed the existing conditions in the following categories:

Population. This chart showed that there are many single family dwellings within the corridor and 112,000 residents lived within this area as of the 2000 Census. US Census Bureau-1990,2000 Census [2]

Employment Data. Approximately 225,000 people are employed within this corridor.

Existing Business Establishments and Employment.

1. Industrial Market
2. Office Market
3. Retail Centers

In 1979, The Long Island Regional Planning Board studied the corridor from SSP to NSP and released "Industrial Location Analysis-1980" [3]. This study zeroed in on features such as zoning, existing land use, potential development, roads and mass transit. The result was a land use plan which suggested different types of development were desirable for the different lengths of the corridor. For example, it was recommended that Melville encourage office and industrial development while the south area encourage industrial and commercial.

In 2000, The Long Island Regional Planning Board and Dowling College produced a report titled "Route 110 Corridor: An Intermodal Transportation and Land Use Study (LIRPB&DC, 2000) [4]. This report recommended the creation of an intermodal transportation system.

Traffic Flow

A group of faculty and students had analyzed traffic counts from two NYSDOT stationary continuous count stations. One counter, at station 0743 on NY110 is located 0.3 miles south of the Northern State Parkway overpass in Melville. This data was collected from 1989 to 2005. The second stationary continuous counter of interest is located at station 0798 on NY495 about 0.1 miles west of exit 49 which is the NY110 exit. This data was provided from 1997 to 2005. Each of the continuous traffic counters provides data by weekdays, Saturdays, Sundays and by week totals. The data provided gives ADT (average daily traffic) and high hourly average. This data, when compared to the road's capacity at a particular section will provide a picture of the status of traffic at that section at a point in time.
All intersections along this stretch of corridor have at least one right turning lane and one left turning lane. The major intersections sometimes have double left turning lanes as well and some major intersections have double turning lanes, both right and left, along with signal protection for each movement. The NYSDOT has been diligent in providing a right turn lane or insisting that it be provided by the developer of a site as part of his traffic mitigation process. No where on this section of corridor does traffic wait at a signal in a through lane blocking through traffic. NY110 has ample shoulder room for additional turning lane queues when necessary. Other parallel roads such as New Highway, Walt Whitman Road, and Pinelawn Road are all town or county roads and do not have turning lanes at all intersections so traffic does queue in the through lane. Improvements to these areas would greatly enhance NY110 by encouraging vehicles to use these peripheral roads.

The corridor has double left turn lanes and double right turn lanes at all of its major intersections. This is usually the result of not having enough area to lengthen the queue for a single turn lane. The major intersections have grown in traffic volume such that the single turning lanes will not suffice and the area is not able to extend the queue. This being a fact at most of the major intersections, they have all developed double turn lanes, either left, right or both usually with protected signal movements.

Existing Traffic Signals (Protected Signals):

In the full length (Amityville to Halesite) of the NY110 corridor, there are two types of signals systems. The first is a set of forty-seven signals in seven systems (called "Masters") in a signal operations mode controlled by NYSDOT Signals Operation Group in the Traffic and Safety Engineering Department. The second group is a set of ten signals under the control of NYSDOT INFORM group also a part of the Traffic and Safety Engineering Department. Of the seven "masters", three are within our area of interest. There are six signals in the South Farmingdale master, nine signals in the Farmingdale master and four signals in the Melville master. The signals in each of the "masters" are synchronized and are optimized by the signal operation group

to best service the traffic flow at the time. This optimization is done by changing the signal timing to allow the best combination of traffic flow through the intersections being controlled. The INFORM signals control the major intersections and are not synchronized to one another but are optimized by the INFORM system of cameras. Starting at the northern termini of our study, the INFORM signals are at the intersection of NY110 and the following: Jericho Turnpike (NY25)

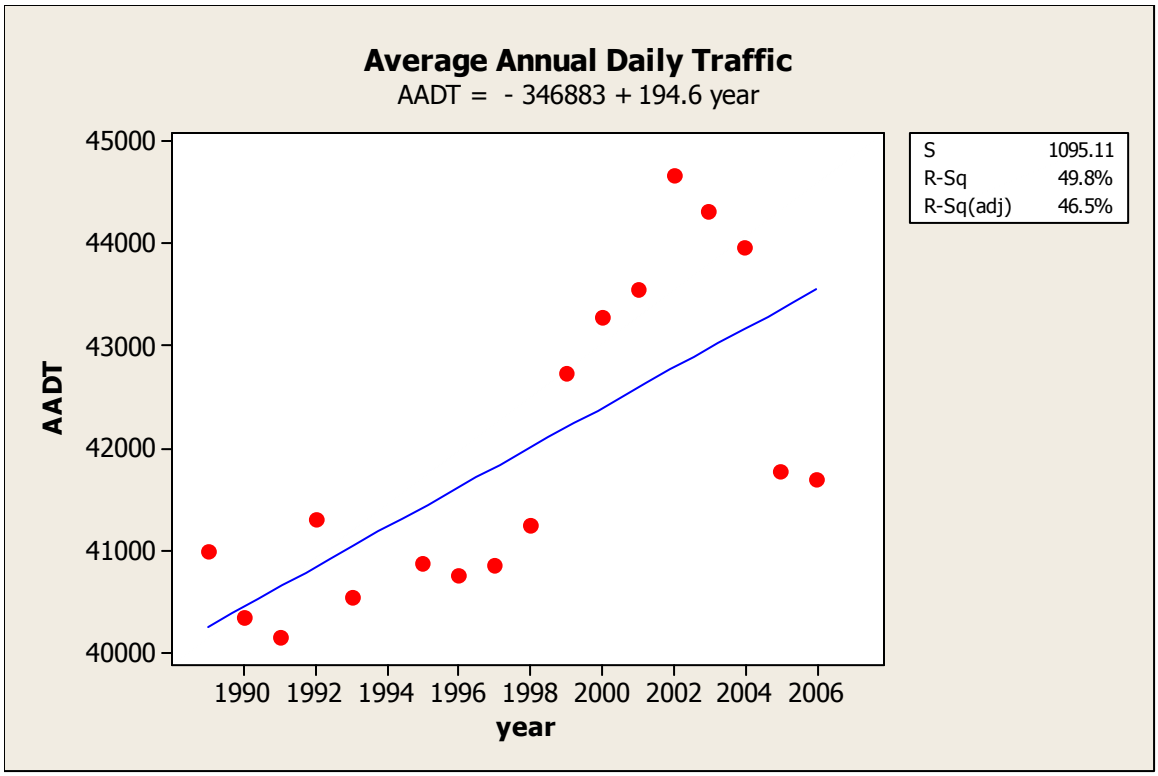
Old Country Road
Pinelawn Road
North and South Service Roads of the LIE (NY495)
Huntington Quadrangle
Melville Park
Baylis Road

All of these signals have two six foot by twenty foot activator loops on each side of each cross street. When a car stops on these loops, the signal reads that there is a car waiting at a "red" to proceed. The mainline (NY110) has semi-activated signal loops. At the major intersections the mainline has protected movements so they would have a loop detector in the left turn lane and usually in the right turn lane also. All the cross streets have detectors in both left and right turn lanes including double lefts and double rights. The detectors on the mainline (NY110) are usually for volume counting only. Some mainline detectors are used for speed readings. All of these major intersections controlled by INFORM have eight phase signals to allow all the through movements and all the turn movements to happen "protected" to avoid conflict points. These eight phase signals require a vehicle to wait for a long period of time but do give protection to each vehicle in that the conflict points have been eliminated.

## Traffic Flow: A local view of Route 110

The statistical analysis that follows is based on traffic counts provided by the New York State Department of Transportation (NYSDOT). Data has been collected continuously since 1989 from a permanent count station on Route 110, just 0.3 miles south of the Northern State Parkway in Melville. At this particular location Route 110 consists of two lanes in both directions. We will first examine the evolution of the Annual Average Daily Traffic (AADT) over the last 16 years. Annual Average Daily Traffic is the average daily traffic volume in both directions. Daily traffic volumes may vary considerably from AADT due to seasonal events and major differences between weekday and weekend traffic. Our statistical analysis will address some of these issues as well.

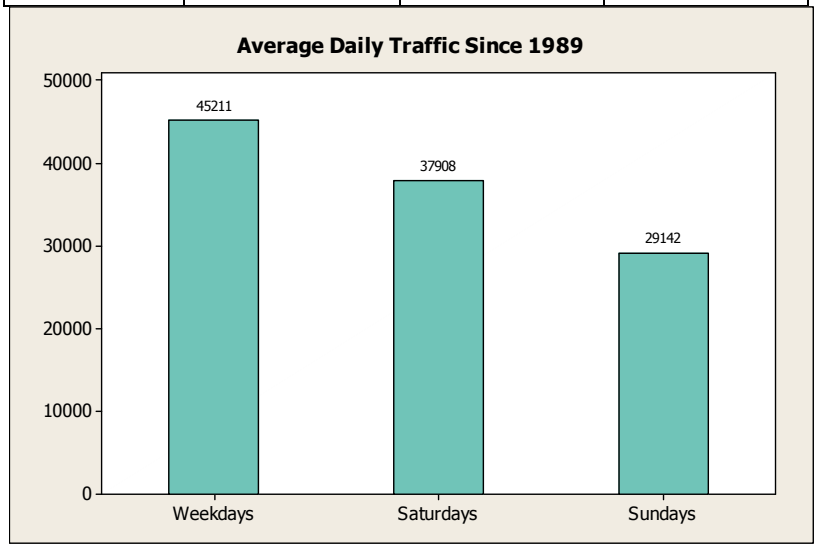
| YEAR | AADT |
|---|---|
| 1989 | 40995 |
| 1990 | 40337 |
| 1991 | 40142 |
| 1992 | 41310 |
| 1993 | 40532 |
| 1994 | ------- |
| 1995 | 40880 |
| 1996 | 40744 |
| 1997 | 40842 |
| 1998 | 41243 |
| 1999 | 42731 |
| 2000 | 43294 |
| 2001 | 43552 |
| 2002 | 44688 |
| 2003 | 44334 |
| 2004 | 43966 |
| 2005 | 41781 |
| 2006 | 41691 |

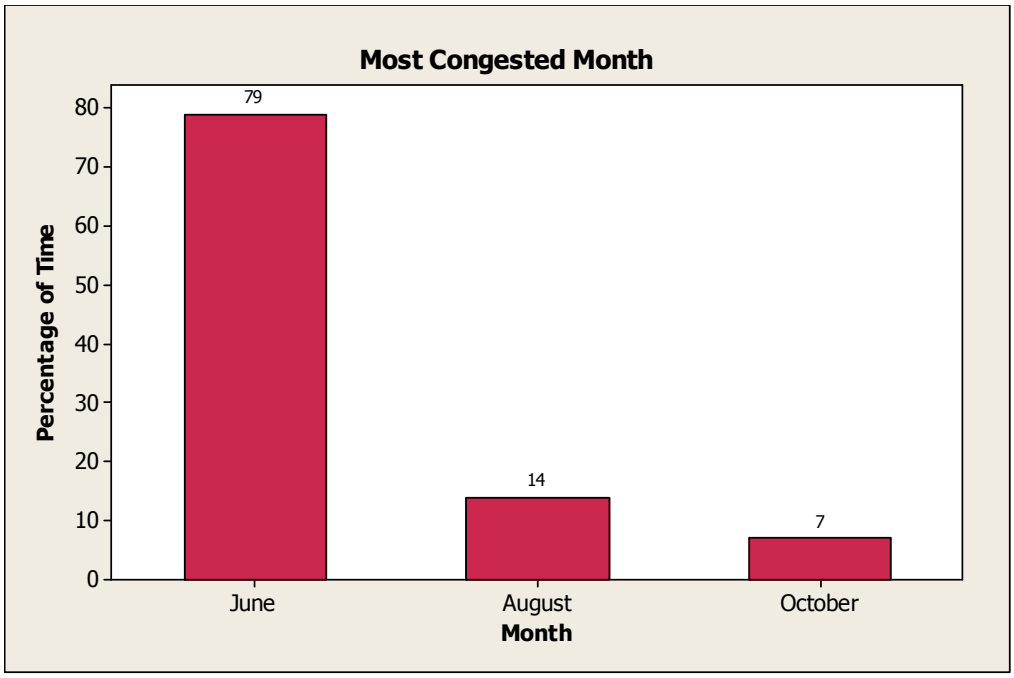



Looking at the evolution of the AADT over the years, the regression analysis shows a moderate correlation ( $r = 0.71$ ). After traffic volumes had peaked in 2002, there has been an average decline in traffic of about 2% ever since. It will be interesting to find out if this trend will continue in the near future. As one might have expected, a closer look reveals a Route 110 with three drastically different outlooks. There is 35% more traffic on an average weekday compared to an average weekend day, and 30% more traffic on Saturdays compared to Sundays. Traffic on Weekdays is relatively more predictable with a standard deviation of only 1,140 cars, while Saturdays exhibit the highest variability with a standard deviation of 3,165 cars. It may come as a surprise to many people that June is by far the most congested month, and December is nowhere to be found with regard to congestion.

| Year | AADT Weekdays | AADT Saturday | AADT Sunday |
|---|---|---|---|
| 1989 | 45246 | 35096 | 26887 |
| 1990 | 44155 | 34874 | 26471 |

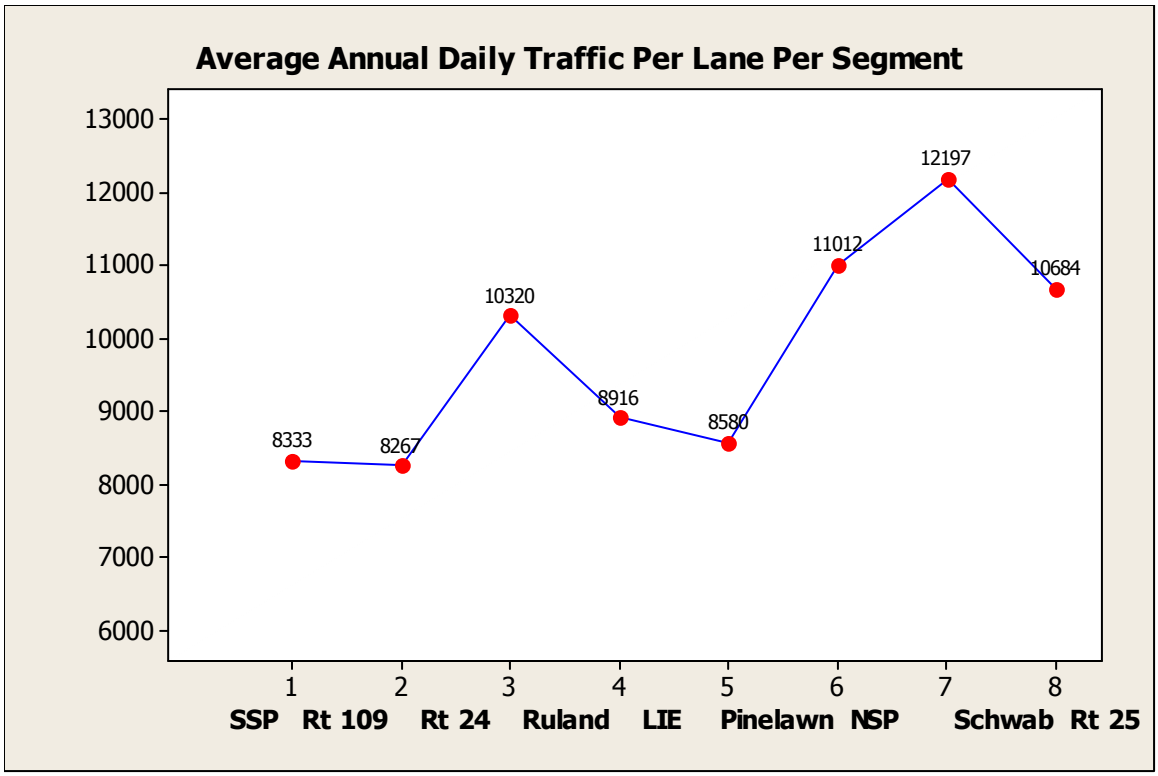
| | | | |
|---|---|---|---|
| 1991 | 43954 | 34996 | 26560 |
| 1992 | 45261 | 35251 | 27361 |
| 1993 | 44571 | 34554 | 26711 |
| 1995 | 44462 | 36370 | 28070 |
| 1996 | 44017 | 36385 | 28238 |
| 1997 | 44163 | 36671 | 28353 |
| 1998 | 44567 | 36871 | 28422 |
| 1999 | 44456 | 38429 | 28422 |
| 2000 | 46523 | 39639 | 30945 |
| 2001 | 45345 | 43902 | 33903 |
| 2002 | 46114 | 45661 | 36607 |
| 2003 | 47735 | 40301 | 31294 |
| 2004 | 47371 | 39851 | 30922 |
| 2005 | 45401 | 37435 | 28796 |
| 2006 | 45246 | 38154 | 27453 |






Traffic Flow: A Global View of Route 110

Through its portable traffic program, the New York State Department of Transportation periodically collects traffic counts from different sections of the State touring system for specific projects. These counts are taken annually, usually during July, August and September, and cover short periods of time. The analysis in this section is based on short counts from eight sections of Route 110, starting at Southern State Parkway and ending at Route 25.

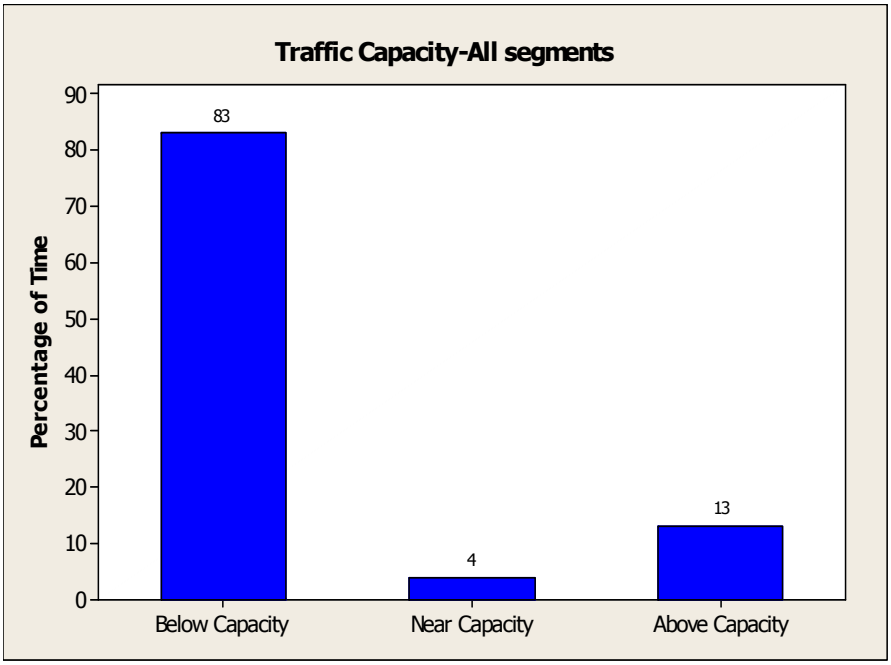



The graph shows that traffic flow along Route 110 is anything but uniform. Each segment of NY110 exhibits its own unique characteristics. South of the Long Island Expressway, (Central & South Sections) there seems to be higher traffic volumes between Route 24 and Ruland Road, while on the North Section the portion of Route 110 between Pinelawn Road and Route 25 dominates in terms of traffic and at an alarming rate. Data also shows that Friday is the most congested day of the week (about 80% of the time) with Thursday almost always being close second.

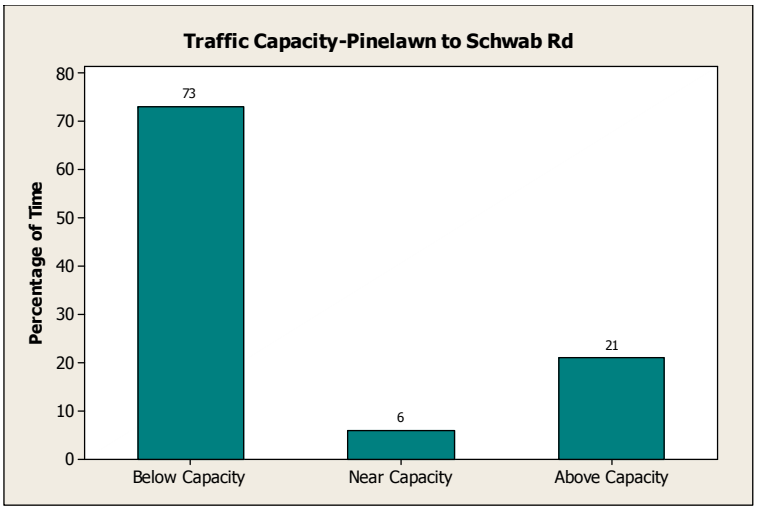
## TRAVEL DEMAND AND TRAFFIC CAPACITY

A critical aspect for understanding traffic flow in a given lane or roadway is travel demand. Travel demand is the number of vehicles that desire to use a section of a given roadway during a specified time period. However, in reality, demand can be higher than the actual traffic counts. This is especially true where there is congestion, as drivers look for alternative routes, and some trips are not made because of the constraints in the system. An even more critical aspect is the traffic capacity of a particular facility. Traffic capacity is the maximum amount of traffic that a given facility can be reasonably

be expected to accommodate during a given time period, (usually per hour). According to the Highway Capacity Manual under favorable conditions, an arterial street can typically process approximately 600 passenger cars per hour per lane (pcphpl), while an urban freeway can handle approximately 2400 pcphpl. For Route 110 however, according to NYSDOT maximum capacity is closer to 800 pcphpl. Looking at our data from all sections of Route 110 as they were described earlier, we observe that while 83% of the time Route 110 operates below maximum capacity, traffic volumes exceeded traffic capacity about 13% of the time. It is important to emphasize that these numbers only describe the state of Route 110 mostly during the months of the summer, and should not viewed as average daily conditions.




It is worth mentioning that while most of the sections contributed heavily towards the high percentage of time that Route 110 operates below capacity, the section between Pinelawn Road and Schwab Road contributed heavily towards the 13% of the time that Route 110 experiences traffic above its maximum capacity. See the chart below.

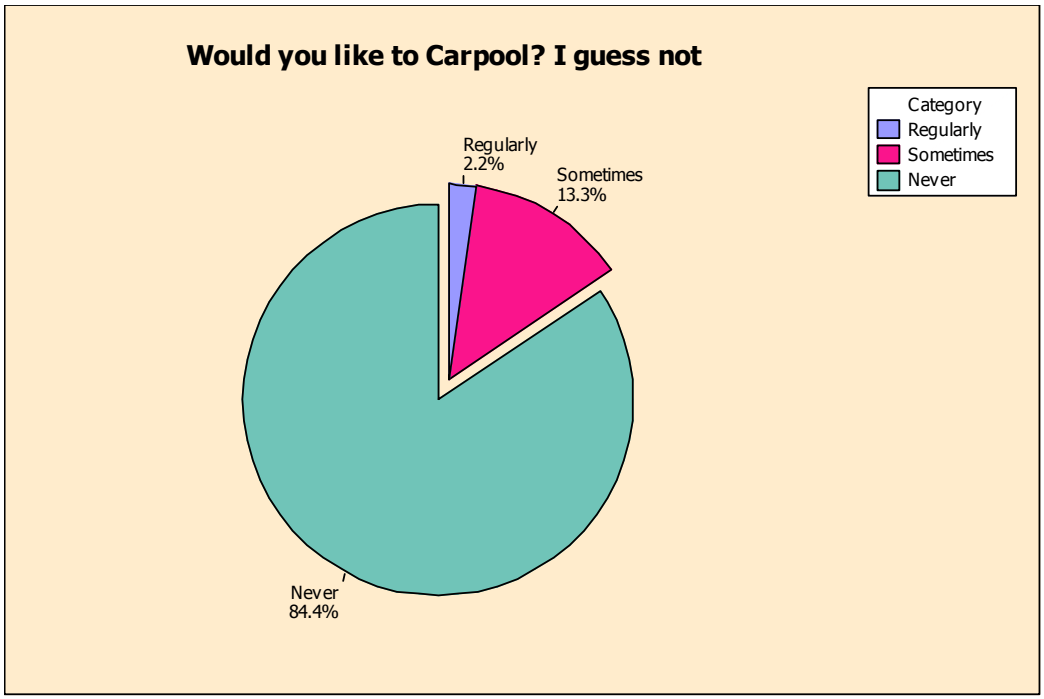



Another interesting observation is the extension of "rush hour" into "rush hours" for certain segments of Route 110.

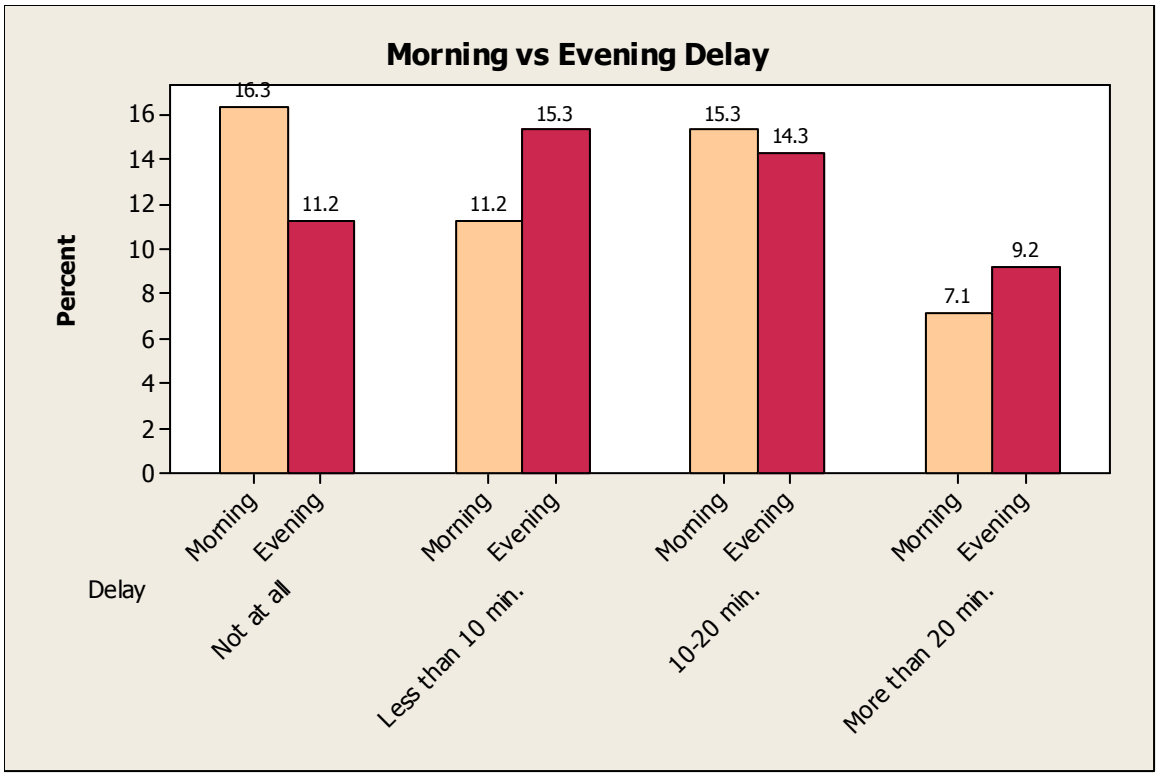
Popular Opinion Survey

In order to obtain information on the movements of corridor users (those who work on the NY110 Corridor), we had the students conduct a series of telephone interviews with forty-five randomly selected people who work in the Route 110 Corridor. The focus of the interviews was on the following questions:

- Do you carpool and how often?
- What are the entry and exit points during your visit to Route 110?
- How long do you use Route 110 during your morning and evening commute?
- What is your estimated delay on Route 110 during your morning and evening commute?
- What is your normal shift?




Preliminary estimates show that an average person spends about 12 minutes on Route 110 for each trip, with an average delayed time of 8 minutes for the morning commute and 10 minutes for the afternoon/evening commute. The data also shows very diverse and flexible shifts with only 25% of the people working from 9am to 5pm. Based on those interviewed, the following statistics were gathered on entry and exit points.




Conclusion

The project introduced real life data collection and analysis to the students. It also clarified some of the long held beliefs of the local usurers of route 110. It showed that people's personal opinions about delay and congestions do not always match with statistical conclusions and national trends.

Acknowledgement

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1 Overview of Existing Conditions in the Route 110 Corridor, by Suffolk County Department of Planning, 2001
2 US Census Bureau-1990,2000 Census
3 The Long Island Regional Planning Board, Corridor Study SSP to NSP, "Industrial Location Analysis-1980"
4 The Long Island Regional Planning Board / Dowling College, "Route 110 Corridor: An Intermodal Transportation and Land Use Study, 2000