4.8 Air Quality

4.8.1 How are Air Quality Standards Regulated?

Air Quality refers to the condition of the air and level of pollutants such as smoke, dust, smog, or other impurities. Air quality is assessed by measuring pollution indicators or criteria pollutants.

Criteria pollutants are the only air pollutants with acceptable levels defined by national air quality standards that define allowable concentrations of these substances in ambient air. The criteria pollutants are carbon monoxide, ozone, nitrogen, lead, sulfur dioxide, and particulate matter.

The Clean Air Act of 1970 amended (CAA) section 176(c) requires that federal transportation projects remain consistent with state air quality goals found in the State Implementation Plan (SIP) which is developed by the South Carolina Department of Health and Environmental Control (SCDHEC). Transportation Conformity is the process to ensure consistency and that transportation activities do not cause new violations of the National Ambient Air Quality Standards (NAAQS), worsen existing violations of the standard, or delay timely attainment of the standard. Atmospheric pollutants which are considered as such by the NAAQS include carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO2), ozone (O3), particulate matter (PM10 and PM2.5), and sulfur dioxide (SO2). The United States Environmental Protection Agency (USEPA) also regulates mobile source air toxics (MSATs). Due to their association with roadway transportation sources, CO, O3, PM2.5, and MSATs are reviewed for potential effects on nearby receptors with respect to roadway projects. The SCDHEC's Bureau of Air Quality is responsible for regulating and ensuring compliance with the CAA in South Carolina.

Section 107 of the CAA requires the USEPA to publish a list of all geographic areas in compliance with the NAAQS as well as those not in compliance. This designation is made on a pollutant-by-pollutant basis for geographic areas. The USEPA's current designations and scale of an area are as follows:

- Attainment - Area is in compliance with NAAQS
- Unclassified - Area has insufficient data to make a determination. Unclassified areas are treated as being in attainment.
- Nonattainment - Area is not in compliance with NAAQS
- Maintenance - Area once classified as nonattainment but currently demonstrates attainment of NAAQS

Charleston County is currently in attainment based on air quality monitoring data collected in the region.

4.8.2 What are the Potential Environmental Consequences to Air Quality?

4.8.2.1 How would the No-Build Alternative Impact Air Quality?

The No-Build alternative would result in more traffic congestion and idling of vehicles, which would result in an increase in pollutants. In addition, as industry and population grow there will be more vehicles within the corridor and congestion will also increase. This traffic congestion will increase pollution to the detriment of local air quality. The No-Build alternative is not anticipated to put the region into nonattainment or maintenance for any of the NAAQS.

4.8.2.2 How would the Reasonable Alternatives Impact Air Quality?

The absolute concentrations of benzene and ethyl benzene will experience a greater reduction in the Recommended Preferred Alternative than in the No-Build alternative.

A quantitative analysis of MSAT impacts was conducted for the interchange at I-526 and I-26. This interchange experiences the highest daily traffic along the corridor and would therefore be the expected location of greatest impacts to air quality on nearby populations. All Reasonable Alternatives, which include a single 2050 build and no build scenario, would experience significant overall reductions between 2015 and 2050 for all MSAT pollutants included in the analysis. These reductions, in large part, are due to the tiered emission reduction requirements imposed on auto makers doing business within the United States. The quantitative MSAT impact analysis placed special focus on the highest air quality impacts within the interchange-adjacent EJ neighborhoods as compared to the highest impacts within the greater modeling domain. For all pollutants examined except benzene and ethyl benzene, the locations of highest impact within the modeling domain were not located in any of the EJ neighborhoods adjacent to the interchange. In the case of benzene and ethyl benzene, the domain-wide highest impact locations were located within the Highland Terrace EJ neighborhood. There are many contributors to this including the proximity of the Highland Terrace neighborhood to a single-lane interchange ramp link with exceptionally low peak hour average speeds coupled with the fact that both pollutants are emitted at much higher rates at low vehicle speeds in the USEPA's latest version of MOtor Vehicle Emission Simulator (MOVES2014b), the emissions model used for this analysis. There are several proposed single-lane or multi-lane ramps with relatively low rates of average speed situated very close to the location of highest impact in Highland Terrace.

Between 2015 and 2050, concentrations of benzene are projected to experience an 88.46 percent reduction in the No-Build alternative whereas the projected reduction for the Recommended Preferred Alternative is marginally higher, at 90.11 percent. For ethyl benzene, the projected reduction in the No-Build alternative is 92.26 percent and that for the Recommended Preferred Alternative is, again, marginally higher at 93.34 percent. While all MSAT emissions, in general, are projected to drop precipitously between 2015 and 2050 due to improved vehicle emission requirements, it should be noted that the impact analysis showed greater impacts on receptors (i.e. residents) closer to the interchange for all pollutants modeled. For more detailed information please refer to the quantitative impact assessment for MSATs found in Appendix J, Air Quality Impact Analysis.

During construction, the contractor(s) will ensure particulate matter emissions will be minimized by using fugitive dust control measures such as covering or treating disturbed areas with dust suppression techniques, sprinkling, covering loaded trucks, and other dust abatement controls, as appropriate. Construction-related Mobile Source Air Toxics (MSAT) emissions will be minimized by using low emission diesel fuel for non-road diesel construction equipment. Provisions will be included in project plans and specifications requiring contractors to make every reasonable effort to minimize construction air quality impacts through abatement measures such as limiting construction equipment idling and other emission limitation techniques, as appropriate.

The contractor(s) will ensure that all construction equipment is properly tuned and maintained. Idling time will be minimized to save fuel and reduce emissions. Water will be applied to control dust impacts off site. There will be no open burning of removed vegetation. Vegetation will be chipped or delivered to waste energy facilities.

4.9 Noise

4.9.1 What is Noise?

Highway traffic noise is usually a composite of noises from engine exhaust, drive train, and tire-roadway interaction. Decibels (dB) are the unit used to measure the intensity of sound. The commonly accepted range of human hearing is between the threshold of hearing at zero decibels and the threshold of pain at 140 decibels.

Noise is defined as unwanted sound from natural or man-made sources.

The degree of disturbance or annoyance from exposure to unwanted sound – noise – depends upon three factors:

- The amount, nature, and duration of the intruding noise;
- The relationship between the intruding noise and the existing (ambient) sound environment; and
- The situation in which the disturbing noise is heard

In considering the first of these factors, it is important to note that individuals have a varying sensitivity to noise. Loud noises bother some people more than others. The time patterns and durations of noise(s) also affect perception as to whether the noise is seen as offensive. For example, noises that occur during nighttime (sleeping) hours are typically considered to be more offensive than the same noises in the daytime.

Regarding the second factor, individuals tend to judge the annoyance of an unwanted noise in terms of its relationship to noise from other sources (background noise). A car horn blowing at night when background noise levels are low would generally be more objectionable than one blowing in the afternoon when background noise levels are typically higher.

The third factor – situational noise – is related to the intrusion of noise with activities of individuals. For traffic noise measurements, decibels are most commonly reported in terms of the A-weighting frequency scale, which best includes the frequencies to which human hearing is typically most sensitive and is denoted by the abbreviation dB(A). In a 60 dB(A) environment such as is commonly found in a large business office, normal conversation would be possible, while sleep might be difficult. Loud noises may easily interrupt activities that require a quiet setting for greater mental concentration or rest; however, the same loud noises may not interrupt activities requiring less mental focus or tranquility.

Noise levels from rail and both commercial and military aircraft from the Charleston International Airport were considered. Refer to Appendix K for further information of how railroad and aircraft noise were taken into consideration in the noise analysis.

4.9.2 How does SCDOT Evaluate Noise Impacts?

FHWA has developed Noise Abatement Criteria (NAC) and procedures to be used in the planning and design of highways. The purpose of establishing regulations is, "to provide procedures for noise studies and noise abatement measures to help protect the public's health, welfare and livability, to supply noise abatement criteria, and to establish requirements for information to be given to local officials for use in the planning and design of highways approved pursuant to Title 23, United states Code (U.S.C.)." FHWA's abatement criteria and procedures are set forth in Title 23 CFR Part 772, which also states, "in abating traffic noise impacts, a highway agency shall

give primary consideration to exterior areas where frequent human use occurs."

Table 4.9, Noise Abatement Criteria, is a summary of the NAC for various land uses. Regarding traffic noise, fluctuating sound levels of traffic noise are represented in terms of Leq, the steady, or "equivalent," noise level with the same energy. If the difference between the existing noise level and the predicted noise level under the Recommended Preferred Alternative equals 15 dBA equivalent sound level (Leq) or greater, noise impacts would occur.

Table 4.9 Noise Abatement Criteria

Activity Category	Leq (h)* Noise Levels (dBA)	Description of Activity Category
A	57 (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 (exterior)	Residential
C	67 (exterior)	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52 (interior)	Auditoriums, day care 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)	Hotels, motels, offices, restaurants/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.

* Leq(h) is hourly equivalent sound level

SCDOT's Traffic Noise Abatement Policy (October 16, 2019) establishes official policy on highway noise. This policy describes SCDOT's process that is used in determining traffic noise impacts, construction noise impacts, abatement measures, and the equitable and cost-effective expenditure of public funds for traffic noise abatement. Where the FHWA has given highway agencies flexibility in implementing the 23 CFR Part 772 standards, this policy describes SCDOT's approach to implementation.

Ambient sound level data was acquired at thirty-six noise monitoring locations (NMLs) between April 1 and April 4, 2019. The I-526 Lowcountry Corridor WEST Detailed Noise Analysis is in Appendix K and contains the technical details of the modeling and impact analysis.

The two categories of traffic noise impacts are defined as 1) those that "approach" or exceed the FHWA NAC and 2) those that represent a "substantial increase" over existing noise levels as defined by SCDOT.

A Traffic Noise Model (TNM) 2.5 model representing existing conditions was created utilizing receptors, roadways, terrain lines, ground zones, and barriers (to represent structures). Classified traffic and speed data during each monitoring session was applied to validate the baseline TNM model at all ambient noise monitoring locations for which traffic was the dominant source to SCDOT's goal and the FHWA-accepted tolerance of within ±3 decibels (±3 dB(A)). For further information about the measurement of the existing noise levels and validation of the TNM 2.5 model, please refer to the Detailed Noise Analysis, which can be found in Appendix K. Refer to Appendix K for figures that show the noise receptor locations and model validation locations.[1]

4.9.3 What are the Potential Noise Environmental Consequences?

TNM-predicted traffic noise levels were evaluated at all project noise-sensitive receptors; noise levels were then assessed at correlating locations. TNM model elements were then incorporated into the validated TNM model(s) to represent the Design Year 2050 Build scenario. Traffic noise impacts were assessed per SCDOT NAC and Substantial Increase Criteria of 15 dB(A) increase in predicted design year loudest-hour equivalent noise levels over existing base year loudest-hour equivalent noise levels.

Approximately 2,200 individual noise receptors were identified in the project area.

The project area is divided into Noise Study Areas (NSAs) consisting of similar land uses. Forty-nine NSAs were identified in the project corridor, see Detailed Traffic Noise Analysis Report found in Appendix K. The existing land use consists of primarily single-family and multi-family residences (Category B) as well as some places of worship, apartment pools, trails (Category C), medical facilities and places of worship (Category D), and restaurant patios (Category E). Receptors representing places of worship and medical facilities were only considered as Category D if no exterior area of frequent human activity was identified.

4.9.3.1 How would the No-Build Alternative Impact Noise?

Based on the noise analysis for the No-Build alternative, noise levels would approach or exceed the NAC established in SCDOT Traffic Noise Abatement Policy for 589 receptors. The majority of the levels exceeding the NAC are at NAC Category B (residences). Preliminary predicted exterior noise levels for the No-Build alternative range from 43 to 78 dB(A).

1 Traffic Noise Abatement Policy", South Carolina Department of Transportation, October 16, 2019

4.9.3.2 How would the Recommended Preferred Alternative Impact Noise?

The Recommended Preferred Alternative traffic noise is predicted to impact 720 receptors. Table 4.10 shows the number and types of predicted traffic noise impacts designated as either approaching or exceeding the FHWA NAC. The table also shows a substantial increase in Recommended Preferred Alternative traffic noise levels over existing ambient noise levels, or by meeting both criteria. Preliminary predicted exterior noise levels for the Recommended Preferred Alternative range from 45 to 80 dB(A).

Table 4.10 Predicted Traffic Noise Impact Summary

Study Alternative	Reason for Noise Impact	Noise Abatement Criteria Impact by Activity Categories[1]							All Activity Categories
		A	B	C	D	E	F[5]	G[6]	
Design Year 2050 Build	NAC Only[1]	0	710	9	0	1	0	0	720
	Substantial Increase Only[2]	0	0	0	0	0	0	0	0
	By Both Criteria[3]	0	0	0	0	0	0	0	0
	Total Impacts[4]	0	710	9	0	1	0	0	720

1 Predicted traffic noise impacts due to loudest hourly equivalent noise levels that approach or exceed NAC (refer to Appendix G)
2 Predicted traffic noise impacts due to Design Year loudest hourly equivalent noise levels that are a "Substantial Increase" over existing base year levels
3 Predicted traffic noise level impacts due to both 1 and 2
4 Only one of the Note 1 and Note 2 conditions must be met for an impact to exist
5 There are no impact criteria for NAC F land use facilities, no analysis of noise impacts is required
6 There are no impact criteria for undeveloped lands; however, appropriate predicted traffic noise levels contours are provided to local officials to aid in future land use planning efforts. Per TNM 2.5 and in accordance with 23 CFR Part 772

4.9.4 How would Noise Impacts be Mitigated?

In accordance with 23 CFR §772.13 (c) and SCDOT's Noise Abatement Policy, noise abatement measures must be considered for reducing or eliminating noise levels to impacted receivers.[2] When considering noise abatement measures, primary consideration shall be given to exterior areas where frequent human use occurs. Since South Carolina is not part of the FHWA-approved Quiet Pavement Pilot Program, the use of quieter pavements was not considered as an abatement measure for the proposed project. Planting of vegetation or landscaping is not an acceptable Federal-aid noise abatement measure and was not considered as a potential abatement measure. Only dense stands of evergreen vegetation planted for a width of 100 feet between the roadway and noise-sensitive receptors can reduce noise levels. The following measures were considered to reduce or eliminate the traffic noise impacts:

- Acquisition of rights-of-way;
- Traffic management;
- Alteration of horizontal and vertical alignments;
- Acquisition of real property or interests therein (predominantly unimproved property) to serve as a buffer zone to preempt development;
- Noise insulation of public use or nonprofit institutional structures; and
- Noise barriers

Of these noise abatement measures, only noise barriers were carried forward for consideration. The acquisition of additional right-of-way to alter the alignment or create a buffer zone would result in an increase in impacts.

Each impacted receptor was evaluated for feasibility and reasonableness of noise abatement per SCDOT Policy. Appendix K includes a description of abatement consideration for each NSA. Refer to Figures 4.11 and 4.12 for the locations of the NSAs.

Consideration for noise abatement measures was given to all impacted receptors. Traffic noise impacts are predicted to occur in 40 of the 49 identified NSAs.

The following NSAs were not considered for noise abatement:

- NSA-1 - Only one impacted receptor
- NSA-3 - No impacted receptors
- NSA-11 - No impacted receptors
- NSA-12 - Only one impacted receptor
- NSA-14 - The walking trail at Faber Place does not have enough usage to have an equivalent receptor value that will equal three.
- NSA-15 - Per the Awaken Church Day School, only 35 children and two staff members use the playground for one hour per day. The equivalent receptor value does not equal three.
- NSA-17a - Only one impacted receptor
- NSA-18 - For receptors R18-1, R18-2, R18-3 and R18-13 along Paramount Drive, a noise abatement measure will not be feasible due to the driveway access to the College of Charleston and a break at Lysa Avenue. A noise abatement measure would not be possible for the impacted receptors along Dorchester Road due to major power transmission lines crossing Dorchester Road. Also, in order to install a noise wall along Dorchester Road, the right-of-way necessary to build the wall would result in the acquisition of the impacted residences.
- NSA-19 - the pool area at Suburban Extended Stay is not impacted by the project
- NSA-20 - The Kingdom of God Ministries is not impacted by the project

2 "Traffic Noise Abatement Policy", South Carolina Department of Transportation, October 16, 2019.

- NSA-20a - The future Charleston County School System stadium is an Active Sports Area. Per SCDOT Policy active sports areas do not fall within the classification of non-residential uses, as a quiet environment is not important for normal activities. As such, these areas are equivalent to one impacted residence.
- NSA-22 - Noise abatement measures for impacted receptors R22-1, R22-2, R22-3 and R22-12 will not be feasible due to driveway access along west Montague Avenue and powerlines. NSA-22 is also within the 65 dB contour noise levels from the Charleston International Airport.
- NSA-23 - No impacted receptors
- NSA-24 - No impacted receptors
- NSA-30 - Only one impacted receptor
- NSA 33 - Only one impacted receptor
- NSA-33a - For the impacted townhouse receptors east of North Rhett Avenue at Seeport Drive, abatement measures will not be feasible due to major power lines and the driveway access at the townhouses.
- NSA-34 - Only one impacted receptor
- NSA-34a - The R.M. Hendricks Park is under the Cooper River Bridge. Noise abatement measures will not be feasible for the park due to major powerlines along Virginia Avenue. Also, the walking trail through the park does not have enough usage for an equivalent receptor value that will equal three. See Appendix B.
- NSA-35 - Only two impacted receptors
- NSA-35a - No impacted receptors
- NSA-36 - No impacted receptors

The following barrier was analyzed but did not meet feasibility criteria.

- NSA-29 - South of I-526, east of US 52 (Rivers Avenue), south of Filbin Creek and west of the CSX Railroad.

The following barriers met feasibility criteria but did not meet the reasonableness criteria for allowable cost per benefit (cost-effectiveness).

- NSA-2 - West of I-526 and surrounding Savage Road
- NSA-16 - West of I-526 and south of Paramount Drive
- NSA-17 - East of I-526 and south of Dorchester Road and east of Paramount Drive
- NSA-21 - East of I-526 and south of West Montague Avenue
- NSAs 26/26a - West of I-26, east of South Aviation Avenue and adjacent to the Norfolk Southern Railway
- NSA-27 - North of I-526, east of I-26, south of Filbin Creek and west of US 52 (Rivers Avenue)
- NSA-28 - South of I-526, east of I-26 and west of US 52 (Rivers Avenue)
- NSA-31/31a - North of I-526, east of the CSX Railway, north of the Norfolk Southern Railway and east of Attaway Street. Although preliminary met cost-effectiveness criteria, during the constructability review, additional costs were considered to employ a structure mounted noise wall. The cost needed to achieve federal safety compliance for a structure-mounted noise wall on the collector-distributor (C-D) viaduct and other issues related to construction and maintenance renders NW 31/31a as cost-prohibitive and should not be included for construction in the project. See Appendix E of the DEIS Appendix G.
- NSA-32/32a - South of I-526, east of Attaway Street, south of Filbin Creek and the Norfolk Southern Railway, east of Parkside Drive and west of N Rhett Avenue
- NSA-37 - East of I-26, west of US 52 (Rivers Avenue), south of Remount Road and north of the Norfolk Southern Railway
- NSA-37a - East of I-26, west of US 52 (Rivers Avenue) and south (and north) of the Norfolk Southern Railway

The following noise barriers are presently considered to be feasible and reasonable and are recommended for construction. During the constructibility review for the following noise barriers, it was determined that the construction will be typical ground-mounted roadside noise wall construction with no additional cost to accommodate the wall. Refer to Appendix G.

- NSA-4 and NSA-6 - West of I-526 between Paul Cantrell Boulevard and Ashley River Road in West Ashley. Based on the studies completed to date, the State intends to install a noise abatement measure in the form of a barrier at the Arboretum Condominiums and Plantation Oaks Apartments. These preliminary indications of a likely abatement measure are based upon preliminary design for a barrier of 20 feet high and 2,640 feet long and a cost of $1,847,860 that will reduce the noise level by 5 to 13 dB(A) for 213 residences. If during final design these conditions substantially change, the abatement measure might not be provided. A final decision on the installation of the abatement measure will be made upon completion of the project design and the public involvement process.
- NSA-6a and NSA-8 - West of I-526 between Ashley River Road and the Ashley River in West Ashley. Based on the studies completed to date, the State intends to install a noise abatement measure in the form of a barrier at the Planters Trace Apartments and the Middleton Cove Apartments. These preliminary indications of a likely abatement measure are based upon preliminary design for a barrier of 16 feet high and 3,000 feet long and a cost of $1,680,035 that will reduce the noise level by 5 to 11 dB(A) for 157 residences. If during final design these conditions substantially change, the abatement measure might not be provided. A final decision on the installation of the abatement measure will be made upon completion of the project design and the public involvement process.
- NSA-5 - East of I-526 and north of Paul Cantrell Boulevard. Based on the studies completed to date, the State intends to install a noise abatement measure in the form of a barrier at residences along Richmond Street and the Colonial Village at Westchase Apartments. These preliminary indications of a likely abatement measure are based upon preliminary design for a barrier of 19 feet high and 2,969 feet long and a cost of $1,974,525 that will reduce the noise level by 5 to 13 dB(A) for 191 residences. If during final design these conditions substantially change, the abatement measure might not be provided. A final decision on the installation of the abatement measure will be made upon completion of the project design and the public involvement process.
- NSAs 7, 9 and 10 - East of I-526 and north of Ashley Harbor. Based on the studies completed to date, the State intends to install a noise abatement measure in the form of a barrier at the Ashley Oaks Apartments and the Ashley Harbor community. These preliminary indications of a likely abatement measure are based upon preliminary design for a barrier of 13 feet high and 4,560 feet long and a cost of $2,074,800 that will reduce the noise level by 5 to 14 dB(A) for 140 residences, tennis courts and a walking trail. If during final design these conditions substantially change, the abatement measure might not be provided. A final decision on the installation of the abatement measure will be made upon completion of the project design and the public involvement process.
- NSA-25 - East of I-526 and west of I-26, across from Boeing Company and Charleston International Airport. Based on the studies completed to date, the State intends to install a noise abatement measure in the form of a barrier at the Centre Pointe Apartments. These preliminary indications of a likely abatement measure are based upon preliminary design for a barrier of 19 feet high and 1,650 feet long and a cost of $1,097,250 that will reduce the noise level by 5 to 12 dB(A) for 38 residences. If during final design these conditions substantially change, the abatement measure might not be provided. A final decision on the installation of the abatement measure will be made upon completion of the project design and the public involvement process.

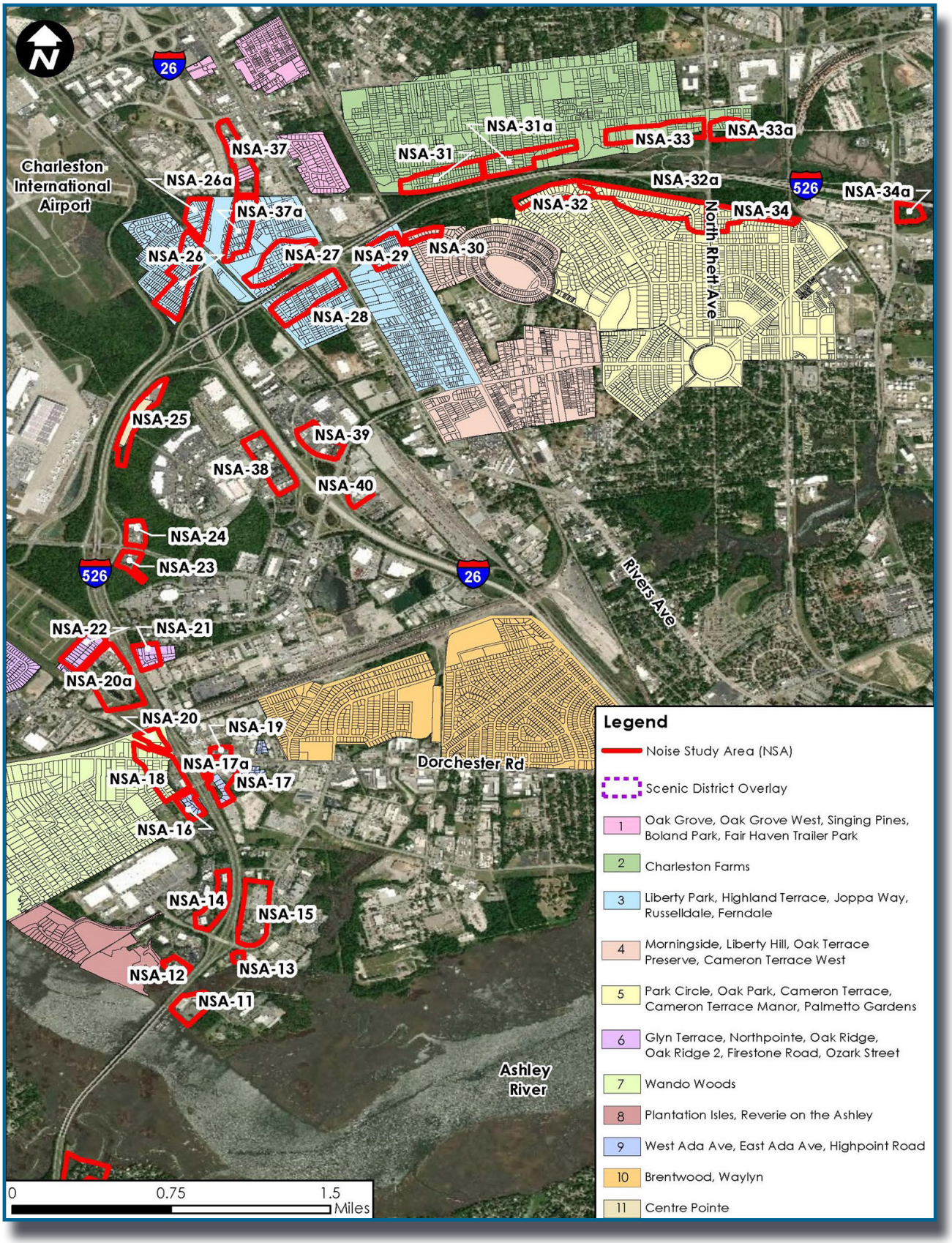

Figure 4.11 North Charleston Noise Study Areas

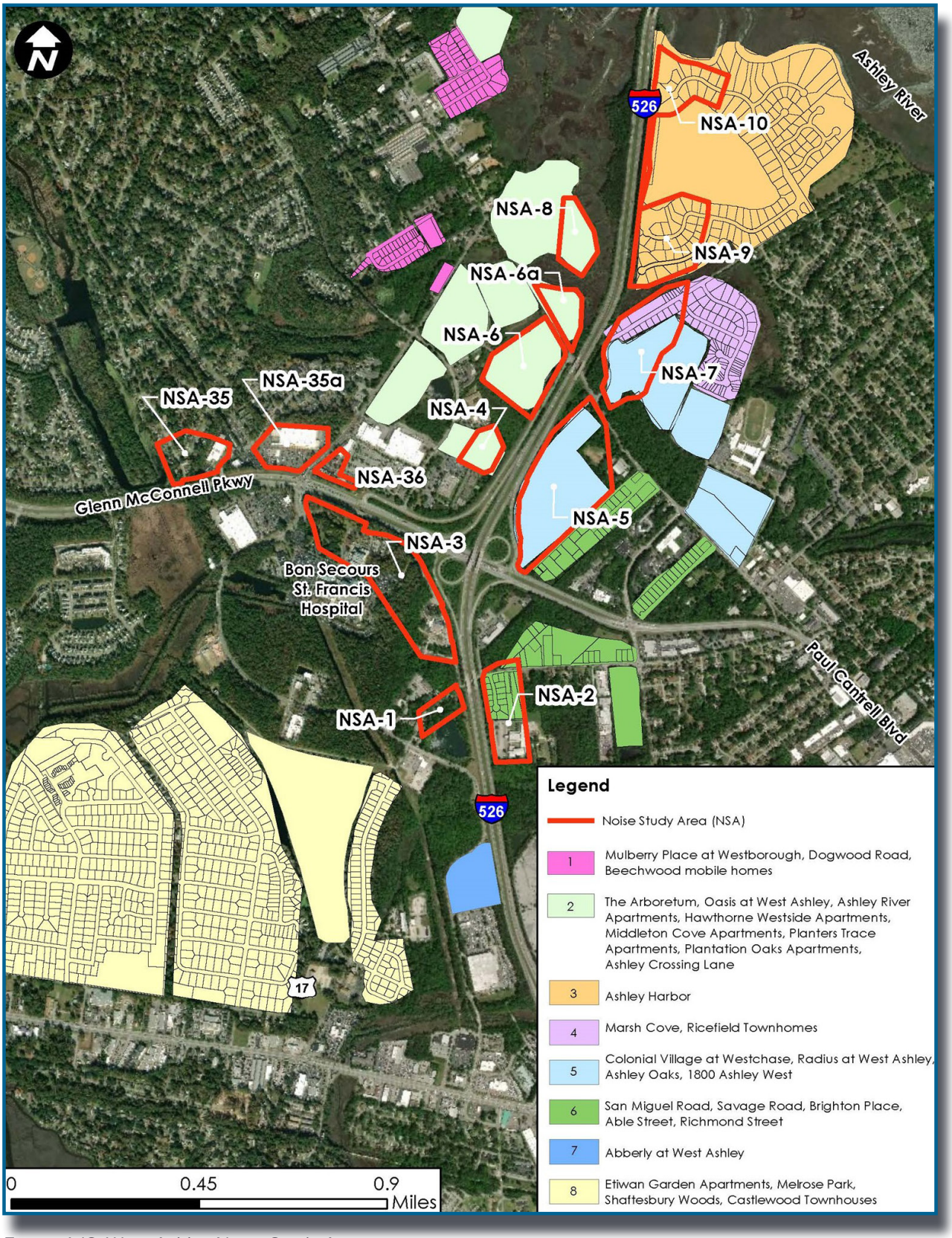

Figure 4.12 West Ashley Noise Study Areas

Table 4.11 Noise Wall Analysis Summary

Noise Barrier Name (NSA)	Length (ft)	Area (ft^2)	Number of Benefited Receptors	Cost per Benefited Receptor/ Allowable Cost per Benefited Receptor	Recommended for Construction
NW 2 (NSA-2)	2,070	49,409	18	$96,073 / $30,000	No
NW 4/6 (NSAs 4 and 6)	2,640	52,796	213	$8,675 / $30,000	Yes
NW 6a/8 (NSAs 6a and 8)	3,000	48,001	157	$10,701 / $30,000	Yes
NW 5 (NSA 5)	2,969	56,415	191	$10,338 / $30,000	Yes
NW 7/9/10 (NSAs 7,9 and 10)	4,560	59,280	140	$14,820 / $30,000	Yes
NW 16 (NSA-16)	840	16,801	6	$98,006 / $30,000	No
NW 17 (NSA-17)	2,196	33,913	5	$237,391 / $30,000	No
NW 21 (NSA-21)	2,333	44,325	23	$67,451 / $30,000	No
NW 25 (NSA-25)	1,650	31,350	38	$28,875 / $30,000	Yes
NW 26/26a (NSAs 26 and 26a)	4,669	109,976	62	$62,083 / $30,000	No
NW 27 (NSA-27)	5,675	90,046	53	$59,464 / $30,000	No
NW 28 (NSA-28)	5,516	81,787	78	$36,699 / $30,000	No
NW 29 (NSA-29)	5,491	65,885	37	$62,624 / $30,000	No
NW 31/31a (NSAs 31 and 31a)	7,734	85,164	121	$24,634 / $30,000	No
NW 32/32a (NSAs 32 and 32a)	4,197	50,362	51	$34,562 / $30,000	No
NW 37 (NSA-37)	1,850	43,264	29	$52,215 / $30,000	No
NW 37a (NSA-37a)	2,310	50,441	28	$63,051 / $30,000	No

Note: Barrier heights vary within the NSA. Noise abatement was considered for all predicted traffic noise impacts.

In accordance with the 2019 SCDOT Traffic Noise Abatement Policy, noise walls NW 4/6, NW 6a/8, NW 5, NW 7/9/10, and NW 25, for the Recommended Preferred Alternative, meet Policy feasibility and reasonableness criteria and are recommended for construction. **The contractor will ensure the walls are designed and constructed to provide the appropriate noise abatement based on the parameters stated in the noise assessment completed for this project, and in close coordination with 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.

SCDOT and/or the contractor will make every reasonable effort to minimize construction noise through abatement measures such as work-hour controls and proper maintenance of muffler systems. During construction, powered construction equipment will not be operated during traditional evening and/or sleeping hours within 150 feet of a noise sensitive site, to be decided either by local ordinance and/or agreement with SCDOT.

4.10 Water Quality

4.10.1 How is Water Quality Assessed?

The Clean Water Act (CWA) of 1972 regulates the discharge of pollutants into our state's waters. The standards set by each state are based on criteria recommended by the USEPA. The USEPA has delegated the responsibility of monitoring and regulating water quality in South Carolina to the SCDHEC.

A drainage area is a geographic area in which all water drains to a common point. Watersheds are formed by the smaller drainage areas draining into a common outlet and a group of watersheds make up a sub-basin. Larger river basins are comprised of sub-basins.

4.10.2 In which Drainage Basin is the Project Located?

The US Geological Society (USGS) categorizes drainage areas by specific numbers, or hydrologic unit codes (HUCs). Sub river basins (within larger river basins) are given an eight-digit HUC (e.g. 03050201). Ten-digit HUCs are also provided for watersheds within eight-digit HUCs (e.g. 03050201-07). SCDHEC divides South Carolina into eight major river basins.[3] The proposed project study area is located entirely within the Santee River Basin. The Santee River Basin is subdivided into sub-basins and the project study area is predominantly located within the Cooper River sub-basin (HUC 03050201). However, the extreme southern portion of the project study area extends into the Stono River sub-basin (HUC 03050202). Refer to Figure 4.13. For more detailed information about the Santee River Basin and related sub-basins, please refer to Appendix L, the Natural Resources Technical Memorandum.

4.10.3 What Watersheds are within the Project Study Area?

The Cooper River and Stono River Sub-Basins are further divided into watersheds. The project is located within the Stono River Watershed (03050202-02), the Ashley River Watershed (HUC 03050201-06), and the Cooper River Watershed (03050201-07). For more information about the watersheds, please refer to Appendix LI, the Natural Resources Technical Memorandum.

3 https://www.scdhec.gov/sites/default/files/docs/HomeAndEnvironment/Docs/Watershed/wwqa/Santee_WWQA_2013.pdf

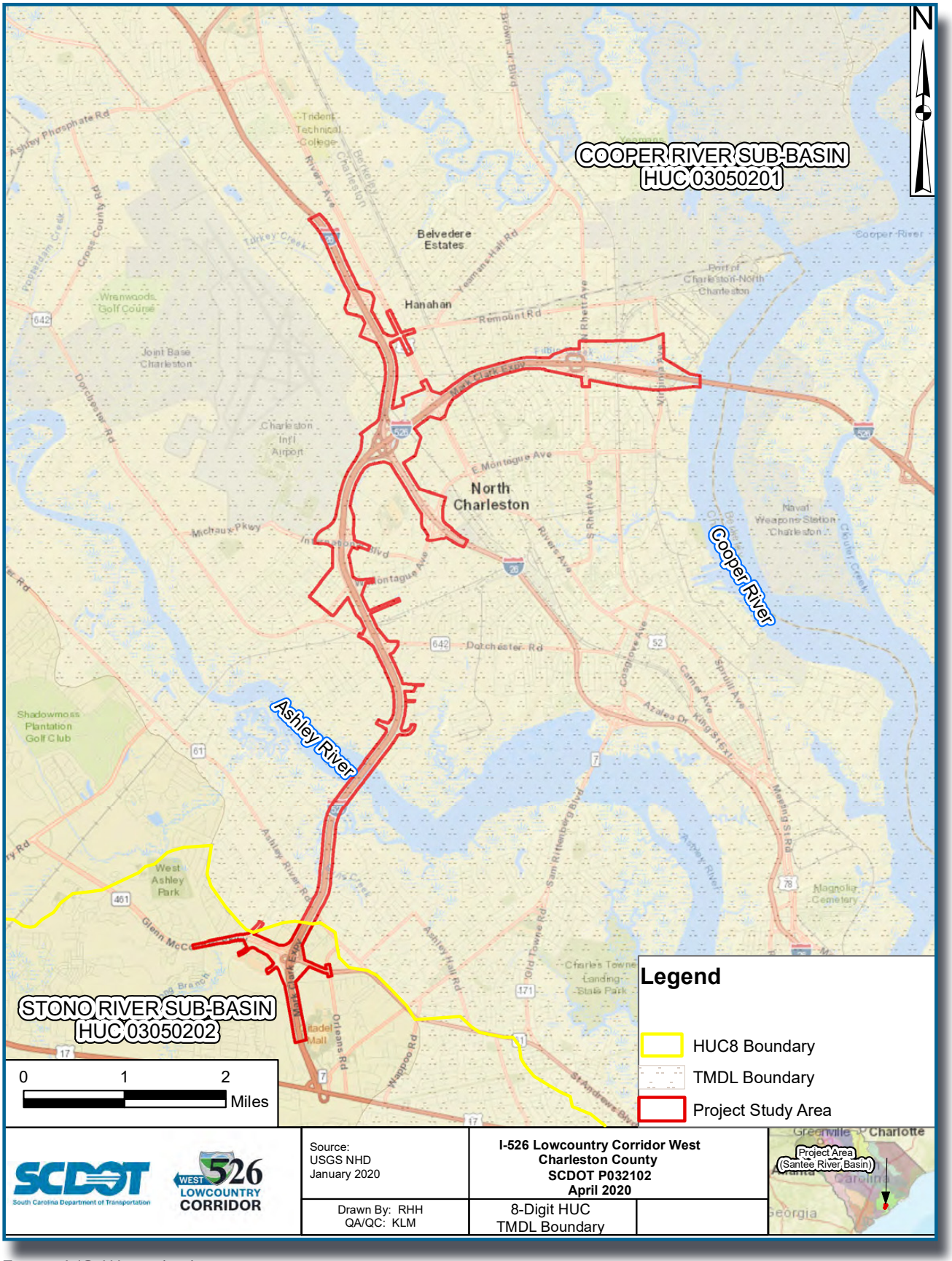

Figure 4.13 Watersheds

4.10.4 Are any Impaired Streams Located in the Project Study Area?

In accordance with Section 303(d) of the CWA, SCDHEC evaluates water bodies identified as impaired from pollutants included on the Section 303(d) list. The 303(d) list targets water bodies that do not meet water quality standards set by the state for water quality management, as well as identifying the cause(s) of the impairment and the designated classifications.

The 303(d) list is a state list of waters not meeting water quality standards or having impaired uses.

There are five water quality monitoring stations located within or near the project study area, refer to Figure 4.14. Station MD-249 is located within the project study area along Filbin Creek. According to SCDHEC's 2016 Section 303(d) list and the draft 2018 303(d) list, recreational use is not supported in Filbin Creek due to elevated levels of Enterococcus bacteria. Enterococcus is a large genus of bacteria that can be harmful to swimmers and others who use the rivers and streams when there are elevated levels in the water.

Two stations are located on the Cooper River. Station MD-248 is located downstream of the project, in the Cooper River, and station MD-044 is located upstream in the Cooper River. Neither MD-248 nor MD-044 are listed on the current or draft 303(d) lists.

Two stations are present in the Ashley River. Station MD-135 is downstream of the project area and is not listed as impaired on the current or draft 303(d) lists. Monitoring station MD-049 is located upstream of the project study area along the Ashley River and is listed on the SCDHEC's 2016 Section 303(d) list and the draft 2018 303(d) list. At this station, recreational use is not supported due to elevated levels of Enterococcus bacteria. Additionally, aquatic life uses are not supported at MD-049 based on pH and turbidity.[4] For more information about the water quality monitoring stations, please refer to Appendix L, the Natural Resources Technical Memorandum.

"pH is a measure of how acidic/basic water is... The pH of water is a very important measurement concerning water quality... Not only does the pH of a stream affect organisms living in the water, a changing pH in a stream can be an indicator of increasing pollution or some other environmental factor."
USGS - Water Science School: https://www.usgs.gov/special-topic/water-science-school/science/ph-and-water?qt-science_center_objects=0#qt-science_center_objects

"Turbidity is the measure of relative clarity of a liquid... Material that causes water to be turbid includes clay, silt, very tiny inorganic and organic matter, algae, dissolved colored organic compounds, and plankton and other microscopic organisms... In streams, increased sedimentation and siltation can occur, which can result in harm to habitat areas for fish and other aquatic life."
USGS – Water Science School: https://www.usgs.gov/special-topic/water-science-school/science/turbidity-and-water?qt-science_center_objects=0#qt-science_center_objects

4 https://www.scdhec.gov/food-safety/food-monitoring-advisories/fish-consumption-advisories/ashley-river-fish-consumption

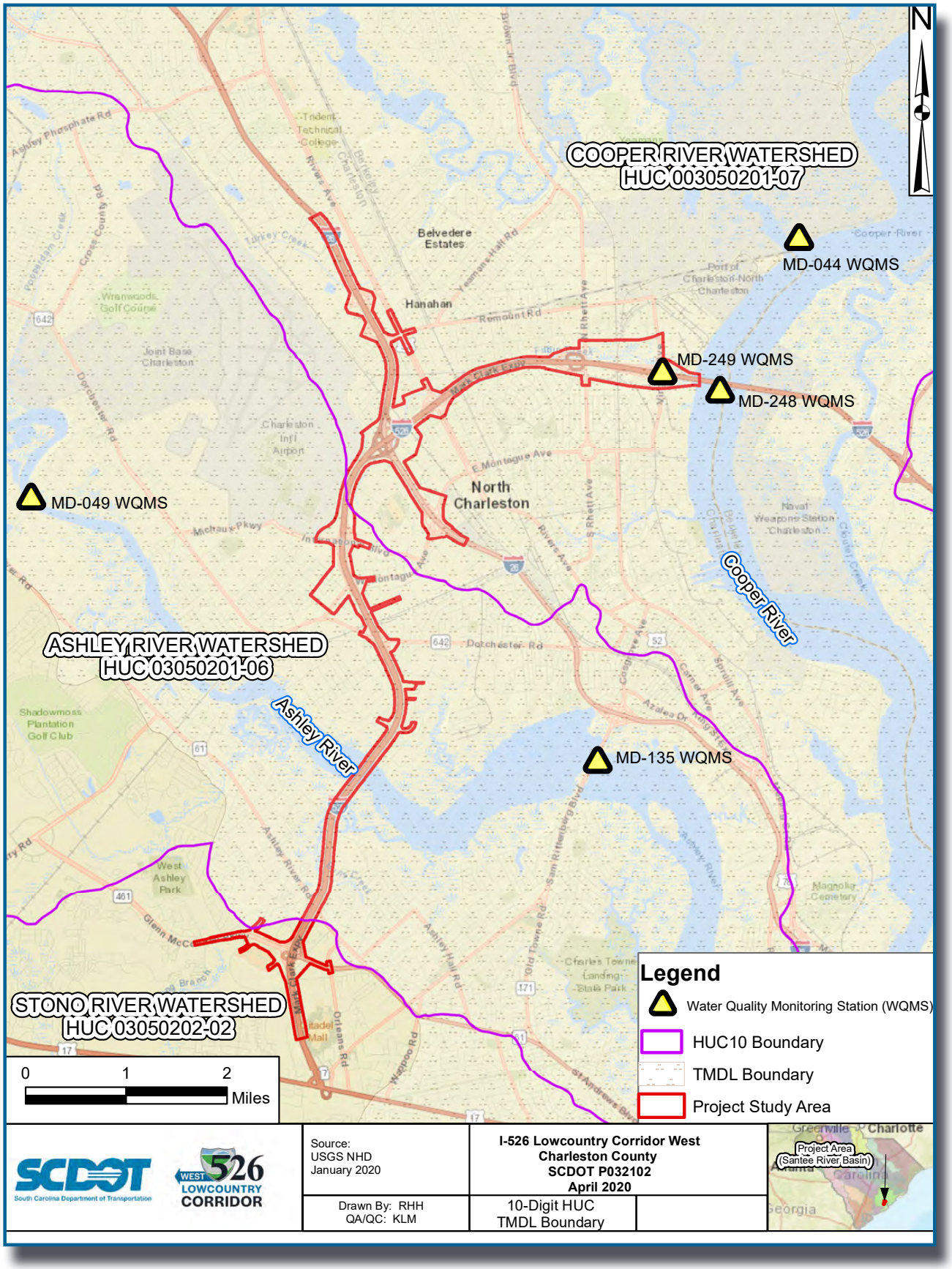

Figure 4.14 Water Quality Monitoring Stations

4.10.5 Have any TMDLs been Developed in the Project Study Area?

Once a site is included on the 303(d) list of impaired waters, a Total Maximum Daily Load (TMDL) must be developed. For more information about TMDL please refer to Appendix L, the Natural Resources Technical Memorandum.

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 SCDHEC.

A TMDL has been developed for the Charleston Harbor, Cooper, Ashley, and Wando Rivers and approved by the USEPA to identify opportunities to increase dissolved oxygen (DO) in the watershed.[5] Many coastal waters in South Carolina have DO levels below the established DO criteria. Wastewater dischargers and other anthropogenic influences may contribute to low DO in coastal waters. Natural factors can create naturally low DO conditions: such factors include organic loading, reduced oxygen levels from wetlands and marshes, and estuarine dynamics in the mixing zone where freshwater and saltwater come together. The waters in and around Charleston Harbor are both naturally low in DO and further impacted by wastewater dischargers. The National Pollutant Discharge Elimination System (NPDES) permit program regulates point source pollution by considering stormwater discharges, non-point sources, and natural background sources.

4.10.6 Are any Point Sources Located in the Project Study Area?

Point source discharge means a discharge which is released to the waters of the State by a discernible, confined, and discrete conveyance, including but not limited to a pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, vessel, or other floating craft from which waste is or may be discharged. The NPDES Permit Program was created by Section 402 of the CWA. In 1975, the SCDHEC Bureau of Water received authority from the USEPA to administer the NPDES Permit Program in South Carolina. For more information about point source discharges please refer to Appendix L.

The SCDHEC Bureau of Water is responsible for the permitting, compliance, monitoring, and enforcement activities of the NPDES program.

According to the Water Quality Assessment Report for the Santee River Basin (SCDHEC, 2013) and the SC Watershed Atlas (SCDHEC, 2018), six NPDES major discharge permitted facilities are authorized directly in, or within the vicinity of the proposed project. One is in the project study area and the remaining five are located north and south of the project.

- Kapstone Charleston Craft, LLC (SC0001759) holds a permit to discharge as a paperboard mill. This is located just north of Filbin Creek within the project study area and a second site is located just outside of the project study area.

For more information about the five NPDES major discharge permits issued within 2.5 miles of the project, but outside the project study area, refer to Appendix L.

One NPDES General Permit has been issued to Defense Fuel Support (SCG340022) to discharge as a petroleum bulk and/or terminal. This discharge location is situated within the project study area near Virginia Avenue, refer to Figure 4.15. Five NPDES discharge General Permits have been issued for areas near (within 2.5 miles) but outside of the project study area, refer to Appendix L.

5 https://www.scdhec.gov/sites/default/files/docs/HomeAndEnvironment/Docs/Chas_Hbr_DO_TMDL.pdf

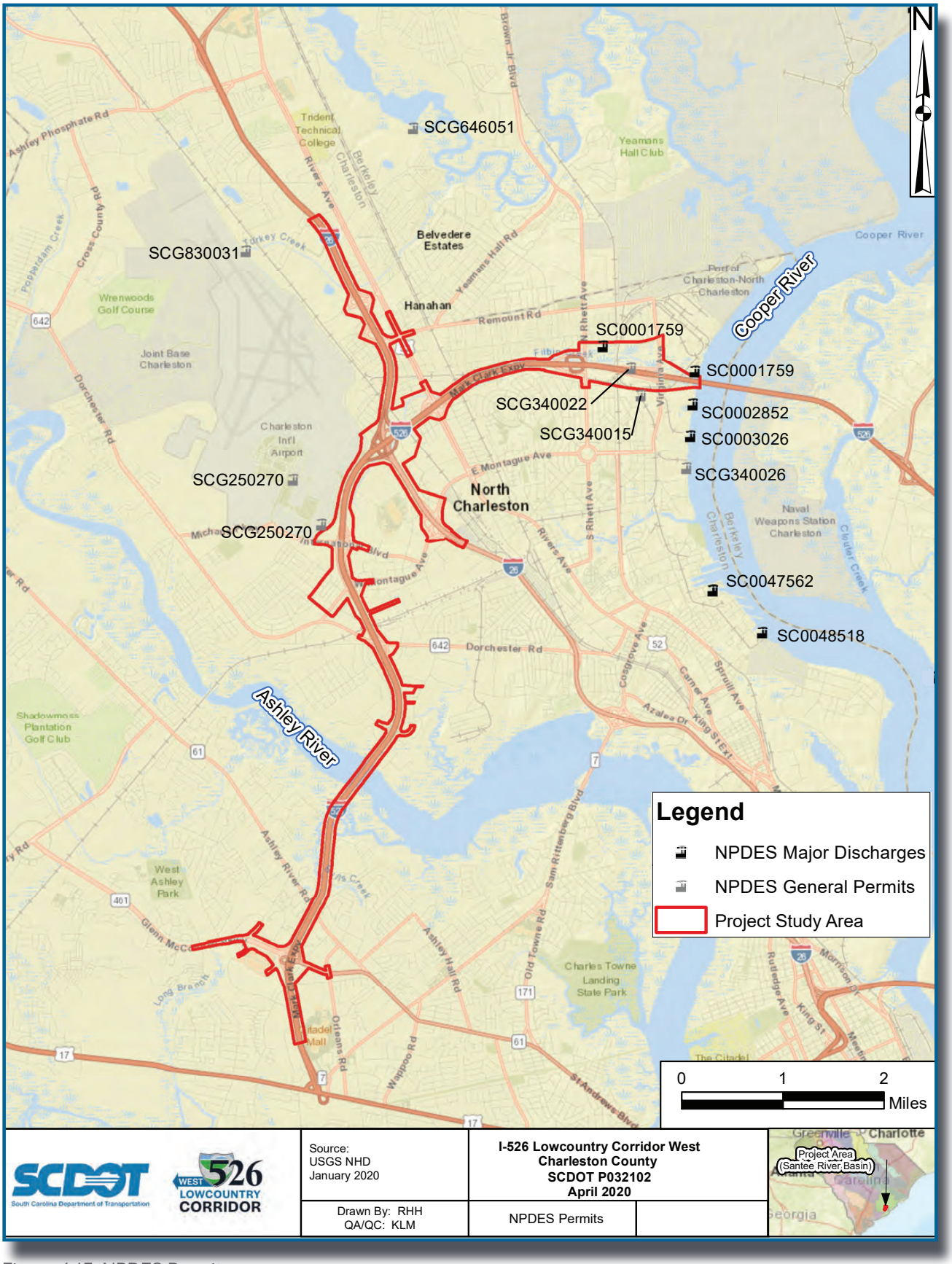

Figure 4.15 NPDES Permits

4.10.7 What are the Potential Environmental Consequences to Water Quality?

4.10.7.1 How would the No-Build Alternative Impact Water Quality?

The existing conditions would remain unchanged under the No-Build Alternative. This alternative would have negligible effects on water quality.

4.10.7.2 How would the Reasonable Alternatives Impact Water Quality?

The Reasonable Alternatives each propose to increase traffic capacity throughout the project study area (PSA) by adding more travel lanes, altering interchanges, widening bridges, and other road-related improvements. By adding travel lanes and reconfiguring interchanges, the amount of paved surfaces will change. Hardened areas that were once vegetated and could absorb rainwater (pervious surfaces) will be replaced by paved surfaces that are impenetrable to precipitation (impervious surfaces). The impervious surfaces can allow more stormwater and pollutants to run-off the surface into adjacent waterbodies. Additionally, through the process of pavement removal, some areas that are currently impervious would be reduced and restored to a pervious surface. These two actions are not equal and more impervious surface would be generated rather than removed as a result of the proposed project.

The Reasonable Alternatives impacts a similar footprint and will result in similar impacts to water quality within the project study area.

Table 4.12 shows that the Reasonable Alternatives would each increase the amount of impervious surface in the project study area. Each Reasonable Alternative would also remove some existing pavement, converting it back to a pervious surface.

Table 4.12 Increase of Impervious Surface by the Reasonable Alternative

	8-lane Mainline & Paul Cantrell Blvd	I-26/I-526 System & I-526 at Rivers Ave				I-526 at N Rhett/Virginia Ave				
		1	2*	1A	2A	1	2	2A*	5	6
Existing Right-of-Way (ROW) boundary (acres)	378	418	422	419	424	167	162	152	173	166
Impervious to Pervious (acres)	4	6	8	5	6	6	3	3	2	4
Pervious to Impervious (acres)	54	21	24	44	25	21	12	36	32	22

* Recommended Preferred Alternative

The term “nonpoint source” is defined to mean any source of water pollution that does not meet the legal definition of “point source” in section 502(14) of the CWA. Nonpoint source pollution generally results from water related to land runoff, precipitation, atmospheric deposition, and natural or manmade drainage systems. This type of pollution can come from many sources and is caused by rainfall moving over and through the ground. As the runoff moves, it picks up and carries natural and human-made pollutants that can be deposited into lakes, rivers, wetlands, coastal waters, and ground waters.

Non-point source pollution from a variety of sources would be present in the PSA. Fertilizers from maintained grasses and lawns can be picked up in water flow. Oil and grease found on roadways can be washed away during rainstorms. Sediment from construction sites can contain pollutants that can be picked up through water runoff. The implementation of a stormwater management plan for the collection and treatment of roadway stormwater runoff would decrease the potential of pollutants and sediments to impact the water quality.

The Ashley River is listed on the 303(d) List of Impaired Waters as a result of low dissolved oxygen. The proposed project will have a negligible effect on the dissolved oxygen levels in the Ashley River.

Much of the project study area is located within a TMDL watershed. The proposed project is not anticipated to affect this designation. Best management practices (BMPs) would be followed regardless of the Reasonable Alternative selected. These practices would eliminate or reduce sedimentation, thereby minimizing the potential effects sedimentation would have on the impairments in the project study area.

Examples of best management practices (BMPs) would be installation of grass swales, detention basins, check dams, silt fencing, etc.

4.10.8 How would Water Quality Impacts be Mitigated?

The final design of the proposed project would take into consideration the increase in the amount of stormwater during the stormwater modeling process. SCDOT BMPs guidelines would be followed during design and construction to minimize the amount of runoff pollution to streams. Similar to the current design, excess stormwater would be retained in vegetated swales, ditches, and detention basins before it is released into open waterbodies. This would reduce the number of suspended solids in stormwater and allow those solids to settle out before the water flows on to adjacent streams and ponds or other waters.

These policies recommend a range of sediment and erosion control measures for stormwater runoff including temporary silt fence, sediment basins, filter berms, and/or re-vegetative plantings.

During the construction process the contractor would avoid and minimize impacts resulting from stormwater runoff through adhering to policies contained in 23 CFR 650 B and S.C. Code of Regulations 72-400. SCDOT has also issued an Engineering Directive Memorandum (Number 23), dated April 10, 2015, regarding Department procedures to be followed to ensure compliance with Regulation 72-400, Standards for Stormwater Management and Sediment Reduction. Exposed areas would be stabilized by following the Department's Supplemental Technical Specification for Seeding (SCDOT Designation SC-M-810 (11-08)). **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.**

Due to the existing water quality impairments and the approved TMDL within the project watershed, SCDHEC may require additional water quality protection and stormwater treatment measures during and after construction. Specific mitigation requirements for impacts to water quality would be established during the CWA Section 404/401 permitting process.

4.11 Water Resources

Waters of the US (WOUS) are defined by 33 CFR 328.3(a)-(c) and protected by Section 404 of the CWA (33 U.S.C. 1344). WOUS also include wetlands, or areas that are saturated by water that support a majority of vegetation adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

The term Waters of the US includes the oceans, territorial seas; tributaries; lakes, ponds, and impoundments of jurisdictional waters; and adjacent wetlands.

Generally WOUS do not include groundwater, stormwater run-off, upland cut ditches, prior converted cropland, artificially irrigated areas, artificial lakes/ponds, or waste treatment systems (33 CFR 328.3(b)). WOUS do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the CWA, the final authority regarding CWA jurisdiction remains with the USEPA.

4.11.1 What Agencies are Responsible for Regulating Water Resources?

The United States Army Corps of Engineers (USACE) Charleston District regulates WOUS, including wetlands in South Carolina. The USACE's authority to regulate impacts to WOUS comes from Section 404 of the CWA. The USACE utilizes specific hydrologic, soil, and vegetation criteria in establishing the boundary of wetlands within their jurisdiction. In addition to wetlands, the USACE defines WOUS within CWA as Traditional Navigable Waters (TNWs) – including territorial seas and surface waters that flow to TNWs. Impoundments of these waters (ponds, lakes, and reservoirs) are also considered to be WOUS. Executive Order 11990 (Protection of Wetlands) established a national policy to avoid adverse impacts on wetlands wherever there is a practicable alternative. FHWA set forth the Department of Transportation Order 5660.1A in 1978 to comply with this direction. Alternatives which avoid wetlands must be considered.

SCDHEC also has jurisdiction over WOUS in South Carolina. SCDHEC's regulatory authority derives from Section 401 of the CWA. A Section 401 water quality certification from SCDHEC is required whenever a project needs a federal license or permit for an activity that may result in a discharge to a navigable water or other WOUS. In South Carolina, the South Carolina Department of Health and Environmental Control Office of Ocean and Coastal Resource Management (SCDHEC OCRM) is the regulatory agency responsible for implementing the Coastal Zone Management Act and the South Carolina Coastal Tidelands and Wetland Act of 1977, which was enacted by the state to protect, preserve, restore, and enhance the coastal resources of South Carolina. SCDHEC-OCRM's objective is to manage wetland alterations, activities, and alterations to tidally influenced critical areas. The project study area contains WOUS that are defined as "critical area."

Critical area is defined by the SCDHEC-OCRM as any of the following: 1) coastal waters; 2) tidelands; 3) beach/dune systems; and 4) beaches.

SCDHEC has classified the waterbodies (streams and rivers) of South Carolina based on the desired uses of each waterbody. SCDHEC has established standards for various parameters to protect all uses within each waterbody classification. Waterbody classifications are named or listed in South Carolina Regulation 61-69 (R.61-69), Classified Waters. All waters of South Carolina are classified even if they are not specifically named or listed in R.61-69. Waters not listed are assigned the classification of the receiving waterbody to which they flow. Waters classifications are shown in Appendix L. the Natural Resources Technical Memorandum.

4.11.2 What Methodology was used for the Analysis of Water Resources?

Information concerning the water resources within the project study area was obtained from federal, state, and local sources including USGS topographic maps, USEPA, USGS, Natural Resources Conservation Service (NRCS) soil surveys, United States Fish and Wildlife Service (USFWS) National Wetlands Inventory, SCDHEC, South Carolina Department of Natural Resources (SCDNR) Light Detection and Ranging (LiDAR) digital elevation model datasets, Charleston County, and City of Charleston. Information regarding ground water resources was obtained from the USGS Ground Water Atlas of the U.S. and USGS Groundwater Availability in the Atlantic Coastal Plain of North and South Carolina.[6,7] Surface water resources information is listed in the Natural Resources Technical Memorandum (NRTM) in Appendix L. Information regarding drinking water resources was gathered from the Charleston Water System (CWS).[8]

4.11.2.1 What Water Resources Exist within the Project Study Area?

Groundwater resources were identified in the project study area primarily through desktop research using the USGS Groundwater Atlas of the U.S., USGS Groundwater Availability in the Atlantic Coastal Plain of North and South Carolina, and SCDHEC's monitoring report of users who withdraw more than 3 million gallons in any month.

The Coastal Plain covers two-thirds of the State yet contains about 95% of it's groundwater resources. It consists of layers of unconsolidated sand, clay, and limestone. Sand and limestone layers are porous and constitute the water-bearing zones called aquifers; clay layers are relatively impervious and constitute the confining units.

Following review of available background data, site visits were conducted on several occasions from August to December 2016, January to February 2017, and throughout September 2019 to document the potential of WOUS, including wetlands. WOUS were determined using the Routine On-Site Determination Method as outlined by the 1987 USACE Wetland Delineation Manual and the Atlantic and Gulf Coastal Plain Region Regional Supplement, Version 2.0. The USACE was provided a preliminary jurisdictional determination (PJD), which identifies the locations and boundaries of wetlands and other aquatic resources on-site that are presumed to be the subject of regulatory jurisdiction. The USACE approved the PJD on October 31, 2019 and figures depicting all WOUS are provided in Appendix M.

6 USGS. 1990. "Groundwater Atlas of the U.S. – Alabama, Florida, South Carolina". Accessed 03/03/2020. https://pubs.usgs.gov/ha/ha730/ch_g/G-Floridan.html

7 Campbell, B.G., and Coes, A.L., eds., 2010, Groundwater availability in the Atlantic Coastal Plain of North and South Carolina: U.S. Geological Survey Professional Paper 1773, 241 p., 7 pls. https://pubs.usgs.gov/pp/1773/pdf/pp1773.pdf

8 https://www.scdhec.gov/sites/default/files/media/document/R.19-450.pdf

4.11.3 What Groundwater Resources Exist within the Project Study Area?

Water found within the pores and cracks of underground materials such as gravel, sand, and rock is considered groundwater. The proposed project is within the Atlantic Coastal Plain geologic region of South Carolina, which covers the southeastern two-thirds of the state. Figure 4.18 shows the different geologic regions of South Carolina. Most geologic features within the Coastal Plain in South Carolina consist of gravels, sands, and crystalized sediments that water can flow through quite easily.[9] These permeable layers form the State's largest and most important aquifers.[10] There are seven overarching hydrostratigraphic systems found in the Coastal Plain of South Carolina, four aquifer systems and three confining systems, which are then broken down into additional classifications.[11] The proposed project lies within the Floridian Aquifer System that is made from crystalline rocks, sand, silt, gravel, and clay.[12] These aquifers contain a large volume of groundwater that has accumulated over years and can remain within the aquifer for hundreds of years.[13] The Floridian Aquifer System is very permeable, which means that precipitation can easily filter through the soil to recharge the groundwater.[14]

Historically, groundwater use in the project area dates to at least 1670 when European settlers arrived in what is now Charleston, SC, and constructed shallow, hand-dug wells. With time and increasing population, Charleston began to have water-quality problems with the surficial aquifer, so other sources of water supply were sought, especially deeper aquifers. Developing these deeper aquifers for adequate groundwater supplies led to declining water levels in the study area, which in some cases, date back to the latter part of the 19th century.

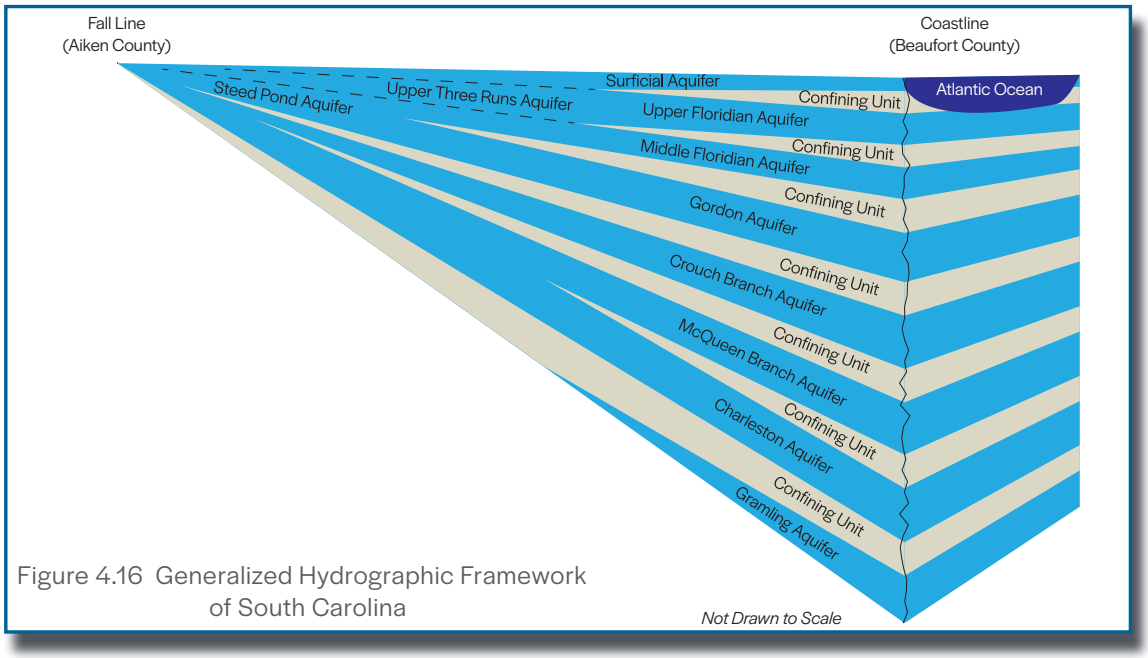

Figure 4.16 Generalized Hydrographic Framework of South Carolina

9 Campbell, B.G., and Coes, A.L., eds., 2010, Groundwater availability in the Atlantic Coastal Plain of North and South Carolina: U.S. Geological Survey Professional Paper 1773, 241 p., 7 pls. https://pubs.usgs.gov/pp/1773/pdf/pp1773.pdf

10 Andrew Wachob, Joseph A. Gellici, and Brooke Czwartacki. 2017. Potentiometric Surface Maps of the South Carolina Coastal Plain Aquifers: November-December 2016. SCDNR Water Resources Report 60. http://hydrology.dnr.sc.gov/pdfs/reports/Report_60_Potentiometric_maps_2016.pdf

11 SCDNR Hydrology website - http://hydrology.dnr.sc.gov/aquifers.html

12 Campbell, B.G., and Coes, A.L., eds., 2010, Groundwater availability in the Atlantic Coastal Plain of North and South Carolina: U.S. Geological Survey Professional Paper 1773, 241 p., 7 pls. https://pubs.usgs.gov/pp/1773/pdf/pp1773.pdf

13 USGS What is Groundwater? Accessed 03/03/2020 https://www.usgs.gov/faqs/what-groundwater?qt-news_science_products=0#qt-news_science_products

14 USGS. 1990. "Groundwater Atlas of the U.S. – Alabama, Florida, South Carolina". Accessed 03/03/2020. https://pubs.usgs.gov/ha/ha730/ch_g/G-Floridan.html

4.11.4 What Surface Water Resources Exist within the Project Study Area?

4.11.4.1 Wetlands

A total of 86 wetland areas met the criteria for classification and were identified within the project study area during field site reviews. Refer to Table 4.13. Wetlands are classified based upon type of hydrophytic species present, percentage of cover within the recorded data point, and proximity to saline environment. Wetland types identified include palustrine emergent wetlands, palustrine forested wetlands, palustrine scrub shrub wetlands, and estuarine wetlands. For more detailed information about each wetland type refer to the NRTM located in Appendix L. Executive Order 11990 (Protection of Wetlands) established a national policy to avoid adverse impacts on wetlands wherever there is a practicable alternative. FHWA set forth the Department of Transportation Order 5660.1A in 1978 to comply with this direction. Alternatives which avoid wetlands must be considered.

Table 4.13 Wetland Types within the Project Study Area

Wetland Type	Number of Wetland Sites	Total Acres
Palustrine Emergent Wetlands	15	120.05
Palustrine Forested Wetlands	59	111.79
Palustrine Scrub/Shrub Wetlands	1	3.02
Estuarine Emergent Wetlands	9	90.27

4.11.4.2 Streams

Freshwater streams, tidally influenced streams, and open water ponds (identified in the Jurisdictional Determination (JD) as non-wetlands waters) were evaluated in the field. Tables 4.14 and 4.15 show the identified features. For more detailed information refer to the NRTM in Appendix L.

Table 4.14 Rivers and Streams within the Project Study Area

Feature Name	Number of Features	Linear Feet
Unnamed Freshwater Tributaries	24	28,923.55
Filbin Creek	1	8,831.15
Turkey Creek	1	144.98
Unnamed Tidally Influenced Tributaries	6	5,745.94
Filbin Creek	1	3,575.42
Bulls Creek	1	237.85

Table 4.15 Open Water Ponds within the Project Study Area

Feature Name	Number of Features	Total Acres
Open Water Ponds	10	6.89

4.11.4.3 Drinking Water Resources

CWS obtains its drinking water from the Edisto River and Bushy Creek Reservoir. The Edisto River is part of the Ashepoo-Combahee Edisto (ACE) Basin while the Bushy Creek Reservoir is part of the Saluda River Basin. The collected water is treated at the Hanahan Water Treatment Plant. The water goes through a process of rapid mixing, flocculation, sedimentation, filtration, and disinfection. To disinfect the water, CWS uses chloride and ammonia called chloramines. Fluoride is also added to the water before distribution to numerous properties. The distribution system has over 1,800 miles of water mains.[15]

The primary source of drinking water is surface water. Residences and businesses within the project study area are serviced by Charleston Water System.

The retail service areas include portions of Charleston, Berkeley, and Dorchester Counties. CWS also provides water on a wholesale basis to Joint Base Charleston, Berkeley County, Dorchester County Public Works, Isle of Palms Water and Sewer Commission, Mount Pleasant Waterworks, St. Johns Water Company, Town of Folly Beach, Town of Lincolnville, and the Town of Sullivan's Island. CWS serves approximately 400,000 people and 10,000 fire hydrants.

To aid, improve, and protect water quality, CWS, in collaboration with Joint Base Charleston, has been granted funding to develop a Watershed Based Plan for the Bushy Park Reservoir and Foster Creek Watershed.

4.11.4.4 Wild and Scenic Rivers

Nationwide Rivers Inventory

The National Park Service maintains the Nationwide Rivers Inventory (NRI) and is a source of information for statewide river assessments and federal agencies involved with stream-related projects. The I-526 LCC WEST project is not crossing a river segment listed on the NRI. There are also no federally designated Wild and Scenic Rivers within the project study boundary.

State Designated Scenic Rivers

The Ashley River, from US 17 to I-526, was designated as a State Scenic River in 1998 and 1999 for its variety of habitat communities and its 26 historic sites.[16] In 2002 an Ashley Scenic River Management Plan was developed for the 22-mile segment in Dorchester and Charleston Counties. The Ashley Scenic River Management Plan establishes goals and recommendations related to water quality, recreational use and access, preservation and conservation, and land management and development.[17] The I-526 LCC WEST project does cross the Ashley River at the point where the Scenic River designation ends.

The purpose of the South Carolina Scenic Rivers Act of 1989 is to protect "unique or outstanding scenic, recreational, geologic, botanical, fish, wildlife, historic or cultural values" of selected rivers or river segments in the state.

15 www.charlestonwater.com. (n.d.). Source Water | Charleston Water System, SC - Official Website. [online] Available at: http://www.charlestonwater.com/492/Source-Water [Accessed 4 Mar. 2020].

16 SCDNR Ashley Scenic River Project Overview. Accessed 3/6/2020. http://www.dnr.sc.gov/water/river/scenic/ashley.html

17 Ashley Scenic River Management Plan Report 25. January 2003. http://www.dnr.sc.gov/water/river/pdf/ashleyriver.pdf

4.11.5 What are the Potential Environmental Consequences to Water Resources?

4.11.5.1 How would the No-Build Alternative Impact Water Resources?

The existing conditions would remain unchanged under the No-Build Alternative. This alternative would have no effect on water resources.

4.11.5.2 How would the Reasonable Alternatives Impact Water Resources?

Potential impacts (including but not limited to filling, clearing, piping, and armoring) to water resources are categorized into freshwater wetland, Critical Area, Critical Area bridge construction, pond, and stream. All impacts are based on Right-of-Way, refer to Table 4.16. Wetlands and WOUS were given special consideration during development and evaluation of the project. The project would utilize steeper fill slopes in and near wetlands where possible to avoid having a long reaching slope that would extend into a wetland. The area of the roadway footprint was reduced, which reduced related fill in salt marsh and freshwater wetlands. Stormwater treatment is planned for existing embankments and medians where possible. Temporary work trestles and barges are proposed for construction access in and near the Ashley River to avoid placing fill or causeways for access.

Unintentional direct impacts to wetlands, streams, and water quality can occur during construction due to the failure of sediment and erosion control measures, accidental encroachment, or hazardous material spills. Permitted impacts will directly alter streams and wetlands which can lead to a change in hydrology leading to more runoff or decreased floodplain storage. These effects on water resources can lead to the degradation of water quality.

Erosion control measures would be implemented during construction, to include seeding of slopes, temporary silt fences, and sediment basins in median as appropriate. These measures would minimize temporary construction impacts on adjacent wetlands. Other best management practices would be required of the contractor to ensure compliance with policies reflected in 23 CFR 650B.

Table 4.16 Impacts to Water Resources

Impact Type based on ROW	No-Build	Paul Cantrell Blvd to International Blvd	I-26/I-526 System & I-526 at Rivers Ave				I-526 at N Rhett/Virginia Ave				
			1	2*	1A	2A	1	2	2A*	5	6
Freshwater Wetland (acres)	0	19.3	28.5	28.5	28.5	28.5	54.5	51.3	49.9	57.3	50.8
Critical Area (acres)	0	19.6	0	0	0	0	2.3	2.3	2.4	2.8	2.7
Critical Area Bridge Construction Temporary Access (acres)	0	9.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pond (acres)	0	0.03	0	0	0	0	0	0	0	0	0
Freshwater Stream (feet)	0	327.0	13,327.1	13,327.1	13,327.1	13,327.1	5,169.1	5,169.1	4,977.6	5,197.4	5,205.9

* Recommended Preferred Alternative

4.11.5.3 Waters of the US Conditions and Impacts

In addition to the total quantity of WOUS impacts, the quality or condition of those resources was also considered. In evaluating the importance of the wetlands, the analysis should consider such factors as the primary functions of the wetlands (e.g., flood control, wildlife habitat, ground water recharge, etc.); the relative importance of these functions to the total wetland resource of the area; and other factors such as uniqueness that may contribute to the wetlands importance. Higher quality wetlands and streams are generally valued for their function and aesthetics. Medium and lower quality wetlands still provide functional value to the ecosystem, but to a lower degree or with less effectiveness. Definitions of wetland and stream quality are based on characteristics outlined in the USACE, Charleston District Guidelines for Preparing a Compensatory Mitigation Plan (dated October 7, 2010). The USACE Charleston District Guidelines consider the type and existing condition when evaluating impacts to wetlands and streams. Wetland and stream quality was defined as follows:

Wetlands

High Quality:

- Existing Condition: Fully functional wetlands that appear to the delineators to be primarily undisturbed, or existing disturbances do not substantially alter important functions
- Type: Tidal wetlands, bottomland hardwoods and riverine systems, including headwaters and riparian

Medium Quality:

- Existing Condition: Partially impaired wetlands that appear to the delineators to have a partial or full loss of one or more functions. Examples of impacts contributing to this category include partial ditching, drainage modifications, minor excavation, shading, and activities categorized as routine maintenance such as clear cutting. Examples include mixed pine-hardwood wetlands, scrub-shrub wetlands, segmented and/or ditched wetlands, and wetlands adjacent to or abutting streams
- Type: Seeps and bogs, depressions, pocosins, and flatwoods

Low Quality:

- Existing Condition: Impaired or very impaired wetlands that appear to the delineators to have a permanent loss of one or more functions. Examples of impacts contributing to this category include fill, fragmentation, stormwater discharge outlets, channelization of adjacent water features, mechanical excavation, drained

areas, vegetation conversion, and heavy routine maintenance. Examples include stormwater basins, clear-cut wetlands, permanently cleared utility corridors, and wetlands that have been heavily modified
- Type: Man-made lakes and ponds, impoundments, some modified emergent wetlands

Streams

High Quality:
- Existing Condition: Fully functional streams that appear to be primarily undisturbed with stable, vegetated stream banks, and riparian buffers. Examples include streams with listed species and streams identified as highly diverse are considered fully-functional
- Type: Headwater streams (1st and 2nd Order)

Medium Quality:
- Existing Condition: Partially impaired streams that appear to have limited human-influence or natural disturbance, resulting in a partial loss of one or more functions. Examples of impacts contributing to this category include minor channelization, partial piping, shading, riparian clearing, culverts, bank armoring, detention, stormwater discharge, and channel modification
- Type: All other streams identified as “partially impaired”

Low Quality:
- Existing Condition: Impaired or very impaired streams that appear to the delineators to have unvegetated stream banks and severe loss of function. This includes streams with significant human-influence or natural disturbance. Examples of impacts contributing to this category include channelization, piping, shading, substantial riparian clearing, perched culverts, bank armoring, detention, stormwater discharge, and channel modification
- Type: All other streams with a condition of “impaired”

Table 4.17 Waters of the US Conditions and Impacts

	No-Build	Paul Cantrell Blvd to International Blvd	I-26/I-526 System & I-526 at Rivers Ave				I-526 at N Rhett/Virginia Ave				
			1	2*	1A	2A	1	2	2A*	5	6
High Quality Wetland Fill (acres)	0	19.6	0.0	0.0	0.0	0.0	2.3	2.3	2.4	2.8	2.7
Medium Quality Wetland Fill (acres)	0	18.8	27.7	27.7	27.7	27.7	54.2	51.0	49.7	57.0	50.6
Low Quality Wetland Fill (acres)	0	0.2	0.8	0.8	0.8	0.8	0.2	0.2	0.2	0.2	0.2
High Quality Stream Pipe (feet)	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Medium Quality Stream Pipe (feet)	0	220.7	5,038.0	5,038.0	5,038.0	5,038.0	4,500.1	4,500.1	4,311.0	4,503.7	4,539.3
Low Quality Stream Pipe (feet)	0	106.3	8,289.1	8,289.1	8,289.1	8,289.1	669.0	669.0	666.6	666.6	666.6

* Recommended Preferred Alternative

4.11.6 What are the Indirect Impacts on Water Resources and Water Quality?

An indirect and cumulative effects analysis of water resources and water quality was undertaken using an eight-step methodology described in Section 4.3.5. Additional details can be found in the Community Impact Analysis (CIA), Appendix D. Indirect effects to wetlands, streams, and water quality from transportation projects are typically associated with land use changes that occur as a result of the project. In these cases, the transportation project may provide new access to previously undeveloped land or provide additional capacity resulting in shorter commutes from surrounding areas. The proposed project would not alter existing land use within the Wetland, Streams, and Water Quality Indirect and Cumulative Effects (WSWQ-ICE) study area, refer to Figure 4.17. Because the WSWQ-ICE study area is already developed, land use changes are occurring as part of City-led development and local planning initiatives rather than induced land use changes associated with the proposed project.

Indirect impacts to water quality, streams, and wetlands can occur as a result of the direct increase in impervious surface associated with the proposed project. The increase in impervious surface may lead to an increase of stormwater runoff into the adjacent streams and wetlands. The runoff carries pollutants and the increase in peak discharge can lead to scour and bank erosion which then leads to an increase in sediment migration. The pollutants and sediment travel from the adjacent floodplains, streams and wetlands to points further downstream.

The proposed freeway widening, improved I-26/I-526 interchange, and associated improvements on Rivers Avenue at Aviation Drive would not alter existing land use within the majority of the WSWQ-ICE study area, as it is already developed. The improved mobility associated with the proposed improvements would not create indirect land use effects across the broader region as growth and development will continue to occur regardless of the proposed project. As such, significant impacts to water quality resulting from land use change associated with the project are not anticipated. Significant impacts to wetlands and streams may occur but will be avoided and minimized in order to comply with existing regulations and obtain permits from the regulatory agencies. The impacts will be offset by mitigation and enhancement strategies.

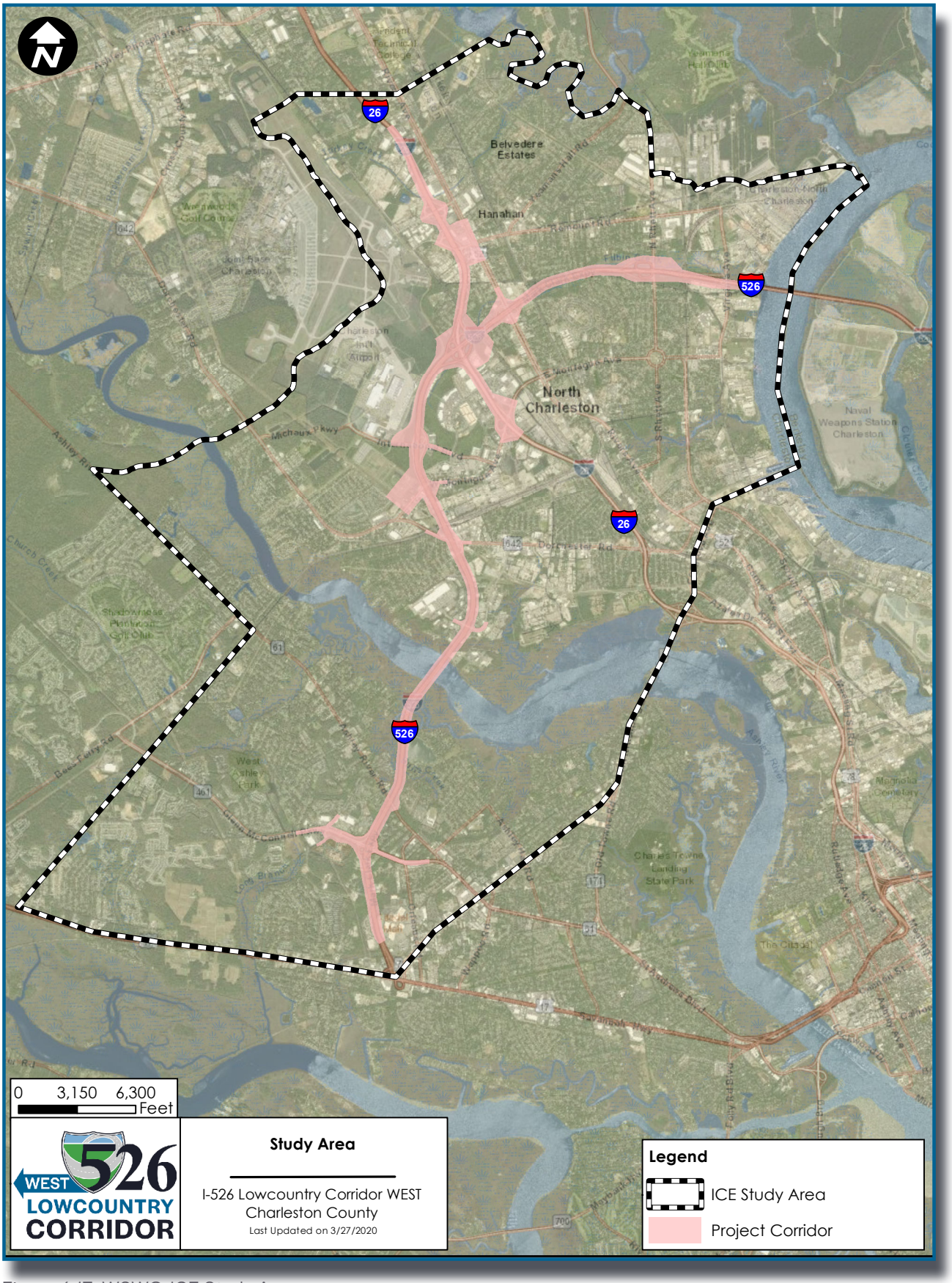

Figure 4.17 WSWQ-ICE Study Area

4.11.7 What are the Cumulative Impacts on Water Resources and Water Quality?

Past actions have resulted in impacts and the loss of wetlands and streams. Aerial photography and topography from the past century were used to describe growth in the WSWQ-ICE study area that led to these impacts (see Section 4.3.6). While current regulations protect these water resources to some degree, impacts will continue to occur regardless of the proposed project. Minor impacts will likely be permitted while major impacts will be offset by mitigation. These impacts may continue as future development and redevelopment continue. Water quality has been impacted by past actions, including the original construction of I-526 and I-26 and subsequent development of West Ashley and infill development of North Charleston, leading to the impairment of some waterbodies. Additional planned development such as programmed transportation improvements, the Volvo car factory in Ridgeville, and Palmetto Commerce Park will add to these impairments; however, it is unlikely to be a significant increase given the current high percentage of existing developed land. Isolated parcels of undeveloped land are found in the WSWQ-ICE study area. Many more regulations are in place to protect water quality since these impairments were first identified. More recent losses to wetlands since these regulations have been in place can be measured by comparing the Multi-Resolution Land Characteristics Consortium (MRLC) National Land Cover Database (NLCD) from 2016 to the NLCD from 2001. In that time period wetland coverage decreased from 1.7% due to an increase in developed lands.

Due to the high amount of development that has and is planned to occur in the WSWQ-ICE study area, cumulative impacts to the water resources are numerous and already evident in water quality data, as discussed previously. Impacts lead to loss of the resource or degradation depending on the action. Streams and wetlands are lost due to fill. Degradation occurs when streams are dammed, channelized or their banks are armored, when wetlands are converted from forest to open water, and when riparian buffers are removed. Water quality degradation occurs due to an increase in pollutant loads from the surrounding land and/or an increase in stormwater runoff. Additional details on past and future projects and development is included in Appendix F and Sections 4.1.5.1, 4.1.5.2, and 4.3.6.

4.11.8 How would Impacts to Water Resources and Water Quality be Mitigated?

Potential indirect and cumulative effects to water resources are likely however to what degree is difficult to determine. **Consequences of the identified effects will be limited by implementing mitigation and other strategies as determined by requirements set forth in permits that will be needed for the proposed project to go to construction.** These include:

- Following SCDOT BMPs including designing using the Context Sensitive Solutions (CSS) process.[18]
- Compensatory mitigation - Unavoidable impacts to streams and wetlands will be permitted through the 401/404 and SCDHEC OCRM Coastal Zone Permitting regulatory process. Impacts will be mitigated at a ratio set by USACE Charleston District Compensatory Mitigation Guidelines. SCDOT is proposing to mitigate for these impacts using mitigation credits from banks that serve the Cooper River watershed. A mitigation plan will be prepared for inclusion in the 401/404 permit application package.
- Stormwater Pollution Prevention Plan (SWPPP) - The SWPPP contains information regarding sediment and erosion control based on SCDOT water quality manual and SCDOT's general permits (MS4 and

18 SCDOT Roadway Design Manual. https://www.scdot.org/business/pdf/roadway/2017_SCDOT_Roadway_Design_Manual.pdf

construction).[19] It also contains information on temporary and permanent stormwater management practices. Preliminary designs include the use of roadside swales to help improve the water quality of stormwater runoff as well as the addition of water storage along the upper reaches of Filbin Creek on both sides of the I-26 and I-526 interchange to reduce the impact of stormflows.

In addition, these same regulations apply to future development by others that may occur within the WSWQ-ICE study area. Finally, the proposed project and other growth in the area is consistent with regional development policies.

Compensatory mitigation is the third step in a sequence of actions that must be followed to offset impacts to aquatic resources. The 1990 Memorandum of Agreement (MOA) between the USEPA and the Department of Army establishes a three-part process, known as the mitigation sequence to help guide mitigation decisions and determine the type and level of mitigation required under CWA Section 404 regulations.

Step 1. Avoid - Adverse impacts to aquatic resources are to be avoided and no discharge shall be permitted if there is a practicable alternative with less adverse impact.
Step 2. Minimize - If impacts cannot be avoided, appropriate and practicable steps to minimize adverse impacts must be taken.
Step 3. Compensate - Appropriate and practicable compensatory mitigation is required for unavoidable adverse impacts which remain. The amount and quality of compensatory mitigation may not substitute for avoiding and minimizing impacts.

Compensatory mitigation is normally required to offset unavoidable losses of WOUS. The Council on Environmental Quality has defined mitigation in 40 CFR Part 1508.20 to include: avoiding impacts, minimizing impacts, rectifying impacts, reducing impacts over time, and compensating for impacts. Compensatory mitigation usually consists of the restoration or enhancement of existing degraded wetlands or waters. This type of mitigation is only undertaken after avoidance and minimization actions are exhausted. Specific mitigation requirements would be established during the Section 404 permitting process.

As project designs are developed there may be roadway alignment shifts to avoid impacts to WOUS. Additionally, impacts may be minimized through reductions in right-of-way widths, fill slopes, and culvert lengths, and the use of bridges in lieu of culverts where appropriate.

Utilizing USACE's online resource, the Regulatory In-Lieu Fee and Bank Information Tracking System (RIBITS), there are several USACE mitigation banks with service areas that cover, or partially cover, the project study area.

These operating and pending banks may not have enough credits to satisfy the estimated impacts of the project. It is unknown at this time if a mitigation bank or banks would be able to provide enough credits to offset the estimated impacts, or if the credits would be available at the time of the permitting and construction schedule. If mitigation bank credits cannot be purchased, compensatory mitigation for unavoidable impacts to aquatic resources could be met by establishing a permittee responsible mitigation (PRM) plan. Under a PRM plan, restoration, establishment, enhancement, or preservation of wetlands and streams would be undertaken by the permittee. This would require protection and restoration of an off-site property containing wetland and/or stream systems, as reviewed and approved by the USACE.

19 https://www.scdot.org/business/storm-water.aspx (MS4 stands for Municipal Separate Storm Sewer System)

4.12 Floodplains

4.12.1 What are Floodplains?

Floodplains are low-lying areas located near the channel of a river, stream, or other type of waterbody. These areas are subject to periodic flooding during heavy rains and/or long periods of wet weather. Floodplains provide storage for flood waters, protect the surrounding environment from erosion, and provide habitat for wildlife. Thus, floodplains provide crucial functions in the natural environment. Federal agencies are required to reduce impact risk to floodplains and their associated floodways and/or main channel of flow. Floodplain areas exist within the study area, and this section describes the floodplains and potential impacts to those areas.

4.12.2 How are Floodplains Regulated?

Executive Order 11988 entitled "Floodplain Management," requires federal agencies to avoid making modifications to and supporting development in floodplains wherever practical. Furthermore, floodplain and floodway protection are mandated under several federal, state, and local laws. Floodplains subject to inundation by the 1-percent annual chance flood event are regulated by the Federal Emergency Management Agency (FEMA). FEMA publishes maps depicting areas of regulated floodplains and floodways. The Flood Insurance Rate Map (FIRM) is the most common of the flood maps. The FIRM is a community map on which FEMA has delineated both the special hazard areas and the risk premium zones applicable to the community. FIRMs depict the boundaries of flood hazard areas and differentiate them by zone.

Zone AE floodplains are areas subject to inundation by the 1-percent annual chance flood event and are determined by detailed methods. Base flood elevations (BFEs) are available for Zone AE floodplains and are provided on FIRMs.

Zone VE floodplains are areas subject to inundation by the 1-percent annual chance flood event with additional hazards due to storm-induced velocity wave action. VE Zones are also known as the coastal high hazard areas. BFEs derived from detailed hydraulic analyses are shown in the FEMA mapping of Zone VE areas. Refer to Photograph 5 to see an example of a VE flood zone in the project study area.

Zone X500 is a moderate flood hazard area and is an area between the limits of the base flood and the 0.2-percent annual chance (or 500-year) flood. Zone X500 includes areas of 100-year flood with average depths of less than one foot or with drainage areas less than one square mile.

Photograph 1 Ashley River; a VE flood zone

Zone X is considered a minimal flood hazard from the principal source of flood in the area and determined to be outside the 0.2-percent annual chance floodplain.

4.12.3 What Floodplains are Located within the Project Study Area?

Based upon a review of the floodplain mapping and a GIS analysis, the proposed project crosses several areas designated by FEMA as floodplains. The proposed project is within a FEMA-regulated flood zone. Most of these areas are within Zone AE. The Ashley River and a portion of the tidal marshes surrounding the Ashley River are in Zone VE. For more detailed information refer to Appendix N.

4.12.4 How would the No-Build Alternative Impact Floodplains?

No-Build Alternative would not improve the roadway network beyond what is currently planned. Typical maintenance activities such as culvert and ditch clean-out and repair would continue to occur. The No-Build Alternative would have no effect on floodplains since existing conditions would remain unchanged.

4.12.5 How would the Reasonable Alternatives Impact Floodplains and How were the Impacts Evaluated?

A potential floodplain impact evaluation has been performed by overlaying digital files of the Reasonable Alternatives' potential right-of-way boundaries with the FEMA FIRM maps depicting the floodplains in the project study area. The preliminary right-of-way corridors for each of the alternatives were used to determine the amount of floodplain impacts that would potentially occur for each alternative. Refer to Table 4.18.

Most of the Reasonable Alternatives would be located within FEMA designated floodplains. Based on preliminary bridge locations/lengths, Alternatives 1A and 2A at the system interchange appear to have the greatest impact to floodplains within the project corridor, while Alternatives 1 and 2 would result in slightly lower impacts. At N Rhett Avenue and Virginia Avenue, Alternative 5 would have the greatest floodplain impacts and Alternative 2A would have the least amount of impacts. The mainline of I-526 from Paul Cantrell Boulevard to International Boulevard would impact approximately 378 total acres of floodplains.

Table 4.18 Potential Impacts to Floodplains from the Reasonable Alternatives

FEMA Flood Designation	Paul Cantrell Blvd to International Blvd	I-26/I-526 System & I-526 at Rivers Ave				I-526 at N Rhett/Virginia Ave				
		1	2*	1A	2A	1	2	2A*	5	6
AE (acres)	47	37	37	38	38	139	135	135	147	138
VE (acres)	29	N/A	N/A	N/A	N/A	3	3	3	3	3
X (acres)	309	382	382	384	386	24	24	15	23	25
Total Acres (AE + VE + X)	385	419	419	422	424	166	162	153	173	166

* Recommended Preferred Alternative

Per FHWA Technical Advisory 6640.8A the level of potential risk or environmental impact resulting from any floodplain encroachments must be analyzed. A hydraulic analysis must be conducted for an encroachment of a FEMA-regulated floodplain. The hydraulic analysis is used to determine if the project is likely to increase the risk of flooding within the floodplain. To meet the requirements of a "No-Rise" condition, FEMA requires projects which would encroach on Regulated Floodways and Zone AE floodplains to result in a change no greater than one foot from the established 100-year flood elevations.

Regional hydrologic models were developed to evaluate potential flooding impacts that would result from the Reasonable Alternatives. Because the project is so close to the coast, base floodplain elevations are based on hurricane storm surge. Under the storm surge scenario the project would not have a significant encroachment on the base floodplain.

Design measures considered to minimize floodplain encroachments may include special flood related design criteria, elevating facilities above base flood levels, locating nonconforming structures and facilities out of the floodplain, or minimizing fill placed in floodplains.

The hydrologic and hydraulic models were developed to also assess water elevations as it relates to rainfall-driven flooding, such as a non-hurricane storm surge event. In this scenario, the project would also not result in a significant encroachment on the base floodplain elevation. The models were developed based on preliminary drainage designs. These designs may vary in the future as final plans are developed and additional study would be completed. **The project would be designed in an effort to meet "No-Rise" requirements. In the event a "No-Rise" condition cannot be achieved, coordination with FEMA will require the preparation of a CLOMR (Conditional Letter of Map Revision)/LOMR (Letter of Map Revision) package for the encroachment. This includes a detailed hydraulic analysis, determination of floodplain impacts, and preparation of the CLOMR. Following construction, impacts to the floodplain would be verified prior to the issuance of the LOMR.** A LOMR is FEMA's modification to an effective FIRM, or Flood Boundary and Floodway Map (FBFM), or to the Flood Insurance Study. LOMRs are generally based on the implementation of physical measures that affect the hydrologic or hydraulic characteristics of a flooding source and thus result in the modification of the existing regulatory floodway, the effective BFEs, or the Special Flood Hazard Area (Flood zones AE and VE for this project). SCDOT Bridge Scope and Risk Assessment forms and SCDOT Floodplain Checklist form were completed for each crossing based on the preliminary analysis, refer to Appendix N.

There is no incompatible floodplain development that would result from the proposed project. All bridge and necessary culvert crossings would be designed to FEMA standards and would be constructed within an existing urban transportation corridor. The project would be designed to be consistent with local floodplain development plans and coordinated with local floodplain officials in Charleston County, the City of Charleston, and the City of North Charleston.

While the Reasonable Alternatives would not result in a significant encroachment on the base floodplain, there is no practicable alternative that would avoid all impacts to floodplains because the floodplain crossings are perpendicular to the roadway. It is FHWA's policy "to avoid longitudinal encroachments, where practicable" [23 CFR 650.103(b)]. Longitudinal encroachments are parallel or nearly parallel to a stream or the edge of a lake. **Where regulatory floodplains are defined, hydraulic structures will be designed to accommodate a 100-year (1-percent annual chance) flood. Where no regulatory floodplain is defined, culverts and bridges will be designed to accommodate a 50-year magnitude flood event. Ongoing design efforts and coordination with resource and regulatory agencies would continue to minimize floodplain impacts during the final design process.**

4.12.6 What are the Indirect and Cumulative Effects to Floodplains?

Flooding concerns are a major issue for residents and business owners in the Lower Coastal Plain and Coastal Zone regions of South Carolina. Federal Emergency Management Agency (FEMA) regulated floodplains are found along all of the major waterways and many of the tributaries within the ICE study area, refer to Appendix F. Floodplains provide water storage during storm events, help improve water quality, and provide habitat for terrestrial and aquatic species. Floodplains mapped as AE and VE which are considered high risk areas within the 100-year floodplain. Flood zones AE have mapped base flood elevations while flood zones VE are impacted by coastal flooding with velocity hazards or wave action. Development within the Ashley and Stono Rivers floodplains within the ICE study area is limited. The Goose Creek floodplain is dammed in the upper portion and has little development in the lower portion. The Cooper River floodplain is highly developed. FEMA regulated floodplains can change as a result of changing conditions related to climate as well as growth and development. As noted previously, development within the FEMA mapped floodplains is regulated but not completely prohibited within the study area.

The proposed freeway widening, improved I-26 / I-526 interchange, and associated improvements on Rivers Avenue at Aviation Drive would not alter existing land use within the majority of the ICE study area, as it is already developed. The improved mobility associated with the proposed improvements would not create indirect land use effects across the broader region as growth and development will continue to occur regardless of the proposed project. As such, impacts to water quality resulting from land use change associated with the project are not anticipated.

4.12.7 How would Impacts to Floodplains be Mitigated?

Preliminary engineering studies were conducted to determine impacts and ways to avoid and minimize impacts through the use of bridges when practicable. The use of bridges would reduce impacts to streams, wetlands, and floodplains. Although the bridge piers may need to be placed within these regulated features, impacts from the use of these piers are much less when compared to fill impacts. **SCDOT Design/Build team will send a set of final plans and request for floodplain management compliance to the local County Floodplain Administrator to the project letting date.**

Final detailed hydraulic and hydrologic studies for each bridge crossing will be performed during final design to determine the correct sizing of bridges and culverts. The project will be designed to be consistent with local floodplain development plans.

At this phase of project development, general hydraulic analysis has been conducted and would be later updated with detailed studies. Bridge lengths would be a primary factor in determining the level of floodplain impacts that are proposed. Bridge structures would be designed in accordance with FEMA standards. Pursuant to the FEMA certification, the project will be designed to allow for no more than a one-foot rise in flood elevations. **The Engineer of Record will send a set of final plans and request for floodplain management compliance to the local County Floodplain Administrator prior to the project letting date.**

A "No-Rise" certification would be required from FEMA to ensure that any proposed structure would result in less than a one-foot rise in flood elevations.

4.13 Natural Resources

The purpose of this section is to describe the natural resources located within the study area and evaluate potential impacts. Natural resources such as landforms, soils, natural communities, and wildlife are important in providing plant and animal habitats. Landforms and soils provide plants a method of water storage and a habitat for wildlife. The potential impacts and minimization of impacts to natural resources, to the extent practicable, is documented below.

4.13.1 How were Natural Resources within the Project Study Area Identified and Assessed?

Field reviews were conducted August to December 2016, January to February 2017, and in September 2019 to document the natural resources, potential wetlands, and Waters of the U.S. (WOUS). In addition to the site visits, literature and reference materials were also reviewed to document the soils, natural communities, and wildlife. Refer to Appendix L for the Natural Resource Technical Memorandum (NRTM).

4.13.2 How are Natural Resources Protected?

Within the project study corridor, a variety of mammals, birds, fish, and plants are protected through federal and/or state regulations. In addition, certain areas of habitat which support targeted species are designated by the USFWS and National Oceanic and Atmospheric Administration (NOAA) Fisheries as critical habitat.

4.13.2.1 Endangered Species Act

The federal Endangered Species Act (ESA) of 1973 (50 CFR Part 402), as amended, is the federal regulatory tool that serves to administer permits, implement recovery plans, and monitor federally protected (endangered and threatened) species. The ESA is administered and regulated by the USFWS and by NOAA Fisheries. Because of the federal nexus of the proposed project, consultation with the USFWS and NOAA is required.

Section 7 of the ESA mandates consultation with USFWS and NOAA for proposed projects that "may affect" federally endangered and threatened species. This project requires Informal Consultation and the preparation of two Biological Assessments; one for USFWS and one for NOAA.

4.13.2.2 Federal Protected Species

Species with the federal classification of endangered or threatened are protected under the ESA. The term endangered species is defined as "any species which is in danger of extinction throughout all or a significant portion of its range," and the term threatened species is defined as "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (16 U.S.C. 1532).

When a species is proposed for listing as endangered or threatened under the ESA, USFWS and NOAA must consider whether there are areas of habitat believed to be essential to the species' conservation. Those areas may be proposed for designation as critical habitat.

At-Risk Species (ARS) is an informal term that refers to those species which may need concentrated conservation actions and have been submitted for listing as threatened or endangered. The USFWS designations of ARS does not provide federal protection and requires no Section 7 consultation under the ESA.

Executive Order 13186 "Responsibilities of Federal Agencies to Protect Migratory Birds" also directs and guides Federal agencies in implementing the Migratory Bird Treaty Act (MBTA). The migratory bird species protected by the MBTA are listed in 50 CFR § 10.13. The USFWS has statutory authority and responsibility for enforcing the MBTA. Any activity which results in the "take" of migratory birds or eagles is prohibited unless authorized by USFWS.

The MBTA makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to federal regulations (16 USC § 703–712).

4.13.2.3 Bald and Golden Eagle Protection Act

The bald eagle is no longer protected under the ESA, but the species is afforded federal protection through the Bald and Golden Eagle Protection Act (BGEPA) of 1940, as well as the MBTA. The BGEPA, 16 USC 668-668c, prohibits the "take" of bald eagles including their parts, nests, or eggs by anyone, without a permit issued by the Secretary of the Interior.

4.13.2.4 State Protected Species

Animal species that are on the South Carolina state protected species list receive protection under the South Carolina Nongame and Endangered Species Conservation Act (South Carolina Code, Title 50). State endangered species are defined as any species or subspecies of wildlife whose prospects of survival or recruitment within the state are in jeopardy or are likely within the foreseeable future to become so. It is unlawful for any person to "take," possess, transport, export, process, sell or offer for sale or ship, and for any common or contract carrier knowingly to transport or receive for shipment any species or subspecies of wildlife appearing on the state list of protected species without appropriate authorization.

4.13.3 What Natural Resources are in the Project Study Area?

4.13.3.1 Landform and Soils

The Sea Islands/ Coastal Marsh region contains the lowest elevations in South Carolina and is a highly dynamic environment affected by ocean wave, wind, and river action. Mostly organic and clayey soils occur in the freshwater, brackish, and salt marshes.

The proposed project is in the Coastal Plain physiographic province of South Carolina and is specifically situated within the Southern Coastal Plain (75) Level III Ecoregion.[20] The Southern Coastal Plain extends from South Carolina and Georgia through much of central Florida, and along the Gulf coast lowlands of the Florida Panhandle, Alabama, and Mississippi. It appears to be mostly flat plains, but it is a heterogeneous region also containing barrier islands, coastal lagoons, marshes, and swampy lowlands along the Gulf and Atlantic coasts. It was once covered by a variety of forest communities that included trees of longleaf pine, slash pine, pond pine, beech, sweetgum, southern magnolia, white oak, and laurel oak. Currently, land cover in the ecoregion as a whole is mostly slash and loblolly pine with oak-gum-cypress forest in some low-lying areas. Other areas are used as pasture for beef cattle or urban land uses. The study area is further characterized by falling within the Sea Islands/Coastal Marsh (75j) Level IV Ecoregion.[21] For detailed information on each of the soil series and associated mapping units, refer to Appendix L.

4.13.3.2 Natural Habitat Communities

The majority of the project study area is comprised of existing roadway. Areas which are not developed are classified based upon vegetation and land-form types. Vegetative terrestrial communities are distinguished by dominant plant species, community types, location in the landscape, past disturbances, and hydrologic characteristics. Only those habitats located directly within the study area are characterized. The study area is examined through current and historical Google Earth imagery, USDA ortho imagery, and USGS topographic maps to discern areas with similar signatures, and the data is being verified and classified through on-site field review. Essential Fish Habitat (EFH) is also present and is addressed in the NRTM. The habitat communities found within the project study area are listed below. Refer to Appendix L for more detailed information about each habitat community.

- Maintained Development
- Mixed Pine/Hardwood Forest
- Scrub/Shrub
- Bottomland Hardwood Forest
- Tidal Wetlands
- Brackish Marsh
- Freshwater Herbaceous Wetlands
- Forested Wetlands
- Cypress-Tupelo Wetlands
- Open Freshwater

20 Griffith, et al., 2002
21 Griffith, et al., 2002

4.13.4 General Wildlife

Common mammal species likely to occur in the study area include white-tailed deer, striped skunk, river otter, raccoon, bats, cotton mouse, opossum, eastern gray squirrel, and eastern cottontail rabbit.

Wildlife readily observed and documented during the field reviews, or those likely to occur within the study area, are summarized below.

Common bird species either observed during field reviews or known to occur within the study area include Carolina chickadee, northern mockingbird, blue jay, northern cardinal, brown thrasher, common grackle, American crow, American goldfinch, American robin, eastern towhee, Carolina wren, eastern bluebird, chipping sparrow, red-bellied woodpecker, barred owl, red-tailed hawk, red-shouldered hawk, turkey vulture, and osprey. Wading birds and waterfowl include Canada goose, Muscovy duck, mallard, great egret, green heron, and great blue heron.

Some crayfish, common fishes, and other aquatic organisms were readily observed in both brackish and freshwater areas. Those species, as well as others that are likely to be present include marsh fiddler crab, periwinkle snail, eastern mudsnail, mosquito fish, channel catfish, sailfin molly, bluegill, silver perch, Atlantic menhaden, and bay anchovy.

There are many common reptile and amphibian species that could occur in the study area including American alligator, green tree frog, various leopard frog species, skink, Carolina anole, eastern glass lizard, eastern garter snake, eastern king snake, black racer, pond sliders, eastern box turtle, snapping turtle, and American toad.

4.13.5 Federal and State Protected Species

Per review of the USFWS Information, Planning, and Conservation (IPaC) online database, there is no critical habitat for threatened or endangered species within the study area.

A review of the USFWS species list provides existing information concerning the potential occurrence of threatened or endangered species within Charleston County. Refer to Appendix L for a copy of the list provided by the USFWS in 2016; it is also included in the NRTM, which is also provided in Appendix L. This online database identifies 24 federally threatened or endangered species known to occur or to have formerly occurred in Charleston County. Refer to Table 4.19 for the list of federally threatened or endangered species, which has not changed since the 2016 list. The bald eagle is listed under the BGEPA but was removed from the federal list of Threatened and Endangered Species, effective August 8, 2007.

The SCDNR Rare, Threatened, and Endangered Species Inventory database was also reviewed for information regarding species with state endangered or threatened status. Nine additional species are currently listed as state threatened or endangered in Charleston.

ARS are also included in the Natural Resources Technical Memorandum, refer to Appendix L for informational purposes. These species do not receive legal protection from the ESA; therefore, specific surveys for the species were not conducted. During field surveys, none of the ARS were identified within the project study area.

Table 4.19 Federal and State Protected Species in Charleston County

Common Name	Scientific Name	Protected Status	Conclusion or Impacts
Amphibian			
Dwarf siren	*Pseudobranchus striatus*	Threatened (State)	May affect, not likely to adversely affect
Flatwoods salamander	*Ambystoma cingulatum*	Threatened (Federal), Endangered (State)	No effect
Gopher frog	*Lithobates capito*	Endangered (State)	No effect
Bird			
American swallow-tailed kite	*Elanoides forficatus*	Endangered (State)	May affect, not likely to adversely affect
American wood stork	*Mycteria americana*	Threatened (Federal), Endangered (State)	May affect, not likely to adversely affect
Bachman's warbler	*Vermivora bachmanii*	Endangered (Federal & State)	May affect, not likely to adversely affect
Bald eagle	*Haliaeetus leucocephalus*	BGEPA, Threatened (State)	No effect
Eastern black rail	*Laterallus jamaicensis*	Protected (Federal)	May affect, not likely to adversely affect
Least tern	*Sterna antillarum*	Threatened (State)	No effect
Piping plover	*Charadrius melodus*	Threatened (Federal), Endangered (State)	No effect
Red-cockaded woodpecker	*Picoides borealis*	Endangered (Federal & State)	No effect
Red knot	*Calidris canutus rufa*	Threatened (Federal)	No effect
Wilson's plover	*Charadrius wilsonia*	Threatened (State)	May affect, not likely to adversely affect
Fish			
Atlantic sturgeon	*Acipenser oxyrinchus*	Endangered (Federal)	May affect, not likely to adversely affect
Shortnose sturgeon	*Acipenser brevirostrum*	Endangered (Federal & State)	May affect, not likely to adversely affect
Mammal			
Finback whale	*Balaenoptera physalus*	Endangered (Federal & State)	No effect
Humpback whale	*Megaptera novaengliae*	Endangered (Federal & State)	No effect
Northern long-eared bat	*Myotis septentrionalis*	Threatened (Federal)	May affect, but any resulting incidental take is not prohibited by the final 4(d) rule
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	Endangered (State)	May affect, not likely to adversely affect
Right whale	*Balaena glacialis*	Endangered (Federal)	No effect
Sei whale	*Balaenoptera borealis*	Endangered (Federal)	No effect
Sperm whale	*Physeter macrocephalus*	Endangered (Federal)	No effect
West Indian manatee	*Trichechus manatus*	Threatened (Federal), Endangered (State)	May affect, not likely to adversely affect
Mollusk			
Atlantic pigtoe	*Fusconaia masoni*	Endangered (State)	No effect

Table 4.19 Federal and State Protected Species in Charleston County (continued)

Common Name	Scientific Name	Protected Status	Observed in Study Area
Plant			
American chaff seed	*Schwalbea americana*	Endangered (Federal)	No effect
Canby's dropwort	*Oxypolis canbyi*	Endangered (Federal)	May affect, not likely to adversely affect
Pondberry	*Lindera melissifolia*	Endangered (Federal)	May affect, not likely to adversely affect
Seabeach amaranth	*Amaranthus pumilus*	Threatened (Federal)	No effect
Reptile			
Green sea turtle	*Chelonia mydas*	Threatened (Federal & State)	No effect
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered (Federal & State)	No effect
Leatherback sea turtle	*Dermochelys coriacea*	Endangered (Federal)	No effect
Loggerhead sea turtle	*Caretta caretta*	Threatened (Federal & State)	No effect
Southern hognose snake	*Heterodon simus*	Threatened (State)	No effect
Spotted turtle	*Clemmys guttata*	Threatened (State)	May affect, not likely to adversely affect

Note: USFWS concurred with these findings on April 6, 2020 and NOAA Fisheries concurred on Month X, 2020

4.13.5.1 Migratory Birds

There are hundreds of species of migratory birds protected by the MBTA that may nest in, forage in, or fly through, the study area. Birds that are considered non-native species such as the house sparrow and the European starling are examples of species that are not protected under the MBTA. In addition, many groups of hunted or game birds, such as ducks, geese, doves, and some shorebirds are subject to limited protection and can be hunted in specific seasons. Migratory birds which may be foraging or moving through the project study area are less likely to be affected by project impacts as they can generally move more readily from construction-related disturbances. Ground nests, arboreal nests, and nests built on man-made structures could occur within the project study area. Active nests were not noted on any structures; however, nests in shrubs and trees are present throughout the project study area.

Photograph 2 Great blue heron foraging within the I-526 LCC WEST Project Study Area

The federal Migratory Bird Treaty Act of 1918, as amended, 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.

4.13.6 Essential Fish Habitat

Essential Fish Habitat (EFH) is defined as waterbodies and substrate that fish and other organisms need to spawn, breed, feed, and grow to maturity (16 USC 1802, 50 CFR 600.10).

4.13.6.1 What is Essential Fish Habitat?

Wetlands, reefs, rivers, and other aquatic habitats are considered EFH because of their importance to fish throughout their lifecycle. Proper management and conservation of EFH is necessary for the survival of fish populations, as well as the ecological and economic benefits they provide.[22]

Certain locations and types of EFH have a greater need for conservation and management than others. These areas are referred to as Habitat Areas of Particular Concern (HAPC). HAPC are considered high priority areas for conservation, management, or research. HAPCs receive such designation because they are rare, sensitive, stressed by development, or important to overall ecosystem function.[23]

4.13.6.2 How is Essential Fish Habitat Protected?

Magnuson-Stevens Fishery Conservation and Management Act of 1976

The Magnuson-Stevens Fishery Conservation and Management Act (MSFA) is the law governing marine fisheries in the United States. A fishery is one or more species of fish which are managed as a unit for commercial, recreational, or subsistence purposes. The MSFA was passed to address concerns of overfishing and unregulated foreign activity affecting fisheries in the US. This law expanded the US federal jurisdiction from 12 miles offshore to 200 miles and established eight regional fishery management councils.[24]

Regional Fisheries Management Councils

Regional fisheries management councils are responsible for the monitoring and regulation of fisheries within the waters of their respective regions. The South Atlantic Fisheries Management Council (SAFMC) is tasked with conserving and managing fish stocks for the South Atlantic region, which includes the coast of South Carolina. Some fish species managed by the Mid-Atlantic Fisheries Management Council (MAFMC) also occur within the coastal waters of South Carolina.

22 https://www.fisheries.noaa.gov/national/habitat-conservation/essential-fish-habitat
23 https://www.fisheries.noaa.gov/national/habitat-conservation/essential-fish-habitat
24 https://www.fisheries.noaa.gov/insight/understanding-laws-and-noaa-fisheries

NOAA Fisheries

NOAA Fisheries is a division of NOAA and is responsible for managing the marine resources of the United States. NOAA Fisheries works closely with the regional fisheries management councils to describe and identify EFH and HAPC as well as minimize adverse impacts to these habitats. Adverse effects to EFH are those that reduce the quality and/or quantity of EFH. These adverse effects include direct, indirect, site specific, habitat wide impacts, individual, cumulative, or synergistic consequences of actions.[25]

Table 4.20 EFH Types within the Project Study Area

EFH Type	Ashley River	Filbin Creek
Estuarine Emergent Wetlands	X	X
Palustrine Emergent Wetlands		X
Intertidal Non-Vegetated Flats	X	X
Riverine Tidal Creek		X
Estuarine Tidal Creeks	X	X
Unconsolidated Bottom (Coastal Inlets)	X	X

Table 4.21 provides a total acreage for each EFH type and quality found within the project area. Refer to the EFH Assessment in Appendix K for more detailed information about these habitat types, Managed Fisheries and EFH/HAPC.

Table 4.21 EFH Acreage within the Project Study Area

EFH Type	Quality	Acres
Estuarine Emergent Wetlands	High	72.4
	Low	35.2
Palustrine Emergent Wetlands	Low	59.8
Intertidal Non-Vegetated Flats	High	3
Riverine Tidal Creek	Low	1.3
Estuarine Tidal Creeks	High	11.6
	Low	7.8
Unconsolidated Bottom	High	25
Oysters	High	0.8
Total EFH Area		216.9

25 https://www.fisheries.noaa.gov/new-england-mid-atlantic/habitat-conservation/essential-fish-habitat-assessment-consultations

4.13.6.3 How is Essential Fish Habitat within the Project Study Area Identified and Assessed?

The SAFMC provides descriptions of the different types of EFH in the region. These descriptions are being used to determine which habitat types are present within the I-526 LCC WEST and where their boundaries lie. Using GIS data and aerial imagery, habitat types and their boundaries are predicted based on the visible water levels and the presence or lack of vegetation. Field assessments were conducted to either confirm or make changes to the mapped EFH boundaries. These assessments were completed during low tide to ensure that all habitat types were accounted for and identified correctly. EFH within the project area is found in the portion that crosses the Ashley River and the portion that crosses Filbin Creek and its confluence with the Cooper River. Both systems are tidally influenced and have similar habitats.

4.13.7 How would the No-Build Alternative Impact Natural Resources?

Since existing conditions are unaffected by the No-Build Alternative, no effects on natural resources are anticipated under the No-Build scenario.

4.13.8 How would the Reasonable Alternatives Impact Natural Resources?

4.13.8.1 Federal and State Protected Species

An ESA Section 7 project affect determination on bald eagle is not necessary as the species is no longer protected by the ESA and does not require Section 7 consultation. As proposed, there would be no impacts to bald eagle.

There are no known populations of threatened or endangered species residing in the project area. Suitable habitat occurs within the project study area for nine federally listed threatened or endangered species. There are no candidate species, or critical habitat within or near the project study area. Proposed threatened species may not yet be, or are not protected under the ESA, but other Federal regulations still apply. There is one proposed threatened species: the Eastern black rail, which is protected by the MBTA. Under section 7(a)(4) of the ESA, federal agencies must confer with the USFWS and/or NOAA if their action will jeopardize the continued existence of a proposed species. No adverse effects are anticipated for any federal or state protected species. Refer to Table 4.17 for the effects determination for each species. **Coordination with NOAA and USFWS will continue during development of the FEIS. SCDOT will provide NOAA and USFWS updated analysis for changes to previous effect determinations on protected species.**

4.13.8.2 Agency Coordination and Consultation Findings

Under Section 7 of the ESA consultation with USFWS and NOAA is required for projects that "may affect" federally endangered and threatened species. Informal Consultation was initiated with both agencies, resulting in a Biological Assessment being prepared for each agency, detailing potential species impacts and effects. The Biological Assessments can be found in Appendix L. A Letter of Intent (LOI) was sent to USFWS and NOAA Fisheries by SCDOT on January 27, 2016. The USFWS provided a response to the LOI on February 1, 2016, refer to Appendix L. USFWS concurred with the species findings on April 6, 2020, concluding Section 7 consultation for species under USFWS jurisdiction. Refer to Appendix L for USFWS correspondence. NOAA Fisheries concurrence with species findings under their jurisdiction is pending, but anticipated in November 2020. Refer to Appendix L for NOAA Fisheries correspondence. Biological Opinions are not anticipated from either NOAA or USFWS.

Coordination with NOAA Fisheries and USFWS will continue during development of the FEIS.

4.13.8.3 Essential Fish Habitat

The EFH Technical Report outlines potential impacts to EFH. Refer to Appendix O for the technical report and for documentation of NOAA Fisheries coordination and consultation.

Adding new bridge support structures may result in a net benefit to oysters within the project limit by providing new hard surfaces for them to grow on.

The proposed project will result in unavoidable impacts to EFH. Impacts to EFH are expected where two additional bridge structures would be constructed over the Ashley River and where new structures would be constructed over portions of Filbin Creek and its associated floodplain to accommodate the widening of I-526. Additionally, improvements to the interchange access for the I-526 connections at N Rhett Avenue and Virginia Avenue would result in impacts to EFH.

Most of the EFH within the project area is proposed to be spanned with bridges. Due to the project being in the early stages of design, the exact methods used to construct the proposed bridges have not been determined. Additionally, since the construction of the project will be awarded as a design-build contract, **the specific construction methods and extent and duration of impacts would ultimately be determined by the design-build contractor based on guidelines and conditions established by SCDOT, FHWA, and state and federal regulatory agencies including SCDHEC-OCRM, USACE, USFWS, and NOAA Fisheries.** The proposed impacts to EFH are based on the conceptual design at this time. Additionally, the potential impact to managed fishery species will vary based on life stage, habitat use, distribution, and abundance.

Permanent direct impacts to EFH are expected from the placement of permanent fill for roadway and bridge approaches or bridge structures and sub-structures, such as concrete bridge pilings or shafts. The permanent direct impacts to EFH associated with the Ashley River bridges will impact high quality estuarine emergent wetlands, high quality intertidal non-vegetated flats, oysters, and high-quality unconsolidated bottom EFH. The permanent direct impacts to EFH associated with Filbin Creek will permanently impact high quality and low quality estuarine emergent wetlands, high quality and low quality estuarine tidal creeks, high quality intertidal non-vegetated flats, low quality palustrine emergent wetlands, low quality riverine tidal creeks, and high quality oysters. Permanent indirect impacts to EFH include the possible conversion or loss of function of EFH due to loss of vegetation from shading. Permanent shading impacts are expected to occur to high quality estuarine

emergent wetlands in the Ashley River evaluation area and low quality palustrine emergent wetlands in the Filbin Creek evaluation area. A second indirect impact associated from the placement of new bridge structure and sub-structure in tidally influenced waters is the creation of suitable habitat for oyster propagation.

To evaluate temporary impacts to EFH it was assumed the contractor would use temporary trestles as the main method of construction access. However, the contractor may use temporary trestles, barges, timber mats, or a combination of multiple methods of construction access to complete the new bridge structures. **Temporary fill may be used for some access, but will not be the only method of construction access for the project.** The final construction access methods will be determined by the design build contractor in coordination with SCDOT and FHWA. Temporary direct impacts to EFH will result from the placement of temporary fill for construction access for the project. **All construction access materials will be removed to the greatest extent practicable at the completion of construction.**

No matter which method the contractor uses for construction access, the EFH associated with the Ashley River will experience temporary direct impacts to high quality estuarine emergent wetlands, high quality estuarine tidal creek, high quality intertidal non-vegetated flats, high quality unconsolidated bottom, and high quality oysters. Construction access in the Filbin Creek EFH will temporarily impact high quality and low quality estuarine emergent wetlands, high quality and low quality estuarine tidal creeks, high quality intertidal non-vegetated flats, low quality palustrine emergent wetlands, low quality riverine tidal creeks, and high quality oysters.

Additionally, the proposed project would result in temporary indirect impacts to EFH from shading or loss of vegetation associated with construction access. The proposed temporary trestle would shade high quality estuarine emergent wetlands and low quality palustrine emergent wetlands EFH.

Table 4.22 summarizes all impacts to EFH within the project limits. The total impacts represent an estimation of the worst-case scenario for the respective impact types discussed in previous sections. Quality of areas impacted are designated as HQ for high quality and LQ for low quality.

Since there will be impacts to the EFH and possibly aquatic species managed by the SAFMC, an EFH Mitigation Plan will be established.

Table 4.22 EFH Impacts within the Project Study Area

Impact Type	EFH Type						
	Estuarine Emergent Wetlands	Estuarine Tidal Creek	Intertidal Non-Vegetated Flats	Palustrine Emergent Wetlands	Riverine Tidal Creek	Unconsolidated Bottom	Oysters
Permanent Direct (Concrete Piles, Drilled Shafts, Approach/Causeway Fill, Potential Existing Material Removal)	1.6 acres (HQ)	0.5 acres (HQ) 1.3 acres (LQ)	0.4 acres (HQ)	1.4 acres (LQ)	0.3 acres (LQ)	0.2 acres (HQ)	0.4 acres (HQ)
Permanent Indirect (Shading, Additional Surface Area for Oysters)	3.2 acres (HQ)	0.1 acres	0 acres	10.3 acres (LQ)	0 acres	0 acres	0 acres (HQ)
Temporary Direct (Temporary Trestle Pilings, Barges, Timber Mats)	0.2 acres (HQ) 0.1 acres (LQ)	0.2 acres (HQ) 0.1 acres (LQ)	0.2 acres (HQ)	0.1 acres (LQ)	0.1 acres (LQ)	0.2 acres (HQ)	0.2 acres (HQ)
Temporary Indirect (Shading, Siltation)	4.9 acres (HQ) 0.1 acres (LQ)	0.2 acres (HQ) 0.1 acres (LQ)	0.2 acres (HQ)	7 acres (LQ)	0.1 acres (LQ)	0.2 acres (HQ)	0.2 acres (HQ)
Total	10.1 acres	2.5 acres	0.8 acres	18.8 acres	0.5 acres	0.6 acres	0.8 acres

The project will ultimately result in unavoidable impacts to EFH. The placement of fill for the widening of I-526 LCC WEST, bridge approaches, and new bridge structure and sub-structure will result in permanent direct impacts to EFH. Shading associated with permanent bridge structures will result in the permanent indirect impacts to EFH. Impacts associated with construction access will result in temporary direct and indirect impacts. The permanent loss of EFH and the temporal lag for restoration to existing conditions from temporary impacts may take months or years. Therefore, it is the determination of SCDOT that the proposed project would adversely impact the EFH in the project area. NOAA Fisheries has reviewed the findings of the EFH assessment and had no objections to the findings documented by SCDOT. SCDOT received a concurrence letter from NOAA Fisheries on September 2, 2020 regarding the potential impacts to EFH. A copy of the letter can be found in Appendix O.

Coordination with NOAA Fisheries will continue during development of the FEIS. SCDOT will provide NOAA Fisheries updated analysis for any projected increases to previously estimated impacts to EFH.

4.13.9 How would Project Impacts to Natural Resources be Mitigated?

4.13.9.1 Federal and State Protected Species

Steps will be taken to avoid and minimize impacts to wetlands and aquatic areas to protect federally listed species found to have habitat within the project study area: the West Indian manatee, American wood stork, black rail, Bachman's warbler, Atlantic sturgeon, shortnose sturgeon, pondberry and Canby's dropwort. These species rely on wetlands, open water areas. or both for habitat; therefore, habitat degradation and elimination should be minimized. Piping plovers inhabit areas adjacent to open water and could also benefit from measures to minimize impacts to wetlands and aquatic habitat. In addition, state listed species may also benefit from measures to protect wetlands and water quality.

SCDOT commits to implementing the following conservation measures, or actions, to minimize or compensate for effects to each species:

- Follow SCDOT Best Management Practices during construction and maintenance.
- Drilled shafts should be used in place of driven piles where possible.
- Obtain NPDES permit and prepare a Stormwater Pollution Prevention Plan
- Ensure equipment does not obstruct or impede passage through more than 50 percent of the Ashley River.
- Use of "slow starts" for pile driving, barge movement, and other vessel movement where activity ramps up slowly in an effort to deter marine species from the work area.
- Avoid demolition of existing in-water structures.
- Obligations under Section 7 of the Endangered Species Act must be considered if (1) new information reveals impacts associated with this project may affect listed species or critical habitat in a manner not previously considered, (2) the project is subsequently modified in a manner which was not considered in this assessment, or (3) a new species is listed or critical habitat is determined that may be affected by the proposed improvements."
- All contractors involved in the construction will be required to comply with the USFWS Manatee Protection Guidelines (Appendix E) for in-water work.
- Conservation measures would be undertaken to minimize the three predominate risks to manatees including vessel strikes, noise, and turbidity. The contractor would adhere to the USFWS Manatee Protection Guidelines during project construction to eliminate the possibility of construction related manatee injury or death. To avoid striking manatees, construction vessels would operate at low speeds (no-wake or idle) within the project area and when operating with less than a 4-foot clearance from the bottom. The use of a designated spotter between May 15 and October 15 would provide reasonable assurance against impacts resulting from in-water work. In-water moving equipment would be halted if a manatee is spotted within 50 feet of the in-water construction area. Any collision or injury to manatees will be reported immediately to the USFWS South Carolina Field Office.
- The project manager and/or contractor would inform all project personnel that manatees may be present in the project area. The project manager would ensure that all construction personnel know the general appearance of the species and their habit of moving about completely or partially submerged in shallow water.

4.13.9.2 Essential Fish Habitat

Impacts to EFH would be minimized to the maximum extent practicable. As the project design progresses, the proposed construction limits will be refined, and further avoidance and minimization measures taken to reduce the amount of impact to EFH. The concepts for bridges over both estuarine and riverine tidal creeks have been designed to span the entire creek channels and avoid any roadway fill impacts to the channels where practicable. In addition, maximizing the length of spans and the distance between bents and columns where practicable will minimize the amount of fill being placed in EFH.

SCDOT and NOAA Fisheries have developed an EFH-specific list of general BMPs to minimize construction-related impacts to EFH and water quality within the project watershed. It is anticipated that many of these BMPs will be incorporated as conditions/commitments to the Section 404/401 permit. **In accordance with the permit, the project plans and/or Environmental Compliance Plan will clearly state all environmental commitments and BMPs to be implemented during and following project construction.**

A final mitigation plan will be developed for the 404/401 permit and will include consideration for impacts to EFH as part of that plan. This mitigation plan will be established as part of the Section 404 permitting phase of the project. SCDOT/FHWA will develop the mitigation plan in coordination with the appropriate resource agencies.

This mitigation plan will be established as part of the Section 404 permitting phase of the project. The EFH Mitigation Plan may include mitigation measures such as purchasing mitigation credits from an approved mitigation bank or Permittee Responsible Mitigation (PRM) methods such as causeway removal, living shorelines, oyster bed restoration, and/or other methods of mitigating for EFH impacts. SCDOT/FHWA will develop the mitigation plan in coordination with the appropriate resource agencies, including NOAA Fisheries.

4.14 Cultural Resources

A cultural resource survey was completed to identify and evaluate potential cultural resources within the project study area that may be affected by the proposed I-526 LCC WEST corridor improvements project. The results of this survey and any potential effects of the proposed project on cultural resources are summarized below. For more detailed information, refer to Appendix P.

Cultural resources consist of archaeological sites, isolated artifacts, historic architecture, and historic districts, as well as traditional cultural properties (TCPs).

4.14.1 How are Cultural Resources Protected?

4.14.1.1 National Historic Preservation Act

The National Historic Preservation Act (NHPA) of 1966 was passed to preserve historical and archaeological sites in the United States. NHPA establishes the National Register of Historic Places which is the official list of the nation's historic places worthy of preservation. Section 106 of the NHPA requires federal agencies involved in an undertaking (funding, permitting, etc.) to consider the impacts on cultural resources. 36 CFR 800, Subpart B establishes a process for federal agencies to follow when complying the requirements of the Section 106 process which is completed in consultation with the State Historic Preservation Office (SHPO) and the federally recognized Native American tribes. Due to the proposed I-526 LCC WEST project being a federal undertaking, FHWA must comply with the NHPA including applicable regulations.

4.14.1.2 Department of Transportation Act of 1966, Section 4(f), as Amended

Section 4(f) of the US Department of Transportation Act (as amended by SAFETEA-LU, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users) provides protection for publicly owned parks, recreation areas, wildlife and waterfowl refuges, and historic sites.[26] Historic sites protected by this regulation include sites that are eligible for listing or listed on the NRHP. Section 4(f) only applies to U.S DOT agencies, including FHWA, projects. The Section 106 process is used to address historic properties in the Section 4(f) evaluation, but Section 106 and Section 4(f) are separate acts with separate requirements. Section 4(f) is discussed in detail in Section 4.11: Section 4(f).

4.14.2 How were Cultural Resources Identified?

The cultural resources survey conducted for the I-526 LCC WEST Project includes background research, a terrestrial archaeological survey, an underwater archaeological survey, and an architectural survey.

ArchSite is an online database managed by SCIAA and SCDAH that contains information about recorded archaeological sites.

26 U.S. Department of Transportation Federal Highway Administration (USDOT FHWA). 2012. Environmental Review Toolkit: Section 4(f) Policy Paper. 7/20/2012. https://www.environment.fhwa.dot.gov/legislation/section4f/4fpolicy.aspx#ppra. Web accessed: 1/20/2020.

4.14.2.1 Background Research

Background research was done at the South Carolina Institute of Archaeology and Anthropology (SCIAA) and online at ArchSite to locate any previously recorded archaeological resources or NRHP properties within or near the project. Background research resulted in the identification of several previously recorded cultural resources within 0.25 mile of the project; these are discussed in detail in the Cultural Resource Report. Refer to Appendix P.

4.14.2.2 Archaeological Field Survey

The archaeological survey was completed August 23-26, 2016: September 13-17 2017; and in February 2020, in accordance with the South Carolina Standards and Guidelines for Archaeological Investigations.[27] The surveys conducted for this project applied systematic shovel testing and visual surfaces inspections. Each shovel test measured approximately 30-by-30 centimeters (cm) in diameter, was excavated approximately 40-60 cm below surface into sterile subsoil and fill was sifted. Visual surface inspection was used in areas with good ground surface visibility. Refer to Appendix P for additional details.

4.14.2.3 Architectural Survey

An intensive architectural survey of aboveground cultural resources was designed to identify, record, and evaluate all historic architectural resources (buildings, objects, designed landscapes, structures, and/or other sites with aboveground elements) within the project study area.

Field survey methods complied with both the Survey Manual: South Carolina Statewide Survey of Historic Properties and the National Register Bulletin 24, Guidelines for Local Surveys: A Basis for Preservation Planning. During field surveys, the integrity of each architectural resource and previously recorded resources within the project study area were evaluated to determine eligibility for the South Carolina Survey of Historic Properties. The principal measure used by the South Carolina Department of Archives and History (SCDAH) to define historic architectural resources is a minimum age of 50-years. All architectural resources in the project study area were recorded with survey forms, maps, and digital photographs. Refer to Appendix P for additional details.[28,29]

27 Council of South Carolina Professional Archaeologists, South Carolina Department of Archives and History, and South Carolina Institute of Anthropology and Archaeology (COSCAPA). 2015. "South Carolina Standards and Guidelines for Archaeological Investigations". State Historic Preservation Office, Review and Compliance Branch, Columbia, South Carolina.

28 South Carolina Department of Archives and History (SCDAH). 2011. "Survey Manual: South Carolina Statewide Survey of Historic Properties". South Carolina Department of Archives and History, Columbia, South Carolina.

29 Parker, Patricia L. 1985. National Register Bulletin 24: Guidelines for Local Surveys: A Basis for Preservation Planning. U.S. Department of the Interior, National Park Service, Interagency Resources Division, Washington, D.C.

4.14.2.4 NRHP Eligibility

As per 36 CFR 60.4, all cultural resources encountered are assessed to determine significance based on four broad evaluative criteria. Any resource (building, structure, site, object, or district) may be eligible for the NRHP that:

A. is associated with events that have made a significant contribution to the broad pattern of history;
B. is associated with the lives if persons significant in the past;
C. embodies the distinctive characteristics of a type, period, or method of construction, or represents the work of a master, possesses high artistic value, or represents a significant and distinguishable entity whose components may lack individual distinction; or
D. has yielded, or is likely to yield, information to history or prehistory.

4.14.2.5 How are Historic Resources Evaluated?

A resource may be eligible under one or more of the listed criteria. Archaeological sites are most often, but not always, evaluated using Criterion D. Criteria A, B, and C are most frequently applied to historic buildings, structures, non-archaeological sites, objects, and districts. 50 years of age is used as a broad guideline to define "historic" in the NRHP evaluation process, but if a more recent resource displays "exceptional" significance it may be considered for eligibility. To recommend a resource as eligible for the NRHP, it must be associated with an important historic context in local, regional (state), or national history and it must retain the integrity necessary to reflect and represent its historic context.[30]

4.14.3 What Archaeological Resources were Found During the Survey?

During the archaeological survey of the I-526 LCC WEST Project, investigators revisited one previously identified site (38CH17) and identified one new archaeological site (38CH2523). In this section we describe each archaeological site and summarize the NRHP assessments for each site.

Site 38CH17, the remnants of a large brick kiln, was originally recorded in 1972. According to Brockington's Cultural Resource Survey, the site is a pile of bricks which appears to be the main area for firing bricks. One pile of clay appears to be where clay was stored until it could be used. A borrow pit is located about 300 feet east of the site. According to original site documentation, the borrow pit was largely destroyed during the construction of the existing I-526 but the small portion that still exists was revisited during the investigations of the proposed I-526 LCC WEST project. Based on previous and current evaluations, Site 38CH17 is recommended as not eligible for the NRHP under Criterion D and warrants no further management consideration.

A newly identified concrete bridge and earthen causeway, Site 38CH2523, was investigated during the current evaluations. The early twentieth century site consists of a bridge that once crossed Bulls Creek and an earthen causeway. The middle portion of the bridge does not exist today and no evidence of a former road on the eastern side of the bridge exists. The site is recommended as not eligible for the NRHP under Criterion D and warrants no further management consideration.

30 Brockington. 2019. Cultural Resources Survey of the I-526 Corridor Improvements Project.

Anomaly 006-1 could be associated with an early ferry vessel or bridge structure and avoidance is recommended for this site. The site is of indeterminate eligibility and further investigations to determine the site's NRHP eligibility status are not necessary as avoidance is recommended. A project commitment has been made to avoid the site, including a 100-ft radius buffer surrounding the resource. Anomaly 001-1 likely represents modern debris and is recommended not eligible for the NRHP. No further management of Anomaly 001-1 is warranted.

Two anomalies were identified during the underwater archaeological survey, Anomaly 006-1 and Anomaly 001-1.

Refer to Appendix P for additional detail on the archaeological resources.

4.14.4 What were the Results of the Architectural Survey?

The architectural survey was conducted from July 26 to September 7, 2016. The survey was designed to identify and evaluate historic architectural resources in the project study area using the SCDAH's (2005, 2018) Survey Manual: South Carolina Statewide Survey of Historic Properties. Table 4.22 lists all architectural resources within the project study area and the recommended NHRP eligibility determination of each site.

Table 4.23 Architectural Resources in the Project Study Area

Resource Number	Name	Date	NRHP Status
7806	Bethune School	1952	Eligible
7916	Charleston Mining and Manufacturing Company (CMMC)	1870-1930	Not Eligible

Resource 7806, Bethune Elementary, is eligible for the NRHP under Criteria A and C. The proposed I-526 LLC WEST Corridor Improvements will have no adverse effect on this resource as the proposed improvements take place on a raised roadway with a building and vegetation which provide a buffer limiting most of the viewshed. No further management considerations are warranted for this resource.

Resource 7916, Charleston Mining and Manufacturing Company (CMMC), was recommended for as eligible and SHPO concurred in a letter dated June 1, 2020. The site has been reevaluated and the previous finding reversed. Resource 7916 is determined not eligible for NRHP listing. SHPO concurred in a letter dated September 1, 2020. Refer to Appendix P for SHPO concurrence letters.

Ashley Hall Plantation is a NRHP-listed property located approximately 0.25 miles outside of the project study area buffer on the bank of the Ashley River. The roadway and bridge over the Ashely River are in the property's viewshed. Proposed construction activities do not change the height of these bridges; therefore, the project will have no adverse effect on Ashley Hall Plantation. Additional consultation with SHPO is required if bridge heights are raised. Refer to Figure 4.18 for the historic properties near the project study area.

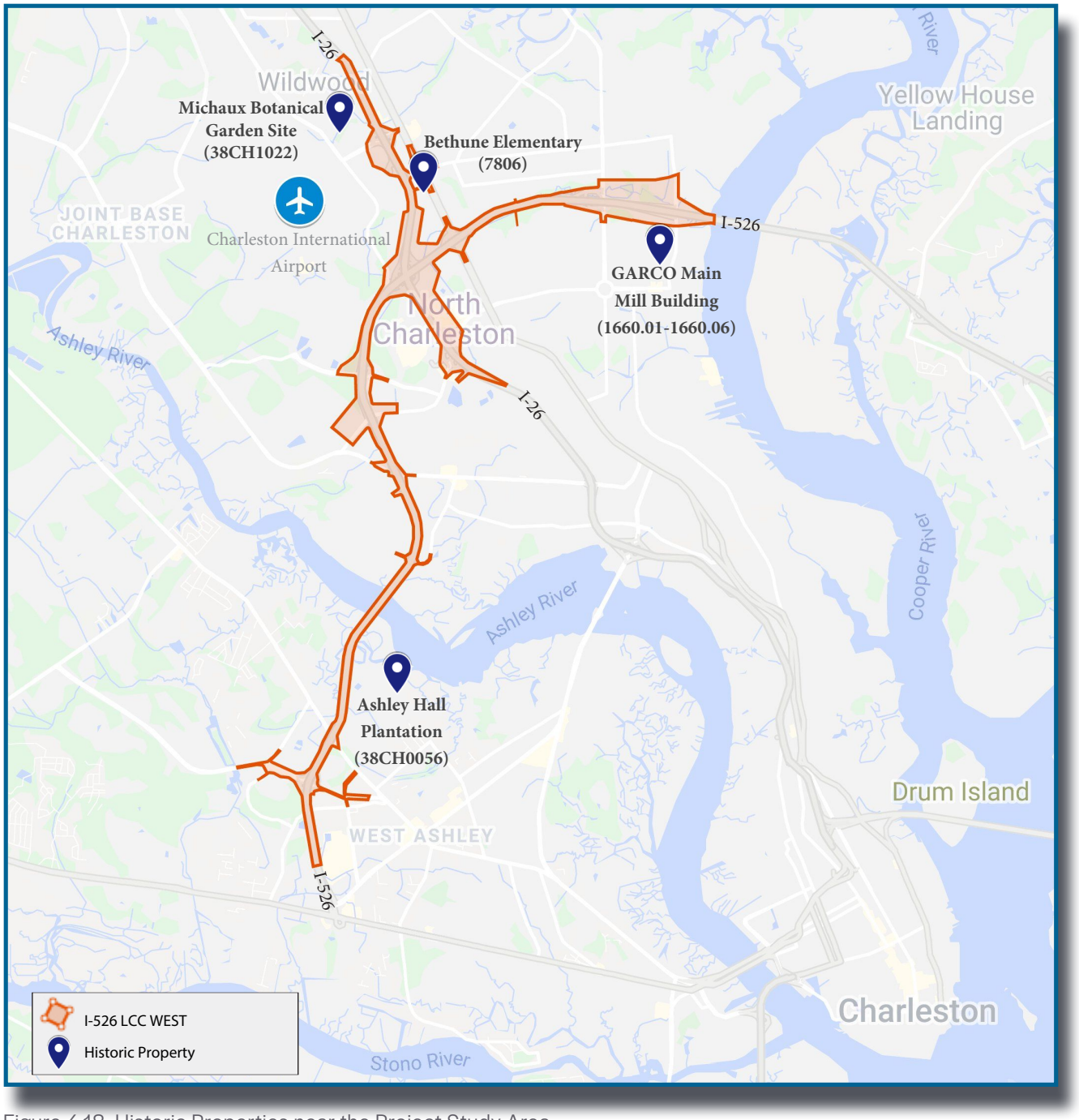

Figure 4.18 Historic Properties near the Project Study Area

4.14.5 What are the Potential Impacts to Cultural Resources?

The No-Build alternative would have no effect on NRHP-eligible or listed resources.

The proposed undertaking is not anticipated to have an adverse effect on NRHP-eligible or listed resources. The Bethune School (Resource 7806) is the only cultural resource within the project study area that is eligible for NRHP listing. The No-Build alternative would not have any impact on this resource. The Proposed Reasonable Alternatives would not directly impact the Bethune School, and there will be a 300-foot buffer that restricts the majority of the viewshed. Avoidance of Anomaly 006-1, an underwater resource that may be associated with

an early ferry vessel or bridge structure, is recommended and included as an Environmental Commitment, in addition to a 100-foot radius buffer for any construction-related activities surrounding the resource.

4.14.6 Consultation & Coordination with Federally Recognized Tribes

The objective of tribal consultation is to identify resources of importance; to assess the nature and extent of the impact on the characteristics of the resources; and to work through a collaborative process to identify acceptable measures for avoiding, minimizing, or mitigating significant impacts to the resources.

The NHPA requires consultation with federally recognized Native American tribes when federal agencies are involved in an undertaking with the potential to affect resources of religious or cultural significance, when the location of the undertaking is within an area of traditional use for the tribe, when the location is on tribal land, or where such properties might be affected regardless of the undertaking's location. 36 CFR 800 requires consultation at a government-to-government level in acknowledgment of the sovereign status of the tribes. In the case of the I-526 LCC WEST project, this means that the FHWA must take the lead in consulting with the tribes.

On March 29, 2019, an invitation to be a consulting part on the I-526 LCC West project was sent via email to the Tribal Historic Preservation Officers (THPO) for the Catawba Indian Nation, Eastern Shawnee Indians, and Muscogee Creek Nation. The Catawba Indian Nation responded via email on May 6, 2019 indicating they wished to be a consulting party. On June 18, 2019, SCDOT transmitted electronic copies of the overall eligibility of resources in the project study area to the Muscogee (Creek) Nation and Eastern Shawnee Nation, and a physical copy of the report to the Catawba Indian Nation on behalf of FHWA. The Catawba Indian Nation returned a signed concurrence letter to SCDOT on June 26, 2019. On July 2, 2020 SCDOT received a concurrence letter from the Catawba Indian Nation on both the I-526 Lowcountry Corridor West Project, Charleston Co., SC Addendum II report and the I-526 West Cultural Resources Effect Determination Memo. Responses to Section 106 coordination efforts were not received from the Eastern Shawnee Indians or Muscogee Creek Nation. Refer to Appendix A for more details on these letters and responses.

4.14.7 Consultation & Coordination with SHPO

On April 15, 2019 SCDOT sent SHPO an electronic copy of the overall eligibility of resources in the project study area. SCDOT received SHPO comments in a May 7, 2019 email. After revisions were completed, three physical copies and an electronic copy of the revised draft cultural resources reports were sent to SCDOT on May 29, 2019. On July 16, 2019, SCDOT transmitted a physical copy of the report to the SHPO on behalf of the FHWA. SCDOT and the SHPO concurred with the eligibility of resources within the project study area, July 16, 2019. On May 27, 2020, SCDOT sent SHPO an electronic copy of the I-526 West Addendum 2 Report. SCDOT and SHPO also concurred with the I-526 West Addendum 2 Report on May 27, 2020. SHPO concurred on the findings of no adverse effect to historic resources on June 1, 2020. Refer to Appendix P for documentation of the coordination and consultation efforts.

4.14.8 What Mitigation Measures would be Taken to Protect Cultural Resources?

During the construction phase of the project, 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.

If any such remains are encountered, the Resident Construction Engineer (RCE) must immediately be notified and all work in the vicinity of the discovered materials and site work shall cease until a SCDOT Archaeologist directs otherwise.

SCDOT will coordinate with the Project Engineer to ensure the unknown underwater anomaly 006-1 in the Ashley River is delineated and a 100-ft radius is labeled on all plan sheets. This label shall include the following detail to Prime and Sub Contractors "Within a 100 ft radius from X coordinate 2299561.02 and Y coordinate 365570.49, the Contractor shall not place any permanent or temporary spud, anchoring device or other item that would impact the river bottom." The protected area shall be noted in the environmental compliance inspection forms for the project and evaluated during each scheduled visit. If impacts to the river bottom are suspected, notification to SCDOT ESO Compliance office shall occur and additional investigations may be needed at the expense of the Contractor.

Resource 7806 and Ashley Hall Plantation will be clearly plotted on all construction plans along with an appropriate buffer of 25 feet around each resource. This zone will be clearly delineated in the field and all ground disturbance and construction staging activities would be conducted outside of this buffer area in order to avoid all possible impacts to these resources. A 100-ft radius buffer surrounding Anomaly 006-1 is recommended for any ground disturbing activities to avoid impacts to this resource.