Project Level Traffic Forecast Report

TIP PROJECT R-2576

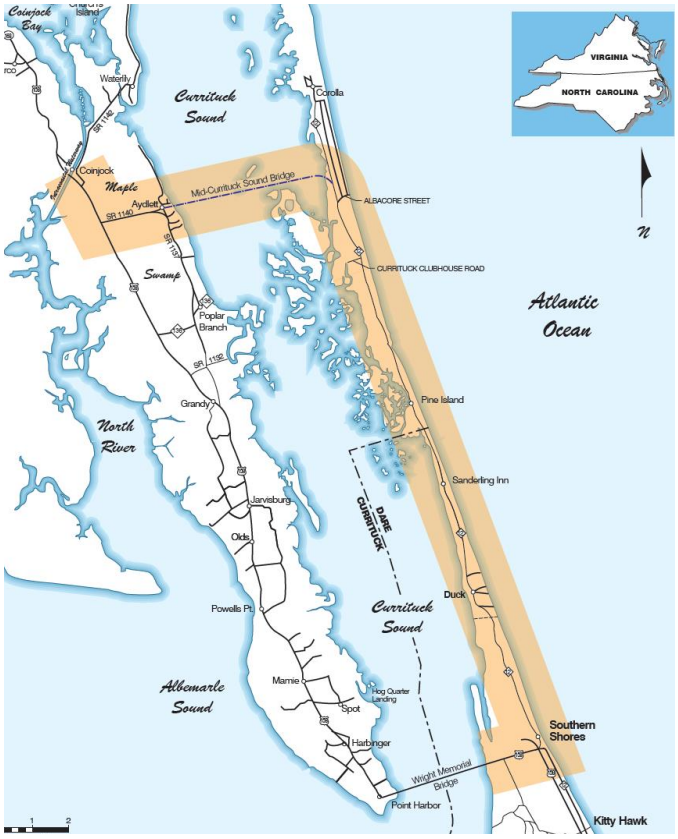
Mid-Currituck Bridge

Currituck and Dare Counties

WBS # 34470.1.TA1

June 15, 2016

Prepared By: WSP | Parsons Brinckerhoff



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Traffic Forecast Cover Letter

MEMORANDUM TO: **Brian Wert, PE**
State Traffic Forecast Engineer, NCDOT

FROM: **Michael Fendrick, PE, PTOE**
WSP | Parsons Brinckerhoff (PB)

DATE: ***June 15, 2016***

SUBJECT: **Traffic Forecast for TIP Project R-2576**
Currituck County and Dare County
Mid-Currituck Bridge
US 158 near Aydlett to NC 12 south of Corolla on Outer Banks

Please find attached the 2015 (Base Year) / 2040 (Future Year) Traffic Forecast for TIP project R-2576, Mid-Currituck Bridge. This Traffic Forecast supports the Mid-Currituck Bridge Final Environmental Impact Statement (FEIS) study reevaluation being conducted by the North Carolina Turnpike Authority (NCTA). This forecast was reviewed and approved by TPB on June 10, 2016.

The Mid-Currituck Bridge project is a new seven-mile bridge connecting US 158 near Aydlett to NC 12 south of Corolla on the Currituck County Outer Banks. The project study area includes US 158 between Barco and Southern Shores and follows NC 12 north from Southern Shores to Corolla.

Previous traffic forecasts for the Mid-Currituck Bridge were developed in 2002 and 2009. This is the third forecast for the project replacing the previous forecasts.

The project lies within Albemarle Rural Planning Organization (RPO) and does not have an official travel demand model.

The following forecasts were reviewed during the development of this forecast. Each of these forecasts was completed for different stages of the R-2576 study. The first four were for previous iterations of the NEPA forecast and the final bullet was completed independently and separate from the previous NEPA forecast.

- *Traffic Needs Analysis* dated July 2002
- *2025 Traffic Alternatives Report* dated May 2007
- *2035 Traffic Forecast Report* dated March 2009
- *2035 Detailed Alternatives Traffic Forecast Report* dated March 2009
- *Mid-Currituck Bridge Final Report Traffic and Revenue Forecasts* dated July 2011

Staff from NCDOT (and their consultants) including Brian Wert, John Conforti, Jennifer Harris, Spencer Franklin, and Tracy Roberts were consulted during the development of this forecast regarding land use, toll assumptions, and project details.

The following six (6) scenarios are provided in the forecast (i.e., the ***detailed forecasts with balanced turn movements***):

- 2015 Base Year No-Build for Summer Weekday
- 2040 Future Year No-Build / ER2 for Summer Weekday
- 2040 Future Year Build Bridge with Tolls Scenario for Summer Weekday
- 2015 Base Year No-Build for Summer Weekend
- 2040 Future Year No-Build / ER2 for Summer Weekend
- 2040 Future Year Build Bridge with Tolls Scenario for Summer Weekend

In addition to the detailed forecasts, link based forecasts were prepared for evaluation of Purpose and Need for this project. The following six (6) scenarios are also provided for specific links for AADT, Non-Summer Weekday, Non-Summer Weekend, Summer Weekday and Summer Weekend (i.e., the ***link forecasts***):

- 2015 Base Year No-Build
- 2015 Base Year Build without Tolls
- 2015 Base Year Build with Tolls
- 2040 Future Year No-Build / ER2
- 2040 Future Year Build without Tolls
- 2040 Future Year Build with Tolls

Certain assumptions were made in the development of the forecast

Forecast period: Instead of AADT, the design period for this project is the Summer Weekday. Additional analysis is also needed for the Summer Weekend. A balanced AADT forecast was not produced (although a link based forecast is provided.)

Fiscal Constraint: In areas outside an MPO, the future year forecasts assume construction of projects listed within the State Transportation Improvement Plan (STIP) with ROW or Construction funding allocated. The funding must begin in the 10 years of the STIP and not be programmed only in Post Years.

According to the current (March 2016) STIP for the years 2016-2025, two projects were identified that included ROW funding within the project area and are, therefore, assumed to be in place for the financially constrained network. The two projects are:

- R-3419: US 158 widening from the Wright Memorial Bridge past the NC 12 intersection to the south ($13.0 million in ROW funding in FY 2025)
- R-4457: Improvements at the US 158/NC 12 intersection ($4.6 million in ROW funding in FY 2024)

Development Activity: The following assumptions have been made when developing the future year 2040 traffic forecast:

- Planned maximum buildout, based on total number of approved lots for future development, was assumed along NC 12
- Projected population growth was assumed for rural areas along US 158
- A combination of population growth, current and potential retail expansion, and tourist trends were utilized for urbanized areas along US 158 south of the Wright Memorial Bridge
- External station zones on US 158 and NC 168 were based on historic traffic growth, projected population, and tourist growth trends

Toll Diversion & Revenue Maximization: The TransCAD tool was used to examine the impact of tolls and diversion from the proposed Mid-Currituck Bridge. A sensitivity analysis was conducted to evaluate how to estimate Mid-Currituck bridge volumes based on an assumption that the toll rates would be managed to maximize toll revenue. Based on this analysis, a toll time equivalent of 30 minutes was applied in the analysis.

Methodology: The Base Year No-Build forecast was developed primarily based upon traffic counts taken for this forecast. An origin-destination (OD) trip matrix estimation tool was developed using a TransCAD tool and ODME processes. The TransCAD tool was utilized to assist in assignment of trips to the network for the Base Year Build, Future Year No-Build and Build Bridge forecasts.

Interpolation:
To determine any intermediate years, straight-line interpolation may be used. Summer Weekday (design) and Summer Weekend (peak) volumes may be extrapolated for up to two years immediately following 2040. If it is determined that any of these assumptions have become inconsistent with the project and surrounding area activity, please request updated projections at this location.

If you have any questions, or I can be of further assistance, please do not hesitate to call me at 919-836-4053, or e-mail me at fendrick@pbworld.com. Thank you.

cc : FILE (Currituck County and Dare County, TIP Project R2576)

cc: (*via e-mail as PDF attachments*):

Traffic Forecast Report

1. Project Background

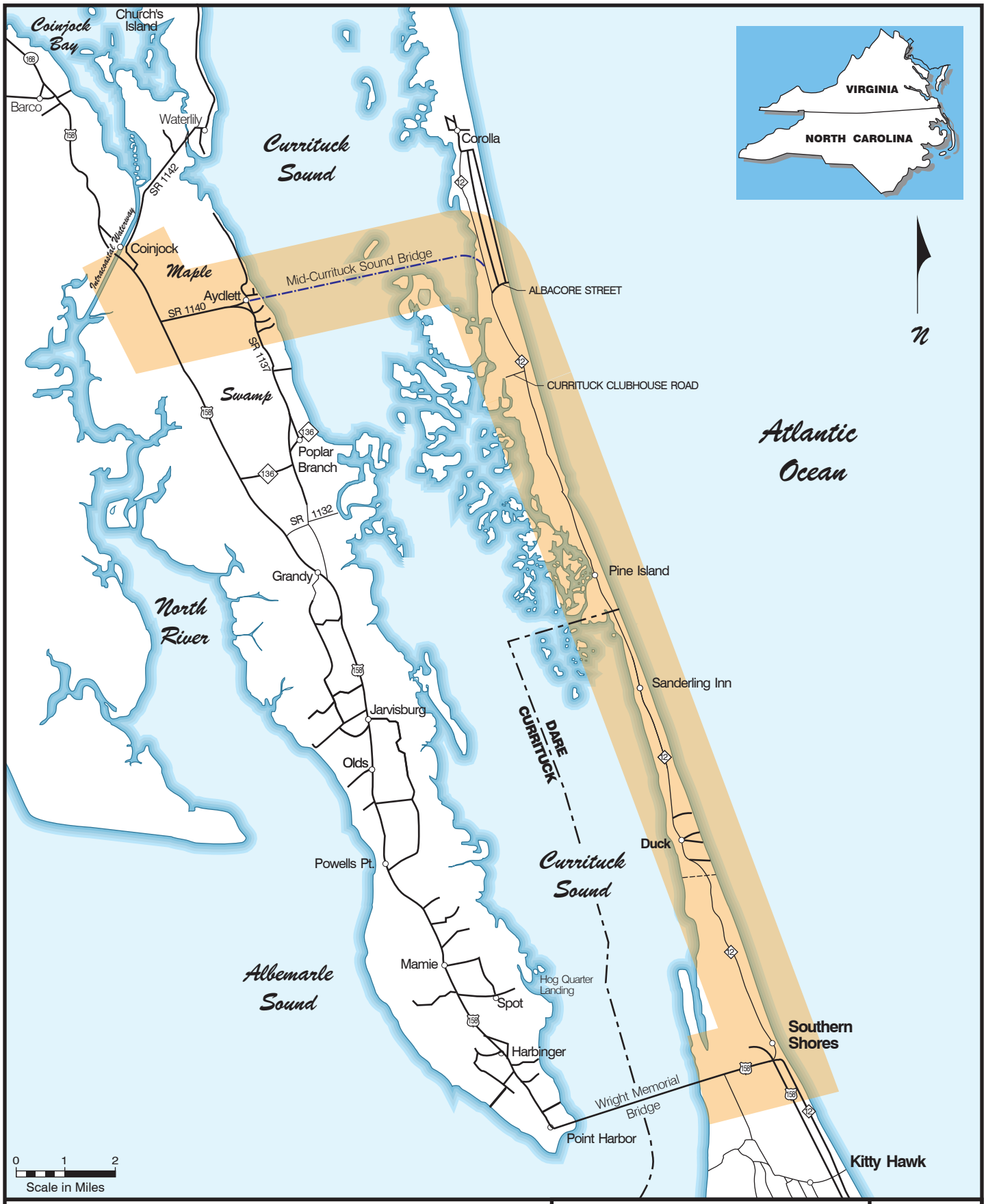
1.1 Project Request Information

This 2040 Traffic Forecast Report supports the Mid-Currituck Bridge Final Environmental Impact Statement (FEIS) reevaluation being conducted by the North Carolina Turnpike Authority (NCTA). The Mid-Currituck Bridge project is a new seven-mile bridge connecting US 158 near Aydlett to NC 12 south of Corolla on the Currituck County Outer Banks. The project study area includes US 158 between Barco and Southern Shores and follows NC 12 north from Southern Shores to Corolla as shown in Figure 1.

The Mid-Currituck Bridge has been under study for several years dating back to before 1995. The most recent forecast was prepared and summarized in the 2035 Detailed Study Alternatives Report dated October 2009. This forecast was utilized as part of the development of the EIS process to evaluate congestion measures and design requirements for the proposed project. In 2012, a Record of Decision (ROD) was prepared based on the 2035 traffic forecast. Prior to final signature, however, the NC General Assembly rescinded state funding that was required for the project. At that time, a decision was made that the ROD would not be signed since there was inadequate funding to construct the project.

In 2015, the Mid-Currituck Bridge project was included in NCDOT's 2016-2025 STIP for construction funding starting in 2017. To proceed with the project, multiple elements needed to be reevaluated and the NEPA documentation needed completion. As part of this reevaluation process, it was determined that the traffic forecast needed to be updated, primarily to account for a general slowdown in development activity in Currituck and Dare Counties since the previous forecast was released.

As a result, the NCTA requested an update of the traffic forecast. This updated forecast is intended for two primary purposes: to update the project's purpose and need and assessment of the travel benefits of the project, as well as to evaluate the required geometric improvements needed to serve future traffic volumes. For this project, the design period is the Summer Weekday. In addition, a Summer Weekend forecast was developed to test worst case operations from a systems perspective as well as to verify operations.



LEGEND

Design Study Area

Future Bridge Corridor

Study Area

Figure 1

1.2 Forecast History

The Mid-Currituck Bridge has been under study for several years dating back to before 1995. During the course of the study, multiple forecasts have been developed including:

- *Traffic Needs Analysis* dated July 2002: The July 2002 report documented the methodology, assumptions, and findings for 2001 traffic conditions, future (2025) No-Build traffic conditions, and hurricane evacuation clearance times. The 2025 No-Build traffic conditions included analysis of thirteen roadway links and two intersections. Hereinafter, the July 2002 report will be referred to as the *Traffic Needs Report* (or TNR).

- *2025 Traffic Alternatives Report* dated May 2007: Building upon the TNR No-Build analysis, follow-up analysis was developed to look at 2025 traffic forecasts and traffic capacity under potential Build Bridge alternatives including US 158 and NC 12 widening and new Build Bridge scenarios for a new link, the Mid-Currituck Bridge. In addition, non-highway alternatives were investigated, including a sketch-level examination of reversible lanes. The primary land use assumption in the analysis was that buildout of the NC 12 peninsula would occur by 2025.

Soon after the development of the 2025 forecast, the environmental study process was temporarily halted. In 2005, the environmental study process was restarted under the North Carolina Turnpike Authority (NCTA) with the intent to construct the project with toll revenues providing a portion of the construction and other costs. The 2025 forecasts were updated to 2035. The 2025 forecasts were used as inputs to this process, but additional review of trends since 2001 were conducted including a traffic count and data collection effort completed in August 2006. The traffic forecast was documented in the following documents:

- *2035 Traffic Forecast Report* (dated March 2009, analysis occurred in the 2006 to 2007 time frame): In addition to extending the design forecasts to 2035 (from 2025), additional forecast scenarios were examined. A new 2035 No-Build forecast was developed. These forecasts used the same basic spreadsheet model as the 2025 forecast, with revised trip matrices. The spreadsheet model was then adjusted to include a toll diversion element resulting in 2035 with bridge forecasts with tolls. Forecasts were again developed on a link basis and did not include intersection turning movements.

- *2035 Detailed Alternatives Traffic Forecast Report* (dated March 2009, analysis occurred in the 2007 to 2008 time frame): The next step in this round of traffic forecasting used the assumptions and 2035 forecasts from the *2035 Traffic Forecast Report* (March 2009) to develop a more detailed forecast that examined two specific alignments for NC 12. In addition, this forecast included balanced turn movement forecasts for more than 40

intersections on NC 12 and US 158. The primary data used in developing the balanced turn movements were traffic counts made in the summer of 2006. Although the previous 2035 forecast was used as the primary input, the additional turn movement analysis resulted in some adjustments to the forecast traffic volumes on NC 12 and US 158. This report represents the traffic forecasts used in the previous FEIS.

The traffic forecast reports noted above were developed to support NCDOT in the preparation of NEPA documents. These forecasts were not used as part of the revenue forecasting used for examining financial feasibility of tolls. The Traffic and Revenue (T&R) studies were performed separately and were documented in the *Mid-Currituck Bridge Final Report Traffic and Revenue Forecasts (July 2011)* prepared by ARUP for the Currituck Development Group. The NEPA and T&R reports were developed separately using different methodologies.

1.3 Need for Updated Forecast

In 2015, the Mid-Currituck Bridge project was included in NCDOT's 2016-2025 STIP for construction. As part of restarting the environmental analysis process, an evaluation of the previous forecast was prepared to determine whether updates were needed to the 2035 traffic forecast included in the 2035 Detailed Alternatives Traffic Forecast Report. The primary reason for this review was anecdotal evidence that the increases in tourism demand had fallen due to economic factors related to the Great Recession and that this has resulted in lower traffic volumes than anticipated.

The analysis examined traffic, development, and tourism growth trends for the period from 2008-2015 and compared the existing 2015 volumes to the anticipated 2015 volumes based on a straight line interpolation of the 2035 traffic forecast to 2015. The analysis focused on three links in the study network – US 158 near the Knapp Bridge, US 158 at the Wright Memorial Bridge, and NC 12 near Duck.

A technical memorandum documenting the need for a new forecast was developed and is included as Appendix D. The memorandum includes tables documenting the observed trends in data generally divided into 3 periods – 1990 to 2001 (used for the original 2025 forecasts), 2001 to 2006 (used in the 2035 forecasts), and 2006-2013/14 (corresponding with the new 2040 forecast). Key findings in the memorandum included:

- Review of traffic growth trends indicated that traffic volumes have remained flat and or decreased since 2006 (the base year for the 2035 forecast) showing a lower anticipated traffic demand than utilized in the previous forecast. In general, growth in traffic volumes peaked in the 1990s, slowed during the early 2000s, and then dropped for the period from 2006 to 2013.
- Review of land use trends indicated that permanent population in Dare and Currituck County increased fairly steadily from 1990 through 2006, but slowed from growth rates of approximately 3 percent per year to less than 1 percent per year since 2006.

- Review of State Data Center socio-economic projections indicated a lower anticipated population growth rate in both Dare and Currituck County than the State Data Center had assumed when the 2035 traffic forecast was developed. Specifically, the State Data Center projections reduced the projected growth rate for both Dare and Currituck County by 45 percent (i.e., future estimates of Currituck County population growth was projected to reduce from 2.9 percent to 1.6 percent annually, while Dare County population growth was projected to reduce from 1.8 percent to 1.0 percent annually.
- Tourist related trends were also examined. The key indicator examined Gross Occupancy tax receipts collected in Dare County and summarized by the Outer Banks Visitors Bureau. The receipts increased at 9.0 percent annually from 1994-2000 and 7.2 percent annually from 2001-2006. Since 2006, the annual increase has remained positive but the annual growth rate reduced to 3.7 percent. Note that this data is not a pure indicator of tourist growth since tax rates may have changed over this period. In addition, as the occupancy tax was applied there is anecdotal evidence suggesting that the percentage of rentals paying the tax has increased since it was originally put in place. Nevertheless, it is indicative that growth in tourism has slowed, but is continuing to increase.
- The number of visitors at specific attractions on the Outer Banks (such as the Wright Memorial and Jockey's Ridge) was also examined. This data was less reliable as differences in growth were noted depending upon the attraction. After review, it was identified that "free" attractions (such as Jockey's Ridge) tended to have increase in use during the most recent periods while "pay" attractions often had reduced usage. Also note that the Centennial celebration at the Wright Memorial was included in the data from the period 2001-2006 which corresponded with high attendance levels.
- As a final indicator, income trends were examined using Mean Household Income as reported annually by the U.S. Census. In general, the decline in growth trends match well with the observed decrease in income levels since 2001 in North Carolina and 2006 in the United States. Although not a definitive measure, it could be reflective of a drop in disposable income utilized for vacations.

As noted, a technical memorandum was developed examining these trends and is included as Appendix D. This analysis combined with the age of the last forecast (more than five years old) resulted in a conclusion that a formal revision of the traffic forecast for the project was needed.

2. Sources of Information and Data

2.1 Related Forecasts

As noted, the Mid-Currituck Bridge has been under study for several years dating back to before 1995. During the course of the study, multiple forecasts have been developed as documented in Section 1.2.

Since the release of the 2035 Detailed Alternative Traffic Forecast, Comprehensive Transportation Plans (CTP) were developed for Currituck County (May 2012) and Dare County (July 2015). These forecasts were developed using data available after 2006 and reflect lower future volumes and future growth rates than in the 2035 Mid-Currituck Bridge forecasts.

No other project level forecasts have been prepared in the project study area.

2.2 Comparison of Forecast Methods

The traffic forecast for the project was developed using a combination of spreadsheet methods and a TransCAD network for the assignment of trip tables and derivation of a base OD matrix. The methodology applied techniques that were similar to, but different from models utilized in the 2035 NEPA traffic forecast as well as the ARUP/CDG toll revenue study. The key differences in the methodologies are illustrated in Table 1.

2.3 Historic AADT

Historic AADT volumes are illustrated for multiple links on the network in Table C2 of Appendix C. Note that for the Wright Memorial Bridge, two rates are provided – the published AADT from County maps and the calculated AADT from the ATR counter on the Wright Memorial Bridge. In general, the ATR counter should be more accurate since it provides a measure of true AADT without the need for conversion factors.

Also note that due to the extreme seasonal variations in traffic – not just day to day and month to month, but also year to year based on economic conditions and tourism, the AADT counts reported by NCDOT include more fluctuations than in other areas of the state. For instance, growth trends shown in AADT volumes do not necessarily correspond to annual growth during the summer. Nevertheless, the AADT trends provide useful data to inform the forecast process.

Table 1. Comparison of Forecast Methods

	Parsons Brinckerhoff NEPA Forecast	Arup/CDG Traffic & Revenue Analysis	Update of NEPA Forecast
Purpose	• NEPA Forecast to assess project need & impacts	• Toll & Revenue Estimation	• Refined NEPA Forecast to assess project need & impacts
Model Type	• Spreadsheet based • Link Based forecast • Turn Movement Balancing for intersections only	• Traditional Demand Model • Economic Analysis using Elasticity of Demand • Proprietary approach	• Spreadsheet combined with use of TransCAD for trip assignment and ODME • Turn Movement Balancing • Convert to Link based
Base & Future Year	• 2006 • 2035	• 2009 • Multiple future years	• 2015 • 2040
Time Periods	• Daily Model • Summer Weekday & Summer Weekend • Factors from Wright Memorial Bridge for Non-summer	• Peak Period Model • Multiple Day Scenarios • Different times of Day	• Daily Model • Summer Weekday & Summer Weekend • Factors from Wright Memorial Bridge for Non-summer
Data Collected	• 2006 Summer TM and Classification Counts • Speed studies • Wright Memorial Bridge ATR Data	• 2009 Summer TM and Classification Counts • Speed Studies • Visitor Surveys • Detailed Land Use Data at TAZ level • Income Studies	• 2015 Summer TM and Classification Counts • Speed studies • Wright Memorial Bridge ATR Data
Trip Purposes	• Single purpose	• Tourists & Residents	• Single purpose
Trip Estimation	• OD matrix from ODME	• 4 Step Process	• OD Matrix from refined iterations of ODME matrix assigned with TransCAD
Tolling Methodology	• Sketch model within spreadsheet. • Used 3 VOT for Low, Medium & High Income • Assigned percentage of diversion to all trip pairs.	• Proprietary model based. • Used 2 person types Tourist & Resident • Used 3 trip types Business, Commute, & Other • Value of Time by trip purpose & period.	• TransCAD assignment using time equivalent for tolls. • Estimating maximum revenue potential point.

2.4 Field Data Collection

Field data were collected by NCDOT's Technical Service Group using multiple On-Call subconsultants in July and August 2015 to coincide with summer peaks. Traffic data included turn movement counts at 40 intersections (summer weekday at 40 and summer weekend at 16). Seven day (168 hours) classification counts were collected at 19 locations. Count locations are illustrated in Figure B5 of Appendix B. Classification count locations (which correspond with the key link locations) are summarized in Table 2. A summary of turn movement count locations is included in Table B3 of Appendix B. Additional Data Collection information is summarized in Appendix B.

The design period for the traffic forecasts are summer weekday and summer weekend so the counts were utilized without conversion factors. For conversion to non-summer and AADT periods, the Wright Memorial Bridge ATR data was utilized to estimate conversion factors since it applies directly to the study area.

Table 2. Classification Counts

Link #	NCDOT FILE #	Classification Count Location	Start Date	End Date
C-1	15-14019	US 158 at Intracoastal Waterway Bridge approach, North of SR 1405 Waterlily Rd	July 8, 2015	July 15, 2015
C-2	15-14020	US 158 North of NC 136 Macedonia Church Rd	July 8, 2015	July 15, 2015
C-3	15-14021	US 158 North of SR 1127 Garrenton Rd	July 8, 2015	July 15, 2015
C-4	15-14022	US 158 South of SR 1111 S Spot Rd	July 8, 2015	July 15, 2015
C-5	15-14023	US 158 - Wright Memorial Bridge approach, East of SR 1187 Holly Ln	July 8, 2015	July 15, 2015
C-6	15-02018	US 158 West of SR 1206 Dogwood Trail / The Woods Dr	July 14, 2015	July 21, 2015
C-7	15-10050	US 158 West of Juniper Trail	July 15, 2015	July 22, 2015
C-8	15-10051	US 158 East of NC 12 and West of Putter Ln	July 15, 2015	July 22, 2015
C-9A	15-10052	NC 12 North of Coastal Provision Market	July 15, 2015	July 22, 2015
C-9B	15-10053	NC 12 North of E Dogwood Trail	July 15, 2015	July 22, 2015
C-10	15-18010	NC 12 North of Sea Oats Trail	July 15, 2015	July 22, 2015
C-11	15-18014	NC 12 North of SR 1409 Christopher Dr	July 15, 2015	July 22, 2015
C-14A	15-18012	NC 12 South of Audubon Dr (Hampton Inn Hotel)	July 15, 2015	July 22, 2015
C-14B	15-18013	NC 12 South of Hunt Club Dr / Spindrift Trail	July 8, 2015	July 15, 2015
C-12B	15-02021	NC 12 North of Currituck Clubhouse Rd / Schooner Ridge Rd	August 4, 2015	August 11, 2015
C-12A	15-10049	NC 12 North of SR 1402 Albacore St	July 15, 2015	July 21, 2015
C-13	15-02019	NC 12 South of Devil's Bay / Herring St	July 8, 2015	July 15, 2015
C-16B	15-02022	NC 12 North of SR 1409 Shad St	July 8, 2015	July 15, 2015
C-16A	15-02020	NC 12 North of High Dune Loop near end of paved NC 12 beach access	August 4, 2015	August 11, 2015

During the summer weekend counts, severe congestion and queuing delays were noted on both NC 12 and US 158. A comparison of the 13 hour turn movement counts and the adjacent classification counts indicated that for roadway sections within a couple mile of the US 158/ NC 12 intersection, the classification counts undercounted actual field counted volumes at the intersections. For this reason, the classification counts were adjusted using the 13 hour turn movement count volumes for the applicable intersection approach and departure corresponding to each classification count location. It was observed that as congestion reduced, queuing reduced, and speeds increased the classification counters closely matched the turn movement counts. Therefore, the classification counts were directly used for non-congested periods (including the 11 hours at night) to compute the 24 hour counts.

2.5 Travel Time Studies

Travel time studies were conducted on July 17 and 18 in order to overlap the period of the traffic counts. Heavy levels of congestion were noted, particularly on US 158 east of the Wright Memorial Bridge and on NC 12 during the summer weekend. Travel time runs were collected using GPS data collection units. Overall, a series of 26 runs were performed on the Summer Weekday and 16 runs on the Summer Weekend.

A summary of the resulting travel times is included in Table B4 of Appendix B. The data is compared with similar travel time data collected in 2006. A comparative review indicates that travel times were very close on the summer weekday. On the summer weekend, the 2015 data showed longer travel times and slower speeds than were observed in 2006. While this may be due to variations or flow issues related to the specific day observed, it is indicative that queuing and delays continue to be a major issue throughout the day.

2.6 Other Field Investigation

A formal re-examination of existing land uses and development was not conducted as part of this field investigation. This evaluation was not performed since the previous forecast effort included this step and new data was available identifying all building permits that had been approved on along NC 12 since the previous forecast was developed. Also, the reduced level of growth since the previous forecast is indicative of minor changes in land use.

2.7 Other Data Sources

Key sources of information and data included the previous NEPA documentation for the Mid-Currituck Bridge. This included multiple documents and reports. A key source of land use assumptions on the NC 12 portion of the study area was the *Indirect and Cumulative Effects Technical Report* (Parsons Brinckerhoff, 2011). As was done for the 2035 forecast, the updated 2040 forecast assumed that full buildout of the planned long term development along NC 12 was assumed to be reached although the buildout year was shifted to 2040 as opposed to 2025. The key element in this assumption is not the specific year that buildout is attained, but that buildout will be reached prior to the 2040 forecast year.

Other documents used in this analysis included:

- *Dare County Comprehensive Transportation Plan (July 2015)*
- *Currituck County Comprehensive Transportation Plan (May 2012)*

Key Data sources included:

- State Data Center population and land use projections
- US Census
- NCDOT AADT maps
- Wright Memorial Bridge ATR, A2703, data

2.8 Local Contacts

In addition to reports and similar data sources, face to face interviews were held with local planners and other staff. The key contacts are identified in Table 3.

Table 3. Local Contacts

Name of Contact	Organization	Date of Contact	Contact Information	Information
Peter Bishop	Currituck County	February 2015	Economic Development Director	1. County Economic Indicators 2. Economic Vision Plan 3. New Community Facilities
Donna Creef	Dare County	February 2015	Planning Director	1. New County & Municipality Plans County 2. Comprehensive Transportation Plan 3. Barco Diversion Hurricane Evacuation Plan
Wes Haskett	Town of Southern Shores	February 2015	Planner/Code Enforcement Officer	1. CAMA Land Use Plan Update 2. Building Permits 3. Census Data Update
Joseph Heard	Town of Duck	February 2015	Director of Community Development	1. CAMA Land Use Plan Update 2. Comprehensive Pedestrian Plan 3. Building Permits 4. Census Data Update 5. New Community Facilities

3. Base Year 2015 No-Build Forecast

3.1 Assumptions

The 2015 Base Year No Build forecast represents existing conditions. For this project, two balanced forecasts were developed - Summer Weekday matching the design period and Summer Weekend reflecting highest case traffic volumes. In addition to the turn movement based balanced forecasts, link forecasts were developed for 16 key links.

3.2 Methodology

A review of previous traffic forecasts, summer traffic counts, area AADT history, and engineering judgment serve as the basis for the 2015 Base Year No-Build Traffic Forecast. For this study, the design period is the Summer Weekday. In addition, a summer weekend base year forecast was developed. A balanced AADT forecast was not developed although link based forecasts were developed for non-summer and AADT volumes.

3.2.1 Balanced Turn Movement Forecast

A variation of the NCDOT Traffic Forecast Utility (TFU) spreadsheet was also a major tool used in the determination of the traffic forecast volumes. The NCDOT TFU spreadsheet includes the calculation of a validation score that considers the approach volumes and design factors for each intersection. The score is utilized as a tool in selecting the appropriate volumes and factors with a score that is less than 1.0 being considered to be valid. However, if a score is greater than 1.0 it will receive additional evaluation to determine if the selected volumes and factors are acceptable, especially for those that are based on count data and well established travel patterns or trends. Ultimately, the approach volumes and factors will be selected based on engineering judgment such that the AADTs and turn movements can be converted to peak hour volumes.

The data from the field-collected traffic counts were incorporated into the spreadsheet in order to replicate volumes as closely as possible for each intersection in the traffic forecast. The traffic forecast volumes in the 2015 Base Year traffic forecast are representative of patterns observed in the collected traffic counts. The Base Year 2015 No Build balanced forecasts for Summer Weekday and Summer Weekend are shown in Appendix A.

3.2.2 Link Based Forecast

The balanced Summer Weekday traffic forecasts provide an estimate of daily turn movements at all study intersections and roadway sections. For the project's comparison of alternatives, however, a methodology to examine system-wide network capacity including congested VMT (vehicle miles travelled) was applied during previous iterations of the forecast and alternatives comparison that examined capacity of 15-16 link roadways. In order to apply a similar method, the balanced turn movement forecasts were combined to develop a weighted average of traffic volumes using a similar link structure. By applying this weighted average after the

development of the detailed forecast, the more detailed balanced forecast and the link based forecast examined are consistent.

Once the traffic forecast volumes were determined, they were compared to historic AADT trends for reasonableness. Table C2 of Appendix C provides a comparison of historic AADT and trends.

3.2.3 Conversion to Specific Time Periods

After careful review for reasonableness checks, the 168 hour mainline classification counts and 13-Hour TMCs were applied without conversion factors since the project design period is the Summer Weekday. The 120 hour classification counts were utilized to identify weekend and weekday flow differences.

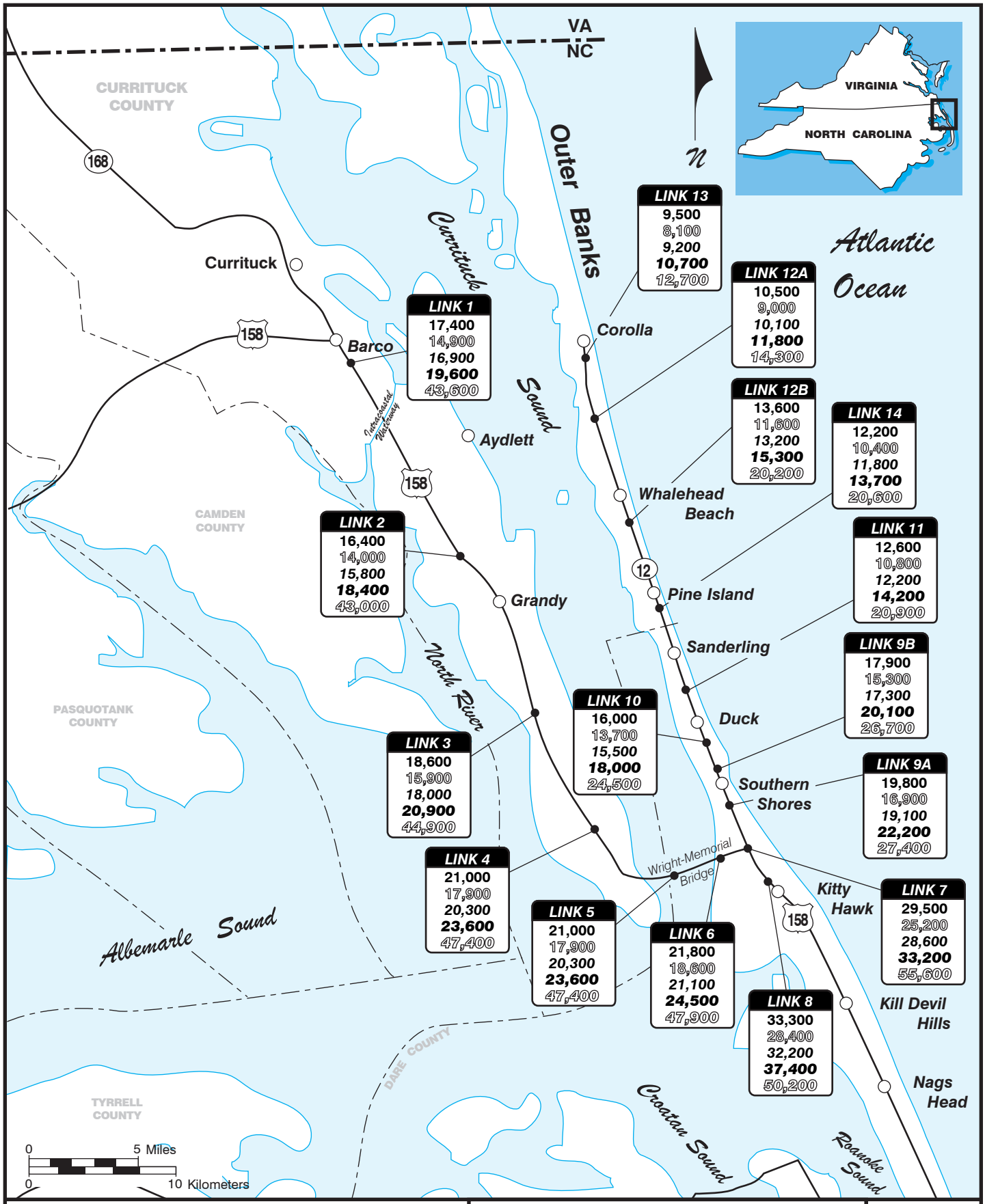
In addition, a detailed review of the 24 hour/ 365 day automatic counter (ATR) on the Wright Memorial Bridge was analyzed to develop conversion factors between the following periods: Summer Weekday, Summer Weekend, Non-Summer Weekday, and Non-Summer Weekend, and AADT as shown in Table 4.

Table 4. Conversion Factors for Daily Traffic Periods

Daily Traffic Volume Conversion factor	Factor
Average Annual Daily Traffic (AADT)	0.89
Average Non-Summer Weekday	0.76
Average Non-Summer Weekend	0.86
Average Non-Summer Saturday	0.96
Average Summer Weekday	1.00
Average Summer Weekend	1.54
Average Summer Saturday	1.74

1. Conversion factors based on Wright Memorial Bridge ATR (A2703) data from 2008-2012 (2013 & 2014 data not usable due to non-summer construction closures).
2. Conversion shown is for converting Summer Weekday forecast to each period. The Summer Weekday forecast should be multiplied by the factor.

These factors are applied and illustrated in the Base Year 2015 link based forecast shown in Figure 2. The weighted average link based forecast is presented in a table format in Table C7 in Appendix C.



LEGEND

38,100 - Annual Average Daily Traffic
33,400 - Non-Summer Weekday Traffic
21,900 - Non-Summer Weekend Traffic
54,800 - Summer Weekday Traffic
59,800 - Summer Weekend Traffic

Base Year (2015) Daily Traffic Volumes without a Mid-Currituck Bridge

Figure

2

3.3 Design Factors

The balanced traffic forecast (shown in Appendix A for the existing 2015 Summer Weekday and Summer Weekend) includes design factors for traffic flow including truck percentages, peak hour percentage (or k-Factor), and directional distribution (D). Each of these values is used to convert daily traffic volumes to peak hour volumes for capacity analysis. The methodology and chosen values for these factors are described below.

3.3.1 Truck Percentages

Truck Percentages were determined using the 120-Hour mainline classification count data, the 16-Hour TMC data, and previous traffic forecasts developed for this project. Overall truck percentages were then separated into the two NCDOT standard classifications: Duals (single-unit trucks with at least one dual-tired axle) and TTSTs (multi-unit trucks with single or twin trailers). The data is provided in Table B2 in Appendix B.

Adjustments to the truck percentages were applied to NC 12 since this route is almost exclusively passenger vehicles, particularly during peak periods. Since the road effectively operates as a cul-de-sac, trucks are limited exclusively to delivery trucks to grocery stores and other retail. Nevertheless, the truck percentages from the classification counts were showing approximately 7 percent trucks, a relatively high percentage. After review of the data, field operations, and previous forecasts, it was determined that a portion of the vehicles being counted as heavy vehicles were likely recreation vehicles or vehicles with trailers.

To take this into account, the truck percentages are shown in the forecast for 3 categories – Duals, TTST, and Recreational vehicles. This is the same breakdown used in the previous forecast. On NC 12 it was estimated that the heavy vehicle percentages are 2 percent Duals, 1 percent TTST, and 4 percent recreational vehicles for both the Summer Weekend and Summer Weekday.

On US 158, heavy vehicle percentages varied between the Summer Weekday and Summer Weekend and by the section of roadway. On the Summer Weekday, heavy vehicle percentages were relatively consistent with 4 percent Dual, 2 percent TTST, and 2 percent Recreational vehicles used in the forecast. On the Summer Weekend, however, a lower heavy vehicle percentage occurs north of the Wright Memorial Bridge with an increase in heavy vehicles occurring south and east of the Wright Memorial Bridge. On the Summer Weekend, 2/1/2 percent heavy vehicles were assumed north of the Wright Memorial Bridge and 3/2/2 percent to the south.

Data used in determining the truck percentages and the chosen values are provided in Table C1 in Appendix C. Note that for pavement design purposes, the truck percentages shown for the Summer Weekday forecast can be assumed as the same as the AADT (since a formal balanced AADT forecast is not presented). In addition, the recreational vehicles can be assumed to be Duals for pavement design at the discretion of the designer.

3.3.2 Peak Hour Percentage (k factor)

The k factor represents the percentage of traffic that occurs in the peak hour of traffic flow. In most urban areas the peak flow is relatively stable with an AM and PM peak corresponding with commuting times. Traffic flow in the study area, however, varies from this more typical pattern. The primary difference is on the Summer Weekend when high volumes and congested flow can be observed for 6 to 10 hours of the day.

As a result, the terms AM and PM peak periods are more applicable than peak hour. Under existing conditions, traffic is already subject to extreme delays and queuing. The AM peak period occurs over about a 3 to 4 hour period and the PM peak period occurs over a 4 to 6 hour period. In general, in the afternoon the arriving tourists are more spread out than the tourists leaving in the morning since check in times are more flexible than check out times. Note, however, that incidents such as poor weather or a vehicle crash can extend the peak period longer. The 2015 k-factors included in the forecast relatively match existing data from the classification counts, but it can be expected that as congestion occurs, the peak hour spreading will extend over longer periods of the day which can reduce the k-factor since the roadway cannot process the peak hourly demand.

3.3.3 Directional Distribution

The directional distribution (D) provides information on the direction of traffic flow in the peak period. On US 158, the directional distribution showed more even directional flow and was estimated to be 55 percent in the peak direction. On NC 12, splits were more pronounced and the forecast assumed a 60 percent split in the peak direction.

Directional peaking is in opposite directions for the flows on the Summer Weekday and Summer Weekend. On the Summer Weekday, the peak period for traffic flow is the PM peak when there is a combination of commuter traffic as well as local tourist traffic. During the PM peak, the peak direction of flow is in the southbound direction on NC 12 with peak directional flow then either going south to Kitty Hawk or north to the Wright Memorial Bridge and points north via US 158.

On the Summer Weekend (particularly on Saturday), the peak demand is in the morning southbound on NC 12 which continues on US 158 over the Wright Memorial Bridge and to points north. This coincides with tourists having to leave their weekly rental by check out time. The PM peak is a reverse of this movement with tourists travelling south on US 158 and then going north on NC 12 in the study area to access their weekly rental. In general the AM peak demand is higher than the PM peak since there is a reduced time window for check out times than check-in times. In addition, tourists arriving at the Outer Banks have longer length trips that tend to spread out their arrival times.

4. General Model Data

4.1 Model Information

Neither Dare nor Currituck counties are a part of a Metropolitan Planning Organization therefore no regional travel demand model is available. In previous forecasts, a spreadsheet model was utilized to estimate traffic growth and assignments. In general, this method was still acceptable, but newer methods were available to simplify the assignment of trip tables.

Specifically, in this iteration, origin destination tables were used similar to the spreadsheet methodology. To allow for a simpler, mechanized assignment of trips, however, TransCAD software was utilized. The TransCAD assignment allowed for more refined estimates of travel time and delays to be incorporated into the assignment. In addition, it provided a more standardized method of testing toll diversion.

Although TransCAD is used by NCDOT as part of model development in multiple MPOs and other urban areas, the TransCAD tool utilized in this forecast is not a formal calibrated model and was not intended to serve as such. Instead it provided a refined way of processing the estimated trip tables by simplifying the assignment process. This tool was a key component of developing the future traffic forecasts and the assumptions applied in using this tool are outlined in this section of the report.

4.2 Methodology

4.2.1 Estimating Existing Trip Tables

For the 2015 Base Year, OD trip matrices were estimated for Summer Weekday and Summer Weekend based on 2015 traffic count data. This included a combination of the classification count data and the turn movement count data. The turn movement count data were utilized primarily near the US 158 and NC 12 intersection to account for queuing issues observed during peak periods.

Using the daily traffic volumes, a 2015 Base Year trip table was developed using Origin-Destination Matrix Estimation (ODME) method in TransCAD. The OD trip matrix represents daily vehicle trips between all zones in the study area. This was the same method utilized in previous iterations of the forecast to develop the existing trip table. As an improvement to the previous forecast, separate OD matrices were developed for the Summer Weekday and Summer Weekend to better account for flow differences. After the initial development, some refinements were applied to more accurately reflect flows that would be expected to and from retail areas as well as less developed zones.

Table C4 in Appendix C identifies the zonal trips for both the Summer Weekday and Summer Weekend in the 2015 Base Year trip tables.

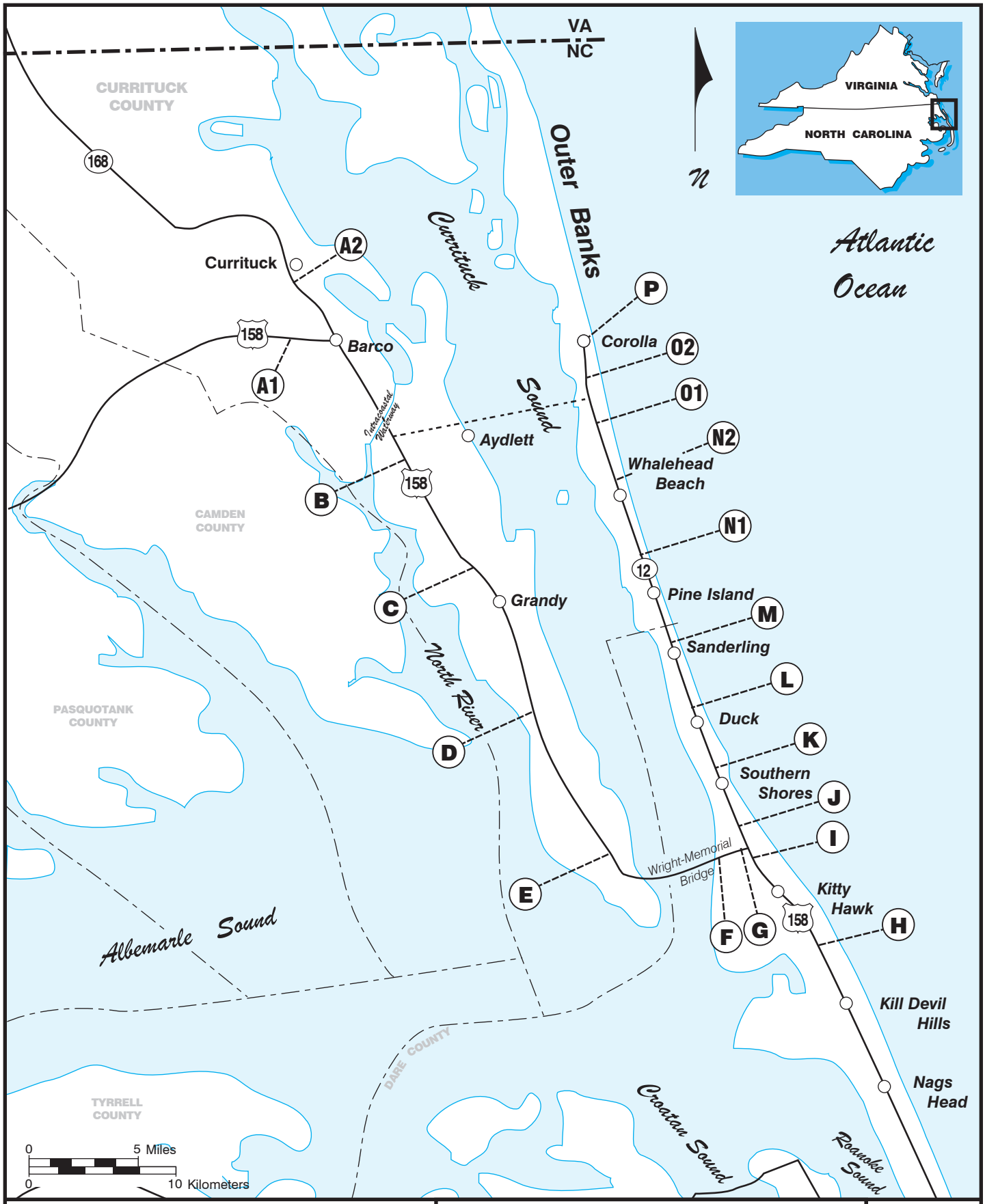
4.2.2 Estimating Future Trip Tables

For the 2040 Future Year, growth rates were applied to the 2015 matrices to estimate 2040 Summer Weekday and 2040 Summer Weekend OD trip matrices. Similar to previous iterations, the trip matrices were divided into multiple zones as illustrated in Figure 3. For each of these zones, growth rates were identified looking at multiple criteria. Key assumptions included:

- Zones along NC 12 (J through O) were based on the assumptions for planned maximum buildout based upon the total number of approved lots for future development
- Rural zones along US 158 were based on primarily on projected population growth
- More urbanized zones on US 158 south of the Wright Memorial Bridge were examined using a combination of population growth, current development and potential retail expansion, and tourist trends
- External station zones on US 158 and NC 168 were based on historic traffic growth, projected population, and tourist growth trends

There were two sources that were utilized and updated for estimating the growth rates. These documents were:

- The analysis developed in the previous phase of the forecast identified the maximum potential development in the zones bordering NC 12. For this iteration, it was assumed that full buildout would be reached in these zones by the 2040 design year. This compares with the previous forecast that assumed buildout would be reached by 2025. The key factor, however, is not the specific year that buildout is reached, but that for the NC 12 sections buildout will be reached before the 2040 forecast year. The buildout assumptions are examined in Section 4.3.
- Another key input to estimating the growth rates was the technical memorandum evaluating the potential impact of reduced growth rates on the 2035 forecast. This memorandum is included in Appendix D. Key findings included in this analysis are described in Section 1.3. Observations that were applied in the estimation of growth rates at each zone included revised estimates of population growth from the State Data Center, observations of tourist trends, and traffic growth, particularly at external stations.



LEGEND

(A) - Zone

Travel Zones for Origin - Destination Trip Estimation

Figure

3

4.3 Buildout Assumptions along NC 12

Planned Buildout by 2040 was assumed for the NC 12 accessible portion of the Outer Banks north of the intersection of NC 12 and US 158 based on the total number of lots approved for future development. For the section north of the NC 12 termini, a continuation of recent building trend was assumed. This represents planned and expected development in the area where traffic movement would be most affected by a Mid-Currituck Bridge.

The best starting point for planning a new transportation project is to ask, based on land use plans and development trends, what level of development needs to be served and how well will the various alternatives serve that development. In the case of the Outer Banks from Southern Shores north, developable land is fully subdivided or future development is defined by Planned Unit Development. Thus, the level of development that would ultimately need to be served is known.

To examine the Buildout scenario, a review of the development plans and existing development was conducted. For each of the zones along NC 12 (Zones J through P in Figure 3), the existing number of housing/rental units were compared to the maximum allowable units. Table 5 provides a summary for the assumed buildout scenario.

Table 5. Buildout Assumptions along NC 12 in Currituck and Dare Counties

Zone	2007 Units utilized in Previous Forecast	New Units / Build Permits 2007-2014	2014 Existing Units	2040 Maximum Build out Units	2014 to 2040 Additional Units	Projected Growth Units	Annual Growth 2014-2040
P	611	120	731	854 (of 3,150 total lots)	123	17%	0.60%
O1, O2	1,553	24	1,577	1,750	173	11%	0.40%
N1, N2	2,123	214	2,337 (includes 291 hotel rms)	5,119 (includes 1373 hotel rms)	2,782	119%	3.06%
L, M	1,839	44	1,883	1,999	116	6%	0.23%
J, K	2,910	127	3,037	3,400	363	12%	0.44%
Total	***9,036***	***529***	***9,565***	***13,122***	***3,557***	***37%***	***1.22%***

It should be noted that this analysis is also being performed to identify the geometric requirements and likely impacts associated with the project. To properly identify these

requirements, improvements on NC 12 should be sized to accommodate this planned and expected development so that such improvements only need to be built once. The Mid-Currituck Bridge is planned for two lanes and an interchange would be required at US 158 at today's development levels for summer weekend operations. As a result, the Buildout assumption cannot result in a design of these major project features that contain notable unneeded capacity should build-out not be reached.

Using the information in Table 5, growth rates were estimated and applied to the trip matrices. Note that the actual trips from each zone are not simply proportional to the number of units in the zone. Other factors including number of bedrooms per unit, type of unit, and locations with retail development were examined and taken into account to determine trips as well. Both land use growth rates and trip growth rates for each zone in the network are shown in Table C4 of Appendix C. Key observations and conclusions from Table 5 include:

Dare County along NC 12

In Dare County along NC 12 (Zones J, K, L and M), Buildout of planned and expected development is appropriate because these areas are already over 90 percent built out with only 479 units not yet developed.

Currituck County along NC 12

In Currituck County along NC 12 (Zones N1, N2, O1, and O2), almost 3,000 units have yet to be developed. Of these, approximately half have been identified as future hotel units. The undeveloped units are concentrated in Zones N1 and N2, with Zones O1 and O2 being over 94 percent developed. Although 3.06 percent annual growth is required to obtain buildout in Zones N1 and N2 by 2040, this level of development is considered reasonable due to:

- Even factoring in 3.06 percent growth into Zones N1 and N2, the overall annual growth rate needed along NC 12 to achieve buildout is 1.22 percent per year as shown in Table 5**Error! Reference source not found.**. Comparing with the observed land use trends noted in Section 1.3, this rate is approximately one-third the 3.7 percent annual increase in tourist trends. In addition, it is lower than the 1.6 percent annual population growth projected by the State Data Center for Currituck County.
- With over 90 percent of possible units developed in Dare County and Corolla, it is assumed that demand for new development that would have occurred in these areas will be shifted into Zones N1 and N2.
- In addition, there is currently a limited amount of hotel development throughout the Outer Banks (not just in the study area). Since the land use plans identify specific areas for hotels, this development type would be attracted into these zones, possibly from throughout the Outer Banks area. Also note that the construction of a hotel introduces

hundreds of units at once. Therefore, increases in land use are attained in steps rather than an incremental increase each year.

- Similar to Dare County, streets and utilities in Currituck County are installed in almost all subdivisions, most public facilities are planned or in place, and planned major commercial areas have developed. This basic infrastructure is assumed to allow for the development of planned and expected housing and rental units.

Thus, assuming Buildout of planned and expected development also is appropriate in the NC 12 accessible portions of Currituck County.

Non-Road Accessible Section north of Corolla and NC 12

In the non-NC 12 accessible portion of the Currituck County Outer Banks, Buildout was not assumed. Instead, a review of development trends on this section of the Outer Banks was performed. This analysis is summarized in Table 6.

Table 6. Growth Trend in Non-Road Accessible Section north of NC 12 (Zone P)

Year	**1995**	**2001**	**2007**	**2014**	**2040 - low**	**2040 - high**
Developed Units	244	374	611	731	854	1423
Range	**1995-2001**	**2001-2007**	**2007-2014**	**1995-2014**	**2014-2040 low**	**2014-2040 high**
Annual Growth Rate (if compounded)	7.4%	10.3%	2.6%	5.9%	0.6%	2.6%s
Annual Increase in Units	22	40	17	26	5 units/yr	17 units/yr
Buildout Units using Increase in Units					854	1142
Annual Percentage Growth (based on Increase in Units)					0.6%	1.7%

Assumptions, steps, and observations from Table 6 about development in the non-NC 12 accessible section include:

- As shown in Table 5, there are a total of 3,150 total lots in Zone P. Consistent with previous analysis, it is assumed that this level of buildout is not practical north of NC 12. Restrictions on development include the area's lack of federal flood insurance, lack of local paved roads and public services, and designation as a limited service area and land with low suitability for development in the Currituck County CAMA land use plan. In addition, there are commitments in place not to extend NC 12 further north.
- The first step was to identify the existing number of units and historical land use growth trends on this section of the Outer Banks.
    - Based on previous studies, the number of development units was identified for 1995, 2001, 2007 and 2014. With these volumes, annual growth rates were examined for both compounded growth and annual increase in units.
    - Since 1995, growth in units has been at 5.9 percent compounded annually with an average of 26 new units each year. Between 2007-2014, the growth slowed down to 2.6 percent per year. This corresponded to an annual increase of 17 units per year.
- The previous forecast assumed that practical buildout in Zone P was 854 units of the 3,150 total units that are available. Assuming an increase in housing of 17 units per year (i.e. matching the 2007-2014 trend) would result in an increase to 1,142 units. After consideration, the forecast was developed with buildout remaining at 854 units. This is consistent with assumptions for the previous ICE analysis and forecast and is applicable because:
    - Using a lower assumed practical buildout than the historic annual growth rate is consistent with previous analysis. Specifically, the growth rate assumed in the 2035 forecast for Zone P was 1.2 percent per year as compared with the observed 10.3 percent short term growth rate (2001-2007).
    - As occurred between 2007 to 2014, it is anticipated that the annual growth rate in new units will continue to drop into the future given that the limited available infrastructure will likely not support high rates of continued growth. Therefore, the assumed practical buildout of 854 units is reasonable.
- Although not anticipated, a high growth scenario assuming that the growth in new units continues at a similar rate (17 new units per year) to that observed from 2007 to 2014 through 2040 is shown in Table 6. After evaluation of the forecast, it is possible that the forecasted volume at the northern-most end of NC 12 could increase by up to 1,200 vpd if this higher level of growth would occur.

Based on this analysis, the buildout assumption of 854 developed units of the total 3,150 available units is appropriate in the non-NC 12 accessible portions of Currituck County located north of Corolla.

4.4 Delay Assumptions

A highway network including zone connectors was developed for the study area in TransCAD. Table 7 shows the attributes used for links including speed, daily capacity and volume-delay parameters. A series of iterations were conducted to determine appropriate delay expectations, particularly during the Summer Weekend. The initial assignment of daily capacity, Alpha and Beta were based on the assumption that US 158 is a major arterial and NC 12 is a minor arterial within the study area. However, due to the unique nature of the study area with high daily traffic volumes observed during summer tourist season, the Alpha and Beta for US 158 are more representative of a typical principal arterial and for NC 12 more representative of a typical major arterial as shown in Table 7.

Utilizing these variables, the volume delay function curve, especially on NC 12, was tested with Base Year traffic and field collected travel time data. Higher future traffic volumes were also tested to make sure that the output link delay is reasonable. In general, the values for volume-delay function being used in the model imply relatively higher daily capacity and lower resulting delay than typical peak hour formulations. This is an appropriate assumption for a 24 hour model since the delay functions must reflect multiple hours of the day including periods with low volumes. Also note that this assumption will result in a conservative forecast for the proposed bridge (i.e. a lower daily volume on the proposed bridge) since delays in the 24 hour model do not reflect delays in the peak period exclusively.

Table 7. Link Capacity and Volume-Delay Function Parameters

Highway	Median Type	Speed Limit	Daily (LOS E) Capacity (per lane)	Alpha	Beta
US 158	Divided	45 mph	13,600 vpd	0.15	4.5
US 158	TWLTL	45	13,000	0.15	4.5
US 158 (WMB)	Divided	55	14,000	0.15	4.5
US 158	TWLTL	55	13,400	0.15	4.5
US 158	Undivided	45-55	12,000	0.15	4.5
Mid-Currituck Bridge	Undivided	55	12,000	0.15	4.5
NC 12	TWLTL	35-45	11,000	0.15	5
NC 12	Undivided	35-45	10,000	0.15	5

4.5 Toll Diversion Analysis

TransCAD allows for the use of a generalized cost equation for volume-delay function. The generalized cost function is based on BPR delay function and calculates cost for each link as:

$$Cost_i = Toll_i + VOT \times FF\,Time_i \left[1 + \propto_i \left(\frac{volume_i}{capacity_i}\right)^{\beta_i}\right]$$

4.5.1 Comparison of Toll Assumptions in Previous Forecasts

In applying this function, one of the key assumptions is Value of Time (VOT). The previously developed Traffic & Revenue analysis was reviewed with regards to VOT and multiple assumptions that were applicable to the T&R analysis but not applicable to the NEPA forecast. Specific differences included:

- The T&R analysis used multiple peak period trip models that allowed for more detailed estimates of travel time delays throughout different periods of the day. The new forecast examines daily traffic.
- The T&R analysis assigned multiple trip purposes and assigned different values of time to each type of trip. The new forecast uses a single OD matrix without specific trip purposes.
- The T&R analysis examined variable toll rates and based on both the mix of trip purposes and hourly delays. For instance, a review of Table 18 from the *Mid-Currituck Bridge Final Report Traffic and Revenue Forecasts (July 2011)*, prepared by ARUP, identifies more than 60 different toll rates.
- The T&R analysis used an economic based analysis of willingness to pay tolls that examines multiple factors not included in a conventional traffic forecast.

As a result of these differences, there were multiple values of time and toll rates tested in the T&R analysis. Based on this review, selecting a single value of time and toll rate to represent daily toll diversion was not a precise method. Table 8 identifies the average VOT and toll rates used in the two previous studies.

Table 8. Comparison of Average Toll Rates & Value of Time in Previous Forecasts

Summer Tolls	A. 2035 NEPA Traffic Forecast Using Daily Sketch Planning Method			B. Traffic & Revenue Study Using 24 Hour Weighted Peak Period Model (Arup & CDG)		
	Toll in 2015$	VOT in 2015$	Toll Equivalent (minutes)	Toll in 2009$	VOT in 2015$	Toll Equivalent (minutes)
Future Weekday	$12	$35	21	$10	$16	38
Future Weekend	$12	$40	18	$17	$17	57

1. PB's summer weekend used 3 Values of Time - $15/$20 (low), $35/$37.50 (medium), $70/$60 (high)
2. Arup/CDG Value of Time and Toll Assumptions computed *from Mid-Currituck Bridge Final Report Traffic and Revenue Forecasts (July 2011).*

4.5.2 Applying Revenue Maximization Sensitivity Analysis

In order to better determine an appropriate value of time and toll rate to apply, an alternative method was utilized. Specifically, as represented in the standard toll equation above, a toll can be converted to equivalent minutes of travel time or delay. As a result, the ratio of the toll charge to the value of time becomes the determining factor rather than toll or VOT alone. (Note: Toll time equivalent is calculated by dividing the toll rate by the VOT. For instance, a driver with a Value of Time of $30 can save 30 minutes using the tolled link. This driver would be willing to pay up to $15 for a toll since driver perceives 30 minutes as worth $15. In this case, the Toll Equivalent would be $15 toll divided by $30/hour VOT equaling a 30 minute toll time equivalent.

Another basic assumption was that regardless of the VOT or the specific time period being assessed, it is likely that the toll facility will be operated in order to maximize toll revenues. This is particularly true during the summer months with the highest potential toll demand as well as the highest potential delays on the alternate or free route due to higher volumes and congestion.

Based on these two factors, a series of sensitivity analyses was conducted. By testing multiple toll rates, the total revenue per day was estimated and graphed based on three values of time ($20, $28, and $36 per hour) and multiple toll rates. The daily traffic volumes as well as the total revenue were graphed along with the resulting time equivalent for each toll rate. Graphs were developed for a series of three values of time using both summer weekday and summer weekend trip tables as shown in Figure 4 and in additional detail in Section C6 of Appendix C.

A comparison of the curves indicated that peak revenue occurred at a toll time equivalent of approximately 35 minutes for both Summer Weekday and Summer Weekend. Based on this observation, a toll time equivalent of 30 minutes was used for the forecast. By assuming the toll to be charged is slightly below the maximum revenue, this assumption yields a forecast that reaches 90% of toll revenue maximization and, as an operational matter, would encourage increased use of the toll bridge. Note that this is consistent with practice on other toll facilities also since it is difficult to estimate in real time the actual maximum revenue point so there is a push to approach, but not exceed a toll rate where traffic volumes and revenue drop off.

Note that the actual toll time equivalent was slightly different for the Summer Weekday and Summer Weekend periods. This was expected based on the different trip patterns and tourist/resident mix during these periods. Nevertheless, the 30 minute toll time equivalent was applicable to both.

It should also be recognized that this methodology was developed in order to reflect the average diversion resulting from tolls on a daily basis. A more detailed analysis of hourly flows would likely yield different toll time equivalents for different time of day since the levels of delay on the network varies depending upon congestion levels which in turn depend on varying traffic demand throughout the day.

Figure 4. Revenue Maximization Sensitivity Analysis for Toll Diversion

5. Base Year 2015 Build Bridge Forecast

5.1 Assumptions

A formal Base Year Build Bridge (BY B) forecast with balanced daily turn movements was not produced for this project. This level of detail was not requested because capacity analysis was not required for the intersections in this hypothetical scenario. As part of the Purpose and Need Analysis, however, a link based forecast was developed for this scenario.

To produce the link level forecast for this scenario, the TransCAD tool was utilized by applying the 2015 Existing Base Year trip tables and assigning it to the future 2040 Build Bridge network. A link level forecast was developed for 17 links on US 158 and NC 12 in the study area. The assignment was tested in two steps – first by estimating the traffic volumes and related diversion to the new bridge based on no tolls. A secondary analysis was then completed assuming tolls on the bridge using a 30 minute toll time equivalent (as discussed in Section 4.5).

If needed, the 2015 Base Year Build Bridge link based forecast can be used to interpolate interim values assuming straight line interpolation between the 2015 Base Year Build Bridge and 2040 Future Year Build Bridge scenarios.

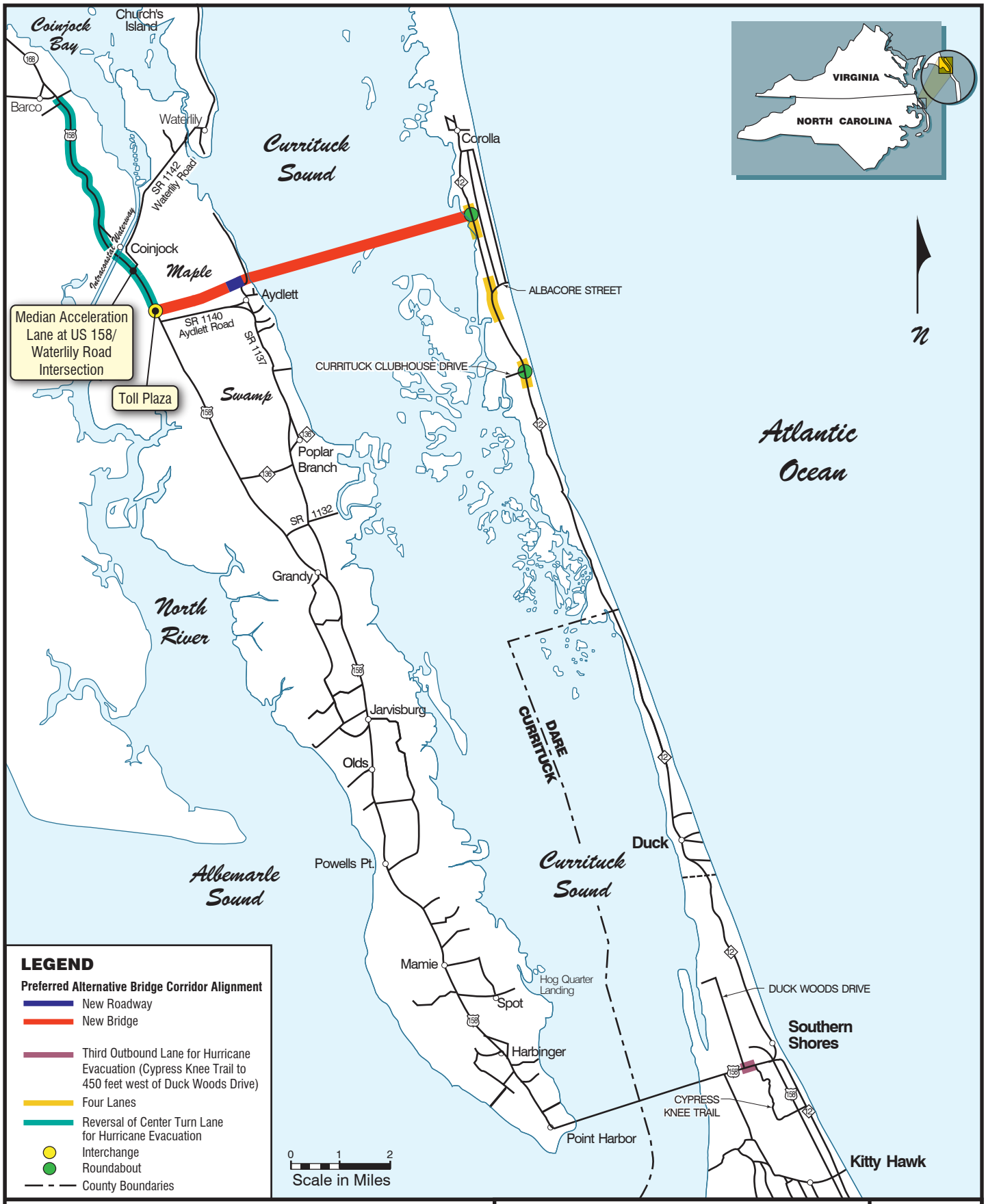
5.2 MCB-4 Alternative

The Build Bridge scenario for this project is assumed to reflect the Preferred Alternative identified in the previously completed FEIS analysis as shown in Figure 5. The Preferred Alternative assumes a Mid-Currituck Bridge with improvements on NC 12 in Currituck County as well as an interchange at the US 158/ NC 12 connection on the west side of the proposed bridge.

In the past forecasts there were two Build Bridge scenario forecasts – with and without widening on NC 12 in Dare County. This was investigated at that time because widening of NC 12 in Dare County reduced congestion and delays on NC 12 affecting the assignment as to whether drivers were willing to pay a toll and use the new bridge. The widening of NC 12 was studied in previous alternatives study and was not pursued because of extensive impacts to existing development and strong public sentiment against any widening on NC 12 in Dare County. Therefore, this forecast considers only the Preferred Alternative.

The Preferred Alternative is based upon the MCB4 alternative examined in previous design iterations. Key features of the Build Bridge MCB4 alternative include:

- Constructing a two-lane toll bridge across the Currituck Sound
- Widening NC 12 to four lanes for 2.1 miles concentrated at three locations: the bridge terminus, the commercial area surrounding Albacore Street, and Currituck Clubhouse Drive plus left turn lanes at two additional intersections
- An interchange at the connection of US 158 to the Mid-Currituck Bridge



FEIS Preferred Alternative

Figure 5

- Hurricane evacuation improvements including:
    - On the mainland, reversing the center turn lane on US 158 between the US 158/Mid-Currituck Bridge interchange and NC 168.
    - On the Outer Banks, adding approximately 1,600 feet of new third outbound lane to the west of the NC 12/US 158 intersection to provide additional road capacity during a hurricane evacuation.

The same development scenarios are assumed for all alternatives (2040 No Build, Widen Existing Roads (ER2), and Build Bridge (MCB4). Consideration of the potential for the capacity of NC 12 with the No-Build Alternative and the widen existing roads alternative to affect travel to and from NC 12 and in turn constrain development will be addressed in a reevaluation of the indirect and cumulative effects assessment.

5.3 Methodology

The 2015 Base Year Build Bridge forecast was developed utilizing the TransCAD tool. The 2015 Base Year network was expanded to include a new bridge across the Currituck Sound. The 2015 Base Year trip matrix table developed for the 2015 Base Year No Build was then assigned to the Build Bridge network. The TransCAD model was used for the assignment of this trip matrix to the network. Trip pairs that could make a faster trip using the new bridge were assigned by the TransCAD tool to the route with the fastest travel time between origin and destination.

As a second step, tolls were imposed on the bridge based upon a detailed review of value of time and the toll rates as discussed in Section 4.5. Utilizing a 30 minute toll time equivalent of delay to maximize revenue, the same 2015 trip table was reassigned to the network with tolls. The link level toll assignment for the 2015 Base Year Build Bridge scenario was conducted after the development of the Future Year Build Bridge forecast.

As part of this reassignment and computation of toll diversion, a screenline of vehicles crossing either the Wright Memorial Bridge and/or the proposed Mid-Currituck Bridge was evaluated. The screenline comparison is summarized in Table 9. The link based forecast for the 2015 Build Bridge scenario is shown in Figure 6 and in Table C7 of Appendix C. This table shows the link based daily traffic for both the Summer Weekday and Summer Weekend volumes. In addition, AADT, Non-Summer Weekday, and Non-Summer Weekend volumes are shown based upon the conversion factors noted in Table 4 in Section 3.2.3. The table also includes the 2015 Existing forecast without the bridge. In addition, the No Toll scenario is illustrated for information purposes although it is not intended to represent an alternative for additional analysis.

Table 9Note that in the screenline comparison shown in Table 9, addition of the new bridge does not increase overall crossings of the Currituck Sound based on this review.

Table 9. 2015 TransCAD Screenline Analysis

Summer Weekday			
SCREENLINE	**2015 Existing**	**2015 Build Bridge (no tolls)**	**2015 Build Bridge (with tolls)**
Wright Memorial Bridge	23,600	17,480	20,368
Mid-Currituck Bridge	No Build	6,120	3,232
TOTAL	**23,600**	**23,600**	**23,600**
Summer Weekend			
SCREENLINE	**2015 Existing**	**2015 Build Bridge (no tolls)**	**2015 Build Bridge (with tolls)**
Wright Memorial Bridge	47,400	32,300	37,200
Mid-Currituck Bridge	No Build	15,100	10,200
TOTAL	**47,400**	**47,400**	**47,400**

5.4 Design Factors

Since a formal balanced turn movement forecast was not developed for this scenario, design factors were not developed for application to this scenario.

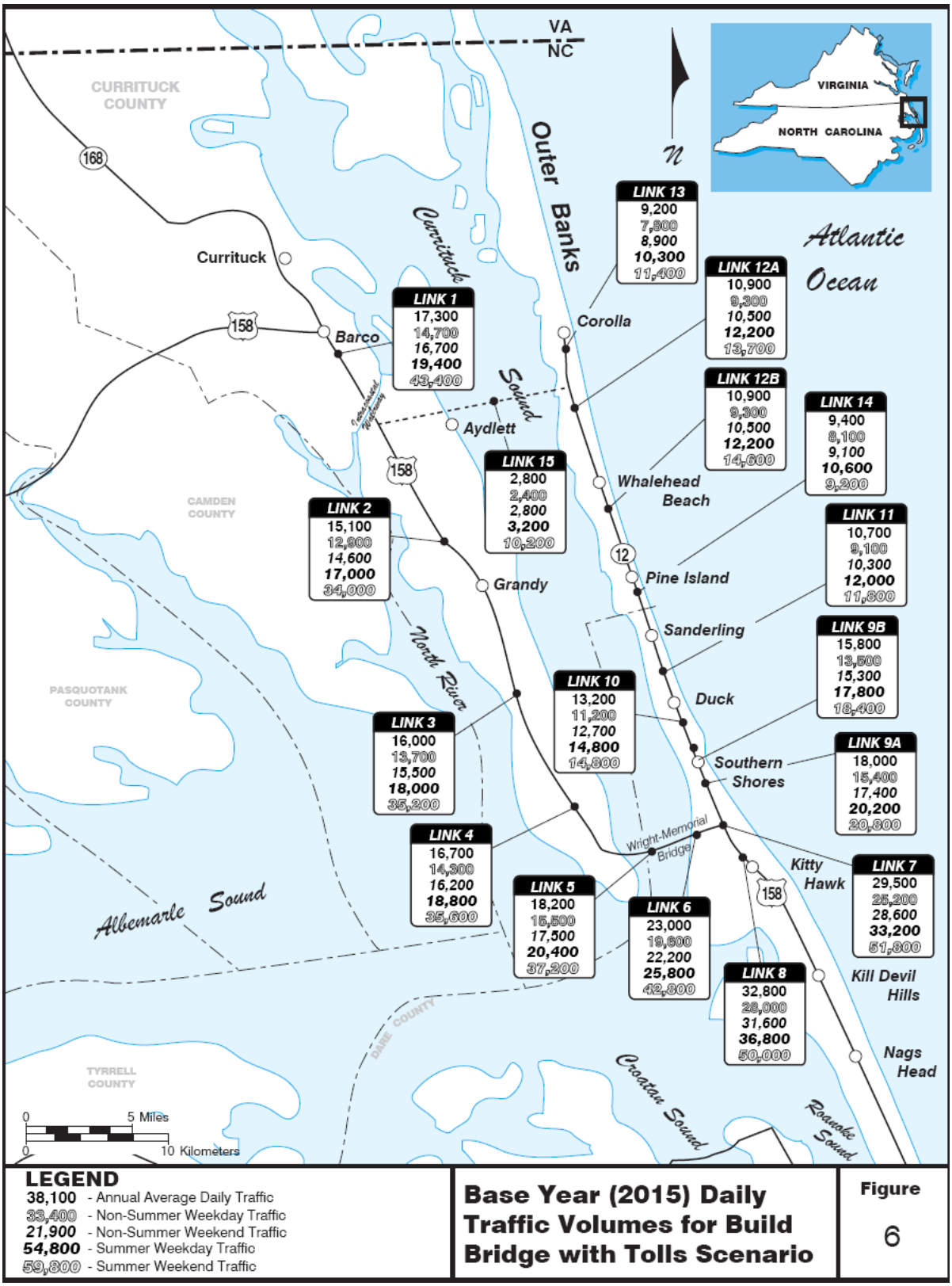


Figure 6. Base Year (2015) Build Bridge with Tolls Scenario Daily Traffic Volumes

6. Future Year No-Build/Widen Existing Roads (ER2) Forecast

Future Year 2040 No-Build (FY NB) forecasts were developed for both summer weekday and summer weekend conditions. The No Build scenario includes no additional roadway links or new alignment as part of the network. Since the network connections are the same, it is assumed that the No Build forecast will be the same as scenarios with widening of existing roads. This assumption is valid because the forecast is based upon future trip tables that assume full buildout of land use to meet local plans. Without any alternate routes, vehicles would still make their planned trips despite increased congestion assuming the same levels of development.

Use of the No-Build for widening existing road scenarios does assume:

- The proposed future laneage in a Widen Existing Roads scenario would affect network congestion benefits to be applied in the reevaluation of the Purpose and Need. Therefore, as part of the network congestion analysis, No-Build and Widen Existing Road scenarios will need to be evaluated separately taking into account the capacity of each link.
- While the Widen Existing Roads forecast could apply to multiple variations of widening schemes, for purposes of the Purpose and Need analysis, it is to be assumed that ER2 is the scenario that will need to be tested. For this reason, the No Build / Widen Existing Roads scenario will be referred to as No Build / ER2 scenario for this forecast effort.

As stated, a No Build/ ER2 forecast will be the same as scenarios with widening of existing sections of US 158 and NC 12. For this reason, the No Build forecast is referred to in this report as the No Build/ ER2 forecast. Two forecast formats are prepared. The detailed forecasts provide balanced daily turn movement at intersections within the project study area. The second forecast format provides a weighted average link based forecast and was developed for evaluation of the Purpose and Need network congestion analysis. The link based forecast examines 16 links on US 158 and NC 12 and was developed from the detailed forecasts. AADT, non-summer weekday and non-summer weekend forecasts were then developed for the 16 links based on factors derived from Wright Memorial Bridge ATR. Both the detailed and the link based forecasts are included in Appendix A. The link forecasts are also shown in Table C7 of Appendix C.

6.1 Assumptions

It was assumed that there will be no new links or new alignment roadways in the highway link network for the study area. Therefore, the future year 2040 highway link network is modeled the same as the Existing 2015 highway network. Travel demand (daily OD trip matrix) was assumed to increase proportional to the anticipated growth in the study area and unconstrained by highway capacity as discussed in Section 4.3.

6.2 ER2 Alternative

The "ER" in ER2 stands for "Existing Roads." A Mid-Currituck Bridge is not included in this alternative, but only widening of existing sections of US 158 and NC 12. ER2 was developed to achieve maximum transportation benefits using the existing roadways, while minimizing impacts to communities along those roads. The basic features of ER2 are:

- Widening US 158 to a six -lane super-street between the Wright Memorial Bridge and the NC 12 intersection with US 158.
- Constructing an interchange at the current intersection of US 158, NC 12, and the Aycock Brown Welcome Center entrance.
- Widening NC 12 to three lanes (two travel lanes and a center lane for left turns) between US 158 and a point just north of Hunt Club Drive in Currituck County (except for the existing three-lane section in Duck, which will be unchanged) and to four lanes with a median from just north of Hunt Club Drive to Albacore Street.
- Hurricane evacuation improvements on US 158 between NC 168 and the Wright Memorial Bridge

6.3 Fiscal Constraint

The latest STIP available at the time of this study, released March 2016, has two projects identified in the study area. Both projects have funding identified for right-of-way included in the latest March 2016 STIP. Both projects meet NCDOT's threshold of having either ROW or construction funding identified in the current STIP. Therefore, both projects are assumed to be part of the fiscally constrained network for this forecast.

- R-3419: US 158 widening from the Wright Memorial Bridge past the NC 12 intersection to the south ($13.0 million in ROW funding in FY 2025)
- R-4457: Improvements at the US 158/NC 12 intersection ($4.6 million in ROW funding in FY 2024)

This stated, it is critical to note that this identification is very recent and specific improvements have not been identified. In addition, the R-3419 project extends on US 158 from the Wright Memorial Bridge south to US 64, a distance of approximately 16 miles including 1.6 miles in the project study area. Also note that the *Dare County Comprehensive Transportation Plan* currently calls for R-3419 improvements to improve the existing 5-lane US 158 to a 4-lane boulevard (as opposed to an additional lane as identified in the STIP).

For the US 158 at NC 12 intersection (R-4457), the 2016 STIP specifically calls for intersection improvements. The wording has been changed from descriptions in the 2015 STIP that called for a grade separated interchange. Multiple concepts could be applied to improve the intersection ranging from synchronized street improvements to relocating the visitor center

access (creating a tee intersection) to a conventional widening along US 158 and/or NC 12 on the intersection approaches. Note that the *Dare County Comprehensive Transportation Plan* does identify the need for capacity improvements for this intersection. Also note that the TransCAD tool being used for trip assignment utilizes link based capacity in the assignment process. Delay reductions related to intersection improvements are, therefore, not explicitly calculated in the assignment process.

Note that the difference in the traffic forecast with a 4 lane versus 6 lane section on US 158 is only 100 vph. This shift computes to a 0.4 percent decrease at the Mid-Currituck Bridge and a 0.4 percent increase at the Wright Memorial Bridge. Based on this test, it was assumed that the Build Bridge forecast is applicable whether or not the NC 12 improvements in the STIP are in place by 2040.

Nevertheless, the primary impact of these improvements will be related to network congestion benefits to be applied in the reevaluation of the Purpose and Need. Recognizing the uncertainties with these two future projects, consideration to conducting a sensitivity analysis may be beneficial to examine congestion benefits if these STIP projects are not in place by 2040.

6.4 Development Activity

For future year 2040, a growth rate was identified for each zone. The assumptions in developing the future trip table are described in Section 4.2.2. The specific growth rates are also identified in Table C4 of Appendix C. As described in Section 4.2.2, specific growth trends were examined in detail as described in the Technical Memorandum reviewing previous traffic forecasts and the need for new traffic forecasts included in Appendix D.

In all cases, it was assumed that the future growth rates were based upon planned development in the study area. In general, the growth will remain similar to what is currently in place with the exception of new hotels identified for the southern section of NC 12 in Currituck County. No other major development activity is anticipated in the study area.

6.5 Methodology

The future year No Build/ ER2 forecasts for summer weekday and summer weekend are based on link volume growth and trip allocation from TransCAD tool developed for this study. For the endpoints on the study area - NC 168 and US 158 near Barco (north), US 158 and NC 12 in Kitty Hawk (south), NC 12 in Corolla (north) - and Wright Memorial Bridge the volumes are directly from TransCAD tool. For zones which are near buildout and where low to moderate growth is expected, the low to moderate increase in side street traffic is generally based on growth rate for the zone. For zones N1 and N2, where high growth is anticipated, trips were allocated to side streets based on unbuilt parcel and available land from aerial imagery.

The mainline and turn movement volumes were then checked for balancing and adjusted as necessary for the balanced daily forecast show in Appendix A.

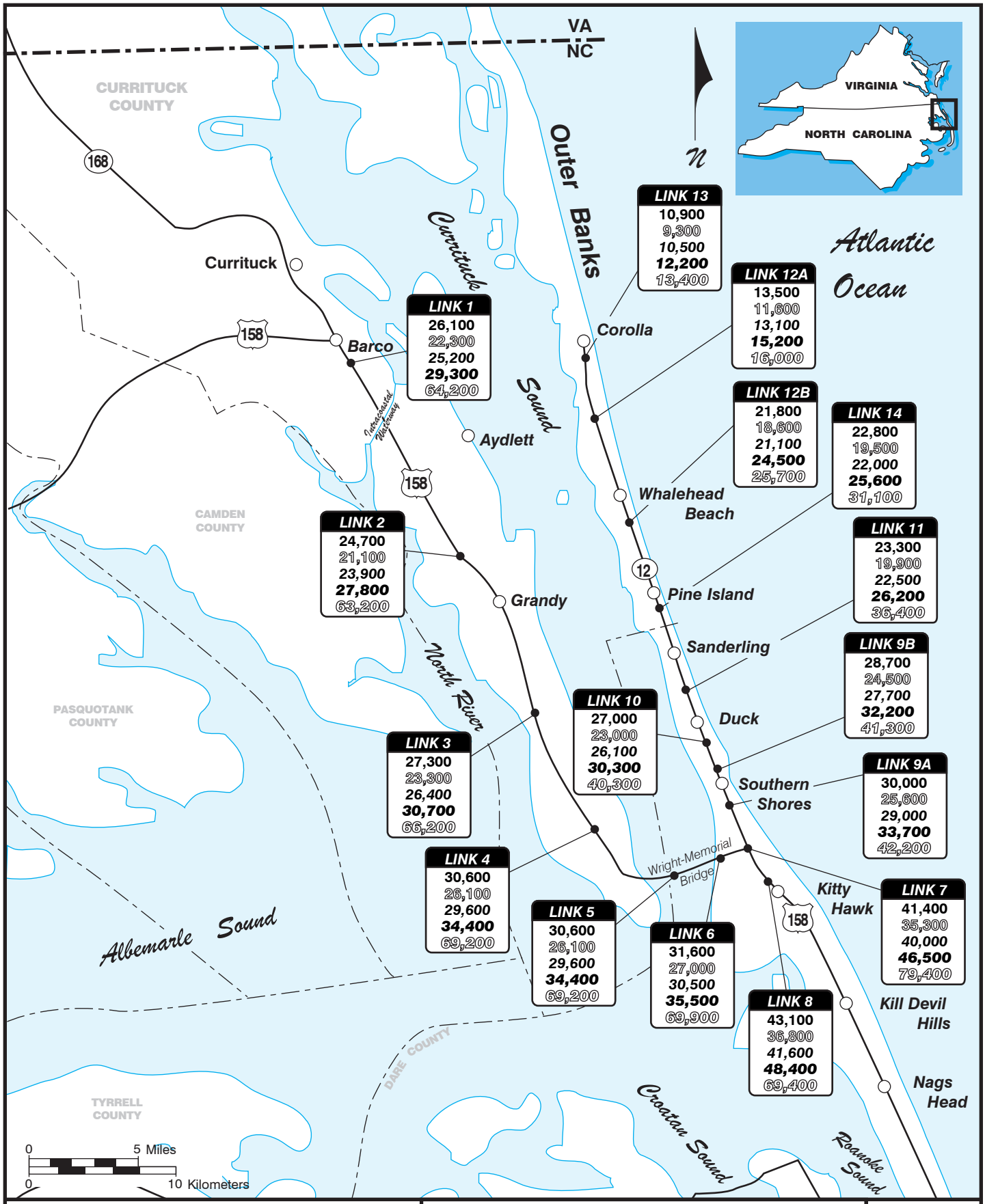
Once the balanced traffic forecasts were finalized, a weighted average of the detailed forecast was combined to estimate link volumes for the Purpose and Need analysis. The 2040 No Build/ ER2 link volumes and growth rate used in development of the forecast is provided in Table C8 of Appendix C. A summary of the 2040 No Build/ ER2 scenario is also illustrated in Figure 7.

6.6 Design Factors

For the summer weekday, all design factors are similar to the base year Existing forecast.

For the summer weekend, except for K, design factors are similar to the base year Existing forecast. The K factor for US 158 and NC 12 is lower than the base year existing (No Build) to account for traffic spreading due to severe congestion. Note that peak summer weekend already experiences high levels of congestion and increased demand in 2040 will extend congested periods to cover longer portions of the day. This is particularly critical on NC 12 in Dare County if the Mid-Currituck Bridge is not built.

Design factors for future year No Build/ ER2 are provided in Table C1 of Appendix C for both summer weekday and summer weekend.



LEGEND

38,100 - Annual Average Daily Traffic
33,400 - Non-Summer Weekday Traffic
21,900 - Non-Summer Weekend Traffic
54,800 - Summer Weekday Traffic
59,800 - Summer Weekend Traffic

Future Year (2040)
No Build / ER2
Daily Traffic Volumes
without a Mid-Currituck Bridge

Figure

7

7. Future Year Build Bridge Forecast

The future year Build Bridge (FY B) scenario assumes that a tolled Mid-Currituck Bridge has been provided with some additional improvements on the NC 12 and US 158 approaches to the project. Future year 2040 Build Bridge forecasts with balanced daily traffic volumes were developed for both summer weekday and summer weekend conditions.

A weighted average forecast for 16 links on US 158 and NC 12 plus one link representing Mid-Currituck Bridge was developed from the detailed forecasts. AADT, non-summer weekday and non-summer weekend forecasts were then developed for the 16 plus 1 links based on factors derived from the Wright Memorial Bridge ATR. These link forecasts are shown in Appendix A and in Table C7 of Appendix C.

7.1 Assumptions

7.1.1 Highway Network

The only change in the highway network between FY NB and FY B is a tolled Mid-Currituck bridge. Mid-Currituck Bridge was modeled as a 2-lane undivided facility with 55 mph posted speed limit. A toll travel time equivalent of 30 minutes was utilized as described in Section 4.5. Table C6 in Appendix C provides additional details regarding toll methodology.

7.1.2 Land Use

It is assumed that total land use and land use patterns remain the same in the No Build/ ER2 and Build Bridge scenario. The level of growth on the NC 12 of the Outer Banks is assumed to match the long term plan which assumes buildout of existing lots along NC 12. Therefore, the same trip matrix was applied for the future No Build/ ER2 and Build Bridge scenarios. The Summer Weekday and Summer Weekend trip matrices were tested separately using the TransCAD model.

Potential impacts of congestion on whether the planned development levels can be attained for the parcels along NC 12 will be addressed as part of an updated ICI analysis.

7.2 Alternatives

As identified in Section 5.2 and illustrated in the Build Bridge scenario, this project is assumed to reflect the Preferred Alternative identified in the previously completed FEIS analysis. The Preferred Alternative assumes that the MCB4 alternative is provided with improvements on NC 12 in Currituck County as well as an interchange at the US 158/ NC 12 connection on the west side of the proposed bridge.

In the past forecasts there were two Build Bridge scenario forecasts – with and without widening on NC 12 in Dare County. This was investigated because widening of NC 12 in Dare County reduced congestion and delays on NC 12 affecting the assignment as to whether drivers

were willing to pay toll and use new bridge. The widening of NC 12 was studied in previous alternatives study and was not pursued because of extensive impacts to existing development and strong public sentiment against any widening on NC 12 in Dare County. Therefore, this forecast considers only the Preferred Alternative (originally referred to as MCB4).

7.3 Methodology

The future year Build Bridge forecasts for summer weekday and summer weekend are based on zonal trip volume and trip allocation from TransCAD tool developed for this study. The trip matrix used for the 2040 No Build/ ER2 was assigned using the TransCAD tool with the 2040 Build Bridge network including the proposed Mid-Currituck County Bridge.

A two-step process was applied in developing the Build Bridge forecasts. The trip matrix was assigned first using a no toll scenario and then revised using a toll scenario. As explained in Section 4.5, a toll time equivalent of 30 minutes was applied to both the Summer Weekday and Summer Weekend TransCAD scenarios to estimate future daily traffic volumes with the toll in place.

7.3.1 Screenline Review

As part of this reassignment and computation of toll diversion, a screenline of vehicles crossing either the Wright Memorial Bridge and/or the proposed Mid-Currituck Bridge was evaluated. The screenline comparison is summarized in Table 10. The addition of the new bridge does not increase overall crossings of the Currituck Sound based on this review.

Table 10. 2040 TransCAD Screenline Analysis

Summer Weekday			
SCREENLINE	**2040 No Build/ ER2**	**2040 Build Bridge (no tolls)**	**2040 Build Bridge (with tolls)**
WMB	34,400	22,920	25,940
MCB	-	11,920	8,460
TOTAL	**34,400**	**34,840**	**34,400**
Summer Weekend			
SCREENLINE	**2040 No Build/ ER2**	**2040 Build Bridge (no tolls)**	**2040 Build Bridge (with tolls)**
WMB	69,200	45,900	51,400
MCB	-	23,700	18,000
TOTAL	**69,200**	**69,600**	**69,400**

7.3.2 Toll Diversion Review

An additional step in the review of the forecast was a review of the toll diversion as it compared with previous forecasts. While it is anticipated that there will be differences with previous forecasts due to updated data as well as different methodologies and assumptions, a check was done to make sure there were not major differences related to toll diversion as shown in Table 11. As indicated, the toll diversion anticipated as part of this 2040 NEPA traffic forecast are similar to the two previous forecasts and actually fall between the two extremes of the previous forecasts.

Table 11. Comparison of Toll Diversion with Previous Forecasts

Summer Period	A. 2035 NEPA Traffic Forecast Using Daily Sketch Planning Method 2035 Volumes			B. Traffic & Revenue Study Using 24 Hour Weighted Peak Period Model (Table 26 from Arup & CDG) 2030 Volumes			C. TransCAD Assignment Using Estimate of Maximum Revenue Analysis 2040 Volumes		
	No Toll (vpd)	With Toll (vpd)	Percent Diversion	No Toll (vpd)	With Toll (vpd)	Percent Diversion	No Toll (vpd)	With Toll (vpd)	Percent Diversion
Future Weekday	23,700	14,500	39%	12,307	9,361	24%	11,900	8,500	29%
Future Weekend	35,000	22,500	35%	31,354	24,176	23%	23,700	17,900	24%

Note: This review was done as the forecast was being prepared. As a result, the volumes for the current 2040 forecast reflect the rounded assignment results from the TransCAD tool and not refinements that occurred in developing the final balanced forecast.

7.3.3 Preparation of Build Bridge Forecast

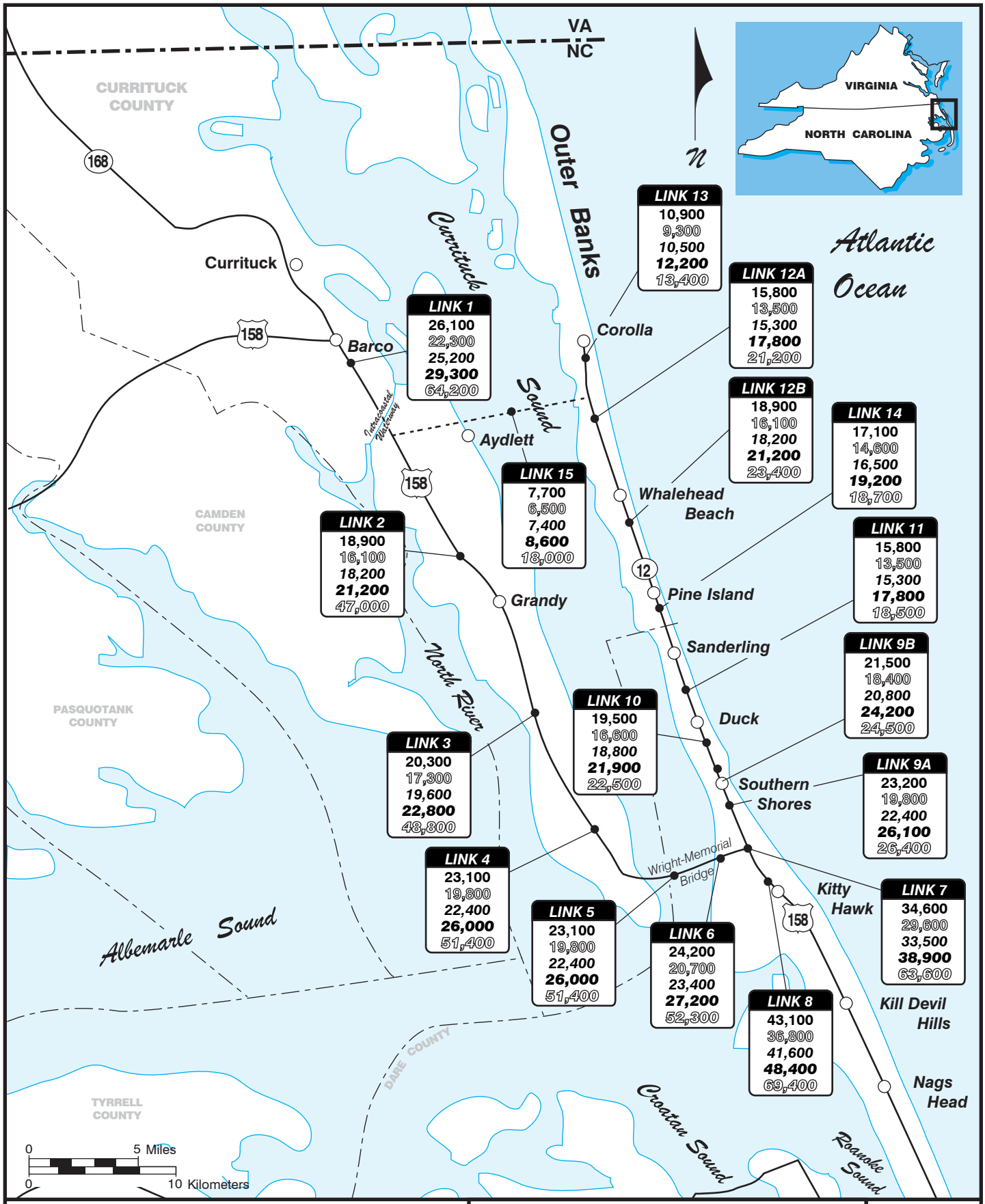
The mainline and turn movement volumes were then checked for balancing and adjusted as necessary for the balanced daily forecast show in Appendix A.

Once the balanced traffic forecasts were finalized, a weighted average of the detailed forecast was combined to estimate link volumes for the Purpose and Need analysis. The 2040 Build Bridge link volumes and growth rate used in development of the forecast is provided in Table C8 of Appendix C. A summary of the 2040 Build Bridge scenario link forecast is also illustrated in Figure 8. The tables identify Summer Weekday and Summer Weekend forecasts plus AADT, Non-Summer Weekday, and Non-Summer Weekend volumes factored from the Summer Weekday link level forecast.

7.4 Design Factors

For both summer weekday and summer weekend, all design factors are similar to base year Existing forecast. Unlike the 2040 No Build, the provision of the proposed bridge provides an alternate route for splitting traffic volumes and reducing congestion on both US 158 and NC 12. As a direct result, there is reduced need for peak period spreading as compared with the No Build scenario (which included reduced peak hour percentages (the K factor) due to peak period spreading.

Design factors for future year No Build are provided in Table C1 of Appendix C for both summer weekday and summer weekend.



LEGEND

38,100 - Annual Average Daily Traffic
33,400 - Non-Summer Weekday Traffic
21,900 - Non-Summer Weekend Traffic
54,800 - Summer Weekday Traffic
59,800 - Summer Weekend Traffic

Future Year (2040) Daily Traffic Volumes for Build Bridge with Tolls Scenario

Figure

8

8. Issues for Consideration in the Indirect & Cumulative Effects Analysis related to the Forecast

As described in this report, multiple assumptions were made as part of the development of this forecast. Many of these assumptions dealt with land use growth and consideration of buildout restrictions on the Outer Banks along NC 12. All 2040 forecasts (No Build, Widen Existing Roads ER2, and Build Bridge MCB-4) assume full buildout on the NC 12-accessible Outer Banks consistent with local regional plans and expectations.

It is recognized that not building the Mid-Currituck Bridge could place a constraint on the construction of planned and expected development because of congestion on NC 12 and portions of US 158. These scenarios are not examined in this forecast. Instead they will be examined in a separate indirect and cumulative effects (ICE) reevaluation. This was previously done for the 2012 FEIS utilizing the 2035 traffic forecast prepared in 2006.

8.1 Potential Impact Causing Factors Related to the Forecast

The indirect and cumulative effects analysis documented in the 2012 FEIS examined five additional factors that could potentially affect traffic volumes and travel patterns on the thoroughfare network in the project area. These factors and the conclusions reached related to forecasting were:

1. What is the potential for an increase in permanent residents on the Outer Banks? It was concluded there would be a negligible or slight increase in permanent residents on the Outer Banks with a Mid-Currituck Bridge.

2. What is the potential for an increase in the number of day trips to the Outer Banks? Where would an increased number of day trips potentially occur? What would be the nature of those trips? It was concluded that with a Mid-Currituck Bridge there was some potential for an increase in the number of day trips over the No-Build Alternative with the potential higher in the non-NC 12-accessible area.

3. Would development in the paved NC 12-accessible Outer Banks change in terms of future development location, rate, or type? It was concluded that there would be no reasonably foreseeable change in the overall type and density of development with implementation of the detailed study alternatives, including the Mid-Currituck Bridge, compared to the No-Build Alternative. Negligible or no increase in the demand for houses and businesses throughout the Outer Banks resort area would be foreseeable over the No-Build Alternative. Furthermore, the communities are expecting and currently planning for forecast future levels of development.

4. Would development within the non-paved-road accessible area north of the terminus of NC 12 on the Currituck County Outer Banks change in terms of future development location, rate, or type? It was concluded that for the non-paved road-accessible Outer Banks (sometimes referred to as Carova or non-NC12-accessible), there would be no reasonably

foreseeable change in the location, rate, or type of development with implementation of the detailed study alternatives, including a Mid-Currituck Bridge, compared to the No-Build Alternative.

5. Would development on mainland Currituck County change in terms of future development location, rate, or type? It was concluded that it is reasonably foreseeable that the introduction of a Mid-Currituck Bridge would alter the location of some future Outer Banks service-oriented businesses. Some business development that might otherwise have been scattered in planned commercial areas on the Outer Banks and mainland near the Wright Memorial Bridge would concentrate at locations on the mainland near the terminus of the Mid-Currituck Bridge at US 158. This change would represent a net gain in business development in a concentrated location on the Currituck County mainland.

The conclusions of scenarios 2 and 5 were that the improvements to the project area thoroughfare network would result in some potential for an increase in day trips and that commercial development at the NC 12 interchange with a Mid-Currituck Bridge was likely. For scenarios 1, 3, and 4, the effect of improvements was found to be negligible or slight. The addition of day trips with a Mid-Currituck Bridge would increase traffic on the Mid-Currituck Bridge and NC 12. Commercial development at the US 158 interchange would increase traffic on the Mid-Currituck Bridge and change travel patterns on NC 12 and US 158 near the interchange.

The impact on such changes in trip and travel patterns would be positive in terms of potentially increasing toll revenue on the Mid-Currituck Bridge. When such changes result in an increase in trips on NC 12 and a Mid-Currituck Bridge, as well as new turning movements on US 158 in the vicinity of the US 158 interchange, the potential exists for creating or adding to congestion. This potential impact will be addressed in the new level-of-service analysis that will be conducted based on the traffic forecasts in this report.

8.2 Potential Impact Causing Effects Related to the Forecast

The following section clarifies some of the assumptions and findings related to these five impact causing activities and how the updated forecast could potentially affect these activities as compared with the previous traffic forecast effort. This overview is for informational purposes and will need to be examined in a separate indirect and cumulative effects (ICE) reevaluation using the updated 2040 forecast.

- Land Use Growth Rates: The key difference between the 2040 and 2035 forecasts is that land use growth rates have been reduced since the previous forecast, and, as a result, the forecasted traffic demand is lower for the new 2040 traffic forecast than the older 2035 traffic forecast. This reduction in demand is reflected in the traffic forecast including an examination of diversion between the Wright Memorial Bridge and the Mid-Currituck Bridge related to travel time as well as tolling. (See Section 1.3)

- Travel Time Savings: From a forecasting perspective, a reduction in 2040 travel demand compared to the 2035 forecast should result in reduced travel times on the network for most trips. The travel time savings for vehicles using the new bridge will likely be lower than identified in the 2035 analysis since delays will be reduced and travel speeds increased on US 158 and NC 12. (See Section 4.4)

- Toll Assumptions: Tolling on the proposed Mid-Currituck Bridge was assumed for both the 2035 and 2040 traffic forecasts. The toll diversion analysis assumed that toll rates would be generally set to optimize the total revenue collected on the new bridge. If toll rates were to be reduced to a lower level or eliminated, there could be an increased use of the proposed Mid-Currituck Bridge and fewer vehicles using the Wright Memorial Bridge. Under a No Toll or reduced toll scenario, the Access Alteration Effects would be different than under the assumed toll scenario in the 2040 forecast. (See Section 4.5)

- Development Policies: Changes in development policies could change anticipated development levels assumed in the forecast. The current land use is based on the assumption that all previously approved parcels along NC 12 will be developed by 2040. Since no land remains available that has not already been identified for development, reductions in allowed development are very unlikely. Similarly, it is assumed that changes in policy that could allow for increased development density of new or rebuilt lots are unlikely. (See Section 4.3)

Appendices

Appendix A - Traffic Forecasts

Appendix B - Data Collection Tables

Appendix C - Forecast Documentation Tables

Appendix D - Technical Memorandum: Need for Updated Traffic Forecast

Appendix A - Forecasts

A1. Summer Weekday - Base Year (2015) No Build A-2

A2. Summer Weekday - Future Year (2040) No Build / ER2 A-4

A3. Summer Weekday - Future Year (2040) Build Bridge with Tolls A-6

A4. Summer Weekend - Base Year (2015 Existing) No Build A-8

A5. Summer Weekend - Future Year (2040) No Build / ER2 A-10

A6. Summer Weekend - Future Year (2040) Build Bridge with Tolls A-12

A7. Link Forecast Table A-14

A8. Link Forecasts - Base Year (2015) No Build A-16

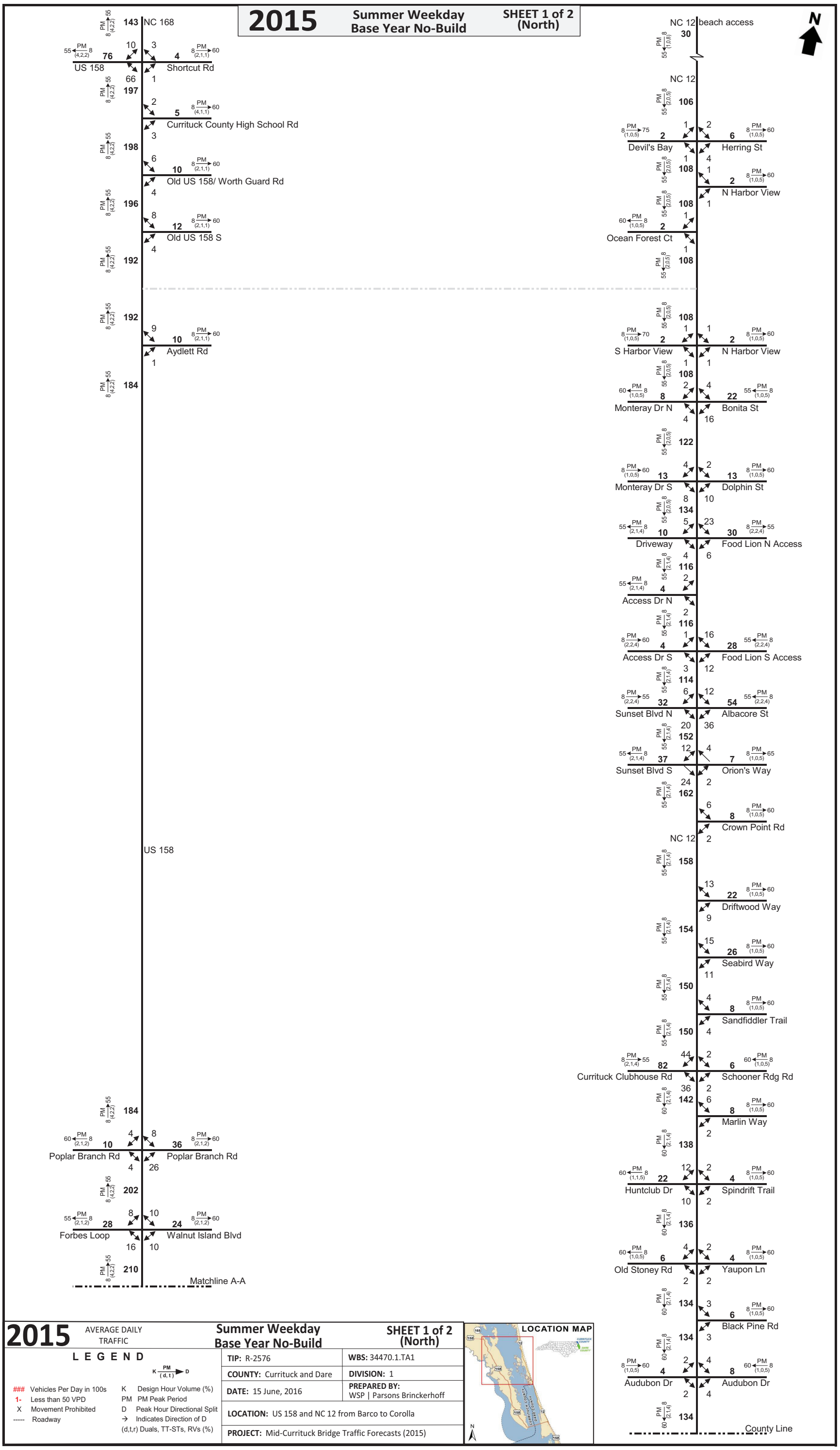
A9. Link Forecasts - Base Year (2015) Build Bridge w Tolls A-17

A10. Link Forecasts - Future Year (2040) No Build / ER2 A-18

A11. Link Forecasts - Future Year (2040) Build Bridge w Tolls A-19

2015 Summer Weekday Base Year No-Build

SHEET 1 of 2 (North)



2015 AVERAGE DAILY TRAFFIC

Summer Weekday Base Year No-Build

SHEET 1 of 2 (North)

LEGEND

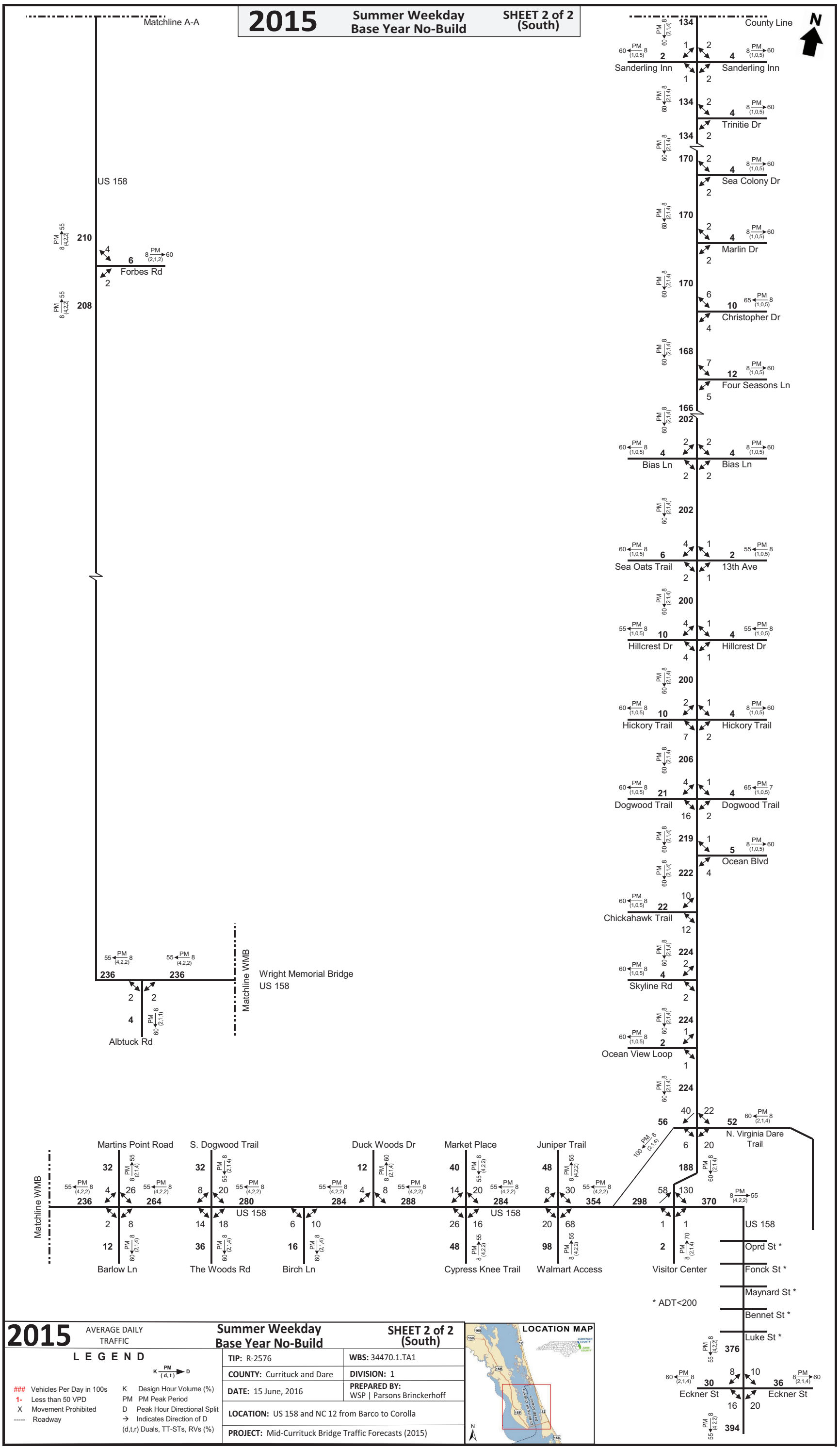
K PM (d, t) D

Vehicles Per Day in 100s
1- Less than 50 VPD
X Movement Prohibited
----- Roadway

K Design Hour Volume (%)
PM PM Peak Period
D Peak Hour Directional Split
→ Indicates Direction of D
(d,t,r) Duals, TT-STs, RVs (%)

TIP: R-2576	**WBS:** 34470.1.TA1
COUNTY: Currituck and Dare	**DIVISION:** 1
DATE: 15 June, 2016	**PREPARED BY:** WSP | Parsons Brinckerhoff
LOCATION: US 158 and NC 12 from Barco to Corolla	
PROJECT: Mid-Currituck Bridge Traffic Forecasts (2015)	

LOCATION MAP


2015
Summer Weekday
Base Year No-Build
SHEET 2 of 2
(South)
Matchline A-A
County Line
N
US 158
Forbes Rd
Sanderling Inn
Trinitie Dr
Sea Colony Dr
Marlin Dr
Christopher Dr
Four Seasons Ln
Bias Ln
Sea Oats Trail
13th Ave
Hillcrest Dr
Hickory Trail
Dogwood Trail
Ocean Blvd
Chickahawk Trail
Skyline Rd
Ocean View Loop
N. Virginia Dare Trail
Albtuck Rd
Wright Memorial Bridge
US 158
Matchline WMB
Martins Point Road
S. Dogwood Trail
Duck Woods Dr
Market Place
Juniper Trail
Barlow Ln
The Woods Rd
Birch Ln
Cypress Knee Trail
Walmart Access
Visitor Center
Oprd St *
Fonck St *
Maynard St *
Bennet St *
Luke St *
Eckner St
* ADT<200
2015
AVERAGE DAILY TRAFFIC
Summer Weekday
Base Year No-Build
SHEET 2 of 2
(South)
LEGEND
Vehicles Per Day in 100s
1- Less than 50 VPD
X Movement Prohibited
----- Roadway
K Design Hour Volume (%)
PM PM Peak Period
D Peak Hour Directional Split
→ Indicates Direction of D
(d,t,r) Duals, TT-STs, RVs (%)
TIP: R-2576
WBS: 34470.1.TA1
COUNTY: Currituck and Dare
DIVISION: 1
DATE: 15 June, 2016
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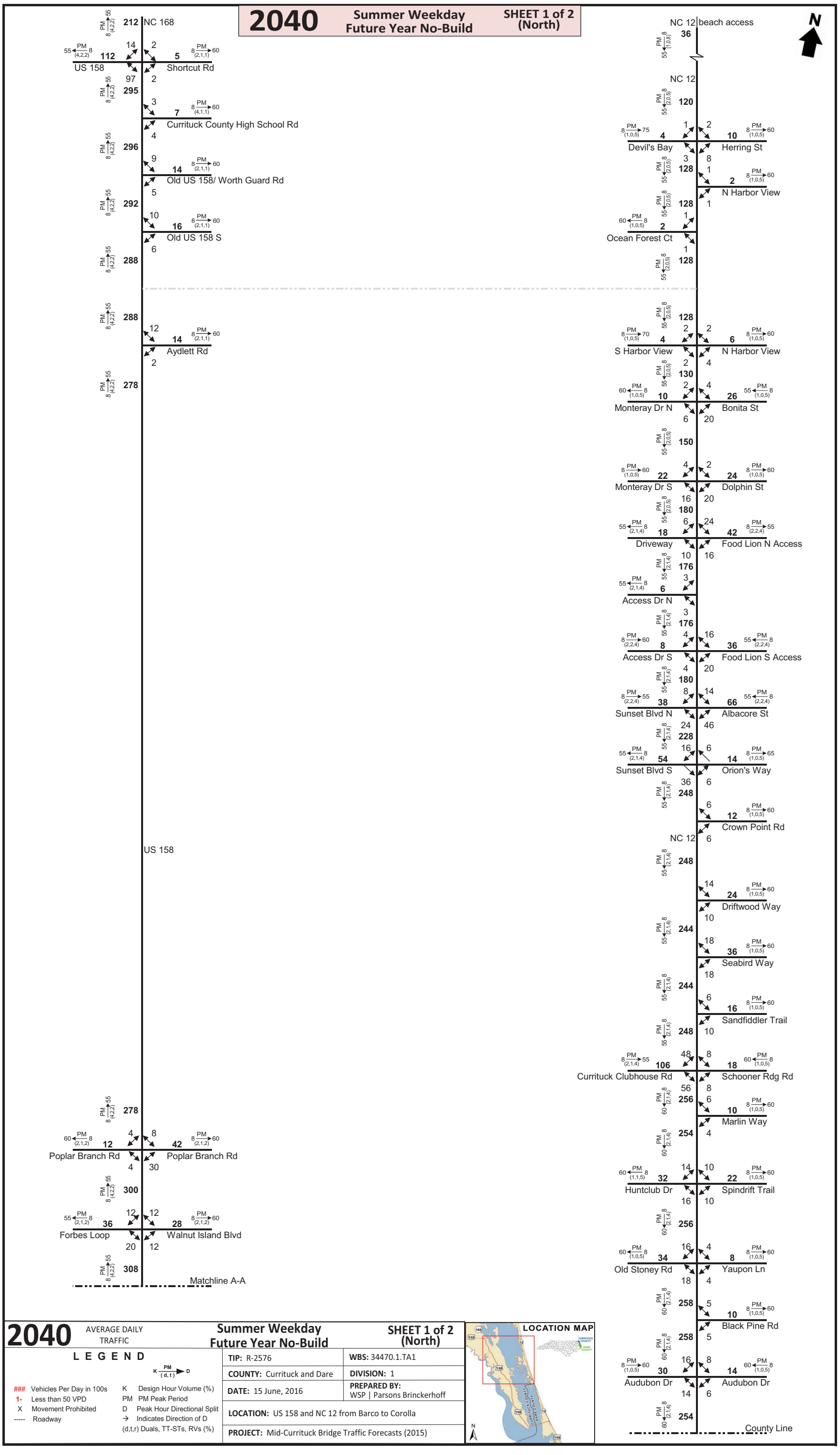
LOCATION: US 158 and NC 12 from Barco to Corolla
PROJECT: Mid-Currituck Bridge Traffic Forecasts (2015)
LOCATION MAP

2040 Summer Weekday Future Year No-Build

SHEET 1 of 2 (North)



2040 AVERAGE DAILY TRAFFIC

Summer Weekday Future Year No-Build

SHEET 1 of 2 (North)

LEGEND

K PM (d,t) D

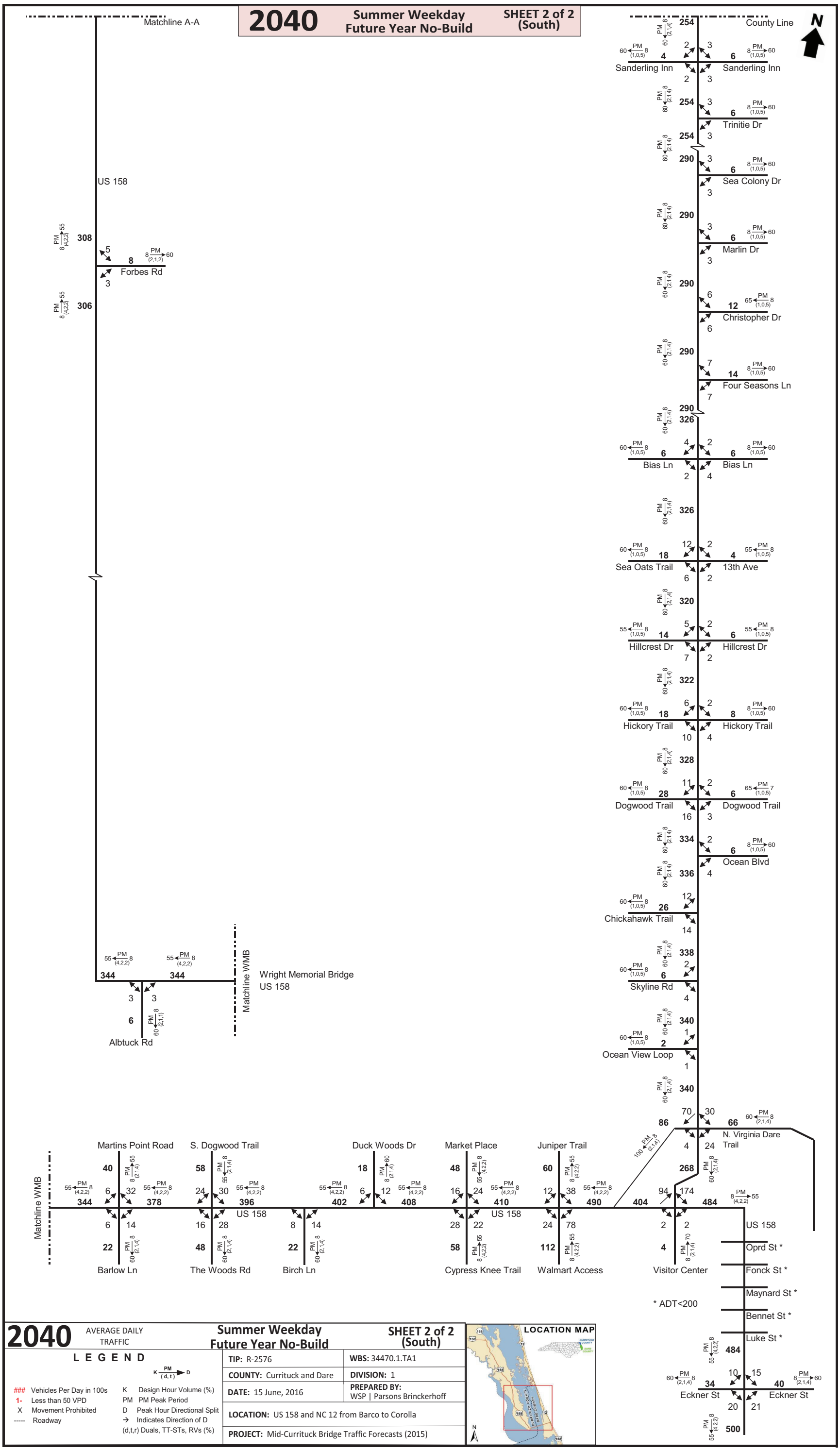
###	Vehicles Per Day in 100s
1-	Less than 50 VPD
X	Movement Prohibited
-----	Roadway
K	Design Hour Volume (%)
PM	PM Peak Period
D	Peak Hour Directional Split
→	Indicates Direction of D
(d,t,r)	Duals, TT-STs, RVs (%)

TIP: R-2576	**WBS:** 34470.1.TA1
COUNTY: Currituck and Dare	**DIVISION:** 1
DATE: 15 June, 2016	**PREPARED BY:** WSP | Parsons Brinckerhoff
LOCATION: US 158 and NC 12 from Barco to Corolla	
PROJECT: Mid-Currituck Bridge Traffic Forecasts (2015)	

LOCATION MAP

2040 Summer Weekday Future Year No-Build

SHEET 2 of 2 (South)



2040 AVERAGE DAILY TRAFFIC

Summer Weekday Future Year No-Build

SHEET 2 of 2 (South)

LEGEND

K PM (d, t) D

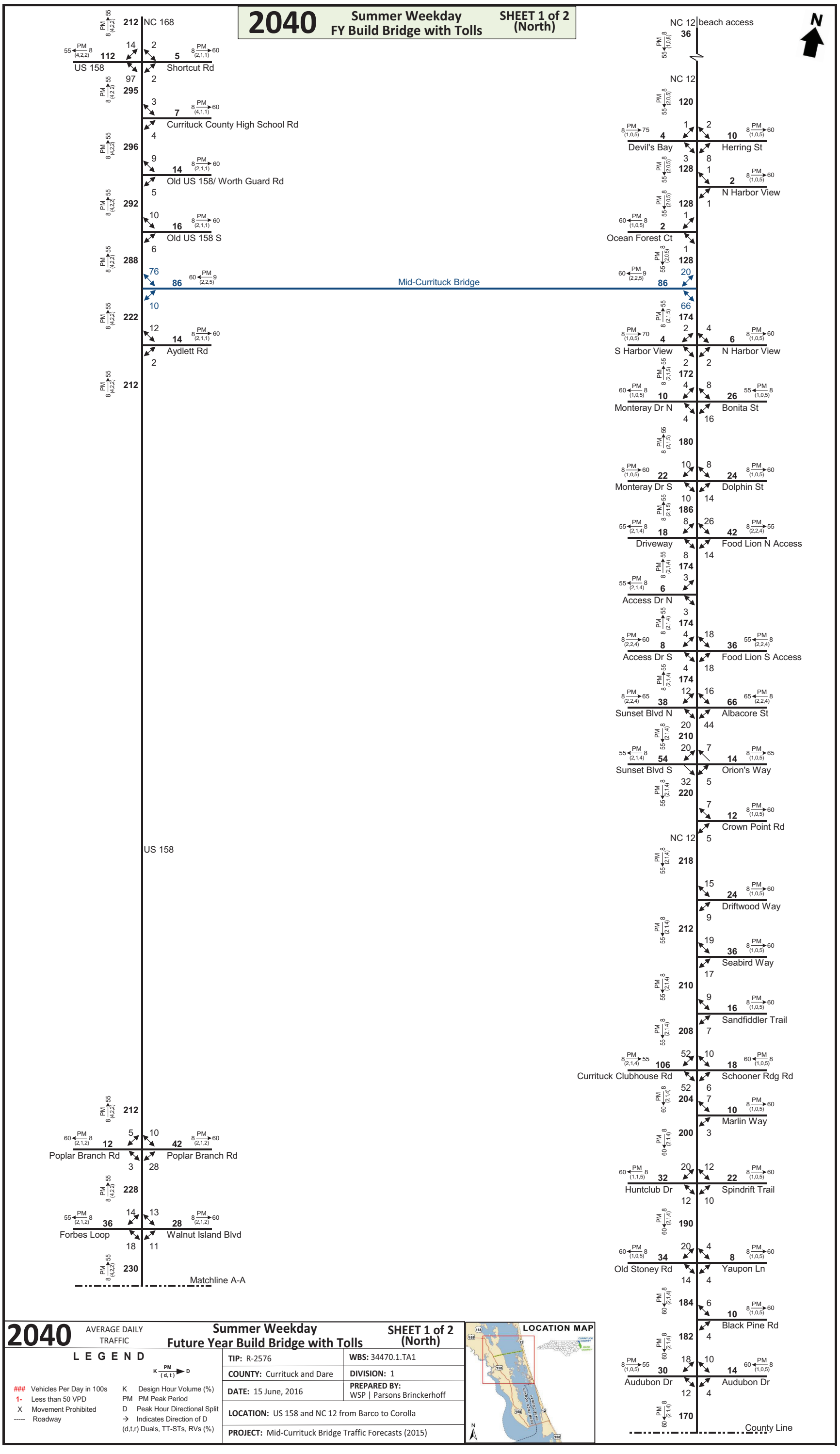
###	Vehicles Per Day in 100s	K	Design Hour Volume (%)
1-	Less than 50 VPD	PM	PM Peak Period
X	Movement Prohibited	D	Peak Hour Directional Split
-----	Roadway	→	Indicates Direction of D
			(d,t,r) Duals, TT-STs, RVs (%)

TIP: R-2576	**WBS:** 34470.1.TA1
COUNTY: Currituck and Dare	**DIVISION:** 1
DATE: 15 June, 2016	**PREPARED BY:** WSP | Parsons Brinckerhoff
LOCATION: US 158 and NC 12 from Barco to Corolla	
PROJECT: Mid-Currituck Bridge Traffic Forecasts (2015)	

LOCATION MAP

2040 Summer Weekday FY Build Bridge with Tolls

SHEET 1 of 2 (North)



2040 AVERAGE DAILY TRAFFIC

Summer Weekday Future Year Build Bridge with Tolls

SHEET 1 of 2 (North)

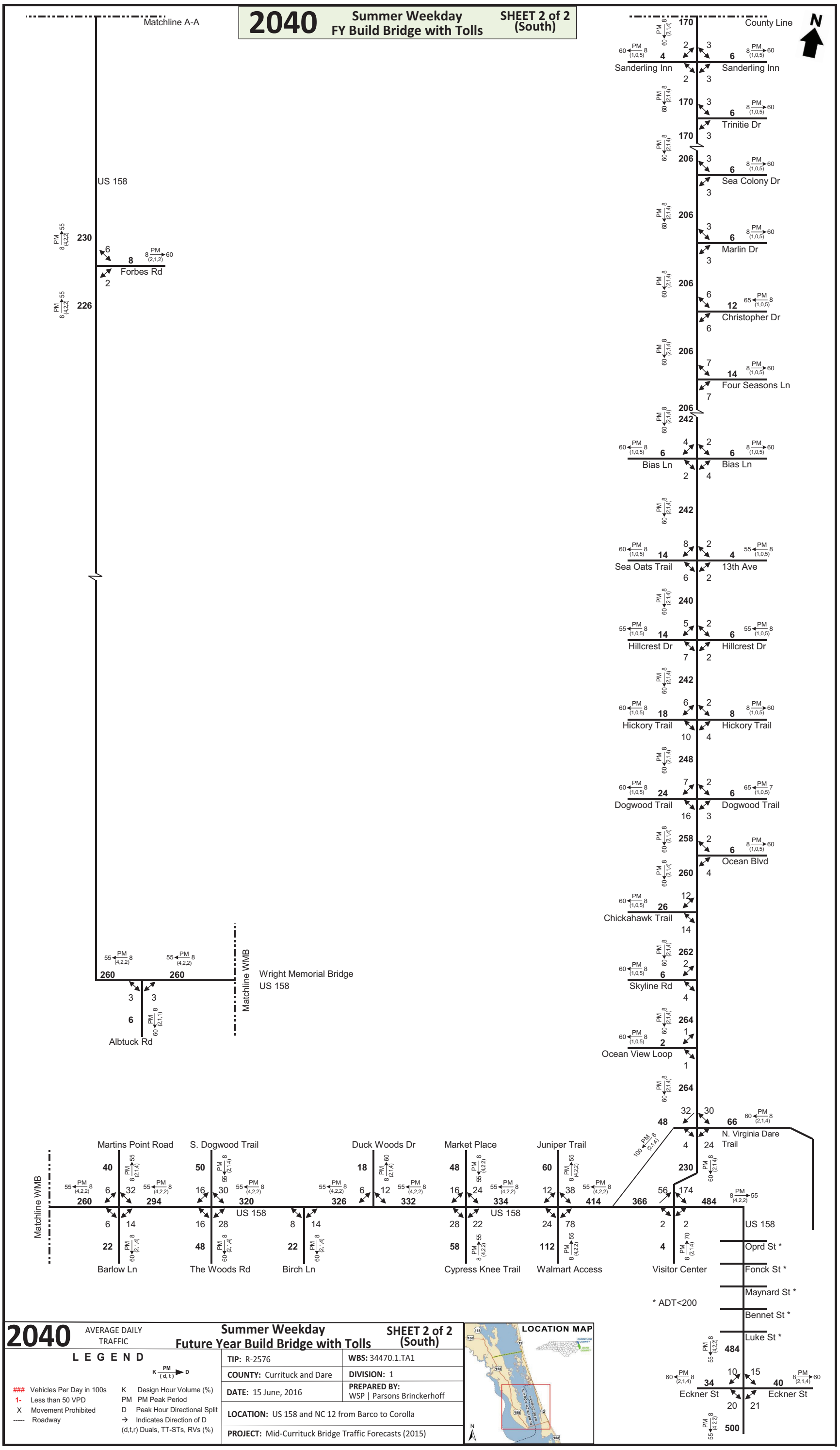
LEGEND

K PM (d,t) D

###	Vehicles Per Day in 100s
1-	Less than 50 VPD
X	Movement Prohibited
-----	Roadway
K	Design Hour Volume (%)
PM	PM Peak Period
D	Peak Hour Directional Split
→	Indicates Direction of D
(d,t,r)	Duals, TT-STs, RVs (%)

TIP: R-2576	**WBS:** 34470.1.TA1
COUNTY: Currituck and Dare	**DIVISION:** 1
DATE: 15 June, 2016	**PREPARED BY:** WSP | Parsons Brinckerhoff
LOCATION: US 158 and NC 12 from Barco to Corolla	
PROJECT: Mid-Currituck Bridge Traffic Forecasts (2015)	

LOCATION MAP


2040
Summer Weekday
FY Build Bridge with Tolls
SHEET 2 of 2
(South)
Matchline A-A
County Line
N
US 158
Forbes Rd
Sanderling Inn
Trinitie Dr
Sea Colony Dr
Marlin Dr
Christopher Dr
Four Seasons Ln
Bias Ln
Sea Oats Trail
13th Ave
Hillcrest Dr
Hickory Trail
Dogwood Trail
Ocean Blvd
Chickahawk Trail
Skyline Rd
Ocean View Loop
Albtuck Rd
Matchline WMB
Wright Memorial Bridge
US 158
N. Virginia Dare Trail
Martins Point Road
S. Dogwood Trail
Duck Woods Dr
Market Place
Juniper Trail
Barlow Ln
The Woods Rd
Birch Ln
Cypress Knee Trail
Walmart Access
Visitor Center
Oprd St *
Fonck St *
Maynard St *
Bennet St *
Luke St *
* ADT<200
Eckner St
2040
AVERAGE DAILY TRAFFIC
Summer Weekday
Future Year Build Bridge with Tolls
SHEET 2 of 2
(South)
LEGEND
Vehicles Per Day in 100s
1- Less than 50 VPD
X Movement Prohibited
----- Roadway
K Design Hour Volume (%)
PM PM Peak Period
D Peak Hour Directional Split
→ Indicates Direction of D
(d,t,r) Duals, TT-STs, RVs (%)
TIP: R-2576
WBS: 34470.1.TA1
COUNTY: Currituck and Dare
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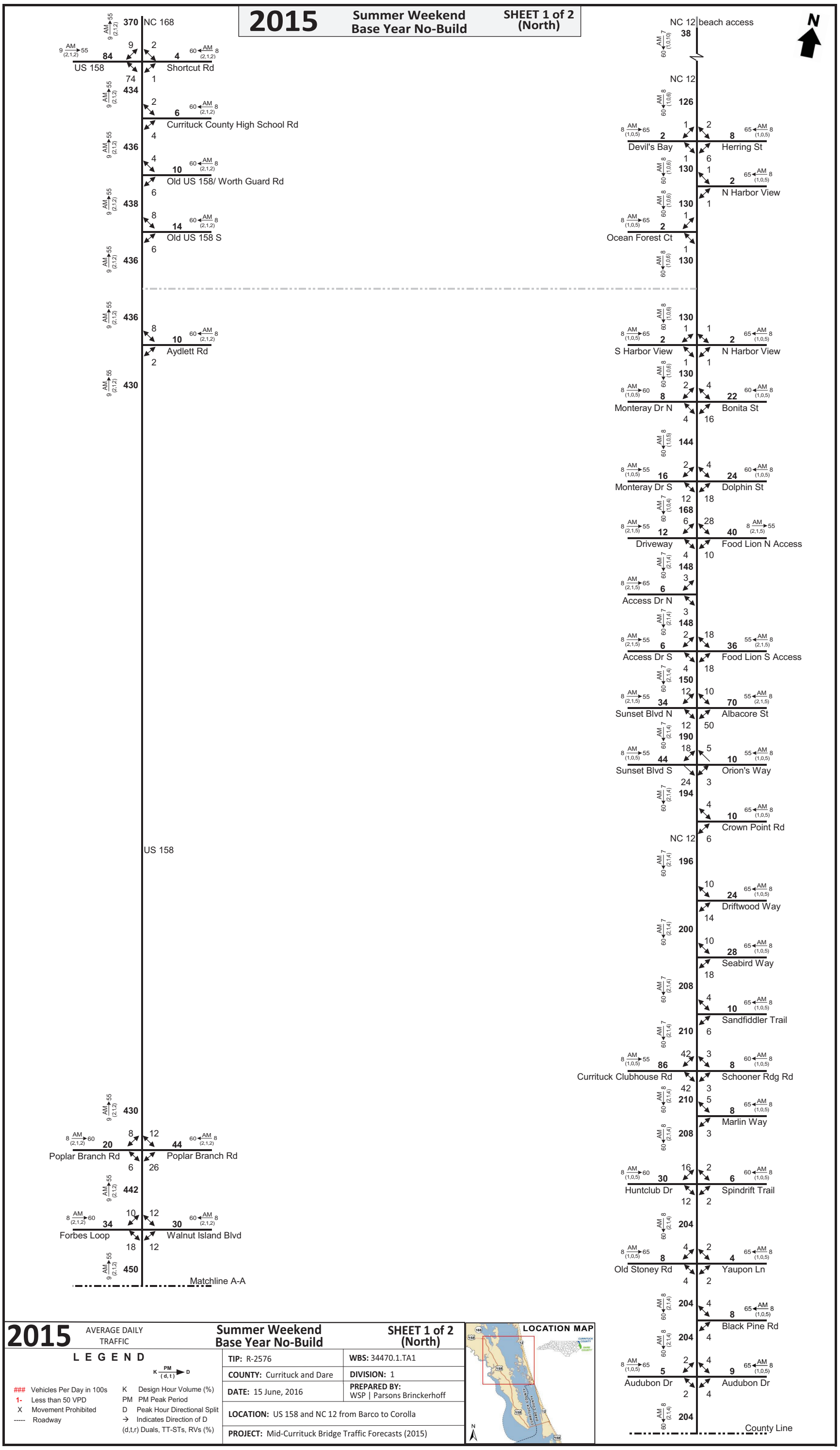
DATE: 15 June, 2016
PREPARED BY: WSP | Parsons Brinckerhoff
LOCATION: US 158 and NC 12 from Barco to Corolla
PROJECT: Mid-Currituck Bridge Traffic Forecasts (2015)
LOCATION MAP

2015 Summer Weekend Base Year No-Build

SHEET 1 of 2 (North)



2015 AVERAGE DAILY TRAFFIC

Summer Weekend Base Year No-Build

SHEET 1 of 2 (North)

LEGEND

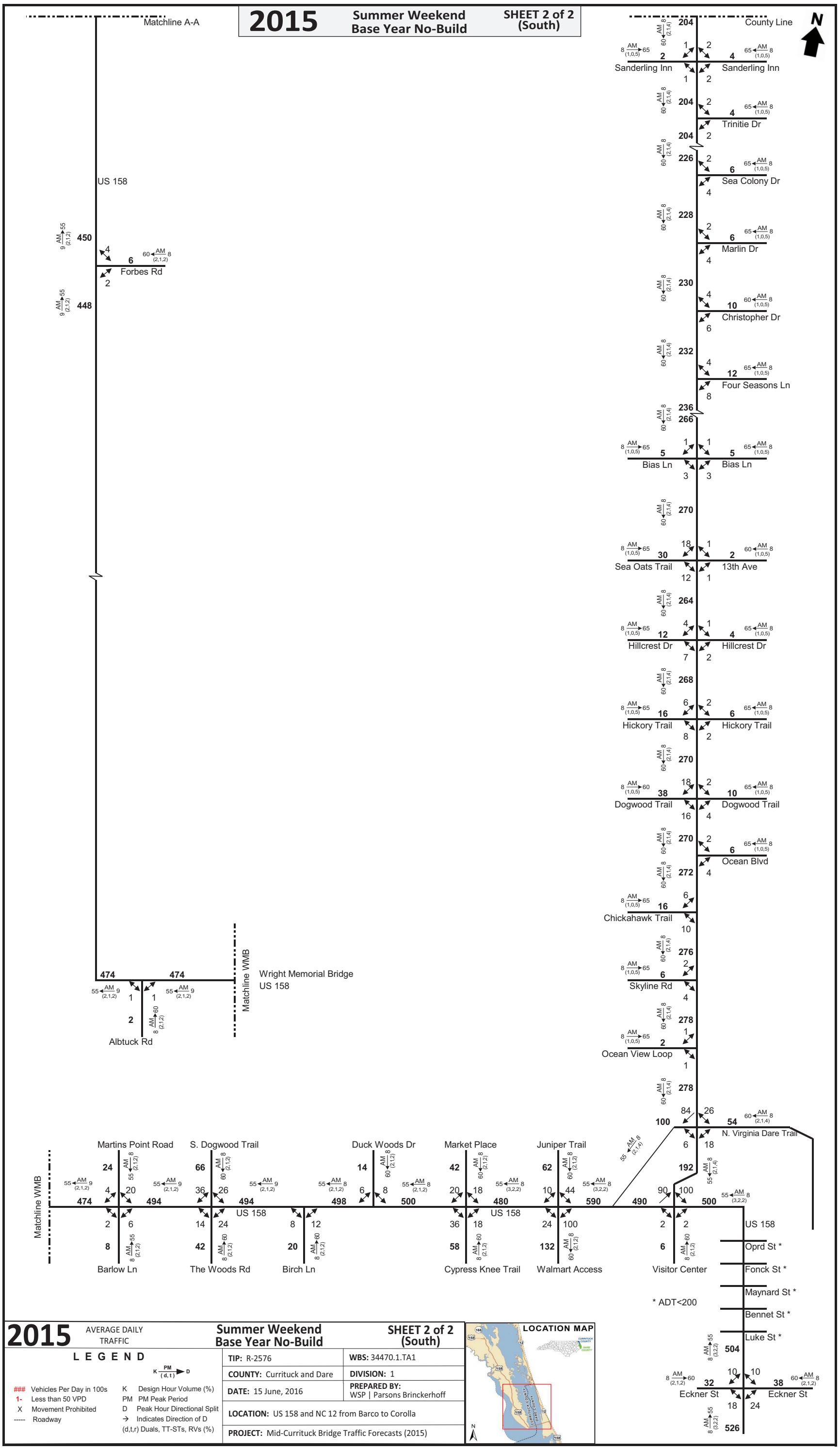
K (PM) (d, t) D

### Vehicles Per Day in 100s	K Design Hour Volume (%)
1- Less than 50 VPD	PM PM Peak Period
X Movement Prohibited	D Peak Hour Directional Split
----- Roadway	→ Indicates Direction of D
	(d,t,r) Duals, TT-STs, RVs (%)

TIP: R-2576	**WBS:** 34470.1.TA1
COUNTY: Currituck and Dare	**DIVISION:** 1
DATE: 15 June, 2016	**PREPARED BY:** WSP | Parsons Brinckerhoff
LOCATION: US 158 and NC 12 from Barco to Corolla	
PROJECT: Mid-Currituck Bridge Traffic Forecasts (2015)	

LOCATION MAP

2015 Summer Weekend Base Year No-Build SHEET 2 of 2 (South)



2015 AVERAGE DAILY TRAFFIC

Summer Weekend Base Year No-Build — **SHEET 2 of 2 (South)**

LEGEND

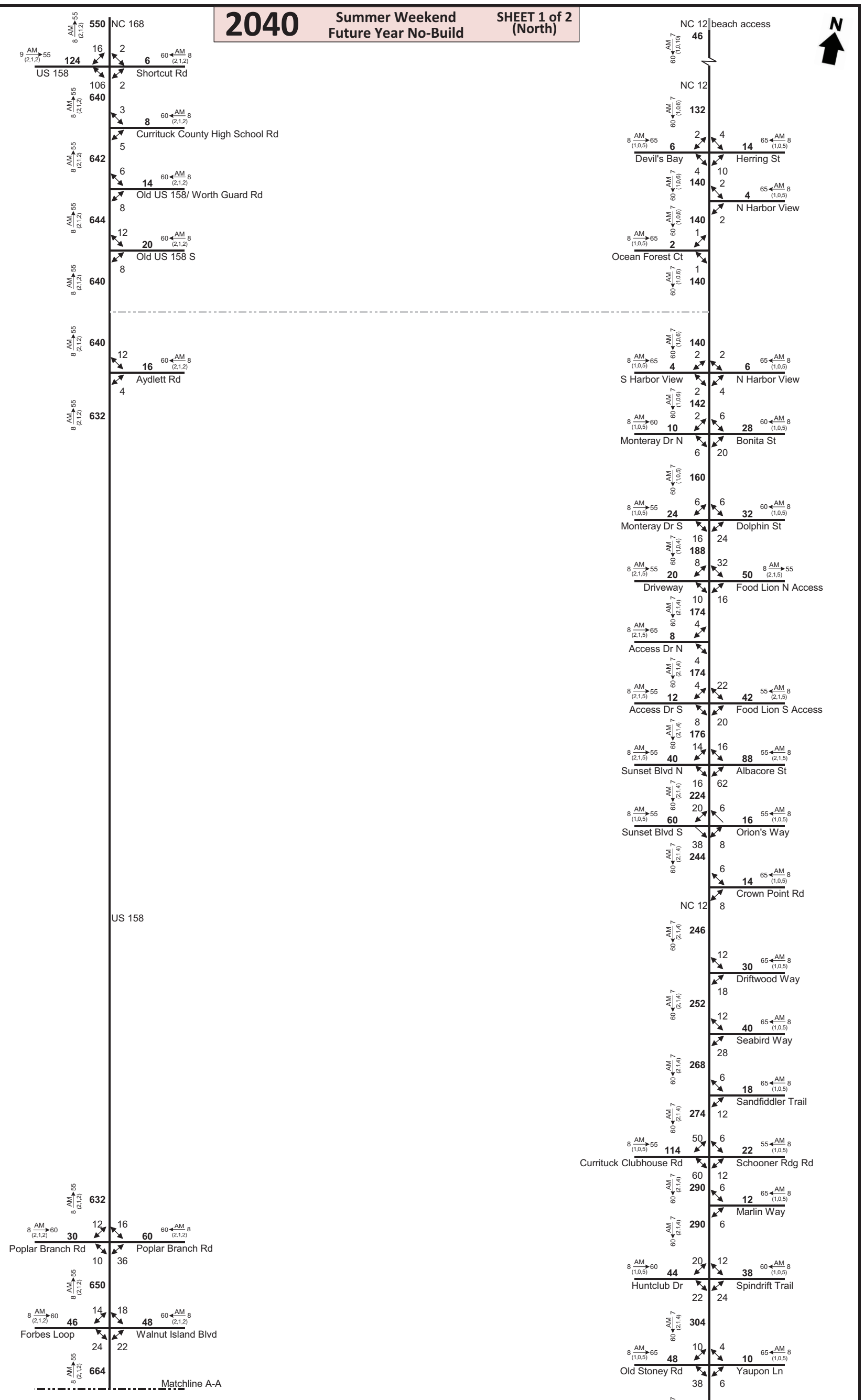
K PM (d, t) D

- ### Vehicles Per Day in 100s
- 1- Less than 50 VPD
- X Movement Prohibited
- ----- Roadway
- K Design Hour Volume (%)
- PM PM Peak Period
- D Peak Hour Directional Split
- → Indicates Direction of D
- (d,t,r) Duals, TT-STs, RVs (%)

TIP: R-2576	**WBS:** 34470.1.TA1
COUNTY: Currituck and Dare	**DIVISION:** 1
DATE: 15 June, 2016	**PREPARED BY:** WSP | Parsons Brinckerhoff
LOCATION: US 158 and NC 12 from Barco to Corolla	
PROJECT: Mid-Currituck Bridge Traffic Forecasts (2015)	

2040 Summer Weekend Future Year No-Build

SHEET 1 of 2 (North)



2040 AVERAGE DAILY TRAFFIC

Summer Weekend Future Year No-Build

SHEET 1 of 2 (North)

LEGEND

K (PM) (d, t) D

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PM	PM Peak Period
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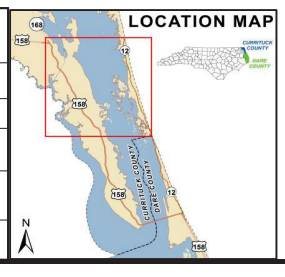
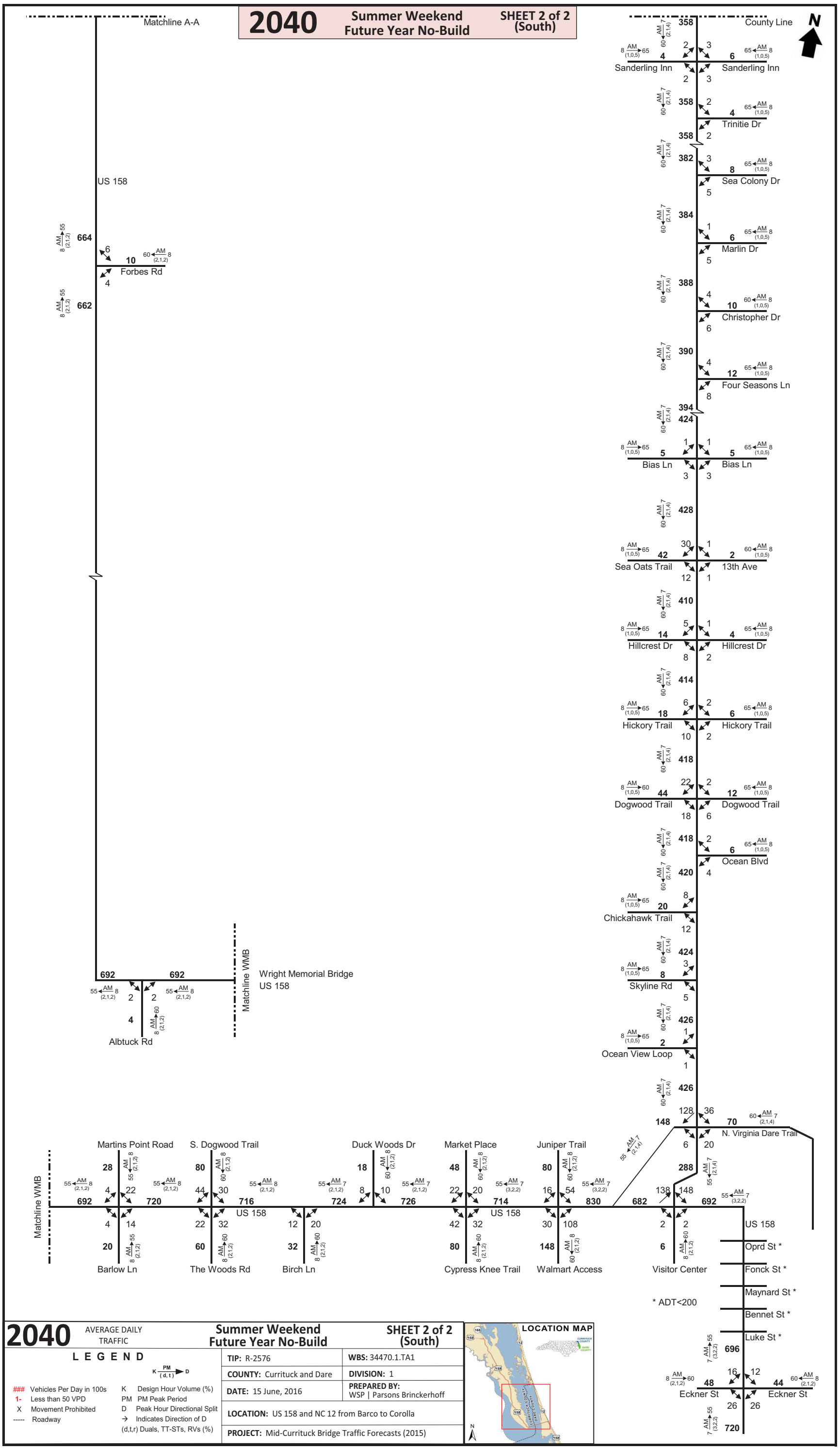
COUNTY: Currituck and Dare	**DIVISION:** 1
DATE: 15 June, 2016	**PREPARED BY:** WSP | Parsons Brinckerhoff
LOCATION: US 158 and NC 12 from Barco to Corolla	
PROJECT: Mid-Currituck Bridge Traffic Forecasts (2015)	

LOCATION MAP



2040 Summer Weekend Future Year No-Build

SHEET 2 of 2 (South)



2040 AVERAGE DAILY TRAFFIC

Summer Weekend Future Year No-Build

SHEET 2 of 2 (South)

LEGEND

K PM (d, t) D

###	Vehicles Per Day in 100s
1-	Less than 50 VPD
X	Movement Prohibited
-----	Roadway

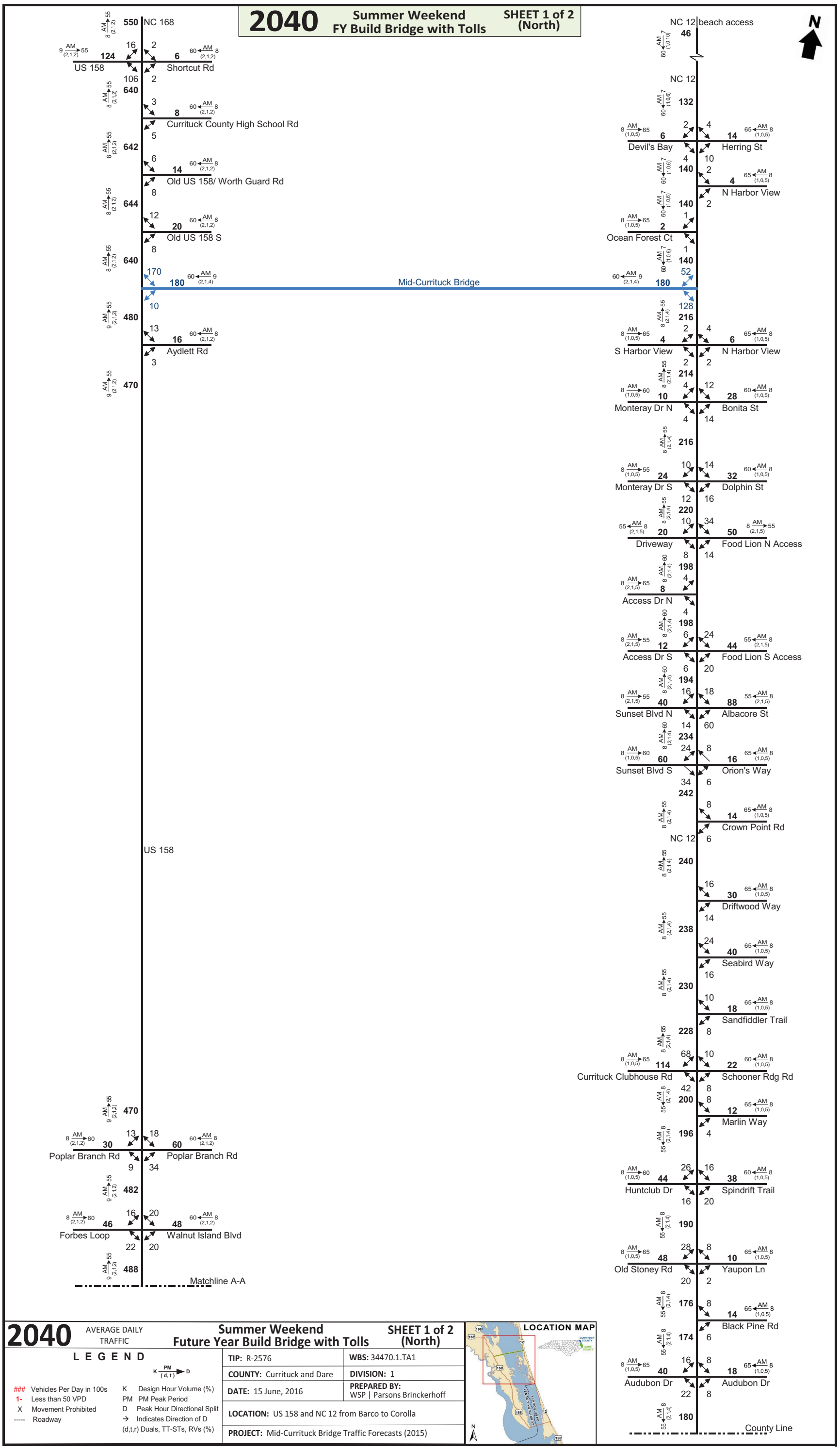
K	Design Hour Volume (%)
PM	PM Peak Period
D	Peak Hour Directional Split
→	Indicates Direction of D
(d,t,r)	Duals, TT-STs, RVs (%)

TIP: R-2576	**WBS:** 34470.1.TA1
COUNTY: Currituck and Dare	**DIVISION:** 1
DATE: 15 June, 2016	**PREPARED BY:** WSP | Parsons Brinckerhoff
LOCATION: US 158 and NC 12 from Barco to Corolla	
PROJECT: Mid-Currituck Bridge Traffic Forecasts (2015)	

LOCATION MAP

2040 Summer Weekend FY Build Bridge with Tolls

SHEET 1 of 2 (North)



2040 AVERAGE DAILY TRAFFIC

Summer Weekend Future Year Build Bridge with Tolls

SHEET 1 of 2 (North)

LEGEND

K PM (d, t) D

###	Vehicles Per Day in 100s	K	Design Hour Volume (%)
1-	Less than 50 VPD	PM	PM Peak Period
X	Movement Prohibited	D	Peak Hour Directional Split
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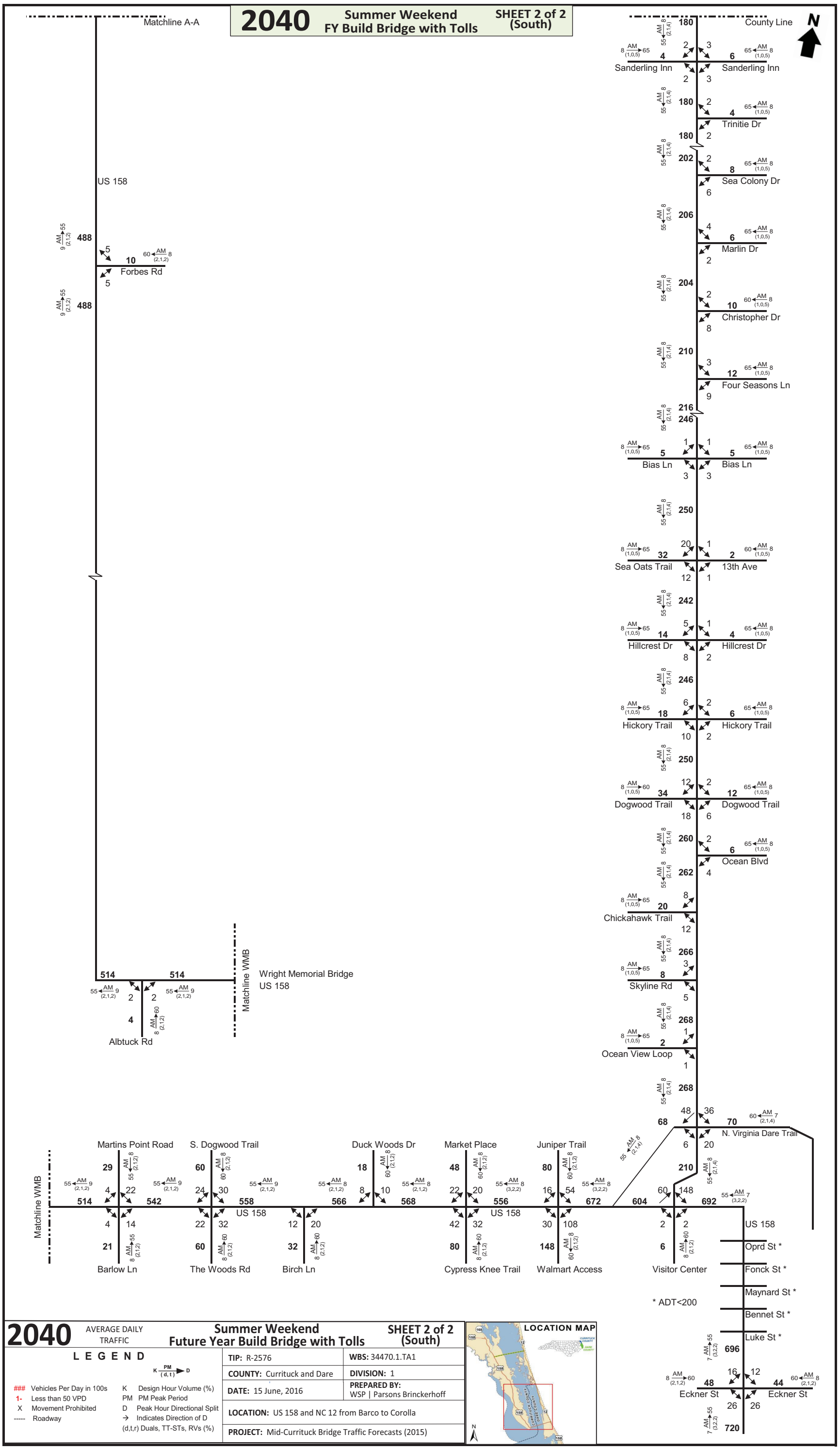
LOCATION MAP

2040 Summer Weekend FY Build Bridge with Tolls

SHEET 2 of 2 (South)



2040 AVERAGE DAILY TRAFFIC

Summer Weekend Future Year Build Bridge with Tolls

SHEET 2 of 2 (South)

LEGEND

K (PM) (d, t) D

###	Vehicles Per Day in 100s
1-	Less than 50 VPD
X	Movement Prohibited
-----	Roadway
K	Design Hour Volume (%)
PM	PM Peak Period
D	Peak Hour Directional Split
→	Indicates Direction of D
(d,t,r)	Duals, TT-STs, RVs (%)

TIP: R-2576	**WBS:** 34470.1.TA1
COUNTY: Currituck and Dare	**DIVISION:** 1
DATE: 15 June, 2016	**PREPARED BY:** WSP | Parsons Brinckerhoff
LOCATION: US 158 and NC 12 from Barco to Corolla	
PROJECT: Mid-Currituck Bridge Traffic Forecasts (2015)	

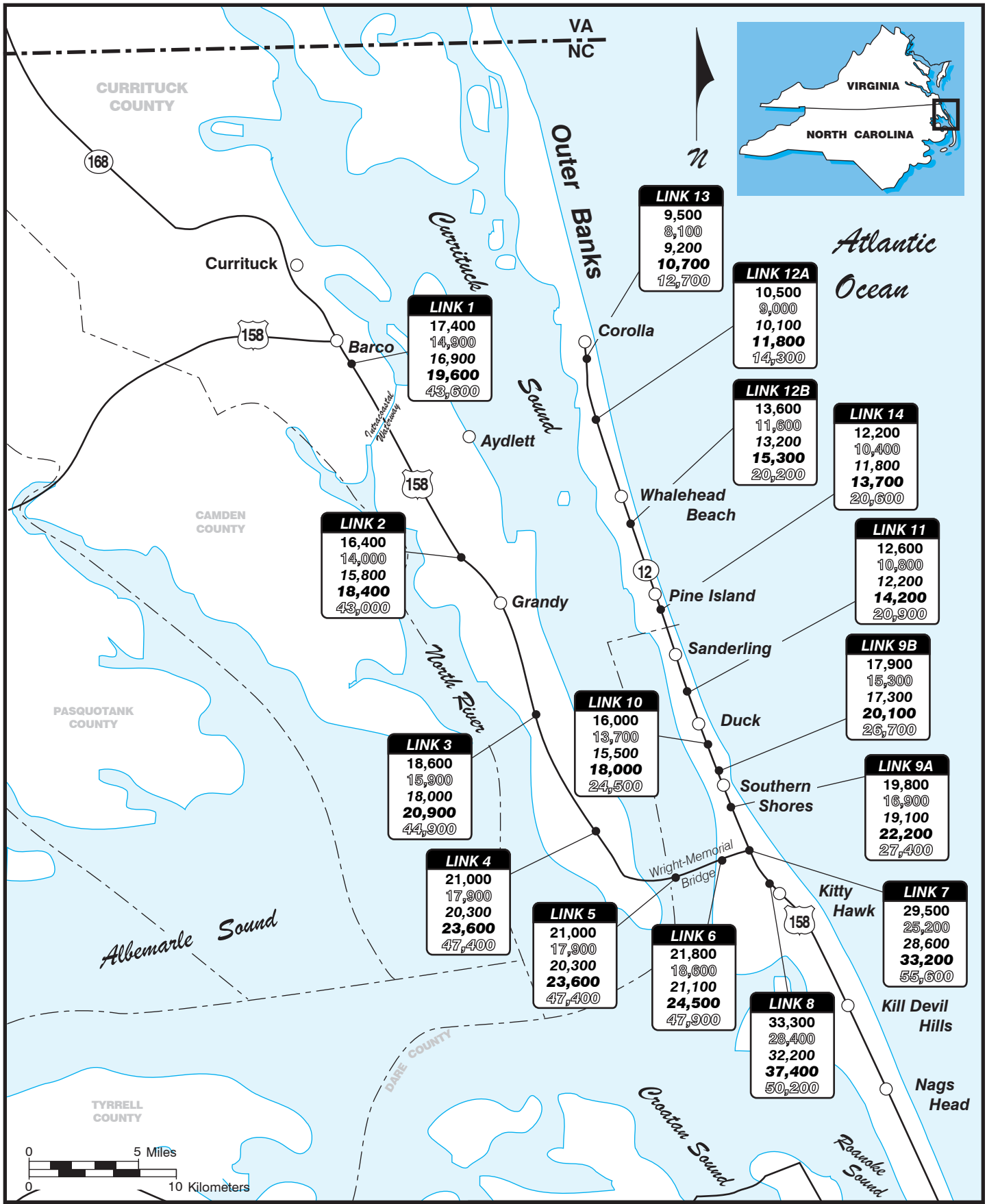
LOCATION MAP

LINK VOLUMES

			2015 Base Year No Build					2015 Build Bridge (no Tolls)					2015 Build Bridge (with Tolls)				
Link #	Route	Between	AADT	Non-Summer Weekday	Non-Summer Weekend	Summer Weekday	Summer Weekend	AADT	Non-Summer Weekday	Non-Summer Weekend	Summer Weekday	Summer Weekend	AADT	Non-Summer Weekday	Non-Summer Weekend	Summer Weekday	Summer Weekend
1	US 158	Barco and Mid-Currituck Bridge	17,400	14,900	16,900	19,600	43,600	17,300	14,700	16,700	19,400	43,400	17,300	14,700	16,700	19,400	43,400
2	US 158	Mid-Currituck Bridge and Grandy	16,400	14,000	15,800	18,400	43,000	14,100	12,000	13,600	15,800	30,400	15,100	12,900	14,600	17,000	34,000
3	US 158	Grandy and Powells Point	18,600	15,900	18,000	20,900	44,900	14,000	11,900	13,500	15,700	30,900	16,000	13,700	15,500	18,000	35,200
4	US 158	Powells Point and Point Harbor	21,000	17,900	20,300	23,600	47,400	14,400	12,300	13,900	16,200	31,000	16,700	14,300	16,200	18,800	35,600
5	**US 158**	**Wright Memorial Bridge**	**21,000**	**17,900**	**20,300**	**23,600**	**47,400**	**15,600**	**13,300**	**15,100**	**17,500**	**32,300**	**18,200**	**15,500**	**17,500**	**20,400**	**37,200**
6	US 158	Barlow Lane and Cypress Knee Trail	21,800	18,600	21,100	24,500	47,900	20,400	17,400	19,700	22,900	37,900	23,000	19,600	22,200	25,800	42,800
7	US 158	Cypress Knee Trail and NC 12	29,500	25,200	28,600	33,200	55,600	27,000	23,000	26,100	30,300	46,900	29,500	25,200	28,600	33,200	51,800
8	US 158	south of NC 12 and Eckner St	33,300	28,400	32,200	37,400	50,200	32,800	28,000	31,600	36,800	50,000	32,800	28,000	31,600	36,800	50,000
9A	NC 12	US 158 and Dogwood Trail	19,800	16,900	19,100	22,200	27,400	15,400	13,100	14,900	17,300	15,900	18,000	15,400	17,400	20,200	20,800
9B	NC 12	Dogwood Trail and Sea Oats Trail	17,900	15,300	17,300	20,100	26,700	13,300	11,300	12,800	14,900	13,500	15,800	13,500	15,300	17,800	18,400
10	NC 12	Sea Oats Trail and Christopher Dr	16,000	13,700	15,500	18,000	24,500	12,000	10,300	11,600	13,500	13,600	13,200	11,200	12,700	14,800	14,800
11	NC 12	Christopher Dr and Audubon Dr	12,600	10,800	12,200	14,200	20,900	10,900	9,300	10,600	12,300	13,800	10,700	9,100	10,300	12,000	11,800
14	NC 12	Audubon Dr and Currituck Clubhouse Rd	12,200	10,400	11,800	13,700	20,600	10,200	8,700	9,900	11,500	13,200	9,400	8,100	9,100	10,600	9,200
12B	NC 12	Currituck Clubhouse Rd and Albacore St	13,600	11,600	13,200	15,300	20,200	12,600	10,800	12,200	14,200	18,700	10,900	9,300	10,500	12,200	14,600
12A	NC 12	Albacore St and Mid-Currituck Bridge	10,500	9,000	10,100	11,800	14,300	13,200	11,200	12,700	14,800	18,300	10,900	9,300	10,500	12,200	13,700
13	NC 12	northern end of NC 12	9,500	8,100	9,200	10,700	12,700	9,200	7,800	8,900	10,300	11,400	9,200	7,800	8,900	10,300	11,400
15	**MCB**	**US 158 and NC 12**	**-**	**-**	**-**	**-**	**-**	**5,400**	**4,600**	**5,200**	**6,100**	**15,100**	**2,800**	**2,400**	**2,800**	**3,200**	**10,200**

LINK VOLUMES

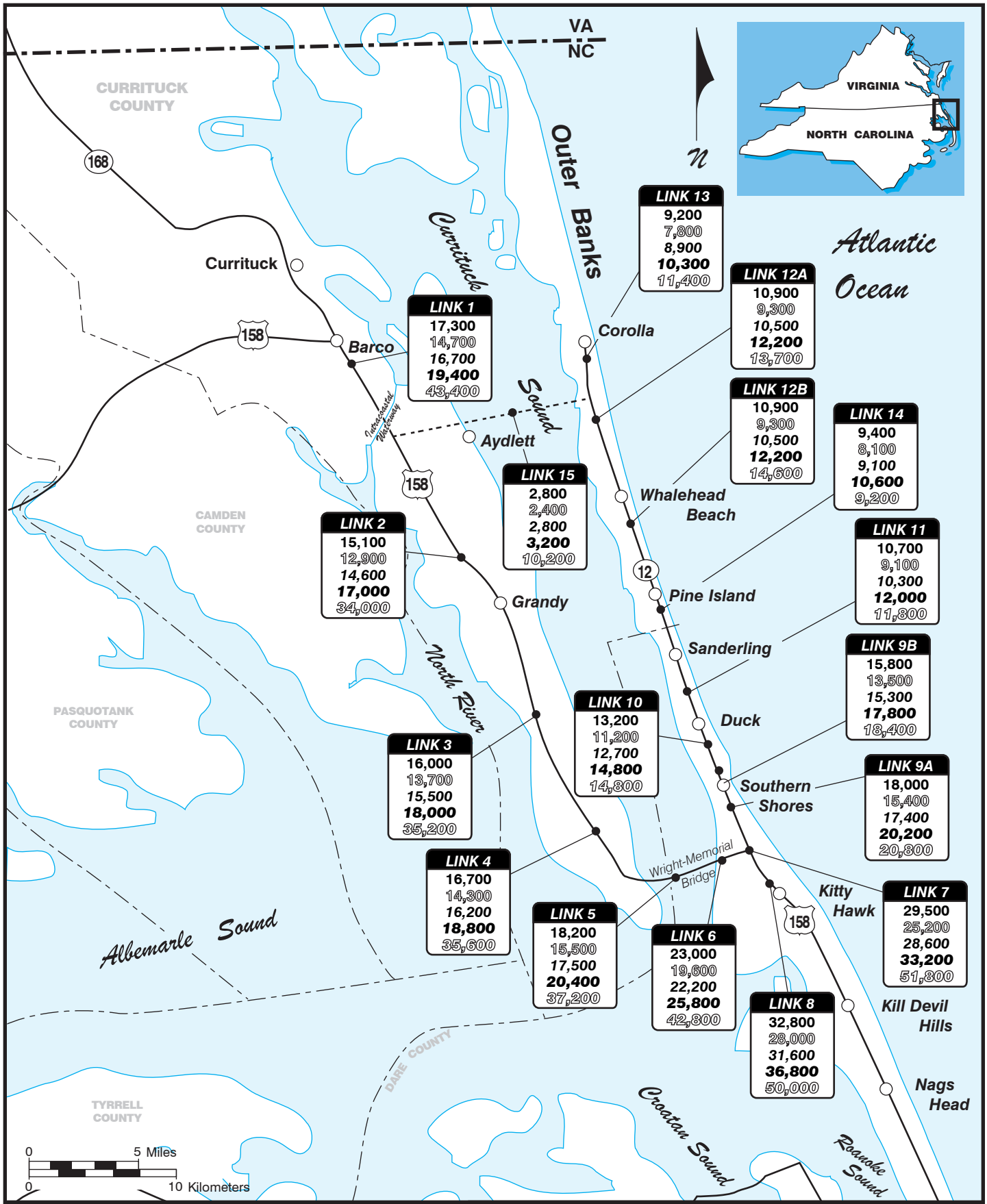
			2040 No Build / ER2					2040 Build Bridge (no Tolls)					2040 Build Bridge (with Tolls)				
Link #	Route	Between	AADT	Non-Summer Weekday	Non-Summer Weekend	Summer Weekday	Summer Weekend	AADT	Non-Summer Weekday	Non-Summer Weekend	Summer Weekday	Summer Weekend	AADT	Non-Summer Weekday	Non-Summer Weekend	Summer Weekday	Summer Weekend
1	US 158	Barco and Mid-Currituck Bridge	26,100	22,300	25,200	29,300	64,200	25,500	21,700	24,600	28,600	64,300	26,100	22,300	25,200	29,300	64,200
2	US 158	Mid-Currituck Bridge and Grandy	24,700	21,100	23,900	27,800	63,200	19,600	16,700	18,900	22,000	43,700	18,900	16,100	18,200	21,200	47,000
3	US 158	Grandy and Powells Point	27,300	23,300	26,400	30,700	66,200	18,900	16,100	18,200	21,200	44,300	20,300	17,300	19,600	22,800	48,800
4	US 158	Powells Point and Point Harbor	30,600	26,100	29,600	34,400	69,200	19,300	16,500	18,700	21,700	44,200	23,100	19,800	22,400	26,000	51,400
5	**US 158**	**Wright Memorial Bridge**	**30,600**	**26,100**	**29,600**	**34,400**	**69,200**	**20,400**	**17,400**	**19,700**	**22,900**	**45,900**	**23,100**	**19,800**	**22,400**	**26,000**	**51,400**
6	US 158	Barlow Lane and Cypress Knee Trail	31,600	27,000	30,500	35,500	69,900	26,100	22,300	25,200	29,300	52,100	24,200	20,700	23,400	27,200	52,300
7	US 158	Cypress Knee Trail and NC 12	41,400	35,300	40,000	46,500	79,400	34,600	29,600	33,500	38,900	62,900	34,600	29,600	33,500	38,900	63,600
8	US 158	south of NC 12 and Eckner St	43,100	36,800	41,600	48,400	69,400	42,900	36,600	41,500	48,200	69,000	43,100	36,800	41,600	48,400	69,400
9A	NC 12	US 158 and Dogwood Trail	30,000	25,600	29,000	33,700	42,200	21,400	18,300	20,700	24,100	22,500	23,200	19,800	22,400	26,100	26,400
9B	NC 12	Dogwood Trail and Sea Oats Trail	28,700	24,500	27,700	32,200	41,300	19,100	16,300	18,500	21,500	19,600	21,500	18,400	20,800	24,200	24,500
10	NC 12	Sea Oats Trail and Christopher Dr	27,000	23,000	26,100	30,300	40,300	18,200	15,500	17,500	20,400	19,700	19,500	16,600	18,800	21,900	22,500
11	NC 12	Christopher Dr and Audubon Dr	23,300	19,900	22,500	26,200	36,400	17,300	14,700	16,700	19,400	20,100	15,800	13,500	15,300	17,800	18,500
14	NC 12	Audubon Dr and Currituck Clubhouse Rd	22,800	19,500	22,000	25,600	31,100	16,800	14,400	16,300	18,900	19,600	17,100	14,600	16,500	19,200	18,700
12B	NC 12	Currituck Clubhouse Rd and Albacore St	21,800	18,600	21,100	24,500	25,700	20,300	17,300	19,600	22,800	27,900	18,900	16,100	18,200	21,200	23,400
12A	NC 12	Albacore St and Mid-Currituck Bridge	13,500	11,600	13,100	15,200	16,000	18,200	15,500	17,500	20,400	26,800	15,800	13,500	15,300	17,800	21,200
13	NC 12	northern end of NC 12	10,900	9,300	10,500	12,200	13,400	10,100	8,700	9,800	11,400	12,500	10,900	9,300	10,500	12,200	13,400
15	**MCB**	**US 158 and NC 12**	**-**	**-**	**-**	**-**	**-**	**10,600**	**9,000**	**10,200**	**11,900**	**23,700**	**7,700**	**6,500**	**7,400**	**8,600**	**18,000**



LEGEND

38,100 - Annual Average Daily Traffic
33,400 - Non-Summer Weekday Traffic
21,900 - Non-Summer Weekend Traffic
54,800 - Summer Weekday Traffic
59,800 - Summer Weekend Traffic

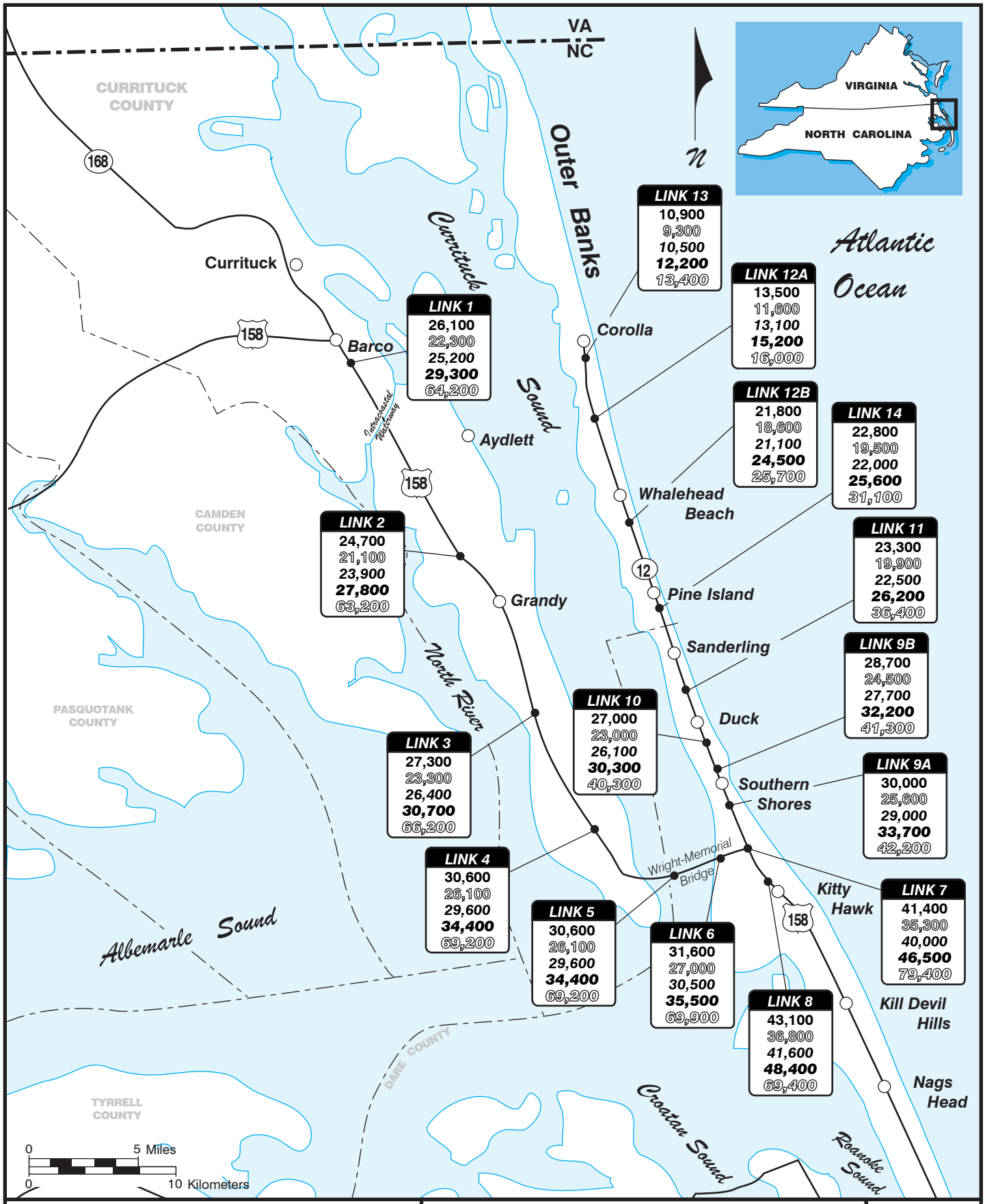
Base Year (2015) Daily Traffic Volumes without a Mid-Currituck Bridge



LEGEND

38,100 - Annual Average Daily Traffic
33,400 - Non-Summer Weekday Traffic
21,900 - Non-Summer Weekend Traffic
54,800 - Summer Weekday Traffic
59,800 - Summer Weekend Traffic

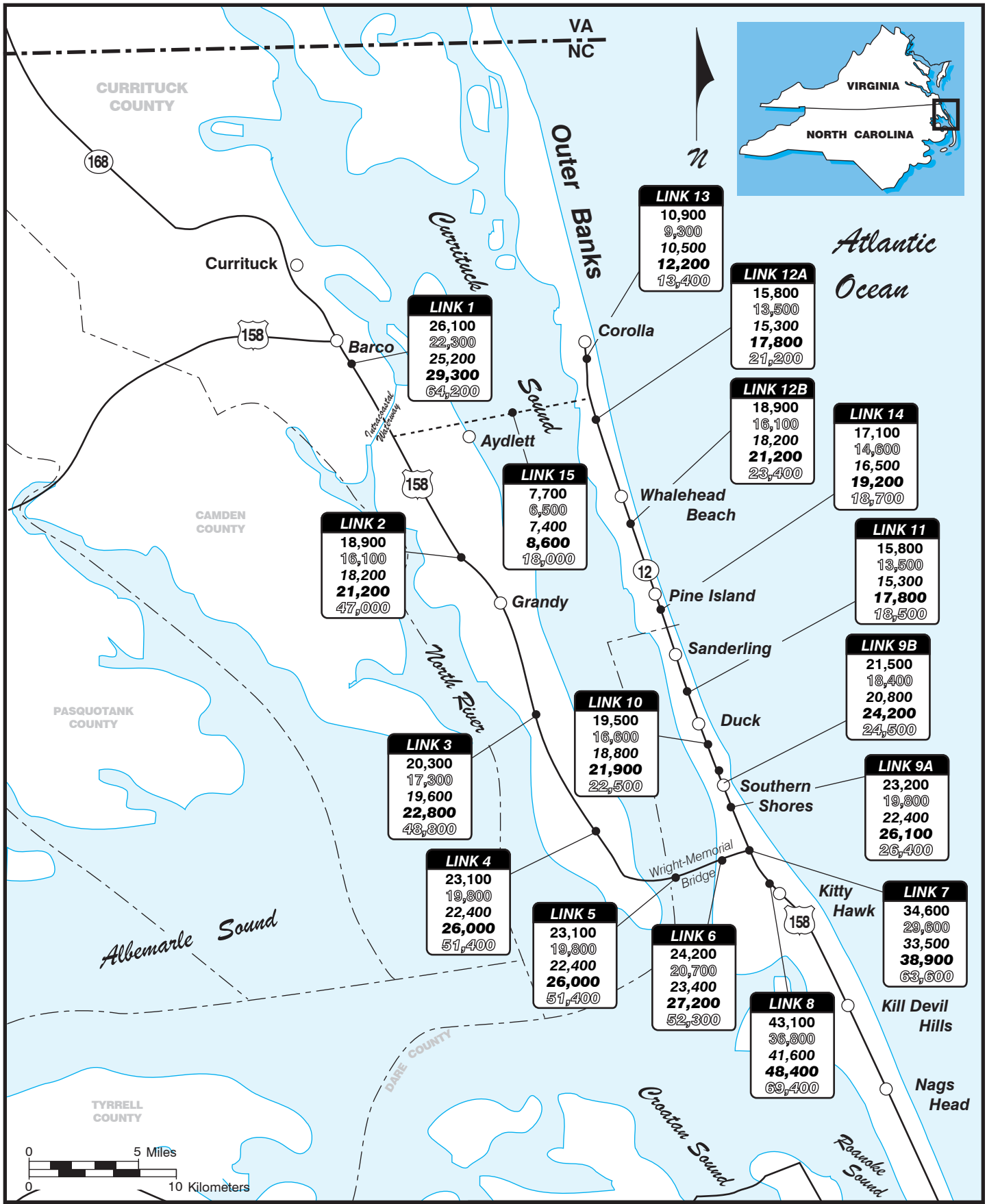
Base Year (2015) Daily Traffic Volumes for Build Bridge with Tolls Scenario



LEGEND

38,100 - Annual Average Daily Traffic
33,400 - Non-Summer Weekday Traffic
21,900 - Non-Summer Weekend Traffic
54,800 - Summer Weekday Traffic
59,800 - Summer Weekend Traffic

Future Year (2040) No Build / ER2 Daily Traffic Volumes without a Mid-Currituck Bridge



LEGEND

38,100 - Annual Average Daily Traffic
33,400 - Non-Summer Weekday Traffic
21,900 - Non-Summer Weekend Traffic
54,800 - Summer Weekday Traffic
59,800 - Summer Weekend Traffic

Future Year (2040) Daily TrafficVolumes for Build Bridge with Tolls Scenario

Appendix B

Data Collection Tables

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B1. DATA COLLECTION - Class Counts 2

B2. DATA COLLECTION - Class Count Summary 3

B3. DATA COLLECTION - Turn Movement Counts 5

B4. FIELD INVESTIGATION - Travel Times 7

B5. COUNT LOCATION MAP 8

B1. DATA COLLECTION - Class Counts

Link #	NCDOT FILE #	Count Location	Start Date	End Date
C-1	15-14019	US 158 at Intracoastal Waterway Bridge approach, North of SR 1405 Waterlily Rd	July 8, 2015	July 15, 2015
C-2	15-14020	US 158 North of NC 136 Macedonia Church Rd	July 8, 2015	July 15, 2015
C-3	15-14021	US 158 North of SR 1127 Garrenton Rd	July 8, 2015	July 15, 2015
C-4	15-14022	US 158 South of SR 1111 S Spot Rd	July 8, 2015	July 15, 2015
C-5	15-14023	US 158 - Wright Memorial Bridge approach, East of SR 1187 Holly Ln	July 8, 2015	July 15, 2015
C-6	15-02018	US 158 West of SR 1206 Dogwood Trail / The Woods Dr	July 14, 2015	July 21, 2015
C-7	15-10050	US 158 West of Juniper Trail	July 15, 2015	July 22, 2015
C-8	15-10051	US 158 East of NC 12 and West of Putter Ln	July 15, 2015	July 22, 2015
C-9A	15-10052	NC 12 North of Coastal Provision Market	July 15, 2015	July 22, 2015
C-9B	15-10053	NC 12 North of E Dogwood Trail	July 15, 2015	July 22, 2015
C-10	15-18010	NC 12 North of Sea Oats Trail	July 15, 2015	July 22, 2015
C-11	15-18014	NC 12 North of SR 1409 Christopher Dr	July 15, 2015	July 22, 2015
C-14A	15-18012	NC 12 South of Audubon Dr (Hampton Inn Hotel)	July 15, 2015	July 22, 2015
C-14B	15-18013	NC 12 South of Hunt Club Dr / Spindrift Trail	July 8, 2015	July 15, 2015
C-12B	15-02021	NC 12 North of Currituck Clubhouse Rd / Schooner Ridge Rd	August 4, 2015	August 11, 2015
C-12A	15-10049	NC 12 North of SR 1402 Albacore St	July 15, 2015	July 21, 2015
C-13	15-02019	NC 12 South of Devil's Bay / Herring St	July 8, 2015	July 15, 2015
C-16B	15-02022	NC 12 North of SR 1409 Shad St	July 8, 2015	July 15, 2015
C-16A	15-02020	NC 12 North of High Dune Loop near end of paved NC 12 beach access	August 4, 2015	August 11, 2015

B2. DATA COLLECTION - Class Count Summary

					SUMMER WEEKDAY																				
US 158					SB or EB						NB or WB						TOTAL	PEAK			K	D	DUALS	TTST	ADT
PB #	NCDOT #	Count Location	DATE	TIME	PV	DUALS	TTST	TWINS	UND	TOTAL	WB	DUALS	TTST	TWINS	UND	TOTAL		Time	SB	NB					
C-1	15-14019	US 158 at Intracoastal Waterway Bridge approach, North of SR 1405 Waterlily Rd	7/8/2015	00:00	8,731	534	272	2	19	9,558	9,136	307	238	3	17	9,701	**19,260**	17:00 - 18:00	666	722	7.2%	52%	4.4%	2.7%	**19,300**
			7/15/2015	00:00	91%	6%	3%	0%	0%		94%	3%	2%	0%	0%			PM	1,388						
C-2	15-14020	US 158 North of NC 136 Macedonia Church Rd	7/8/2015	00:00	8,385	412	249	1	13	9,060	8,459	356	233	2	16	9,066	**18,126**	17:00 - 18:00	615	691	7.2%	53%	4.2%	2.7%	**18,100**
			7/15/2015	00:00	93%	5%	3%	0%	0%		93%	4%	3%	0%	0%			PM	1,306						
C-3	15-14021	US 158 North of SR 1127 Garrenton Rd	7/8/2015	00:00	9,747	272	223	2	15	10,259	9,883	298	223	3	15	10,422	**20,682**	17:00 - 18:00	630	904	7.4%	59%	2.8%	2.2%	**20,700**
			7/15/2015	00:00	95%	3%	2%	0%	0%		95%	3%	2%	0%	0%			PM	1,534						
C-4	15-14022	US 158 South of SR 1111 S Spot Rd	7/8/2015	00:00	8,649	414	216	2	14	9,295	10,014	724	261	2	21	11,021	**20,316**	17:00 - 18:00	552	990	7.6%	64%	5.6%	2.3%	**20,300**
			7/15/2015	00:00	93%	4%	2%	0%	0%		91%	7%	2%	0%	0%			PM	1,542						
C-5	15-14023	US 158 - Wright Memorial Bridge approach, East of SR 1187 Holly Ln	7/8/2015	00:00	11,200	514	236	3	18	11,971	11,010	547	186	1	6	11,750	**23,721**	17:00 - 18:00	746	856	6.8%	53%	4.5%	1.8%	**23,700**
			7/15/2015	00:00	94%	4%	2%	0%	0%		94%	5%	2%	0%	0%			PM	1,602						
C-6	15-02018	US 158 West of SR 1206 Dogwood Trail / The Woods Dr	7/14/2015	08:00	11,847	368	133	27	0	12,375	10,611	819	188	41		11,658	**24,033**	17:00 - 18:00	797	1,018	7.6%	56%	4.9%	1.3%	**24,000**
			7/21/2015	08:00	96%	3%	1%	0%	0%		91%	7%	2%	0%	0%			PM	1,815						
C-7	15-10050	US 158 West of Juniper Trail	7/15/2015	09:00	8,931	1,400	567	167	424	11,489	9,214	912	573	211	489	11,400	**22,889**	17:00 - 18:00	717	865	6.9%	55%	10.1%	5.0%	**22,900**
			7/22/2015	09:00	78%	12%	5%	1%	4%		81%	8%	5%	2%	4%			PM	1,582						
C-8	15-10051	US 158 East of NC 12 and West of Putter Ln	7/15/2015	09:00	15,724	790	546	63	564	17,687	15,997	825	497	59	954	18,333	**36,020**	17:00 - 18:00	1,298	1,290	7.2%	50%	4.5%	2.9%	**36,000**
			7/22/2015	09:00	89%	4%	3%	0%	3%		87%	5%	3%	0%	5%			PM	2,588						
NC 12					SB						NB						TOTAL	PEAK			K	D	DUALS	TTST	ADT
PB #	NCDOT #	Count Location	DATE	TIME	PV	DUALS	TTST	TWINS	UND	TOTAL	PV	DUALS	TTST	TWINS	UND	TOTAL		Time	SB	NB					
C-9A	15-10052	NC 12 North of Coastal Provision Market	7/15/2015	09:00	7,079	621	483	588	459	9,231	6,281	598	381	768	390	8,417	**17,649**	17:00 - 18:00	796	442	7.0%	64%	6.9%	4.9%	**17,600**
			7/22/2015	09:00	77%	7%	5%	6%	5%		75%	7%	5%	9%	5%			PM	1,238						
C-9B	15-10053	NC 12 North of E Dogwood Trail	7/15/2015	09:00	6,549	539	373	462	312	8,235	6,122	453	335	562	241	7,712	**15,947**	16:00 - 17:00	707	409	7.0%	63%	6.2%	4.4%	**15,900**
			7/22/2015	09:00	80%	7%	5%	6%	4%		79%	6%	4%	7%	3%			PM	1,116						
C-10	15-18010	NC 12 North of Sea Oats Trail	7/15/2015	00:00	8,947	459	101	2	0	9,510	8,773	510	116	1	0	9,400	**18,910**	16:00 - 17:00	844	602	7.6%	58%	5.1%	1.1%	**18,900**
			7/21/2015	00:00	94%	5%	1%	0%	0%		93%	5%	1%	0%	0%			PM	1,446						
C-11	15-18014	NC 12 North of SR 1409 Christopher Dr	7/15/2015	00:00	8,908	681	178	7	0	9,773	8,920	668.4	158.6	6.2	0	9,753	**19,526**	16:00 - 17:00	816	622	7.4%	57%	6.9%	1.7%	**19,500**
			7/21/2015	00:00	91%	7%	2%	0%	0%		91%	7%	2%	0%	0%			PM	1,438						
C-14A	15-18012	NC 12 South of Audubon Dr (Hampton Inn Hotel)	7/15/2015	00:00	6,040	353	59	0	0	6,453	5,661	324	61	0	0	6,047	**12,500**	11:00 - 12:00	487	645	9.1%	57%	5.4%	1.0%	**12,500**
			7/21/2015	00:00	94%	5%	1%	0%	0%		94%	5%	1%	0%	0%			NOON	1,132						
C-14B	15-18013	NC 12 South of Hunt Club Dr / Spindrift Trail	7/8/2015	00:00	5,701	745	86	0	0	6,532	5,870	419	75	1	0	6,365	**12,897**	11:00 - 12:00	500	510	7.8%	50%	9.0%	1.2%	**12,900**
			7/15/2015	00:00	87%	11%	1%	0%	0%		92%	7%	1%	0%	0%			NOON	1,010						
C-12B	15-02021	NC 12 North of Currituck Clubhouse Rd / Schooner Ridge Rd	8/4/2015	15:00	7,603	325	16	0	0	7,944	7,377	395	17	2	0	7,792	**15,736**	11:00 - 12:00	570	665	7.8%	54%	4.6%	0.2%	**15,700**
			8/12/2015	15:00	96%	4%	0%	0%	0%		95%	5%	0%	0%	0%			NOON	1,235						
C-12A	15-10049	NC 12 North of SR 1402 Albacore St	7/15/2015	09:00	3,913	421	294	281	294	5,202	4,240	281	134	359	148	5,163	**10,365**	11:00 - 12:00	370	383	7.3%	51%	6.8%	4.1%	**10,400**
			7/22/2015	09:00	75%	8%	6%	5%	6%		82%	5%	3%	7%	3%			NOON	753						
C-13	15-02019	NC 12 South of Devil's Bay / Herring St	8/4/2015	00:00	573	5,094	3	0	0	5,670	5,250	275	5	1	0	5,531	**11,201**	11:00 - 12:00	482	490	8.7%	50%	5.0%	0.1%	**11,200**
			8/12/2015	00:00	10%	90%	0%	0%	0%		95%	5%	0%	0%	0%			NOON	972						
C-16B	15-02022	NC 12 North of SR 1409 Shad St	7/8/2015	00:00	4,829	348	8	1	0	5,185	5,047	87	6	0	0	5,140	**10,325**	11:00 - 12:00	484	421	8.8%	53%	4.2%	0.1%	**10,300**
			7/15/2015	00:00	93%	7%	0%	0%	0%		98%	2%	0%	0%	0%			NOON	905						
C-16A	15-02020	NC 12 North of High Dune Loop near end of paved NC 12 beach access	8/4/2015	00:00	940	505	1	0	0	1,446	1,140	416	0	0	0	1,556	**3,002**	11:00 - 12:00	127	177	10.1%	58%	30.7%	0.0%	**3,000**
			8/12/2015	00:00	65%	35%	0%	0%	0%		73%	27%	0%	0%	0%			NOON	304						

- Suspect data

B2. DATA COLLECTION - Class Count Summary

					SUMMER WEEKEND																				
US 158					SB or EB						NB or WB						TOTAL	PEAK			K	D	DUALS	TTST	ADT
PB #	NCDOT #	Count Location	DATE	TIME	PV	DUALS	TTST	TWINS	UND	TOTAL	WB	DUALS	TTST	TWINS	UND	TOTAL		Time	SB	NB					
C-1	15-14019	US 158 at Intracoastal Waterway Bridge approach, North of SR 1405 Waterlily Rd	7/8/2015	00:00	21,415	606	280	4	41	22,346	19,932	257	287	1	30	20,507	**42,853**	9:00 - 10:00	2,156	2,087	9.9%	51%	2.0%	1.3%	**42,900**
			7/15/2015	00:00	96%	3%	1%	0%	0%		97%	1%	1%	0%	0%			AM	4,243						
C-2	15-14020	US 158 North of NC 136 Macedonia Church Rd	7/8/2015	00:00	20,828	435	236	0	25	21,524	21,067	588	283	1	23	21,962	**43,486**	10:00 - 11:00	2,166	2,043	9.7%	51%	2.4%	1.2%	**43,500**
			7/15/2015	00:00	97%	2%	1%	0%	0%		96%	3%	1%	0%	0%			AM	4,209						
C-3	15-14021	US 158 North of SR 1127 Garrenton Rd	7/8/2015	00:00	21,976	199	201	0	23	22,399	17,978	222	234	1	27	18,462	**40,861**	10:00 - 11:00	2,190	1,864	9.9%	54%	1.0%	1.1%	**40,900**
			7/15/2015	00:00	98%	1%	1%	0%	0%		97%	1%	1%	0%	0%			AM	4,054						
C-4	15-14022	US 158 South of SR 1111 S Spot Rd	7/8/2015	00:00	20,722	350	200	0	31	21,303	21,731	321	188	2	31	22,273	**43,576**	10:00 - 11:00	2,209	2,123	9.9%	51%	1.5%	0.9%	**43,600**
			7/15/2015	00:00	97%	2%	1%	0%	0%		98%	1%	1%	0%	0%			AM	4,332						
C-5	15-14023	US 158 - Wright Memorial Bridge approach, East of SR 1187 Holly Ln	7/8/2015	00:00	21,358	369	173	0	49	21,949	17,919	871	307	0	0	19,097	**41,046**	8:00 - 9:00	1,914	1,868	9.2%	51%	3.0%	1.2%	**41,000**
			7/15/2015	00:00	97%	2%	1%	0%	0%		94%	5%	2%	0%	0%			AM	3,782						
C-6	15-02018	US 158 West of SR 1206 Dogwood Trail / The Woods Dr	7/14/2015	08:00	18,023	678	193	47		18,941	19,651	903	328	64		20,946	**39,887**	8:00 - 9:00	1,690	1,661	8.4%	50%	4.0%	1.3%	**39,900**
			7/21/2015	08:00	95%	4%	1%	0%	0%		94%	4%	2%	0%	0%			AM	3,351						
C-7	15-10050	US 158 West of Juniper Trail	7/15/2015	09:00	8,243	968	646	288	1180	11,325	12077	880	836	362	1275	15,430	**26,755**	7:00 - 8:00	896	1,142	7.6%	56%	6.9%	5.5%	**26,800**
			7/22/2015	09:00	73%	9%	6%	3%	10%		78%	6%	5%	2%	8%			AM	2,038						
C-8	15-10051	US 158 East of NC 12 and West of Putter Ln	7/15/2015	09:00	14,819	489	365	47	912	16,632	14563	487	327	39	2598	18,014	**34,646**	17:00 - 18:00	1,510	1,088	7.5%	58%	2.8%	2.0%	**34,600**
			7/22/2015	09:00	89%	3%	2%	0%	5%		81%	3%	2%	0%	14%			PM	2,598						
NC 12					SB						NB						TOTAL	PEAK			K	D	DUALS	TTST	ADT
PB #	NCDOT #	Count Location	DATE	TIME	PV	DUALS	TTST	TWINS	UND	TOTAL	PV	DUALS	TTST	TWINS	UND	TOTAL		Time	SB	NB					
C-9A	15-10052	NC 12 North of Coastal Provision Market	7/15/2015	09:00	5817	325	207	242	565	7,156	2975	199	162	296	1195	4,827	**11,983**	7:00 - 8:00	762	537	10.8%	59%	4.4%	3.1%	**12,000**
			7/22/2015	09:00	81%	5%	3%	3%	8%		62%	4%	3%	6%	25%			AM	1,299						
C-9B	15-10053	NC 12 North of E Dogwood Trail	7/15/2015	09:00	5534	341	229	197	503	6,804	2721	210	188	260	1001	4,380	**11,184**	6:00 - 7:00	823	273	9.8%	75%	4.9%	3.7%	**11,200**
			7/22/2015	09:00	81%	5%	3%	3%	7%		62%	5%	4%	6%	23%			AM	1,096						
C-10	15-18010	NC 12 North of Sea Oats Trail	7/15/2015	00:00	11,892	414	77	8	0	12,391	12,001	579	196	9	0	12,785	**25,176**	7:00 - 8:00	1,192	854	8.1%	58%	3.9%	1.1%	**25,200**
			7/21/2015	00:00	96%	3%	1%	0%	0%		94%	5%	2%	0%	0%			AM	2,046						
C-11	15-18014	NC 12 North of SR 1409 Christopher Dr	7/15/2015	00:00	11,456	762	173	7	0	12,398	11,981	871	179	7	0	13,038	**25,436**	7:00 - 8:00	1,126	783	7.5%	59%	6.4%	1.4%	**25,400**
			7/21/2015	00:00	92%	6%	1%	0%	0%		92%	7%	1%	0%	0%			AM	1,909						
C-14A	15-18012	NC 12 South of Audubon Dr (Hampton Inn Hotel)	7/15/2015	00:00	9,405	376	49	0	0	9,830	9,164	359	45	0	0	9,568	**19,398**	7:00 - 8:00	997	523	7.8%	66%	3.8%	0.5%	**19,400**
			7/21/2015	00:00	96%	4%	0%	0%	0%		96%	4%	0%	0%	0%			AM	1,520						
C-14B	15-18013	NC 12 South of Hunt Club Dr / Spindrift Trail	7/8/2015	00:00	7,458	782	61	0	0	8,301	8,798	399	48	3	0	9,248	**17,549**	8:00 - 9:00	683	637	7.5%	52%	6.7%	0.6%	**17,500**
			7/15/2015	00:00	90%	9%	1%	0%	0%		95%	4%	1%	0%	0%			AM	1,320						
C-12B	15-02021	NC 12 North of Currituck Clubhouse Rd / Schooner Ridge Rd	8/4/2015	15:00	9883	319	7	1	0	10,210	9980	380	10	0	0	10,370	**20,580**	15:00 - 16:00	683	700	6.7%	51%	3.4%	0.1%	**20,600**
			8/12/2015	15:00	97%	3%	0%	0%	0%		96%	4%	0%	0%	0%			PM	1,383						
C-12A	15-10049	NC 12 North of SR 1402 Albacore St	7/15/2015	09:00	4824	446	345	411	312	6,338	5641	321	170	463	159	6,754	**13,092**	15:00 - 16:00	400	425	6.3%	52%	5.9%	3.9%	**13,100**
			7/22/2015	09:00	76%	7%	5%	6%	5%		84%	5%	3%	7%	2%			PM	825						
C-13	15-02019	NC 12 South of Devil's Bay / Herring St	8/4/2015	00:00	584	5976	6	0	0	6,566	6279	227	3	0	0	6,509	**13,075**	15:00 - 16:00	438	564	7.7%	56%	3.5%	0.1%	**13,100**
			8/12/2015	00:00	9%	91%	0%	0%	0%		96%	3%	0%	0%	0%			PM	1,002						
C-16B	15-02022	NC 12 North of SR 1409 Shad St	7/8/2015	00:00	5,731	357	4	0	0	6,092	5,775	68	1	0	0	5,844	**11,936**	15:00 - 16:00	527	631	9.7%	54%	3.6%	0.0%	**11,900**
			7/15/2015	00:00	94%	6%	0%	0%	0%		99%	1%	0%	0%	0%			PM	1,158						
C-16A	15-02020	NC 12 North of High Dune Loop near end of paved NC 12 beach access	8/4/2015	00:00	1,053	247	0	0	0	1,300	1,335	32	0	0	0	1,367	**2,667**	15:00 - 16:00	62	119	6.8%	66%	10.5%	0.0%	**2,700**
			8/12/2015	00:00	81%	19%	0%	0%	0%		98%	2%	0%	0%	0%			PM	181						

- Suspect data

B3. DATA COLLECTION - Turn Movement Counts

Int #	NCDOT FILE #	Intersection	Duration	Weekday / Weekend	Date
61	15-08007	NC 12 and Devil's Bay / Herring St	13 hr	Weekday	July 14, 2015
62	15-08008	NC 12 and N Harbor View	13 hr	Weekday	July 14, 2015
62	15-08009	NC 12 and N Harbor View	13 hr	Weekend	July 11, 2015
63	15-08010	NC 12 and Ocean Forest Ct	13 hr	Weekday	July 14, 2015
64	15-08011	NC 12 and S Harbor View / N Harbor View	13 hr	Weekday	July 14, 2015
2	15-08012	NC 12 and Monteray Dr / Bonita St	13 hr	Weekday	July 14, 2015
3	15-08013	NC 12 and Monteray Dr / Dolphin St	13 hr	Weekday	July 14, 2015
4	15-08014	NC 12 and N Food Lion Access	13 hr	Weekday	July 14, 2015
58	15-08015	NC 12 and S Food Lion Access	13 hr	Weekday	July 14, 2015
5	15-03009	NC 12 and Albacore St / Sunset Blvd	13 hr	Weekday	July 15, 2015
5	15-03010	NC 12 and Albacore St / Sunset Blvd	13 hr	Weekend	July 18, 2015
6	15-03011	NC 12 and Orion's Way / Sunset Blvd	13 hr	Weekday	July 15, 2015
7	15-03012	NC 12 and Crown Point Rd	13 hr	Weekday	July 14, 2015
8	15-03013	NC 12 and Driftwood Way	13 hr	Weekday	July 15, 2015
9	15-03014	NC 12 and Seabird Way	13 hr	Weekday	July 15, 2015
10	15-03015	NC 12 and Sandfiddler Trail	13 hr	Weekday	July 15, 2015
11	15-03016	NC 12 and Currituck Clubhouse Dr / Schooner Ridge Rd	13 hr	Weekday	July 15, 2015
11	15-03018	NC 12 and Currituck Clubhouse Dr / Schooner Ridge Rd	13 hr	Weekend	July 18, 2015
12	15-03017	NC 12 and Marlin Way	13 hr	Weekday	July 15, 2015
14	15-14009	NC 12 and Spindrift Trail / Hunt Club Dr	13 hr	Weekday	July 9, 2015
14	15-14010	NC 12 and Spindrift Trail / Hunt Club Dr	13 hr	Weekend	July 11, 2015
18	15-14011	NC 12 and Audubon Dr / Hampton Inn	13 hr	Weekday	July 9, 2015
26	15-14012	NC 12 and Christopher Dr	13 hr	Weekday	July 16, 2015
26	15-14013	NC 12 and Christopher Dr	13 hr	Weekend	July 18, 2015
29	15-14014	NC 12 and Sea Oats Trail /13th Ave	13 hr	Weekday	July 16, 2015
29	15-14015	NC 12 and Sea Oats Trail /13th Ave	13 hr	Weekend	July 18, 2015
30	15-14016	NC 12 and Hillcrest Dr	13 hr	Weekday	July 16, 2015
33	15-14017	NC 12 and Dogwood Trail	13 hr	Weekday	July 16, 2015
33	15-14018	NC 12 and Dogwood Trail	13 hr	Weekend	July 18, 2015
34	15-18001	NC 12 and Ocean Blvd	13 hr	Weekday	July 15, 2015
35	15-18002	NC 12 and Chickahawk Trail	13 hr	Weekday	July 15, 2015

B3. DATA COLLECTION - Turn Movement Counts

Int #	NCDOT FILE #	Intersection	Duration	Weekday / Weekend	Date
38	15-18003	NC 12 and N Virginia Dare Trail	13 hr	Weekday	July 22, 2015
38	15-18004	NC 12 and N Virginia Dare Trail	13 hr	Weekend	July 18, 2015
57-1	15-18005	US 158 and NC 168	13 hr	Weekday	July 8, 2015
57-1	15-18006	US 158 and NC 168	13 hr	Weekend	July 11, 2015
57-2	15-18007	US 158 and Currituck County High School	13 hr	Weekday	July 8, 2015
65	15-18008	US 158 and SR 1143 (Old US 158 / Worth Guard Rd)	13 hr	Weekday	July 8, 2015
56	15-18009	US 158 and SR 1405 (Old US 158 / Waterlily Rd)	13 hr	Weekday	July 8, 2015
55	15-02009	US 158 and SR 1139/SR 1140 (Aydlett Rd)	13 hr	Weekday	July 9, 2015
55	15-02010	US 158 and SR 1139/SR 1140 (Aydlett Rd)	13 hr	Weekend	July 11, 2015
53-1	15-02011	US 158 and SR 1131 Poplar Branch Rd	13 hr	Weekday	July 9, 2015
53-1	15-02012	US 158 and SR 1131 Poplar Branch Rd	13 hr	Weekend	July 11, 2015
53-2	15-02013	US 158 and SR 1186 Walnut Island Blvd / Forbes Loop	13 hr	Weekday	July 8, 2015
51	15-02014	US 158 and 1118 Forbes Rd	13 hr	Weekday	July 7, 2015
51	15-02015	US 158 and 1118 Forbes Rd	13 hr	Weekend	July 11, 2015
50	15-02016	US 158 and SR 1100 Albtuck Rd	13 hr	Weekday	July 7, 2015
50	15-02017	US 158 and SR 1100 Albtuck Rd	13 hr	Weekend	July 11, 2015
49	15-05007	US 158 and Barlow Ln	13 hr	Weekday	July 21, 2015
49	15-05008	US 158 and Barlow Ln	13 hr	Weekend	July 18, 2015
48	15-05009	US 158 and S Dogwood Trail / The Woods Rd	13 hr	Weekday	July 22, 2015
45	15-05010	US 158 and Market Place / Cypress Knee Trail	13 hr	Weekday	July 22, 2015
45	15-05011	US 158 and Market Place / Cypress Knee Trail	13 hr	Weekend	July 18, 2015
43	15-05012	US 158 and Juniper Trail / Walmart Access	13 hr	Weekday	July 22, 2015
41	15-05013	US 158 and NC 12	13 hr	Weekday	July 22, 2015
41	15-05014	US 158 and NC 12	13 hr	Weekend	July 18, 2015
39	15-05015	US 158 and Eckner St	13 hr	Weekday	July 22, 2015

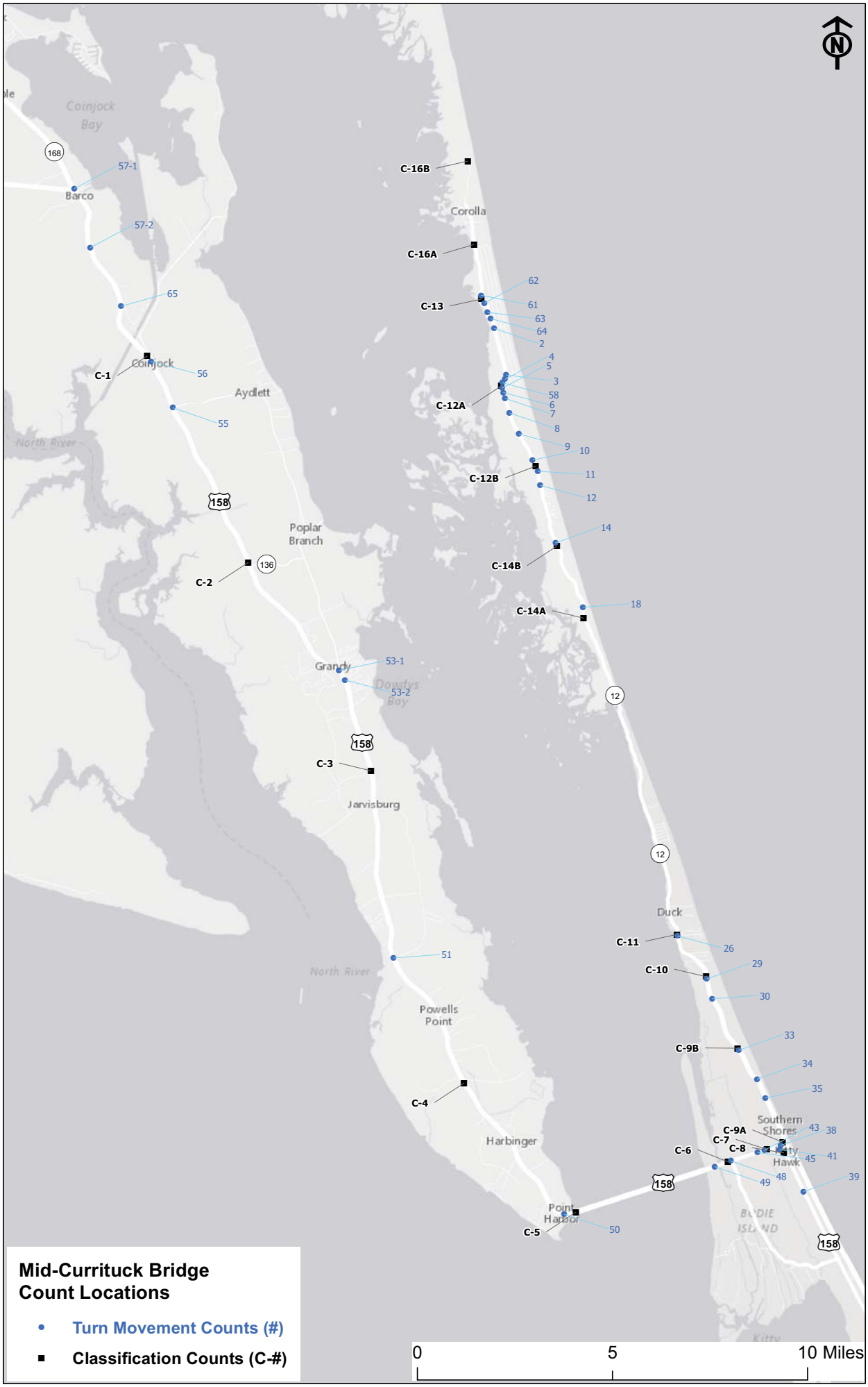
B4. FIELD INVESTIGATION - Travel Times

SUMMER WEEKDAY		Travel Time (minutes)						Average Travel Speed (mph)			
Section	Inbound Segment	2006 Report			Existing (2015)			2006 Report		Existing (2015)	
		Distance (mi)	Uncongested	Existing (2006)	Distance (mi)	Average	Maximum	Uncongested	Existing (2006)	Average	Lowest
A	US158 SB - New Bridge to WMB	22.9	25.5	25.6	22.9	23.8	24.4	54	54	58	56
B	US158 SB - WMB to NC 12	1.3	2.6	3.4	1.3	2.4	3.2	30	23	33	24
C	NC 12 NB - US158 to County Line	9.8	17.6	18.0	9.9	18.9	21.8	33	33	31	27
D	NC 12 NB - County Line to New Bridge	7.0	13.0	13.0	8.6	13.3	14.2	32	32	39	36
TOTAL		**41**	**58.7**	**60.0**	**42.7**	**58.4**	**63.6**	**42**	**41**	**44**	**40**
Section	Outbound Segment	2006 Report			Existing (2015)			2006 Report		Existing (2015)	
		Distance (mi)	Uncongested	Existing (2006)	Distance (mi)	Average	Maximum	Uncongested	Existing (2006)	Average	Lowest
A	US158 SB - WMB to New Bridge	0	0	0	22.9	24.8	26.0	0	0	55	53
B	US158 SB - NC 12 to WMB	0	0	0	1.3	2.1	2.8	0	0	37	28
C	NC 12 NB - County Line to US158	0	0	0	9.9	18.8	22.6	0	0	32	26
D	NC 12 NB - New Bridge to County Line	0	0	0	8.6	13.3	13.8	0	0	39	37
TOTAL		**0**	**0**	**0**	**42.7**	**59.0**	**62.5**	**0**	**0**	**43**	**41**

NOTE: A Null value indicates not available data

SUMMER WEEKEND		Travel Time (minutes)						Average Travel Speed (mph)			
Section	Inbound Segment	2006 Report			Existing (2015)			2006 Report		Existing (2015)	
		Distance (mi)	Uncongested	Existing (2006)	Distance (mi)	Average	Maximum	Uncongested	Existing (2006)	Average	Lowest
A	US158 SB - New Bridge to WMB	22.9	25.5	29.4	22.9	50.2	74.2	54	47	27	19
B	US158 SB - WMB to NC 12	1.3	2.6	5.5	1.3	11.2	17.3	31	15	7	5
C	NC 12 NB - US158 to County Line	9.8	17.6	31.1	9.9	64.3	75.8	33	19	9	8
D	NC 12 NB - County Line to New Bridge	7.0	13.0	13.0	8.6	13.4	13.5	32	34	39	38
TOTAL		**41**	**58.7**	**79.0**	**42.7**	**139.1**	**180.8**	**42**	**31**	**18**	**14**
Section	Outbound Segment	2006 Report			Existing (2015)			2006 Report		Existing (2015)	
		Distance (mi)	Uncongested	Existing (2006)	Distance (mi)	Average	Maximum	Uncongested	Existing (2006)	Average	Lowest
A	US158 SB - WMB to New Bridge	0	0	0	22.9	24.7	25.3	0	0	56	54
B	US158 SB - NC 12 to WMB	0	0	0	1.3	5.0	8.8	0	0	16	9
C	NC 12 NB - County Line to US158	0	0	0	9.9	26.4	37.1	0	0	23	16
D	NC 12 NB - New Bridge to County Line	0	0	0	8.6	13.8	15.3	0	0	37	34
TOTAL		**0**	**0**	**0**	**42.7**	**69.9**	**86.5**	**0**	**0**	**37**	**30**

NOTE: A Null value indicates not available data


Mid-Currituck Bridge
Count Locations
Turn Movement Counts (#)
Classification Counts (C-#)
0
5
10 Miles
Coinjock Bay
Barco
Coinjock
Aydlett
North River
Poplar Branch
Grandy
Dowdys Bay
Jarvisburg
Powells Point
Harbinger
Point Harbor
Corolla
Duck
Southern Shores
Kitty Hawk
BODIE ISLAND
C-1
C-2
C-3
C-4
C-5
C-6
C-7
C-8
C-9A
C-9B
C-10
C-11
C-12A
C-12B
C-13
C-14A
C-14B
C-16A
C-16B
57-1
57-2
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Appendix C

Forecast Documentation Tables

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C1. DESIGN FACTORS - K, D and HV (Dual,TT-ST,RV)

#	Location	Summer Weekday																		
		2015 Class Count				2015 Base Year No Build					2040 Future Year No Build / ER2					2040 Future Year Build Bridge w Tolls				
		K	D	Duals	TTSTs	K	D	Duals	TT-STs	RVs	K	D	Duals	TT-STs	RVs	K	D	Duals	TT-STs	RVs
C-1	US 158 at Intracoastal Waterway Bridge approach, North of SR 1405 Waterlily Rd	7.2%	52%	4.4%	2.7%	8%	55%	4%	2%	2%	8%	55%	4%	2%	2%	8%	55%	4%	2%	2%
C-2	US 158 North of NC 136 Macedonia Church Rd	7.2%	53%	4.2%	2.7%	8%	55%	4%	2%	2%	8%	55%	4%	2%	2%	8%	55%	4%	2%	2%
C-3	US 158 North of SR 1127 Garrenton Rd	7.4%	59%	2.8%	2.2%	8%	55%	4%	2%	2%	8%	55%	4%	2%	2%	8%	55%	4%	2%	2%
C-4	US 158 South of SR 1111 S Spot Rd	7.6%	64%	5.6%	2.3%	8%	55%	4%	2%	2%	8%	55%	4%	2%	2%	8%	55%	4%	2%	2%
C-5	US 158 - Wright Memorial Bridge approach, East of SR 1187 Holly Ln	6.8%	53%	4.5%	1.8%	8%	55%	4%	2%	2%	8%	55%	4%	2%	2%	8%	55%	4%	2%	2%
C-6	US 158 West of SR 1206 Dogwood Trail / The Woods Dr	7.6%	56%	4.9%	1.3%	8%	55%	4%	2%	2%	8%	55%	4%	2%	2%	8%	55%	4%	2%	2%
C-7	US 158 West of Juniper Trail	6.9%	55%	*10.1%*	*5.0%*	8%	55%	4%	2%	2%	8%	55%	4%	2%	2%	8%	55%	4%	2%	2%
C-8	US 158 East of NC 12 and West of Putter Ln	7.2%	50%	4.5%	2.9%	8%	55%	4%	2%	2%	8%	55%	4%	2%	2%	8%	55%	4%	2%	2%
C-9A	NC 12 North of Coastal Provision Market	7.0%	64%	6.9%	4.9%	8%	60%	2%	1%	4%	8%	60%	2%	1%	4%	8%	60%	2%	1%	4%
C-9B	NC 12 North of E Dogwood Trail	7.0%	63%	6.2%	4.4%	8%	60%	2%	1%	4%	8%	60%	2%	1%	4%	8%	60%	2%	1%	4%
C-10	NC 12 North of Sea Oats Trail	7.6%	58%	5.1%	1.1%	8%	60%	2%	1%	4%	8%	60%	2%	1%	4%	8%	60%	2%	1%	4%
C-11	NC 12 North of SR 1409 Christopher Dr	7.4%	57%	6.9%	1.7%	8%	60%	2%	1%	4%	8%	60%	2%	1%	4%	8%	60%	2%	1%	4%
C-14A	NC 12 South of Audubon Dr (Hampton Inn Hotel)	9.1%	57%	5.4%	1.0%	8%	60%	2%	1%	4%	8%	60%	2%	1%	4%	8%	60%	2%	1%	4%
C-14B	NC 12 South of Hunt Club Dr / Spindrift Trail	7.8%	50%	9.0%	1.2%	8%	60%	2%	1%	4%	8%	60%	2%	1%	4%	8%	60%	2%	1%	4%
C-12B	NC 12 North of Currituck Clubhouse Rd / Schooner Ridge Rd	7.8%	54%	4.6%	0.2%	8%	55%	2%	1%	4%	8%	55%	2%	1%	4%	8%	55%	2%	1%	4%
C-12A	NC 12 North of SR 1402 Albacore St	7.3%	51%	6.8%	4.1%	8%	55%	2%	1%	4%	8%	55%	2%	1%	4%	8%	55%	2%	1%	4%
C-13	NC 12 South of Devil's Bay / Herring St	8.7%	50%	*47.9%*	*0.1%*	8%	55%	2%	0%	5%	8%	55%	2%	0%	5%	8%	55%	2%	0%	5%
C-16B	NC 12 North of SR 1409 Shad St	8.8%	53%	4.2%	0.1%	8%	55%	2%	0%	5%	8%	55%	2%	0%	5%	8%	55%	2%	0%	5%
C-16A	NC 12 North of High Dune Loop near end of paved NC 12 beach access	10.1%	58%	30.7%	0.0%	8%	55%	1%	0%	8%	8%	55%	1%	0%	8%	8%	55%	1%	0%	8%

- suspect data

C1. DESIGN FACTORS - K, D and HV (Dual,TT-ST,RV)

#	Location	Summer Weekend																		
		2015 Class Count				2015 Base Year No Build					2040 Future Year No Build / ER2					2040 Future Year Build w Tolls				
		K	D	Duals	TT-STs	K	D	Duals	TT-STs	RVs	K	D	Duals	TT-STs	RVs	K	D	Duals	TT-STs	RVs
C-1	US 158 at Intracoastal Waterway Bridge approach, North of SR 1405 Waterlily Rd	9.9%	51%	2.0%	1.3%	9%	55%	2%	1%	2%	8%	55%	2%	1%	2%	8%	55%	2%	1%	2%
C-2	US 158 North of NC 136 Macedonia Church Rd	9.7%	51%	2.4%	1.2%	9%	55%	2%	1%	2%	8%	55%	2%	1%	2%	9%	55%	2%	1%	2%
C-3	US 158 North of SR 1127 Garrenton Rd	9.9%	54%	1.0%	1.1%	9%	55%	2%	1%	2%	8%	55%	2%	1%	2%	9%	55%	2%	1%	2%
C-4	US 158 South of SR 1111 S Spot Rd	9.9%	51%	1.5%	0.9%	9%	55%	2%	1%	2%	8%	55%	2%	1%	2%	9%	55%	2%	1%	2%
C-5	US 158 - Wright Memorial Bridge approach, East of SR 1187 Holly Ln	9.2%	51%	3.0%	1.2%	9%	55%	2%	1%	2%	8%	55%	2%	1%	2%	9%	55%	2%	1%	2%
C-6	US 158 West of SR 1206 Dogwood Trail / The Woods Dr	8.4%	50%	4.0%	1.3%	9%	55%	2%	1%	2%	8%	55%	2%	1%	2%	9%	55%	2%	1%	2%
C-7	US 158 West of Juniper Trail	7.6%	56%	6.9%	5.5%	8%	55%	3%	2%	2%	7%	55%	3%	2%	2%	8%	55%	3%	2%	2%
C-8	US 158 East of NC 12 and West of Putter Ln	7.5%	58%	2.8%	2.0%	8%	55%	3%	2%	2%	7%	55%	3%	2%	2%	8%	55%	3%	2%	2%
C-9A	NC 12 North of Coastal Provision Market	*10.8%*	*59%*	4.4%	3.1%	8%	60%	2%	1%	4%	7%	60%	2%	1%	4%	8%	55%	2%	1%	4%
C-9B	NC 12 North of E Dogwood Trail	*9.8%*	*75%*	4.9%	3.7%	8%	60%	2%	1%	4%	7%	60%	2%	1%	4%	8%	55%	2%	1%	4%
C-10	NC 12 North of Sea Oats Trail	8.1%	58%	3.9%	1.1%	8%	60%	2%	1%	4%	7%	60%	2%	1%	4%	8%	55%	2%	1%	4%
C-11	NC 12 North of SR 1409 Christopher Dr	7.5%	59%	6.4%	1.4%	8%	60%	2%	1%	4%	7%	60%	2%	1%	4%	8%	55%	2%	1%	4%
C-14A	NC 12 South of Audubon Dr (Hampton Inn Hotel)	7.8%	66%	3.8%	0.5%	8%	60%	2%	1%	4%	7%	60%	2%	1%	4%	8%	55%	2%	1%	4%
C-14B	NC 12 South of Hunt Club Dr / Spindrift Trail	7.5%	52%	6.7%	0.6%	8%	60%	2%	1%	4%	7%	60%	2%	1%	4%	8%	55%	2%	1%	4%
C-12B	NC 12 North of Currituck Clubhouse Rd / Schooner Ridge Rd	6.7%	51%	3.4%	0.1%	7%	60%	2%	1%	4%	7%	60%	2%	1%	4%	8%	55%	2%	1%	4%
C-12A	NC 12 North of SR 1402 Albacore St	6.3%	52%	5.9%	3.9%	7%	60%	2%	1%	4%	7%	60%	2%	1%	4%	8%	60%	2%	1%	4%
C-13	NC 12 South of Devil's Bay / Herring St	7.7%	56%	*47.4%*	*0.1%*	8%	60%	1%	0%	6%	7%	60%	1%	0%	6%	7%	60%	1%	0%	6%
C-16B	NC 12 North of SR 1409 Shad St	9.7%	54%	3.6%	0.0%	8%	60%	1%	0%	6%	7%	60%	1%	0%	6%	7%	60%	1%	0%	6%
C-16A	NC 12 North of High Dune Loop near end of paved NC 12 beach access	6.8%	66%	10.5%	0.0%	7%	60%	1%	0%	10%	7%	60%	1%	0%	10%	7%	60%	1%	0%	10%

- suspect data

C2. HISTORIC AADTs - 1990 through 2014

Location	ANNUAL AVERAGE DAILY TRAFFIC (AADT)																									GROWTH RATE (AGR)		
	1990	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	1990-2002	2002-2007	2007-2014
US 158																												
South of SR 1247 Barco Rd	**7,300**	7,900	8,800	10,300	7,900	8,600	0	8,400	9,200	11,000	12,000	11,000	**10,000**	10,000	11,000	10,000	11,000	**11,000**	10,000	8,700	8,900	10,000	10,000	9,000	**12,000**	2.7%	1.9%	1.3%
West of NC 168	**3,500**	3,800	4,200	5,700	4,800	5,300	5,300	5,000	5,900	6,000	6,000	6,600	**7,500**	6,900	7,100	6,400	7,100	**6,400**	6,200	5,200	5,500	6,000	6,000	**5,100**		6.6%	-3.1%	-3.7%
North of SR 1405 Waterlilly Rd													**17,000**	15,000	15,000	14,000		**15,000**	14,000	12,000	12,000	14,000	14,000	**12,000**		-	-2.5%	-3.7%
South of SR 1146 Swains Ln	**7,200**	10,800	11,600	13,400	14,500	13,100	11,900	10,900	14,000	16,000	15,000	20,000	**18,000**	17,000	15,000	16,000	17,000	**17,000**	16,000	13,000	14,000	15,000	15,000	15,000	**17,000**	7.9%	-1.1%	0.0%
North of NC 136 Macedonia Church Rd	**7,500**	9,500	9,400	11,800	9,400	12,600	10,500	8,700	11,000	14,000	14,000	16,000	**15,000**	13,000	14,000	14,000	13,000	**13,000**	13,000	11,000	11,000	12,000	12,000	11,000	**14,000**	5.9%	-2.8%	1.1%
South of NC 136 Macedonia Church Rd	**7,200**	9,000	9,900	12,400	12,000	13,500	11,500	9,300	11,000	12,000	14,000	19,000	**15,000**	13,000	14,000	14,000	14,000	**13,000**	12,000	11,000	11,000	12,000	12,000	13,000	**14,000**	6.3%	-2.8%	1.1%
West of SR 1131 Poplar Branch Rd													**17,000**	20,000	18,000	15,000	16,000	**16,000**	16,000	15,000	13,000	16,000	16,000	15,000	**18,000**	-	-1.2%	1.7%
North of SR 1120 Newberns Landing Rd	**8,000**	8,400	9,300	10,000	10,600	10,900	12,800	12,200	16,000	14,000	16,000	18,000	**18,000**	16,000	16,000	15,000	18,000	**16,000**	14,000	13,000	12,000	14,000	14,000	14,000	**16,000**	7.0%	-2.3%	0.0%
South of SR 1111 S Spot Rd	**9,800**	10,800	12,000	12,600	13,100	13,700	14,800	13,800	13,000	15,000	17,000	20,000	**19,000**	17,000	16,000	16,000	18,000	**17,000**	17,000	14,000	13,000	15,000	15,000	**15,000**		5.7%	-2.2%	-2.1%
East of SR 1100 S Albtuck Rd (WMB)	**10,000**	10,400	12,400	12,700	13,600	13,500	13,000	12,500	16,000	16,000	18,000	21,000	**21,000**	18,000	19,000	18,000	20,000	**18,000**	17,000	16,000	14,000	16,000	16,000	**16,000**		6.4%	-3.0%	-1.9%
North of SR 1127 Garrenton Rd	**8,900**	11,100	11,900	12,700	14,000	12,700	11,400	12,200	14,000	14,000	16,000	18,000	**18,000**	18,000	16,000	16,000	17,000	**16,000**	14,000	14,000	12,000	14,000	14,000	**14,000**		6.0%	-2.3%	-2.2%
South of SR 1405	**8,700**	9,600	9,800	11,700	11,600	11,900	12,900	0	15,000	14,000	14,000	17,000	**14,000**	14,000	15,000	15,000	16,000	**15,000**	14,000	11,000	12,000	13,000	13,000	**12,000**		4.0%	1.4%	-3.7%
South of SR 1217 Collington Rd													**39,000**	43,000	40,000	35,000	34,000	**36,000**	40,000	32,000	28,000	26,000	34,000	**34,000**		-	-1.6%	-0.9%
South of SR 1493	**20,000**	21,100	24,200	22,700	24,000	24,000	27,200	20,700	30,000	25,000	30,000	27,000	**29,000**	29,000	30,000	26,000	30,000	**27,000**	28,000	23,000	21,000	24,000	24,000	**23,000**		3.1%	-1.4%	-2.6%
West of SR 1418	**18,100**	16,700	18,400	18,000	20,200	19,800	24,500	20,700	23,000	24,000	28,000	28,000	**23,000**	23,000	25,000	23,000	25,000	**23,000**	26,000	21,000	22,000	21,000	21,000	25,000	**26,000**	2.0%	0.0%	1.8%
South of SR 1206 Kitty Hawk Rd													**35,000**	37,000	34,000	31,000	36,000	**32,000**	33,000	27,000	24,000	27,000	27,000	27,000	**23,000**	-	-1.8%	-4.6%
NC 12																												
South of SR 1206 Kitty Hawk Rd													**4,900**	5,300	4,000	4,200	4,300	**4,900**	4,200	3,000	3,200	3,700	3,600	**3,600**		-	0.0%	-5.0%
South of SR 1217 Collington Rd													**6,900**	6,100	6,900	6,400	5,800	**7,000**	5,800	4,900	4,600	5,500	5,300	7,300	**6,700**	-	0.3%	-0.6%
South of SR 1205 Kitty Hawk Fishing Pier Rd	**2,700**	2,900	3,200	3,300		3,700	4,100	3,600	11,000	2,600	4,100	3,400	**4,100**	3,200	3,300	3,300	3,300	**3,900**	3,700	2,800	3,200	3,900	3,900	3,100	**5,300**	3.5%	-1.0%	4.5%
South of Skyline Rd		**21,100**	19,600	19,600	21,900	22,000	20,200	20,000	17,000	11,000	18,000	15,000	**15,000**	18,000		14,000	15,000	**15,000**	15,000	11,000	9,900	13,000	12,000	**12,000**		-3.1%	0.0%	-3.7%
North of Bias Ln		**15,700**	15,000	15,000	13,400	14,100	15,300	15,000	16,000	9,600	16,000	10,000	**12,000**	15,000	14,000	11,000	14,000	**13,000**	13,000	9,500	9,000		11,000	8,900	**10,000**	-2.4%	1.6%	-3.7%
South of SR 1479 Widgeon Dr		**15,400**	15,300	15,300	14,700	15,000	13,900	13,500	12,000	6,800	12,000	7,500	**11,000**	11,000	11,000	9,900	10,000	**11,000**	9,500	5,500	6,500	7,900	5,300	**6,800**		-3.0%	0.0%	-7.7%
North of Ogein Dr																				**3,900**			5,900		**6,300**	-	-	10.1%
South of SR 1402 Albacore St																				**3,700**					**6,400**	-	-	11.6%
OTHER SIDE STREETS																												
SR 1140 Aydlett Rd East of US 158	0	**750**	0	900	0	900	0	490	0	890	0	800	**1,100**	0	1,100	0	**1,100**	0	1,200	0	1,000	0	**1,100**	0	0	3.5%	0.0%	0.0%
SR 1131 Poplar Branch Rd North of US 158	0	**1,900**	0	2,100	0	2,300	0	2,100	0	2,700	0	**2,900**	0	2,800	0	2,800	0	**3,000**	0	2,600	0	3,200	0	**3,000**	0	4.3%	0.6%	0.0%
SR 1186 Walnut Island Blvd East of US 158	0	0	0	0	0	0	0	0	0	0	0	0	0	**1,800**	0	1,900	0	**1,900**	0	1,800	0	1,800	0	**1,700**	0	-	1.4%	-1.8%
SR 1118 Forbes Rd East of US 158	0	**300**	0	230	0	290	0	250	0	320	0	**340**	0	410	0	510	0	**560**	0	440	0	460	0	**430**	0	1.3%	8.7%	-4.3%
SR 1405 Waterlilly Rd South of SR 1141	0	0	0	0	0	0	0	0	0	0	0	0	0	**950**	0	1,000	0	**1,100**	0	1,000	0	1,100	0	**950**	0	-	3.7%	-2.4%
SR 1206 The Woods Rd South of US 158	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**2,700**	0	0	**3,000**	0	0	-	-	3.6%
SR 1275 White St East of US 158	0	0	0	0	0	0	0	0	0	0	0	0	0	**550**	0	410	0	**470**	0	360	0	380	0	**450**	0	-	-3.9%	-0.7%

AADTs used for calculating annualized growth rate are shown in bold

C3. HISTORIC COUNT - Wright Memorial Bridge ATR (A2703)

Year	Avg Summer Saturday	Avg Summer Weekend	Avg Summer Weekday	Avg Non-Summer Weekend	Avg Non-Summer Weekday	Avg Annual Daily	*NCDOT Published AADT*
1997	29,219	26,802	17,227	15,537	12,954	15,346	*12,500*
1998	34,205	30,857	19,471	18,126	14,151	17,350	*16,000*
1999	33,213	29,380	19,657	17,573	15,181	18,095	*16,000*
2000	36,450	33,277	19,948	18,168	15,500	17,519	*18,000*
2001	34,441	30,687	20,565	17,359	16,454	18,325	*21,000*
2002	38,789	34,845	22,536	16,997	16,908	18,962	*21,000*
2003	37,453	33,755	23,482	19,268	18,028	20,425	*18,000*
2004	37,643	33,373	24,016	19,707	18,718	20,953	*19,000*
2005	39,868	34,974	23,914	18,590	18,570	20,718	*18,000*
2006	38,802	34,106	22,942	19,144	18,238	20,530	*20,000*
2007	39,738	34,902	22,941	20,359	18,119	20,806	*18,000*
2008	37,243	32,622	21,156	18,868	16,782	19,353	*17,000*
2009	36,660	33,002	22,027	19,292	16,375	19,197	*16,000*
2010	38,183	33,759	22,160	19,483	16,576	19,724	*14,000*
2011	38,746	33,604	21,526	17,130	16,233	18,876	*16,000*
2012	38,320	34,202	21,651	18,383	16,327	19,013	*16,000*
2013	37,507	33,756	21,798	20,432	17,053	20,547	*16,000*
2014	38,998	35,465	22,704	-	-	-	-
2015	40,581	36,989	23,221	-	-	-	-

ATR A2703 Data Availability

Year	Summer Saturday	Summer Weekend	Summer Weekday	Non-Summer Weekend	Non-Summer Weekday	All Days
1997	92%	96%	98%	99%	91%	94%
1998	77%	73%	80%	67%	66%	69%
1999	100%	100%	100%	61%	67%	74%
2000	46%	46%	70%	70%	86%	77%
2001	77%	85%	86%	88%	91%	89%
2002	69%	73%	74%	83%	87%	83%
2003	100%	100%	100%	97%	98%	99%
2004	100%	100%	98%	97%	99%	99%
2005	100%	96%	100%	97%	99%	99%
2006	100%	100%	100%	91%	93%	94%
2007	100%	100%	100%	91%	91%	93%
2008	100%	100%	100%	85%	86%	89%
2009	100%	100%	98%	99%	100%	99%
2010	100%	100%	98%	83%	84%	88%
2011	100%	100%	100%	88%	87%	91%
2012	100%	100%	100%	96%	99%	99%
2013	100%	100%	98%	60%	62%	71%
2014	85%	85%	76%	13%	10%	28%
2015	62%	62%	64%	45%	44%	49%

Note: Limited data available for 2014 and 2015 due to maintenance

C4. GROWTH RATE - Zonal Trips

	Summer Weekday			Summer Weekend		
Zone	2015 Base Yr	2040 Future Yr	Annualized Growth Rate	2015 Base Yr	2040 Future Yr	Annualized Growth Rate
A1	3,700	5,510	**1.61%**	4,200	6,260	**1.61%**
A2	7,000	10,430	**1.61%**	18,500	27,570	**1.61%**
B	1,240	1,720	**1.32%**	1,020	1,420	**1.33%**
C	2,100	2,920	**1.33%**	2,300	3,200	**1.33%**
D	960	1,330	**1.31%**	1,080	1,500	**1.32%**
E	1,560	2,170	**1.33%**	1,640	2,280	**1.33%**
F	4,660	5,960	**0.99%**	5,640	7,220	**0.99%**
G	7,740	9,910	**0.99%**	11,640	14,900	**0.99%**
H	18,400	24,100	**1.09%**	25,000	34,500	**1.30%**
I	2,600	3,330	**0.99%**	2,700	3,460	**1.00%**
J	2,180	2,570	**0.66%**	2,760	3,250	**0.66%**
K	2,420	2,930	**0.77%**	3,100	3,690	**0.70%**
L	2,020	2,220	**0.38%**	2,320	2,520	**0.33%**
M	1,140	1,260	**0.40%**	1,440	1,590	**0.40%**
N1	3,120	6,120	**2.73%**	3,920	7,100	**2.40%**
N2	3,480	8,280	**3.53%**	4,280	9,480	**3.23%**
O1	2,210	2,430	**0.38%**	2,800	3,060	**0.36%**
O2	3,830	4,110	**0.28%**	4,130	4,390	**0.24%**
P	1,500	1,800	**0.73%**	1,850	2,160	**0.62%**
Total	***71,860***	***99,100***	***1.29%***	***100,320***	***139,550***	***1.33%***

Projected Land Use Growth and Trip Growth along NC 12 zones

Zone	2014 Existing Units	2040 Maximum Build out Units	2014 to 2040 Additional Units	Projected Growth Units	Forecast Sum Weekday Trip Growth	Forecast Sum Weekend Trip Growth
P	731	854	123	17%	20%	17%
O1, O2	1,577	1,750	173	11%	8%	8%
N1, N2	2,337	5,119	2,782	119%	118%	102%
L, M	1,883	1,999	116	6%	10%	9%
J, K	3,037	3,400	363	12%	20%	18%
Total	***9,565***	***13,122***	***3,557***	***37%***	***45%***	***40%***

C5. BUILD BRIDGE FORECAST - Trip Diversion

District 1 -	West of Wright Memorial Bridge	- Zones A1, A2, B, C, D, E
District 2 -	South of US 158-NC 12 intersection and Wright Memorial Bridge	- Zones F, G, H, I
District 3 -	North of US 158-NC 12 intersection and county line	- Zones J, K, L, M
District 4 -	North of county line	- Zones N1, N2, O1, O2, P

Total Trips (2040)

Summer Weekday

District	1	2	3	4	Total
1	6,880	10,370	2,100	4,730	24,080
2	10,370	21,740	4,340	6,850	43,300
3	2,100	4,340	1,000	1,540	8,980
4	4,730	6,850	1,540	9,620	22,740
Total	24,080	43,300	8,980	22,740	**99,100**

Summer Weekend

District	1	2	3	4	Total
1	7,640	21,420	3,930	9,240	42,230
2	21,420	28,700	3,960	6,000	60,080
3	3,930	3,960	1,840	1,320	11,050
4	9,240	6,000	1,320	9,630	26,190
Total	42,230	60,080	11,050	26,190	**139,550**

Trips using Mid-Currituck Bridge (2040 Build Bridge without Tolls Scenario)

Summer Weekday

District	1	2	3	4	Total
1	0	0	1,140	4,710	5,850
2	0	0	0	110	110
3	1,140	0	0	0	1,140
4	4,710	110	0	0	4,820
Total	5,850	110	1,140	4,820	**11,920**

Summer Weekend

District	1	2	3	4	Total
1	0	0	2,540	9,220	11,760
2	0	0	0	99	99
3	2,540	0	0	0	2,540
4	9,218	99	0	0	9,317
Total	11,759	99	2,540	9,319	**23,717**

Percentage of Total

District	1	2	3	4	Total
1	0%	0%	54%	100%	24%
2	0%	0%	0%	2%	0%
3	54%	0%	0%	0%	13%
4	100%	2%	0%	0%	21%
Total	24%	0%	13%	21%	**12%**

District	1	2	3	4	Total
1	0%	0%	65%	100%	28%
2	0%	0%	0%	2%	0%
3	65%	0%	0%	0%	23%
4	100%	2%	0%	0%	36%
Total	28%	0%	23%	36%	**17%**

Trips using Mid-Currituck Bridge (2040 Build Bridge with Tolls Scenario)

Summer Weekday

District	1	2	3	4	Total
1	0	0	0	4,230	4,230
2	0	0	0	0	0
3	0	0	0	0	0
4	4,230	0	0	0	4,230
Total	4,230	0	0	4,230	**8,460**

Summer Weekend

District	1	2	3	4	Total
1	0	0	0	8,930	8,930
2	0	0	0	0	0
3	0	0	0	0	0
4	8,930	0	0	0	8,930
Total	8,930	0	0	8,930	**17,860**

Percentage of Total

District	1	2	3	4	Total
1	0%	0%	0%	89%	18%
2	0%	0%	0%	0%	0%
3	0%	0%	0%	0%	0%
4	89%	0%	0%	0%	19%
Total	18%	0%	0%	19%	**9%**

District	1	2	3	4	Total
1	0%	0%	0%	97%	21%
2	0%	0%	0%	0%	0%
3	0%	0%	0%	0%	0%
4	97%	0%	0%	0%	34%
Total	21%	0%	0%	34%	**13%**

C6. TOLL ASSIGNMENT - Tolls and Value of Time (VOT)

A generalized cost function was used in TransCAD for trip assignment.

The function is based on BPR delay function and calculates cost for each link, i, as:

$$Cost_i = Toll_i + VOT \times FF\,Time_i \left[1 + \propto_i \left(\frac{volume_i}{capacity_i}\right)^{\beta_i}\right]$$

Dividing both sides by VOT, a ratio of toll to VOT becomes the determining factor along with standard volume based delay.

Alternatively, the ratio of toll to VOT can be interpreted as equivalent minutes of travel time or delay.

Traffic volume and revenue curves for different Value of Time (VOT) and toll (daily) were generated as shown below.

Based on revenue curve, a value to the left of the peak representing about 90% of maximum revenue was used.

This translates to about 30 minutes of time equivalent for daily toll rate for both Summer Weekday and Weekend.

Tables below summarize toll, Value of Time (VOT), equivalent delay and traffic volume on mid-Currituck bridge

Summer Weekday

Equiv. min of delay		Value of Time, VOT ($/hr)		
Traffic vol on MCB		$12	$20	$28
Toll ($)	$0	*0.0* 11,920	*0.0* 11,920	*0.0* 11,920
	$6	***30.0*** **8,460**	*18.0* 9,080	*12.9* 10,000
	$10	*50.0* 4,510	*30.0* 8,460	*21.4* 8,800
	$14	*70.0* 670	*42.0* 5,840	*30.0* 8,460

Summer Weekend

Equiv. min of delay		Value of Time, VOT ($/hr)		
Traffic vol on MCB		$12	$20	$28
Toll ($)	$0	*0.0* 23,720	*0.0* 23,720	*0.0* 23,720
	$6	*30.0* 17,860	*18.0* 19,390	*12.9* 21,040
	$10	*50.0* 12,520	***30.0*** **17,860**	*21.4* 19,000
	$14	*70.0* 8,870	*42.0* 14,310	*30.0* 17,860

Tables for generating traffic and revenue curves.

DAY	TOLL	VOT	Time Equiv	MCB_VOL	WMB_VOL	Revenue
Weekend	$0	$12	0	23,717	45,859	$0
Weekend	$1	$12	5	21,280	47,900	$21,280
Weekend	$2	$12	10	21,040	48,140	$42,080

DAY	TOLL	VOT	Time Equiv	MCB_VOL	WMB_VOL	Revenue
Weekday	$0	$12	0	11,920	22,920	$0
Weekday	$1	$12	5	10,480	23,920	$10,480
Weekday	$2	$12	10	10,000	24,400	$20,000

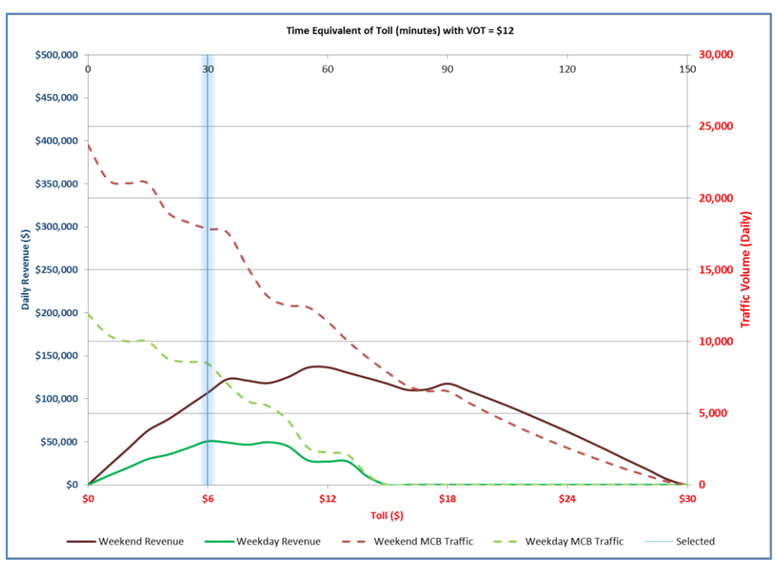
DAY	TOLL	VOT	Time Equiv	MCB_VOL	WMB_VOL	Revenue
Weekend	$0	$20	0	23,717	45,859	$0
Weekend	$1	$20	3	21,802	47,378	$21,802
Weekend	$2	$20	6	21,280	47,900	$42,560

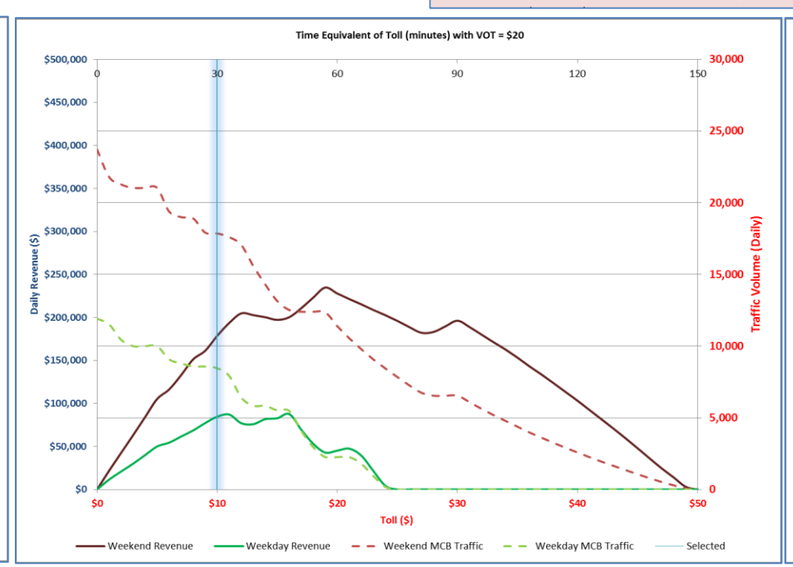
DAY	TOLL	VOT	Time Equiv	MCB_VOL	WMB_VOL	Revenue
Weekday	$0	$20	0	11,920	22,920	$0
Weekday	$1	$20	3	11,520	22,880	$11,520
Weekday	$2	$20	6	10,440	23,960	$20,880

DAY	TOLL	VOT	Time Equiv	MCB_VOL	WMB_VOL	Revenue
Weekend	$0	$28	0	23,717	45,859	$0
Weekend	$1	$28	2	22,291	46,949	$22,291
Weekend	$2	$28	4	21,280	47,900	$42,560
Weekend	$3	$28	6	21,220	47,960	$63,660
Weekend	$4	$28	9	21,040	48,140	$84,160
Weekend	$5	$28	11	21,040	48,140	$105,200
Weekend	$6	$28	13	21,040	48,140	$126,240
Weekend	$7	$28	15	21,040	48,140	$147,280
Weekend	$8	$28	17	19,975	49,205	$159,797
Weekend	$9	$28	19	19,000	50,180	$171,000
Weekend	$10	$28	21	19,000	50,180	$190,000
Weekend	$11	$28	24	18,980	50,200	$208,785
Weekend	$12	$28	26	17,920	51,260	$215,040
Weekend	$13	$28	28	17,920	51,260	$232,960
Weekend	$14	$28	30	17,860	51,320	$250,040
Weekend	$15	$28	32	17,860	51,320	$267,900
Weekend	$16	$28	34	17,600	51,580	$281,600
Weekend	$17	$28	36	16,839	52,341	$286,255
Weekend	$18	$28	39	15,791	53,389	$284,231
Weekend	$19	$28	41	14,833	54,347	$281,823
Weekend	$20	$28	43	13,964	55,216	$279,273
Weekend	$21	$28	45	13,147	56,033	$276,087
Weekend	$22	$28	47	12,520	56,660	$275,440
Weekend	$23	$28	49	12,520	56,660	$287,960
Weekend	$24	$28	51	12,400	56,780	$297,600
Weekend	$25	$28	54	12,400	56,780	$310,000
Weekend	$26	$28	56	12,400	56,780	$322,400
Weekend	$27	$28	58	12,063	57,117	$325,701
Weekend	$28	$28	60	11,391	57,789	$318,942
Weekend	$29	$28	62	10,774	58,406	$312,447

DAY	TOLL	VOT	Time Equiv	MCB_VOL	WMB_VOL	Revenue
Weekday	$0	$28	0	11,920	22,920	$0
Weekday	$1	$28	2	11,684	22,716	$11,684
Weekday	$2	$28	4	10,755	23,645	$21,510
Weekday	$3	$28	6	10,440	23,960	$31,320
Weekday	$4	$28	9	10,120	24,280	$40,480
Weekday	$5	$28	11	10,000	24,400	$50,000
Weekday	$6	$28	13	10,000	24,400	$60,000
Weekday	$7	$28	15	10,000	24,400	$70,000
Weekday	$8	$28	17	9,611	24,789	$76,885
Weekday	$9	$28	19	8,965	25,435	$80,683
Weekday	$10	$28	21	8,800	25,600	$88,000
Weekday	$11	$28	24	8,580	25,820	$94,380
Weekday	$12	$28	26	8,580	25,820	$102,960
Weekday	$13	$28	28	8,460	25,940	$109,980
Weekday	$14	$28	30	8,460	25,940	$118,440
Weekday	$15	$28	32	7,920	26,480	$118,800
Weekday	$16	$28	34	7,483	26,917	$119,726
Weekday	$17	$28	36	6,175	28,225	$104,978
Weekday	$18	$28	39	5,840	28,560	$105,120
Weekday	$19	$28	41	5,840	28,560	$110,960
Weekday	$20	$28	43	5,767	28,633	$115,347
Weekday	$21	$28	45	5,520	28,880	$115,920
Weekday	$22	$28	47	5,520	28,880	$121,440
Weekday	$23	$28	49	4,830	29,570	$111,094
Weekday	$24	$28	51	3,909	30,491	$93,823
Weekday	$25	$28	54	3,099	31,301	$77,475
Weekday	$26	$28	56	2,362	32,038	$61,417
Weekday	$27	$28	58	2,260	32,140	$61,020
Weekday	$28	$28	60	2,260	32,140	$63,280
Weekday	$29	$28	62	2,260	32,140	$65,540

Charts below show traffic and revenue as a function of toll for 3 different VOT ($12, $20, and $28)





C7. LINK VOLUMES

			2015 Base Year No Build					2015 Build Bridge (no Tolls)*					2015 Build Bridge (with Tolls)*				
Link #	Route	Between	AADT	Non-Summer Weekday	Non-Summer Weekend	Summer Weekday	Summer Weekend	AADT	Non-Summer Weekday	Non-Summer Weekend	Summer Weekday	Summer Weekend	AADT	Non-Summer Weekday	Non-Summer Weekend	Summer Weekday	Summer Weekend
1	US 158	Barco and Mid-Currituck Bridge	17,400	14,900	16,900	19,600	43,600	17,300	14,700	16,700	19,400	43,400	17,300	14,700	16,700	19,400	43,400
2	US 158	Mid-Currituck Bridge and Grandy	16,400	14,000	15,800	18,400	43,000	14,100	12,000	13,600	15,800	30,400	15,100	12,900	14,600	17,000	34,000
3	US 158	Grandy and Powells Point	18,600	15,900	18,000	20,900	44,900	14,000	11,900	13,500	15,700	30,900	16,000	13,700	15,500	18,000	35,200
4	US 158	Powells Point and Point Harbor	21,000	17,900	20,300	23,600	47,400	14,400	12,300	13,900	16,200	31,000	16,700	14,300	16,200	18,800	35,600
5	**US 158**	**Wright Memorial Bridge**	**21,000**	**17,900**	**20,300**	**23,600**	**47,400**	**15,600**	**13,300**	**15,100**	**17,500**	**32,300**	**18,200**	**15,500**	**17,500**	**20,400**	**37,200**
6	US 158	Barlow Lane and Cypress Knee Trail	21,800	18,600	21,100	24,500	47,900	20,400	17,400	19,700	22,900	37,900	23,000	19,600	22,200	25,800	42,800
7	US 158	Cypress Knee Trail and NC 12	29,500	25,200	28,600	33,200	55,600	27,000	23,000	26,100	30,300	46,900	29,500	25,200	28,600	33,200	51,800
8	US 158	south of NC 12 and Eckner St	33,300	28,400	32,200	37,400	50,200	32,800	28,000	31,600	36,800	50,000	32,800	28,000	31,600	36,800	50,000
9A	NC 12	US 158 and Dogwood Trail	19,800	16,900	19,100	22,200	27,400	15,400	13,100	14,900	17,300	15,900	18,000	15,400	17,400	20,200	20,800
9B	NC 12	Dogwood Trail and Sea Oats Trail	17,900	15,300	17,300	20,100	26,700	13,300	11,300	12,800	14,900	13,500	15,800	13,500	15,300	17,800	18,400
10	NC 12	Sea Oats Trail and Christopher Dr	16,000	13,700	15,500	18,000	24,500	12,000	10,300	11,600	13,500	13,600	13,200	11,200	12,700	14,800	14,800
11	NC 12	Christopher Dr and Audubon Dr	12,600	10,800	12,200	14,200	20,900	10,900	9,300	10,600	12,300	13,800	10,700	9,100	10,300	12,000	11,800
14	NC 12	Audubon Dr and Currituck Clubhouse Rd	12,200	10,400	11,800	13,700	20,600	10,200	8,700	9,900	11,500	13,200	9,400	8,100	9,100	10,600	9,200
12B	NC 12	Currituck Clubhouse Rd and Albacore St	13,600	11,600	13,200	15,300	20,200	12,600	10,800	12,200	14,200	18,700	10,900	9,300	10,500	12,200	14,600
12A	NC 12	Albacore St and Mid-Currituck Bridge	10,500	9,000	10,100	11,800	14,300	13,200	11,200	12,700	14,800	18,300	10,900	9,300	10,500	12,200	13,700
13	NC 12	northern end of NC 12	9,500	8,100	9,200	10,700	12,700	9,200	7,800	8,900	10,300	11,400	9,200	7,800	8,900	10,300	11,400
15	**MCB**	**US 158 and NC 12**	**-**	**-**	**-**	**-**	**-**	**5,400**	**4,600**	**5,200**	**6,100**	**15,100**	**2,800**	**2,400**	**2,800**	**3,200**	**10,200**

Daily Traffic Volume Conversion factor	Factor
AADT / Avg Summer Weekday	0.89
Avg Non-Summer Weekday / Avg Summer Weekday	0.76
Avg Non-Summer Weekend / Avg Summer Weekday	0.86
Avg Non-Summer Saturday / Avg Summer Weekday	0.96
Avg Summer Weekend / Avg Summer Weekday	1.54
Avg Summer Saturday / Avg Summer Weekday	1.74

Based on Wright Memorial Bridge ATR (A2703) data
2008 through 2012

Note:
2015 Existing Summer Weekday and Summer Weekend are based on weighted average link volumes from balanced traffic forecast sheets
* 2015 Build Bridge (both with and without tolls) Summer Weekday and Summer Weekend are from TransCAD tool
AADT, Non-Summer Weekday and Non-Summer Weekend are based on traffic conversion factors applied to Summer Weekday

C7. LINK VOLUMES

			2040 No Build / ER2					2040 Build Bridge (no Tolls)*					2040 Build Bridge (with Tolls)				
Link #	Route	Between	AADT	Non-Summer Weekday	Non-Summer Weekend	Summer Weekday	Summer Weekend	AADT	Non-Summer Weekday	Non-Summer Weekend	Summer Weekday	Summer Weekend	AADT	Non-Summer Weekday	Non-Summer Weekend	Summer Weekday	Summer Weekend
1	US 158	Barco and Mid-Currituck Bridge	26,100	22,300	25,200	29,300	64,200	25,500	21,700	24,600	28,600	64,300	26,100	22,300	25,200	29,300	64,200
2	US 158	Mid-Currituck Bridge and Grandy	24,700	21,100	23,900	27,800	63,200	19,600	16,700	18,900	22,000	43,700	18,900	16,100	18,200	21,200	47,000
3	US 158	Grandy and Powells Point	27,300	23,300	26,400	30,700	66,200	18,900	16,100	18,200	21,200	44,300	20,300	17,300	19,600	22,800	48,800
4	US 158	Powells Point and Point Harbor	30,600	26,100	29,600	34,400	69,200	19,300	16,500	18,700	21,700	44,200	23,100	19,800	22,400	26,000	51,400
5	**US 158**	**Wright Memorial Bridge**	**30,600**	**26,100**	**29,600**	**34,400**	**69,200**	**20,400**	**17,400**	**19,700**	**22,900**	**45,900**	**23,100**	**19,800**	**22,400**	**26,000**	**51,400**
6	US 158	Barlow Lane and Cypress Knee Trail	31,600	27,000	30,500	35,500	69,900	26,100	22,300	25,200	29,300	52,100	24,200	20,700	23,400	27,200	52,300
7	US 158	Cypress Knee Trail and NC 12	41,400	35,300	40,000	46,500	79,400	34,600	29,600	33,500	38,900	62,900	34,600	29,600	33,500	38,900	63,600
8	US 158	south of NC 12 and Eckner St	43,100	36,800	41,600	48,400	69,400	42,900	36,600	41,500	48,200	69,000	43,100	36,800	41,600	48,400	69,400
9A	NC 12	US 158 and Dogwood Trail	30,000	25,600	29,000	33,700	42,200	21,400	18,300	20,700	24,100	22,500	23,200	19,800	22,400	26,100	26,400
9B	NC 12	Dogwood Trail and Sea Oats Trail	28,700	24,500	27,700	32,200	41,300	19,100	16,300	18,500	21,500	19,600	21,500	18,400	20,800	24,200	24,500
10	NC 12	Sea Oats Trail and Christopher Dr	27,000	23,000	26,100	30,300	40,300	18,200	15,500	17,500	20,400	19,700	19,500	16,600	18,800	21,900	22,500
11	NC 12	Christopher Dr and Audubon Dr	23,300	19,900	22,500	26,200	36,400	17,300	14,700	16,700	19,400	20,100	15,800	13,500	15,300	17,800	18,500
14	NC 12	Audubon Dr and Currituck Clubhouse Rd	22,800	19,500	22,000	25,600	31,100	16,800	14,400	16,300	18,900	19,600	17,100	14,600	16,500	19,200	18,700
12B	NC 12	Currituck Clubhouse Rd and Albacore St	21,800	18,600	21,100	24,500	25,700	20,300	17,300	19,600	22,800	27,900	18,900	16,100	18,200	21,200	23,400
12A	NC 12	Albacore St and Mid-Currituck Bridge	13,500	11,600	13,100	15,200	16,000	18,200	15,500	17,500	20,400	26,800	15,800	13,500	15,300	17,800	21,200
13	NC 12	northern end of NC 12	10,900	9,300	10,500	12,200	13,400	10,100	8,700	9,800	11,400	12,500	10,900	9,300	10,500	12,200	13,400
15	**MCB**	**US 158 and NC 12**	**-**	**-**	**-**	**-**	**-**	**10,600**	**9,000**	**10,200**	**11,900**	**23,700**	**7,700**	**6,500**	**7,400**	**8,600**	**18,000**

Daily Traffic Volume Conversion factor	Factor
AADT / Avg Summer Weekday	0.89
Avg Non-Summer Weekday / Avg Summer Weekday	0.76
Avg Non-Summer Weekend / Avg Summer Weekday	0.86
Avg Non-Summer Saturday / Avg Summer Weekday	0.96
Avg Summer Weekend / Avg Summer Weekday	1.54
Avg Summer Saturday / Avg Summer Weekday	1.74

Based on Wright Memorial Bridge ATR (A2703) data
2008 through 2012

Note:
2040 No Build and 2040 Build Bridge with Tolls are based on weighted average link volumes from balanced traffic forecast sheets
* 2040 Build Bridge without tolls Summer Weekday and Summer Weekend are from TransCAD tool
AADT, Non-Summer Weekday and Non-Summer Weekend are based on traffic conversion factors applied to Summer Weekday

C8. GROWTH RATES - TransCAD Tool and Forecast

			Summer Weekday										Summer Weekend									
			TransCAD Tool					Forecast					TransCAD Tool					Forecast				
Link #	Route	Between	2015 Base Year No Build	2040 No Build / ER2	2040 Build Bridge (with Tolls)	2015 to 2040 No Build / ER2 Ann. Growth Rate	2015 to 2040 Build Bridge (w Tolls) Ann. Growth Rate	2015 Base Year No Build	2040 No Build / ER2	2040 Build Bridge (with Tolls)	2015 to 2040 No Build / ER2 Ann. Growth Rate	2015 to 2040 Build Bridge (w Tolls) Ann. Growth Rate	2015 Base Year No Build	2040 No Build / ER2	2040 Build Bridge (with Tolls)	2015 to 2040 No Build / ER2 Ann. Growth Rate	2015 to 2040 Build Bridge (w Tolls) Ann. Growth Rate	2015 Base Year No Build	2040 No Build / ER2	2040 Build Bridge (with Tolls)	2015 to 2040 No Build / ER2 Ann. Growth Rate	2015 to 2040 Build Bridge (w Tolls) Ann. Growth Rate
1	US 158	Barco and Mid-Currituck Bridge	19,400	28,600	28,600	1.6%	1.6%	19,600	29,300	29,300	1.6%	1.6%	43,400	64,340	64,340	1.6%	1.6%	43,600	64,200	64,200	1.6%	1.6%
2	US 158	Mid-Currituck Bridge and Grandy	19,800	29,240	22,500	1.6%	0.5%	18,400	27,800	21,200	1.7%	0.6%	44,000	65,020	47,920	1.6%	0.3%	43,000	63,200	47,000	1.6%	0.4%
3	US 158	Grandy and Powells Point	21,200	31,200	22,740	1.6%	0.3%	20,900	30,700	22,800	1.5%	0.3%	45,400	66,620	48,760	1.5%	0.3%	44,900	66,200	48,800	1.6%	0.3%
4	US 158	Powells Point and Point Harbor	22,000	32,260	23,800	1.5%	0.3%	23,600	34,400	26,000	1.5%	0.4%	45,800	67,060	49,200	1.5%	0.3%	47,400	69,200	51,400	1.5%	0.3%
5	**US 158**	**Wright Memorial Bridge**	**23,600**	**34,400**	**25,940**	1.5%	0.4%	**23,600**	**34,400**	**26,000**	1.5%	0.4%	**47,400**	**69,180**	**51,320**	1.5%	0.3%	**47,400**	**69,200**	**51,400**	1.5%	0.3%
6	US 158	Barlow Lane and Cypress Knee Trail	29,000	41,200	32,740	1.4%	0.5%	24,500	35,500	27,200	1.5%	0.4%	53,000	75,700	57,840	1.4%	0.4%	47,900	69,900	52,300	1.5%	0.4%
7	US 158	Cypress Knee Trail and NC 12	36,400	50,820	42,360	1.3%	0.6%	33,200	46,500	38,900	1.4%	0.6%	62,000	86,660	68,800	1.3%	0.4%	55,600	79,400	63,600	1.4%	0.5%
8	US 158	south of NC 12 and Eckner St	36,800	48,200	48,200	1.1%	1.1%	37,400	48,400	48,400	1.0%	1.0%	50,000	69,000	69,000	1.3%	1.3%	50,200	69,400	69,400	1.3%	1.3%
9A	NC 12	US 158 and Dogwood Trail	23,440	36,040	27,580	1.7%	0.7%	22,200	33,700	26,100	1.7%	0.6%	31,000	46,260	28,400	1.6%	-0.3%	27,400	42,200	26,400	1.7%	-0.1%
9B	NC 12	Dogwood Trail and Sea Oats Trail	21,000	33,380	24,920	1.9%	0.7%	20,100	32,200	24,200	1.9%	0.7%	28,600	43,280	25,420	1.7%	-0.5%	26,700	41,300	24,500	1.8%	-0.3%
10	NC 12	Sea Oats Trail and Christopher Dr	18,000	30,200	21,740	2.1%	0.8%	18,000	30,300	21,900	2.1%	0.8%	25,000	39,060	21,200	1.8%	-0.7%	24,500	40,300	22,500	2.0%	-0.3%
11	NC 12	Christopher Dr and Audubon Dr	15,200	27,480	19,020	2.4%	0.9%	14,200	26,200	17,800	2.5%	0.9%	22,000	35,900	18,040	2.0%	-0.8%	20,900	36,400	18,500	2.2%	-0.5%
14	NC 12	Audubon Dr and Currituck Clubhouse R	13,800	26,240	17,780	2.6%	1.0%	13,700	25,600	19,200	2.5%	1.4%	19,400	33,120	15,260	2.2%	-1.0%	20,600	31,100	18,700	1.7%	-0.4%
12B	NC 12	Currituck Clubhouse Rd and Albacore S	14,800	25,520	21,220	2.2%	1.5%	15,300	24,500	21,200	1.9%	1.3%	20,200	31,000	23,300	1.7%	0.6%	20,200	25,700	23,400	1.0%	0.6%
12A	NC 12	Albacore St and Mid-Currituck Bridge	13,000	14,560	17,860	0.5%	1.3%	11,800	15,200	17,800	1.0%	1.7%	15,400	17,060	21,600	0.4%	1.4%	14,300	16,000	21,200	0.5%	1.6%
13	NC 12	northern end of NC 12	10,300	11,420	11,420	0.4%	0.4%	10,700	12,200	12,200	0.5%	0.5%	11,400	12,540	12,540	0.4%	0.4%	12,700	13,400	13,400	0.2%	0.2%
15	**MCB**	**US 158 and NC 12**	**-**	**-**	**8,460**	**-**	**-**	**-**	**-**	**8,600**	**-**	**-**	**-**	**-**	**17,860**	**-**	**-**	**-**	**-**	**18,000**	**-**	**-**

Appendix D

Memorandum

From: Mike Fendrick

Date: August 25, 2015

Subject: Review of Mid-Currituck Bridge Project Area Traffic and Traffic Forecasts

To: file

From: Mike Fendrick

Date: August 25, 2015

Subject: Review of Mid-Currituck Bridge Project Area Traffic and Traffic Forecasts

1. OVERVIEW

The Mid-Currituck Bridge project in Currituck County, North Carolina has been under study since 1994. The most recent study, which began in 2001, resulted in a Final Environmental Impact Statement (FEIS) in 2012. As part of the study beginning in 2001, traffic forecasts were developed and used in the assessment of alternatives. A Record of Decision (ROD) following the release of the 2012 FEIS was not signed because of changing state funding priorities. With funding issues apparently resolved, NCDOT is examining the 2012 FEIS to determine if changes in the project setting could alter 2012 FEIS findings and the decision on a Preferred Alternative. The purpose of this memorandum is to examine the traffic forecasts used in the 2012 FEIS's traffic evaluation. The memorandum also addresses the traffic forecasts from the perspective of North Carolina Department of Transportation (NCDOT) *"Guidelines to Determine When to Request an Updated Traffic Forecast"* (February 24, 2009).

To consider the continued validity of the Mid-Currituck Bridge project traffic forecasts requires understanding the process and timing utilized in the development of the forecasts assumed in the 2012 FEIS. Those forecasts were developed in multiple phases/steps.

During Mid-Currituck Bridge studies from 2001 to 2005 under the direction of NCDOT staff, the design year for traffic analysis was 2025. The traffic forecasts were presented in two documents:

- *Currituck Sound Area Transportation Study Traffic Needs Analysis (July 2002):* The traffic forecasts presented in this document relied primarily on traffic data acquired in 2001. Growth trends were examined based on historical Average Annual Daily Traffic (AADT) data back to 1990. No-Build 2025 traffic forecasts were developed for Average Annual Daily Traffic (AADT), as well as Non-Summer Weekday, Summer Weekday, and Summer Weekend traffic. These forecasts focused on roadway link volumes in the project area and did not include balanced turn movements at intersections.

- *Mid-Currituck Bridge 2025 Traffic Alternatives Report* (final report dated June 2008, but the forecasts were developed from 2002 to 2004): This analysis included traffic forecasts for 2025 with a Mid-Currituck Bridge crossing. The growth rates and assumptions were consistent with the *Currituck Sound Area Transportation Study Traffic Needs Analysis* (July 2002). Using a spreadsheet tool developed for the study, No-Build 2025 traffic forecasts were used to develop an origin-destination (O-D) matrix, and this trip matrix was assigned to a highway network that

included a Mid-Currituck Bridge. The resulting assignment was utilized to develop the 2025 forecasts with a Mid-Currituck Bridge.

Soon after the development of the 2025 forecasts, the environmental study process was temporarily halted. In 2005, the environmental study process was restarted by the North Carolina Turnpike Authority (NCTA) with the intent to construct the project as a toll facility and with toll revenues providing a portion of the construction and other costs. The 2025 forecasts were updated to 2035. The 2025 forecasts were used as inputs to this process, but additional review of trends since 2001 were conducted including a traffic count and data collection effort completed in August 2006. The traffic forecasts were documented in the following reports:

- *2035 Traffic Forecast Report* (dated March 2009, analysis occurred in the 2006 to 2007 time frame): In addition to extending the design forecasts to 2035 (from 2025), additional forecast scenarios were examined. New 2035 No-Build forecasts were developed. In addition, two 2035 forecasts with a Mid-Currituck Bridge were developed assuming no tolls. The difference in these two with bridge forecasts was that one assumed a 4-lane NC 12 in Dare County and the other matched the existing section of NC 12 (2 lanes for most of its length with 3 lanes in the Duck commercial area and in Southern Shores south of Skyline Drive). These forecasts used the same basic spreadsheet model as the 2025 forecasts, with revised trip matrices. The spreadsheet model was then adjusted to include a toll diversion element resulting in 2035 forecasts with a tolled bridge for the same two treatments (4-lane and 2- or 3-lane sections on NC 12). Forecasts were again developed on a roadway link basis and did not include intersection turning movements.

- *2035 Detailed Alternatives Traffic Forecast Report* (dated March 2009, analysis occurred in the 2007 to 2008 time frame): The next step in this round of traffic forecasting used the assumptions and 2035 forecasts from the *2035 Traffic Forecast Report* (March 2009) to develop more detailed forecasts that examined two specific alignments for NC 12. The two alignments (C1 and C2) tied into the Currituck Outer Banks at two separate locations: the southern alignment (C1) tied into NC 12 south of Crown Point Road and the northern alignment (C2) connected to NC 12 north of Ocean Forest Court. In addition, these forecasts included balanced turn movement forecasts for more than 40 intersections on NC 12 and US 158. The primary data used in developing the balanced turn movements were traffic counts made in the summer of 2006. Although the previous 2035 forecasts were used as the primary input, the additional turn movement analysis resulted in some adjustments to the forecast traffic volumes on NC 12 and US 158. This report represents the traffic forecasts used in the FEIS.

The following paragraphs document critical assumptions used in the forecast process, and presents an examination of traffic, land use, and tourist data from roughly 2007 to present. The latter is used in considering whether the 2035 forecasts released in 2009 are still applicable.

The forecast documents noted above, were developed and utilized for application to the Mid-Currituck Bridge environmental studies process only. Separate traffic forecasts were developed by

others and completed in 2011 that was used to determine the financial feasibility of the Mid-Currituck Bridge.

2. TRAFFIC GROWTH TRENDS SINCE THE DEVELOPMENT OF FEIS FORECASTS

Since traffic volume counts can be compared to the traffic forecasts, a review of existing traffic volume trends was conducted. Multiple sources were reviewed, including both the NCDOT AADT volumes developed on an annual basis for state roads in the project area, as well as automatic 24-hour/7-days per week traffic recorder (ATR) count station on the Wright Memorial Bridge.

NCDOT AADT volumes were compared at three locations in the project area – on US 158 in Currituck County near the proposed western terminus of the Mid-Currituck Bridge, on the Wright Memorial Bridge, and on NC 12 near Duck. These three sections provide a basic comparison of traffic flows throughout the project area. As shown in Table 1, traffic growth rates were highest prior to 2001 (utilized in the *2025 Traffic Alternatives Report*), decreased for the period from 2000-2006 (used in the *2035 Traffic Forecast Report* and *2035 Detailed Alternatives Traffic Forecast Report*), and slowed further from 2006-2013.

Table 1. Annual Traffic Growth Rates at Key Locations in the Project Area

Station	County	Location	1990-2000[1]		1997-2000[2]		2000-2006[3]		2006-2013[4]	
21/ 3403	Currituck	US 158 near Knapp Bridge	4.9%		9.4%		2.3%		-4.0%	
			8,700	14,000	10,700	14,000	14,000	16,000	16,000	12,000
A-2703-	Dare/ Currituck	US 158 at Wright Memorial Bridge	6.1%		12.9%		1.8%		-3.1%	
			10,000	18,000	12,500	18,000	18,000	20,000	20,000	16,000
28	Dare	NC 12 in/near Duck (N of SR 1418)	0.2%		2.2%		-2.2%		-6.3%	
			15,700	16,000	15,000	16,000	16,000	14,000	14,000	8,900

[1] Used in the *2025 Traffic Alternatives Report*
[2] Short term range used in *2025 Traffic Alternatives Report* based on Wright Memorial Bridge ATR data availability (1997 data available)
[3] Used in the *2035 Traffic Forecast Report* and *2035 Detailed Alternatives Traffic Forecast Report*
[4] Trends since 2035 traffic forecasts

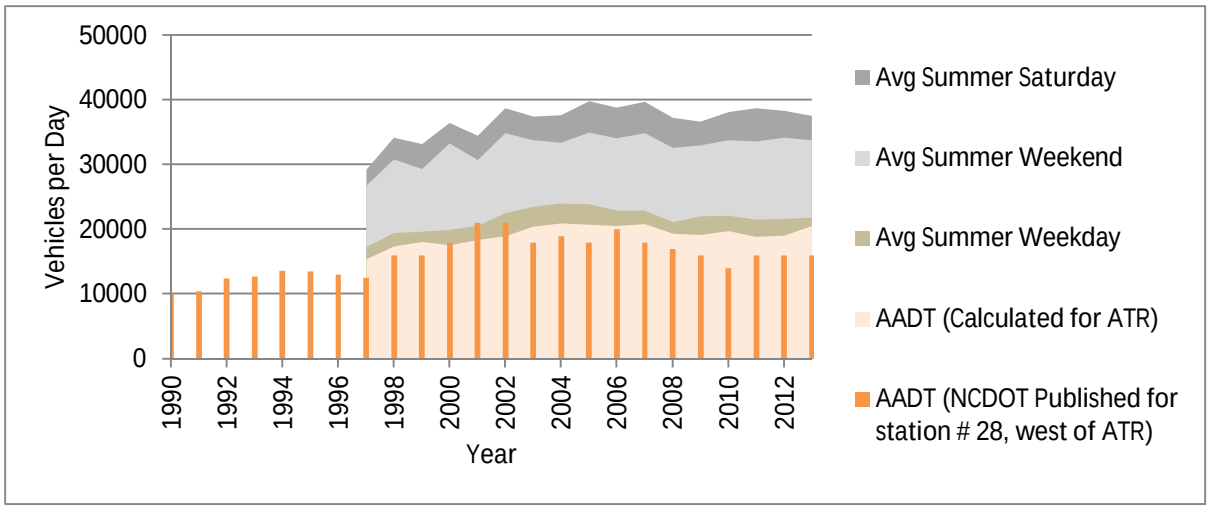
The highest congestion in the project area occurs in summer. The summer weekday is the design period for the Mid-Currituck Bridge project. Therefore, a review of Wright Memorial Bridge counts was conducted using summer data from the permanent count station. Table 2 presents annual traffic growth rates at the Wright Memorial Bridge for four time periods between 1990 and 2013. Figure 1 provides an illustration of historical counts at the Wright Memorial Bridge based on the ATR counter.

Table 2. Annual Traffic Growth Rates at Wright Memorial Bridge

Traffic Growth at Wright Memorial Bridge	1990-2000		1997-2000		2000-2006		2006-2013	
Wright Memorial Bridge AADT (from NCDOT AADT maps)	6.1%		12.9%		1.8%		-3.1%	
	10,000	18,000	12,500	18,000	18,000	20,000	20,000	16,000
Wright Memorial Bridge ATR AADT	NA		4.4%		2.0%		0.5%	
	NA	NA	15,300	17,500	17,500	19,700	19,700	20,300
Wright Memorial Bridge ATR Summer Weekday	NA		5.0%		2.0%		-0.6%	
	NA	NA	17,200	19,900	19,900	22,400	22,400	21,500
Wright Memorial Bridge ATR Summer Weekend	NA		7.5%		-0.8%		0.4%	
	NA	NA	26,800	33,300	33,300	31,700	31,700	32,600

ATR data summarized from the Wright Memorial Bridge automatic count station (ATR) which records volumes 24 hours per day/ 365 days per year. Historical data at this location dates back to 1997.

Figure 1. Wright Memorial Bridge Historical ATR Counts for Multiple Years



Key observations from Table 2 and Figure 1 include:

- The annual growth trend on a summer weekday has declined from 5.0 percent per year prior to 2001 to 2.0 percent per year in the period before 2007 (when the 2035 forecasts were developed). Since 2006 the rate has declined further to -0.6 percent per year, a decline in traffic volumes.

- The annual growth trends on the summer weekend have followed a slightly different pattern with increased annual growth (0.4 percent) from 2006 to 2013 compared to a drop in traffic for the period from 2000 to 2006 (-0.8 percent).

- The NCDOT AADT growth at the Wright Memorial Bridge does not match the 24 hour/365 day automatic counter. The difference in growth rates based on the 24/365 ATR counter should be more accurate since the 24/365 counter provides a true AADT. In contrast, the NCDOT AADT maps are based on a 24 hour count conducted at any time during the year, and then factored to account for the day the count was taken. The conversion factors are derived from a combination of multiple sources representing the Outer Banks. While both measures show a decreasing annual growth rate since 2000, the 24/365 ATR counter shows growth is continuing to occur while the AADT volumes indicate an actual reduction in AADT volumes.

- Summer Weekday and Summer Weekend volumes are substantially higher than AADT volumes ranging from 50 percent to 75 percent higher.

- In general, based on the ATR counter there was substantial traffic growth on the Wright Memorial Bridge in the period from 1997 to 2004. Traffic growth peaked in 2004 and has been essentially stable for the last 10 years.

3. TRAFFIC FORECAST COMPARISONS

A comparison of recent traffic growth rates presented in Section 2 was made with the forecasted annual growth rate used in the 2035 traffic forecasts. The same three locations discussed in Section 2 in Table 1 were used in this comparison to represent distinct areas of the roadway network. The historic traffic growth trends for these three locations are shown in Table 1.

Comparison of Mid-Currituck Bridge Forecasts

Table 3 compares the incremental changes in the traffic forecasts for the Mid-Currituck Bridge as presented in the three reports documenting the steps in the forecasting process:

- *2025 Mid-Currituck Bridge Traffic Alternatives Report* (superseded)

- *2035 Mid-Currituck Bridge Traffic Forecast Report* (refined in detailed alternatives forecasts)

- *2035 Mid-Currituck Bridge Detailed Alternatives Traffic Forecast Report* (the forecasts reflected in the FEIS)

A review of Table 3 illustrates multiple items including:

- The annual growth rate for the Mid-Currituck Bridge project was determined and then refined as documented in these three reports. In general, as each iteration of the forecasts was revised, the annual forecasted growth rate was reduced slightly. For instance, on US 158 near the proposed Mid-Currituck Bridge termini, the annual growth rate was reduced from 3.7 percent to 2.6 percent and then 2.4 percent with the 2035 Detailed Alternatives Traffic Forecast used in the FEIS.

Table 3. Comparison of Mid-Currituck Bridge Traffic Forecasts at 3 Links
& Effect of Constrained Land Use Assumptions on Forecasted Traffic Growth – No Build

Forecast Source	Forecast Developed	Overall Growth Period	2006-2025		2025-2035 Constrained[1]		AADT Overall Growth	
US 158 near Mid-Currituck Bridge western termini (S of SR 1405) – Currituck Sta. 21								
2025 Traffic Alternatives Report	2002	2001-2025	NA		NA		3.7%	
							15,800	37,500
2035 Traffic Forecast Report	2007	2006-2035	3.0%		1.9%		2.6%	
			21,300	37,500	37,500	45,400	22,300	45,400
2035 Detailed Alternatives Traffic Forecast Report	2008	2006-2035	2.7%		1.8%		2.4%	
			22,300	37,300	37,300	44,600	22,300	44,600
US 158 at Wright Memorial Bridge								
2025 Traffic Alternatives Report	2002	2001-2025	NA		NA		3.7%	
							18,300	43,500
2035 Traffic Forecast Report	2007	2006-2035	3.0%		1.1%		2.4%	
			24,600	43,500	43,500	48,700	24,600	48,700
2035 Detailed Alternatives Traffic Forecast Report	2008	2006-2035	3.1%		1.1%		2.4%	
			22,100	39,400	39,400	44,200	22,100	44,200
NC 12 north of Duck (N of SR 1479) – Dare Sta. 27								
2025 Traffic Alternatives Report	2002	2001-2025	NA		NA		2.6%	
							12,600	23,400
2035 Traffic Forecast Report	2007	2006-2035	2.4%		0.1%		1.6%	
			15,000	23,400	23,400	23,700	15,000	23,700
2035 Detailed Alternatives Traffic Forecast Report	2008	2006-2035	1.8%		0.1%		1.2%	
			16,300	23,100	23,100	23,300	16,300	23,300

[1] The 2035 forecasts assumed more rapid growth from the existing to 2025 when it was anticipated that build-out of undeveloped lots would be largely completed on NC 12 in the study area. After build-out is reached, growth is referred to as constrained, reflecting that land use growth will have generally reached a maximum along NC 12.

- The 2035 forecasts used in the FEIS had a different growth rate before and after 2025. The variation resulted from build-out assumptions used on the Outer Banks. From a project planning perspective, full build-out on the NC 12-accessible Outer Banks was assumed in the original 2025 forecasts and partial build-out was assumed in the non-NC 12-accessible Outer Banks in Currituck County that was based on building permit trends resulting in the 3.0 percent growth from 2006 to 2025. When the traffic forecasts were extended into 2035 the only additional Outer Banks growth assumed was in the non-NC 12-accessible Outer Banks in Currituck County resulting in the 1.9 percent growth from 2025 to 2035.

- In general, there was a minor decrease in the forecasts between the *2035 Traffic Forecast Report* and the *2035 Detailed Alternatives Traffic Forecast Report*. The difference was greatest at the Wright Memorial Bridge (48,700 vpd reduced to 44,200 vpd) resulting from the use of more detailed forecasting techniques used for the forecasts presented in the *2035 Detailed Alternatives Traffic Forecast Report*. Specifically, the detailed examination of turn movements

at key intersections south of the Wright Memorial Bridge indicated that traffic patterns on the Wright Memorial Bridge were more reflective of US 158 on the mainland than on the tourist focused sections south of the bridge. The detailed review of turn movements near the Wright Memorial Bridge indicated that tourist traffic was less likely to cross over to the mainland during the week than assumed in the link based forecast.

Comparison of the *2035 Detailed Alternatives Traffic Forecast Report* Forecasts with CTP Forecasts

Since the release of the *2035 Detailed Alternative Traffic Forecast Report*, Comprehensive Transportation Plans (CTP) were developed for Currituck County (final in 2012) and Dare County (final in 2015). These forecasts were developed using data available after 2006 and reflect lower future volumes and future growth rates than in the Mid-Currituck Bridge forecasts. A comparison on the three forecasts is presented in Table 4 examining the same three roadway links (i.e. US 158 near the Knapp Bridge, the Wright Memorial Bridge, and NC 12 north of Duck).

Table 4. Comparison of Forecasted Annual Growth Rates at 3 Roadway Links with CTP Estimates

Forecast Source	Forecast Developed	Overall Growth Period	AADT Overall Growth		Summer Weekday Overall Growth	
US 158 near Mid-Currituck Bridge western termini (S of SR 1405) – Currituck Sta. 21						
2035 Detailed Alternatives Traffic Forecast Report – No Build and with Bridge	2008	2006-2035	2.4%		2.4%	
			22,300	44,600	25,700	51,300
Currituck County CTP – No Build	2012	2009-2035	0.9%		0.9%	
			14,000	18,200	16,100	20,400
US 158 at Wright Memorial Bridge						
2035 Detailed Alternatives Traffic Forecast Report – No Build	2008	2006-2035	2.4%		2.4%	
			22,100	44,200	29,400	58,900
2035 Detailed Alternatives Traffic Forecast Report – with Bridge	2012	2006-2035	2.4%		2.4%	
			17,300	34,500	23,000	46,000
Currituck County CTP – with Bridge	2012	2009-2035	2.4%		2.4%	
			17,000	31,700	22,600	42,300
Dare County CTP – No Build	2014	2012-2040	1.2%		1.2%	
			20,400	28,400	27,100	37,900
NC 12 north of Duck (N of SR 1479) – Dare Sta. 28 in/near Duck						
2035 Detailed Alternatives Traffic Forecast Report – No Build	2008	2006-2035	1.2%		1.2%	
			16,300	23,300	20,400	29,100
2035 Detailed Alternatives Traffic Forecast Report – with Bridge	2012	2006-2035	1.2%		1.2%	
			13,800	19,700	17,200	24,600
Dare County CTP – No Build	2014	2012-2040	1.2%		1.2%	
			8,400	11,700	10,500	14,600

In comparing the forecasts in Table 4, the following issues need to be considered:

- The Dare County CTP forecast was developed for Summer Weekday and the Currituck County forecast was based on AADT. To facilitate comparison, each of these forecasts was converted to

the other period based on conversion factors taken from Wright Memorial Bridge continuous counts from 2006.

- The Dare County CTP assumes a No Mid-Currituck Bridge scenario as compared with the Currituck County CTP that assumes the Mid-Currituck Bridge is constructed. Although the Mid-Currituck Bridge is assumed as part of the Currituck County CTP, no forecast is included for the new bridge.

- The Dare County CTP only examines Dare County and similarly, the Currituck County CTP only examines Currituck County. As a result, the only link with forecasts from both CTPs is at the Wright Memorial Bridge.

- On NC 12, an annual growth rate of 1.2 percent is observed for both the Mid-Currituck Bridge and Dare County CTP forecast. Similarly, the Mid-Currituck Bridge and Currituck County CTP growth rates are both 2.4 percent (although Dare County is lower at 1.6 percent).

- Both the Dare County and Currituck County CTP forecasts have a lower volume starting point for the forecasted growth to begin from as compared with the Mid-Currituck Bridge forecasts. Thus, the CTP 2035 forecasts are all lower than the Mid-Currituck Bridge 2035 forecasts.

Illustrative Comparison of Traffic Forecasts at Wright Memorial Bridge

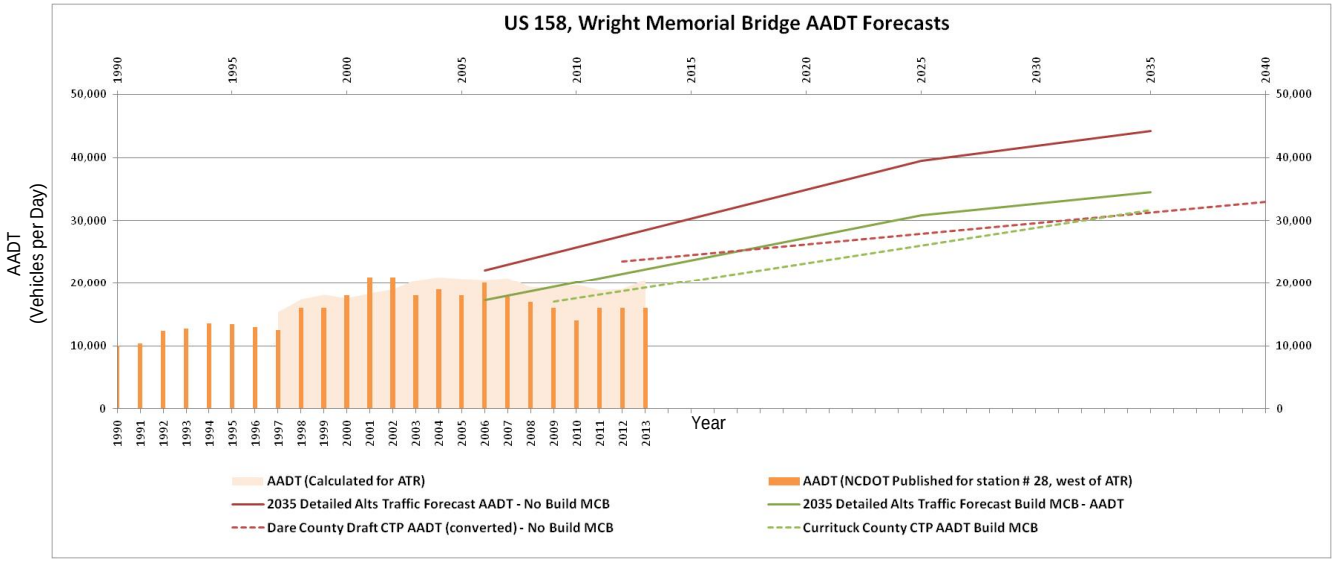
Since the Wright Memorial Bridge is the only location where both Dare County and Currituck County CTPs have a common forecasted link, a comparison of the historic growth and the forecasted traffic growth from each of the examined forecasts is illustrated in Error! Reference source not found.. Key observations from Error! Reference source not found. include:

- The Mid-Currituck Bridge project's *2035 Detailed Alternatives Traffic Forecast Report* forecasts increase at a steeper slope (2.4 percent from 2006-2035 as shown in Table 4) than the historic traffic trends since 2006 (0.5 percent from Table 2).

- The Mid-Currituck Bridge project's *2035 Detailed Alternatives Traffic Forecast Report* forecasts increase at a slower rate starting in 2025 reflective of the anticipated land use build-out along NC 12 at that time (3.0 percent prior to 2025 and 1.9 percent after 2025 from Table 3).

- The Dare County CTP forecast was converted to AADT for purposes of this graph. The Dare County CTP forecast assumes a No Mid-Currituck Bridge scenario. The Dare County CTP forecast has a much flatter annual growth rate (1.2 percent from Table 4) resulting in a Dare County CTP 2040 AADT (28,400 vehicles per day [vpd]) substantially lower than the *2035 Detailed Alternatives Traffic Forecast Report's* No Build traffic forecast (44,200 vpd). (Note: Both No Mid-Currituck Bridge scenarios are illustrated in a reddish color.)

Figure 2. Comparison of Traffic Forecasts at Wright Memorial Bridge



- The Currituck County CTP assumes that the Mid-Currituck Bridge is constructed and anticipates a 2035 AADT of 31,700 vpd. This compares with 34,500 vpd AADT for the *2035 Detailed Alternatives Traffic Forecast Report*'s Build forecast with the Mid-Currituck Bridge in place (see Table 4). Overall, the Mid-Currituck Bridge project's *2035 Detailed Alternatives Traffic Forecast Report* forecast and the Currituck County CTP forecast are similar. (Note: Both Build Mid-Currituck Bridge scenarios are shown in a greenish color.)

- Although both the Currituck County CTP and the Dare County CTP converge in 2035 to forecast a similar AADT of approximately 32,000 vpd, it must be noted that the Currituck County CTP assumes the Mid-Currituck Bridge is completed while the Dare County CTP assumes a No Build condition for the Mid-Currituck Bridge. Therefore, there is a divergence in the assumptions for the two forecasts.

4. LAND USE TREND COMPARISONS

The key issue for this review is to determine if land use and tourism trends since the preparation of the 2035 traffic forecasts in 2006 to 2007, could bring into question the validity of the 2035 traffic forecasts used in the Mid-Currituck Bridge EIS process for determining purpose and need, detailed study alternative travel benefits, and preliminary design features. To examine this, multiple data sources were examined to compare trends before and after the development of traffic forecasts in 2006 to 2007. The comparison focuses on average annual growth rates for the periods before and after 2006 to 2007.

Although these trends generally are not directly correlated to traffic trends, the review provides an indicator of land use and tourism pressures on traffic both before and after the development of the 2035 forecasts. Table 5 illustrates key land use trends oriented to permanent population in the entirety of Currituck and Dare County. This growth is more reflective of increases in local population affecting both non-summer and summer traffic. Key observations are:

- Both Currituck and Dare Counties were growing at a pace of nearly 3 percent annually prior to 2001. From 2001 to 2006 the growth rate increased in Currituck County 4.3 percent and declined in Dare County to 2.1 percent. Since 2006, however, annual population growth in both Currituck and Dare County has slowed to less than 1 percent.

Table 5. Land Use Trends – Permanent Population

Land Use Trends	Trend Prior to 2025 Forecasts		Trend Prior to 2035 Forecasts		Trend Since 2035 Forecasts	
County Population Actual Growth Rate from State Data Center	1990-2001		2001-2006		2006-2013	
Historic Population - Currituck	2.9%		4.3%		0.8%	
	13,736	18,733	18,733	23,132	23,132	24,506
Historic Population - Dare	2.9%		2.1%		0.3%	
	22,746	31,069	31,069	34,421	34,421	35,273
County Population Projections (entire County) for period from 2000-2025			SDC Projection in 2007		Latest SDC Projection in 2015	
State Data Center Population Projection – Currituck County	NA		2.9%		1.6%	
			18,290	37,332	18,290	27,303
State Data Center Population Projection – Dare County			1.8%		1.0%	
			30,170	47,535	30,170	38,589
Dare County CTP			NA		0.9%	
					30,170	37,526

Note: Data from this table is from the State Data Center website with the exception of the bottom measure, which was taken from the Dare County CTP.

- The State Data Center provides population projections for all counties within the state. When the 2035 forecasts were developed, the State Data Center projection reduced the projected growth rate for both Dare and Currituck County by 45 percent (i.e., 1.6 percent is 55 percent of 2.9 percent, and 1.0 percent is 55 percent of 1.8 percent).

Table 6 illustrates land use trends for the permanent population in Currituck and Dare counties. Key observations from Table 6 are:

- Gross Occupancy receipt trends for hotels and rental homes prepared by the Dare County Outer Banks Visitors Bureau were examined going back to 1994. Tourist growth in Dare County increased at an annual growth of between 7 to 9 percent from 1994 to 2006. This growth rate

Table 6. Tourist-Related Trends

	Trend Prior to 2025 Forecasts		Trend Prior to 2035 Forecasts		Trend Since 2006 when 2035 Forecasts Developed	
Gross Occupancy Receipts in Dare County	1994-2001		2001-2006		2006-2014	
Annual[1]	9.0%		7.2%		3.7%	
	$120M	$219M	$219M	$310M	$310M	$414M
Visitors to Tourist Sites – Outer Banks[2]			2000-2006		2006-2014	
Overall Visitor Sites – Average of Annual Growth Rate at 12 Sites	NA		-0.1%		-2.3%	
Overall Visitor Sites – Average of Summer Growth Rate at 12 Sites	NA		-1.5%		-3.0%	
Aquarium – Summer	NA		-6.3%		-1.4%	
			138K	166K	166K	148K
Wright Memorial Brothers Historic Site - Summer	NA		1.4%		-1.7%	
			432K	468K	468K	424K
Jockey's Ridge	NA		0.7%		2.6%	
			979K	1,058K	1,058K	1,211K
Mean Household Income (Annual Growth Rate) from US Census[3]	1995-2001		2001-2006		2006-2013	
United States	1.2%		0.0%		-1.0%	
	$51,719	$55,562	$55,562	$55,689	$55,689	$51,939
North Carolina	0.6%		-1.7%		-1.6%	
	$48,536	$50,212	$50,212	$45,980	$45,980	$41,208

[1] Gross occupancy trends from http://www.outerbanks.org/media/912872/gross_occupancy_summary.pdf for 2001-2014 and from https://www.southernenvironment.org/uploads/pages/Dare%20County%20Gross%20Occupancy%201994-2011.pdf for 1994-2001.
[2] Visitation Volume collected from Outer Banks Visitors Bureau.
[3] Income data summarized from US Census Table H-8. Median Household Income by State in 2013. http://www.census.gov/hhes/www/income/data/statemedian/

decreased for the period from 2006 to 2014, but maintained a notable growth rate of 3.7 percent. Although the majority of this information applies to Dare County outside of the study area, this is a useful measure of tourist demand at the Outer Banks overall.

- Visitors to multiple tourist sites are tracked each year. This information was combined to examine trends that may be reflective of tourist trips at the Outer Banks. Overall, the number of visitors attending tourist sites decreased since 2006 as compared with previous years, although there were some sites (such as Jockey's Ridge) with increased visitors.

- A review of mean household income was examined with respect to decreasing growth trends since the development of the 2035 forecasts. In general, the decline in growth trends matches well with a decrease in income levels since 2006. Although not a definitive measure, it could be reflective of a drop in disposable income utilized for vacations.

5. BUILD-OUT ANALYSIS ON NC 12

A key element of the traffic forecasts for the Mid-Currituck Bridge is the limits on developable land on NC 12 in both Dare and Currituck County. As identified in Section 4.2.3.1 of the November 2011 *Indirect and Cumulative Effects Technical Report*, developable land along NC 12 has been nearly entirely subdivided. In the 2035 forecasts, land use along NC 12 was assumed to reach full build-out prior to 2035. In the non-NC12 –accessible areas, an approximately 3 percent annual growth rate was assumed based on past growth trends at the time resulting in a conclusion that 854 of 3,150 lots in the non-NC 12-accessible area would be developed by 2035.

A summary of the number of developed units in the project area and those forecast by 2035 and used in the Mid-Currituck Bridge project's 2035 Detailed Alternatives traffic forecasts are presented in Table 7.

Table 7. Number of Developed Units on and North of NC 12

Number of Developed Units	1995[1]	2001[2]	2007[3]	2014[4]	2035 forecasts[5]
Currituck County Outer Banks - non-road accessible	244	374	611	731	854
Currituck County Outer Banks along NC 12	1,468	3,432	3,676	3,914	6,869
Currituck County Total	1,712	3,806	4,287	4,645	7,723
Dare County (Outer Banks Along NC 12 north of US 158) Total	4,000	4,387	4,749	4,890	5,399
Total Project Area for NC 12 north of US 158	5,712	8,193	9,036	9,535	13,122

[1] 1995 data in Table 7 was taken from Table 1 of the *Mid-Currituck Sound Bridge Study Traffic Report* prepared by Parsons Brinckerhoff (November 1995)
[2] 2001 data in Table 7 was taken from Section 2.1.3 of the *Currituck Sound Area Transportation Study Traffic Needs Analysis* prepared by Parsons Brinckerhoff (July 2002)
[3] 2007 data in Table 7 was taken from Table 4-7 of the *Indirect and Cumulative Effects Technical Report* for the project prepared by Parsons Brinckerhoff (November 2011)
[4] Data on units developed since 2007 was obtained for the area from the following website: http://www.homefacts.com/
[5] Build-out of the NC 12-accessible Outer Banks in the project area and estimate of practical expansion in the non-NC 12-accesible Outer Banks.

The information in Table 7 was converted to an annual rate of increase in Table 8. As shown, the growth rate slowed down substantially beginning in 2001 within Currituck County except in the non-NC 12-accessible Outer Banks. Dare County growth also slowed beginning in 2001, although the

Table 8. Historic Annual Rate of Increase in Developed Units

Annual Rate of Increase in Developed Units	1995-2001		2001-2007		2007-2014	
Currituck County Outer Banks - non-road accessible	7.4%		8.5%		2.6%	
	244	374	374	611	611	731
Currituck County Outer Banks along NC 12	15.2%		1.2%		0.9%	
	1,468	3,432	3,432	3,676	3,676	3,914
Currituck County Total	14.2%		2.0%		1.2%	
	1,712	3,806	3,806	4,287	4,287	4,645
Dare County (Outer Banks Along NC 12 north of US 158) Total	1.6%		1.4%		0.4%	
	4,000	4,387	4,387	4,749	4,749	4,890
Total Study Area for NC 12 north of US 158	6.2%		3.9%		0.8%	
	5,712	8,193	8,193	9,036	9,036	9,535

reduction was moderate compared to Currituck County. All areas have seen a further drop in growth rates since 2007.

In order to examine the effect of the lower than anticipated growth rates from 2007 to 2014, a review of the potential effect on the 2035 forecasts were conducted. By examining the required land use growth rate needed to reach assumed build-out levels by 2035, an assessment of whether current growth rates will attain build-out in the design period can be made. Note that 2007 was utilized instead of 2006 to match the 2007 analysis included in the project's Indirect and Cumulative Effects Analysis as shown in Table 7.

Table 9 presents a comparison of past annual developed units growth rates with the future growth rate needed to reach forecasted development levels. Key observations from Table 9 include:

- The annual development growth rate in the Outer Banks portion of the project area would have to be higher between 2014 and 2035 than what occurred between 2007 and 2014, particularly in Currituck County to reach development levels assumed for 2035 in the *2035 Detailed Alternatives Traffic Forecast Report*'s forecasts.

- If the 2007 to 2014 growth rate were to continue into the future, development levels in the total Outer Banks portion of the project area would not reach development assumed in the 2035 forecasts until 21 years after 2035, and up to 41 years in Currituck County.

- When looking at the number of development units built in the approximately 20 year period from 1995 to 2014 and comparing it to the number of units required for the approximately 20 year period from 2014 to 2035, the numbers are similar, indicating that with a change in whatever has affected growth rates for the last seven years, the 2035 development forecasts

Table 9. Comparison of Past Annual Developed Units Growth Rates with the Future Growth Rate Needed to Reach Forecasted Development Levels

Annual Rate of Increase in Developed Units	Actual Annual Growth 1995-2014		Actual Annual Growth 2007-2014		Growth Rate needed to Reach Development Levels in 2035 Traffic Forecasts starting in 2014		Year in Which Development Levels in 2035 Traffic Forecasts would be Reached Using 2007-2014 Growth Rate starting in 2014
Currituck County Outer Banks - non-road accessible	487 (5.9%)		120 (2.6%)		123 (0.7%)		2020
	244	731	611	731	731	854	
Currituck County Outer Banks along NC 12	2,446 (5.3%)		238 (0.9%)		2,955 (2.7%)		2077
	1,468	3,914	3,676	3,914	3,914	6,869	
Currituck County Total	2,933 (5.4%)		358 (0.8%)		3,078 (2.5%)		2076
	1,712	4,645	4,287	4,645	4,645	7,723	
Dare County (Outer Banks Along NC 12 north of US 158) Total	890 (1.1%)		141 (0.4%)		509 (0.5%)		2038
	4,000	4,890	4,749	4,890	4,890	5,399	
Total Project Area for NC 12 north of US 158	3,823 (2.7%)		499 (0.8%)		3,587 (1.5%)		2056
	5,712	9,535	9,036	9,535	9,535	13,122	

remain possible. However, as shown by the number of developed units in Table 7, 75 percent of the units built in the Outer Banks portion of the project area in the 21 years from 1995 to 2007 were built by 2001 (built in the first 6 years) and the number of new developed units is less in each successive 6 year period.

Determining why slower growth has occurred since 2001 was not a part of this consideration of recent traffic and development growth trends. However, as was discussed in the indirect and cumulative effects analysis, a contributor to decline in overall development growth rate in the Outer Banks portion of the project area could be the high levels of summer congestion on NC 12. A 2012 draft memorandum prepared by Parsons Brinckerhoff whose results were to be used in a response to FEIS comments estimated that traffic congestion on NC 12 could limit development to 10,847 development units in 2035, rather than the 13,122 assumed in the traffic forecasts. Development was at 9,535 units in 2014 as noted in Table 7. To achieve 10,847 units by 2035 would require a rate of development from 2014 to 2035 of only 0.6 percent, less than the rate that has occurred between 2007 and 2014 (0.8 percent).

7. RECOMMENDATIONS

Land Use and Traffic Assumptions

This review of land use and traffic growth trends examines the potential impact that recent development trends may have had on the 2035 traffic forecasts for the Mid-Currituck Bridge project used in the studies that led to the 2012 FEIS. For most trends examined, growth continues but the rate has declined, beginning in 2001. Recent CTP forecasts have shown a notable decrease in traffic on US 158 and population forecasts for both Currituck County and Dare County as a whole have declined. One conclusion that could be reached is that the development assumptions underlying the *2035 Detailed Alternatives Traffic Forecast Report*'s forecasts are higher than current trends. Therefore, the assumptions used in the *2035 Detailed Alternatives Traffic Forecast Report*'s forecasts warrant reconsideration and reconsideration is recommended.

However, project planning to date has been to consider the need for road improvements to serve development on NC 12 north of US 158 as planned and expected. This included full build-out on the NC 12-accessible Outer Banks irrespective of when it occurs for both the no-build and build forecasts. It is recommended that the same future growth scenario continue to be used for both no-build and build forecasts. Further, it is recommended that this growth scenario assume planned and expected development on the Outer Banks from the US 158/NC 12 intersection to the Virginia State Line. In addition to being the assumptions with *2035 Detailed Alternatives Traffic Forecast Report*'s traffic forecasts for 2035, these were the assumptions in the development of alternatives for the Mid-Currituck Bridge project and in determining how well the alternatives meet the purpose and need for the project. These assumptions are appropriate because the best starting point for planning a new transportation project is to ask, based on land use plans and subdivision plats, what level of planned and expected future development needs to be served and how well will the various alternatives serve that development.

It also was discussed in the Section 4.2.3 (particularly Section 4.2.3.5) of the 2011 *Indirect and Cumulative Effects Technical Report* and Section 3.6.1.4 of the 2012 FEIS (page 3-109) that the capacity of NC 12 to carry traffic under the No-Build Alternative and ER2 could act as a constraint on planned and expected future development. This would not be the case with the Preferred Alternative. The cumulative impact assessment considered the impacts of both planned and expected future development and the change in that impact that would occur if development were constrained by NC 12 capacity with the No-Build Alternative or ER2.

Following the completion of the updated traffic forecasts, new capacity analyses will be needed to re-examine project need and the benefits of the Preferred Alternative compared with ER2. It is recommended that the potential for the No-Build Alternative and ER2 to constrain future development also be revisited and any changes in indirect and cumulative impact findings be addressed in the re-evaluation report.

Finally, given that the project is not proposed for letting until FY 2019 (as indicated in the 2016-2025 State Transportation Improvement Program [STIP]), any additional traffic forecasts would have a 2040 design year, five years beyond the current forecasts.

Assessment of Potential Impact of Updated Forecasts on the Preferred Alternative Selection

While additional traffic forecasts could affect the Preferred Alternative decision, it appears to be unlikely. Congestion is currently severe on the summer weekday on US 158 and NC 12 so, despite recent slower traffic growth and development rates, it is unlikely that no need for the project would be revealed by new traffic forecasts. Although growth has slowed, existing and future development patterns or locations have not changed, so it is unlikely that new traffic forecasts would reveal that ER2 would now reduce area congestion better than a Mid-Currituck Bridge. The *2035 Detailed Alternatives Traffic Forecast Report*'s forecasts revealed no difference in bridge traffic between the two bridge corridor alternatives, C1 and C2. Again since existing and future development patterns or locations have not changed it is unlikely that new traffic forecasts would result in a changed bridge corridor selection.

Assessment of Potential Impact of Updated Forecasts on Preferred Alternative Design

Any additional traffic forecasts could affect FEIS findings related to the preliminary design of the Preferred Alternative. When considering the potential effect on the preliminary design, four design elements should be reviewed: the proposed bridge, the US 158 interchange, the tie-in to NC 12 at the eastern termini of the project, and other NC 12 improvements.

1. Proposed Bridge: The proposed bridge is a two-lane section (minimum number of lanes), which precludes reducing the width. The traffic capacity analysis for the bridge had indicated that level of service (LOS) E operations would occur in some peak periods, including the summer weekend. A reduction in design year traffic volumes that may be produced in new forecasts could result in the reduction of the overall number of time periods for which LOS E would occur. Nevertheless, the minimum two-lane section would be needed.

2. US 158 Interchange: In developing the design for the Preferred Alternative, it was noted that although LOS D would be provided for in the design period (summer weekday), it would not be acceptable to have LOS F operations and queuing as part of the summer weekend. As part of the analysis, it was noted that unacceptable queuing and delays could occur on US 158 with a Mid-Currituck Bridge intersection (rather than an interchange) under 2006 summer weekend volumes. For this reason combined with future summer weekday requirements, a grade separated interchange is included as part of the Preferred Alternative at US 158. The interchange has single lane ramps leading west from the two-lane bridge approach and leading east into the toll plaza. Thus, lower traffic forecasts would be unlikely to change the interchange design.

3. Tie in at NC 12: At the eastern terminus of the bridge, the current proposed design ties into a proposed multi-lane roundabout on NC 12. Even if there were to be a notable reduction in volumes, peak summer weekend flows would likely still require a dual lane roundabout. This is because continuous traffic flow already occurs when traffic leaves the Outer Banks and with a continuous stream of traffic entering a roundabout from one approach, other approaches to a roundabout are subject to substantial queuing since inadequate gaps are in place for traffic on

other approaches. It also should be noted that LOS F operations at a roundabout are typically to be avoided, even if only limited to peak periods. This is because a LOS F roundabout will typically have one or two approaches that are completely shut down resulting in queuing. Since existing peak periods on summer weekends can last more than 6 continuous hours per day, extreme queuing could be expected at times with a single lane roundabout. Therefore, it is anticipated that a multi-lane roundabout likely would be still required.

4. NC 12 improvements – The tie-in from the multi-lane roundabout into the existing NC 12 and other improvements proposed on NC 12 could possibly be shortened as the result of updated forecasts. If this were to occur, it could shorten the length of the proposed improvements on NC 12, reducing the potential natural and human environmental impacts. However, the improvements would then not be adequate to carry traffic associated with full build-out of the NC 12-accessible Outer Banks, potentially necessitating additional improvements in the future. The potential cost savings and reduced near-term impact that might be associated with shorter NC 12 improvements would need to be compared with the mobilization cost and impacts of two construction periods, one in the near-term and one later when traffic demand requires the full proposed improvement.

NCDOT Guidelines on Updating Forecasts – Flow Chart

A review of NCDOT's *"Guidelines to Determine When to Request an Updated Traffic Forecast"* from February 24, 2009 was conducted. The guidelines can be found at:

https://connect.ncdot.gov/projects/planning/Pages/ProjectLevelTrafficForecasting.aspx

The guidelines contain a flow chart that guides the engineer/planner through a series of questions in determining whether updated forecasts are needed. Key questions related to the Mid-Currituck Bridge project and responses are:

- Box 1: Is the future forecast year (2035) less than the current let year plus 20 years – Yes because the let year in FY 2019 and plus 20 years is FY 2039.
- Box 2: Is the study area experiencing growth not considered in the original forecasts – Yes but lower than assumed in the *2035 Detailed Alternatives Traffic Forecast Report*'s forecasts.
- Box 3: Is the traffic forecast 5 years old or older from the Base Year – Yes because the base year for the *2035 Detailed Alternatives Traffic Forecast Report*'s forecasts is 2006.
- Box 4: Is the study area in a low growth area – No, growth has slowed but still occurs.
- Box 5: Will the current phase of the project (Final NEPA document or right-of-way plans) be completed within the "allowable extrapolated" future year – Yes, but traffic growth rates have declined since the *2035 Detailed Alternatives Traffic Forecast Report*'s forecasts raising the question of whether extending its growth rate to 2040 is appropriate.

Based on this criteria and the responses above, updated traffic forecasts for the Mid-Currituck Bridge project are needed for both for no-build and build alternatives.

Overall Recommendations for Updated Forecasts

Based upon this review, it is recommended that updated traffic forecasts be developed for the Mid-Currituck Bridge. These forecasts would be used to consider the following items:

- How updated no-build traffic forecasts affect project need when considered in the context of a revised capacity analysis.
- How updated build traffic forecasts affect the travel benefits of the detailed study alternatives when considered in the context of a revised capacity analysis, and in turn the Preferred Alternative decision made in the FEIS.
- How updated build traffic forecasts affect the design capacity requirements assumed in developing the preliminary design for the Preferred Alternative, including the US 158 interchange, the number of lanes on the bridge, tie-in at NC 12 and NC 12 improvements. As in the past traffic forecasts, the key design period would be the summer weekday and the key congestion period would be the summer weekend.

To accomplish the above, a standard NCDOT forecast process is proposed. This will include the development of balanced turn movements. The forecasts would be prepared and utilized with the following steps.:

- To consider project need and benefits, as was done for the current forecasts, 15 key links will be utilized to examine the 50-plus mile roadway network including US 158 from Barco south to NC 12 (30 miles) and then north on NC 12 between US 158 and Corolla (19 miles) plus approximately 7 miles for the proposed Mid-Currituck Bridge. Both the no-build and build forecasts would be needed for this analysis. The volumes for the 15 key links will be determined using a combination sub-links from the balanced traffic forecasts. Volumes also would be generated for a 16th link on NC 12 from Corolla to the end of NC 12. The with bridge scenario would consider toll diversion.
- To consider the preliminary design of the Preferred Alternative, the more detailed traffic forecast information with balanced turn movements will be utilized. Unlike the need and benefits analysis which examines the entire thoroughfare network in the project area, it is recommended that this analysis focus only on those roadway sections with design elements included in the Preferred Alternative. This network would be much shorter with approximately 3 miles along US 158, 4 miles along NC 12, and the proposed Mid-Currituck Bridge. These more detailed forecasts would include balanced turn movements at all intersections with more than 1,000 vehicles per day.

- It is recommended that in re-visiting growth trends assumed in the current forecasts, that the Build traffic forecasts continue to use the assumptions of full build-out in the NC 12-accessible Outer Banks with growth in the non-NC 12-accessible area based on development trends. It is further recommended that two No-Build forecasts be developed, one using the same development assumptions as the Build scenario and one assuming development on the Outer Banks north of US 158 is constrained by congestion on NC 12. Since the growth rate to the design year assuming development is constrained by congestion on NC 12 is less than the low growth rate that has occurred from 2007 to 2014, the two forecasts as defined would represent the range of possible growth scenarios on the Outer Banks north of US 158. Note also that the 2012 draft memorandum referenced above also includes constrained development forecasts for ER2 of 11,591 development units (hotel rooms and houses) in 2035. Traffic forecasts using this development scenario are not recommended because it is in between the No-Build forecast of 10,847 development units and the unconstrained development forecast of 13,122 units and its effects would be captured by the low and high results of these two scenarios.

- Given the timing of project implementation, 2040 is now an appropriate design year with a 2015 base year.

These general recommendations are subject to change within the context of detailed work plan development discussions with NCDOT, NCTA, and FHWA.