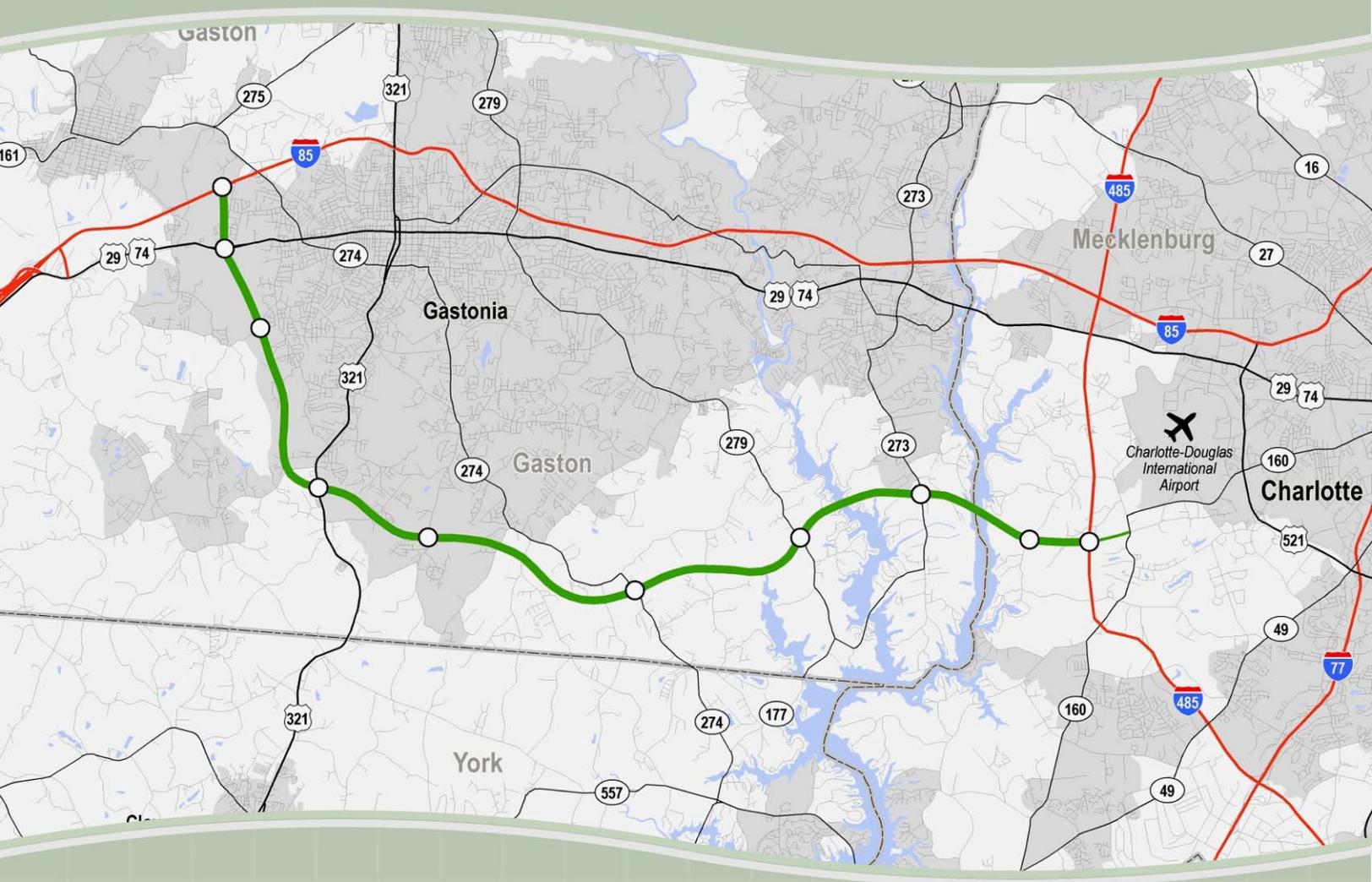


# Final Report

## Proposed Garden Parkway

### Comprehensive Traffic and Revenue Study



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### Comprehensive Traffic and Revenue Study

Prepared For



Prepared By



November 15, 2011

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# CHAPTER 1

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## INTRODUCTION

The proposed Garden Parkway, west of the Charlotte metropolitan area, is one of several candidate toll facility projects under consideration by the North Carolina Turnpike Authority (NCTA). Preliminary or “Level 2” traffic and revenue studies were conducted in 2006 for the project, and the NCTA decided to proceed with this comprehensive or “Level 3” study to support project financing of this approximately 20.9-mile facility.<sup>(1)</sup>

### PROJECT DESCRIPTION

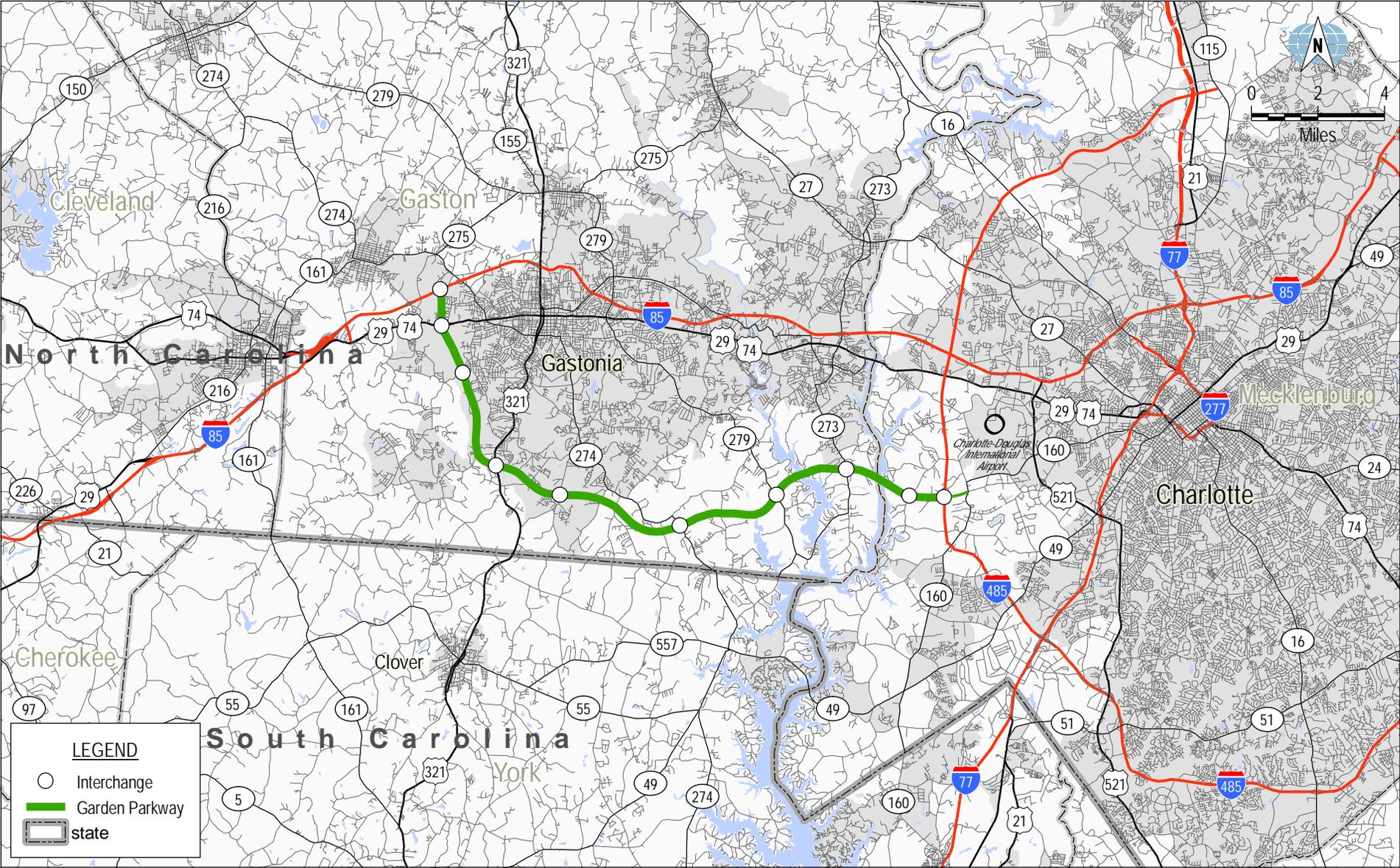
Figures 1-1 and 1-2 depict the project location and its relationship to the surrounding transportation system. The Garden Parkway, planned to open in January 2016, would generally follow an east-west orientation from I-485 near the Charlotte-Douglas International Airport to US 321, where it would turn north to I-85 on the western side of Gastonia. The Parkway would provide a new crossing of the Catawba River and would provide direct access from the southern area of Gaston County to Charlotte. Currently only three options for crossing the river exist in the area including I-85, US 29/74 and NC/SC 49. I-85 and US 29/74 are expected to experience increased congestion levels, and the Garden Parkway would provide an alternative for some drivers. NC/SC 49 is in a growing area of the two states, and residents in this area could be part of the potential customer base for the proposed toll road.

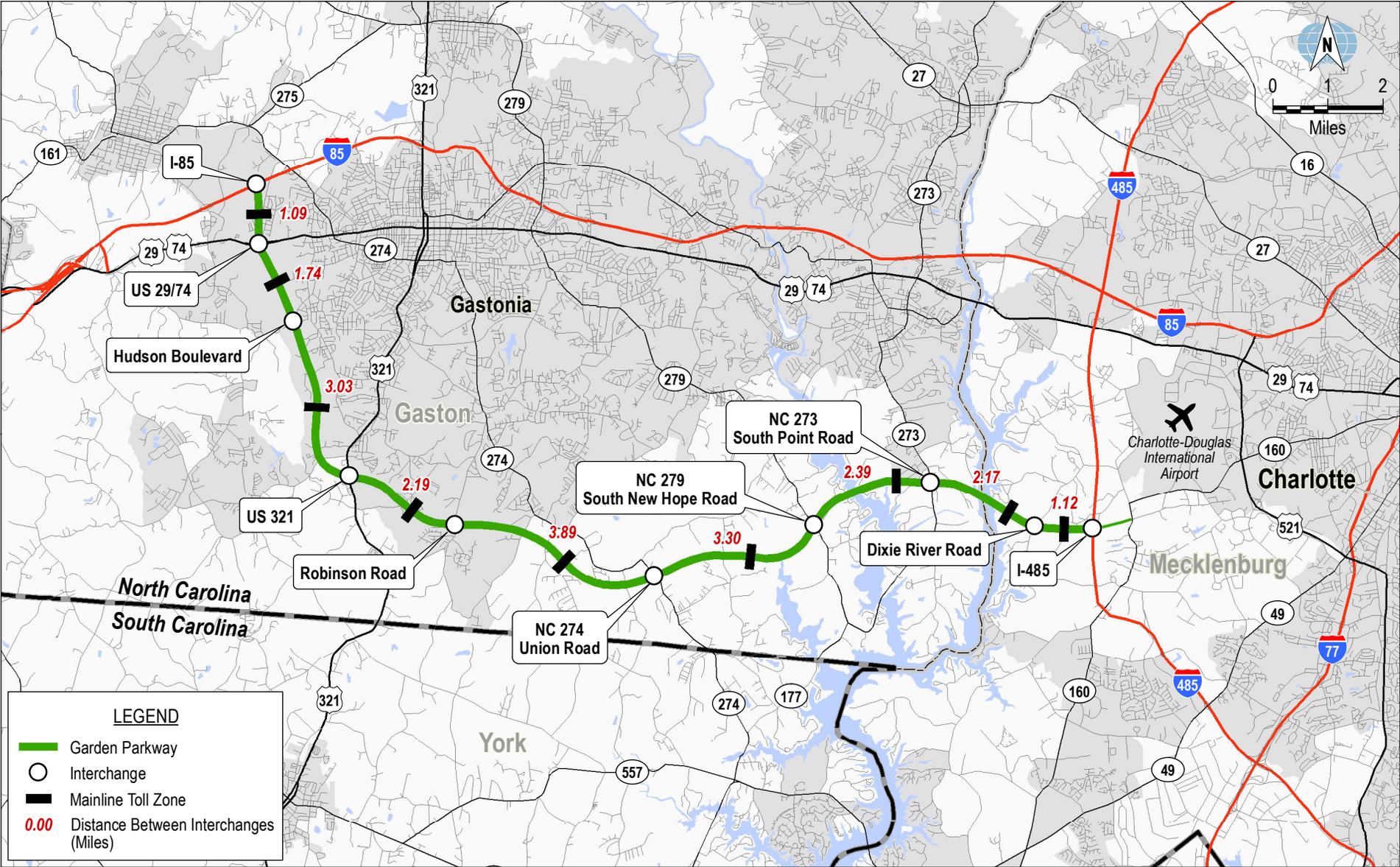
### PROJECT CONFIGURATION AND TOLL COLLECTION CONCEPT

The project would have eight intermediate interchanges beginning at I-485, commonly referred to as the Charlotte Outer Loop, and ending at I-85 west of Edgewood Road (exit 13). Intermediate interchanges are planned for Dixie River Road, South Point Road (NC 273), South New Hope Road (NC 279), Union Road (NC 274), Robinson Road, York Road (US 321), Hudson Boulevard, and Franklin Boulevard (US 29/74).

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<sup>(1)</sup> Proposed Gaston East-West Connector Preliminary Traffic and Revenue Study, Wilbur Smith Associates for the North Carolina Turnpike Authority, October 12, 2006.





**LEGEND**

- █ Garden Parkway
- Interchange
- ▬ Mainline Toll Zone
- 0.00 Distance Between Interchanges (Miles)



All-electronic tolling (AET) is the intended method of toll collection for the Garden Parkway. There would be no conventional toll plazas, but rather a “tolling zone” designated along the mainline of the highway between each set of adjacent interchanges. Rates would be based on the distances covered by each tolling zone, except for the zone between Dixie River Road and South Point Road where a higher toll would be assessed for drivers crossing the Catawba River. For some shorter movements, a minimum toll would be established. Cash payments of tolls would not be available. Motorists not equipped with transponders for electronic toll collection (ETC) would be permitted to use the road under a video toll collection (VTC) system. Patrons electing to use ETC would receive a discount due to the lesser cost of toll collections and processing as compared to the more labor and technology-intensive VTC.

The Parkway will be constructed based on expected traffic demand. The NCTA has decided to construct the facility with two lanes in each direction between I-485 and US 321 and with one lane in each direction from US 321 to I-85. For purposes of this study, this configuration was assumed for the full 40-year project period.

## SCOPE OF WORK

This study is a follow-up to the preliminary study described earlier, and previously collected data was reviewed and updated as necessary. Inventories of the corridor operating conditions including traffic counts and speed-delay studies on competing and complementary routes within the traffic impact study area plus other relevant routes outside the study area were conducted.

Previous reports and study materials related to the proposed Garden Parkway were also reviewed. This information included the long-range transportation plan for the Gaston Urban Area Metropolitan Planning Organization (GUAMPO), the Mecklenburg-Union Metropolitan Planning Organization (MUMPO), and work associated with the preparation of the project environmental impact statement. Information on the planned transportation improvement program (TIP) was reviewed to determine the potential impacts of planned improvements on the traffic and revenue potential of the Garden Parkway.

### ORIGIN-DESTINATION SURVEY

An origin-destination (OD) survey was conducted in the project area to identify current travel patterns and trip characteristics. A mail-back survey procedure was followed in which motorists were given survey cards while

stopped at traffic signals and encouraged to return them by pre-paid mail. The information obtained in this survey was used to calibrate the travel demand model in the study corridor.

#### STATED PREFERENCE SURVEY

Stated preference (SP) surveys were also conducted to estimate motorist value of time (VOT) for use in the toll diversion models. Three methods were used in obtaining survey responses. First, live interviews were conducted at various employment centers, shopping areas, and government offices. Second, internet-based interactive surveys were also conducted with OD survey respondents who provided e-mail addresses on the OD survey card. Finally, individuals who provided e-mail addresses at public meetings for the environmental impact analysis were also asked if they wished to participate in the SP survey.

#### TRAFFIC MODEL REFINEMENT

The latest available version of the Metrolina Regional Travel Demand Model (MRTDM 09 v1) was used in this study. This traffic model covers all of Mecklenburg, Union, Gaston, and Cabarrus Counties as well as adjacent portions of Stanly County. The model is maintained by MUMPO on behalf of the other areas.

During the time of the study, GUAMPO and MUMPO completed new long range transportation plans (LRTPs) with significant changes to the future roadway projects as compared to the model used for the preliminary study. This comprehensive toll traffic and revenue study used the base same model with certain modifications as discussed in Chapter 6.

The socioeconomic data used in the MRTDM trip generation process was adjusted by an independent economist.<sup>(2)</sup> Accordingly, new trip tables were developed by applying the new socioeconomic data to the trip generation, trip distribution, and mode choice modules of the MRTDM.

The revised base-year model was calibrated in the immediate project area to achieve the best traffic volume assignments compared to observed traffic counts and observed speeds during speed-delay studies.

The toll collection concept used in the preliminary studies was revised to reflect the NCTA's decision to use AET without toll plazas. As was the case for the earlier study, zone disaggregation was required along the Garden Parkway. The trip tables were disaggregated on a proportionate basis using the updated trip generation and distribution process. Future-year trip

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<sup>(2)</sup> Kenan Institute for Private Enterprise of the University of North Carolina at Chapel Hill.

tables were also disaggregated to reflect the new disaggregated zone system.

Information was also obtained regarding regional and corridor income characteristics to aid in the development of estimated VOT for potential users of the candidate toll facility. Additional information from the SP survey was used to establish VOT by trip purpose and income level. This is a critical model parameter used to assess motorists' willingness to pay tolls and to estimate motorists' sensitivity to toll rates for the facility. Vehicle operating cost (VOC) parameters were also established specific to the study corridor.

#### **INDEPENDENT CORRIDOR GROWTH ANALYSIS**

Economic growth is particularly important for a start-up toll facility such as the proposed Garden Parkway which relies heavily on future population and employment growth along the corridor for traffic growth. Economic analyses were performed by independent economists from the Kenan Institute of Private Enterprise using the most current MPO forecasts available at the time of the study. Following the release of U.S. Census Bureau 2010 Census, Kenan performed a comprehensive review and update to growth projections. Special attention was given to reviewing socioeconomic growth rates for the study area, which currently has relative low density development in the southern part of Gaston County. The independent economist adjusted the MPOs' new forecasts as described in its report. These forecasts by the independent economist were then used in the travel demand model to create new trip tables for the toll diversion analysis.

#### **TRAFFIC AND REVENUE ANALYSIS**

The refined models were used to run a series of traffic assignments, both with and without the proposed Garden Parkway. In each case, traffic assignments were run for AM peak, PM peak and off-peak time periods. A review was made of the reasonableness of the travel demand estimates, particularly under a toll condition, using various evaluation techniques such as select link analysis, corridor share analysis, and capture rate.

Toll sensitivity analyses were conducted for 2016 and 2035 traffic demand to determine optimum toll rates. These optimum rates were then used to conduct traffic assignments for other interim years.

Based on the results of the traffic modeling analysis, annual estimates of traffic and revenue from the proposed Garden Parkway were developed for the base-case condition from opening year 2016 through 2035. The

forecasts beyond 2035 were based on an extrapolation of modeling results from 2035.

Revenue estimates in the early years of the projection period were adjusted to reflect ramp-up, a pattern of gradual build-up in demand for new toll facilities. This reflects the fact that the full demand along a facility is not typically realized when it opens, but gradually phases in over a period of two to four years.

Finally, estimates of revenue leakage were prepared to reflect potential losses of revenue due to system operational factors, unreadable license plates, unidentified vehicle owners, and account collection factors.

#### **SENSITIVITY TESTS**

A series of sensitivity tests were also performed to provide additional information on the sensitivity of the forecasts to changes in key parameters such as no growth in key socioeconomic parameters, higher and lower economic growth compared to the base case, different percentages of ETC usage, different values of time, and fluctuations in fuel cost.

## **REPORT STRUCTURE**

The remainder of this report consists of six chapters.

- Chapter 2 presents the existing traffic conditions in the project study area.
- Chapter 3 summarizes the travel pattern surveys.
- Chapter 4 contains a summary of the SP surveys.
- Chapter 5 describes the socioeconomic characteristics of the study area using the independent economist's socioeconomic forecast.
- Chapter 6 describes the development of the traffic forecast model, assumed roadway and transit improvements, toll configuration, toll sensitivity, recommended toll rates, traffic and gross revenue forecasts, and revenue leakage.
- Chapter 7 contains the results of a series of sensitivity tests on key model parameters.

# CHAPTER 2

## EXISTING TRAFFIC CONDITIONS

Data collection is a key component of any comprehensive traffic and revenue study. For this study, the collection of existing traffic data is necessary to accomplish the following objectives:

- Calibrate the base year model to current/baseline observed traffic conditions to assure that the forecasting tools are adequately replicating current conditions in the study area prior to forecasting future traffic volumes; and
- Understand existing travel behavior as a context for the evolution of future travel behavior after construction of the proposed toll road and other planned facilities in the area over the forecast period.

To achieve these objectives, current data on traffic speeds, traffic volumes, and mix of vehicle types in the study area were compiled. In addition, extensive route reconnaissance and reviews of available traffic statistics on highways within the study area were conducted.

This current empirical documentation of the traffic network in the study area was augmented by available traffic trend data from North Carolina Department of Transportation (NCDOT). Available information on programmed highway improvements scheduled in the study area was also incorporated into the analysis.

This chapter describes the collection of data used to characterize the operational performance of existing facilities in the proposed Garden Parkway study area.

## EXISTING HIGHWAY SYSTEM

The proposed Garden Parkway would primarily facilitate traffic movement in an east-west direction from I-85 west of Gastonia to I-485 in the area of Charlotte-Douglas International Airport. The Garden Parkway would provide a limited-access alternative to I-85, including a new crossing of the Catawba River between US 29/74 and NC/SC 49.

The area surrounding the proposed Garden Parkway, which includes Gaston and Mecklenburg Counties in North Carolina and York County in South Carolina, is currently served by the following major facilities as summarized in Table 2-1:

**Table 2-1  
Key Attributes of Major Routes within the Study Area**

Route	Location in Study Area	Direction in Study Area	Per Direction	Controlled Access	Traffic Signals	Speed Limit
I-485	I-85 to NC 49	North/South	3	Yes	No	65 mph
I-85	I-485 to US 74/29	East/West	3	Yes	No	65 mph
I-77	I-485 (north) to I-485 (south)	North/South	3	Yes	No	60 mph
US 321	I-85 to Ridge Road	North/South	2-3	No	Yes	35-55 mph
US 29/74	I-485 to I-85	East/West	2-3	No	Yes	35-55 mph
SC 557	SC 274 to Ridge Road	East/West	1	No	No	50 mph
NC/SC 279	I-85 to to NC 274	North/South	2	No	Yes	45 mph
NC/SC 274	I-85 to SC 557	North/South	2	No	Yes	45-55 mph
NC 273	I-85 to to NC 279	North/South	1	No	Yes	45 mph
NC 160	I-485 to NC 49	North/South	1	No	No	45/50 mph
NC/SC 49	I-485 to SC 274	East/West	2	No	Yes	45-50 mph
Hudson Boulevard	Davis Park Road to NC 279	East/West	2	No	Yes	35-45 mph
Ridge Road	SC 557 to US 321	East/West	1	No	No	45 mph

- I-485, the Charlotte Outer Loop, is a six-lane limited access Interstate highway nearly encircling Charlotte. The final 6.4-mile segment completing the Outer Loop on the northeastern side of Charlotte is scheduled to open in late 2014. Within the study area, I-485 extends north-south 2.5 miles east of the Catawba River and just west of Charlotte-Douglas International Airport. The speed limits along I-485 are posted at 65 mph.
- I-85 extends east-west to the north of Gastonia, connecting Gastonia to Charlotte, I-485, and Charlotte-Douglas International Airport. It is a six-lane limited access Interstate highway, with posted speed limits of 65 miles per hour (mph). The proposed Garden Parkway would run parallel to I-85. A major toll-free crossing of the Catawba River is also provided by I-85 between NC 27 and US 29/74. I-85 is the main highway that enters Charlotte from the west. It extends from Montgomery, Alabama to Petersburg, Virginia, connecting Charlotte with major

metropolitan areas including Atlanta; Greenville/Spartanburg, South Carolina; and the Triad Region and Durham in North Carolina.

- I-77 extends north-south through the region, passing through downtown Charlotte, crossing I-85 just north of downtown Charlotte and I-485 twice, at the north and southwest portions of the Outer Loop. It also intersects I-277 twice, on either side of downtown. Between the South Carolina border and the southern intersection with I-277, I-77 is a six-lane facility, increasing to eight lanes until the northern intersection with I-485, where the facility drops to five and then four lanes. Throughout most of the study area, the speed limit on I-77 is 60 mph.
- US 321 is a major north-south route within the study area, traveling through Gaston County via downtown Gastonia. South of I-85, US 321 is a four-lane arterial roadway, with speed limits posted at between 35 and 55 mph. Actual travel speeds are typically lower due to numerous signalized intersections and business access locations along the roadway. North of I-85, US 321 is a four-to-six-lane divided freeway. US 321 serves numerous communities to the south and generally parallels I-77. US 321 connects Gastonia with Hickory, North Carolina to the north. There is a planned interchange between US 321 and the Garden Parkway.
- US 29/74 is an arterial east-west roadway connecting to I-85 at Interchange 10, through the business district of Gastonia and into Charlotte. Given the number of businesses, retail stores, schools and hotels located along US 29/74, the facility serves as a major thoroughfare for local traffic. In addition, US 29/74 also carries traffic between Gastonia and Charlotte, providing a toll-free crossing of the Catawba River just south of I-85. In Mecklenburg County, US 29/74 provides connections to I-485, Charlotte-Douglas International Airport, I-77 and downtown Charlotte. US 29/74 runs parallel to both I-85 and the proposed alignment of the Garden Parkway. Within the study area, US 29/74 is primarily a six-lane facility, narrowing to four lanes at two river crossings and in the vicinity of the planned interchange with the Garden Parkway. Posted speed limits vary between 35 and 55 mph. Actual average speeds are lower due to a number of signalized intersections and business access locations.
- SC 557, together with Ridge Road and NC/SC 49 (see below), is an east-west arterial roadway that leads to the only crossing of Lake Wylie in the area, and therefore the most direct route to Charlotte from York County, SC. The relevant segment of SC 557 discussed here is fairly short, running only 2.2 miles between Ridge Road and SC 274,

where the roadway becomes SC 49. SC 557 is a two-lane rural highway with a posted speed of 50 mph.

- NC/SC 279 is a north-south arterial roadway that runs somewhat diagonally from Gastonia, NC, to its terminus at SC 274 in the vicinity of Lake Wylie. In Gastonia, NC 279 is a four-lane facility passing through dense retail, office and residential areas. South of Hudson Boulevard, the road narrows to two lanes and passes through low-density residential and rural areas. There is a planned interchange between NC 279 and the Garden Parkway.
- NC 274 travels from the northwest corner of Gaston County to the southwest corner, becoming SC 274 in York County, South Carolina. NC 274 provides a major north-south connection between downtown Gastonia, outlying rural areas, and the NC/SC 49 crossing of Lake Wylie. NC 274 is a four-lane arterial roadway between I-85 and NC 2446, narrowing to two lanes south of that location. Posted speed limits are between 45 and 55 mph. There is a planned interchange between NC 274 and the Garden Parkway.
- NC 273 is a north-south arterial that runs parallel to and just west of the Catawba River. Through the study area, NC 273 extends south from I-85 in Belmont as a four-lane roadway with intensive retail development for approximately one mile, crossing US 29/74 along the way. South of NC 7, NC 273 passes through low- and medium-density suburban residential development, narrowing to two lanes after approximately one mile, and continuing until the road's southern terminus at NC 279. There is a planned interchange between NC 273 and the Garden Parkway.
- NC 160 connects NC 49 to I-485 east of Lake Wylie, providing a direct connection between NC 49 traffic to and from York County, SC, and Charlotte Douglas International Airport. NC/SC 49 is a four-lane arterial roadway that provides a crossing of Lake Wylie, South Carolina, 12 miles south of I-85. The posted speed limits on NC/SC 49 vary between 45 and 55 mph. Within the study area, NC/SC 49 serves growing residential areas from Lake Wylie to I-485.
- Hudson Boulevard is a local east-west roadway in Gastonia. It is a four-lane arterial with posted speed limits of between 35 and 45 mph. Paired with NC 279, which is a 45 mph north-south arterial roadway, motorists are able to travel between the western end of Gastonia and the northern end of Lake Wylie. These facilities would potentially compete with the proposed Garden Parkway between Linwood Road

and NC 279 / New Hope Road.

- Ridge Road, together with SC 557 and NC/SC 49, forms an east-west corridor in northern York County, SC, carrying traffic across Lake Wylie and into the Charlotte area. Ridge Road is rural in nature, featuring two lanes, no shoulder, and a speed limit of 45 mph.

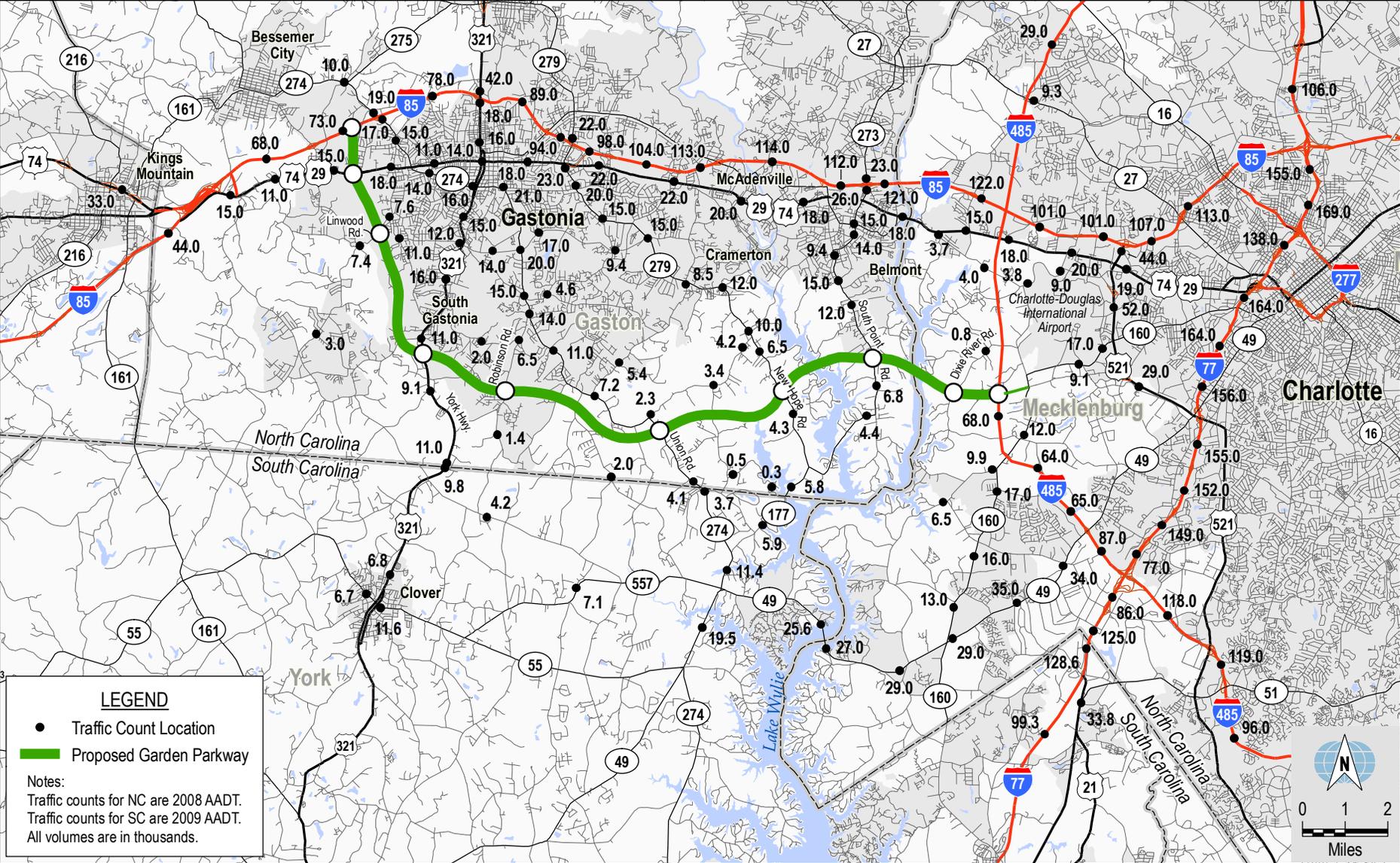
## HISTORICAL TRENDS

NCDOT and the South Carolina Department of Transportation (SCDOT) regularly conduct traffic counts for selected roadways in each state. Main-line and ramp traffic volumes are collected annually on Interstate and limited access highways and are used to develop estimates of Average Annual Daily Traffic (AADT). Traffic counts on arterial roadways are usually collected biennially in North Carolina. Traffic data from NCDOT and SCDOT were reviewed to aid in the traffic model calibration process. Figure 2-1 provides a summary of selected 2008 and 2009 traffic counts conducted by NCDOT and SCDOT.

I-85 has AADT volumes ranging from 122,000 at the Catawba River crossing to 44,000 just east of the border between Gaston and Cleveland counties. Between the Gaston Mall at Cox Road and US 29/74, I-85 main-line AADT volumes decrease by roughly 5,000 vehicles after each interchange, moving east to west. Major interchanges on I-85 are at NC 273, Cox Road, US 321 and US 29/74, where the difference in I-85 AADT volumes on either side of the interchange is 9,000 vehicles or more.

Traffic volumes on several roadways within the study area are also shown in the figure. AADT volumes on US 29/74 range between 11,000 and 22,000 vehicles, with volumes east of the proposed Garden Parkway generally about 20,000 vehicles. US 321 AADT volumes south of I-85 range between 9,100 and 18,000 vehicles per day. Lastly, according to NCDOT data, the NC/SC 49 crossing of the Catawba River carries an average of 27,000 vehicles per day.

Average annual traffic growth between 2002 and 2008 is illustrated in Figure 2-2. As shown in the figure, traffic volumes in downtown Gastonia and along US 29/74 generally declined during this period that ended in 2008 when traffic nationally had declined due to the combination of a recession and higher fuel prices. At the same time, traffic volumes grew outside of the Gastonia urban area along NC 274 and NC 273, as well as on NC 160 and NC 49 in the southwestern corner of Mecklenburg County. This would indicate that between 2002 and 2008 traffic generally shifted



Source: North Carolina DOT, South Carolina DOT

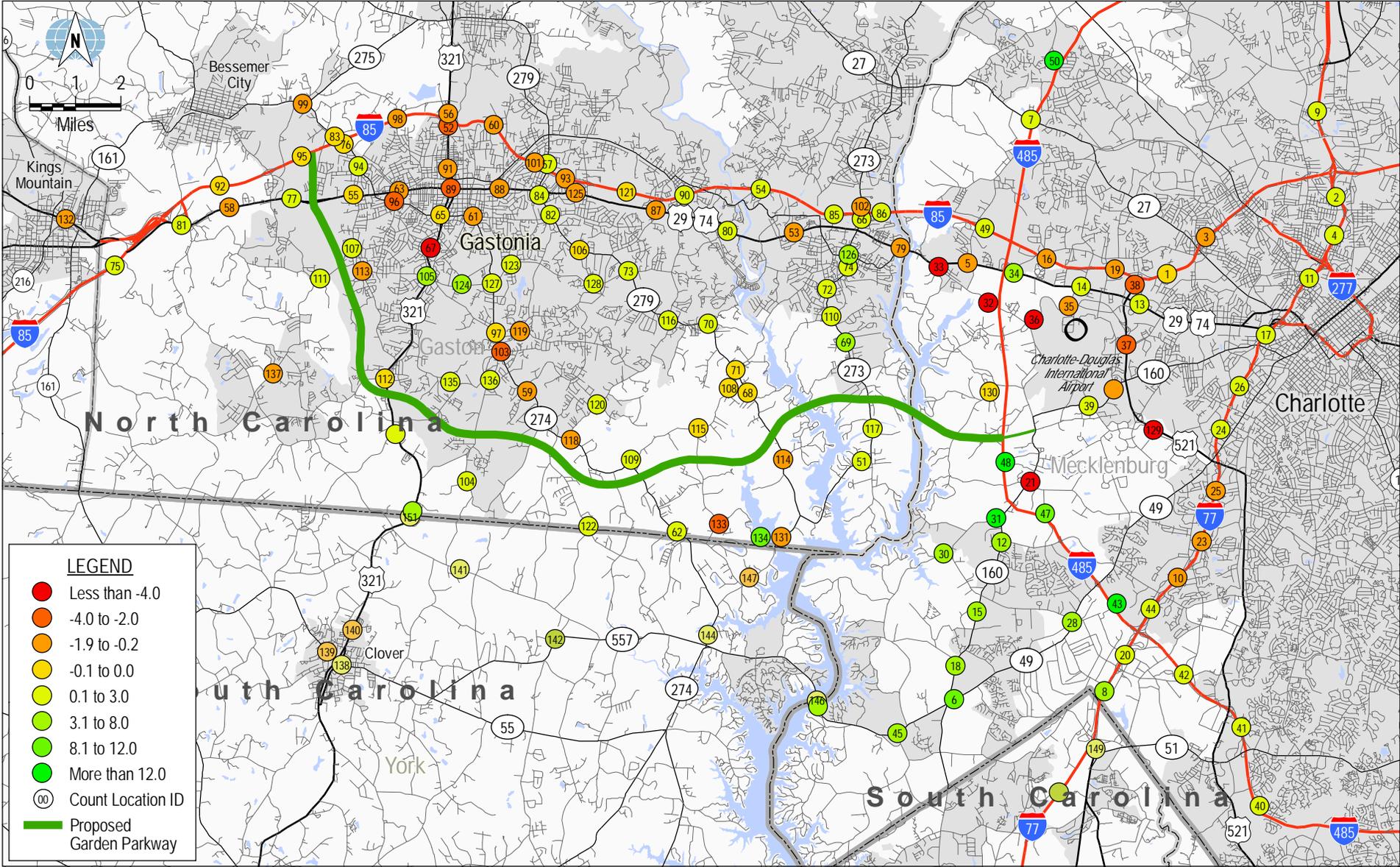


**AVERAGE ANNUAL DAILY TRAFFIC  
 2008 (NC) AND 2009 (SC) VOLUMES**

FIGURE 2-1

# Proposed Garden Parkway Comprehensive Traffic and Revenue Study

NC 103881 / 4-28-11 / Average Annual Percent Growth.mxd



Source: North Carolina DOT, South Carolina DOT



**AVERAGE ANNUAL DAILY TRAFFIC  
ANNUAL GROWTH RATE 2002-2008**

FIGURE 2-2

from downtown Gastonia to outlying areas. Table 2-2 provides a summary of historical traffic counts between 2002 and 2008 that are shown on the figure.

Four traffic screenlines were developed to analyze north-south and east-west traffic and to provide a better understanding of the changes in study area traffic patterns between 2002 and 2008. Table 2-3 provides a detailed analysis of these screenlines. Screenline 1, which represents the Catawba River crossings, grew at an average annual rate of 1.9 percent between 2002 and 2008. Screenline 2, representing east-west roads just east of Gastonia, grew at an average annual rate of 0.5 percent per year, with the majority of growth along the screenline focused between NC 279 and NC 274 and in York County, South Carolina. Capturing east-west roads to the west of Gastonia, Screenline 3 is the only screenline to show an overall loss of traffic between 2002 and 2008, decreasing at an average rate of 0.3 percent per year. Lastly, Screenline 4 captures north-south travel, primarily between Gaston County in North Carolina and York County in South Carolina. Between 2002 and 2008, Screenline 4 grew at an average rate of 0.4 percent per year. The screenline locations and growth rates are also provided graphically in Figure 2-3.

## 2010 TRAFFIC VOLUMES AND CHARACTERISTICS

Traffic information supplied by NCDOT was supplemented by new traffic counts conducted within the proposed Garden Parkway study area and other key locations in October and November 2009, and July and August 2010. The purpose of this supplemental work was to obtain current traffic volumes as an aid in recalibrating the regional transportation demand model in the area of the proposed Garden Parkway. Three types of counts were performed, as summarized in Table 2-4. Two seven-day counts were conducted on the mainline of I-85, one at the Catawba River crossing and one just west of the proposed interchange with the Garden Parkway. Two-day traffic counts were also conducted on selected I-85 ramps between Interchange 13 and Interchange 27. Lastly, six traffic counts were also conducted on arterial roadways within the study area. The locations of these supplemental traffic counts are shown in Figure 2-4.

**Table 2-2  
Historic Roadway Traffic Counts  
2002-2008**

Map Location	Route Name	Traffic Count Location	Average Annual Daily Traffic Volume (Thousands)							Average Annual Growth (2002-2008)
			2002	2003	2004	2005	2006	2007	2008	
1	I-85	From Exit 33 to Exit 34AB	107.0	104.0	102.0	111.0	118.0	121.0	107.0	0.0%
2	I-77	From Exit 12 to Exit 13	148.0	150.0	145.0	147.0	151.0	152.0	155.0	0.8%
3	I-85	From Exit 34AB to Exit 35	116.0	112.0	111.0	120.0	124.0	126.0	113.0	-0.4%
4	I-77	From Exit 11 to Exit 12	159.0	160.0	155.0	160.0	163.0	164.0	169.0	1.0%
5	US 29-74	West of NC 1197	16.0	13.0	13.0	--	14.0	--	15.0	-1.1%
6	NC 49	East of NC 160	--	--	19.0	--	26.0	--	29.0	11.2%
7	NC 27	East of NC 1769	8.4	--	8.9	--	--	--	9.3	1.7%
8	I-77	From SC Line to Exit 1	97.0	97.0	114.0	120.0	126.0	124.0	125.0	4.3%
9	I-77	From Exit 13 to Exit 16	98.0	92.0	96.0	104.0	113.0	115.0	106.0	1.3%
10	I-77	From Exit 3 to Exit 4	154.0	149.0	154.0	145.0	147.0	142.0	149.0	-0.5%
11	I-77	From Exit 10B to Exit 11	134.0	131.0	132.0	135.0	135.0	137.0	138.0	0.5%
12	NC 160	South of NC 1143 Brown Grier Road	14.0	--	15.0	--	16.0	--	17.0	3.3%
13	US 29-74 (Wilkinson Boulevard)	West of Boyer Street	17.0	--	18.0	--	18.0	--	19.0	1.9%
14	US 29-74	East of NC 1191	18.0	--	19.0	--	17.0	--	20.0	1.8%
15	NC 160	South of NC 1410 Westinghouse Boulevard	13.0	--	15.0	--	15.0	--	16.0	3.5%
16	I-85	From Exit 30 to Exit 32	103.0	102.0	102.0	102.0	106.0	108.0	101.0	-0.3%
17	I-77	From NC 160 to Exit 9	161.0	157.0	160.0	161.0	161.0	163.0	164.0	0.3%
18	NC 160	South of NC 1119	8.3	--	9.9	--	11.0	--	13.0	7.8%
19	I-85	From Exit 32 to Exit 33	107.0	106.0	106.0	103.0	107.0	111.0	101.0	-1.0%
20	I-77	From Exit 1 to Exit 2	82.0	76.0	84.0	83.0	82.0	80.0	86.0	0.8%
21	NC 160	North of Shopton Road	16.0	--	19.0	--	11.0	--	12.0	-4.7%
22	NC 49	East of Moss Road	--	--	26.0	--	30.0	--	35.0	7.7%
23	I-77	From Exit 4 to Exit 5	161.0	155.0	158.0	149.0	151.0	146.0	152.0	-1.0%
24	I-77	From Exit 6A to Exit 7	153.0	149.0	152.0	153.0	154.0	153.0	156.0	0.3%
25	I-77	From Exit 5 to Exit 6B	164.0	159.0	162.0	153.0	155.0	152.0	155.0	-0.9%
26	I-77	From Exit 7 to Exit 8	162.0	157.0	160.0	160.0	162.0	163.0	164.0	0.2%
27	NC 160	West of Airport Drive	19.0	--	17.0	--	17.0	--	17.0	-1.8%
28	NC 49	South of Westinghouse Boulevard	--	--	25.0	--	31.0	--	34.0	8.0%
29	NC 49	West of Shafter Road	--	--	23.0	--	25.0	--	27.0	4.1%
30	Shopton Road West	West of Westinghouse Boulevard	4.4	--	4.5	--	5.0	--	6.5	6.7%
31	Shopton Road West	West of NC 160	4.0	--	4.8	--	6.8	--	9.9	16.3%
32	NC 1191	East of NC 1446	12.0	--	14.0	--	5.6	--	4.0	-16.7%
33	Old Dowd Road	South of US 29-74	9.6	--	11.0	--	5.2	--	3.7	-14.7%
34	US 29-74	East of I-485	13.0	--	13.0	--	16.0	--	18.0	5.6%
35	Old Dowd Road	East of Rental Car Drive	10.0	--	10.0	--	9.1	--	9.0	-1.7%
36	NC 1191	East of NC 1199	6.9	--	7.1	--	5.6	--	3.8	-9.5%
37	US 521	North of Morris Field Drive	61.0	--	61.0	--	50.0	--	52.0	-2.6%
38	US 521	South of I-85 Service Road	53.0	--	56.0	--	44.0	--	44.0	-3.1%
39	NC 160	East of Sirus Lane	9.0	--	9.7	--	10.0	--	9.1	0.2%
40	I-485	From Exit 61 to Exit 64	83.0	86.0	95.0	100.0	96.0	93.0	96.0	2.5%
41	I-485	From Exit 64 to Exit 65	107.0	107.0	109.0	124.0	121.0	117.0	119.0	1.8%
42	I-485	From Exit 65 to Exit 67 (I-77)	102.0	101.0	104.0	121.0	119.0	116.0	118.0	2.5%
43	I-485	From Exit 67 (I-77) to Exit 1	31.0	29.0	38.0	70.0	82.0	88.0	87.0	18.8%
44	I-77	From Exit 2 to Exit 3	74.0	67.0	75.0	74.0	72.0	70.0	77.0	0.7%
45	NC 49	East of Pleasant Hill Road	--	--	--	--	26.0	--	29.0	5.6%
46	I-485	From Exit 1 to Exit 3	11.0	12.0	14.0	48.0	62.0	66.0	65.0	34.5%
47	I-485	From Exit 3 to Exit 4	--	--	--	47.0	61.0	65.0	64.0	10.8%
48	I-485	From Exit 4 to Exit 9	--	--	--	48.0	62.0	69.0	68.0	12.3%
49	I-85	From Exit 29 to Exit 30	--	--	--	121.0	122.0	127.0	122.0	0.3%
50	I-485	From Exit 14 to Exit 16	--	--	--	--	--	15.0	29.0	93.3%
51	NC 273	West of NC 2525	4.0	--	4.3	--	4.2	--	4.4	1.6%

**Table 2-2 (Cont'd)  
Historic Roadway Traffic Counts  
2002-2008**

Map Location	Route Name	Traffic Count Location	Average Annual Daily Traffic Volume (Thousands)						Average Annual Growth (2002-2008)	
			2002	2003	2004	2005	2006	2007		2008
52	US 321	South of I-85	21.0	--	20.0	--	20.0	--	18.0	-2.5%
53	US 29-74	East of NC 2017	109.0	112.0	109.0	120.0	118.0	120.0	114.0	-1.7%
54	I-85	From Exit 23 to Exit 26	--	--	--	--	--	--	--	0.8%
55	US 29-74	West of NC 1136	18.0	--	18.0	--	18.0	--	18.0	0.0%
56	US 321	North of I-85	43.0	--	47.0	--	44.0	--	42.0	-0.4%
57	NC 279 (New Hope Road)	North of Remount Road	19.0	--	21.0	--	23.0	--	22.0	2.5%
58	US 29-74	East of NC 1251	12.0	--	12.0	--	11.0	--	11.0	-1.4%
59	NC 274	East of NC 2656	12.0	--	12.0	--	11.0	--	11.0	-1.4%
60	I-85	From Exit 17 to Exit 19	95.0	94.0	91.0	94.0	96.0	96.0	89.0	-1.1%
61	Garrison Boulevard	West of NC 274	22.0	--	20.0	--	22.0	--	21.0	-0.8%
62	NC 274	West of NC 2589	3.8	--	4.3	--	3.8	--	4.1	1.3%
63	US 29-74	East of Linwood Rd	12.0	--	12.0	--	12.0	--	11.0	-1.4%
64	US 321	South of NC 2655	8.7	--	9.0	--	10.0	--	11.0	4.0%
65	Garrison Boulevard	West of US 321 S	16.0	--	16.0	--	16.0	--	16.0	0.0%
66	NC 273	South of I-85	24.0	--	24.0	--	23.0	--	26.0	1.3%
67	US 321	North of Carolina Avenue	22.0	--	--	--	19.0	--	15.0	-6.2%
68	NC 279	South of Wycliff Lane	6.5	--	6.7	--	6.6	--	6.5	0.0%
69	NC 273	South of NC 2574	9.5	--	11.0	--	11.0	--	12.0	4.0%
70	NC 279	East of NC 2490	11.0	--	11.0	--	12.0	--	12.0	1.5%
71	NC 279	North of NC 2520	10.0	--	10.0	--	10.0	--	10.0	0.0%
72	North Central Street	South of Ethan Lane	8.3	--	9.0	--	9.3	--	9.4	2.1%
73	NC 279 (New Hope Road)	South of Hudson Boulevard	14.0	--	15.0	--	14.0	--	15.0	1.2%
74	NC 273	South of Brook Street	12.0	--	13.0	--	14.0	--	14.0	2.6%
75	I-85	From Exit 8 to Exit 10	43.0	46.0	46.0	48.0	46.0	47.0	44.0	0.4%
76	NC 274	South of I-85	17.0	--	18.0	--	18.0	--	17.0	0.0%
77	US 29-74	East of NC 1340	14.0	--	14.0	--	14.0	--	15.0	1.2%
78	US 321	North of Huffman Drive	17.0	--	17.0	--	17.0	--	16.0	-1.0%
79	US 29-74 (Wilkinson Boulevard)	East of NC 7	20.0	--	21.0	--	18.0	--	18.0	-1.7%
80	US 29-74	East of NC 2209	18.0	--	19.0	--	20.0	--	20.0	1.8%
81	US 29-74	East of NC 1303	14.0	--	13.0	--	14.0	--	15.0	1.2%
82	NC 279 (New Hope Road)	North of NC 2466	--	--	18.0	--	20.0	--	20.0	2.7%
83	NC 274	North of I-85	19.0	--	20.0	--	19.0	--	19.0	0.0%
84	NC 279	South of New Hope Drive	20.0	--	22.0	--	20.0	--	23.0	2.4%
85	I-85	From Exit 26 to Exit 27	104.0	106.0	104.0	115.0	114.0	117.0	112.0	1.2%
86	I-85	From Exit 27 to Exit 29	104.0	104.0	103.0	120.0	121.0	125.0	121.0	2.6%
87	US 29-74	West of NC 2329	23.0	--	23.0	--	23.0	--	22.0	-0.7%
88	US 29-74 (Franklin Boulevard)	East of South Church Street	20.0	--	18.0	--	18.0	--	18.0	-1.7%
89	US 29-74/NC 274 (Franklin Boulevard)	East of US 321 South	16.0	--	16.0	--	14.0	--	14.0	-2.2%
90	I-85	From Exit 22 to Exit 23	110.0	112.0	110.0	119.0	118.0	120.0	113.0	0.4%
91	US 321 (Chester Street)	North of West Rankin Avenue	17.0	--	17.0	--	17.0	--	16.0	-1.0%
92	I-85	From Exit 10 to Exit 13	68.0	70.0	66.0	70.0	72.0	73.0	68.0	0.0%
93	I-85	From Exit 20 to Exit 21	101.0	101.0	98.0	103.0	105.0	106.0	98.0	-0.5%
94	NC 274	North of Crescent Lane	14.0	--	18.0	--	15.0	--	15.0	1.2%
95	I-85	From Exit 13 to Exit 14	73.0	75.0	71.0	75.0	77.0	78.0	73.0	0.0%
96	Garrison Boulevard	West of Linwood Rd	16.0	--	14.0	--	16.0	--	14.0	-2.2%
97	NC 274	North of NC 2446	15.0	--	15.0	--	15.0	--	15.0	0.0%
98	I-85	From Exit 14 to Exit 17	80.0	82.0	77.0	81.0	84.0	84.0	78.0	-0.4%
99	NC 274	West of NC 1312	11.0	--	12.0	--	11.0	--	10.0	-1.6%
100	US 321	South of NC 1108	8.5	--	8.7	--	9.4	--	9.1	1.1%
101	I-85	From Exit 19 to Exit 20	102.0	100.0	98.0	100.0	102.0	102.0	94.0	-1.4%
102	NC 273	North of I-85	25.0	--	24.0	--	26.0	--	23.0	-1.4%

Table 2-2 (Cont'd)  
Historic Roadway Traffic Counts  
2002-2008

Map Location	Route Name	Traffic Count Location	Average Annual Daily Traffic Volume (Thousands)							Average Annual Growth (2002-2008)
			2002	2003	2004	2005	2006	2007	2008	
103	NC 274	North of Pineridge Lane	16.0	--	16.0	--	14.0	--	14.0	-2.2%
104	NC 2423	South of NC 2641	1.3	--	1.3	--	1.4	--	1.4	1.2%
105	Hudson Boulevard	West of US 321	9.7	--	11.0	--	12.0	--	12.0	3.6%
106	NC 279 (New Hope Road)	West of Armstrong Park Road	15.0	--	15.0	--	16.0	--	15.0	0.0%
107	NC 1131	West of NC 1136	--	--	7.2	--	8.0	--	7.6	1.4%
108	NC 2435	South of NC 2889	4.2	--	4.2	--	4.2	--	4.2	0.0%
109	NC 2435	North of NC 274	2.1	--	2.2	--	2.1	--	2.3	1.5%
110	NC 273	South of NC 2534	13.0	--	14.0	--	14.0	--	15.0	2.4%
111	NC 1131	North of NC 1133	7.1	--	6.9	--	7.6	--	7.4	0.7%
112	US 321	South of NC 1103	11.0	--	11.0	--	11.0	--	11.0	0.0%
113	Hudson Boulevard	East of NC 1136	12.0	--	9.7	--	10.0	--	11.0	-1.4%
114	NC 279	South of NC 2523	4.4	--	4.5	--	4.4	--	4.3	-0.4%
115	NC 2435	East of NC 2431	3.4	--	3.5	--	3.3	--	3.4	0.0%
116	NC 2439	South of NC 279	7.2	--	7.9	--	8.5	--	8.5	2.8%
117	NC 273	South of NC 2798	5.8	--	6.2	--	6.6	--	6.8	2.7%
118	NC 274	East of NC 2439	7.4	--	8.1	--	7.4	--	7.2	-0.5%
119	NC 2445	East of NC 2446	4.9	--	5.0	--	6.4	--	4.6	-1.0%
120	NC 2439	North of NC 2440	5.3	--	5.5	--	5.5	--	5.4	0.3%
121	I-85	From Exit 21 to Exit 22	104.0	105.0	102.0	110.0	110.0	111.0	104.0	0.0%
122	NC 2425	South of NC 3087	1.9	--	1.4	--	1.6	--	2.0	0.9%
123	Hudson Boulevard	East of NC 274	15.0	--	15.0	--	16.0	--	17.0	2.1%
124	Hudson Boulevard	West of NC 274	11.0	--	13.0	--	13.0	--	14.0	4.1%
125	US 29-74 (Wilkinson Boulevard)	West of Glenwood Drive	23.0	--	24.0	--	24.0	--	22.0	-0.7%
126	NC 273 (Park Street)	North of NC 7	12.0	--	13.0	--	14.0	--	15.0	3.8%
127	NC 274	South of Hudson Boulevard	--	--	19.0	--	22.0	--	20.0	1.3%
128	Hudson Boulevard	East of Bradford Street	8.2	--	8.8	--	8.8	--	9.4	2.3%
129	US 521	South of West Tyvola Road	--	--	36.0	--	25.0	--	29.0	-5.3%
130	Dixie River Road	West of West Dixie Drive	--	--	--	--	--	--	0.8	--
131	NC 279	South of NC 273	6.1	--	6.7	--	5.9	--	5.8	-0.8%
132	US 74 Bypass	West of NC 161	34.0	33.0	33.0	33.0	34.0	36.0	33.0	-0.5%
133	NC 2650	East of NC 2431	0.6	--	0.5	--	0.6	--	0.5	-3.0%
134	NC 2650	South of NC 2836	0.2	--	0.3	--	0.3	--	0.3	11.0%
135	NC 2412	East of NC 2672	1.9	--	1.9	--	2.0	--	2.0	0.9%
136	NC 2416	South of NC 2625	5.7	--	5.8	--	6.4	--	6.5	2.2%
137	NC 1126	South of NC 1113	3.2	--	2.8	--	2.9	--	3.0	-1.1%
138	SC 55	US 321 to SC 557/S-852	11.5	11.9	12.6	--	--	12.4	12.8	1.8%
139	SC 55	S-836 to US 321	7.7	7.8	7.9	--	7.7	7.1	7.0	-1.6%
140	US 321	S-1553 to S-4	7.4	4.6	8.3	--	--	7.8	7.3	-0.2%
141	SC 27	SC 557 to US 321	3.8	3.9	4.3	--	--	4.5	4.4	2.5%
142	SC 557	SC 55 to SC 49/274	6.1	5.9	6.3	--	--	7.4	7.8	4.2%
143	SC 49	SC 55/274 to SC 274/557	14.2	13.9	14.3	--	--	18.8	19.8	5.7%
144	SC 274	SC 49 to S-177	11.0	10.6	10.6	--	--	11.3	11.6	0.9%
145	SC 274	S-177 to NC State Line	--	3.8	3.9	--	--	4.0	3.8	0.0%
146	SC 49	SC 274/557 to NC State Line	23.6	20.6	21.2	--	--	28.4	26.3	1.8%
147	SC 177	SC 274 to NC State Line	6.2	6.1	6.1	--	--	6.5	6.1	-0.3%
148	I-77	SC 98 to SC 1441	78.5	79.7	81.3	--	--	101.1	99.1	4.0%
149	US 21	US 21 Business to NC State Line	31.5	30.3	36.2	--	--	33.2	34.8	1.7%
150	I-77	SC 1441 to NC State Line	97.2	97.6	107.1	--	--	129.1	129.1	4.8%
151	US 321	SC 4 to NC State Line	9.9	10.5	10.5	--	--	11.3	11.1	1.9%

Note: -- indicates counts were not available.

Sources: North Carolina Department of Transportation, Traffic Survey Unit  
South Carolina Department of Transportation

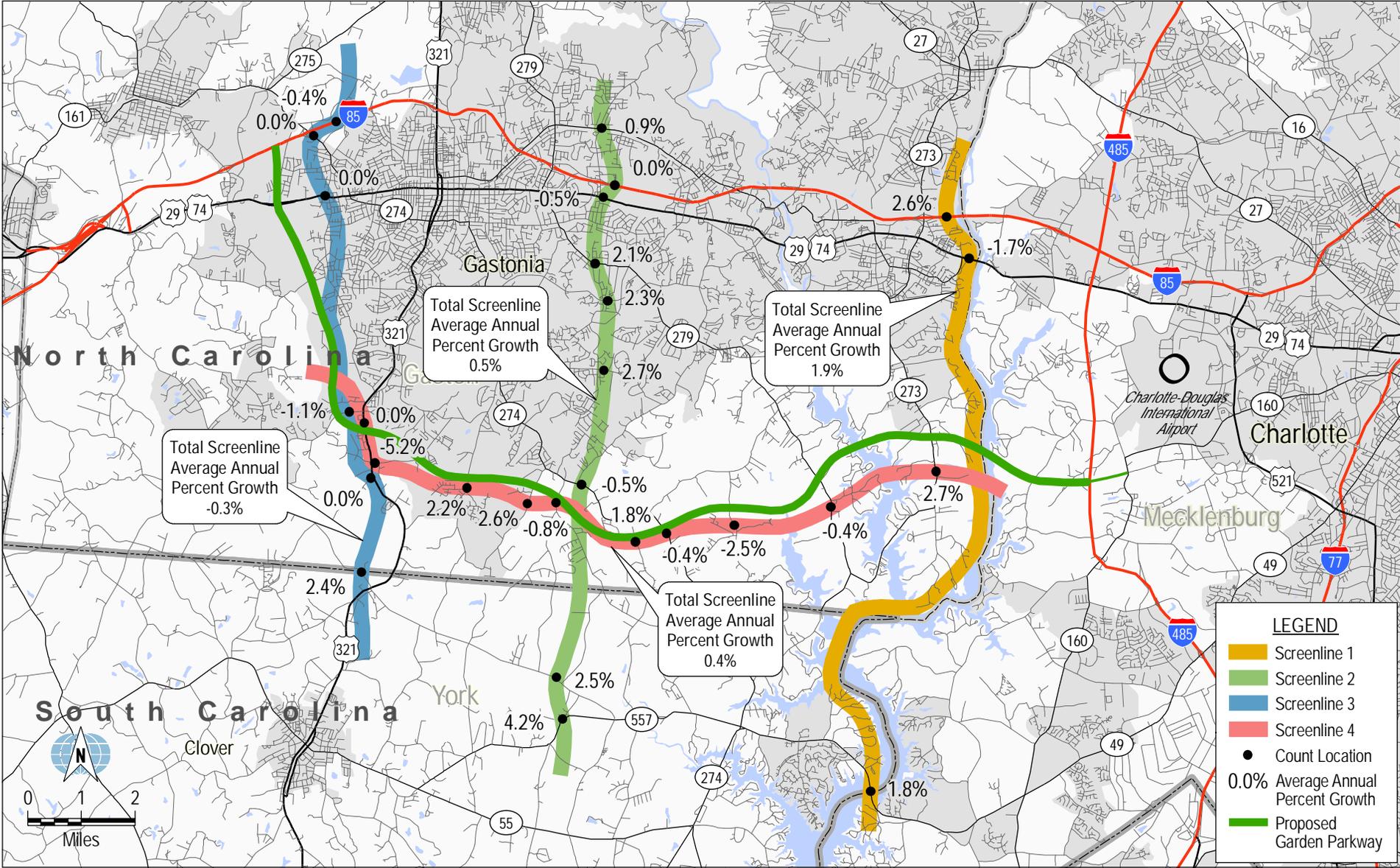
**Table 2-3  
Historical Growth at Screenline Locations**

			Average Annual Daily Traffic Volume and Average Annual Traffic Growth Rate							
Route	State	Location	2002 Traffic (000s)	Average Annual Growth 2002-2004	2004 Traffic (000s)	Average Annual Growth 2004-2006	2006 Traffic (000s)	Average Annual Growth 2006-2008	2008 Traffic (000s)	Average Annual Growth 2002-2008
<b>Screenline 1: East-West Roads that Cross the Catawba River</b>										
SC 49	SC	SC 274/557 to NC State Line	23.6	-5.2%	21.2	--	--	--	26.3	1.8%
US 29-74 (Wilkinson Boulevard)	NC	East of NC 7	20.0	2.5%	21.0	-7.4%	18.0	0.0%	18.0	-1.7%
I-85	NC	From Exit 27 To Exit 29	104.0	-0.5%	103.0	8.4%	121.0	0.0%	121.0	2.6%
<b>Total Screenline 1 <sup>(1)</sup></b>			<b>147.6</b>	<b>-0.8%</b>	<b>145.2</b>	<b>5.9%</b>	<b>139.0</b>	<b>0.0%</b>	<b>165.3</b>	<b>1.9%</b>
<b>Screenline 2: Central East-West Roads</b>										
SC 557	SC	SC 55 TO SC 49/274	6.1	0.8%	6.2	--	--	--	7.8	4.2%
SC 27	SC	SC 557 TO US 321	3.8	6.4%	4.3	--	--	--	4.4	2.5%
NC 274	NC	East of NC 2439	7.4	4.6%	8.1	--	--	--	7.2	-0.5%
NC 2445	NC	West of Kentwood Drive	4.0	6.1%	4.5	12.5%	5.7	-9.2%	4.7	2.7%
Hudson Boulevard	NC	East of Bradford Road	8.2	3.6%	8.8	0.0%	8.8	3.4%	9.4	2.3%
NC 279 (New Hope Road)	NC	East of Armstrong Park Road	15.0	6.5%	17.0	0.0%	17.0	0.0%	17.0	2.1%
US 29-74 (Wilkinson Boulevard)	NC	East of Armstrong Park Road	35.0	0.0%	35.0	--	--	--	34.0	-0.5%
I-85	NC	From Exit 21 To Exit 22	104.0	-1.0%	102.0	3.8%	110.0	-2.8%	104.0	0.0%
NC 7 (Ozark Avenue)	NC	East of Cox Road	7.5	3.9%	8.1	3.0%	8.6	-4.2%	7.9	0.9%
<b>Total Screenline 2 <sup>(1)</sup></b>			<b>191.0</b>	<b>0.8%</b>	<b>194.0</b>	<b>3.4%</b>	<b>150.1</b>	<b>-2.4%</b>	<b>196.4</b>	<b>0.5%</b>
<b>Screenline 3: Western East-West Roads</b>										
SC 42	SC	US 321 to NC State Line	1.6	3.1%	1.7	--	--	--	1.9	2.4%
NC 1108	NC	West of US 321	1.5	0.0%	1.5	-3.4%	1.4	3.5%	1.5	0.0%
NC 1103	NC	West of US 321	6.3	-3.2%	5.9	1.7%	6.1	-1.7%	5.9	-1.1%
US 29-74	NC	West of NC 1136	18.0	0.0%	18.0	0.0%	18.0	0.0%	18.0	0.0%
NC 274	NC	South of I-85	17.0	2.9%	18.0	0.0%	18.0	-2.8%	17.0	0.0%
I-85	NC	From Exit 14 to Exit 17	80.0	-1.9%	77.0	4.4%	84.0	-3.6%	78.0	-0.4%
<b>Total Screenline 3 <sup>(1)</sup></b>			<b>124.4</b>	<b>-0.9%</b>	<b>122.1</b>	<b>2.9%</b>	<b>127.5</b>	<b>-2.8%</b>	<b>122.3</b>	<b>-0.3%</b>
<b>Screenline 4: North-South Roads in Proximity to the Project</b>										
NC 273	NC	South of NC 2798	5.8	3.4%	6.2	3.2%	6.6	1.5%	6.8	2.7%
NC 279	NC	South of NC 2523	4.4	1.1%	4.5	-1.1%	4.4	-1.1%	4.3	-0.4%
NC 2431	NC	North of NC 2433	1.4	0.0%	1.4	0.0%	1.4	-7.4%	1.2	-2.5%
NC 274	NC	South of NC 2435	4.4	4.4%	4.8	-1.0%	4.7	-4.3%	4.3	-0.4%
NC 2428	NC	South of NC 274	0.9	0.6%	0.9	-1.1%	0.9	6.1%	1.0	1.8%
NC 2425	NC	South of NC 274	4.5	0.0%	4.5	-1.1%	4.4	-1.1%	4.3	-0.8%
NC 2423	NC	South of NC 3077	1.2	0.0%	1.2	0.0%	1.2	8.0%	1.4	2.6%
NC 2416	NC	South of NC 2625	5.7	0.9%	5.8	5.0%	6.4	0.8%	6.5	2.2%
NC 2420	NC	East of US 321	2.2	6.6%	2.5	--	--	--	1.6	-5.2%
US 321	NC	South of NC 1103	11.0	0.0%	11.0	0.0%	11.0	0.0%	11.0	0.0%
<b>Total Screenline 4 <sup>(1)</sup></b>			<b>41.5</b>	<b>1.6%</b>	<b>42.8</b>	<b>0.8%</b>	<b>41.0</b>	<b>-0.2%</b>	<b>42.4</b>	<b>0.4%</b>

<sup>(1)</sup> The total traffic volume includes all traffic count locations available for the year. The total average annual growth between two years only includes the data point locations that were in common for both years. For this reason, the total traffic volumes are not comparable between 2004, 2006 and 2008, as many count locations were unavailable during 2006. The total average annual growth is comparable through the years, as it is calculated based only on the common count sites.

Note: -- indicates counts were not available.

Sources: North Carolina Department of Transportation, Traffic Survey Unit  
South Carolina Department of Transportation



Source: North Carolina DOT, South Carolina DOT

**AVERAGE ANNUAL PERCENT GROWTH  
 AT SCREENLINE LOCATIONS (2002-2008)**

**Table 2-4  
Supplemental Traffic Count Locations**

<b>Station Number <sup>(1)</sup></b>	<b>Road and Location</b>	<b>Direction <sup>(2)</sup></b>	<b>Dates</b>	<b>Duration</b>	<b>Days</b>
<b>Interstate 85 Mainline Locations:</b>					
1	I-85 mainline, between Interchanges 27 and 29	EB/WB	7/25/10 - 7/31/10	7 Days	Sun - Sat
2	I-85 mainline, between Interchanges 13 and 14	EB/WB	7/25/10 - 7/31/10	7 Days	Sun - Sat
<b>Interstate 85 Ramp Locations:</b>					
3	I-85 Interchange 13, WB Exit Ramp	WB	7/27/10 - 7/28/10	2 Days	Tue - Wed
3	I-85 Interchange 13, EB Entry Ramp	EB	8/2/10 - 8/3/10	2 Days	Mon - Tue
4	I-85 Interchange 14, WB Exit Ramp	WB	8/2/10 - 8/3/10	2 Days	Mon - Tue
4	I-85 Interchange 14, EB Entry Ramp	EB	7/27/10 - 7/28/10	2 Days	Tue - Wed
5	I-85 Interchange 17, WB Exit Ramp	WB	7/27/10 - 7/28/10	2 Days	Tue - Wed
5	I-85 Interchange 17, EB Entry Ramp	EB	7/27/10 - 7/28/10	2 Days	Tue - Wed
5	I-85 Interchange 17, EB Exit Ramp	EB	7/27/10 - 7/28/10	2 Days	Tue - Wed
5	I-85 Interchange 17, WB Entry Ramp	WB	7/27/10 - 7/28/10	2 Days	Tue - Wed
6	I-85 Interchange 19, WB Exit Ramp	WB	7/27/10 - 7/28/10	2 Days	Tue - Wed
6	I-85 Interchange 19, EB Entry Ramp	EB	7/27/10 - 7/28/10	2 Days	Tue - Wed
6	I-85 Interchange 19, EB Exit Ramp	EB	7/27/10 - 7/28/10	2 Days	Tue - Wed
6	I-85 Interchange 19, WB Entry Ramp	WB	7/27/10 - 7/28/10	2 Days	Tue - Wed
7	I-85 Interchange 20, WB Exit Ramp	WB	7/27/10 - 7/28/10	2 Days	Tue - Wed
7	I-85 Interchange 20, EB Entry Ramp	EB	7/27/10 - 7/28/10	2 Days	Tue - Wed
7	I-85 Interchange 20, EB Exit Ramp	EB	7/27/10 - 7/28/10	2 Days	Tue - Wed
7	I-85 Interchange 20, WB Entry Ramp	WB	7/27/10 - 7/28/10	2 Days	Tue - Wed
8	I-85 Interchange 21, WB Exit Ramp	WB	7/27/10 - 7/28/10	2 Days	Tue - Wed
8	I-85 Interchange 21, EB Entry Ramp	EB	7/27/10 - 7/28/10	2 Days	Tue - Wed
8	I-85 Interchange 21, EB Exit Ramp	EB	7/27/10 - 7/28/10	2 Days	Tue - Wed
8	I-85 Interchange 21, WB Entry Ramp	WB	7/27/10 - 7/28/10	2 Days	Tue - Wed
9	I-85 Interchange 22, WB Exit Ramp	WB	7/27/10 - 7/28/10	2 Days	Tue - Wed
9	I-85 Interchange 22, EB Entry Ramp	EB	7/27/10 - 7/28/10	2 Days	Tue - Wed
9	I-85 Interchange 22, EB Exit Ramp	EB	7/27/10 - 7/28/10	2 Days	Tue - Wed
9	I-85 Interchange 22, WB Entry Ramp	WB	8/2/10 - 8/3/10	2 Days	Mon - Tue

**Table 2-4 (cont'd.)  
Supplemental Traffic Count Locations**

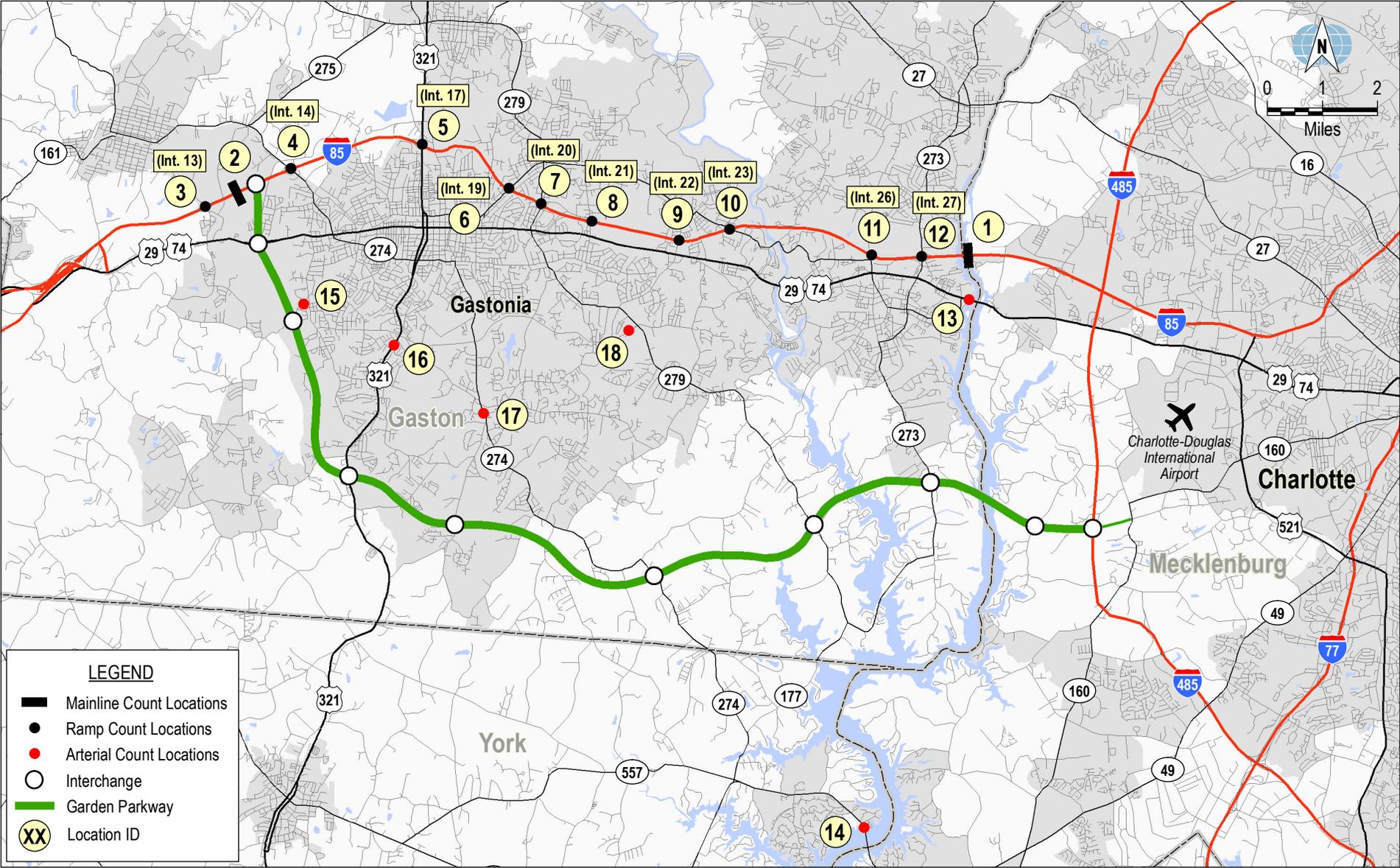
<b>Station Number <sup>(1)</sup></b>	<b>Road and Location</b>	<b>Direction <sup>(2)</sup></b>	<b>Dates</b>	<b>Duration</b>	<b>Days</b>
10	I-85 Interchange 23, WB Exit Ramp	WB	7/27/10 - 7/28/10	2 Days	Tue - Wed
10	I-85 Interchange 23, EB Entry Ramp	EB	7/27/10 - 7/28/10	2 Days	Tue - Wed
10	I-85 Interchange 23, EB Exit Ramp	EB	7/27/10 - 7/28/10	2 Days	Tue - Wed
10	I-85 Interchange 23, WB Entry Ramp	WB	7/27/10 - 7/28/10	2 Days	Tue - Wed
11	I-85 Interchange 26, WB Exit Ramp	WB	7/27/10 - 7/28/10	2 Days	Tue - Wed
11	I-85 Interchange 26, EB Entry Ramp	EB	7/27/10 - 7/28/10	2 Days	Tue - Wed
11	I-85 Interchange 26, EB Exit Ramp	EB	7/27/10 - 7/28/10	2 Days	Tue - Wed
11	I-85 Interchange 26, WB Entry Ramp	WB	7/27/10 - 7/28/10	2 Days	Tue - Wed
12	I-85 Interchange 27, WB Exit Ramp	WB	7/27/10 - 7/28/10	2 Days	Tue - Wed
12	I-85 Interchange 27, EB Entry Ramp	EB	7/27/10 - 7/28/10	2 Days	Tue - Wed
12	I-85 Interchange 27, EB Exit Ramp	EB	7/27/10 - 7/28/10	2 Days	Tue - Wed
12	I-85 Interchange 27, WB Entry Ramp	WB	7/27/10 - 7/28/10	2 Days	Tue - Wed

**Arterial Locations:**

13	US 29/74, between Catawba Street (NC 7) and Moores Chapel Loop (NC)	EB/WB	7/27/10 - 7/28/10 10/26/09 - 11/2/09	2 Days 7 Days	Tue - Wed Sun - Sat
14	NC/SC 49, between Blucher Circle (NC) and and Shaherlia Drive (SC)	EB/WB	7/27/10 - 7/28/10 10/26/09 - 11/2/09	2 Days 7 Days	Tue - Wed Sun - Sat
15	Linwood Rd., west of Davis Park Road	NB/SB	10/16/09 - 10/25/09	10 Days	Fri - Sun
16	US 321, south of Hudson Boulevard	NB/SB	10/16/09 - 10/25/09	10 Days	Fri - Sun
17	NC 274 (Union Rd.), south of Robinwood Road	SB	10/16/09 - 10/25/09	10 Days	Fri - Sun
18	E. Hudson Blvd., west of NC 279 (South New Hope Road)	EB/WB	10/16/09 - 10/25/09	10 Days	Fri - Sun

<sup>(1)</sup> See Figure 2-4 for locations.

<sup>(2)</sup> EB - eastbound  
WB - westbound  
NB - northbound  
SB - southbound



AADT volumes were calculated using the field data collection and North Carolina's published axle and seasonal correction factors as summarized below.

#### **2010 AVERAGE WEEKDAY TRAFFIC VOLUMES BY VEHICLE CLASS**

A balanced profile of current traffic volumes on I-85 was developed by vehicle type, as shown in Figure 2-5. Commercial vehicles were defined based on the existing model parameters, and include two-axle, six-tire trucks and all larger vehicles. Average annual weekday traffic (AWDT) volumes on the I-85 mainline range from an average of 84,200 vehicles per weekday between Interchanges 13 and 14 to 135,400 vehicles per weekday between Interchanges 27 and 28. Interchange 17 has the greatest average weekday traffic volumes, with the major movement being to and from the east. On average, 30,000 vehicles enter and exit I-85 to and from the east from US 321 each weekday. Interchange 27, which is the first interchange west of the Catawba River, also shows significant weekday traffic volumes to and from the east.

The balanced vehicle class composition for the I-85 mainline and ramps is shown in Figure 2-6. While overall traffic volumes decrease along I-85 as one proceeds west from Charlotte, the percent of commercial vehicle traffic increases. On the eastern end of I-85 in the study area, commercial vehicles comprise 21.6 percent of total AWDT volumes. On the western end of I-85, commercial vehicles comprise 32.8 percent of total AWDT volumes. This is due to the fact that commercial vehicle AWDT volumes on I-85 remain nearly steady throughout the study area at between 26,000 and 29,000 vehicles per weekday, while passenger car AWDT volumes drop from 106,200 to 56,600 vehicles. The intersections with the greatest percentage of commercial vehicle traffic are Interchanges 14 through 19, which are also the closest to downtown Gastonia.

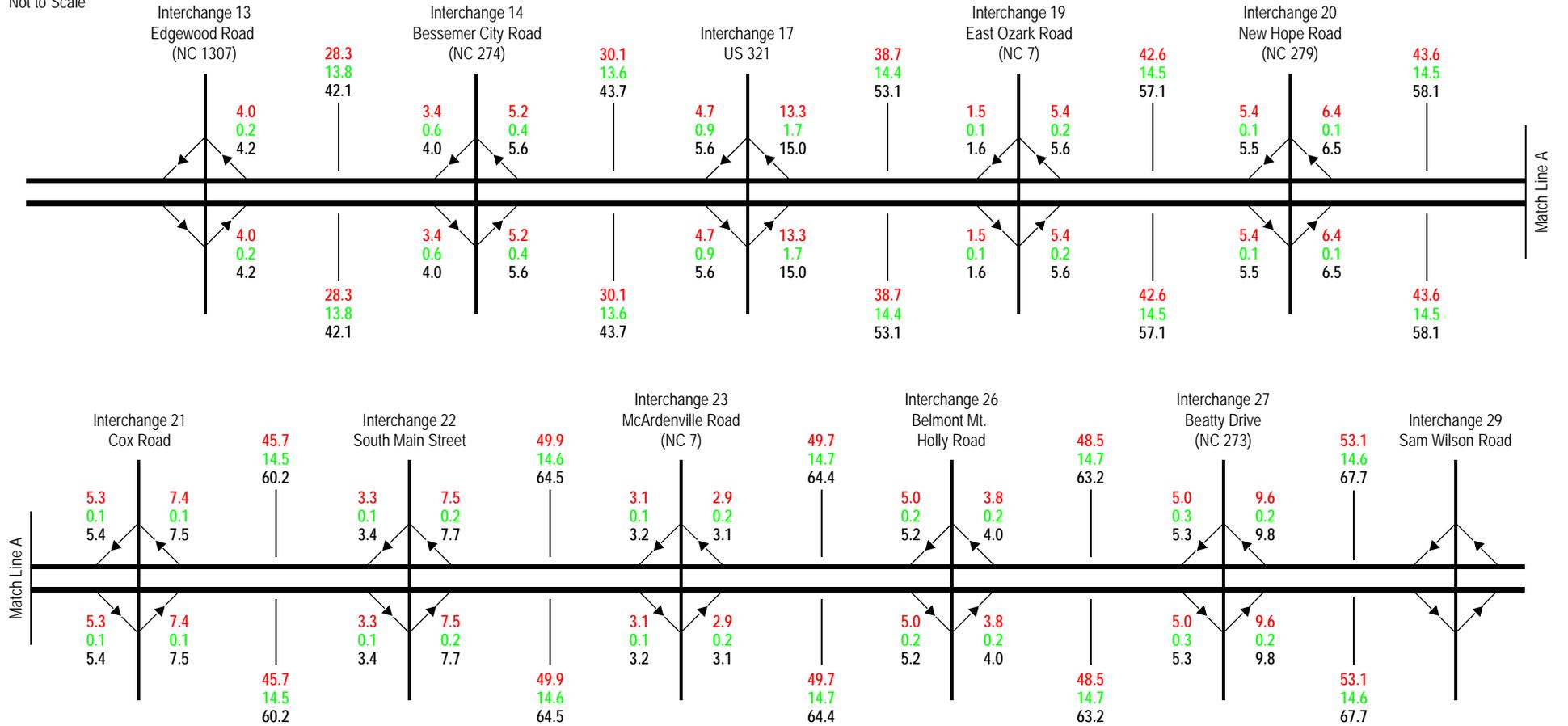
Table 2-5 shows the 2010 AWDT volumes for the six traffic counts conducted at arterial locations. Count locations 13 and 14 show 2010 AWDT volumes for the two other crossings of the Catawba River within the study area: US 29/74 and NC/SC 49. US 29/74 carried an average of 21,100 vehicles per weekday over the Catawba River in 2010, while NC/SC 49 carried 30,400 vehicles per weekday. The majority of traffic at both locations was passenger cars, with 4.3 percent and 2.6 percent of total vehicles at the US 29/74 and NC/SC 49 crossings classified as commercial vehicles, respectively. The remaining four arterial count locations are intended to shed light on the traffic patterns between downtown Gastonia and the proposed Garden Parkway. Of these four locations, NC 274 at Station 17 had the highest 2010 AWDT volume with 21,200 vehicles. US 321 at Station 16 had the highest volume of commercial vehicle traffic of the arterial lo-

# Proposed Garden Parkway Comprehensive Traffic and Revenue Study

NC 103881 / Landscape - DFR.pptx



Not to Scale



Source: Traffic counts in July and August 2010.

### LEGEND

- 00.0 - Passenger Cars
- 00.0 - Commercial Vehicles
- 00.0 - Total

Traffic volumes in thousands.

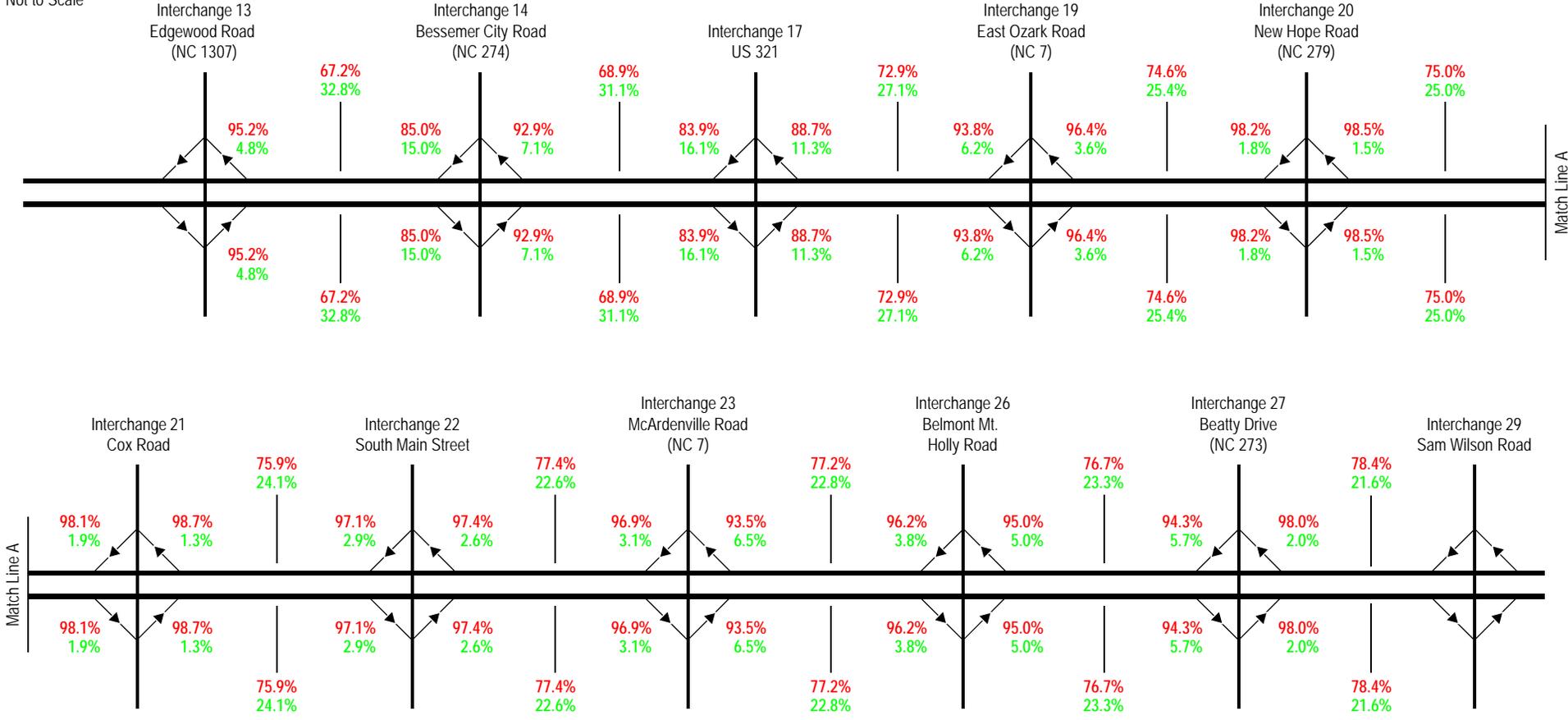


## 2010 AVERAGE ANNUAL WEEKDAY TRAFFIC VOLUMES ON I-85

FIGURE 2-5



Not to Scale



Source: Traffic counts in July and August 2010.

**LEGEND**  
 00.0 - Percent Passenger Cars  
 00.0 - Percent Commercial Vehicles



**PERCENT VEHICLE CLASS COMPOSITION  
2010 AVERAGE ANNUAL WEEKDAY**

FIGURE 2-6

cations counted, with 1,700 commercial vehicles per weekday or 9.4 percent of total weekday traffic.

**Table 2-5  
2010 Average Annual Weekday Traffic Volumes at Arterial Count Stations**

Station Number <sup>(1)</sup>	Road	Location	Passenger Cars		Commercial Vehicles		Total Vehicles	
			Volume	Percent	Volume	Percent	Volume	Percent
13	US 29/74	Between Catawba Street (NC 7) and Moores Chapel Loop	20,200	95.7%	900	4.3%	21,100	100%
14	NC/SC 49	Between Blucher Circle (NC) and Shaherlia Drive (SC)	29,600	97.4%	800	2.6%	30,400	100%
15	Linwood Road	West of Davis Park Road	6,900	97.2%	200	2.8%	7,100	100%
16	US 321	South of Hudson Boulevard	16,300	90.6%	1,700	9.4%	18,000	100%
17	NC 274	South of Robinwood Road	20,100	94.8%	1,100	5.2%	21,200	100%
18	East Hudson Boulevard	West of NC 279 (South New Hope Road)	6,500	95.6%	300	4.4%	6,800	100%

<sup>(1)</sup> See Figure 2-4 for locations.  
Source: Traffic counts in 2009 and 2010

#### DAILY TRAFFIC VARIATIONS

The data collected during the supplemental counts conducted in 2009 and 2010 were used to analyze daily traffic variations. Table 2-6 summarizes the daily variations in traffic volumes at the two mainline count locations on I-85 and the six arterial count locations.

As shown in the table, the two stations located on I-85 show different daily traffic variation patterns. The average weekday passenger car traffic volume at Station 1, which is at the Catawba River crossing, is 3 percent greater than the average day while the average weekend passenger car traffic volume is 6 percent lower than the average day. This suggests an overall commuter pattern at this location. By contrast, the average weekday passenger car traffic volume at Station 2, west of Gastonia, is 1 percent lower than the average day while the average weekend passenger car traffic volume is 3 percent greater than the average day. Looking at individual days at this location, passenger car traffic volumes on Thursday through Sunday are greater than the average day. This suggests that traffic volumes at this location may be based more on non-work activities such as shopping, social activities, and recreation.

**Table 2-6  
Daily Traffic Variations**

Day	Daily Index <sup>(1)</sup>							
	Station 1 I-85 (River Crossing)		Station 2 I-85 (west side)		Station 13 US 29/74		Station 14 NC/SC 49	
	PC <sup>(2)</sup>	CV <sup>(3)</sup>	PC	CV	PC	CV	PC	CV
Monday	1.00	1.05	0.98	0.96	1.06	0.96	0.97	1.21
Tuesday	0.96	1.11	0.93	1.06	1.08	1.06	1.04	1.12
Wednesday	1.02	1.18	0.95	1.10	1.11	1.10	1.08	1.18
Thursday	1.04	1.18	1.02	1.19	1.13	1.19	1.10	1.23
Friday	1.11	1.14	1.07	1.20	1.20	1.20	1.18	1.28
Saturday	0.96	0.72	1.02	0.76	0.81	0.76	0.91	0.62
Sunday	0.91	0.62	1.04	0.71	0.62	0.71	0.72	0.37
<b>Average Day</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>
<b>Average Weekday</b>	<b>1.03</b>	<b>1.13</b>	<b>0.99</b>	<b>1.10</b>	<b>1.12</b>	<b>1.10</b>	<b>1.07</b>	<b>1.20</b>
<b>Average Weekend</b>	<b>0.94</b>	<b>0.67</b>	<b>1.03</b>	<b>0.74</b>	<b>0.72</b>	<b>0.74</b>	<b>0.82</b>	<b>0.50</b>

Day	Daily Index <sup>(1)</sup>							
	Station 15 Linwood Road		Station 16 US 321		Station 17 NC 274		Station 18 East Hudson Boulevard	
	PC	CV	PC	CV	PC	CV	PC	CV
Monday	1.00	1.03	0.99	1.21	1.03	1.06	0.99	1.35
Tuesday	0.99	1.21	1.00	1.16	1.04	1.08	1.14	0.97
Wednesday	1.04	1.15	1.05	1.15	1.08	1.13	1.10	0.95
Thursday	1.08	1.18	1.04	1.16	1.07	1.11	1.10	0.94
Friday	1.13	1.23	1.12	1.17	1.13	1.12	1.13	1.28
Saturday	0.94	0.65	0.97	0.68	0.86	0.89	0.78	0.79
Sunday	0.81	0.54	0.82	0.47	0.79	0.61	0.76	0.74
<b>Average Day</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>
<b>Average Weekday</b>	<b>1.05</b>	<b>1.16</b>	<b>1.04</b>	<b>1.17</b>	<b>1.07</b>	<b>1.10</b>	<b>1.09</b>	<b>1.10</b>
<b>Average Weekend</b>	<b>0.88</b>	<b>0.60</b>	<b>0.90</b>	<b>0.58</b>	<b>0.83</b>	<b>0.75</b>	<b>0.77</b>	<b>0.77</b>

<sup>(1)</sup> Ratio of Individual day's traffic to average daily traffic for the week, weekend, or weekday.  
<sup>(2)</sup> PC - Passenger Car  
<sup>(3)</sup> CV - Commercial Vehicle

Source: Traffic counts conducted in 2009 and 2010.

At the other two river crossings, Stations 13 and 14, the average weekday passenger car traffic volumes are greater than the average day by 12 percent and 7 percent, respectively, suggesting a typical commuter-based traffic pattern. A similar pattern can also be observed at the other four locations surveyed. In terms of passenger car traffic, the day of the week with the greatest average traffic volumes is Friday for all locations.

Looking at commercial vehicle daily traffic variations, most locations show traffic volumes above the daily average between Tuesday and Friday. The only exception is at Station 18, where the Monday and Friday traffic volumes are significantly greater than the rest of the week. This may be due to the low volumes at this location and not indicative of any particular traffic patterns. In general, Monday commercial vehicle traffic is greater than the average day, except at Stations 2 and 13 where it is 4 percent less than the average day. Average weekend commercial traffic varies from 23 percent to 50 percent less than the average day at all locations.

#### **HOURLY TRAFFIC VARIATIONS**

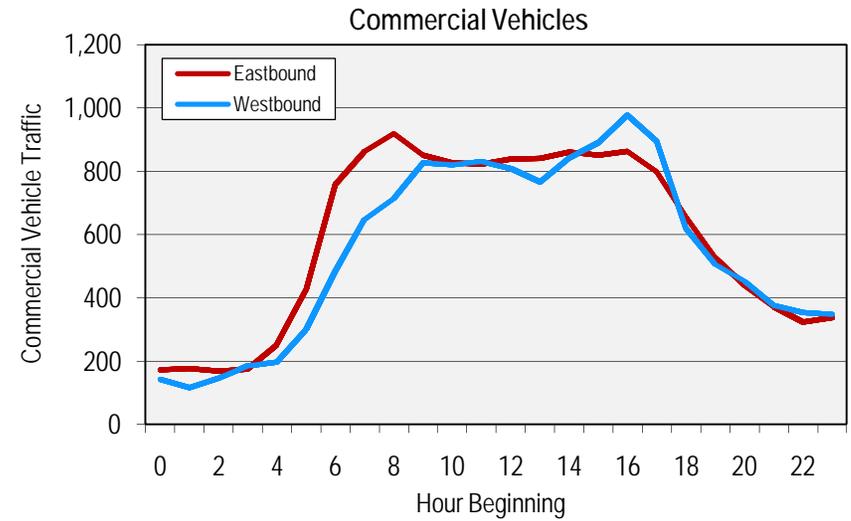
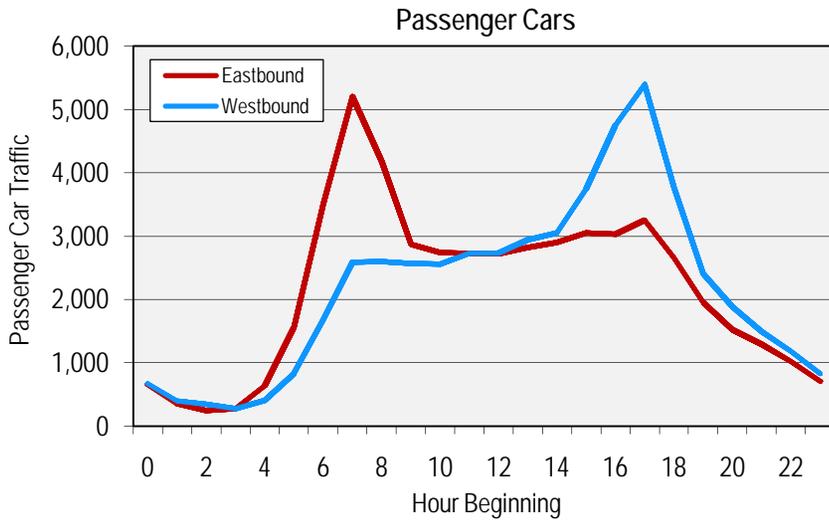
Figure 2-7 provides the hourly traffic distribution for the two mainline count locations on I-85. Passenger car traffic at Station 1, which is located between Interchanges 27 and 29 at the Catawba River crossing, shows a clear commuter pattern with an eastbound AM peak between 6:00 and 9:00 AM and a westbound PM peak between 2:00 and 6:00 PM. At Station 2, which is located west of Gastonia, an AM peak between 6:00 and 9:00 AM can be observed in the eastbound direction, while a similar sized PM peak exists in both directions between 2:00 PM and 6:00 PM. Commercial vehicle traffic at both locations is relatively stable between 7:00 AM and 5:00 PM.

Hourly variations at the other two Catawba River crossings, US 29/74 and NC/SC 49, are shown in Figure 2-8. Passenger car traffic at Station 13, which at the US 29/74 crossing of the Catawba River, shows an eastbound AM Peak between 6:00 and 9:00 AM and a westbound PM Peak between 3:00 and 6:00 PM. The hourly traffic variations at this location are similar to those of Station 1 on I-85, where commuters travel to Charlotte in the morning and return to Gastonia in the evening. At Station 14, which is the NC/SC 49 crossing of Lake Wylie, commuters appear to be travel in both directions, with an AM Peak in both directions between 6:00 and 9:00 AM and a PM Peak in both directions between 3:00 and 6:00 PM. Commercial vehicle traffic at both locations is relatively low with the majority of traffic volume occurring between 6:00 AM and 6:00 PM.

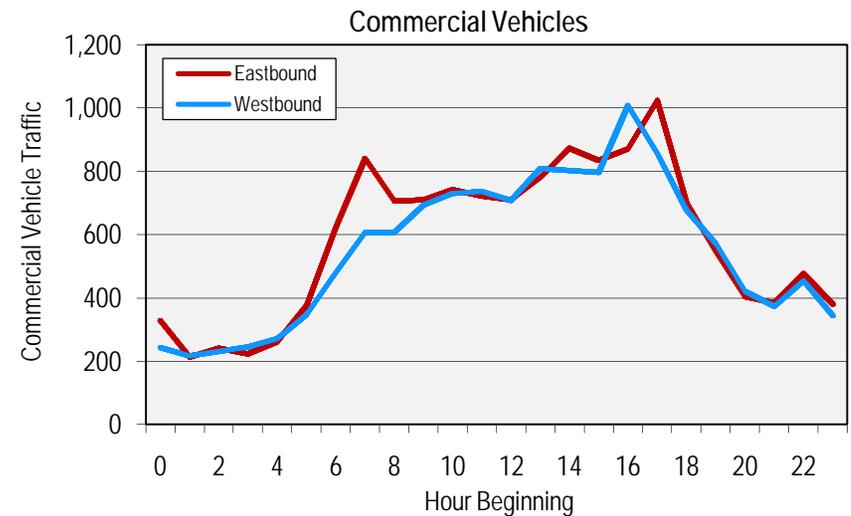
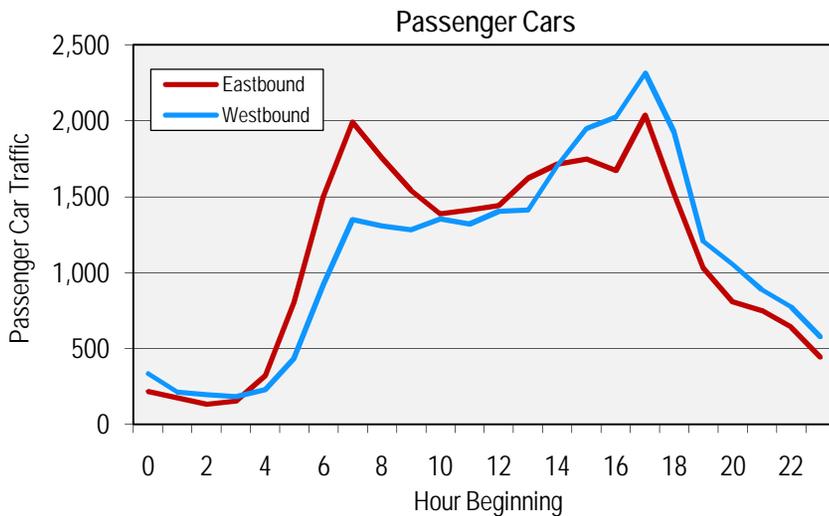
#### **TRAVEL SPEEDS AND DELAYS**

Weekday travel speeds within the project study area were observed in April 2010. Travel speed and delay runs were conducted during the AM, PM, and off-peak periods on multiple roads in each direction within the study area:

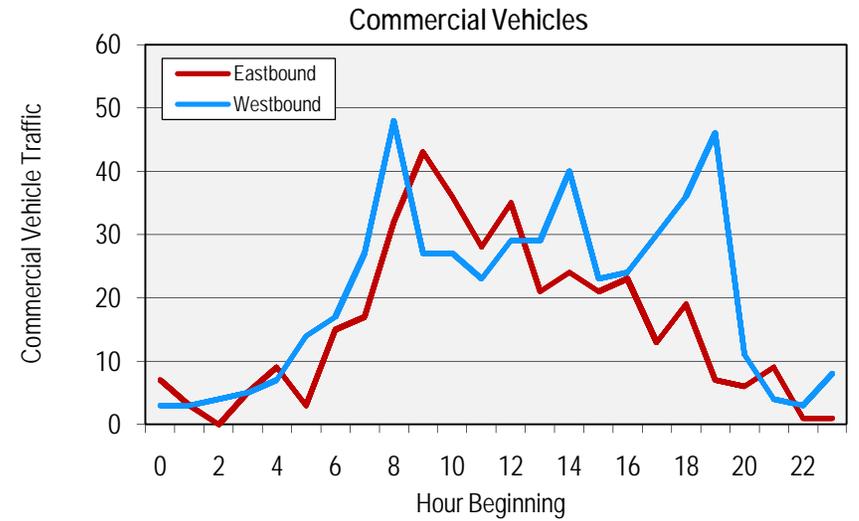
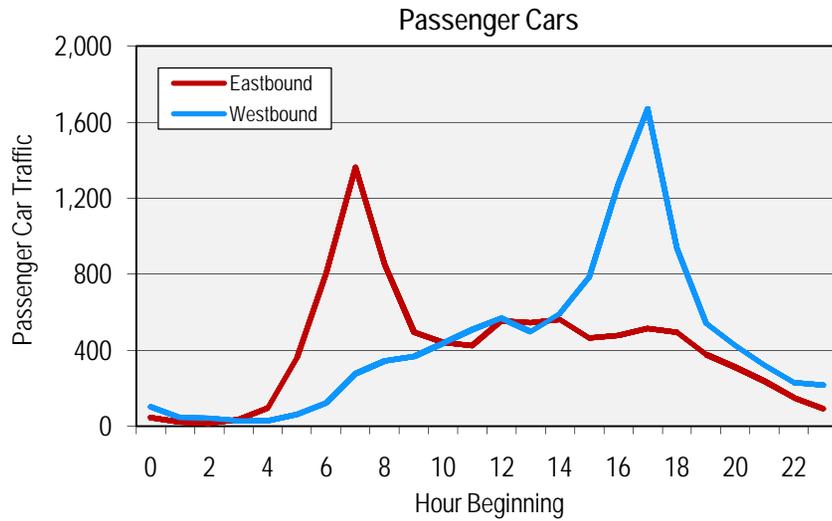
**Station 1: I-85 Mainline, Between Interchanges 27 and 29 (Catawba River)**



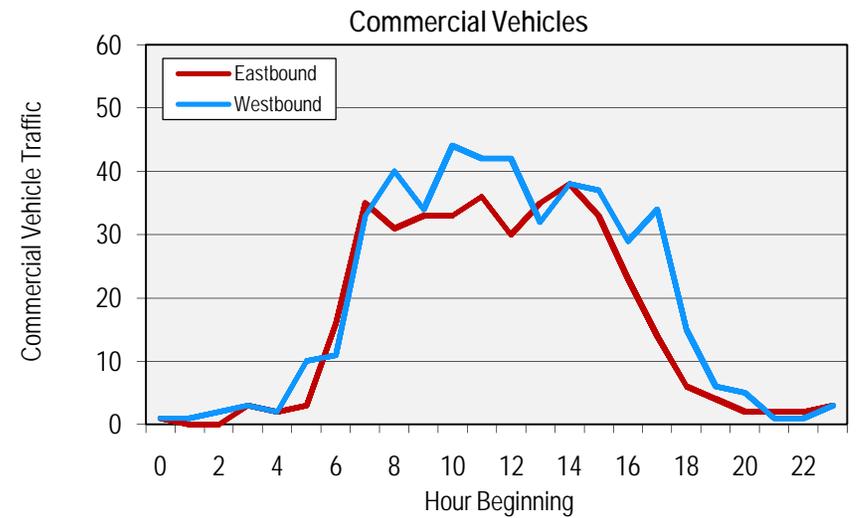
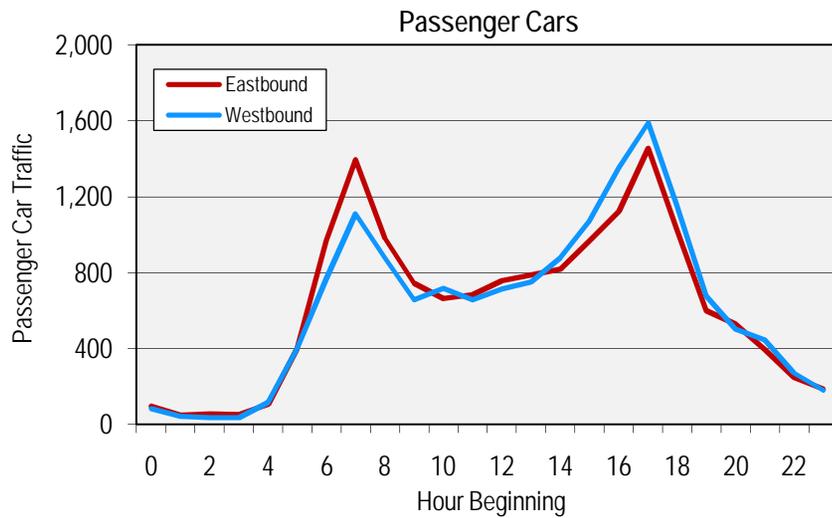
**Station 2: I-85 Mainline, Between Interchanges 13 and 14 (West of Gastonia)**



**Station 13: US 29/74, Between Catawba Street (NC 7) and Moores Chapel Loop (Catawba River)**



**Station 14: NC/SC 49, Between Blucher Circle and Shaherlia Road (Lake Wylie)**



<u>North – South Routes</u>	<u>East – West Routes</u>
▪ I-485	▪ I-85
▪ US 321	▪ US 29/74
▪ NC 274	▪ Ridge Road
▪ SC 274	▪ SC 557
▪ SC 279	▪ NC 49
▪ NC 279	
▪ NC 273	
▪ NC 160	

The speed and delay study results are summarized for the north-south routes in Table 2-7 and for the east-west routes in Table 2-8. Average observed travel speeds collected during the typical AM peak period (7:00 AM – 9:00 AM) are shown in Figure 2-9, while average observed travel speeds for the PM peak period (4:00 PM – 6:00 PM) are shown in Figure 2-10. Figure 2-11 provides the average observed travel speeds during the remaining off-peak hours.

On I-85, travel speeds are generally over 60 mph with some minor slow-downs at the I-485 interchange to the east and at the US 29/74 interchange to the west. During the AM peak period, some additional slower speeds were observed eastbound near the Gastonia Mall on Cox Road and at the NC 273 interchange. During the PM peak and off-peak periods some slower speeds were also observed westbound between US 321 and NC 274.

Another major roadway surveyed was US 29/74. Average travel speeds for the entire roadway ranged between 35 and 40 mph for all time periods. Generally, US 29/74 between US 321 and NC 273 had the slowest observed average speeds, ranging between 25 and 45 mph. This segment of US 29/74 runs through downtown Gastonia and past major commercial areas.

On US 321, average speeds tended to be greater further south from Gastonia. Average speeds between I-85 and Hudson Boulevard, which includes downtown Gastonia, were observed at 35 mph or less. Between Hudson Boulevard and the proposed Garden Parkway, travel speeds were observed at between 30 and 35 mph, with slightly slower speeds during the AM peak period. South of the proposed Garden Parkway, average speeds on US 321 were about 50 mph, except in the vicinity of Ridge Road where they drop to between 35 and 45 mph.

**Table 2-7  
Speed and Delay Studies on Selected North-South Routes**

Segment Start	Segment End	Distance (Miles)	Observed Travel Speeds (MPH)					
			Northbound			Southbound		
			AM	Midday	PM	AM	Midday	PM
<b>I-485</b>								
Exit 1 (NC 49)	Exit 4 (NC 160)	2.7	68.1	65.0	65.4	55.4	59.1	69.9
Exit 4 (NC 160)	Exit 9 (US 29/74)	5.1	67.6	64.1	67.6	67.4	68.6	69.9
Exit 9 (US 29/74)	Exit 10 (I-85)	0.7	48.2	42.4	38.4	65.0	64.7	57.0
<b>Total Distance/Average Speed</b>		<b>8.5</b>	<b>65.6</b>	<b>61.7</b>	<b>63.0</b>	<b>62.9</b>	<b>65.0</b>	<b>68.7</b>
<b>US 321</b>								
Ridge Road	Robinson Road	1.0	40.8	40.8	41.8	35.1	39.1	43.7
Robinson Road	Crowder's Creek Road	2.4	49.6	49.3	49.6	47.4	51.6	50.4
Crowder's Creek Road	East-West Hudson Boulevard	2.5	31.9	39.7	36.9	33.0	34.9	35.6
East-West Hudson Boulevard	US 29/74	2.1	27.4	29.5	30.9	26.0	28.3	25.1
US 29/74	I-85	1.4	29.6	31.4	27.6	30.3	25.9	27.1
<b>Total Distance/Average Speed</b>		<b>9.4</b>	<b>34.2</b>	<b>37.3</b>	<b>36.3</b>	<b>33.3</b>	<b>34.6</b>	<b>34.0</b>
<b>NC 274</b>								
SC State Line	Union New Hope Road	2.1	49.2	54.4	49.2	49.8	45.6	48.2
Union New Hope Road	Robinson Road	4.5	39.7	41.0	35.0	41.3	37.0	41.3
Robinson Road	East Hudson Boulevard	1.5	38.1	37.1	29.1	32.5	36.9	27.2
East Hudson Boulevard	East Garrison Boulevard	1.5	27.7	32.3	40.6	31.7	23.3	37.3
<b>Total Distance/Average Speed</b>		<b>9.6</b>	<b>38.5</b>	<b>40.8</b>	<b>37.0</b>	<b>39.2</b>	<b>35.2</b>	<b>38.7</b>
<b>SC 274</b>								
SC 557	NC State Line	2.6	50.6	49.5	53.2	45.5	41.1	51.7
<b>SC 279 / NC 279</b>								
SC 274	SC State Line	1.9	45.7	48.0	44.8	46.4	49.8	44.2
SC State Line	Armstrong Road	1.0	49.8	49.1	49.8	49.1	57.3	59.2
<b>Total Distance/Average Speed</b>		<b>2.9</b>	<b>47.1</b>	<b>48.4</b>	<b>46.4</b>	<b>47.3</b>	<b>52.1</b>	<b>48.5</b>
<b>NC 279</b>								
Union New Hope Road	Beatty Road	2.3	26.9		24.6	43.6		40.2
Beatty Road	East Hudson Boulevard	1.5	36.6		40.5	40.8		37.9
East Hudson Boulevard	East Garrison Boulevard	2.1	26.6		29.5	31.9		24.4
East Garrison Boulevard	US 29/74	0.7	36.1		28.5	29.5		13.4
US 29/74	I-85	0.5	37.9		14.2	40.5		25.3
<b>Total Distance/Average Speed</b>		<b>7.1</b>	<b>29.8</b>		<b>27.1</b>	<b>37.1</b>		<b>27.8</b>
<b>NC 273</b>								
NC 279	R. L. Stowe Road	6.3	48.0		45.1	48.0		44.6
R. L. Stowe Road	US 29/74	2.2	35.4		34.1	33.3		31.8
US 29/74	I-85	0.4	22.6		7.0	25.8		31.6
<b>Total Distance/Average Speed</b>		<b>8.9</b>	<b>42.2</b>		<b>34.1</b>	<b>41.8</b>		<b>39.9</b>
<b>NC 160</b>								
NC 49	I-485	4.9	34.1		36.9	40.8		35.1

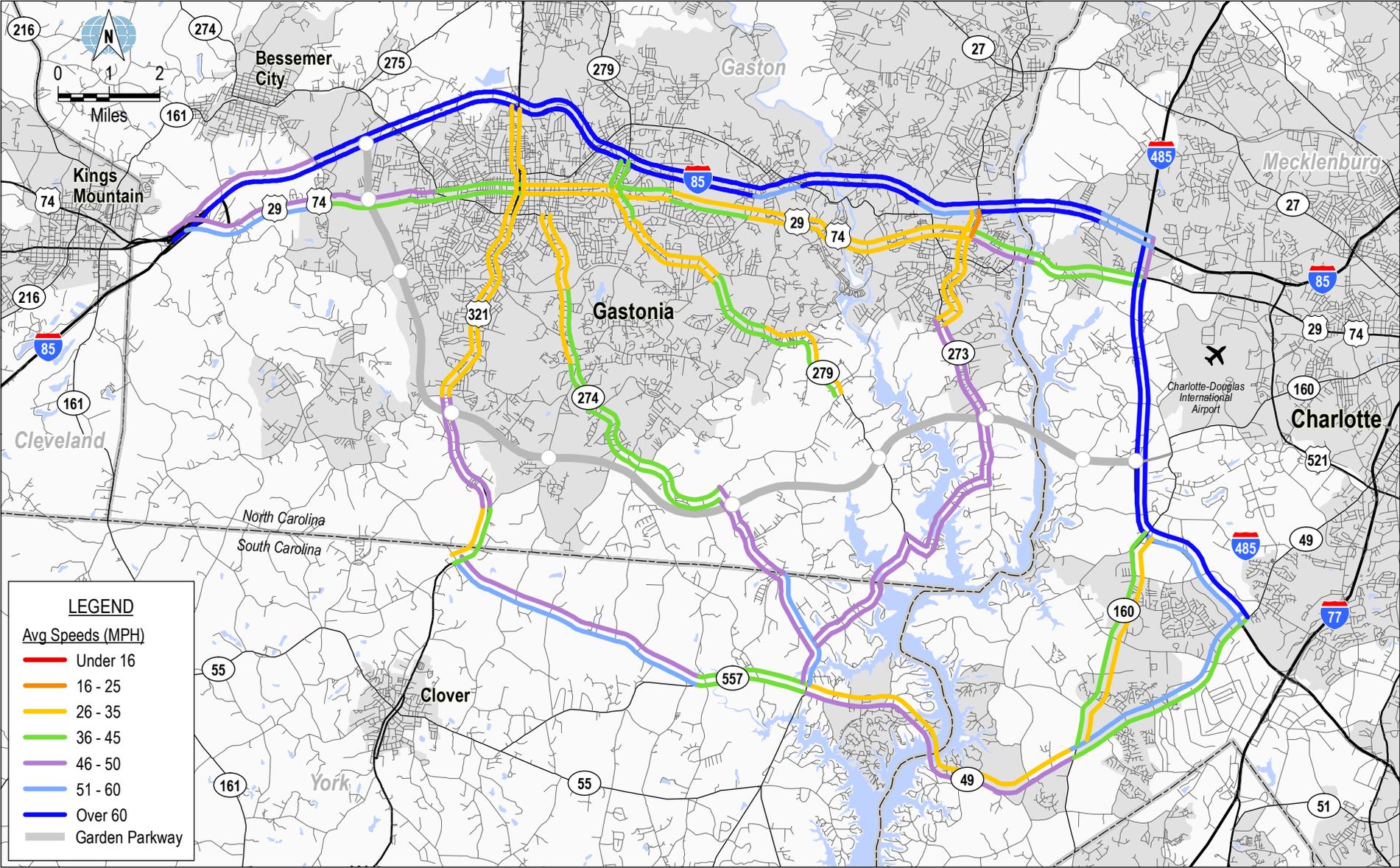
Source: Speed and Delay Studies, April 12 - 16, 2010

**Table 2-8  
Speed and Delay Studies on Selected East-West Routes**

Segment Start	Segment End	Distance (Miles)	Observed Travel Speeds (MPH)					
			Eastbound			Westbound		
			AM	Midday	PM	AM	Midday	PM
<b>I-85</b>								
Exit 10A/B (US 29/74)	Exit 13 (Edgewood Road)	2.3	64.0	65.5	66.1	46.9	59.7	49.5
Exit 13 (Edgewood Road)	Exit 14 (NC 274)	1.7	65.8	66.5	68.8	66.3	66.7	64.9
Exit 14 (NC 274)	Exit 17 (US 321)	2.5	66.8	65.8	67.8	61.8	54.1	56.7
Exit 17 (US 321)	Exit 19 (NC 7)	2.0	62.8	64.0	64.5	66.1	69.5	65.2
Exit 19 (NC 7)	Exit 20 (NC 279)	0.6	63.9	65.7	62.2	68.6	70.0	61.4
Exit 20 (NC 279)	Exit 21 (Cox Road)	0.9	66.8	64.3	63.1	65.2	63.8	65.2
Exit 21 (Cox Road)	Exit 22 (South Main Street)	1.6	62.4	62.4	63.1	62.0	60.9	64.3
Exit 22 (South Main Street)	Exit 23 (NC 7)	1.0	58.3	71.4	67.3	60.6	62.2	60.6
Exit 23 (NC 7)	Exit 26 (North Main Street)	2.7	66.1	65.2	67.0	65.1	64.0	64.0
Exit 26 (North Main Street)	Exit 27 (NC 273)	1.0	58.6	64.1	64.1	66.8	64.9	61.8
Exit 27 (NC 273)	Exit 29 (Sam Wilson Road)	2.6	62.7	66.3	63.1	68.8	71.2	68.8
Exit 29 (Sam Wilson Road)	Exit 30 (I-485)	0.7	55.9	52.5	57.1	57.9	51.2	48.9
<b>Total Distance/Average Speed</b>		<b>19.6</b>	<b>63.5</b>	<b>64.8</b>	<b>65.1</b>	<b>61.9</b>	<b>62.8</b>	<b>60.7</b>
<b>US 29/74</b>								
I-85 Ramp	Edgewood Road	2.3	53.1	54.8	47.6	47.6	46.1	37.2
Edgewood Road	NC 274	2.3	35.7	31.0	34.1	46.4	41.4	47.8
NC 274	US 321	1.7	37.3	31.8	32.8	35.8	40.6	35.8
US 321	NC 279	1.9	29.2	26.3	28.8	34.1	33.5	27.8
NC 279	Cox Road	1.1	35.4	33.1	27.9	42.3	30.0	36.4
Cox Road	South Main Street	1.6	42.5	37.0	36.0	32.5	29.5	29.7
South Main Street	NC 273	4.6	32.8	34.3	32.4	33.3	36.4	38.9
NC 273	Moore's Chapel Road	1.4	46.9	47.3	39.7	40.2	36.4	34.7
Moore's Chapel Road	I-485 Ramp	2.0	37.6	41.1	36.5	44.0	36.4	53.4
<b>Total Distance/Average Speed</b>		<b>18.9</b>	<b>37.0</b>	<b>35.6</b>	<b>34.4</b>	<b>38.2</b>	<b>38.0</b>	<b>37.4</b>
<b>Ridge Road</b>								
US 321	SC 557	5.4	51.1		52.8	48.5		55.0
<b>SC 557</b>								
Ridge Road	SC 274	2.2	37.1		45.1	37.6		43.9
<b>NC 49</b>								
SC 274	NC 160	7.2	47.4		43.5	31.6		27.8
NC 160	I-485	4.5	37.5		28.1	51.7		48.3
<b>Total Distance/Average Speed</b>		<b>11.7</b>	<b>43.0</b>		<b>35.9</b>	<b>37.1</b>		<b>33.2</b>

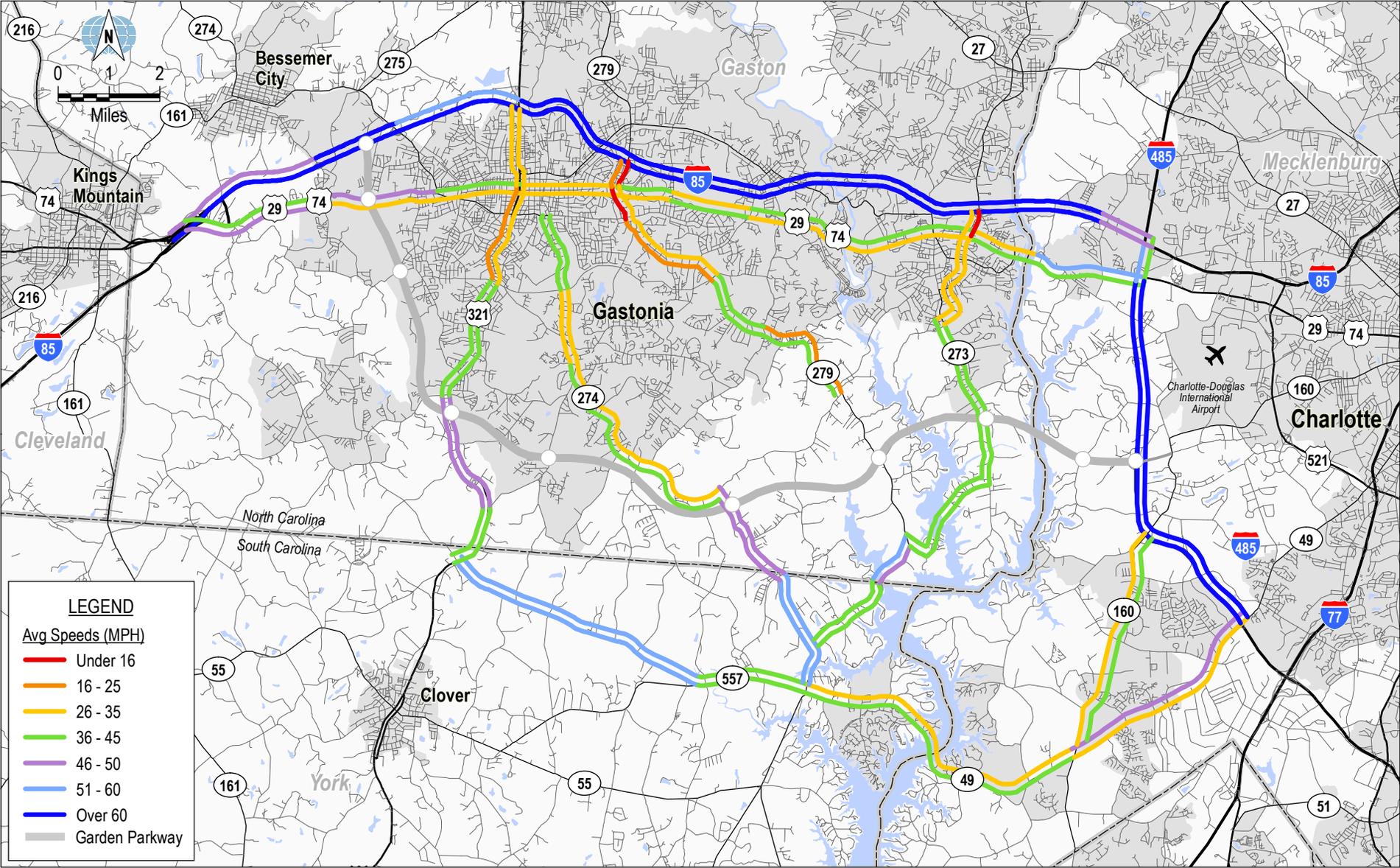
Source: Speed and Delay Studies, April 12 - 16, 2010

# Proposed Garden Parkway Comprehensive Traffic and Revenue Study



# Proposed Garden Parkway Comprehensive Traffic and Revenue Study

NC 103881 / Graphics / Arcview / Avg PM Pk Speeds2.mxd / 3-15-11

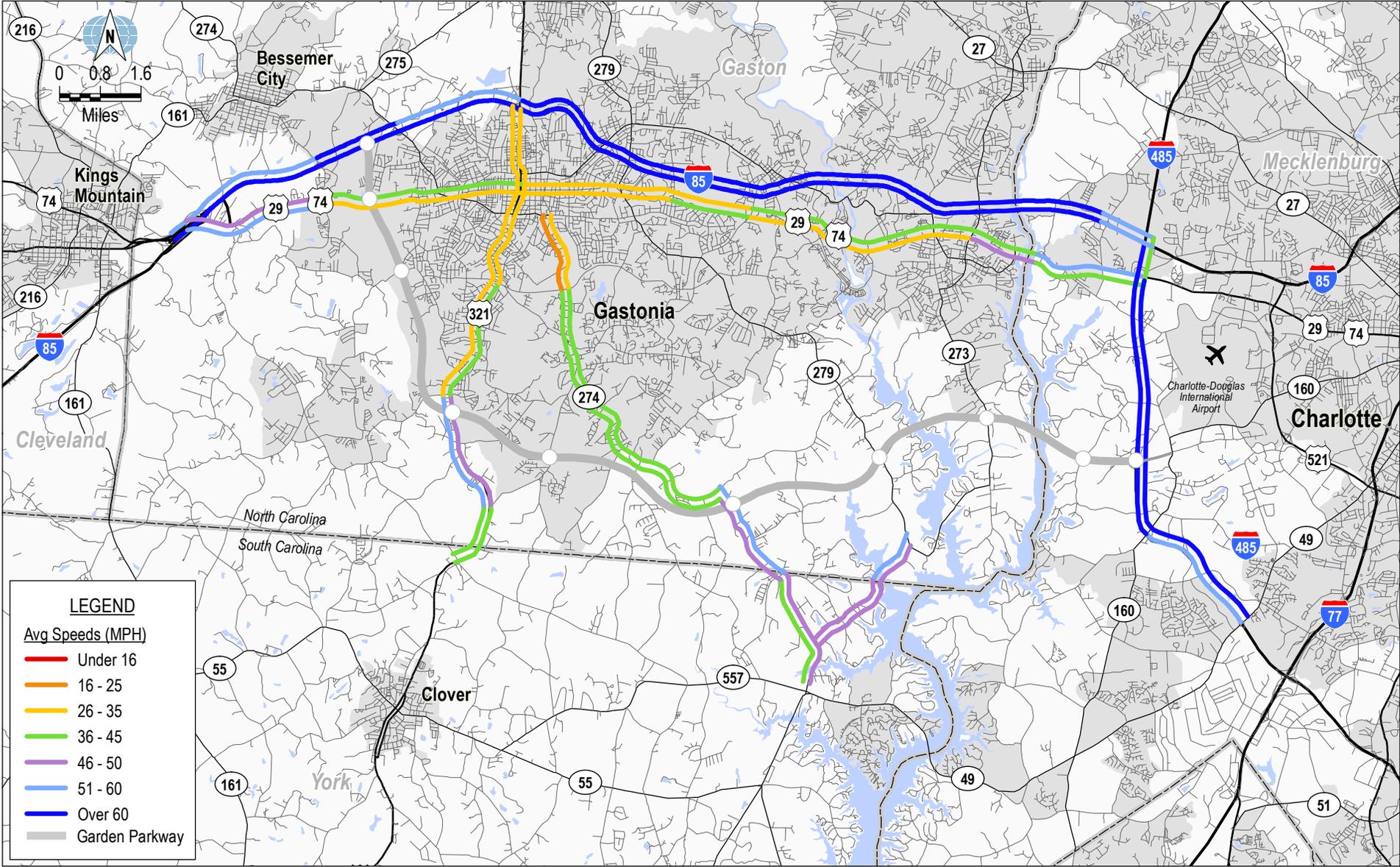


**AVERAGE PM PEAK SPEEDS - 2010**

FIGURE 2-10

# Proposed Garden Parkway Comprehensive Traffic and Revenue Study

NC 103881 / Graphics / Arcview / Avg Off Pk Speeds2.mxd / 3-15-11



**AVERAGE OFF PEAK SPEEDS - 2010**

FIGURE 2-11

On other local roadways, traffic congestion can also be observed near downtown Gastonia and I-85. For example, speeds below 25 mph were observed during the PM peak period on NC 279 between Hudson Boulevard and I-85 as well as on NC 273 between US 29/74 and I-85. Additionally, travel speeds on NC 274 between Gastonia and Hudson Boulevard are generally less than 35 mph, except during the PM peak period.

## **EXISTING TRANSIT SERVICES IN THE STUDY AREA**

### **TRANSIT AGENCIES**

Several transit and paratransit agencies operate within the study area. The Charlotte Area Transit System (CATS) is operated by the City of Charlotte. The Mecklenburg Transportation System is run by the Department of Social Services for Mecklenburg County. The Gastonia Transit System is operated by the City of Gastonia.

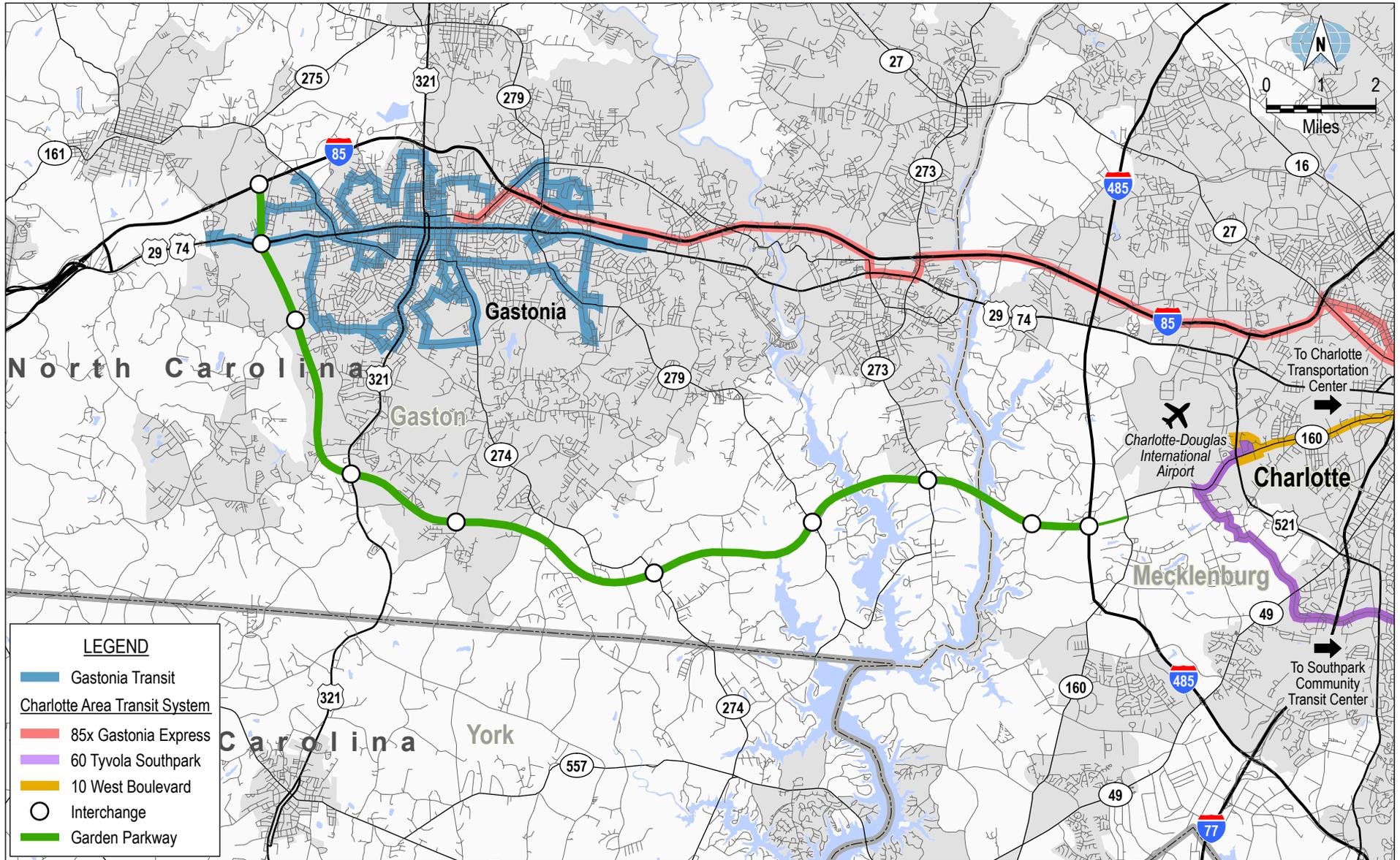
CATS provides four different types of transit services. The first is bus service for the entire Charlotte metropolitan area including some service into Union County serving Rock Hill, South Carolina, which is outside of the study area. The second type of service is a light rail system called Lynx that runs along I-77 from Uptown Charlotte to I-485. CATS also has special transportation which caters to the disabled and elderly. Finally CATS has vanpools and carpools for commuters. With the vanpools and CATS Express service a guaranteed ride home is available in case of emergencies. It is a mid-sized system which concentrates in the more urbanized areas of the metropolitan area.

The Mecklenburg Transportation System and the Gastonia Transit System provide demand-response services to Mecklenburg County and the City of Gastonia, respectively. These services are mainly reserved for senior citizens and people with disabilities.

Gastonia Transit System also provides fixed route bus service for the City of Gastonia. The agency operates nine local bus routes, each beginning at the Gastonia Transit Center, and has an annual ridership of over 260,000 passengers.

### **FIXED ROUTE SERVICES IN THE STUDY AREA**

Figure 2-12 displays the relevant bus route services in the study area, but none are in the southern part of the county in the area of the proposed Garden Parkway.



The Gastonia Transit System is shown in blue. Based on an annual ridership of 261,600 people in FY 2010, it is estimated that the Gastonia Transit System carries just over 1,000 riders per weekday. This would be an average of 115 riders per transit line per weekday.

CATS operates three bus routes that either parallel or compliment the proposed Garden Parkway although they do not cover the immediate area surrounding the proposed Parkway. Route 85X, the Gastonia Express between Downtown Charlotte and the Gastonia Transit Center via I-85, provides four weekday morning runs and one late afternoon run to Charlotte. In the opposite direction, one weekday morning run and four late afternoon runs are provided. No service is available on weekends and holidays. At full capacity, it is estimated that the route could carry over 400 passengers per day. The one-way fare is \$3.50 or \$140 for a monthly pass.

Route 60 and Route 10 carry passengers to and from the Boulevard Homes neighborhood adjacent to the Charlotte-Douglas International Airport. While the western terminus of these two routes is within three miles of the eastern terminus of the proposed Garden Parkway, there is no major parking facility within the area for commuters to leave their cars and continue via transit. Therefore, it is unlikely that these two routes would add any additional commuters to the proposed Garden Parkway.

After a review of the Long Range Transportation Plans (LRTPs) of the Mecklenburg-Union Metropolitan Planning Organization (MUMPO) and the Gastonia Urban Area MPO (GUAMPO), as well as the transit network component of the regional traffic demand model, it was determined that no new major transit projects of potential impact to the proposed Garden Parkway are scheduled for construction or implementation during the study period.

## **JOURNEY TO WORK**

The study area for the Garden Parkway incorporates portions of Mecklenburg and Gaston Counties in North Carolina and York County in South Carolina. The majority of commuters living in those counties chose to drive alone to work according to the US Census 2005-2009 American Community Survey. Mecklenburg County has the largest percentage of workers using public transportation to commute to work (3.0 percent), as well as the largest percentage of people walking (1.4 percent) to work. York County has the largest percentage of people choosing to carpool to work (13.3 percent). Mecklenburg County, as the most populous of the three counties, has the most commuters using public transportation

(13,290) and carpooling (53,301). The means of travel to work in Mecklenburg, Gaston, and York counties is provided in Table 2-9. For the three-county area, 78.8 percent of workers drove alone and another 11.9 percent carpoolled to work. Less than 2.5 percent used public transportation.

**Table 2-9  
Mode of Transportation to Work  
2009**

Mode	Mecklenburg County, NC		Gaston County, NC		York County, SC		Three County Area	
	Workers Age 16+	% of Total Workers	Workers Age 16+	% of Total Workers	Workers Age 16+	% of Total Workers	Workers Age 16+	% of Total Workers
Drove Alone	338,962	77.2%	75,031	83.8%	81,259	90.8%	495,252	78.8%
Carpooled	53,301	12.1%	9,287	10.4%	11,905	13.3%	74,493	11.9%
Public Transportation	13,290	3.0%	471	0.5%	399	0.4%	14,160	2.3%
Taxicab	354	0.1%	16	0.0%	46	0.1%	416	0.1%
Motorcycle	408	0.1%	212	0.2%	145	0.2%	765	0.1%
Bicycle	691	0.2%	62	0.1%	204	0.2%	957	0.2%
Walked	7,688	1.8%	555	0.6%	1,431	1.6%	9,674	1.5%
Other Means	3,624	0.8%	1,681	1.9%	479	0.5%	5,784	0.9%
Worked at Home	20,765	4.7%	2,168	2.4%	4,018	4.5%	26,951	4.3%
Total	439,083	100.0%	89,483	100.0%	99,886	111.6%	628,452	100.0%

Source: 2005-2009 American Community Survey, US Census Bureau.

Commuter travel time is influenced by several factors, such as the location of major employment centers, county size, and population. Table 2-10 provides 2009 travel time data for Mecklenburg, Gaston, and York Counties. The average commute time for the three counties was 26.3 minutes. Commutes in Gaston County averaged 26.2 minutes.

Table 2-11 shows 2009 vehicle occupancy data for Mecklenburg, Gaston, and York Counties as estimated by the US Census Bureau. The average vehicle occupancy for the three counties was roughly the same, ranging from 1.15 persons to 1.20 persons. The percentage of commuters driving alone in the three counties was 86.9 percent.

**Table 2-10  
Travel Time to Work  
2009**

Trip Length	Mecklenburg County, NC		Gaston County, NC		York County, SC		Three County Area	
	Commuters	% of Total	Commuters	% of Total	Commuters	% of Total	Commuters	% of Total
Less than 5 minutes	9,182	2.2%	2,471	2.8%	2,826	2.9%	14,479	2.4%
5 to 9 minutes	33,898	8.1%	7,384	8.5%	9,747	10.2%	51,029	8.5%
10 to 14 minutes	54,778	13.1%	11,207	12.8%	12,391	12.9%	78,376	13.0%
15 to 19 minutes	67,509	16.1%	14,372	16.5%	14,446	15.1%	96,327	16.0%
20 to 24 minutes	73,144	17.5%	15,556	17.8%	15,147	15.8%	103,847	17.3%
25 to 29 minutes	32,337	7.7%	6,409	7.3%	8,286	8.6%	47,032	7.8%
30 to 34 minutes	69,076	16.5%	12,830	14.7%	14,111	14.7%	96,017	16.0%
35 to 39 minutes	14,516	3.5%	2,764	3.2%	3,213	3.4%	20,493	3.4%
40 to 44 minutes	16,724	4.0%	3,410	3.9%	3,450	3.6%	23,584	3.9%
45 to 59 minutes	27,872	6.7%	7,055	8.1%	7,756	8.1%	42,683	7.1%
60 to 89 minutes	11,911	2.8%	2,624	3.0%	3,115	3.2%	17,650	2.9%
90 or more minutes	7,371	1.8%	1,233	1.4%	1,380	1.4%	9,984	1.7%
<b>Total</b>	<b>418,318</b>	<b>100.0%</b>	<b>87,315</b>	<b>100.0%</b>	<b>95,868</b>	<b>100.0%</b>	<b>601,501</b>	<b>100.0%</b>
<b>Average Travel Time (Minutes)</b>	<b>26.3</b>		<b>26.2</b>		<b>26.1</b>		<b>26.3</b>	

Source: 2005-2009 American Community Survey, US Census Bureau.

**Table 2-11  
Commuter Vehicle Occupancy  
2009**

Trip Length	Mecklenburg County, NC		Gaston County, NC		York County, SC		Three County Area	
	Motorists	% of Total	Motorists	% of Total	Motorists	% of Total	Motorists	% of Total
Drove alone	338,962	86.4%	75,031	89.0%	81,259	96.4%	413,993	86.9%
2-person carpool	39,983	10.2%	7,202	8.5%	9,444	11.2%	47,185	9.9%
3-person carpool	6,291	1.6%	1,269	1.5%	1,424	1.7%	7,560	1.6%
4-person carpool	3,793	1.0%	426	0.5%	576	0.7%	4,219	0.9%
5- or 6-person carpool	2,083	0.5%	274	0.3%	272	0.3%	2,357	0.5%
7-or-more-person carpool	1,151	0.3%	116	0.1%	189	0.2%	1,267	0.3%
<b>Total</b>	<b>392,263</b>	<b>100.0%</b>	<b>84,318</b>	<b>100.0%</b>	<b>93,164</b>	<b>110.5%</b>	<b>476,581</b>	<b>100.0%</b>
<b>Average Vehicle Occupancy</b>	<b>1.20</b>		<b>1.15</b>		<b>1.18</b>		<b>1.20</b>	

Source: 2005-2009 American Community Survey, US Census Bureau.

# CHAPTER 3

## TRAVEL PATTERN SURVEYS

Travel pattern surveys were conducted in October of 2010 at fourteen locations within the study area. The travel patterns observed through the surveys served as integral inputs into the travel demand model for the project traffic and toll revenue forecast. The key findings of the travel pattern surveys are summarized below.

### METHODOLOGY AND PROCEDURES

Fourteen survey locations were selected for the travel pattern survey in order to provide an adequate representation of study area traffic. Given the significance of I-85 within the study area both as a major carrier of traffic and as a parallel route to the proposed Garden Parkway, eight locations were selected along I-85, at westbound exit ramps. Other major arterial roadways within the study area were also surveyed, including the two crossings of the Catawba River at US 29/74 and NC/SC 49. Table 3-1 lists the location of each survey station, as well as the date and time that survey cards were distributed. Figure 3-1 depicts the geographic locations of the fourteen survey stations.

At each location, surveys were conducted in a single direction of travel, at the ends of highway ramps or at signalized intersections in accordance with an operation and safety plan developed for each location. During later survey processing, observed one-way trips were “reversed” in order to provide estimates of daily travel patterns in each direction. The survey team coordinated with county and local officials to ensure that safety concerns were taken into consideration. The survey was conducted in such a manner as to minimize impact on traffic flow and maximize safety to motorists and survey personnel.

The survey questionnaire was distributed in the form of a postage-paid business-reply card. Figure 3-2 shows the mail-back, handout survey questionnaire. The survey contained eight questions that queried motorists about their trip origin and destination, where they live, their trip purpose, trip frequency, and vehicle occupancy. An optional question was included

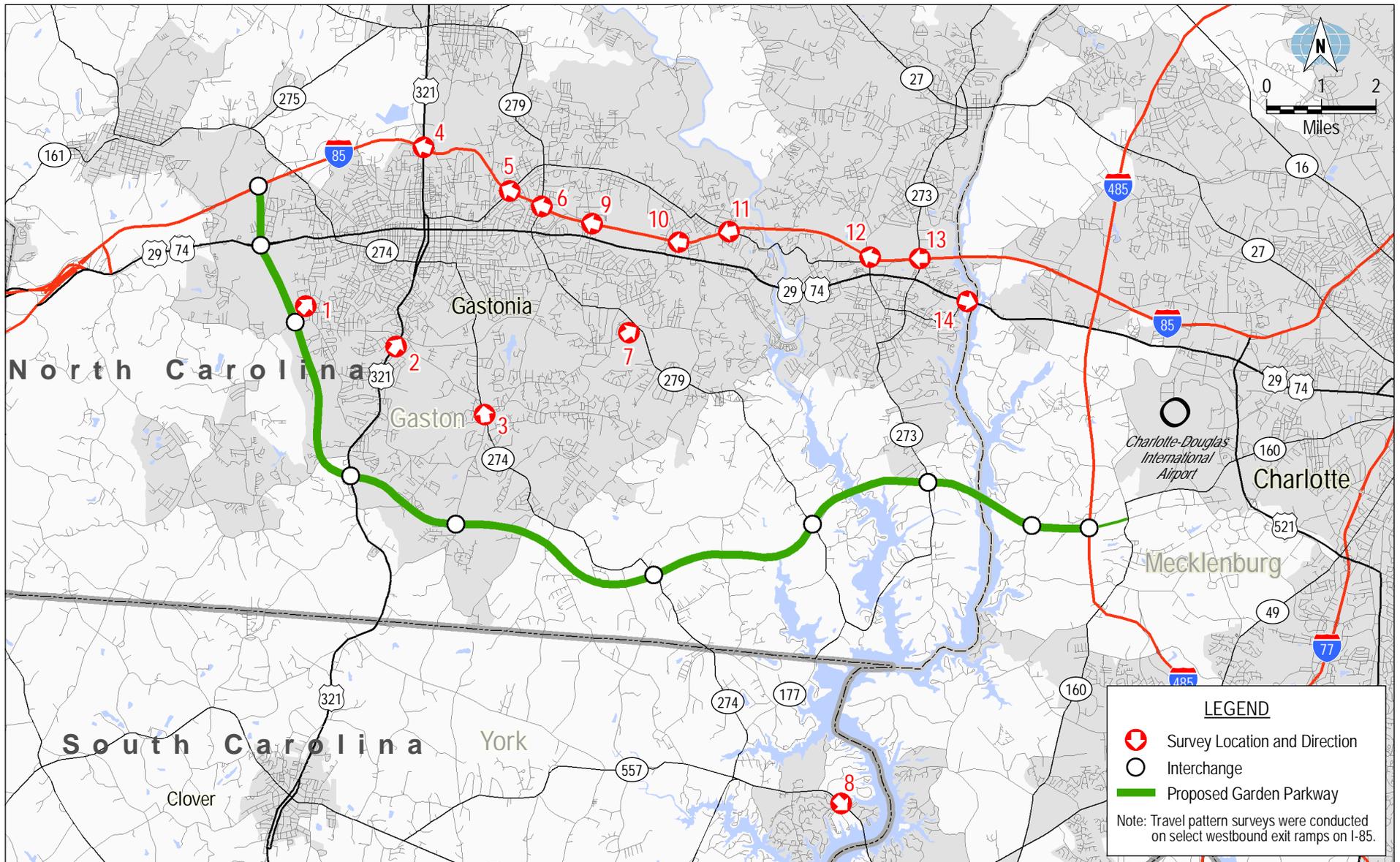
asking if motorists wished to participate in an internet-based survey of transportation options. The results of that survey are described in Chapter 4.

**Table 3-1  
Travel Pattern Survey Locations**

<b>Survey Station</b>	<b>Road</b>	<b>Location</b>	<b>Date</b>	<b>Day <sup>(1)</sup></b>	<b>Direction <sup>(2)</sup></b>
<b>I-85 Westbound Exit Ramps</b>					
4	I-85	Interchange 17, US 321	10/21/2009	Wednesday	WB
5	I-85	Interchange 19, East Ozark Road	10/21/2009	Wednesday	WB
6	I-85	Interchange 20, North New Hope Road	10/21/2009	Wednesday	WB
9	I-85	Interchange 21, Cox Road	10/22/2009	Thursday	WB
10	I-85	Interchange 22, South Main Street	10/27/2009	Tuesday	WB
11	I-85	Interchange 23, McAdenville Road	10/27/2009	Tuesday	WB
12	I-85	Interchange 26, NC 7	10/27/2009	Tuesday	WB
13	I-85	Interchange 27, NC 273	10/27/2009	Tuesday	WB
<b>Arterials</b>					
1	South Linwood Road	West of Davis Park Road	10/20/2009	Tuesday	EB
2	US 321	South of Hudson Boulevard	10/20/2009	Tuesday	NB
3	NC 274	South of Robinwood Road	10/20/2009	Tuesday	NB
7	East Hudson Boulevard	South of NC 279	10/22/2009	Thursday	EB
8	SC 49	West of Heritage Road, SC	10/29/2009	Thursday	EB
14	US 29/74	West of Hazeline Road	10/28/2009	Wednesday	EB
<sup>(1)</sup> Survey cards were handed out over the twelve-hour period from 7 AM through 7 PM.					
<sup>(2)</sup> WB = westbound, EB = eastbound, NB = northbound					

Upon receipt, the completed questionnaires were filtered for validity and entered into a geographic information systems (GIS) database. This GIS database was a valuable tool in evaluating the validity of each travel survey and ensuring that model trip tables reflected current usage patterns of the highway system in the study area.

Of the 35,466 surveys distributed, a total of 4,530 valid surveys were returned or 12.8 percent of the total. Of these, only 86 responses came from commercial vehicle operators. Table 3-2 indicates the number of surveys distributed and the return rate for each location. Given the low number of commercial vehicle surveys returned, only the 4,444 valid survey responses from passenger cars were considered in the analysis of trip characteristics.





**Table 3-2  
Travel Pattern Survey Response Rates and Sample Sizes**

Survey Station	Location	Direction <sup>(1)</sup>	Total Surveys Distributed <sup>(2)</sup>	Valid Surveys Returned	Return Rate	Passenger Car Summary <sup>(2)</sup>		
						Estimated AAWDT <sup>(3)</sup>	Valid Car Surveys Returned	Sample Size
<b>I-85 Westbound Exit Ramps</b>								
4	Interchange 17, US 321	WB	5,572	601	10.8%	9,992	572	5.7%
5	Interchange 19, East Ozark Road	WB	3,482	445	12.8%	4,009	440	11.0%
6	Interchange 20, North New Hope Road	WB	2,068	189	9.1%	4,760	186	3.9%
9	Interchange 21, Cox Road	WB	2,910	315	10.8%	6,120	310	5.1%
10	Interchange 22, South Main Street	WB	1,691	197	11.6%	5,629	195	3.5%
11	Interchange 23, McAdenville Road	WB	1,542	131	8.5%	2,422	129	5.3%
12	Interchange 26, NC 7	WB	1,595	206	12.9%	2,890	204	7.1%
13	Interchange 27, NC 273	WB	3,620	442	12.2%	7,284	418	5.7%
<b>Arterials</b>								
1	South Linwood Road, west of Davis Park Road	EB	1,576	225	14.3%	2,632	224	8.5%
2	US 321, south of Hudson Boulevard	NB	3,516	296	8.4%	5,613	292	5.2%
3	NC 274, south of Robinwood Road	NB	2,367	280	11.8%	7,667	279	3.6%
7	East Hudson Boulevard, south of South New Hope Road	EB	1,591	222	14.0%	2,218	220	9.9%
8	SC 49, west of Heritage Road, SC.	EB	3,095	864	27.9%	11,253	860	7.6%
14	US 29/74, west of Hazeline Road	EB	841	117	13.9%	7,364	115	1.6%
Total			35,466	4,530	12.8%	79,853	4,444	5.6%

<sup>(1)</sup> WB = westbound, EB = eastbound, NB = northbound

<sup>(2)</sup> Surveys were handed out to all vehicles, but only responses from passenger cars (including SUVs, pick-up trucks, and motorcycles) were incorporated into the model due to small sample sizes for trucks.

<sup>(3)</sup> This is the estimated 2010 Average Annual Weekday Traffic (AAWDT) that would have passed through the survey station in the direction of the survey during the survey hours of 7:00 AM through 7:00 PM. The estimated AAWDT is based on traffic counts conducted as part of this study, that were adjusted for day of week and seasonality.

## PASSENGER CAR TRIP CHARACTERISTICS

The travel pattern survey results illustrated several trends in passenger car trip characteristics in the proposed Garden Parkway study area as discussed below.

### TRIP PURPOSE

The trip purpose distribution for passenger cars resulting from the travel pattern surveys is presented in Table 3-3. The primary trip purpose for those passenger car respondents traveling on both I-85 and the arterial roadways was travel “to and from work.” This response accounted for 43.2 percent of I-85 passenger cars surveyed and 42.3 percent of arterial passenger cars surveyed. The second largest trip purpose was “Personal Business”, representing 24.3 percent of I-85 passenger cars surveyed and 21.8 percent of arterial passenger cars surveyed. The third largest trip purpose for I-85 passenger cars was “Company Business” at 13.4 percent of respondents, varying between 7.0 percent and 20.6 percent by survey station. The survey stations located closer to Gastonia to the west had higher percentages of “Company Business” trips, while those further from Gastonia to the East had lower percentages. The third largest trip purpose on the arterial roadways was “Shopping” at 12.4 percent. Figure 3-3 presents the passenger car percent trip purpose distribution graphically.

### TRIP FREQUENCY

The trip frequency distribution for passenger cars by survey station is presented in Table 3-4. Of passenger car respondents, 47.8 percent of those traveling on I-85 and 49.1 percent of those traveling on arterial roadways reported making a similar trip five or more times per week. Motorists making a similar trip once a week or less accounted for 29.8 percent of I-85 passenger car trips and 23.4 percent of arterial passenger car trips. Figure 3-3 presents the passenger car percent trip frequency distribution graphically.

### VEHICLE OCCUPANCY

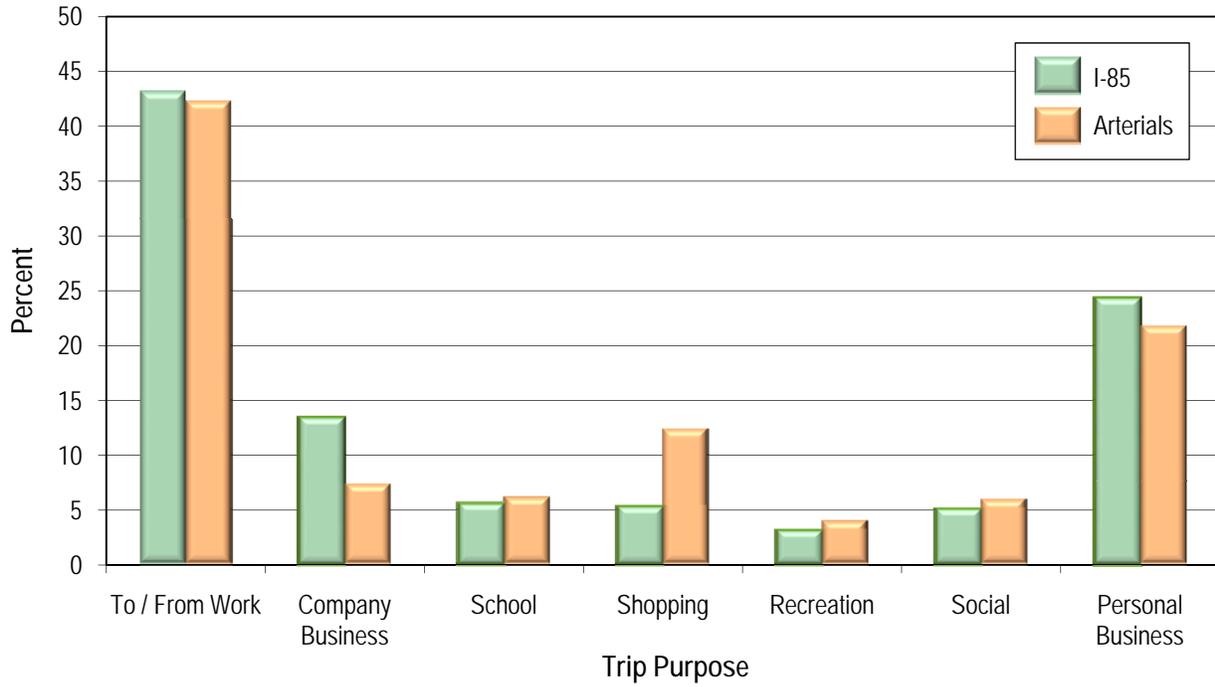
The vehicle occupancy rates for passenger cars by survey station are presented in Table 3-5. Vehicle occupancy rates were found to be similar among I-85 and arterial roadway respondents, with arterial roadway respondents having slightly higher rates of vehicle occupancy. Single occupant vehicles accounted for 74.8 and 69.4 percent of passenger survey responses at I-85 and arterial roadway stations, respectively. The average vehicle occupancy among I-85 and arterial roadway respondents was 1.4 and 1.5 persons per vehicle, respectively.

Table 3-3  
Passenger Car Trip Purpose Distribution By Survey Station

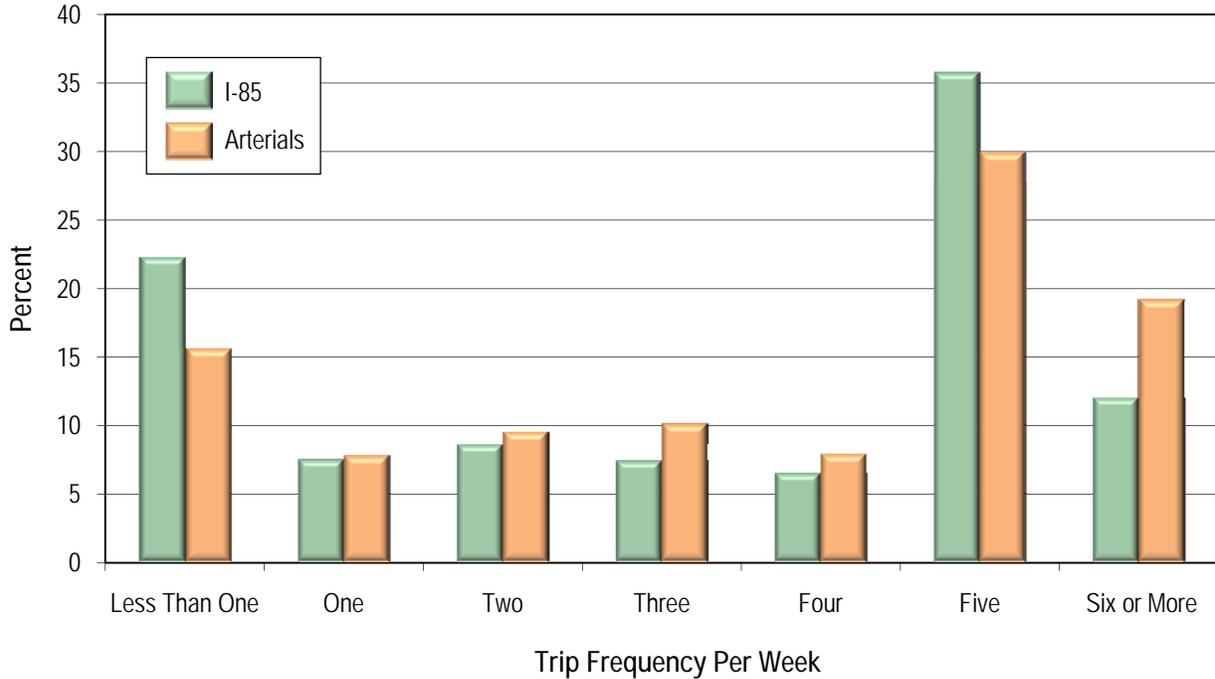
Number	Survey Station Location	Trip Purpose								Total
		To/From Work	Company Business	School	Shopping	Recreation	Social	Personal Business		
<b>I-85 Westbound Exit Ramps</b>										
4	Interchange 17, US 321	42.3%	20.6%	8.4%	3.8%	5.3%	6.5%	13.1%	100%	
5	Interchange 19, East Ozark Road	51.9%	14.4%	4.9%	3.8%	1.9%	3.4%	19.8%	100%	
6	Interchange 20, North New Hope Road	48.6%	10.3%	4.4%	5.0%	4.8%	5.2%	21.8%	100%	
9	Interchange 21, Cox Road	39.8%	15.7%	3.5%	10.0%	2.4%	4.0%	24.5%	100%	
10	Interchange 22, South Main Street	41.2%	15.1%	9.9%	7.7%	1.7%	8.8%	15.6%	100%	
11	Interchange 23, McAdenville Road	35.5%	7.0%	2.0%	1.7%	0.6%	10.1%	43.2%	100%	
12	Interchange 26, NC 7	58.1%	7.4%	10.7%	3.7%	5.7%	2.0%	12.5%	100%	
13	Interchange 27, NC 273	39.7%	9.2%	2.1%	5.3%	1.8%	2.1%	39.7%	100%	
<b>All I-85 Westbound Exit Ramp Stations</b>										
		<b>43.2%</b>	<b>13.4%</b>	<b>5.6%</b>	<b>5.3%</b>	<b>3.1%</b>	<b>5.1%</b>	<b>24.3%</b>	<b>100%</b>	
<b>Arterials</b>										
1	South Linwood Road, west of Davis Park Road	34.1%	4.7%	7.5%	21.0%	1.2%	6.4%	25.2%	100%	
2	US 321, south of Hudson Boulevard	35.2%	10.3%	6.9%	11.4%	4.3%	5.7%	26.2%	100%	
3	NC 274, south of Robinwood Road	37.2%	5.4%	11.2%	8.9%	6.6%	3.4%	27.3%	100%	
7	East Hudson Boulevard, south of South New Hope Road	31.0%	10.2%	5.9%	6.5%	4.2%	10.4%	31.7%	100%	
8	SC 49, west of Heritage Road, SC.	47.3%	7.4%	3.6%	11.6%	4.7%	6.6%	18.7%	100%	
14	US 29/74, west of Hazeline Road	52.2%	6.9%	4.0%	16.9%	0.9%	6.3%	12.7%	100%	
<b>All Arterial Road Survey Stations</b>										
		<b>42.3%</b>	<b>7.4%</b>	<b>6.2%</b>	<b>12.4%</b>	<b>4.0%</b>	<b>6.0%</b>	<b>21.8%</b>	<b>100%</b>	
<b>All Survey Stations</b>										
		<b>42.8%</b>	<b>10.7%</b>	<b>5.8%</b>	<b>8.5%</b>	<b>3.5%</b>	<b>5.5%</b>	<b>23.2%</b>	<b>100%</b>	

Source: Based on 12-Hour Travel Pattern Surveys Conducted By Wilbur Smith Associates In October 2009.

Passenger Car Percent Trip Purpose Distribution  
At Combined I-85 and Arterial Survey Locations



Passenger Car Percent Trip Frequency Distribution  
At Combined I-85 and Arterial Survey Locations



**Table 3-4  
Passenger Car Trip Frequency Distribution By Survey Station**

Number	Survey Station Location	Frequency Per Week									
		Less Than One	One	Two	Three	Four	Five	Six or More	Total		
<b>I-85 Westbound Exit Ramps</b>											
4	Interchange 17, US 321	27.8%	8.6%	8.1%	6.6%	5.6%	32.7%	10.7%	100%		
5	Interchange 19, East Ozark Road	16.0%	7.9%	11.6%	7.8%	6.2%	38.5%	12.0%	100%		
6	Interchange 20, North New Hope Road	22.2%	9.5%	8.0%	5.9%	7.5%	35.0%	11.8%	100%		
9	Interchange 21, Cox Road	28.8%	10.1%	7.8%	10.4%	5.2%	28.7%	9.0%	100%		
10	Interchange 22, South Main Street	22.7%	5.5%	10.2%	7.4%	6.6%	34.2%	13.5%	100%		
11	Interchange 23, McAdenville Road	13.3%	5.3%	6.0%	4.2%	5.1%	56.3%	9.7%	100%		
12	Interchange 26, NC 7	18.0%	4.5%	7.9%	5.4%	10.0%	38.2%	16.0%	100%		
13	Interchange 27, NC 273	17.5%	5.7%	8.4%	8.8%	7.1%	38.5%	14.1%	100%		
	<b>All I-85 Westbound Exit Ramp Stations</b>	<b>22.3%</b>	<b>7.5%</b>	<b>8.6%</b>	<b>7.4%</b>	<b>6.5%</b>	<b>35.8%</b>	<b>12.0%</b>	<b>100%</b>		
<b>Arterials</b>											
1	South Linwood Road, west of Davis Park Road	16.0%	7.0%	9.7%	12.6%	6.8%	28.6%	19.3%	100%		
2	US 321, south of Hudson Boulevard	17.9%	8.8%	11.2%	7.9%	6.6%	24.7%	22.9%	100%		
3	NC 274, south of Robinwood Road	13.5%	8.3%	8.9%	9.2%	9.4%	30.0%	20.6%	100%		
7	East Hudson Boulevard, south of South New Hope Road	20.0%	8.4%	9.4%	14.1%	9.2%	23.0%	15.9%	100%		
8	SC 49, west of Heritage Road, SC.	17.2%	6.9%	10.3%	7.2%	8.9%	30.7%	18.9%	100%		
14	US 29/74, west of Hazeline Road	12.1%	7.9%	7.4%	14.9%	5.9%	35.5%	16.3%	100%		
	<b>All Arterial Road Survey Stations</b>	<b>15.6%</b>	<b>7.8%</b>	<b>9.5%</b>	<b>10.1%</b>	<b>7.9%</b>	<b>29.9%</b>	<b>19.2%</b>	<b>100%</b>		
	<b>All Survey Stations</b>	<b>19.2%</b>	<b>7.6%</b>	<b>9.0%</b>	<b>8.7%</b>	<b>7.1%</b>	<b>33.0%</b>	<b>15.4%</b>	<b>100%</b>		

Source: Based on 12-Hour Travel Pattern Surveys Conducted By Wilbur Smith Associates In October 2009.

**Table 3-5  
Passenger Car Vehicle Occupancy Distribution By Survey Station**

Number	Survey Station Location	Vehicle Occupancy						Total
		One	Two	Three	Four	Five	Six or More	
<b>I-85 Westbound Exit Ramps</b>								
4	Interchange 17, US 321	72.9%	20.4%	4.6%	1.7%	0.2%	0.3%	100%
5	Interchange 19, East Ozark Road	79.7%	14.5%	3.3%	0.7%	1.3%	0.4%	100%
6	Interchange 20, North New Hope Road	71.1%	22.5%	5.3%	1.1%	0.0%	0.0%	100%
9	Interchange 21, Cox Road	72.7%	22.1%	3.6%	1.0%	0.4%	0.2%	100%
10	Interchange 22, South Main Street	72.8%	19.8%	3.6%	1.4%	0.0%	2.4%	100%
11	Interchange 23, McAdenville Road	79.8%	11.0%	6.2%	1.2%	1.2%	0.5%	100%
12	Interchange 26, NC 7	75.9%	18.8%	2.2%	1.7%	0.7%	0.7%	100%
13	Interchange 27, NC 273	78.5%	16.4%	2.8%	1.8%	0.4%	0.2%	100%
	<b>All I-85 Westbound Exit Ramp Stations</b>	<b>74.8%</b>	<b>18.9%</b>	<b>3.9%</b>	<b>1.4%</b>	<b>0.4%</b>	<b>0.6%</b>	<b>100%</b>
<b>Arterials</b>								
1	South Linwood Road, west of Davis Park Road	59.2%	31.4%	4.7%	1.6%	1.6%	1.6%	100%
2	US 321, south of Hudson Boulevard	68.5%	19.1%	9.9%	1.8%	0.0%	0.7%	100%
3	NC 274, south of Robinwood Road	65.8%	22.6%	8.1%	2.7%	0.8%	0.0%	100%
7	East Hudson Boulevard, south of South New Hope Road	66.0%	22.2%	7.8%	3.5%	0.5%	0.0%	100%
8	SC 49, west of Heritage Road, SC.	73.0%	17.6%	6.3%	2.0%	0.8%	0.4%	100%
14	US 29/74, west of Hazeline Road	72.8%	19.8%	5.4%	1.6%	0.4%	0.0%	100%
	<b>All Arterial Road Survey Stations</b>	<b>69.4%</b>	<b>20.5%</b>	<b>7.0%</b>	<b>2.1%</b>	<b>0.6%</b>	<b>0.3%</b>	<b>100%</b>
	<b>All Survey Stations</b>	<b>72.3%</b>	<b>19.7%</b>	<b>5.4%</b>	<b>1.7%</b>	<b>0.5%</b>	<b>0.5%</b>	<b>100%</b>

Source: Based on 12-Hour Travel Pattern Surveys Conducted By Wilbur Smith Associates In October 2009.

#### TRIP PURPOSE BY TRIP FREQUENCY

Table 3-6 presents the distribution of trip purposes by trip frequency among passenger cars. 82.7 percent of passenger car trips made “To / From Work” were made five or more times per week. “School” trips also had a high trip frequency, with 68.5 percent of trips being made five or more times per week and 11.4 percent of trips being made four times per week. The average trip frequencies for trips described as “To / From Work” and as “School” were 5.1 and 4.7 trips per week, respectively. “Company Business” trips, though work-related, tended to be made less frequently. Similarly, trips described as “Shopping,” “Recreation,” “Social,” and “Personal Business” tended to be made less frequently, with average trip frequencies ranging between 1.9 and 2.4 times per week.

#### VEHICLE OCCUPANCY BY TRIP PURPOSE

Table 3-7 presents the passenger-car trip purpose distribution by vehicle occupancy. 87.0 percent of passenger car trips made “To / From Work” and 86.8 of “Company Business” trips were single-occupancy vehicles. Other trip purposes tended to have higher rates of vehicle occupancy, with between 36.0 and 51.7 percent of respondent vehicles having two to three occupants.

#### COMPARISON OF TRIP PURPOSE CHARACTERISTICS

The average trip frequency and average vehicle occupancy by trip purpose for passenger cars is presented in Table 3-8. For the purposes of this analysis, high frequency trip purposes are defined as those that occur more than three times per week on average, while high occupancy trips are defined as those having an average of more than 1.5 persons.

As shown in Table 3-8, trips described as “To / From Work” are low occupancy but high frequency, while trips described as “Company Business” are both low occupancy and low frequency. While it is to be expected that commuters would travel to work every day and business-related trips would be much less frequent, it is interesting to note that both types of work-related trips are almost all single-occupancy vehicle trips. “School” trips are both high frequency and high occupancy, as expected. While not quite as high occupancy as “School” trips, trips described as “Recreation” have the highest average occupancy rates among those trip purposes with a low trip frequency. “Shopping,” “Social” and “Personal Business” trips all share similar characteristics, with a low trip frequency and an average occupancy of roughly 1.6 persons.

**Table 3-6  
Passenger Car Trip Purpose by Trip Frequency - All Survey Stations Combined**

Trip Purpose	Frequency Per Week						Total	
	Less than One	One	Two	Three	Four	Five		Six or More
To/From Work	1.5%	1.5%	2.5%	4.9%	6.9%	60.9%	21.8%	100%
Company Business	40.8%	11.4%	18.0%	7.9%	5.6%	6.7%	9.6%	100%
School	4.1%	3.5%	6.5%	6.0%	11.4%	47.3%	21.2%	100%
Shopping	26.2%	14.0%	18.2%	20.1%	8.6%	3.7%	9.1%	100%
Recreation	36.8%	14.6%	17.4%	12.1%	10.5%	2.2%	6.4%	100%
Social	43.2%	12.3%	15.8%	10.0%	9.5%	3.0%	6.3%	100%
Personal Business	39.5%	15.5%	12.2%	12.5%	5.4%	6.1%	8.9%	100%
<b>All Trip Purposes</b>	<b>19.2%</b>	<b>7.6%</b>	<b>9.0%</b>	<b>8.7%</b>	<b>7.1%</b>	<b>33.0%</b>	<b>15.4%</b>	<b>100%</b>

Source: Based on 12-Hour Travel Pattern Surveys Conducted By Wilbur Smith Associates In October 2009.

**Table 3-7  
Passenger Car Trip Purpose by Vehicle Occupancy - All Survey Stations Combined**

Trip Purpose	Frequency Per Week						Total
	One	Two	Three	Four	Five	Six or More	
To/From Work	87.0%	9.9%	2.5%	0.4%	0.2%	0.2%	100%
Company Business	86.8%	10.6%	1.5%	0.8%	0.1%	0.3%	100%
School	36.3%	31.3%	20.4%	6.7%	2.3%	2.9%	100%
Shopping	52.2%	38.1%	6.8%	1.2%	1.0%	0.7%	100%
Recreation	40.9%	39.6%	11.1%	6.4%	0.6%	1.4%	100%
Social	57.6%	30.3%	8.2%	2.6%	1.4%	0.0%	100%
Personal Business	60.2%	28.9%	7.0%	3.0%	0.5%	0.3%	100%
<b>All Trip Purposes</b>	<b>71.6%</b>	<b>20.2%</b>	<b>5.4%</b>	<b>1.8%</b>	<b>0.5%</b>	<b>0.4%</b>	<b>100%</b>

Source: Based on 12-Hour Travel Pattern Surveys Conducted By Wilbur Smith Associates In October 2009.

**Table 3-8  
Average Trip Characteristics by Trip Purpose**

<b>Trip Purpose</b>	<b>Average Trips Per Week</b>	<b>Average Passengers Per Vehicle</b>
To/From Work	5.1	1.2
Company Business	2.1	1.2
School	4.7	2.2
Shopping	2.4	1.6
Recreation	2.0	1.9
Social	1.9	1.6
Personal Business	2.1	1.6
<b>All Trip Purposes</b>	<b>3.6</b>	<b>1.4</b>

Source: Travel Pattern Survey, October 2010

#### LOCATION OF PRIMARY RESIDENCE

The primary residence of motorists within the proposed Garden Parkway study area impacts factors such as trip length and willingness to pay tolls as well as potential electronic toll collection (ETC) participation rates. Table 3-9 presents the primary residence location of all survey respondents. 60.4 percent indicated that their primary residence was one of three cities: Gastonia (34.8 percent), Charlotte (15.2 percent), and Belmont (10.5 percent). By state, North Carolina respondents represented the majority, with approximately 83 percent listing a city or town in North Carolina as their primary residence. Those listing a town or city in South Carolina as their primary residence comprised a total of 15 percent. The most common South Carolina area of residence was Clover, just south of the state line. Note that the category “All Other Locations” includes locations in both North and South Carolina.

**Table 3-9  
Primary Residence Location of Surveyed Passenger Car Drivers**

<b>City</b>	<b>State</b>	<b>Percent of Reported Residences</b>
Gastonia	NC	34.8%
Charlotte	NC	15.2%
Belmont	NC	10.5%
Clover	SC	9.7%
Mount Holly	NC	5.5%
Dallas	NC	2.5%
York	SC	2.3%
Lincolnton	NC	2.0%
Lowell	NC	1.5%
Cramerton	NC	1.4%
Fort Mill	SC	1.6%
Bessemer City	NC	1.0%
Stanley	NC	1.0%
Kings Mountain	NC	0.9%
All Other Locations		10.1%
<b>Total</b>		<b>100.0%</b>
<p>Note: Approximately 83 percent of passenger car respondents had a primary residence in North Carolina and another 15 percent had a primary residence in South Carolina.</p>		
<p>Source: Based On The Travel Pattern Surveys Conducted by Wilbur Smith Associates in October 2009.</p>		

## TRAVEL PATTERNS

The travel survey was used to identify hundreds of origin-destination (O-D) trip pairs for use in the modeling process. This section summarizes key findings regarding major movements within the region.

### MAJOR O-D CITIES

The fourteen survey stations were selected to allow for a variety of trip origins and destinations that could be identified and related to the travel demand model. Table 3-10 presents a summary of major city pairs for four selected survey stations. Two stations are situated on I-85 exit ramps. The first is at Interchange 27, just west of the Catawba River.

**Table 3-10  
Major O-D City Pairs for Selected Survey Stations**

<b>Survey Station</b>	<b>Survey Location</b>	<b>Origin City</b>	<b>Destination City</b>	<b>Percent of Weekday Trips</b>
<b>I - 85</b>				
13	Interchange 27, Westbound Exit Ramp to NC 273	Charlotte, NC	Belmont, NC	42%
		Charlotte, NC	Mount Holly, NC	24%
		Charlotte, NC	Gastonia, NC	8%
		Charlotte, NC	Stanley, NC	4%
		Huntersville, NC	Belmont, NC	3%
		All Other Cities		19%
		Total		100%
Percent of Trips That Cross Catawba River				100%
4	Interchange 17, Westbound Exit Ramp to US 321	Charlotte, NC	Lincolnton, NC	11%
		Charlotte, NC	Hickory, NC	9%
		Charlotte, NC	Dallas, NC	6%
		Charlotte, NC	Gastonia, NC	5%
		Gastonia, NC	Lincolnton, NC	5%
		Gastonia, NC	Dallas, NC	5%
		Gastonia, NC	Gastonia, NC	5%
		Belmont, NC	Dallas, NC	3%
		Charlotte, NC	Cherryville, NC	3%
		Belmont, NC	Gastonia, NC	3%
		Charlotte, NC	Lenoir, NC	2%
		Charlotte, NC	Bessemer City, NC	2%
		Charlotte, NC	Boone, NC	2%
		Charlotte, NC	Blowing Rock, NC	2%
		Mount Holly, NC	Gastonia, NC	1%
		All Other Cities		36%
		Total		100%
Percent of Trips That Cross Catawba River				66%
<b>Eastbound on US 29/74 at Catawba River Bridge</b>				
14	West of Hazeline Road	Belmont, NC	Charlotte, NC	52%
		Gastonia, NC	Charlotte, NC	17%
		Mount Holly, NC	Charlotte, NC	11%
		All Other Cities		20%
		Total		100%
Percent of Trips That Cross Catawba River				100%
<b>Eastbound on SC 49 at Lake Wylie Bridge</b>				
8	West of Heritage Road	Lake Wylie, SC	Charlotte, NC	31%
		York, SC	Charlotte, NC	15%
		Lake Wylie, SC	Fort Mill, SC	8%
		Gastonia, NC	Charlotte, NC	6%
		Clover, SC	Fort Mill, SC	5%
		Lake Wylie, SC	Rock Hill, SC	4%
		Clover, NC	Charlotte, NC	3%
		Belmont, NC	Charlotte, NC	2%
		Lake Wylie, SC	Pineville, NC	2%
		Gastonia, NC	Fort Mill, SC	2%
		All Other Cities		22%
		Total		100%
Percent of Trips That Cross Catawba River				100%

Source: Based on Travel Pattern Surveys Conducted By Wilbur Smith Associates In October 2009.

The second I-85 station is at Interchange 17, the interchange with US 321 several miles to the west of the first station. The other representative stations are at crossings of the Catawba River and Lake Wylie on US 29/74 and SC 49, respectively.

At Interchange 27 on I-85, the survey showed that just two O-D city pairs accounted for 66 percent of the traffic at the survey station. Charlotte was the trip origin for both pairs, with trips destined for Belmont and Mount Holly, which are both near this exit.

A different pattern is evident at Interchange 17, which is at US 321. At this location, numerous O-D city pairs were surveyed. Fifteen different pairs constituted 64 percent of the travel pattern with no one city pair dominating the sample.

The survey on US 29/74 just west of the Catawba River had a similar pattern to the results on I-85 at Interchange 27. Over half the trips were between Charlotte and Belmont, which is at the bridge. Another 17 percent of trips were between Charlotte and Gastonia.

Finally, the survey on SC 49 at the bridge over Lake Wylie (Catawba River) showed a predominance of trips originating in the immediate vicinity of the bridge. Approximately 31 percent were between Lake Wylie and Charlotte, and another 15 percent were from York to Charlotte. Trips between these cities would likely not divert to the toll road. Some trips could potentially divert, such as between Gastonia and Charlotte (6 percent), Belmont and Charlotte (2 percent), and Gastonia and Fort Mill, SC (2 percent). All trips surveyed at this location also crossed the river.

#### **MAJOR RIVER CROSSINGS**

Further analysis was conducted to examine the total share of trips at each survey station that also cross the Catawba River or Lake Wylie. These statistics illustrate the long distance trips that are more likely in some locations to be the market from which the Garden Parkway would draw its customers. Table 3-11 summarizes the percentages by station. The I-85 survey stations show some variety in the percentage of trips that cross the Catawba River. The survey station farthest away from Charlotte at US 321 showed 66 percent of trips that crossed the river. However only some of those trips might offer potential patrons for the Parkway, as indicated earlier in Table 3-10. For two stations, at US 29/74 (station 14) and SC 49 (station 8), all surveyed trips crossed the Catawba River or Lake Wylie. However, as shown previously in Table 3-10, only certain O-D city pairs are likely to offer significant numbers of potential patrons to use the Parkway. For the other arterial locations, between 11 and 17 percent of survey trips crossed the river and could be considered as potential to the Parkway.

**Table 3-11  
Percent of Surveyed Weekday Passenger Car Trips that Cross the Catawba River**

<b>Survey Station</b>	<b>Survey Road</b>	<b>Percent of Surveyed Trips</b>
<b>I-85 Westbound Exit Ramps</b>		
4	Interchange 17, US 321	66%
5	Interchange 19, East Ozark Road	56%
6	Interchange 20, North New Hope Road	57%
9	Interchange 21, Cox Road	58%
10	Interchange 22, South Main Street	83%
11	Interchange 23, McAdenville Road	79%
12	Interchange 26, NC 7	89%
13	Interchange 27, NC 273	86%
<b>All I-85 Westbound Exit Ramp Survey Stations</b>		<b>72%</b>
<b>Arterials</b>		
1	South Linwood Road, west of Davis Park Road	11%
2	US 321, south of Hudson Boulevard	13%
3	NC 274, south of Robinwood Road	12%
7	East Hudson Boulevard, south of South New Hope Road	17%
8	SC 49, west of Heritage Road, SC.	100%
14	US 29/74, west of Hazeline Road	100%
<b>All Arterial Road Survey Stations</b>		<b>56%</b>
<b>All Survey Stations</b>		<b>65%</b>
Source: Wilbur Smith Associates Based on Travel Pattern Surveys conducted in 2009		

# CHAPTER 4

## STATED PREFERENCE SURVEYS

The Garden Parkway stated preference (SP) survey was conducted by Resource Systems Group (RSG) for WSA and NCTA. The objective of the SP survey was to estimate levels of the toll sensitivity, or value of time (VOT) of travelers in the proposed Garden Parkway study area. The survey was designed to provide sufficient detail to allow analyses of traveler responses to different toll structures and toll collection options; and to allow analysis of toll sensitivity to support route diversion modeling. The inputs and results of the SP survey were documented in a technical memorandum provided to the NCTA.

### APPROACH

The SP survey instrument was programmed using software developed by RSG for field intercept surveys using laptops and for online survey administration through RSG's website, SurveyCafe.com.

Respondents for the SP survey were recruited from several sources. Travel pattern survey respondents who provided their email addresses received email invitations to participate in the SP survey as a follow-up. Field intercept surveys were conducted at locations with high pedestrian traffic such as offices, libraries, shopping centers, motor vehicle departments, and community colleges. Online surveys were also offered to members of the community that requested to participate in the survey.

The customized computer-based survey software adapts to the trip characteristics of each respondent, making the survey questions realistic for them. By performing calculations behind the scenes, the software allows for the presentation of complex ideas in a simple manner. Electronic validation of each question eliminated non-response and prevented the entry of invalid inputs. Responses were recorded directly

into a database after every question, reducing data entry costs and eliminating transcription error.

## **SURVEY QUESTIONNAIRE**

The survey questionnaire briefly introduced the purpose of the survey and then asked questions grouped into four sections: trip description, SP with questions about travel time and toll cost, SP follow-up questions, and demographic questions.

### **TRIP DESCRIPTION**

Respondents were screened to ensure that they had made trips recently within the region. Each was asked to provide details of their trip, including day of the week, the purpose of their trip, the time period in which their trip began, the roads they used during their trip, and where their trip began and ended. These data were used to validate the Garden Parkway as a possible alternative for the respondent's reported trip and as inputs to build the alternatives described in the SP scenarios. An example informational question screen is shown in Figure 4-1.

After entering origin and destination information, respondents were asked for additional details about their trips including trip duration, amount of travel delay experienced, vehicle occupancy and how many times a week they make the particular trip.

### **STATED PREFERENCE SECTION**

Because the proposed Garden Parkway travels through a corridor that is not densely populated currently, the survey was designed to accommodate travelers from the larger Charlotte region. The description of the proposed toll road varied depending upon the respondent's reported trip. The origin and destination pair reported for each trip was compared to the study corridor to determine the language the respondent would see for the rest of the survey. Half of the respondents who reported a trip through the study corridor were introduced to the Garden Parkway before the SP exercises, while the other half were introduced to a generic, unnamed toll route. All respondents who reported a trip outside of the study corridor were shown a generic tolled option during the SP questions. By using a split sample, it was possible to separate the effect that potential biases toward or against the Garden Parkway could have on the estimates of travel time and toll cost sensitivities.

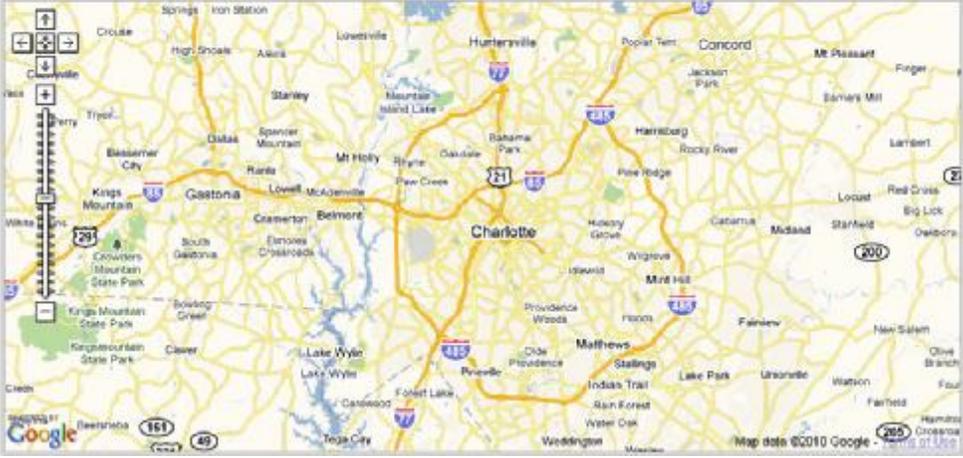
## METROLINA REGION TRAVEL STUDY

**You reported a trip that began at your home. Where is this located?**

Please enter the address, business name, or closest street intersection in the box below.

(Examples: Bank of America Stadium, Charlotte or 5415 Andrew Jackson Highway, Gastonia)

If you don't know the address or business information, please click on the map to zoom in on the location until a marker is placed under your click.



Example Informational Question

## METROLINA REGION TRAVEL STUDY

Below are 2 different travel options for your weekday trip for personal business with 3 people in the vehicle. These options include information on travel time and travel cost.

**If these options were the only options available for your weekday trip for personal business which would you choose? Click on one of the two boxes below to select your preferred choice.**

Information in blue will vary from screen to screen.

<div style="background-color: #003366; color: white; padding: 5px; font-weight: bold;">Current route</div> <p style="text-align: center;">Travel time: <b>41 minutes</b></p> <hr style="border: 0; border-top: 1px solid #ccc; margin: 5px 0;"/> <p style="text-align: center;">Toll free</p>	<div style="background-color: #003366; color: white; padding: 5px; font-weight: bold;">Tolled route</div> <p style="text-align: center;">Travel time: <b>31 minutes</b></p> <hr style="border: 0; border-top: 1px solid #ccc; margin: 5px 0;"/> <p style="text-align: center;">Toll cost: <b>\$2.00</b></p>
---	---

Next Question →
Question 1 of 8

Example Stated Preference Experiment

***Definition of Alternatives*** - The SP section consisted of eight hypothetical scenarios, with each scenario presenting two alternatives for traveling between the respondent's trip origin and destination. Figure 4-1 also shows an example SP experiment which would have been one out of eight such questions. In this example, two alternatives were presented. The first offered the respondent's travel time using their current route, which will remain toll-free. The second alternative offered the estimated travel time and toll cost for the Garden Parkway or generic tolled route for the same trip. In the survey, the order in which the alternatives were presented was randomized by respondent so that each alternative was shown as the left-most alternative half of the time.

***Definition of Attributes and Levels*** - Travel times for the respondent's current route, as well as travel times and toll costs for the Garden Parkway alternative, were presented at different values or "levels" in the eight hypothetical scenarios presented to each respondent. The current travel times reported by the respondents were varied by multiplying or adding one of several factors to test the different levels. By varying the travel times and toll costs shown in each of the eight experiments, the respondent was faced with different time savings for different costs, allowing them to demonstrate their travel preferences across a range of VOTs.

The specific values assigned in each SP experiment were determined by using an orthogonal experimental design, which ensured that information was collected from respondents in a statistically efficient manner. The experimental design consisted of 32 scenarios, and each respondent saw 8 of the 32 scenarios in a randomized order.

#### STATED PREFERENCE FOLLOW-UP

Directly following the SP section, respondents who did not select the Garden Parkway alternative in any of the eight SP scenarios were asked to indicate their primary reason for not choosing the toll road. Respondents who chose the Garden Parkway option at least once were asked their likelihood of acquiring an electronic toll collection (ETC) device as well as their familiarity with these devices. Those respondents who were not "very likely" to acquire an ETC device were asked if a reduced toll would increase their likelihood of ETC use. Respondents who still were not interested in ETC devices were asked why they were unlikely to open an ETC account.

The final follow-up section of the survey asked about respondents' opinions of the project and their primary reason for support or opposition. Finally, respondents were asked some attitudinal questions regarding tolling in general.

## DEMOGRAPHICS

Following completion of the survey, respondents were asked a series of questions to collect demographic data such as zip code of residence, household size, number of household vehicles, gender, age, employment status, and income. This information was used to determine differences in responses among traveler market segments.

## SURVEY RESULTS

### SAMPLE OVERVIEW

SP data from 1,276 respondents was collected during the survey. The number of usable records was reduced to 1,151 after completing data checks and outlier analyses during the VOT estimation work. Following are the numbers of final usable responses from the three sources:

- Intercepts at activity sites (659);
- Origin-destination (OD) participants who volunteered to participate in the SP survey (383); and
- Individuals who requested their participation in the SP survey (109).

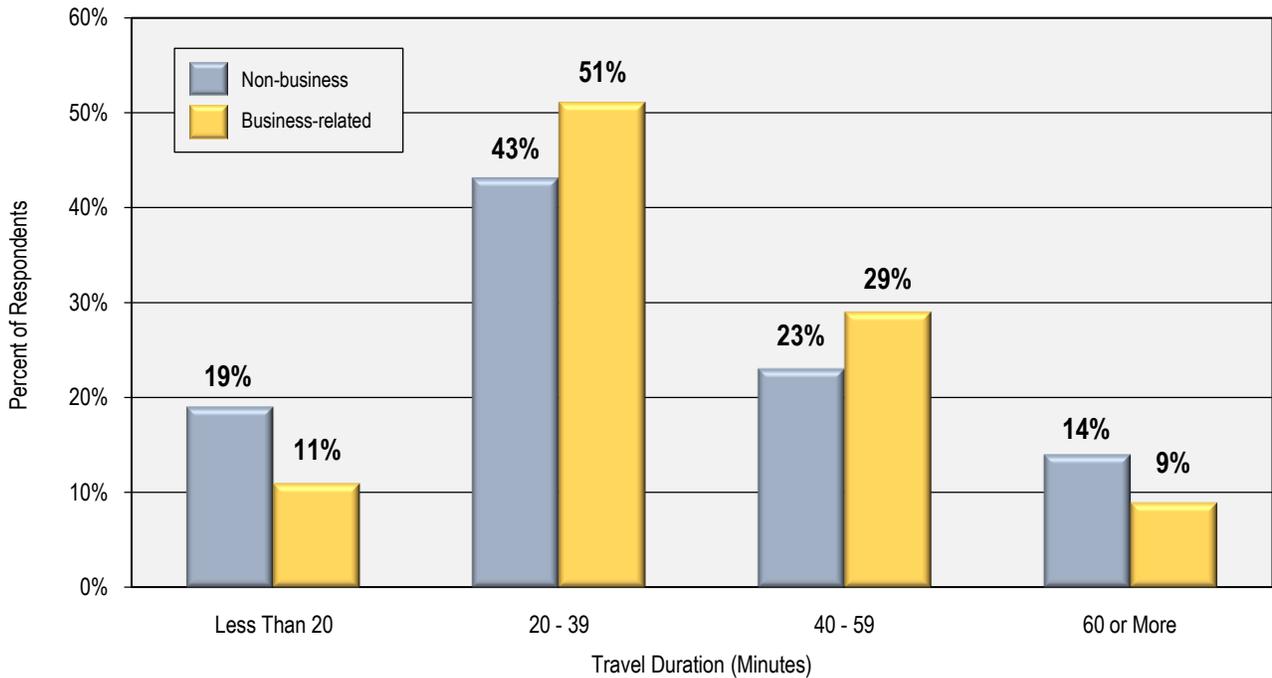
The intercept surveys were conducted at the following twelve locations:

- Gaston Main Library;
- ITT Technical Institute;
- Gaston YMCA (two locations);
- Plaza Fiesta;
- Gaston Tax Office;
- Founder's Hall;
- Bi-Lo Grocery Store (three locations);
- Union Road Library; and
- Lake Wylie Library.

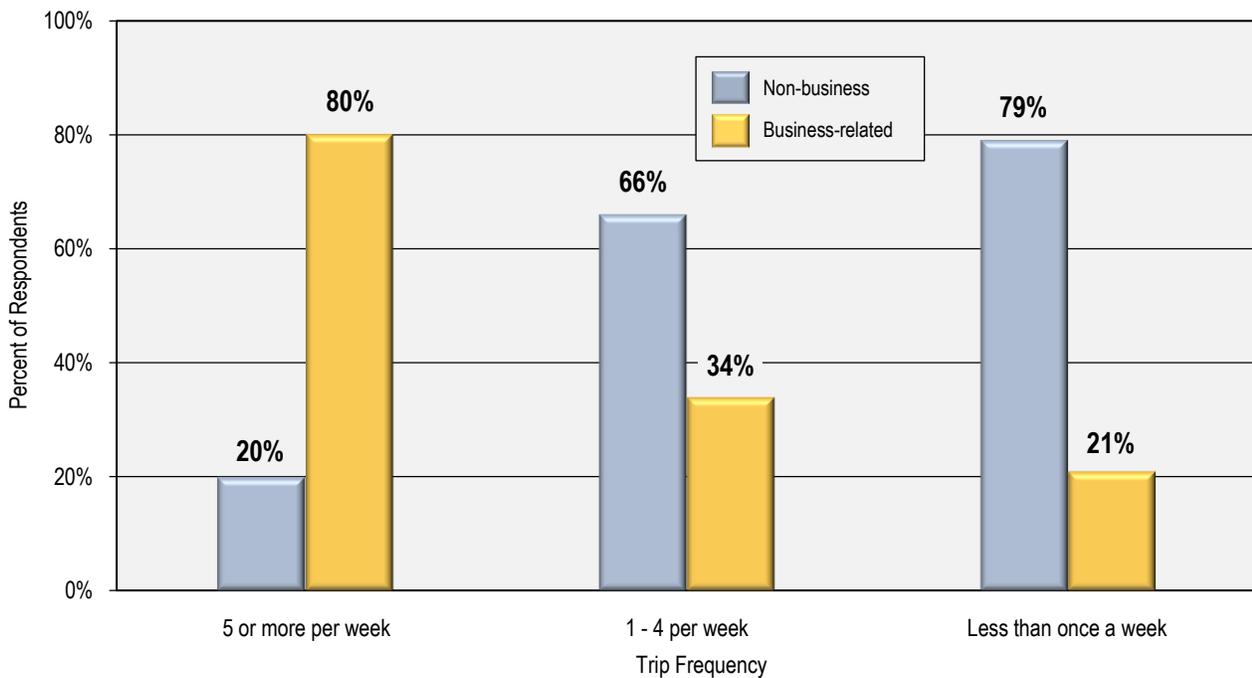
### RESPONDENT TRIP CHARACTERISTICS

Most (92 percent) of respondents indicated that their trip began at home, and nearly half (48 percent) reported the purpose of the trip was either to or from work or for company business. Less than 2 percent reported that the trip purpose was to go to or from the Charlotte Douglas International Airport. The majority of trips (63 percent) took less than 40 minutes to complete, and another 26 percent were made within 40-60 minutes. Commute and business-related trips were generally longer in duration than non-business trips, as indicated in Figure 4-2. Commute and business-related trips dominated for respondents reporting trip frequencies of five

### Travel Duration by Trip Purpose



### Trip Purpose by Trip Frequency



or more a week. Less frequent trips were predominantly non-business-related travel.

#### RESPONDENT CHARACTERISTICS

The sample was comprised of 56 percent men and 44 percent women. The greatest proportion of respondents (40 percent) reported a household size of two people. The median age was between 45 and 54 years of age. The plurality (43 percent) of respondents had two vehicles in their household, and another 23 percent had three vehicles.

53 percent of respondents indicated that they were employed full time; 8 percent were employed part time and another 7 percent were self employed. Approximately 7 percent were unemployed. The remaining respondents were retired, homemakers, and students. The median annual household income of the respondents was estimated at \$62,500.

#### MODEL ESTIMATION

Data from the SP alternatives were expanded into a dataset that contained eight observations for each usable survey. The statistical estimation and specification testing was completed using a conventional maximum likelihood procedure that estimated a single set of coefficients for a multinomial logit model. These coefficients were used to estimate the value of travel time savings for travelers in the proposed Garden Parkway study area. The model coefficients provide information about the relative importance of travel time and toll cost that can be used to infer travelers' VOT. The VOT estimates were input into the travel demand model used to estimate traffic and revenue for the proposed Garden Parkway.

Survey records were screened to ensure that all observations to be included in the model estimation process represented realistic trips and reasonable trade-offs in the SP experiments. Several variables were used for screening purposes including examination time used to complete the survey, source of respondent data, travel time, trip distance, income, GIS analysis, and invariance (selection of the same alternative throughout the SP experiment). After reviewing these variables and the effects that extreme values had on the VOT estimates, survey records meeting the following conditions were excluded from the final model:

- Inconsistent choice behavior;
- Time to take the eight SP survey exercises less than 32 seconds; and
- Implied travel speeds over 80 miles per hour.

This outlier analysis reduced the number of usable respondent records from 1,276 to 1,151.

The final model structures were provided to the NCTA in a technical memorandum. The final VOT model was based on several parameters including median income, and toll cost and time sensitivity for respondents in favor of the project and for respondents opposed to the project. Experience in model development has shown that respondents opposed to transportation projects can under-estimate time sensitivity and over-estimate toll cost sensitivity, which can result in unrealistic VOT estimates. To account for these respondents in the estimation process, separate time and toll sensitivity coefficients were developed based on the opinion of the respondent. Additionally, the impact of income on toll sensitivity was positive and statistically significant; therefore the toll coefficients include a logarithmic income transformation, in dollars, to account for this effect.

#### VALUE OF TIME

VOT at various income levels were developed from the time and cost coefficients in the model described above. The implied VOT to pay a toll on the Garden Parkway was estimated at \$9.20/hour for the respondents with household income of \$62,500. Table 4-1 shows the range of VOT at differing household income levels. It should be noted that these values in Table 4-1 were chosen to be a representative sample but the actual values used in the traffic and revenue analysis were localized for the average income for each traffic analysis zone (TAZ) in the model.

**Table 4-1  
Estimated Values of Time  
Garden Parkway  
Stated Preference Survey  
2010 Dollars**

<b>Average Household Income</b>	<b>Value of Time Per Hour</b>
\$10,000	\$7.67
20,000	\$8.25
30,000	\$8.59
40,000	\$8.83
50,000	\$9.01
60,000	\$9.16
<b>62,500</b> *	<b>\$9.20</b>
70,000	\$9.29
80,000	\$9.40
90,000	\$9.50
100,000	\$9.59
110,000	\$9.67
120,000	\$9.74
130,000	\$9.81
140,000	\$9.87
150,000	\$9.93

\* Survey sample median income

## APPLICATION TO MODEL FOR TRAFFIC AND REVENUE FORECAST

An estimated VOT was calculated for each TAZ within the travel demand model used for the traffic and revenue analysis for this project. For travel between each zone pair in the region, a weighted average VOT was calculated based on the number of trips originating within each zone, and the household income for that zone. This weighted VOT matrix was used as input to the traffic assignments to test the attractiveness of the project under a variety of tolling conditions.

# CHAPTER 5

## STUDY AREA GROWTH REVIEW

When conducting a study to determine the viability of a start-up toll facility such as the Garden Parkway, forecasted economic growth is a significant factor which must be reviewed thoroughly. It is especially significant in the case of the proposed Garden Parkway due to the dependence of travel demand on future development of southern Gaston County. As this study is to be used in support of project financing, it was deemed necessary to have an independent analysis of the expected economic growth of the region and study corridor. The independent economist was tasked with reviewing and potentially adjusting baseline estimates and forecasts of socioeconomic growth for all parameters that were used in the regional travel demand model. The forecast values prepared through this process were used in the study rather than relying on the growth estimates developed by the Gaston Urban Area Metropolitan Planning Organization (GUAMPO) and the Mecklenburg Union Metropolitan Planning Organization (MUMPO).

The independent economist selected to update socioeconomic growth estimates was the Kenan Institute of Private Enterprise of the Kenan-Flagler Business School at the University of North Carolina at Chapel Hill. The team of economists had no affiliation with the original forecasts developed by the MPOs or with local governments or developers in the area. As such, the review of regional economic growth and review of the creation of traffic analysis zone (TAZ) level data sets were unbiased and independently-performed.

### METHODOLOGY

A brief overview of the methodology employed by the independent economist is presented below. A detailed description of the work is in the Kenan report provided in a technical memorandum to the NCTA.

Kenan employed two methods in reviewing and adjusting the regional socioeconomic forecast that was used for this traffic and revenue study. The results of these two approaches were used to adjust the MPO TAZ-level forecast data.

The first method was a top-down approach which began with national and regional forecasts of population and employment. The reasonableness of the resulting forecasts was checked based on a thorough review of recent population and employment growth trends. Additionally, the competitiveness of the region's key industries and the input from several local economic experts were used to check the reasonableness of the forecasts.

The second method was a bottom-up review of the TAZ-level forecast developed by GUAMPO and MUMPO. The basic assumptions upon which the MPOs' jurisdictions forecast socioeconomic growth were reviewed by Kenan. Interviews with local planners, developers, and others were used to verify the reasonableness of the forecasts as well as to better understand contingencies upon which the projections might vary significantly.

The original analysis was completed in 2010 at a time when the economy in the region was still experiencing the effects of the recession. Additional analyses were conducted in 2011 to incorporate the initial results of the 2010 Census. The independent economist reviewed the analysis completed earlier and adjusted the 2010 base year estimates to reflect more current conditions including the 2010 Census.

The adjustment methodology described here and throughout the remainder of this chapter was applied region-wide, with specific adjustments made at the regional, county, sector, and TAZ level. The sectors that were developed as logical aggregations of TAZ clusters within the core study area are discussed later in this chapter. The independent economist focused particular attention on the Garden Parkway corridor when making small-area (i.e. TAZ) adjustments.

## COMPARISON WITH PREVIOUS FORECASTS

While earlier preliminary Garden Parkway studies completed by WSA used the MPO forecasts of socioeconomic data, for this comprehensive-level study the socioeconomic forecasts produced by Kenan form the basis of the traffic and revenue forecasts presented later in this report. Four unique sets of socioeconomic data are of interest to this study. The first of these forecasts is the 2005 MPO dataset which was used in the preliminary studies completed by WSA. The second dataset is a new set of forecasts

prepared by GUAMPO and MUMPO, which was completed in 2008 and provided to Kenan as a starting point for their economic review for the comprehensive traffic and revenue study for the proposed Monroe Connector/Bypass in Union County<sup>(1)</sup>. The third dataset was an updated version provided by MUMPO for the Garden Parkway traffic and revenue study. The fourth and final set consisted of the TAZ-level forecasts prepared by Kenan after a review of the two MPO data sets and the 2010 census. Each of these four forecasts differs; and as such it was important to compare them, identify any major changes, and recognize the potential effect on traffic and revenue the changes in socioeconomic forecasts could cause.

Tables 5-1 and 5-2 present comparisons of the population and employment forecasts, respectively, for the Garden Parkway study area. The study area values for each of the four forecasts have been included: the 2005 MPO forecasts used in the preliminary studies, the 2008/2009 forecasts prepared by the MPOs, the 2010 forecasts prepared by the MPOs, and the forecasts prepared by Kenan, the independent economist. The same information is presented graphically in Figures 5-1 and 5-2 for the Garden Parkway study area.

#### POPULATION IN THE GARDEN PARKWAY STUDY AREA

The MPO and Kenan population forecasts in the study area are different as summarized in Table 5-1. The current MPO 2010 base year forecasts are 1.2 percent higher than study area population used in the preliminary study and very similar for 2015 and 2025. The MPO 2010 forecast for 2035 is 3.1 percent lower than the preliminary study. Following the review by the independent economist, in contrast the adjusted population estimates for 2010 used in the current study are 2.4 percent lower than the preliminary study forecasts which in turn means that the 2010 study area population estimates used in this traffic and revenue study are lower than the current MPO population estimates. By 2015 the independent economist forecasts are 3.3 percent lower than the forecasts used in the earlier study. For 2025 the differences are negligible, and for 2035 the independent economist forecasts are 2.2 percent lower than the forecast in the preliminary study. For example, the independent economist study area forecast for 2015 shows a population of approximately 185,000, as compared with 192,000 in the preliminary study. A similar pattern is also shown for 2025, but by 2035 the independent economist forecast is slightly higher than the current 2035 MPO forecast, though still lower than the preliminary study.

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<sup>(1)</sup> Proposed Monroe Connector/Bypass Comprehensive Traffic and Revenue Study, Final Report, prepared by Wilbur Smith Associates for North Carolina Turnpike Authority, October 22, 2010.

**Table 5-1  
Comparison of Population Projections  
Garden Parkway Study Area**

Year	MPO 2005 <sup>(1)</sup>		MPO 2009 <sup>(2)</sup>		Current MPO 2010 <sup>(3)</sup>		Independent Economist <sup>(4)</sup>	
	Population Forecast	Change from 2005 MPO Forecast	Population Forecast	Change from 2005 MPO Forecast	Population Forecast	Change from 2005 MPO Forecast	Population Forecast	Change from 2005 MPO Forecast
2010	171,418	-0.7%	170,228	-0.7%	173,422	1.2%	167,235	-2.4%
2015	191,748	2.7%	196,921	2.7%	191,800	0.0%	185,384	-3.3%
2025	231,359	3.6%	239,741	3.6%	233,046	0.7%	230,830	-0.2%
2035	269,987	-0.6%	268,396	-0.6%	261,494	-3.1%	263,977	-2.2%

Year	Average Annual Growth		Independent Economist <sup>(4)</sup>
	MPO 2005 <sup>(1)</sup>	Current MPO 2010 <sup>(3)</sup>	
2010-2015	2.3%	2.0%	2.1%
2015-2025	1.9%	2.0%	2.2%
2025-2035	1.6%	1.2%	1.4%
2010-2035	1.8%	1.7%	1.8%

<sup>(1)</sup> Forecasts were prepared by the Gaston Urban Area and Mecklenburg Union MPOs in 2005 and were used in the Proposed Gaston East-West Connector Preliminary Traffic and Revenue Study.

<sup>(2)</sup> Forecasts were prepared by the Gaston Urban Area and Mecklenburg Union MPOs in 2009 and were used in the Proposed Monroe Connector/Bypass Comprehensive Traffic and Revenue Study. (Data covers entire Metrolina Region.)

<sup>(3)</sup> Forecasts were prepared by the Gaston Urban Area and Mecklenburg Union MPOs in 2010.

<sup>(4)</sup> Forecasts prepared by Kenan Institute of Private Enterprise based on review of 2009 and 2010 MPO forecasts.

**Table 5-2  
Comparison of Employment Projections  
Garden Parkway Study Area**

Year	MPO 2005 <sup>(1)</sup>		MPO 2009 <sup>(2)</sup>		Current MPO 2010 <sup>(3)</sup>		Independent Economist <sup>(4)</sup>	
	Employment Forecast	Change from 2005 MPO Forecast	Employment Forecast	Change from 2005 MPO Forecast	Employment Forecast	Change from 2005 MPO Forecast	Employment Forecast	Change from 2005 MPO Forecast
2010	102,950	2.2%	105,225	2.2%	92,603	-10.1%	96,973	-5.8%
2015	113,273	-1.1%	112,047	-1.1%	98,847	-12.7%	108,766	-4.0%
2025	134,364	-2.4%	131,097	-2.4%	116,939	-13.0%	128,928	-4.0%
2035	155,956	-4.0%	149,682	-4.0%	134,845	-13.5%	147,217	-5.6%

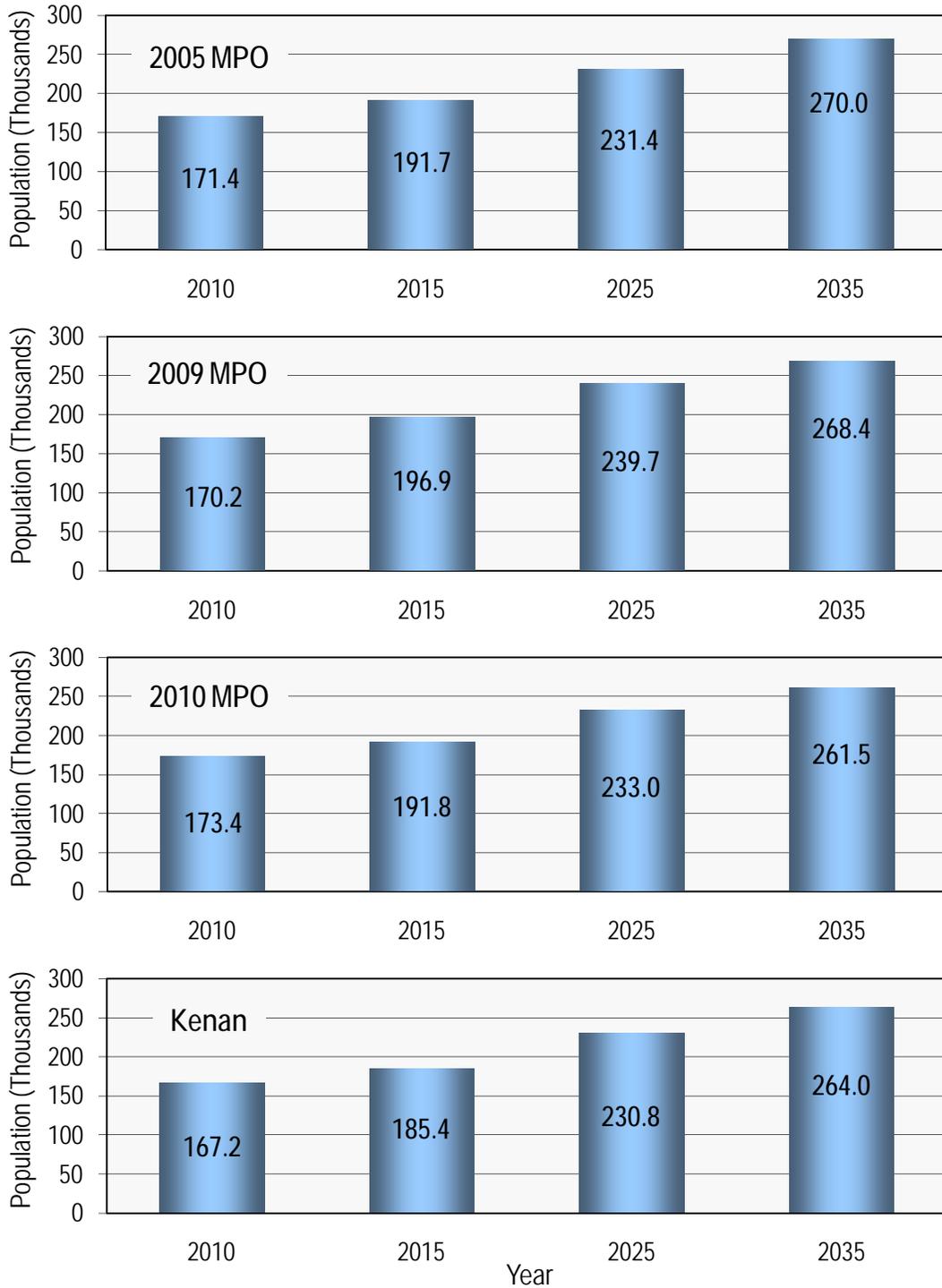
Year	Average Annual Growth	
	MPO 2005 <sup>(1)</sup>	Independent Economist <sup>(4)</sup>
2010-2015	1.9%	2.3%
2015-2025	1.7%	1.7%
2025-2035	1.5%	1.3%
2010-2035	1.7%	1.7%

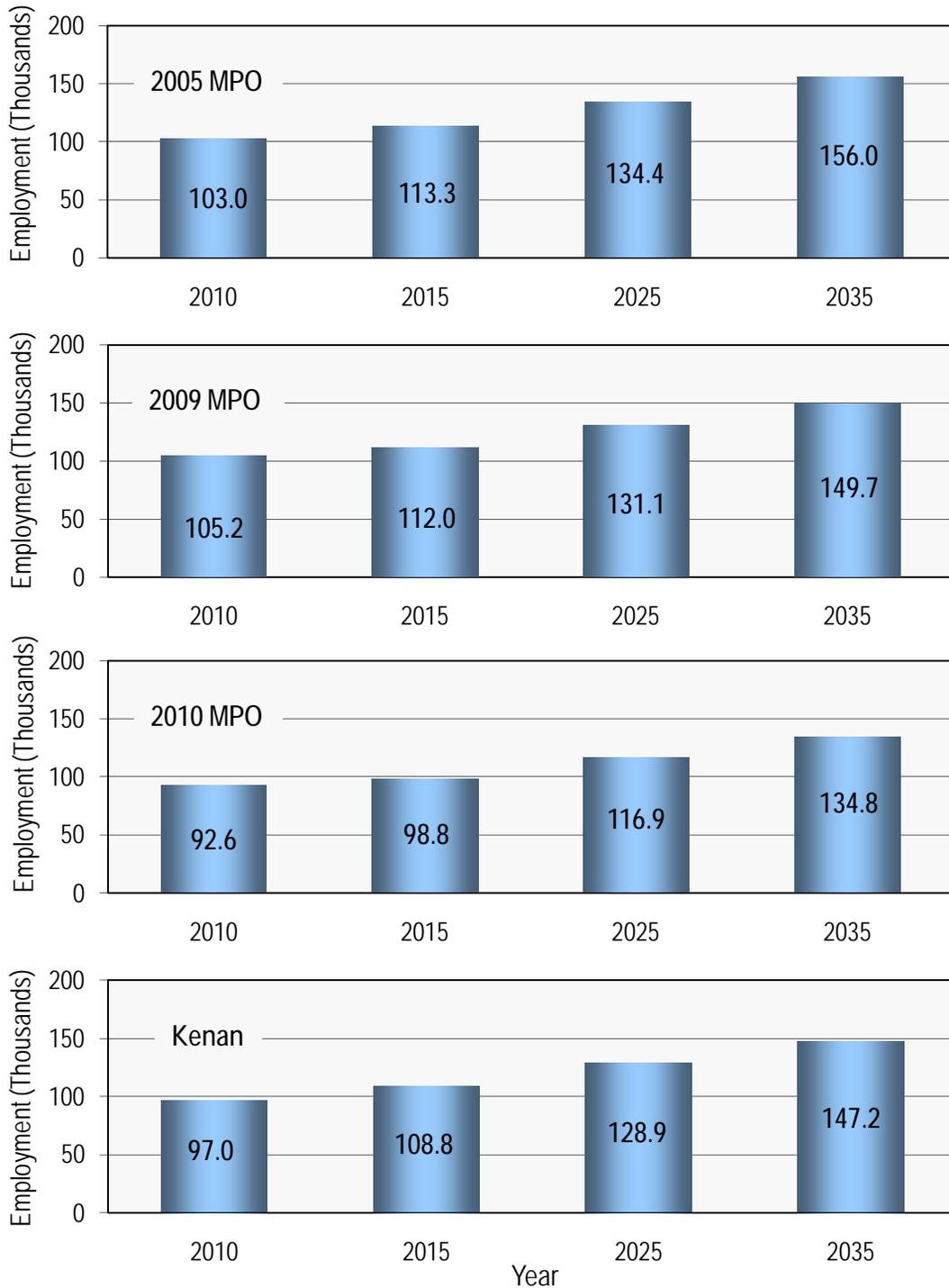
<sup>(1)</sup> Forecasts were prepared by the Gaston Urban Area and Mecklenburg Union MPOs in 2005 and were used in the Proposed Gaston East-West Connector Preliminary Traffic and Revenue Study.

<sup>(2)</sup> Forecasts were prepared by the Gaston Urban Area and Mecklenburg Union MPOs in 2009 and were used in the Proposed Monroe Connector/Bypass Comprehensive Traffic and Revenue Study. (Data covers entire Metrolina Region.)

<sup>(3)</sup> Forecasts were prepared by the Gaston Urban Area and Mecklenburg Union MPOs in 2010.

<sup>(4)</sup> Forecasts prepared by Kenan Institute of Private Enterprise based on review of 2009 and 2010 MPO forecasts.





COMPARISON OF EMPLOYMENT PROJECTIONS IN  
THE GARDEN PARKWAY STUDY AREA

FIGURE 5-2

#### EMPLOYMENT IN THE GARDEN PARKWAY STUDY AREA

Table 5-2 presents a similar comparison of the four employment forecasts for the study area. The current MPO employment forecasts are significantly lower in comparison to the study area employment forecasts used in the preliminary study. However, these MPO forecasts were prepared before the recession began and the 2010 census was released. The independent economist reviewed these forecasts and adjusted them upward based on more current information. However, the independent economist's forecasts are still lower than the forecasts used in the preliminary study. In the base year, the study area employment is estimated to be nearly 5.8 percent lower than the employment used in the preliminary study. For 2015 and 2025, the independent economist forecasts are 4.0 percent lower than the forecasts used in the preliminary study, and by 2035 the employment forecasts used for this study are 5.6 percent lower than in preliminary study.

#### GROWTH PROJECTIONS

The updated forecasts within the Garden Parkway study area were analyzed further in two ways in order to gain additional insight into the locations where the changes in growth are expected. The study area was split up into 16 individual sectors, each comprised of a number of TAZs. These 16 sectors are depicted in relation to the Garden Parkway in Figure 5-3. The forecasts were also summarized by county for the entire Metrolina region, the area covered by the regional transportation model.

#### POPULATION FORECASTS

Table 5-3 summarizes population growth within the study area using the Kenan forecasts. In 2010 according to the Census, the Charlotte region had nearly 2.2 million residents with approximately 167,000 living within the Garden Parkway study area, or 7.7 percent of the total region. By 2035, Kenan forecasts that the regional population will reach slightly over 3.4 million people, while the study area population will nearly reach 264,000. By 2035, the study area's share of the total region's population is expected to be 7.8 percent, which is a slight increase from 2010 levels. Overall, the study area is expected to experience average annual growth of 1.8 percent per year between 2010 and 2035, which is similar to the regional growth.



**Table 5-3  
Study Area Population Projections**

Study Area Sector	2010 Census	Average Annual Growth	2015	Average Annual Growth	2025	Average Annual Growth	2035	Average Annual Growth 2010-2035	Total Growth 2010-2035
1	5,946	1.9%	6,546	2.3%	8,238	1.3%	9,386	1.8%	57.9%
2	24,767	1.8%	27,096	1.1%	30,118	0.5%	31,538	1.0%	27.3%
3	31,149	1.8%	34,131	1.0%	37,865	0.3%	38,854	0.9%	24.7%
4	13,123	2.7%	15,012	3.0%	20,226	2.2%	25,065	2.6%	91.0%
5	8,997	2.0%	9,938	2.3%	12,455	1.3%	14,132	1.8%	57.1%
6	2,348	4.3%	2,898	4.0%	4,275	4.0%	6,346	4.1%	170.3%
7	5,420	2.1%	6,023	4.9%	9,741	3.0%	13,138	3.6%	142.4%
8	12,739	2.7%	14,587	3.1%	19,706	2.1%	24,223	2.6%	90.1%
9	7,339	3.2%	8,590	4.3%	13,058	2.7%	16,986	3.4%	131.4%
10	4,678	3.1%	5,443	6.8%	10,493	3.5%	14,838	4.7%	217.2%
11	4,674	1.7%	5,088	2.3%	6,391	1.6%	7,520	1.9%	60.9%
12	7,132	1.6%	7,731	1.4%	8,911	0.3%	9,149	1.0%	28.3%
13	2,232	2.4%	2,515	3.3%	3,475	2.1%	4,288	2.6%	92.1%
14	6,505	1.9%	7,157	2.0%	8,705	1.6%	10,194	1.8%	56.7%
15	8,899	2.3%	9,975	2.4%	12,681	1.9%	15,378	2.2%	72.8%
16	21,287	1.3%	22,654	0.8%	24,492	-0.7%	22,942	0.3%	7.8%
Total Study Area									
Population	167,235	2.1%	185,384	2.2%	230,830	1.4%	263,977	1.8%	57.8%
Charlotte Regional									
Population	2,174,302	1.9%	2,391,545	2.0%	2,904,281	1.5%	3,367,469	1.8%	54.9%
Percent of Charlotte Region									
	7.7%		7.8%		7.9%		7.8%		

Study Area Sector	Population Change			
	2010-2015	2015-2025	2025-2035	2010-2035
1	600	1,692	1,148	3,440
2	2,329	3,022	1,420	6,771
3	2,982	3,734	989	7,705
4	1,889	5,214	4,839	11,942
5	941	2,517	1,677	5,135
6	550	1,377	2,071	3,998
7	603	3,718	3,397	7,718
8	1,848	5,119	4,517	11,484
9	1,251	4,468	3,928	9,647
10	765	5,050	4,345	10,160
11	414	1,303	1,129	2,846
12	599	1,180	238	2,017
13	283	960	813	2,056
14	652	1,548	1,489	3,689
15	1,076	2,706	2,697	6,479
16	1,367	1,838	-1,550	1,655
Total Study Area				
Population Change	18,149	45,446	33,147	96,742
Charlotte Regional				
Population Change	217,243	512,736	463,188	1,193,167

Source: Kenan Institute of Private Enterprise, Summarized by Traffic Analysis Zone

Growth is estimated to be modest over the 25-year forecast period. Figure 5-4 highlights the growth for each of the sectors within the study area. Sectors where annual population growth is forecast to be greater than 3.0 percent are for the most part located in the southern area of Gaston County through which the proposed toll road would pass. The area forecast to experience the slowest population growth lies in proximity to I-85 in Gaston County.

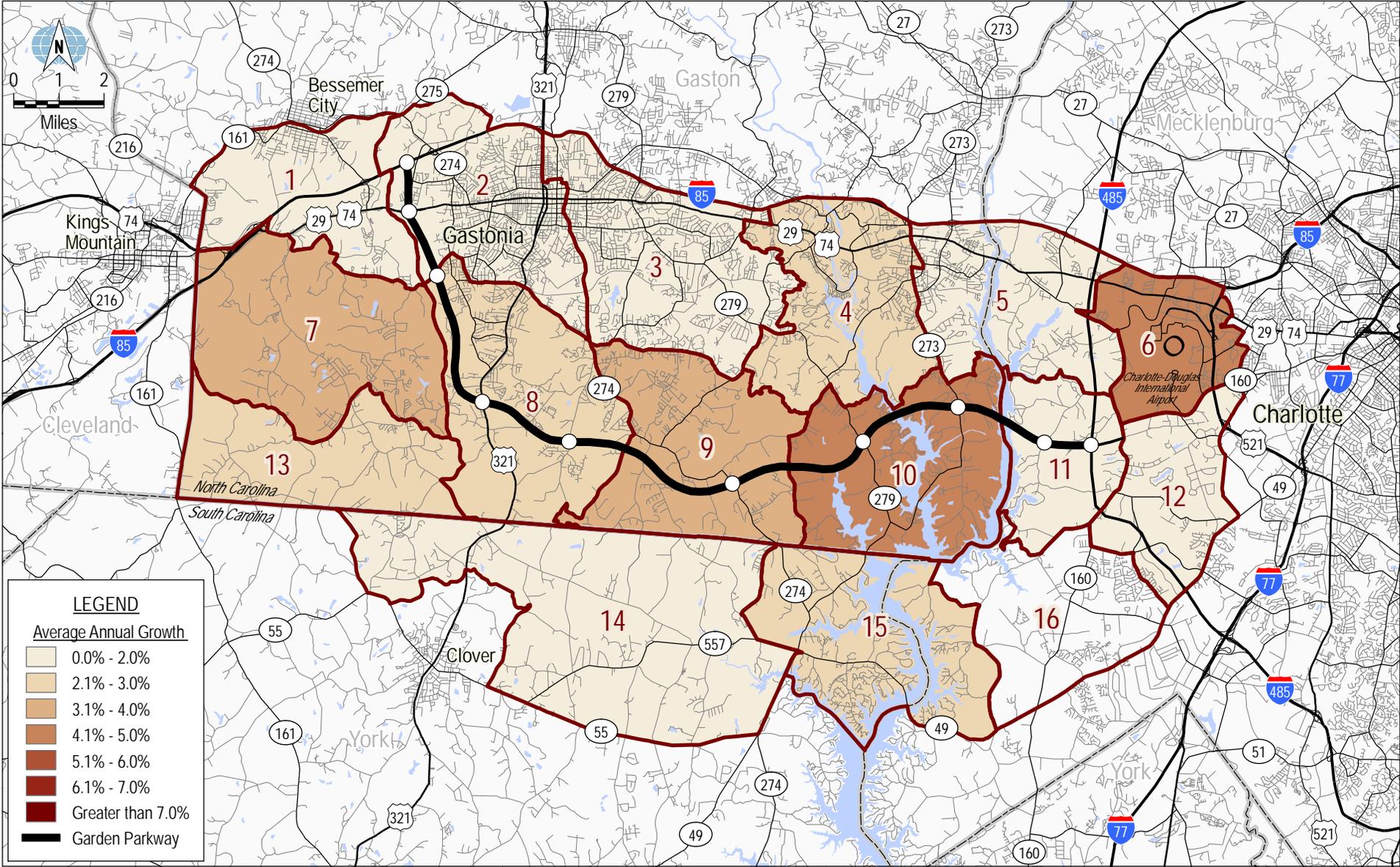
Regional population statistics by county are summarized in Table 5-4. In 2010, Gaston County was the second largest North Carolina County in the Metrolina region by population, after Mecklenburg County, which contains the City of Charlotte. York County in South Carolina was the second largest in the region. Similar patterns are forecast for the later years. Growth rates from 2010 to 2035 for the region are expected to be 1.8 percent annually for the region and slightly higher for Gaston County. Overall the North Carolina counties in the region are expected to grow faster (1.8 percent annually) than the South Carolina counties (1.6 percent annually) between 2010 and 2035.

#### EMPLOYMENT FORECASTS

As shown in Table 5-5, study area total employment represented 9.3 percent of the Charlotte region's total employment in 2010. By 2035 though, this percentage is forecast to decrease significantly to 7.9 percent. Employment in the study area is forecast to increase from approximately 97,000 to 147,000 between 2010 and 2035, which is an annual increase of 1.7 percent. This is significantly lower than the 2.3 percent annual employment growth forecast for the entire Charlotte region.

Figure 5-5 illustrates the projected employment growth between 2010 and 2035 for each sector within the study area. While the entire area is expected to experience modest employment growth, the area west of the project and the eastern portion of the project are expected to experience the greatest growth. For the most part, these zones are forecast to have annual growth rates of approximately 6.0 percent.

Regional employment statistics by county are summarized in Table 5-6. On a county basis, Gaston County had the second highest employment (70,000) in the region in 2010, which is dominated by Mecklenburg County. By 2035, other counties in the region are expected to have more employment than Gaston County. The regional annual growth rate between 2010 and 2035 is estimated at 2.3 percent. Gaston County's rate over the same period is estimated at 1.4 percent annually compared to growth rates as much as 4.0 percent for other counties.



**Table 5-4  
Charlotte Region Population Projections**

County	2010 Census	Average Annual Growth	2015		2025		2035		Average Annual Growth 2010-2035	Total Growth 2010-2035
			Average Annual Growth	2015	Average Annual Growth	2025	Average Annual Growth	2035		
Cabarrus	178,010	2.2%	198,807	2.6%	255,834	2.3%	322,055	2.4%	80.9%	
Cleveland (partial)	73,721	1.9%	80,876	1.6%	94,813	1.2%	106,708	1.5%	44.7%	
Gaston	206,088	2.1%	228,917	2.2%	283,287	1.4%	326,530	1.9%	58.4%	
Iredell (partial)	72,494	1.7%	79,032	2.0%	96,286	2.3%	120,598	2.1%	66.4%	
Lincoln	78,260	2.0%	86,539	2.4%	109,183	2.2%	136,353	2.2%	74.2%	
Mecklenberg	919,620	1.9%	1,008,145	1.7%	1,197,424	1.0%	1,322,241	1.5%	43.8%	
Rowan	138,430	2.2%	154,128	2.0%	187,752	1.4%	215,594	1.8%	55.7%	
Stanly	60,587	1.7%	65,995	1.6%	77,326	1.1%	86,007	1.4%	42.0%	
Union	201,290	2.0%	222,155	2.5%	285,201	2.6%	367,273	2.4%	82.5%	
Subtotal - NC	1,928,500	2.0%	2,124,594	2.0%	2,587,106	1.5%	3,003,359	1.8%	55.7%	
Lancaster (partial)	19,728	0.8%	20,556	1.3%	23,347	1.2%	26,274	1.2%	33.2%	
York	226,074	1.7%	246,395	1.8%	293,828	1.4%	337,836	1.6%	49.4%	
Subtotal - SC	245,802	1.7%	266,951	1.7%	317,175	1.4%	364,110	1.6%	48.1%	
Charlotte Regional Population	2,174,302	1.9%	2,391,545		2,904,281		3,367,469	1.8%	54.9%	

County	Population Change			
	2010-2015	2015-2025	2025-2035	2010-2035
Cabarrus	20,797	57,027	66,221	144,045
Cleveland (partial)	7,155	13,937	11,895	32,987
Gaston	22,829	54,370	43,243	120,442
Iredell (partial)	6,538	17,254	24,312	48,104
Lincoln	8,279	22,644	27,170	58,093
Mecklenberg	88,525	189,279	124,817	402,621
Rowan	15,698	33,624	27,842	77,164
Stanly	5,408	11,331	8,681	25,420
Union	20,865	63,046	82,072	165,983
Subtotal - NC	196,094	462,512	416,253	1,074,859
Lancaster (partial)	828	2,791	2,927	6,546
York	20,321	47,433	44,008	111,762
Subtotal - SC	21,149	50,224	46,935	118,308
Charlotte Regional Population Change	217,243	512,736	463,188	1,193,167

Source: Kenan Institute of Private Enterprise, Summarized by County

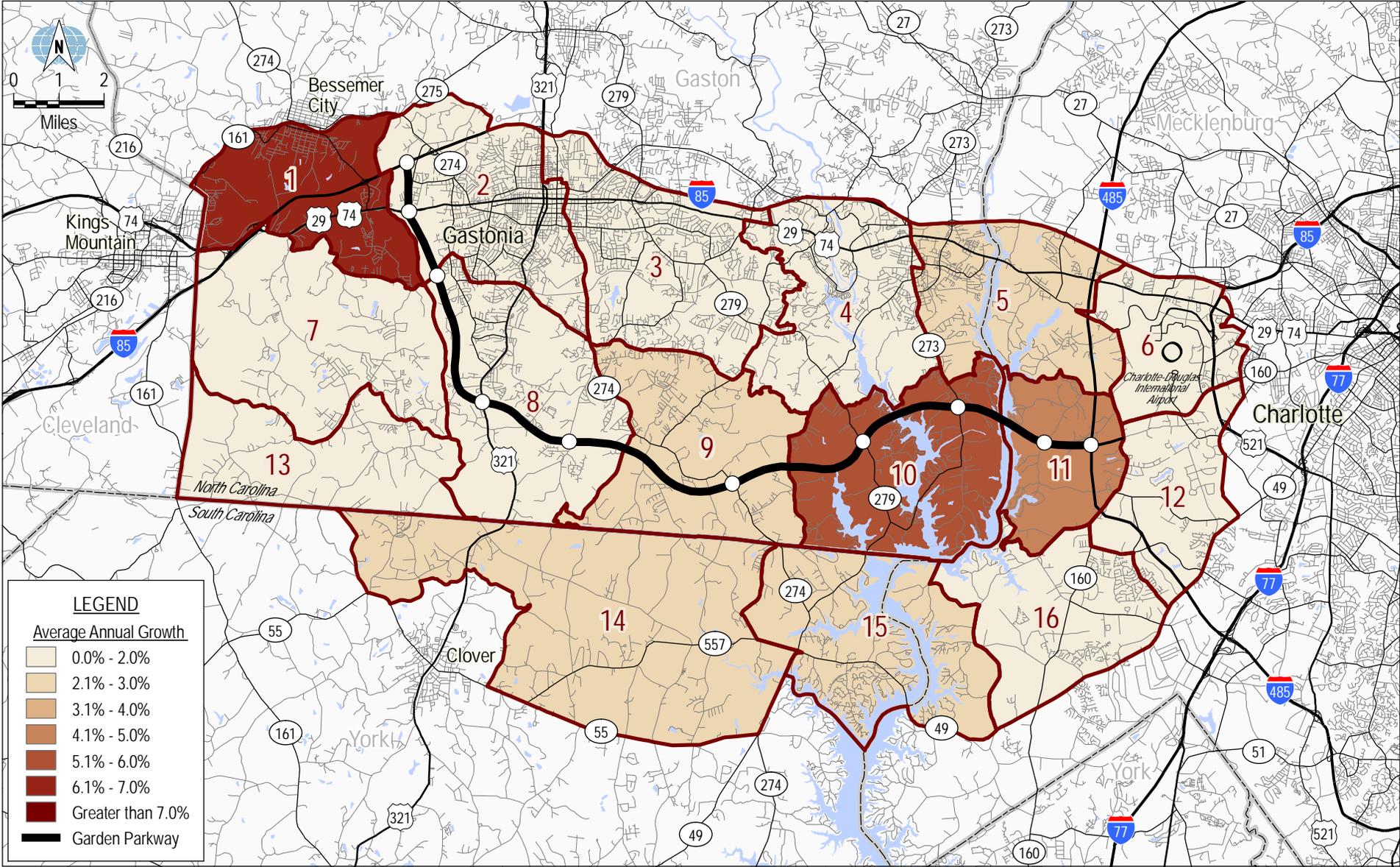
**Table 5-5  
Study Area Employment Projections**

Study Area Sector	2010	Average Annual Growth	2015	Average Annual Growth	2025	Average Annual Growth	2035	Average Annual Growth 2010-2035	Total Growth 2010-2035
1	1,149	8.9%	1,758	2.9%	2,345	8.5%	5,306	6.3%	361.8%
2	12,876	0.3%	13,094	0.9%	14,358	1.1%	16,029	0.9%	24.5%
3	12,132	0.3%	12,336	0.7%	13,227	1.1%	14,755	0.8%	21.6%
4	5,978	1.7%	6,514	1.0%	7,163	0.8%	7,757	1.0%	29.8%
5	6,894	4.1%	8,417	2.9%	11,182	1.8%	13,329	2.7%	93.3%
6	18,384	2.7%	21,052	2.0%	25,578	1.2%	28,841	1.8%	56.9%
7	275	0.1%	277	0.8%	299	1.6%	351	1.0%	27.6%
8	3,146	1.4%	3,372	1.4%	3,894	1.1%	4,343	1.3%	38.0%
9	952	3.8%	1,145	4.3%	1,745	0.6%	1,853	2.7%	94.6%
10	500	13.8%	955	6.9%	1,858	1.1%	2,073	5.9%	314.6%
11	890	8.2%	1,320	4.4%	2,036	2.6%	2,639	4.4%	196.5%
12	18,536	2.4%	20,893	1.5%	24,136	0.9%	26,279	1.4%	41.8%
13	44	-0.5%	43	0.2%	44	0.9%	48	0.3%	9.1%
14	1,024	3.7%	1,227	2.4%	1,555	1.6%	1,816	2.3%	77.3%
15	1,747	3.5%	2,074	2.4%	2,634	1.8%	3,141	2.4%	79.8%
16	12,446	2.8%	14,289	1.7%	16,874	1.0%	18,657	1.6%	49.9%
Total Study Area Employment	96,973	2.3%	108,766	1.7%	128,928	1.3%	147,217	1.7%	51.8%
Charlotte Regional Employment	1,046,055	3.8%	1,258,860	2.3%	1,572,851	1.7%	1,855,614	2.3%	77.4%
Percent of Charlotte Region	9.3%		8.6%		8.2%		7.9%		

**Employment Change**

Study Area Sector	2010-2015	2015-2025	2025-2035	2010-2035
1	609	587	2,961	4,157
2	218	1,264	1,671	3,153
3	204	891	1,528	2,623
4	536	649	594	1,779
5	1,523	2,765	2,147	6,435
6	2,668	4,526	3,263	10,457
7	2	22	52	76
8	226	522	449	1,197
9	193	600	108	901
10	455	903	215	1,573
11	430	716	603	1,749
12	2,357	3,243	2,143	7,743
13	-1	1	4	4
14	203	328	261	792
15	327	560	507	1,394
16	1,843	2,585	1,783	6,211
Total Study Area Employment Change	11,793	20,162	18,289	50,244
Charlotte Regional Employment Change	212,805	313,991	282,763	809,559

Source: Kenan Institute of Private Enterprise, Summarized by Traffic Analysis Zone



**Table 5-6  
Charlotte Region Employment Projections**

County	2010 Census	Average Annual Growth	2015	Average Annual Growth	2025	Average Annual Growth	2035	Average Annual Growth 2010-2035	Total Growth 2010-2035
Cabarrus	67,779	6.2%	91,497	2.8%	120,017	2.3%	150,674	3.2%	122.3%
Cleveland (partial)	29,890	1.7%	32,482	1.1%	36,080	0.8%	38,889	1.1%	30.1%
Gaston	70,322	1.6%	76,043	1.5%	87,839	1.2%	99,200	1.4%	41.1%
Iredell (partial)	27,924	11.0%	47,111	2.6%	60,807	2.1%	74,788	4.0%	167.8%
Lincoln	24,704	5.3%	32,007	2.7%	41,681	2.1%	51,434	3.0%	108.2%
Mecklenberg	619,667	3.1%	722,658	2.2%	894,038	1.6%	1,044,714	2.1%	68.6%
Rowan	56,107	4.0%	68,231	1.7%	80,475	1.1%	89,794	1.9%	60.0%
Stanly	20,657	2.9%	23,823	1.5%	27,534	1.0%	30,328	1.5%	46.8%
Union	55,775	5.7%	73,575	4.2%	111,188	2.7%	145,133	3.9%	160.2%
Subtotal - NC	972,825	3.7%	1,167,427	2.3%	1,459,659	1.7%	1,724,954	2.3%	77.3%
Lancaster (partial)	3,476	3.7%	4,169	2.3%	5,228	1.9%	6,337	2.4%	82.3%
York	69,754	4.6%	87,264	2.2%	107,964	1.4%	124,323	2.3%	78.2%
Subtotal - SC	73,230	4.5%	91,433	2.2%	113,192	1.4%	130,660	2.3%	78.4%
Charlotte Regional Employment	1,046,055	3.8%	1,258,860		1,572,851		1,855,614	2.3%	77.4%

County	Employment Change			
	2010-2015	2015-2025	2025-2035	2010-2035
Cabarrus	23,718	28,520	30,657	82,895
Cleveland (partial)	2,592	3,598	2,809	8,999
Gaston	5,721	11,796	11,361	28,878
Iredell (partial)	19,187	13,696	13,981	46,864
Lincoln	7,303	9,674	9,753	26,730
Mecklenberg	102,991	171,380	150,676	425,047
Rowan	12,124	12,244	9,319	33,687
Stanly	3,166	3,711	2,794	9,671
Union	17,800	37,613	33,945	89,358
Subtotal - NC	194,602	292,232	265,295	752,129
Lancaster (partial)	693	1,059	1,109	2,861
York	17,510	20,700	16,359	54,569
Subtotal - SC	18,203	21,759	17,468	57,430
Charlotte Regional Employment Change	212,805	313,991	282,763	809,559

Source: Kenan Institute of Private Enterprise, Summarized by County

#### NUMBER OF HOUSEHOLDS

The growth in the number of households within the study area closely mimics the expected population growth. Table 5-7 summarizes the households contained in the Kenan forecasts. In 2010, the number of households in the study area was estimated at approximately 65,000, or 7.7 percent of the total region's households. By 2035 the number of households within the study area is forecast to increase to approximately 103,000, which would be 8.0 percent of the region's households. The study area's forecasted 2010 – 2035 annual household growth rate of 1.9 percent is slightly higher than the 1.8 percent annual growth rate anticipated for the region.

Again, the highest growth rates are forecast in the sectors alongside the proposed toll road in southern Gaston County. Gaston County in North Carolina and York County in South Carolina had the greatest number of households in 2010 outside of Mecklenburg County as shown in Table 5-8. By 2035 other counties will have gained households in parallel with the population growth described earlier. Overall the North Carolina counties are expected to grow slightly faster than the South Carolina counties in the region.

#### HOUSEHOLD INCOME

Mean household incomes, by sector, were estimated using a weighted average of the Kenan forecasts as summarized in Table 5-9. All values shown are in 2000 dollars. In 2010, the median household income in the region was estimated at \$60,970. The Garden Parkway study area had a mean income nearly 7.6 percent lower than the region, at \$56,326. Over the forecast period, study area incomes were forecast to gain slightly on the regional incomes. As shown, by 2035, study area incomes are forecast to be 5.1 percent lower than regional mean household incomes.

Similar patterns are evident in Table 5-10, which contains household income statistics by county in the region. As would be expected, Mecklenburg County has the highest household income at nearly \$71,000 in 2010. The regional average was \$60,970 for that year, but Gaston County on the other hand, had an average household of \$49,729. Similar patterns are shown in the later years with other counties gaining more in household income as employment rises in those counties.

**Table 5-7  
Study Area Households Projections**

Study Area Sector	2010 Census	Average Annual Growth	2015	Average Annual Growth	2025	Average Annual Growth	2035	Average Annual Growth 2010-2035	Total Growth 2010-2035
1	2,336	2.3%	2,619	2.1%	3,239	1.3%	3,674	1.8%	57.3%
2	9,269	2.1%	10,283	1.2%	11,607	0.6%	12,370	1.2%	33.5%
3	12,803	1.8%	13,967	1.0%	15,407	0.3%	15,825	0.9%	23.6%
4	5,265	3.0%	6,115	3.0%	8,190	2.2%	10,199	2.7%	93.7%
5	3,624	1.9%	3,984	2.1%	4,895	0.9%	5,377	1.6%	48.4%
6	763	4.7%	958	4.2%	1,452	4.6%	2,276	4.5%	198.3%
7	1,992	2.5%	2,258	5.2%	3,761	3.2%	5,158	3.9%	158.9%
8	4,669	3.2%	5,458	3.3%	7,573	2.3%	9,501	2.9%	103.5%
9	2,746	3.5%	3,268	4.5%	5,060	2.8%	6,661	3.6%	142.6%
10	1,763	3.2%	2,062	7.1%	4,082	3.6%	5,818	4.9%	230.0%
11	1,606	1.8%	1,752	2.6%	2,268	2.0%	2,762	2.2%	72.0%
12	2,833	1.7%	3,083	1.4%	3,533	0.0%	3,535	0.9%	24.8%
13	835	2.7%	955	3.5%	1,344	2.3%	1,682	2.8%	101.4%
14	2,438	2.2%	2,718	2.2%	3,382	1.9%	4,084	2.1%	67.5%
15	3,722	1.6%	4,024	1.7%	4,740	1.2%	5,342	1.5%	43.5%
16	7,897	1.6%	8,567	1.1%	9,517	-0.4%	9,130	0.6%	15.6%
Total Study Area Households	64,561	2.2%	72,071	2.3%	90,050	1.4%	103,394	1.9%	60.1%
Charlotte Regional Households	833,220	2.0%	922,172	2.0%	1,121,448	1.5%	1,299,793	1.8%	56.0%
Percent of Charlotte Region	7.7%		7.8%		8.0%		8.0%		

**Households Change**

Study Area Sector	2010-2015	2015-2025	2025-2035	2010-2035
1	283	620	435	1,338
2	1,014	1,324	763	3,101
3	1,164	1,440	418	3,022
4	850	2,075	2,009	4,934
5	360	911	482	1,753
6	195	494	824	1,513
7	266	1,503	1,397	3,166
8	789	2,115	1,928	4,832
9	522	1,792	1,601	3,915
10	299	2,020	1,736	4,055
11	146	516	494	1,156
12	250	450	2	702
13	120	389	338	847
14	280	664	702	1,646
15	302	716	602	1,620
16	670	950	-387	1,233
Total Study Area Households Change	7,510	17,979	13,344	38,833
Charlotte Regional Households Change	88,952	199,276	178,345	466,573

Source: Kenan Institute of Private Enterprise, Summarized by Traffic Analysis Zone

**Table 5-8  
Charlotte Region Households Projections**

County	2010 Census	Average Annual Growth	2015	Average Annual Growth	2025	Average Annual Growth	2035	Average Annual Growth 2010-2035	Total Growth 2010-2035
Cabarrus	65,668	2.5%	74,154	2.6%	96,272	2.4%	121,859	2.5%	85.6%
Cleveland (partial)	29,471	1.9%	32,420	1.5%	37,630	1.1%	41,995	1.4%	42.5%
Gaston	79,872	2.3%	89,489	2.3%	111,794	1.4%	129,020	1.9%	61.5%
Iredell (partial)	27,185	2.0%	29,979	2.1%	37,067	2.4%	46,993	2.2%	72.9%
Lincoln	30,338	2.1%	33,597	2.2%	41,965	2.1%	51,824	2.2%	70.8%
Mecklenberg	362,224	2.0%	398,946	1.7%	473,323	1.0%	522,129	1.5%	44.1%
Rowan	53,143	2.3%	59,521	2.0%	72,611	1.4%	83,546	1.8%	57.2%
Stanly	23,591	1.9%	25,880	1.6%	30,378	1.1%	33,869	1.5%	43.6%
Union	67,856	2.3%	75,878	2.7%	99,072	2.7%	129,459	2.6%	90.8%
Subtotal - NC	739,348	2.1%	819,864	2.0%	1,000,112	1.5%	1,160,694	1.8%	57.0%
Lancaster (partial)	8,009	0.9%	8,368	1.2%	9,433	1.1%	10,541	1.1%	31.6%
York	85,863	1.8%	93,940	1.8%	111,903	1.4%	128,558	1.6%	49.7%
Subtotal - SC	93,872	1.7%	102,308	1.7%	121,336	1.4%	139,099	1.6%	48.2%
Charlotte Regional Households	832,220	2.0%	922,172		1,121,448		1,299,793	1.8%	56.0%

County	Households Change			
	2010-2015	2015-2025	2025-2035	2010-2035
Cabarrus	8,486	22,118	25,587	56,191
Cleveland (partial)	2,949	5,210	4,365	12,524
Gaston	9,617	22,305	17,226	49,148
Iredell (partial)	2,794	7,088	9,926	19,808
Lincoln	3,259	8,368	9,859	21,486
Mecklenberg	36,722	74,377	48,806	159,905
Rowan	6,378	13,090	10,935	30,403
Stanly	2,289	4,498	3,491	10,278
Union	8,022	23,194	30,387	61,603
Subtotal - NC	80,516	180,248	160,582	421,346
Lancaster (partial)	359	1,065	1,108	2,532
York	8,077	17,963	16,655	42,695
Subtotal - SC	8,436	19,028	17,763	45,227
Charlotte Regional Households Change	88,952	199,276	178,345	466,573

Source: Kenan Institute of Private Enterprise, Summarized by County

**Table 5-9  
Study Area Average Household Income  
(Constant 2000 USD)**

Study Area Sector	2010	2015	2025	2035
1	\$44,699	\$45,153	\$45,383	\$45,272
2	40,968	41,102	40,855	40,030
3	57,132	58,298	60,671	62,459
4	54,446	55,666	56,506	55,634
5	52,015	54,974	56,367	57,331
6	27,525	28,198	29,655	31,110
7	46,038	46,685	46,183	46,000
8	45,936	46,931	49,634	50,869
9	73,062	73,138	70,903	69,272
10	59,567	60,626	63,969	65,121
11	57,272	57,643	58,248	57,512
12	61,434	62,298	62,908	62,409
13	50,683	50,931	50,768	50,136
14	47,132	47,664	48,169	48,116
15	82,337	84,138	86,728	88,075
16	73,849	66,303	67,407	67,761
Total Study Area Average Income	\$56,326	\$57,332	\$58,120	\$57,861
Percent of Charlotte Region	92.4%	93.5%	94.3%	94.9%
Charlotte Region Average Income	\$60,970	\$61,301	\$61,663	\$60,960

Source: Kenan Institute of Private Enterprise, Summarized by Traffic Analysis Zone

**Table 5-10  
Charlotte Region Average Household Income  
(Constant 2000 USD)**

County	2010	2015	2025	2035
Cabarrus	\$57,518	\$58,450	\$59,999	\$61,057
Cleveland (partial)	\$39,457	\$39,939	\$40,547	\$40,835
Gaston	\$49,729	\$50,487	\$51,736	\$52,121
Iredell (partial)	\$59,699	\$60,323	\$61,137	\$61,615
Lincoln	\$46,972	\$47,626	\$48,547	\$49,057
Mecklenberg	\$70,990	\$70,812	\$70,545	\$68,655
Rowan	\$46,307	\$46,916	\$47,573	\$47,596
Stanly	\$40,794	\$41,399	\$42,244	\$42,685
Union	\$66,307	\$67,343	\$67,823	\$67,317
Average - NC	\$61,672	\$61,937	\$62,230	\$61,430
Lancaster (partial)	\$49,215	\$50,178	\$51,424	\$51,950
York	\$56,026	\$56,748	\$57,466	\$57,457
Average - SC	\$55,445	\$56,210	\$56,996	\$57,040
Charlotte Region Average Income	\$60,970	\$61,301	\$61,663	\$60,960

Source: Kenan Institute of Private Enterprise, Summarized by County

# CHAPTER 6

## TRAFFIC AND REVENUE ANALYSIS

Chapter 6 presents a summary of the traffic and revenue analysis conducted for the proposed Garden Parkway. In addition to an overview of the travel demand modeling process, this chapter also presents information on the regional highway improvement program, basic assumptions upon which the traffic and revenue forecasts are based, a toll rate sensitivity analysis, and the traffic and revenue forecasts for the proposed toll road.

### ANALYTICAL METHODOLOGY

This section describes the general procedures followed to prepare the forecasts of annual toll traffic and gross toll revenue. Figure 6-1 depicts the process schematically.

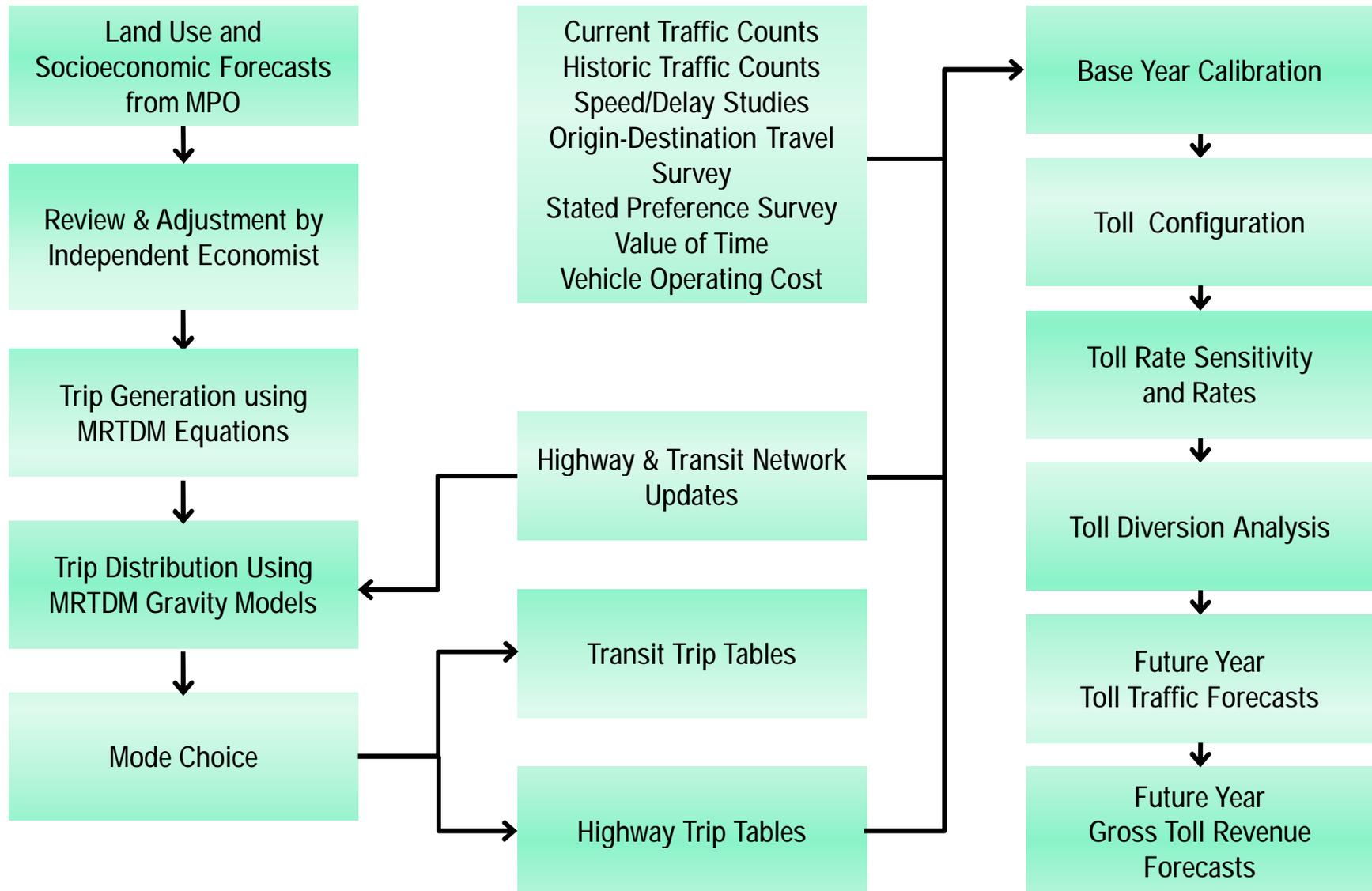
#### METROLINA REGIONAL TRANSPORTATION DEMAND MODEL

The Metrolina Regional Travel Demand Model (MRTDM) was used for this traffic and revenue analysis. MRTDM is a single unified travel demand model that encompasses the combined area of three Metropolitan Planning Organizations<sup>(1)</sup> (MPOs) in the region and is jointly maintained by those MPOs in conjunction with several other agencies and both state DOTs. The model current at the time of the analysis (early 2010) was MRTDM 09 v1. This was subsequently updated using the MPO's fiscally constrained future road project list in the 2035 long range transportation plans (LRTPs) and amendments for MUMPO and GUAMPO along with other adjustments described below.

WSA performed the following actions in the modeling process for this study:

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<sup>(1)</sup> Gaston Urban Area Metropolitan Planning Organization (GUAMPO)  
Mecklenburg-Union Metropolitan Planning Organization (MUMPO)  
Cabarrus-Rowan Metropolitan Planning Organization (CRMPO)



#### MODEL NETWORK UPDATES – FUTURE ROADWAY AND TRANSIT IMPROVEMENTS

The model current at the time of the analysis was updated using the MPO's fiscally constrained future road project list shown in the 2035 LRTPs and amendments. Special attention was paid to proposed roadway improvements in the Garden Parkway study area. Detailed coding was added to represent the locations of proposed interchanges and tolling zones.

#### LAND USE AND SOCIOECONOMIC DATA USED FOR THE TRIP GENERATION PROCESS

Land use and socioeconomic data prepared by the MPOs in 2010 was reviewed by an independent economist. Subsequently the 2010 census data became available, and adjustments to the socioeconomic data in the MRTDM were made by the economist for use in the trip generation process for this comprehensive study. All of this was described in Chapter 5.

#### TRANSPORTATION ANALYSIS ZONES

Extensive checking was performed to ensure that the socioeconomic data prepared by the independent economist was allocated properly to the traffic analysis zone (TAZ) structure used in the current MRTDM. In addition, some of the TAZs were disaggregated into smaller TAZs to allow for a better representation of the roadway system within the study area. Trip tables were disaggregated accordingly to fit this revised TAZ structure.

#### TRIP GENERATION, DISTRIBUTION, AND MODE CHOICE

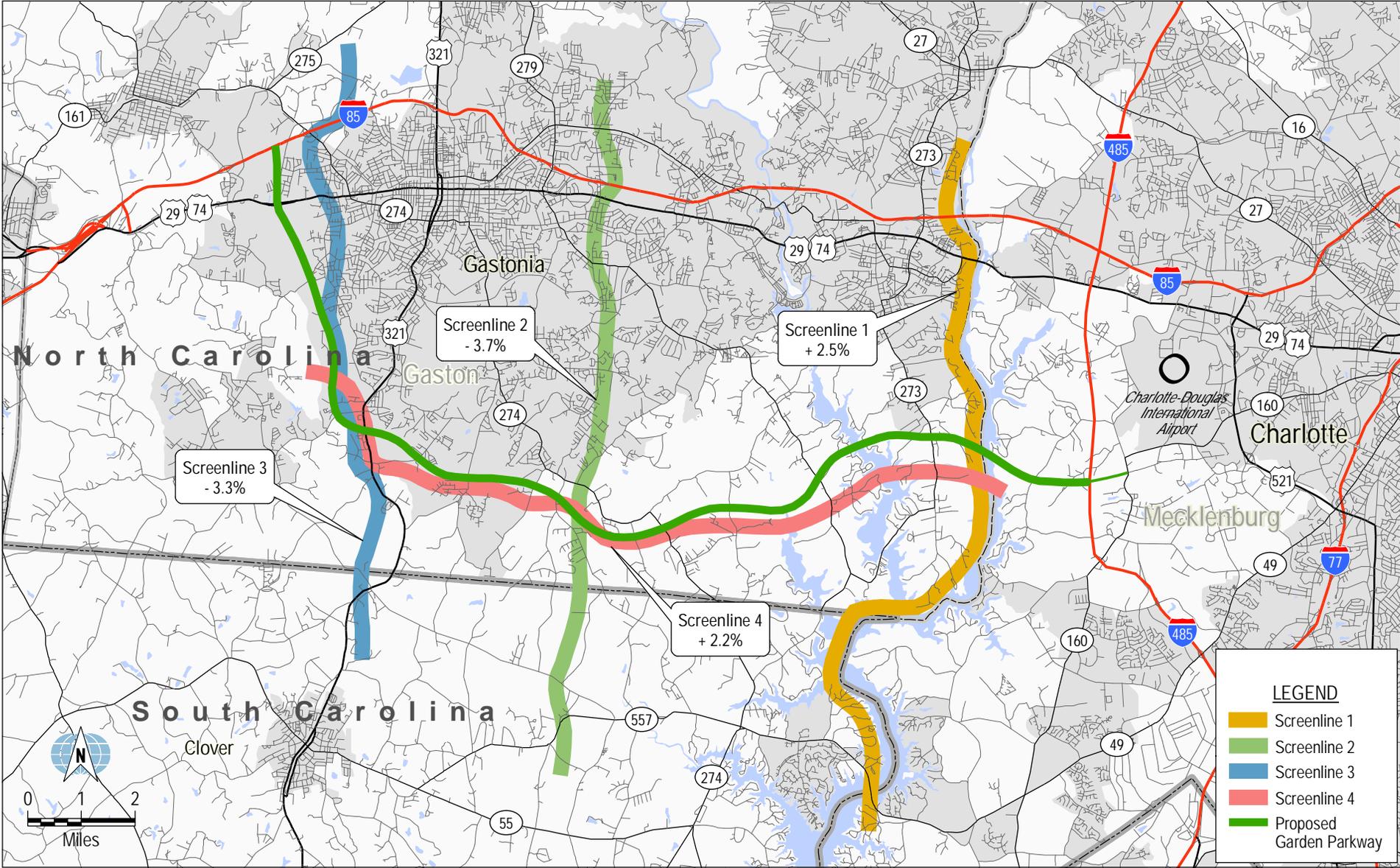
Three standard steps – trip generation, distribution and mode choice – were performed in the modeling process based upon the revised socioeconomic data.

#### MODEL CALIBRATION

The model was calibrated for 2010 in the vicinity of the proposed Garden Parkway by comparing model results with observed traffic volumes and travel speeds. Screenline analyses in the study area resulted in adjustments to travel speeds and trip tables for some movements in order to calibrate the model in the Garden Parkway corridor. Figure 6-2 illustrates how the final aggregate volume across each screenline in the calibrated model compares against the traffic counts. As shown, differences ranged from calibrated volumes that were 2.5 percent above aggregate counts at Screenline 1, to model volumes 3.7 percent below the counts at Screenline 2.

#### VEHICLE OPERATING COST

Updates were made to the assumed operating costs of passenger vehicles and trucks using available data from AAA and other sources. Vehicle operating costs (VOC) reflected an average gasoline price of approximately



PERCENT DIFFERENCE BETWEEN CALIBRATED  
SCREENLINE VOLUMES AND COUNTS

\$3.00 per gallon<sup>(2)</sup>, inflated by 2.5 percent annually for future-year costs. Note that this value is meant to represent average prices and not short-term market volatility.

#### VALUE OF TIME

Estimates of the value of time (VOT) were calculated using updated median income information at the TAZ level and results of the stated preference survey described in Chapter 4. Values of time differed by trip purpose and TAZ. The overall average VOT for passenger cars was \$0.174 per minute in the opening year (2016).

#### TRAFFIC DIVERSION ANALYSIS

Following calibration of the model, a series of traffic assignments were generated for 2016, 2025, and 2035 under no build, toll-free, and tolled conditions. Several toll rates were tested for 2016 and 2035 in order to estimate the optimum toll rates.

The toll diversion analysis was conducted using trips tables disaggregated by time period, trip purpose, vehicle type, and toll payment method. The diversion analysis process involves comparing travel time and distance for a trip path on the Garden Parkway with a path on the best toll-free alternative routes. The estimated traffic that would be expected to use the toll road is a function of travel time and distance savings, the assumed monetary value of these savings, and the toll rate being tested in any given assignment. In general, as the total costs to use the proposed toll road increase, estimated usage of the toll road decreases.

The model also recognizes capacity constraints on roadways. Speeds for future-year forecasts are calculated based on volume-to-capacity ratios and reflect increasing congestion over time on both the proposed toll facility and existing toll-free roads.

#### FISCAL YEAR CONVERSION

The forecasts for this study were initially performed on a calendar-year basis because the MRTDM parameters were also on a calendar-year basis. Forecasts were performed for an average weekday, then annualized to a calendar year. The annualized forecasts were then converted to a fiscal-year basis to conform to the NCTA's fiscal year which begins on July 1. The details of the conversion process are presented later in this chapter.

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<sup>(2)</sup> 2010 dollars based on average fuel price between April 2010 and April 2011 for the Lower Atlantic Region. U.S. Energy Information Administration (EIA).

#### REVENUE LEAKAGE AND FEE REVENUE

The travel demand toll models are used to prepare estimates of traffic and gross toll revenue. However, some revenue will not be collected for various reasons. The final step of the process is to estimate the amount of uncollected revenue and revenue collected from administrative fees and civil penalties associated with late payments and collection procedures.

#### BASIC ASSUMPTIONS

The traffic and revenue estimates for the Garden Parkway are predicated on the following basic assumptions, which are considered reasonable for purposes of the base case forecast:

1. The Garden Parkway will open to traffic by January 1, 2016, which is the beginning of the second half of Fiscal Year 2016;
2. The segment of the Garden Parkway between I-485 and US 321 will have two lanes in each direction, and the section from US 321 to I-85 will have one lane in each direction;
3. Tolls would be charged for three vehicle classes and two payment methods, and will be increased annually. The toll rates and tolling zone locations will be as shown later in this chapter;
4. No new toll-free facilities or additional capacity will be constructed during the projection period, other than those in the current Transportation Improvement Plan;
5. The system will operate in a cashless environment whereby both electronic toll collection (ETC) and video tolling (VTC) options will be available. Provisions will be made for drivers to pay with cash at off-site locations;
6. The breakdown between ETC and VTC payment methods will be as described later in this chapter;
7. Revenue leakage due to unreadable or uncollectible ETC or VTC transactions, or any transactions that cannot be processed and payment collected will occur. The leakage estimates contained in this report are dependent upon the selection of appropriate toll collection technology and the adoption of business rules and enforcement procedures designed to minimize the loss of revenue;

8. Economic growth in the project study area and associated travel demand will occur as forecast by the independent economist, as described in Chapter 5;
9. Inflation will average 2.5 percent per year over the forecast period;
10. The Garden Parkway will be well maintained, efficiently operated, effectively signed, and promoted to encourage maximum usage and to reach the assumed percentage goals for ETC and VTC usage;
11. Motor fuel will remain in adequate supply throughout the forecast period. Fuel prices are assumed to be approximately \$3.00 per gallon in 2010 dollars, and remain at that level, in real terms after adjustment for inflation, throughout the forecast period; and
12. No national or regional emergency will arise that would abnormally restrict the use of motor vehicles.

Any significant departure from these basic assumptions could materially affect traffic and revenue potential on the proposed Garden Parkway.

## FUTURE TRANSPORTATION IMPROVEMENTS

### ROADWAYS

Motorist behavior and the number of vehicles that would use the proposed Garden Parkway would be heavily influenced by the operating conditions on other area roadways in the study area. The process of transportation project development and funding makes it impossible to know with certainty which proposed transportation improvements will be implemented and when. However, it is important that reasonable assumptions are made regarding future improvements, since such improvements could have a considerable effect on the number of vehicles that would use the Garden Parkway.

The MRTDM contains all future highway improvements listed in the three MPOs' fiscally constrained 2035 transportation plans in effect at the time of the analysis. Table 6-1 lists the planned road improvements that could affect traffic volumes on the Garden Parkway. The improvements that would have the most significant impact on the operation of the toll road and the year that they are programmed in the MRTDM include:

- **Model Year 2016**
  - Several road widenings in the Garden Parkway corridor;
  - I-485 South widening;

- **Model Year 2025**
  - Improved access to the Charlotte-Douglas International Airport from the I-485 and the Garden Parkway;
  - Widening of Catawba River Bridge on US 29/74;
  - Several road widenings in the Garden Parkway corridor;
  - I-485 West widening
  - I-485 South widening;
  
- **Model Year 2035**
  - Several road widenings in the Garden Parkway corridor;

None of these highway improvements would compete directly with the proposed Garden Parkway except for the widening of US 29/74 at the Catawba River crossing because it would add capacity to one of the few river crossings. Other improvements could complement the proposed toll road by providing better access to the toll road interchanges.

#### **PUBLIC TRANSPORTATION**

Transit service is currently limited within the corridor providers, and no major changes are expected that could affect the proposed toll road.

#### **TOLL STRUCTURE**

The recommended toll structure was established for three vehicle classes. This study evaluated six combinations of vehicle class and toll rates in order to estimate the anticipated traffic and revenue for the Garden Parkway.

#### **VEHICLE CLASSES**

Three vehicle classes are recommended in order to simplify the toll structure for the public. The three vehicle classes are as follows:

- **Class 1, Two-axle Vehicles** – Included in this class are any two-axle vehicle regardless of the number of tires;
  
- **Class 2, Three-axle Vehicles** – Included in this class are vehicles with three axles including two-axle vehicles towing a single-axle trailer. Class 2 toll rates are two times the Class 1 rates; and
  
- **Class 3, Four- or More-axle Vehicles** – Included in this class are vehicles with four or more axles, including two-axle vehicles towing a two-axle trailer. Class 3 toll rates are four times the Class 1 rates.

**Table 6-1  
Major Highway Improvements Contained in  
Metrolina Regional Travel Demand Model (MRTDM)**

Name and Location	Project Description	Model Year
Gastonia; NC 1136 (Myrtle School Road)	US 29-74 to NC 1255 (Hudson Boulevard) - Widen to 3 lanes	2015
Mount Holly; NC 273 (South Main Street)	South of Catawba Drive to Highland Street at Rankin Avenue - Widen to 4 lanes	2015
Dixie River Road/NC 160 Connector	Dixie River Road to NC 160 - New road (2 lanes)	2015
Titman/Cramerton Road	South New Hope Road (NC 274) to Wilkinson - Widen to 4 lanes	2015
Gastonia; New Hope Road (NC 279)	Burtonwood Drive to Armstrong Park Drive - 4-Lane divided	2015
NC 279	Robinson Clemmer Road to NC 275 - Widen to 4	2015
NC 279 Widening	Old US 321 to Costner School Road - Widen to 4-Lane divided	2015
NC 279 Widening	Cherryville Road to Sun Beam Farm Road - Widen to 4-Lane divided	2015
Belmont-Mt. Holly North Loop	Catawba River to NC 273 East of Mt. Holly - 4-Lane new location	2015
I-485	NC 115 to I-85 (R-2248E) - New freeway (8 lanes)	2015
Little Rock Road Relocation	Flintrock Road to Freedom Drive - New road (4	2015
NC 160 (West Boulevard)	Steele Creek Road to I-485(W) - New road (2 lanes)	2015
I-485 South	I-77 to Johnston Road - Widen to 4 lanes	2015
I-85 / I-485	Interchange - Construct new interchange	2015
NC 274 (Gastonia	Maine Ave to NC 275 - Widen to 4 lanes	2015
Cox Road	I-85 to Franklin (US 29/74) - Widen to 6-Lane divided	2015
I-85/US 321 Interchange Improvements	I-85 and US 321, Gastonia - Interchange reconfiguration	2025
NC 160 (West Boulevard)	Yorkmont Drive to Steele Creek Road - New road (4 lanes), bike lanes	2025
NC 160 (West Boulevard)	Yorkmont Drive to Airport Drive - New road (4 lanes),	2025
Dallas; US 321	Ratchford Drive - Interchange	2025
Gastonia; Linwood Road	Garden Parkway/US 29-74/NC 274 (Franklin Boulevard) - Widen to 3-lanes	2025
Belmont; NC 7	I-85 to US 29-74 - Widen to 4 lanes	2025
Gastonia; Union Road (NC 274)	Robinson Road to Beaty Road - 5-lane and new 4-lane divided	2025

(continued)

**Table 6-1 (cont'd.)  
Major Highway Improvements Contained in  
Metrolina Regional Travel Demand Model (MRTDM)**

Name and Location	Project Description	Model Year
US 29/74 South Fork River Bridge	Market Avenue to Albert Avenue) - Widen to 6-lanes	2025
Catawba River Bridge	Catawba Street (NC 7) to East bank of Catawba River - Widen to 6-lanes	2025
Cramerton; South New Hope Road (NC 279)	Titman Road to Union-New Hope Road - Widen to 4-lane divided	2025
Gastonia; York Road (US Belmont-Mt. Holly Central	Hudson Boulevard to Beam Avenue - Widen to 4-Segment between Northern and Central Loop - 4-	2025
Clanton Road Extension	West Boulevard to Wilkinson Boulevard - New road (2 lanes, median, bike lanes	2025
Gilead Road	US 21 to NC 115 - Widen to 4 lanes, bike lanes	2025
I-485	NC 16 (Providence Rd) to US 74 - Widen to 6 lanes	2025
I-485	Johnston Road to NC 16 (Providence Road) - Widen to 6 lanes	2025
NC 115 (Old Statesville Road)	Potts Street to county line - Widen to 4 lanes, median, bike lanes	2025
NC 115 (Old Statesville Road)	Bailey Road to Potts Street - Widen to 4 lanes	2025
Northeast Parkway Extension	New NC 51 to Old NC 51 - New 2 lanes, bike lanes	2025
NC 160 (West Boulevard)	Steele Creek Road to I-485(W) - Widen to 4 lanes, median	2025
I-485	I-77 to Johnston Road - Widen to 6 lanes, Johnston Road flyover	2035
Belmont-Mt. Holly Loop (Cental Segment)	Wilkinson Boulevard to Mt. Holly Connector/Loop Link - 4-lanes divided new location	2035
Lowell-Bethesda Road/Beaty Road	South New Hope Road to Westover Street - Widen to 4-Lane divided	2035
Lowell-Bethesda Road/Groves St Connector	Lowell-Bethesda Rd to 29/74 (Wilkinson) to Groves St - 4-Lane divided with bridge over RR and new	2035

#### COLLECTION METHODS

Toll rates for the Garden Parkway would be established for two collection methods – ETC and VTC. These two methods, in the absence of a cash option, are also collectively referred to as All Electronic Tolling (AET):

***Electronic Toll Collection*** – This toll rate is based on the use of an electronic transponder or tag, which identifies the vehicle as it passes through each tolling zone and debits the user’s account accordingly. ETC is the preferred method for toll collection on the project. ETC is considered highly reliable and is the most convenient and economical method for collecting tolls. It is expected that ETC will be strongly promoted by NCTA. The ETC toll rate will be the base rate upon which other rates are set. The ETC toll rate will be 35 percent lower than the VTC rate because of the additional costs associated with VTC.

***Video Toll Collection*** – This toll rate is based on the use of digital video technology to capture an image of the license plate as the vehicle passes through each tolling zone. Motorists that use the VTC payment method will not receive the 35 percent discount that is offered to ETC patrons.

With VTC, toll road users that do not register for an ETC account will be identified through license plate video imaging and vehicle registration information provided by the North Carolina Division of Motor Vehicles and corresponding agencies in other states. These non-registered users will be considered potential customers and provided an opportunity to pay before they are assessed any fees or penalties. The NCTA will not collect cash payments for tolls on the Garden Parkway. However, cash payments will be accepted at a designated location in the vicinity of the toll facility where drivers may also open an ETC account prior to using the facility.

#### TOLL COLLECTION PERCENTAGES BY COLLECTION METHOD

Table 6-2 shows the model input assumptions of ETC users and VTC users for each modeling year. These “input percentages” are shown separately for Class 1 vehicles and Class 2 and 3 vehicles. The input percentages were used as a starting point in apportioning the total number of trips into theoretical market shares, and represent potential users of the facility, rather than those that ultimately choose to use the Garden Parkway. It is expected that the actual breakdown between ETC and VTC payment methods will differ from the input percentages. Specifically, since VTC users would be subjected to higher toll rates than ETC users, the “output percentage” of VTC users would be expected to decrease as compared with the input percentage. Conversely, the proportion of actual users on the Garden Parkway with ETC is expected to be higher than the nominal input assumptions. As shown in the table, it is also assumed that the ETC percentage will increase over time, as a result of aggressive marketing of the

payment method and increasing adoption of ETC both in North Carolina and nationwide.

**Table 6-2  
Toll Collection Percentages of Total Transactions  
Garden Parkway**

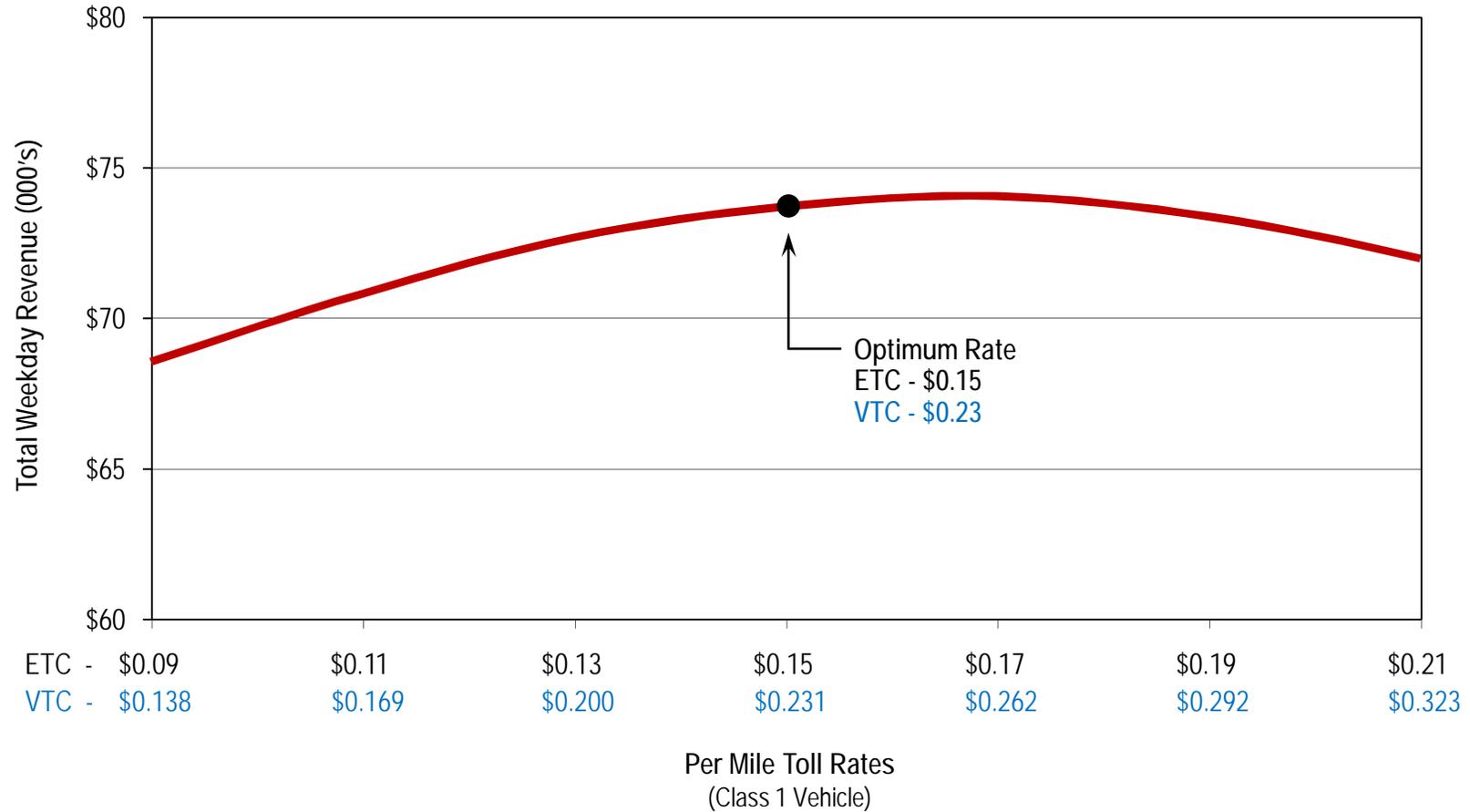
Year	Model Input Assumptions Class 1 Vehicles		Video After Diversion Analysis	Model Input Assumptions Class 2 and 3 Vehicles		Video After Diversion Analysis
	ETC	VTC		ETC	VTC	
2016	65.0%	35.0%	28.8%	85.0%	15.0%	10.0%
2020	75.0%	25.0%	22.4%	89.0%	11.0%	6.5%
2025	81.0%	19.0%	15.4%	89.0%	11.0%	6.8%
2030	84.0%	16.0%	13.5%	89.0%	11.0%	7.1%
2035	84.0%	16.0%	12.4%	89.0%	11.0%	7.0%

## TOLL RATE SENSITIVITY

Figure 6-3 shows the 2016 Class 1 vehicle toll sensitivity curve for ETC and VTC assuming the entire toll road was in operation. This year was used to determine the optimum base case per-mile toll rate, which is the ETC rate for Class 1 vehicles. Note that the effective rate-per-mile for some movements is actually greater than the rate selected in the toll sensitivity analysis. This is due to several tolling zones that have minimum tolls as well as the addition of a premium placed on the tolling zone that includes the Catawba River crossing.

As shown in the figure, the selected base-case ETC toll rate for a Class 1 vehicle traveling the full length of the toll road would be approximately \$0.15 per mile. The VTC rate for a Class 1 vehicle would be \$0.23 per mile. Tolls for ETC-equipped vehicles would be deducted from the owner's account as the vehicle passes through each toll collection zone. Tolls collected in each zone would be based on the length of that segment.

The base toll rate is set slightly below the rate which would maximize toll revenue in order to provide a limited "margin of safety" for setting future rates. Rates were assumed to increase annually as discussed later in this chapter. Table 6-3 compares the ETC toll rate for the Garden Parkway in 2016 with toll rates for ETC at other comparable toll road facilities. At \$0.181 per mile for a through trip, the Garden Parkway ETC rate for Class 1 vehicles would be slightly above the average ETC rates for comparable urban toll roads, which is \$0.157 per mile. Note that in this table the opening-year 2016 rates are being compared to current toll rates on the listed



**Table 6-3  
Comparison of Per-mile ETC Toll Rates for Select Urban Toll Roads  
Passenger Vehicles**

Agency and Facility Name	Length (Miles)	ETC Toll <sup>(1)</sup>	Cost/ Mile
Harris County Toll Road Authority (Houston, TX) - Fort Bend Parkway	7.5	\$2.55	\$0.340
Transportation Corridor Agencies (Orange County, CA) - San Joaquin Hills Tollway (SR 73)	15.0	\$5.00	\$0.333
Northwest Parkway, LLC (Denver, Co) - Northwest Parkway	10.0	\$3.10	\$0.310
Transportation Corridor Agencies (Orange County, CA) - Route 261	6.0	\$1.60	\$0.267
E-470 Public Highway Authority (Denver, CO) - E-470 Tollway	47.0	\$11.75	\$0.250
Transportation Corridor Agencies (Orange County, CA) - Route 241	24.5	\$6.00	\$0.245
Texas Tollways (Austin, TX) - Loop 1	3.0	\$0.68	\$0.227
Orlando-Orange County Expressway Authority - John Land Apoka Expressway (SR 414)	5.0	\$1.00	\$0.200
Harris County Toll Road Authority (Houston, TX) - Westpark Tollway	19.0	\$3.80	\$0.200
Miami-Dade Expressway Authority - Gragny Parkway (SR 924)	5.4	\$1.00	\$0.185
<b>North Carolina Turnpike Authority - Garden Parkway</b>	<b>20.9</b> <sup>(3)</sup>	<b>\$3.79</b>	<b>\$0.181</b>
Central Texas Regional Mobility Authority (Austin, TX) - 183A Toll	11.6	\$2.00	\$0.172
Tampa-Hillsborough Expressway Authority - Lee Roy Selmon Crosstown Expressway	15.0	\$2.50	\$0.167
Orlando-Orange County Expressway Authority - East-West Expressway (SR 408)	22.1	\$3.50	\$0.158
North Carolina Turnpike Authority - Triangle Expressway (Under Construction)	17.8	\$2.72	\$0.153
Harris County Toll Road Authority (Houston, TX) - Sam Houston Tollway	70.0	\$10.60	\$0.151
North Texas Tollway Authority (Dallas, TX) - President George Bush Turnpike (PGBT)	30.5	\$4.58	\$0.150
North Texas Tollway Authority (Dallas, TX) - Dallas North Tollway (DNT)	32.0	\$4.62	\$0.144
Miami-Dade Expressway Authority - Don Shula (South Dade) Expressway (SR 874)	7.0	\$1.00	\$0.143
Miami-Dade Expressway Authority - East-West Expressway (Dolphin) (SR 836)	14.0	\$2.00	\$0.143
Osceola County, FL - Osceola Parkway (SR 522)	12.4	\$1.75	\$0.141
North Texas Tollway Authority (Dallas, TX) - Sam Rayburn Tollway (SR 121)	26.0	\$3.60	\$0.138
Florida Turnpike Enterprise - Daniel Webster Western Beltway Part C (SR 429)	11.0	\$1.50	\$0.136
Texas Tollways (Austin, TX) - SH 45 Southeast	7.4	\$1.00	\$0.135
Harris County Toll Road Authority (Houston, TX) - Hardy Toll Road	21.1	\$2.60	\$0.123
Orlando-Orange County Expressway Authority - Daniel Webster Western Beltway (SR 429)	22.0	\$2.50	\$0.114
Orlando-Orange County Expressway Authority - Central Florida Greenway (SR 417)	36.0	\$4.00	\$0.111
Texas Tollways (Austin, TX) - SH 130	49.0	\$5.40	\$0.110
Texas Tollways (Tyler, TX) - Loop 49	7.0	\$0.75	\$0.107
Texas Tollways (Austin, TX) - SH 45	13.0	\$1.36	\$0.105
Orlando-Orange County Expressway Authority - Beachline Expressway (SR 528)	24.0	\$2.25	\$0.094
Florida Turnpike Enterprise (Orlando, FL) - Seminole Expressway (SR 417)	17.0	\$1.50	\$0.088
Florida Turnpike Enterprise (Tampa, FL) - Veterans Expressway (SR 589)	15.0	\$1.25	\$0.083
Florida Turnpike Enterprise (Broward County, FL) - Sawgrass Expressway (SR 869)	20.8	\$1.50	\$0.072
Average of Other Agencies (Excludes North Carolina Turnpike Authority)			\$0.157

<sup>(1)</sup> Tolls for peak conditions.

<sup>(2)</sup> 2013 ETC rates  
Maximum distance from NC 147 at I-40 to NC 55 Bypass at Holly Springs

<sup>(2)</sup> 2016 ETC rates  
Maximum distance from I-485 to I-85

Source: Toll Agency Web Sites

facilities. It is probable that some of the listed facilities will raise their rates between now and 2016. As previously discussed, the effective rate of \$0.181 per mile for a through trip is higher than the optimum rate of \$0.15 per mile shown in the sensitivity curve, due to the imposition of minimum tolls for some segments, as well as the premium charged at the Catawba River crossing.

## RECOMMENDED TOLL RATES BY LOCATION

The nine proposed mainline tolling zones are between each pair of interchanges, as follows:

- Between I-485 and Dixie River Road;
- Between Dixie River Road and NC 273, South Point Road;
- Between NC 273, South Point Road and NC 279;
- Between NC 279 and NC 274;
- Between NC 274 and Robinson Road;
- Between Robinson Road and US 321;
- Between US 321 and Hudson Boulevard;
- Between Hudson Boulevard and US 29/74; and
- Between US 29/74 and I-85.

Table 6-4 shows annual ETC and VTC rates for Class 1 vehicles for each tolling zone from the opening year through 2035. Since the Garden Parkway will operate as a cashless toll collection system, tolls can be increased relatively easily. In the preliminary study, tolls were assumed to increase every five years beginning in 2015. However, in the current study, small annual increases in toll rates are assumed, rather than larger increases every five years.

All of the toll rates for each tolling zone are based on a per-mile rate, subject to a \$0.31 minimum toll per zone, with the exception of Tolling Zone 2, where an additional premium is charged to cross the Catawba River. This premium, set at \$0.60 for passenger cars in 2016, and proportionally higher for other vehicle classes, reflects the high capital cost associated with constructing a major new river crossing, as well as the limited options for toll-free alternatives for this particular segment.

Toll rates for other categories of vehicles were established as multiples of the Class 1 ETC rates shown in Table 6-4. A Class 2 vehicle would be charged a rate double the Class 1 vehicle rate; and a Class 3 vehicle would be charged four times the Class 1 vehicle rate. ETC rates would be at a 35 percent discount over the VTC rates for all classes.

Table 6-4  
Recommended Annual Toll Rates by Tolling Zone  
Class 1 - ETC and VTC  
Garden Parkway  
April 14, 2011

Year	Mainline 1, I-485 - Dixie River Road		Mainline 2, Dixie River Road - NC 273, South Point Road		Mainline 3, NC 273, South Point Road - NC 279, South New Hope Road		Mainline 4, NC 279, South New Hope Road - NC 274, Union Road		Mainline 5, NC 274, Union Road - Robinson Road		Mainline 6, Robinson Road - US 321		Mainline 7, US 321 - Hudson Boulevard		Mainline 8, Hudson Boulevard - US 2974, Franklin Boulevard		Mainline 9 US 2974, Franklin Road - I-85		Maximum Toll	
	ETC	VTC	ETC	VTC	ETC	VTC	ETC	VTC	ETC	VTC	ETC	VTC	ETC	VTC	ETC	VTC	ETC	VTC	ETC	VTC
2016	\$0.31	\$0.47	\$0.91	\$1.40	\$0.31	\$0.47	\$0.43	\$0.66	\$0.51	\$0.78	\$0.31	\$0.47	\$0.39	\$0.60	\$0.31	\$0.47	\$0.31	\$0.47	\$3.79	\$5.79
2017	\$0.32	\$0.49	\$0.94	\$1.44	\$0.44	\$0.67	\$0.44	\$0.67	\$0.53	\$0.81	\$0.32	\$0.49	\$0.40	\$0.61	\$0.32	\$0.49	\$0.32	\$0.49	\$3.91	\$5.96
2018	\$0.33	\$0.50	\$0.97	\$1.49	\$0.45	\$0.69	\$0.45	\$0.69	\$0.55	\$0.84	\$0.33	\$0.50	\$0.41	\$0.63	\$0.33	\$0.50	\$0.33	\$0.50	\$4.03	\$6.15
2019	\$0.34	\$0.52	\$1.00	\$1.53	\$0.47	\$0.72	\$0.47	\$0.72	\$0.57	\$0.87	\$0.34	\$0.52	\$0.42	\$0.64	\$0.34	\$0.52	\$0.34	\$0.52	\$4.16	\$6.36
2020	\$0.35	\$0.53	\$1.03	\$1.58	\$0.49	\$0.75	\$0.49	\$0.75	\$0.59	\$0.90	\$0.35	\$0.53	\$0.43	\$0.66	\$0.35	\$0.53	\$0.35	\$0.53	\$4.29	\$6.54
2021	\$0.36	\$0.55	\$1.06	\$1.63	\$0.51	\$0.78	\$0.51	\$0.78	\$0.61	\$0.93	\$0.36	\$0.55	\$0.44	\$0.67	\$0.36	\$0.55	\$0.36	\$0.55	\$4.42	\$6.76
2022	\$0.37	\$0.56	\$1.09	\$1.67	\$0.53	\$0.81	\$0.53	\$0.81	\$0.63	\$0.96	\$0.37	\$0.56	\$0.45	\$0.67	\$0.37	\$0.56	\$0.37	\$0.56	\$4.56	\$6.94
2023	\$0.38	\$0.58	\$1.12	\$1.72	\$0.55	\$0.84	\$0.55	\$0.84	\$0.65	\$1.00	\$0.38	\$0.58	\$0.46	\$0.70	\$0.38	\$0.58	\$0.38	\$0.58	\$4.70	\$7.19
2024	\$0.39	\$0.60	\$1.15	\$1.76	\$0.57	\$0.87	\$0.57	\$0.87	\$0.67	\$1.03	\$0.39	\$0.60	\$0.48	\$0.73	\$0.39	\$0.60	\$0.39	\$0.60	\$4.84	\$7.42
2025	\$0.40	\$0.61	\$1.20	\$1.84	\$0.58	\$0.89	\$0.58	\$0.89	\$0.68	\$1.04	\$0.40	\$0.61	\$0.50	\$0.76	\$0.40	\$0.61	\$0.40	\$0.61	\$5.01	\$7.66
2026	\$0.41	\$0.63	\$1.24	\$1.90	\$0.60	\$0.92	\$0.60	\$0.92	\$0.70	\$1.07	\$0.41	\$0.63	\$0.53	\$0.81	\$0.41	\$0.63	\$0.41	\$0.63	\$5.16	\$7.91
2027	\$0.42	\$0.64	\$1.28	\$1.96	\$0.62	\$0.95	\$0.62	\$0.95	\$0.72	\$1.10	\$0.42	\$0.64	\$0.55	\$0.84	\$0.42	\$0.64	\$0.42	\$0.64	\$5.31	\$8.11
2028	\$0.43	\$0.66	\$1.32	\$2.03	\$0.64	\$0.98	\$0.64	\$0.98	\$0.74	\$1.13	\$0.43	\$0.66	\$0.57	\$0.87	\$0.43	\$0.66	\$0.43	\$0.66	\$5.46	\$8.37
2029	\$0.44	\$0.67	\$1.36	\$2.09	\$0.66	\$1.01	\$0.66	\$1.01	\$0.76	\$1.16	\$0.44	\$0.67	\$0.59	\$0.90	\$0.44	\$0.67	\$0.44	\$0.67	\$5.61	\$8.57
2030	\$0.45	\$0.69	\$1.40	\$2.15	\$0.68	\$1.04	\$0.68	\$1.04	\$0.78	\$1.20	\$0.45	\$0.69	\$0.61	\$0.93	\$0.45	\$0.69	\$0.45	\$0.69	\$5.76	\$8.83
2031	\$0.46	\$0.70	\$1.44	\$2.21	\$0.70	\$1.07	\$0.70	\$1.07	\$0.80	\$1.23	\$0.46	\$0.70	\$0.63	\$0.96	\$0.46	\$0.70	\$0.46	\$0.70	\$5.91	\$9.04
2032	\$0.47	\$0.72	\$1.48	\$2.27	\$0.72	\$1.10	\$0.72	\$1.10	\$0.82	\$1.27	\$0.47	\$0.72	\$0.65	\$1.00	\$0.47	\$0.72	\$0.47	\$0.72	\$6.07	\$9.30
2033	\$0.48	\$0.73	\$1.53	\$2.35	\$0.74	\$1.13	\$0.74	\$1.13	\$0.86	\$1.32	\$0.48	\$0.73	\$0.67	\$1.03	\$0.48	\$0.73	\$0.48	\$0.73	\$6.25	\$9.56
2034	\$0.49	\$0.75	\$1.58	\$2.43	\$0.76	\$1.16	\$0.76	\$1.16	\$0.89	\$1.36	\$0.49	\$0.75	\$0.71	\$1.09	\$0.49	\$0.75	\$0.49	\$0.75	\$6.43	\$9.85
2035	\$0.52	\$0.80	\$1.62	\$2.49	\$0.79	\$1.21	\$0.79	\$1.21	\$0.93	\$1.43	\$0.53	\$0.81	\$0.73	\$1.12	\$0.52	\$0.80	\$0.52	\$0.80	\$6.73	\$10.33

**Note:**  
Class 2 tolls are two times the Class 1 video tolls.  
Class 3 tolls are four times the Class 1 video tolls.

Figure 6-4 graphically displays the base ETC toll rates in 2016 and 2035 at each tolling zone location for Class 1, Class 2 and Class 3 vehicles. The opening-year ETC toll for a full-length trip through nine tolling zones on the Garden Parkway would be \$3.79 for Class 1 vehicles, rising to \$6.73 by 2035.

Similarly, Figure 6-5 illustrates the VTC toll rates for Class 1 vehicles by location for 2016 and 2035. The 2016 VTC rate for a full-length trip would be \$5.79, rising to \$10.33 by 2035.

All rates are in future-year dollars; that is, there would be no further increase for inflation beyond the rates indicated. The increase in tolls between the opening year and the later years of operation is slightly greater than the direct effect of inflation, reflecting the opportunity for some level of “real increase” in rates based on significant increases in projected traffic demand in future years..

## ESTIMATED WEEKDAY TRAFFIC VOLUMES

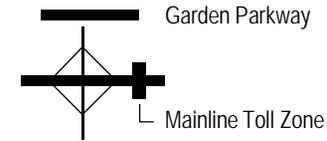
Estimates of weekday traffic volumes in 2016, 2025, and 2035 are shown in Figure 6-6. The opening year highest volume on the Parkway is estimated to occur between I-485 and Dixie River Road, where the opening year traffic is estimated to be 27,000 vehicles per day. The lowest daily volume is expected at the western terminus of the Parkway, between US 29/74 and I-85, with 5,800 vehicles per day. As illustrated on the figure, the daily volumes generally decrease steadily from east to west, with the exception of a considerable uptick in the segment between Hudson Boulevard and US 29/74. The traffic volumes shown do not reflect downward “ramp-up” adjustments, which are incorporated later in the annual forecasts.

In 2035, the maximum traffic section for the Parkway is still expected to be between I-485 and Dixie River Road, where volumes are forecasted to reach 48,000 vehicles per day.

Table 6-5 illustrates the market shares of traffic on major roadways in the project corridor, including the Garden Parkway, traveling across the three previously described east-west screenlines. As shown, the Garden Parkway’s market share is expected to range from 4.4 percent to 11.4 percent across the three screenlines in 2016. By 2035, Garden Parkway market share is expected to rise across all three screenlines, ranging from 6.2 percent to 15.2 percent of traffic.

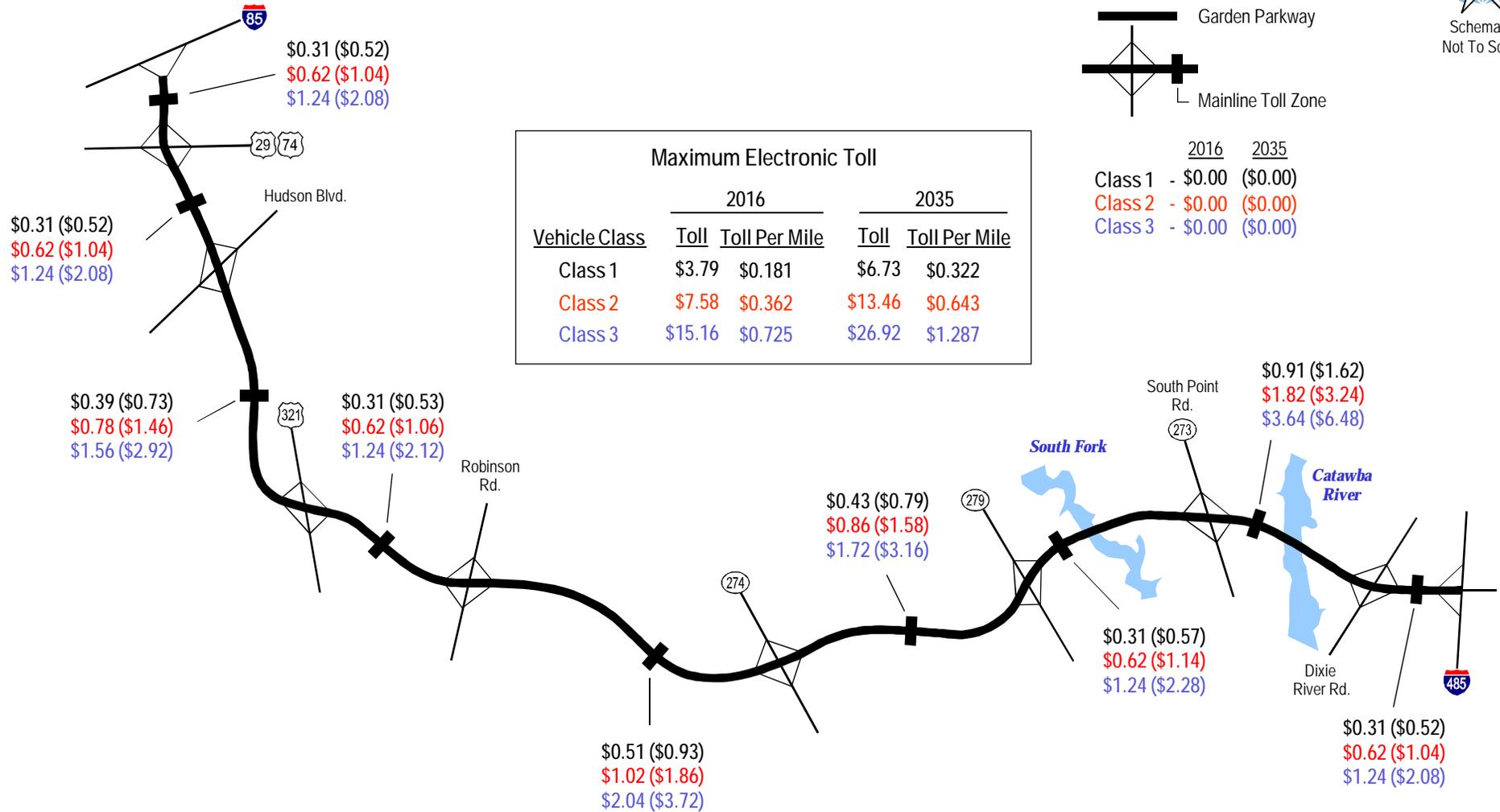


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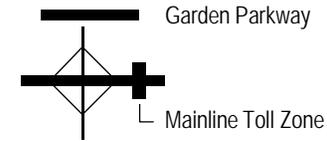
	2016	2035
Class 1	- \$0.00	(\$0.00)
Class 2	- \$0.00	(\$0.00)
Class 3	- \$0.00	(\$0.00)

Vehicle Class	2016		2035	
	Toll	Toll Per Mile	Toll	Toll Per Mile
Class 1	\$3.79	\$0.181	\$6.73	\$0.322
Class 2	\$7.58	\$0.362	\$13.46	\$0.643
Class 3	\$15.16	\$0.725	\$26.92	\$1.287



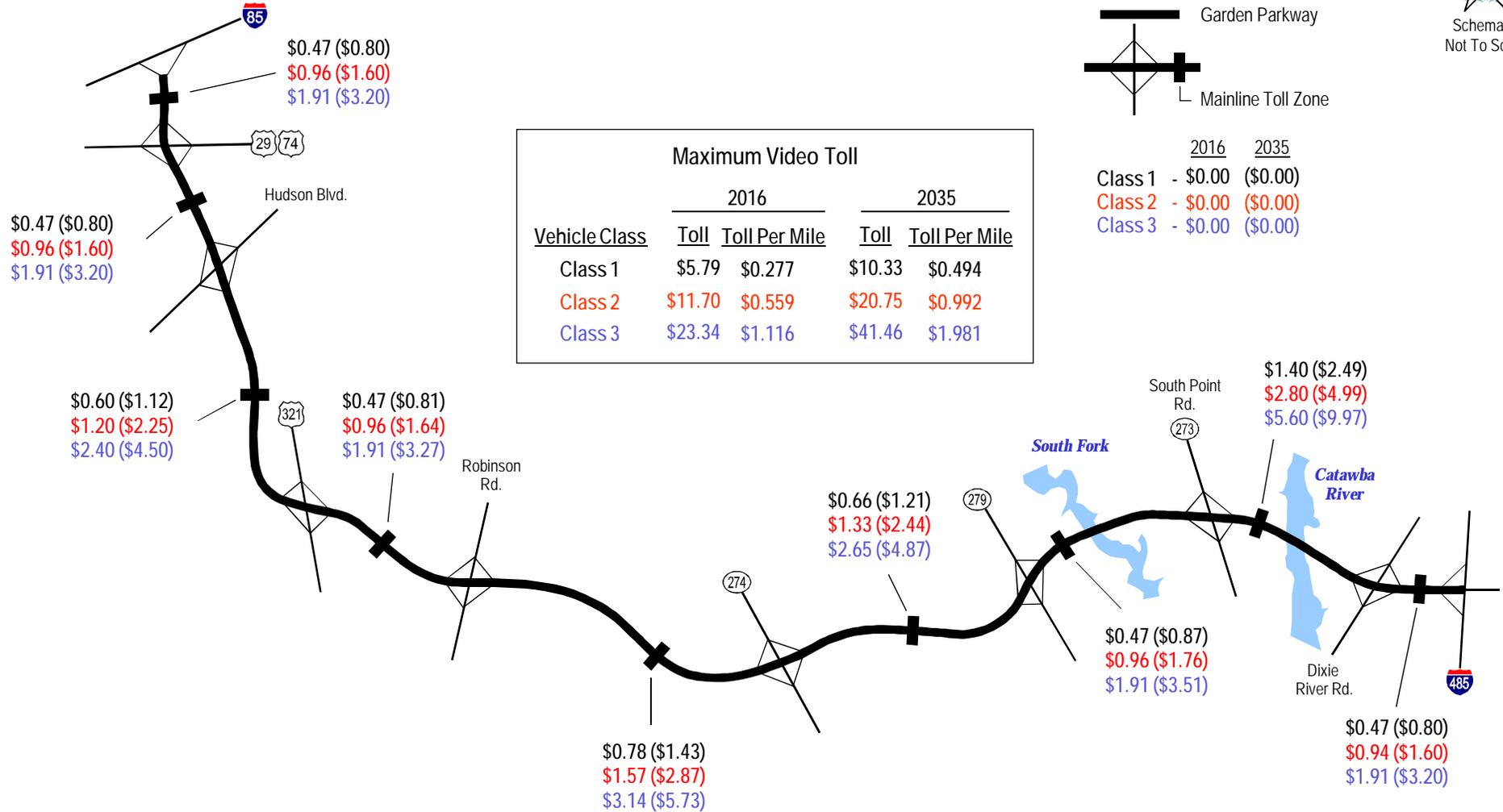


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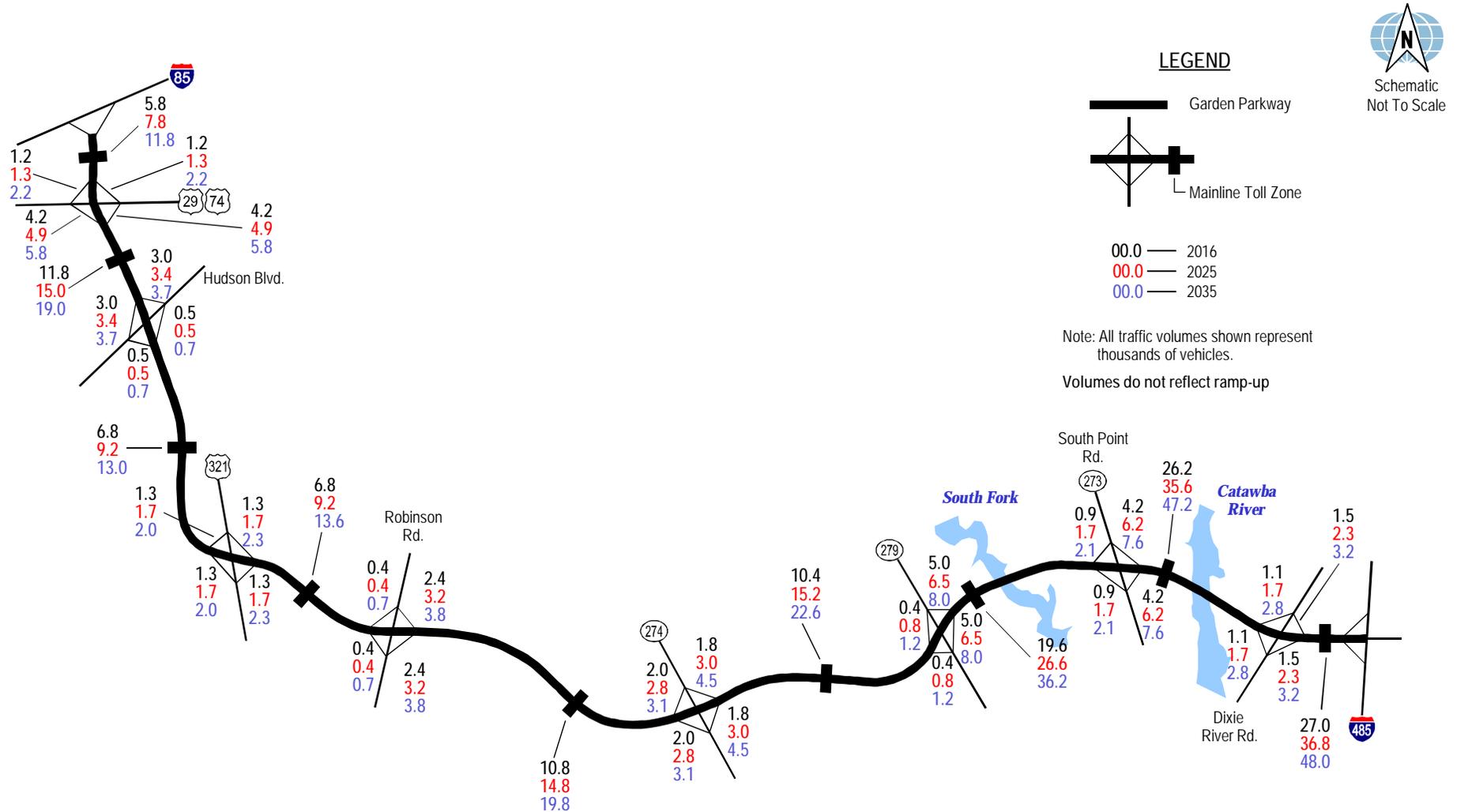


	2016	2035
Class 1	- \$0.00	(\$0.00)
Class 2	- \$0.00	(\$0.00)
Class 3	- \$0.00	(\$0.00)

Vehicle Class	2016		2035	
	Toll	Toll Per Mile	Toll	Toll Per Mile
Class 1	\$5.79	\$0.277	\$10.33	\$0.494
Class 2	\$11.70	\$0.559	\$20.75	\$0.992
Class 3	\$23.34	\$1.116	\$41.46	\$1.981



# Proposed Garden Parkway Comprehensive Traffic and Revenue Study



**Table 6-5  
Market Share of Total Weekday Screenline Volumes**

Route	2010		2016		2025		2035	
	Traffic	Market Share						
<b>Screenline 1: East-West Roads that Cross the Catawba River</b>								
I 85 bridge	135,500	72.5%	146,200	63.4%	164,400	60.8%	181,000	58.3%
Wilkinson Blvd Bridge	21,100	11.3%	27,000	11.7%	34,300	12.7%	44,100	14.2%
<b>GARDEN PARKWAY</b>	---	---	<b>26,200</b>	<b>11.4%</b>	<b>35,600</b>	<b>13.2%</b>	<b>47,200</b>	<b>15.2%</b>
Charlotte Highway bridge	30,400	16.3%	31,300	13.6%	35,900	13.3%	38,300	12.3%
<b>Total Screen Line</b>	<b>187,000</b>	<b>100.0%</b>	<b>230,700</b>	<b>100.0%</b>	<b>270,200</b>	<b>100.0%</b>	<b>310,600</b>	<b>100.0%</b>
<b>Screenline 2: Central East-West Roads</b>								
Lowell Road	8,500	4.1%	10,200	4.3%	11,800	4.3%	16,600	5.4%
I 85	120,400	57.4%	127,300	53.7%	143,200	52.0%	155,100	50.1%
E Franklin Blvd	18,200	8.7%	18,200	7.7%	19,400	7.0%	22,100	7.1%
S New Hope Road	18,200	8.7%	18,200	7.7%	22,700	8.2%	20,800	6.7%
E Hudson Blvd	9,900	4.7%	12,600	5.3%	15,000	5.4%	16,400	5.3%
Hoffman Road	9,100	4.3%	11,300	4.8%	14,700	5.3%	20,300	6.6%
Kendrick Road	4,900	2.3%	6,100	2.6%	6,800	2.5%	8,700	2.8%
union Road	7,600	3.6%	9,000	3.8%	12,200	4.4%	14,100	4.6%
<b>GARDEN PARKWAY</b>	---	---	<b>10,800</b>	<b>4.6%</b>	<b>14,800</b>	<b>5.4%</b>	<b>19,800</b>	<b>6.4%</b>
Ridge Road	4,600	2.2%	4,900	2.1%	5,600	2.0%	6,400	2.1%
SC 557	8,200	3.9%	8,500	3.6%	9,100	3.3%	9,300	3.0%
<b>Total Screen Line</b>	<b>209,600</b>	<b>100.0%</b>	<b>237,100</b>	<b>100.0%</b>	<b>275,300</b>	<b>100.0%</b>	<b>309,600</b>	<b>100.0%</b>
<b>Screenline 3: Western East-West Roads</b>								
I 85	93,700	66.5%	99,200	64.4%	112,400	63.0%	130,700	62.2%
Bessemer City Road	18,200	12.9%	17,600	11.4%	19,400	10.9%	20,900	9.9%
W Franklin Blvd	19,300	13.7%	19,100	12.4%	23,000	12.9%	26,500	12.6%
Crowders Creek Road	6,200	4.4%	6,800	4.4%	8,300	4.6%	10,300	4.9%
<b>GARDEN PARKWAY</b>	---	---	<b>6,800</b>	<b>4.4%</b>	<b>9,200</b>	<b>5.2%</b>	<b>13,000</b>	<b>6.2%</b>
Crawford Road	1,600	1.1%	2,100	1.4%	2,900	1.6%	4,200	2.0%
Ferguson Ridge Road	1,900	1.3%	2,400	1.6%	3,300	1.8%	4,500	2.1%
<b>Total Screen Line</b>	<b>140,900</b>	<b>100.0%</b>	<b>154,000</b>	<b>100.0%</b>	<b>178,500</b>	<b>100.0%</b>	<b>210,100</b>	<b>100.0%</b>

## ANNUALIZATION AND RAMP-UP ESTIMATION PROCEDURES

Weekday traffic by vehicle class and payment method was estimated for each tolling zone and multiplied by the applicable toll rates to develop estimates of average weekday gross toll revenue. The weekday transaction and revenue estimates were then annualized and converted to fiscal years. The following sections describe the process in greater detail.

### FISCAL YEAR CONVERSION AND ANNUALIZATION

Because each new fiscal year begins on July 1, a full fiscal year consists of the second half of one calendar year and the first half of the following calendar year. Therefore, the first step in converting from calendar year to fiscal year forecasts was to divide the transaction and revenue forecasts for each calendar year in half, allocating one half to each fiscal year. Since the Garden Parkway will open in January 2016, the opening year transaction and revenue forecasts are for a half fiscal year. This process, shown in detail for FY 2016 in Table 6-6, yields annual forecasts of 20.0 million transactions and \$11.8 million in revenue, assuming no adjustments for ramp-up. This annualization assumes lower weekend and holiday traffic. For annualization purposes, it was assumed that average weekend and holiday traffic would be 60 percent of average weekday traffic. Accounting for this, the annualized traffic is equivalent to 319 times the average weekday traffic, before accounting for ramp-up.

### RAMP-UP ADJUSTMENT

The annualized forecast of transactions and revenues for FY 2016 was further adjusted to reflect ramp-up. Ramp-up is the phenomenon experienced on most start-up toll facilities in which initial traffic is suppressed, followed by high levels of growth over the first three years or so of operation as the public gradually becomes aware of and begins using the new facility.

There are a number of reasons for the ramp-up phenomenon. For example, not all motorists who will use the facility are from the local area, therefore it may take several months before certain travelers are aware that the roadway is there, or where it goes. It will also take several months for the project to begin appearing on new maps and for motorists to become accustomed to using the facility. The duration and level of ramp-up adjustments can be directly affected by a well-conceived promotion and signing program.

**Table 6-6  
Toll Transactions and Gross Toll Revenue Estimates, Fiscal Year 2016  
Garden Parkway**

Toll Zone	Class 1		Class 2		Class 3		Total
	ETC	VTC	ETC	VTC	ETC	VTC	
<b>Weekday Transactions - Calendar Year 2016</b>							
Mainline 1: I-485 - Dixie River Road	18,300	7,650	354	45	586	64	27,000
Mainline 2: Dixie River Road - NC 273, South Point Road	17,851	7,337	339	43	569	61	26,200
Mainline 3: NC 273, South Point Road - NC 279, South New Hope Road	13,439	5,368	218	26	498	51	19,600
Mainline 4: NC 279, South New Hope Road - NC 274, Union Road	7,190	2,694	125	13	345	33	10,400
Mainline 5: NC 274, Union Road - Robinson Road	7,344	2,869	157	18	374	38	10,800
Mainline 6: Robinson Road - US 321	4,626	1,725	120	13	289	27	6,800
Mainline 7: US 321 - Hudson Boulevard	4,504	1,731	179	20	330	36	6,800
Mainline 8: Hudson Boulevard - US 29/74, Franklin Boulevard	7,782	3,281	271	34	387	44	11,800
Mainline 9: US 29/74, Franklin Road - I-85	3,797	1,654	112	15	198	24	5,800
Weekday Total Transactions	84,833	34,309	1,875	227	3,576	378	125,200
<b>Toll - 2016</b>							
Mainline 1: I-485 - Dixie River Road	\$0.31	\$0.47	\$0.62	\$0.96	\$1.24	\$1.91	
Mainline 2: Dixie River Road - NC 273, South Point Road	\$0.91	\$1.40	\$1.82	\$2.80	\$3.64	\$5.60	
Mainline 3: NC 273, South Point Road - NC 279, South New Hope Road	\$0.31	\$0.47	\$0.62	\$0.96	\$1.24	\$1.91	
Mainline 4: NC 279, South New Hope Road - NC 274, Union Road	\$0.43	\$0.66	\$0.86	\$1.33	\$1.72	\$2.65	
Mainline 5: NC 274, Union Road - Robinson Road	\$0.51	\$0.78	\$1.02	\$1.57	\$2.04	\$3.14	
Mainline 6: Robinson Road - US 321	\$0.31	\$0.47	\$0.62	\$0.96	\$1.24	\$1.91	
Mainline 7: US 321 - Hudson Boulevard	\$0.39	\$0.60	\$0.78	\$1.20	\$1.56	\$2.40	
Mainline 8: Hudson Boulevard - US 29/74, Franklin Boulevard	\$0.31	\$0.47	\$0.62	\$0.96	\$1.24	\$1.91	
Mainline 9: US 29/74, Franklin Road - I-85	\$0.31	\$0.47	\$0.62	\$0.96	\$1.24	\$1.91	
<b>Weekday Gross Toll Revenue - Calendar Year 2016</b>							
Mainline 1: I-485 - Dixie River Road	\$5,673	\$3,596	\$219	\$43	\$727	\$122	\$10,380
Mainline 2: Dixie River Road - NC 273, South Point Road	16,244	10,272	617	120	2,071	342	29,666
Mainline 3: NC 273, South Point Road - NC 279, South New Hope Road	4,166	2,523	135	25	618	97	7,564
Mainline 4: NC 279, South New Hope Road - NC 274, Union Road	3,092	1,778	108	17	593	87	5,675
Mainline 5: NC 274, Union Road - Robinson Road	3,745	2,238	160	28	763	119	7,053
Mainline 6: Robinson Road - US 321	1,434	811	74	12	358	52	2,741
Mainline 7: US 321 - Hudson Boulevard	1,757	1,039	140	24	515	86	3,561
Mainline 8: Hudson Boulevard - US 29/74, Franklin Boulevard	2,412	1,542	168	33	480	84	4,719
Mainline 9: US 29/74, Franklin Road - I-85	1,177	777	69	14	246	46	2,329
Weekday Total Transactions	\$39,700	\$24,576	\$1,690	\$316	\$6,371	\$1,035	\$73,688

<b>Annualization Procedure <sup>(1)</sup> (Rounded to Thousands)</b>		
Annualization Factor: 319 days per year		
Period	Total Annual Transactions	Total Annual Gross Revenue
Calendar 2016	39,939,000	\$23,506,000
<b>Conversion to Fiscal Year (Rounded to Thousands)</b>		
Period	Total Transactions	Total Gross Revenue
Half of Calendar 2016	19,970,000	\$11,753,000
<b>Ramp-up Factors</b>		
Period	Total Transactions	Total Gross Revenue
January-June 2016	0.550	0.550
<b>2016 Transactions and Gross Revenue After Ramp-up</b>		
Fiscal Year 2016	Total Transactions	Total Gross Revenue
	10,984,000	\$6,464,000

<sup>(1)</sup> Excludes any allowance for uncollectible revenue

For purposes of this study, a 36-month ramp-up period was assumed. The nominal traffic and revenue estimates prepared for the opening three years are adjusted downward to reflect the time it will take to gradually build up demand. Table 6-7 shows the ramp-up factors by time period. Ramp-up factors were developed for monthly intervals and aggregated into six-month averages, to be applied to each of the half-year increments used in the conversion from calendar years to fiscal years.

**Table 6-7  
Ramp-up Factors  
Garden Parkway**

<b>Fiscal Year</b>	<b>Factor <sup>(1)</sup></b>	
	<b>July - December</b>	<b>January - June</b>
2016		0.550
2017	0.670	0.773
2018	0.854	0.915
2019	0.975	1.000

<sup>(1)</sup> Average 6-month factor applied to forecast of total traffic.

After application of these ramp-up factors, the Garden Parkway is estimated to have 11.0 million transactions and \$6.5 million in gross toll revenue in FY 2016 as shown in Table 6-6.

#### **FY 2025 AND FY 2035 TRANSACTIONS AND REVENUE**

Tables 6-8 and 6-9 show the anticipated transactions and gross toll revenue for FY 2025 and FY 2035, respectively, based on the weekly traffic estimates contained in Figure 6-6. In both of these cases, no ramp-up adjustments were made. The annualization factor of 319 days was also used in these future-year forecasts, based on the assumption that weekend and holiday traffic is 60 percent of weekday traffic.

### **ESTIMATED ANNUAL TOLL TRANSACTIONS AND REVENUE**

#### **GROSS TRANSACTIONS AND REVENUE**

Estimated annual toll transactions by vehicle class and year are shown in Table 6-10 and in Figure 6-7. Annual transactions are expected to increase from about 11.0 million in FY 2016 to 72.7 million by FY 2035. Traffic

**Table 6-8  
Toll Transactions and Gross Toll Revenue Estimates, Fiscal Year 2025  
Garden Parkway**

Toll Zone	Class 1		Class 2		Class 3		Total	Class 1		Class 2		Class 3		Total									
	ETC	VTC	ETC	VTC	ETC	VTC		ETC	VTC	ETC	VTC	ETC	VTC										
	Weekday Transactions - Calendar Year 2024												Weekday Transactions - Calendar Year 2025										
Mainline 1, I-485 - Dixie River Road	28,504	5,672	557	26	727	58	35,544	29,917	5,443	585	53	745	57	36,800									
Mainline 2, I-485 - Dixie River Road - NC 273, South Point Road	27,696	5,410	521	27	693	53	34,400	29,056	5,189	546	47	709	52	35,600									
Mainline 3, NC 273, South Point Road - NC 279, South New Hope Road	20,777	3,929	338	19	602	44	25,709	21,794	3,763	355	29	616	43	26,600									
Mainline 4, NC 279, South New Hope Road - NC 274, Union Road	11,813	2,097	205	13	437	30	14,595	12,465	2,025	216	16	449	29	15,200									
Mainline 5, NC 274, Union Road - Robinson Road	11,435	2,104	243	17	461	33	14,293	12,006	2,014	255	21	472	32	14,800									
Mainline 6, Robinson Road - US 321	7,095	1,241	175	13	349	23	8,896	7,437	1,186	183	14	357	23	9,200									
Mainline 7, US 321 - Hudson Boulevard	6,963	1,245	236	16	405	31	8,896	7,305	1,189	243	18	415	30	9,200									
Mainline 8, Hudson Boulevard - US 29/74, Franklin Boulevard	11,464	2,266	333	24	464	37	14,588	11,969	2,151	341	29	474	36	15,000									
Mainline 9, US 29/74, Franklin Road - I-85	5,911	1,203	147	13	251	22	7,547	6,205	1,152	152	13	257	21	7,800									
<b>Weekday Total Transactions</b>	<b>131,658</b>	<b>25,167</b>	<b>2,755</b>	<b>168</b>	<b>4,389</b>	<b>331</b>	<b>164,468</b>	<b>138,154</b>	<b>24,112</b>	<b>2,876</b>	<b>240</b>	<b>4,494</b>	<b>323</b>	<b>170,200</b>									
	<b>Toll - 2024</b>							<b>Toll - 2025</b>															
Mainline 1, I-485 - Dixie River Road	\$0.39	\$0.60	\$0.78	\$1.20	\$1.56	\$2.40		\$0.40	\$0.61	\$0.80	\$1.24	\$1.60	\$2.47										
Mainline 2, I-485 - Dixie River Road - NC 273, South Point Road	\$1.15	\$1.76	\$2.30	\$3.54	\$4.60	\$7.08		\$1.20	\$1.84	\$2.40	\$3.70	\$4.80	\$7.39										
Mainline 3, NC 273, South Point Road - NC 279, South New Hope Road	\$0.39	\$0.60	\$0.78	\$1.20	\$1.56	\$2.40		\$0.42	\$0.64	\$0.84	\$1.30	\$1.68	\$2.59										
Mainline 4, NC 279, South New Hope Road - NC 274, Union Road	\$0.57	\$0.87	\$1.14	\$1.76	\$2.28	\$3.51		\$0.58	\$0.89	\$1.16	\$1.79	\$2.32	\$3.57										
Mainline 5, NC 274, Union Road - Robinson Road	\$0.67	\$1.03	\$1.34	\$2.07	\$2.68	\$4.13		\$0.68	\$1.04	\$1.36	\$2.10	\$2.72	\$4.19										
Mainline 6, Robinson Road - US 321	\$0.39	\$0.60	\$0.78	\$1.20	\$1.56	\$2.40		\$0.40	\$0.61	\$0.80	\$1.24	\$1.60	\$2.47										
Mainline 7, US 321 - Hudson Boulevard	\$0.50	\$0.76	\$1.00	\$1.54	\$2.00	\$3.08		\$0.53	\$0.81	\$1.06	\$1.64	\$2.12	\$3.27										
Mainline 8, Hudson Boulevard - US 29/74, Franklin Boulevard	\$0.39	\$0.60	\$0.78	\$1.20	\$1.56	\$2.40		\$0.40	\$0.61	\$0.80	\$1.24	\$1.60	\$2.47										
Mainline 9, US 29/74, Franklin Road - I-85	\$0.39	\$0.60	\$0.78	\$1.20	\$1.56	\$2.40		\$0.40	\$0.61	\$0.80	\$1.24	\$1.60	\$2.47										
	<b>Weekday Gross Toll Revenue - Calendar Year 2024</b>							<b>Weekday Gross Toll Revenue - Calendar Year 2025</b>															
Mainline 1, I-485 - Dixie River Road	\$11,117	\$3,403	\$434	\$31	\$1,134	\$139	\$16,258	\$11,967	\$3,320	\$468	\$66	\$1,192	\$141	\$17,154									
Mainline 2, I-485 - Dixie River Road - NC 273, South Point Road	\$31,850	\$9,522	\$1,198	\$96	\$3,188	\$375	\$46,229	\$34,867	\$9,548	\$1,310	\$174	\$3,403	\$384	\$49,686									
Mainline 3, NC 273, South Point Road - NC 279, South New Hope Road	\$8,103	\$2,357	\$264	\$23	\$939	\$106	\$11,792	\$9,153	\$2,408	\$298	\$38	\$1,035	\$111	\$13,043									
Mainline 4, NC 279, South New Hope Road - NC 274, Union Road	\$6,733	\$1,824	\$234	\$23	\$996	\$105	\$9,915	\$7,230	\$1,802	\$251	\$29	\$1,042	\$104	\$10,458									
Mainline 5, NC 274, Union Road - Robinson Road	\$7,661	\$2,167	\$326	\$35	\$1,235	\$136	\$11,560	\$8,164	\$2,095	\$347	\$44	\$1,284	\$134	\$12,068									
Mainline 6, Robinson Road - US 321	\$2,767	\$745	\$137	\$16	\$544	\$55	\$4,264	\$2,975	\$723	\$146	\$17	\$571	\$57	\$4,489									
Mainline 7, US 321 - Hudson Boulevard	\$3,482	\$946	\$236	\$25	\$810	\$95	\$5,594	\$3,872	\$963	\$258	\$30	\$880	\$98	\$6,101									
Mainline 8, Hudson Boulevard - US 29/74, Franklin Boulevard	\$4,471	\$1,360	\$260	\$29	\$724	\$89	\$6,933	\$4,788	\$1,312	\$273	\$36	\$758	\$89	\$7,256									
Mainline 9, US 29/74, Franklin Road - I-85	\$2,305	\$722	\$115	\$16	\$392	\$53	\$3,603	\$2,482	\$703	\$122	\$16	\$411	\$52	\$3,786									
<b>Weekday Total Transactions</b>	<b>\$78,489</b>	<b>\$23,046</b>	<b>\$3,204</b>	<b>\$294</b>	<b>\$9,962</b>	<b>\$1,153</b>	<b>\$116,148</b>	<b>\$85,498</b>	<b>\$22,874</b>	<b>\$3,473</b>	<b>\$450</b>	<b>\$10,576</b>	<b>\$1,170</b>	<b>\$124,041</b>									

Annualization Procedure <sup>(1)</sup> (Rounded to Thousands)		
Annualization Factor: 319 days per year		
Period	Total Annual Transactions	Total Annual Gross Revenue
Calendar 2024	52,465,000	\$37,051,000
Calendar 2025	54,294,000	\$39,569,000
Conversion to Fiscal Year (Rounded to Thousands)		
Period	Total Transactions	Total Gross Revenue
Half of Calendar 2024	26,233,000	\$18,526,000
Half of Calendar 2025	27,147,000	\$19,785,000
<b>Total Fiscal Year 2025</b>	<b>53,380,000</b>	<b>\$38,311,000</b>

<sup>(1)</sup> Excludes any allowance for uncollectible revenue

**Table 6-9  
Toll Transactions and Gross Toll Revenue Estimates, Fiscal Year 2035  
Garden Parkway**

Toll Zone	Class 1		Class 2		Class 3		Total	Class 1		Class 2		Class 3		Total
	ETC	VTC	ETC	VTC	ETC	VTC		ETC	VTC	ETC	VTC	ETC	VTC	
<b>Weekday Transactions - Calendar Year 2034</b>														
Mainline 1, I-485 - Dixie River Road	39,091	5,886	759	69	944	71	46,820	40,173	5,937	779	71	967	73	48,000
Mainline 2, Dixie River Road - NC 273, South Point Road	38,534	5,695	712	62	906	66	45,975	39,655	5,752	732	64	929	67	47,200
Mainline 3, NC 273, South Point Road - NC 279, South New Hope Road	29,570	4,215	494	41	806	56	35,182	30,494	4,267	511	42	829	58	36,200
Mainline 4, NC 279, South New Hope Road - NC 274, Union Road	18,316	2,465	319	24	639	42	21,805	19,022	2,516	332	25	662	43	22,600
Mainline 5, NC 274, Union Road - Robinson Road	16,036	2,197	344	27	626	41	19,271	16,513	2,218	355	28	644	43	19,800
Mainline 6, Robinson Road - US 321	10,882	1,425	263	20	504	33	13,127	11,298	1,453	273	21	522	34	13,600
Mainline 7, US 321 - Hudson Boulevard	10,285	1,361	327	25	557	40	12,595	10,841	1,382	337	26	573	41	13,000
Mainline 8, Hudson Boulevard - US 29/74, Franklin Boulevard	15,246	2,202	427	35	624	46	18,580	15,630	2,209	437	35	642	48	19,000
Mainline 9, US 29/74, Franklin Road - I-85	9,314	1,399	231	19	377	30	11,370	9,690	1,428	240	20	391	31	11,800
<b>Weekday Total Transactions</b>	<b>187,274</b>	<b>26,845</b>	<b>3,876</b>	<b>322</b>	<b>5,983</b>	<b>425</b>	<b>224,725</b>	<b>193,116</b>	<b>27,162</b>	<b>3,996</b>	<b>332</b>	<b>6,159</b>	<b>438</b>	<b>231,200</b>
<b>Toll - 2034</b>														
Mainline 1, I-485 - Dixie River Road	\$0.49	\$0.75	\$0.98	\$1.51	\$1.96	\$3.02		\$0.52	\$0.80	\$1.04	\$1.60	\$2.08	\$3.20	
Mainline 2, Dixie River Road - NC 273, South Point Road	\$1.58	\$2.43	\$3.16	\$4.87	\$6.32	\$9.73		\$1.62	\$2.49	\$3.24	\$4.99	\$6.48	\$9.97	
Mainline 3, NC 273, South Point Road - NC 279, South New Hope Road	\$0.53	\$0.81	\$1.06	\$1.64	\$2.12	\$3.27		\$0.57	\$0.87	\$1.14	\$1.76	\$2.28	\$3.51	
Mainline 4, NC 279, South New Hope Road - NC 274, Union Road	\$0.76	\$1.16	\$1.52	\$2.34	\$3.04	\$4.68		\$0.79	\$1.21	\$1.58	\$2.44	\$3.16	\$4.87	
Mainline 5, NC 274, Union Road - Robinson Road	\$0.89	\$1.36	\$1.78	\$2.74	\$3.56	\$5.48		\$0.93	\$1.43	\$1.86	\$2.87	\$3.72	\$5.73	
Mainline 6, Robinson Road - US 321	\$0.49	\$0.75	\$0.98	\$1.51	\$1.96	\$3.02		\$0.53	\$0.81	\$1.06	\$1.64	\$2.12	\$3.27	
Mainline 7, US 321 - Hudson Boulevard	\$0.71	\$1.09	\$1.42	\$2.19	\$2.84	\$4.37		\$0.73	\$1.12	\$1.46	\$2.25	\$2.92	\$4.50	
Mainline 8, Hudson Boulevard - US 29/74, Franklin Boulevard	\$0.49	\$0.75	\$0.98	\$1.51	\$1.96	\$3.02		\$0.52	\$0.80	\$1.04	\$1.60	\$2.08	\$3.20	
Mainline 9, US 29/74, Franklin Road - I-85	\$0.49	\$0.75	\$0.98	\$1.51	\$1.96	\$3.02		\$0.52	\$0.80	\$1.04	\$1.60	\$2.08	\$3.20	
<b>Weekday Gross Toll Revenue - Calendar Year 2034</b>														
Mainline 1, I-485 - Dixie River Road	\$19,155	\$4,415	\$744	\$104	\$1,850	\$214	\$26,482	\$20,890	\$4,750	\$810	\$114	\$2,011	\$234	\$28,809
Mainline 2, Dixie River Road - NC 273, South Point Road	60,884	13,839	2,250	302	5,726	642	83,643	64,241	14,322	2,372	319	6,020	668	87,942
Mainline 3, NC 273, South Point Road - NC 279, South New Hope Road	15,672	3,414	524	67	1,709	183	21,569	17,382	3,712	583	74	1,890	204	23,845
Mainline 4, NC 279, South New Hope Road - NC 274, Union Road	13,920	2,859	485	56	1,943	197	19,460	15,027	3,044	525	61	2,092	209	20,958
Mainline 5, NC 274, Union Road - Robinson Road	14,272	2,988	612	74	2,229	225	20,400	15,357	3,172	660	80	2,396	246	21,911
Mainline 6, Robinson Road - US 321	5,332	1,069	258	30	988	100	7,777	5,988	1,177	289	34	1,107	111	8,706
Mainline 7, US 321 - Hudson Boulevard	7,302	1,483	464	55	1,582	175	11,061	7,768	1,548	492	59	1,673	185	11,725
Mainline 8, Hudson Boulevard - US 29/74, Franklin Boulevard	7,471	1,652	418	53	1,223	139	10,956	8,128	1,767	454	56	1,335	154	11,894
Mainline 9, US 29/74, Franklin Road - I-85	4,564	1,049	226	29	739	91	6,698	5,039	1,142	250	32	813	99	7,375
<b>Weekday Total Transactions</b>	<b>\$148,572</b>	<b>\$32,768</b>	<b>\$5,981</b>	<b>\$770</b>	<b>\$17,989</b>	<b>\$1,966</b>	<b>\$208,046</b>	<b>\$159,820</b>	<b>\$34,634</b>	<b>\$6,435</b>	<b>\$829</b>	<b>\$19,337</b>	<b>\$2,110</b>	<b>\$223,165</b>

Annualization Procedure <sup>(1)</sup> (Rounded to Thousands)		
Annualization Factor: 319 days per year		
Period	Total Annual Transactions	Total Annual Gross Revenue
Calendar 2034	71,687,000	\$66,367,000
Calendar 2035	73,753,000	\$71,190,000
Conversion to Fiscal Year (Rounded to Thousands)		
Period	Total Transactions	Total Gross Revenue
Half of Calendar 2034	35,844,000	\$33,184,000
Half of Calendar 2035	36,877,000	\$35,995,000
<b>Total Fiscal Year 2035</b>	<b>72,721,000</b>	<b>\$68,779,000</b>

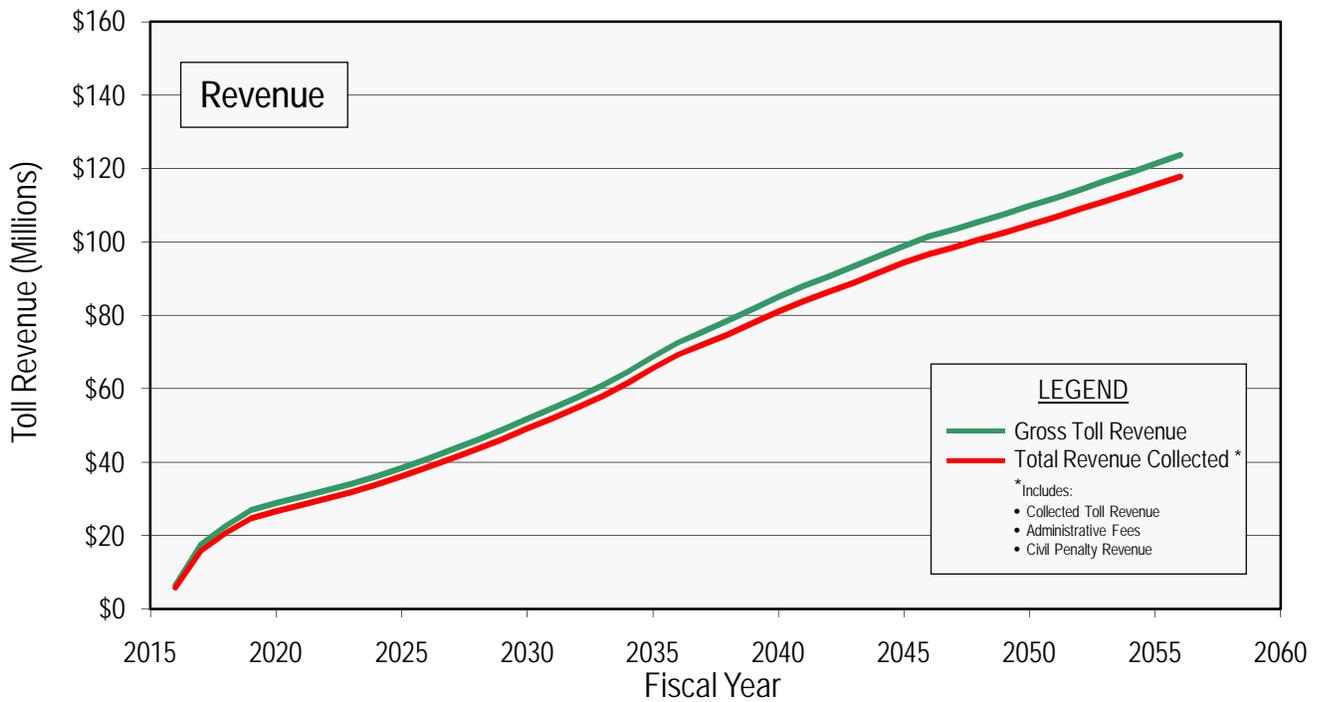
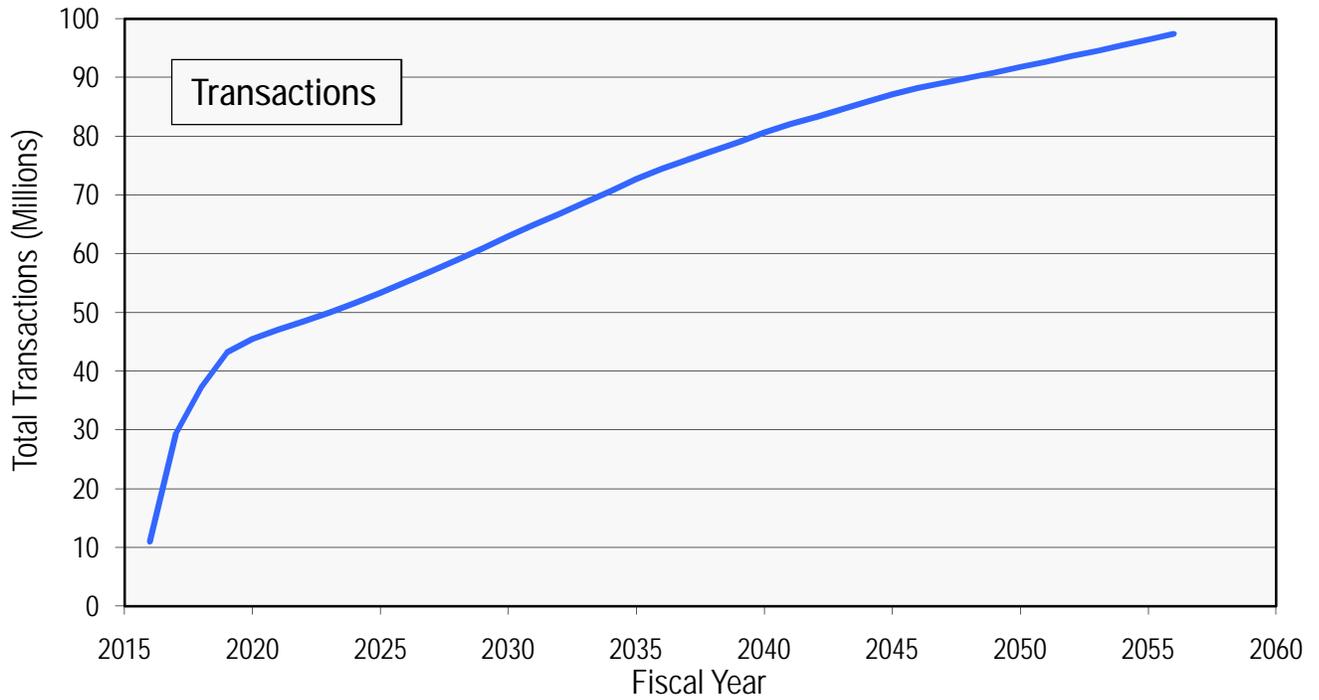
<sup>(1)</sup> Excludes any allowance for uncollectible revenue

**Table 6-10  
Estimated Annual Toll Transactions  
Garden Parkway  
(Thousands)  
April 14, 2011**

Fiscal Year	Class 1			Class 2			Class 3			Total Transactions	Percent ETC
	ETC	VTC	Total Class 1	ETC	VTC	Total Class 2	ETC	VTC	Total Class 3		
2016 <sup>(1)</sup>	7,442	3,010	10,452	165	20	185	314	33	347	10,984	72.1%
2017	20,184	7,750	27,934	444	43	487	835	86	921	29,342	73.1%
2018	26,301	9,187	35,488	574	36	610	1,052	104	1,156	37,254	75.0%
2019	31,210	9,911	41,121	675	30	705	1,207	115	1,322	43,148	76.7%
2020	33,605	9,697	43,302	721	23	744	1,256	114	1,370	45,416	78.3%
2021	35,497	9,329	44,826	757	23	780	1,288	112	1,400	47,006	79.9%
2022	37,247	8,938	46,185	790	28	818	1,319	110	1,429	48,432	81.3%
2023	39,084	8,563	47,647	824	35	859	1,351	108	1,459	49,965	82.6%
2024	41,012	8,204	49,216	860	46	906	1,384	106	1,490	51,612	83.8%
2025	43,035	7,860	50,895	898	65	963	1,417	104	1,521	53,379	85.0%
2026	44,884	7,739	52,623	934	78	1,012	1,459	105	1,564	55,199	85.6%
2027	46,541	7,833	54,374	968	81	1,049	1,509	108	1,617	57,040	85.9%
2028	48,260	7,928	56,188	1,003	83	1,086	1,561	112	1,673	58,947	86.2%
2029	50,045	8,026	58,071	1,039	86	1,125	1,615	116	1,731	60,927	86.5%
2030	51,898	8,124	60,022	1,077	90	1,167	1,671	120	1,791	62,980	86.8%
2031	53,664	8,222	61,886	1,113	93	1,206	1,724	123	1,847	64,939	87.0%
2032	55,335	8,318	63,653	1,147	95	1,242	1,775	127	1,902	66,797	87.2%
2033	57,058	8,415	65,473	1,182	98	1,280	1,827	130	1,957	68,710	87.4%
2034	58,837	8,514	67,351	1,218	101	1,319	1,881	134	2,015	70,685	87.6%
2035	60,672	8,614	69,286	1,256	104	1,360	1,936	138	2,074	72,720	87.8%
2036	62,220	8,751	70,971	1,287	107	1,394	1,984	141	2,125	74,490	87.9%
2037	63,465	8,926	72,391	1,313	109	1,422	2,024	144	2,168	75,981	87.9%
2038	64,734	9,104	73,838	1,339	111	1,450	2,064	147	2,211	77,499	87.9%
2039	66,028	9,286	75,314	1,366	113	1,479	2,106	150	2,256	79,049	87.9%
2040	67,349	9,472	76,821	1,393	116	1,509	2,148	153	2,301	80,631	87.9%
2041	68,526	9,638	78,164	1,418	118	1,536	2,185	155	2,340	82,040	87.9%
2042	69,554	9,782	79,336	1,439	120	1,559	2,218	158	2,376	83,271	87.9%
2043	70,597	9,929	80,526	1,461	121	1,582	2,251	160	2,411	84,519	87.9%
2044	71,656	10,078	81,734	1,483	123	1,606	2,285	162	2,447	85,787	87.9%
2045	72,731	10,229	82,960	1,505	125	1,630	2,319	165	2,484	87,074	87.9%
2046	73,639	10,357	83,996	1,524	127	1,651	2,348	167	2,515	88,162	87.9%
2047	74,375	10,460	84,835	1,539	128	1,667	2,372	169	2,541	89,043	87.9%
2048	75,119	10,565	85,684	1,554	129	1,683	2,396	170	2,566	89,933	87.9%
2049	75,870	10,671	86,541	1,570	130	1,700	2,419	172	2,591	90,832	87.9%
2050	76,629	10,777	87,406	1,585	132	1,717	2,444	174	2,618	91,741	87.9%
2051	77,395	10,885	88,280	1,601	133	1,734	2,468	175	2,643	92,657	87.9%
2052	78,169	10,994	89,163	1,617	134	1,751	2,493	177	2,670	93,584	87.9%
2053	78,951	11,104	90,055	1,633	136	1,769	2,518	179	2,697	94,521	87.9%
2054	79,740	11,215	90,955	1,650	137	1,787	2,543	181	2,724	95,466	87.9%
2055	80,538	11,327	91,865	1,666	138	1,804	2,568	182	2,750	96,419	87.9%
2056	81,343	11,440	92,783	1,683	140	1,823	2,594	184	2,778	97,384	87.9%

<sup>(1)</sup> FY 2016, January - June

Note: Forecasts for FY 2016 - 2019 reflect an assumed ramp-up to full traffic volumes beginning in the second half of FY 2019.



estimates for FY 2016 through FY 2019 were adjusted downward to reflect the impact of a three year ramp-up period as discussed above and shown in Table 6-7.

ETC transactions are expected to be the largest proportion of users and are estimated to increase from about 72.1 percent market share in the opening year to nearly 87.8 percent by FY 2035. Transaction estimates through FY 2035 are based on a detailed modeling analysis. Transactions between FY 2035 and FY 2056 were assumed to grow at the rates shown in Table 6-11.

**Table 6-11  
Annual Transaction and Revenue Growth Rate Assumptions  
2035 – 2056  
Garden Parkway**

Period	Annual Growth Rate	
	Transactions	Toll Revenue
2035 - 2040	2.0%	4.0%
2040 - 2045	1.5%	3.0%
2045 - 2056	1.0%	2.0%

In developing the assumed extrapolated growth rates beyond FY 2035, the patterns of growth determined by the travel demand modeling over years prior to FY 2035 were considered. Prior to FY 2035, model results showed an annual decline in the growth of VTC transactions, largely due to assumed continued increases in ETC market penetration. In general, overall transaction growth rates were assumed to continue their decline beyond FY 2035, dropping to an overall average growth rate of 1.0 percent per year subsequent to FY 2045.

Experience on other facilities suggests that ETC penetration typically reaches a maximum level in the range of 90 percent. Accordingly, WSA assumed declines in VTC transactions would “bottom out” between FY 2035 and FY 2040, with zero growth assumed in that category during that period and beyond. This resulted in the stabilization of the ETC share at 87.9 percent of total transactions from FY 2036 to the end of the forecast period.

Annual revenue estimates are provided in Table 6-12 and illustrated in Figure 6-7. Revenue estimates are presented for each vehicles class and payment method. The total annual gross revenue is expected to increase from \$6.5 million in FY 2016 to \$68.8 million by FY 2035. This reflects the impact of both traffic growth and annual toll increases. Again, revenue estimates during the first three years of operation were adjusted to reflect a

**Table 6-12  
Estimated Annual Gross Toll Revenue  
Garden Parkway  
(Thousands)  
April 14, 2011**

Fiscal Year	Class 1			Class 2			Class 3			Total Gross Revenue <sup>(2)</sup>	Percent ETC
	ETC	VTC	Total Class 1	ETC	VTC	Total Class 2	ETC	VTC	Total Class 3		
2016 <sup>(1)</sup>	\$3,483	\$2,156	\$5,639	\$148	\$28	\$176	\$559	\$91	\$650	\$6,465	64.8%
2017	9,615	5,649	15,264	408	60	468	1,513	241	1,754	17,486	66.0%
2018	12,921	6,902	19,823	545	50	595	1,965	300	2,265	22,683	68.0%
2019	15,815	7,677	23,492	662	40	702	2,324	340	2,664	26,858	70.0%
2020	17,565	7,743	25,308	730	31	761	2,484	349	2,843	28,912	71.9%
2021	19,121	7,684	26,805	791	31	822	2,637	353	2,990	30,617	73.6%
2022	20,671	7,581	28,252	851	40	891	2,783	357	3,140	32,283	75.3%
2023	22,337	7,481	29,818	916	55	971	2,937	362	3,299	34,088	76.8%
2024	24,118	7,400	31,518	986	78	1,064	3,097	365	3,462	36,044	78.2%
2025	26,156	7,324	33,480	1,065	118	1,183	3,276	371	3,647	38,310	79.6%
2026	28,195	7,461	35,656	1,144	148	1,292	3,484	386	3,870	40,818	80.4%
2027	30,087	7,768	37,855	1,220	158	1,378	3,708	410	4,118	43,351	80.8%
2028	32,081	8,092	40,173	1,300	168	1,468	3,943	435	4,378	46,019	81.1%
2029	34,182	8,422	42,604	1,384	179	1,563	4,190	461	4,651	48,818	81.4%
2030	36,394	8,753	45,147	1,472	190	1,662	4,449	489	4,938	51,747	81.8%
2031	38,613	9,091	47,704	1,579	201	1,780	4,709	523	5,232	54,716	82.1%
2032	40,853	9,433	50,286	1,669	213	1,882	4,974	552	5,526	57,694	82.3%
2033	43,326	9,818	53,144	1,748	225	1,973	5,264	576	5,840	60,957	82.6%
2034	46,018	10,235	56,253	1,854	239	2,093	5,577	610	6,187	64,533	82.8%
2035	49,188	10,751	59,939	1,980	255	2,235	5,953	650	6,603	68,777	83.1%
2036	52,002	11,269	63,271	2,093	269	2,362	6,292	686	6,978	72,611	83.2%
2037	54,082	11,720	65,802	2,177	280	2,457	6,543	714	7,257	75,516	83.2%
2038	56,246	12,189	68,435	2,264	291	2,555	6,805	742	7,547	78,537	83.2%
2039	58,495	12,676	71,171	2,355	303	2,658	7,077	772	7,849	81,678	83.2%
2040	60,835	13,183	74,018	2,449	315	2,764	7,360	803	8,163	84,945	83.2%
2041	62,959	13,644	76,603	2,534	326	2,860	7,617	831	8,448	87,911	83.2%
2042	64,847	14,053	78,900	2,610	336	2,946	7,846	856	8,702	90,548	83.2%
2043	66,793	14,475	81,268	2,689	346	3,035	8,081	882	8,963	93,266	83.2%
2044	68,796	14,909	83,705	2,769	356	3,125	8,324	908	9,232	96,062	83.2%
2045	70,860	15,356	86,216	2,852	367	3,219	8,573	935	9,508	98,943	83.2%
2046	72,627	15,739	88,366	2,924	376	3,300	8,787	959	9,746	101,412	83.2%
2047	74,079	16,054	90,133	2,982	384	3,366	8,963	978	9,941	103,440	83.2%
2048	75,561	16,375	91,936	3,042	392	3,434	9,142	997	10,139	105,509	83.2%
2049	77,072	16,702	93,774	3,102	399	3,501	9,325	1,017	10,342	107,617	83.2%
2050	78,613	17,036	95,649	3,165	407	3,572	9,511	1,038	10,549	109,770	83.2%
2051	80,186	17,377	97,563	3,228	415	3,643	9,702	1,059	10,761	111,967	83.2%
2052	81,789	17,724	99,513	3,292	424	3,716	9,896	1,080	10,976	114,205	83.2%
2053	83,425	18,079	101,504	3,358	432	3,790	10,084	1,101	11,195	116,489	83.2%
2054	85,094	18,440	103,534	3,425	441	3,866	10,296	1,123	11,419	118,819	83.2%
2055	86,796	18,809	105,605	3,494	450	3,944	10,501	1,146	11,647	121,196	83.2%
2056	88,531	19,185	107,716	3,564	459	4,023	10,711	1,169	11,880	123,619	83.2%

<sup>(1)</sup> FY 2016, January - June

<sup>(2)</sup> EXCLUDES ANY ALLOWANCE FOR UNCOLLECTIBLE REVENUE.

Note: Forecasts for FY 2016 - 2019 reflect an assumed ramp-up to full traffic volumes beginning in the second half of FY 2019.

progressive ramp-up pattern. Assumed annual growth rates for gross toll revenue beyond FY 2035 are shown in Table 6-11. ETC and VTC revenue growth rates were assumed to be 4.0 percent annually between FY 2035 and FY 2040, declining to 3.0 percent growth per year from between FY 2040 and FY 2045, and declining further to 2.0 percent per year between FY 2045 and FY 2056.

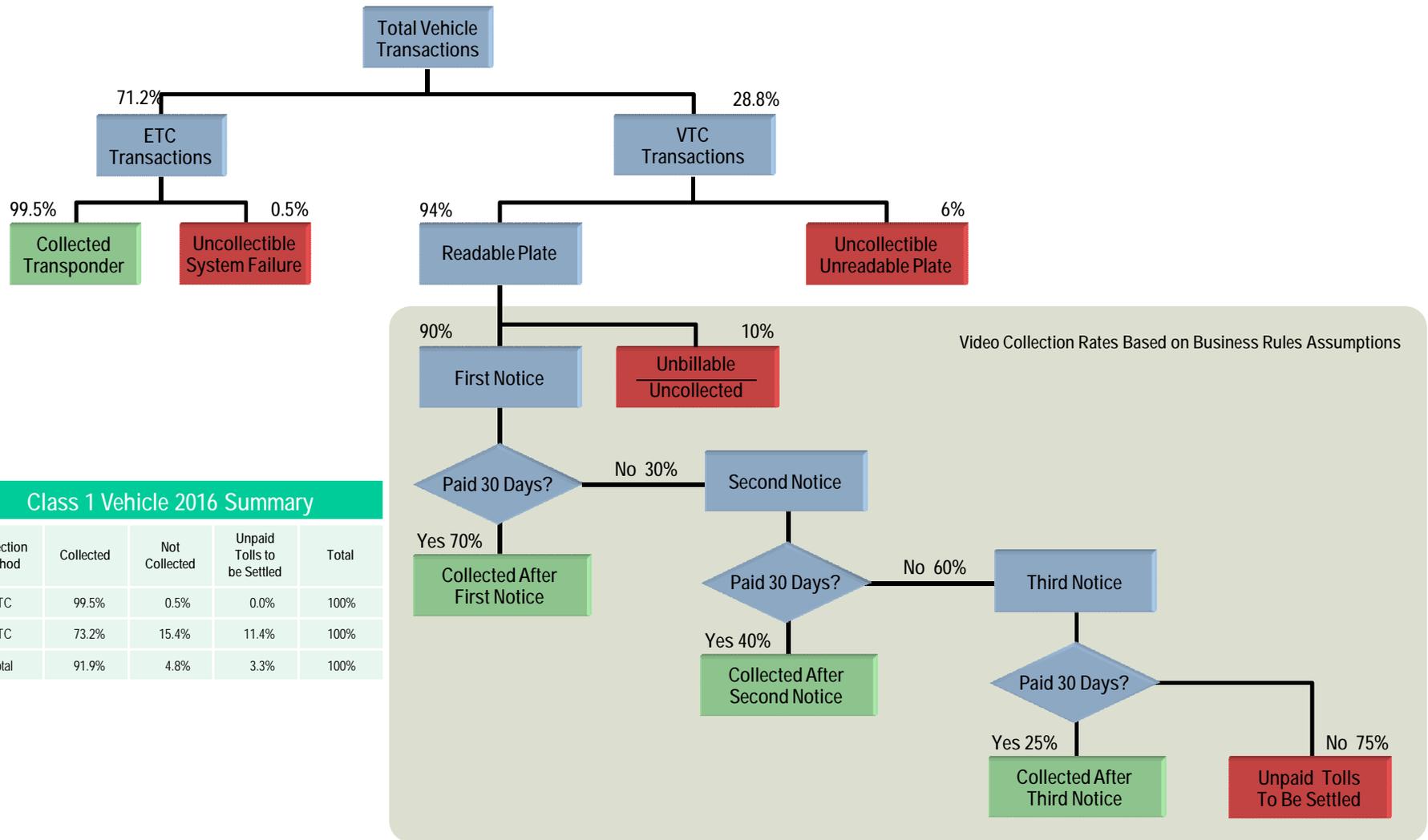
ETC transactions are expected to account for between 71.9 and 83.2 percent of total revenue after the ramp-up period. This is a lower percentage than the proportion of transactions, reflecting the fact that VTC users pay a higher toll rate than ETC users.

#### **REVENUE COLLECTION, ENFORCEMENT, AND LEAKAGE**

The hardware required for implementing AET includes vehicle-mounted transponders; overhead antennas; and roadside equipment such as readers, controllers, electrical circuit protection and distribution equipment, vehicle detection trigger devices, cameras, and supplemental lighting; as well as image processors and transmission equipment housed in an environmentally controlled roadside cabinet. Taken together with the necessary software and operational procedures, an AET collection system can be quite complex, with the potential for lost revenue unless appropriate technology is used and business rules followed. Even when best practices and strict enforcement policies are followed, it is not possible to eliminate all revenue losses. This section describes the collection procedures, enforcement tools, fee structures, and the resulting estimate of net collected toll revenue.

***Payment and Collection Structure*** - Figure 6-8 illustrates the toll collection process and revenue collection flow which will be used on the Garden Parkway. As noted previously, no option will be provided for direct payment in cash at the time of passage through tolling zone. However, opportunities for payment in cash will be provided in the vicinity of the toll road. In addition to showing the flow of potential transactions, Figure 6-8 also shows assumed collection rates and percentages of uncollectable revenue at each point for the opening year.

***ETC and VTC Proportions*** - Each vehicle that passes through an AET toll zone will fall into one of two categories, based on whether or not they are equipped with an ETC transponder. The share of traffic distribution between ETC and VTC transactions, by vehicle class, was a direct output in each year of the modeling process, as previously described. In the example shown in Figure 6-8, which reflects 2016 conditions, the model estimated approximately 71.2 percent of Class 1 vehicles would be equipped with ETC transponders and 28.8 percent would not.



Class 1 Vehicle 2016 Summary				
Collection Method	Collected	Not Collected	Unpaid Tolls to be Settled	Total
ETC	99.5%	0.5%	0.0%	100%
VTC	73.2%	15.4%	11.4%	100%
Total	91.9%	4.8%	3.3%	100%

**Electronic Toll Collection** - Of the ETC transactions, 99.5 percent were expected to be valid transactions, resulting in collected revenue. This collection rate may appear high when compared to typical ETC express lane operations on other toll facilities today. However, on those facilities, any vehicles in ETC express toll lanes that are not equipped with transponders are considered violators. In the NCTA system, vehicles without transponders would fall into the “video transaction” category and be processed as shown on the right side of the chart. Hence, the 0.5 percent uncollectable rate for ETC transactions would only relate to unusual system failure conditions.

**Video Toll Collection** - VTC transactions are estimated to represent 28.8 percent of total Class 1 transactions in 2016. In Figure 6-8, uncollectable transactions are shown in the red boxes at several locations in the VTC collection structure.

Collection assumptions were made by the NCTA based on NCTA business rules. The collection amounts included both the toll and the processing fees and civil penalties. The appendix contains the NCTA assumptions and estimates for the pending revenue category.

Collectability assumptions were modified slightly over time to reflect anticipated improvements in technology and billing practices. Table 6-13 shows revenue collection assumptions for each class of vehicle at each of the various decision points shown in Figure 6-8.

Most (94 percent) of the VTC transactions are assumed to contain readable license plate images. Six percent of VTC transactions are assumed to have unreadable license plates such as plates which are obscured by trailer hitches or inclement weather conditions. If license plates are unreadable, there is no further opportunity for billing and toll collection. Among the remaining 94 percent, it was assumed that ten percent would be unbillable due to failure to identify a registered owner or a valid mailing address. The remaining 90 percent would be billed for payment due in the mail. Notices will be sent to a customer until payment is received or until the notice escalates to DMV registration hold (NC customers) or to a collection agency (out of state customers). Figure 6-8 shows the estimated collection rates for each of the bills that would be sent.

The figure also summarizes the collection rates by collection method for Class 1 vehicles in 2016. In total, the revenue from approximately 91.9 percent of Class 1 vehicle transactions in 2016 are estimated to be col-

lected. 4.8 percent of transactions are uncollectible, and an additional 3.3 percent are unpaid violations.

**Table 6-13  
Revenue Collection Assumptions  
Garden Parkway**

Assumption	Percent by Year				
	2016	2020	2025	2030	2035
<b>Electronic Toll Collection</b>					
ETC Collectible	99.5%	99.5%	99.5%	99.5%	99.5%
ETC Uncollectible	0.5%	0.5%	0.5%	0.5%	0.5%
Total ETC Transactions	100.0%	100.0%	100.0%	100.0%	100.0%
<b>Video Toll Collection</b>					
Readable Plates	94%	94%	95%	95%	96%
Unreadable Plates	6%	6%	5%	5%	4%
Total Plates Imaged	100%	100%	100%	100%	100%
Billable Plates	90%	90%	90%	90%	90%
Unbillable Plates	10%	10%	10%	10%	10%
Total Billable and Unbillable Plates	100%	100%	100%	100%	100%
Collected - First Notice	70%	70%	70%	70%	70%
Not Collected - First Notice	30%	30%	30%	30%	30%
Total First Notice	100%	100%	100%	100%	100%
Collected - Second Notice	40%	40%	40%	40%	40%
Not Collected - Second Notice	60%	60%	60%	60%	60%
Total Second Notice	100%	100%	100%	100%	100%
Collected - Second Notice	25%	25%	25%	25%	25%
Not Collected - Second Notice	75%	75%	75%	75%	75%
Total Second Notice	100%	100%	100%	100%	100%

***Toll Collection Enforcement*** – The NCTA has developed an enforcement plan based on state legislation.

- **Payment Procedures and Processing Fees** – The recipient of a bill for unpaid tolls can pay the bill within 30 days with no additional fees and penalties. If the recipient does not pay within 30 days, the NCTA may re-bill the amount and may add up to a \$6 processing fee with a maximum of \$48 in processing fees allowed within a twelve-month period. The processing fee will be based on the additional cost of identifying the user who has not paid a toll and the NCTA will retain processing fee receipts.
- **Civil Penalties** – Unpaid notices that included a processing fee are escalated to a \$25 civil penalty on the next notice. Only one civil penalty will be imposed in any six-month period. This penalty must be collected by the NCTA. Provided, the NCTA can retain only the actual

costs of collecting the penalty not to exceed 20 percent of the amount collected. The remaining portion of the penalty, by law, will be deposited to the State's Civil Penalty and Forfeiture Fund.

- **Registration Block** – The NCTA will notify the Department of Motor Vehicles of North Carolina of registered vehicle owners who have not paid tolls, processing fees, and civil penalties. The Department of Motor Vehicles will withhold the vehicle registration renewal of the vehicle until the overdue amounts are paid in full.
- **Collection Agency** – The NCTA has the ability to submit unpaid toll notices for out of state customers to a collection agency for payment.
- **Review and Disputes** – The NCTA will institute appropriate dispute resolution processes including informal reviews, administrative hearings, and judicial review.

*Estimated Collected Revenue* – Table 6-14 summarizes the total annual collected toll revenue plus additional revenue from administrative fees. The percent of collected toll revenue ranges from 90.2 percent in the opening year to 95.3 percent in 2035 and beyond. With fee revenue included, the total revenue collected is slightly higher. Figure 6-7 presented earlier also illustrates the toll revenue collected in comparison to the gross toll revenue.

## DISCLAIMER

Current accepted professional practices and procedures were used in the development of these traffic and revenue forecasts. However, as with any forecast of the future, it should be understood that there may be differences between forecasted and actual results caused by events and circumstances beyond the control of the forecasters. In formulating its forecasts, WSA has reasonably relied upon the accuracy and completeness of information provided (both written and oral) by NCTA and other local and state agencies. WSA also has relied upon the reasonable assurances of some independent parties and are not aware of any facts that would make such information misleading.

WSA has made qualitative judgments related to several key variables in the development and analysis of the traffic and revenue forecasts that must be considered as a whole; therefore selecting portions of any individual result without consideration of the intent of the whole may create a misleading or incomplete view of the results and the underlying methodologies used to obtain the results. WSA gives no opinion as to the value or merit to partial information extracted from this report.

All estimates and projections reported herein are based on WSA's experience and judgment and on a review of information obtained from multiple state and local agencies, including NCTA, by an independent third party. These estimates and projections may not be indicative of actual or future values, and are therefore subject to substantial uncertainty. Future developments cannot be predicted with certainty, and may affect the estimates or projections expressed in this report, such that WSA does not specifically guarantee or warrant any estimate or projections contained within this report.

While WSA believes that some of the projections or other forward-looking statements contained within the report are based on reasonable assumptions as of the date in the report, such forward looking statements involve risks and uncertainties that may cause actual results to differ materially from the results predicted. Therefore, following the date of this report, WSA will take no responsibility or assume any obligation to advise of changes that may affect its assumptions contained within the report, as they pertain to socioeconomic and demographic forecasts, proposed residential or commercial land use development projects and/or potential improvements to the regional transportation network.

**Table 6-14  
Annual Toll Transactions and Net Revenue Forecasts  
Garden Parkway  
(Thousands)**

Fiscal Year	Total Gross Transactions	Gross Toll Revenue	Collected Toll Revenue	Collected Percent of Gross Toll Revenue	Administrative Fee Revenue <sup>(1)</sup>	Total Revenue Collected <sup>(2)</sup>	Revenue Percent of Total Revenue Collected	Uncollectible Toll Revenue <sup>(3)</sup>	Pending Toll Revenue for Unpaid Violations to be Settled <sup>(4)</sup>	Total Uncollected Revenue	Percent Uncollected
2016 <sup>(5)</sup>	10,984	\$6,465	\$5,834	90.2%	\$31	\$5,865	99.5%	\$371	\$260	\$631	9.8%
2017	29,342	17,486	15,830	90.5%	79	15,909	99.5%	974	682	1,656	9.5%
2018	37,254	22,663	20,659	91.1%	94	20,753	98.5%	1,195	829	2,024	8.9%
2019	43,148	26,858	24,602	91.6%	101	24,703	98.6%	1,334	922	2,256	8.4%
2020	45,416	28,912	26,629	92.1%	99	26,728	99.6%	1,354	929	2,283	7.9%
2021	47,006	30,617	28,340	92.6%	95	28,435	99.7%	1,354	923	2,277	7.4%
2022	48,432	32,283	30,024	93.0%	92	30,116	99.7%	1,351	908	2,259	7.0%
2023	49,965	34,088	31,840	93.4%	88	31,928	99.7%	1,346	902	2,248	6.6%
2024	51,612	36,044	33,799	93.8%	84	33,883	99.8%	1,349	896	2,245	6.2%
2025	53,379	38,310	36,123	94.3%	81	36,204	99.8%	1,286	901	2,187	5.7%
2026	55,199	40,818	38,572	94.5%	81	38,653	99.8%	1,323	923	2,246	5.5%
2027	57,040	43,351	41,004	94.6%	82	41,086	99.8%	1,383	964	2,347	5.4%
2028	58,947	46,019	43,566	94.7%	83	43,649	99.8%	1,447	1,006	2,453	5.3%
2029	60,927	48,818	46,258	94.8%	84	46,342	99.8%	1,513	1,047	2,560	5.2%
2030	62,980	51,747	49,079	94.8%	85	49,164	99.8%	1,580	1,088	2,668	5.2%
2031	64,939	54,716	51,937	94.9%	86	52,023	99.8%	1,647	1,132	2,779	5.1%
2032	66,797	57,694	54,800	95.0%	87	54,887	99.8%	1,717	1,177	2,894	5.0%
2033	68,710	60,957	57,939	95.0%	88	58,027	99.8%	1,794	1,224	3,018	5.0%
2034	70,685	64,533	61,378	95.1%	89	61,467	99.9%	1,875	1,280	3,155	4.9%
2035	72,720	68,777	65,545	95.3%	90	65,635	99.9%	1,871	1,361	3,232	4.7%
2036	74,490	72,611	69,221	95.3%	93	69,314	99.9%	1,965	1,425	3,390	4.7%
2037	75,981	75,516	71,991	95.3%	95	72,086	99.9%	2,042	1,483	3,525	4.7%
2038	77,499	78,537	74,870	95.3%	96	74,966	99.9%	2,126	1,541	3,667	4.7%
2039	79,049	81,678	77,865	95.3%	98	77,963	99.9%	2,209	1,604	3,813	4.7%
2040	80,631	84,945	80,981	95.3%	100	81,081	99.9%	2,297	1,667	3,964	4.7%
2041	82,040	87,911	83,807	95.3%	102	83,909	99.9%	2,378	1,726	4,104	4.7%
2042	83,271	90,548	86,320	95.3%	104	86,424	99.9%	2,449	1,779	4,228	4.7%
2043	84,519	93,266	88,909	95.3%	105	89,014	99.9%	2,524	1,833	4,357	4.7%
2044	85,787	96,062	91,578	95.3%	107	91,685	99.9%	2,599	1,885	4,484	4.7%
2045	87,074	98,943	94,324	95.3%	108	94,432	99.9%	2,675	1,944	4,619	4.7%
2046	88,162	101,412	96,677	95.3%	110	96,787	99.9%	2,743	1,992	4,735	4.7%
2047	89,043	103,440	98,608	95.3%	111	98,719	99.9%	2,798	2,034	4,832	4.7%
2048	89,933	105,509	100,561	95.3%	112	100,693	99.9%	2,856	2,072	4,928	4.7%
2049	90,832	107,617	102,593	95.3%	113	102,706	99.9%	2,910	2,114	5,024	4.7%
2050	91,741	109,770	104,644	95.3%	114	104,758	99.9%	2,969	2,157	5,126	4.7%
2051	92,657	111,967	106,739	95.3%	115	106,854	99.9%	3,030	2,198	5,228	4.7%
2052	93,584	114,205	108,872	95.3%	116	108,988	99.9%	3,091	2,242	5,333	4.7%
2053	94,521	116,489	111,049	95.3%	118	111,167	99.9%	3,153	2,287	5,440	4.7%
2054	95,466	118,819	113,271	95.3%	119	113,390	99.9%	3,216	2,332	5,548	4.7%
2055	96,419	121,196	115,537	95.3%	120	115,657	99.9%	3,279	2,380	5,659	4.7%
2056	97,384	123,619	117,847	95.3%	121	117,968	99.9%	3,343	2,429	5,772	4.7%

<sup>(1)</sup> Administrative fees collected in connection with second and third notices for video transactions. Pending HNTB input.

<sup>(2)</sup> Total toll revenue collected plus any administrative fees

<sup>(3)</sup> Revenue not collectible due to system failure, bad accounts, unreadable license plates, or unbillable transactions.

<sup>(4)</sup> Revenue not collected after three notices have been sent.

<sup>(5)</sup> FY 2016, January - June

Note: All collected revenue and administrative fee revenue estimated based on NCTA business rules and estimated collection rates. Forecasts for FY 2016 - 2019 reflect an assumed ramp-up to full traffic volumes beginning in the second half of FY 2019.

# CHAPTER 7

## SENSITIVITY TESTS

A series of tests were conducted to provide a measure of the sensitivity of annual transactions and revenue to changes in key study assumptions. The sensitivity tests were conducted for the base model year 2016 and future year 2035. The summarized findings of the sensitivity tests are presented in Table 7-1. Sensitivity tests were conducted based on the following modifications to the key assumptions used in the base-case analysis:

- **MPO Socioeconomic Forecasts** – The base socioeconomic forecasts from the MPO forms the basis for future travel demand in place of the forecasts developed by the independent economist;
- **Revised Long Term Economic Growth** – The rate of growth in regional travel demand was increased and decreased by 30 percent;
- **Value of Time (VOT)** – VOT was increased and decreased by 20 percent;
- **Electronic Toll Collection (ETC) Participation** – Higher and lower participation rates of ETC, and corresponding change in VTC rates;
- **Higher Motor Fuel Prices** – 5 percent reduction in regional travel demand resulting from increased fuel prices; and
- **No Growth** – A six-year lag in economic growth in regional travel demand. No growth between 2010 and 2016.

### MPO SOCIOECONOMIC FORECASTS

The base case traffic and revenue forecast for this study was estimated using the socioeconomic forecasts that were prepared by the independent economist rather than those prepared by the Gaston Urban Area Metropolitan Planning Organization (GUAMPO) and the Mecklenburg-Union Metropolitan Planning Organization (MUMPO) for use in the joint MRTDM.



The MPO socioeconomic forecasts for the region were somewhat more aggressive in early years than those developed by the independent economist and used in the base case forecast and somewhat less aggressive in future years, as discussed in Chapter 5. For this sensitivity test, the travel demand model used the MPO socioeconomic forecast in the trip generation process. This test resulted in gross toll revenues that were 3.0 percent higher for FY 2016 and approximately 0.6 percent lower in FY 2035 as compared to estimated revenue for the base case.

## **LOWER OR HIGHER LONG TERM ECONOMIC GROWTH**

Increases and decreases in the long term growth rates in regional travel demand were tested to examine the effects of such delays or accelerations on annual transactions and revenues on the Garden Parkway. This was modeled by adjusting the rate of trip growth in the trip tables by plus or minus 30 percent from the base case forecast.

### **INCREASED GROWTH**

This test assumed that the total traffic growth rate in the base-year trip tables would increase by 30 percent. For example, a 3.5 percent annual growth rate for a specific movement in the base case trip table would be increased to 4.6 percent annual growth in the sensitivity test. Under this higher growth rate test, the gross toll revenue increased by approximately 14.7 percent in FY 2016 and 25.8 percent by FY 2035.

### **DECREASED GROWTH**

Conversely, the lower traffic growth sensitivity test assumed a 30 percent decrease in growth for each movement in the trip tables. As indicated in Table 7-1, the reduction in gross toll revenue is 14.0 percent in FY 2016 and 25.4 percent in FY 2035.

Based on this analysis of higher and lower traffic growth rates, it appears that the gross revenue is more or less equally sensitive to higher and lower traffic growth in all the years.

## **VALUE OF TIME**

Individual VOT is a critical parameter in the toll diversion model, because a motorist's decision to use a toll road is heavily influenced by the travel time savings relative to the toll charged. VOTs for individual movements are based on the stated preference (SP) survey results, estimates of median household income, and annual hours worked by traffic analysis zone

(TAZ). In these two sensitivity tests, the base case value of time for each movement was increased and decreased by 20 percent.

#### HIGHER VOT

Higher VOT would favor the Garden Parkway because more drivers would be willing to pay a toll to save travel time in comparison to the base case. This test increased the median VOT for all trip purposes in the traffic assignment process by 20 percent. Under this scenario, as presented in Table 7-1, the total annual gross revenue increased by 6.9 percent in FY 2016 and 4.7 percent in FY 2035.

#### LOWER VOT

Lowering the base case VOT by 20 percent had the opposite effect on the Garden Parkway because fewer people would be willing to pay a toll to save travel time. The reduction in gross toll revenue in comparison to the base case is estimated to be 8.2 percent in the opening year and 6.1 percent in 2035.

Thus the forecast model is slightly more sensitive to lower VOT than to higher VOT.

## ELECTRONIC TOLL COLLECTION PARTICIPATION

The base case assumption for ETC participation is that participation rates would increase over time as drivers become more familiar with the lower costs and greater convenience of ETC. Conversely the use of the VTC payment method would decrease over the years as ETC increases.

Two sensitivity tests were conducted with respect to the relative market shares of the ETC and VTC payment methods. The first test assumed higher levels of initial ETC participation and the second test assumed lower levels of ETC participation. Table 7-2 shows the percentages of ETC and VTC participation for the base case and for the two sensitivity tests. As noted in Chapter 6, ETC participation rates are an input assumption used in the travel demand model, and represent the *potential* users of each payment method, rather than those who ultimately opt to use the Garden Parkway as opposed to an alternate route. Due to the higher toll rates applied to VTC transactions, the model output generally results in a higher ETC participation rate, and a correspondingly lower VTC rate, in comparison with the input assumptions. The sensitivity tests described in this section refer to modification in these input assumptions, allowing the model to dictate the resulting actual ETC participation rates.

**HIGHER ETC PARTICIPATION**

For this test, the input ETC participation rate for FY 2016 was increased from 65 to 78 percent for Class 1 vehicles, and from 85 to 99 percent for Class 2 and 3 vehicles. Note that WSA capped ETC penetration at 99 percent regardless of growth assumption. The toll diversion model indicates that this increase would have a negative impact on gross toll revenues, due to the lower rates applied to ETC transactions. The FY 2016 revenue is estimated to be 2.0 percent less than the base-case revenue. By FY 2035, the revenue is estimate to be 3.3 percent lower compared to the base case.

<b>Table 7-2 Toll Collection Percentages of Total Transactions - ETC Participation Sensitivity Tests Garden Parkway</b>				
<b>Base Case</b>				
<b>Fiscal Year</b>	<b>Model Input Assumptions - Class 1</b>		<b>Model Input Assumptions - Class 2/3</b>	
	<b>ETC</b>	<b>VTC</b>	<b>ETC</b>	<b>VTC</b>
2016	65%	35%	85%	15%
2035	84%	16%	89%	11%
<b>Higher ETC Participation</b>				
<b>Fiscal Year</b>	<b>Model Input Assumptions - Class 1</b>		<b>Model Input Assumptions - Class 2/3</b>	
	<b>ETC</b>	<b>VTC</b>	<b>ETC</b>	<b>VTC</b>
2016	78%	22%	99%	1%
2035	99%	1%	99%	1%
<b>Lower ETC Participation</b>				
<b>Fiscal Year</b>	<b>Model Input Assumptions - Class 1</b>		<b>Model Input Assumptions - Class 2/3</b>	
	<b>ETC</b>	<b>VTC</b>	<b>ETC</b>	<b>VTC</b>
2016	52%	48%	68%	32%
2035	67%	33%	71%	29%

**REDUCED ETC PARTICIPATION**

For this test, ETC participation rates for FY 2016 were reduced to 52.0 percent and 68.0 percent for Class 1 and Class 2 and 3 vehicles, respectively. A reduction in ETC participation would be expected to have a small positive effect on gross toll revenues because of the price differential of the payment types, though the higher effective toll rate may result in

a decrease in total transactions. As shown in Table 7-1, revenues are increased by 2.0 percent in FY 2016 and 3.5 percent in FY 2035.

Although these two sensitivity tests indicate that changes in the share of ETC participation have some impact on gross toll revenue, this analysis did not include any allowances for revenue losses due to uncollectible video tolling charges. Under the lower ETC share sensitivity test, more VTC transactions would occur, which means that more revenue would be lost due to leakage than with the base case, which would partially erode the positive revenue impacts shown in Table 7-1. Toll revenue estimates displayed in Table 7-1 reflect gross estimates.

## **INCREASED FUEL COST**

This sensitivity test was based on the assumption that significantly higher fuel prices would result in fewer vehicles traveling in the region. Therefore, in order to reflect gas price increases in the range of 65 percent, the FY 2016 and FY 2035 base trip tables were reduced by 5 percent. This reduction was based on observed elasticities in regional vehicle miles of travel and fuel prices during recent national surges in fuel prices. Under this hypothetical scenario, total annual revenues were reduced by approximately 5.4 percent in the opening year and 5.7 percent in 2035.

## **NO GROWTH SCENARIO**

This critical sensitivity test was performed to estimate the impacts of a significant recession in which growth in the region is delayed by a total of six years. This test is particularly important for the proposed Garden Parkway since much of the growth in travel demand in the project corridor is expected to occur through land development. Should that development not materialize or be delayed, there would be substantial impacts on revenues, especially in the early years of the project. Moreover, the 2016 opening year, under this scenario, shows zero growth from observed 2010 levels. As such, one may gain insight into how the project would perform were it to open under 2010 conditions.

The length, severity, and long term impacts of recessions are difficult to predict. Even the most recent recession is still the subject of considerable speculation as to its long term impact on the US economy, as well as the potential for a second “double dip” recession. WSA performed a sensitivity test to analyze the potential impact of economic downturn on Garden Parkway traffic and revenue. This sensitivity test assumed that the effect of economic downturn would be adequately represented by a six year lag

in the base case socioeconomic forecast for FY 2016. Under this scenario, the gross toll revenue was reduced by 45.6 percent in FY 2016 and 14.0 percent in FY 2035. The higher percentage of reduction in revenue for FY 2016 shows that the project relies very heavily on future development and travel demand growth through the opening year.