The South Carolina Department of Transportation

HIGHWAY CAPACITY ANALYSIS REPORT

for

Replacement of US 701 Bridges

Over Great Pee Dee River,
Pee Dee Overflow & Yauhannah Lake

Horry/Georgetown Counties, SC

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Table of Contents

1.0 Project Description

The purpose of the project is to improve safety by replacing the three existing conditionally deficient and functionally obsolete bridges along a 2-mile long segment of U.S. Route 701 that begins near the U.S. Route 701 / Trinity Road intersection in Georgetown County and extends just beyond the U.S. Route 701 / Lucas Bay Road intersection in Horry County. The bridges over Yauhannah Lake, Great Pee Dee River and Pee Dee Overflow will be replaced as part of the project. The existing U.S. Route 701 in the proposed project corridor is a two-lane highway with minimal shoulders. The location of the proposed improvements to U.S. Route 701 can be found in Figure 1 on the following page.

2.0 Purpose of Analysis

The purpose of this capacity analysis is to confirm the capacity requirements of the proposed roadway and bridge, and the ability of the proposed facility to accommodate the projected future traffic volume. The analysis will be used to establish the typical roadway and bridge sections, and determine the resulting level of service for the proposed facility.

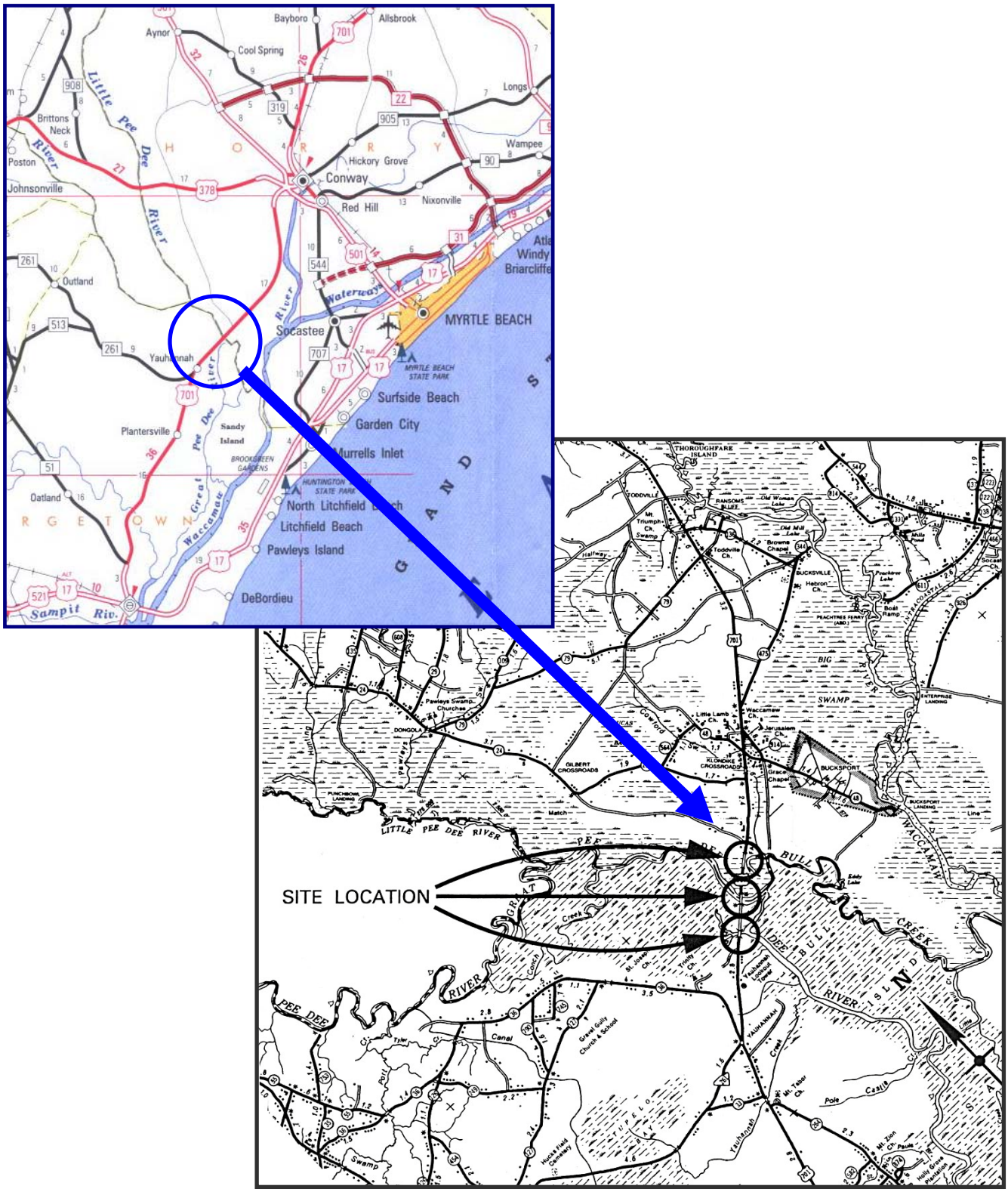

Figure 1. Site Location Map

3.0 Accident History Analysis

Historical accident data, including the number of accidents on the project corridor during the period from January 1, 2004 to December 31, 2008, was furnished by the South Carolina Department of Transportation for this study. A summary of this data is presented in Table 1.

The three primary accident types observed were angle (43 percent), rear end (29 percent), and other (18 percent). The percentage of head-on accidents, which can typically be a high percentage of accidents for two-lane roadways, is generally low for this corridor.

Table 1. Historical Accident Data on US 701 from
MP 0.0 – MP 1.5
MP 20.5 – MP 22.0
Horry/Georgetown County
1/1/01 – 9/1/04

Accident Type	Amount	Percentage
Angle	12	42.9%
Rear End	8	28.6%
Other*	5	17.8%
Sideswipe	3	10.7%
Total	**28**	

* Other includes median barrier, guardrail, & animals etc.

ADT = 5650
Approx. Length = 3.0 Miles

Twenty eight (28) accidents were reported for this section of the roadway during the study period resulting in a total accident rate of 90.5 accidents per 100 million vehicle-miles (acc/100mvm). A summary of the accident rates for the corridor has been computed in Table 2 on the following page. Seven of the accidents were injury accidents resulting in an injury accident rate for the corridor of 22.6 injury acc/100mvm. No fatality accidents occurred during the study period, resulting in a fatal accident rate of 0.0 fatal acc/100mvm.

Table 2. Study Corridor Accident Rates

Accidents	Amount	Percentage	Accident Rates (Acc/100 mvm)
PDO*	21	75.0%	---
Injuries	7	25.0%	22.6
Fatalities	0	0.0%	0.0
Total	**28**		90.5

* PDO = Property Damage Only

Based on the above historical accident data, the accident, injury and fatality rates for existing US 701 within the project corridor has been computed and compared to the National rates and the South Carolina state rates as published by the National Highway Traffic Administration (NHTSA, 2006). In accordance with industry standards, the rates are computed per 100 million vehicle-miles. A summary of the various accident rates is given in Table 3. The fatality accident, total accident and injury accident rates are considerably less than the national averages.

Table 3. Comparison of Accident Rates in Study Corridor to South Carolina and National Averages

Type	Accident Rate (Acc/100 mvm)	Injury Rate * (Acc/100 mvm)	Fatality Rate * (Acc/100 mvm)
Study Corridor	90.5	22.6	0.0
National*	198.2	85	1.4
South Carolina*	---	---	2.1

* Obtained from "Traffic Safety Facts – 2006", by National Highway Traffic Safety Administration.
mvm – million vehicles-miles

It is expected that the proposed US 701 Bridge Replacement Project with wider shoulders in the bridge and roadway sections will not result in an increase in the accident rates for the US 701 corridor.

4.0 Highway Capacity Analysis

4.1 Traffic Data

Traffic data was obtained from SCDOT for Station 175 on US 701 in Horry County from the years 1994 to 2008. This station, located between the Georgetown County line and S-110, is in close proximity to the bridge site with no major side roads between the Station and bridge site. The traffic data is presented in Table 4.

Table 4. Traffic Data from SCDOT for Station 175 on US 701 Between the Georgetown County Line and S-110

AADT Year	AADT	AADT Year	AADT
1994	5500	2002	7700
1995	5900	2003	7000
1996	3500	2004	7000
1997	6500	2005	7500
1998	6400	2006	7700
1999	7300	2007	7600
2000	7600	2008	7300
2001	7300		

Based on the traffic data given in Table 4, a best-fit curve (linear/regression) for the historical AADT data was developed and is presented in Figure 2 on the following page. The best-fit curve will be used as part of the capacity analysis to determine the future AADT for the years 2012 (assumed end of construction), 2022 (10 years beyond assumed end of construction) and 2032 (20 years beyond assumed end of construction).

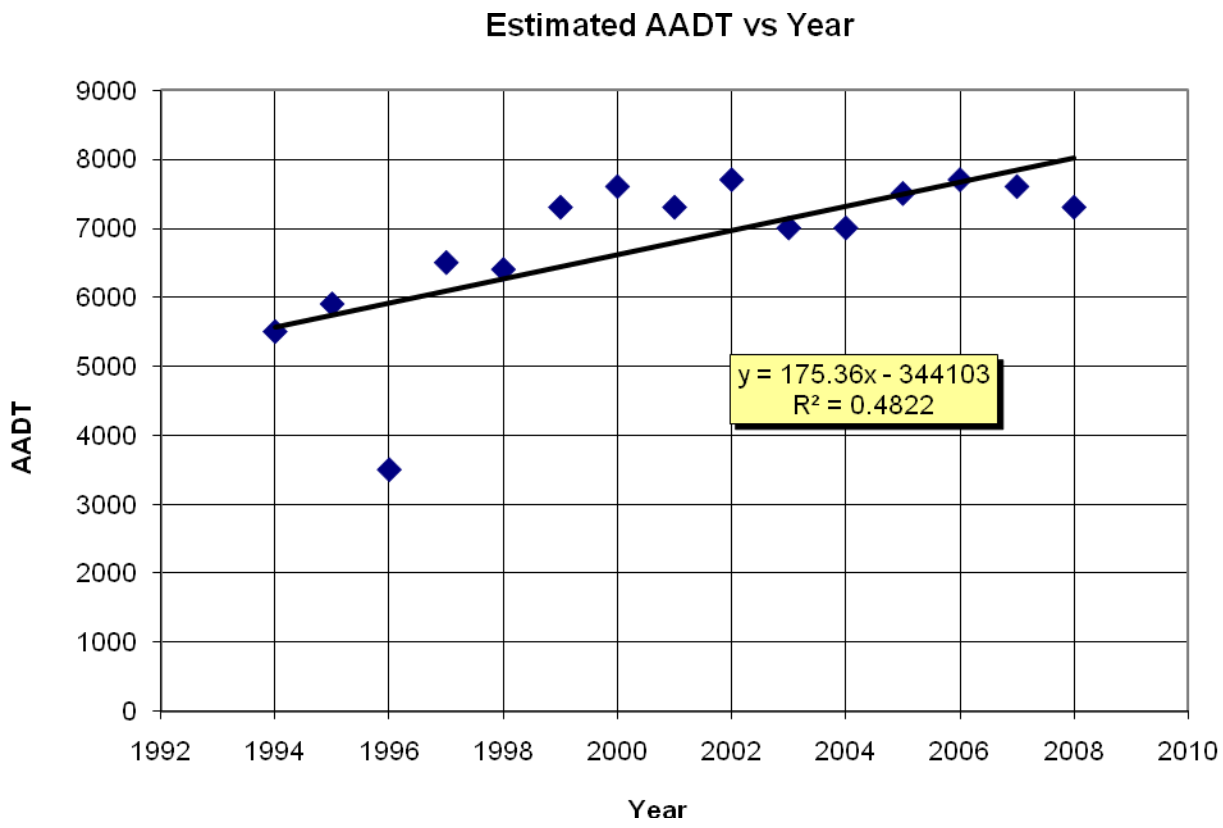

Figure 2. Historical AADT and Best Fit Curve (Linear/Regression)

4.2 Capacity Analysis

Based on discussions with the Department's Traffic Division, it was agreed that a highway capacity analysis would be performed for each of the following cases:

- Case 1: "No-build" option with historical traffic growth projections.
- Case 2: "Build" option with historical traffic growth projections.
- Case 3: "No-build" option with 3% average annual traffic growth rate.
- Case 4: "Build" option with 3% average annual traffic growth rate.

The "no-build" option corresponds to the existing roadway and bridge configuration with limited shoulder widths on the bridge. The "build" option is based on the proposed US 701 replacement facility with 10-foot wide shoulders including a bicycle lane. Historical traffic growth projections were based on the "best fit" traffic projection curve determined from Figure 2. The level of service (LOS) for the existing "no-build" option and the future "build" option was determined for the years 2012 (assumed end of construction),

2022 (10 years beyond assumed end of construction) and 2032 (20 years beyond assumed end of construction).

The highway capacity analysis was performed using the Highway Capacity Software (HCS) considering a two lane analysis for the existing facility and the proposed facility. The analysis was based on the geometric assumptions given in Table 5

Table 5. Highway Capacity Analysis Traffic Assumptions

Assumptions		
Item	**Value**	**Reference Recommendation**
Highway Class	Class I	*SCDOT Hwy Design Manual*
Terrain	Level	
Design Hourly Volume Factor, "K"	0.10	*SCDOT Hwy Design Manual*
Directional Split	60/40	*TRB Highway Capacity Manual*
Peak Hour Factor, PHF	0.88	*TRB Highway Capacity Manual*
% Trucks and buses, P_T	14 %	*TRB Highway Capacity Manual*
% Recreational Vehicles, P_R	4 %	*TRB Highway Capacity Manual*
% No-passing zones	20 %	*TRB Highway Capacity Manual*
Access Points/mi	8 /mi.	*TRB Highway Capacity Manual*

The results of the highway capacity analysis are given in Table 6 on the following page. The roadway level of service is measured on an A to F scale, with A representing free-flow conditions and F representing forced or breakdown flow with stop and go conditions. In accordance with the SCDOT Highway Design Manual, LOS B is desirable for Class I rural two-lane arterial highways with level/rolling terrain. The LOS for Class I highways is based on the average travel speed and the percent time-spend following.

The HCS analysis yielded identical results for the "no-build" option and the "build" option since the traffic volumes were equal. Although the average travel speed increases for the "build option" in comparison to the "no-build" option, the LOS is primarily governed by the percentage of time spent following. The roadway geometry (i.e., shoulder widths) does not influence the percentage of time spent following. Therefore, there is no difference in the LOS between the "no-build" option and the "build" option. Utilizing traffic projections based on historical traffic data (i.e., Case 1 and Case 2), results in a constant LOS D for all years investigated. Traffic projections based on a constant traffic growth rate of 3% results in a LOS C at the end of construction and deteriorates to a LOS E twenty years after the completion of construction. The LOS is identical for the "no-build" and "build" options.

Table 6. Highway Capacity Analysis Results

CAPACITY ANALYSIS RESULTS							
Case	**Analysis Year**	**AADT**	**Peak Hour Volume**	**Average Travel Speed**	**% Time Spent Following**	**LOS**	**v/c**
Case 1 No-Build w/ Historical Data	2012	8,800	880	51.0	65.2	D	0.32
	2022	10,500	1,050	49.8	70.0	D	0.38
	2032	12,300	1,230	48.4	74.4	D	0.44
Case 2 Build w/ Historical Data	2012	8,800	880	54.0	65.2	D	0.32
	2022	10,500	1,050	52.8	70.0	D	0.38
	2032	12,300	1,230	51.4	74.4	D	0.44
Case 3 No-Build w/ 3% Growth	2012	8,300	830	51.3	63.4	C	0.30
	2022	11,100	1,110	49.4	71.6	D	0.40
	2032	14,900	1,490	46.1	80.4	E	0.54
Case 4 Build w/ 3% Growth	2012	8,300	830	54.3	63.4	C	0.30
	2022	11,100	1,110	52.4	71.6	D	0.40
	2032	14,900	1,490	49.1	80.4	E	0.54

5.0 Conclusions

The purpose of the US 701 Bridge Replacement Project is to improve safety for the motoring public, as well as the safety of bicyclists, by replacing the three existing conditionally deficient and functionally obsolete bridges. The proposed project will improve safety by providing dedicated bike lanes and shoulder widths that are wider than the existing facility. Although the highway capacity analysis results indicates that there is not an improvement in the level of service between the "no-build" option and the "build" option, the results do demonstrate that the proposed bridge replacement will not negatively impact the level of service for US 701.

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