

Appendix F

Indirect and Cumulative Effects Assessment





INDIRECT AND CUMULATIVE EFFECTS ASSESSMENT

INTERSTATE 526 (I-526)

FROM PAUL CANTRELL BOULEVARD TO VIRGINIA AVENUE
NORTH CHARLESTON AND CHARLESTON, SOUTH CAROLINA

DRAFT

9/30/2020



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INTRODUCTION

Indirect effects (also known as secondary effects) are caused by the action but occur later in time or are farther removed in distance from the project but are still considered “reasonably foreseeable.” These impacts may include growth-inducing effects and thereby impacts related to land use changes that would not otherwise occur without the project implementation. Changes in rate and type of development can result in adverse effects on air, water, and other natural systems, including ecosystems.¹ Analysis of indirect impacts follows the eight steps outlined in the *National Cooperative Highway Research Program Report (NCHRP) 466: Estimating the Indirect Effects of Proposed Transportation Projects*.²

Cumulative effects are defined as “the impact of the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions...”³ As stated in FHWA guidance on assessing cumulative effects, not all impact categories require a cumulative impact assessment. Resources requiring cumulative impact assessment are determined early in the project development process, based on each project’s setting and context.⁴ Given the urbanized setting of the proposed project, community impacts, water quality, and streams/wetlands were identified as categories meriting cumulative impact assessment. These categories were developed in consideration of input received during early agency coordination and public involvement. Cumulative effects on communities are discussed in the following section.

STEP 1 – SCOPING

Step 1 identifies the purpose and need for the project; identifies physical and ecological resource issues that affect the human environment; and identifies potentially significant issues and effects for further analysis. This step also sets the appropriate boundaries for the analysis.

PROJECT DESCRIPTION

As noted in Section 1.1 of the Community Impact Assessment (CIA) prepared for this project, the South Carolina Department of Transportation (SCDOT), along with the Federal Highway Administration (FHWA), seeks to increase capacity and improve operations of I-526 Lowcountry Corridor West - one of South Carolina’s most congested highways – from Paul Cantrell Boulevard to the Cooper River. The project location can be seen in Exhibit 1 below.

¹ 40 CFR § 1508.8

² National Cooperative Highway Research Program. Report 466: Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects. 2002. Web. https://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_466.pdf

³ 40 CFR § 1508.7

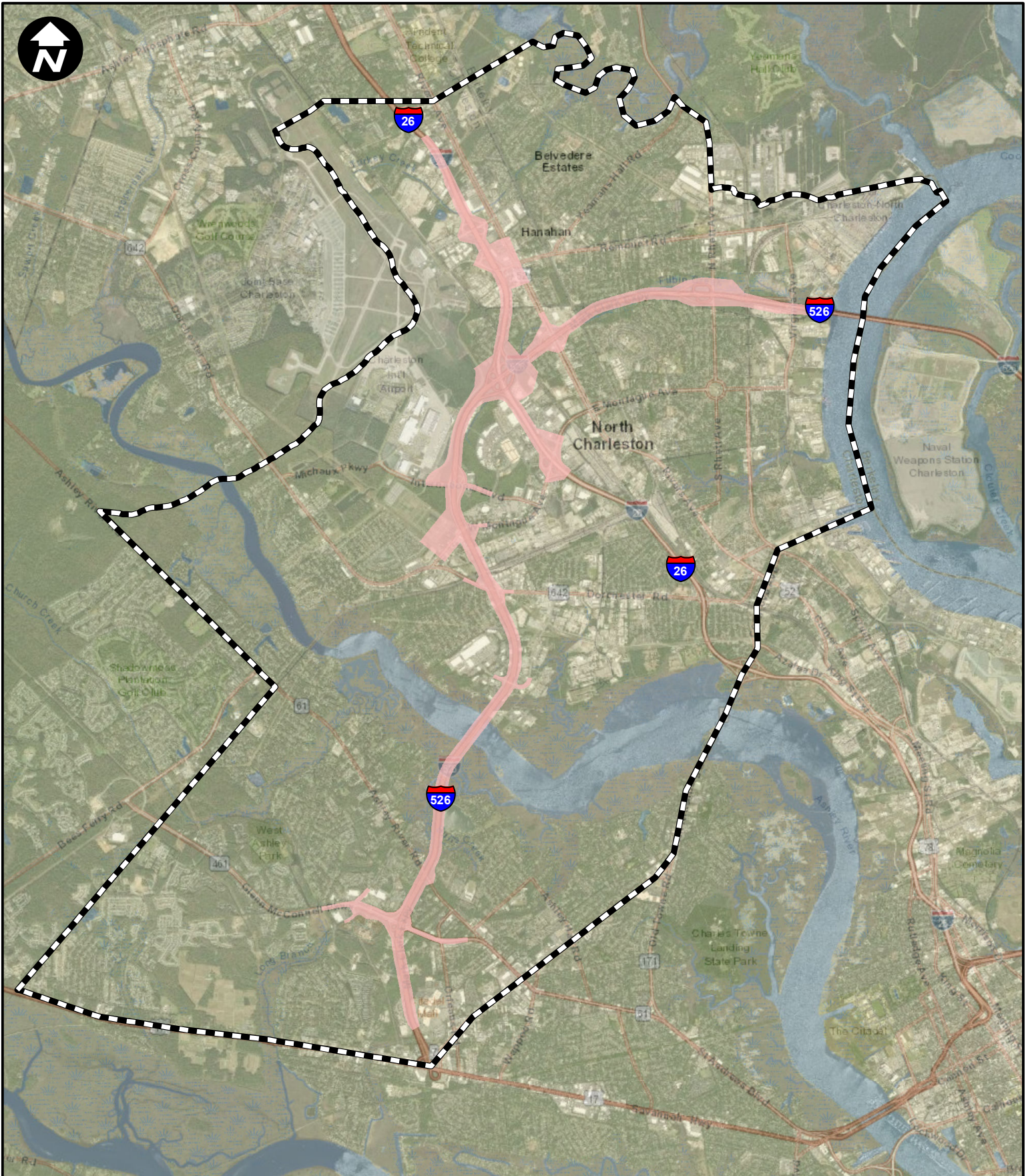
⁴ Federal Highway Administration. Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process. Web. <https://www.environment.fhwa.dot.gov/nepa/QAimpact.aspx>

The I-526 LCC WEST project would require additional right-of-way at various locations along the project corridor. As noted in Section 5.9.1 of the CIA, the original construction of I-526 resulted in direct impacts to the Russelldale neighborhood. The right-of-way acquired for the highway was very narrow and as such, there are currently many homes and businesses located in close proximity to the existing interstate structures. Therefore, there are several communities along the corridor that would be directly impacted with any improvements or changes to the interstate corridor.

The proposed project intersects several communities in both North Charleston and West Ashley, whose boundaries and detailed descriptions are included in the CIA. West Ashley is one of six incorporated areas of the City of Charleston. However, indirect and cumulative effects are anticipated to expand beyond these communities. As such, the indirect and cumulative effects (ICE) study area is defined by SC 7 and the Cooper River to the east; the North Charleston Marine Terminal and Goose Creek to the north; the HUC 12 Boundary, SC 61 and the CSX rail line to the west; and US 17 to the south. The ICE study area can be seen in Figure 1.



Exhibit 1: I-526 LCC West Project Corridor





0 3,150 6,300
Feet



**Study Area
Figure 1**

I-526 Lowcountry Corridor WEST
Charleston County
Last Updated on 3/27/2020

Legend

-  ICE Study Area
-  Project Corridor

PROJECT PURPOSE AND NEED

As noted in Section 1.1.2 of the CIA, the purpose of the project is to increase capacity at the I-26/I-526 interchange and along the I-526 mainline, thereby relieving traffic congestion and improving operations at the I-26/I-526 interchange and along the I-526 mainline from Paul Cantrell Boulevard to Virginia Avenue.

The need of this project is derived from the following factors, which are detailed further in Chapter 2 of the Draft Environmental Impact Statement (DEIS):

- Growth in population and employment
- Decreased mobility and increased traffic congestion
- Existing traffic conditions
- Projected traffic conditions
- Geometric Deficiencies

STEP 2 – STUDY AREA DIRECTION AND GOALS

The second step focuses on assembling information regarding general trends and goals within the ICE study area. The trends and goals in question are independent of the proposed project and typically concern social, economic, ecological, and/or growth-related issues, and are used to determine whether the proposed improvements are consistent with local and regional planning goals and objectives.

COMMUNITY

As noted in Section 3.2.2 of the CIA, the project corridor is located within the jurisdiction of the City of Charleston, City of North Charleston, Charleston County, and the Berkeley-Charleston-Dorchester Council of Governments (BCDCOG). The following documents were referenced to develop discussions on existing and future land use in the North Charleston portion of the ICE study area.

The *2018 Charleston County Comprehensive Plan* has a time horizon of 2023. The Plan includes growth management planning in the form of an urban growth boundary, future land use analysis, and zoning. Several areas within the ICE study area were identified as areas needing review for consistency, as shown in blue hatching in Exhibit 2 to the right.

The Charleston Area Transportation Study (CHATS) *Long Range Transportation Plan* (LRTP) has a time horizon of 2040. The LRTP includes a plan for multimodal transportation projects within the CHATS planning area (which includes Berkeley, Charleston, and Dorchester Counties).

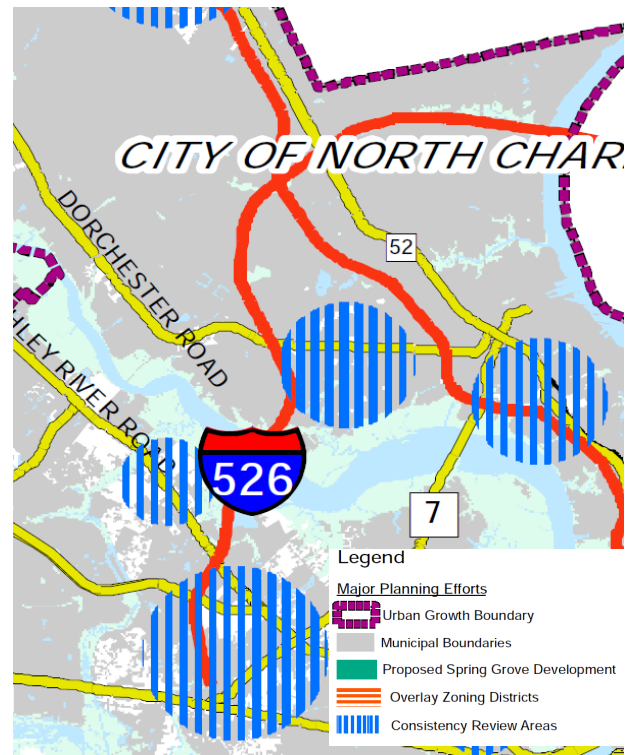


Exhibit 2. Special Planning Areas

Source: Charleston County 2018 Comprehensive Plan
<https://www.charlestoncounty.org/departments/zoning-planning/comp-plan.php>

To maintain consistency with local and regional bike and pedestrian plans, the I-526 bridge over the Ashley River will be designed to accommodate a planned shared-use path.^{5,6} The addition of a shared-use path and thus wider bridge across the Ashley River would create additional direct wetland impacts. The construction of the shared-use path may create impacts in the future, likely in the form of minor water quality effects associated with increased impervious surface. However, without a designated route for the shared-use path, environmental impacts associated with the shared-use path at this time. Additional details on the future shared-use path can be found in Chapter 4.7 of the DEIS.

North Charleston

The *Prime North Charleston Comprehensive Plan* has a time horizon of 2020. The Plan includes several non-motorist Priority Investment Areas that fall within the ICE study area:

- Road diet and cycle track on Park Circle from West Montague to East Montague
- Pedestrian bridge connecting Riverfront park to the Noisette Creek Greenway
- Streetscaping and improved bicycle lanes on Spruill Avenue from Park Circle to Pittsburgh Avenue
- Hiker/biker trail on the Ashley Riverfront from Leeds Avenue to south of North Bridge

Major programmed projects in the North Charleston area, in addition to this project, are described below.⁷ Programmed projects focus on providing increased capacity and access to the Port through commuter corridors and are included in Exhibit 3 below.

- Project # 0036524PE01: I-26 Widening & Interchange improvements along I-26 from near I-526 (Exit 212) to near Port Access Road (Exit 217). Right of way is occurring at present and construction is scheduled for 2024.
- Project # 0037345RD01: New Location Roadway for Port Access Road from I-26 (Exit 217) to Proposed Port Terminal. Funded through General Assembly appropriations and SC State Ports Authority. Construction is currently underway and anticipated to be complete in 2021.
- Project # P032102: Planning & Environmental Linkages Study to evaluate this section of the I-526 corridor in order to establish the needs, explore the feasibility of a range of bridge improvements, and establish the scope of future interstate improvements projects. Right of way is scheduled for 2020 and construction is scheduled for 2022.

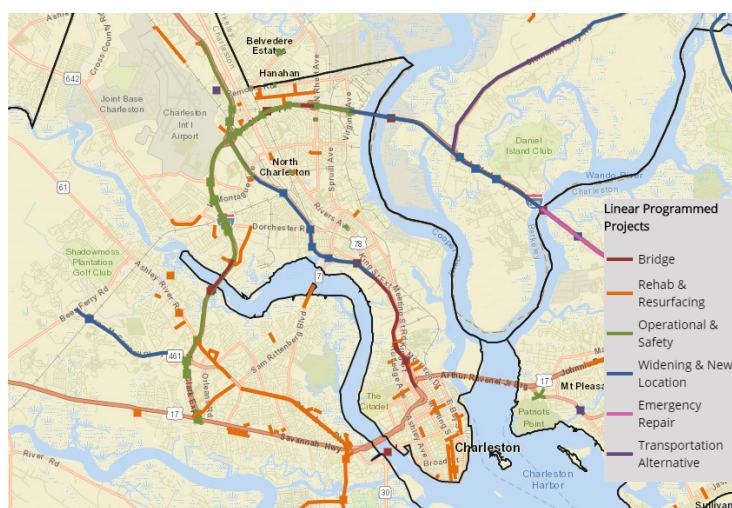


Exhibit 3: SCDOT Programmed Projects

Source: SCDOT

<https://scdot.maps.arcgis.com/apps/MapSeries/index.html?appid=ca1cd69fc88945f4bb465e16765d761c>

⁵ Berkeley-Charleston-Dorchester Council of Governments (BCDCOG). Walk + Bike BCD. 2017. <https://www.walkbikebcd.com/documents.html>

⁶ Berkeley-Charleston-Dorchester Council of Governments (BCDCOG). Long Range Transportation Plan. 2019. <https://www.bcdcog.com/long-range-transportation-plan/>

⁷ SCDOT. SCDOT Programmed Project Viewer. February 12, 2019. Web. <https://scdot.maps.arcgis.com/apps/MapSeries/index.html?appid=ca1cd69fc88945f4bb465e16765d761c>

- Project # P029633: Intersection Improvements at Murray Drive (S-88) at Yeamans Hall Road (S-24) in Berkeley County.

West Ashley

The *2010 Century V City Plan* has a time horizon of 2025 and outlines land use, future goals, economic development, and cultural resources, among other topics.

Plan West Ashley has a time horizon of 2023 and multiple Priority Progress Areas within the ICE study area, shown in Exhibit 4 to the right. The Priority Progress Areas were selected due to their high elevation and their “part in West Ashley’s historic development patterns and future area of economic growth.”⁸ The Plan identifies “adaption areas” at the Citadel Mall to encourage resilient development. It also identifies several open space opportunities including a greenway to bikeway connection through US 17 (Savannah Highway), connectivity enhancements to the Ashley River, and a gateway formation during the realignment of a roadway at Sam Rittenberg Boulevard.

The *2018 Charleston City Transportation Plan* has a time horizon of 2023 and includes guidance to strategize future development.

In addition to the I-526 Improvements project, one additional project in West Ashley is programmed for funding, the widening of Glenn McConnell Parkway (Project #P037878).⁷

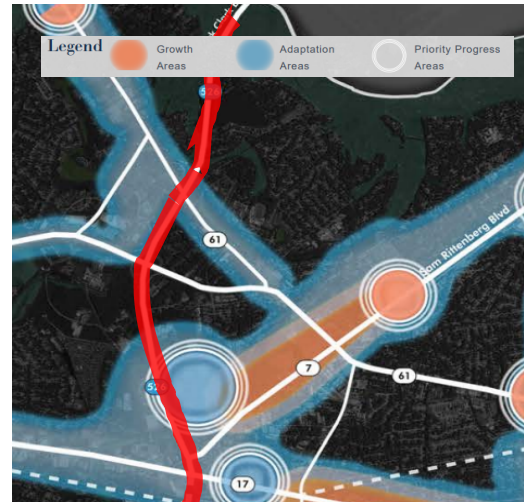


Exhibit 4: Priority Progress Areas in West Ashley

Source: City of Charleston
<https://www.charleston-sc.gov/1527/Plan-West-Ashley-Master-Plan>

WATER QUALITY

In addition to the planning documents described above, there are stormwater, flood, and coastal zone management programs that place restrictions or additional requirements on development in order to protect water quality. The City of North Charleston, City of Charleston, and Charleston County all have municipal storm sewer systems (MS4s) that are permitted under a National Pollutant Discharge Elimination System (NPDES) permit. The permit requires the jurisdictions to have stormwater management plans that promote pollution prevention, monitoring, construction and post construction stormwater management. In addition, stormwater pollution prevention plans (SWPPs) are site specific plans that identify potential stormwater pollution sources and appropriate stormwater control measures to be used during construction and during operation of industrial activities in order to reduce pollution. It provides operators with procedures on how to implement and comply with specific permit conditions (SCDHEC N.d.(c)).

Charleston County has a flood ordinance that restricts or prohibits uses that can result in increased erosion, flood heights or flood velocities. While there are special requirements for construction in flood zones, it is not prohibited. The South Carolina Coastal Management Program was established under the Coastal Zone Management Act (1972) to manage coastal resources. Implementation of the program includes direct regulation

⁸ City of Charleston. *Plan West Ashley*. February 2018. Web. <https://www.charleston-sc.gov/1527/Plan-West-Ashley-Master-Plan>

of impacts to critical areas such as coastal waters, tidelands, beaches, and beach dune systems (SCDHEC N.d.(d)). Much of the ICE study area lies within the coastal critical area.

WATERSHEDS

The ICE study area is located within the Cooper River (HUC 03050201) and Stono River (HUC 03050202) sub basins within Charleston, Dorchester, and Berkeley Counties (Figure 2). The two sub basins consist mainly of forested land and forested wetland. Urban and agricultural land account for less than a quarter of the land in these multi-county basins. The ICE study area can be further divided into watersheds. There are four, 12-digit HUCs (hydrologic unit codes) located within the ICE study area. The Lower Ashley River, Lower Cooper River and Goose Creek watersheds are within the Cooper River sub basin and the Stono River watershed is within the Stono River sub basin. The watersheds, described below, are used in the following sections to identify, analyze, and evaluate indirect and cumulative effects.

The Lower Ashley River Watershed

A majority of the ICE study area falls within the Lower Ashley River watershed (HUC 030502010605). South Carolina Department of Health and Environmental Control (SCDHEC) classifies the Ashley River as Freshwaters (FW) until Bacons Bridge at Church Creek, where it is classified as Class SA saltwaters (SA). This portion of the Ashley River accepts drainage primarily from Church Creek, Macbeth Creek, Brickyard Creek, and Bulls Creek, eventually draining into the Charleston Harbor. Land cover within this watershed consists of primarily residential and commercial development as well as Charleston International Airport.

Goose Creek Watershed

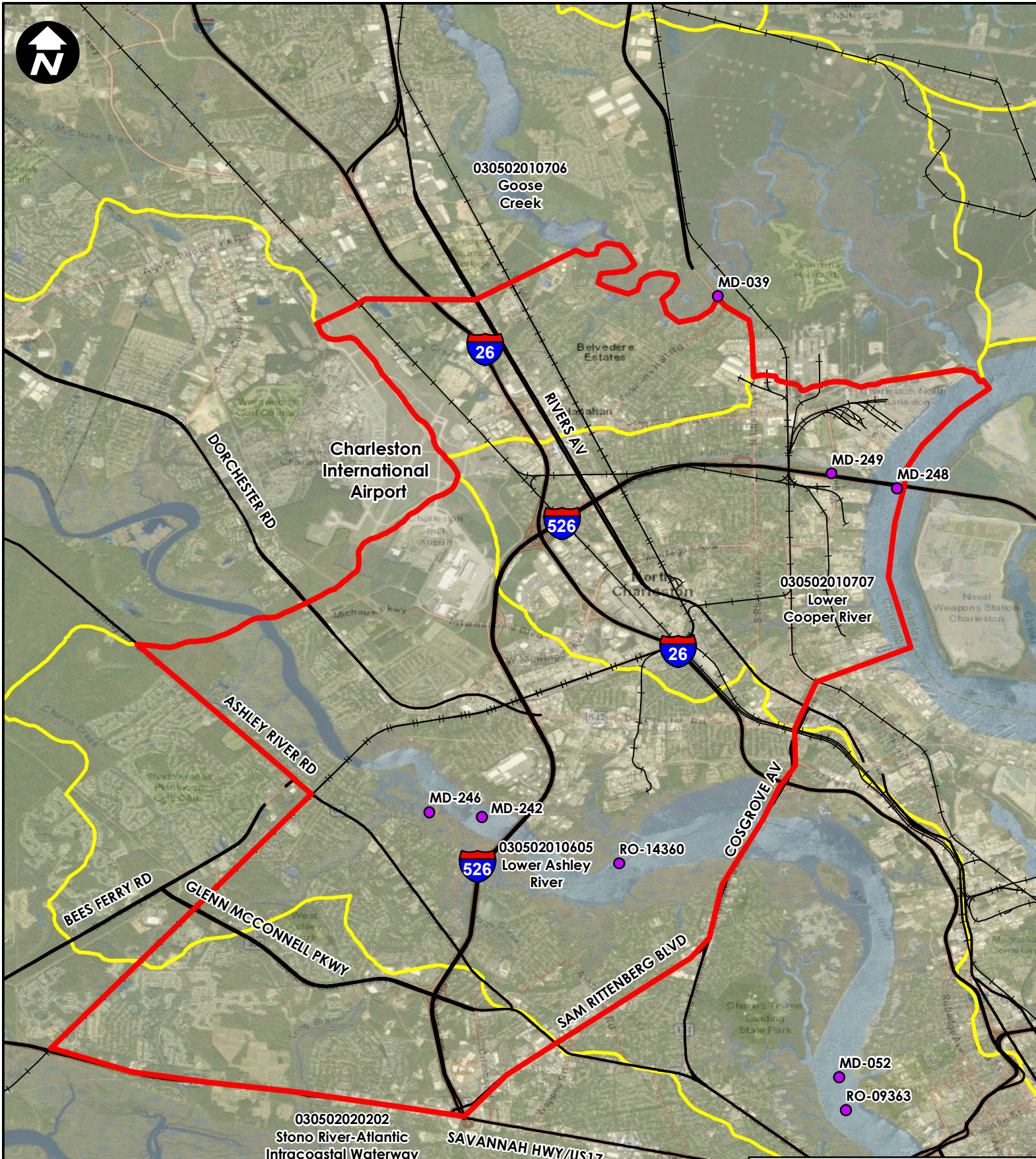
The Goose Creek watershed (HUC 030502010706) is in the northern portion of the ICE study area, north of the Lower Cooper River watershed. SCDHEC classifies Goose Creek as Class FW freshwater (FW) from its headwaters, eventually changing to Class SB saltwaters (SB) downstream of the Goose Creek Reservoir. Goose Creek is dammed from the Goose Creek Reservoir, where it is used primarily for recreation and water supply. This portion of Goose Creek accepts drainage primarily from Turkey Creek, eventually draining into the Cooper River, which drains into the Charleston Harbor. Land cover within this area consists primarily of residential and commercial development.

The Lower Cooper River Watershed

The Lower Cooper River watershed (HUC 030502010707) is in the northeastern portion of the ICE study area, north of the Lower Ashley River watershed. SCDHEC classifies the Cooper River as Class SB saltwaters (SB). This portion of the Cooper River accepts drainage primarily from Filbin Creek and Noisette Creek, eventually draining into the Charleston Harbor. Land cover within this area consists primarily of residential, industrial, and commercial development.

Stono River Watershed

The Stono River watershed (HUC 030502020205) is in the southern portion of the ICE study area, south of the Lower Ashley River watershed. SCDHEC classifies this portion of the Stono River as Shellfish Harvesting Waters (SFH). It accepts drainage primarily from Long Branch Creek and many unnamed tributaries, eventually draining to either the Atlantic Ocean or the Ashley River, which drains into the Charleston Harbor. Land cover within this area consists primarily of residential and commercial development.



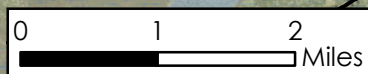
Legend

- Water Quality Monitoring Stations
- ICE Study Area
- Streets
- Railroads
- Watersheds

**WEST 526
LOWCOUNTRY
CORRIDOR**

**Water Quality Monitoring Stations
Figure 2**

I-526 Lowcountry Corridor WEST
Charleston County
Last Updated on 3/27/2020



STEP 3 – NOTABLE FEATURES & HEALTH OF RESOURCES

The primary objective of Step 3 is to inventory the base-line environmental conditions of the project area. This involves preparing an inventory of existing land use, water resource conditions, and socioeconomic conditions. The purpose of this step is to identify environmental issues within the ICE study area against which the proposed project will be compared.

LAND USE

North Charleston

North Charleston is primarily an incorporated urban/suburban mixed-use area that is comprised of sections of three different counties: Berkeley, Charleston and Dorchester. Existing land use plans for this area are described in the *Prime North Charleston 2020*, the *2018 Charleston County Comprehensive Plan*, and the *CHATS LRTP*. Overall, as of 2017, North Charleston land use is primarily made of agriculture/forestry (29.3%), single-family residential (14.6%) and multiuse family home (16.9%).⁹ The City of North Charleston annexed approximately 10,000 acres of agricultural/forestry land west of the Ashley River for future development. This annexation helps account for the large percentage of agriculture/forestry land in a developing, and often dense, city. The majority of North Charleston's residential growth is concentrated in the northern portion of the city located in Dorchester County. However, the southern part of the city is also beginning to see suburban corridors that are experiencing rapid development. Commercial (11.9%) and industrial (5.2%) uses are concentrated near Cross Country Road, Rivers Avenue, Dorchester Road, Ashley Phosphate Road, and Montague Avenue. These areas include Centre Pointe, the North Charleston Coliseum, Convention Center, Tanger Outlet Mall, Northwoods Mall, and the Performing Arts Center. According to the *2018 Charleston County Comprehensive Plan*, North Charleston is also within the Urban Growth Boundary for Charleston County, the goal of which, is to appropriately manage higher intensity growth within the boundary.¹⁰ Existing land use in North Charleston within the ICE study area is predominantly single-family residential, as evidenced in Exhibit 5 below. North Charleston is flanked on the east by the Cooper River and on the west by the Ashley River. The Charleston International Airport and Boeing facilities border I-526 on the west. Commercial land use is scattered throughout the ICE study area, primarily focused along Virginia Avenue, Rivers Avenue, I-26, Dorchester Road, and the airport. A cluster of commercial development is centered around the Tanger Outlets, which are located in the southwest quadrant of the I-526 and I-26 interchange. The ICE study area also contains industrial land uses, which is heavily focused along Virginia Avenue in the vicinity of I-526 and railroad lines that run throughout North Charleston.

⁹ City of North Charleston. Prime North Charleston Comprehensive Plan. Web. <https://drive.google.com/drive/folders/1rLGv4fgjB8MOosdv1oXmS9rr3IOE5nkm>

¹⁰ Charleston County. Comprehensive Plan. November 18, 2009. Web. <https://www.charlestoncounty.org/departments/zoning-planning/files/comp/2017-2018%20Comprehensive%20Plan.pdf?v=904>

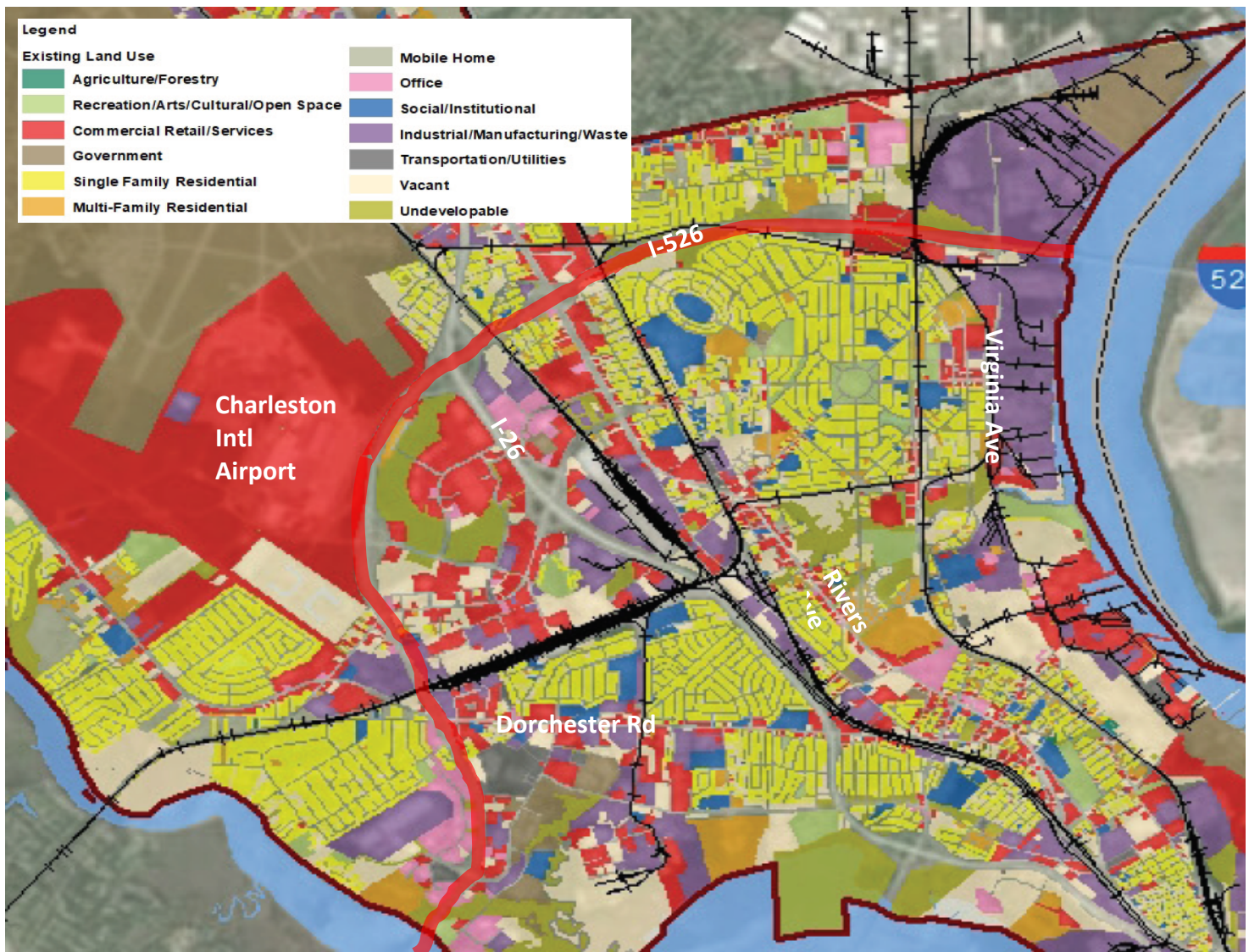


Exhibit 5. Existing Land Use – North Charleston
 Source: City of North Charleston. Prime North Charleston Comprehensive Plan.
<https://drive.google.com/drive/folders/1rLgv4fqjB8MOosdv1oXmS9rr3IOE5nkm>

West Ashley

As included in CIA Section 3.2.2, West Ashley is primarily suburban in character, with job centers concentrated along major roads like US-17, Ashley River Road, and Sam Rittenberg Boulevard. Land use plans for this area are outlined in the 2017 Plan West Ashley document, which most often defines West Ashley characteristics in terms of outer West Ashley, which lies west of I-526, and inner West Ashley, which lies east of I-526.

Because of its proximity to downtown Charleston, inner West Ashley serves as a suburb to Charleston and is developing at a similarly rapid rate. This has caused an increase in housing prices and a trend of gentrification, particularly in many of the historically affordable neighborhoods in inner West Ashley. Much of the new development in West Ashley is sprawling in nature, as shown in Image 1 below. GIS land use data is not available for the City of Charleston.

The Ashley River forms the northern boundary of the portion of West Ashley within the ICE study area. The Ashley River is a designated State Scenic River, protected under the SC Scenic Rivers Act of 1989.¹¹ As such, a 50 to 100-foot buffer on either side of the Ashley River has been provided to protect the River from urban development.

As previously noted, the majority of land use in the West Ashley portion of the ICE study area consists of sprawling suburban residential and commercial developments. Commercial uses are primarily located along Glenn McConnell Parkway, Paul Cantrell Boulevard, and US 17. The Citadel Mall located on Orleans Road east of I-526 and just north of US 17 is the largest commercial development in the ICE study area.



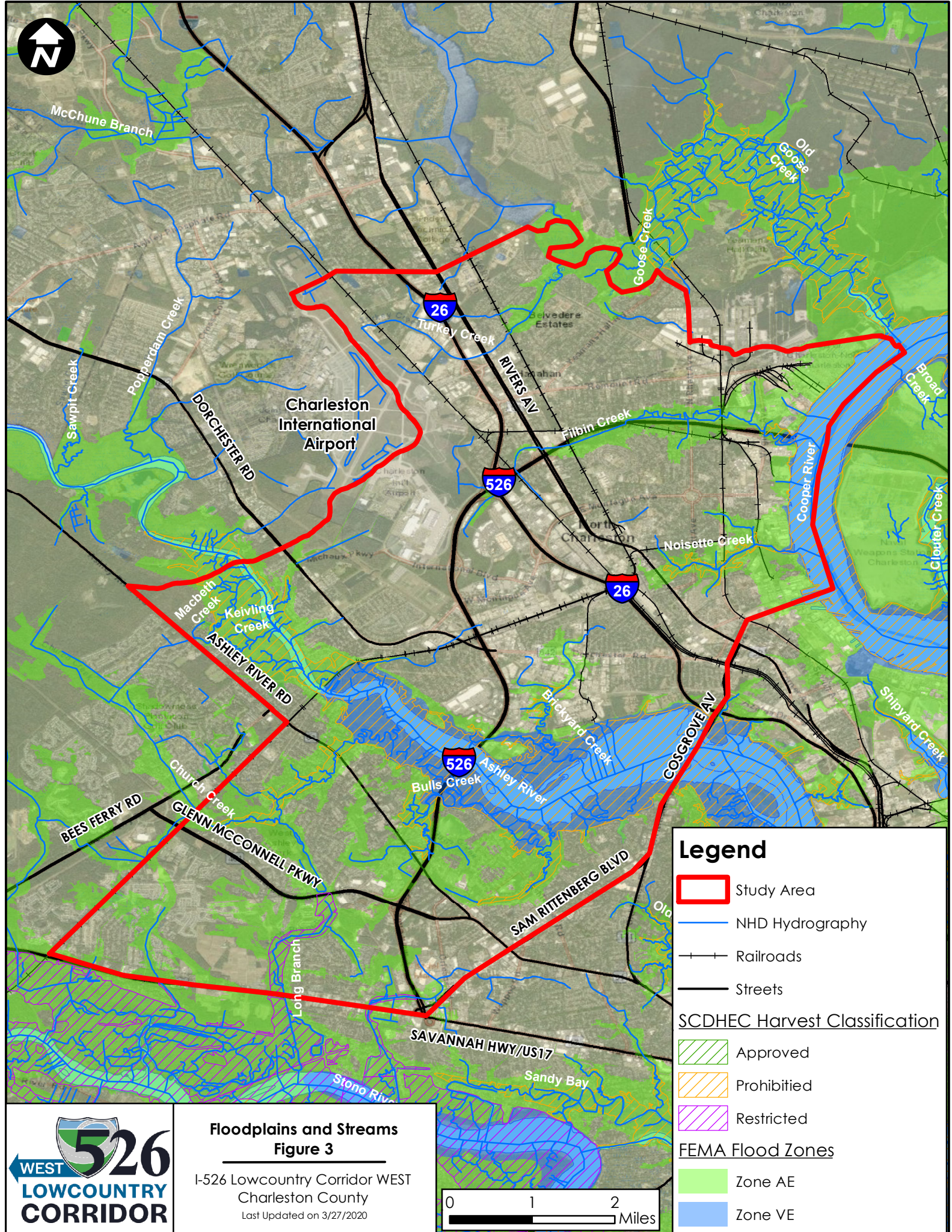
Image 1. Urban Sprawl – West Ashley
Source: City of Charleston. Plan West Ashley.
<https://www.charleston-sc.gov/DocumentCenter/View/21319/What-is-Plan-West-Ashely--Presentation-March-2019?bidId=>

FLOODPLAINS, WETLANDS, AND STREAMS

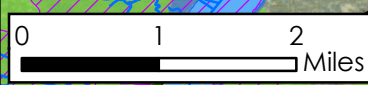
Floodplains

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 (Figure 3). Floodplains provide water storage during storm events, help improve water quality, and provide habitat for terrestrial and aquatic species. Figure 3 highlights 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.

¹¹ SC Department of Natural Resources. Ashley Scenic River Management Plan. January 2003. Web. <http://dnr.sc.gov/water/river/pdf/ashleyriver.pdf>



Floodplains and Streams
Figure 3
 I-526 Lowcountry Corridor WEST
 Charleston County
 Last Updated on 3/27/2020



Legend

- Study Area
- NHD Hydrography
- Railroads
- Streets

SCDHEC Harvest Classification

- Approved
- Prohibited
- Restricted

FEMA Flood Zones

- Zone AE
- Zone VE

Wetlands and Streams

As noted above, the Ashley River is designated as a state scenic river. It has historical, cultural, and natural significance to South Carolina and is valued for its recreational uses. The proposed project would widen the General William C. Westmoreland Bridge along I-526 over the Ashley River; however, this widening would not conflict with any of the river's recreational uses. Additionally, there would be no surface losses of the Ashley River as the bridge is anticipated to be widened using bridge pilings. During construction, the use of this section of the river may be temporarily limited during construction for safety, however, it would not affect use upstream or downstream.

The Cooper River and Stono River are not designated as state scenic rivers. The Cooper River is considered an important commercial waterway and one of the most historically significant rivers in South Carolina. The Stono River is also historically significant to South Carolina and is an integral part of the Intracoastal Waterway. The proposed project would not directly impact these rivers.

Wetlands are located throughout the ICE study area, along the rivers and their tributaries, as well as in the headwaters of tributaries. Wetland types include low and high tidal marshes as well as forested and emergent freshwater wetlands. These wetlands along with the rivers and their tributaries are considered Waters of the United States (WOTUS) as described in DEIS Section 4.7. These features are regulated by the United States Army Corp of Engineers (USACE) and the SCDHEC. Wetlands have had varying degrees of protection since wetland regulations were enacted in 1977. A no net loss policy has evolved over time and now requires mitigation to offset impacts to wetlands and WOTUS. However minor impacts are permitted without mitigation and can have a cumulative effect on wetlands and WOTUS.

One way to measure the impact development has had on wetlands and streams in the recent past is to compare land cover datasets from different time periods. The Multi-Resolution Land Characteristics Consortium (MRLC) National Land Cover Database (NLCD) maintains land cover data for various time periods between 2001 and 2016. A comparison of the 2001 NLCD and the 2016 NLCD indicate a loss in water resources along with other open spaces, over time. There was a decrease in woody wetlands, emergent herbaceous wetlands, and open water which was correlated with increases in all developed land categories (Table 1).

Table 1. 2001 and 2016 NLCD Land Cover Comparison

Land Cover	2001 %	2016 %
Developed, Low Intensity	20.3	21.5
Developed, Open Space	16.1	16.5
Emergent Herbaceous Wetlands	13.7	13.1
Woody Wetlands	13.2	12.1
Developed, Medium Intensity	9.4	11.6
Open Water	9.4	9.0
Evergreen Forest	8.9	7.5
Developed, High Intensity	4.6	5.7
Barren Land	1.2	1.2
Hay/Pasture	0.8	0.5
Herbaceous	0.7	0.4
Shrub/Scrub	0.7	0.4
Deciduous Forest	0.5	0.3
Mixed Forest	0.5	0.3
Cultivated Crops	0.1	0.1

Aerial photography and topography can also be used to better understand the impacts to floodplains, wetlands, and streams over time. A review of historic United States Geological Survey (USGS) topographic maps of the ICE study area were the foundation of the following analysis.

In North Charleston, as early as 1904, Goose Creek was dammed to create the Goose Creek Reservoir. Aerial photography and topography beginning in the 1940's show a progression of impacts to additional resources. By 1943, the Cooper River was channelized, and the eastern edge of the Charleston Peninsula was armored by hard engineering techniques that allowed very little to no potential for water storage. By 1959, the majority of the development existed to the west of the railroad, primarily in the Park Circle area, surrounding Filbin Creek and the U.S. Military Reservation and Charleston Transportation Corps Depot at the mouth of Goose Creek. Development progressively increased by 1973, taking place around the Charleston Air Force Base, along Pepperdam Creek, along Turkey Creek, and growing along Goose Creek and the Cooper River. This increase in development, including the development of I-26, began to encroach onto many of the Goose Creek and Cooper River tributaries, such as Turkey Creek, further modifying its shape and hydrologic flow. The construction of I-526 began in the early 1980's, beginning in West Ashley and crossing over the Ashley River into North Charleston. By 1986, I-526 extended over Filbin Creek and development expanded along Pepperdam Creek, further modifying the creek channels. By 1989, I-526 extended over the Cooper River out of North Charleston. Within the last two decades, development has progressively increased around the Charleston Air Force Base and along I-526.

West Ashley was primarily undeveloped in the middle of the 20th century. By the early 1970's, there was an increase in development along Sam Rittenberg Blvd, north of Saint Andrews, and along the Stono River and Long Branch Creek, south of Sam Rittenberg Blvd. This development encroached along the edges of the Ashley River and Stono River marshes and floodplains, reducing water storage. In addition, the flow of Long Branch Creek was drastically modified and dammed, dividing the hydrologic flow within Long Branch Creek, disconnecting it from Church Creek, where development continued along Church Creek to Ashley River Road. Man-made channels were constructed north of Long Branch Creek. During this same time period, residential areas began to develop, east of the railroad, directly adjacent to an unnamed tributary of the Stono River, encroaching into its floodplains and filling wetlands, further reducing water storage. This area has continued to grow, extending along Ashley River Road towards Bees Ferry Road, surrounding Church Creek and encroaching into Bulls Creek and what was once Long Branch Creek by 1984. Construction of Glenn McConnell Blvd in the early 1990's caused a spike in development. Within the last 15 years, there has been significant development along the railroad, encroaching onto Stono River tributaries and into wetlands north of US 17 and along Long Branch Creek, drastically changing the landscape of the ICE study area and modifying the hydrologic conditions of this part of West Ashley.

WATER QUALITY

As described previously, impacts to floodplains, wetlands, and streams have occurred multiple times in the ICE study area. Further indication of these impacts can be found by looking at water quality within the ICE study area. In accordance with Section 303(d) of the 1972 Federal Clean Water Act (CWA), SCDHEC uses the State of South Carolina Monitoring Strategy to evaluate water bodies identified as impaired for appropriate inclusion on the Section 303(d) list along with an outline of the parameters that do not meet standards (SCDHEC 2020). The 303(d) list is published every two years.

According to SCDHEC, there are ten surface water quality monitoring stations (WQMS) located within or just downstream of the ICE study area (Figure 2). Multiple waterbody segments within the ICE study area have been listed as impaired between 1998 and 2018 (Table 2). Waters are found impaired mostly due to elevated levels of enterococci, fecal coliform, and *E. coli* bacteria as well as low levels of dissolved oxygen. Contamination by these pollutants often occurs in areas with high levels of developed land and stormwater runoff. Note that fecal coliform was used as an indicator up to 2012 and was replaced with enterococci in 2014 as mandated by the EPA. Both indicators are forms of bacteria.

The Ashley River, Filbin Creek, Goose Creek and the Stono River have consistently tested high for bacteria (*E. coli*, enterococci or fecal coliform). Dissolved oxygen levels have been an issue in the Ashley River for twenty years. Church Creek no longer appears as impaired; however, the monitoring station is considered historic and no longer used to determine impaired waters. Therefore, it cannot be assumed that water quality improved or stayed the same.

Table 2. History of Impaired support Use Designations for Major Streams

Waterbody Name	Station	Year Listed	Impairment	Use Not Supported
Filbin Creek	MD-249	2014, 2016, 2018	Enterococci	Recreational Use
		1998, 2000, 2002, 2004, 2006, 2008, 2010, 2012	Fecal Coliform	Recreational Use
		2004	Dissolved oxygen	Aquatic Life Use
Cooper River	MD-248	1998	Fecal Coliform	Recreational Use
Cooper River	MD-045	1998	Fecal Coliform	Recreational Use
Ashley River	MD-242	1998, 2000, 2002	Dissolved Oxygen	Aquatic Life Use
		1998, 2000, 2002	Fecal Coliform	Recreational Use
Ashley River	MD-052	2000, 2008, 2012, 2014, 2016, 2018	Dissolved Oxygen	Aquatic Life Use
		2010	Copper	Aquatic Life Use
		1998	Fecal Coliform	Recreational Use
Ashley River	RO-09363	2014, 2016, 2018	Dissolved Oxygen	Aquatic Life Use
		2012	Fecal Coliform	Recreational Use
		2014, 2016, 2018	Enterococci	Recreation Use
Church Creek	MD-246	2000, 2002	Dissolved oxygen	Aquatic Life Use
		1998, 2000, 2002, 2004, 2006, 2008	Fecal coliform	Recreational Use
		2002	Turbidity	Aquatic Life Use
Goose Creek	MD-039	2014, 2016, 2018	Enterococci	Recreational Use
		1998, 2000, 2002, 2004, 2006, 2008, 2010, 2012	Fecal Coliform	Recreational Use
Stono River	11-11	2016, 2018	Fecal Coliform or <i>E. coli</i>	Shellfish Harvesting

Once a WQMS has been added to the 303(d) list, it will remain on the list until the water quality standard set by SCDHEC has been attained or a plan has been developed and approved by the EPA to attain the standard. This plan is known as a total maximum daily load (TMDL) (SCDHEC 2020). TMDLs are established for impaired waters by establishing the amount of pollutant that can enter the waterbody daily and still meet water quality standards (Table 3). A TMDL was approved in October 2003 and again in April 2013 for DO in Charleston Harbor, Cooper, Ashley and Wando Rivers (SCDHEC 2020). The TMDL watershed covers the majority of the ICE study area except for a small area in the southwest portion that drains to Stono River.

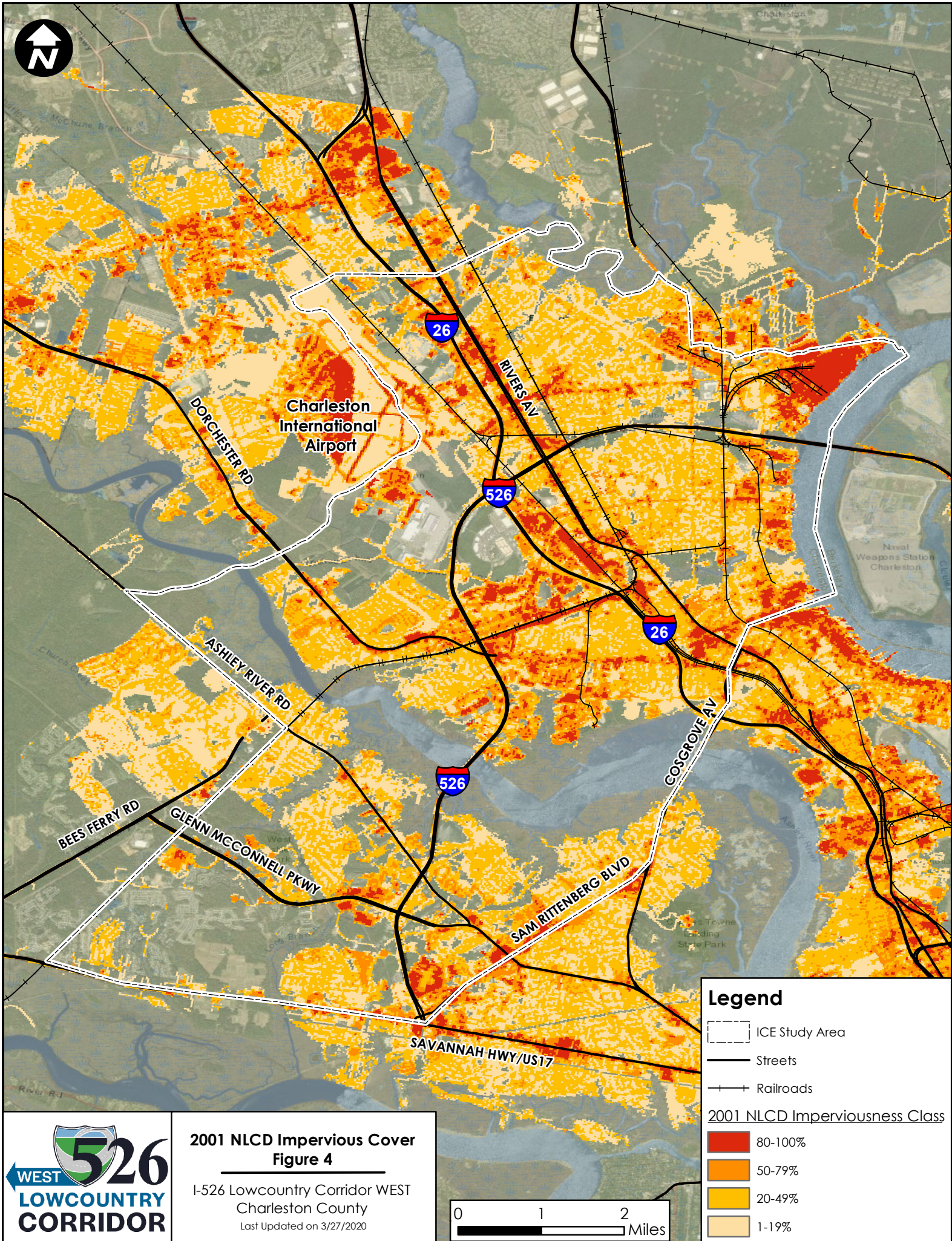
Table 3. 303(d) 2018 List of Impaired Waters and TMDLs within the I-526 ICE Study Area.

Waterbody Name	Stations	Description	Impairment	Not Supported	TMDL
Filbin Creek	MD-249	At Virginia Avenue	Enterococci	Recreational Use	N
Ashley River	MD-052	Ashley River at Sal RR Bridge	Dissolved Oxygen	Aquatic Life Use	Y
Ashley River	RO-09363	Ashley River between Oldtown Creek and the Ashley River Memorial Bridge	Dissolved Oxygen	Aquatic Life Use	Y
			Enterococci	Aquatic Life Use	N
Goose Creek	MD-039	~2 miles north of I-526 at the S-08-136 bridge	Enterococci	Recreational Use	N
Stono River	11-11	~1 mile south of US 17 and I-526 at Marker #21A	Fecal Coliform or <i>E. coli</i>	Shellfish Harvesting	N

Another tool to evaluate cumulative effects of water quality over time is to look at impervious surfaces within a study area. The MRLC NLCD also maintains impervious surface data for various time periods between 2001 and 2016. A comparison of the 2001 impervious surface and the 2016 impervious surface indicate an increase from approximately 50% in 2001 to 55% in 2016. The majority of that increase can be attributed to non-road impervious surfaces such as structures, driveways, and parking lots (Table 4). An increase of impervious surface is associated with a decrease in water quality as there is less infiltration during storm events leading to more runoff. The larger storm flows can lead to erosion and can carry pollutants to receiving waters. This information can be seen in Figures 4-6 below.

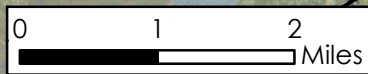
Table 4. 2001 and 2016 NLCD Impervious Surface Comparison

Imperviousness Type	2001 %	2016 %
Primary road	0.9	0.9
Secondary road	2.8	3.0
Tertiary road	15.5	16.9
Non-road impervious	31.2	34.6
Total	50.4	55.4



**2001 NLCD Impervious Cover
Figure 4**

I-526 Lowcountry Corridor WEST
Charleston County
Last Updated on 3/27/2020

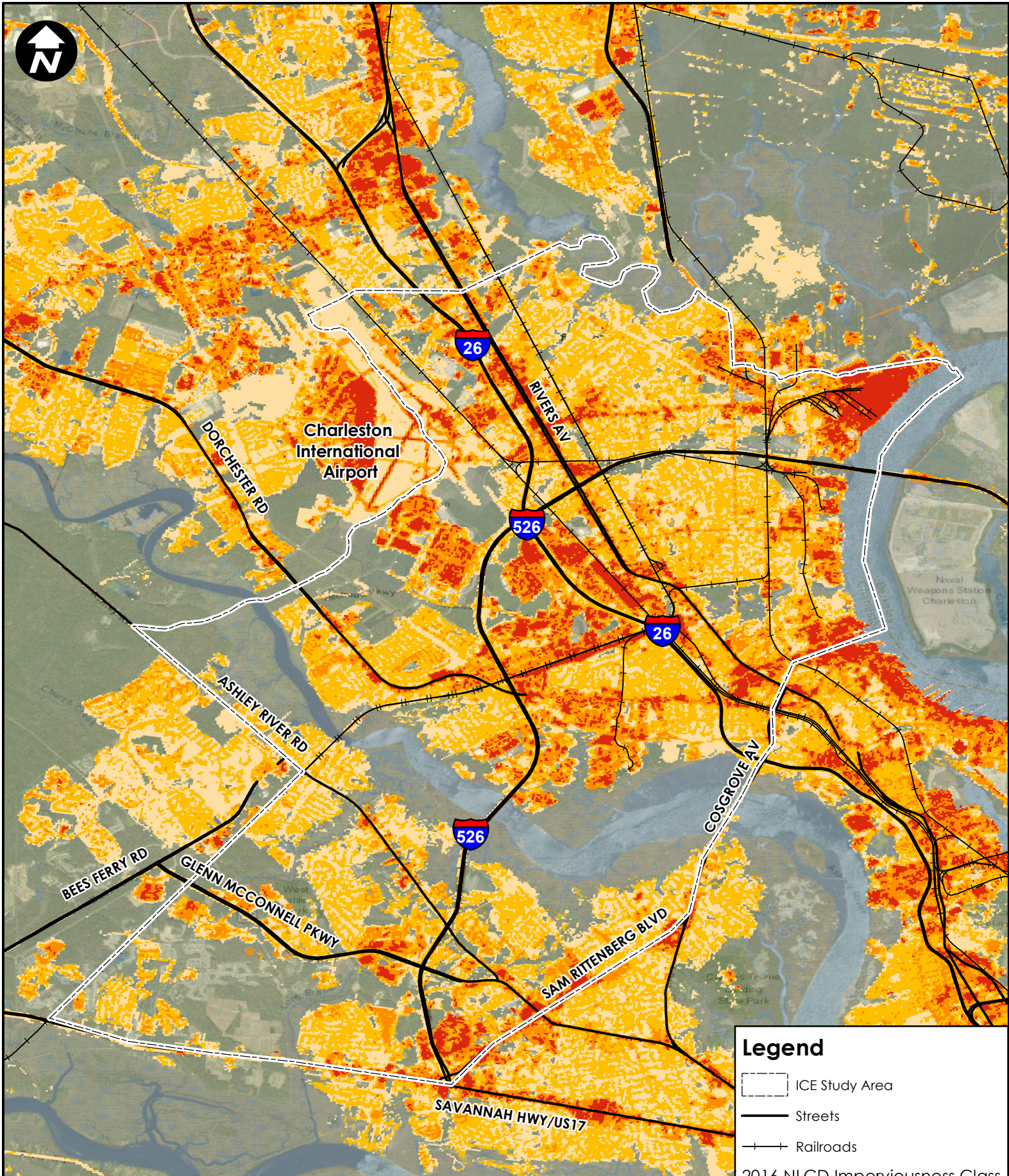


Legend

- ICE Study Area
- Streets
- Railroads

2001 NLCD Imperviousness Class

- 80-100%
- 50-79%
- 20-49%
- 1-19%



Legend

ICE Study Area

Streets

Railroads

2016 NLCD Imperviousness Class

> 80%

50-79%

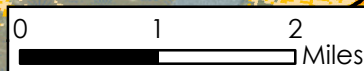
20-49%

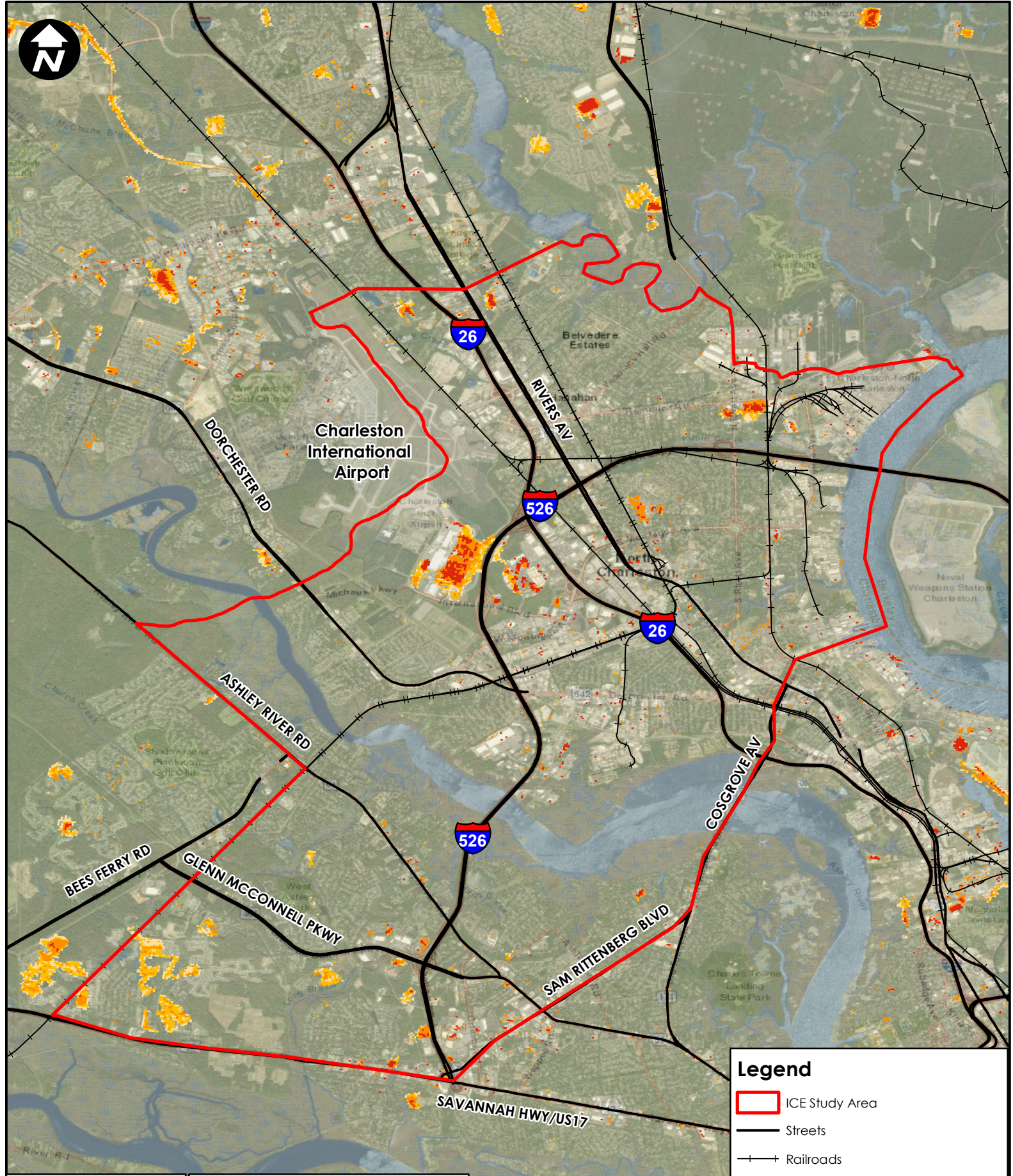
1-19%



**2016 NLCD Impervious Cover
Figure 5**

I-526 Lowcountry Corridor WEST
Charleston County
Last Updated on 3/27/2020





Legend

- ICE Study Area
- Streets
- Railroads

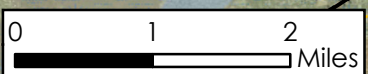
NLCD Imperviousness Change Class

- > 80%
- 50-79%
- 20-49%
- 1-19%



**2001-2016 NLCD
Impervious Change
Figure 6**

I-526 Lowcountry Corridor WEST
Charleston County
Last Updated on 3/27/2020



Some waterways are classified as shellfish waters (Figure 3). This includes shellfish management area 10B which consists of the Lower Ashley and Lower Cooper Rivers and area 11 which consists primarily of the northern part of the Stono River. Shellfish harvesting is prohibited in area 10B. Municipal and industrial point source discharges as well as historic and current land uses surrounding the rivers make shellfish harvest unsanitary for human consumption. Shellfish harvesting is restricted in area 11 based on results from fecal coliform monitoring. Water quality has declined in this area due to development and the associated stormwater runoff. Heavier rains in recent years have also contributed. Feral hogs and the removal of riparian vegetation along the Stono River may also have contributed to the decline in water quality (SCDHEC 2019 (b)).

HUMAN ENVIRONMENT

All resources described in the following section are shown in Figures 7-8.

North Charleston

The original construction of I-526 in the 1980's resulted in the bisection of neighborhoods and therefore disruption of community cohesion. According to the 1985 I-526 SCDOT Construction Plans, approximately 61 residences and 9 businesses were relocated. The original construction of I-26 in the 1960's resulted in similar effects, with 1960 I-26 SCDOT Construction Plans including 45 residential relocations. These past actions changed the landscape of the ICE study area converting natural habitat to developed communities. Additional cumulative effects to communities along the I-526 corridor are anticipated with the potential displacement of approximately 150 residences with this project. A majority of these residential displacements are located in North Charleston due to the proximity of homes to the existing interstate and the commercial nature of West Ashley within the ICE study area. A review of aerial photography from Google Earth beginning in 1989 indicates an increase in development, most notably with the construction of the Citadel Mall in the 1980s. Subsequent development occurred along Centre Pointe Drive.

The North Charleston portion of the ICE study area includes numerous community features that are detailed as follows:

- The Cooper River Memorial Library, located at 3503 Rivers Avenue, is the only library located in the North Charleston portion of the ICE study area.
- Four EMS stations and five fire stations: EMS stations include Charleston County EMS Station #2, Charleston County Volunteer Rescue, Roper St. Francis Hospital, and MUSC Children's Health. Fire stations include North Charleston Fire Department #3, North Charleston Fire Department, North Charleston Fire Department #1, and the Hanahan Fire Department.
- Five elementary schools, one middle school, four high schools, and three universities. Public schools located in North Charleston are part of Charleston County's District Four.
- Thirty-eight religious institutions. Notably, Royal Missionary Baptist Church, located at 4761 Luella Avenue, provides 34 different outreach opportunities in the Liberty Hill community. This church operates a food bank, has a prison inmate outreach, hosts summer camps for kids and teaches members of the community on health/wellness education, among many other programs.¹²
- Five parks and 11 community center facilities. These centers are run by the city and provide nearby communities with facilities such as basketball courts, event rooms for renting, playgrounds, picnic areas, and bathrooms. They also provide a wide variety of programs and activities designed to meet the needs of nearby residents such as day care throughout the year and summer camps. The different community

¹² Royal Missionary Baptist Church. *Ministries*. Web. <https://royalmbc.org/index.php/about-us-top/ministries>

centers allow distinct neighborhoods to have a place for community gathering. Notable centers within the CIA study area include the Russelldale Community Center, Charleston Farms Community Center, Ferndale Community Center, Felix Pinckney Community Center, Miner Crosby Community Center, and the Highland Terrace/Liberty Park Community Center.

- Four senior facilities, Trident Area Agency on Aging, Samuel L. Hart Senior Center, Park Circle Senior Center, and Langit Assisted Living Facility.

West Ashley

As noted previously, the original construction of I-526 and I-26 in the 1960's and 1980's resulted in the bisection of neighborhoods and therefore disruption of community cohesion. However, as a majority of West Ashley within the project study area was not yet developed at those times, these cumulative impacts are limited to North Charleston. The cumulative effects of past highway projects on Environmental Justice populations are discussed below.

A review of aerial photography from Google Earth indicates an increase in development with the construction of the Bon Secours Hospital, which opened in the 1990s, and development along Glenn McConnell Parkway.

The West Ashley portion of the ICE study area contains the following community features:

- The Cynthia Graham Hurd/St. Andrews Regional Library, located at 1735 North Woodmere Drive, is the only library located in the West Ashley portion of the ICE study area. The library has public computers, a job resource center, and rooms available for reservation.¹³
- Healthcare services in West Ashley are provided at four locations within the ICE study area: the Medical University of South Carolina, Bon Secours St. Francis Hospital, Roper St. Francis Health Care, and Health First. The ICE study area also contains five fire stations, three of which are operated by St. Andrews.
- Eight senior/assisted living facilities: Brookdale West Ashley, The Palmettos of Charleston, Ashley Gardens Assisted Living, Ashley Park, Waring Senior Center, Ashley Rivers Plantation, Grandview Apartments, and Harmony at West Ashley.
- Three parks: Willie Gaines Park, Dogwood Park, and West Ashley Park. Of note, West Ashley Park is a 260-acre public park that includes four soccer fields, two playgrounds, a disk golf course, two basketball courts, and four softball fields, as well as trails for walking and biking.¹⁴

Environmental Justice Communities

There are six Environmental Justice communities within the ICE study area: Ferndale, Highland Terrace, Liberty Park, Russelldale, Ada Avenue, and Camps. As noted previously, the original construction of I-526 and I-26 bisected neighborhoods in North Charleston, as also evidenced in historic USGS topographic maps (see Exhibit 6). The original construction of I-26 impacted 25 residences and 1 mobile home in Highland Terrace, and 22 residences, three stores, and one church, Enoch Chapel Methodist, in Liberty Park. Enoch Methodist Church has been relocated three times since its founding in 1904 on Dorchester Road due to transportation projects.¹⁵ The original construction of I-526 impacted 17 residences, 12 likely residences, two apartments, two mobile homes, one motel, two restaurants, and nine stores. This physical barrier constructed between homes in neighborhoods divided communities and disrupted existing community cohesion. Further residential displacements associated

¹³ Charleston County Public Library. *Cynthia Graham Hurd St. Andrews Library*. Web. <https://www.ccpl.org/branches/st-andrews>

¹⁴ Charleston Parks Conservancy. *West Ashley Park*. Web. <https://www.charlestonparksconservancy.org/park/west-ashley-park>

¹⁵ Post and Courier. "Highway widening project threatens to again uproot North Charleston church, area community." March 6, 2020. Web. https://www.postandcourier.com/business/real_estate/highway-widening-project-threatens-to-again-uproot-north-charleston-church/article_b75a08e2-5cd3-11ea-b5a8-9be5e3dcb682.html

with the proposed project serve to further divide the communities.

The I-526 West Community Advisory Council (CAC) is a group of residents of the affected EJ neighborhoods. CAC members have noted that residents displaced with previous I-526 and I-26 projects were not compensated fairly or justly.¹⁶ This resulted in the relocation of residents outside of their communities, further disrupting community cohesion. CAC members also noted that encroachment impacts should have been relocations as many residents were left with very small parcels close to a freeway.

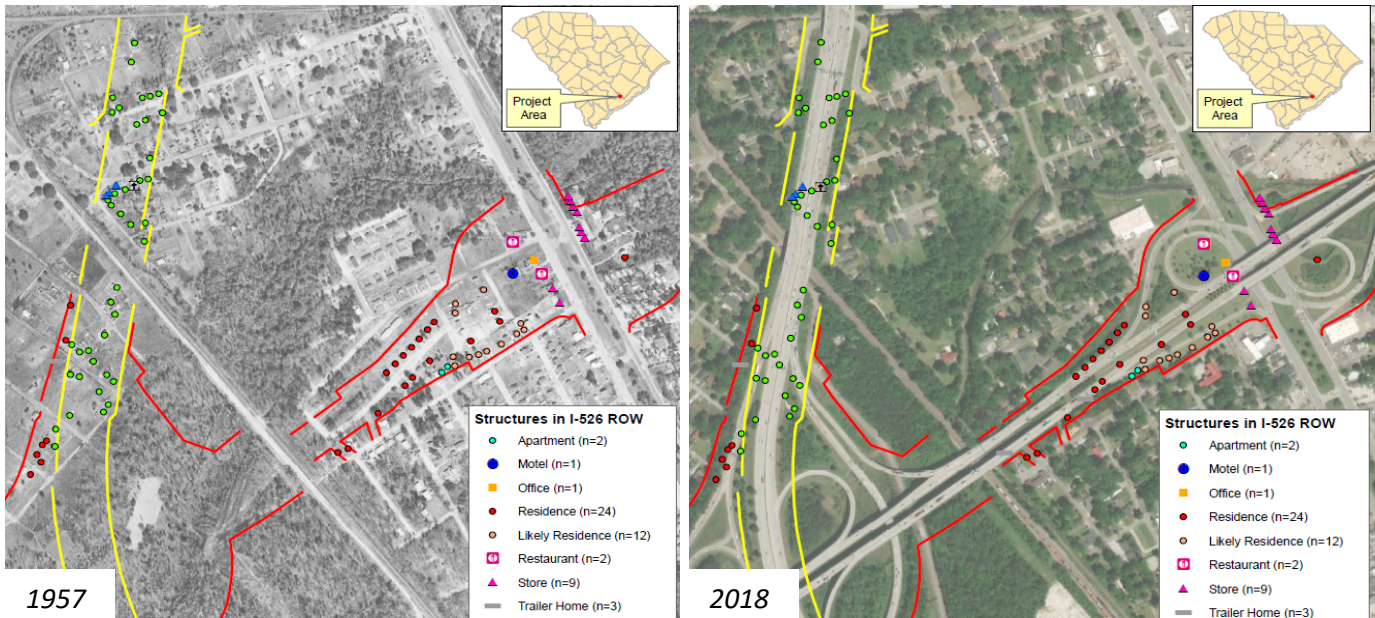


Exhibit 6. Past Impacts of I-526 and I-26

Source: SCDOT

These communities contain their own notable community resources as described below. While there are no community resources located in the Ada Avenue neighborhood, Miner Crosby Community Center is located adjacent to the neighborhood and likely utilized by residents.

Ferndale

- Light of the World Church at 1937 Jason Street
- Harvest Pointe Church at 4870 Piedmont Avenue
- Iglesia de Dios El Redil, a Spanish speaking church, shares a space with Harvest Pointe Church at 4870 Piedmont Avenue
- Ferndale Community Center at 1919 Piedmont Avenue, which regularly hosts senior exercise classes, Tai Chi class, line dancing class, and is available for rent.¹⁷

Highland Terrace

- St. Matthews Reformed Episcopal Church at 5264 Good Street
- Highland Terrace-Liberty Park Community Center, 2401 Richardson Drive; amenities include a basketball court, playground, and the community center. The center is staffed part-time and outdoor recreation areas are open down to dusk. The City of North Charleston hosts a yearly afterschool program for up to

¹⁶ Community Advisory Council Meeting No. 4, Meeting Minutes. January 4, 2020.

¹⁷ Ferndale Community Center. *About*. Web. <https://ferndalecommunitycenter.org/>

30 children and a summer camp for up to 30 children. All children that attend these programs are from the Highland Terrace and Liberty Park communities. A variety of groups, such as Boeing, M.A.D. (Men Against Domestic Violence), and the Charleston Center come to the afterschool program and summer camp to host educational, enrichment, and cultural activities. A few of these activities include a reptile program, library activities, and an anti-bullying program. The center also serves as a voting poll during elections. Community members use the center for social events, such as birthday parties, family reunions, and baby showers. The center is available for rent to all residents of North Charleston, but is mainly utilized by members of the Highland Terrace and Liberty Park communities. Center usage varies throughout the year, but increases during large events, such as graduation. The center is not available for rent during summer months when summer camp is in session.

Liberty Park

- Enoch Chapel Methodist at 2355 James Bell Drive
- Bethel Pentecostal Holiness at 2331 Elder Avenue
- Biblical House of God at 2205 Van Buren Avenue
- Life Changers Covenant Ministries at 2410 Eleanor Drive

Russelldale

- Russelldale Community Center, 2248 Russelldale Avenue; amenities include a basketball court, playground equipment, and the community center. The center is staffed part-time and outdoor recreation areas are open dawn to dusk. The City of North Charleston hosts a yearly afterschool program for up to 30 children and a summer camp for up to 30 children. All children that attend these programs are from the Russelldale community. A variety of groups, such as Boeing, M.A.D. (Men Against Domestic Violence), and the Charleston Center come to the afterschool program and summer camp to host educational, enrichment, and cultural activities. A few of these activities include a reptile program, library activities, and an anti-bullying program. When active, the Community Council would meet once a month at the center. Community members use the center for social events, such as birthday parties, family reunions, and baby showers. The center is available for rent to all residents of North Charleston, but it is mainly utilized by members of the Russelldale community. Center usage varies throughout the year, but increases during large events, such as graduation. The center is not available for rent during summer months when summer camp is in session.

Camps

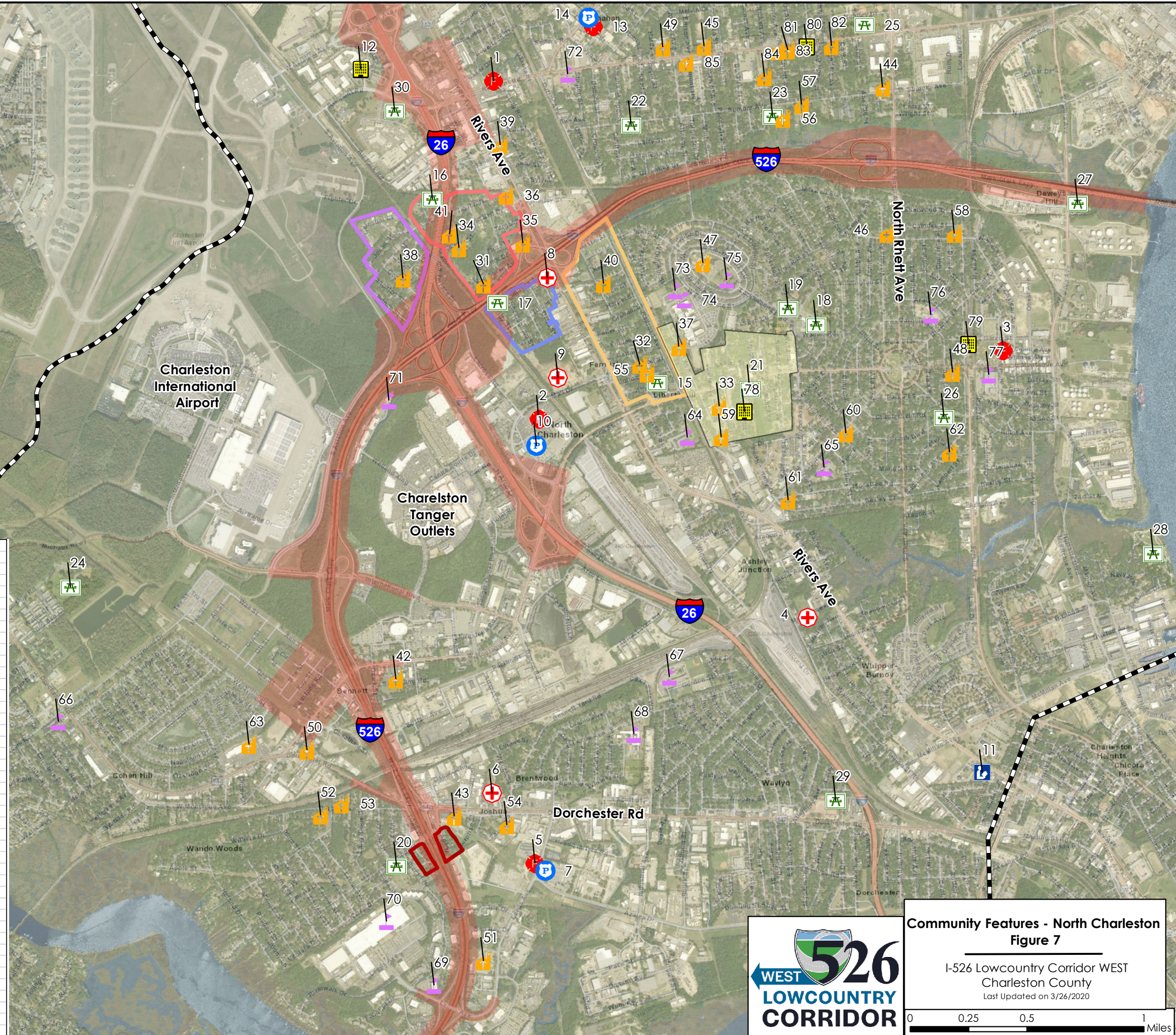
- World Harvest Community Church, 3441 West Montague Avenue; which owns a property with a large field used for recreational activities, including a volleyball court.



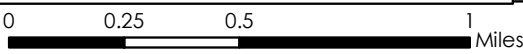
Legend

- ICE Study Area
- Project Corridor
- Ada Avenue
- Ferndale
- Highland Terrace
- Liberty Park
- Russelldale
- Liberty Hill
- Church
- EMS
- Fire Station
- Library
- Recreation Facility
- Police Station
- School
- Senior Facility

1 North Charleston Fire Dept. #3	44 Seacoast Church
2 North Charleston Fire Dept.	45 Aldersgate United Methodist Church
3 North Charleston Fire Dept. #1	46 Church of the Resurrection
4 County of Charleston EMS Station #2	47 St. Andrew's Park Circle
5 North Charleston Fire Dept. Station #7	48 North Charleston United Methodist Church
6 Charleston County Volunteer Rescue	49 Remount Baptist Church
7 Charleston County Sheriff's Office	50 Cokesbury United Methodist Church
8 Roper St. Francis Hospital	51 Awaken Church
9 MUSC Children's Health	52 Wando Woods Baptist Church
10 North Charleston Police Department	53 Iglesia Ni Cristo
11 Cooper River Memorial Library	54 Joshua Baptist Church
12 Trident Area Agency on Aging	55 Iglesia de Dios El REDIL
13 Hanahan Fire Department	56 Christ Temple Church
14 Hanahan Police Department	57 Body of Christ
15 Ferndale Community Center	58 Pittman Street Baptist Church
16 Highland Terrace-Liberty Park Community Center	59 Abyssinia Baptist Church
17 Russelldale Community Center	60 Holmes Avenue Baptist Church
18 Danny Jones Athletic Complex	61 Canaan Missionary Baptist Church
19 Armory Park Community Center	62 Faith Anointed
20 Miner Crosby Community Center	63 Calvary Temple of Praise
21 Felix Pickney Community Center	64 Morningside Middle School
22 Charleston Farms Community Center	65 Malcolm C. Hursey Elementary School
23 Ellis Park	66 Goodwin Elementary School
24 Collins Park Community Center	67 Garrett Academy of Technology
25 Ingevity Kapstone Park	68 North Charleston High School
26 Quarterman Park	69 Webster University
27 Ralph M. Hendricks Park	70 Limestone College
28 Riverfront Park	71 Strayer University
29 Jeanene Batten Community Center	72 Matilda F. Dunston Primary School
30 City of North Charleston Athletic Center	73 Academic Magnet High School
31 Biblical House of God	74 Charleston County School Of The Arts
32 Harvest Pointe Church	75 North Charleston Creative Arts Elementary School
33 Royal Missionary Baptist Church	76 North Charleston Elementary School
34 Bethel Pentecostal Holiness	77 North Charleston High School
35 Life Changers Covenant Ministries	78 Samuel L. Hart Senior Center
36 Pilgrim Baptist Church	79 Park Circle Senior Center
37 Little Bethel Pentecostal Holiness Church	80 Langit Assisted Living Facility
38 St. Matthew's Reformed Episcopal Church	81 Victory Missionary Baptist Church
39 Life Empowerment Ministries	82 Faith Believers Tabernacle
40 Light of the World Church	83 First Southern Methodist Church
41 Enoch Chapel Methodist	84 New Vision AME Zion Church
42 World Harvest Community Church	85 Revelation of Christ Church
43 New Zion RMUE	












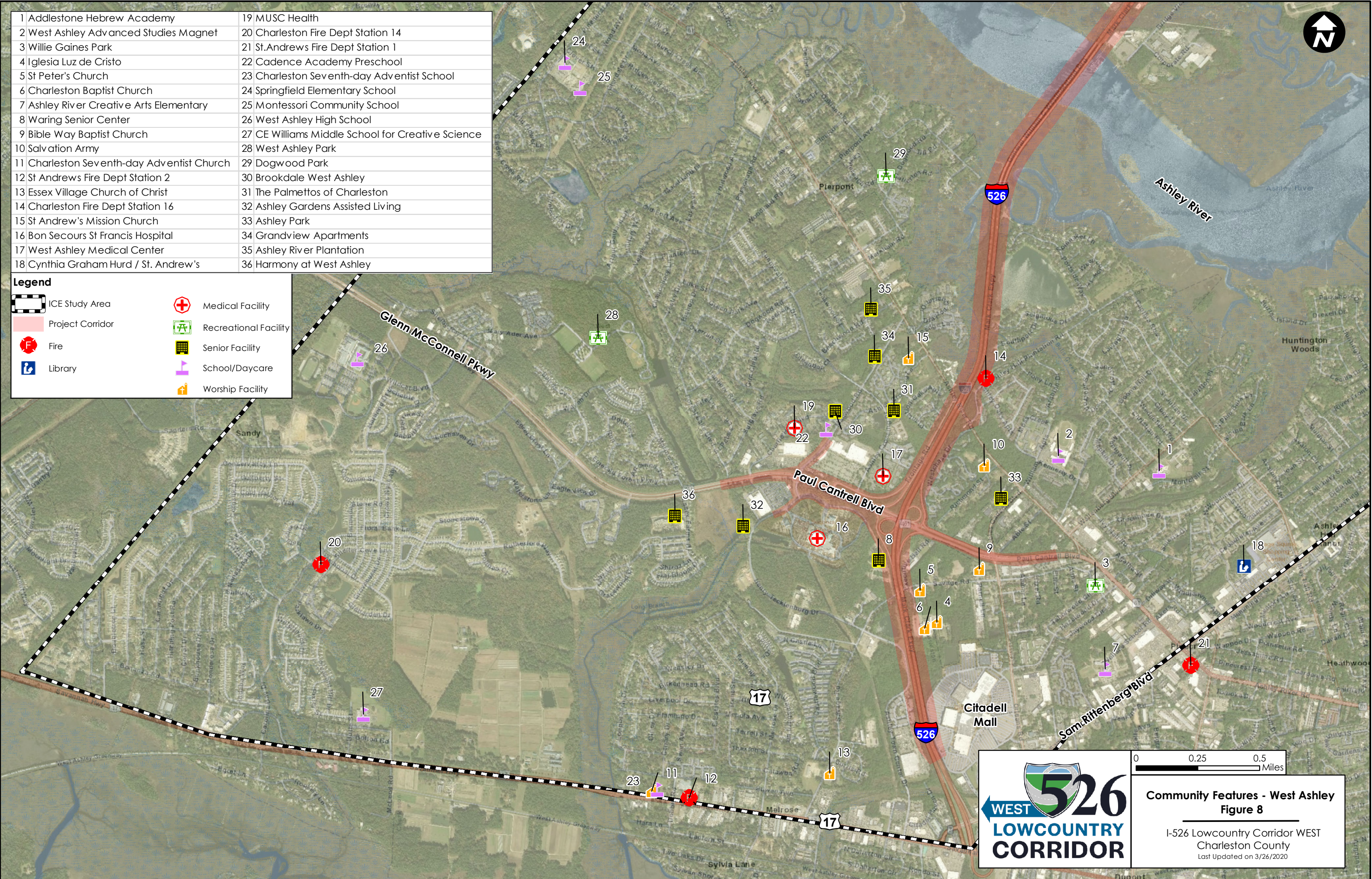
Community Features - North Charleston
Figure 7
 I-526 Lowcountry Corridor WEST
 Charleston County
 Last Updated on 3/26/2020




1 Adlestone Hebrew Academy	19 MUSC Health
2 West Ashley Advanced Studies Magnet	20 Charleston Fire Dept Station 14
3 Willie Gaines Park	21 St.Andrews Fire Dept Station 1
4 Iglesia Luz de Cristo	22 Cadence Academy Preschool
5 St Peter's Church	23 Charleston Seventh-day Adventist School
6 Charleston Baptist Church	24 Springfield Elementary School
7 Ashley River Creative Arts Elementary	25 Montessori Community School
8 Waring Senior Center	26 West Ashley High School
9 Bible Way Baptist Church	27 CE Williams Middle School for Creative Science
10 Salvation Army	28 West Ashley Park
11 Charleston Seventh-day Adventist Church	29 Dogwood Park
12 St Andrew's Fire Dept Station 2	30 Brookdale West Ashley
13 Essex Village Church of Christ	31 The Palmettos of Charleston
14 Charleston Fire Dept Station 16	32 Ashley Gardens Assisted Living
15 St Andrew's Mission Church	33 Ashley Park
16 Bon Secours St Francis Hospital	34 Grandview Apartments
17 West Ashley Medical Center	35 Ashley River Plantation
18 Cynthia Graham Hurd / St. Andrew's	36 Harmony at West Ashley

Legend

-  ICE Study Area
-  Medical Facility
-  Project Corridor
-  Recreational Facility
-  Fire
-  Senior Facility
-  Library
-  School/Daycare
-  Worship Facility





0 0.25 0.5 Miles

Community Features - West Ashley
Figure 8

I-526 Lowcountry Corridor WEST
Charleston County
Last Updated on 3/26/2020

STEP 4 – IMPACT CAUSING ACTIVITIES

Step 4 includes identifying impact-causing activities of the proposed project. These impact-causing activities are identified at a project level, and then compared against reasonably foreseeable indirect and cumulative effects in the future.

Proposed improvements include widening I-526, the modification of the Paul Cantrell Boulevard/Magwood Drive interchange, and upgrades to five interchanges along I-526: the I-526 at Paul Cantrell Boulevard interchange; the I-26/I-526 system-to-system interchange; the I-526 at Rivers Avenue interchange; the I-526 at North Rhett Avenue interchange and the I-526 at Virginia Avenue interchange. As noted in Section 5.6 of the CIA, these changes will also result in an increase in traffic noise levels in 40 of the 49 Noise Study Areas (NSAs). The increase in sound levels as a result of the proposed improvements is not substantial, and in some cases result in a decrease in sound levels due to parapets on elevated sections. Many locations in the study area are currently approach or exceed the Noise Abatement Criteria (NAC). The traffic noise report included an analysis for 49 total NSAs, additional details can be found in the Detailed Noise Analysis (DEIS Appendix K). Noise walls to reduce traffic noise level increases are preliminarily recommended in North Charleston Area 11 (Centre Pointe Apartments), West Ashley Area 2 (The Arboretum, Oasis at West Ashley, Ashley River Apartments, Hawthorne Westside Apartments, Middleton Cove Apartments, Planters Trace Apartments, Plantation Oaks Apartments, Ashley Crossing Lane), West Ashley Area 3 (Ashley Harbor), and West Ashley Area 4 (Marsh Cove, Ricefield Townhomes).

The proposed modification of the Paul Cantrell Boulevard/Magwood Drive intersection and upgrades to existing interchanges would create travel pattern changes for those accessing I-526 or adjacent roadways. All build alternatives propose access management modifications at I-26 and West Montague Avenue. Changes in travel patterns and access in West Ashley include the modification of the I-526/Paul Cantrell Boulevard interchange that includes: a new bridge carrying westbound lanes of Paul Cantrell Boulevard over Magwood Drive and widening of the I-526 westbound exit ramp to accommodate the new bridge bypassing the Magwood Drive intersection. These changes in access and circulation patterns are anticipated to decrease travel time.

The proposed construction of a new interchange, and upgrades to existing interchanges will create impacts to floodplains, wetlands, streams and water quality during and after construction. Construction activities such as earthwork include clearing, excavation and filling of uplands as well as floodplains, wetlands, and streams. This changes hydrology and land cover. Sedimentation and possible spills can occur during construction. The increase in impervious surface associated with the project would lead to additional runoff carrying sediment and other pollutants.

Table 5. Impact Causing Activities

Impact-Causing Activity	Project Specific Activity	Relevant Details
Communities		
Access alteration	Changes in access; interchange upgrades; new interchange	Interchange upgrades and the conversion of an existing intersection to interchange may improve traffic patterns and access, and therefore travel time
Right-of-way acquisition	Widening of I-526, interchange upgrades, new interchange	Existing I-526 would be widened; interchange upgrades and new interchange would require additional ROW; displacements mostly located in EJ communities
Land Transformation	Extension and addition of frontage roads (I-26/I-526 System-to-System)	Extension of I-26 EB C-D system and new C-D systems on north/ south sides of I-526
Modification of regime	Widening and expanded facility	Noise impacts in communities associated with roadway widening, the addition of frontage roads, and a new interchange
Floodplains, Streams, Wetlands, and Water Quality		
Hydrologic Modification	Alteration of drainage patterns and flows	Widening of the road will include culvert and bridge extensions and potential increase in backwater
Land Alteration	Alteration of ground cover	Conversion of pervious surfaces to impervious surfaces. Loss of trees that serve as riparian buffers to streams and wetlands. Conversion of forested wetlands to herbaceous wetlands or ponded areas.
Land Alteration	Wetland fill and stream fill	New fill would be placed in wetlands for road-widening embankments; culverts placed in streams for access and drainage
Land Alteration	Reduced water quality	Increase in impervious surface leading to increase in runoff and pollutant loads carried to floodplains, streams, and wetlands

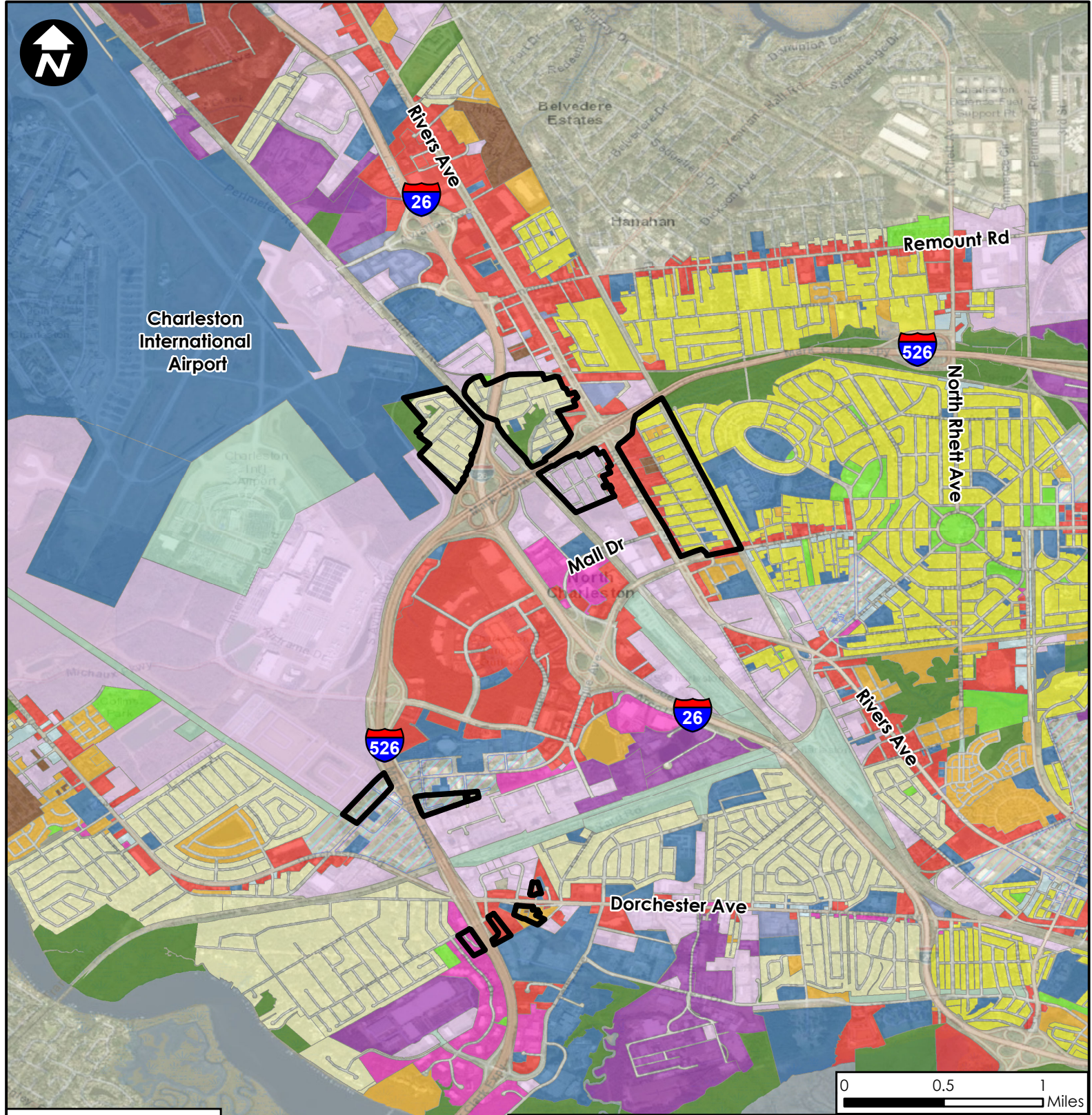
STEP 5 – POTENTIALLY SIGNIFICANT INDIRECT EFFECTS AND REASONABLY FORESEEABLE ACTIONS

The objective of this step is to compare the list of project impact-causing actions with the lists of goals and notable features to explore potential cause effect relationships and establish which effects are potentially substantial and merit subsequent detailed analysis (or conversely, which effects are not potentially substantial and require no further assessment). Based upon the information provided in the previous steps, the indirect effects may be identified. This step is essentially a screening step; only those impacts which may be substantial require further analysis.

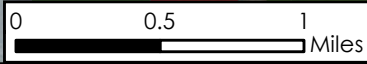
LAND USE CHANGES

North Charleston

As noted in Section 5.1 of the CIA, the project would require additional right-of-way at various locations along the project corridor. The proposed improvements would not alter existing land use along this densely developed project corridor. Because the project corridor and surrounding vicinity are already developed, land use changes along the project corridor and vicinity would occur as part of local planning initiatives rather than induced land use changes associated with the proposed project. Future land use can be seen in Figure 9.



Charleston International Airport



**North Charleston Future Land Use
Figure 9**

I-526 Lowcountry Corridor WEST
Charleston County
Last Updated on: 7/15/2020

LEGEND

- | | |
|--------------------------------|--|
| EJ Neighborhood | Multi-Family Residential |
| Conservation | Neighborhood Commercial District |
| Heavy Industrial District | Office, Professional District |
| Highway Oriented Use (B-3) | Parks and Recreation |
| Institutional | Redevelopment Priority District |
| Light Industrial District | Single-Family Residential, Suburban |
| Major Business/Retail District | Single-Family Residential, Traditional |
| Mixed Use | Transportation/Utilities |
| Mobile Home Residential | |

Future land uses will generally remain consistent with existing land use, primarily single-family residential, commercial, and light industrial. However, as detailed in Section 5.1 of the CIA, one notable exception is a proposed change in land use for the Russelldale neighborhood which would be zoned as “Light Industrial District” (M-1) together with areas to the south along Mall Drive and East Montague Avenue in future land use mapping. In an area where affordable housing, and housing in general, is scarce and at a premium already, the conversion from residential to industrial uses would contribute to cumulative effects, as noted in Step 6.

Charleston and surrounding municipalities have pro-growth policies, as evident by the future redevelopment of Palmetto Commerce Park and the Volvo car factory in Ridgeville.^{18,19} Additionally, as included in Section 5.1 of the CIA, As seen in Exhibit 8, a “Catalyst Area” is noted near the Environmental Justice neighborhoods, seen in red, in North Charleston. A catalyst area is “designed to function as multimodal transportation hub and development activities to support regional and local transportation networks, such as commuter rail, light rail, and interconnecting buses, all with a high level of bicycle and pedestrian accessibility.”²⁰ The catalyst area near the Russelldale neighborhood would focus development efforts on the Mall Drive district to expand growth from the existing commercial small lot and ‘big box’ retail, hotels, and restaurants.

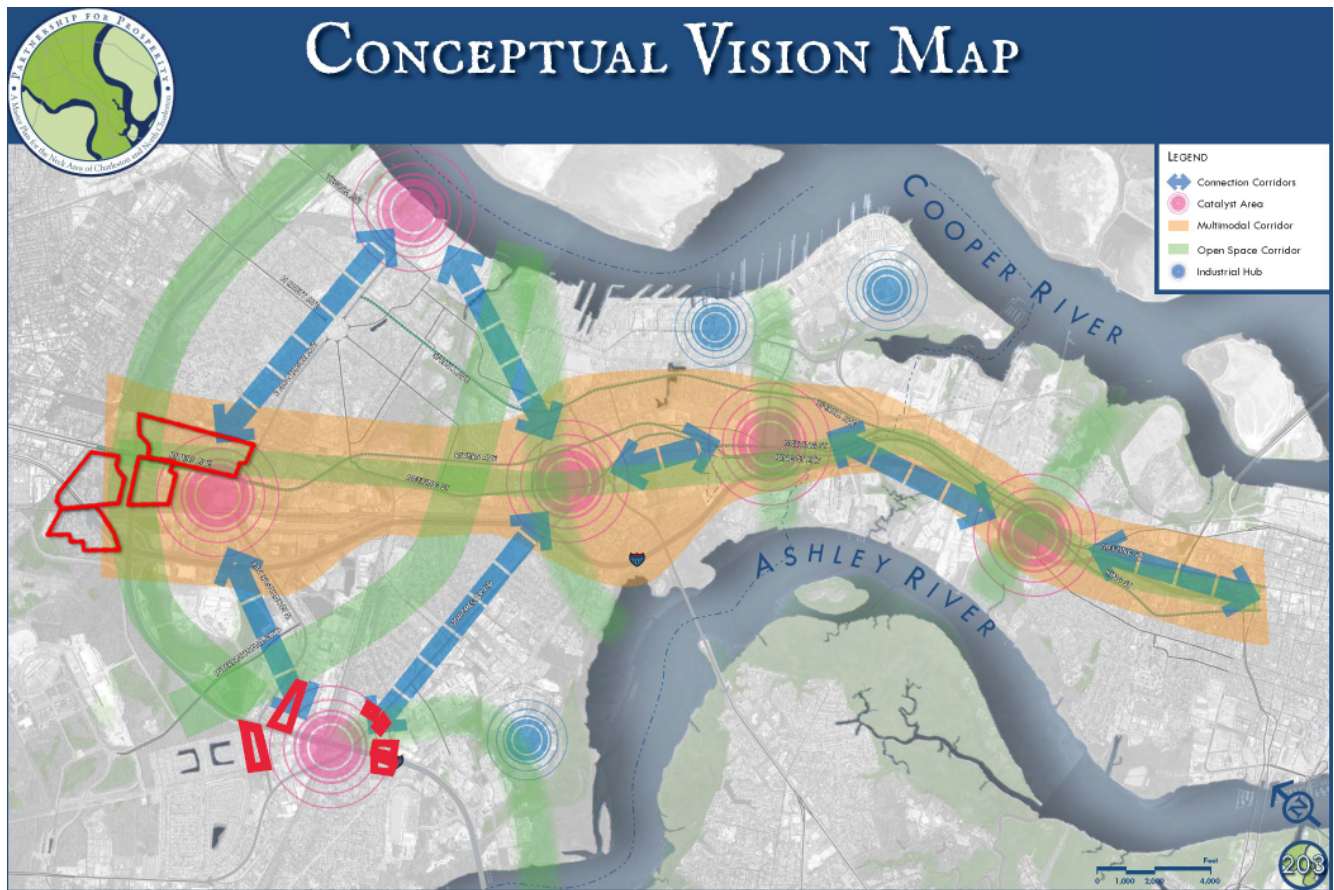


Exhibit 8: Catalyst Areas that reflect economic development zones in the neck of Charleston and North Charleston.

Note: Red polygons represent EJ neighborhoods.

Source: Partnership for Prosperity, Berkeley-Charleston-Dorchester Council of Governments (BCDCOG)

http://www.neckprosperity.org/uploads/2/5/0/5/25050083/draftreport_131206_web.pdf

¹⁸ The Post and Courier. “Retail center planned for industry-laden Palmetto Commerce Park in North Charleston.” July 1, 2019. Web. https://www.postandcourier.com/business/real_estate/retail-center-planned-for-industry-laden-palmetto-commerce-park-in/article_53d612ce-9925-11e9-9a25-5bc6603c1597.html

¹⁹ Volvo Cars. South Carolina Factory. Web. <https://www.volvocars.com/us/about-volvo/our-story/south-carolina-factory>

²⁰ Partnership for Prosperity. “Catalyst Overview.” Web. http://www.neckprosperity.org/uploads/2/5/0/5/25050083/8_catalystareas_all.pdf

West Ashley

The West Ashley area is a suburb of Charleston and North Charleston and is characterized by a mixture of residential and commercial land use with limited undeveloped/available land. Future land use would remain consistent with existing land use (see Exhibit 9 below).



Exhibit 9: Future Land Use in West Ashley

Source: Century V: 2010 Comprehensive Plan Update, City of Charleston, SC
<https://www.charleston-sc.gov/285/Century-V-Plan>

As noted previously, I-526 and I-26 are utilized as ‘commuter corridors’ serving traffic beyond West Ashley communities. Since the ICE study area is already developed, any growth is anticipated to occur as redevelopment, and induced land use changes associated with the project are not anticipated in West Ashley.

According to the Century V Plan, several areas along US 17/ I-526 have been identified as economic development accommodation zones (see Exhibit 10 to right). Consistent with future land use plans, this area is planned for high intensity mixed uses, which would most likely include vehicle-dependent commercial development. In addition, the Century V plan includes an urban growth boundary that expands West Ashley and Johns Island further west.

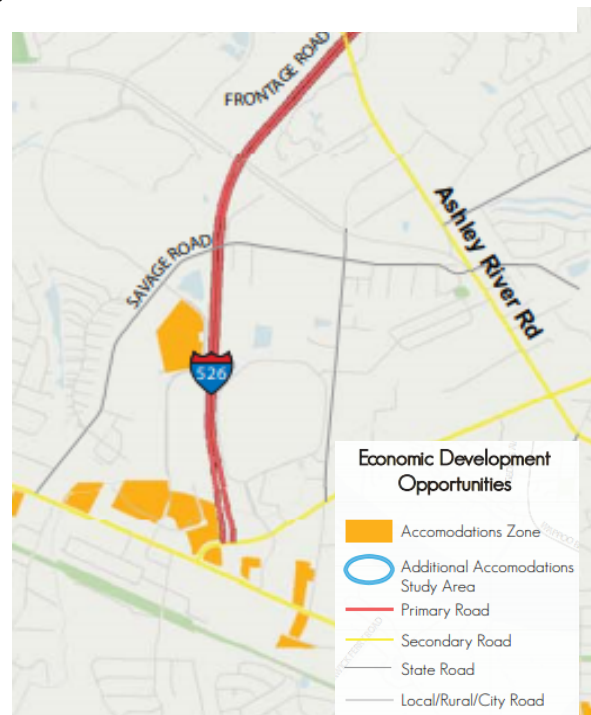


Exhibit 10: Economic Development Opportunities

Source: 2015 Century V Plan

<https://www.charleston-sc.gov/DocumentCenter/View/513/Land-Use?bidId=>

FLOODPLAINS, WETLANDS, STREAMS AND WATER QUALITY

Indirect impacts to floodplains, 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 in the ICE study area leading to more runoff or decreased floodplain storage. These effects on water resources can lead to the degradation of water quality.

Indirect impacts to water quality, streams, wetlands and floodplains 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.

Past actions have resulted in impacts and the loss of floodplains, wetlands, and streams. 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, leading to the impairment of some waterbodies. Additional development will add to these impairments; however, it is unlikely to be a significant impact given the current high percentage of existing developed land. Many more regulations are in place to protect water quality since these impairments were first identified.

Due to the high amount of development that has occurred in the 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, wetlands and floodplains 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.

STEPS 6 AND 7— INDIRECT AND CUMULATIVE EFFECTS ANALYSIS

Step 6 includes the analysis of indirect and cumulative impacts of the resources under each Notable Feature. Step 7 summarizes and evaluates the analysis performed in the above-mentioned steps for potential indirect and cumulative effects. The purpose of Steps 6 and 7 is to assess the significance of effects identified in Step 5 and evaluate these effects.

COMMUNITY

North Charleston

The North Charleston area is characterized by residential, industrial, and commercial land use with limited undeveloped available land. As noted in Section 3.1.3 of the CIA, North Charleston has experienced a high level of gentrification, resulting in the displacement of African American residents who have lived in these communities for generations. This includes an associated increase in home values and therefore number of renters, especially in comparison to the surrounding Dorchester and Berkeley Counties.²¹

I-526 and I-26 are utilized as ‘commuter corridors’ serving traffic beyond North Charleston communities. Because the ICE study area is already developed, any growth is anticipated to occur as redevelopment, and induced land use changes associated with the project are not anticipated in North Charleston.

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. Regional population growth and development trends, pro-growth policies, and the availability of water, sewer, schools, and other infrastructure, indicate that growth and development will continue to occur in the broader Charleston region regardless of the proposed project.

As noted previously, the proposed improvements will result in an increase in traffic levels in six areas within the North Charleston portion of the study area. However, these communities currently experience highway traffic and air traffic noise as they are located adjacent to interstates I-526 and I-26 and the Charleston International Airport. The original construction of I-526 and I-26 through the North Charleston communities and construction and subsequent expansion of the Charleston International Airport, as detailed in Section 3.1.6 of the CIA, generated a substantial increase in highway and air traffic noise. In addition, two railroad corridors intersect the project area, a Norfolk Southern (NS) Railway railroad corridor which runs northwest to southeast through the project area adjacent to I-26 and turning east at running east to west just north of Liberty Park. A CSX railroad corridor also runs northwest to southeast in the project area, intersecting I-526 just east of Rivers Avenue. Both railroad corridors generate noise. As Charleston and the surrounding areas have increasingly developed, traffic levels and infill development has increased, resulting in an additional increase in noise levels in the communities. The proposed improvements in combination with future projects will contribute to the cumulative noise levels in these communities. Noise abatement measures are preliminarily recommended in two of the six areas.

West Ashley

West Ashley is a suburb of Charleston and is characterized by a mixture of residential and commercial land use with limited undeveloped available land. Commercial retailers include ‘big box’ names such as Costco and Target and are located along Sam Rittenberg Boulevard. As noted previously, I-526 and I-26 are utilized as ‘commuter corridors’ serving traffic beyond West Ashley communities. Because the ICE study area is already developed, any growth is anticipated to occur as redevelopment, and induced land use changes associated with the project are not anticipated in West Ashley.

²¹ The Post and Courier. “Survey: It’s cheaper to rent in Charleston County, but better to buy in Berkeley and Dorchester.” January 9, 2017. Web. https://www.postandcourier.com/business/survey-it-s-cheaper-to-rent-in-charleston-county-but/article_95a8f8f6-c87b-11e6-bc01-672a54e4dd0f.html

As noted previously, several areas along US 17/I-526 have been identified as economic development accommodation zones. Consistent with future lane use plans, this area is planned for high intensity mixed uses, which would most likely include travel-oriented commercial development. In addition, the *Century V Plan* includes an urban growth boundary that expands West Ashley and Johns Island further west.

Changes in travel patterns and access in West Ashley include a modification of the I-526/Paul Cantrell Boulevard interchange. All alternatives propose a new bridge carrying the westbound lanes of Paul Cantrell Boulevard over Magwood Drive and widening the I-526 westbound exit ramp to accommodate a new bridge, bypassing the Magwood Drive intersection. These changes in access and circulation patterns are anticipated to decrease travel time.

As noted previously, the proposed improvements will result in an increase in traffic levels in seven areas within the West Ashley portion of the study area. However, these communities currently experience highway traffic and air traffic noise as they are located adjacent to interstate I-26. The original construction of I-26 through the West Ashley communities generated a substantial increase in highway and air traffic noise. As Charleston and the surrounding areas have increasingly developed, traffic levels and infill development has increased, resulting in an additional increase in noise levels in the communities. As noted previously, two railroad corridors intersect the project area which generate noise in the communities. The proposed improvements in combination with future projects will contribute to the cumulative noise levels in these communities. Noise abatement measures are preliminarily recommended in three of the seven areas.

Environmental Justice Neighborhoods

In addition to indirect and cumulative effects included above, further effects are anticipated to occur in EJ communities in the ICE study area. The original construction of I-526 and I-26 corridors divided neighborhoods and displaced EJ communities. This physical barrier constructed between homes in neighborhoods divided communities and disrupted existing community cohesion. Additional cumulative effects to communities along the I-526 corridor are anticipated with the potential displacement of approximately 120 residences. Further residential displacements associated with the proposed project serve to further divide the communities. A majority of these residential displacements are located in North Charleston due to the predominantly commercial nature of land use along the West Ashley portion of the project corridor and the fact that most development in West Ashley occurred after I-526. Feedback from the I-526 West Community Advisory Council has indicated that residents displaced or encroached upon by the previous I-526 and I-26 projects were not compensated fairly or justly.¹⁶

Following the original construction of I-526 and I-26, the expansion of the Charleston Airport in 2005, as detailed in Section 3.1.6 of the CIA, further reduced the amount of affordable housing in the area. The Charleston Airport is located in the northwest portion of the ICE study area, adjacent to the Highland Terrace and Liberty Park neighborhoods. Combined with industrial growth in North Charleston and surrounding areas, prior and present growth patterns reduce the amount of available land, and availability of affordable housing. The original construction of I-526 bisected the Camps neighborhood and Ada Avenue, introducing commercial uses to the area and the remainder of Wando Woods, thus negatively impacting community cohesion. The proposed project will result in further impacts to these neighborhoods, further contributing to cumulative effects on community cohesion.

As noted previously, the Russelldale neighborhood is currently zoned for single-family residential use with some multi-family residential and commercial uses on the periphery of the neighborhood. Russelldale's future land use mapping is shown as "Light Industrial District" which is not consistent with current land uses. This change would contribute to cumulative impacts experienced by this EJ neighborhood, further fragmenting residences from each other and creating a barrier to reestablishing any form of community cohesion.

The original construction of I-526 and I-26 also resulted in visual impacts to the EJ neighborhoods as the elevated highway bisected these neighborhoods. Views of the elevated I-526 and I-26 are visible from viewpoints throughout the EJ neighborhoods and dominate the backdrop of each neighborhood above residences. The EJ neighborhoods proximity to I-526 and I-26 will result in further disproportionate visual impacts as compared to the remainder of the study area with the proposed project's widening of each facility, further encroaching on the EJ neighborhoods viewshed. In comparison, I-526 and I-26 were present in West Ashley before a majority of development occurred, and thus a larger buffer exists between the facility and residences. A planting plan is included as part of potential project mitigation which may contribute to beautification or other aesthetic improvements, and is anticipated to offset any further visual impacts from the widening of I-526 and I-26 on the EJ neighborhoods. For more information on the visual impacts anticipated for this project, please see the Visual Impact Assessment, DEIS Appendix E.

Community Advisory Council members have noted there are existing problems with stormwater management which have been exacerbated by prior expansions of I-26. This has resulted in stormwater runoff into North Charleston EJ neighborhoods, and the washing out of yards due to minimal SCDOT right-of-way between I-526 and adjacent homes.¹⁶ The proposed project will result in an increase in impervious surface in a flat area, which would result in an increase in runoff. Filbin Creek and I-526 from SC 52 to the CSX railroad fall within a FEMA 100-year flood zone (AE). This flood zone includes portions of the Russelldale and Liberty Park neighborhoods.

As noted previously, the proposed improvements will result in an increase in traffic levels in two areas within the Environmental Justice portion of the study area. However, these communities currently experience highway traffic and air traffic noise as they are located adjacent to interstates I-526 and I-26 and the Charleston International Airport. The original construction of I-526 and I-26 through the North Charleston communities and construction and subsequent expansion of the Charleston International Airport, as detailed in Section 3.1.6 of the CIA, generated a substantial increase in highway and air traffic noise. In addition, as noted above, two railroad corridors are located within the project area and generate noise. As Charleston and the surrounding areas have increasingly developed, traffic levels and infill development has increased, resulting in an additional increase in noise levels in the communities. The proposed improvements in combination with future projects will contribute to the cumulative noise levels in these communities. Noise abatement measures are not recommended for these areas as the cost per benefitted receptor does not meet the criteria for reasonableness.

In addition to cumulative effects contributed by past highway projects, there are a number of adverse cumulative/recurring EJ effects broadly experienced by low-income/minority residents in the North Charleston area. Typical adverse cumulative/recurring EJ effects experienced by low-income/minority residents in the North Charleston area include:

- Intergenerational poverty
- Segregation and isolation
- Surface transportation projects
- Changing job markets

- Lack of affordable housing
- Exposure to environmental pollutants
- Exposure to flooding
- Limited access to transit
- Lack of sidewalks and bike facilities; and
- Language barriers (LEP)²²

One example of a cumulative/recurring effect is exposure to environmental pollutants. Minority and low-income neighborhoods in North Charleston are more exposed to toxins from the area’s industrial facilities than the City of North Charleston’s predominantly white, non-Hispanic neighborhoods which are located away from the port and associated facilities in North Charleston. Industrial facilities in the Charleston metro area produce approximately 26% of the state’s toxic chemical releases. Impacts on air quality stemming from a combination of high traffic volumes and a larger-than-average fraction of the fleet being comprised by heavy duty vehicles are compounded by the fact that several minority and low-income communities are located in close proximity to the I-526 and I-26 corridors. The residents of neighborhoods immediately surrounding the I-526 and I-26 interchange are likely to experience greater impacts to the quality of the air they breathe than residents living in areas further removed from high-traffic interchanges like the I-526 and I-26 interchange²³. A study that tracked the number of children treated for asthma at the Medical University of South Carolina (MUSC) over a 40-year period found a 20-fold increase of asthma instances among African-American children; four times the instances of asthma in white children over the same period.²⁴

FLOODPLAINS, WETLANDS, STREAMS, AND WATER QUALITY

The proposed improvements associated with the I-526 LCC WEST project 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, significant impacts to water quality resulting from land use change associated with the project are not anticipated. Based on the project design, direct floodplain impacts will not occur. Hydraulic modeling will be completed to demonstrate this and should result in a no-rise certification. Therefore, significant impacts to floodplain hydrology 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 as described in Step 8.

STEP 8 – MITIGATION & ENHANCEMENT STRATEGIES

COMMUNITY

As noted previously, indirect impacts to these communities would include increased traffic and therefore noise levels, and cumulative/recurring effects to these communities would include further displacement, a lack of affordable housing, exposure to environmental pollutants and flooding, limited access to transit and pedestrian/bicycle facilities, among others. An Environmental Justice Mitigation Plan is being prepared for the

²² [http://onlinepubs.trb.org/onlinepubs/archive/NotesDocs/25-25\(36\)_FR.pdf](http://onlinepubs.trb.org/onlinepubs/archive/NotesDocs/25-25(36)_FR.pdf)

²³ I-526 LCC WEST Air Quality Analysis. May 2020.

²⁴ <https://www.charlestoncitypaper.com/charleston/is-pollution-poisoning-charlestons-african-american-and-low-income-communities/Content?oid=5790876>

project (see DEIS Appendix H). The mitigation plan focuses on providing effective mitigation to project impacts to the Environmental Justice neighborhoods Ferndale, Russelldale, Highland Terrace, and Liberty Park. The mitigation plan provides mitigation under four pillars : cohesion, enhancement, preservation, and revitalization. Mitigation for indirect and cumulative effects as listed will include:

- Replacement and enhancement of the Highland Terrace-Liberty Park community center,
- Intergovernmental agreement between SCDOT and the City of North Charleston to ensure programs and activities are provided at the replacement Highland Terrace-Liberty Park community center and recreational facilities
- Pedestrian and bicycle facility improvements between the replacement community center and surrounding community
- Development of the Filbin Creek Greenway System
- Addition of transit amenities and improvements to Charleston Area Regional Transportation (CARTA) bus stops along Rivers Avenue
- Fugitive dust control measures to minimize particulate matter emissions
- Construction-related Mobile Source Air Toxics (MSAT) emission minimization
- Right-of-way and relocation assistance to displaced residents
- 130 replacement affordable housing units
- Financial and first-time home buyer counseling to displaced residents
- Reimbursement and relocation assistance to business relocations
- Career development and job search resources
- School to work scholarship program

FLOODPLAINS, WETLANDS, STREAMS, AND WATER QUALITY

Based on the information and analysis presented above, potential indirect and cumulative effects 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 best management practices including designing using the Context Sensitive Solutions (CSS) process²⁵.
- 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.
- A Stormwater Prevention Plan (SWPP). The SWPPP contains information regarding sediment and erosion control based on the SCDOT water quality manual and SCDOT's general permits (MS4 and construction)²⁶. 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. The storage will not impact existing wetlands.
- Attainment of a no-rise certificate. Hydraulic analysis and modeling will be used to demonstrate avoidance of impacts to floodplains. As such floodplain mitigation will not be required, however

²⁵ SCDOT Roadway Design Manual. https://www.scdot.org/business/pdf/roadway/2017_SCDOT_Roadway_Design_Manual.pdf

²⁶ <https://www.scdot.org/business/storm-water.aspx>

floodplain storage will be increased in the upper reaches of Filbin Creek as part of the stormwater management plan. This action helps offset some of the indirect and cumulative effects of floodplains that have been altered in the past within the ICE study area.

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

APPENDIX A: RESOURCES

40 CFR § 1508.7

40 CFR § 1508.8

I-526 Preliminary Relocation Report

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