

Proposed
US 64 Corridor Improvements
Hurricane Evacuation Reevaluation

FINAL Technical Memorandum

April 2019

Prepared for

NCDOT and



Plan Design Enable



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Prepared for

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I. INTRODUCTION

The proposed US 64 Corridor Improvement project is being reevaluated given that the previous analysis was released in the summer of 2012 and no major steps were taken to advance the project. This technical memorandum revisits the hurricane evacuation need identified in the original effort and the possible hurricane evacuation benefits of the proposed improvements to widen the corridor so it is a continuous four-lane facility (or at least one that provides two westbound evacuation lanes) from the Outer Banks inland.

WSP USA, the primary consultant addressing all aspects of reevaluating the project, has retained Atkins North America to update the hurricane analysis. Atkins has been directly involved in the previous US 64 evacuation analysis iterations and the transportation consultant for the Federal Emergency Management Agency (FEMA)/US Army Corps of Engineers (USACE) Hurricane Evacuation Studies (HES) that have been performed for the entire coastal region of North Carolina over the last 30 years.

Specifically, Atkins was retained to determine hurricane evacuation clearance times for a 2016 Base Year, Future Year 2040 No-Build, and a Future Year 2040 US 64 Improvement Alternative that widens the corridor to a continuous four-lane facility or provides two westbound evacuation lanes. The reevaluation includes updated land use, behavioral assumptions from the recently completed FEMA/USACE HES, roadway service volume/capacity figures based on North Carolina Department of Transportation's (NCDOT) maximum observed directional traffic counts, and recognition of the National Hurricane Center's (NHC) new hurricane watch and warning timeframes.

II. BACKGROUND ISSUES

In the 2000 to 2005 timeframe, the State of North Carolina sought to identify the most appropriate way to handle hurricane evacuation as part of the purpose and need of coastal roadway improvement projects. A formal study effort involving emergency management directors, law enforcement officers, and NCDOT officials was conducted and recognized ambient clearance times for all of the North Carolina coastal counties and inland counties along the sounds. The study focused on existing clearance times for many different storm intensities and tourist occupancy conditions as well as the realities of the warning system present at that time. Participants were asked to discuss and agree on a "not to exceed" clearance time that would try to be achieved, maintained, and recognized in coastal NCDOT corridor improvement projects affecting the hurricane evacuation situation. This resulted in an 18-hour legislative clearance time standard/goal that was based on the NHC's previous warning and watch timeframes of 24 and

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36 hours respectively. With an assumed average 6-hour pre-landfall hazards time (time before eye landfall when conditions become too bad to drive) added to 18 hours of evacuation travel, evacuations could be called for within the 24-hour NHC warning timeframe that existed 15 years ago.

An 18-hour clearance time standard was adopted by the State General Assembly in 2005 and is contained in North Carolina General Statute 136-102.7. While the legislation references the 18 hours as a standard, references to the legislation have called the 18 hours a “threshold”, a “goal”, and a “standard”.

Previous responses by NCDOT/ North Carolina Turnpike Authority (NCTA) to questions about the legislative intent are instructive:

“The legislation does say the 18 hours is a standard. It does not, however, dictate how that standard is to be met. It does not mandate that transportation officials achieve that standard in a single project either statewide or regionally. Therefore, for coastal projects that contain a controlling link (a segment of road whose capacity governs the forecast clearance time), state transportation officials currently expect to include hurricane evacuation in the statement of purpose and need and evaluate alternatives with the goal of bringing the forecast clearance time closer to the 18-hour standard. Such alternatives could include both new road infrastructure and emergency management strategies, such as reversing travel lanes during an evacuation.

FHWA has discussed the standard versus goal question with (previous) NCDOT leadership and agreed with mutual NCDOT and NCTA staff interpretation of the 18-hour standard as a goal for individual projects rather than a “must meet” directive. Previous NCDOT leadership believes this was the intent of the legislature at adoption.” (September 5, 2007 Updated Response to Agency Comments, Mid Currituck Bridge Study, TIP No. R-2576, NCTA).

Currently (in 2019), the NHC now issues warnings and watches 36 and 48 hours (respectively) in advance of tropical systems. This current reevaluation recognizes the need to consider the new 36/48-hour warning and watch NHC timeframes. Since the original goal of 18 hours was tied to the previous warning time of 24 hours, it would appear that a different goal should be established by NCDOT for evaluating the hurricane evacuation impacts of highway improvement projects. **It is strongly recommended that a new study effort be performed over the next year with state**



and local officials throughout the entire coastal area to establish a new clearance time goal and recommend modifications to the existing state statute).

The new goal should be a maximum of 30 hours which would allow for an assumed 6 hours of pre-landfall hazards time and 30 hours of vehicle evacuation so that evacuation advisories could be issued within the new 36-hour warning period. Keeping in mind that at 36 hours before eye landfall, hurricanes could be located some 500+ miles away (Daytona Beach e.g.) for a storm moving at a 15-mph forward speed and given the difficulty in convincing residents and tourists to leave this far in advance, a shorter timeframe may be more prudent to adopt once deliberated.

Times calculated in this analysis will be judged as positive if at or under 30 hours. However, once a new ‘standard’ is adopted, environmental documentation on project alternatives for coastal roadway improvement projects should incorporate the new benchmark for evaluation purposes.

This evaluation continues the use of a Category 3 hurricane, 75% tourist occupancy scenario for hurricane evacuation alternatives analysis. While the NHC still maintains that a Category 5 hurricane is possible for the Outer Banks and while certain rapidly intensifying storms may in fact require the evacuation of a 95% tourist occupancy condition (along with permanent residents), this should be considered a “maximum possible” scenario and NOT a “maximum probable” scenario. Given the peak time of year (mid-August through September) and hurricane history of the area, the maximum probable scenario of a Category 3 with 75% tourist occupancy should be the scenario that is considered as a measure of public safety consideration in analyzing roadway improvement alternatives. The 2017 hurricane season has shown that we have not seen all the hurricane possibilities that could happen in various localities.

III. EVACUEE DEMAND INPUT ASSUMPTIONS

One of the most important inputs to the hurricane evacuation analysis was the population and dwelling unit data assumed for the existing condition (2016 Base Year), Future Year 2040 No-Build, and Future Year 2040 US 64 Improvement scenarios. WSP USA developed the data for the recent Mid-Currituck Bridge (MCB) analysis alternatives and used the traffic evacuation zone boundaries from the recent FEMA/USACE HES for Dare and Currituck Counties. Data variables include permanent population and dwelling units, as well as seasonal population and dwelling unit figures. People and vehicles per unit were specified and varied by evacuation zone.

The 2040 dwelling unit forecast assumes the same development levels on the Outer Banks north of US 158 as the 2040 MCB traffic forecasts prepared by WSP USA for assessing project traffic congestion benefits. Dwelling unit forecasts in 2040 developed as a part of an on-going

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investment grade traffic and revenue study commissioned by the NCTA were used for Bodie Island from Kitty Hawk to Oregon Inlet. For 2040, Roanoke Island and Hatteras Island dwelling unit forecasts were based on growth trend data and available vacant property information provided by Dare County. Existing conditions (2016) for the hurricane modeling were grown from 2014 housing data included in the FEMA/USACE HES by applying 1.5 percent growth over a two-year period.

Appendix A provides the population and dwelling unit data by evacuation zone (Tables A-1 through A-3). Seasonal dwelling unit totals in Currituck County are 5,008 and 8,264 for the 2016 Base Year, and Future Year 2040 respectively. Seasonal dwelling unit totals in Dare County are 20,183 and 22,848 for the Base Year, and Future Year 2040 respectively. Permanent population is expected to grow modestly in each county between 2016 and 2040 with an increase of just under 5,000 people in each county.

In addition to population and dwelling unit assumptions, the reevaluation of hurricane evacuation incorporated the latest behavioral assumptions and tourist occupancies used in the FEMA/USACE *North Carolina HES Restudy (2015)* for 23 counties in coastal North Carolina. These assumptions include participation rates, destination/direction of travel information, vehicle usage, and four levels of tourist occupancy specified by evacuation zone, storm intensity, and seasonal versus permanent units. The assumptions are specified by evacuation zone and appear in **Appendix A** (Table A-4). The assumptions were vetted by emergency managers throughout the coastal counties in North Carolina and reflect the assumption that both permanent and seasonal residents will respond in earnest to messages/evacuation advisories that local officials are issuing. When planning for evacuations and developing clearance times, times should give people the opportunity to evacuate whether they choose to or not in a major storm condition.

The percent of permanent occupied dwelling units and seasonal units, vehicles per dwelling unit, and people per dwelling unit were assumed to be the same in 2040 as that assumed for 2015 in the *North Carolina HES Restudy (2015)*. The ratio of permanent to seasonal units was assumed not to change. The average number of vehicles and people per dwelling unit was assumed not to change because Dare and Currituck county land use plans provide no indication of an intent to increase dwelling unit densities beyond those defined by current county development and zoning regulations.

One substantive change in behavioral assumptions for this reevaluation involves the percent of evacuees assumed to travel northbound into Virginia and beyond versus those evacuees who are assumed to travel westbound to inland North Carolina destinations. In the previous *US 64*

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Hurricane Evacuation Analysis (based on the 2000 FEMA/USACE model), one-third of the Outer Banks evacuees were assumed to go northbound on NC 168 out of the region into Virginia versus two-thirds assumed to go westbound to inland destinations. This assumption was reversed based on the strong direction and opinions of emergency management and law enforcement stakeholders during preparation of the *Barco Diversion Plan Study (2012)* and the recent *North Carolina HES Restudy (2015)*. Highest hourly directional traffic counts during peak tourist season also confirm this substantive and needed change in assumptions. This change in assumption greatly influenced the route assignments and clearance time findings discussed below.

Evacuation demand expressed in vehicles generated by evacuation zone, by category of storm, and by tourist occupancy were then calculated by applying the behavioral and socioeconomic parameters to each evacuation zone's permanent and seasonal dwelling units. These generated "out of area" evacuation vehicles by category of storm and four tourist occupancies are displayed in **Appendix B** for the 2016 Base Year, Future Year 2040 No-Build, Future Year 2040 US 64 Improvement Alternative.

IV. SERVICE VOLUMES / CAPACITIES AND ROUTE USAGE

An important input is the assumption of how many vehicles per hour can be processed through various roadway segments over the course of an evacuation. To lessen the subjectivity of calculating theoretical service volume figures, the latest NCDOT highest hourly directional traffic count for all of 2016/2017 was incorporated as a starting hourly evacuation service volume ("capacity figure") for key bottlenecks. During the heaviest tourist occupancy weekends on the Outer Banks, a glimpse of maximum directional roadway traffic congestion occurs on summer weekends (typically July 4th weekend) as turnover of seasonal units occurs. For US 64, NCDOT permanent count station A2702 (US 64 0.60 miles west of Old Ferry Landing Road) indicates a maximum directional hourly count of 1,048 vehicles on a 2016 early July holiday weekend.

For future year roadway improvement alternatives where number of lanes assumptions change, a starting evacuation flow rate was input that mirrors what has been observed in other coastal areas for similar facility types and number of lanes configurations. Hourly directional service volumes during evacuations typically diminish as the evacuation progresses and traffic overwhelms the road network. Atkins has had a wealth of experience looking at traffic counts during evacuations to understand flow characteristics. For this analysis, Atkins diminished the starting flow figure (based on the highest observed directional traffic count) during the second and third quarters of the evacuation and then assumed the flow recovers during the last quarter of the evacuation as seen in actual hurricane evacuation traffic counts in other U.S. locations.

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This reality is now built into clearance time calculations. The assumed starting flow rate for each analysis segment by improvement alternative is shown in **Table 1**. Future roadway capacities reflect the build out of the MCB preferred alternative.

Table 1: Starting Evacuation Service Volume (by Road Segment, by Year and Improvement Alternative)

Roadway Segments	Base Year	Future No-Build	Future US 64 Imp
US 158 westbound east of Wright Memorial Bridge	2,200	2,200	2,200
Wright Memorial Bridge westbound	2,238	2,238	2,238
US 158 northbound west of Wright Memorial Bridge to MCB terminus	2,210	2900	2900
Mid-Currituck Bridge (MCB)	0	1200	1200
US 158 from MCB terminus to Barco	2,210	2,900	2,900
US 158 westbound from Barco to Elizabeth City	1,000	1,800	1,800
NC 168 northbound from Barco to Virginia	1,916	1,916	1,916
US 64 westbound	1,000	1,000	1,800

Hurricane Florence Traffic Counts

One of the most interesting ways to get intel about the traffic metrics of an evacuation in any coastal location is to examine traffic counts taken during the event and comparing them to normal traffic counts at the same locations/bottlenecks. Fortunately, NCDOT collected hourly and daily counts on US 64 just east of the Alligator River (station A2702) and on US 158 just east of the Wright Memorial Bridge (station R2702) during the recent Hurricane Florence evacuation off the Outer Banks. Ideally, evacuation traffic counts when coupled with behavioral interviews of permanent and tourist evacuees yield a wealth of behavioral characteristics and validation metrics for clearance time modeling. In this case, just traffic counts were available so no household evacuation participation rates or vehicle usage data by Dare County subarea are available for model validation. However, the Florence traffic count data is useful.

An October 9,2018 memo compiled by Mr. Keith Dixon of NCDOT’s Transportation Planning Division provides the available Hurricane Florence traffic count data. The data time span shows traffic counts from approximately two weeks prior to the Governors evacuation order for the NC Islands to approximately two weeks after the landfall of Hurricane Florence. Tables provided in the memo compare the 2018 traffic recorded at these locations with the 2017 traffic recorded for a comparable time period. Based upon the data, traffic volumes were substantially higher on

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Monday and Tuesday, September 10 and 11, 2018, than the daily counts from the second week of September 2017, and were comparable to the previous Monday, which was Labor Day. While the Governor and North Carolina Emergency Management did an exemplary job of calling for evacuation days before landfall, the Outer Banks public must have been very much on edge about the storm. Evacuation started in earnest at least a day ahead of the Governors' order. This is clearly seen in the count information at the US 64 and US 158 stations and must have been a reflection of the intensity of the storm and projected path being communicated by The Weather Channel® and local and state officials.

The memo documenting the Hurricane Florence evacuation traffic counts also shows hourly counts (non-directional) at both traffic count stations. These are useful for two purposes important to the hurricane analysis assumptions for US 64 improvements and MCB implementation. First, the total number of vehicles traversing each county location show that US 64 never reached capacity. The highest hourly count on US 64 during the Hurricane Florence evacuation was 685 vehicles which compares to an assumed maximum evacuation hourly directional service volume of 1,000 vehicles per hour. This is most likely the result of less than 100% evacuation participation by the permanent residents below Whalebone Junction and the distribution of the evacuation demand over more than one day. Interestingly, at the US 158 count station, it appears maximum evacuation directional service volume was reached during the evacuation with the highest hour showing 2,574 vehicles. Since this is a total of both directions it compares favorably to the analysis assumption of 2,238 vehicles per hour in one direction assumed in this environmental documentation and analysis.

Second, the counts show that the volumes of traffic leaving the county on the north end (US 158) versus south end (US 64) are 3 to 4 times larger, thus validating the new behavioral assumption about evacuation traffic route usage. Emergency management and law enforcement officials who informed analysis assumptions in recent studies were clearly correct that the old assumption of two-thirds westbound versus one-third northbound was not right and needed to be reversed.

Route Usage Assumptions

In terms of which roadway segments each evacuation zone would use for each improvement alternative, route usage assumptions were specified for every evacuation zone considering westbound (inland North Carolina destinations) and northbound (Virginia and beyond destinations) desired direction of travel. Percentages using key roadway segments were incorporated and varied by alternative. To be as transparent as possible with route usage assumptions, the analysis shows the roadway segment usage for every evacuation zones'

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westbound and northbound traffic. These route usage assumptions were then applied to the generated zonal out of area evacuation vehicles for each evacuation zone to develop evacuation vehicles by roadway segment, by storm intensity, by tourist occupancy, and by roadway improvement alternative.

For this US 64 analysis, three levels of US 64 usage were modeled:

- 1) US 64 evacuee normal usage based on the behavioral assumption of two-thirds northbound versus one-third westbound destination desire with no major influence by emergency, NCDOT, or law enforcement.
- 2) US 64 enhanced usage by evacuees based on local and real-time messaging to Nags Head and Outer Banks evacuees south of Whalebone Junction to use US 64 if possible. This might encourage up to half (50%) of these areas' normal northbound evacuees to use US 64 and head inland before turning northbound.
- 3) North Carolina (NC)-Virginia (VA) Border Traffic Control Plan/forced usage under extreme evacuation congestion conditions in southeast Virginia, the implementation of the current NC-VA Border Traffic Control Plan may create huge congestion at Barco as evacuees are forced westbound from there. This congestion could partially be helped by aggressive direction of the Nags Head and south of Whalebone Junction evacuees to use US 64 regardless of their ultimate destination. This may encourage up to 80% of these areas' normal northbound evacuees to use US 64 and head inland before turning northbound.

The route usage assumptions and calculated vehicles by roadway segment are shown in **Appendix B** for each of the three US 64 usage alternatives.

V. CLEARANCE TIMES

Incorporating the above input assumptions and metering the traffic through the roadway segments, a full range of clearance times were developed and are shown in **Appendix C** for each storm intensity, tourist occupancy, analysis year, improvement alternative (2016 Base Year, Future Year 2040 No-Build, Future Year 2040 US 64 Improved) and US 64 usage assumption (normal, enhanced, NC-VA Border Traffic Control Plan/forced). **Table 2** summarizes the key times for the three focal bottlenecks (US 64 westbound, US 158 at Barco, and NC 168 into Virginia) that this study highlights for comparison purposes. Clearance time is the theoretical time from the first vehicle leaving the Outer Banks to the last evacuating vehicle reaching I-95. Times assume that all tourists evacuate and that the permanent residents also participate as instructed by local emergency management. Historically, the Outer Banks permanent residents have not evacuated

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as they should, making evacuations less intense than the clearance times would suggest. Recently, North Carolina has not seen a storm strong enough to convince many of the Outer Banks permanent residents that they need to leave, but perhaps the severe impacts of 2017 hurricane activity in other parts of the country and Hurricane Florence impacts in 2018 may encourage evacuation.

Normal US 64 Evacuee Usage

Clearance times under normal evacuee usage for the 2016 Base Year, range from 18.5 hours to approximately 36 hours depending on the intensity of hurricane and tourist occupancy. The controlling bottleneck is US 158 from the Wright Memorial Bridge (WMB) to the Barco intersection and the time associated with this segment dictates when officials must start evacuating the seasonal and permanent populations. *The benchmark Category 3 with 75% occupancy clearance time for the base year is approximately 31 hours. Under the benchmark scenario and with normal evacuee usage, US 64 has a clearance time of 21.4 hours given base year evacuee demand and roadway capacity.*

Table 2: Roadway Segment Clearance Times (Based on Category 3-5 / 75% Occupancy)

Roadway Segments	NC 168	US 158 at Barco	US 64
Base Year 2016	27.2	31.1	21.4
Future Year 2040 No-Build	32.3	29.1	23.8
Future Year 2040 Improved US 64	32.3	29.1	14.6
Base Year 2016 <i>Enhanced Use</i>	24.6	28.6	26.9
Future Year 2040 No-Build <i>Enhanced Use</i>	29.4	27.0	29.9
Future Year 2040 Improved US 64 <i>Enhanced Use</i>	29.4	27.0	18.0
Base Year 2016 <i>with Border Plan activation and forced use of US 64</i>	4.4	26.9	30.7*
Future Year 2040 No-Build <i>with Border Plan activation and forced use of US 64</i>	4.6	25.5	34.2*
Future Year 2040 Improved US 64 <i>with Border Plan activation and forced use of US 64</i>	4.6	25.5	20.4*

*Highest time is associated with US 158 from Barco to Elizabeth City but could be mitigated by 3 wb lanes once improved.

Note: Even with ER2 land use under the Future Year 2040 No-Build Forced Use scenario, the maximum time is over 32 hours.

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For the Future Year 2040 No-Build scenario under normal US 64 usage, times range from approximately 18.4 to 37.6 hours depending on the intensity and tourist occupancy. The controlling bottleneck shifts to NC 168. The MCB is assumed to be in place and a third outgoing evacuation lane on US 158 from the MCB terminus to Barco is assumed to be in place. It should also be noted that US 158 from Barco to Elizabeth City is assumed to be widened in accordance with the NCDOT plans and work program [State Transportation Improvement Program (STIP) Project R-2574] for the future year. *The benchmark Category 3 with 75% occupancy clearance time for the Year 2040 with the No-Build Alternative is at 32.3 hours.* With no impetus for increased usage of US 64 by evacuees, the Future Year 2040 Improved US 64 scenario has the same time range from approximately 18.4 to 37.6 hours and the *benchmark Category 3 with 75% occupancy clearance time is still at 32.3 hours.*

Under normal usage, US 64 has a clearance time of 23.8 hours given future year evacuee demand and unimproved roadway capacity. For the Future Year 2040 condition with an improved US 64 times are greatly reduced to 14.6 hours. Obviously with no specific encouragement by local officials to use US 64, US 64 will be relatively underutilized compared to US 158 and NC 168.

Enhanced Evacuee Usage of US 64

Clearance times under enhanced usage (as described above in the report) for the 2016 Base Year, range from 17,1 hours to approximately 33.2 hours depending on the intensity of hurricane and tourist occupancy. The controlling bottleneck is still US 158 from the Wright Memorial Bridge to Barco but congestion levels are reduced due to the shift of traffic to the US 64 corridor. Under enhanced usage, *the benchmark Category 3 with 75% occupancy clearance time for the base year is approximately 28.6 hours. Under the benchmark scenario and with enhanced evacuee usage, US 64 has a clearance time of 26.9 hours given base year evacuee demand and roadway capacity, and balances congestion with the “competing” US 158 corridor.*

For the Future Year 2040 No-Build scenario under enhanced US 64 usage, times range from approximately 18.2 to 34.6 hours depending on the intensity and tourist occupancy. The controlling bottleneck is NC 168 and the US 64 corridor with relatively similar levels of congestion. Again, it is assumed that the MCB, the ability to have a third outgoing evacuation lane on US 158 at Barco and an improved US 158 from Barco to Elizabeth City is in place. *The benchmark Category 3 with 75% occupancy clearance time for the Year 2040 with the No-Build Alternative and enhanced use is just under 30 hours at 29.9 hours. Under enhanced usage, US 64 has a clearance time of 29.9 hours given future year evacuee demand and unimproved roadway capacity and is comparable in congestion to NC 168.*

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The Future Year 2040 Improved US 64 scenario with enhanced usage, has a time range from approximately 16.8 to 34.1 hours and the *benchmark Category 3 with 75% occupancy clearance time is just under 29.4 hours due to the remaining unimproved congestion on NC 168. For the Future Year 2040 condition with an improved US 64, times on the US 64 corridor are greatly reduced to 18 hours.*

NC-VA Border Traffic Control Plan Implementation/Forced Use

Clearance times with implementation of the current North Carolina-Virginia Border Traffic Control Plan and forced usage (as described above) for the 2016 Base Year, range from 31.8 to 68 hours on the current two-lane US 158 between Barco and Elizabeth City as traffic is forced onto this segment from NC 168. Under this horrendous condition, *the benchmark Category 3 with 75% occupancy clearance time for the base year is approximately 58 hours. Under the benchmark scenario and with forced evacuee usage, US 64 has a clearance time of 30.7 hours (and aside from US 158 west of Barco) becomes the controlling segment given base year evacuee demand and roadway capacity. In many respects, if NC 168 northbound is closed to NC evacuees, the extreme potential congestion on US 158 west of Barco should make maximum use of US 64 much easier to achieve.*

For the Future Year 2040 No-Build scenario, clearance times with implementation of the current North Carolina-Virginia Border Traffic Control Plan and forced usage, range from 22.6 to 47.6 hours on an improved US 158 between Barco and Elizabeth City as traffic is forced onto this segment from NC 168. Under this condition, *the benchmark Category 3 with 75% occupancy clearance time for the base year is approximately 41.2 hours. Under the benchmark scenario and with forced evacuee usage, US 64 has a clearance time of 34.2 hours (and aside from US 158 west of Barco) becomes the controlling segment given future year evacuee demand and roadway capacity. This is especially true if the US 158 west of Barco segment can accommodate three westbound lanes leaving one open for emergency vehicles which may be possible depending on the actual US 158 improvement footprint. Again, if NC 168 northbound is closed to NC evacuees, the potential congestion on US 158 west of Barco should make maximum use of US 64 much easier to achieve.*

For the Future Year 2040 US 64 Improved condition with NC-VA Border Traffic Control Plan/forced usage implementation, times are similar (21 to 44 hours) on US 158 but are dramatically improved on US 64 from 12.8 hours to 23.5 hours depending on the intensity and tourist occupancy. With the Future Year 2040 US 64 Improved scenario with forced usage, the

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benchmark Category 3 with 75% occupancy clearance time is 20.4 hours on US 64 but remains 38 hours on US 158 west of Barco assuming two westbound lanes.

VI. HURRICANE EVACUATION BENEFITS OF THE US 64 PROPOSED IMPROVEMENTS

The proposed improvements to US 64 in conjunction with aggressive emergency messaging to encourage or force usage of US 64 in various circumstances would provide many benefits to hurricane evacuations off the Outer Banks of North Carolina. Key benefits which should be recognized include:

- 1) Provides a substantial multi-lane redundant escape route for the Outer Banks evacuees desiring to go westbound and northbound out of Dare County if an incident or crash blocks the northern US 158/NC 168 escape routes. Specifically, if US 158 at the Barco intersection or the Wright Memorial Bridge/future MCB northern egress routes have an incident that shuts down one of those escape routes even temporarily, the improved US 64 route would serve as a, much needed alternative evacuation route.
- 2) With implementation of the NC-VA Border Traffic Control Plan, aggressive route usage messaging, a fast-moving intense hurricane, and contraflow use of US 158 between Barco and Elizabeth City (to create 3 westbound lanes), US 64 can and will play a critical role to evacuation and in that circumstance would be the most significant bottleneck. In this scenario, where southeastern Virginia and the Outer Banks of NC are evacuating in earnest (a scenario we have not fully seen), US 64 would save some 8.7 hours of overall evacuation clearance time allowing thousands of residents and tourists the ability to escape that might otherwise not be able to leave.
- 3) Options for moving evacuation traffic on US 64 in the face of a crash or incident while still maintaining an eastbound incoming lane are greatly enhanced by widening/improving the current two-lane section of US 64 off the Outer Banks and out of Dare County.
- 4) Even with normal (no special traffic messaging) US 64 evacuation usage, the improved US 64 would save south Outer Banks and some Nags Head residents and tourists 6 to 12 hours of evacuation clearance time depending on the scenario. However, the reduction of overall county evacuation time in the enhanced usage scenario with US 64 improved is modest (1 to 2 hours) due to congestion issues on NC 168 that are not “solved” by the widening of US 64.
- 5) Once a new clearance time goal/threshold/standard is adopted by the North Carolina Assembly which recognizes the new 48/36 hour watch and warning timeframes of the NHC, the combination of enhanced use of US 64 by targeted messaging and proposed improvements will allow the area to fall well within a possible 30-hour or less window and

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a 36-hour warning period (with pre-landfall hazards considered). As a reminder, the 30-hour or less mark would replace the old state legislated 18-hour benchmark associated with the previous 24-hour warning given by the NHC.

**APPENDIX A: POPULATION AND DWELLING UNIT ASSUMPTIONS AND
HURRICANE EVACUATION BEHAVIORAL ASSUMPTIONS SUMMARY**

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Table A-1: Population and Dwelling Unit Assumptions Summary – 2016 BASE / EXISTING YEAR

Evacuation Zone	Current Permanent Population	Current Permanent Occupied Dwelling Units	Current Seasonal Units	Vehicles per Permanent Occupied Dwelling Unit	Vehicles per Seasonal Dwelling Unit	People per Permanent Occupied Dwelling Unit	People per Seasonal Dwelling Unit
Dare 1 - Buxton/Hatteras Island	3,069	1,323	2,627	1.69	2.63	2.32	8.00
Dare 2 - Pea Island/Rodanthe/Salvo area	1,472	675	2,056	1.69	2.94	2.18	8.00
Dare 3 - Whalebone junction to Bodie Island lighthouse	267	129	1,339	1.92	2.64	2.07	8.00
Dare 4 - Nags Head to Whalebone junction	2,649	1,167	1,814	1.91	2.61	2.27	8.00
Dare 5 - Kitty Hawk/Kill Devil Hills area	14,930	6,247	7,210	1.98	2.47	2.39	8.00
Dare 6 - Duck/Southern Shores area	3,856	1,655	3,849	2.04	3.00	2.33	8.00
Dare 7 - Manteo/Roanoke Island	8,131	3,346	1,088	1.81	1.56	2.43	4.00
Dare 8 - Manns Harbor/East Lake area	1,321	520	200	2.20	1.75	2.54	4.00
Currituck 1 - northern Outer Banks/Corova area	99	54	545	3.00	2.80	1.84	8.00
Currituck 2 - Knotts Island	1,648	670	200	2.52	1.90	2.46	5.00
Currituck 3 - Corolla area	484	252	3,623	2.98	2.67	1.92	8.00
Currituck 4 - Jarvisburg/golf courses	3,075	1,240	135	2.33	1.05	2.48	3.00
Currituck 5 - Poplar Branch/Grandy area	4,836	1,950	305	1.93	1.05	2.48	3.00
Currituck 6 - Currituck/Tulls Creek Road area	4,556	1,675	130	2.39	1.05	2.72	3.00
Currituck 7 - Barco/Shawboro area	3,165	1,155	30	1.95	1.05	2.74	3.00
Currituck 8 - Moyock area	7,446	2,550	40	2.31	1.05	2.92	3.00
Dare Totals	35,695	15,062	20,183				
Currituck Totals	25,309	9,546	5,008				

Note: Hyde County will contribute vehicles from Ocracoke and these have been included in background traffic.

Proposed US 64 Corridor Improvements Hurricane Evacuation Reevaluation



Table A-2: Population and Dwelling Unit Assumptions Summary – FUTURE YEAR 2040 – NO BUILD

Evacuation Zone	2040 Permanent Population	2040 Permanent Occupied Dwelling Units	2040 Seasonal Units	Vehicles per Permanent Occupied Dwelling Unit	Vehicles per Seasonal Dwelling Unit	People per Permanent Occupied Dwelling Unit	People per Seasonal Dwelling Unit
Dare 1 - Buxton/Hatteras Island	2,986	1,287	3,038	1.69	2.63	2.32	8.00
Dare 2 - Pea Island/Rodanthe/Salvo area	1,635	750	2,350	1.69	2.94	2.18	8.00
Dare 3 - Whalebone junction to Bodie Island lighthouse	302	146	1,378	1.92	2.64	2.07	8.00
Dare 4 - Nags Head to Whalebone junction	3,008	1,325	2,084	1.91	2.61	2.27	8.00
Dare 5 - Kitty Hawk/Kill Devil Hills area	18,042	7,549	8,534	1.98	2.47	2.39	8.00
Dare 6 - Duck/Southern Shores area	3,754	1,611	3,775	2.04	3.00	2.33	8.00
Dare 7 - Manteo/Roanoke Island	8,517	3,505	1,414	1.81	1.56	2.43	4.00
Dare 8 - Manns Harbor/East Lake area	1,778	700	275	2.20	1.75	2.54	4.00
Currituck 1 - northern Outer Banks/Corova area	118	64	777	3.00	2.80	1.84	8.00
Currituck 2 - Knotts Island	1,895	771	230	2.52	1.90	2.46	5.00
Currituck 3 - Corolla area	566	295	6,512	2.98	2.67	1.92	8.00
Currituck 4 - Jarvisburg/golf courses	3,536	1,426	150	2.33	1.05	2.48	3.00
Currituck 5 - Poplar Branch/Grandy area	5,561	2,243	350	1.93	1.05	2.48	3.00
Currituck 6 - Currituck/Tulls Creek Road area	5,239	1,926	150	2.39	1.05	2.72	3.00
Currituck 7 - Barco/Shawboro area	3,639	1,328	45	1.95	1.05	2.74	3.00
Currituck 8 - Moyock area	8,563	2,933	50	2.31	1.05	2.92	3.00
Dare Totals	40,022	16,873	22,848				
Currituck Totals	29,119	10,985	8,264				

Notes: Hyde County will contribute vehicles from Ocracoke and these have been included in background traffic.

Proposed US 64 Corridor Improvements Hurricane Evacuation Reevaluation



Table A-3: Population and Dwelling Unit Assumptions Summary – FUTURE YEAR 2040 IMPROVED US 64

Evacuation Zone	2040 Permanent Population	2040 Permanent Occupied Dwelling Units	2040 Seasonal Units	Vehicles per Permanent Occupied Dwelling Unit	Vehicles per Seasonal Dwelling Unit	People per Permanent Occupied Dwelling Unit	People per Seasonal Dwelling Unit
Dare 1 - Buxton/Hatteras Island	2,986	1,287	3,038	1.69	2.63	2.32	8.00
Dare 2 - Pea Island/Rodanthe/Salvo area	1,635	750	2,350	1.69	2.94	2.18	8.00
Dare 3 - Whalebone junction to Bodie Island lighthouse	302	146	1,378	1.92	2.64	2.07	8.00
Dare 4 - Nags Head to Whalebone junction	3,008	1,325	2,084	1.91	2.61	2.27	8.00
Dare 5 - Kitty Hawk/Kill Devil Hills area	18,042	7,549	8,534	1.98	2.47	2.39	8.00
Dare 6 - Duck/Southern Shores area	3,754	1,611	3,775	2.04	3.00	2.33	8.00
Dare 7 - Manteo/Roanoke Island	8,517	3,505	1,414	1.81	1.56	2.43	4.00
Dare 8 - Manns Harbor/East Lake area	1,778	700	275	2.20	1.75	2.54	4.00
Currituck 1 - northern Outer Banks/Corova area	118	64	777	3.00	2.80	1.84	8.00
Currituck 2 - Knotts Island	1,895	771	230	2.52	1.90	2.46	5.00
Currituck 3 - Corolla area	566	295	6,512	2.98	2.67	1.92	8.00
Currituck 4 - Jarvisburg/golf courses	3,536	1,426	150	2.33	1.05	2.48	3.00
Currituck 5 - Poplar Branch/Grandy area	5,561	2,243	350	1.93	1.05	2.48	3.00
Currituck 6 - Currituck/Tulls Creek Road area	5,239	1,926	150	2.39	1.05	2.72	3.00
Currituck 7 - Barco/Shawboro area	3,639	1,328	45	1.95	1.05	2.74	3.00
Currituck 8 - Moyock area	8,563	2,933	50	2.31	1.05	2.92	3.00
Dare Totals	40,022	16,873	22,848				
Currituck Totals	29,119	10,985	8,264				

Note: Hyde County will contribute vehicles from Ocracoke and these have been included in background traffic.

Proposed US 64 Corridor Improvements Hurricane Evacuation Reevaluation



Table A-4: Hurricane Evacuation Behavioral Assumptions Summary – 2016 BASE / EXISTING YEAR AND 2040 FUTURE YEAR

Evacuation Zone	Participation Rates			Out of Area Destination Rates			Vehicle Usage		Desired Travel Direction		Tourist Occupancies Tested			
	Permanent Occupied Dwelling Units		Seasonal Units	Permanent Occupied Dwelling Units		Seasonal Units	Permanent Occupied Dwelling Units	Seasonal Units	North-bound	West-bound	Low	Medium	High	Max
	Category 1-2	Category 3-5	Category 1-5	Category 1-2	Category 3-5	Category 1-5								
Dare 1 - Buxton/Hatteras Island	90%	100%	100%	80%	84%	100%	90%	100%	50%	50%	35%	50%	75%	95%
Dare 2 - Pea Island/Rodanthe/Salvo area	90%	100%	100%	80%	84%	100%	90%	100%	50%	50%	35%	50%	75%	95%
Dare 3 - Whalebone junction to Bodie Island lighthouse	85%	100%	100%	80%	84%	100%	85%	100%	65%	35%	35%	50%	75%	95%
Dare 4 - Nags Head to Whalebone junction	85%	100%	100%	80%	84%	100%	85%	100%	65%	35%	35%	50%	75%	95%
Dare 5 - Kitty Hawk/Kill Devil Hills area	85%	100%	100%	80%	84%	100%	85%	100%	65%	35%	35%	50%	75%	95%
Dare 6 - Duck/Southern Shores area	85%	100%	100%	80%	84%	100%	85%	100%	65%	35%	35%	50%	75%	95%
Dare 7 - Manteo/Roanoke Island	70%	100%	100%	80%	84%	100%	75%	100%	40%	60%	35%	50%	75%	95%
Dare 8 - Manns Harbor/East Lake area	70%	100%	100%	80%	84%	100%	75%	100%	25%	75%	35%	50%	75%	95%
Currituck 1 - northern Outer Banks/Corova area	85%	100%	100%	85%	89%	100%	85%	100%	70%	30%	35%	50%	75%	95%
Currituck 2 - Knotts Island	85%	100%	100%	85%	89%	100%	85%	100%	100%	0%	35%	50%	75%	95%
Currituck 3 - Corolla area	85%	100%	100%	85%	89%	100%	85%	100%	70%	30%	35%	50%	75%	95%
Currituck 4 - Jarvisburg/golf courses	35%	90%	100%	50%	63%	100%	75%	100%	70%	30%	35%	50%	75%	95%
Currituck 5 - Poplar Branch/Grandy area	35%	90%	100%	50%	63%	100%	75%	100%	50%	50%	35%	50%	75%	95%
Currituck 6 - Currituck/Tulls Creek Road area	35%	90%	100%	50%	63%	100%	75%	100%	50%	50%	35%	50%	75%	95%
Currituck 7 - Barco/Shawboro area	15%	85%	100%	40%	55%	100%	75%	100%	50%	50%	35%	50%	75%	95%
Currituck 8 - Moyock area	15%	85%	100%	50%	63%	100%	75%	100%	50%	50%	35%	50%	75%	95%

**APPENDIX B: OUT OF AREA EVACUATION VEHICLES, ROUTE USAGE
ASSUMPTIONS, AND VEHICLES BY ROADWAY SEGMENT**

Proposed US 64 Corridor Improvements Hurricane Evacuation Reevaluation



Table B-1: Out of Area Evacuation Vehicles – 2016 BASE / EXISTING YEAR

Evacuation Zone	Category 1-2				Category 3-5			
	35% occupancy	50% occupancy	75% occupancy	95% occupancy	35% occupancy	50% occupancy	75% occupancy	95% occupancy
Dare 1 - Buxton/Hatteras Island	3,867	4,903	6,631	8,012	4,108	5,145	6,872	8,254
Dare 2 - Pea Island/Rodanthe/Salvo area	2,855	3,762	5,273	6,482	2,978	3,885	5,396	6,605
Dare 3 - Whalebone junction to Bodie Island lighthouse	1,380	1,911	2,794	3,501	1,414	1,944	2,828	3,535
Dare 4 - Nags Head to Whalebone junction	2,945	3,656	4,839	5,786	3,249	3,959	5,142	6,089
Dare 5 - Kitty Hawk/Kill Devil Hills area	13,382	16,054	20,506	24,068	15,065	17,736	22,188	25,750
Dare 6 - Duck/Southern Shores area	5,993	7,725	10,612	12,921	6,452	8,184	11,071	13,380
Dare 7 - Manteo/Roanoke Island	3,138	3,392	3,817	4,156	4,409	4,664	5,088	5,428
Dare 8 - Manns Harbor/East Lake area	603	655	743	813	843	896	983	1,053
Currituck 1 - northern Outer Banks/Corova area	634	862	1,244	1,549	657	886	1,267	1,572
Currituck 2 - Knotts Island	1,170	1,227	1,322	1,398	1,410	1,467	1,562	1,638
Currituck 3 - Corolla area	3,847	5,298	7,716	9,651	3,954	5,405	7,823	9,758
Currituck 4 - Jarvisburg/golf courses	429	450	486	514	1,278	1,300	1,335	1,363
Currituck 5 - Poplar Branch/Grandy area	606	654	734	798	1,713	1,761	1,841	1,905
Currituck 6 - Currituck/Tulls Creek Road area	573	594	628	655	1,750	1,771	1,805	1,832
Currituck 7 - Barco/Shawboro area	112	117	125	131	801	805	813	820
Currituck 8 - Moyock area	346	352	363	371	2,380	2,387	2,397	2,406
Dare Totals	34,164	42,057	55,214	65,739	38,518	46,412	59,569	70,094
Currituck Totals	7,717	9,555	12,617	15,068	13,943	15,781	18,843	21,294

Note: Hyde County will contribute vehicles from Ocracoke and these have been included in background traffic.

Proposed US 64 Corridor Improvements Hurricane Evacuation Reevaluation



Table B-2: Out of Area Evacuation Vehicles – FUTURE YEAR 2040 – NO-BUILD

Evacuation Zone	Category 1-2				Category 3-5			
	35% occupancy	50% occupancy	75% occupancy	95% occupancy	35% occupancy	50% occupancy	75% occupancy	95% occupancy
Dare 1 - Buxton/Hatteras Island	4,206	5,404	7,402	9,000	4,441	5,639	7,637	9,235
Dare 2 - Pea Island/Rodanthe/Salvo area	3,239	4,276	6,003	7,385	3,376	4,413	6,140	7,522
Dare 3 - Whalebone junction to Bodie Island lighthouse	1,435	1,981	2,890	3,618	1,473	2,019	2,929	3,656
Dare 4 - Nags Head to Whalebone junction	3,367	4,182	5,542	6,630	3,711	4,527	5,886	6,974
Dare 5 - Kitty Hawk/Kill Devil Hills area	16,017	19,179	24,449	28,664	18,050	21,212	26,481	30,697
Dare 6 - Duck/Southern Shores area	5,863	7,562	10,393	12,658	6,310	8,009	10,840	13,105
Dare 7 - Manteo/Roanoke Island	3,437	3,767	4,319	4,760	4,769	5,100	5,651	6,092
Dare 8 - Manns Harbor/East Lake area	815	887	1,008	1,104	1,139	1,211	1,331	1,427
Currituck 1 - northern Outer Banks/Corova area	879	1,206	1,750	2,185	907	1,233	1,777	2,212
Currituck 2 - Knotts Island	1,345	1,411	1,520	1,608	1,622	1,687	1,797	1,884
Currituck 3 - Corolla area	6,625	9,233	13,580	17,058	6,751	9,359	13,705	17,183
Currituck 4 - Jarvisburg/golf courses	491	515	554	586	1,468	1,492	1,531	1,563
Currituck 5 - Poplar Branch/Grandy area	697	752	844	917	1,969	2,024	2,116	2,190
Currituck 6 - Currituck/Tulls Creek Road area	659	683	722	754	2,013	2,036	2,076	2,107
Currituck 7 - Barco/Shawboro area	133	140	152	161	925	932	944	953
Currituck 8 - Moyock area	399	407	420	431	2,739	2,747	2,760	2,771
Dare Totals	38,379	47,239	62,006	73,820	43,269	52,129	66,896	78,709
Currituck Totals	11,230	14,347	19,543	23,699	18,393	21,510	26,706	30,862

Note: Hyde County will contribute vehicles from Ocracoke and these will be included in background traffic.

Proposed US 64 Corridor Improvements Hurricane Evacuation Reevaluation



Table B-3: Out of Area Evacuation Vehicles – FUTURE YEAR 2040 IMPROVED US 64

Evacuation Zone	Category 1-2				Category 3-5			
	35% occupancy	50% occupancy	75% occupancy	95% occupancy	35% occupancy	50% occupancy	75% occupancy	95% occupancy
Dare 1 - Buxton/Hatteras Island	4,206	5,404	7,402	9,000	4,441	5,639	7,637	9,235
Dare 2 - Pea Island/Rodanthe/Salvo area	3,239	4,276	6,003	7,385	3,376	4,413	6,140	7,522
Dare 3 - Whalebone junction to Bodie Island lighthouse	1,435	1,981	2,890	3,618	1,473	2,019	2,929	3,656
Dare 4 - Nags Head to Whalebone junction	3,367	4,182	5,542	6,630	3,711	4,527	5,886	6,974
Dare 5 - Kitty Hawk/Kill Devil Hills area	16,017	19,179	24,449	28,664	18,050	21,212	26,481	30,697
Dare 6 - Duck/Southern Shores area	5,863	7,562	10,393	12,658	6,310	8,009	10,840	13,105
Dare 7 - Manteo/Roanoke Island	3,437	3,767	4,319	4,760	4,769	5,100	5,651	6,092
Dare 8 - Manns Harbor/East Lake area	815	887	1,008	1,104	1,139	1,211	1,331	1,427
Currituck 1 - northern Outer Banks/Corova area	879	1,206	1,750	2,185	907	1,233	1,777	2,212
Currituck 2 - Knotts Island	1,345	1,411	1,520	1,608	1,622	1,687	1,797	1,884
Currituck 3 - Corolla area	6,625	9,233	13,580	17,058	6,751	9,359	13,705	17,183
Currituck 4 - Jarvisburg/golf courses	491	515	554	586	1,468	1,492	1,531	1,563
Currituck 5 - Poplar Branch/Grandy area	697	752	844	917	1,969	2,024	2,116	2,190
Currituck 6 - Currituck/Tulls Creek Road area	659	683	722	754	2,013	2,036	2,076	2,107
Currituck 7 - Barco/Shawboro area	133	140	152	161	925	932	944	953
Currituck 8 - Moyock area	399	407	420	431	2,739	2,747	2,760	2,771
Dare Totals	38,379	47,239	62,006	73,820	43,269	52,129	66,896	78,709
Currituck Totals	11,230	14,347	19,543	23,699	18,393	21,510	26,706	30,862

Note: Hyde County will contribute vehicles from Ocracoke and these will be included in background traffic.

Proposed US 64 Corridor Improvements Hurricane Evacuation Reevaluation



Table B-4: Route Usage Assumptions (Percent of Out Traffic Using Specific Route Segments by Directional Destination) — **NORMAL USE**

WESTBOUND DESTINATIONS

Evacuation Zone	US 158 east of Wright Memorial Bridge	Wright Memorial Bridge	US 158 from Wright Memorial Bridge to Mid-Currituck terminus	Proposed Mid-Currituck Bridge	US 158 From Mid-Currituck Bridge terminus to Barco	US 158 from Barco to Elizabeth City	168 North-bound Barco to Virginia State Line	US 64 West-bound	Percent of Trip Generation Desiring Westbound Destination
Dare 1 - Buxton/Hatteras Island	0%	0%	0%	0%	0%	0%	0%	100%	50%
Dare 2 - Pea Island/Rodanthe/Salvo area	0%	0%	0%	0%	0%	0%	0%	100%	50%
Dare 3 - Whalebone junction to Bodie Island lighthouse	0%	0%	0%	0%	0%	0%	0%	100%	35%
Dare 4 - Nags Head to Whalebone junction	50%	50%	50%	0%	50%	50%	0%	50%	35%
Dare 5 - Kitty Hawk/Kill Devil Hills area	100%	100%	100%	0%	100%	100%	0%	0%	35%
Dare 6 - Duck/Southern Shores area	50%	50%	50%	50%	100%	100%	0%	0%	35%
Dare 7 - Manteo/Roanoke Island	0%	0%	0%	0%	0%	0%	0%	100%	60%
Dare 8 - Manns Harbor/East Lake area	0%	0%	0%	0%	0%	0%	0%	100%	75%
Currituck 1 - northern Outer Banks/Corova area	0%	0%	0%	100%	100%	100%	0%	0%	30%
Currituck 2 - Knotts Island	0%	0%	0%	0%	0%	0%	0%	0%	0%
Currituck 3 - Corolla area	0%	0%	0%	100%	100%	100%	0%	0%	30%
Currituck 4 - Jarvisburg/golf courses	0%	0%	100%	0%	100%	100%	0%	0%	30%
Currituck 5 - Poplar Branch/Grandy area	0%	0%	70%	0%	100%	100%	0%	0%	50%
Currituck 6 - Currituck/Tulls Creek Road area	0%	0%	0%	0%	0%	100%	0%	0%	50%
Currituck 7 - Barco/Shawboro area	0%	0%	0%	0%	10%	100%	0%	0%	50%
Currituck 8 - Moyock area	0%	0%	0%	0%	0%	100%	0%	0%	50%
Key:	<i>Base Year / No Mid-Currituck Bridge</i>								

Proposed US 64 Corridor Improvements Hurricane Evacuation Reevaluation



Table B-4: Route Usage Assumptions (Percent of Out Traffic Using Specific Route Segments by Directional Destination) — **NORMAL USE (continued)**

NORTHBOUND DESTINATIONS

Evacuation Zone	US 158 east of Wright Memorial Bridge	Wright Memorial Bridge	US 158 from Wright Memorial Bridge to Mid-Currituck terminus	Proposed Mid-Currituck Bridge	US 158 From Mid-Currituck Bridge terminus to Barco	US 158 from Barco to Elizabeth City	168 North-bound Barco to Virginia State Line	US 64 West-bound	Percent of Trip Generation Desiring Northbound Destination
Dare 1 - Buxton/Hatteras Island	70%	70%	70%	0%	70%	0%	70%	30%	50%
Dare 2 - Pea Island/Rodanthe/Salvo area	70%	70%	70%	0%	70%	0%	70%	30%	50%
Dare 3 - Whalebone junction to Bodie Island lighthouse	70%	70%	70%	0%	70%	0%	70%	30%	65%
Dare 4 - Nags Head to Whalebone junction	90%	90%	90%	0%	90%	0%	90%	10%	65%
Dare 5 - Kitty Hawk/Kill Devil Hills area	100%	100%	100%	0%	100%	0%	100%	0%	65%
Dare 6 - Duck/Southern Shores area	50%	50%	50%	50%	100%	0%	100%	0%	65%
Dare 7 - Manteo/Roanoke Island	20%	20%	20%	0%	20%	0%	20%	80%	40%
Dare 8 - Manns Harbor/East Lake area	0%	0%	0%	0%	0%	0%	0%	100%	25%
Currituck 1 - northern Outer Banks/Corova area	0%	0%	0%	100%	100%	0%	100%	0%	70%
Currituck 2 - Knotts Island	0%	0%	0%	0%	0%	0%	0%	0%	100%
Currituck 3 - Corolla area	0%	0%	0%	100%	100%	0%	100%	0%	70%
Currituck 4 - Jarvisburg/golf courses	0%	0%	100%	0%	100%	0%	100%	0%	70%
Currituck 5 - Poplar Branch/Grandy area	0%	0%	70%	0%	100%	0%	100%	0%	50%
Currituck 6 - Currituck/Tulls Creek Road area	0%	0%	0%	0%	0%	0%	100%	0%	50%
Currituck 7 - Barco/Shawboro area	0%	0%	0%	0%	10%	0%	100%	0%	50%
Currituck 8 - Moyock area	0%	0%	0%	0%	0%	0%	100%	0%	50%
Key:	<i>Base Year / No Mid-Currituck Bridge</i>								

Proposed US 64 Corridor Improvements Hurricane Evacuation Reevaluation



Table B-5: Route Usage Assumptions (Percent of Out Traffic Using Specific Route Segments by Directional Destination) — **ENHANCED USE**

WESTBOUND DESTINATIONS

Evacuation Zone	US 158 east of Wright Memorial Bridge	Wright Memorial Bridge	US 158 from Wright Memorial Bridge to Mid-Currituck terminus	Proposed Mid-Currituck Bridge	US 158 From Mid-Currituck Bridge terminus to Barco	US 158 from Barco to Elizabeth City	168 North-bound Barco to Virginia State Line	US 64 West-bound	Percent of Trip Generation Desiring Westbound Destination
Dare 1 - Buxton/Hatteras Island	0%	0%	0%	0%	0%	0%	0%	100%	50%
Dare 2 - Pea Island/Rodanthe/Salvo area	0%	0%	0%	0%	0%	0%	0%	100%	50%
Dare 3 - Whalebone junction to Bodie Island lighthouse	0%	0%	0%	0%	0%	0%	0%	100%	35%
Dare 4 - Nags Head to Whalebone junction	25%	25%	25%	0%	25%	25%	0%	75%	35%
Dare 5 - Kitty Hawk/Kill Devil Hills area	100%	100%	100%	0%	100%	100%	0%	0%	35%
Dare 6 - Duck/Southern Shores area	50%	50%	50%	50%	100%	100%	0%	0%	35%
Dare 7 - Manteo/Roanoke Island	0%	0%	0%	0%	0%	0%	0%	100%	60%
Dare 8 - Manns Harbor/East Lake area	0%	0%	0%	0%	0%	0%	0%	100%	75%
Currituck 1 - northern Outer Banks/Corova area	0%	0%	0%	100%	100%	100%	0%	0%	30%
Currituck 2 - Knotts Island	0%	0%	0%	0%	0%	0%	0%	0%	0%
Currituck 3 - Corolla area	0%	0%	0%	100%	100%	100%	0%	0%	30%
Currituck 4 - Jarvisburg/golf courses	0%	0%	100%	0%	100%	100%	0%	0%	30%
Currituck 5 - Poplar Branch/Grandy area	0%	0%	70%	0%	100%	100%	0%	0%	50%
Currituck 6 - Currituck/Tulls Creek Road area	0%	0%	0%	0%	0%	100%	0%	0%	50%
Currituck 7 - Barco/Shawboro area	0%	0%	0%	0%	10%	100%	0%	0%	50%
Currituck 8 - Moyock area	0%	0%	0%	0%	0%	100%	0%	0%	50%
Key:	<i>With Enhanced Use of US 64</i>					<i>Base Year / No Mid-Currituck Bridge</i>			

Proposed US 64 Corridor Improvements Hurricane Evacuation Reevaluation



Table B-5: Route Usage Assumptions (Percent of Out Traffic Using Specific Route Segments by Directional Destination) — **ENHANCED USE (continued)**

NORTHBOUND DESTINATIONS

Evacuation Zone	US 158 east of Wright Memorial Bridge	Wright Memorial Bridge	US 158 from Wright Memorial Bridge to Mid-Currituck terminus	Proposed Mid-Currituck Bridge	US 158 From Mid-Currituck Bridge terminus to Barco	US 158 from Barco to Elizabeth City	168 North-bound Barco to Virginia State Line	US 64 West-bound	Percent of Trip Generation Desiring Northbound Destination
Dare 1 - Buxton/Hatteras Island	35%	35%	35%	0%	35%	0%	35%	65%	50%
Dare 2 - Pea Island/Rodanthe/Salvo area	35%	35%	35%	0%	35%	0%	35%	65%	50%
Dare 3 - Whalebone junction to Bodie Island lighthouse	35%	35%	35%	0%	35%	0%	35%	65%	65%
Dare 4 - Nags Head to Whalebone junction	45%	45%	45%	0%	45%	0%	45%	55%	65%
Dare 5 - Kitty Hawk/Kill Devil Hills area	100%	100%	100%	0%	100%	0%	100%	0%	65%
Dare 6 - Duck/Southern Shores area	50%	50%	50%	50%	100%	0%	100%	0%	65%
Dare 7 - Manteo/Roanoke Island	10%	10%	10%	0%	10%	0%	10%	90%	40%
Dare 8 - Manns Harbor/East Lake area	0%	0%	0%	0%	0%	0%	0%	100%	25%
Currituck 1 - northern Outer Banks/Corova area	0%	0%	0%	100%	100%	0%	100%	0%	70%
Currituck 2 - Knotts Island	0%	0%	0%	0%	0%	0%	0%	0%	100%
Currituck 3 - Corolla area	0%	0%	0%	100%	100%	0%	100%	0%	70%
Currituck 4 - Jarvisburg/golf courses	0%	0%	100%	0%	100%	0%	100%	0%	70%
Currituck 5 - Poplar Branch/Grandy area	0%	0%	70%	0%	100%	0%	100%	0%	50%
Currituck 6 - Currituck/Tulls Creek Road area	0%	0%	0%	0%	0%	0%	100%	0%	50%
Currituck 7 - Barco/Shawboro area	0%	0%	0%	0%	10%	0%	100%	0%	50%
Currituck 8 - Moyock area	0%	0%	0%	0%	0%	0%	100%	0%	50%
Key:	<i>With Enhanced Use of US 64</i>					<i>Base Year / No Mid-Currituck Bridge</i>			

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Table B-6: Route Usage Assumptions (Percent of Out Traffic Using Specific Route Segments by Directional Destination) – US 64 BORDER TRAFFIC CONTROL FORCED USE

WESTBOUND DESTINATIONS

Evacuation Zone	US 158 east of Wright Memorial Bridge	Wright Memorial Bridge	US 158 from Wright Memorial Bridge to Mid-Currituck terminus	Proposed Mid-Currituck Bridge	US 158 From Mid-Currituck Bridge terminus to Barco	US 158 from Barco to Elizabeth City	168 North-bound Barco to Virginia State Line	US 64 West-bound	Percent of Trip Generation Desiring Westbound Destination
Dare 1 - Buxton/Hatteras Island	0%	0%	0%	0%	0%	0%	0%	100%	0%
Dare 2 - Pea Island/Rodanthe/Salvo area	0%	0%	0%	0%	0%	0%	0%	100%	0%
Dare 3 - Whalebone junction to Bodie Island lighthouse	0%	0%	0%	0%	0%	0%	0%	100%	0%
Dare 4 - Nags Head to Whalebone junction	10%	10%	10%	0%	10%	10%	0%	90%	10%
Dare 5 - Kitty Hawk/Kill Devil Hills area	100%	100%	100%	0%	100%	100%	0%	0%	100%
Dare 6 - Duck/Southern Shores area	50%	50%	50%	50%	100%	100%	0%	0%	50%
Dare 7 - Manteo/Roanoke Island	0%	0%	0%	0%	0%	0%	0%	100%	0%
Dare 8 - Manns Harbor/East Lake area	0%	0%	0%	0%	0%	0%	0%	100%	0%
Currituck 1 - northern Outer Banks/Corova area	0%	0%	0%	100%	100%	100%	0%	0%	0%
Currituck 2 - Knotts Island	0%	0%	0%	0%	0%	0%	0%	0%	0%
Currituck 3 - Corolla area	0%	0%	0%	100%	100%	100%	0%	0%	0%
Currituck 4 - Jarvisburg/golf courses	0%	0%	100%	0%	100%	100%	0%	0%	0%
Currituck 5 - Poplar Branch/Grandy area	0%	0%	70%	0%	100%	100%	0%	0%	0%
Currituck 6 - Currituck/Tulls Creek Road area	0%	0%	0%	0%	0%	100%	0%	0%	0%
Currituck 7 - Barco/Shawboro area	0%	0%	0%	0%	10%	100%	0%	0%	0%
Currituck 8 - Moyock area	0%	0%	0%	0%	0%	100%	0%	0%	0%
Key:	<i>With Border Traffic Control Plan and Forced Use of US 64 with shift to US 158</i>					<i>Base Year / No Mid-Currituck Bridge</i>			

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Table B-6: Route Usage Assumptions (Percent of Out Traffic Using Specific Route Segments by Directional Destination) — **US 64 BORDER TRAFFIC CONTROL FORCED USE** (continued)

NORTHBOUND DESTINATIONS

Evacuation Zone	US 158 east of Wright Memorial Bridge	Wright Memorial Bridge	US 158 from Wright Memorial Bridge to Mid-Currituck terminus	Proposed Mid-Currituck Bridge	US 158 From Mid-Currituck Bridge terminus to Barco	US 158 from Barco to Elizabeth City	168 North-bound Barco to Virginia State Line	US 64 West-bound	Percent of Trip Generation Desiring Northbound Destination
Dare 1 - Buxton/Hatteras Island	14%	14%	14%	0%	14%	10%	4%	86%	50%
Dare 2 - Pea Island/Rodanthe/Salvo area	14%	14%	14%	0%	14%	10%	4%	86%	50%
Dare 3 - Whalebone junction to Bodie Island lighthouse	14%	14%	14%	0%	14%	10%	4%	86%	65%
Dare 4 - Nags Head to Whalebone junction	7%	7%	7%	0%	7%	5%	2%	93%	65%
Dare 5 - Kitty Hawk/Kill Devil Hills area	100%	100%	100%	0%	100%	95%	5%	0%	65%
Dare 6 - Duck/Southern Shores area	50%	50%	50%	50%	100%	95%	5%	0%	65%
Dare 7 - Manteo/Roanoke Island	1%	1%	1%	0%	1%	0%	1%	99%	40%
Dare 8 - Manns Harbor/East Lake area	0%	0%	0%	0%	0%	0%	0%	100%	25%
Currituck 1 - northern Outer Banks/Corova area	0%	0%	0%	100%	100%	95%	5%	0%	70%
Currituck 2 - Knotts Island	0%	0%	0%	0%	0%	0%	0%	0%	100%
Currituck 3 - Corolla area	0%	0%	0%	100%	100%	95%	5%	0%	70%
Currituck 4 - Jarvisburg/golf courses	0%	0%	100%	0%	100%	95%	5%	0%	70%
Currituck 5 - Poplar Branch/Grandy area	0%	0%	70%	0%	100%	95%	5%	0%	50%
Currituck 6 - Currituck/Tulls Creek Road area	0%	0%	0%	0%	0%	95%	5%	0%	50%
Currituck 7 - Barco/Shawboro area	0%	0%	0%	0%	10%	95%	5%	0%	50%
Currituck 8 - Moyock area	0%	0%	0%	0%	0%	95%	5%	0%	50%
Key:	<i>With Border Traffic Control Plan and Forced Use of US 64 with shift to US 158</i>					<i>Base Year / No Mid-Currituck Bridge</i>			

APPENDIX C: BOTTLENECKS / CLEARANCE TIME CALCULATIONS

Proposed US 64 Corridor Improvements Hurricane Evacuation Reevaluation



Table C-1: Bottlenecks / Clearance Time Calculations (By Road Segment, By Year, and Improvement Alternative) — **NORMAL USE**

BASE YEAR SEGMENT CLEARANCE TIMES

(No North Carolina/Virginia Border Plan Activation)

Roadway Segments	Category 1-2				Category 3-5			
	35% occupancy	50% occupancy	75% occupancy	95% occupancy	35% occupancy	50% occupancy	75% occupancy	95% occupancy
US 158 westbound east of Wright Memorial Bridge	18.0	21.8	28.2	33.3	19.4	23.2	29.6	34.7
Wright Memorial Bridge westbound	17.8	21.5	27.8	32.8	19.1	22.9	29.1	34.2
US 158 northbound west of Wright Memorial Bridge to future Mid-Currituck Bridge terminus	18.4	22.2	28.6	33.7	20.6	24.4	30.8	35.9
Future Mid-Currituck Bridge <i>(not in place for Base Year)</i>								
US 158 from future Mid-Currituck Bridge terminus to Barco	18.5	22.3	28.7	33.8	20.9	24.7	31.1	36.2
US 158 westbound from Barco to Elizabeth City	13.9	16.3	20.4	23.7	17.9	20.3	24.4	27.7
NC 168 northbound from Barco to Virginia	15.8	19.0	24.3	28.5	18.8	21.9	27.2	31.4
US 64 westbound	13.6	15.8	19.5	22.5	15.5	17.7	21.4	24.4

FUTURE YEAR 2040 NO-BUILD SEGMENT CLEARANCE TIMES

(No North Carolina/Virginia Border Plan Activation)

Roadway Segments	Category 1-2				Category 3-5			
	35% occupancy	50% occupancy	75% occupancy	95% occupancy	35% occupancy	50% occupancy	75% occupancy	95% occupancy
US 158 westbound east of Wright Memorial Bridge	15.9	18.7	23.5	27.3	17.3	20.1	24.9	28.7
Wright Memorial Bridge westbound	15.6	18.5	23.2	26.9	17.0	19.8	24.5	28.3
US 158 northbound west of Wright Memorial Bridge to future Mid-Currituck Bridge terminus	16.3	19.2	24.0	27.9	18.6	21.5	26.3	30.2
Future Mid-Currituck Bridge	12.9	16.4	22.2	26.9	13.2	16.7	22.6	27.2
US 158 from future Mid-Currituck Bridge terminus to Barco	17.3	20.9	27.0	31.9	19.4	23.0	29.1	34.0
US 158 westbound from Barco to Elizabeth City	10.4	12.1	14.9	17.2	12.9	14.6	17.5	19.8
NC 168 northbound from Barco to Virginia	18.4	22.4	29.0	34.2	21.8	25.7	32.3	37.6
US 64 westbound	14.8	17.3	21.6	25.1	16.9	19.5	23.8	27.2

Proposed US 64 Corridor Improvements Hurricane Evacuation Reevaluation



Table C-1: Bottlenecks / Clearance Time Calculations (By Road Segment, By Year, and Improvement Alternative) — **NORMAL USE (continued)**

FUTURE YEAR 2040 IMPROVED US 64 SEGMENT CLEARANCE TIMES

(No North Carolina/Virginia Border Plan Activation)

Roadway Segments	Category 1-2				Category 3-5			
	35% occupancy	50% occupancy	75% occupancy	95% occupancy	35% occupancy	50% occupancy	75% occupancy	95% occupancy
US 158 westbound east of Wright Memorial Bridge	15.9	18.7	23.5	27.3	17.3	20.1	24.9	28.7
Wright Memorial Bridge westbound	15.6	18.5	23.2	26.9	17.0	19.8	24.5	28.3
US 158 northbound west of Wright Memorial Bridge to future Mid-Currituck Bridge terminus	16.3	19.2	24.0	27.9	18.6	21.5	26.3	30.2
Future Mid-Currituck Bridge	12.9	16.4	22.2	26.9	13.2	16.7	22.6	27.2
US 158 from future Mid-Currituck Bridge terminus to Barco	17.3	20.9	27.0	31.9	19.4	23.0	29.1	34.0
US 158 westbound from Barco to Elizabeth City	10.4	12.1	14.9	17.2	12.9	14.6	17.5	19.8
NC 168 northbound from Barco to Virginia	18.4	22.4	29.0	34.2	21.8	25.7	32.3	37.6
US 64 westbound	9.6	11.1	13.4	15.4	10.8	12.2	14.6	16.5

Proposed US 64 Corridor Improvements Hurricane Evacuation Reevaluation



Table C-2: Bottlenecks / Clearance Time Calculations (By Road Segment, By Year, and Improvement Alternative) — **ENHANCED USE**

BASE YEAR SEGMENT CLEARANCE TIMES

(No North Carolina/Virginia Border Plan Activation)

Roadway Segments	Category 1-2				Category 3-5			
	35% occupancy	50% occupancy	75% occupancy	95% occupancy	35% occupancy	50% occupancy	75% occupancy	95% occupancy
US 158 westbound east of Wright Memorial Bridge	16.6	20.1	25.8	30.4	17.9	21.3	27.1	31.7
Wright Memorial Bridge westbound	16.4	19.8	25.4	30.0	17.7	21.0	26.7	31.2
US 158 northbound west of Wright Memorial Bridge to future Mid-Currituck Bridge terminus	17.0	20.5	26.2	30.8	19.1	22.5	28.3	32.9
Future Mid-Currituck Bridge <i>(not in place for Base Year)</i>								
US 158 from future Mid-Currituck Bridge terminus to Barco	17.1	20.6	26.3	31.0	19.4	22.8	28.6	33.2
US 158 westbound from Barco to Elizabeth City	13.6	16.0	20.0	23.1	17.5	19.9	23.9	27.1
NC 168 northbound from Barco to Virginia	14.4	17.2	21.8	25.5	17.2	20.0	24.6	28.3
US 64 westbound	16.6	19.7	24.7	28.8	18.8	21.8	26.9	31.0

FUTURE YEAR 2040 NO-BUILD SEGMENT CLEARANCE TIMES

(No North Carolina/Virginia Border Plan Activation)

Roadway Segments	Category 1-2				Category 3-5			
	35% occupancy	50% occupancy	75% occupancy	95% occupancy	35% occupancy	50% occupancy	75% occupancy	95% occupancy
US 158 westbound east of Wright Memorial Bridge	14.3	16.8	20.8	24.1	15.6	18.0	22.1	25.4
Wright Memorial Bridge westbound	14.1	16.5	20.5	23.8	15.4	17.8	21.8	25.0
US 158 northbound west of Wright Memorial Bridge to future Mid-Currituck Bridge terminus	14.8	17.2	21.3	24.6	17.0	19.4	23.5	26.8
Future Mid-Currituck Bridge	12.9	16.4	22.2	26.9	13.2	16.7	22.6	27.2
US 158 from future Mid-Currituck Bridge terminus to Barco	16.1	19.4	25.0	29.4	18.1	21.4	27.0	31.4
US 158 westbound from Barco to Elizabeth City	10.2	11.8	14.6	16.9	12.7	14.4	17.2	19.4
NC 168 northbound from Barco to Virginia	16.8	20.3	26.2	30.9	20.0	23.5	29.4	34.1
US 64 westbound	18.2	21.7	27.5	32.2	20.5	24.1	29.9	34.6

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Table C-2: Bottlenecks / Clearance Time Calculations (By Road Segment, By Year, and Improvement Alternative) — **ENHANCED USE (continued)**

FUTURE YEAR 2040 IMPROVED US 64 SEGMENT CLEARANCE TIMES

(No North Carolina/Virginia Border Plan Activation)

Roadway Segments	Category 1-2				Category 3-5			
	35% occupancy	50% occupancy	75% occupancy	95% occupancy	35% occupancy	50% occupancy	75% occupancy	95% occupancy
US 158 westbound east of Wright Memorial Bridge	14.3	16.8	20.8	24.1	15.6	18.0	22.1	25.4
Wright Memorial Bridge westbound	14.1	16.5	20.5	23.8	15.4	17.8	21.8	25.0
US 158 northbound west of Wright Memorial Bridge to future Mid-Currituck Bridge terminus	14.8	17.2	21.3	24.6	17.0	19.4	23.5	26.8
Future Mid-Currituck Bridge	12.9	16.4	22.2	26.9	13.2	16.7	22.6	27.2
US 158 from future Mid-Currituck Bridge terminus to Barco	16.1	19.4	25.0	29.4	18.1	21.4	27.0	31.4
US 158 westbound from Barco to Elizabeth City	10.2	11.8	14.6	16.9	12.7	14.4	17.2	19.4
NC 168 northbound from Barco to Virginia	16.8	20.3	26.2	30.9	20.0	23.5	29.4	34.1
US 64 westbound	11.5	13.5	16.7	19.3	12.8	14.8	18.0	20.6

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Table C-3: Bottlenecks / Clearance Time Calculations (By Road Segment, By Year, and Improvement Alternative) — **US 64 BORDER TRAFFIC CONTROL FORCED USE**

BASE YEAR SEGMENT CLEARANCE TIMES

(With North Carolina/Virginia Border Plan Activation)

Roadway Segments	Category 1-2				Category 3-5			
	35% occupancy	50% occupancy	75% occupancy	95% occupancy	35% occupancy	50% occupancy	75% occupancy	95% occupancy
US 158 westbound east of Wright Memorial Bridge	15.7	18.9	24.2	28.5	16.9	20.1	25.4	29.6
Wright Memorial Bridge westbound	15.5	18.6	23.8	28.0	16.6	19.8	25.0	29.2
US 158 northbound west of Wright Memorial Bridge to future Mid-Currituck Bridge terminus	16.1	19.3	24.6	28.9	18.0	21.2	26.6	30.9
Future Mid-Currituck Bridge (<i>not in place for Base Year</i>)								
US 158 from future Mid-Currituck Bridge terminus to Barco	16.1	19.4	24.7	29.0	18.3	21.6	26.9	31.2
US 158 westbound from Barco to Elizabeth City	31.8	38.6	50.0	59.2	40.6	47.4	58.8	68.0
NC 168 northbound from Barco to Virginia	3.8	4.0	4.2	4.4	4.0	4.1	4.4	4.6
US 64 westbound	18.7	22.3	28.3	33.1	21.1	24.7	30.7	35.5

FUTURE YEAR 2040 NO-BUILD SEGMENT CLEARANCE TIMES

(With North Carolina/Virginia Border Plan Activation)

Roadway Segments	Category 1-2				Category 3-5			
	35% occupancy	50% occupancy	75% occupancy	95% occupancy	35% occupancy	50% occupancy	75% occupancy	95% occupancy
US 158 westbound east of Wright Memorial Bridge	13.2	15.4	19.0	21.9	14.4	16.6	20.2	23.1
Wright Memorial Bridge westbound	13.1	15.2	18.7	21.6	14.2	16.4	19.9	22.7
US 158 northbound west of Wright Memorial Bridge to future Mid-Currituck Bridge terminus	13.7	15.9	19.5	22.4	15.8	18.0	21.6	24.5
Future Mid-Currituck Bridge	12.9	16.4	22.2	26.9	13.2	16.7	22.6	27.2
US 158 from future Mid-Currituck Bridge terminus to Barco	15.3	18.4	23.6	27.8	17.2	20.3	25.5	29.7
US 158 westbound from Barco to Elizabeth City	22.6	27.4	35.5	42.0	28.2	33.1	41.2	47.6
NC 168 northbound from Barco to Virginia	3.9	4.1	4.5	4.7	4.1	4.3	4.6	4.9
US 64 westbound	20.5	24.6	31.5	37.1	23.1	27.2	34.2	39.7

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Table C-3: Bottlenecks / Clearance Time Calculations (By Road Segment, By Year, and Improvement Alternative) — **US 64 BORDER TRAFFIC CONTROL FORCED USE (continued)**

FUTURE YEAR 2040 IMPROVED US 64 SEGMENT CLEARANCE TIMES

(With North Carolina/Virginia Border Plan Activation)

Roadway Segments	Category 1-2				Category 3-5			
	35% occupancy	50% occupancy	75% occupancy	95% occupancy	35% occupancy	50% occupancy	75% occupancy	95% occupancy
US 158 westbound east of Wright Memorial Bridge	13.2	15.4	19.0	21.9	14.4	16.6	20.2	23.1
Wright Memorial Bridge westbound	13.1	15.2	18.7	21.6	14.2	16.4	19.9	22.7
US 158 northbound west of Wright Memorial Bridge to future Mid-Currituck Bridge terminus	13.7	15.9	19.5	22.4	15.8	18.0	21.6	24.5
Future Mid-Currituck Bridge	12.9	16.4	22.2	26.9	13.2	16.7	22.6	27.2
US 158 from future Mid-Currituck Bridge terminus to Barco	15.3	18.4	23.6	27.8	17.2	20.3	25.5	29.7
US 158 westbound from Barco to Elizabeth City	22.6	27.4	35.5	42.0	28.2	33.1	41.2	47.6
NC 168 northbound from Barco to Virginia	3.9	4.1	4.5	4.7	4.1	4.3	4.6	4.9
US 64 westbound	12.8	15.1	18.9	22.0	14.3	16.6	20.4	23.5

