Proposed Mid-Currituck Bridge

Preliminary Traffic and Revenue Study

Final Report

NORTH CAROLINA
Turnpike Authority

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Final Report

Prepared For

NORTH CAROLINA
Turnpike Authority

Prepared By

ENGINEERS
PLANNERS
ECONOMISTS

Wilbur Smith Associates

January 24, 2007

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Mr. David W. Joyner
Executive Director
North Carolina Turnpike Authority
5400 Glenwood Avenue
Suite 400
Raleigh, NC 27612

Re: **Preliminary Traffic and Revenue Study – Proposed Mid-Currituck Bridge**

Dear Mr. Joyner:

Wilbur Smith Associates (WSA) is most pleased to submit this report summarizing the results of our preliminary traffic and revenue study for the proposed Mid-Currituck Bridge.

The proposed Mid-Currituck Bridge would involve construction of seven miles of new road and bridge from US 158 on the mainland to NC 12 in the northern Outer Banks. This area has very limited road access. A single two-lane road serves the entire length of the Outer Banks from Southern Shores at the intersection of US 158 and NC 12 to the end of the paved road at Corolla. Additional development is present north of Corolla, which is accessible only via four-wheel drive vehicles operating on the beach. The proposed bridge would save 35 miles and over an hour for some journeys between the mainland and the northern Outer Banks. In the summer, the intersection at Southern Shores is heavily congested which causes severe travel delays particularly on the weekends. Few if any opportunities exist to relieve these congestion levels and the proposed bridge would significantly ease the congestion as the area continues to grow.

We prepared our forecasts using a transportation demand model developed specifically for this study since no other models were available. We conducted extensive origin-destination surveys of motorists in the area as well as traffic studies. However, please note that this study was conducted at a preliminary level of detail and is not sufficient to support project financing. Comprehensive traffic and revenue studies would be needed before financing.

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Our project manager, David Danforth, and other key members of the project team including Amit Thomas, Patrycja Padlo, Marc Torello, and Will Letchworth gratefully acknowledge the assistance provided by NCTA staff, the Town of Southern Shores, the NCDOT, and others during the course of the study. We have appreciated this opportunity to be of service to the Authority.

Respectfully submitted,

WILBUR SMITH ASSOCIATES

Edward J. Regan, III
Senior Vice President

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CHAPTER 1
INTRODUCTION

The proposed Mid-Currituck Bridge is one of several candidate toll projects under consideration by the North Carolina Turnpike Authority (NCTA). The primary objective of the preliminary traffic and revenue study for the proposed Bridge was to determine the potential toll revenue that could be expected from the facility.

The study was conducted at a preliminary feasibility study level, commonly referred to as a "level 2" traffic and revenue analysis. This level of analysis is not intended for use in direct support of project financing. A more detailed, comprehensive traffic and revenue study would be required for that purpose.

PROJECT DESCRIPTION

The Currituck Outer Banks is a part of the North Carolina Outer Banks system. The primary industry of the Outer Banks is tourism and tourist-related commercial activities, retail sales. Access to the Currituck Outer Banks is along US 158, such as cottage rentals and uses the Wright Memorial Bridge to cross the Currituck Sound between Point Harbor on the Currituck County mainland and Kitty Hawk on the Outer Banks. Visitors can also reach the Currituck Outer Banks using US 64 which connects the mainland to the Outer Banks at Manteo.

Figure 1-1 depicts the regional setting of the project and its relationship to the surrounding transportation system. The project study area extends along US 158 from the intersection of US 158 and US 168 at Barco to the intersection of US 158 and NC 12 in Southern Shores and along NC 12 from Southern Shores to Corolla. NC 12 is the only state-maintained road on the Currituck Outer Banks and is approximately 22 miles in length. Additional residential housing is located north of Corolla at Swan Beach, North Swan Beach, and Carova Beach. Public access to these areas is

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REGIONAL LOCATION MAP

FIGURE 1-1

available only by 4-wheel drive vehicle along the beach or boat. No public access is available via Virginia.

The proposed Mid-Currituck Bridge and access road would connect NC 12 on the Currituck Outer Banks to US 158, a distance of approximately seven miles. Preliminary environmental and project development studies are underway; the final location of the proposed new bridge and roadway has not been chosen. The routing shown in Figure 1-2 illustrates the general location, which begins on US 158 near Aydlett and crosses Maple Swamp and the Currituck Sound to Corolla.

Figure 1-2 also illustrates the approximate location of the single toll plaza, which would be located on the mainland near US 158. All traffic using the bridge would pass through this plaza and pay a toll either in cash or electronically.

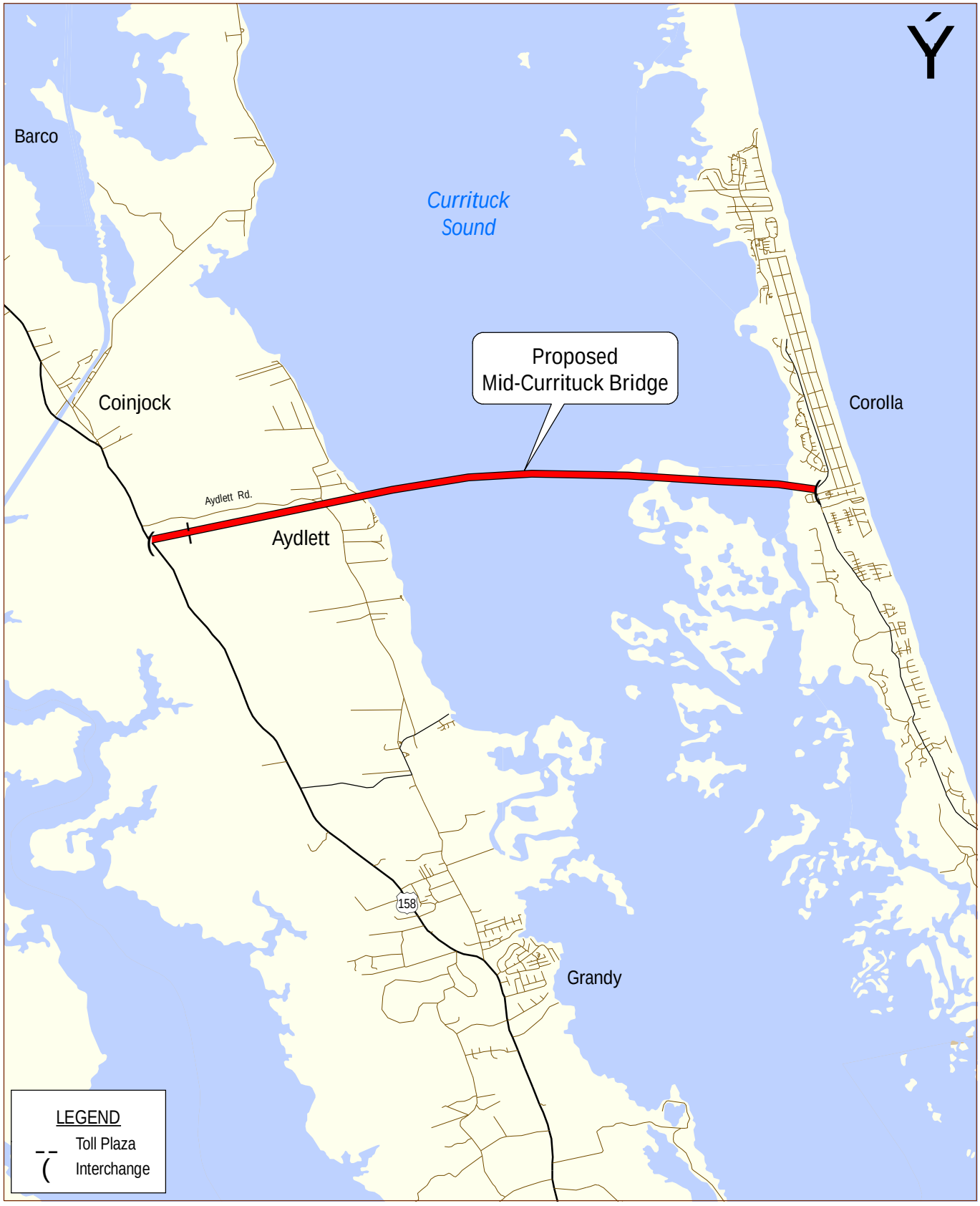
Currently, the Wright Memorial Bridge is the first connection to the Outer Banks from the mainland south of the Virginia border, a distance of approximately 32 miles. The Wright Memorial Bridge and NC 12 experience significant congestion primarily during the peak tourist season. However, travel time along NC 12 deteriorates during peak hours on a year round basis.

The distance from the Aydlett area on US 158 to Corolla is approximately 45 miles. During peak periods this journey can take 1.5 hours or more. The analysis conducted as part of this study indicates that the proposed bridge could save as much as 35 miles and nearly an hour of driving time between Corolla and Coinjock during peak periods when the new bridge is first opened.

The proposed Mid-Currituck Bridge would provide residents and visitors with an alternative route to access the Outer Banks that would avoid the congestion on NC 12. In addition, the toll facility would be a second access for mainland based emergency services; and would provide an important additional emergency evacuation route.

SCOPE OF WORK

Existing traffic volumes and speed delay data were developed for the study area's network to create a baseline picture of traffic operating conditions in the area. The State Transportation Improvement Program was re-



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PROJECT LOCATION MAP

FIGURE 1-2

viewed to identify any programmed improvements to the roadway network over the next seven-year period.

Previous reports and studies on the proposed Mid-Currituck Bridge project were also reviewed. This material included a draft environmental impact statement (DEIS) evaluating the potential impacts of the proposed project as an un-tolled facility, the draft Currituck County Coastal Area Management Act (CAMA) Land Use Plan, and NCDOT annual traffic counts.

Supplemental traffic counts and a survey of motorist travel patterns were conducted for this preliminary traffic and revenue study. Response to the surveys was strong with just under 12,000 surveys distributed and over 1,800 valid surveys returned, a return rate of over 15 percent. Questions asked in the survey were designed to identify the respondent's travel profile. Questions asked included whether or not the respondent resides locally, the respondent's purpose for the trip, how often the respondent makes the trip, and where the trip began and ended. This information provided the basis for the development of a travel demand model for the area and for future public involvement activities for the Mid-Currituck Bridge supplemental environmental studies.

Traffic Model Development

After the baseline data was collected, a travel demand model was developed to simulate traffic in the project study area. This model subdivided the area into 29 traffic analysis zones based on the geography and the distribution of trips in the area. Existing land use data collected from the draft Currituck County CAMA Land Use Plan was used to identify the characteristics of the traffic analysis zones. Year 2006 traffic projected by the model was calibrated to the traffic counts provided by NCDOT and the counts collected for this study. After the model was calibrated to accurately reflect current conditions, programmed improvements to the roadway network were added for use in analyzing future conditions.

Area Growth Analysis

Future growth is particularly important in determining the potential viability of a proposed facility such as the Mid-Currituck Bridge. In order to forecast future volumes in the study area, growth patterns as identified by the draft Currituck County CAMA Land Use Plan, the Duck CAMA Land Use Plan and the Kitty Hawk Land Use Plan were reviewed.

Growth for the year 2025 as projected by these plans was assigned to the appropriate traffic analysis zones in order to develop a traffic model for that year. After the year 2025 model was developed, the growth projec-

tions were refined to develop projections for the opening year of 2013, and interim years of 2015 and 2020. These interim-year models were integral to predicting the future year's revenue streams for the proposed toll road.

TRAFFIC AND REVENUE ANALYSIS

After the traffic model was refined for current and future years, a series of traffic assignments was developed with and without the proposed Mid-Currituck Bridge. In each case, these model runs included peak tourist season and off-peak tourist season periods as well as weekend and weekday traffic. These runs also modeled the proposed facility as un-tolled and tolled at various rates to test the sensitivity of the toll traffic to different toll rates. A review of the reasonableness of the results of these analyses particularly under tolled conditions was performed using various evaluation techniques including select link, corridor share, and capture rate.

Toll sensitivity curves for year 2025 were developed to determine the optimal toll rates. These optimum rates were utilized in developing traffic assignments for future years.

Based on the traffic modeling results, annual estimates of traffic and revenue were prepared for the proposed Mid-Currituck Bridge from the 2013 opening year through 2025. Revenue forecasts for the early years were adjusted to include a "ramp up" period. Traffic on a new toll road increases gradually as customers become accustomed to using the facility. This reflects the fact that full demand on a toll facility is not typically realized immediately upon opening but gradually over a period of two to four years. Allowances were also made for induced traffic, which often occurs when a new transportation facility such as this bridge provides significantly better access to previously underserved areas.

REPORT STRUCTURE

The remainder of this report consists of four chapters and an appendix:

- Chapter 2 presents existing traffic conditions in the study area and surrounding areas.
- Chapter 3 describes the results of the origin-destination survey conducted in the study area.
- Chapter 4 describes the existing socioeconomic conditions and the projected socioeconomic growth of the area.
- Chapter 5 describes the development of the traffic forecast model, assumed roadway improvements, toll scenarios, toll sensitivity, traffic and revenue forecasts and the net toll operating revenue analysis.

CHAPTER 2

EXISTING TRAFFIC CONDITIONS

A major part of the effort of this study involved collecting data and documenting existing traffic conditions and travel behavior in order to:

- Predict travel behavior after the proposed Mid-Currituck Bridge and other facilities planned over the forecast period are constructed; and
- Develop a travel demand model to forecast future traffic in the study area that adequately replicates observed existing traffic conditions.

To achieve these objectives, data on traffic speeds, traffic volumes, and vehicle types in the study area were compiled. Additionally, a route reconnaissance and a review of available traffic statistics on highways within the study area were conducted.

This empirical documentation of the area roadway network was augmented through the collection of available traffic trend data from North Carolina Department of Transportation (NCDOT). Information on programmed highway improvements in the study area were reviewed and incorporated into the analysis.

This chapter describes the data used to characterize the operational performance of the existing roads and bridges in Currituck and Dare Counties. These traffic data collection efforts consisted of three components:

- route reconnaissance;
- speed/delay travel studies; and
- historical traffic count data.

Route reconnaissance studies were preformed on major roadways such as US 158 and NC 12. This effort was used to create the travel demand model characteristics that would accurately reflect current conditions.

This is an important component in creating and calibrating a new travel demand model.

Speed and delay studies were performed using GPS units to collect the location and speed of vehicles while in motion. This information is used to calibrate the travel demand model and to assess the current travel speeds and levels of congestion on the existing road network. These studies were conducted on US 158 from Barco on the mainland to Kitty Hawk on the Outer Banks; and on NC 12 from Kitty Hawk to the northern terminus of NC 12.

Historical traffic counts were reviewed to evaluate traffic growth in the region as context for understanding the evolution of travel behavior after the proposed toll bridge is constructed. This information was supplemented by new traffic counts on major roadways in the Currituck Sound study area.

ROUTE RECONNISSANCE

Site visits were conducted in August, during the peak tourist season, and in September, which provided data more typical of off-peak conditions. Key attributes such as the following were also collected on sections of US 158, US 64 and NC 12:

- posted speed limits;
- number of lanes;
- presence and location of turning lanes; and
- location of interchanges and traffic signals.

Information was collected on the following sections of US 158, US 64 and NC12:

- US 158 from intersection with NC 168 at Barco to the US 158/NC 12 intersection at Southern Shores;
- US 158 from the US 158/NC 12 intersection in Southern Shores to US 64;
- NC 12 from Southern Shores to Corolla; and
- US 64/264 from US 158 to Roanoke Island via Roanoke Sound Bridge.

These roadways were farther subdivided to better represent the observed characteristics. Figure 2-1 shows the locations of each section and Table 2-1 describes key attributes.

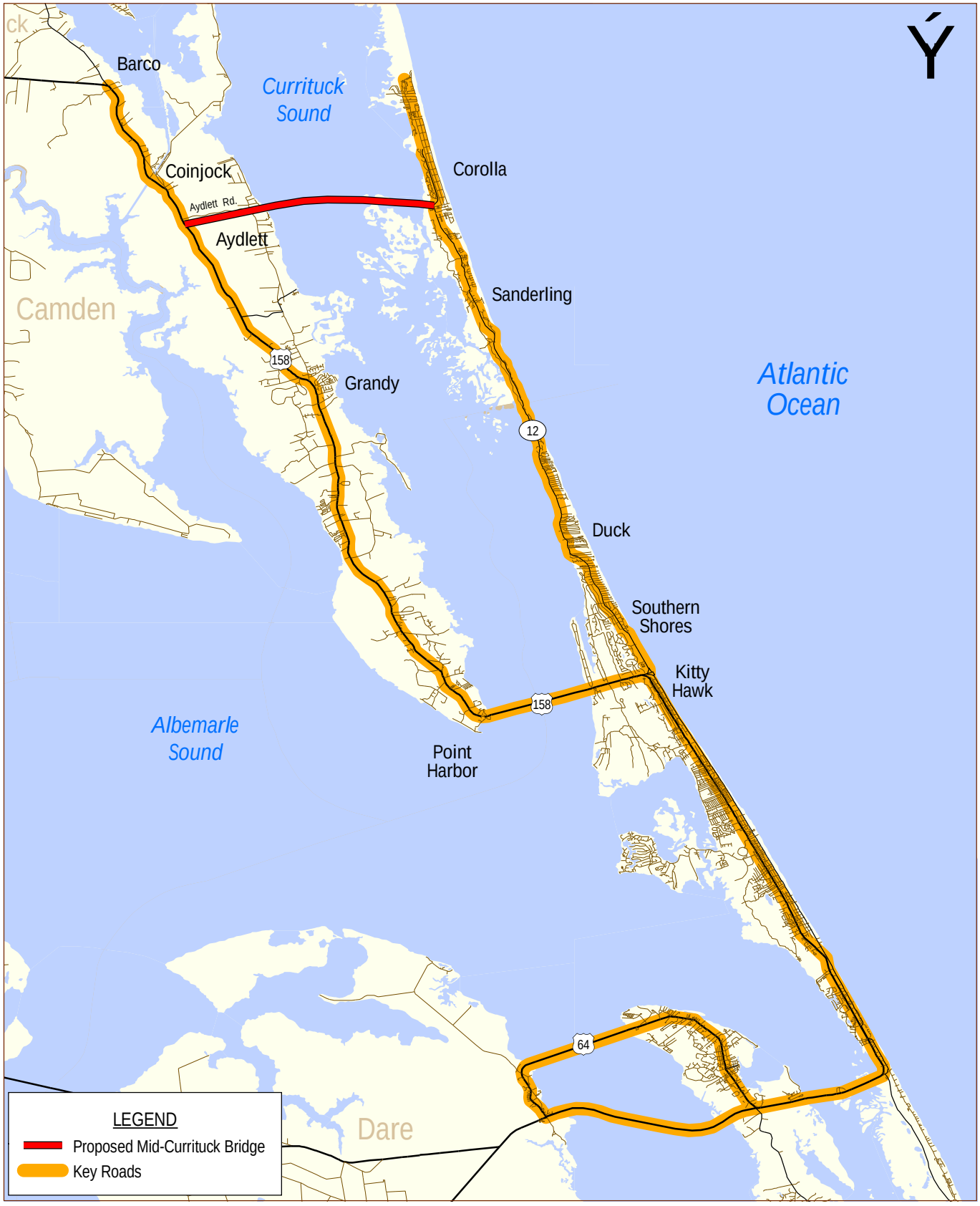
Table 2-1
Key Attributes of Studied Roadways

Route	Location	Lanes Per Direction	Traffic Lights	Left Turn Lanes	Posted Speed Limit
US 158	NC 168 to Point Harbor	2	Yes	Yes	55
US 158	Wright Memorial Bridge	2	No	No	55
US 158	Southern Shores to Whalebone	2	Yes	Yes	45-50
NC 12	Southern Shores to Corolla	1	Yes	Yes	35-45
US 64	Whalebone to Stumpy Point	2	No	No	55

SPEED AND DELAY STUDIES

Another important component in modeling calibration is speed-delay analysis. This features analysis captures the travel speeds and travel delays drivers experience along various roadways at different times. Speed and delay studies using GPS units were performed in both directions on US 158 and NC 12 during peak and off-peak hours and on multiple days. The results of those studies are presented in Table 2-2. Speeds during the off-peak season generally were found near posted speed limits. However, during peak periods, the speeds were considerably lower.

Average operating speeds on some sections of US 158 and NC 12 during peak periods were considerably below the averages shown in Table 2-2. This is particularly true at the Wright Memorial Bridge and at the junction of US 158 and NC 12 at Southern Shores in the southbound direction on Saturdays in the summer season when vacation rental changeovers occur.



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LOCATION OF ROUTE RECONNAISSANCE

FIGURE 2-1

Table 2-2
Average Speeds on US 158 and NC 12

	Peak Season				Off season			
	AM		PM		AM		PM	
Route	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB
Weekday								
Mainland, US 158/NC 168 to Point Harbor	53.0	-	52.0	-	53.6	51.5	56.2	52.9
Wright Memorial Bridge, US 158	-	43.6	46.4	-	40.0	50.0	46.0	49.2
Southern Shores to Corolla, NC 12	-	35.8	-	35.0	39.1	36.4	38.0	37.0
Weekend								
Mainland, US 158/NC 168 to Point Harbor	58.4	-	58.0	58.6	58.6	-	57.7	-
Wright Memorial Bridge, US 158	51.0	-	35.0	51.0	39.4	44.3	51.8	48.2
Southern Shores to Corolla, NC 12	39.0	-	37.0	36.5	39.5	-	42.0	37.0

HISTORICAL TRAFFIC COUNTS

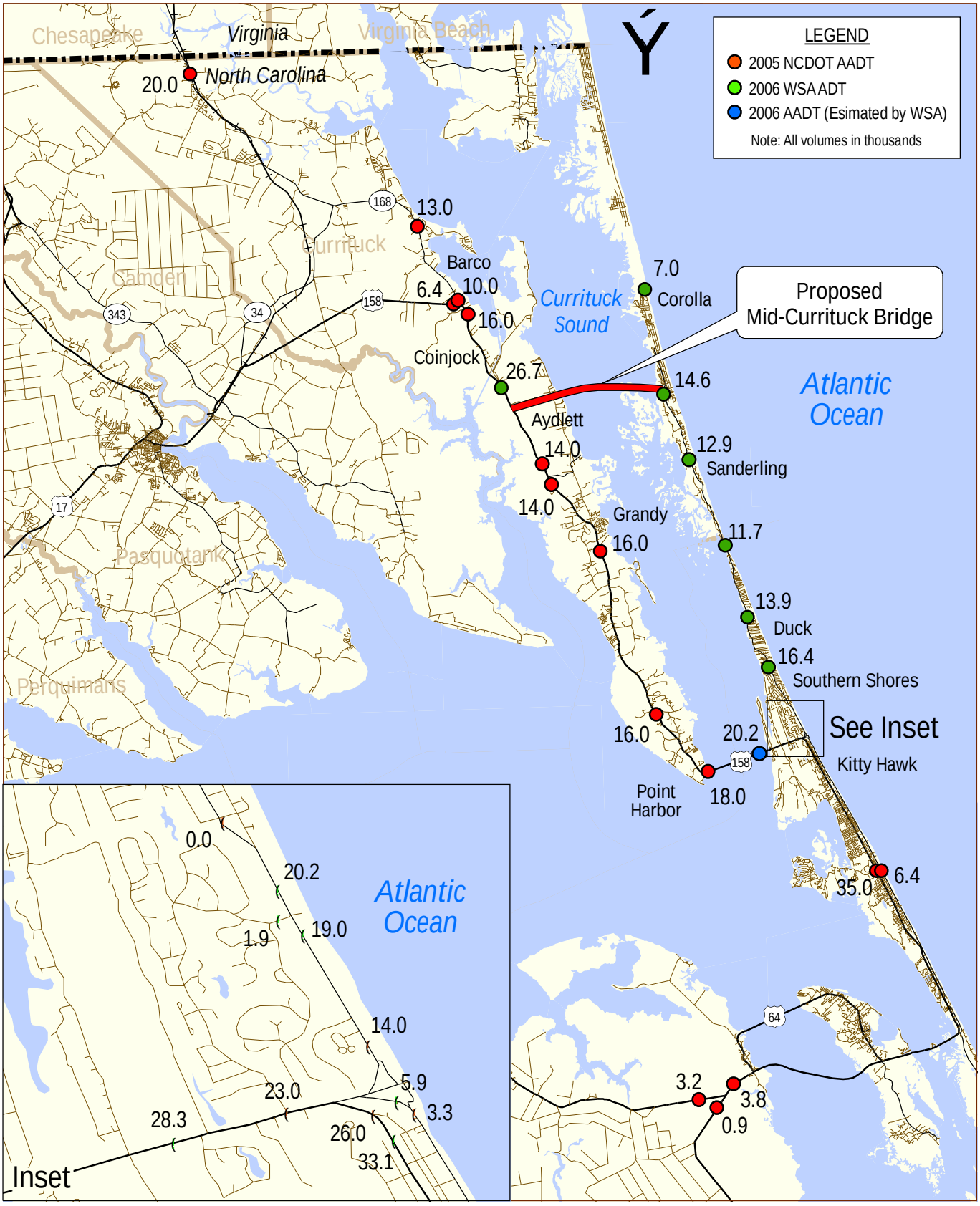
A variety of historical traffic count data was used in this study to better understand the traffic patterns of Currituck and Dare Counties; specifically, traffic growth, traffic variation due to tourism and traffic variations due to day of the week. Figure 2-2 represents traffic volumes at various locations along US 158, US 168, US 64 and NC 12. All volumes are shown in thousands of vehicles.

Table 2-3 shows volume patterns between 1995 and 2005 for several locations. Overall, traffic volumes peaked in 2001 followed by a slight decline over two years and gradual increase in 2004/2005. Part of this decrease in 2001 could be the result of a general decline in tourism travel following the 2001 terrorist attacks. Another factor that probably dampened travel in 2005 was the sudden increase in fuel prices.

The principal competing route to the proposed toll bridge would be the Wright Memorial Bridge (US 158) across Currituck Sound. Figure 2-3 compares traffic volumes on US 158 to traffic volumes on NC 12 north of the US 158/NC 12 junction.

US 158 on the mainland between Barco and Point Harbor has exhibited little growth in the most recent five-year period (2000-2005). Average Annual Daily Traffic (AADT) crossing the US 158 Bridge was at 18,000 vehicles per day (vpd) in 2005 as reported by NCDOT. However, on the east side of the bridge the US 158 AADT was 23,000 vpd in 2005. US 158 to the south of the NC 158/NC 12 intersection was 26,000 vpd in 2005. NC 12 to the north of this junction carried about 14,000 vpd in 2005. The higher volume to the east of the bridge in comparison to the volume west of the bridge indicates that a large amount of traffic is “local” to the Outer Banks. That is, this local traffic is generated by the various businesses between the US 158 Bridge and the US 158/NC 12 intersection.

Traffic levels on NC 12 between Southern Shores and Corolla appeared to be down in 2005. Fuel prices may be one reason. However, another reason could be that congestion along this road has reached a saturation point and has become a deterrent to traffic growth.



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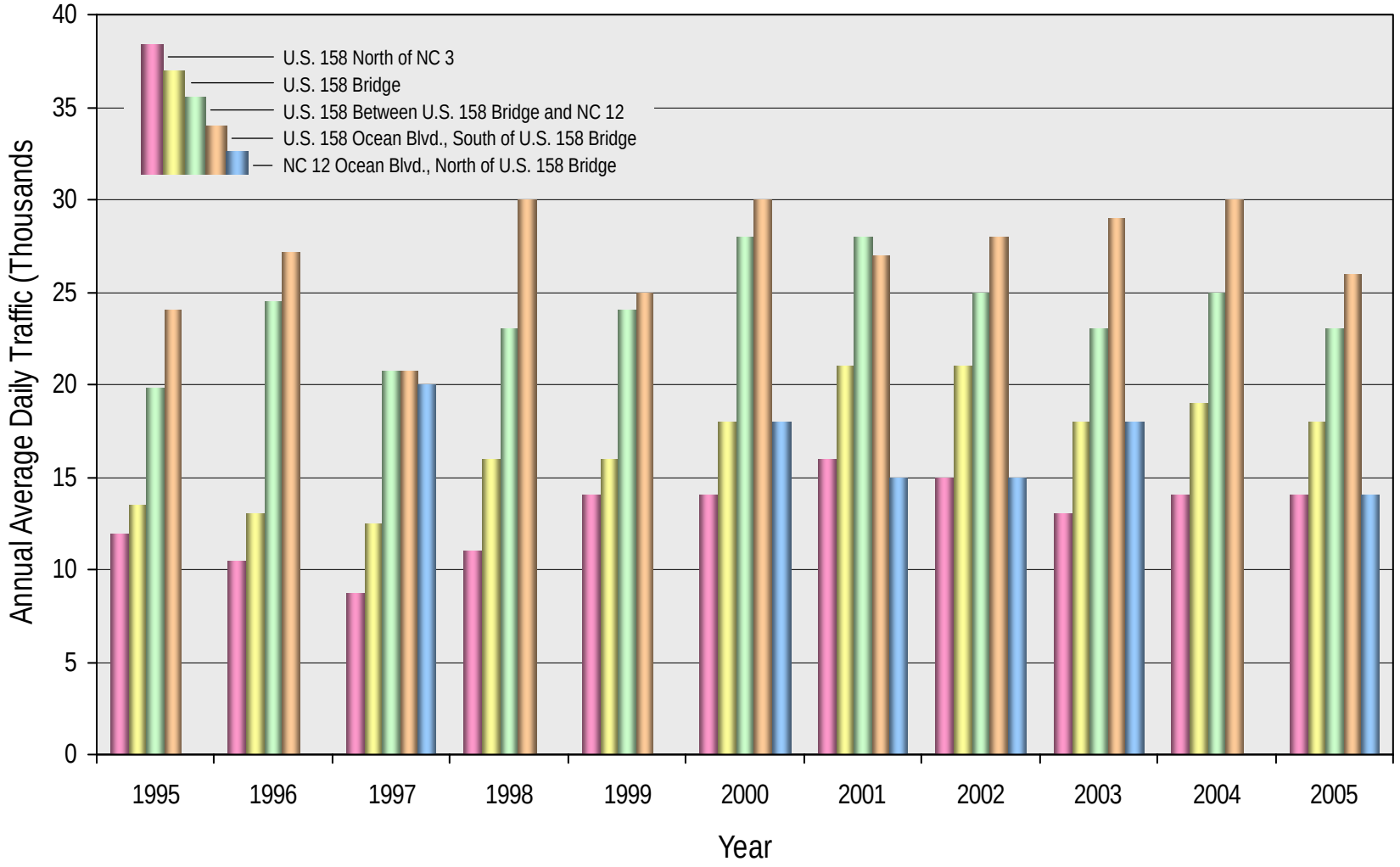
ANNUAL AVERAGE DAILY TRAFFIC COUNTS
AT SELECTED STUDY AREA LOCATIONS

FIGURE 2-2



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AVERAGE ANNUAL DAILY TRAFFIC AT SELECTED LOCATIONS

FIGURE 2-3

Table 2-3
Annual Average Daily Traffic Trends
on US 158, US 168, US 64 and NC 12

Location	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	AAPC (1) 1995-2000	AAPC 2000-2005	AAPC 1995-2005
US 158 North of Lucinda Lane	13,700	14,800	13,800	13,000	15,000	17,000	20,000	19,000	17,000	16,000	16,000	4.41%	-1.21%	1.56%
US 158 South of Hickory Hill Drive	12,700	---	12,200	14,000	14,000	16,000	18,000	18,000	14,000	16,000	16,000	4.73%	0.00%	2.34%
US 158 South of NC 3	---	11,500	9,300	11,000	12,000	14,000	19,000	15,000	13,000	14,000	14,000		0.00%	
US 158 North of NC 3	11,900	10,500	8,700	11,000	14,000	14,000	16,000	15,000	13,000	14,000	14,000	3.30%	0.00%	1.64%
US 158 South of NC 168	13,100	11,900	10,900	14,000	16,000	15,000	20,000	18,000	17,000	15,000	16,000	2.75%	1.30%	2.02%
NC 168, Barco, North of US 158	8,600	10,000	8,400	9,200	11,000	12,000	11,000	10,000	10,000	11,000	10,000	6.89%	-3.58%	1.52%
US 158 West of Intersection with NC 168	5,300	5,300	5,000	5,900	6,000	6,000	6,600	7,500	6,900	7,100	6,400	2.51%	1.30%	1.90%
NC 168, North of South Mill Road	---	8,500	14,800	14,000	15,000	17,000	24,000	22,000	21,000	23,000	20,000		3.30%	
US 158/Croatan Highway, South of NC 1217	33,200	35,100	33,400	31,000	29,000	34,000	40,000	39,000	43,000	40,000	35,000	0.48%	0.58%	0.53%
US 158 Point Harbor (Wright Memorial Bridge)	13,500	13,000	12,500	16,000	16,000	18,000	21,000	21,000	18,000	19,000	18,000	5.92%	0.00%	2.92%
US 158 Between Wright Memorial Bridge and NC 12	19,800	24,500	20,700	23,000	24,000	28,000	28,000	25,000	23,000	25,000	23,000	7.18%	-3.86%	1.51%
US 158 Ocean Boulevard, South of US 158 Bridge	24,000	27,200	20,700	30,000	25,000	30,000	27,000	28,000	29,000	30,000	26,000	4.56%	-2.82%	0.80%
South Virginia Dare Trail, South of Wright Memorial Bridge	7,400	12,800	9,100	14,000	4,500	9,000	9,400	6,900	6,100	6,900	6,400	3.99%	-6.59%	-1.44%
NC 12 Ocean Boulevard, North of US 158 Bridge	---	---	20,000	---	---	18,000	15,000	15,000	18,000	---	14,000		-4.90%	
NC 12 Ocean Boulevard, South of US 158 Bridge	3,700	4,100	3,600	11,000	2,600	4,100	3,400	4,100	3,200	3,300	3,300	2.07%	-4.25%	-1.14%
US 64 & US 264, Stumpy Point, before fork	3,800	3,000	2,500	3,300	---	3,600	4,700	4,000	4,000	---	3,800	-1.08%	1.09%	0.00%

(1) AAPC: Average Annual Percent Change
Source: NC DOT

Table 2-4
Daily Traffic Variations on US 158 and NC 12

	Daily Index (1)							
Location & Nearest Crossing Road	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Average Day
US158 - Young Road	131	74	71	74	70	98	182	100
US158 - Dogwood Trail	114	91	93	89	93	100	121	100
NC 12 - Fonck Street	93	93	85	92	108	117	112	100
NC 12 - Hilton	92	94	95	94	107	110	107	100
NC 12 - Chicahawk South	99	87	91	102	104	106	111	100
NC 12 - Chicahawk	88	98	98	105	109	111	90	100
NC 12 - Chicahawk North	101	88	93	103	97	108	109	100
NC 12 - 9th Avenue	105	86	90	103	106	106	105	100
NC 12 - Sandy Ridge Road	102	76	72	99	110	108	134	100
NC 12 - Station Bay Cove	94	80	88	98	105	101	135	100
NC 12 - Dubose	89	83	87	98	107	100	136	100
NC 12 - Crown Point Road	89	90	85	96	108	105	126	100
NC 12 - 3rd Street	91	85	90	98	104	104	128	100
NC 12 - North Beach Access	115	112	119	109	63	38	144	100

(1) Daily Index: Ratio of individual day's traffic to average daily traffic for the week
Source: Counts in August and September 2006

Supplemental traffic counts were collected at the locations shown in green on Figure 2-2. These counts demonstrate the differences between factors such as day of week and/or seasonal variations. Table 2-4 shows the daily traffic variations observed on US 158 and NC 12. The higher traffic volumes on weekends are most likely the result of tourists arriving or departing from their vacation destinations and "day trippers" to the public beach access points. For example, at US 158 and Dogwood Trail between the US 158 Bridge and NC 12, Saturday traffic was 132 percent higher than the average daily traffic for this location.

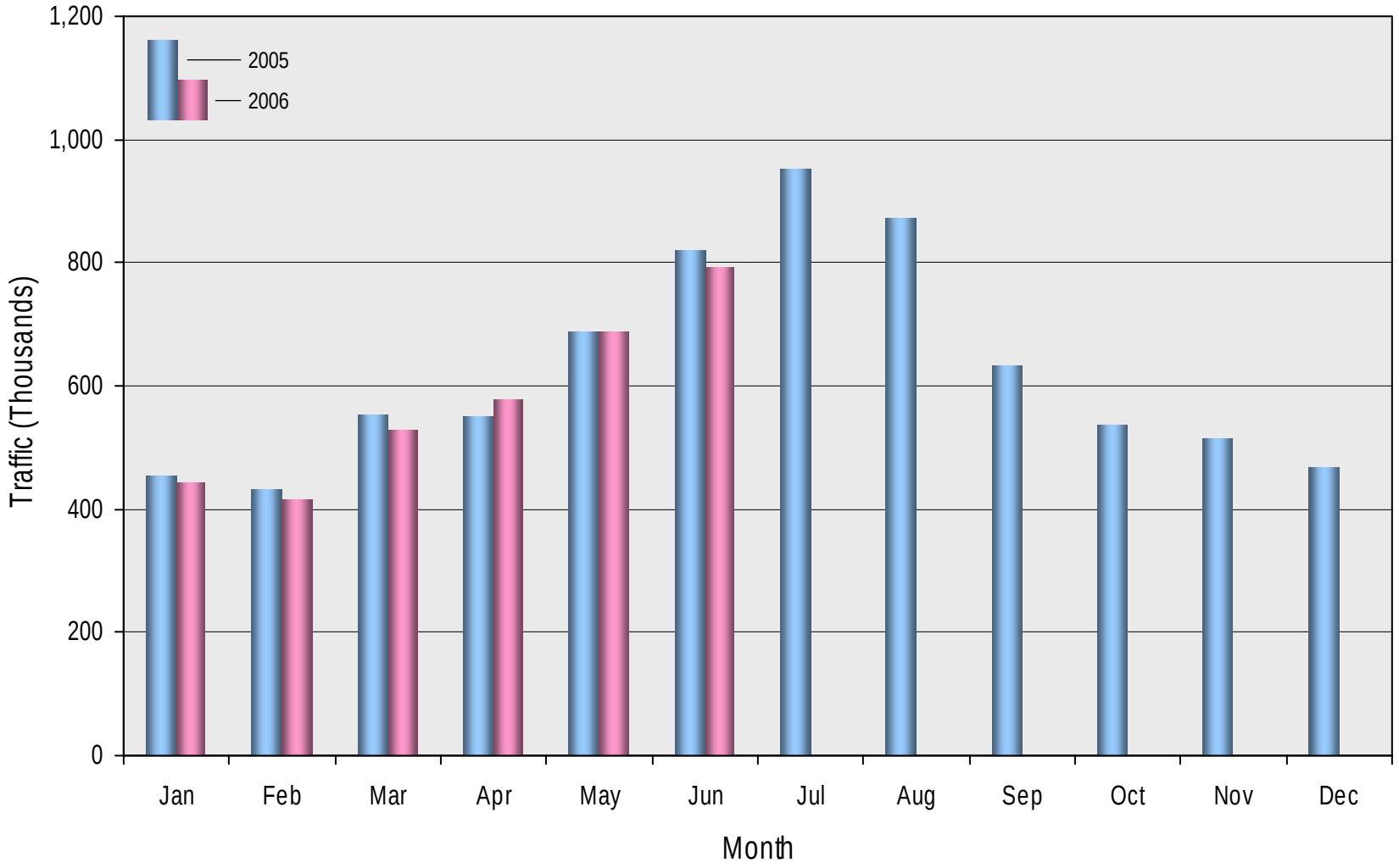
Figure 2-4 shows monthly traffic variations for 2005 and 2006 collected from the Wright Memorial Bridge permanent automatic traffic recording station. In 2005, traffic volumes during July were 45.5 percent higher than during February. This clearly shows that during summer months traffic on US 158 and NC 12 can double due to tourism.

As it might be expected, passenger vehicles predominate in this region. Table 2-5 shows that nearly 99 percent of the vehicles counted over 7-day periods in the peak and off-peak seasons were passenger vehicles and light trucks such as pickups and other light and medium size trucks.

Table 2-5
Vehicle Classification at Selected Locations

Location & Nearest Crossing Road	Passenger Vehicles	Light and Medium Trucks	Heavy Trucks	Total Vehicles
	(percent)			
US 158 - Young Road Northbound	75.45	21.94	2.61	100
US 158 - Young Road Southbound	84.52	13.84	1.64	100
NC 12 - Fonck Street Eastbound	82.23	15.74	2.02	100
NC 12 - Fonck Street Westbound	88.29	9.63	2.09	100
NC 12 - Hilton	73.47	25.81	0.72	100
NC 12 - Chicahawk South	74.21	24.94	0.86	100
NC 12 - Chicahawk North	72.12	26.93	0.95	100
NC 12 - 9th Avenue	82.44	16.84	0.73	100
NC 12 - Sandy Ridge Road	82.60	16.68	0.72	100
NC 12 - Station Bay Cove	73.86	25.10	1.03	100
NC 12 - Dubose	80.60	18.75	0.65	100
NC 12 - Crown Point Road	77.98	21.40	0.61	100
NC 12 - 3rd Street	88.90	10.88	0.22	100
NC 12 - North Beach Access	71.01	28.73	0.26	100
Average:	79.38	19.45	1.17	100

Source: Counts in August and September 2006



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TOTAL TRAFFIC - WRIGHT MEMORIAL BRIDGE
2005 AND 2006

FIGURE 2-4

CHAPTER 3

MOTORIST TRAVEL SURVEY

This chapter describes the methodology used to collect information on travel patterns and trip characteristics in the study area and analyzes the survey findings. This information is an integral element of the travel demand forecasting process that is used to generate the traffic and revenue projections.

One of the important objectives of this study is to develop a detailed profile of potential users of the proposed Mid-Currituck Bridge. This profile is based on origin and destination (O-D) surveys that were conducted to collect information about actual travel movements in the project area. The following sections describe the survey locations, the survey process utilized to obtain the information, and the survey results that were used in the development of a traffic and revenue forecasting model.

SURVEY STATION LOCATION AND PROCEDURES

The travel survey was conducted over four days on August 24 and 26 and September 28 and 30, 2006.

The survey station was located in Southern Shores just north of the intersection of NC 12 and US 158 at Chicahauk Trail. A station at this location was expected to intercept the largest number of potential Mid-Currituck Bridge users. Figure 3-1 shows the location of the survey station in the northbound and southbound directions on NC 12. In conjunction with survey operations, 7-day traffic counts were also conducted at the same location as the surveys. Vehicles were classified by axle groupings. These counts were used to expand the survey sample to reflect average weekday and weekend traffic levels during the 2006 peak tourist season; and average weekday and weekend traffic levels during the off-season.

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ORIGIN-DESTINATION SURVEY LOCATION
AUGUST AND SEPTEMBER, 2006

FIGURE 3-1

The survey was conducted in accordance with an operation and safety plan developed specifically for this survey. The plan diagrammed the location of signage, survey personnel, supervisors, and police; and described the conduct of the survey and safety procedures to be followed.

SURVEY METHODOLOGY

A mail-back handout survey approach was implemented to intercept motorists at the survey location. The hour, day and direction of each survey were indicated on the survey questionnaire. Surveys were conducted during four days in August and September to gather data about travel patterns on peak season weekdays, peak season weekends, off-season weekdays, and off-season weekends between 7:00 am to 7:00 pm. Police officers were used to assist with traffic operations and safety procedures. Warning signs were positioned along the approaches to each intersection advising motorists of the survey operation ahead. When the traffic signals turned red, survey personnel passed among the stopped vehicles and distributed postage-paid, pre-addressed mail-back survey questionnaires. When the traffic signals turned green, survey personnel exited the intersection so that motorists could pass unimpeded.

The survey questionnaires were designed so that the survey would remain anonymous, with no linkage between individual motorists and their questionnaires. Motorists were primarily queried as to their trip origin and destination, as well as their residency status in the Outer Banks. Local traffic was distinguished from tourist traffic. Furthermore, trip purpose, trip frequency, vehicle occupancy for both locals and tourists were obtained. Finally, frequency and seasonality of visits were queried for tourists. Figure 3-2 shows the mail-back handout survey questionnaire.

The survey results provided a database from which trip tables were constructed that reflected the current usage patterns of the highway system in the study area. The information was geo-coded using a Geographical Information System (GIS) method to take advantage of the accurate nature of the trip origin and destination locating capabilities of GIS. The O-D survey data was then converted to a traffic zone system throughout the region and screened for logical movements and other quality control measures.

Information concerning the motorists who utilize NC 12 in their daily travels was obtained. The results, when coupled with the data obtained

Travel Pattern Survey - August 2006

Dear Motorist:

The North Carolina Turnpike Authority (NCTA) is conducting a feasibility study for a proposed bridge linking US 158 on the mainland with NC 12 in the Corolla area of the northern Outer Banks. NCTA is requesting your assistance and is asking for information about the one-way trip that you made today when you received this questionnaire. Please complete the questionnaire and drop it into the mail at your earliest convenience. Postage is pre-paid. All information is confidential and will not be used for any purpose other than the feasibility study. Thank you for your participation.

7

8

A. Where did you start your one-way trip today? Please be as specific as possible. If you do not know the street address where this one-way trip began, please identify the nearest intersection, shopping area, resort complex, subdivision, etc.

9

Street Address, nearest intersection or location

City or town State Zip Code (if known)

10

B. Where did you end your one-way trip today? Please be as specific as possible. If you do not know the street address where this one-way trip ended, please identify the nearest intersection, shopping area, resort complex, subdivision, etc. The answer should not be the same as your answer for Question A.

11

Street Address, nearest intersection or location

City or town State Zip Code (if known)

12

C. Please indicate the main purpose of your one-way trip. (Circle one)

1. To or from work
2. Company Business
3. Personal Business
4. School
5. Shopping
6. Social / Recreational
7. Begin or End Vacation Stay

13

D. How many times per week do you make this one-way trip? (Circle one)

Less than 1 1 2 3 4 5 6 or more

E. How many people, including yourself and any children were in your vehicle? (Circle one)

1 2 3 4 5 6 or more

14

F. Please identify the type of vehicle you were driving. (Circle one)

1. Passenger Car, SUV or Pickup Truck
2. 2-axle, 6 tire Truck or Bus
3. 3-axle Truck or Bus
4. 4-axle Truck
5. Truck with 6 or more axles
6. Motorcycle

15

G. What is the state of registration of your vehicle? _____

H. If you are a permanent resident of any of the following communities, please indicate below. (Circle one)

1. Southern Shores
2. Duck
3. Sanderling
4. Corolla
5. 4-wheel drive area
6. Not a resident of communities listed.

16

I. If you are a visitor or vacationer of any of the following communities, please indicate the location of your hotel, cottage, condo or resort complex. (Circle one)

1. Southern Shores
2. Duck
3. Sanderling
4. Corolla
5. 4-wheel drive area
6. Not a visitor or vacationer of communities listed.

17

J. If you are a visitor or vacationer to the area, how often do you come to the area? (Circle one)

1. First time
2. Once per year
3. Twice per year
4. Three times per year
5. Four times per year
6. More than four times per year

18

K. If you are a visitor, what time of year do you typically visit this area? (Circle all that apply)

1. Spring
2. Summer
3. Fall
4. Winter

1	5	1														
STA	DAY	DIR	HR		C	D	E	F	G	H	I	J		K		

Note: A similar form was used in September 2006.

NORTH CAROLINA Turnpike Authority

SAMPLE SURVEY FORM - AUGUST 2006

FIGURE 3-2

from the route reconnaissance program and the classification counts conducted, were used to calibrate the traffic model.

The remaining sections of this chapter provide a compendium of some of the statistical results of the survey.

SURVEY SAMPLE SIZE

The O-D survey provided motorists with a significant opportunity to participate in the planning of a major transportation infrastructure improvement. The mail-back program allowed the NCTA to sample citizens who potentially will use the Mid-Currituck Bridge in the course of their daily commute or start/end of vacation. The percent sampled varied by peak season versus off-season, weekday versus weekend and time of survey; but overall an adequate percentage of the motorists intercepted replied to the survey for statistical accuracy and empirical analysis of the results. Table 3-1 shows the number of motorists contacted during the course of the survey process.

A total of 1,844 valid surveys were returned from a total of 11,855 distributed to motorists during the four days of survey operations. The surveys returned represented 15.6 percent of the surveys distributed. The capture rate for the 8 periods ranged from a low of 9 percent returned on the off-season weekend to a high of 23.1 percent returned on the peak season weekday. This level of return is considered to be sufficient to identify major trip patterns and motorist characteristics.

TRIP CHARACTERISTICS

The survey responses were analyzed to determine the different trip characteristics of potential customers of the proposed bridge. Since the survey was conducted during different seasons and days of the week, the information was useful in determining seasonal and day of the week trip characteristics.

Table 3-1
Motorist Survey Sample Size

Survey	Date	Direction	Number of Surveys Distributed	Number of Valid Surveys Returned	Passing Traffic	Percent of Passing Traffic Surveyed	Percent Rate of Returned Surveys
OFF-SEASON							
Weekday	9/28/2006	Northbound	1,045	128	5,884	17.8	12.2
Weekday	9/28/2006	Southbound	1,485	204	5,721	26.0	13.7
Weekend	9/30/2006	Northbound	830	75	4,706	17.6	9.0
Weekend	9/30/2006	Southbound	1,800	177	4,896	36.8	9.8
		Subtotal	**5,160**	**584**	**21,207**	**24.3**	**11.3**
PEAK SEASON							
Weekday	8/24/2006	Northbound	1,099	199	7,525	14.6	18.1
Weekday	8/24/2006	Southbound	2,686	499	7,917	33.9	18.6
Weekend	8/26/2006	Northbound	1,302	191	9,552	13.6	14.7
Weekend	8/26/2006	Southbound	1,608	371	7,243	22.2	23.1
		Subtotal	**6,695**	**1,260**	**32,237**	**20.8**	**18.8**
		Total	**11,855**	**1,844**	**53,444**	**22.2**	**15.6**

Location: NC 12 at Chicahauk Trail, Southern Shores, NC

RESIDENCY STATUS

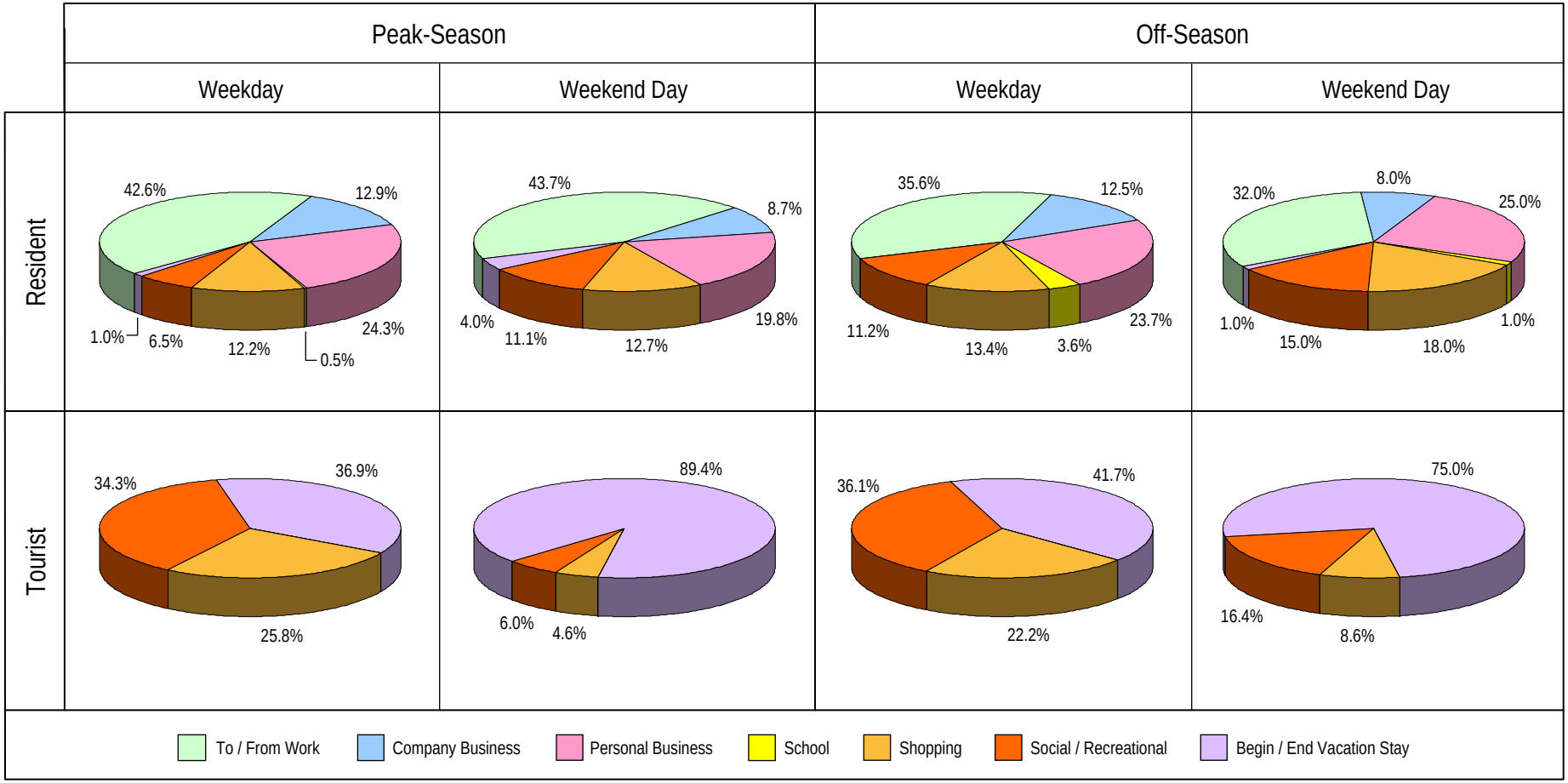
The survey requested respondents to indicate the location of their residence or hotel/rental unit between Southern Shores and the Virginia State Line. If the respondent did not reside in the designated area, additional responses as to trip purpose were utilized to assess residency status. For example, only tourists could answer: begin/end vacation stay; similarly only residents could answer: to/from work. It was important to determine residency status of the respondents in order to estimate the number of potential users of the proposed toll bridge. As shown in Table 3-2, the overwhelming numbers of trips during the peak season weekend were made by tourists, 78 percent. Similarly, during off season weekends, tourists remained the highest percentage of NC 12 users, 60 percent. During the weekday peak season, residents constituted 58 percent of the motorists on NC 12, compared to 42 percent tourists. During an off-season weekday, a higher percentage (68 percent) of motorists were residents.

Table 3-2
Residency Status
of Motorists on NC 12

	Residents	Tourists	Total
		Peak Season	
Weekday	57.7%	42.3%	100.0%
Weekend	22.4%	77.6%	100.0%
		Off-Season	
Weekday	67.5%	32.5%	100.0%
Weekend	39.7%	60.3%	100.0%

TRIP PURPOSE

The profile of trip purpose shown in Figure 3-3, indicates great variation during the survey periods. The purpose of motorists traveling on the NC 12 differs significantly between residents and tourists and between peak and off-peak seasons.



NORTH CAROLINA Turnpike Authority

TRIP PURPOSE DISTRIBUTION

FIGURE 3-3

Residents - For example, work trips accounted for 36 percent of trips made by residents weekday off season weekdays and 43 percent of weekday trips during peak season. Weekend trips to work averaged around 32 percent to 44 percent during peak season. The next highest trip purpose was personal business, followed by shopping. This was the trend for both weekdays and weekends during season and off season.

Tourists – For tourists the predominant purpose of off-season weekend travel on NC 12 was to begin or end their vacation. This percentage peaked at 89 percent during season weekends and 75 percent during off season weekends. This trend continued for weekdays with smaller peaks of 37 percent during season and 42 percent off season. The percentages were substantially higher on weekends because rental change-overs usually occur on the weekend, and visitors are either packing or unpacking rather than doing any other travel. The second most frequent trip purpose for tourists was social/recreational or shopping. During off-season weekdays and weekends, this trip purpose represented 36 percent and 16 percent of trips on NC 12, respectively. During peak season weekdays and weekends, social/recreational trips represented 34 percent and 6 percent of trips on NC 12, respectively.

TRIP FREQUENCY

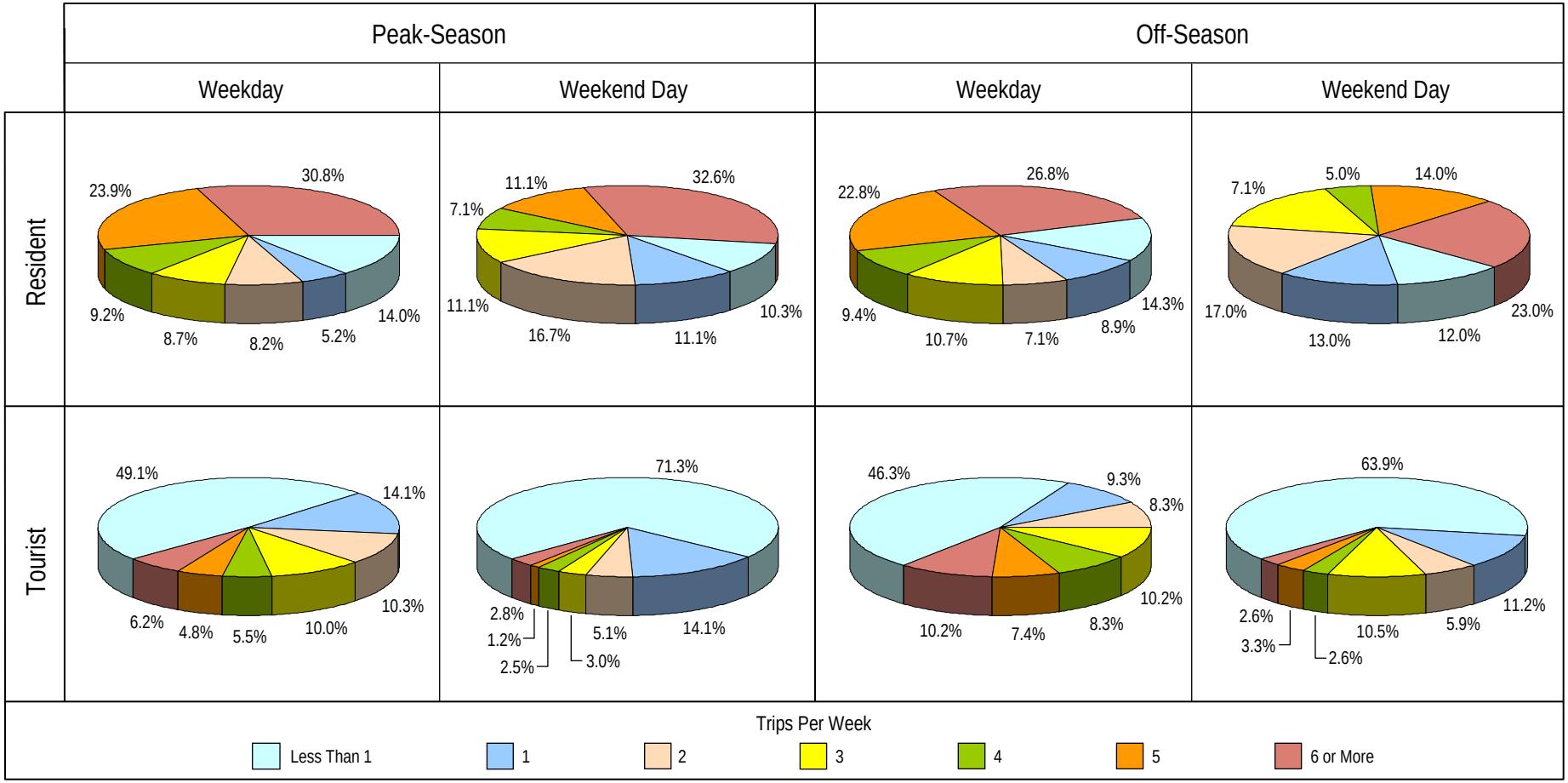
The trip frequency patterns of motorists traveling on NC 12 north of US 158 are presented in Figure 3-4.

Residents – Residents make more trips per week than visitors particularly during the peak season. Again, the frequency can be explained by trips to from work.

Tourists – Most tourists make one or no trips during weekdays. The majority of tourists queried were at the start or end of their vacation. More frequent trips for tourist were: shopping, and social recreational. In general tourists did not make as frequent trips as frequently as the residents.

VEHICLE OCCUPANCY

Vehicle occupancy rates for residents and tourists using NC 12 are shown in Figure 3-5. A majority of resident survey respondents traveled alone or with one passenger during all periods. As expected, tourist vehicle occupancy rates were higher, especially during the peak season, which attracts family vacationers. During the off-peak season, the highest percentage of vehicle occupancy was two passengers per vehicle, which reflected more couples and day trippers when compared to the peak season.



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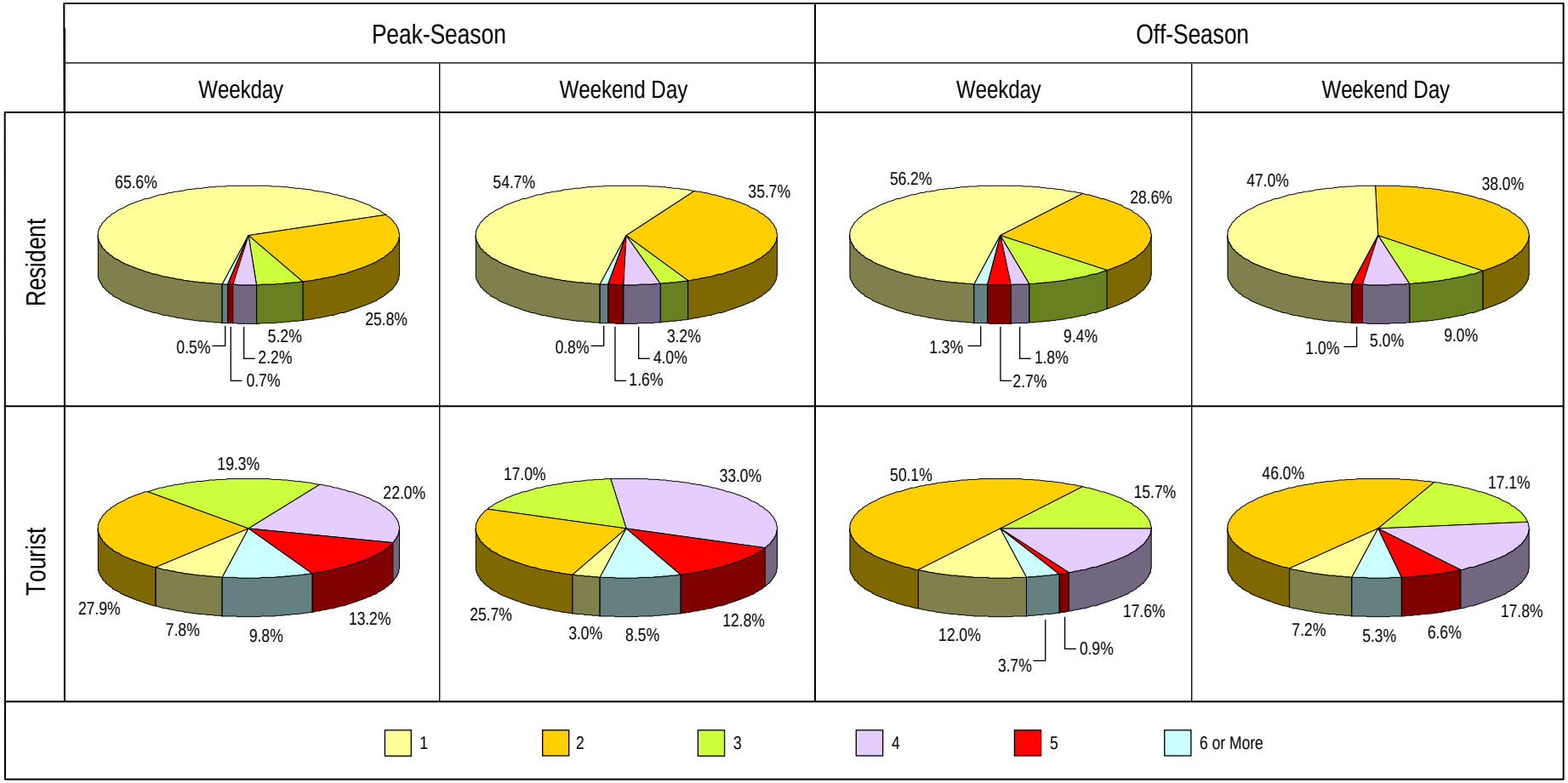
TRIP FREQUENCY DISTRIBUTION

FIGURE 3-4



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VEHICLE OCCUPANCY DISTRIBUTION

FIGURE 3-5

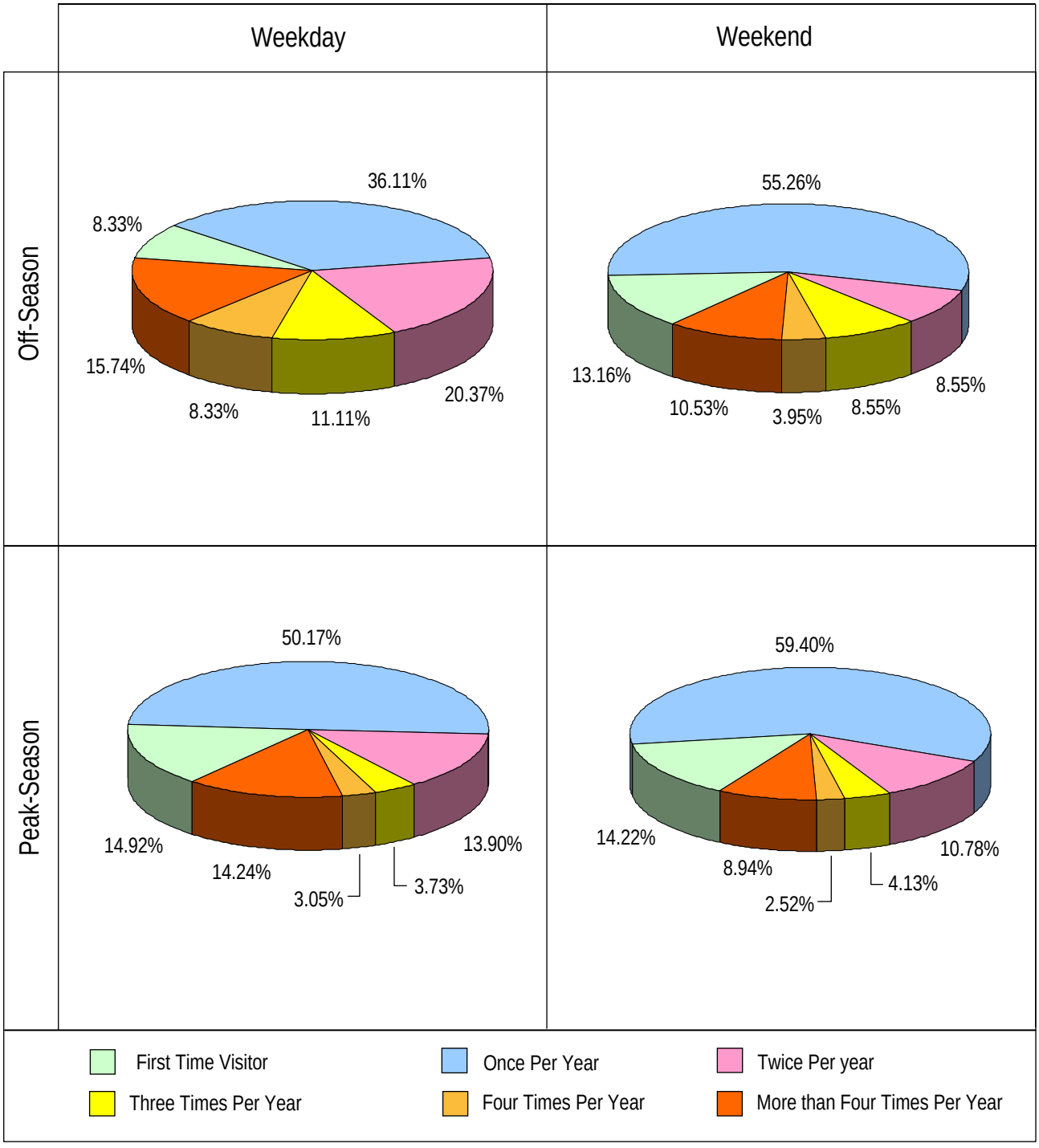
Vacation Season And Frequency – Tourists were asked about their frequency of vacations to the Outer Banks as summarized in Figure 3-6. During the peak season, between 14 and 15 percent of respondents indicated that they were on their first vacation to the area. Between 50 and 59 percent responded that they come once a year during the peak season. A somewhat smaller percentage reported visiting the Outer Banks during the off-season. Even though the first time or single visit categories predominate, more frequent visitors were also significant.

TRIP ENDS

Trip origins and destinations from the survey were coded to a zone system using GIS techniques in order to identify travel patterns for inclusion in the area transportation model. Figure 3-7 shows the zone structure that was created for this study and used in the transportation demand model described in Chapter 5.

Table 3-3 shows the total trips that begin and end for each of the Transportation Analysis Zones (TAZs) developed for the model. The travel patterns from the survey provided the basis for the forecasts of trips and travel patterns for future years. Table 3-3 also designates the sections of the study area that each TAZ represents.

These trip end summaries were based on the travel survey conducted for this study and represent only traffic that passed through the survey station in Southern Shores. For example, over 43,000 trip ends were estimated during the peak season – weekend day survey. Of those approximately 52 percent of the trips started or ended north of the US 158/NC 12 intersection at Southern Shores. Approximately 10 percent of the remaining weekend trips started and/or ended south of the US 158/NC 12 intersection. The table also illustrates the differences between weekday travel and weekend travel and between peak season travel and off-season travel. The weekend changeover of vacation rental houses is illustrated by the increased number of trips. During the peak season weekend, over 17 percent of the trips were to or from states generally north of North Carolina and 14 percent were from states to the south or west. On peak season weekdays, trips to or from these states were much lower.



NORTH CAROLINA Turnpike Authority

VACATION FREQUENCY DISTRIBUTION

FIGURE 3-6

NORTH CAROLINA Turnpike Authority

MODEL TRANSPORTATION ANALYSIS ZONES

FIGURE 3-7

Table 3-3
Base Year Trip Ends
2006

Origin or Destination	Transportation Analysis Zone	Trip Ends							
		Peak Season - Weekday		Peak Season - Weekend		Off-Season - Weekday		Off-Season - Weekend	
		Traffic	Percent of Traffic	Traffic	Percent of Traffic	Traffic	Percent of Traffic	Traffic	Percent of Traffic
Southern Shores	1, 29	8,067	20.9	4,395	10.2	5,577	20.7	3,166	13.8
Duck	2, 3	6,123	15.8	6,593	15.3	4,546	16.9	3,435	15.0
Pine Island	4, 5, 6	2,370	6.1	4,243	9.8	1,800	6.7	1,996	8.7
Corolla	7, 8	4,409	11.4	6,175	14.3	2,488	9.2	2,628	11.5
Four-Wheel Drive	9	316	0.8	1,180	2.7	423	1.6	499	2.2
Subtotal - NC 12 North to VA Line		21,285	55.0	22,586	52.3	14,834	55.1	11,724	51.1
Kitty Hawk	10	4,277	11.1	1,948	4.5	3,007	11.2	1,830	8.0
Kill Devil Hills	11-13	3,787	9.8	1,041	2.4	2,320	8.6	2,035	8.9
Nags Head	14-15	1,428	3.7	695	1.6	739	2.7	222	1.0
Manteo	16-17	807	2.1	201	0.5	328	1.2	23	0.1
Southern Outer Banks	18, 24	775	2.0	335	0.8	173	0.6	550	2.4
Subtotal - Rest of Outer Banks		11,074	28.6	4,220	9.8	6,567	24.4	4,660	20.3
Subtotal - Outer Banks		32,359	83.6	26,806	62.1	21,401	79.5	16,384	71.5
Mainland - US 158 Peninsula	19	1,136	2.9	701	1.6	1,184	4.4	254	1.1
Delmarva Peninsula	23	395	1.0	943	2.2	164	0.6	340	1.5
SE Virginia/NE North Carolina	26			524	1.2	332	1.2	457	2.0
Eastern North Carolina	27	19		55	0.1	314	1.2	61	0.3
Mainland US 64 Area	22	536	1.4	159	0.4	1,026	3.8	394	1.7
North of Barco	25	380	1.0	651	1.5	754	2.8	486	2.1
Subtotal - Nearby Areas		2,466	6.4	3,033	7.0	3,774	14.0	1,992	8.7
Northern States	20	2,139	5.5	7,524	17.4	1,115	4.1	2,889	12.6
Southern/Western States	21, 28	1,726	4.5	5,819	13.5	626	2.3	1,663	7.3
Total Trip Ends		38,690	100.0	43,182	100.0	26,916	100.0	22,928	100.0

CONCLUSIONS

This origin-destination survey yielded valuable information not only for use in developing the transportation model for this study but also for use in developing marketing programs for the Mid-Currituck toll bridge. Trip patterns from the O-D survey were used to prepare estimates of current and future area traffic and the likelihood that portions of that traffic might use the proposed toll bridge. By identifying trip frequency, visitor frequency, and residency status, the survey could also be used to design toll pricing plans for different market segments.

CHAPTER 4

CORRIDOR GROWTH REVIEW

Economic growth is particularly important for any start-up toll facility such as the proposed Mid-Currituck Bridge. This bridge will provide better access to a remote, but growing area of the Outer Banks that has tourism as its economic base. At the same time, the amount of land available for development is very limited and will be a deciding factor in the amount of growth that can be sustained in the future.

This economic review centered on the growth of population, employment, and available new housing units as a means of assessing future growth in traffic that might use the proposed toll bridge. Since this is a preliminary traffic and revenue study, an independent economic analysis was not conducted; however, an independent economic analysis focusing on tourism would be necessary for any later study that would be used in support of project financing.

METHODOLOGY

The basic data sources for this economic review included the draft Currituck County Coastal Area Management Act (CAMA) Land Use Plan, the Duck, NC CAMA Land Use Plan, and the City of Kitty Hawk Land Use Plan. The Currituck Plan was used as the source for projected growth and future land-uses for the portion of the study area located in Currituck County. The other plans provided guidance on the potential for growth in the Dare County portion of the study area.

Earlier studies conducted by another consultant, Parsons Brinckerhoff (PB), were reviewed to evaluate the undeveloped property on Currituck Outer Banks and the potential ultimate build-out date, which was assumed to be 2025.

The economic growth analysis for this study used information contained in the land use plans discussed above to update assumptions and forecasts from the previous PB studies.

FACTORS INFLUENCING ECONOMIC GROWTH

Currituck County is a coastal North Carolina county characterized by two dominant economic features. The Currituck Outer Banks is part of the North Carolina barrier island system which maintains a vibrant tourist industry. According to the County's CAMA Land Use Plan Currituck County's population grew from an off-season population of 22,500 to 86,988 during the 2005 peak season. This peak season population growth focuses on the Currituck Outer Banks. The high seasonal population creates a very significant demand on the community's transportation network.

The mainland portion of Currituck County has much more in common with rural North Carolina. The Currituck County CAMA Land Use Plan notes that approximately 50 percent of the County's work force commutes out of the County to work. These commuters generally travel to the Norfolk/Newport News portion of Virginia.

HOUSEHOLD FORECASTS

The number of households in the various traffic analysis zones was the primary unit of analysis for the earlier PB study. This analysis refines the earlier work by comparing projected growth from that study with the growth projected for the area by the Currituck County CAMA Plan. It is important to note that the PB projections were for the ultimate build-out for the area and that the draft Currituck CAMA Plan projects growth to 2025. The growth in dwelling units anticipated by the Currituck County CAMA Plan was calculated by multiplying the number of acres available for residential development by the proposed residential density shown in the CAMA Plan.

Growth projections for the Dare County portion of the study area were estimated using the Duck CAMA Land Use Plan and the Town of Kitty Hawk Land Use Plan for guidance. The projected growth in these plans was approximately 500 dwelling units or a little over 10 percent less than the earlier PB projections. The primary reduction in dwelling units occurred in Dare County, where 500 dwelling units were assumed to be added by 2025 instead of the 1,000 dwelling units forecast in the earlier

study. This reduction is justifiable for three reasons. First the Duck CAMA Plan identified only 386 undeveloped lots within its jurisdiction.

Second a review of aerial photography of the area confirms it as being nearly built out at this time. Finally, neither of the two CAMA land-use plans indicates that the area will include high density dwelling units. They do identify that existing dwelling units will be replaced by larger dwelling units filling the lots they occupy more fully, but they do not indicate a greater number of dwelling units per acre. Table 4-1 compares the current allocation of housing units to the earlier PB analysis.

In order to test the realism of the dwelling units assignment process, the growth anticipated in the draft CAMA Land Use Plans was compared to the total number of existing undeveloped platted lots on the Currituck Outer Banks. Table 4-2 illustrates that the existing platted lots should be able to accommodate the growth projected for the area.

POPULATION FORECASTS

The projected dwelling units were converted to seasonal and permanent dwelling units using the ratios identified in the Currituck County CAMA Plan. The CAMA Land Use Plan estimates that 150 seasonal dwelling units will be added every year until 2025. Removing the projected seasonal dwelling units from the total projected dwelling units indicates approximately 6,300 new permanent residential units will be constructed in Currituck County (only 250 of these new permanent dwelling units are projected for the Currituck Outer Banks) by the year 2025. Table 4-3 shows the allocation of permanent and seasonal dwelling units by area for 2000 and 2025.

Population estimates for this study assume that the current permanent residential household size will remain relatively stable for the Currituck Outer Banks. Estimates of seasonal population were calculated by dividing the CAMA Land Use Plan Seasonal Population estimate by the projected new number of seasonal dwelling units. This calculation resulted in a seasonal occupancy rate of approximately 14 persons per unit. This calculation is consistent with the draft Currituck County CAMA Plan estimated seasonal population density. These densities were used for the Dare portion of the study area also. Table 4-4 shows the population increases projected for Currituck County.

Table 4-1
Allocation of Housing Units

Sub-Area	Previous Zones [1]	Existing Dwelling Units [2]	Previously Projected New Dwelling Units (2000 to Build-Out) [3]	Expected Increase in Dwelling Units (2000-2025) [4]	Expected Total Number of Units by 2025 [4]
Southern Shores north of NC 12	A	374	480	500	2,337
Sanderling and Duck	B	1,463	1,068		
Currituck Co. south of Albacore	C	936	2,255	2,598	3,534
Currituck Co. north of Albacore in Corolla	D	1,099	517	596	1,694
Non-road accessible	E	988	700	806	1,794
Total (Outer Banks - Currituck)		3,023	3,472	4,000	7,023
Total (Outer Banks - PB Study Area Portion)		4,860	5,020	4,500	9,360
Mainland [4]		7,046	N/A	6,200	13,246
Knotts Island [4]		618	N/A	400	1,018
Total Dwelling Units in Study Area		12,524	N/A	11,100	23,624

[1] Parsons Brinckerhoff zone system from 2001 study which allocated housing units to zones from Corolla in the north to Kitty Hawk in the south.
[2] The number of existing dwelling units is based on Census 2000.
[3] Future growth as projected by PB 2001 study.
[4] Based on Draft Currituck County Coastal Area Management Agency (CAMA) Land Use Plan, September 2006 and allocated to PB zones by WSA based on PB percentage split by zone.
Source: Draft Currituck County Coastal Area Management Act (CAMA) Land Use Plan, September 2006.

Table 4-2
Existing Undeveloped Lots on Currituck County Outer Banks

Area	Existing Residential Lots	Developed Lots	Estimated Remaining Developable Lots [1]
Northern Outer Banks Area	3,100	436	2,664
Southern Outer Banks Area	4,279	3,330	949
Total (Outer Banks)	7,379	3,766	3,613
Mainland [2]			6,200
Knotts Island			400
Duck [3]			386

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[1] Developable lots refers to exsting platted lots that are currently undeveloped.

[2] Number of developable lots for Mainland Currituck and Knotts Island was estimated based on the amount of developable area in the Draft CAMA Land Use Plan, assuming a density of 2 dwelling units and 3 dwelling units per acre, respectively, as per CAMA.

[3] Number of vacant lots according to the Town of Duck Land Use Plan, 2003-2004.

Sources: Draft Currituck County Coastal Area Management Act (CAMA) Land Use Plan, September 2006 and the Town of Duck Land Use Plan, 2003-2004.

Table 4-3
Allocation of Seasonal and Permanent Dwelling Units

Sub-Area	2000 Permanent Dwelling Units	2000 Seasonal Dwelling Units	2025 Permanent Dwelling Units	2025 Seasonal Dwelling Units
Southern Shores north of NC 12	41	333	255	2,082
Sanderling and Duck	160	1,303		
Currituck Co. south of Albacore	102	834	292	3,243
Currituck Co. north of Albacore in Corolla	120	979	140	1,554
Non-road accessible	108	880	148	1,646
Total (Outer Banks - Currituck)	330	2,693 [(1)]	580	6,443 [(2)]
Total (Outer Banks - PB Study Area Portion)	531	4,329	835	8,525
Mainland (3)	6,387	659 [(1)]	12,007	1,239 [(3)]
Knotts Island (3)	577	41 [(1)]	950	68 [(3)]
Total Dwelling Units in Study Area	7,495	5,029	13,793	9,831

[(1)] Seasonal Dwelling Units for 2000 is from Draft Currituck County CAMA Land Use Plan, 2006 & allocated to zones by WSA based on PB percentage split; in Dare County, same seasonal percentage as Currituck Island is assumed.

[(2)] Currituck County CAMA Land Use Plan estimates that 150 seasonal dwelling units will be added per year in the Outer Banks.

[(3)] The split between seasonal and non-seasonal dwelling units was assumed in 2025 based on the corresponding split of dwelling units in 2000.

Source: Draft Currituck County Coastal Area Management Act (CAMA) Land Use Plan, September 2006.

Table 4-4
Population Projections for Currituck County

Area	2000 Permanent Population	2000 Seasonal Population	2025 Permanent Population	2025 Seasonal Population
Population - Outer Banks	767 [1]	37,702	1,485	44,534
Population - Mainland	14,848 [1]	4,415	30,743	8,563
Population - Knotts Island	1,341 [1]	275	2,434	467
Total (Currituck)	16,956	42,392	34,662	53,564

[1] 2000 Permanent Population figures are from Currituck County CAMA Land Use Plan. The allocation of projected population to seasonal and permanent classifications assumes a consistent relationship between permanent and seasonal populations over time.
Source: Draft Currituck County Coastal Area Management Act (CAMA) Land Use Plan, September 2006.

EMPLOYMENT FORECASTS

Employment is the second determinant of trip generation used in this study. For the purposes of this study it was assumed that the current ratio of employment to population identified in the draft Currituck County CAMA Land Use Plan would continue. The draft Plan identifies that 50 percent of residents are in the work force. This assumption leads to a projected Currituck workforce of 5,678 persons. The draft Plan also notes that 50 percent of the work force commutes out of the County. Working from the population projection noted above, this assumption leads to an estimated increase of the workforce in Currituck County by 2,839 persons in 2025. For the purposes of this study it is assumed that the current ratio of employment types will continue in 2025. Table 4-5 illustrates the expected total growth in employment by employment type and general location.

It should be noted that for the purposes of this study it is assumed that the tourist related occupations will be focused primarily within the Currituck Outer Banks portion of the study area. The employment sectors affected by this assumption are Retail, Arts and Entertainment, and Accommodations.

ALLOCATION TO TRAFFIC ANALYSIS ZONES

In order to prepare a more detailed toll analysis, this study developed more Traffic Analysis Zones than were used in earlier studies. Table 4-6 presents a zonal equivalency table which shows the relationship between the new and old zone system. The portions of Currituck County outside of the earlier zone system were split into external zones. It should also be noted that the draft Currituck County CAMA Land Use Plan does not show the location of anticipated commercial redevelopment growth. For the purposes of this study it is assumed that commercial development on the Currituck Outer Banks will increase in density as redevelopment occurs. It is also assumed that there will be a significant work performed at home in light of current national trends.

Table 4-5
Employment Projections for Currituck County

Employment Type	Percent Share of Sector [1]	Share of Sub-Area as a Percentage of Currituck County [2]		
		Mainland %	Outer Banks %	Knott's Island %
Retail	0.27	58	40	2
Health Care	0.07	85	5	10
Arts, entertainment and food services	0.06	58	40	2
Accomodation	0.13	50	49	1
Other services (except pub.admin)	0.05	85	10	5
Construction	0.14	85	10	5
Manu	0.05	85	10	5
Wholesale	0.03	85	10	5
Transportation	0.01	85	10	5
Info	0.02	85	10	5
Finance	0.01	85	10	5
Real Esate	0.11	85	10	5
Professional	0.04	85	10	5
Management	0.00	85	10	5
Admin	0.02	85	10	5

	2000	2025
Total (Outer Banks - Currituck)	697	1,394
Mainland	2,032	4,064
Knotts Island	107	215
Total (Currituck)	2,836 [3]	5,673 [4]

[1] 2000 Employment percent share by sector is derived from the Draft Currituck County CAMA Land Use Plan, 2006. It is assumed that the current ratio of employment types will continue in 2025.
[2] The Share of each sub-area as a percentage of Currituck County is based on the assumption that retail and arts, food services, and accomodation employment types will be concentrated largely in the Currituck Outer Banks area.
[3] 2000 Total County Employment is derived from the Draft Currituck County CAMA Land Use Plan, 2006.
[4] It is assumed that the 2025 Employment for each Currituck sector will be roughly double the 2000 employment estimate per assumptions in the Draft Currituck County CAMA Land Use Plan, 2006.

Table 4-6

Comparison of Transportation Analysis Zones

Previous Zone (1)	New Zone (2)
J and 1/2 of K	1
	29
L and 1/2 of K	2
M	3
N	4
N	5
N	6
O	7
P	8
	9
I, F and G	10
H	11
	12
	13
	14
	15
	16
	17
	18
	24
	19
	23

(1) Parsons Brinckerhoff, 2004

(2) New zones 20, 21, 22,25, 26, 27, 28 are considered external zones (zones outside the study area) to the PB Outer Banks study area.

CHAPTER 5

TRAFFIC AND REVENUE ANALYSIS

Chapter 5 presents a summary of the traffic and revenue analysis conducted for the proposed Mid-Currituck Bridge. 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 traffic and revenue forecasts for the proposed Mid-Currituck Bridge.

TRAFFIC MODEL DEVELOPMENT

A simplified transportation demand model was developed specifically for this study since the area does not have a transportation planning model.

The study area was divided into 29 Transportation Analysis Zones (TAZs). Principal roadways were included in order to provide a basis of comparison between travel via the existing Wright Memorial Bridge and the proposed Mid-Currituck Bridge. External zones were also included to identify the origins and destinations of travel outside the study area. Figure 3-7, presented earlier in Chapter 3, depicts the TAZs in the study area. The TAZs of most interest are along NC 12 between Corolla and the intersection of US 158 and NC 12 at Southern Shores. Each major area along NC 12 was assigned to a separate zone in order to estimate travel to and from these TAZs via either the existing bridge or the proposed bridge. Areas south of the US 158/NC 12 intersection were subdivided into TAZs also to estimate travel between the study area and other locations along the Outer Banks such as Kitty Hawk and Nags Head.

The travel origin-destination (O-D) survey described in Chapter 3 was used to prepare an estimate of existing traffic and travel patterns in the study area. Traffic counts conducted concurrently with the O-D survey were used to factor the survey results by time period and season. The survey results provided other important trip characteristic information such as

trip purpose, time of travel, residence of respondents, trip frequency, and season of travel. This information was used to develop growth rates for each trip type in order to project future year trip estimates. Growth rates for the different trip tables were estimated based on available data from sources such as the draft Currituck CAMA Land Use Plan described in Chapter 4.

A simplified highway system was developed to correspond to the TAZ system. The system included NC 12 from Southern Shores to the end of the paved road in Corolla and the off-road route between Corolla and the Virginia State Line; US 158 on the mainland and south through Kitty Hawk and the southern beaches; and the connections on the mainland such as NC 168, US 158, and US 64. The proposed Mid-Currituck Bridge was shown as a single link with appropriate coding to identify a single mainline toll plaza east of US 158. Roads in this simplified model network were compared with proposed future improvements identified in regional transportation plans.

The base year 2006 model was run and the results were compared with actual traffic counts supplied by the NCDOT and those collected specifically for this study. Adjustments were made to input network speeds and trip tables in order to improve the calibration of the model in comparison with actual counts.

Following calibration, a series of traffic assignments to the highway network were made for years 2013, 2015, 2020, and 2025 under no build, toll free, and tolled conditions. Several toll rates were tested for the opening year in order to estimate the optimum toll rates.

Traffic assignments to the proposed toll facility were made using a diversion assignment technique. This process involved comparing the travel time and distance for trips using the Mid-Currituck Bridge with trips using the best toll-free alternative route (i.e., the existing Wright Memorial Bridge). The estimated share of total traffic that would be expected to use the facilities was a function of travel time and distance savings, a monetary value placed on these savings and the toll charges being tested in any given assignment. In general, as the total costs to use the proposed Mid-Currituck Bridge increased in comparison to the alternative free route, the share of traffic on the Mid-Currituck Bridge decreased. At lower toll rates, a higher share would be estimated.

The model also recognized capacity constraints on roadways in the study area. Speeds were adjusted in future conditions to reflect increasing congestion on the toll facility alternative free routes.

Induced traffic can be expected with the addition of any major new transportation facility such as the proposed Mid-Currituck Bridge. This traffic would result from new residential, vacation, retail, and commercial development that would occur with the new facility. Traffic forecast models normally are based upon growth rates of existing traffic, not induced traffic. However, in this case, it is appropriate to assume a certain level of induced or "new" traffic resulting from the implementation of the new bridge. For this preliminary analysis the following assumptions were made:

- 2013 Additional 10 percent; and
- 2014 at later Additional 20 percent.

This assumption of potential induced traffic would need to be carefully reviewed should an investment-grade study be required in support of project financing. However, for this preliminary study, the assumption is considered to be reasonable.

BASIC ASSUMPTIONS

The preliminary traffic and revenue estimates for the Mid-Currituck Bridge were predicated on the following basic assumptions, which are considered reasonable for purposes of this preliminary analysis:

1. The Mid-Currituck Bridge would open to traffic by January 1, 2013, as a tolled facility

2. Roadway improvements included in the current TIP were assumed to be implemented.

3. The necessary environmental analyses for the Mid-Currituck Bridge would be prepared in sufficient time to allow for design and construction as a toll road.

4. Toll rates and the toll plaza location would be as shown in this chapter.

5. No new competing facilities or additional capacity would be constructed during the project period, other than those listed in the current Transportation Improvement Plan.

6. For purposes of this preliminary analysis, cash and electronic toll collection options would be available at the toll plaza, although it is assumed that at least 75 percent of users would use electronic toll collection.

7. Economic growth in the project study area, and associated travel demand would occur as described in the Currituck County CAMA Land Use Plan.

8. For purposes of this study, inflation was assumed to average 2.5 percent per year.

9. The toll bridge would be signed and promoted effectively to encourage maximum usage.

10. Motor fuel would remain in adequate supply and no national or regional emergency would 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 Mid-Currituck Bridge.

ROADWAY IMPROVEMENTS

People's travel behavior and the number of vehicles that would use the proposed Mid-Currituck Bridge in the future would be heavily influenced by the operating conditions of other area roadways. 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 using the Mid-Currituck Bridge.

A list of the planned road improvements that could potentially affect traffic volumes on the Mid-Currituck Bridge is provided in Table 5-1. However, none would have a major effect on potential traffic because the addition of this bridge would vastly improve access Currituck Island, particularly to the Corolla area.

Table 5-1
Major Roadway Improvements in Currituck and Dare Counties

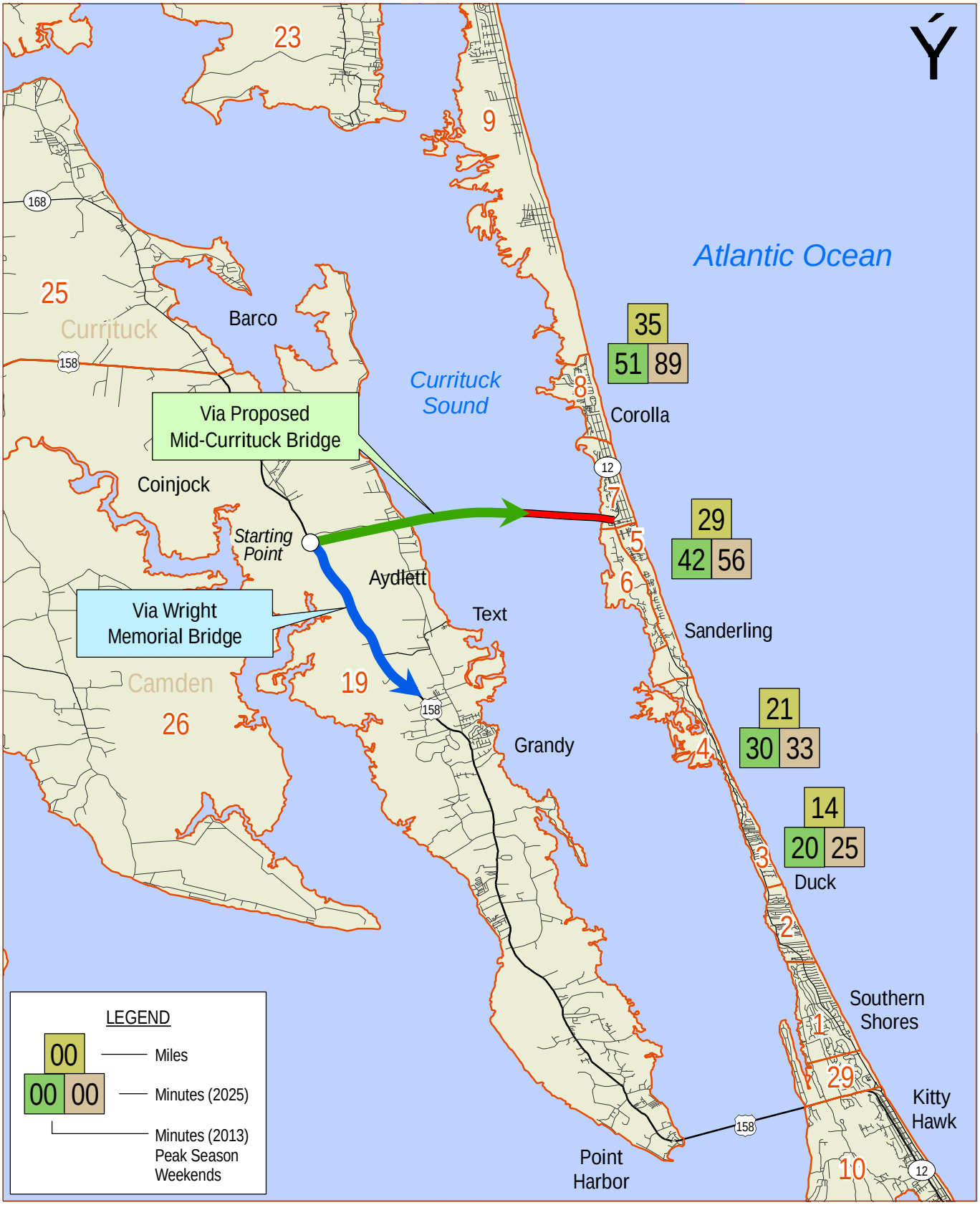
Name and Location	Project Description	Status
NC 158	US 158 and NC 12 at Southern Shores, Convert existing at-grade intersection to interchange.	Planning and design in progress.
US 64	East of Alligator River to USS 264; widen to multi-lanes.	Planning and design in progress. Right of way programed for 2012.
US 64	East of Columbia ot East of Alligator River; widen to multi-lanes.	Planning and design in progress. Right of way programed for 2012. Mitigation and construction for some sections programmed for 2012.

Source: NCDOT Transporation Program

TIME AND DISTANCE SAVINGS

The construction of the Mid-Currituck Bridge would improve access to a growing area of the northern Outer Banks. Figure 5-1 illustrates the time and distance savings based on forecasts contained in the travel demand model for 2013 and 2025. This figure shows typical travel via both bridges from a common point on the mainland to major locations along NC 12 from Southern Shores to Corolla. For example, the distance savings to Corolla is approximately 35 miles using the proposed bridge. In 2013, the time savings during a typical summer weekend day are estimated at 51 minutes. However, by 2025, when traffic levels have grown significantly, the time savings are much higher. During a 2025 summer weekend, motorists to and from Corolla would save 89 minutes by using the Mid-Currituck Bridge.

Time savings resulting from the new bridge will be less for trips to and from other locations south of Corolla. For example, travel to Duck would be approximately 20 minutes less in 2013 via the new bridge in comparison to the existing bridge.



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DISTANCE AND TIME SAVINGS WITH MID-CURRITUCK BRIDGE

FIGURE 5-1

Other distance and time savings for locations south of the new bridge are also shown. Time savings are less for these locations because the distance savings are also less. At some point in the vicinity of Duck, the time savings of the new bridge are effectively zero, which means that a motorist could travel via either bridge. However, with the addition of a toll on the Mid-Currituck Bridge, some motorists will place a value on their time savings before choosing which route to take.

TOLL RATES AND SYSTEM CONFIGURATION

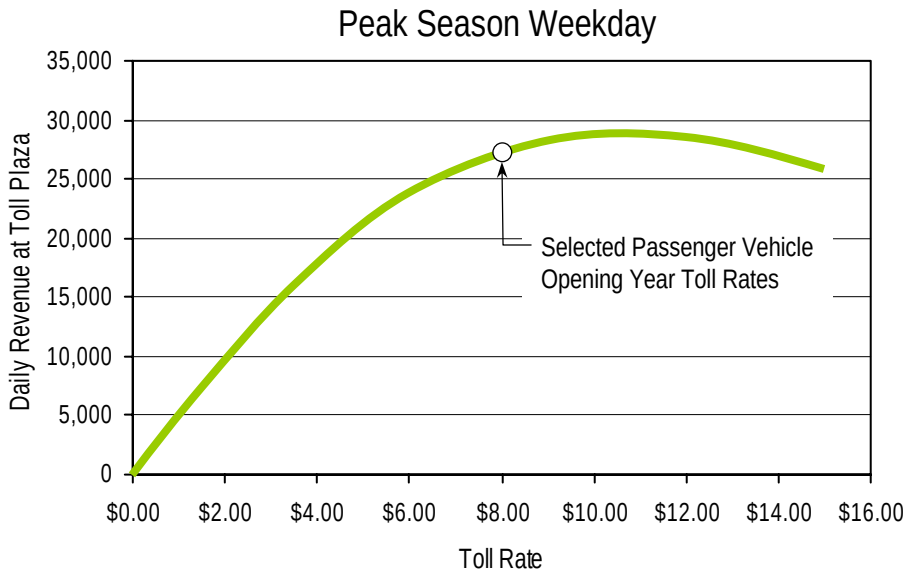
The Mid-Currituck Bridge would have a single mainline plaza near the western entrance to the facility. The total length of the toll facility would be approximately 7 miles.

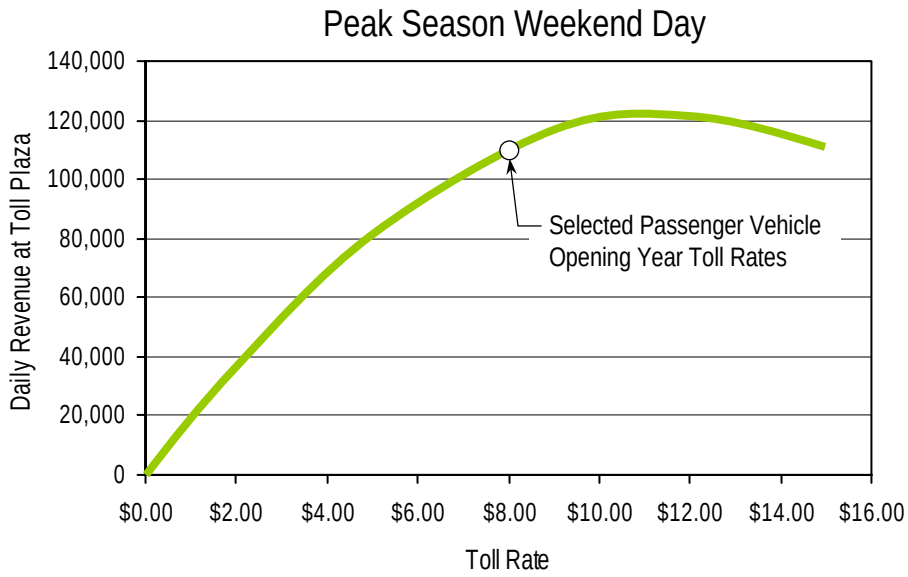
Various toll rates were tested at 2013, 2020, and 2025 levels for four time periods:

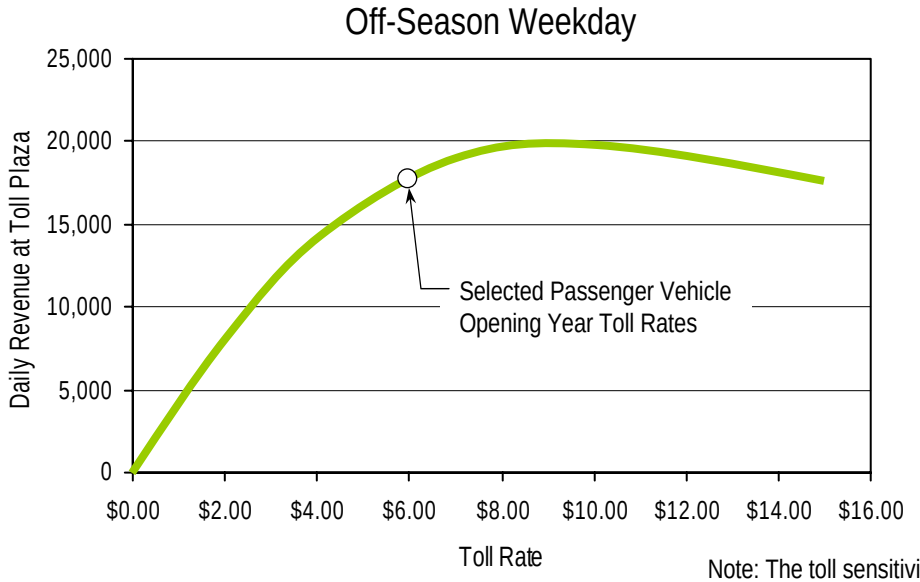
- Peak Season Weekday (Memorial Day – Labor Day)
- Peak Season, Weekend Day
- Off-Season, Weekday
- Off-Season, Weekend Day

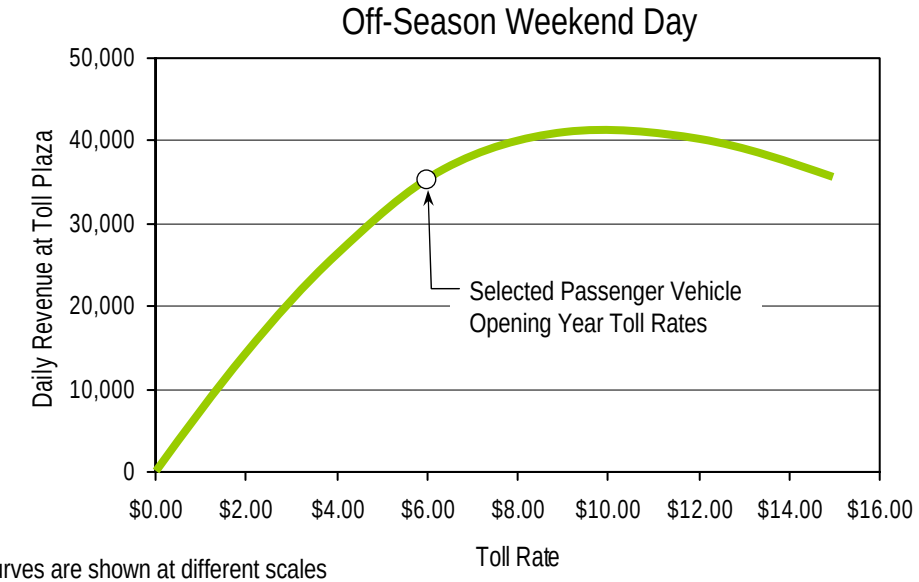
Passenger car rates were tested at levels from $5 to $20 to identify the maximum revenue potential for each period. Toll sensitivity curves for the bridge are shown in Figure 5-2. Generally, maximum revenue potential would result between approximately $9 and $12 depending upon the season of the year. However, only slightly lower revenue would be expected at tolls ranging from $6 to $8 in the 2013 opening year for the peak and off seasons, respectively. Future increases in tolls were assumed to begin at 2015 and continue at five-year increments thereafter.

Selecting opening toll rates slightly below the maximum point on the toll sensitivity curves allows some flexibility in setting future rates. The Mid-Currituck Bridge would provide a significant time and distance savings for trips to and from the northern end of the Currituck Outer Banks particularly in the peak travel demand season. As a result a higher toll was selected for the summer peak season. Table 5-2 shows the rates proposed for the bridge plaza for the two seasons. During the peak season, the rates would start at $8 and increase to $12 by 2025 with increases assumed in 2015, 2020, and 2025. During the rest of the year, rates would be slightly lower. The off-season rate would begin at $6 and rise to $9 by 2025.









Note: The toll sensitivity curves are shown at different scales to illustrate sensitivity at different toll rates.

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ESTIMATED 2013 TOLL SENSITIVITY CURVES - REVENUE

FIGURE 5-2

Table 5-2
Passenger Car Toll Rates
Proposed Mid-Currituck Bridge

Year	Peak Season	Off Season
2013	$8	$6
2015	$9	$7
2020	$10	$8
2025	$12	$9

All rates are in future-year dollars and adjusted for inflation, which is assumed for this study to average 2.5 percent per year. The increase in tolls between the opening year and the later years of operation is slightly greater than inflation, reflecting the significant increases in traffic demand which would require some level of "real increase" in rates beyond inflation.

Rates shown in the table are for passenger cars; trucks would have proportionally higher toll rates. In developing revenue estimates for these preliminary study findings, it was assumed that truck rates would average 2.5 times passenger car rates.

As shown in Table 5-3, these rates are toward the high end of the range of toll rates now in effect for other toll bridges. It is also important to recognize that the toll rates shown for the Mid-Currituck Bridge are in 2013 dollars. Toll rates on the other facilities shown in the table would likely increase by 2013 also.

Bridge toll rates tend to be higher than tolls on highways because of the time and distance saved by using toll bridges. Generally, the higher tolls are seen on bridges where there is a very large time and distance savings in comparison to alternative routes. For example, the Chesapeake Bay-Bridge Tunnel saves substantial travel time for not only through trips but also trips to and from the Delmarva Peninsula. The $12 toll for passenger cars has been set accordingly.

Table 5-3
Comparison of Bridge/Tunnel Toll Rates for Passenger Cars

Toll Facility	One-way Toll Rate	Remarks
AK - Whittier Tunnel	$12.00	Tolled in single direction only
VA - Chesapeake Bay Bridge Tunnel	$12.00	Tolled in single direction only
NC - Proposed Mid-Currituck Bridge (2013 Peak Season)	**$8.00**	
FL - Sanibel Causeway and Bridge	$6.00	Tolled in single direction only
NY/NJ - Lincoln Tunnel, Holland Tunnel, George Washington, Goethals, Outerbridge Crossing and Bayonne Bridges	$6.00	Each, tolled in single direction only
NC - Proposed Mid-Currituck Bridge (2013 Off Peak Season)	**$6.00**	
CA - Golden Gate Bridge	$5.00	Tolled in single direction only
NY - Verrazano-Narrows, Triborough, Bronx-Whitestone, Queens-Midtown Bridges and Brooklyn-Battery Tunnels	$4.50	Each, tolled in single direction only
CA - San Fransisco-Oakland Bay Bridge	$4.00	Tolled in single direction only
MO - Lake of the Ozarks Bridge	$4.00	
MI - Ambassador Bridge	$3.00	
NJ/PA - Ben Franklin, Betsy Ross, Commodore Barry and Walt Whitman Bridges	$3.00	Each, tolled in single direction only
NY - Ogdensburg Bridge	$2.75	
NY/Canada - Peace Bridge	$2.50	
NJ/PA - Pennsylvania/New Jersey Turnpike Bridge - WB	$2.40	
NJ/PA - Burlington-Bristol Bridge	$2.00	Tolled in single direction only
NJ/PA - Tacony Palmyra Bridge	$2.00	Tolled in single direction only
RI - Pell Bridge	$2.00	
NJ/PA - Pennsylvania/New Jersey Turnpike Bridge - EB	$1.00	

Source: International Bridge, Tunnel and Turnpike Association

ESTIMATED WEEKDAY TRAFFIC VOLUMES

Preliminary estimates of traffic for peak season and off-season weekdays and weekends are shown for years 2013, 2015, and 2025 in Figure 5-3. Toll-free traffic would be higher. The traffic volumes shown include an allowance for induced traffic but do not reflect ramp-up effects, which were incorporated later into the annual forecasts.

Traffic during peak season weekends is estimated at 13,500 vehicles per day (vpd) for the opening year. By 2025 the toll traffic would rise to 19,200 vpd, an average growth of about 3 percent per year.

Similarly, toll traffic forecasts for off-season weekdays would be significantly lower as shown in the figure. This traffic level represents the lower end of the traffic forecasts for a time period when fewer vacationers visit the area. Traffic volumes during this period are forecast to begin at 3,000 vpd in 2013 and rise to 4,100 vpd by 2025.

Not to Scale

LEGEND

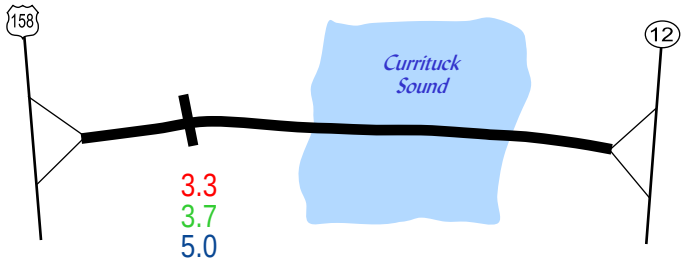
Toll Road

Mainline Toll Plaza

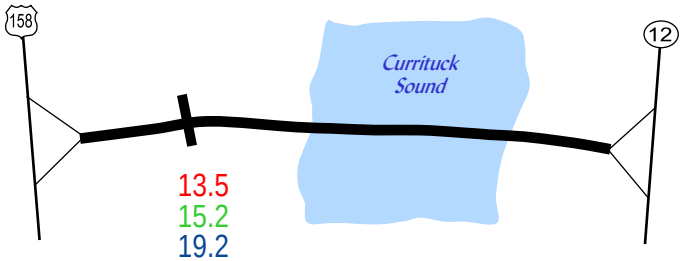
0.0 — 2013
0.0 — 2015
0.0 — 2025

Note: 1. All traffic volumes shown represent thousands of vehicles.
2. Includes induced traffic.

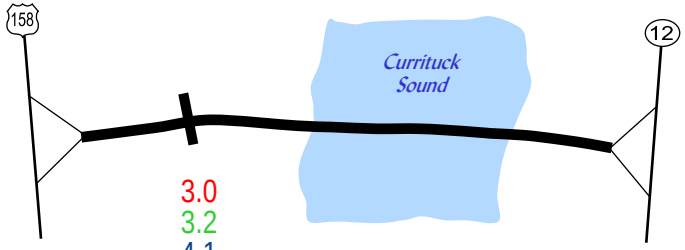
Peak Season Weekday



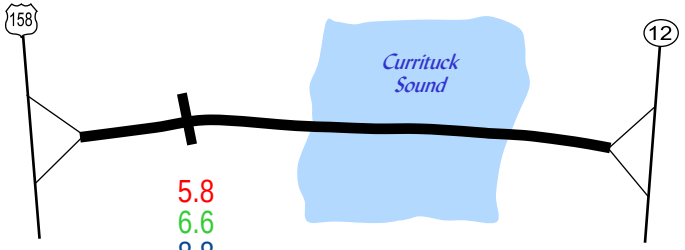
Peak Season Weekend Day



Off-Season Weekday



Off-Season Weekend Day



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ESTIMATED 2013, 2015 AND 2025 TRAFFIC VOLUMES

FIGURE 5-3

ESTIMATED DAILY TRANSACTIONS AND REVENUE

Table 5-4 shows estimated daily transactions and revenues for the four time periods and the annualization process for the opening year of traffic in 2013, 2015, and 2025. Each of the daily forecasts was annualized using the factors shown and then totaled to show annual forecasts.

For example, total weekend day transactions during the peak season represent the highest traffic volumes that would use the proposed bridge. This traffic is estimated in 2013 at 12,300 vpd, resulting in average weekend revenue of $99,900 per day. Induced traffic in the opening year was assumed to be 10 percent of the traffic forecast by the model. Average peak season weekend conditions were expanded to "annual peak season weekend" levels by using a factor of 32 days. Annual peak season weekend revenue, before adjusting for ramp-up, is estimated at $3.5 million. The first year ramp-up factor was 0.61 indicating a 39 percent reduction from nominal revenue estimates, which results in an adjusted opening year peak season weekend revenue estimate of $2.1 million.

Ramp-up is a phenomenon that occurs on most new start-up toll facilities. High levels of growth may be experienced over the first three years or so of operation as the motoring public gradually becomes aware of the facility and begins using it.

There are a number of reasons for the "ramp-up" phenomenon. For example, since not all motorists who will use the facility are from the local area, it may take several months before certain travelers are aware that the facility is open, or where the facility goes. It will also take several months for the project to begin to appear 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.

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 were adjusted downward to reflect the time it will take to gradually build up demand. For example, in the first year of operation, traffic is estimated to be 61 percent of the baseline estimated result, increasing to about 95 percent by the end of the third full year of operation.

Table 5-4
Estimated Daily, Season, and Annual Transactions and Revenue
Proposed Mid-Currituck Bridge

2015

	Off-Season Weekday			Off-Season Weekend Day			Peak Season Weekday			Peak Season Weekend Day			Annual Total		
	Traffic	Average Toll *	Revenue	Traffic	Average Toll *	Revenue	Traffic	Average Toll *	Revenue	Traffic	Average Toll *	Revenue	Traffic	Average Toll *	Revenue
Base Daily Traffic and Revenue	2,700	$6.0900	$16,400	5,300	$6.0900	$32,200	3,000	$8.1200	$24,700	12,300	$8.1200	$99,900			
Induced Daily Traffic and Revenue	270		1,640	530		3,220	300		2,470	1,230		9,990			
Total Daily Traffic and Revenue	2,970	$6.0900	$18,040	5,800	$6.0900	$35,400	3,300	$8.1200	$27,200	13,500	$8.1200	$109,900			
Days per year	185		185	78		78	70		70	32		32			
Annual Traffic and Revenue Before Ramp-up	549,000		$3,337,000	452,000		$2,761,000	231,000		$1,904,000	432,000		$3,517,000	1,664,000		$11,519,000
Ramp-up Adjustment	0.61		0.61	0.61		0.61	0.61		0.61	0.61		0.61	0.61		0.61
Annual Traffic and Revenue After Ramp-up - 2013	**334,000**		**$2,033,000**	**276,000**		**$1,684,000**	**145,000**		**$1,161,000**	**264,000**		**$2,145,000**	**1,019,000**		**$7,023,000**

2015

	Off-Season Weekday			Off-Season Weekend Day			Peak Season Weekday			Peak Season Weekend Day			Annual Total		
	Traffic	Average Toll *	Revenue	Traffic	Average Toll *	Revenue	Traffic	Average Toll *	Revenue	Traffic	Average Toll *	Revenue	Traffic	Average Toll *	Revenue
Base Daily Traffic and Revenue	2,700	$7.1050	$19,200	5,500	$7.1050	$39,100	3,100	$9.1350	$28,300	12,700	$9.1350	$116,000			
Induced Daily Traffic and Revenue	540		3,840	1,100		7,820	620		5,660	2,540		23,200			
Total Daily Traffic and Revenue	3,200	$7.1050	$23,000	6,600	$7.1050	$46,900	3,700	$9.1350	$34,000	15,200	$9.1350	$139,200			
Days per year	185		185	78		78	70		70	32		32			
Annual Traffic and Revenue Before Ramp-up	592,000		$4,255,000	515,000		$3,658,000	259,000		$2,380,000	486,000		$4,454,000	1,852,000		$14,747,000
Ramp-up Adjustment	0.95		0.95	0.95		0.95	0.95		0.95	0.95		0.95	0.95		0.95
Annual Traffic and Revenue After Ramp-up - 2015	**566,000**		**$4,025,000**	**487,000**		**$3,457,000**	**245,000**		**$2,249,000**	**459,000**		**$4,209,000**	**1,757,000**		**$13,940,000**

2025

	Off-Season Weekday			Off-Season Weekend Day			Peak Season Weekday			Peak Season Weekend Day			Annual Total		
	Traffic	Average Toll *	Revenue	Traffic	Average Toll *	Revenue	Traffic	Average Toll *	Revenue	Traffic	Average Toll *	Revenue	Traffic	Average Toll *	Revenue
Base Daily Traffic and Revenue	3,400	$9.1350	$31,100	7,300	$9.1350	$66,700	4,200	$12.1800	$51,200	16,000	$12.1800	$194,900			
Induced Daily Traffic and Revenue	680		6,220	1,460		13,340	840		10,240	3,200		38,980			
Total Daily Traffic and Revenue	4,080	$9.1350	$37,300	8,800		$80,000	5,000	$12.1800	$61,400	19,200	$12.1800	$233,900			
Days per year	185		185	78		78	70		70	32		32			
Annual Traffic and Revenue Before Ramp-up	755,000		$6,895,000	686,000		$6,240,000	350,000		$4,298,000	614,000		$7,485,000	2,405,000		$24,918,000
Ramp-up Adjustment	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Annual Traffic and Revenue After Ramp-up - 2025	**755,000**		**$6,895,000**	**686,000**		**$6,240,000**	**350,000**		**$4,298,000**	**614,000**		**$7,485,000**	**2,405,000**		**$24,918,000**

* Average toll based on following assumptions:
Percent Truck = 1 percent of total traffic.
Truck Tolls = 2.5 times higher than car toll.

Similar procedures were followed for the other model periods to arrive at annualized forecasts for each period. The resultant annualized forecast for the four periods was then combined to reach the total traffic and revenue forecast.

ESTIMATED ANNUAL TRANSACTIONS AND REVENUE

Preliminary estimates of annual toll revenues were prepared for each of the four periods between 2013 and 2050. These estimates were based on the toll rates shown previously; the modeling results for years 2013, 2015, 2020, and 2025 levels; the assumed ramp-up for the early years, and the assumed induced traffic. Intermediate years were estimated through interpolation. Traffic and revenue between 2025 and 2040 and 2040 and 2050 were assumed to grow at constant annual rates.

As shown in Table 5-5, the annual revenue is in the opening year is estimated at about $7.0 million after ramp-up and induced traffic, and is estimated to increase to $24.9 million by 2025.

Figures 5-4 and 5-5 show the transaction and revenue forecasts in graphical form for the recommended toll rates. As tolls increase, traffic decreases as fewer drivers are willing to pay higher tolls. However, total system revenue would continue to rise until the increasing toll rates resulted in enough drivers choosing the free alternatives to cause a decrease in total revenue.

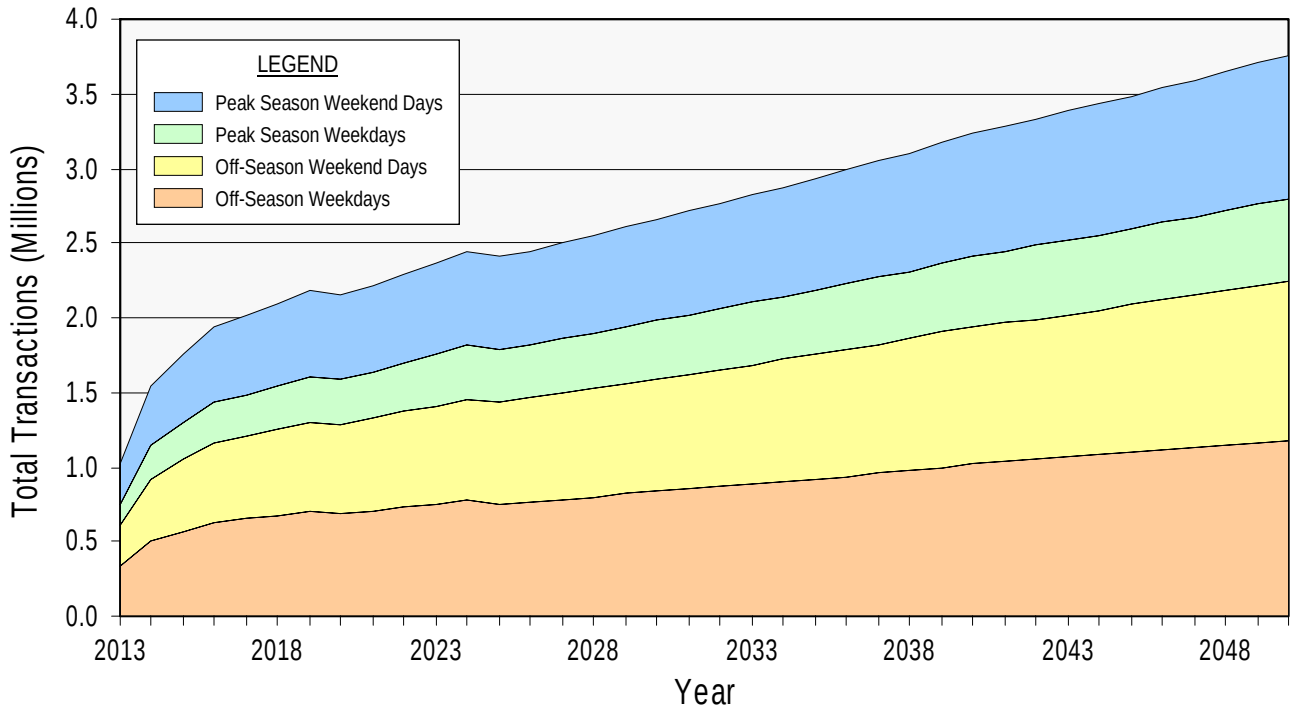
ESTIMATED NET REVENUE

Table 5-6 provides estimates of annual net revenue. Preliminary estimates of operating costs related to toll collection were developed for the analysis, including a nominal fixed component and a variable component per transaction. The nominal fixed component was assumed to increase at 2.5 percent per year for inflation, while a variable component of operating cost increased in proportion with traffic growth. Note, these operating costs do not include costs for roadway maintenance and rehabilitation. Net revenue is estimated at $5.3 million in 2013, increasing to $19.6 million by 2025.

Table 5-5
Annual Toll Transactions and
Gross Revenue Forecasts
Mid-Currituck Bridge
(Thousands)

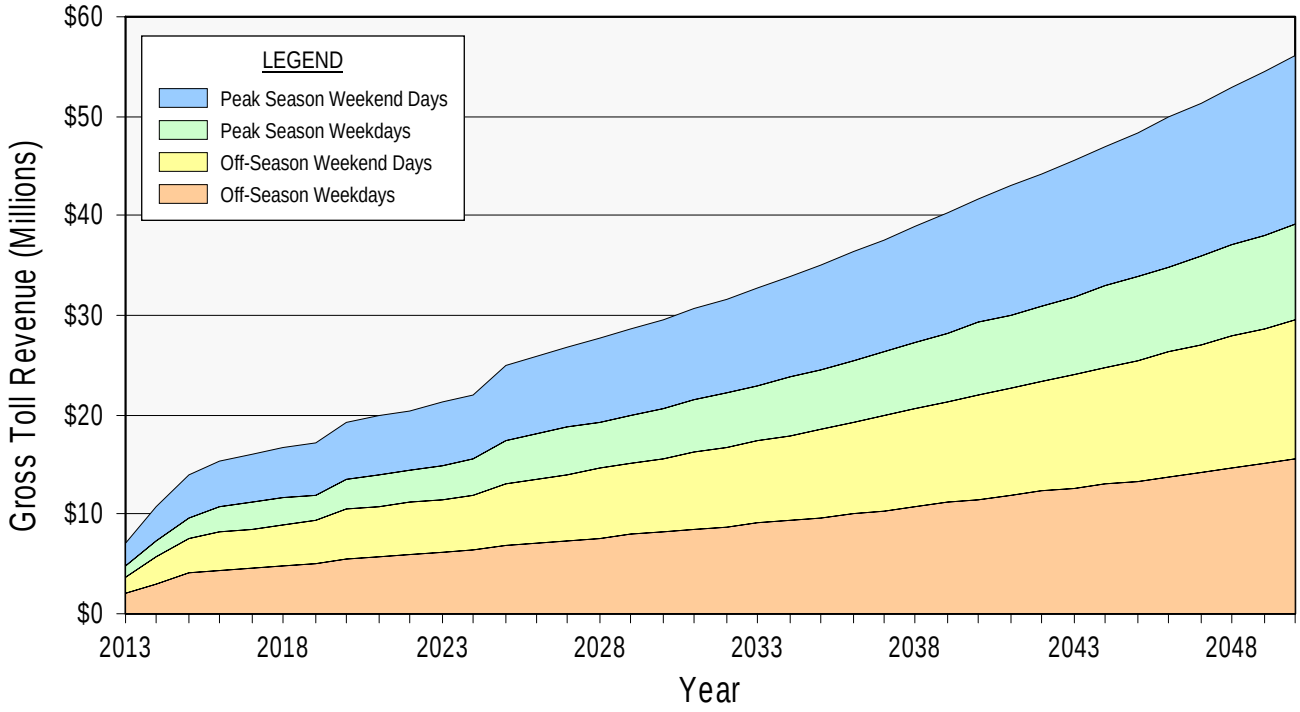
	Annual Total	
Year	Total Transactions	Total Revenue
2013	1,019	$7,023
2014	1,542	10,667
2015	1,757	13,940
2016	1,944	15,346
2017	2,011	15,963
2018	2,090	16,608
2019	2,182	17,270
2020	2,146	19,165
2021	2,212	19,816
2022	2,295	20,489
2023	2,362	21,186
2024	2,446	21,904
2025	2,405	24,918
2026	2,448	25,783
2027	2,499	26,693
2028	2,550	27,629
2029	2,609	28,589
2030	2,660	29,588
2031	2,712	30,636
2032	2,768	31,699
2033	2,820	32,810
2034	2,874	33,964
2035	2,931	35,151
2036	2,994	36,374
2037	3,052	37,654
2038	3,106	38,972
2039	3,180	40,332
2040	3,238	41,746
2041	3,288	42,995
2042	3,332	44,286
2043	3,382	45,617
2044	3,434	46,990
2045	3,486	48,391
2046	3,541	49,847
2047	3,592	51,345
2048	3,644	52,880
2049	3,705	54,466
2050	3,761	56,103

Note: Forecasts for 2013 - 2015 reflect an assumed ramp-up to full traffic levels beginning in 2016. Forecasts also reflect induced traffic.



ANNUAL TRANSACTION FORECAST

FIGURE 5-4



ANNUAL GROSS REVENUE FORECAST

FIGURE 5-5

Table 5-6
Annual Net Toll Revenue Forecasts
Proposed Mid-Currituck Bridge
(Thousands)

Year	Gross Toll Revenue	Toll Operating Expense	Net Toll Operating Revenue
2013	$7,023	$1,720	$5,303
2014	10,667	1,793	8,874
2015	13,940	1,848	12,092
2016	15,346	1,903	13,443
2017	15,963	1,952	14,011
2018	16,608	2,002	14,606
2019	17,270	2,055	15,215
2020	19,165	2,101	17,064
2021	19,816	2,154	17,662
2022	20,489	2,210	18,279
2023	21,186	2,265	18,921
2024	21,904	2,324	19,580
2025	24,918	2,375	22,543
2026	25,783	2,434	23,349
2027	26,693	2,494	24,199
2028	27,629	2,556	25,073
2029	28,589	2,619	25,970
2030	29,588	2,684	26,904
2031	30,636	2,750	27,886
2032	31,699	2,818	28,881
2033	32,810	2,888	29,922
2034	33,964	2,959	31,005
2035	35,151	3,032	32,119
2036	36,374	3,107	33,267
2037	37,654	3,184	34,470
2038	38,972	3,262	35,710
2039	40,332	3,343	36,989
2040	41,746	3,426	38,320
2041	42,995	3,509	39,486
2042	44,286	3,595	40,691
2043	45,617	3,683	41,934
2044	46,990	3,773	43,217
2045	48,391	3,865	44,526
2046	49,847	3,960	45,887
2047	51,345	4,057	47,288
2048	52,880	4,156	48,724
2049	54,466	4,258	50,208
2050	56,103	4,362	51,741

Note:
Forecasts for 2013 - 2015 reflect an assumed ramp-up to full traffic levels beginning in 2016.
Forecasts also reflect induced traffic.

CONCLUSIONS

The conclusions of this preliminary study of the proposed Mid-Currituck Bridge can be summarized as follows:

- **Implementation of the Mid-Currituck Bridge is Critical** – Current traffic levels are high during the peak tourist seasons especially on weekends when many vacationers and weekend day-trippers are either starting or ending their visits to the beaches. These traffic levels are expected to grow such that NC 12 will be over capacity in the future. Travel times between the mainland and the Currituck Outer Banks can only increase without the proposed bridge.

- **The Distance and Time Savings Alone May be Sufficient Reason to Construct this Bridge** – This bridge cuts travel distance and time by over 35 miles and nearly an hour respectively for some trips in the opening year. Experience on other toll facilities indicates that motorists would pay high tolls to avoid the congestion such as occurs along NC 12 presently and will continue to occur in the future without improvements.

- **The Mid-Currituck Bridge Would Provide an Important New Evacuation Route** – The analysis of this study indicated that development is expanding in the northern end of the study area between Corolla and the Virginia State Line. The only land-based route out of the area is along NC 12 and across the Wright Memorial Bridge. Given the current limited evacuation route options, the growth of the area, and the time and distance savings that would happen with the proposed bridge, it appears that the new bridge is needed for public safety reasons in addition to the distance and time savings that would accrue to motorists.

DISCLAIMER

Current professional practices and procedures were used in the development of these preliminary traffic and revenue study findings. However, there is considerable uncertainty inherent in future traffic and revenue forecasts for any toll facility. There may sometimes be differences between forecasted and actual results caused by events and circumstances beyond the control of the forecasters. These differences could be material. Also, it should be recognized that traffic and revenue forecasts in this document are intended to reflect the overall estimated long-term trend.

Actual experience in any given year may vary due to economic conditions and other factors.

It is also emphasized that this study is considered preliminary and findings are subject to considerable refinement. It was not performed at a sufficient level of detail to be used in project financing and is not intended for that purpose. Considerably more detailed studies would be required prior to project financing.