

# ENVIRONMENTAL ASSESSMENT

Road S-33 (Clements Ferry Road) Widening Project:  
Jack Primus Road To SC 41  
Berkeley County, South Carolina



SUBMITTED: APRIL 2018





U.S. Department  
of Transportation  
**Federal Highway  
Administration**

South Carolina

April 5, 2018

1835 Assembly Street, Suite 1270  
Columbia, South Carolina 29201  
803-765-5411  
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In Reply Refer To:  
HDA-SC

**ELECTRONIC CORRESPONDENCE ONLY**

Mr. Chad Long  
Director Environmental Services Office  
South Carolina Department of Transportation (SCDOT)  
955 Park Street, P.O. Box 191  
Columbia, South Carolina 29202

Dear Mr. Long:

The Federal Highway Administration (FHWA) has reviewed the Environmental Assessment (EA) for the Proposed Road S-33 (Clements Ferry Road) Widening Project from Jack Primus Road to SC 41 (Federal Project No. P029503) in Berkeley County, South Carolina and finds that it adequately addresses the potential impacts of the proposal. Based on the analysis provided in the EA and supporting documents we have determined that an Environmental Impact Statement (EIS) is not required. The EA is approved and acceptable for public availability and comment. The EA shall be made available for public review for a minimum of thirty (30) days before FHWA makes its final determination. The public availability shall be announced by a notice similar to a public hearing notice. Also, please provide Notice of Availability of the EA to the affected units of government, and to the State intergovernmental review contacts as specified in 23 CFR 771.119(d).

All project commitments documented in the EA are binding and the SCDOT will need to ensure that they are ultimately carried out. The public hearing may be scheduled fifteen (15) days after the document is made available for public review. Enclosed is a copy of the signed document. Please address any questions you may have concerning this project to Ms. Michelle Herrell at 803-765-5460 or [michelle.herrell@dot.gov](mailto:michelle.herrell@dot.gov).

Sincerely,

(for) Emily O. Lawton  
Division Administrator

Enclosure

ec: Mr. Mark Mohr, SCDOT RPG 1 NEPA Coordinator  
Mr. Henry Phillips, SCDOT NEPA Division Manager

**Road S-33 (Clements Ferry Road) Widening Project:**

Jack Primus Road to SC 41

Berkeley County, South Carolina  
P029503

ENVIRONMENTAL ASSESSMENT



Submitted Pursuant to 42 U.S.C 4332 (2) (c) by the  
U.S. Department of Transportation, Federal Highway Administration  
and  
S.C. Department of Transportation, Environmental Services Office

3/30/2018

Date of Approval

A. Mark Moka

S.C. Department of Transportation

4/5/2018

Date of Approval

Michelle G. Herrell

Federal Highway Administration

The following individuals may be contacted for additional information concerning the project:

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Mr. Craig Winn, P.E.  
Program Manager  
S.C. Department of Transportation  
P.O. Box 191  
Columbia, S.C. 29202-0191  
(803) 737-6376

Date: 03/29/2018



Project ID: 27368 County: Berkeley District: District 1 Doc Type: EA Total # of Commitments: 11

Project Name: Road S-33 (Clements Ferry Road) Widening Project: Jack Primus Road to SC 41

The Environmental Commitment **Contractor Responsible** measures listed below **are to be included in the contract and must be implemented**. It is the responsibility of the Program Manager to make sure the Environmental Commitment **SCDOT Responsible** measures are adhered to. If there are questions regarding the commitments listed please contact:

**CONTACT NAME:** Craig Winn, PE, CFM

**PHONE #:** (803)-737-6376

**ENVIRONMENTAL COMMITMENTS FOR THE PROJECT**

**Stormwater**

NEPA Doc Ref: Page: 44

Responsibility: SCDOT

Stormwater control measures, both during construction and post-construction, are required for SCDOT projects with land disturbance and/or constructed in the vicinity of 303(d), TMDL, ORW, tidal, and other sensitive waters in accordance with the SCDOT's MS4 Permit. The selected contractor would be required to minimize potential stormwater impacts through implementation of construction best management practices, reflecting policies contained in 23 CFR 650 B and SCDOT's Supplemental Specifications on Seed and Erosion Control Measures (latest edition).

**Water Quality**

NEPA Doc Ref: Page: 44

Responsibility: SCDOT

The contractor will be required to minimize possible water quality impacts through implementation of BMPs, reflecting policies contained in 23 CFR 650B and the Department's Supplemental Specification on Erosion Control Measures (latest edition) and Supplemental Technical Specifications on Seeding (latest edition). Other measures including seeding, silt fences, sediment basins, etc. as appropriate will be implemented during construction to minimize impacts to water quality.

**General Permit**

NEPA Doc Ref: Page: 44

Responsibility: SCDOT

Impacts to jurisdictional waters will be permitted under a Department of the Army Section 404 permit from the U.S. Army Corps of Engineers. Based on preliminary design, it is anticipated that the proposed project would be permitted under SCDOT's General Permit (GP). The required mitigation for this project will be determined through consultation with the USACE and other resource agencies.

The proposed project is also expected to impact critical area wetlands which would require authorization under the SCDHEC Office of Coastal Resource Management's (OCRM) Critical Area Permit Program.

Project ID: 27368

SCDOT  
NEPA ENVIRONMENTAL COMMITMENTS  
FORM



**ENVIRONMENTAL COMMITMENTS FOR THE PROJECT**

**Floodplains**

NEPA Doc Ref: Page: 46

Responsibility: SCDOT

Final hydraulic analysis and documentation will be completed as part of the final design of the project to ensure no impacts to the existing floodplains. Coordination will be done with the Berkeley County Floodplain Administrator, and a set of final plans and a request for floodplain management compliance will be sent to the County as well.

**Migratory Bird Treaty Act**

NEPA Doc Ref: Page: 50

Responsibility: CONTRACTOR

The federal Migratory Bird Treaty Act, 16 USC § 703-711, states that it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product, manufactured or not. The South Carolina Department of Transportation (SCDOT) will comply with the Migratory Bird Treaty Act of 1918 in regard to the avoidance of taking of individual migratory birds and the destruction of their active nests.

The contractor shall notify the Resident Construction Engineer (RCE) at least four (4) weeks prior to construction/demolition/maintenance of bridges and box culverts. The RCE will coordinate with SCDOT Environmental Services Office (ESO), Compliance Division, to determine if there are any active birds using the structure. After this coordination, it will be determined when construction/demolition/maintenance can begin. If a nest is observed that was not discovered after construction/demolition/maintenance has begun, the contractor will cease work and immediately notify the RCE, who will notify the ESO Compliance Division. The ESO Compliance Division will determine the next course of action.

The use of any deterrents by the contractor designed to prevent birds from nesting, shall be approved by the RCE with coordination from the ESO Compliance Division. The cost for any contractor provided deterrents will be provided at no additional cost to SCDOT.

**Essential Fish Habitat**

NEPA Doc Ref: Page:60

Responsibility: SCDOT

The selected contractor will be required to minimize impacts of siltation and erosion through implementation of Best Management Practices (BMPs).

To the maximum extent practicable all in-water work will take place between November and March.

Project ID: 27368

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FORM



**ENVIRONMENTAL COMMITMENTS FOR THE PROJECT**

**Noise**

NEPA Doc Ref: Page: 76

Responsibility: SCDOT

SCDOT will inform local planning officials of future, generalized noise levels expected to occur in the project vicinity after FHWA has made a final decision on the Environmental document.

**USTs/Hazardous Materials**

NEPA Doc Ref: Page: 78

Responsibility: SCDOT

If avoidance of hazardous materials is not a viable alternative and soils that appear to be contaminated are encountered during construction, the South Carolina Department of Health and Environmental Control (SCDHEC) will be informed. Hazardous materials will be tested and removed and/or treated in accordance with the United States Environmental Protection Agency and the SCDHEC requirements, if necessary.

Further assessment of any sites impacted by the project may be warranted during final design to identify the extent of contamination and necessary remediation measures. Cost of necessary remedial actions would be considered during the right-of-way appraisal and acquisition process.

**Cultural Resources**

NEPA Doc Ref: Page: 80

Responsibility: CONTRACTOR

The contractor and subcontractors must notify their workers to watch for the presence of any prehistoric or historic remains, including but not limited to arrowheads, pottery, ceramics, flakes, bones, graves, gravestones, or brick concentrations during the construction phase of the project, if any such remains are encountered, the Resident Construction Engineer (RCE) will be immediately notified and all work in the vicinity of the discovered materials and site work shall cease until the SCDOT Archaeologist directs otherwise.

Project ID: 27368

SCDOT  
NEPA ENVIRONMENTAL COMMITMENTS  
FORM



**ENVIRONMENTAL COMMITMENTS FOR THE PROJECT**

**Displacements**

NEPA Doc Ref: Page: 81

Responsibility: SCDOT

The SCDOT will acquire all new right-of-way and process any relocations in compliance with the Uniform Relocation Assistance and Real Property Acquisition policies Act of 1970, as amended (42 U.S. C. 4601 et seq.). The purpose of these regulations is to ensure that owners of real property to be acquired for Federal and federally-assisted projects are treated fairly and consistently, to encourage and expedite acquisition by agreements with such owner, to minimize litigation and relieve congestion in the courts, and to promote public confidence in Federal and federally-assisted land acquisition programs.

**Non-Standard Commitment**

NEPA Doc Ref: Page: 84

Responsibility: SCDOT

Access to Properties

An attempt would be made to maintain access to all properties along the corridor. In the event that access could not be maintained, the SCDOT/County would negotiate these impacts during the ROW acquisition process.



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## **1. INTRODUCTION**

Berkeley County and the South Carolina Department of Transportation (SCDOT) propose to widen Road S-33 (Clements Ferry Road) from Road S-119 (Jack Primus Road) to SC 41, for a total distance of approximately 4.5 miles located in Berkeley County, South Carolina (Figure 1). The proposed project would include complementary improvements to selected intersections along the project corridor at Clements Ferry Road and Rivers Reach Drive, Cainhoy Road, and Reflectance Road. The proposed project is included in the Berkeley County One Percent Sales and Use Tax that passed in November of 2008.

The project as proposed would result in certain modifications to the human and natural environment. However, SCDOT has determined that no significant impacts would occur in accordance with 23 CFR §771.115(c) for processing as an Environmental Assessment (EA). Specific environmental studies were conducted in the early stages of project development and understandings of the scope of work to be performed were utilized in making this decision. The project study area (PSA) is illustrated in Figure 2.

Figure 1. Location Map

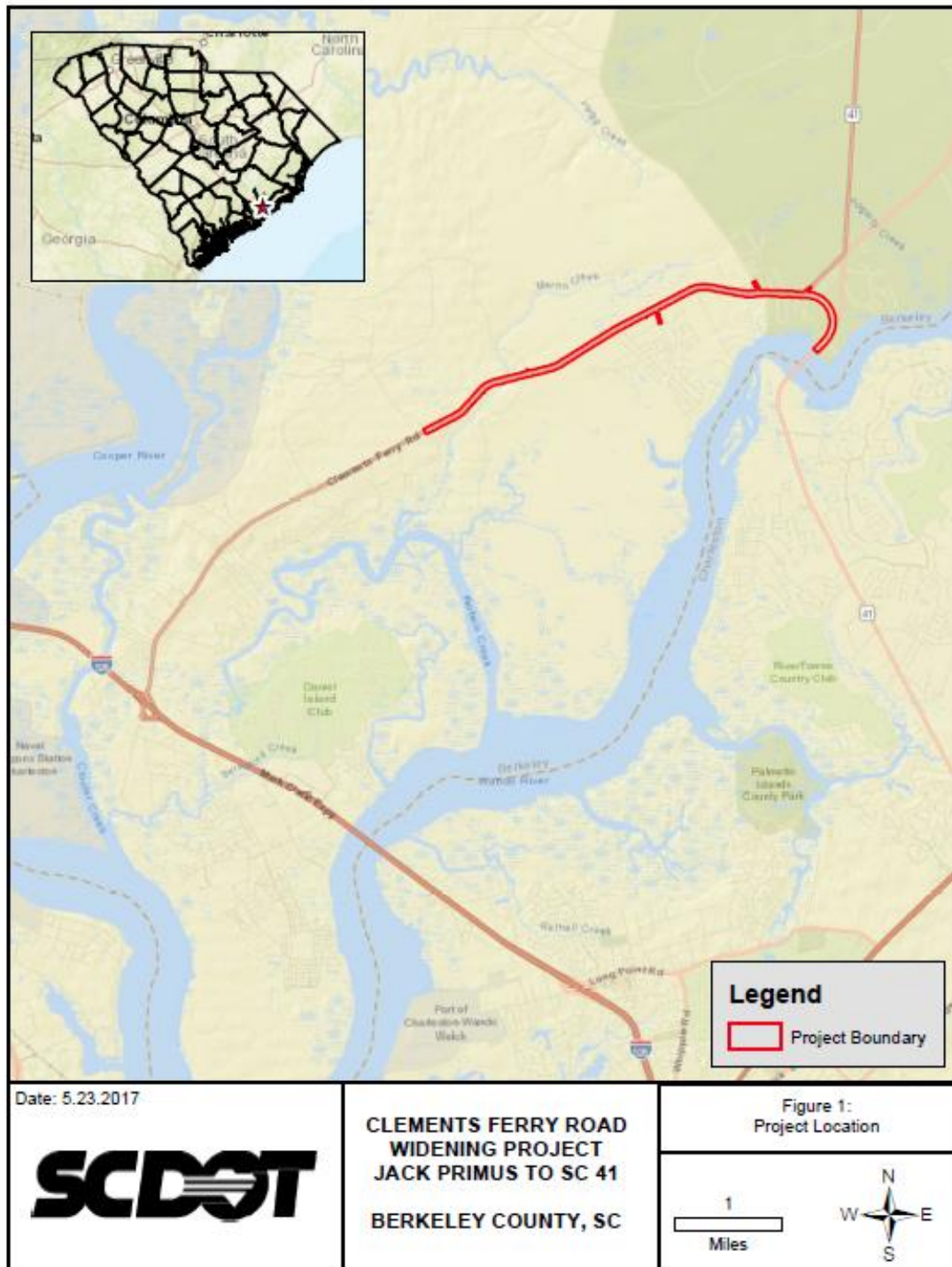


Figure 2. Project Study Area



## 2. PURPOSE AND NEED OF THE PROJECT

### 2.1 Project Setting

The PSA is located in southern Berkeley County in the Lower Coastal Plain of South Carolina. Specifically, the proposed project lies between the Cooper and Wando Rivers in the Ashley-Cooper River Watershed, in what is referred to as the Cainhoy Peninsula. The land uses within the immediate vicinity of the PSA include: commercial/industrial development, residential development, undeveloped forested areas, silviculture, estuarine marshes, existing transportation facilities, and open water associated with the Cooper River and Wando River systems.

This area of Berkeley County is experiencing tremendous growth due to its rural nature, yet close proximity to metropolitan areas. This growth is due in part to the previous construction of I-526 which provided direct access from the Cainhoy Peninsula and Daniel Island to North Charleston and Mt. Pleasant. The commercial/industrial growth is primarily located between I-526 and Jack Primus Road on the western side of Clements Ferry Road, whereas, residential growth is primarily located on the eastern side of Clements Ferry Road.

### 2.2 Existing Facilities

Clements Ferry Road is a two-lane roadway with a grassed shoulder and ditch from Jack Primus Road to SC 41 along the Cainhoy Peninsula. Numerous crossroads and side streets are located along the corridor, including Nelliefield Creek Drive, Peninsula Cove Drive, Rivers Reach Drive, Cainhoy Village Road, Cainhoy Road, and Reflectance Road. There are also two bridge structures located along this segment of Clements Ferry Road, each extending



*Road S-33 (Clements Ferry Road)*

approximately 100 feet in length and spanning waterways. The existing right-of-way



(ROW) along Clements Ferry Road is variable ranging between 33 and 75 feet from centerline on both sides of the roadway.

Clements Ferry Road serves as a minor arterial roadway which connects I-526 and SC 41. The roadway provides important access to communities including Daniel Island and Cainhoy, residential developments, and commercial/industrial businesses. Clements Ferry Road can also serve as an alternate route to US 17 during peak hour traffic.

A partial cloverleaf interchange is located along I-526 at Clements Ferry Road approximately 3.75 miles west of the PSA. Clements Ferry Road from I-526 to Jack Primus Road is currently under construction to widen the existing two-lane roadway to a five-lane roadway. The project was previously developed by Berkeley County in conjunction with SCDOT, and an approved Environmental Assessment/Finding of No Significant Impact (FONSI) was issued in December of 2013<sup>1</sup>.

Clements Ferry Road intersects SC 41 approximately 1,100 feet north of the Wando River. The SCDOT is currently constructing a new bridge over the Wando River, which will include the realignment of the existing skewed intersection of SC 41 at Clements Ferry Road to a T-type intersection. Clements Ferry Road will serve as the primary thoroughfare, with SC 41 intersecting at signaled intersection. This section of SC 41 from the project area to US 17 is a heavily traveled route and provides direct access to numerous residential areas, including Dunes West, River Towne, and The Colonnade at Brick Yard plantation. As such, Charleston County is currently evaluating various improvements, including widening this portion of SC 41.

### 2.3 Project Purpose

The purpose of the project is to increase capacity, improve operational efficiency, improve safety, and provide bicycle and pedestrian accommodations on Clements Ferry Road between Jack Primus Road and SC 41.

### 2.4 Project Need

Berkeley County has identified the need to improve Clements Ferry Road due to the increase in population growth and development occurring in the area. Existing traffic data has been collected throughout the project corridor and the data indicate substantial delays due to traffic congestion. As the population grows and development in the area continues, traffic congestion will continue to worsen, and the operational efficiency of the roadway will decrease as traffic volumes increases.

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<sup>1</sup> *Clements Ferry Road (S-33) Widening Environmental Assessment, December 2013*



Existing and projected traffic volumes are expected to exceed the capacity threshold along the corridor and many intersections.

High traffic volumes on Clements Ferry Road will continue to cause substantial delays on side streets seeking to enter or cross the intersection, as well as for drivers looking for a gap in traffic to make a left-hand turn. Motorists on side streets will experience long delays during the peak periods making crossing or turning maneuvers due to the lack of safe gaps in traffic. Improvements would provide a more efficient transportation facility for commuters, through traffic, pedestrians, and bicyclists.

According to the Berkeley County Planning Department and the 2010 US Census, the County has seen significant growth in the last 20 years. Between 1990 and 2010, the population grew from 86,400 to 177,843—an increase of 106%. The estimated population of Berkeley County was 210,898 as of July 2016<sup>2</sup>. The population in the Wando County Census Division, which includes the PSA, is expected to increase from 12,942 in 2010 to 14,500 by 2030—increase of 12%.



A traffic analysis report was also prepared for the project corridor to determine the existing and design year traffic volumes and operational conditions along the corridor and provide recommendations to address any documented deficiencies<sup>3</sup>. The findings of this study are presented below (Appendix A).

*Traffic on Clements Ferry Road*

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<sup>2</sup> US Census Bureau ([https://factfinder.census.gov/faces/nav/jsf/pages/community\\_facts.xhtml](https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml)), 2017

<sup>3</sup> E. Haselden and Associates. *Clements Ferry Road from Jack Primus Road to SC 41 Widening Study*. Revised February 7, 2018

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### 2.4.1 Increase Capacity

Level of Service (LOS) is a quality measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. There are six LOS letter designations ranging between LOS A and LOS F. LOS A describes completely free-flowing conditions and LOS F describes very unstable flow conditions. Table 1 lists LOS values and describes their respective conditions.

Traffic forecasts were developed for the year 2022 and 2040 by applying a 2% annual growth rate to existing traffic volume data. This growth rate is based on the Berkeley-Charleston-Dorchester Council of Governments (BCDCOG) Charleston Area Transportation Study (CHATS) Travel Demand Model, the SCDOT Traffic Study for Clements Ferry Road from I-526 to Jack Primus Road<sup>4</sup>, and the Cainhoy Traffic Study developed by Thomas and Hutton<sup>5</sup>. To compare LOS and Delay with and without construction of the Clements Ferry Road Project from Jack Primus Road to SC 41, two separate scenarios for 2022 and 2040 were analyzed using 2010 Highway Capacity Manual using Synchro/Simtraffic, Version 9 software.

**Table 1. Intersection Levels of Service**

<b>LOS A</b>	This level of service describes completely free-flow conditions. Desired speed and movements are virtually unaffected by the presence of other vehicles and constrained only by the geometric features of the roadway and driver preferences.
<b>LOS B</b>	Traffic flow is stable. The presence of other vehicles only slightly restricts freedom to maneuver.
<b>LOS C</b>	Traffic flow is stable, but the number of bumper-to-bumper groups of vehicles increases due to slow moving vehicles and turning maneuvers.
<b>LOS D</b>	Unstable traffic flow conditions are approached under LOS D. The desire to pass becomes very high but safe passing opportunities decrease significantly.
<b>LOSE</b>	Passing is virtually impossible. The slowest moving vehicle controls the travel speed.
<b>LOS F</b>	Passing is impossible. The slowest moving vehicle controls the travel speed. Very unstable traffic flow conditions exist.

Source: E. Haselden and Associates. *Clements Ferry Road from Jack Primus Road to SC 41 Widening Study*. Revised February 7, 2018

<sup>4</sup> *Clements Ferry Road (Road S-33) Widening – Phase I Traffic Study – Berkeley County*. September 21,2012

<sup>5</sup> *Cainhoy Traffic Impact Analysis*. Revised February 2015.

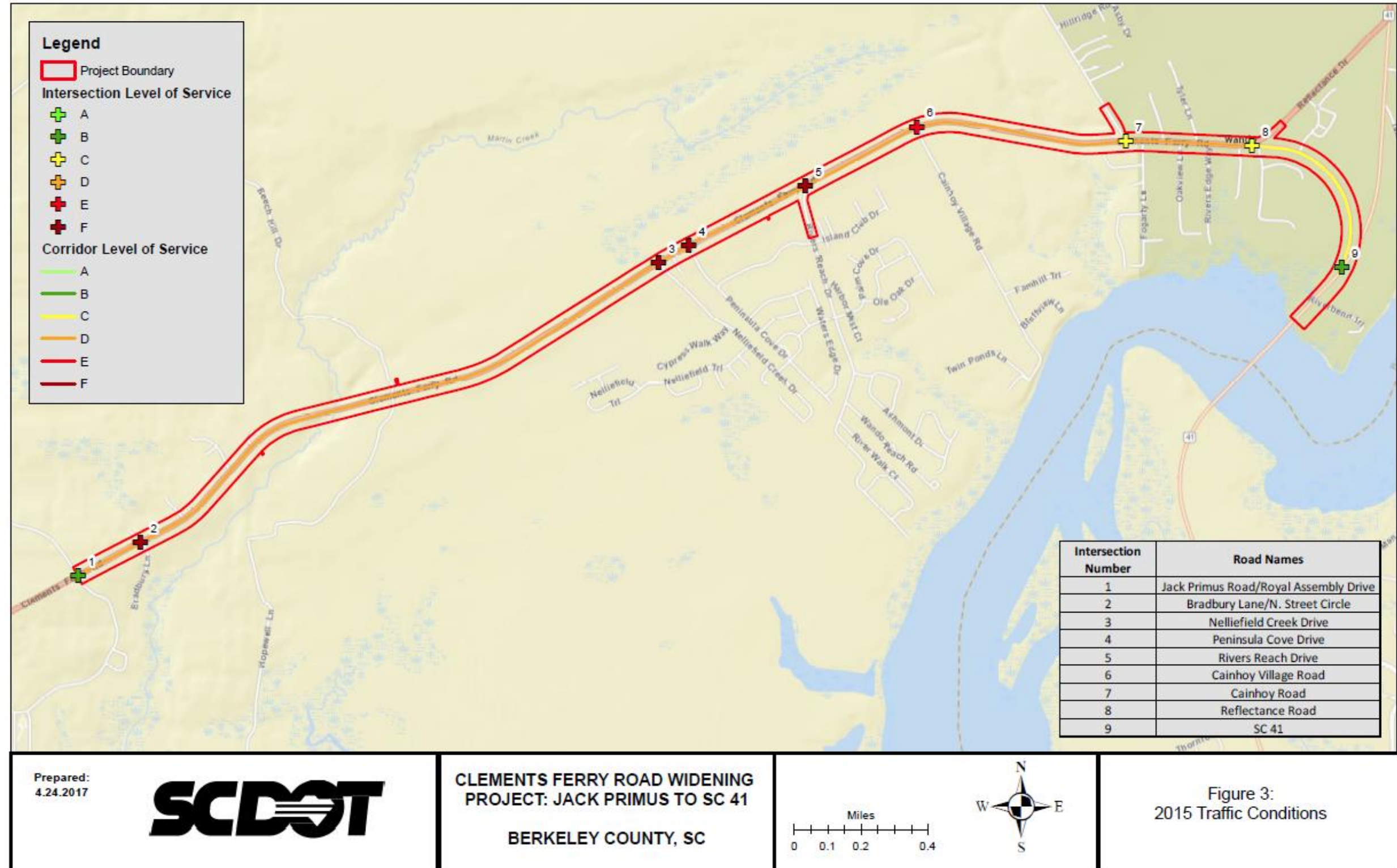


Clements Ferry Road is currently a two-lane section from Jack Primus Road to SC 41 with a 55-mph speed limit from Jack Primus Road to Nelliefield Creek Drive, 45 mph from Nelliefield Creek Drive to Cainhoy Road, then 35 mph to SC 41. Table 2 indicates that the existing (2015) average annual daily traffic (AADT) volume on Clements Ferry Road ranges from 9,800 (LOS C) to 13,800 (LOS E), with these conditions shown in Figure 3. A passing LOS C is 10,800 AADT on Clements Ferry Road in its existing condition as a two-lane undivided minor arterial roadway, according to the SCDOT Roadway Average Daily Traffic Capacities Chart. Clements Ferry Road from Jack Primus Road to Reflectance Road does not meet an acceptable LOS in 2015, as the AADT is over 13,000 in this section of the roadway. By 2040, with or without the Cainhoy Development, an LOS F is anticipated on Clements Ferry Road between Jack Primus Road to SC 41.

**Table 2. Existing and Projected No-Build Traffic Volumes**

Clements Ferry Road Segment	Existing		Design Year – Without Cainhoy Development		Design Year – With Cainhoy Development	
	2015		2040		2040	
	ADT	LOS	ADT	LOS	ADT	LOS
Jack Primus Road to Cainhoy Road	13,800	E	22,640	F	58,273	F
Cainhoy Road to Reflectance Road	13,200	E	21,650	F	57,283	F
Reflectance Road to SC 41	9,800	C	16,080	F	51,713	F

Figure 3. Existing Traffic Conditions



Prepared:  
4.24.2017



CLEMENTS FERRY ROAD WIDENING  
PROJECT: JACK PRIMUS TO SC 41  
BERKELEY COUNTY, SC

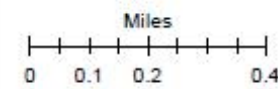


Figure 3:  
2015 Traffic Conditions



### 2.4.2 Operational Efficiency

Existing intersections along Clements Ferry Road are projected to exceed, or have exceeded, their design capacity. This is primarily due to population growth and development along the corridor. Peak hour turning movement counts were collected on Tuesday, April 28, 2015, at the Jack Primus Road/Royal Assembly Drive, Steel Circle/Bradbury Lane, Nelliefield Creek Drive, Peninsula Cove Drive, Rivers Reach Drive, Cainhoy Village Road, Cainhoy Road, Reflectance Road, and SC 41 intersections. Turning movement counts were conducted at each of the intersections from 7:00 to 9:00 AM and 4:00 to 6:00 PM to determine the AM and PM peak hours.

The normal weekday AM peak hour time for all of the study intersections was found to be from 7:00 to 8:00 AM. The normal weekday PM peak hour time varied, but the majority of the intersections had a peak time from 5:00 to 6:00 PM so this time was used in the study analysis.

An intersection capacity analysis was conducted for the existing intersections per the Highway Capacity Manual. The LOS and delay (seconds) results for the existing study hours are shown in Table 3 and illustrated in Figure 3.

**Table 3. Existing Condition Level of Service and Delay (2015) along Project Intersections**

Intersection	AM Peak Hour LOS (Delay in Seconds)	PM Peak Hour LOS (Delay in Seconds)
Jack Primus Road/ Royal Assembly Drive	B (14.4)	B (16.6)
Bradbury Lane/N. Steel Circle	<b>E (48.5)</b>	<b>F (65.3)</b>
Nelliefield Creek Drive	<b>F (130.5)</b>	<b>F (67.2)</b>
Peninsula Cove Drive	<b>F (108.2)</b>	<b>E (37.8)</b>
Rivers Reach Drive	<b>E (49.7)</b>	<b>F (63.0)</b>
Cainhoy Village Road	C (22.1)	<b>E (40.8)</b>
Cainhoy Road	C (31.2)	C (29.8)
Reflectance Road	C (18.6)	C (16.7)
SC 41	B (10.5)	B (11.3)

Without widening Clements Ferry Road by 2022, the following intersections will be operating at the LOS F:

- Bradbury Lane/N. Steel Circle (AM & PM LOS F)
- Nelliefield Creek Drive (AM & PM LOS F)



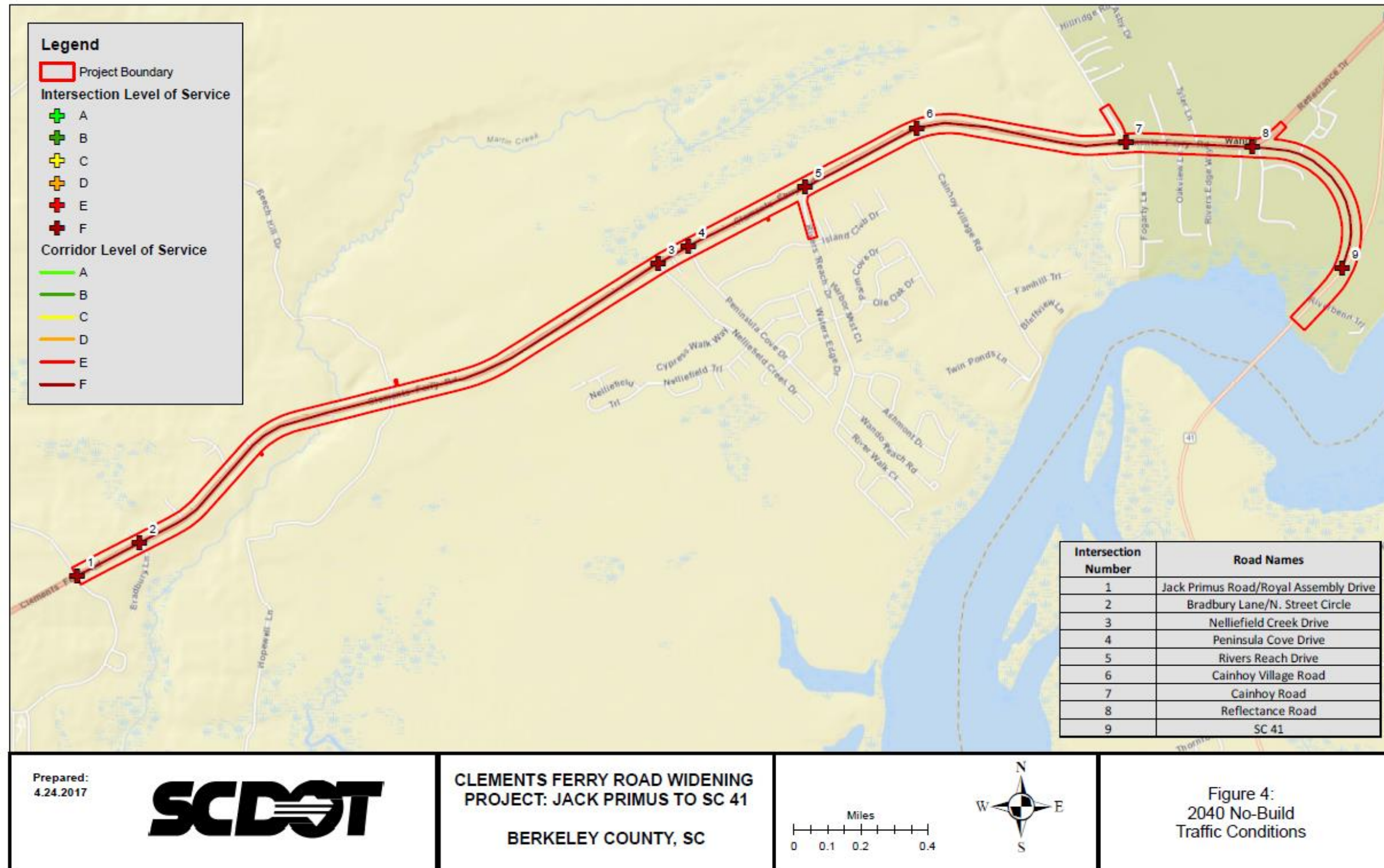
- Peninsula Cove Drive (AM LOS F)
- Rivers Reach Drive (AM & PM LOS F)
- SC 41 (AM & PM LOS F)

By year 2040, all intersections will be operating at LOS F, with the exception of Reflectance Road operating at a LOS B during the PM peak (Table 4 and Figure 4).

**Table 4. No-Build Alternative Forecasted Level of Service and Delay (CHATS Growth Rate)**

Intersection	AM Peak Hour LOS (Delay in Seconds)		PM Peak Hour LOS (Delay in Seconds)	
	2022	2040	2022	2040
Jack Primus Road/ Royal Assembly Drive	B (19.5)	<b>F (106.2)</b>	B (18.5)	<b>F (102.1)</b>
Bradbury Lane/ N. Steel Circle	<b>F (65.5)</b>	<b>F (285.9)</b>	<b>F (79.2)</b>	<b>F (365.5)</b>
Nelliefield Creek Drive	<b>F (317.1)</b>	<b>F (2,495.8)</b>	<b>F (89.1)</b>	<b>F (1,040.8)</b>
Peninsula Cove Drive	<b>F (268.8)</b>	<b>F (2,034.5)</b>	<b>F (65.2)</b>	<b>F (323.0)</b>
Rivers Reach Drive	<b>F (119.4)</b>	<b>F (1,363.7)</b>	<b>F (96.1)</b>	<b>F (2,462.7)</b>
Cainhoy Village Road	D (27.0)	<b>F (69.9)</b>	<b>E (47.2)</b>	<b>F (155.4)</b>
Cainhoy Road	D (48.9)	<b>F (145.8)</b>	C (34.8)	<b>F (148.3)</b>
Reflectance Road	C (23.7)	<b>F (165.7)</b>	A (5.1)	B (14.8)
SC 41	<b>F (270.7)</b>	<b>F (1,060.8)</b>	<b>F (119.0)</b>	<b>F (1,075.1)</b>

Figure 4. No-Build Traffic Conditions in 2040





A trip-generation analysis was performed to develop the projected Cainhoy Development traffic volumes based on the methods and rates published in the ITE Trip Generation Manual, 9th Edition. The City of Charleston Planning Department projects that 11,042 single-family detached homes will be built by 2040 in the Cainhoy Development. The development will also have mixed-use facilities, an elementary/middle and high school, and apartment homes. A Traffic Study by Thomas and Hutton complete in 2015 reflects these uses. This study will only reflect the projected 11,042 units. The BCDCOG 2040 projection model includes 1,250 units. The 2% growth rate incorporated these units, so the trip generation reflects the 11,042 minus 1,250 units for 2040. The 2022 future scenario will use the Trip Generation of 6,854 units. These units were developed by using the growth factor equation with the expectation of 2% reduction in growth over 18 years.

Traffic forecasts were developed for the 2022 and 2040 scenarios by adding the traffic generated by the proposed Cainhoy Development to the 2022 and 2040 volumes at the CHATS growth rate. Table 5 illustrates the impact of the proposed Cainhoy Development on Clements Ferry Road under the No-Build Alternative.

The results show that Clements Ferry Road would be overall LOS F if the Cainhoy Development was built under the existing road conditions (No-Build Alternative).

**Table 5. No-Build Alternative Forecasted Level of Service and Delay (CHATS Growth Rate and Cainhoy Development)**

Intersection	AM Peak Hour LOS (Delay in Seconds)		PM Peak Hour LOS (Delay in Seconds)	
	2022	2040	2022	2040
Jack Primus Road/ Royal Assembly Drive	F (683.9)	F (1,452.6)	F (299.4)	F (2,117.1)
Bradbury Lane/ N. Steel Circle	F (162.5)	F (3,533.2)	F (72.6)	F (ERROR)
Nelliefield Creek Drive	F (5,954.2)	F (106,148.2)	F (2,086.8)	F (11,537.0)
Peninsula Cove Drive	F (4,988.7)	F (127,666.2)	F (170.3)	F (19,888.1)
Rivers Reach Drive	F (4,890.3)	F (36,218.8)	F (5,955.0)	F (26,697.3)
Cainhoy Village Road	F (253.0)	F (36,218.8)	F (206.1)	F (120.5)
Cainhoy Road	F (170.9)	F (586.2)	F (239.2)	F (1,008.9)
Reflectance Road	C (17.6)	F (791.9)	F (52.0)	F (178.5)
SC 41	F (3,134.8)	F (23,955.0)	F (2,120.5)	F (ERROR)

ERROR = Unable to calculate delay because the traffic volume greatly exceeds capacity.





### 2.4.3 Provide Bicycle and Pedestrian Accommodations

A need has been identified for adequate bicycle and pedestrian accommodations to be provided on Clements Ferry Road to serve non-motorized users. The CHATS 2035 Long Range Transportation Plan Update included survey data that indicated that out of 404 survey responses, 244 responses (60%) rated “sidewalks, greenways, and pedestrian signals” as “poor”. Out of 405 responses, 308 responses (76%) rated “on-road bicycle facilities, greenways, designated routes, and bike racks” as “poor”<sup>6</sup>. The Berkeley County Comprehensive Plan also includes objectives to improve conditions and connectivity for bicycles and pedestrians. By providing a safe means of travel for bikers and pedestrians, a shared-use path would provide a safe alternative to vehicular travel that is emission- and cost-free. Clements Ferry Road Widening Project I-526 to Jack Primus Road and the SC 41 Project both include shared-use paths, so the shared-use path from Jack Primus Road to SC 41 will connect the other two planned facilities.

### 2.4.4 Safety

The following crash analysis has been prepared to evaluate accident rates and their causes on this section of Clements Ferry Road for the purposes of aiding development of the project design and evaluating the project. Historical crash data was provided by the South Carolina Department of Public Safety, Office of Highway Safety and Justice Programs (SCDPS) for the three-year period spanning 2014 to 2016. Average AADT data for the years 2014 and 2015 were obtained from the SCDOT. 2016 AADT figures were estimated by applying the 2% annual growth rate identified in the Widening Study prepared by E. Haselden & Associates (revised February 7, 2018) to the SCDOT 2015 AADT figures (see Appendix A). Table 6 presents existing roadway traffic volumes.

**Table 6. Clements Ferry Road Traffic Volumes**

Station Number	Clements Ferry Road Segment	2014 AADT	2015 AADT	2016 AADT
269	Jack Primus Road to Cainhoy Road	14,200	13,800	14,100
274	Cainhoy Road to Reflectance Road	13,900	13,200	13,500
272	Reflectance Road to SC 41	10,100	9,800	10,000

Source: SCDOT

<sup>6</sup> Berkeley-Charleston-Dorchester Council of Governments. [https://bcdcog.com/wp-content/uploads/2015/12/Chapter\\_05\\_Bicycle-Pedestrian-Element.pdf](https://bcdcog.com/wp-content/uploads/2015/12/Chapter_05_Bicycle-Pedestrian-Element.pdf). Last accessed August 2017

Table 7 illustrates the crash history in the study corridor and Table 8 presents the actual crash rates (ACR) for each roadway segment. The accident data was converted into a crash rate to enable the comparison of accident rates between roadway segments and against the statewide average.

**Table 7. Study Corridor Crash History**

Clements Ferry Road Segment	Number of Crashes Per Year			Total
	2014	2015	2016	
Jack Primus Road to Cainhoy Road	14	20	17	51
Cainhoy Road to Reflectance Road	5	4	10	19
Reflectance Road to SC 41	3	4	5	12
<b>Total</b>	<b>22</b>	<b>28</b>	<b>32</b>	<b>82</b>

Source: SCDPS

**Table 8. Clements Ferry Road Actual Crash Rates**

Clements Ferry Road Segment	Segment Length (Miles)	ACR by Year			3-Year Average
		2014	2015	2016	
Jack Primus Road to Cainhoy Road	3.52	77	113	94	95
Cainhoy Road to Reflectance Road	0.36	274	231	564	356
Reflectance Road to SC 41	0.44	185	254	311	250

According to the most recent South Carolina Traffic Collision Fact Book published by the SCDPS, a total of 119,173 collisions were reported over the course of approximately 50 billion miles traveled in the state for the year 2014. These figures correspond with a statewide ACR of 238 for all route classifications.

Comparing the statewide ACR in the year 2014 against the three-year average for each segment of Clements Ferry Road reveals that Clements Ferry Road between Cainhoy Road and Reflectance Road experiences a much higher ACR than the statewide average while the segment between Jack Primus Road and Cainhoy Road experiences a much lower ACR than the statewide average. The segment of Clements Ferry Road between Reflectance Road and SC 41 experiences an ACR approximately equal to the statewide average. Table 9 illustrates the primary contributing factors identified for crashes which occurred within each of the study segments.

**Table 9. Primary Contributing Factors by Road Segment**

Primary Contributing Factor	Jack Primus Road to Cainhoy Road	Cainhoy Road to Reflectance Road	Reflectance Road to SC 41	Total
Driving Too Fast for Conditions	22	9	8	39
Distracted/Inattention	8	3		11
Failed to Yield Right-of-Way	8	2	1	11
Followed Too Closely	4	2		6
Improper Lane Usage/Change	2	0	0	2
Swerving to Avoid Object	0	2	0	2
Wrong Side/Wrong Way	1	0	1	2
Driver Under Influence	1	0	1	2
Aggressive Operation of Vehicle	1	0	0	1
Disregarded Signs/Signals	0	1	0	1
Fatigued/Asleep	1	0	0	1
Lying and/or Illegally in Roadway	1	0	0	1
Other Improper Action	1	0	0	1
Ran Off Road	1	0	0	1
Texting	0	0	1	1
<b>Total</b>	<b>51</b>	<b>19</b>	<b>12</b>	<b>82</b>

Source: SCDPS

It is notable that 23% of accidents attributed to Driving Too Fast for Conditions occurred in the segment of Clements Ferry Road between Cainhoy Road and Reflectance Road which comprises only 8% of the total study corridor by length. This segment also has the lowest posted speed limit (35 mph) and the highest ACR (356) of the PSA.

Further, the SCDPS data shows that the first harmful event in eight of the nineteen accidents which occurred on Clements Ferry Road between Cainhoy Road and Reflectance Road involved impacts to vehicles which were stopped on the road. This may be attributable to the lack of turn lanes and relative increase in driveway and side road access points along this segment which results in more frequent occurrences of left turning vehicles stopped in a through lane.



## 2.5 Logical Termini and Independent Utility

Pursuant to Federal Highway Administration (FHWA) regulations (23 CFR § 771.111(f)), a project should have logical termini and independent utility for transportation improvements as well as an appropriate geographical boundary for evaluating environmental impacts. Logical termini for project development are defined as (1) rational end points for a transportation improvement, and (2) rational end points for a review of the environmental impacts. To have independent utility, a project must be a usable and a reasonable expenditure even if no other transportation improvements are constructed.

The proposed project termini include the intersections of Jack Primus to the west, and SC 41 to the east. The terminus at Jack Primus Road is determined to be a rational endpoint as the section of Clements Ferry Road from Jack Primus to I-526 is currently under construction to be widened from a two-lane road to a five-lane roadway. Therefore, the proposed project would essentially be connecting to, and extending this roadway typical section. The SCDOT and FHWA previously completed an Environmental Assessment and subsequent FONSI for the segment of Clements Ferry Road that is currently under construction. Specifically, these documents, along with supporting studies, determined that there was a 48% drop in traffic volumes east/north of Jack Primus Road along with a 65% decrease in truck volumes.

The terminus at SC 41 is also determined to be a rational endpoint. In addition, the SCDOT is currently reconstructing the SC 41 and Clements Ferry Road intersection as part of the SC 41 bridge replacement over the Wando River.

The proposed project is determined to have independent utility since it provides much needed capacity and safety improvements within the congested project corridor even if no other existing or future projects are completed. In addition, the project would not create a need for improvements on other roadways or require additional improvements to be effective for addressing the stated purpose and need. The project would improve the LOS of the proposed segment and would not worsen the adjacent facilities or require additional improvements to adjacent facilities to achieve the improved LOS. In addition, bicycle and pedestrian facilities would be constructed to provide continuity with advanced and planned facilities for Berkeley/Charleston Counties. It should also be noted that there are several additional transportation improvement projects located adjacent to and in proximity to various other transportation improvement projects.



### 2.6 Reasonable Availability of Funding

On November 4, 2008, the voters of Berkeley County passed a 1% sale and use tax for "financing the costs of highways, roads, bridges, and other transportation-related project facilities, and drainage facilities related thereto." This tax lasted for seven years and all the revenue generated will be used to construct roadway improvements listed in the approved referendum including this segment of Clements Ferry Road. On November 4, 2014, the voters of Berkeley County again passed a 1% sales and use tax. Projects in the original 2008 referendum (which includes Clements Ferry Road Widening) must be completed with funding from the 2014 referendum should a funding shortfall exist from the original 2008 referendum. Clements Ferry Road is one of the highway capacity projects funded as part of this referendum (Table 10). \$9 million in construction funds were recently added in FY 2021 from CHATS guideshare for the project.

**Table 10. Projected Project Cost**

Funding Source	Phase	Cost (\$ millions)
Local (Berkeley County)	Preliminary Engineering	\$2.1
Local (Berkeley County)	Right-of-Way	\$5.7
Local (Berkeley County)	Construction	\$25.5
CHATS (Federal Guideshare)	Construction	\$9.0
<b>TOTAL</b>		<b>\$42.3</b>



### 3. ALTERNATIVES

Various location and design alternatives were evaluated during the development of the project. These alternatives included the No-Build Alternative, or the “do nothing” alternative, along with symmetrical and asymmetrical widening to the north and south along the existing roadway. These alternatives were specifically analyzed to determine reasonability in advancing for further consideration.

While the proposed location and design of the project represents the best build alternative for meeting travel demands while minimizing impacts, input received during the public hearing process and environmental document availability period will be carefully evaluated in future project development, and modifications will be made where appropriate.

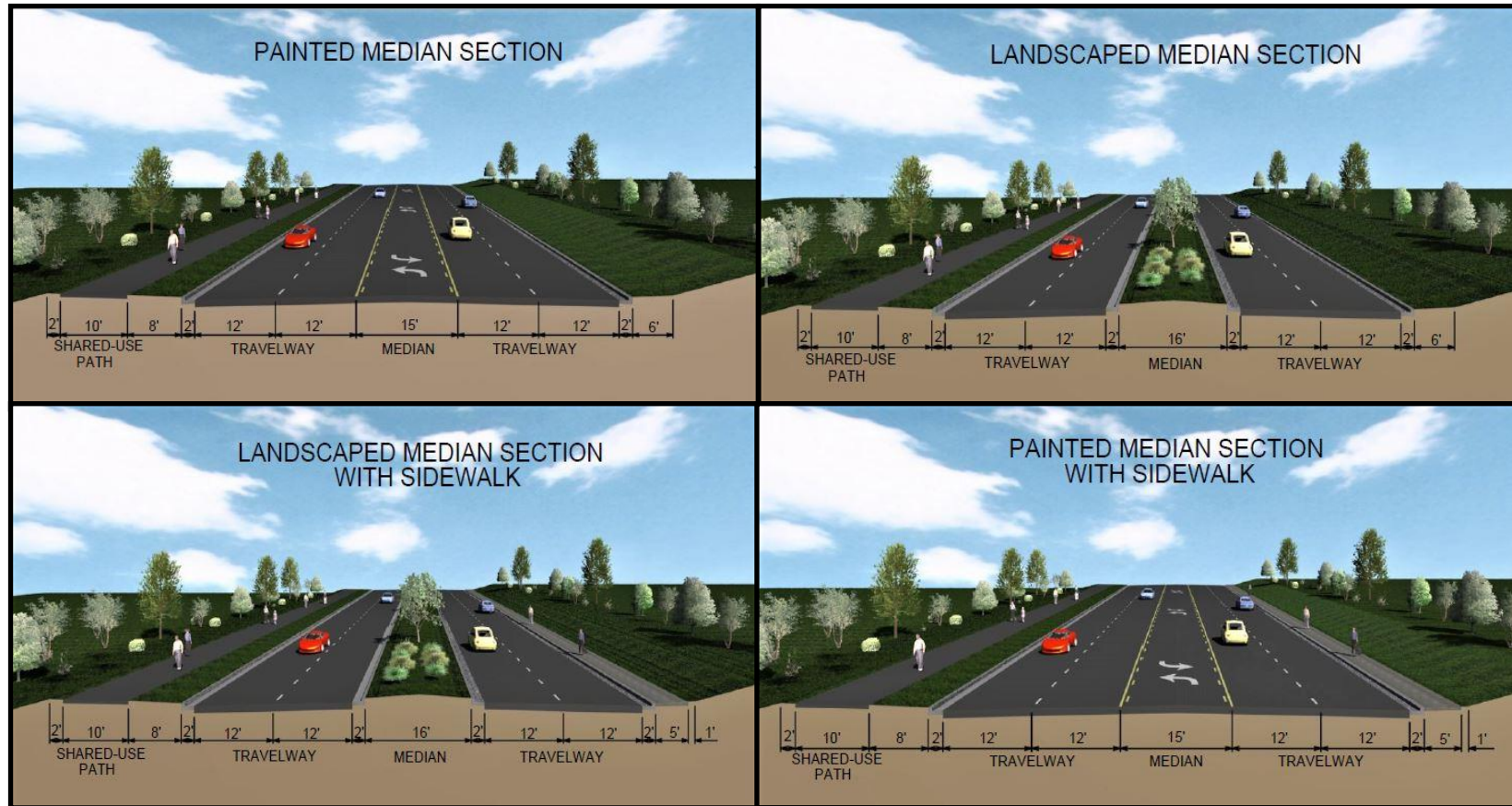
#### 3.1 Proposed Facility

The purpose of the project is to increase capacity, improve operational efficiency, improve safety, and provide bicycle and pedestrian accommodations on Clements Ferry Road between Jack Primus Road and SC 41.

Based on capacity analysis of the roadway, a four-lane roadway with a center two-way left-turn lane or raised landscaped median is recommended. Therefore, the proposed facility would include widening Clements Ferry Road for a distance of approximately 4.5 miles from a two-lane roadway to a four-lane roadway with a center two-way left-turn lane or raised landscaped median, constructing intersection improvements within project limits, and providing a shared-use path for bicyclists and pedestrians (see Figure 5). With construction of the proposed facility, both individual intersection and overall delays are expected to decrease, and the LOS would improve.



Figure 5. Proposed Typical Sections





## 3.2 Alternatives Considered but Eliminated

Various alignment alternatives were considered during early project development, including the No-Build, and widening to the north or south along the entire corridor. As described below, these alternatives were eliminated from further review mainly due to right-of-way impacts and residential and commercial relocations.

### 3.2.1 No-Build Alternative

The No-Build Alternative, which consists of making no improvements to Clements Ferry Road, was considered a baseline for comparison. The No-Build Alternative would not provide for the proposed improvements that are necessary to improve traffic efficiency along this corridor. If the improvements are not made, congestion will worsen, and safety of the traveling public will be compromised. For these reasons, the No-Build Alternative would not meet the purpose and need for the project.

### 3.2.2 Widening to North of Clements Ferry Road

Widening exclusively to the north of the roadway would involve the widening of Clements Ferry Road to the north of the existing roadway resulting in a four-lane curb and gutter roadway with a center two-way left-turn lane or raised planted median (variable 15-16 foot), and a shared-use path along one side of the roadway along the entire length. The alternative would be approximately 4.5 miles long and would include complementary intersection improvements at selected intersections. This alternative would provide the necessary improvements to accommodate future traffic deficiencies from Jack Primus Road to SC 41 through the construction of additional travel lanes, center two-way left-turn lane in some sections, and a shared-use path. In addition, this alignment would require construction of two new bridge structures. As shown in Table 11, this alternative would result in seven residential and one commercial relocations, and impact approximately 2.4 acres of wetlands and 195 linear feet (LF) of stream.

### 3.2.3 Widening to the South of Clements Ferry Road

Widening exclusively to the south would involve the widening of Clements Ferry Road to the south of the existing roadway resulting in a four-lane curb and gutter roadway with a center two-way left-turn lane or raised planted median (variable 15-16 foot), and a shared-use path along one side of the roadway along the entire length. The alternative would be approximately 4.5 miles long and would include complementary intersection improvements at selected intersections. This alternative would provide the necessary improvements to accommodate future traffic deficiencies from Jack Primus Road to SC 41 through the construction of additional travel lanes, center two-way left-turn lane in some sections, and a shared-use path. In addition, this alignment would require





construction of two new bridge structures. As summarized in Table 11, this alternative would result in three residential and five commercial relocations, and impact approximately 2.6 acres of wetlands and 200 LF of stream.

**Table 11. Summary of Impacts for the Alternatives**

Impact Category	North Alternative	South Alternative
Residential Relocations	7	3
Commercial Relocations	1	5
Farmland (acres)	0	0
Floodplains (acres)	2.0	2.0
Wetlands (acres)	2.4	2.6
Streams (linear feet)	195	200
Threatened/Endangered Species	0	0
Cultural Resources	0	1
Hazardous Material Sites	2	4

### 3.3 Preferred Alternative

Based on evaluation of the alternatives that would widen to either the north or south, it was determined that widening asymmetrically north and south of the roadway would minimize impacts to natural resources, utilities, and residential and commercial properties. This alternative was evaluated to identify its ability to meet the purpose and need while minimizing impacts to the human and natural environment.

The Preferred Alternative would involve the asymmetrical widening of Clements Ferry Road to the north and south of the existing roadway resulting in a four-lane curb and gutter roadway with a center two-way left-turn lane or raised planted median. A 10-foot shared use path would be provided along the north side of the roadway for the length of the project, along with the south side from Hopewell Lane to Peninsula Cove Drive. In addition, sidewalk will be provided along the south side from Peninsula Cove Drive to SC 41. The alternative would be approximately 4.5 miles long and would include complementary intersection improvements at selected intersections. This alternative would provide the necessary improvements to accommodate future traffic deficiencies from Jack Primus Road to SC 41 through the construction of additional travel lanes, center two-way left-turn lane in some sections, and a shared-use path. The asymmetrical widening to the north and south of the roadway would avoid and minimize impacts to existing residential and commercial developments, utilities, waters of the U.S., and maintain the two existing bridge structures, thus it was determined to be the Preferred



Alternative. Figures 6a-6d illustrate the Preferred Alternative and Table 12 documents the probable impacts resulting from the Preferred Alternative.

**Table 12. Summary of Impacts for the Build Alternative**

Impact Category	Preferred Alternative (Build)
Residential Relocations	1
Commercial Relocations	0
Farmland (acres)	0
Floodplains (acres)	2.0
Wetlands (acres)	2.7
Streams (linear feet)	160
Threatened/Endangered Species	0
State-Listed Species	0
Cultural Resources - Architectural	0
Cultural Resources - Archaeological	0
Hazardous Material Sites	2*
Right-of-Way (acres)	42.2

\*0.2 acres of proposed new ROW from two identified sites



Figure 6a. Preferred Alternative

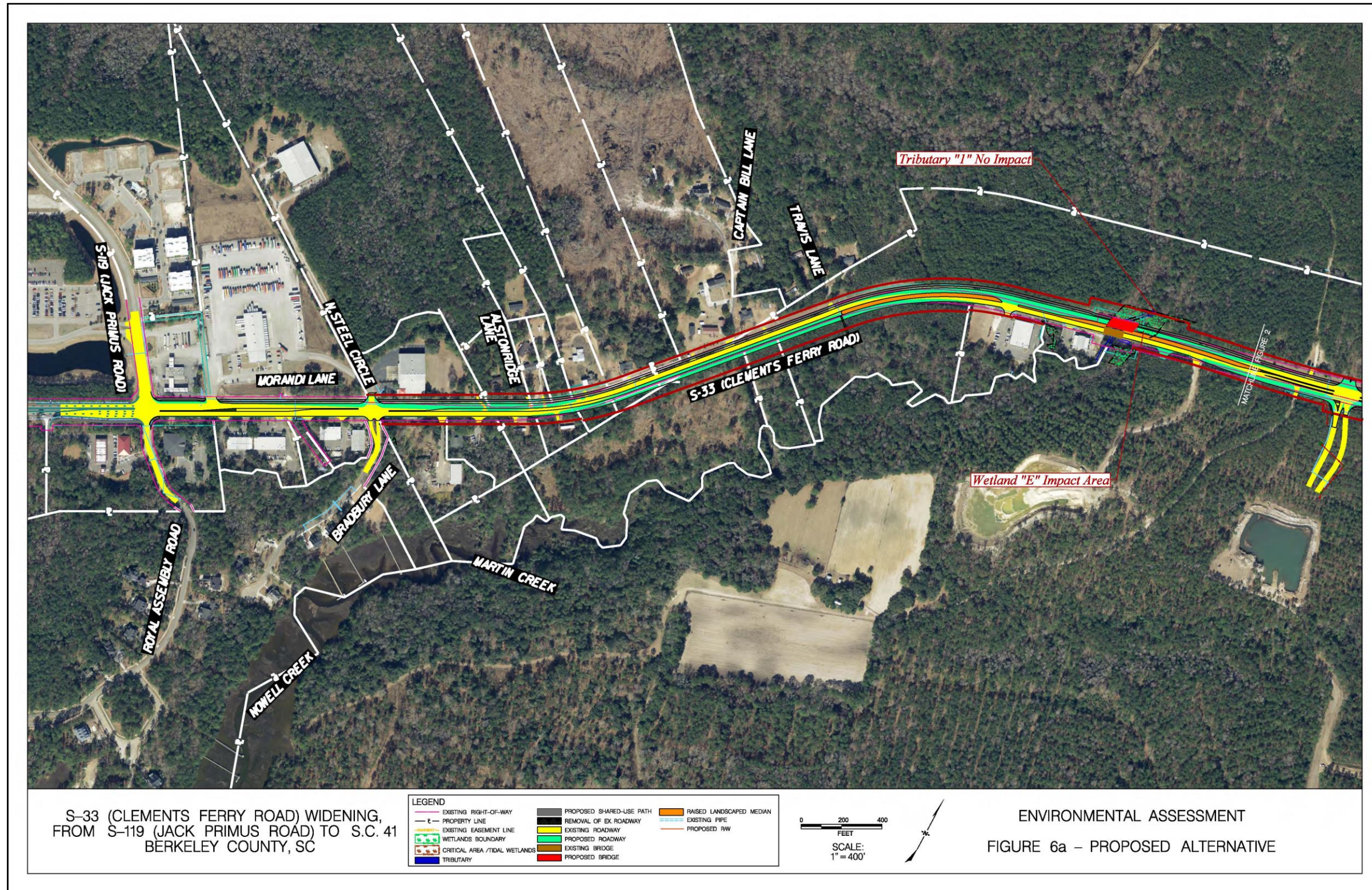




Figure 6b. Preferred Alternative

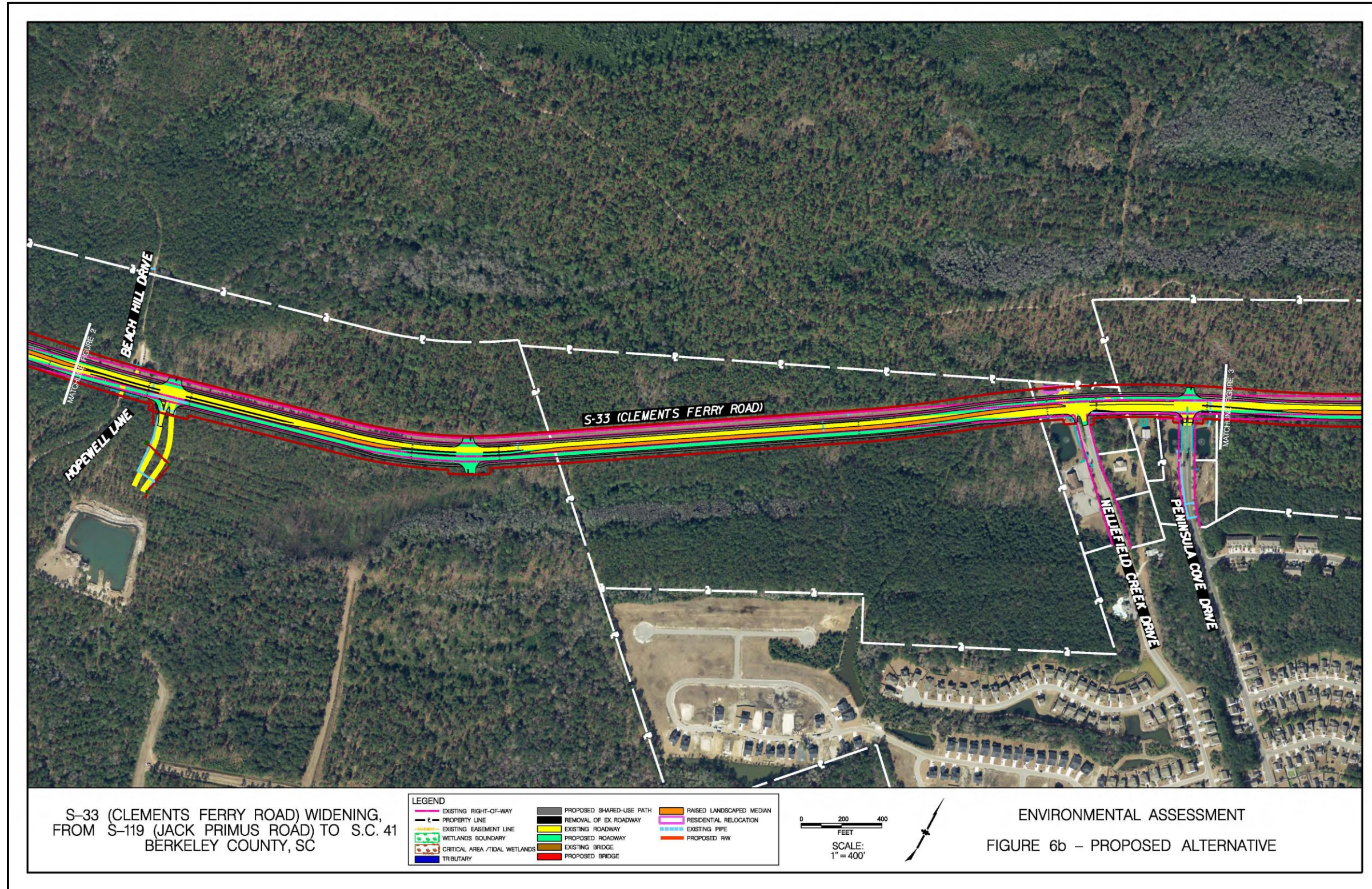




Figure 6c. Preferred Alternative

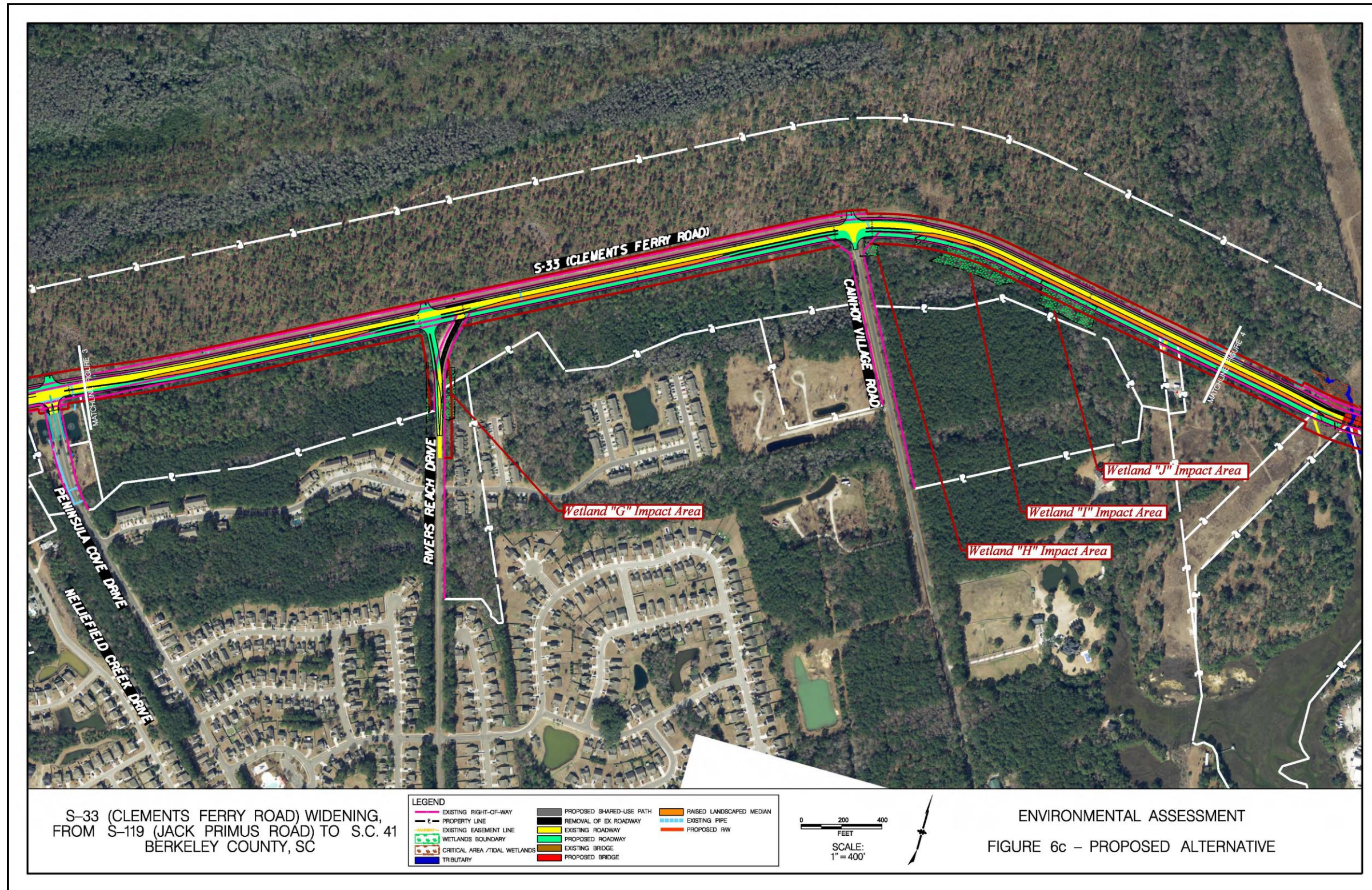
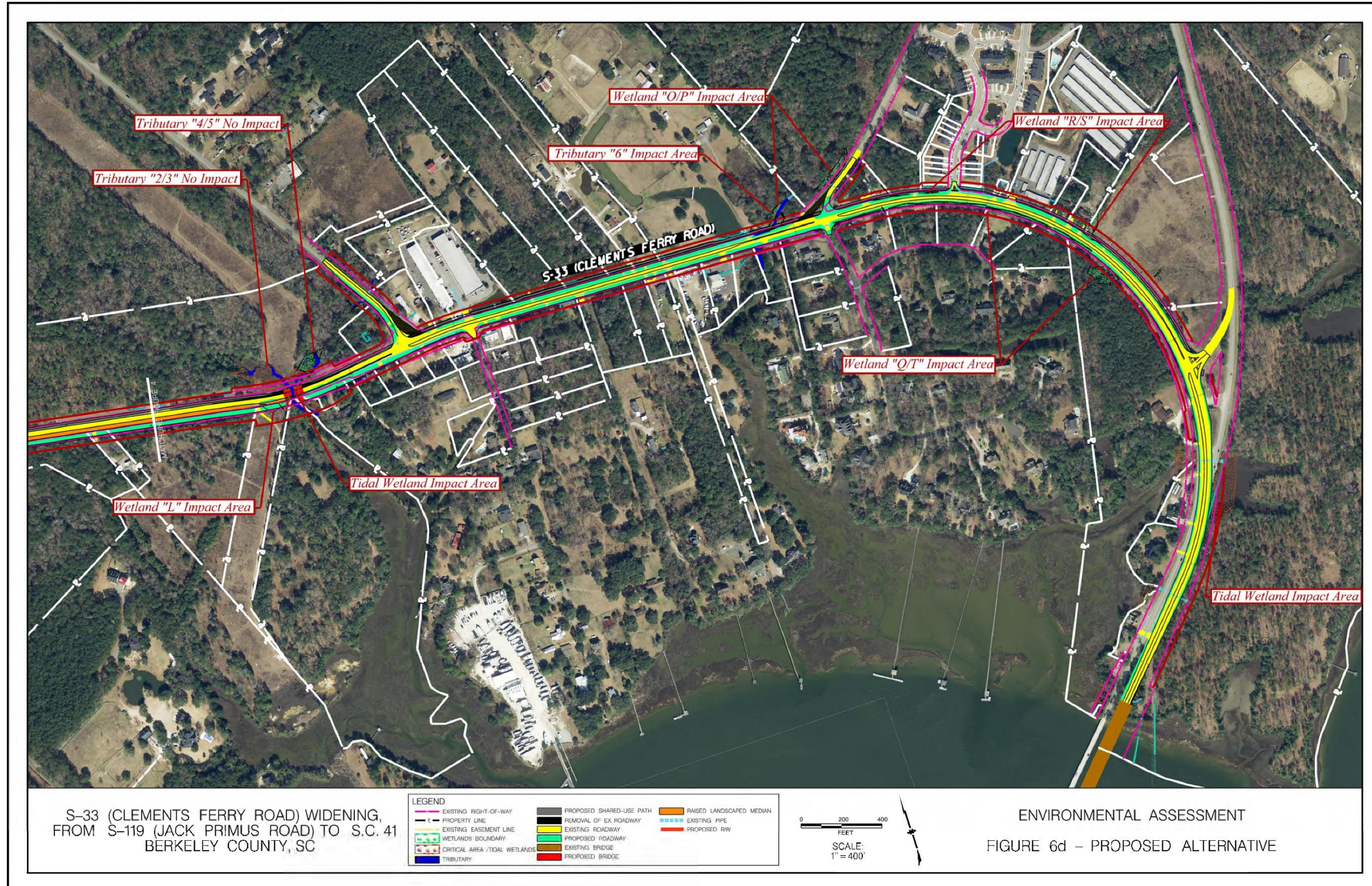




Figure 6d. Preferred Alternative





The widening would begin near the intersection of Clements Ferry Road and Jack Primus Road—tying into work that is currently underway between I-526 and Jack Primus Road. Widening would continue east to SC 41—again tying into work underway there. The total proposed project length is roughly 4.5 miles. In addition, complementary intersection and side-road improvements would be completed at Clements Ferry Road and Rivers Reach Drive, Cainhoy Road, and Reflectance Road; along with additional turn lanes on Clements Ferry Road at Bradbury Lane, Hopewell Lane, Nellifield Creek Drive, Peninsula Drive, and Cainhoy Village Road. Over the course of preliminary engineering, various design modifications have been made in order to avoid and/or minimize adverse impacts to utilities, two existing bridges, private and commercial property, and wetlands/streams.

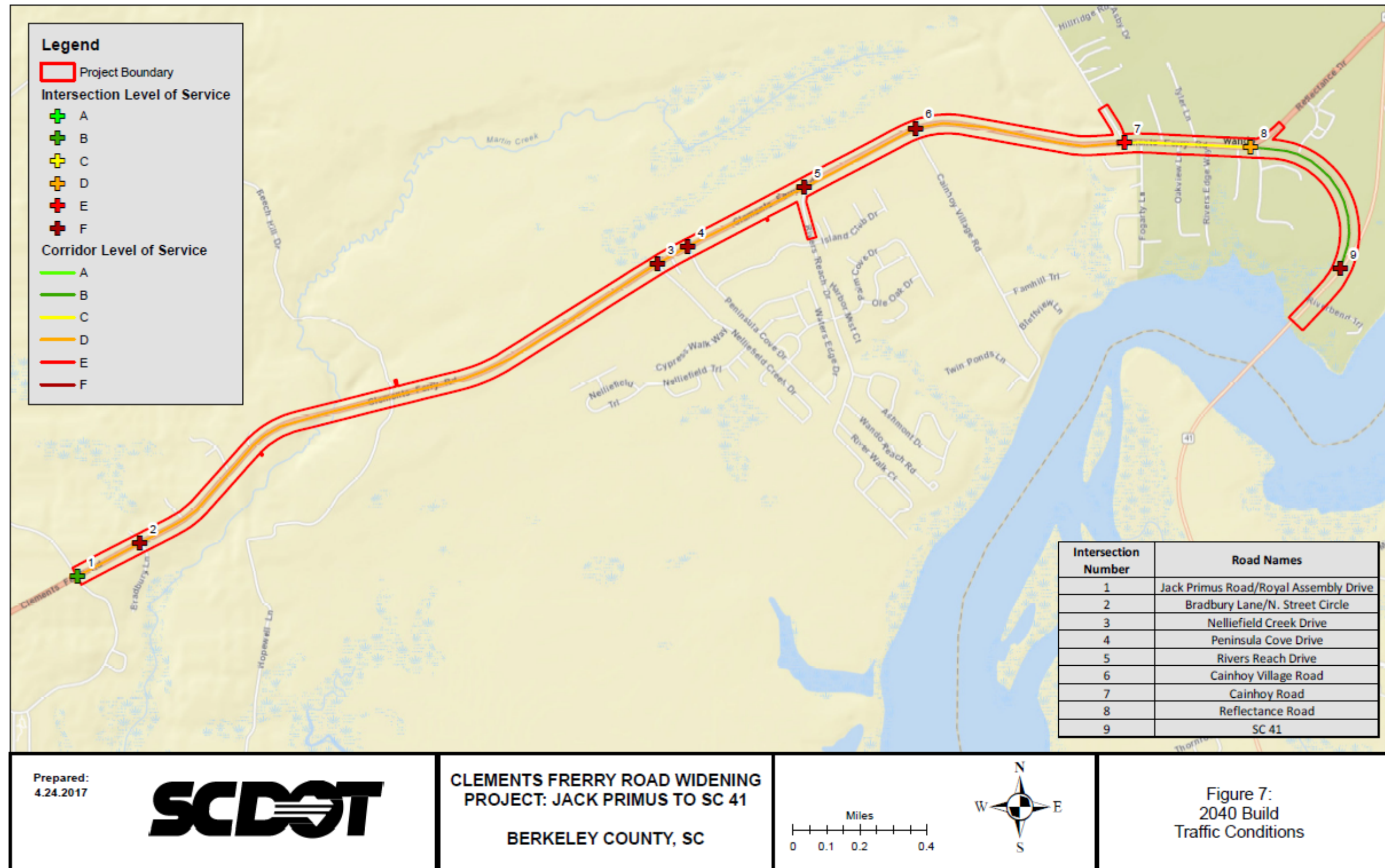
The traffic study conducted for the project also analyzed the Preferred Alternative (i.e., Build Scenario) to evaluate the anticipated improvements by implementing the proposed facility. Traffic volumes were forecasted for the opening year (2022) and design year (2040) by applying a 2% growth rate. This growth rate was developed based on the BCDCOG CHATS Travel Demand Model, the SCDOT Traffic Study for Clements Ferry Road Widening from I-526 to Jack Primus Road, and other studies conducted along the corridor. The widening of Clements Ferry Road is expected to result in acceptable LOS along the corridor through the 2040 design year without Cainhoy Development. With Cainhoy Development, the LOS is still an F; however, the vehicle delay is less with the proposed improvements (Table 13).

**Table 13. Traffic Impacts for the Build Alternative**

Clements Ferry Road Segment	No-Build without Cainhoy Development		Preferred Alternative (Build) without Cainhoy Development		No-Build with Cainhoy Development		Preferred Alternative (Build) with Cainhoy Development	
	2040 ADT	2040 LOS	2040 ADT	2040 LOS	2040 ADT	2040 LOS	2040 ADT	2040 LOS
Jack Primus Road to Cainhoy Road	22,640	F	22,640	D	58,273	F	58,273	F
Cainhoy Road to Reflectance Road	21,650	F	21,650	C	57,283	F	57,283	F
Reflectance Road to SC 41	16,080	F	16,080	B	51,713	F	51,713	F



Figure 7. Build Traffic Conditions in 2040 without Cainhoy Plantation







In addition, the various intersections were also evaluated (see Table 14). As previously explained, LOS is a qualitative measure used to describe the quality of traffic flow/service. LOS is used to analyze highways by categorizing traffic flow and assigning quality levels of traffic based on performance measure like speed and density. Construction of the Preferred Alternative will substantially reduce traffic delays and improve LOS as compared to the No-Build Alternative. When comparing the No-Build to Build Alternative, the individual intersection and overall delay does go down substantially, and LOS improves by widening Clements Ferry Road (Table 13). The proposed improvements will improve the operation of the existing roadway by increasing the capacity. This would ultimately reduce traffic delays, enhance mobility for all traffic, and provide a safer facility for motorists, pedestrians, and bicyclists.

As illustrated in Table 14, without widening Clements Ferry Road, the following intersections are operating at the LOS F by 2022:

- Bradbury Lane/N. Steel Circle (AM & PM LOS F)
- Nelliefield Creek Drive (AM & PM LOS F)
- Peninsula Cove Drive (AM LOS F)
- Rivers Reach Drive (AM & PM LOS F)
- SC 41 (AM & PM LOS F)

By 2040, all intersections will be operating at LOS F, with the exception of Reflectance Road operating at a LOS B during the PM peak.

With the Build Alternative, all the signalized intersections will operate at LOS C or better by 2022, with the exception of SC 41 operating at LOS F in the AM peak and LOS E in the PM peak (Table 14). The stop-control intersections will operate at LOS D or worse for the majority of the intersections, with the following operating at LOS F:

- Bradbury Lane/N. Steel Circle (AM & PM LOS F)
- Nelliefield Creek Drive (AM & PM LOS F)
- Peninsula Cove Drive (AM LOS F)
- Rivers Reach Drive (PM LOS F)

By 2040, the following signalized and stop-control intersections will operate at LOS F; however, the delays along these intersections would be improved resulting in improved operational conditions:



- Bradbury Lane/N. Steel Circle (AM & PM LOS F)
- Nelliefield Creek Drive (AM & PM LOS F)
- Peninsula Cove Drive (AM & PM LOS F)
- Rivers Reach Drive (AM & PM LOS F)
- Cainhoy Village Road (PM LOS F)
- SC 41 (AM & PM LOS F)

**Table 14. No-Build and Build Alternative Forecasted Level of Service and Delay (CHATS Growth Rate without Cainhoy Development)**

Jack Primus Road Intersection	No-Build				Preferred Alternative (Build)			
	AM Peak Hour LOS (Delay in Seconds)		PM Peak Hour LOS (Delay in Seconds)		AM Peak Hour LOS (Delay in Seconds)		PM Peak Hour LOS (Delay in Seconds)	
	2022	2040	2022	2040	2022	2040	2022	2040
Royal Assembly Drive	B(19.5)	<b>F(106.2)</b>	B(18.5)	<b>F(102.1)</b>	B(11.4)	B(16.1)	B(12.3)	B(17.3)
Bradbury Lane/ N. Steel Circle	<b>F(65.5)</b>	<b>F(285.9)</b>	<b>F(79.2)</b>	<b>F(365.6)</b>	<b>F(51.9)</b>	<b>F(166.8)</b>	<b>F(58.3)</b>	<b>F(208.8)</b>
Nelliefield Creek Drive	<b>F(317.1)</b>	<b>F(2,495.8)</b>	<b>F(89.1)</b>	<b>F(1,040.8)</b>	<b>F(57.5)</b>	<b>F(597.7)</b>	<b>F(66.0)</b>	<b>F(1,040.8)</b>
Peninsula Cove Drive	<b>F(268.8)</b>	<b>F(2,034.5)</b>	<b>F(65.2)</b>	<b>F(323.0)</b>	<b>F(55.3)</b>	<b>F(593.9)</b>	<b>E(41.7)</b>	<b>F(148.7)</b>
Rivers Reach Drive	<b>F(119.4)</b>	<b>F(1,363.7)</b>	<b>F(96.1)</b>	<b>F(2,462.7)</b>	D(32.3)	<b>F(336.0)</b>	<b>F(50.9)</b>	<b>F(744.5)</b>
Cainhoy Village Road	D(27.0)	<b>F(69.9)</b>	<b>E(47.2)</b>	<b>F(155.4)</b>	C(17.8)	D(30.8)	<b>E(35.7)</b>	<b>F(91.2)</b>
Cainhoy Road	D(48.9)	<b>F(145.8)</b>	C(34.8)	<b>F(148.3)</b>	B(18.5)	D(39.6)	C(22.8)	<b>E(77.6)</b>
Reflectance Road	C(23.7)	<b>F(165.7)</b>	C(19.6)	B(14.8)	C(15.1)	D(32.3)	B(14.6)	D(25.5)
SC 41	<b>F(270.7)</b>	<b>F(1,060.8)</b>	<b>F(119.0)</b>	<b>F(1,075.1)</b>	<b>F(61.9)</b>	<b>F(560.8)</b>	<b>E(41.3)</b>	<b>F(227.0)</b>

According to the City of Charleston Planning Department, a projected 11,042 single family detached homes will be developed along the corridor by 2040. Therefore, the traffic study also included detailed analysis regarding the potential impact of this development.



Traffic forecasts were again developed for the 2022 and 2040 scenarios by adding the traffic generated by the proposed development to the 2022 and 2040 volumes at the CHATS growth rate.

With the Build Alternative, Clements Ferry Road will be acceptable in year 2022 with the exception of Main Entrance Site, Bradbury Lane/N. Steel Circle, Nelliefield Creek Drive, and Jack Primus Road intersections. By 2040, most intersections will be LOS F (Table 15); however, the delay will be lower than the No-Build Alternative at these intersections.

**Table 15. Build Alternative Forecasted Level of Service and Delay (CHATS Growth Rate and Cainhoy Development)**

Jack Primus Road Intersection	No-Build				Preferred Alternative (Build)			
	AM Peak Hour LOS (Delay in Seconds)		PM Peak Hour LOS (Delay in Seconds)		AM Peak Hour LOS (Delay in Seconds)		PM Peak Hour LOS (Delay in Seconds)	
	2022	2040	2022	2040	2022	2040	2022	2040
Royal Assembly Drive	F(683.9)	F(1,452.6)	F(299.4)	F(2,117.1)	F(263.6)	F(710.0)	C(31.9)	E(65.3)
Bradbury Lane/N. Steel Circle	F(162.5)	F(3,533.2)	F(72.6)	F(ERROR)	F(1,781.8)	F(11,246.2)	F(144.0)	F(1,449.7)
Nelliefield Creek Drive	F(5,954.2)	F(191.3)	F(2,086.8)	F(11,537.0)	F(174.5)	F(499.4)	E(56.6)	F(155.9)
Peninsula Cove Drive	F(4,988.7)	F(127,666.2)	F(170.3)	F(19,888.1)	C(32.1)	F(199.2)	C(26.1)	F(113.9)
Rivers Reach Drive	F(4,890.3)	F(36,218.8)	F(5,955.0)	F(26,697.3)	F(1,830.8)	D(49.0)	F(303.0)	B(11.0)
Cainhoy Village Road	F(253.0)	F(36,218.8)	F(206.1)	F(120.5)	C(25.3)	F(102.4)	B(13.6)	E(56.0)
Cainhoy Road	F(170.9)	F(586.2)	F(239.2)	F(1,008.9)	B(12.1)	D(38.6)	A(8.1)	B(16.8)
Reflectance Road	C(17.6)	F(791.9)	F(52.0)	F(178.5)	C(25.0)	E(65.7)	B(17.0)	C(30.5)
SC 41	F(3,134.8)	F(23,955.0)	F(2,120.5)	F(ERROR)	B(16.2)	F(92.6)	B(15.3)	D(35.2)

ERROR = Unable to calculate delay because the traffic volume greatly exceeds capacity.



## 4. ENVIRONMENTAL RESOURCES AND POTENTIAL IMPACTS

The following section includes a discussion on the environmental resources and the probable beneficial and adverse social, economic, and environmental effects of the Preferred Alternative, and describes the measures proposed to mitigate any adverse impacts. Environmental studies were conducted for the proposed project are incorporated by reference and used to support this conclusion. Figures 6a-6d illustrate the Preferred Alternative. The following provides a brief overview of the environmental findings.

### 4.1 Land Use

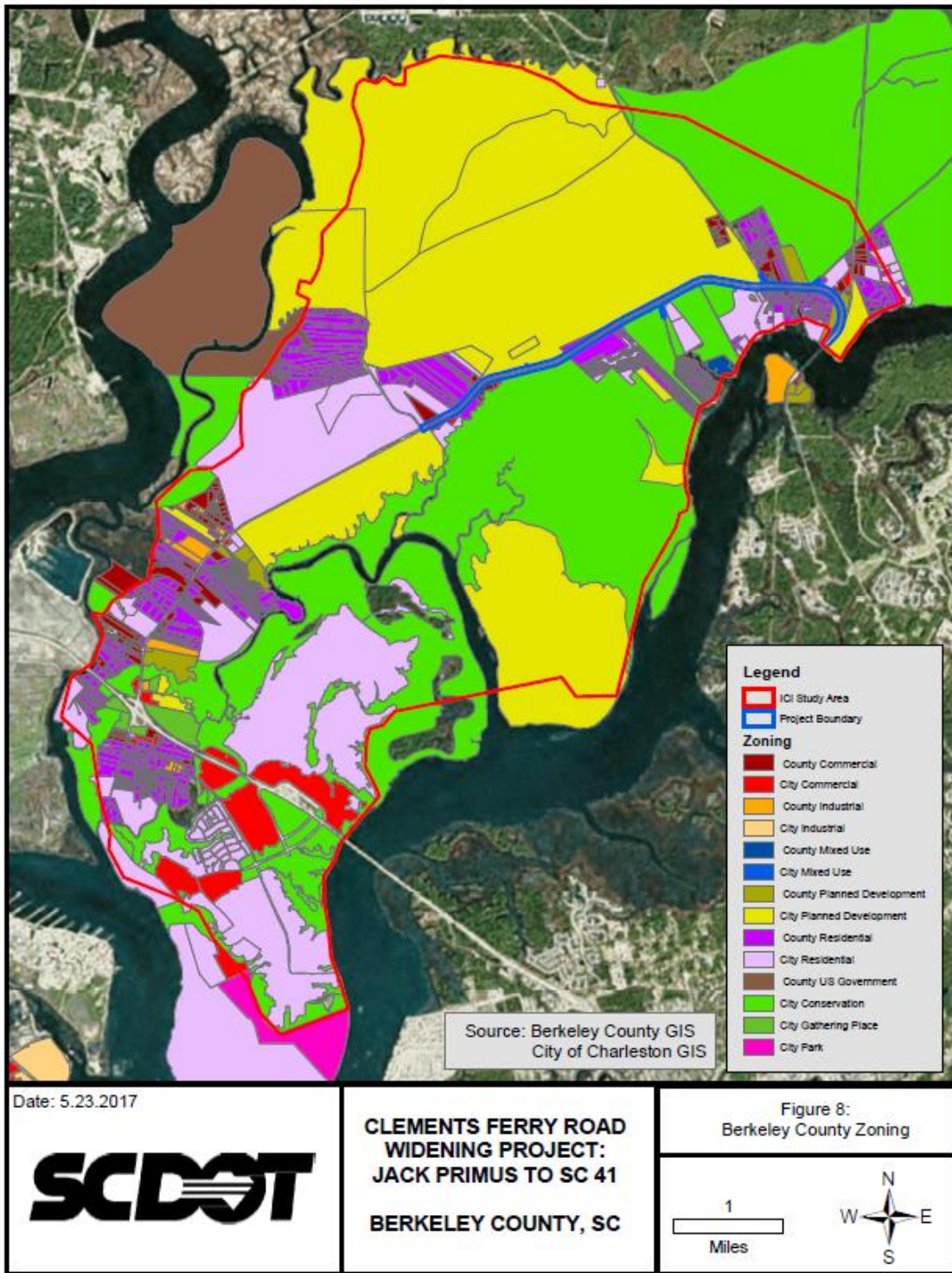
The PSA is located in southern Berkeley County in the lower coastal plain of South Carolina. Specifically, the project lies between the Cooper and Wando Rivers in the Ashley-Cooper River Watershed.

#### 4.1.1 Existing Land Use

The land uses within the immediate vicinity of the project area include commercial/industrial development; residential development; undeveloped forested areas; silviculture; conservation; estuarine marshes; existing transportation facilities; and open water associated with the Cooper River and Wando River systems. Berkeley County zoning (2016) and the City of Charleston zoning (2017) are illustrated in Figure 8. The 1999 Berkeley County Comprehensive Plan designates future land uses along the corridor as residential/rural growth and commercial businesses.

In 2005, leaders of Berkeley, Charleston, and Dorchester Counties, under the auspices of the BCD Council of Governments (BCDCOG), developed the Cainhoy Peninsula Future Land Use and Transportation Plan. This plan was developed to guide future land use planning in this rapidly developing area. The plan identified future land use needs and developed an integrative plan that accommodates future infrastructure, development, and conservation planning needs. The plan identified local and regional transportation needs, and potential truck corridors that connect local industries with other areas. Various low, medium, and high intensity development nodes have been planned along these future transportation corridors to target specific types of development.

Figure 8. Berkeley County Zoning





### 4.1.2 Impacts to Land Use

The Preferred Alternative would not adversely affect current or proposed land uses in the area. The Preferred Alternative would result in the acquisition of 42.2 acres of additional ROW. The required ROW would necessitate the relocation of signage, utilities, and reconfiguration of driveway entrances. Since this is a proposed widening project, the improvements would not provide new access and are not anticipated to cause a direct change in adjacent land use. Local land uses would benefit from the proposed improvements through improved operating conditions.

### 4.1.3 Mitigation

Existing land use was taken into consideration during design of the Preferred Alternative. A number of areas adjacent to the existing roadway such as businesses, residences, and environmentally sensitive areas (i.e., wetlands and streams) were designated as sensitive areas and were avoided to the extent practicable. Due to the lack of impacts, no mitigation is proposed.

## 4.2 Waters of the U.S.

Waters of the U.S. (WOUS), as it applies to the jurisdictional limits of the authority of the U.S. Army Corp of Engineers (USACE), is defined in 33 CFR Part 328, and includes:

- All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
- All interstate waters including interstate wetlands;
- All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds;
- All impoundments, tributaries, and adjacent wetlands to the waters defined above;
- The territorial seas.

Potential WOUS were identified along the PSA through a combination of desktop and field evaluations. This included a review of available mapping, specifically the National Wetland Inventory (NWI) maps, soil surveys, USGS topographic quadrangles (*Cainhoy and North Charleston*), color aerial photography, and GIS data.

The field delineation of wetlands has been completed and a jurisdictional determination was submitted to the USACE for verification of delineated WOUS boundaries. The

identification and subsequent delineation of WOUS within the project area involved placing colored flagging along the upland/wetland boundary, and the subsequent surveying of these flags. The delineations of freshwater wetland areas were performed in accordance with the directives of the *U.S. Army Corps of Engineers 1987 Wetlands Delineation Manual and October 2008 Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region*<sup>7</sup>. This approach utilizes the three-parameter approach that characterizes and identifies wetland hydrology, presence of hydrophytic vegetation and hydric soil conditions. The delineation of critical area (emergent tidal salt marsh) is based upon the prevalence and salt water tolerant vegetation (predominantly emergent herbaceous) and the ebb and flood of the daily tidal cycle. A detailed review of the resources identified within the PSA can be found in the *Natural Resources Technical Memorandum* (Appendix B).

## 4.2.1 Streams and Open Water

### 4.2.1.1 Existing Streams and Open Water

There are three linear drainage features (tributaries) located within the project area. These include a portion of Martins Creek (Tributary 1) and unnamed tributaries to the Wando River (Tributaries 2-3, 4-5, and 6). Martins Creek is considered a freshwater stream with abutting wetlands. Tributary 1 has an average channel width of 12 feet, an average depth of 3-4 feet, and drains southwesterly with connection to the Wando River. Tributaries 2-3 are considered segments of the same tributary system that drains to the Wando River approximately 0.5 miles downstream of the PSA.



*Open Water Pond near Reflectance Road*

This tributary is considered a tidal creek system with an average channel width of 6-8 feet, an average depth of 3-5 feet, and very minimal flow during low tide events. Abutting critical area wetlands are comprised of a vegetative community dominated by black needle rush in the upstream portion of the PSA and by *Spartina* in the downstream portion of the PSA. Tributaries 4-5 are considered segments of the same tributary system that provide freshwater drainage

<sup>7</sup> USACE, <http://www.sac.usace.army.mil/Missions/Regulatory/Permitting-Process/>. Accessed May 2017



into Tributary 3, just upstream of the PSA. Tributaries 4-5 have an average channel width of 5-7 feet and an average depth of 2-3 feet. Tributary 6 is an unnamed, freshwater tributary to the Wando River with an average channel width of 8-10 feet and an average depth of 4-6 feet.

#### 4.2.1.2 Impacts to Streams and Open Water

The proposed project would avoid impacts to Tributaries 1-5 through construction of bridges that would completely span the main tributary reaches. However, the project would result in approximately 160 LF of impact to Tributary 6. Specifically, these impacts would include extending an existing cross line pipe that currently provides conveyance for Tributary 6. These impacts cannot be avoided due to the location of the tributary on each side of the roadway.

### 4.2.2 Wetlands

#### 4.2.2.1 Existing Wetlands

Wetland habitats are defined as those areas that are inundated by water with sufficient frequency and duration to support vegetation that is tolerant of saturated soil conditions. The USACE utilizes specific hydrologic, soil, and vegetation criteria in establishing the boundary of wetlands within their jurisdiction.

In addition, one method of assessing the value and function of wetlands is in terms of wildlife habitat. The U.S. Fish and Wildlife Service (USFWS) Resource Category criteria are outlined in the USFWS Mitigation Policy, 46 CFR 7644-7663. Resource categories and mitigation planning techniques are assigned based on the following criteria:

Category 1 - Communities of one-of-a-kind high value to wildlife, unique and irreplaceable on a national or eco-regional basis, habitat is not replaceable in kind based on present-day scientific and engineering skills within a reasonable time frame.

Category 2 - Communities of high value to wildlife, which are relatively scarce or are becoming scarce on a national, or eco-regional basis, habitat can be replaced in kind within a reasonable time frame based on present-day scientific and engineering skills.

Category 3 - Community types of high to medium wildlife value which are relatively abundant on a national basis, out-of-kind replacement is allowable if a tradeoff analysis demonstrates equivalency of substituted habitat type and/or habitat values. These sites are often in conjunction with a replenishing source.





Category 4 - Community types of low to medium wildlife value, generally losses would not have a substantial adverse effect on important fish and wildlife resources. These sites have often been affected by the present roadway or human disturbances and are usually isolated.

The assessment and identification of wetlands along the project area included a review of available data, mapping, and a series of field investigations. Per above, the wetland areas were delineated and surveyed per USACE guidelines and methods. The critical area and freshwater wetlands/WOUS located within the northeastern portion of the project area have been previously delineated and verified by the SC Department of Health and Environmental Control Office of Ocean and Coastal Resource Management and the USACE as a component of the current SC 41 bridge replacement over the Wando River. This portion of the Clements Ferry Road project corridor overlaps the northern portion of the SC 41 project corridor and is included in the USACE designated project number SAC-2011-364 (SCDOT PIN #32098) which contains both the delineation and general permit for the bridge replacement currently in progress. The permit for the SC 41 bridge replacement was recently re-issued and expires on July 20, 2021.

In addition to the northeastern portion of the project area, isolated areas along the central portion of the project corridor were recently delineated by others and verified by the USACE. Coordination with the consultant representing the applicable landowner has been ongoing and the wetland boundary data from the USACE field-verified delineation was incorporated into the project area for the widening of Clements Ferry Road. A jurisdictional determination has been submitted and is currently being reviewed by USACE.

The delineated wetland areas along the PSA are illustrated in Figures 6a-d and include 24 freshwater wetland areas totaling 4.23 acres along with six tidal wetland areas totaling 1.90 acres. The freshwater wetland areas primarily include palustrine forested wetland types, while the tidal wetland areas primarily include estuarine emergent wetland types.

The dominant freshwater wetlands within the PSA consist of mixed pine-hardwood and hardwood palustrine forested wetlands that are situated within drainageways or adjacent to one of the identified tributary features located along the project corridor. These areas are of common distribution within the outer coastal plain and provide various habitat



*Tributary 3 and Critical Area Wetlands*

functions. These areas contain the three criteria of near surface hydrology, hydric soils and hydrophytic vegetation for wetland determination. Typical of these types of surface features, they interact with near surface groundwater conditions during periods of higher rainfall and function as drainageways to transport surface water runoff from adjacent uplands and higher elevation wetlands to downstream waters. These

areas are considered Category 4 wetlands due to previous disturbance and fragmentation from area development.

The tidal wetlands (critical area wetlands) within the PSA are considered emergent salt marsh wetlands that are directly associated with the Wando River and its tributaries. These areas are subject to the ebb and flood of the daily tidal cycle and are dominated by saltwater tolerant vegetation. These types of emergent wetlands are of common distribution within the vicinity of the project area and typically function as an interface between adjacent uplands/forested wetlands and open tidal surface waters. These areas are generally considered Category 2 wetlands due to the continued development and loss of tidal wetlands on a national scale. These areas are also subject to the SC Coastal Zone Management Act and Section 10 of the Rivers and Harbors Act due to the tidal influence.

Additional detail regarding the WOUS along the PSA is included in the Natural Resources Technical Memorandum that was prepared for the project and found in Appendix B<sup>8</sup>.

#### **4.2.2.2 Impacts to Wetlands**

The proposed improvements would result in various unavoidable impacts to streams and wetlands. Approximately 0.46-acre of tidal/critical area wetlands and 2.2 acres of freshwater wetlands would be impacted through the addition of fill material to accommodate the proposed widening. These impacts would be adjacent to the existing

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<sup>8</sup> Red Bay Environmental, *Natural Resources Technical Memorandum: Clements Ferry Road Widening: Jack Primus Road to SC 41, Berkeley County, SC*. 2017



roadway and are necessary to accommodate the roadway widening. These impacts would include fill impact for construction of the proposed roadway, along with clearing impacts to install and maintain erosional control measures during construction.

Executive Order (EO) 11990 - Protection of Wetlands was issued, in furtherance of NEPA, in order to avoid impacts to wetlands wherever there is a feasible alternative. EO 11990 requires new construction in wetlands to be avoided unless there are no practicable alternatives to the impacts, and the project incorporates all practicable measures to minimize impacts. The assessment of the applicability of alternatives to wetland impacts and the incorporation of avoidance measures considers economic, environmental, and other pertinent factors. Therefore, wetlands and WOUS were given special consideration during development and evaluation of this project. The Preferred Alternative would impact 2.66 acres of WOUS, which is approximately 0.1-acre of additional impact when compared to the other alternatives evaluated. However, the Preferred Alternative would result in less impacts to streams (by 35-40 LF). Given the practicability of avoiding other human and natural resources, particularly minimizing the relocation of residences and businesses along the roadway, the additional impact was determined to be justified.

### 4.2.3 Mitigation

The Preferred Alternative for improving the mainline and various intersections results in the least environmentally damaging build alternative in regard to potential jurisdictional WOUS. Based on the above considerations, it appears that there is no practicable alternative to the proposed new construction in these WOUS; the proposed action would include all practicable measures to minimize harm to wetlands that may result from construction. The Council on Environmental Quality (CEQ) has defined mitigation in 40 CFR §1508.20 to include: avoiding impacts, minimizing impacts, rectifying impacts, reducing impacts over time, and compensating for impacts. Therefore, the three general types of mitigation include avoidance, minimization, and compensatory mitigation.

Avoidance and minimization of impacts were implemented through the use of bridges and strategic shifting of roadway segments to avoid impacts to WOUS. In addition, final project design would evaluate the practicability of increasing roadway fill slopes (i.e., steeper) and/or reducing the length of pipes/culverts within streams to further minimize impacts. Additional minimization measures would be incorporated with final project delivery, including the implementation of appropriate erosion control measures, including but not limited to seeding of slopes, silt fences, and sediment basins. Other best management practices (BMPs) would be required of the contractor to ensure compliance with policies reflected in 23 CFR 650B.



Compensatory mitigation would be required after avoidance and minimization actions are exhausted. Compensatory mitigation would be required to offset unavoidable impacts and functional loss of WOUS. The compensatory mitigation associated with the documented impacts would be developed and coordinated during the Section 404/401 permitting process and would be developed and implemented per the current USACE requirements. The preferred mitigation techniques would be the purchase of mitigation credits from an approved mitigation bank, followed by permittee-responsible mitigation. As such, it is anticipated that compensatory mitigation for project impacts will be attained through the purchase of mitigation credits from a USACE-approved mitigation bank.

### 4.3 Water Quality

Water quality refers to the chemical, physical, biological, and radiological characteristics of water. It is a measure of the condition of water relative to the requirements of one or more biotic species and or to any human need or purpose. It is most frequently used by reference to a set of standards against which compliance can be assessed. The most common standards used to assess water quality relate to health of ecosystems, safety of human contact, and drinking water<sup>9</sup>.

#### 4.3.1 Existing Water Quality

The project area is situated within the lower coastal plain and predominantly in the coastal zone physiographic regions of South Carolina occupying the lower portion of the Cooper River/Charleston Harbor watershed and the Wando River watershed. The majority of the project area is located within the Wando River watershed. As such, the project drains directly to the Wando River via Martins Creek and other unnamed tributaries and wetlands of the Wando River. Both watersheds are characterized as having high growth potential due to the expanding metropolitan Charleston area.

The SC Department of Health and Environmental Control (SCDHEC) is charged with establishing a system and rules for managing and protecting the quality of South Carolina's surface and ground water. This is accomplished through various regulations and programs within SCDHEC which establish official classified water uses for all waters of the State; rules/criteria for protecting classified water uses; and procedures for classifying water uses.

SCDHEC regulation 61-69 contains a list of classified waters; however, the waters on site are not specifically listed in these regulations. Per the regulation, the classification of

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<sup>9</sup><https://nmsfloridakeys.blob.core.windows.net/floridakeys-prod/media/archive/scisummaries/wqfaq.pdf>. Accessed April 2017.



these tributaries assumes the listing of downstream waters. As such, these tributaries are classified according to the classification of the Wando River, which is “Shellfish Harvesting Waters” (SFH)<sup>10</sup>. SCDHEC further defines these waters, along with establishing rules and criteria for protecting and maintaining these classifications<sup>11</sup>. Per regulations, SCDHEC classifies SFH:

“tidal saltwaters protected for shellfish harvesting and uses listed in Class SA and Class SB. Suitable for primary and secondary contact recreation, crabbing, and fishing. Also suitable for the survival and propagation of a balanced indigenous aquatic community of marine fauna and flora.”

SCDHEC, in conjunction with the EPA, works to create and revise water quality standards across the state of South Carolina. Water quality standards are established to protect and improve the quality of the surface waters for use as drinking water, wildlife habitat, and recreation uses. To monitor the quality of surface waters, SCDHEC implements and monitors over 1,000 water-quality monitoring stations across the state.

Surface water within the limits of the proposed project drains to various downstream monitoring stations. The western portion of the PSA, located within the Wando River Basin, drains to Station 09 B-16. Station 09 B-16 is located in Beresfords Creek, approximately one aerial mile southwest of the PSA. The eastern portion of the PSA, also located within the Wando River Basin, drains to Station 09 B-08. Station 09 B-08 is located on the Wando River, approximately three aerial miles south of the PSA. These stations are considered Shellfish Station which primarily monitors for *Fecal coliform* as the parameter to decide if an area is “approved” or “restricted” for shellfish harvesting. The nearest downstream ambient surface water monitoring station is Station MD-264, located along the I-526 bridge over the Wando River.

In accordance with Section 303(d) of the 1972 Federal Clean Water Act (CWA), SCDHEC evaluates water bodies identified as impaired for appropriate inclusion on the Section 303(d) list. The 303(d) list is a State list of waters that are not meeting water quality standards or have impaired uses. The 303(d) list targets water bodies that do not meet water quality standards set for the state for water quality management, as well as identifying the cause(s) of the impairment and the designated classifications.

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<sup>10</sup> <http://www.scdhec.gov/Agency/docs/water-regs/R.61-69.pdf>

<sup>11</sup> SCDHEC, *R.61-68, Water Classifications & Standards, Effective June 27, 2014.* <http://www.scdhec.gov/Agency/docs/water-regs/R.61-68.pdf>. Last accessed May 24, 2017



Once a waterbody is included on the 303(d) list of impaired waters, a Total Maximum Daily Load (TMDL) must be developed within two to thirteen (13) years of initial listing. A TMDL is the amount of a single pollutant (e.g., bacteria, nutrients, metals) that can enter a waterbody on a daily basis and still meet water quality standards set forth by the State.

According to SCDHEC's Watershed and Water Quality Information, provided by an online query in May 2017, the documented water monitoring stations and classifications are fully supported. In addition, a TMDL for dissolved oxygen has been established within the HUC 03050201 watershed, which includes the PSA. Please see Appendix C for a copy of the SCDHEC Watershed and Water Quality Information Report.

### **4.3.2 Impacts to Water Quality**

The Preferred Alternative does have the potential to impact water quality through both the quantity and quality of stormwater runoff. The proposed project would result in an estimated 27.6 acres of new impervious (paved) surface area with the widening of Clements Ferry Road. This would increase the amount of runoff due to the increase in impervious material, which would be captured and conveyed within the existing stormwater systems. The existing drainage systems include various open and closed (i.e., piped) drainage features that effectively convey stormwater offsite. This drainage system would be improved and designed to accommodate the volume of stormwater associated with the Preferred Alternative.

Potential impacts to stormwater quality resulting from vehicular traffic were considered. Water quality pollutants commonly associated with vehicular traffic include suspended solids, heavy metals, nutrients, and oil-and-grease. The proposed project is not expected to affect the existing traffic volumes or vehicle mix, and therefore would result in similar pollutant-loading as the existing condition.

The project would have the potential to temporarily impact water quality during construction through various land-disturbing activities. These activities would increase the potential for sediment loading in runoff by mechanized land clearing, removal of vegetation, and alteration of land contours. This potential shall be minimized through the use of erosion control BMPs which may include the use of silt fence, sediment basins, sediment tubes, or temporary and permanent cover.

### **4.3.3 Mitigation**

An estimated 27.6 acres of new impervious surface would be created with the widening of Clements Ferry Road. The project would incorporate applicable designs and techniques to minimize temporary and permanent construction impacts including various strategies



and techniques as outlined in the SCDOT Stormwater Quality Design Manual<sup>12</sup>. These techniques include various strategies to collect, treat, and convey stormwater prior to discharging to receiving waters. Stormwater control measures, both during construction and post-construction, are required for SCDOT projects with land disturbance and/or constructed in the vicinity of 303(d), TMDL, ORW, tidal, and other sensitive waters in accordance with the SCDOT's MS4 Permit. The contractor would be required to minimize potential stormwater impacts through implementation of construction best management practices, reflecting policies contained in 23 CFR 650B and SCDOT's Supplemental Specifications on Seed and Erosion Control Measures (latest edition).

The potential impacts (during and after construction) of the proposed project on water quality would also be evaluated through Section 401 and 402 of the Clean Water Act, which is administrated through applicable SCDHEC regulations. These regulations require prior approval for land disturbing activities (Section 402), and approval/certification for impacts to Waters of the State (Section 401) to ensure compliance with water quality standards and classified uses. The contractor will be required to minimize possible water quality impacts through implementation of BMPs, reflecting policies contained in 23 CFR 650B and the Department's Supplemental Specification on Erosion Control Measures (latest edition) and Supplemental Technical Specifications on Seeding (latest edition). Other measures including seeding, silt fences, sediment basins, etc. as appropriate will be implemented during construction to minimize impacts to water quality.

#### 4.4 Permits

As documented above, the proposed project would result in unavoidable impacts to 160 LF of potentially jurisdictional tributaries and 2.66 acres of wetlands. A Clean Water Act Section 404 permit is required for impacts to WOUS, including wetlands. Section 404 is administered by the USACE.

Impacts to jurisdictional waters would be permitted under a Department of Army Section 404 permit from the USACE. Based on preliminary design, it is anticipated that the proposed project would be permitted under SCDOT's General Permit. The required mitigation for this project will determined through consultation with the USACE and other resource agencies. In addition to the Section 404 permit, SCDHEC must grant, deny, or waive a Water Quality Certification (WQC), in accordance with Section 401 of the Clean Water Act. The proposed project is also expected to impact critical area wetlands which

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<sup>12</sup> SCDOT Stormwater Quality Design Manual, December 2014



would require authorization under the SCDHEC Office of Coastal Resource Management's (OCRM) Critical Area Permit Program.

Per Section 402 of the Clean Water Act, the project would also require authorization through the National Pollutant Elimination Discharge System (NPDES) Stormwater Program for a construction site exceeding 1.0 acre. In South Carolina, SCDHEC is responsible for administering this program, which is conducted through the Stormwater, Construction, and Agricultural Permitting Division. Since the project is located within the coastal area, additional review and approval would be required by SCDHEC-OCRM to ensure consistency with the SC Coastal Zone Consistency Management Plan.

## 4.5 Floodplains

Executive Order (EO) 11988, Floodplain Management, requires that efforts be made by federal agencies to avoid, to the extent possible, the long and short-term adverse impacts associated with the occupancy and modification of floodplains. When there is a practicable alternative, federal agencies are required to avoid direct or indirect support of floodplain development. The EO prohibits floodplain encroachments that are uneconomic, hazardous, or would result in incompatible development of the floodplain. It also prohibits any action that would cause a critical interruption of an emergency transportation facility, a substantial flood risk, or an adverse impact on the floodplain's natural resource values.

### 4.5.1 Existing Floodplains

The Federal Emergency Management Agency (FEMA) regulates floodplains that are prone to inundation at some frequency. In general, a flood that has a 1% chance of occurring in a given year is referred to as the "100-year flood". The floodplains that would be inundated by the 100-year flood are considered to be the 100-year floodplains. A "Zone AE" floodplain is considered the base 100-year floodplain where base flood elevations are provided from computer modeling. A "Zone A" is considered a floodplain that is expected to be inundated, but with no established BFEs. In addition, a "Zone X" is considered in areas that have a 0.2% annual chance of flooding (i.e., 500-year flood) or areas with a 1% with depths less than 1.0 feet. These areas are identified and depicted on Flood Insurance Rate Maps (FIRM) published by FEMA to illustrate the various flood hazards areas.

The PSA is situated in the following FIRMs: 45019C0320J, 45019C0340J, 45019C0717D, 45019C0736D and 45015C0737D. The floodplains along the PSA include both "Zone AE" and "Zone X" areas. The regulated "Zone AE" floodplain areas are generally associated with portions of the Martins Creek drainage, the Wando River and unnamed





critical/freshwater drainageways/tributaries to the Wando River. As such, the highest concentration of “Zone AE” areas are located within the northeastern portion of the project area and depicted on FIRM# 45015CO737D (Effective October 16, 2003). These areas are illustrated in Figure 9. There is an existing 100-foot bridge structure located along the “Zone AE” floodplains associated with the Martins Creek drainage to maintain adequate conveyance and minimize backwater along this area.

#### **4.5.2 Impacts to Floodplains**

The proposed project will result in approximately 2.0 acres of direct floodplain impact through the placement of fill material and construction of the proposed roadway improvements. A preliminary hydraulic study has been performed to SCDOT guidelines for Hydraulic Design Studies. The results indicate that the project will have no effect on the base floodplain elevation. The project is not expected to be a significant or longitudinal encroachment as defined under 23 CFR 650A. In addition, the project would be developed in accordance with EO 11988 (Floodplain Management and 23 CFR 650 subpart A), and roadway/bridge design would comply with all appropriate floodplain regulations and guidelines. Final hydraulic evaluations will be completed as part of the final design of the project. The design will be completed in accordance with SCDOT and FEMA regulations. The SCDOT “Bridge Replacement Scoping Trip Risk Assessment Form” and the “Location and Hydraulic Design of Encroachments of Floodplains Checklist” have been completed by a hydraulic engineer, and are included in Appendix D.

#### **4.5.3 Mitigation**

Due to the location of 100-year flood limits on both sides of the existing roadway, total avoidance of impacts to floodplains is not possible. Impacts to floodplains were considered throughout the preliminary design phase and were minimized in several ways. The proposed project would widen the existing bridge over the Martins Creek drainage and will maintain the current height and length of the existing structure. In addition, the improvements between the intersection with SC 41 and the Wando River will be constructed along the existing alignment, which will minimize impacts by utilizing as much of the existing roadway as possible. Final hydraulic analysis and documentation will be completed as part of the final design of the project to ensure no impacts to the existing floodplains. Coordination will be done with the Berkeley County Floodplain Administrator, and a set of final plans and a request for floodplain management compliance will be sent to the County as well.



Figure 9. Floodplains



**Legend**

- Project Boundary
- Construction Limits

**Flood Zone**

- A
- AE
- VE
- X

Prepared: 4.24.2017		<b>CLEMENTS FRERRY ROAD WIDENING PROJECT: JACK PRIMUS TO SC 41</b>  <b>BERKELEY COUNTY, SC</b>	<div style="text-align: center;">   </div>
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Figure 9:  
Floodplains



## 4.6 Wildlife

The proposed project was evaluated to determine any potential impacts to terrestrial and aquatic wildlife. These impacts are expected to be minimal as much of the PSA has been developed or is zoned for urban land uses and is dominated by the existing roadway and its associated zone of disturbance. However, with project area encompassing a corridor of approximately 300 feet wide around the existing alignment, which currently includes various land uses and natural habitat communities adjacent to the approximately four-mile long route. These habitat communities include forested freshwater wetlands/drainageways, critical area (emergent tidal salt marsh), pine stands and mixed pine hardwoods.

### 4.6.1 Existing Wildlife

The critical area wetlands situated within the project corridor are located within the northern portions of the project area and is associated with an unnamed tributary to the Wando River and adjacent to the Wando River in the extreme northeastern end of the corridor. The hydrology of these areas is directly influenced by the ebb and flood of the daily tidal cycle as well as runoff from higher elevation wetlands and adjacent uplands. These saltwater systems function as emergent wetlands and are characterized by saltwater tolerant emergent herbaceous species that typically have a salt water tolerant shrub fringe along the interface with adjacent uplands and forested freshwater wetlands. The dominant freshwater wetland features within the project area consist of mixed pine-hardwood and hardwood palustrine forested wetlands that are situated within drainageways or adjacent to one of the three identified tributary features located along the project corridor. These areas are of common distribution within the outer coastal plain and provide various habitat functions including providing habitat for numerous common fish, reptiles, mammals, birds, and macroinvertebrates.

The dominant terrestrial wildlife habitat along the PSA are pine stands of varying age and density adjacent to both sides of the existing alignment of Clements Ferry Road. This habitat type is dominated by stands of loblolly pine (*Pinus taeda*), longleaf pine (*Pinus palustris*) and mixed stands containing both species. The vegetative structure of the stands is highly variable ranging from relatively young stands of dense loblolly plantation pine to somewhat open longleaf and loblolly mixed stands. Understory density is also variable but is generally of a higher percent of coverage with the more managed stands being situated within the portion of the project area that contains the southern portion of Cainhoy Plantation. Understory within these pine-dominated communities generally consist of a mixed-pine hardwood understory and shrub community with varying amounts of herbaceous coverage. As referenced above, the portion of Cainhoy Plantation within the project area represents the only regularly managed pine stands



within the project area. The other dominant upland community within the project area are stands of mixed pine-hardwoods that are the result of post-harvest natural regeneration or maturing stands that were prior-thinned and left relatively unmanaged. Similar to the pine stands referenced above, these stands are of a widely varying age and structure within the project corridor. Dominant canopy species are water oak (*Quercus nigra*), live oak (*Quercus virginiana*), sweetgum (*Liquidambar styraciflua*) and red maple (*Acer rubrum*). The amount of coverage within the understory is largely dependent on the density of the canopy within the differing age classes of this habitat type. Generally, these types of forested communities have a more diverse understory species composition than the pine-dominated stands described above. These communities are frequented by various common mammals, bird, and reptile species.

#### 4.6.2 Impacts to Wildlife

The proposed project was evaluated to determine any potential impacts to terrestrial and aquatic wildlife. The proposed improvements would be largely constructed within and/or immediately adjacent to the existing transportation facilities. As such, the project is expected to require approximately 42.2 acres of new ROW that would directly adjoin the existing ROW. The areas of new ROW may maintain isolated areas of the forested habitat, but the majority of the area would be directly converted to transportation facilities or be subject to routine maintenance and access. However, the potential loss of terrestrial habitat would be along the edge of the existing roadways, which would not create further fragmentation of the undeveloped land.

The project would result in the direct loss of approximately 2.7 acres of WOUS and 160 LF of aquatic (stream) habitat through the construction of the proposed improvements. The area of impact to these features would occur immediately adjacent to the existing roadway and have been previously altered from their historic state; however, they provide suitable habitat for various aquatic species, including, but not limited to, aquatic macro-invertebrates, amphibians, reptiles, and fish. These impacts would be isolated along portions of the tributaries with additional suitable habitat provided upstream and/or downstream of the impacts. In addition, the overall roadway width would be increased, creating a wider barrier for wildlife and increasing the risk of wildlife-auto collisions.

#### 4.6.3 Mitigation

Potential impacts to terrestrial and aquatic wildlife would be minimized through the design, location, and construction techniques utilized for the project. The proposed improvements are generally located along the existing alignment, which minimizes the overall footprint and area of impacts. In addition, this would not result in additional fragmentation of habitat, which would isolate and limit wildlife mobility. The proposed design would avoid impacts to two tributary



systems, including one tidal creek, by completely bridging these features. This would maintain the existing hydrologic regime and habitat characteristics. Various BMPs would be utilized during construction to further minimize potential impacts. These may include, but be limited to erosion and sediment control, and stormwater management.

The federal Migratory Bird Treaty Act, 16 USC § 703-711, states that it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product, manufactured or not. SCDOT will comply with the Migratory Bird Treaty Act of 1918 in regard to the avoidance of taking of individual migratory birds and the destruction of their active nests.

The contractor shall notify the Resident Construction Engineer (RCE) at least four weeks prior to construction/demolition/maintenance of bridges and box culverts. The RCE will coordinate with SCDOT Environmental Services Office (ESO) Compliance Division, to determine if there are any active birds using the structure. After this coordination, it will be determined when construction/demolition/maintenance can begin. If a nest is observed that was not discovered after construction/demolition/maintenance has begun, the contractor will cease work and immediately notify the RCE, who will notify the ESO Compliance Division. The ESO Compliance Division will determine the next course of action.

The use of any deterrents by the contractor designed to prevent birds from nesting, shall be approved by the RCE with coordination from the ESO Compliance Division. The cost for any contractor provided deterrents will be provided at no additional cost to SCDOT.

#### **4.7 Threatened or Endangered Species**

The Federal Endangered Species Act (ESA) of 1973 describes two categories of declining species of plants and animals that need the Act's protections – endangered species and threatened species – and provides these definitions:

ENDANGERED - any species that is in danger of extinction throughout all or a significant portion of its range;

THREATENED - any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA) share responsibility for administration of the ESA. The amended Act provides for the



conservation of threatened and endangered species and the habitat upon which they depend. Section 7 of the Act requires federal agencies to consult with USFWS and NOAA to ensure that activities are not likely to jeopardize the continued existence of listed species or adversely impact their critical habitat.

#### 4.7.1 Existing Threatened or Endangered Species

Pursuant to Section 7 of the Endangered Species Act of 1973, a field survey of the proposed project area was conducted as detailed in the *Natural Resources Technical Memorandum* (Appendix B). Six documented federally endangered species and three threatened species are known to occur within Berkeley County. The threatened and endangered (T&E) species documented for Berkeley County were identified through on-line documentation from the USFWS and the South Carolina Department of Natural Resources (SCDNR) Heritage Trust Program. Note that the Bald Eagle has been de-listed but remains protected subject to the Bald & Golden Eagle Protection Act. The USFWS identified the potential for the following protected species or suitable habitat for these species in Berkeley County:

- Bald Eagle (*Haliaeetus leucocephalus*) - BGEPA
- Shortnose Sturgeon (*Acipenser brevirostrum*) - Endangered
- Atlantic Sturgeon (*Acipenser oxyrinchus*) - Endangered
- Flatwoods Salamander (*Ambystoma cingulatum*) - Threatened
- American Wood Stork (*Mycteria Americana*) - Threatened
- Red-cockaded woodpecker (*Picoides borealis*) – Endangered
- West Indian Manatee (*Trichechus manatus*) - Threatened
- Pondberry (*Lindera melissifolia*) - Endangered
- Canby's dropwort (*Oxypolis canbyi*) - Endangered
- American chaffseed (*Schwalbea Americana*) – Endangered
- Northern long-eared bat (*Myotis septentrionalis*) – Threatened

The SCDNR records were searched for documented occurrences of Federally listed species within the area of Berkeley County where the project area is located and specifically the Cainhoy and North Charleston, SC USGS Quadrangles. The SCDNR identified eight occurrences of the flatwoods salamander, one occurrence of the red-cockaded woodpecker, six occurrences of pondberry and three occurrences of American chaffseed within the Cainhoy, SC USGS Quadrangle. Three occurrences of the red-cockaded woodpecker and one occurrence of the shortnose sturgeon were identified within the North Charleston, SC USGS Quadrangle. Only two of the documented occurrences are located within close proximity to the project area. There are two documented flatwoods salamander occurrences located in relative proximity to the eastern



end of the project area. These two occurrences were documented in 1953 where six individuals were noted as captured and fourteen individuals were reported. One of the occurrences near Clements Ferry Road would now be located within the zone of disturbance of past improvements to the roadway and the second area where a documented occurrence is located currently consists of residential development. The other documented protected species occurrences are located north and west of the project site near the Cooper River.

The habitat assessment of the PSA did not reveal any suitable habitat for the documented protected species for Berkeley County. The habitat types present within the project area corridor and its immediate vicinity are generally of common distribution within the portion of Berkeley County where the project area is situated. The habitat assessment was conducted for listed species and their specific habitat requirements as described below. The only exception to this general finding within the PSA is the portion that is situated within and adjacent to the Cainhoy Plantation tract. Portions of this tract adjacent to the project area (predominantly north side of existing Clements Ferry Road) are regularly maintained and managed. Species surveying in coordination with the USFWS has been on-going on the tract. Results of surveying have indicated that no individuals of the red-cockaded woodpecker and flatwoods salamander are located within the tract in the vicinity of Clements Ferry Road and the PSA.

Though not a documented species known to occur in Berkeley County by the SCDNR, the critical area wetlands within and adjacent to the project area contain potentially suitable habitat for the Federally protected wood stork (*Mycteria americana*).

#### **4.7.2 Impacts to Threatened or Endangered Species**

The review of the project area did not reveal the preferred habitats required by the shortnose and Atlantic sturgeon, flatwoods salamander, West Indian manatee, pondberry, Canby's dropwort and American chaffseed. Based on the lack of suitable habitat and/or no observations of the listed species during field reconnaissance of the project area and coordination with representatives of Cainhoy Plantation, results of the protected species/habitat assessment indicate that the proposed project is not expected to have an effect on these threatened or endangered species or critical habitats currently documented for Berkeley County. Per prior coordination with the USFWS and the aforementioned coordination with representatives of Cainhoy Plantation, the project is not expected to negatively affect the red-cockaded woodpecker or wood stork.



### **Shortnose Sturgeon (*Acipenser brevirostrum*) and Atlantic Sturgeon (*Acipenser oxyrinchus*) – Endangered**

The shortnose sturgeon is a bony, anadromous fish growing to a length of up to four feet. Shortnose sturgeon exhibit five rows of plates along the body, with olive to black coloring along the back, and yellow to white coloring on the belly. Four barbels are located in front of the mouth and are used to locate food along the river bottom. The shortnose sturgeon migrates from salt water to freshwater to spawn from April to May. Spawning occurs every other year for males and every third year for females. The shortnose sturgeon's habitat consists of tidal river systems along the Atlantic coast of North America. This species typically occupies the channels and deeper holes within the river, while feeding in shallow areas at night.

The Atlantic sturgeon's habitat requirements and feeding habits are similar to that of the shortnose sturgeon. The most notable physical differences between the species is the darker coloration of the Atlantic sturgeon and its smaller mouth and more pointed snout when compared to the larger mouth and blunt snout of the shortnose sturgeon. The Atlantic sturgeon also prefers the major river drainages and their mainstems. Both species require fresh or slightly brackish water for spawning and migrate into saltwater (marine) habitat for maturing. As of September 18, 2017, NMFS critical habitat designations for Atlantic sturgeon include the nearby Cooper River and Santee River systems<sup>13</sup>.

Though the northeastern terminus of the project area is in close proximity to the SC Highway 41 Wando River crossing, the proposed project corridor does not include the Wando River itself, or any of its associated, larger tributaries capable of supporting the shortnose and Atlantic sturgeon. The unnamed tidal tributary (critical area) located within the project area boundaries is not of the order that would be considered as potentially suitable habitat for the shortnose and Atlantic sturgeon. The current bridge replacement and associated roadway improvements at the SC Highway 41 crossing are located beyond the limits of the proposed corridor for the widening of Clements Ferry Road. Accordingly, the proposed project is not expected to have an effect on these species.

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<sup>13</sup> NOAA Fisheries Critical Habitat. <http://www.nmfs.noaa.gov/pr/species/criticalhabitat.htm>. Accessed January 2018.



**Flatwoods Salamander (*Ambystoma cingulatum*) – Threatened**

The flatwoods salamander is a small amphibian growing to a length of up to five inches. This species is black in color with a cross-pattern of irregular, gray lines on the back. The belly of the flatwoods salamander is gray to black with whitish to gray spots.

This species prefers fire-maintained, seasonally wet, relatively open pine savannas and pine flatwoods located within the southeastern portion of the United States. These areas consist predominantly of long leaf pine or slash pine with a low percentage of canopy closure and understory coverage. Additionally, this species may be found in the vicinity of cypress ponds. Shallow water wetland habitat is required for laying eggs.

The majority of the proposed project area corridor does not contain potentially suitable habitat for the flatwoods salamander. The majority of undeveloped areas adjacent to the project area do not contain forested wetlands and adjacent forested uplands with the vegetative structure preferred by this species. These areas do not contain the seasonally wet, open longleaf pine and/or slash pine savannas with adjacent open cypress ponds preferred by this species. Cainhoy Plantation, in coordination with the USFWS, has completed five years of monitoring and sampling for the flatwoods salamander and no individuals of this species have been identified. The results of the monitoring and sampling have revealed that the southern portion of Cainhoy Plantation that is adjacent to the proposed project corridor for the widening of Clements Ferry Road is not considered suitable habitat for the flatwoods salamander. Accordingly, the proposed project is not expected to have an effect on this species.

**American Wood Stork (*Mycteria Americana*) – Threatened**

The wood stork is a large wading bird that is approximately 50 inches tall and has a wingspan of approximately five feet. The plumage of the wood stork is primarily white, with black primary and secondary wing feathers and a short black tail. The head and neck are dark gray and primarily unfeathered. The wood stork displays a prominent black bill that is slightly decurved and thick at the base. The wood stork feeds primarily on small fish, including minnows and shellfish.

The wood stork requires shallow wetland areas with a depth of six to 10 inches. The bird's primary habitat is brackish and freshwater wetland areas with associated shallow water zones. The wood stork favors depressional areas within larger wetland systems that are subject to falling water levels due to the resultant concentration of fish species. Wood storks are highly colonial and prefer forested wetland areas (swamps) or islands surrounded by open water for nesting.



Though not a documented species known to occur in Berkeley County by the SCDNR, the critical areas within and adjacent to the project area contain potentially suitable habitat for the Federally protected wood stork. The nesting habitat preferred by this species is not located within the project area corridor. Any disturbance to the wood stork would be limited to the timeframe for construction over on-site critical areas and would be short term and minor in nature only. The proposed project may affect a limited amount of this potentially suitable foraging habitat (critical area) but is not likely to adversely affect the wood stork.

### **Red-cockaded woodpecker (*Picoides borealis*) – Endangered**

The red-cockaded woodpecker is found in the southeastern United States from Florida to Virginia and west to southeast Oklahoma and eastern Texas. It is about the size of the common cardinal, about 8.7 inches long and with a wingspan of about 13.8 inches. Its feathers are black and white with white bars on the back. Its underside is white to gray with notable black spots along the sides of the breast. Males have red spots on each side of the nape, but they are rarely exposed. Females are larger than males and lack the red spots. The most distinguishing feature of this species is its black cap which is called a "cockade."

The red-cockaded woodpecker prefers mature, open pine stands for its nesting habitat. Loblolly and longleaf pines that are 60-plus years old are generally selected for nesting sites. However, other species of southern pines are sometimes used for nesting. As referenced above, the preferred nesting sites for this species generally include relatively open, mature pine stands with an undeveloped or low understory layer. Management of understory growth, such as prescribed fire or use of silvicultural herbicides contributes to the habitat structure preferred by this species. Foraging habitat is frequently limited to pine or pine-hardwood stands that are 30 years or older, with a preference for pine trees with a diameter of 10 inches or larger. Generally, the maximum foraging range for the red-cockaded woodpecker is approximately one-half mile.

The project area corridor does not contain suitable nesting habitat for the red-cockaded woodpecker. Mixed longleaf and loblolly pine stands are present within the review area. However, the existing understory conditions are not preferred by this species due to lack of management and the resultant developed vegetation layer. Habitat conditions are also lacking due to increased development along the project corridor. Portions of Cainhoy Plantation which is adjacent to the central portion of the project corridor may contain limited areas of potentially suitable habitat for the red-cockaded woodpecker. Cainhoy Plantation has recently undergone a detailed red-cockaded woodpecker survey and no individuals of this species have been identified within the southern portion of the tract that is adjacent to the proposed project corridor for the widening of Clements Ferry Road. Habitat conditions within this portion of



Cainhoy Plantation are not of the structure preferred by this species. Accordingly, the proposed project is not expected to have an effect on nesting habitat for this species. Similar to the conditions for the Clements Ferry Road Phase I project corridor, the portions of Cainhoy Plantation adjacent to the project area corridor may be considered potentially suitable foraging habitat for the red-cockaded woodpecker. The proposed project may affect a limited amount of this potentially suitable habitat, but is not likely to adversely affect the red-cockaded woodpecker.

**West Indian Manatee (*Trichechus manatus*) – Threatened**

Though not a documented species for Berkeley County by the SCDNR, the downstream critical areas in the vicinity of the project area near the confluence with the Wando River may contain potentially suitable habitat for the Federally protected West Indian Manatee. However, the limits of the project area do not contain the specific habitat requirements preferred by this species. The critical area within the project area does not contain the access to adjacent deeper channels preferred by the manatee. The critical area within the project area is subjected to daily dry-down due to the tidal cycle and is not situated in close proximity to the confluence with the Wando River. Accordingly, the proposed project is not expected to have an effect on this species.

**Pondberry (*Lindera melissifolia*) – Endangered**

Pondberry is a deciduous shrub found within wetland areas of the southeastern coastal plain and wetland areas associated with the southern portion of the Mississippi River. The shrub grows to a maximum height of approximately six feet and forms dense thickets. The leaves of pondberry are thin and drooping and taper to a point at the tip. Leaves are ovate to elliptic in shape and have an odor resembling sassafras when crushed. Pondberry produces multiple yellow flowers from February to March and red fruit from August to October. Pondberry prefers seasonally wet areas within bottomland hardwoods, and shallow depressions (ponds) located within the sandhills and coastal plain regions.

The wetland drainageways located within the project area corridor are not the seasonally wet, pond or depression habitats preferred by this species. The drainageways within the project area are associated with adjacent flatwoods or contain a tributary component without adjacent bottomland hardwoods and their associated seasonally wet areas. The pineland ponds and depressions preferred by this species along with depressions located within bottomland hardwood communities are not present within the project area. Accordingly, the proposed project is not expected to have an effect on this species.

**Canby's dropwort (*Oxypolis canbyi*) – Endangered**

Canby's dropwort belongs to the mint family (*Apiaceae*). It is a perennial herb which grows from 80 to 120 cm (30 to 50 in) tall. The "quill-like" hollow leaves and the thick, corky wings that extend out from the margins of the fruit are the most distinctive features of the plant. The stems are erect or ascending, round, and slender with arching/ascending or forking branches above the mid-stem. The flowers are monoecious or dioecious (flowers have either male or female parts or both) and small and white, sometimes tinged with red or pink. The flowers are borne on compound umbrella-like structures that extend from the base of the leaves, and the fruit is a schizocarp (fruit splits into one-seeded segments) about 4-6 mm long.

The primary habitats of Canby's dropwort are pineland ponds and savannas, wet meadows, and around the edges of open cypress ponds. This species prefers open habitat with little to no canopy closure of tree species. The habitat types preferred by Canby's dropwort generally consist of hydric soils with a seasonal high-water table. The wetland habitat types preferred by Canby's dropwort are not present within the project area corridor. The wetland areas within the project area consist of wetland drainageways and depressions within flatwoods that have a well-developed canopy and understory. The open habitat characteristics preferred by this species are not present due to lack of understory management, vegetative structure and encroaching development within the southwestern and northeastern portions of the project area. Accordingly, the proposed project is not expected to have an effect on this species.

**American chaffseed (*Schwalbea Americana*) – Endangered**

The American Chaffseed is a perennial herb with large purplish-yellow, tubular flowers. The leaves are alternate, lance-shaped to elliptic, and attach directly to the stalk without a leaf stem. Leaves are 2 to 5 centimeters (1 to 2 inches) long, and herb can be 30-60 centimeters (one to two feet) tall. The entire plant is densely hairy throughout, including the flowers. Flowering occurs from April to June in the South.

American chaffseed prefers fire-maintained areas such as wet savannas and open, moist pine flatwoods. American chaffseed is found in moist to dry, sandy soils of the coastal plain. This species is also documented to occur within open, grass and sedge systems. American chaffseed depends on a fluctuating water table and frequent fire to maintain the open habitat it requires.

Similar to Canby's dropwort described above, the open habitat characteristics preferred by American chaffseed are not present within the project area. The lack of understory management and encroaching development within the southwestern and northeastern portions of the project area have eliminated the potential for the presence of suitable habitat for this species. The only



open, wet grass and sedge system within the project area is situated within critical area adjacent to an unnamed tributary to the Wando River within the eastern portion of the project area. Accordingly, the proposed project is not expected to have an effect on this species.

### **Northern long-eared bat (*Myotis septentrionalis*) – Threatened**

The northern long-eared bat is a medium-sized bat about 3 to 3.7 inches in length but with a wingspan of 9 to 10 inches. As its name suggests, this bat is distinguished by its long ears, particularly as compared to other bats in its genus, *Myotis*, which are actually bats noted for their small ears (*Myotis* means mouse-eared). The northern long-eared bat is found across much of the eastern and north central United States and all Canadian provinces from the Atlantic coast west to the southern Northwest Territories and eastern British Columbia. The species range includes 37 states. White-nose syndrome, a fungal disease known to affect bats, is currently the predominant threat to this bat, especially throughout the Northeast where the species has declined by up to 99 percent from pre-white-nose syndrome levels at many hibernation sites<sup>14</sup>.

The northern long-eared bat prefers cave and mine cavities for hibernation and is known to predominantly roost in hardwood-dominated forest stands in the summer months. This species will shift roosting sites to various trees during the summer season.

The project area is situated along the existing alignment of Clements Ferry Road and its existing zone of disturbance. The forested areas within and adjacent to the project area are dominated by varying age pine stands and mixed pine-hardwood communities. There is a limited amount of mixed hardwood dominated communities immediately adjacent to several identified wetland/waters of the U.S. features identified within the project area. These areas are limited in area due to the nature of the relatively narrow drainageway features. No mine cavities or caves were identified within the project area boundaries during the on-site reconnaissance of the project area during the wetland/waters of the United States field delineation and habitat assessment. SCDNR records were searched for documented occurrences of this species within the area of Berkeley County where the project area is located and specifically the Cainhoy and North Charleston, SC USGS Quadrangles. The SCDNR identified no occurrences of the northern long-eared bat within the project area boundaries. Due to lack of hibernation habitat and the limited amount of hardwood-dominated forested communities, the proposed project is not expected to have an effect on this species.

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<sup>14</sup> U.S. Fish & Wildlife Service. <https://ecos.fws.gov/ecp0/profile/speciesProfile?sPCODE=AOJE>. Accessed March, 2018.



The project would not affect the shortnose sturgeon, Atlantic sturgeon, flatwoods salamander, West Indian manatee, pondberry, Canby's dropwort, or American chaffseed; and may affect, but not adversely affect, the red-cockaded woodpecker or American wood stork. The USFWS concurred on this finding via letter July 19, 2017 and reaffirmed its concurrence via email on February 8, 2018 (Appendix B).

Consultation for the NLEB was conducted per the 4(d) Rule Streamlined Consultation Form. The FHWA determined that the project may affect the NLEB, but that any resulting incidental take of the NLEB is not prohibited by the final 4(d) rule. The USFWS received this form and had no objection (Appendix B). Thus, FHWA presumes that its determination is informed by the best available information and that its project responsibilities under Section 7(a)(2) with respect to the NLEB are fulfilled through the USFWS January 5, 2016, Programmatic Biological Opinion.

### 4.7.3 Mitigation

Due to the linear nature of the project, the need to widen Clements Ferry Road over two existing bridges, and the presence of wetlands on both sides of the roadway, total avoidance of estuarine resources was not feasible. Minimization efforts include using existing bridge approaches for new bridge location as much as possible, utilizing the existing alignment of the roadway as much as possible for widening footprint, and maintaining/improving existing hydrologic connections under the roadway<sup>15</sup>.

## 4.8 Essential Fish Habitat

In conformance with the Magnuson-Stevens Fishery Conservation and Management Act of 1976 (as amended 1996) an assessment would need to be conducted to describe potential adverse effects on essential fish habitat (EFH). EFH is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 USC 1802, 50 CFR 600.10). The National Oceanic and Atmospheric Administration (NOAA) - National Marine Fisheries Service works closely with the South Atlantic Fishery Management Council (SAFMC) to minimize adverse impacts to EFH in the southeast. Adverse effects are those that reduce the quality and/or quantity of EFH, including direct, indirect, site specific, or habitat wide impacts, including individual, cumulative or synergistic consequences of actions.

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<sup>15</sup> Bay Environmental, *Natural Resources Technical Memorandum: Clements Ferry Road Widening: Jack Primus Road to SC 41, Berkeley County, SC*. 2017.



#### 4.8.1 Impacts to Essential Fish Habitat

A total of approximately 0.58 acres of estuarine marsh and tidal creek would be impacted through the addition of fill material and the widening of an existing bridge. The FHWA “Essential Fish Habitat Screening Form” was completed to document and evaluate the impacts to EFH. This form was submitted to National Marine Fisheries Service (NMFS) for consultation regarding these findings. Specifically, the project would result in impact approximately 0.52s acres of emergent wetlands, 0.04 acres of tidal creek, and 0.02 acres of tidal palustrine wetlands through the placement of fill and shading impacts by the proposed bridge structure. The EFH submittal and NMFS correspondence are included in Appendix E.

#### 4.8.2 Mitigation

Due to the linear nature of the project, the need to widen Clements Ferry Road over two existing bridges, and the presence of wetlands on both sides of the roadway, total avoidance of estuarine resources was not feasible. Minimization efforts include using existing bridge approaches for new bridge location, utilizing the existing alignment of the roadway for widening, and maintaining/improving existing hydrologic connections under the roadway as much as possible. The initial consultation with NMFS also documented the following proposed EFH Conservation Recommendations:

- Replacement of the 48-inch reinforced concrete pipes with a small bridge or large culvert that allows for unimpeded flows;
- Adjust mitigation calculations to reflect all EFH in the project area is fully functional.

The County proposes to replace the existing 48-inch pipe with two 48-inch pipes to improve capacity and conveyance of the tributary. The pipes were identified as the preferred design due to the physical location/dimensions of the existing stream, constructability, and costs. The existing conditions of the wetlands and EFH were determined based upon USACE compensatory mitigation guidelines of 2010. Upon further coordination with NMFS, the existing conditions of these areas were determined to be ‘fully functional’ as documented in the final FHWA EFH Form. Final correspondence from NMFS documents that both of the initial conservation recommendations have been adequately incorporated and/or addressed.

The impacts to the critical area wetlands, including EFH, will be appropriately mitigated through the Section 401/404 Permitting Process.



## 4.9 Wild and Scenic Rivers

The National Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271-1287) protects rivers that are listed as significant resources for their wild, scenic, or recreational values, along with those that are under consideration for inclusion on the list. In addition, under a 1979 Presidential Directive, federal agencies are required “to take care to avoid or mitigate adverse effects on rivers identified in the Nationwide Inventory.” There are no federally protected wild, scenic, or recreational rivers, nor are there any rivers listed on the Nationwide River Inventory in the study area. There are no state-designated scenic rivers in the study area; therefore, these resources were not further considered in the EA.

## 4.10 Farmlands

The Farmland Protection Policy Act of 1981 (FPPA) was enacted by Congress to minimize the unnecessary and irreversible conversion of farmland soils to nonagricultural uses, and to assure, to the extent practicable, that federal, state, and local policies are used to protect farmland soils. Farmland soils can be prime farmland soils, unique farmland soils, or farmland soils of statewide or local importance. Prime farmland soils are defined as soils that consistently produce the greatest yields with minimal inputs of energy and economic resources, and farming these soils involves the least environmental impact.

A review of 2010 Census Urban Area Map for Charleston, SC, the PSA is located in either a classified urban area or incorporated area<sup>16</sup>. In addition, the majority of the undeveloped areas along the PSA are zoned/planned for future development. Per the FPPA, the project area is not subject to FPPA review if the impacted land is already in urban development. That said, the project is considered in compliance with the FPPA.

## 4.11 Air Quality

The National Ambient Air Quality Standards (NAAQS) were established by USEPA under the Clean Air Act (CAA), as amended, to protect public health, the environment, and the quality of life from the detrimental effects of air pollution. The NAAQS have been set for the following criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), particulate matter (PM), and sulfur dioxide (SO<sub>2</sub>). The NAAQS primary standards to protect human health and secondary standards to protect human welfare are listed in Table 16. Mobile sources from on-road vehicles contribute to four of the six criteria pollutants: CO, NO<sub>2</sub>, O<sub>3</sub>, and PM.

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<sup>16</sup> 2010 US Census, Urban Area References Maps. Charleston-North Charleston, SC. <https://www.census.gov/geo/maps-data/maps/2010ua.html>. Last accessed June 7, 2017.



**Table 16. National Ambient Air Quality Standards Pollutants**

Pollutant	Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)	Primary	8 hours	9 ppm	Not to be exceeded more than once per year.
		1 hour	35 ppm	
Lead (Pb)	Primary and Secondary	Rolling 3-Month Average	0.15 µg/m <sup>3</sup>	Not to be exceeded.
Nitrogen Dioxide (NO <sub>2</sub> )	Primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years.
	Primary and Secondary	1 year	53 ppb	Annual Mean
Ozone (O <sub>3</sub> )	Primary and Secondary	8 hours	0.070 ppm	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years.
Particle Pollution (PM) <sub>2.5</sub>	Primary	1 year	12.0 µg/m <sup>3</sup>	Annual mean, averaged over 3 years.
	Secondary	1 year	15.0 µg/m <sup>3</sup>	
	Primary and Secondary	24 hours	35 µg/m <sup>3</sup>	98th percentile, averaged over 3 years.
Particle Pollution (PM) <sub>10</sub>	Primary and Secondary	24 hours	150 µg/m <sup>3</sup>	Not to be exceeded more than once per year on average over 3 years.
Sulfur Dioxide (SO <sub>2</sub> )	Primary	1 hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years.
	Secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year.

Source: <https://www.epa.gov/criteria-air-pollutants/naaqs-table>, May 2017.

### 4.11.1 Existing Air Quality

#### 4.11.1.1 National Ambient Air Quality Standards

In accordance with the CAA, all portions of South Carolina are designated as in attainment, non-attainment, or unclassifiable for meeting NAAQS standards. An area with air quality that is better than NAAQS standards is considered to be in attainment, while an area with air quality that is worse than NAAQS standards is considered to be in non-attainment. If there is a lack of information for determining an attainment status, the area is designated as unclassifiable. Each state determines which areas within its boundaries are designated to be in attainment or non-attainment and must develop a State Implementation Plan to ensure that areas achieve and/or maintain attainment status for NAAQS standards. A review of current air quality data determined



that the EPA has designated Berkeley County ‘in attainment’ for the criteria pollutants, and in compliance with the NAAQS. In addition to the criteria air pollutants for which there NAAQS, EPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (i.e., airplanes), area sources (i.e., dry cleaners) and stationary sources (i.e., factories or refineries).

#### **4.11.1.2 Mobile Source Air Toxics**

Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA) of 1990, whereby Congress mandated that the U.S. Environmental Protection Agency (EPA) regulate 188 air toxics, also known as hazardous air pollutants. The EPA assessed this expansive list in its rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007), and identified a group of 93 compounds emitted from mobile sources that are part of EPA’s Integrated Risk Information System (IRIS). In addition, EPA identified nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers or contributors and non-cancer hazard contributors from the 2011 National Air Toxics Assessment (NATA). These are 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter (diesel PM), ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. While FHWA considers these the priority mobile source air toxics, the list is subject to change and may be adjusted in consideration of future EPA rules<sup>17</sup>.

#### **Motor Vehicle Emissions Simulator (MOVES)**

According to EPA, Motor Vehicle Emissions Simulator (MOVES2014) is a major revision to MOVES2010 and improves upon it in many respects. MOVES2014 includes new data, new emissions standards, and new functional improvements and features. It incorporates substantial new data for emissions, fleet, and activity developed since the release of MOVES2010. These new emissions data are for light- and heavy-duty vehicles, exhaust and evaporative emissions, and fuel effects. MOVES2014 also adds updated vehicle sales, population, age distribution, and vehicle miles travelled (VMT) data. MOVES2014 incorporates the effects of three new Federal emissions standard rules not included in MOVES2010. These new standards are all expected to impact MSAT emissions and include Tier 3 emissions and fuel standards starting in 2017 (79 FR 60344), heavy-duty greenhouse gas regulations that phase in during model years 2014-2018 (79 FR 60344), and the second phase of light duty greenhouse gas regulations that phase in during model years 2017-2025 (79 FR 60344). Since the release of MOVES2014, EPA has released

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<sup>17</sup> Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents: [https://www.fhwa.dot.gov/environment/air\\_quality/air\\_toxics/policy\\_and\\_guidance/msat/](https://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/msat/). Accessed June 2017



MOVES2014a. In the November 2015 [MOVES2014a Questions and Answers Guide](#),<sup>5</sup> EPA states that for on-road emissions, MOVES2014a adds new options requested by users for the input of local VMT, includes minor updates to the default fuel tables, and corrects an error in MOVES2014 brake wear emissions. The change in brake wear emissions results in small decreases in PM emissions, while emissions for other criteria pollutants remain essentially the same as MOVES2014. Using EPA's MOVES2014a model, as shown in Figure 10, FHWA estimates that even if VMT increases by 45 percent from 2010 to 2050 as forecast, a combined reduction of 91 percent in the total annual emissions for the priority MSAT is projected for the same time period.

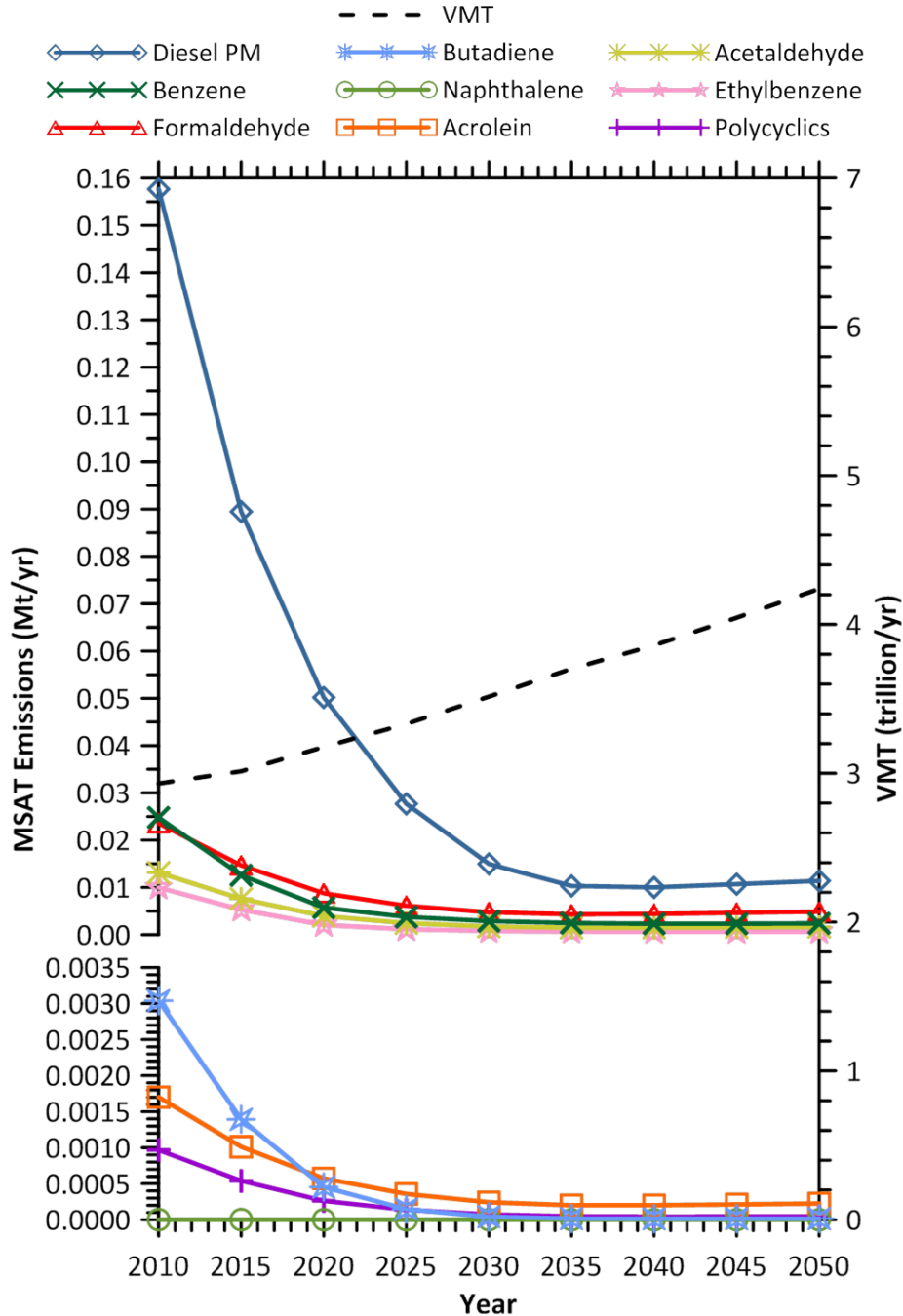
Diesel PM is the dominant component of MSAT emissions, making up 50 to 70 percent of all priority MSAT pollutants by mass, depending on year. Users of MOVES2014a will notice some differences in emissions compared with MOVES2010b. MOVES2014a is based on updated data on some emissions and pollutant processes compared to MOVES2010b, and also reflects the latest Federal emissions standards in place at the time of its release. In addition, MOVES2014a emissions forecasts are based on lower VMT projections than MOVES2010b, consistent with recent trends suggesting reduced nationwide VMT growth compared to historical trends.

### **MSAT Research**

Air toxics analysis is a continuing area of research. While much work has been done to assess the overall health risk of air toxics, many questions remain unanswered. In particular, the tools and techniques for assessing project-specific health outcomes as a result of lifetime MSAT exposure remain limited. These limitations impede the ability to evaluate how potential public health risks posed by MSAT exposure should be factored into project-level decision-making within the context of NEPA.

Nonetheless, air toxics concerns continue to arise on highway projects during the NEPA process. Even as the science emerges, the public and other agencies expect FHWA to address MSAT impacts in its environmental documents. The FHWA, EPA, the Health Effects Institute, and others have funded and conducted research studies to try to more clearly define potential risks from MSAT emissions associated with highway projects. The FHWA will continue to monitor the developing research in this field.

**Figure 10. FHWA Projected National MSAT Emission Trends 2010 – 2050 for Vehicles Operating on Roadways Using EPA’s Moves2014a Model**



Note: Trends for specific locations may be different, depending on locally derived information representing vehicle-miles travelled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors.

Source: EPA MOVES2014a model runs conducted by FHWA, September 2016.



## NEPA Context

The NEPA requires, to the fullest extent possible, that the policies, regulations, and laws of the Federal Government be interpreted and administered in accordance with its environmental protection goals, and that Federal agencies use an interdisciplinary approach in planning and decision-making for any action that adversely impacts the environment (42 U.S.C. 4332). In addition to evaluating the potential environmental effects, FHWA must also take into account the need for safe and efficient transportation in reaching a decision that is in the best overall public interest (23 U.S.C. 109(h)). The FHWA policies and procedures for implementing NEPA are contained in regulation at 23 CFR Part 771. Based on project being a widening of a roadway and not adding substantial capacity, it falls within the category of projects with low potential MSAT effects, and thus, a quantitative analysis was completed for this project.

### 4.11.2 Impacts to Air Quality

#### 4.11.2.1 Impacts to National Ambient Air Quality Standards

Temporary air quality impacts could occur during construction and would be in the form of emissions from construction equipment, dust from construction embankment, and clearing of areas prior to paving or revegetation. During construction, slowed traffic through construction areas may produce additional emissions. Emissions from construction equipment are anticipated to have a minimal impact on air quality due to the amount of time it would take to construct the proposed roadway improvements.

#### 4.11.2.2 Impacts to Mobile Source Air Toxics

A qualitative analysis provides a basis for identifying and comparing potential differences among MSAT emissions, if any, from the various alternatives. The qualitative assessment presented below is derived in part from a study conducted by FHWA entitled *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives*.<sup>18</sup>

### Incomplete or Unavailable Information for Project-Specific MSAT Health Impacts Analysis

In FHWA's view, information is incomplete or unavailable to credibly predict the project-specific health impacts due to changes in mobile source air toxic (MSAT) emissions associated with a proposed set of highway alternatives. The outcome of such an assessment, adverse or not, would be influenced more by the uncertainty introduced into the process through assumption and

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<sup>18</sup>[www.fhwa.dot.gov/environment/air\\_quality/air\\_toxics/research\\_and\\_analysis/mobile\\_source\\_air\\_toxics/msate\\_missions.cfm](http://www.fhwa.dot.gov/environment/air_quality/air_toxics/research_and_analysis/mobile_source_air_toxics/msate_missions.cfm).



speculation rather than any genuine insight into the actual health impacts directly attributable to MSAT exposure associated with a proposed action.

The EPA is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. They are the lead authority for administering the Clean Air Act and its amendments and have specific statutory obligations with respect to hazardous air pollutants and MSAT. The EPA is in the continual process of assessing human health effects, exposures, and risks posed by air pollutants. They maintain the Integrated Risk Information System (IRIS), which is “a compilation of electronic reports on specific substances found in the environment and their potential to cause human health effects” (EPA, <https://www.epa.gov/iris>). Each report contains assessments of non-cancerous and cancerous effects for individual compounds and quantitative estimates of risk levels from lifetime oral and inhalation exposures with uncertainty spanning perhaps an order of magnitude.

Other organizations are also active in the research and analyses of the human health effects of MSAT, including the Health Effects Institute (HEI). A number of HEI studies are summarized in Appendix D of FHWA’s Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents. Among the adverse health effects linked to MSAT compounds at high exposures are: cancer in humans in occupational settings; cancer in animals; and irritation to the respiratory tract, including the exacerbation of asthma. Less obvious is the adverse human health effects of MSAT compounds at current environmental concentrations (HEI Special Report 16, <https://www.healtheffects.org/publication/mobile-source-air-toxics-critical-review-literature-exposure-and-health-effects>) or in the future as vehicle emissions substantially decrease.

The methodologies for forecasting health impacts include emissions modeling; dispersion modeling; exposure modeling; and then final determination of health impacts – each step in the process building on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevents a more complete differentiation of the MSAT health impacts among a set of project alternatives. These difficulties are magnified for lifetime (i.e., 70 year) assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over that time frame, since such information is unavailable.

It is particularly difficult to reliably forecast 70-year lifetime MSAT concentrations and exposure near roadways; to determine the portion of time that people are actually exposed at a specific



location; and to establish the extent attributable to a proposed action, especially given that some of the information needed is unavailable.

There are considerable uncertainties associated with the existing estimates of toxicity of the various MSAT, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population, a concern expressed by HEI (Special Report 16, <https://www.healtheffects.org/publication/mobile-source-air-toxics-critical-review-literature-exposure-and-health-effects>). As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in particular for diesel PM. The EPA states that with respect to diesel engine exhaust, “[t]he absence of adequate data to develop a sufficiently confident dose-response relationship from the epidemiologic studies has prevented the estimation of inhalation carcinogenic risk (EPA IRIS database, Diesel Engine Exhaust, Section II.C. [https://cfpub.epa.gov/ncea/iris/iris\\_documents/documents/subst/0642.htm#quainhal](https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0642.htm#quainhal)).”

There is also the lack of a national consensus on an acceptable level of risk. The current context is the process used by the EPA as provided by the Clean Air Act to determine whether more stringent controls are required in order to provide an ample margin of safety to protect public health or to prevent an adverse environmental effect for industrial sources subject to the maximum achievable control technology standards, such as benzene emissions from refineries. The decision framework is a two-step process. The first step requires EPA to determine an “acceptable” level of risk due to emissions from a source, which is generally no greater than approximately 100 in a million. Additional factors are considered in the second step, the goal of which is to maximize the number of people with risks less than 1 in a million due to emissions from a source. The results of this statutory two-step process do not guarantee that cancer risks from exposure to air toxics are less than 1 in a million; in some cases, the residual risk determination could result in maximum individual cancer risks that are as high as approximately 100 in a million. In a June 2008 decision, the U.S. Court of Appeals for the District of Columbia Circuit upheld EPA’s approach to addressing risk in its two-step decision framework. Information is incomplete or unavailable to establish that even the largest of highway projects would result in levels of risk greater than deemed acceptable ([https://www.cadc.uscourts.gov/internet/opinions.nsf/284E23FFE079CD59852578000050C9DA/\\$file/07-1053-1120274.pdf](https://www.cadc.uscourts.gov/internet/opinions.nsf/284E23FFE079CD59852578000050C9DA/$file/07-1053-1120274.pdf)).

Because of the limitations in the methodologies for forecasting health impacts described, any predicted difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such



assessments would not be useful to decisionmakers, who would need to weigh this information against project benefits, such as reducing traffic congestion, accident rates, and fatalities plus improved access for emergency response, that are better suited for quantitative analysis.

For each alternative in this EA, the amount of MSATs emitted would be proportional to the vehicle miles traveled, or VMT, assuming that other variables such as fleet mix are the same for each alternative. Because the estimated VMT under the Build Alternative (with and without Cainhoy Development) is the same, it is expected there would be no appreciable difference in overall MSAT emissions (Table 17). Also, regardless of the alternative chosen, emissions will likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce annual MSAT emissions by over 90% between 2010 and 2050<sup>19</sup>. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in nearly all cases.

The additional travel lanes will have the effect of moving some traffic closer to nearby homes, schools, and businesses; therefore, under each alternative there may be localized areas where ambient concentrations of MSAT could be higher under certain Build Alternatives than the No-Build Alternative. The localized increases in MSAT concentrations would likely be most pronounced along the expanded roadway sections that would be built between Jack Primus and SC 41. However, the magnitude and the duration of these potential increases compared to the No-Build alternative cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific MSAT health impacts. In sum, when a highway is widened, the localized level of MSAT emissions for the Build Alternative could be higher relative to the No-Build Alternative, but this could be offset due to increases in speeds and reductions in congestion (which are associated with lower MSAT emissions). Also, MSAT will be lower in other locations when traffic shifts away from them. However, on a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than today.

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<sup>19</sup> *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents*, Federal Highway Administration, October 12, 2016





**Table 17. Existing and Projected Traffic Volumes**

Clements Ferry Road Segment	No-Build without Cainhoy Development		Preferred Alternative (Build) without Cainhoy Development		No-Build with Cainhoy Development		Preferred Alternative (Build) with Cainhoy Development	
	2040 ADT	2040 VMT	2040 ADT	2040 VMT	2040 ADT	2040 VMT	2040 ADT	2040 VMT
Jack Primus Road to Cainhoy Road (3.5 miles)	22,640	79,240	22,640	79,240	58,273	203,955.5	58,273	203,955.5
Cainhoy Road to Reflectance Road (.4 miles)	21,650	8,660	21,650	8,660	57,283	22,913.2	57,283	22,913.2
Reflectance Road to SC 41 (.6 miles)	16,080	9,648	16,080	9,648	51,713	31,027.8	51,713	31,027.8

**4.11.3 Mitigation**

Emissions from construction equipment will be short-term and temporary. Construction equipment would be maintained in satisfactory condition to meet minimum exhaust emission standards. The proposed project is not expected to require any additional transportation control strategies to maintain the County's current attainment status, and the project is anticipated to be consistent with the State Air Quality Implementation Plan. The proposed project will be continually evaluated throughout project development to ensure compliance with the most current air quality regulations and attainment status.

**4.12 Noise**

A noise impact assessment (Appendix G) has been prepared in compliance with Title 23 of the Code of Federal Regulations, Part 772 (23 CFR Part 772), and will be provided by SCDOT to local officials in an attempt to prevent future impacts from traffic noise. The current SCDOT Traffic Noise Abatement Policy, dated September 2014, was followed to analyze the potential noise impacts and mitigation as necessary.

The FHWA Traffic Noise Model (TNM 2.5) was used to derive existing and future noise levels. Traffic data was obtained from actual SCDOT vehicle counts and the traffic study entitled



“Clements Ferry Road from Jack Primus Road to SC 41 Widening Study,” prepared by Haselden and Associates in September 2017. Applicable model features, such as shared-use paths and sidewalks were added to the analysis to provide accurate sound level results.

Traffic data included the estimated Average Annual Daily Traffic (AADT) for the existing year (2015) and the design year (2040) and SCDOT’s 2015 peak hour traffic counts that included fleet mix percentages. Design Hour Volume (DHV) percentages were derived from SCDOT’s 2015 peak hour traffic counts and applied to the 2040 volumes (Appendix A). For the Build Alternative, 92-97 percent of the DHV was automobiles, pickup trucks and sport utility vehicles (SUVs). The percentage of heavy duty trucks was 3-8 percent of the DHV. Although medium trucks were observed during field data collection, all truck were assumed to be heavy trucks since the SCDOT’s actual traffic counts that showed all were heavy duty trucks. By assuming all the trucks to be heavy, the predicted noise represents the worst-case scenario.

Sensitive receivers and/or land use types were first identified using aerial photography and street level views from <http://maps.google.com>, then field verified. Exterior usage receiver categories that are potentially impacted by the proposed project include FHWA-developed Noise Abatement Criteria (NAC) categories B, C, D, E, and F.

Based on aerial photography and a field visits, four locations were further evaluated for potentially sensitive receivers. Sixteen undeveloped residential lots at the Cove at Martin’s Creek were included in the traffic noise model (Figure 3). A future mixed-use development at Point Hope Parkway was also included in the traffic noise model based on the approved master plan obtained. Cainhoy Village, a residential development along Cainhoy Village Road, was not included because building permits have not been approved. Thirty-two (32) residential receivers were added to the traffic noise model at the Oak Bluff development that is now under construction.

#### **4.12.1 Noise Impacts**

Traffic noise impacts occur when the predicted traffic noise levels either: (a) approach or exceed the FHWA noise abatement criteria ("approach" meaning within 1 dBA of the value listed in Table 18), or (b) substantially exceed the existing noise levels. According to the SCDOT Traffic Noise Abatement Policy, a 15-dBA increase is deemed to be a "substantial increase." Noise abatement measures must be considered for receivers that fall in either category.

The TNM 2.5 model results for the existing condition, and the 2040 design year No-Build and Build Alternative can be found in Table 4. A total of 73 receivers would exceed the NAC threshold



for the 2040 Build Alternative. No receivers would have a substantial increase impact for the 2040 Build Alternative.

**Table 18. Noise Abatement Criteria: Hourly A-Weighted Sound Level (Decibels)**

Activity Category	Leq(h)	L10(h)	Description of Activity Category
A	57 (Exterior)	60 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67	70	Residential.
C	67 (Exterior)	70 (Exterior)	Active sports areas, amphitheatres, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreational areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52 (Interior)	55 (Interior)	Auditoriums, daycare centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72 (Exterior)	75 (Exterior)	Hotels, motels, offices, restaurant/bars, and other developed lands, properties, or activities not included in A-D or F.
F	-	-	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical) and warehousing.
G	-	-	Undeveloped lands that are not permitted.

Source: 23 CFR Part 772, Table 1.

In the existing condition (2015) there are seventeen (17) receivers that have noise levels that approach or exceed the NAC criteria for its respective land use. Thirteen (13) of the receivers are residential, three (3) are commercial, and one (1) is a museum/community center (Keith School Museum).

The modeling results indicated that seventy-three (73 receivers) would have noise levels that approach or exceed the FHWA’s Noise Abatement Criteria (NAC) for its respective land use. Forty-nine (49) of the receivers are residential, twenty-three (23) are commercial, and one (1) is a museum/community center (Keith School Museum). All would approach or exceed the NAC for the 2040 design year Build Alternative. Table 19 illustrates the existing and modeled noise levels for impacted receivers for the No-Build and Build Alternatives. Figure 11 illustrates the modeled Build Alternative noise impacts in 2040.



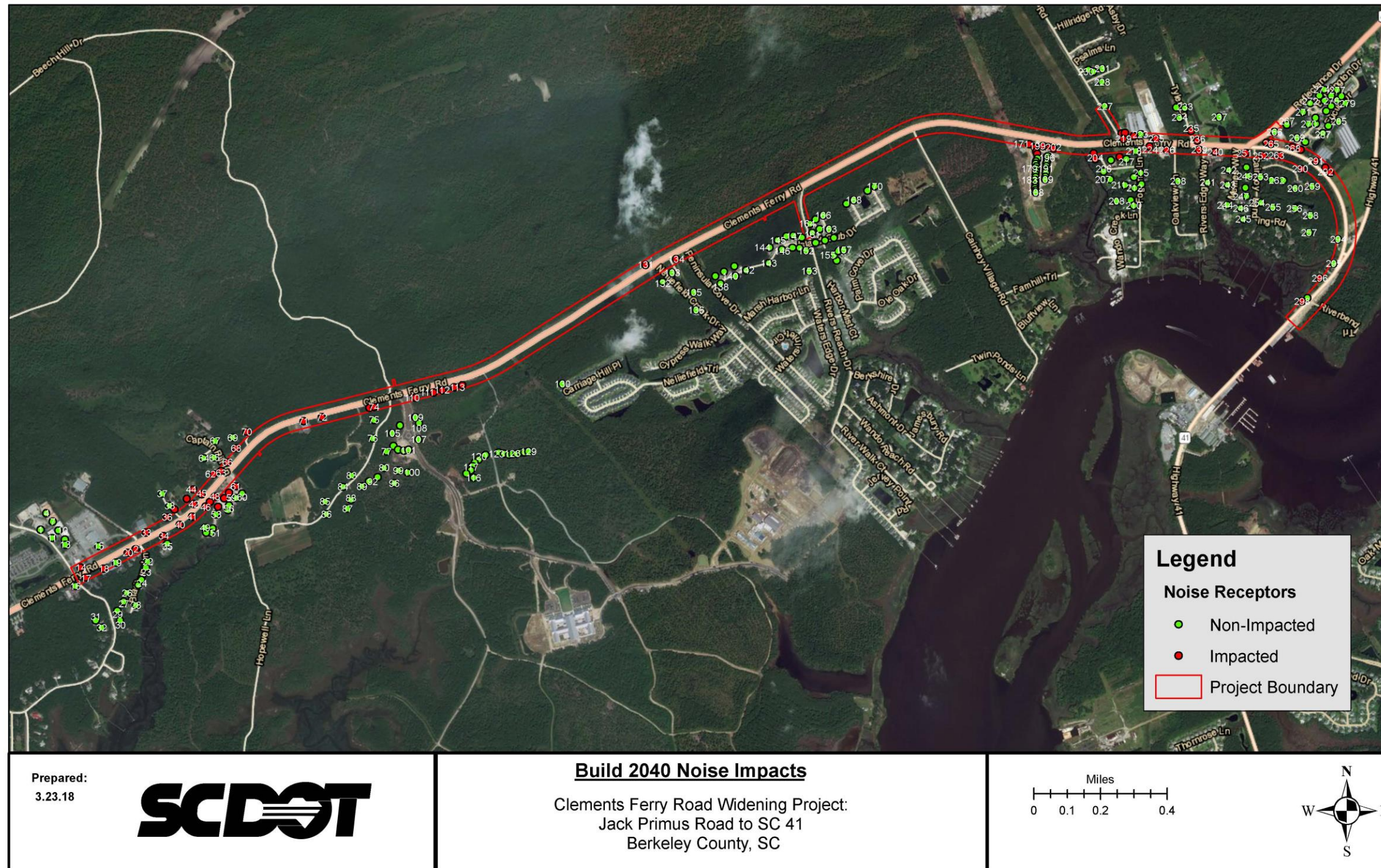
**Table 19. Existing and Modeled Noise Levels for Impacted Receivers**

Receiver	NAC Type	Existing (2015)	No-Build (2040)	Build (2040)	Increase over Existing	NAC Impact	NAC
14	Category E	70.0	76.2	75.1	5.1	Yes	71
17	Category E	67.8	74.0	72.1	4.3	Yes	71
18	Category E	66.9	73.2	71.3	4.4	Yes	71
20	Category E	71.9	78.2	75.4	3.5	Yes	71
21	Category E	71.1	77.4	74.6	3.5	Yes	71
33	Category E	69.4	75.6	74.9	5.5	Yes	71
34	Category E	68.9	75.2	71.7	2.8	Yes	71
36	Category B	65.4	71.6	70.2	4.8	Yes	66
39	Category B	63.6	69.8	67.7	4.1	Yes	66
40	Category B	71.9	78.1	75.4	3.5	Yes	66
41	Category B	70.7	77.0	75.6	4.9	Yes	66
42	Category B	72.6	78.8	75.4	2.8	Yes	66
43	Category B	63.6	69.9	67.1	3.5	Yes	66
44	Category B	62.3	68.6	66.1	3.8	Yes	66
45	Category B	70.8	77.1	73.2	2.4	Yes	66
46	Category B	71.2	77.5	80.1	8.9	Yes	66
47	Category B	72.1	78.4	80.4	8.3	Yes	66
48	Category B	72.2	78.5	79.9	7.7	Yes	66
54	Category B	61.0	67.3	66.2	5.2	Yes	66
57	Category B	61.6	67.9	67.1	5.5	Yes	66
58	Category B	61.5	67.8	66.6	5.1	Yes	66
61	Category B	60.8	67.1	66.0	5.2	Yes	66
62	Category B	66.5	72.8	69.0	2.5	Yes	66
63	Category B	70.1	76.4	72.0	1.9	Yes	66
66	Category B	68.7	75.0	71.0	2.3	Yes	66
68	Category B	65.8	72.1	68.6	2.8	Yes	66
70	Category B	62.4	68.7	66.4	4.0	Yes	66
71	Category E	74.7	81.0	77.5	2.8	Yes	71
72	Category E	69.8	76.1	72.6	2.8	Yes	71
73	Category E	70.7	76.9	76.3	5.6	Yes	71
74	Category E	70.4	76.6	76.6	6.2	Yes	71
110	Category E	66.4	72.7	72.9	6.5	Yes	71
111	Category E	67.7	74.0	74.2	6.5	Yes	71
112	Category E	69.1	75.4	75.9	6.8	Yes	71
113	Category E	69.0	75.2	75.9	6.9	Yes	71
114	Category E	69.5	75.8	76.9	7.4	Yes	71



Receiver	NAC Type	Existing (2015)	No-Build (2040)	Build (2040)	Increase over Existing	NAC Impact	NAC
131	Category B	72.6	78.9	77.3	4.7	Yes	66
134	Category C/D	66.1	72.3	72.0	5.9	Yes	66
171	Category B	65.1	71.3	72.5	7.4	Yes	66
172	Category B	62.8	69.0	69.6	6.8	Yes	66
173	Category B	59.8	66.0	66.7	6.9	Yes	66
174	Category B	58.7	64.9	66.0	7.3	Yes	66
199	Category B	65.1	71.4	73.6	8.5	Yes	66
200	Category B	64.6	70.9	73.5	8.9	Yes	66
201	Category B	64.4	70.6	73.4	9.0	Yes	66
202	Category B	63.9	70.1	72.8	8.9	Yes	66
203	Category B	63.4	69.6	71.1	7.7	Yes	66
204	Category B	59.0	65.2	66.6	7.6	Yes	66
216	Category B	58.7	65.0	66.2	7.5	Yes	66
219	Category B	71.3	77.6	77.1	5.8	Yes	66
220	Category B	62.1	68.3	68.7	6.6	Yes	66
221	Category B	61.5	67.8	68.4	6.9	Yes	66
222	Category E	64.1	70.4	72.0	7.9	Yes	71
224	Category E	69.1	75.5	76.4	7.3	Yes	71
225	Category E	68.5	74.9	77.8	9.3	Yes	71
226	Category E	63.5	69.8	71.3	7.8	Yes	71
235	Category B	57.8	64.2	66.5	8.7	Yes	66
236	Category B	66.7	73.1	75.3	8.6	Yes	66
239	Category B	65.0	71.3	74.4	9.4	Yes	66
240	Category E	62.8	69.2	72.1	9.3	Yes	71
251	Category B	63.6	70.1	72.3	8.7	Yes	66
252	Category B	59.9	67.0	69.7	9.8	Yes	66
263	Category B	61.7	68.9	72.0	10.3	Yes	66
264	Category B	63.0	70.1	72.5	9.5	Yes	66
265	Category B	63.7	70.8	73.8	10.1	Yes	66
268	Category B	62.3	69.6	72.6	10.3	Yes	66
289	Category B	61.9	69.1	72.0	10.1	Yes	66
290	Category B	58.0	65.3	67.1	9.1	Yes	66
291	Category E	63.5	70.7	74.2	10.7	Yes	71
292	Category E	61.7	69.0	71.7	10.0	Yes	71
293	Category B	61.3	68.5	71.2	9.9	Yes	66
296	Category B	60.1	67.3	66.5	6.4	Yes	66
298	Category B	63.9	71.1	67.9	4.0	Yes	66

Figure 11. Build Alternative Noise Impacts in 2040





#### 4.12.2 Mitigation

Since there are receivers that would be impacted by the noise from the Design Year Build Alternative, abatement measures were considered for the proposed project. Overall, as a result of the mitigation analysis, there were no feasible and reasonable solutions to mitigate for the predicted noise impacts according to the SCDOT noise policy. Therefore, there are no noise barriers proposed to be carried forward to the construction phase. The noise analysis prepared for this project is included in Appendix G, and includes the detailed analyses and findings supporting this determination.

Per 23 CFR §772.17, SCDOT will inform local planning officials of future, generalized noise levels expected to occur in the project vicinity after FHWA has made a final decision regarding the proposed project. This information is included in Appendix G.

To minimize construction noise, the contractor will be required to comply with the SCDOT 2007 Standard Specifications for Highway Construction, which includes specifications regarding nuisance noise avoidance. Detailed specifications suggested for consideration for inclusion in the proposed project's construction documents may consist of:

- Construction equipment powered by an internal combustion engine shall be equipped with a properly maintained muffler.
- Air compressors shall meet current USEPA noise emission exhaust standards.
- Air powered equipment shall be fitted with pneumatic exhaust silencers.
- Stationary equipment powered by an internal combustion engine shall not be operated within 150 feet of noise sensitive areas without portable noise barriers placed between the equipment and noise sensitive sites. Noise sensitive sites include residential buildings, motels, hotels, schools, churches, hospitals, nursing homes, libraries and public recreation areas.
- Portable noise barriers shall be constructed of plywood or tongue and groove boards with a noise absorbent treatment on the interior surface (facing the equipment).

#### 4.13 Hazardous Materials

Hazardous materials are generally defined as any material that has or will have, when combined with other materials, a harmful effect on humans or the natural environment. Hazardous materials may be in the form of a solid, sludge, liquid, or gas and are characterized as reactive, toxic, infectious, flammable, explosive, corrosive, or radioactive. A hazardous material that has been used and discarded is considered a hazardous waste.



#### 4.13.1 Existing Hazardous Material Sites

Hazardous waste/material sites are regulated by the Resource Conservation and Recovery Act (RCRA), as amended, the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended, and the Superfund Amendments and Reauthorization Act of 1986 (SARA). Service/gas stations are one of the most common generators of potential hazardous material sites. As older underground storage tanks (USTs) deteriorate, they pose a threat to leak and contaminate surrounding soil and groundwater with gasoline and other petroleum products. The SCDHEC maintains a database of these potential contamination sites and regulates activities associated with the monitoring and/or remediation of a leaking underground storage tank (LUST). The SCDHEC may also issue a letter of “no further action” for sites that no longer show evidence of contaminants present at the site or that have been remediated in accordance with applicable laws.

A Phase 1 Environmental Site Assessment (ESA) was conducted using the American Society for Testing and Materials (ASTM) E 1527-13, Standard Practice for Environmental Site Assessments: Phase I ESA Process. The purpose of the Phase I ESA is to identify, pursuant to ASTM E 1527-13, recognized environmental conditions (RECs) in connection with the proposed project’s study area. ASTM defines the term recognized environmental condition as the presence or likely presence of hazardous substances or petroleum products on the property under conditions that are indicative of an existing release, a past release, or a material threat of a release of hazardous substances or petroleum products into the structures on the property or into the ground, groundwater, or surface water of the site. RECs include, but are not limited to possible sites involving the presence and/or past use of underground storage tanks (USTs), above ground storage tanks (ASTs), and/or other hazardous materials within the PSA. The ESA included federal and state database research along with and an on-site reconnaissance survey of the PSA was performed.

Based on the outlined methods of investigation, the following eight sites with potential contamination were identified in the PSA, and six were identified as RECs (see Appendix H for the complete Phase I ESA Report):

- Blue Water 19: 1952 Clements Ferry Road (REC/LUST)
- Wando Grocery: Clements Ferry Road and Cainhoy Road (REC/LUST)
- Auto Inspectors of South Carolina: 1195 Clements Ferry Road and 1071 Fogarty Lane (REC/historic auto repair facility)
- Cohen Gaskins Jr. Parcel: Clements Ferry Road and SC 41 (REC/documented subsurface contamination)
- Wando Lounge: 2559 and 2601 SC 41 (REC/LUST)





- SCDOT Wando Section Shed: SC 41 (REC/LUST)
- Circle K 2723796: 1971 Clements Ferry Road (not a REC)
- GE Betz, Inc.: 1074 Clements Ferry Road (not a REC)

Subsequent to Terracon's Clements Ferry Road Widening Phase I Environmental Site Assessment Report dated December 22, 2016 prepared for Infrastructure Consulting & Engineering, LLC, petroleum-impacted soil was encountered at the Cohen Gaskins Property (former Wando Lounge Property) on January 20, 2017 by PCL Construction. According to the Soil Removal and Disposal Activities Report dated March 24, 2017 by SCS Engineers (SCS), SCS collected five composite samples across the planned excavation area at the Cohen Gaskins Property. Samples were submitted to TestAmerica Laboratories.

According to the SCS report, composite samples were submitted to TestAmerica Laboratories and analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX), polynuclear aromatic hydrocarbons (PAHs), and lead using the Toxicity Characteristic Leaching Procedure (TCLP). Laboratory analytical results indicated all analyzed constituents were below TCLP criteria. In February 2017, SCS oversaw the removal of approximately 730 tons of impacted soil and removal of 4,300 gallons of petroleum impacted groundwater. The contaminated soil was disposed to the Berkeley County Landfill and the petroleum impacted water was disposed at US Water Recovery. SCS's onsite investigation included subsurface excavation to identify the presence of potential underground storage tanks (USTs). SCS reported that no USTs were located.

#### **4.13.2 Impacts on Hazardous Materials**

The Preferred Alternative would require the acquisition of approximately 0.2 acres from the *Wando Grocery* and *Wando Boat Repair* identified as sites of environmental concern and/or potentially contaminated sites. Further assessment of any sites impacted by the project may be warranted during final design to identify the extent of contamination and necessary remediation measures. Cost of necessary remedial actions would be considered during the right-of-way appraisal and acquisition process. Construction activities within contaminated sites have the potential for construction workers to encounter contaminated soils and can pose health risks.

#### **4.13.3 Mitigation**

It is the SCDOT's policy to avoid the acquisition of underground storage tanks and other hazardous materials, if possible. If avoidance is not a viable alternative and soils that appear to be contaminated are encountered during construction, the South Carolina Department of Health and Environmental Control (SCDHEC) will be informed. Hazardous



materials will be tested and removed and/or treated in accordance with the U.S. Environmental Protection Agency and the SCDHEC requirements, if necessary.

#### 4.14 Cultural Resources

The National Historic Preservation Act of 1966 requires federal agencies to review the effects of any proposed projects on historic properties. Historic resources include districts, buildings, sites, structures, or objects that are significant in American history, architecture, archaeology, engineering, and/or culture. Prior to undertaking a project, a federal agency must determine if any resources exist in the study area through detailed literature searches and field surveys. If resources exist, then the federal agency will consult with the State Historic Preservation Office (SHPO) to determine whether the resource is eligible for listing on the National Register of Historic Places (NRHP) and how the proposed project would impact the resource.

##### 4.14.1 Existing Cultural Resources

The survey of the project included background research, archaeological survey, and architectural survey. The archaeological and architectural surveys performed were designed to provide the necessary management data to allow for the sites and properties to be evaluated for recommendations of eligibility to the NRHP<sup>20</sup>.

###### 4.14.1.1 Archeological Survey

The Archeological survey entailed the systematic examination of the project following South Carolina Standards and Guidelines for Archaeological Investigations (Council of South Carolina Professional Archaeologists [COSCAPA] et al. 2013). The Archeological survey was conducted August 22-26, 2016. The project archaeologist examined the archaeological survey universe through systematic shovel testing and surface inspection. During the archaeological survey, the project archaeologist identified four new archaeological sites (38BK2904-38BK2907) and one isolated find (Isolate 1).

###### 4.14.1.2 Architectural Survey

On September 8, 2016, an architectural historian conducted an intensive architectural survey of all above ground cultural resources within the architectural survey universe to consider any possible visual effects of the proposed undertaking. The architectural survey universe extends 300 feet to either side of the intersecting side streets and is 600 feet wide. The survey was designed to identify, record, and evaluate all historic architectural resources (buildings, structures, objects, designed landscapes, and/or sites with

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<sup>20</sup> Cultural Resource Report and Coordination (Appendix I).



aboveground components) in the project area. Field survey methods complied with the Survey Manual: South Carolina Statewide Survey of Historic Places and National Register Bulletin 24, Guidelines for Local Surveys: A Basis for Preservation Planning. In accordance with the scope of work and standard South Carolina Department of Archives and History (SCDAH) survey practice, the project architectural historian drove every street and road in the architectural survey universe and conducted a pedestrian inspection of all potential historic architectural resources.

The principal criterion used by the SCDAH to define historic architectural resources is a 50-year minimum age; however, that rule does not always allow for the recordation of all historically significant resources. This could include resources related to the civil rights movement, the Cold War, or the development of tourism in South Carolina. The architectural historian identified two newly recorded residential resources (Resources 1210 and 1211) within the architectural survey universe that are over 50 years of age.

#### **4.14.2 Impacts on Existing Cultural Resources**

Sites 38BK2904-38BK2907, Isolate 1, and Resources 1210 and 1211 are not eligible for the NRHP, and no other NRHP-eligible structures were identified in the project area. Therefore, based on background research and reconnaissance survey, it was determined that no historic properties would be affected by the proposed project. The South Carolina SHPO concurred with this determination on May 9, 2017 (see Appendix I). During construction, there may be a potential for encountering unknown resources that were not previously identified.

#### **4.14.3 Mitigation**

No NRHP-eligible sites were identified in the PSA. Therefore, no further management consideration of these resources is warranted. If the current proposed project design changes, additional surveys may be necessary. During construction, the contractor and subcontractor must notify their workers to watch for the presence of any prehistoric or historic remains, including but not limited to arrowheads, pottery, ceramics, flakes, bones, graves, gravestones, or brick concentration during the construction phase of the project, and if any such remains are encountered, the Resident Construction Engineer will be immediately notified and all work in the vicinity of the discovered materials and site work shall cease until the SCDOT Archaeologist directs otherwise.

### **4.15 Section 4(f) and Section 6 (f)Resources**

Section 4(f) of the Department of Transportation Act of 1966 provides protection to publicly owned parks, recreation areas, wildlife and waterfowl refuges, and historic sites.



Under Section 4(f), properties must not be impacted unless no prudent and feasible alternative exists and efforts to minimize impacts to the property are completed.

Section 6(f) resources are places such as public parks, trails, courts, and other recreational areas that were purchased in part through grants from the Land and Water Conservation Fund Act of 1965 (LWCF). The properties are protected by the LWCF from conversion to non-public recreational uses.

There are no Section 4(f) resources in the area, so no additional Section 4(f) analysis is warranted. No Section 6(f) resources are known to exist within the study area either. Since no property would be acquired from any Section 6(f) resources, compliance with the LWCF Act is not required.

#### **4.16 Relocation and Displacements**

The proposed improvements would be largely constructed within and/or immediately adjacent to the existing roadway. Due to this, the acquisition of 42.2 acres of new ROW and the relocation of one residence, would be needed for the proposed project. Berkeley County would acquire all new ROW and process the relocation in compliance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (42 U.S.C. 4601 et seq.). The purpose of these regulations is to ensure that owners of real property to be acquired for Federal and federally-assisted projects are treated fairly and consistently, to encourage and expedite acquisition by agreements with such owner, to minimize litigation and relieve congestion in the courts, and to promote public confidence in Federal and federally-assisted land acquisition programs. If additional residential or business relocations were identified during final design, those being relocated would receive the full benefits entitled under the Uniform Act. These benefits include fair market value compensation for the acquired property as well as equitable compensation normally associated with relocating.

#### **4.17 Social and Economic Resources**

The proposed project was evaluated to identify potential social and economic impacts of the Preferred Alternative. Social impacts, or community impacts, can be defined as the “effects of a transportation action on a community and its quality of life.” This evaluation generally focuses on the various aspects that are important to the surrounding communities and people such as mobility, safety, employment, property impacts, fragmentation of communities, and other items important to the quality of life along the project areas. Social impacts are generally identified through public involvement and



participation, along with an analysis of the how the proposed improvements may impact the various items that are important to the local communities.

Potential economic impacts are also considered and include how the project may benefit or harm the local businesses, local municipalities, and communities. The evaluation of potential economic impacts generally considered project costs, impacts to businesses, mobility/access, and employment potential.

**4.17.1 Existing Social Resources**

The U.S. Census data was evaluated to determine the demographic composition of the proposed project area. Clements Ferry Road corridor is located in zip code 29492 in Berkeley County. The Census data indicates that the project area is located in a predominately white, middle-aged area, high-income area. Specifically, the zip code that encompasses the PSA includes a minority population of approximately 15%, as compared to 34% countywide and statewide. The median age is consistent with the countywide and statewide median ages, but the median household income of \$93,781 is more than double than the median income of the state (\$45,483) and nearly double that of the county (\$52,506). These findings are summarized in the Table 20.

**Table 20. Demographic Characteristics**

Characteristic	South Carolina		Berkeley County		29492	
	Number	Percent	Number	Percent	Number	Percent
Total population	4,625,364	100.0	177,843	100.0	10,262	100.0
Median age (years)	37.9	--	34.5	--	35.5	--
White	3,060,000	66.2	118,232	66.5	8,752	85.3
Average household size	2.49	--	2.66	--	2.45	--
Median Household Income (\$)	45,483	--	52,506	--	93,781	--

Source: 2010 U.S. Census American FactFinder and 2015 American Community Survey

**4.17.2 Impacts on Social Resources**

The Preferred Alternative was analyzed for its potential social impacts in terms of residential and business relocations, alteration of transportation patterns, disruption of planned or established communities, disruption of development, and changes in employment. The Preferred Alternative is located primarily within the existing ROW; however, will require approximately 42.2 acres of new ROW, including the relocation one residence. This ROW would be acquired from various land-uses (commercial and residential) immediately adjacent to the existing ROW. Since this is a proposed widening



project, the improvements would not provide new access and are not anticipated to cause a direct change in adjacent land use.

The social impacts identified are largely associated with impacts to the residences and existing commercial establishments, mainly in regard to changes in access to and from these homes and businesses during construction and once the project is complete. In addition, the Preferred Alternative would impact a grand live oak tree that was identified during the public involvement campaign as having local social importance. Specifically, this tree is located just south of the intersection with Reflectance Road. Additional alignment studies were conducted at this location with the determination that avoidance would result in increased property and relocation impacts. Therefore, the tree will be removed to accommodate the proposed project.

The additional travel lanes and shared-use path would result in improved roadway operational efficiency, decreased traffic congestion, and safer driving conditions; which provide direct beneficial social impacts for commuters, pedestrians, and bicyclists.

#### **4.17.3 Existing Economic Resources**

The surrounding area is comprised residential, commercial, and industrial uses. As such, many of these businesses have been developed and depend upon the local transportation facilities. These developments also provide various employment opportunities.

#### **4.17.4 Impacts on Economic Resources**

The proposed project was evaluated for potential economic impacts to the surrounding communities. The economic impacts considered include the anticipated impacts to local businesses, employment, and the tax base. As a result, it is anticipated that the proposed project would result in both positive and negative economic impacts.

Construction impacts could have adverse short-term impacts on local businesses through temporary traffic delays and disruptions to access. The project could also impact the permanent access points and driveways to various businesses adjacent to the roadway. Specifically, these access points could be impacted by the raised median, consolidation of driveways, and/or restricted movements.

The cost of the proposed project is estimated at \$42.3 million. Construction of the proposed project would have beneficial short-term impacts on the local economy, including construction employment and purchases of goods and services related to construction activities. The proposed project would create temporary employment opportunities for laborers, equipment operators, and other construction-type



employees. In addition, although the inconvenience of construction activities may deter local residents from using businesses located within the study area, retail and service facilities near the proposed project could experience an increase in sales from construction employees.

The proposed project could also have beneficial economic impacts through improved operations, reduced travel delays, and safer conditions. These improvements would improve the overall quality of life by reducing time delays and providing safer driving conditions, which would encourage and sustain existing retail along the roadway. The project would also result in a savings to motorists by decreasing travel time and reducing the potential for traffic accidents and property damage.

#### 4.17.5 Mitigation

Information on construction activities will be updated regularly in order to avoid and minimize the impacts to residents and local businesses during construction. The following strategies have been used on other projects, and would be utilized as necessary:

- Maintaining access to business during construction for customers and deliveries;
- Maintaining or relocating bus stops; and/or
- Maintaining parking lot access.

An attempt would be made to maintain access to all properties along the corridor. In the event that access could not be maintained, the SCDOT/County would negotiate these impacts during the ROW acquisition process.

#### 4.18 Environmental Justice

The USEPA defines environmental justice as “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.” Executive Order (EO) 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires federal agencies to identify community issues of concern during the NEPA planning process, particularly those issues relating to decisions that may have a disproportionate impact to low-income or minority populations.



Census data indicate that the project area is located in a predominately white, middle-aged area, high-income area. Specifically, the zip code that encompasses the PSA includes a minority population of approximately 15%, as compared to 34% countywide and statewide; and the median household income of \$93,781 is more than double than the median income of the state (\$45,483) and nearly double that of the county (\$52,506). Based on the census data, the project is not expected to disproportionately impact any low-income and minority populations.

### 4.19 Indirect and Cumulative Impacts

It is FHWA’s and other federal agencies’ responsibility to consider direct, indirect, and cumulative impacts in the NEPA process as established in the Council on Environmental Quality (CEQ) Regulations for implementing the Procedural Provisions of NEPA. The CEQ regulations define the impacts and effects that must be addressed and considered by federal agencies in satisfying the requirements of the NEPA process. The CEQ regulations note three impact categories - direct, indirect, and cumulative. According to FHWA guidance, the determination or estimation of reasonably foreseeable actions is essential to both indirect and cumulative impact analysis.

Indirect impacts, or effects, are reasonably foreseeable impacts to the environment that are caused by an action, but occur later in time, or are further removed in distance from the PSA. Indirect impacts are generally associated with impacts from induced growth, and other impacts that result from the induced changes in the existing land use patterns, population density, or growth rate of an area<sup>21</sup>. Transportation projects often reduce travel time, enhancing the attractiveness of surrounding land for development through changes in accessibility. These changes in access could influence local development trends. Subsequently, these land use changes could lead to environmental impacts such as degradation of natural habitat and/or water quality issues<sup>22</sup>.

#### 4.19.1 Indirect Impacts

Indirect impact analysis for this project focuses on potential impacts to natural habitat, water quality, and overall land use associated with induced growth as a result of proposed improvements to the transportation network. The identification of these resources took into consideration input gathered throughout the project development (i.e.,

<sup>21</sup> FHWA Interim Guidance: *Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process* (2003).

<sup>22</sup> AASHTO Center for Environmental Excellence. *Practitioner’s Handbook 12 - Assessing Indirect Effects and Cumulative Impacts Under NEPA*. August 2016. <http://environment.transportation.org/pdf/programs/ph12-2.pdf>





comprehensive plans), land use plans, and population trends along with general characteristics of the PSA. The potential indirect impacts along the corridor could result from modifying the existing habitat and land use to residential and/or commercial developments as the roadway capacity and operational efficiency are improved. The development of the area could also result in the need for additional roadways and access drives in order to maintain desirable access to support potential development.

Much of the surrounding area historically consisted of undeveloped forested areas, with the recent influx of residential and commercial developments. As documented, the area immediately surrounding the PSA has experienced rapid growth in recent years and the trend is expected to continue. As such, additional development and construction have the potential to impact land use and natural habitat through the conversion of undeveloped forested habitat to urban/disturbed areas. This could impact the quantity and quality of stormwater runoff, thus impacting water quality and aquatic systems.

### Step 1 – Study Area Boundaries

Indirect impacts are analyzed for resources of concern within particular geographic and temporal boundaries. This allows for the appropriate context to be developed for each resource. Study area boundaries are developed through consideration of input received during the agency coordination and public involvement process, along with the evaluation of the trends and projected growth along the corridor.

The study area associated with the indirect impact analysis extends beyond the general PSA to include Daniel Island and the greater “Cainhoy Peninsula” as illustrated in Figure 12. This study area contains approximately 19,292 acres and includes recent development along with areas projected for mixed low-density development<sup>23</sup>. The indirect impacts will be assessed for each notable resource within this defined area with the baseline conditions represented from just prior to the construction of the I-526 extension and interchange at Clements Ferry Road. Specifically, a review of historic photography determined 1989 as the appropriate baseline for comparison analysis.

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<sup>23</sup> Berkeley County Comprehensive Plan, <https://www.berkeleycountysc.gov/drupal/zoning/plan>, Accessed May 2017

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Figure 12. Indirect and Cumulative Impacts Study Area





## Step 2 – Study Area Communities Trends and Goals

The indirect impacts study area is located along southern Berkeley County, and includes Daniel Island along with portions of the Cainhoy Peninsula. The study area is situated across the *Cooper River/Charleston Harbor* watershed (03050201-070) and the *Wando River* watershed (03050201-040). This area generally drains to the Wando River via Martins Creek and an unnamed tributary to Martin Creek, with the eastern and northern portion draining to the Cooper River.

A review of historical mapping (Figure 12) indicated that the study area was historically comprised of forested and agricultural land use. Specifically, this area was dominated by pine species, longleaf (*Pinus palustris*) and loblolly (*Pinus taeda*), mixed hardwoods, and active row crop production. Much of the area was comprised of various large land holdings (i.e., Cainhoy Plantation), which actively managed and farmed the property. Prior to I-526, Clements Ferry Road originated at SC 41 continued approximately 10 miles and provided access to Cainhoy Road and terminated on Daniel Island. Access to Clements Ferry Road was greatly enhanced with the construction of I-526, which included a full-service interchange at Clements Ferry Road. The improved access facilitated the residential development on Daniel Island along with commercial and industrial facilities along Clements Ferry Road within proximity (i.e., 3 miles) of the interchange.

Today, Daniel Island is considered a premier community in Charleston, and includes various residential communities, including many high-end housing units. In addition, the Island includes supportive infrastructure, commercial establishments, schools, and recreational areas (i.e., golf, tennis courts, etc.). Industrial and other commercial developments have also continued along Clements Ferry Road between I-526 and Jack Primus Road. In addition, recent residential neighborhoods have been developed further northeast along Clements Ferry Road. This trend is expected to continue according to current land use plans. According to the City of Charleston Planning Department a projected 11,042 single family detached homes (code 210) will be developed by year 2040. The development, Cainhoy Plantation, will also have mixed-use facilities, an elementary/middle and high school, and apartment homes.

## Step 3 – Inventory Notable Features

The indirect impact analysis focuses on potential impacts to the surrounding land use, natural habitat, and water quality. The County anticipates the Clements Ferry Road corridor to serve an employment center, while much of the surrounding area is planned for low density housing. As described above, the project area currently includes a large portion of undeveloped forested land. These areas provide natural habitat for a variety

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of wildlife. In addition, the project area is bordered by the Cooper and Wando Rivers which both drain to the Charleston Harbor. Therefore, potential impacts to water quality are considered to be a notable concern.

#### **Step 4 – Identify Impact Causing Activities of the Proposed Action**

The proposed project is adding vehicular capacity and improving operating conditions along Clements Ferry Road. These improvements would increase the acceptable threshold for daily traffic volumes, as well as increase the attractiveness of the area by minimizing time delays. These improvements have the potential to facilitate both planned and unplanned development along the area. In addition, the timing of the planned development may be accelerated with the improvements. As development ensues, forested land use would be converted to disturbed and/or maintained habitat. This would also result in a larger area of impervious material that has the potential for water quality impacts. The following are specific modifications that have the potential to result in indirect impacts: additional travel lanes, improved operational efficiency along intersections, and new/modified access points.

#### **Steps 5 and 6 – Identify and Analyze Potential Impacts**

Indirect impacts include the potential land use changes, habitat modifications, and impacts on water quality as a result of induced development facilitated by transportation improvements (Table 21).

The indirect impact study area is largely planned for low to moderate density suburban and light industrial land uses. These land uses are generally comprised of single and multi-family housing units, retail centers, office buildings, and other developments typical of mixed suburban communities. In addition, this study area includes lands under Berkeley County jurisdiction, but the majority of the area has been annexed into the City of Charleston’s jurisdiction. Therefore, all developments would require appropriate permitting and authorization by the appropriate entity. While much of the area is planned for suburban development, including current approvals of mixed residential/commercial communities, the proposed improvements could result in expediting these developments and/or resulting in more dense communities. The local permitting process would evaluate each request to ensure compatibility and consistency with the overall comprehensive plan for the area. The improvements to Clements Ferry Road alone are not anticipated to accommodate denser growth than what is currently planned. Therefore, even with the improved facility, the projected land uses are anticipated to remain consistent with low to moderate suburban development.



The proposed improvements are expected to accommodate the projected land uses planned in the PSA, which would facilitate planned development along much of the area. That said, this development would convert existing forested land uses to maintained/disturbed habitat. This conversion of land would result in a direct loss of natural and wildlife habitat. As documented, much of the PSA historically and/or currently consists of mixed pine and hardwood forests that provide suitable habitat for a variety of species. Based on the findings presented in the NRTM, the PSA includes the historic presence of the protected red-cockaded woodpecker (*Picoides borealis*) and frosted flatwoods salamander (*Ambystoma cingulatum*), along with bald eagle (*Haliaeetus leucocephalus*) sightings. Regulatory laws and mechanisms are in place and enforced to ensure that any future development or land use changes would not result in any unauthorized harm or taking of a protected species (i.e., Endangered Species Act). However, the construction of residential/commercial developments and associated infrastructure would result in a loss of natural habitat, impacting the ability of the area to support various wildlife species currently utilizing the area. Many of these species are highly mobile (i.e., birds) and could relocate to more desirable habitat. In addition, there are large areas of National Forest lands located just northeast of the PSA that offer similar habitat. In addition, continued scientific studies in urban ecology indicate that many wildlife species have the ability to adapt and continue to thrive in developed areas<sup>24</sup>.

The proposed and potential induced development would convert forested land to maintained and/or disturbed areas in a more urbanized setting. This will also result in the increase in impervious areas associated with local roads, drives, parking areas, and other areas associated with the commercialization of the area. Impervious material prevents the ability of rainfall and runoff to be absorbed by the ground surface, thus increasing the quantity of runoff. The impacts of increased impervious materials and general urbanization on water quality has been extensively studied in recent history. In addition, the quantity (i.e., percentage) of impervious material has been determined to be a critical indicator to the health of a specific watershed<sup>25</sup>.

Urbanization also has the potential to impact the quantity of stormwater by altering the types and quantity of pollutants. In summary, these impacts can lead to the degradation of the physical, biological, and chemical characteristic of the receiving waters. As documented, the project area ultimately drains to either the Cooper or Wando Rivers,

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<sup>24</sup> Scientific American. <https://www.scientificamerican.com/article/wild-animals-of-all-stripes-are-adapting-to-the-cityscape-and-thriving/>. Last accessed May 24, 2017

<sup>25</sup> Smoot, James L., et.al. *Effects of Urbanization on Stream Ecosystems*. [https://nc.water.usgs.gov/albe/pubs/Smoot\\_Effects.pdf](https://nc.water.usgs.gov/albe/pubs/Smoot_Effects.pdf). Last accessed May 24, 2017

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with several tributaries (Beresford Creek, Martin Creek) located within the study area. Since the potential impacts of urbanization on water quality is well documented, there are numerous federal, state, and local regulations (i.e., Section 402 of the Clean Water Act -National Pollution Discharge Elimination System) that have been implemented to avoid and minimize these impacts<sup>26</sup>. These regulations incorporate BMPs and other strategies (i.e., stormwater ponds, ditches, structures) to mitigate the potential impacts of urbanization on water quality through the reduction and treatment of stormwater runoff prior to entering receiving waters. In addition, a TMDL for dissolved oxygen has been established within the HUC 03050201 watershed, which includes the PSA, that sets limits on the total amount of point source discharges allowed into the watershed, thus further minimizing water quality impacts.

### Step 7 – Evaluate Analysis Results

Both qualitative and quantitative methods were used to identify and analyze the potential indirect impacts to the resources of concern resulting from this proposed project. These methods and/or resources included:

- GIS information obtained from public and private sector agencies
- Historical photographs
- Computer Aided Drawing and Design (CADD)
- County planning documents
- Internet research

Table 19 lists the potential indirect and cumulative impacts resulting from this project. The indirect impact study area is zoned for low to moderate density development with planned mixed residential and commercial development along much of the undeveloped areas. The proposed project has the potential to accelerate implementation of these planned developments by improving the travel conditions along Clements Ferry Road. However, the improvements would not be providing new access or altering the overall existing travel patterns. As such, the project would not result in modification to the zoning or impact the type and/or quantity of development. The roadway may facilitate the development resulting in an increase of impervious material and urban development. This would likely increase the quantity of stormwater along the project watershed(s), with a potential to impact the quality of runoff. These impacts would be both temporary during construction and with permanent impacts upon construction of the developments. However, these developments would be required to obtain the required local and state

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<sup>26</sup> U.S. Environmental Protection Agency. <https://www3.epa.gov/region9/water/npdes/stormwater.html>. Last accessed May 24, 2017

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permits. This includes construction permits for land disturbing activities which would ensure that area water quality standards are maintained along the receiving waters.

### **Step 8 – Assess Consequences and Develop Mitigation**

In conclusion, the proposed project has the greatest potential to impact the timing of the planned development along the project corridor, with less potential to induce new growth. As documented, the proposed project would improve the capacity and efficiency of the existing transportation facility. This could result in the area being more desirable, which could facilitate the development and marketing of planned communities. Other potential indirect impacts associated with this include altering the landscape from forested land uses to more urban land uses, which could impact habitat and water quality.

The indirect impacts associated with accelerating the planned development, and subsequent alteration of habitat and land use are mitigated through various local, state, and federal programs. First, the size, density, and type of development would be controlled by the local planning commission, which would be the City of Charleston and Berkeley County. Since this area is zoned for low to moderate mixed-use development, there would be various green space, parks, and recreational facilities incorporated to reduce the overall density of the developments. In addition, the construction of these developments would require appropriate state and federal permitting to maintain existing water quality standards and regulate impacts to waters of the U.S. Unavoidable impacts to these resources would require appropriate mitigation to replace the loss/impact and to achieve a “no net loss” of function. In addition, compliance with other federal laws (i.e., Endangered Species Act, National Historic Preservation Act), would be completed as part of the Section 404 Permitting Process.

Planned and unplanned development would also be required to incorporate appropriate BMPs in regard to both temporary and permanent stormwater, which could include, but not be limited to stormwater ponds, treatment structures, containment of construction activities, and vegetation. Finally, potential impacts associated with the loss of forested land uses and natural habitat could be mitigated through additional protection and greenspace, natural landscaping, and other low impact development strategies. In addition, forested wetland areas would likely be avoided and incorporated as greenspace in the development plans as incentivized by various regulations. Finally, the Francis Marion National Forest is located just northeast of the study area that provides abundance natural habitat for many common and rare species.



#### 4.19.2 Cumulative Impacts

Cumulative impacts or effect, are the impacts on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. According to FHWA, cumulative impact analysis is resource-specific and generally performed for the environmental resources directly impacted by a Federal action under study, such as a transportation project. Cumulative impacts would occur when impacts resulting from the project are added to historical changes in land use as well as reasonably foreseeable future actions.

##### Step 1 – Identify Resources of Importance

The resources of importance for cumulative impact analysis focus on the existing transportation network, local businesses, natural habitat, and WOUS/water quality. The identification of these resources took into consideration input received during agency coordination, public involvement process, project scope, and characteristics of the PSA.

The proposed project includes improvements to an existing roadway facility that is located along a currently low to moderately developed area. The project would require the acquisition of new right-of-way and the conversion of land to transportation uses. These proposed improvements have the potential to impact the existing land use patterns, conversion of natural habitat, and impact WOUS and area water quality.

##### Step 2 – Identify Study Area

Indirect and cumulative impacts are analyzed for resources of concern within geographic and temporal boundaries. This allows for the appropriate context to be developed for each resource. PSA boundaries are developed through consideration of input received during the agency coordination and public involvement process, along with the evaluation of the trends and projected growth along the corridor.

The study area associated with the cumulative impact analysis was determined to be consistent with the indirect impact analysis, and extends beyond the general PSA to include Daniel Island and the greater “Cainhoy Peninsula” as illustrated in Figure 12. This study area contains approximately 19,292 acres and includes recent development along with areas projected for mixed low-density development<sup>27</sup>. The indirect impacts will be assessed for each notable resource within this defined geographical area with the baseline conditions represented from just prior to the construction of the I-526 extension

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<sup>27</sup> Berkeley County Comprehensive Plan, <https://www.berkeleycountysc.gov/drupal/zoning/plan>, Accessed May 2017





and interchange at Clements Ferry Road. Specifically, a review of historic photo determined 1989 as the appropriate baseline for comparison analysis.

### **Step 3 – Discuss Current Health and Context of the Affected Resources**

Clements Ferry Road serves as a minor arterial connection from I-526 north to SC 41, and provides important access to communities including Daniel Island and Wando, residential developments, and commercial/industrial businesses. Clements Ferry Road can also serve as an alternate route to US 17 during peak hour traffic. As such, the Clements Ferry Road and SC 41 facilities are critical to the development and maintenance of the planned land use, which includes mixed residential and commercial developments.

A portion of Clements Ferry Road, I-526 to Jack Primus Road is currently being improved to provide adequate capacity and operation for the various businesses and residential communities along the segment. In addition, the SC 41 bridge over the Wando River is currently being replaced, and early planning and environmental studies of widening SC 41 from the Wando River to US 17 is currently underway.

The cumulative impact study area currently includes undeveloped forested areas consisting of pine and mixed hardwood forests. These areas provide natural habitat for various species, both common and rare as previously discussed. In addition, the project includes various wetlands and other waters of the U.S., including tributaries and drainages to the Cooper River and Wando River. Beresford Creek is the largest tributary system in the project area and primarily drains to the Wando River, but does provide direct connection to the Cooper River (via Clouter Creek). A bridge is located along Clements Ferry Road near I-526 that maintains drainage and conveyance for the Beresford Creek tributary system. Per SCDHEC Regulation 61-69, Classified Waters, the lower portion of Beresford Creek within 4-miles of the Wando River is classified as “shellfish harvesting waters” (SFH) with the remaining of the tributary classified as “SA” saltwaters<sup>28</sup>. SCDHEC Regulation 61-68, Water Classifications and Standards, essentially defines SFH waters as tidal saltwaters protected and suitable for the harvesting of shellfish. SA saltwaters are defined as those suitable for recreation (i.e., swimming, fishing, etc.), but exclude the harvesting of clam, mussels, or oysters for commercial purposes or human consumption<sup>29</sup>. Beresford Creek is listed on the S.C. 2016 303(d) List of Impaired Waterbodies for “aquatic life uses” due to excursions of dissolved oxygen

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<sup>28</sup> <http://www.scdhec.gov/Agency/docs/water-regs/R.61-69.pdf>

<sup>29</sup> <http://www.scdhec.gov/Agency/docs/water-regs/R.61-68.pdf>



concentrations<sup>30</sup>. Martin Creek provides upland drainage with ultimate connection with the Wando River. Martin Creek is not specifically listed on SCHEC’s list of classified waters or 303(d) list, and includes both freshwater nontidal and tidal saltwater areas.

**Step 4 – Identify Direct and Indirect Impacts of the Proposed Project That Might Contribute to a Cumulative Impact**

The proposed project would add additional travel lanes, turn lanes, intersection improvements and bike/pedestrian facilities along a 4.5-mile section of Clements Ferry Road. These improvements would require the acquisition of 42.2 acres of additional right-of-way, one residential displacement, access modification to businesses along the roadway, 2.7 acres of wetland impact, and 160 LF of stream impacts. Potential indirect impacts would be accelerating the planned development, conversion of forested land to urban developed land uses due to the construction of the planned developments, and the quantity and quality of stormwater runoff.

**Step 5 – Identify any other Reasonably Foreseeable Actions**

As documented, the project is located in a rapidly growing area of Berkeley County, with much of the area annexed by the City of Charleston. To accommodate this growth, the SCDOT and local municipalities have various other active and/or programmed transportation projects within and in the vicinity of the cumulative impact study area. The following is a summary of the current and reasonably foreseeable transportation projects:

- I-526 Improvements from near Rivers Avenue to US 17 in Mount Pleasant: Initial environmental studies and conceptual planning;
- Clements Ferry Road Widening from I-526 to Jack Primus Road: Currently under construction;
- SC 41 Bridge Replacement over the Wando River: Currently under construction;
- SC 41 Widening from Wando River to US 17: Initial environmental studies and conceptual planning.

The PSA also has various reasonably foreseeable developments within the area largely zoned for low to moderate mixed development land uses. These developments vary in size and type but will likely consists of single and multi-family housing units, general retail, schools, business/employment centers, and recreational areas. According to the City of Charleston Planning Department, a projected 11,042 single family detached homes will

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<sup>30</sup> SCDHEC, 201 303(d) <http://www.scdhec.gov/HomeAndEnvironment/Water/ImpairedWaters/Overview/>. Accessed January 2018



be developed by the year 2040. The development will also have mixed use facilities, an elementary/middle and high school, and apartment homes.

The development would convert forested land uses, along with increase the density of existing developed areas. Development and continued urbanization of the historically forested land would increase the amount of disturbed areas, decrease natural habitat, increase area of impervious material, and increase traffic volumes along area facilities.

**Steps 6 and 7 – Assess Potential Cumulative Impacts and Report Results**

The most notable actions that impact the study area include the original construction of Clements Road, I-526 and interchange, and the development of Daniel Island. Based on a review of historical aerial photography, it appears that the construction of I-526 and subsequent interchange with Clements Ferry Road was the most notable activity that led to the development and conversion of the Daniel Island. This was further facilitated by the annexation of multiple areas along Daniel Island and Cainhoy Peninsula by the City of Charleston, which further increased the appeal of the area and induced development. The development trend is expected to continue based on current and future zoning regulations and the above mentioned reasonably foreseeable actions.

The change in land use is best demonstrated through the review of aerial mapping. Figure 12 illustrates the PSA in 1989, which consists primarily of forested and agricultural land uses. Specifically, only approximately 368 acres (2%) of the 19,292-acre PSA was considered to be developed land. These disturbed land uses were identified based solely on the review of aerial mapping. Figure 13 illustrates the conditions of the study around 2015, demonstrating that approximately 4,353 acres (23%) of the PSA is developed. It should be noted that the estimate of developed land was based on a review of various mapping, including more recent aerial photography. Therefore, the project area as experienced a 21% increase in developed land since 1989. This trend is expected to continue as much of the remaining undeveloped areas are zoned for light mixed used development and a projected 11,042 single family detached homes will be developed by the year 2040.

This change in land use and increased development, has directly altered existing transportation facilities, area development, and natural habitat. The increased development has burdened many of the local roadway facilities, which is demonstrated by the planned transportation improvement projects within, and in the vicinity of the study area. In addition, this development directly converted forested habitat to disturbed/maintained areas. The conversion to developed land also has the potential to impact the quantity and quality of water quality through increased impervious material.



Reasonable foreseeable actions along the PSA include the continued development along the Cainhoj Peninsula. As documented, the area is zoned for mixed use development, and much of this area has been annexed by the City of Charleston which makes the area more desirable. In addition, there is a large mixed used development plan for much of the remaining undeveloped land along the PSA<sup>31</sup>. The potential build out of this area will continue to impact the local roadway network by increasing the traffic volumes and ultimately resulting in undesirable traffic conditions<sup>32</sup>.

In summary, the cumulative impacts along the PSA are burdened local roadways, increased development converting forested land to disturbed/maintained land uses and increased the area of impervious material (Table 21).

### Step 8 – Assess the Need for Mitigation

The potential cumulative impacts on the transportation facilities, development, natural habitat, and WOUS would be minimized and mitigated through various strategies. The current and future development would require approval from the appropriate local entities (i.e., Berkeley County, City of Charleston). This process would evaluate the potential impacts of potential development to the local roadway facilities and surrounding area. Localized improvements (i.e., signals and intersection improvements) would likely be required as part of the approvals in an effort to mitigate traffic congestion in addition to the previously mentioned proposed roadway improvement projects. Due to the presence of WOUS and streams, the developments would likely require additional state and federal approvals, mainly Sections 401 and 404 of the Clean Water Act, regarding water quality and WOUS. These regulations would ensure the maintenance of water quality standards, and that impacts to WOUS are avoided and minimized as practicable. Based on a review of preliminary developments plans and the SCDHEC watershed plan, it appears that site specific measures would also be incorporated to minimize overall environmental impacts. These include various open areas/green space along existing wetlands, buffers along open waters and drainages, stormwater ponds, and engineered roadway network<sup>33</sup>.

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<sup>31</sup> City of Charleston, Planning Division, <http://sc-charleston.civicplus.com/index.aspx?nid=1095>. Accessed May 23, 2017

<sup>32</sup> *Clements Ferry Road from Jack Primus Road to SC 41 Widening Study*, Haselden and Associates. Revised February 7, 2018

<sup>33</sup> City of Charleston, Planning Division, <http://sc-charleston.civicplus.com/index.aspx?nid=1095>. Accessed May 23, 2017

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**Table 21. Indirect and Cumulative Impact Matrix**

Resources	Direct Impacts	Indirect Impacts	Cumulative Impacts			
			Past	Present	Reasonable Foreseeable	Overall
Land Use	Change access; acquisition of additional transportation right-of-way	Impact to the planned developments – type and quantity	Increased access/transportation facilities; conversion of forested land use to developed areas; increased impervious areas	Transportation projects; increased commercial and residential development	Development and build out of Cainhoy Peninsula per future zoning plans;	Increased development along the areas; increased traffic volumes; increased impervious areas associated with development; loss of natural habitat
Natural Habitat	Acquisition of additional transportation right-of-way	Conversion of undeveloped forested land to developed/urbanized land use	Transportation/ infrastructure facilities; conversion of forested land use to developed areas	Increased infrastructure and development	Build along much of the forested areas along the Cainhoy Peninsula	Conversion of forested land uses to developed areas
Water Quality	Additional travel lanes/roadway footprint resulting in 27.6 acres of additional pavement/ impervious material	Impacts to water quality based on additional impervious surfaces and urbanization	Stormwater runoff from adjacent transportation and urbanized development	Stormwater runoff from adjacent transportation and urbanized development	Stormwater runoff from buildout of undeveloped areas	The area has, and is expected to continue to be developed with urban land uses, increasing the volume of runoff

Figure 13. 1989 Aerial/Development

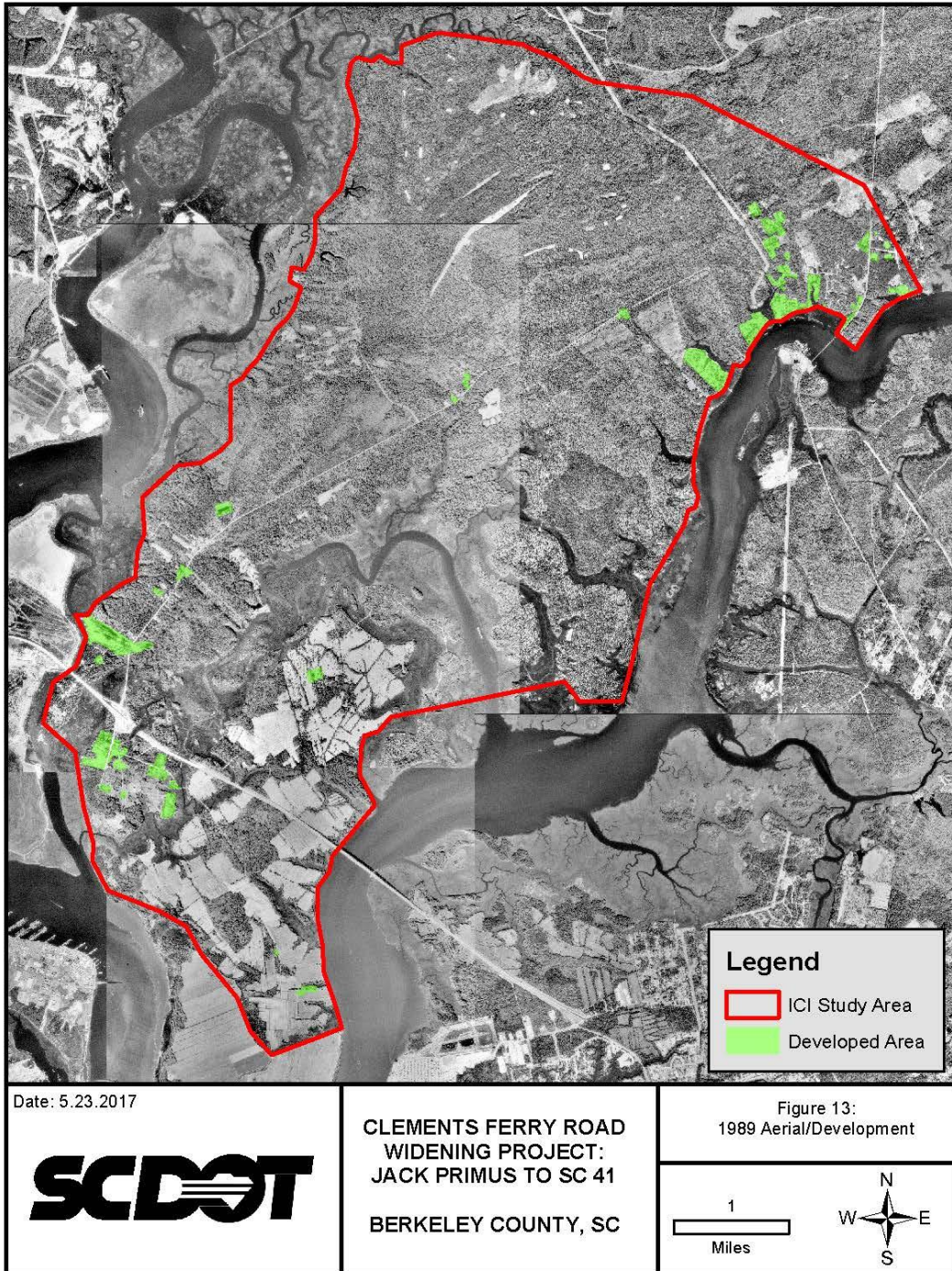
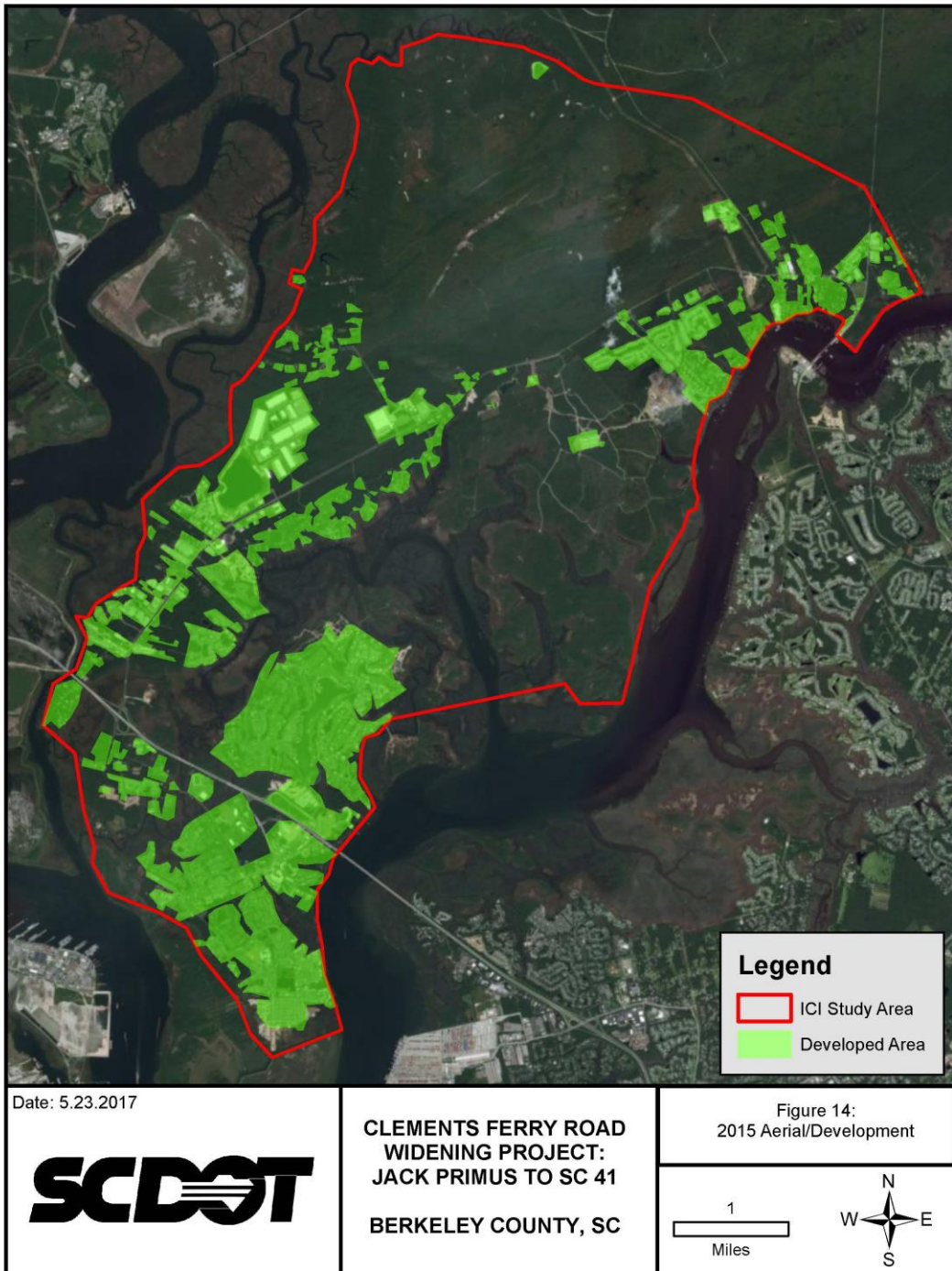


Figure 14. 2015 Aerial/Development





## 5. AGENCY COORDINATION/PUBLIC INVOLVEMENT

SCDOT has coordinated with a number of various local, state, and federal agencies; local stakeholders; and the public to identify issues to consider in development of the project.

### 5.1 Agency Coordination

SCDOT sent a Letter of Intent (LOI) on January 17, 2017, which included a brief description of the proposed project, a location map, contact information, and a request for comments. A copy of the LOI, distribution list, and the response letters are included in Appendix J. SCDOT sent 42 LOIs to representatives of the following:

#### **Federal Agencies:**

Catawba Indian Nation  
Eastern Band of Cherokee Indians  
Federal Highway Administration  
U.S. Army Corps of Engineers  
U.S. Environmental Protection Agency  
U.S. Fish and Wildlife Service  
U.S. Housing and Urban Development  
U.S. Coast Guard  
United Keetoowah Band of Cherokee

#### **State Agencies:**

SC Budget and Control Board  
SC Commissioner of Human Affairs  
SC Department of Agriculture  
SC Department of Archaeology and Anthropology  
SC Department of Archives and History  
SC Department of Health and Environmental Control  
SC Department of Legislative Affairs  
SC Department of Natural Resources  
SC Department of Parks, Recreation, and Tourism  
SC Department of Transportation  
SC Forestry Commission  
SC Secretary of Commerce

#### **Others:**

SC Wildlife Federation  
The National Wild Turkey Foundation  
The Nature Conservancy





The Ridge Heritage Association  
The Sierra Club  
The South Carolina National Heritage Corridor

Response letters were received from the following:

SCDHEC Bureau of Air Quality – response stated South Carolina is currently attaining all of the NAAQS but may face non-attainment when designations for the new ozone standards are made; and that that two criteria pollutants are of concern: Ozone and Particulate Matter 2.5.

SCDHEC Bureau of Land and Waste Management Underground Storage Tank Management Division – response included a map of “non-vulnerable” sites within a half-mile radius of selected project locations that are either known, permitted, or regulated by ACDHEC-BLWM.

SCDNR Wildlife Diversity Section – response did not provide specific comments but expressed general comments regarding highway widening projects including a discussion of minimizing impacts to wetlands and to threatened and endangered species.

Senator Lawrence K. Grooms – response stated that Clements Ferry Road is a vital artery and that its expansion is vital for economic growth and safety.

The U.S. Fish and Wildlife Service South Carolina Ecological Services Office -- response recommended that SCDOT should select the least damaging alignment while the project is in the planning stages and include a list of species that may occur in Berkeley County and are currently protected under the ESA Act of 1973.

The proposed project was also discussed at the Agency Coordination Effort (ACE) meeting held on January 11, 2018. SCDOT, FHWA, SCDNR, SHPO, SCDHEC-OCRM, USFWS, NOAA, and the USACE were in attendance. The Project Team presented a basic description of the project, including administration, management and status of project development. In addition, the Preferred Alternative was presented, which included a discussion of project impacts. The project schedule was also discussed, including potential timing of a public hearing, permit submittal, and construction.



## 5.2 Public Involvement

A Public Information Meeting (PIM) was held at the Philip Simmons Middle School in Wando, S.C. on April 27, 2017, from 5:00 to 7:00 pm. The public notification for the meeting was advertised in the Post and Courier on April 12, 2017. The purpose of the meeting was to provide information and solicit feedback from residents concerning the proposed widening of Clements Ferry Road from Jack Primus Road to SC 41. Another purpose of the meeting was to gather information on historic or cultural resources.

Meeting materials include a copy of the public meeting notice, public meeting handout, public meeting displays, and public meeting sign-in sheets and comment forms. The meeting was attended by Engineering and Environmental personnel from Berkeley County and the SCDOT, and representatives from Infrastructure Consulting & Engineering. The Public Meeting was advertised through a local newspaper advertisement, signage along the roadway, and Berkeley County's website.

A total of 123 people attended the meeting; 31 written comments were received at the meeting; and an additional eight were received after the meeting during the 30-day response period. A summary of the Public Information Meeting is in Appendix K.

Upon approval of the EA, SCDOT will conduct a Public Hearing to provide an opportunity to review and comment on the project. The Public Hearing will be appropriately advertised, along with notification of availability of the approved EA, which will be made available for review prior to the Public Hearing at the appropriate Department's District office, at SCDOT Headquarters, and online at [www.scdot.org](http://www.scdot.org). A public hearing certification package will be prepared decision document that includes responses to all comments received as part of the public hearing process.