2. Development of Alternatives

2.1 Changes to this chapter since the DEIS

Since the Draft Environmental Impact Statement (DEIS), the following changes have been made to this chapter:

- A discussion of the design changes to the Recommended Preferred Alternative (RPA) since the public hearing;
- A description of the Refined Recommended Preferred Alternative (Refined RPA) and updated impact matrix for the Refined RPA; and,
- Updated information clarifying the status of the Newberry Express shuttle.

2.2 Developing Alternatives

This chapter explains how the alternative development and screening process worked from the preliminary alternatives through the Refined RPA presented in this FEIS. Included in this chapter is an assessment of current and projected transportation conditions on the corridor and a review of congestion management strategies that were considered in the development of these alternatives. This chapter also summarizes the screening analysis completed for the alternatives analysis process.

The FHWA Guidance on Preparing and Processing Environmental and Section 4(f) Documents (Technical Advisory T6640.8A), requires an analysis of travel patterns and accessibility in an Environmental Impact Statement (EIS). To that end, the transportation system analysis considered several elements (see callout box). An extensive traffic analysis was conducted to support the process to develop alternatives. This analysis, its findings, and the methodology employed are documented in detail in the *Alternatives Traffic Analysis Technical Memo for Carolina Crossroads I-20/26/126 Corridor Improvement Project*[1] which can be found in Appendix D. This analysis helped identify areas of current and projected congestion, screen potential improvement types to select preferred treatments, and determine the magnitude of improvements to congestion and traffic flow presented with each alternative.

The development and screening of alternatives is documented in detail in the *Final Alternatives Development and Screening Report*

Transportation Analysis Terms

- **Average Daily Traffic (ADT): The total volume of traffic on a roadway during a given time period, divided by the number of days in that time period.**
- **Level of Service (LOS): A term used to qualitatively describe the operating conditions of a roadway based on factors such as speed, travel time, density, delay, and safety.**
- **Vehicle volume to capacity ratio (v/c): The ratio of the vehicle demand compared to the roadway capacity (the roadway geometry) used as the performance measure to assess travel conditions on the regional facilities in the study area.**
- **Peak hour: The hour of the day in which the maximum demand for service is experienced. There typically is an AM and a PM peak.**

[1] SCDOT. 2018. Alternatives Traffic Analysis Technical Memo for Carolina Crossroads I-20/26/126 Corridor Improvement Project. Prepared by STV.

for Carolina Crossroads I-20/26/126 Corridor Improvement Project,[2] located in Appendix C.

The alternatives development and screening process described in this section provides critical information about how well an alternative satisfies the purpose of and need for the proposed Carolina Crossroads I-20/26/126 Corridor Improvement Project (Carolina Crossroads). The criteria used in the tiered screening analysis generated measures that allowed SCDOT and the FHWA to systematically and objectively identify reasonable alternatives and screen out unreasonable alternatives.

NEPA regulations and guidance from FHWA and the Council on Environmental Quality (CEQ) stipulate that there are three primary reasons why an alternative might be determined to be not reasonable and eliminated from further consideration, namely:

1. The alternative does not satisfy the purpose of and need for the project.
2. The alternative is determined to be not practical or feasible from a technical and/or economic standpoint.
3. The alternative substantially duplicates another alternative.

The alternatives development and screening process consisted of the following four basic steps shown in Figure 2-1:

1. **Preliminary Screening:** First, a Range of Alternatives was developed that included an initial list of alternatives that were general in nature. These alternatives were examined to see if they met the primary purpose and need of the project using established evaluation criteria.
2. **Level 1 Screening:** The alternatives that advanced from preliminary screening were then evaluated against first-level (Level 1) screening criteria.
    a. *Level 1A Screening*: In Level 1A of this step, alternatives were evaluated against the purpose and need as well as other screening criteria at a qualitative level, including whether the alternative(s) would result in:
        i. a reduction of conflict points on the I-20/26/126 corridor;
        ii. improved traffic operations on the I-20/26/126 corridor;
        iii. improved connections from the I-20/26/126 corridor;
        iv. reduced/eliminated geometric deficiencies; and
        v. interchanges along I-20/26/126 being under, at, or over capacity, based on general traffic parameters.

    The above criteria were essential to meeting the project purpose and need, and if an alternative was unable to meet them, it was determined “fatally flawed” and not practicable.

[2] SCDOT. 2019. Final Alternatives Development and Screening Report for Carolina Crossroads I-20/26/126 Corridor Improvement Project. Prepared by HDR, STV, and Mead & Hunt.

b. *Level 1B Screening*: Those alternatives that were not fatally flawed then moved to Level 1B screening for a more detailed traffic analysis. Under this analysis, remaining alternatives were evaluated for level-of-service, travel time benefits, volume to capacity benefits, and delay time.

3. **Level 2 Screening:** Alternatives that advanced to Level 2 screening were evaluated against environmental constraints, construction feasibility, cost, and secondary need components including the ability to improve safety, improve freight mobility, improve system linkages, while minimizing community and environmental impacts.
4. **Level 3 Analysis:** Those alternatives that advanced through Level 2 screening became Reasonable Alternatives which were evaluated in detail in the DEIS. From this, RA1 was identified as the RPA by SCDOT for the proposed project in the DEIS.

Changes to the RPA since the DEIS and Public Hearing are documented in Section 2.2.10 and the comparison of the Refined RPA to the RPA from the DEIS is summarized at the end of this chapter.

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Figure 2-1 Alternatives analysis process

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2.2.1 WHO IS RESPONSIBLE FOR MANAGING TRANSPORTATION IN THE COLUMBIA METROPOLITAN AREA?

SCDOT is the agency primarily responsible for planning, construction, maintenance and operation of the roadways within the Carolina Crossroads study area. All interstate, federal and state routes within the corridor are maintained by SCDOT.

Several other agencies support SCDOT in the planning, construction, and maintenance of transportation in the Columbia metropolitan area.

Central Midlands Council of Government (CMCOG) is the designated Metropolitan Planning Organization (MPO) responsible for carrying out the transportation planning process for the Columbia Area Transportation Study (COATS). The primary responsibilities of the MPO are to:

Transportation Elements Analyzed

- **Regional facilities and travel**
- **Arterial road operations**
- **Safety**
- **Freight mobility and access**
- **Transit operations**
- **Non-motorized facilities (bicycle/pedestrian)**

- develop a Long Range Transportation Plan (LRTP), which is, at a minimum, a 25-year transportation vision for the metropolitan area;
- develop a Transportation Improvement Program (TIP), which is the agreed-upon list of specific projects for which federal funds are anticipated; and
- develop a Unified Planning Work Program (UPWP), which identifies in a single document the annual transportation planning activities in support of the objectives established in the LRTP.

As the MPO, CMCOG provides the forum for cooperative decision making in developing regional transportation plans and programs to meet changing needs.

Richland County is responsible for maintaining and improving county roads and drainage infrastructure in Richland County. Richland County maintains approximately 770 miles of roads and bridges. In addition, the Richland County Transportation Department manages the Transportation Penny Program, a special sales and use tax intended to fund infrastructure projects, including:

- improvements to highways, roads (paved and unpaved), streets, intersections, and bridges including related drainage system improvements;
- continued operation of mass transit services provided by Central Midlands Regional Transit Authority (CMRTA) including implementation of near, mid and long-term service improvements; and
- improvements to pedestrian sidewalks, bike paths, intersections and greenways.

Although the proposed project corridor does pass through portions of Richland County, the County is not responsible for maintenance of any roads within the project corridor. Central Midlands COG's *2040 Long Range*

Transportation Plan identifies two fiscally constrained projects within proximity to the proposed Carolina Crossroads corridor:

- LRTP ID #6: Widen Broad River Road from Woodrow Street to I-26 Interchange
- LRTP ID #7: Widen Kennerly Road from Hollingshed Road (S-635) to Broad River Road

Lexington County's Transportation Division provides the labor and equipment to maintain the County's dirt and paved roads, perform bridge repairs, provide traffic control signs and manage construction on local improvement projects. Lexington County currently maintains some roads adjacent to the frontage roads in the project corridor. Central Midlands COG's 2040 Long Range Transportation Plan identifies one fiscally constrained project within proximity to the proposed Carolina Crossroads corridor:

- LRTP ID #11: Widen Bush River Road from Seawright Road (S-1002) to Woodlands Drive

The City of Columbia is responsible for traffic studies, traffic signals and the maintenance of some streets within the city limits. While the project does cross through several areas that are incorporated by the City of Columbia, the City is not responsible for maintaining any of the roads within the project corridor.

2.2.2 WHAT CONGESTION MANAGEMENT STRATEGIES ARE CURRENTLY IN PLACE TO MANAGE CONGESTION?

Congestion management is the application of strategies to improve transportation system performance and reliability. FHWA's congestion management process (CMP) is a systematic approach for managing congestion that provides accurate, up-to-date information on transportation system performance and assesses alternative strategies for congestion management that meet state and local needs. CMP is intended to move these congestion management strategies into the funding and implementation stages.[3]

A CMP is required for all metropolitan areas with a population over 200,000. The intent of a CMP is to outline decision-making that is fully integrated into the metropolitan transportation planning process.

FHWA's CMP model defines eight actions of a successful CMP, including:

- Develop regional objectives for congestion management
- Define CMP Network
- Develop multimodal performance measures
- Collection of data and monitor system performance to define the extent and duration of congestion
- Analyze Congestion Problems and Needs
- Identify and assess congestion management strategies
- Program and implement strategies
- Evaluate strategy effectiveness

[3] FHWA's *Congestion Management Process Guidebook*, April 2011
https://www.fhwa.dot.gov/planning/congestion_management_process/cmp_guidebook/chap01.cfm#sec1.1

FHWA also defines the types of strategies that could aid in congestion management which "*will contribute to the more effective use and improved safety of existing and future transportation systems based on the established performance measures";* [4] these strategies include:

- Travel demand management (TDM) - strategies that reduce demand for single occupancy vehicle trips (SOV) or shift demand out of the peak travel periods. Examples include: non-automotive travel modes (bicycle/pedestrian), ride-sharing, land use controls, and flexible work patterns.
- Traffic operation improvements/ Intelligent Transportation Systems (ITS) technologies - strategies that deal with operation of the existing network of roads, often supported by the use of ITS. Examples include: ramp metering, reversible lanes, signal optimization, geometric improvements to roads and intersections, and incident management.
- Public transportation improvements – strategies that improve transit operations, improve access to transit, and expand transit service to help reduce the number of vehicles on the road by making transit more attractive or accessible. Examples include: expanded service, enhanced transit amenities, bicycle/pedestrian connection accommodations at interchanges, improved access, bus rapid transit, and reserved travel lanes during peak hours.
- Additional system capacity – strategies that add more capacity to the road network, such as additional lanes and new highways, as well as redesigning specific bottlenecks (such as interchanges and intersections) to increase their capacity.

2.2.2.1 Existing CMP Documents Relevant to the Study Area

COATS Congestion Management Plan

The COATS MPO developed a *Congestion Management Plan* in 2015 [5] to meet the unique needs of the Columbia metropolitan area, in conjunction with development of the Long-Range Transportation Plan (LRTP), Transportation Improvement Program (TIP) and corridor studies.

The COATS CMP identified strategies consistent with federal guidance that could be used for congested corridor and intersections within the CMP network. Five congestion mitigation strategies included

- Decreasing the need for trip making (strategies at regional level versus corridor level) – land use policies and regulations, flexible work hours.
- Shifting trips from automobiles to other modes – transit improvements, transit operational improvements, non-motorized modes (sidewalks, bicycle facilities, transit park-and-ride).
- Increasing the use of High Occupancy Vehicles (HOV) – vanpooling, ride share matching services.
- Enhancing operations on existing roadway facilities – intersection improvements, signal coordination, incident management, and access management.

[4] 23 CFR 450.320 (c)4
[5] *Columbia Area Transportation Study Metropolitan Planning Organization Congestion Management Plan,* September 24, 2015

- Increasing roadway capacity through additional arterial roadway capacity – widening existing roads and adding new roads.

The CMP network included approximately 500 miles of arterial roads, major collectors and minor collectors within the COATS MPO boundary. Interstates were not included in the plan because all performance monitoring, analysis and funding for interstate projects is programmed and implemented by SCDOT.

The CMP network overlaps sections of the Carolina Crossroads corridor. Although the I-26 and I-20 interstates are not included, several of the crossing routes within the study area were contained in the network, including St. Andrews Road, Bush River Road, Broad River Road, Harbison Boulevard and Lake Murray Boulevard. The Broad River/Harbison high capacity transit corridor identified in the CMP also crosses through the study area.

Columbia Corridors Corridor Management Plan

The Columbia Corridors Corridor Management Plan[6,7] is a planning-level study that considered approximately 90 miles of interstate corridors and 50 interchanges around the Columbia area, including I-26, I-126, I-20, I-77, and SC 277, with the intent of planning and prioritizing projects for the region that would improve traffic conditions through 2040. This study area focused on and overlapped the Carolina Crossroads project corridor, and coordination occurred between the project teams with traffic data collection, the development of the traffic model (Transmodeler), growth projections, and more.

2.2.2.2 Corridor/Project-level CMP

During project development, the COATS CMP and Columbia Corridors documents were reviewed to ensure any proposed improvements within the corridor were consistent with these plans. CMP strategies were considered throughout the alternative development process for the proposed Carolina Crossroads project, and are discussed in the next section.

Aspects of CMP strategies were considered for incorporation into the RAs. The discussion of each CMP strategy included an evaluation of measures of effectiveness (MOEs) and/or general criteria and FHWA guidance to determine whether each will be incorporated into the project.

As part of the Carolina Crossroads project, a mobility stakeholder group was established to provide input and ensure coordination on the project not only from a transit perspective but also for bicyclist and pedestrians. Based on input from the mobility group, the project team studied existing park-and-ride facilities in the Carolina Crossroads project area and studied existing and future needs for a continuous and adequate supply of parking for rideshare commuters. SCDOT completed a park-and-ride study to identify and recommend preliminary sites for future implementation to service rideshare commuters (Appendix F). The park-and-ride study analyzed population and employment density, worker demographics, work trip origins and destinations, park-and-ride best practices and siting criteria. Five park-and-ride sites were evaluated through Tier 1 and Tier 2 evaluation, and two sites were determined to be most favorable based of the aforementioned criteria. One site is located

[6] Columbia Corridors Travel Demand Management Strategies Report, CDM Smith, October 2017
[7] Columbia Corridors Transit Modal Strategies, CDM Smith, September 2017

within the Carolina Crossroads project limits near the I-26/Broad River Road interchange; and the other site is located to the west of the project limits near the I-20/Lake Drive interchange. SCDOT would work with CMRTA and CMCOG to develop two park-and-ride lots to improve mobility during construction and mitigate congestion resulting from the project. SCDOT would construct the two sites and maintain them during construction of the project. Engineering feasibility, timing and continued maintenance of the sites would be determined in coordination with CMRTA and the CMCOG prior to the start of construction. In the event a permanent site cannot be developed, SCDOT would work with CMRTA and CMCOG to identify and provide funding for existing parking lots that could be leased for park-and-ride use during construction.

The efforts of the study, coupled with efforts of other regional mobility partners, will help to provide additional mobility options for the Midlands region. Also, as noted in the DEIS, the conclusion of several transit studies is that CMRTA (the primary transit provider in the region) should focus on local transit (bus) route improvements. As such, SCDOT is prepared to assist CMRTA efforts through such measure as accommodating transit (bus) stops at interchange locations.

There is popular support for expanding bicycle and pedestrian facilities in the Columbia metropolitan area. SCDOT is prepared to assist the City of Columbia and CMCOG efforts by evaluating the recommendations made in the *Walk Bike Columbia* plan that may be appropriate for inclusion in the Carolina Crossroads Project and accommodating planned bicycle/pedestrian facilities that cross the corridor. Refer to the *Congestion Management Process Technical Memorandum* found in Appendix F of this document.

2.2.3 WHAT WAS THE RANGE OF ALTERNATIVES FOR THE PRELIMINARY SCREENING?

The project team used several methods to identify and develop a Range of Alternatives. In addition to suggestions from SCDOT staff and the project team members, the Range of Alternatives was also identified from previous traffic studies and plans, from scoping comments, from stakeholder working group meetings and comments, from public and agency input and comments, and with considerations to FHWA's Congestion Management Process (CMP) strategies.[8] The COATS MPO Congestion Management Plan provides a toolbox of options that are intended to mitigate congestion. This plan and the strategies are discussed in Section 2.2.2.1. The project team considered these strategies heavily in the development of the Range of Alternatives for preliminary screening. The Range of Alternatives were evaluated against the established purpose and need metrics to move viable alternatives into the Level 1 screening step. Those purpose and need metrics are

- Reduce conflict points at/near interchanges
- Improve traffic operations on mainline and local roads
- Improve connections separate from mainline
- Reduce/eliminate geometric deficiencies

[8] SCDOT. 2018. Carolina Crossroads Congestion Management Process Technical Memorandum.

A Range of Alternatives shown in Figure 2-2 was developed and includes an initial list of alternatives which are general in nature, namely:

Alternative 1 – Make changes to the existing highway transportation corridor including I-20/26/126.

Alternative 2 – Establish a new transportation corridor, identified by the public as a "Northern Alignment".

Alternative 3 – Increase existing Transportation System Management (TSM) / Transportation Demand Management (TDM) strategies or add new TSM/TDM strategies such as intersection and signal improvements, signage and lighting, and general traffic flow improvements.

Alternative 4 – Add Mass Transit within the project study area such as light rail, commuter rail, or Bus Rapid Transit (BRT).

Alternative 5 – No-Build Alternative

Alternative 6 – Widen Broad River Road

Alternative 7 – Widen St. Andrews Road

2. Development of Alternatives

Figure 2-2 Range of alternatives

Public comment regarding the Range of Alternatives and preliminary screening step was solicited at the Public Meeting on October 4, 2016. SCDOT presented the Range of Alternatives (Alternatives 1 through 7) and interchange design options to the public for general feedback including which proposals they liked, which ones they did not, and why.

After the public comment period, these seven alternatives were developed to the point needed to decide whether to retain or eliminate the alternative from detailed study. These seven alternatives were then evaluated in an iterative process to determine if they were practical or feasible based upon their ability to satisfy the purpose and need of the project using established evaluation criteria metrics listed in Figure 2-3.

Alternative 1 – *Existing Corridor Improvements*: Alternative 1 proposed that changes be made to the existing I-20/26/126 highway transportation corridor. This included the addition of new general-purpose lanes along the I-20/26/126 corridor and improvements to the existing interchanges along the corridor. Under preliminary screening, this alternative met the purpose and need of the project as improvements to the existing corridor could reduce congestion and improve mobility. This alternative was advanced to Level 1 screening, and the

project team subsequently developed mainline and interchange improvement options for Level 1 screening. These options are described further in Section 2.2.5.1.

Alternative 2 – *Northern Alignment*: The Northern Alignment was included in the Range of Alternatives due to public desire as evidenced through public comments during project scoping. Additionally, the Northern Alignment has been included occasionally in previous regional planning studies. For these two primary reasons, it was included in the Range of Alternatives for the proposed Carolina Crossroads project.

Alternative 2 proposed to construct a new facility for approximately 11 miles from near the Piney Grove Road interchange at I-26 to near the Killian Road interchange at I-77. The facility would begin east of the roundabout located at the intersection of Piney Grove Road with Piney Woods Road, continue along Piney Grove Road to east of Wil Stel Road, and be constructed on new alignment towards the northeast to the intersection of Broad River Road and Geology Road. The connector would then follow Geology Road to its terminus and continue to the north-northeast running parallel to an existing utility corridor that crosses the Broad River approximately 3.5 miles upstream of the existing I-20 bridge over the Broad River. The connector would continue to the northeast utilizing portions of Harmon Road, Winterwood Road, and Duboard Boyle Road. The connector would intersect with roadways including SC 215 (Monticello Road), Crane Church Road, US 321 (Fairfield Road), Koon Store Road, and US 21 (Wilson Boulevard) before it ties into Killian Road to the west of its interchange with I-77. Under this alternative, two scenarios were studied including an "arterial" option which would be classified as a four-lane divided principal arterial with potentially a 45 mph speed limit, and an "expressway" which would be classified as a four-lane expressway with limited access and a potentially 60 mph speed limit. The arterial would cross local roads at-grade with limited to no controlled access, whereas the expressway would have grade separated overpasses at intersecting roadways and provide access at interchanges for SC 215 (Monticello Road), US 321 (Fairfield Road), and US 21 (Wilson Boulevard) before it ties into Killian Road to the west of its interchange with I-77.

Traffic analysis indicated the construction of the Northern Alignment alternative, either as an expressway or an arterial, would have the potential to attract over 30,000 vehicles per day from the surrounding local network in the 2040 design year. However, the South Carolina Statewide Model (SCSWM) predicts that most of the traffic would be diverted from Broad River Road, and that only approximately four percent of the traffic would be diverted from I-26. If a comparable amount of traffic that would be diverted from Broad River Road were diverted from I-26, then approximately nine percent of the traffic from I-26 would be diverted to the Northern Alignment. Ultimately, the amount of traffic that would be eliminated from the proposed Carolina Crossroads project through implementation of the Northern Alignment is not enough to reduce congestion and improve mobility within the corridor and thereby would not satisfy the purpose and need of the project. It also would not result in improved safety, improved freight mobility, or improved system connections. Therefore, the Northern Alignment was eliminated from further consideration. However, it should be noted that the Northern Alignment may be reviewed and further evaluated under other SCDOT projects and/or studies.[9]

[9] SCDOT. 2016. Carolina Crossroads Assessment of Northern Alignment. Memorandum dated December 12, 2016.

Alternative 3 – *TSM/TDM*: TSM included options that improve efficiency and safety through lower cost improvements. Examples of TSM measures included improving signal timing, adding high occupancy vehicle lanes, adding turn lanes, etc. TDM focuses on regional strategies that would reduce travel demand by reducing the number of vehicle trips and vehicle miles traveled on a roadway, or redistributing this demand in space or time to decrease system deficiency.[10] Examples of TDM strategies include encouraging drivers to carpool or ride the bus, and/or encouraging employers to allow non-standard work hours or telecommuting options for employees.

Given the current and future level of service (LOS), as well as the safety concerns throughout the corridor, TSM and TDM improvements could not adequately improve the corridor and meet purpose and need as a stand-alone alternative. In addition to implementing strategies, typical TDM activities would also include providing contract funds to regional agencies to actively promoting ridesharing and the like, and would require a shift in commuter behavior throughout the region. For these reasons, this alternative was eliminated from further consideration. As previously discussed in Section 2.2.2.2, TSM and/or TDM elements were further evaluated for the proposed project. Refer to Section 2.2.2.2 for further detail

Alternative 4 – *Mass Transit*: As evidenced by public desire to include mass transit in the project alternatives, mass transit options are a growing in interest in the Midlands region. In addition to public desire, FHWA also recommends that mass transit alternatives be considered on proposed highway projects in urbanized areas with populations of over 200,000 people. [11] During project scoping, the public expressed an interest in examining mass transit, specifically passenger rail service, as a solution for the proposed Carolina Crossroads project.

The primary transit provider in the region is CMRTA, known locally as 'The COMET', providing fixed route bus service in Richland County and portions of Lexington County. CMRTA routes do not travel directly within the I-20/26/126 corridor, but they do parallel and/or cross it via major arterials such Broad River Road, Piney Grove Road and others.

CMRTA is currently developing a plan for a more connected and accessible transit system; including development of high frequency service along high capacity corridors and limited stop express routes, as well as restructuring of service to lower density routes such as neighborhoods. Park-and-ride express routes are also being considered which would utilize the region's interstate highway network to service major employment sites and events. An (I-26) Express route connecting Newberry and Columbia is a park-and-ride express route that will be evaluated by CMRTA.

In addition to service provided by CMRTA, SCDOT has supported transit service in the past through sponsorship of the SmartRide express bus service, and specifically the Newberry Express that is operated by the Newberry Council on Aging. The Newberry Express began in 2009, providing express service during peak hours between Newberry and downtown. The Newberry Express was well received and demonstrated a desire for an alternative transportation option in the corridor; however, after approximately eight years the route was

[10] SCDOT. 2018. Carolina Crossroads Congestion Management Process Technical Memorandum.
[11] FHWA. Technical Advisory 6640.8A.

discontinued in fall 2017. Though SCDOT's funding support remained, low ridership created an overall financial shortfall.

Another transit technology that was considered for Alternative 4 was commuter rail. Approximately 133,600 vehicles travel through the Carolina Crossroads corridor each day and based on origin-destination traffic data gathered via Bluetooth technology, approximately 40 percent of these vehicles are traveling through Columbia, approximately 35 percent are traveling into Columbia and the approximately 25 percent remaining were traveling out of Columbia. As of 2006, best-case scenario commuter rail ridership projections are estimated at between 1,200 and 1,500 boardings daily.[12] Compared to the number of vehicles that travel the Carolina Crossroads corridor each day, elimination of 1,500 vehicles would offer a reduction of less than 2 percent.[13] Therefore, implementation of mass transit would not be able to sufficiently reduce congestion or improve mobility within the project corridor and not meet the purpose and need of the project if implemented as a stand-alone alternative. Additionally, the addition of mass transit would not enhance safety, nor improve freight mobility.

For these reasons, the mass transit alternative was not advanced as a stand-alone preliminary alternative for the proposed Carolina Crossroads project. However, the CMCOG and COATS' inclusion of mass transit in the region's LRTP and other plans and studies ensure commitments to it in the future.[14] Additionally, elements of mass transit, such as addition of park-and-ride facilities were evaluated for inclusion in the Refined RPA (refer to Section 2.2.2.2).

Alternative 5 – *No-Build*: Under the provisions of NEPA, the effects of not implementing the proposed action must also be considered. The No-Build alternative provides a baseline for comparing potential environmental impacts with the other reasonable alternatives. Analysis of the No-Build alternative must discuss the existing conditions as well as what would be reasonably expected to occur in the foreseeable future if the proposed action was not constructed. The existing condition of the system is discussed in Chapter 1. For example, the No-Build alternative must include transportation projects that can reasonably be expected to be in place for the design year. Reasonably foreseeable projects typically come from the fiscally constrained list of projects in the Statewide Transportation Improvement Program (STIP) and in the local metropolitan planning organization (in this case CMCOG) long-range plan, as well as other programming documents from the municipalities in which the project occurs. Therefore, though the No-Build alternative would not meet the purpose and need of the project, it will be carried forward as it provides the foundation for comparing the benefits and environmental impacts of the other alternatives.

[12] CMCOG. 2006. Central Midlands *Commuter Rail Feasibility Study*.

[13] SCDOT. 2018. Carolina Crossroads *Congestion Management Process Technical Memorandum*.

[14] Central Midlands Council of Governments (CMCOG). 2015. *Columbia Area Transportation Study (COATS) – Moving the Midlands 2040 Long Range Transportation Plan*;CMCOG. 2015. *Regional Transit Needs Assessment and Feasibility Study*;CMCOG. 2010. *Broad River Road Corridor and Community Master Plan*;CMCOG. 2006. *Central Midlands Commuter Rail Feasibility Study*;CMCOG. 2000. *Central Midlands Regional Rail Study*;Central Midlands Regional Transit Authority (CMRTA). 2010. *Park-and-Ride Study*;SCDOT. 2014. *South Carolina Multimodal Transportation Plan – Regional Transit & Coordination Plan*.

Alternative 6 – *Widen Broad River Road*: Broad River Road (US 76/176) is a major arterial that largely runs parallel to I-26 on the eastern side. Many travelers utilize Broad River Road for local travel, as well as in lieu of I-26, particularly during times of heavy congestion. During the scoping process, the widening of Broad River Road was suggested as a potential alternative for improving the conditions on I-26.

The existing Broad River Road is a five-lane undivided roadway from the existing I-20 interchange north to the intersection with Lake Murray Boulevard. From Lake Murray Boulevard to Lykes Lane, existing Broad River Road is a two-lane undivided roadway. From Lykes Lane to approximately 0.4 mile east of the existing I-26 interchange, Broad River Road is a three-lane undivided roadway. Continuing north along existing Broad River Road, a five-lane undivided section exists to approximately 0.3 mile west of the existing I-26 interchange where Broad River Road transition to a two-lane undivided roadway section to Woodrow Street.

This alternative proposed to widen Broad River to a five-lane section from the I-26/Broad River Road interchange to Lake Murray Boulevard and to a seven-lane section from Lake Murray Boulevard to Bush River Road. For the purposes of preliminary evaluation, it was assumed that all widening would be constructed based on a best-fit widening of the existing alignment of Broad River Road and all intersections along Broad River Road would be reconstructed to accommodate the additional lanes. This scenario was then inputted into the SCSWM to assess the affect that these changes would have on traffic. The outputs suggest that the widening of Broad River Road is likely to divert some traffic from the I-26 corridor. The total amount of traffic eliminated from I-26 varies by segment, but ranges between 2 to 7 percent along the entirety of the I-26 corridor. Ultimately, the amount of traffic that would be eliminated from the proposed Carolina Crossroads project through widening of Broad River Road is not enough to reduce congestion and improve mobility within the corridor and thereby would not satisfy the purpose and need of the project. It also would not result in improved safety, improved freight mobility, or improved system connections. Therefore, the widening of Broad River Road was eliminated from further consideration. It is also worth noting that widening Broad River Road would not be consistent with the Broad River Road Corridor and Community Master Plan (CMCOG, 2010).

Alternative 7 – *Widen St. Andrews Road*: St. Andrews Road (S-32-36) is a major arterial that largely runs parallel to I-26 to the west of it. Many travelers utilize St. Andrews Road for local travel, as well as in lieu of I-26, particularly during times of heavy congestion. During the scoping process, the widening of St. Andrews Road was suggested as a potential alternative for improving the conditions on I-26.

The existing St. Andrews Road is a five-lane undivided roadway from Broad River Road to the existing I-26 interchange. From the existing I-26 interchange to approximately 0.4 mile west of, St. Andrews Road is a seven-lane undivided roadway. Continuing west along existing St. Andrews Road, a five-lane undivided section exists to Lake Murray Boulevard.

This alternative proposes to construct approximately five miles of one additional through lane in each direction along the existing alignment of St. Andrews Road from Broad River Road to the intersection with Lake Murray Boulevard. For the purposes of preliminary evaluation, it was assumed that all widening would be constructed based on a best-fit widening of the existing alignment of St. Andrews Road and all intersections along St. Andrews Road would be reconstructed to accommodate the additional lanes. This scenario was then input into

the SCSWM to assess the affect that these changes would have on traffic. The outputs suggest that the widening of St. Andrews Road is likely to divert some traffic from the I-26 corridor. The total amount of traffic eliminated from I-26 varies by segment, but ranges between 1 to 3 percent along the entirety of the I-26 corridor. Ultimately, the amount of traffic that would be eliminated from the proposed Carolina Crossroads project through widening of St. Andrews Road is not enough to reduce congestion and improve mobility within the corridor and thereby would not satisfy the purpose and need of the project. It also would not result in improved safety, improved freight mobility, or improved system connections. Therefore, the widening of St. Andrews Road was eliminated from further consideration. However, it should be noted that the widening of St. Andrews Road may be reviewed and further evaluated under other Lexington County projects/studies. [15]

2.2.4 WHICH ALTERNATIVES WERE CARRIED FORWARD AS REASONABLE ALTERNATIVES?

Alternative 1 – *Existing Corridor Improvements* was the only build alternative that advanced as a preliminary alternative. **Alternative 5** –*No-Build* was also carried forward. The results of the preliminary screening are summarized in the last row of Figure 2-3 and are further detailed in the documented in detail in the *Final Alternatives Development and Screening Report for Carolina Crossroads I-20/26/126 Corridor Improvement Project*.[16]

[15] SCDOT. 2016. Carolina Crossroads Assessment of Arterial Widening of Broad River Road and St. Andrews Road. Memorandum dated November 14, 2016.
[16] SCDOT. 2018. Final Alternatives Development and Screening Report for Carolina Crossroads I-20/26/126 Corridor Improvement Project. Prepared by HDR, STV, and Mead & Hunt.

Range of Alternatives Evaluation Would the Alternative satisfy Purpose & Need?	Metric	ALT 1 I-20/26/126 Existing Corridor Improvements	ALT 2 New Alignment (Northern Alignment)	ALT 3 Transportation System Management/Transportation Demand Management	ALT 4 Mass Transit	ALT 5 No-Build	ALT 6 Widen Broad River Road	ALT 7 Widen St. Andrews Road
Improve Local Mobility	Reduction in conflict points at/near interchange locations	✓	○	○	○	○	○	○
	Ability to improve traffic operations on mainline and local roads	✓	○	✓	○	○	○	○
	Ability to improve connections separate from mainline	✓	○	○	○	○	○	○
Enhance Traffic Operations	Reduce/eliminate geometric deficiencies	✓	○	○	○	○	○	○
Carry Forward to Level 1 Screening?		✓	○	○ *	○ *	✓ **	○	○

* Components of TSM and/or Mass Transit may be carried forward as potential features of single/stand-alone alternatives
** The No-Build Alternative will be carried forward into Level 2 screening and into the EIS to establish the baseline for traffic and environmental conditions by which build alternatives can be compared.

Figure 2-3 Summary of preliminary screening results

2.2.5 WHAT WAS THE 'LEVEL 1 SCREENING' STEP?

The alternatives that advanced to preliminary screening were then evaluated against first-level (Level 1) screening criteria. For analysis purposes, the Level 1 Screening step was broken down into Level 1A Screening and Level 1B Screening described in this section.

2.2.5.1 How were Representative Alternatives developed?

The alternatives within the Range of Alternatives that met the purpose and need were advanced as Preliminary Alternatives to Level 1A Screening. **Alternative 1** –*Existing Corridor Improvements*, was the only build alternative that advanced as a preliminary alternative. **Alternative 5** - *No-Build*, was also carried forward.

Since the majority of the traffic congestion and safety concerns occur at or near interchange locations along the I-20/26/126 corridor, the project team opted to initially focus on the interchange locations by developing potential improvement options for each of the 12 interchanges located in the corridor. The project team selected potential interchange alternatives from common interchange types. These include the following, or variations of the following:

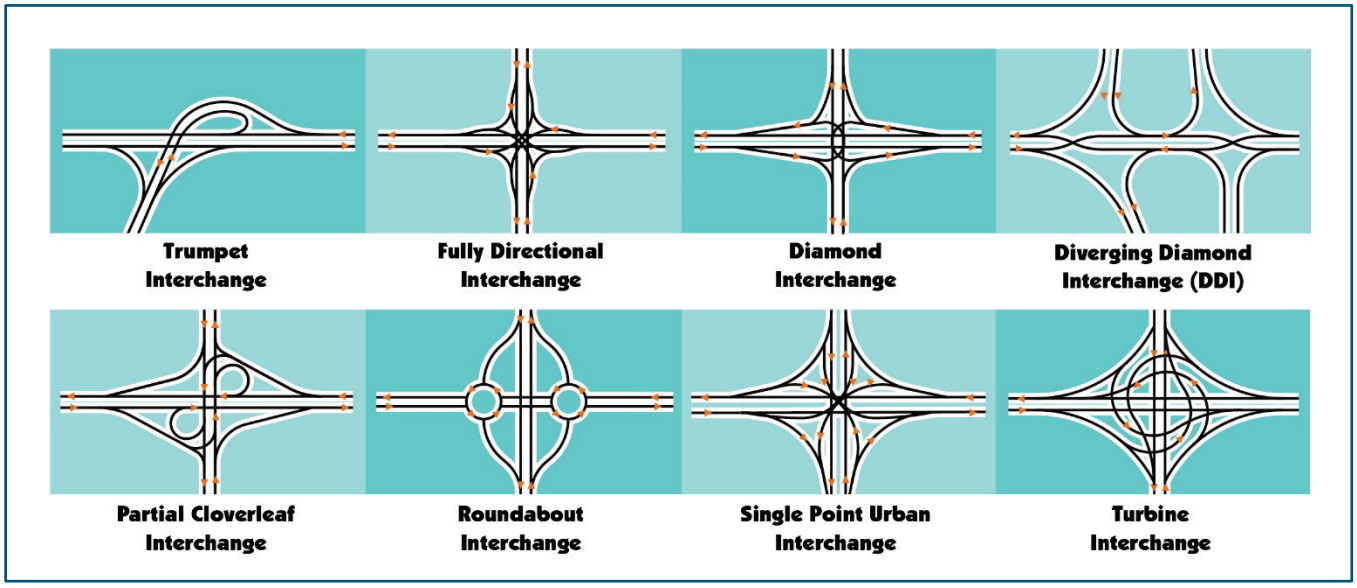


Figure 2-4 Preliminary interchange alternative designs

The process to develop the Representative Alternatives list, described in detail in the *Alternatives Development and Screening Report* (Appendix C) and the *Alternatives Traffic Analysis Technical Memo* (Appendix D), began with the establishment of a range of potential interchange types for each existing interchange on the I-26, I-20, and I-126 mainlines. A total of 49 "accessory options" (AOs) were established for screening as part of Level 1A. Through a pros/cons/fatal flaw exercise, 5 were added (to account for no-action options and to accommodate the potential elimination of the I-126/Bush River Road interchange). The AO options added under this process were named AO50-AO54 and are included with the other 49 options detailed in Table 1 of the *Alternatives Development and Screening Report* (Appendix C).

2. Development of Alternatives

After identification of the interchange improvement options (AO1-AO49) and mainline interstate (I-26) alternatives, the project team began to closely evaluate the merits of each option with the goal of developing holistic, representative alternatives that encompass the entirety of the project corridor. The mainline interstate (I-26) alternatives were inclusive of traffic capacity improvements and there were four alternatives: Mainline Six (6) Lanes with Concrete Median (ML6cm), Mainline Eight (8) Lanes with Concrete Median (ML8cm), Mainline Six (6) Lanes with Collector/Distributor Lanes (ML6cd) and Mainline Eight (8) Lanes with Collector/Distributor Lanes (ML8cd).

The first step in this development of holistic, representative alternatives was for the project team to compare all interchange accessory options (AOs) against the primary purpose and need (reduce congestion and improve mobility), to evaluate their merits, and to note any fatal flaws.

To evaluate whether each alternative addressed the purpose and need, Level 1A Screening used five screening criteria. Namely, would the interchange option (AO):

1) Reduce the number of conflict points currently being experienced by users of the mainline and/or the crossing roadway?
2) Improve the operations on the mainline?
3) Improve the connections from the mainline?
4) Reduce geometric deficiencies currently on the mainline and/or crossing roadway?
5) Result in the interchange being under, at, or over capacity in the design year?

One major purpose of the *Alternatives Traffic Analysis Technical Memo* was to establish the preliminary design year capacity conditions for each interchange option. Given the varying range of accessory options, operations were evaluated using several means. When feasible, the range of interchange types at a given location were ranked using the FHWA tool known as Capacity Analysis for Planning of Junctions (CAP-X). CAP-X is an Excel-based spreadsheet that provides a planning level assessment of conventional and innovative interchange configurations. In some cases, an AO was too complex to be evaluated by CAP-X; in those cases, the AO was excluded from the ranking. In addition to this ranking process, Synchro and SimTraffic was used to establish planning-level operational metrics using delay and LOS to compare interchange configurations. Given the volume of AOs to evaluate, Synchro interchange templates were used. The use of template files eliminated the need to devote substantial effort to develop multiple, often complex, individual interchange models at each interchange location. SIDRA Intersection 6 was another tool used to evaluate capacity of roundabout configurations. More detail on the individual analysis tools can be found in the *Alternatives Traffic Analysis Technical Memo* (Appendix D).

AOs developed for the interchange-to-interchange system where the three freeways meet were assessed using generalized capacity thresholds for freeway and ramp sections.

To further ascertain the merits of each interchange improvement option, the project team also developed lists of pros and cons for each option. Pros and cons typically included, but were not limited to, the footprint, traffic operations, and public feedback. With this exercise, the project team also noted any fatal flaws which could stem from the answers to the screening criteria and/or the pros/cons discussions. The project team then

considered all of the aforementioned collectively to determine which interchange options would advance for consideration under the holistic, representative alternatives. Through the pros/cons/fatal flaw exercise, 38 interchange options were carried forward, six were added (to account for No-Build options and to accommodate the potential relocation of the I-126/Bush River Road interchange), and 16 were eliminated. This process is documented in Table 1 of the *Alternatives Development and Screening Report*, found in Appendix C.

The elimination of 16 interchange options was the first major decision point in Level 1A screening. With the remaining 38 interchange options, the project team then began to develop holistic, representative alternatives that could encompass all viable interchanges (interchange type) and capacity improvements (mainline interstate (I-26) alternatives). In other words, the project team began to develop entire single alternatives that encompass the entirety of the project corridor, along with potential interchange alternative combinations. Through this effort, nine holistic, representative alternatives (RAs), along with a tenth "No-Build" RA, were developed consisting of several interchange alternative options (AOs), and they are summarized in Table 2.1 as follows.

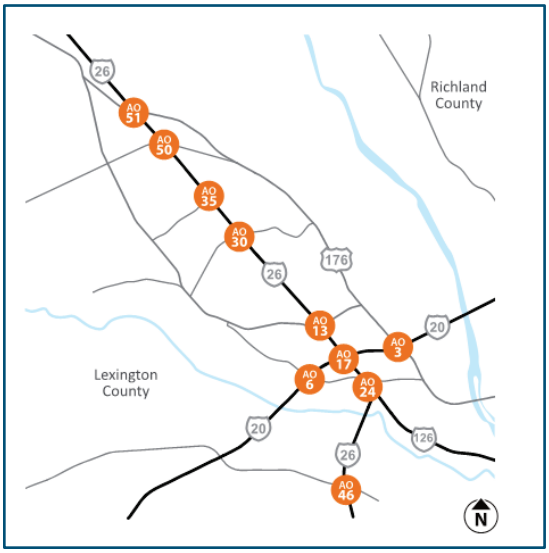
Table 2.1 Holistic Representative Alternatives

Holistic, representative alternative	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9
I-20/26/126 System/system	AO17 Turbine	AO18 Directional w/ interior rights	A021 Turbine braided	AO22 Semi-dir w/ 2 loops	AO20 Directional interchange	AO19 Directional w/ loop & ramp	AO27 E-W connector	AO28 E-W connector Bush River	AO29 Remove southern connector
I-20/Broad	AO3	AO5	AO5	AO3	AO3	AO5	AO5	AO3	AO3
I-20/Bush	AO6	AO10	AO6	AO7	AO8	AO7	AO8	A28	A10
I-26/Bush	AO24	AO24	AO26	AO25	AO24	AO24	AO24	AO24	AO29
I-26/378	AO46	AO47	AO46	AO46	AO46	AO47	AO46	AO46	AO46
I-26/St. Andrews	AO13	AO14	AO16	AO15	AO13	AO14	AO13	AO13	AO15
I-26/Piney Grove	AO30	AO31	AO32	AO32	AO30	AO31	AO30	AO31	AO32
I-26/Harbison	AO35	AO37	AO49	AO35	AO35	AO37	AO49	AO35	AO49
I-26/Lake Murray	AO50	AO42	AO50	AO50	AO50	AO42	AO50	AO50	AO50
I-26/Broad	AO51	AO45	AO43	AO51	AO51	AO43	AO51	AO51	AO51
East-West Connector	NA	NA	NA	NA	NA	NA	AO27	AO28	AO29

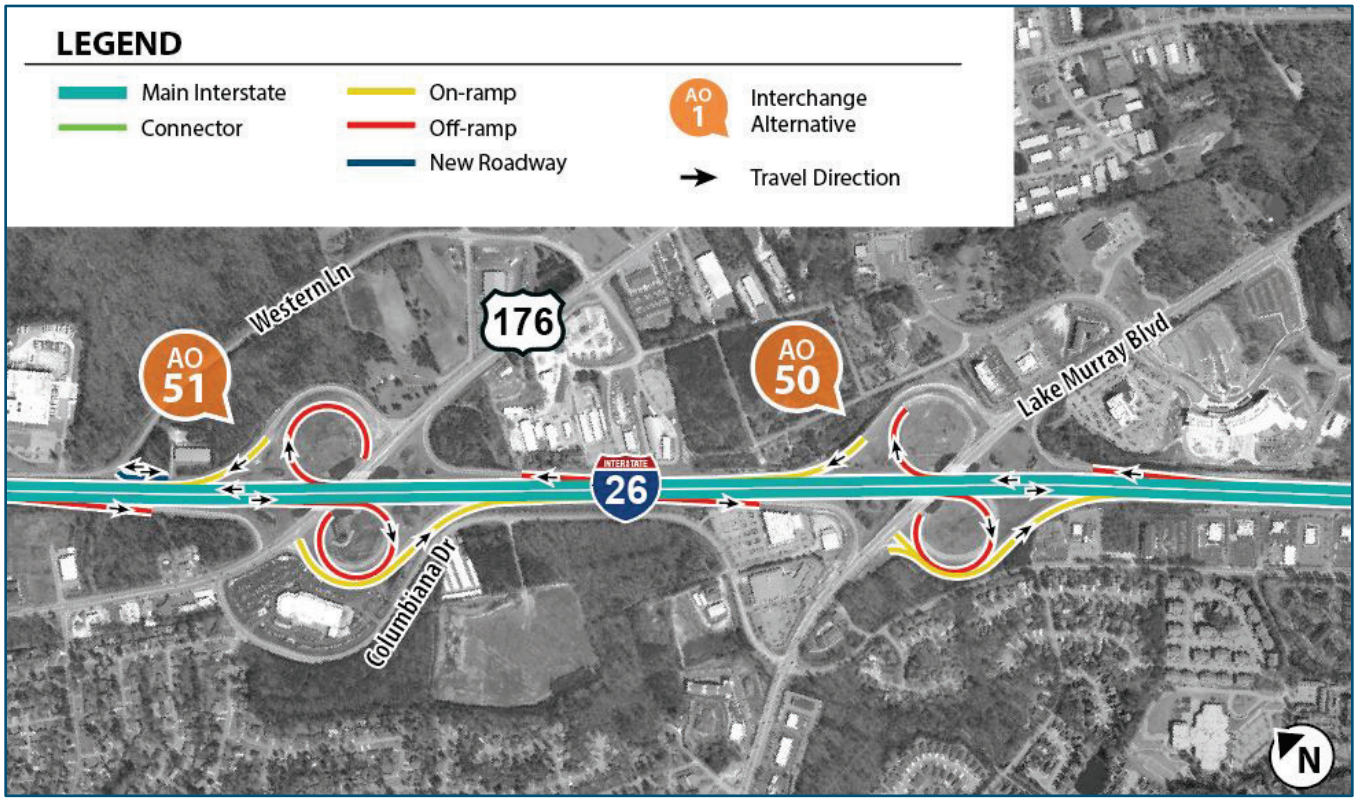
The following paragraphs describe the key features and AOs of RA1 through RA9. Additionally, RA1 through RA9, within the project study area, are displayed in graphics within the following Representative Alternatives (RA1 through RA9). The "No-Build" RA is known as RA10.

2. Development of Alternatives

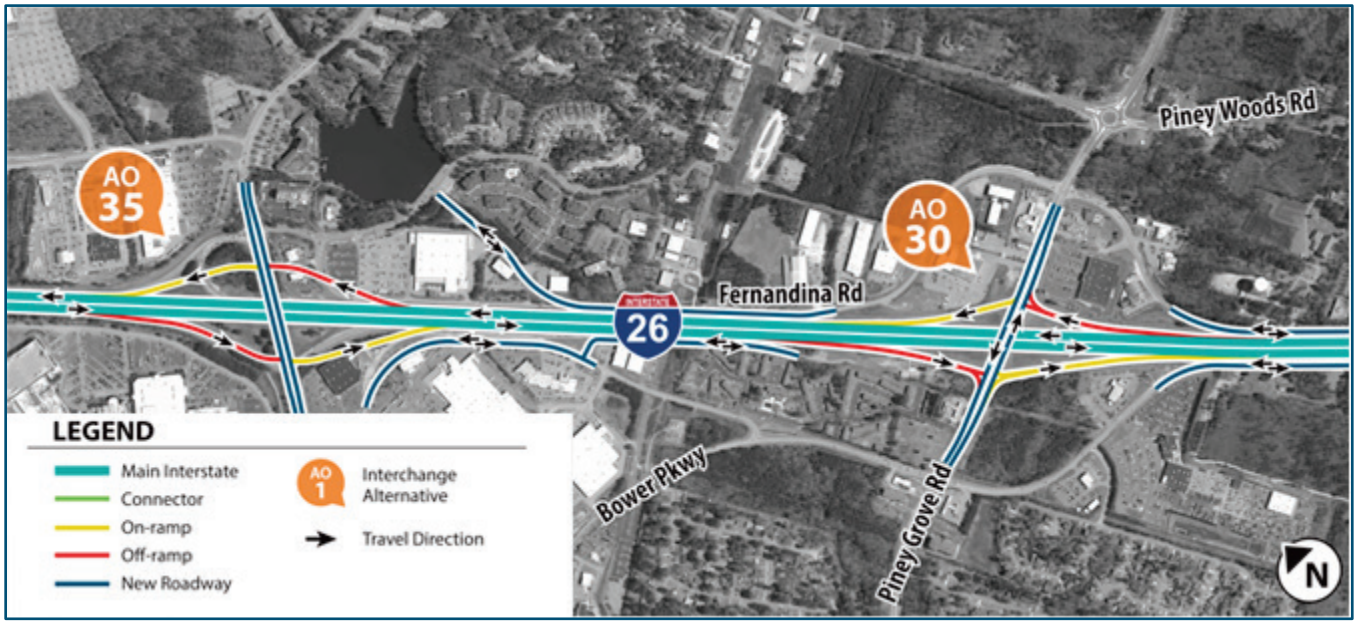
Representative Alternative 1 (RA1) - Turbine:



- Proposed turbine interchange at the I-26 and I-20 junction, which eliminates all loop ramps in the interchange.
- Widening I-26 with one additional lane in each direction from US 176/Broad River Road to I-126.
- New collector-distributor lanes.
- Relocation of the existing interchanges at I-26 and Bush River Road to eliminate traffic conflict points and weaving maneuvers between Bush River Road and the I-20/I-26 interchange.
- Reconfiguration of Colonial Life Boulevard interchange to a full interchange to provide access to Bush River Road from direction of I-126.
- Interchange improvements at each interchange from Harbison Boulevard to I-126 on I-26; from Bush River Road to Broad River Road on I-20; and from I-26 to Colonial Life Boulevard on I-126.
- Along I-26 south of I-126, AO 46 would significantly lengthen the I-26 eastbound exit ramp, separating the exit ramp from mainline traffic lanes and providing an additional exit lane on I-26 eastbound to US 378 to provide additional queuing storage (dual lane exit).

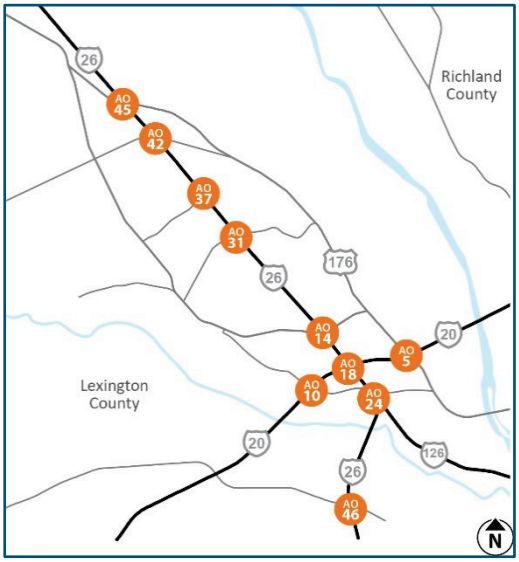


2. Development of Alternatives

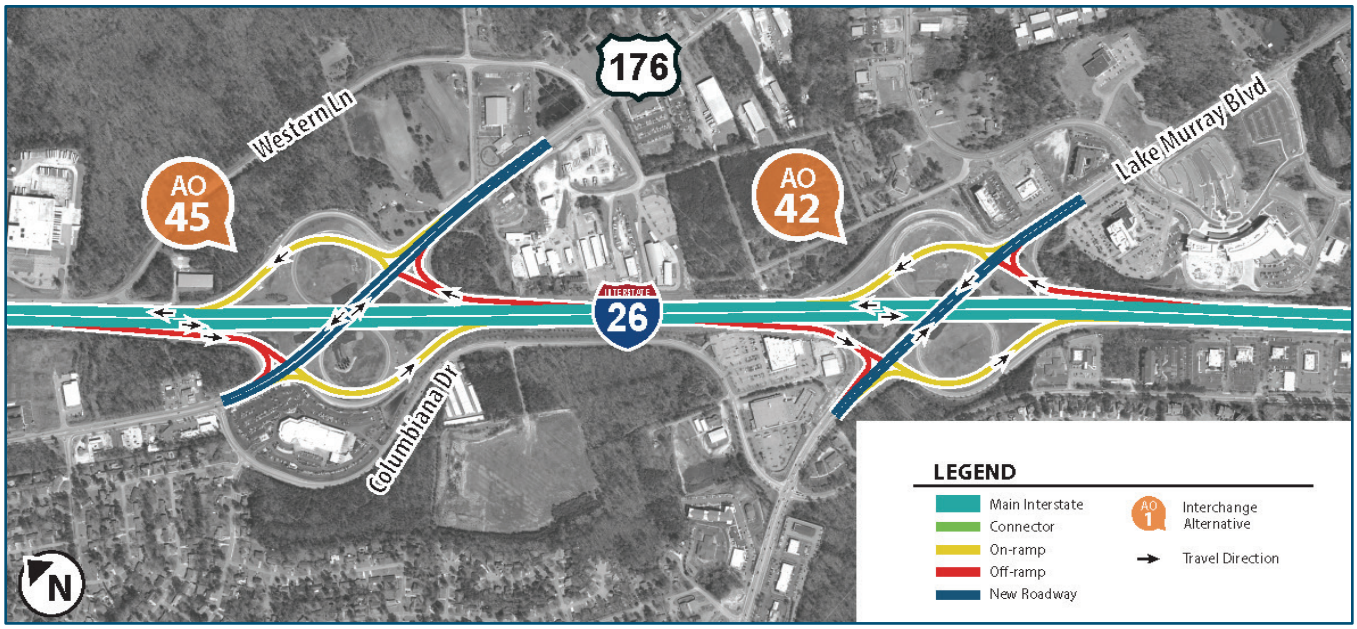


2. Development of Alternatives

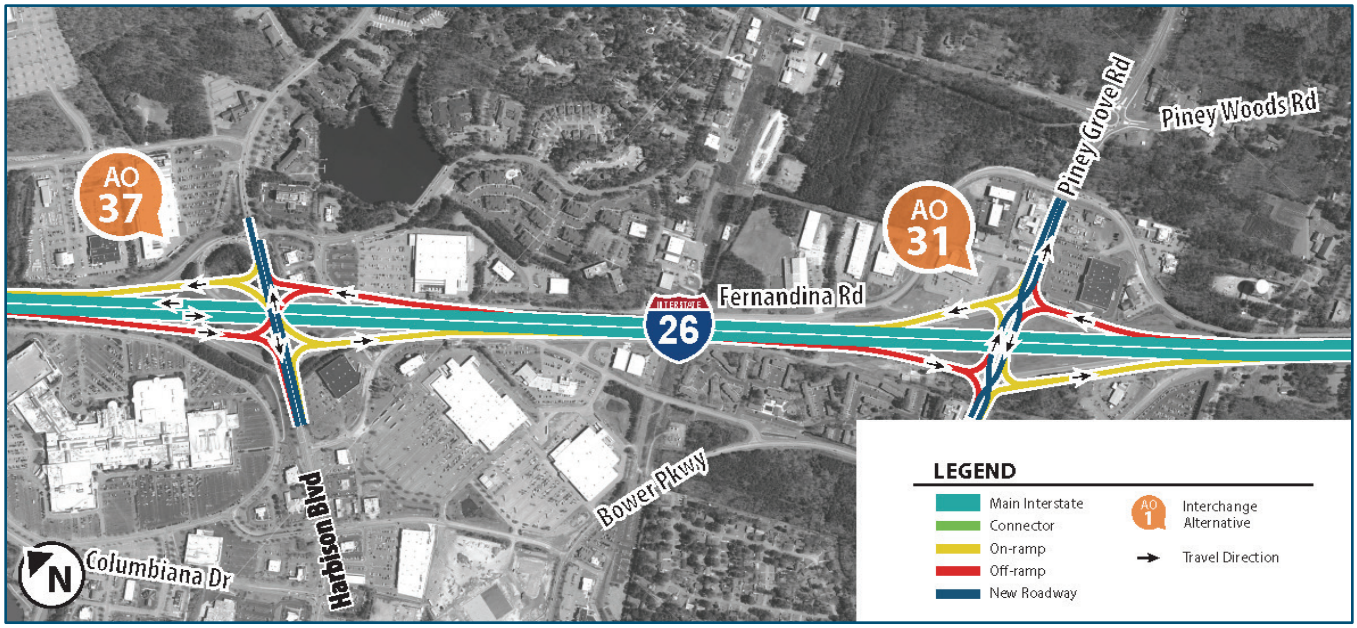
Representative Alternative 2 (RA2) – Directional with Interior Rights:



- Proposed directional interchange with interior rights at the I-26 and I-20 junction, which eliminates all loop ramps in the interchange.
- Widening of I-26 with one additional lane in each direction from US 176/Broad River Road to US 378.
- New collector-distributor lanes.
- Proposed new local roadway connections between I-126 and US 176/Bush River Road.
- Interchange improvements at each interchange from: Harbison Boulevard to I-126 on I-26; from Bush River Road to Broad River Road on I-20; and from I-26 to Colonial Life Boulevard on I-126.
- Proposed new local roadway connections between I-126 and US 176/Bush River Road.
- Relocation of the existing interchanges at I-26 and Bush River Road to eliminate traffic conflict points and weaving maneuvers between Bush River Road and the I-20/I-26 interchange.

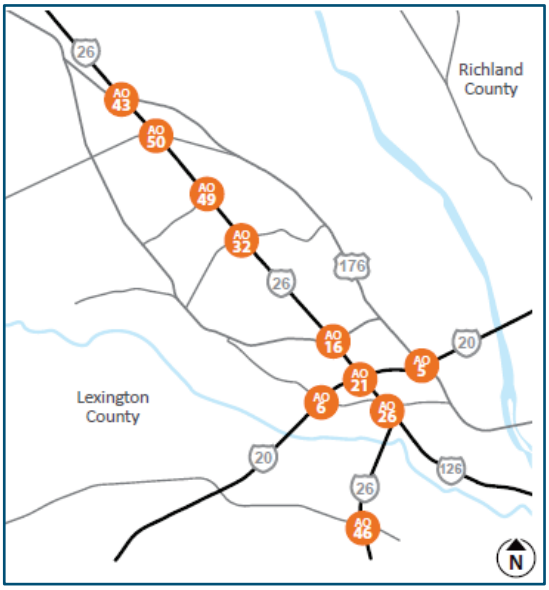


2. Development of Alternatives

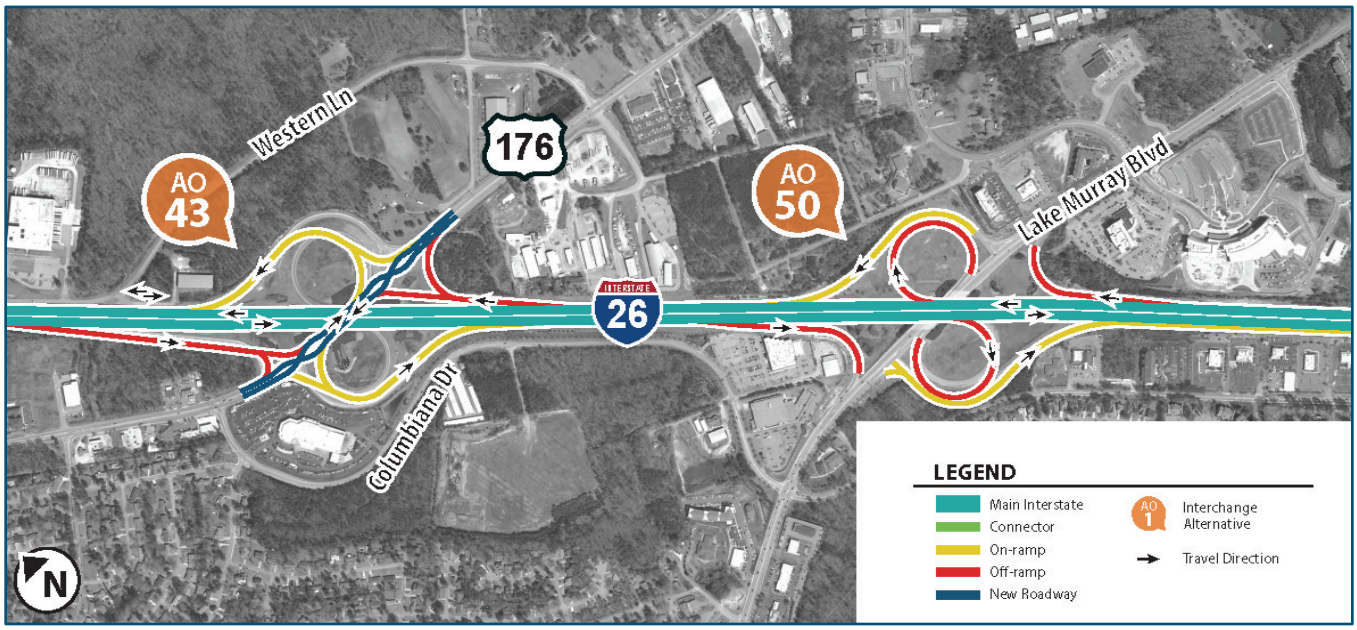


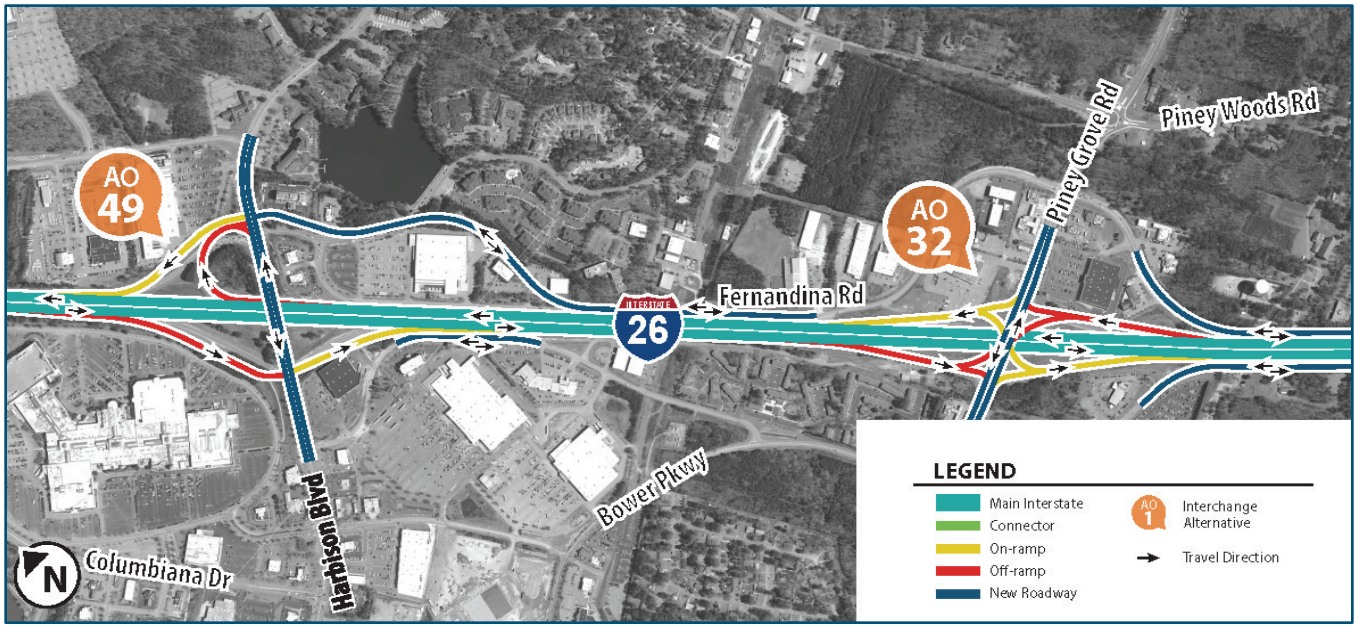
2. Development of Alternatives

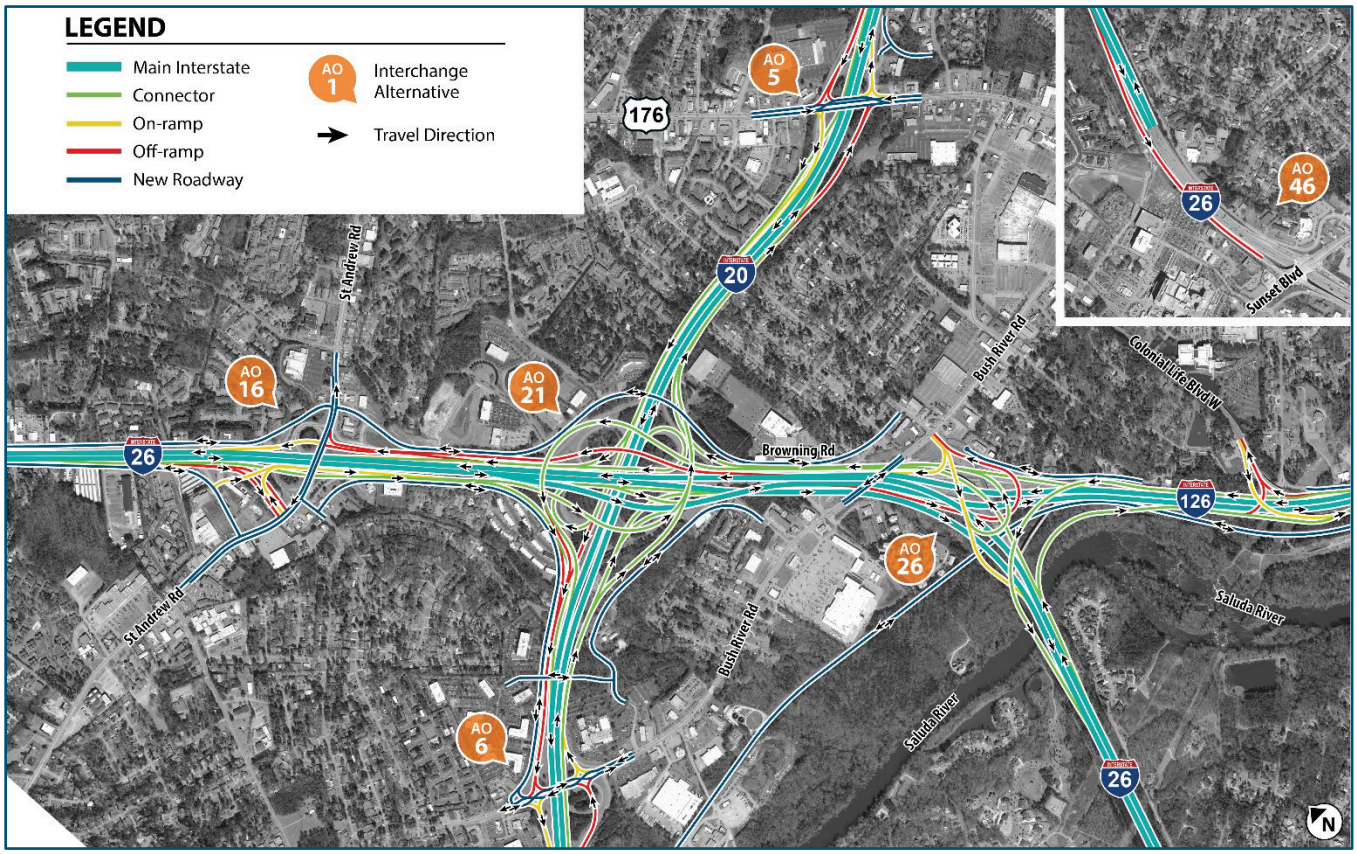
Representative Alternative 3 (RA3) – Turbine Braided:



- Widening of I-26 with one additional lane in each direction from US 176/Broad River Road to US 378.
- New collector-distributor lanes.
- Interchange improvements at each interchange from: Harbison Boulevard to I-126 on I-26; from Bush River Road to Broad River Road on I-20; and from I-26 to Colonial Life Boulevard on I-126.
- Proposed turbine interchange at the I-26 and I-20 junction along with braided ramps that cross over each other through the middle of the proposed turbine interchange.
- Re-design of the existing interchange at I-26 and Bush River Road.
- Convert existing I-26 interchange at Broad River Road to a diverging diamond interchange; and this alternative would replace the existing I-20 and I-26 bridges over the railroad line and on I-126 approaching the Riverbanks Zoo.
- Provide a connector bridge over I-20 between Bush River Road and I-26 to provide local network connectivity over I-20 without direct access to the freeway.
- Along I-26 south of I-126, AO 46 would significantly lengthen the I-26 eastbound exit ramp, separating the exit ramp from mainline traffic lanes and providing an additional exit lane on I-26 eastbound to US 378 to provide additional queuing storage (dual lane exit).

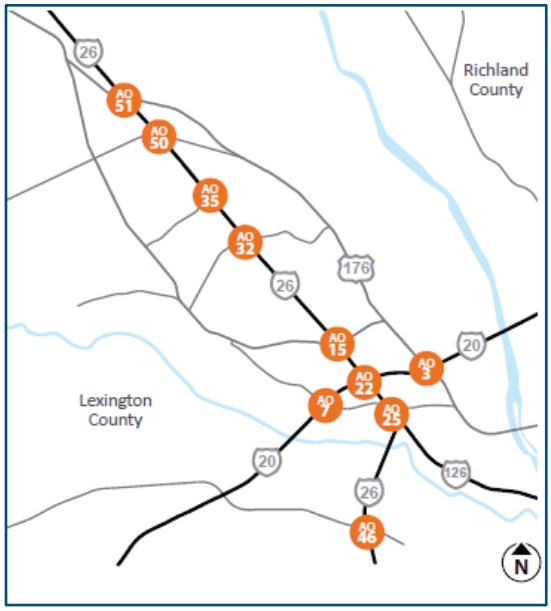



AO 49
AO 32
Piney Grove Rd
Piney Woods Rd
Fernandina Rd
INTERSTATE 26
Bower Pkwy
Harbison Blvd
Columbiana Dr
N
LEGEND
Main Interstate
Connector
On-ramp
Off-ramp
New Roadway
AO 1
Interchange Alternative
Travel Direction

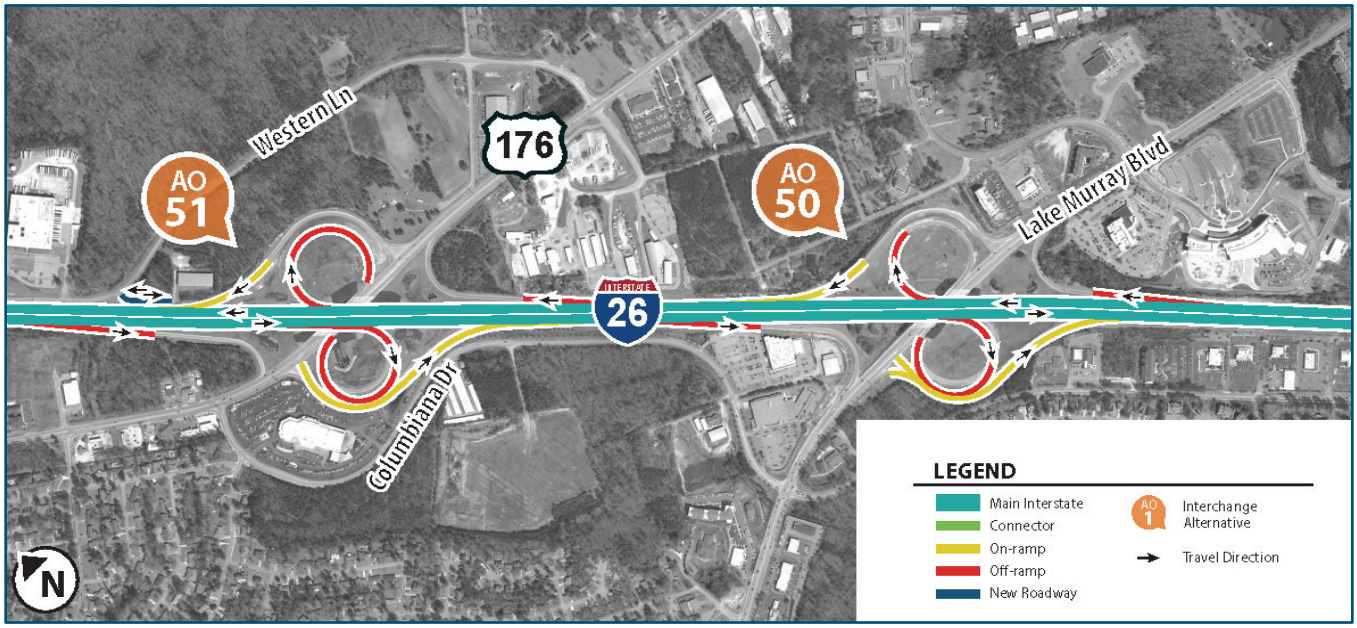

LEGEND
Main Interstate
Connector
On-ramp
Off-ramp
New Roadway
AO 1
Interchange Alternative
Travel Direction
AO 5
176
AO 46
INTERSTATE 26
Sunset Blvd
INTERSTATE 20
Bush River Rd
Colonial Life Blvd W
AO 16
AO 21
St Andrew Rd
INTERSTATE 26
Browning Rd
INTERSTATE 126
AO 26
Saluda River
AO 6
INTERSTATE 26
N

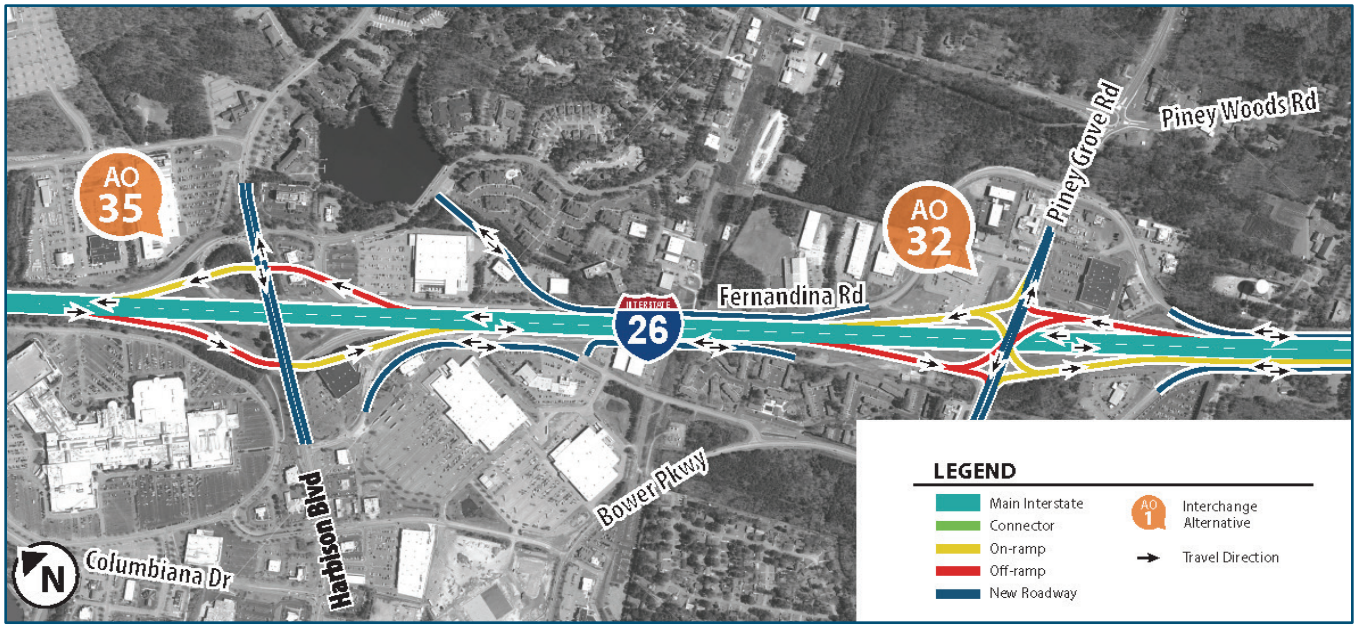
2. Development of Alternatives

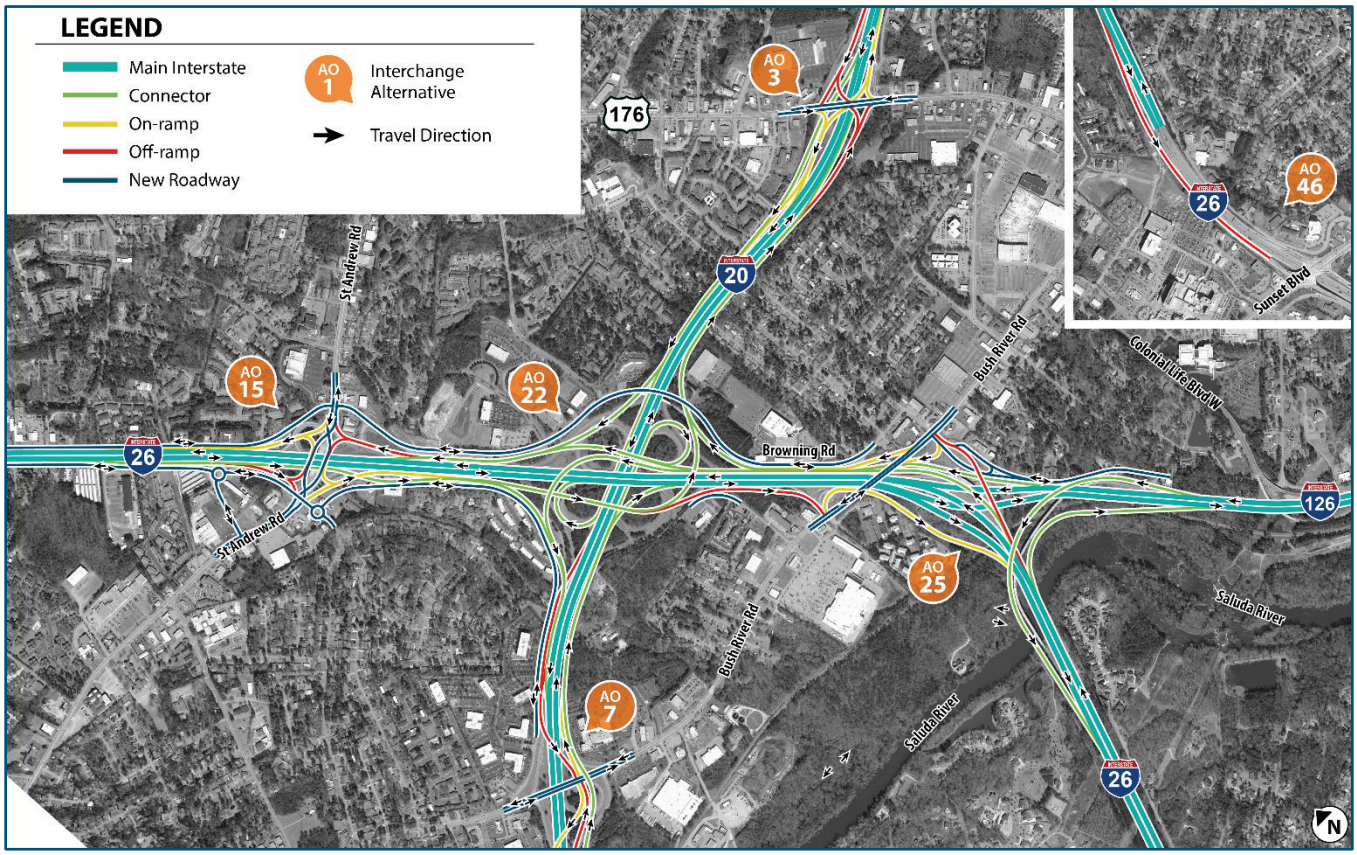
Representative Alternative 4 (RA4) – Semi-Directional with Two Loops:



- Widening of I-26 with one additional lane in each direction from US 176/Broad River Road to US 378, new collector-distributor lanes, new local roadway connections between I-126 and Bush River Road.
- Interchange improvements at each interchange from: Harbison Boulevard to I-126 on I-26; from Bush River Road to Broad River Road on I-20; and from I-26 to Colonial Life Boulevard on I-126.
- Proposed semi-directional interchange with two loop ramps at the I-26 and I-20 junction.
- Modification of the existing interchange at I-26 and Bush River Road - the existing flyover would be re-constructed from I-126 westbound to I-26 eastbound, and access to I-26 from I-20 would be provided by the I-20/Bush River Road interchange to the proposed I-26 and Bush River Road interchange.
- Along I-26 south of I-126, AO 46 would significantly lengthen the I-26 eastbound exit ramp, separating the exit ramp from mainline traffic lanes and providing an additional exit lane on I-26 eastbound to US 378 to provide additional queuing storage (dual lane exit).

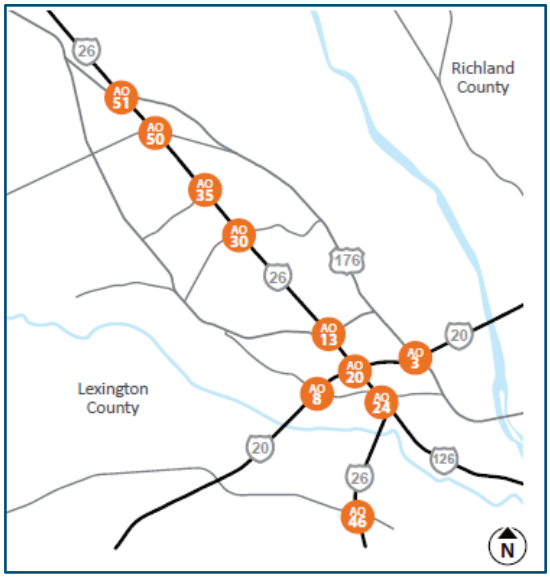



AO 35
AO 32
Piney Grove Rd
Piney Woods Rd
Fernandina Rd
INTERSTATE 26
Bower Pkwy
Harbison Blvd
Columbiana Dr
N
LEGEND
Main Interstate
Connector
On-ramp
Off-ramp
New Roadway
AO 1
Interchange Alternative
Travel Direction

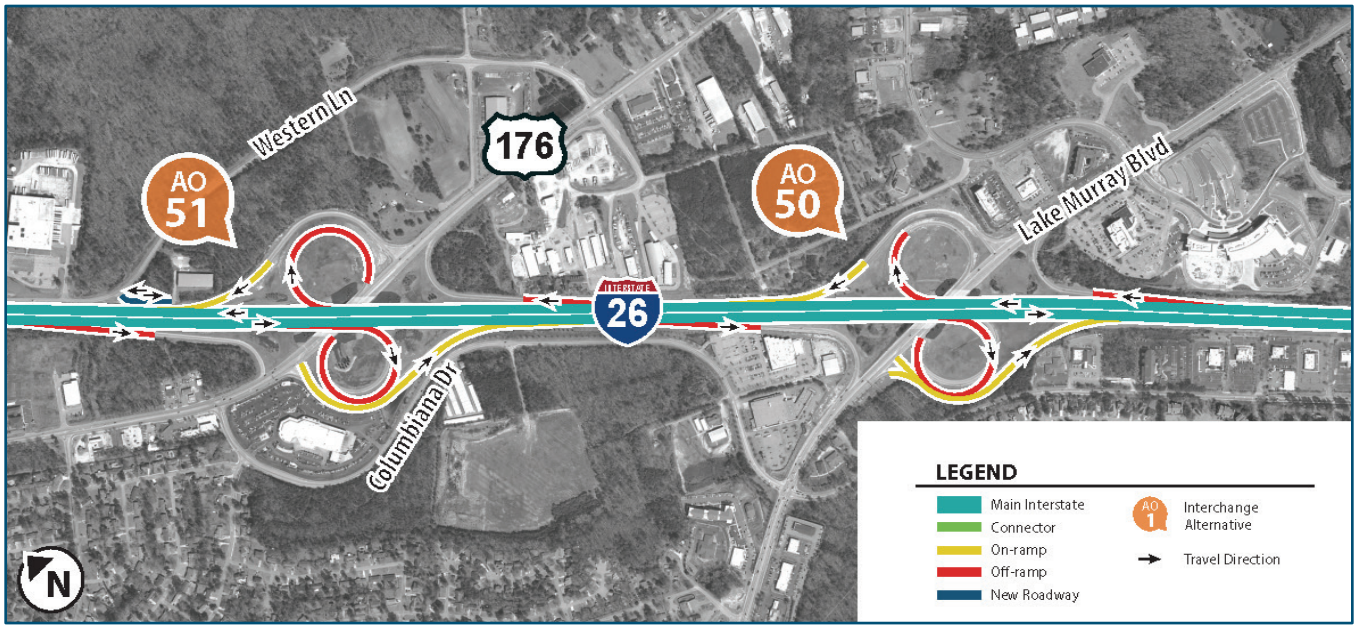

LEGEND
Main Interstate
Connector
On-ramp
Off-ramp
New Roadway
AO 1
Interchange Alternative
Travel Direction
AO 3
176
AO 46
26
Sunset Blvd
20
St Andrew Rd
AO 15
AO 22
Bush River Rd
Colonial Life Blvd W
Browning Rd
126
St Andrew Rd
AO 25
Saluda River
AO 7
Bush River Rd
Saluda River
26
N

2. Development of Alternatives

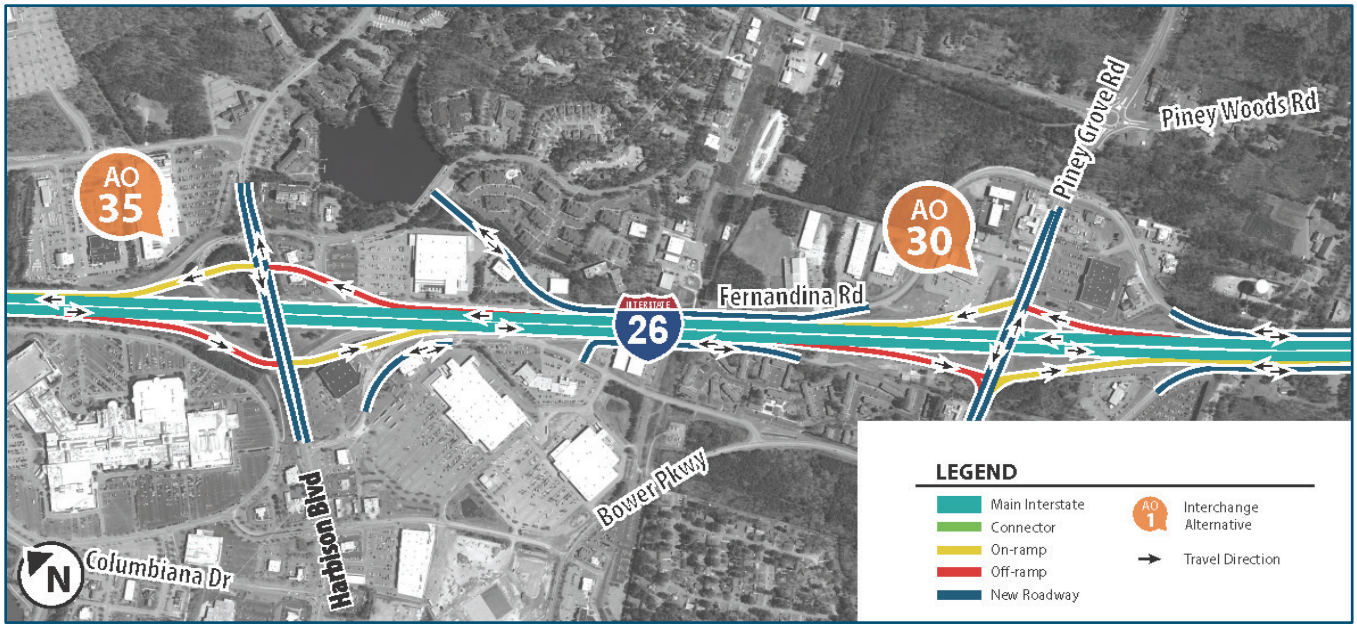
Representative Alternative 5 (RA5) –Directional Interchange:

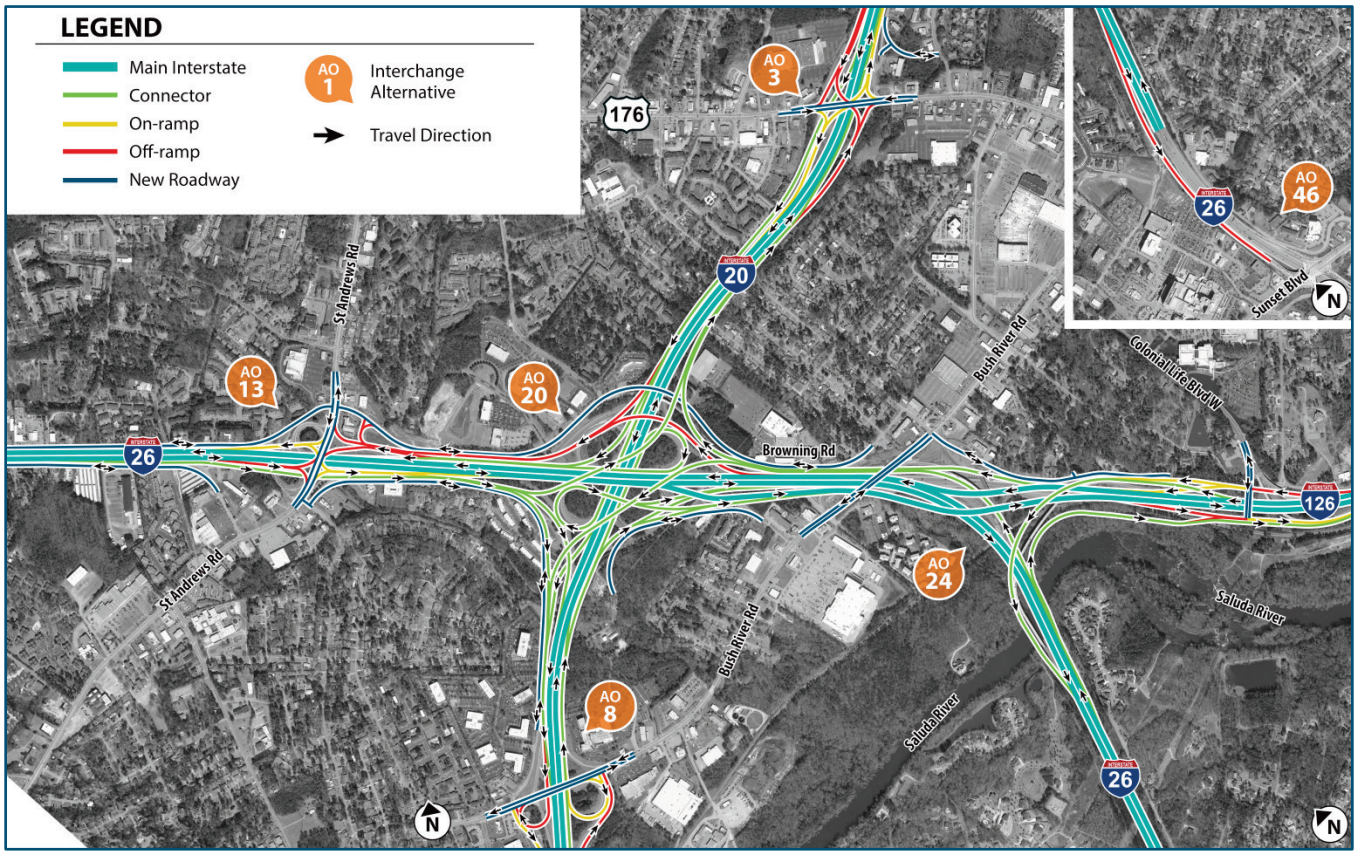


- Widening of I-26 with one additional lane in each direction from US 176/Broad River Road to US 378.
- New collector-distributor lanes.
- Interchange improvements at each interchange from: Harbison Boulevard to I-126 on I-26; from Bush River Road to Broad River Road on I-20; and from I-26 to Colonial Life Boulevard on I-126.
- Proposed directional interchange at the I-26 and I-20 junction, which eliminates two loop ramps and reconfigures the other loop ramps in the interchange. A proposed directional interchange consists of three roadway levels that traverse around a central bridge. The third level is the directional ramps from I-26 to I-20.
- Relocation of the existing interchange at I-26 and Bush River Road and providing access to Bush River Road from a new full-access interchange at Colonial Life Boulevard to eliminate traffic conflict points and weaving maneuvers between Bush River Road and the I-20/I-26 interchange.
- Along I-26 south of I-126, AO 46 would significantly lengthen the I-26 eastbound exit ramp, separating the exit ramp from mainline traffic lanes and providing an additional exit lane on I-26 eastbound to US 378 to provide additional queuing storage (dual lane exit).



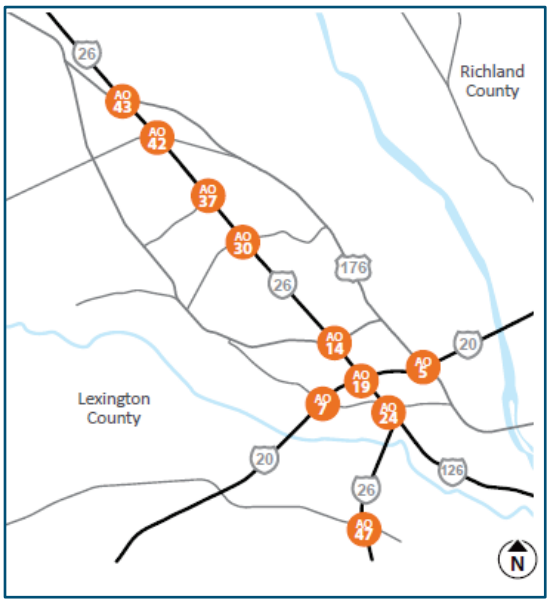
2. Development of Alternatives





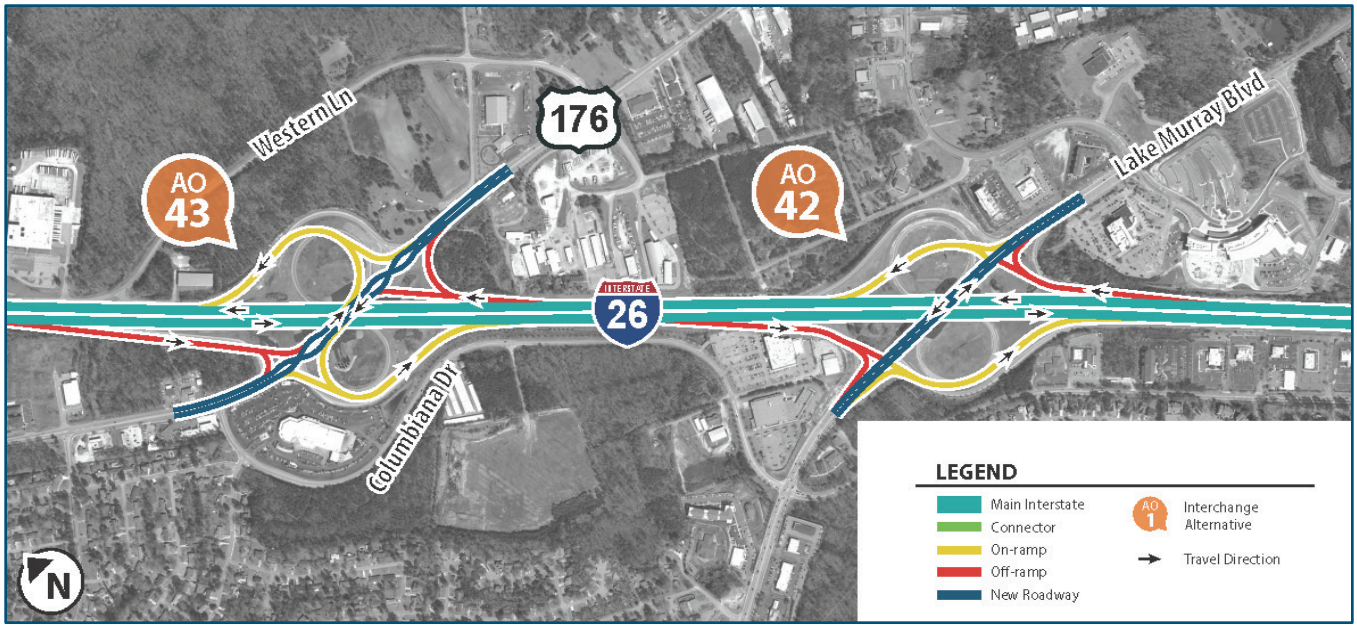
Representative Alternative 6 (RA6) – Directional with Loop & Ramp:

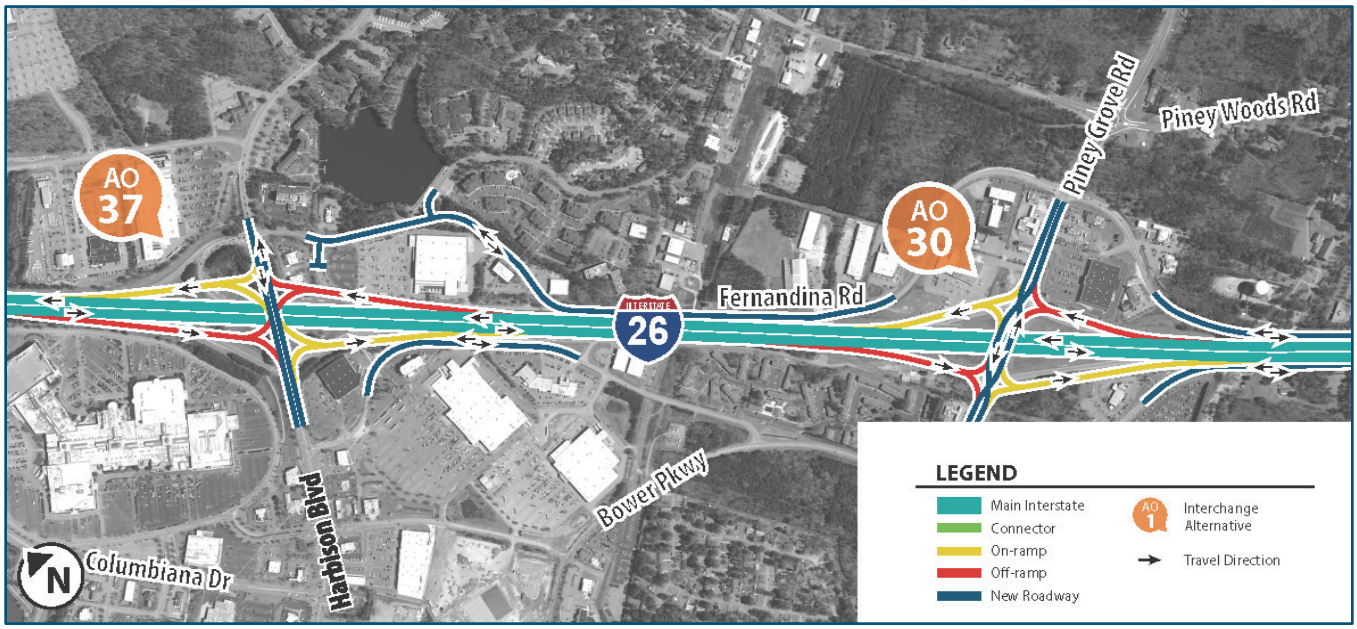
Widening of I-26 with one additional lane in each direction from US 176/Broad River Road to US 378, new collector-distributor lanes, new local roadway connections between I-126 and Bush River Road.



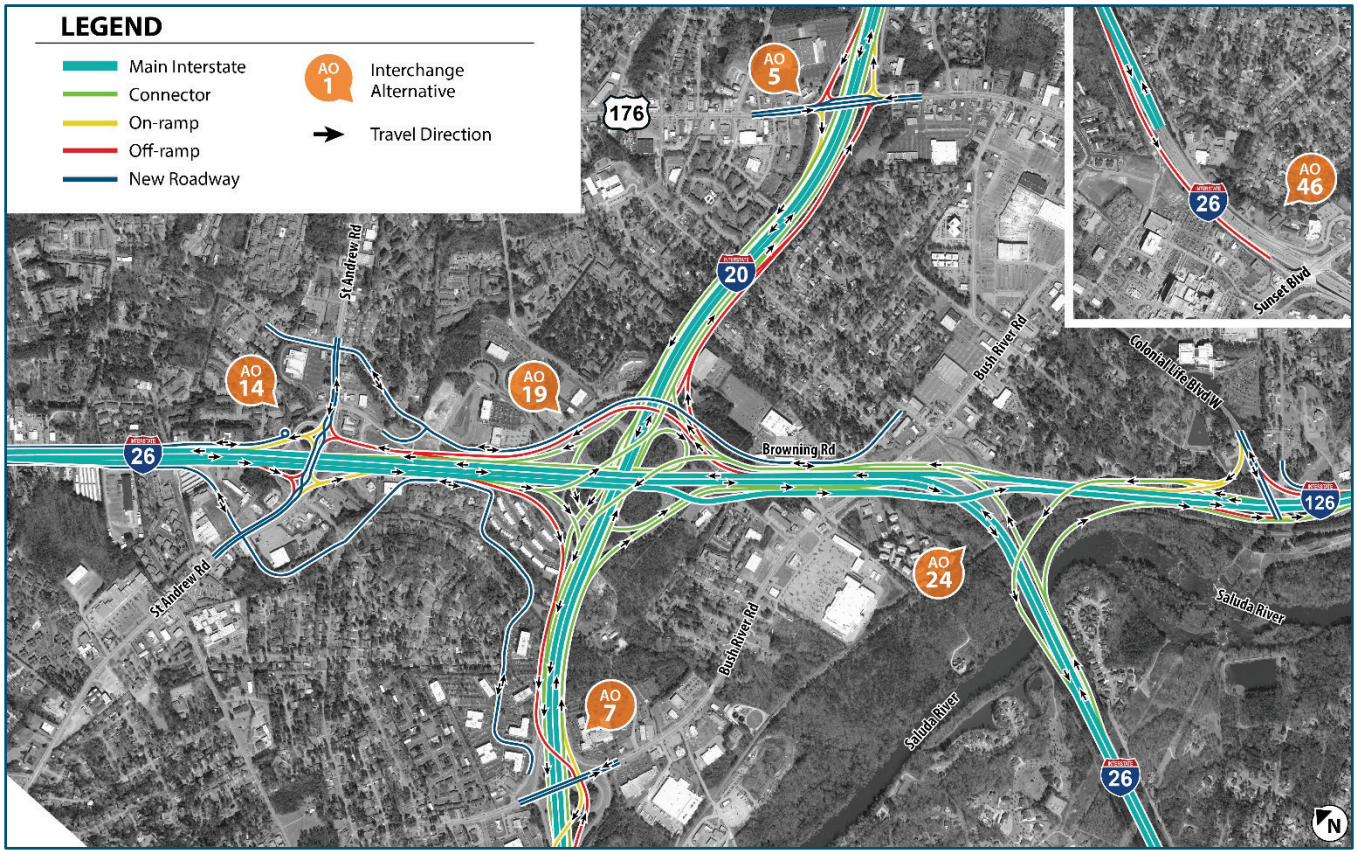
- Interchange improvements from at each interchange from: Harbison Boulevard to I-126 on I-26; west of Bush River Road to Broad River Road on I-20; and from I-26 to Colonial Life Boulevard on I-126. Additionally, a proposed full interchange would be added at I-126 and Colonial Life Boulevard.
- Proposed new local roadway connections would be provided between St. Andrews Road and Bush River Road so that traffic does not need to travel through the interchange of I-26 and I-20.
- Proposed collector-distributor lanes on I-20 eastbound and I-20 westbound west of Bush River Road would require a wider new I-20 bridge over the Saluda River.
- Proposed directional interchange with a loop and ramp from I-20 westbound I-26 eastbound at the I-26 and I-20 junction.
- Relocation of the existing interchange at I-26 and Bush River Road and providing access to Bush River Road from a new full-access interchange at Colonial Life Boulevard to eliminate traffic conflict points and weaving maneuvers between Bush River Road and the I-20/I-26 interchange. The proposed improvements to the existing I-26 and I-126 interchange would require new I-26 bridges over the Saluda River.
- Elimination of the loop ramps for left-turning vehicles and conversion of three existing I-26 interchanges (Broad River Road, Piney Grove Road, and St. Andrews Road) to diverging diamond interchange (DDI) configurations.
- Along I-26 south of I-126, AO 46 would significantly lengthen the I-26 eastbound exit ramp, separating the exit ramp from mainline traffic lanes and providing an additional exit lane on I-26 eastbound to US 378 to provide additional queuing storage (dual lane exit).

2. Development of Alternatives



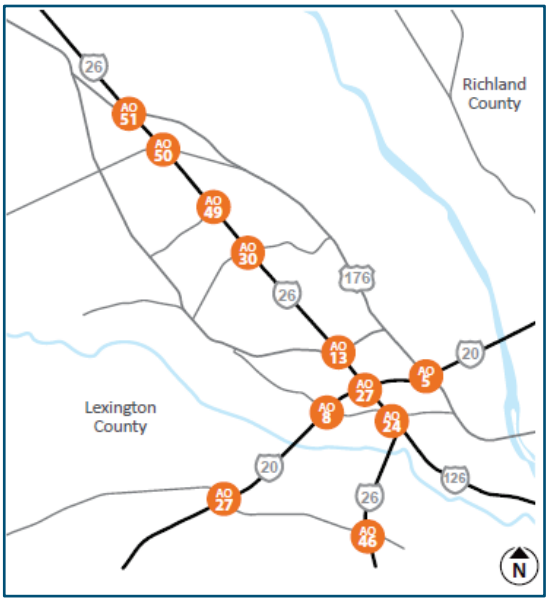


2. Development of Alternatives

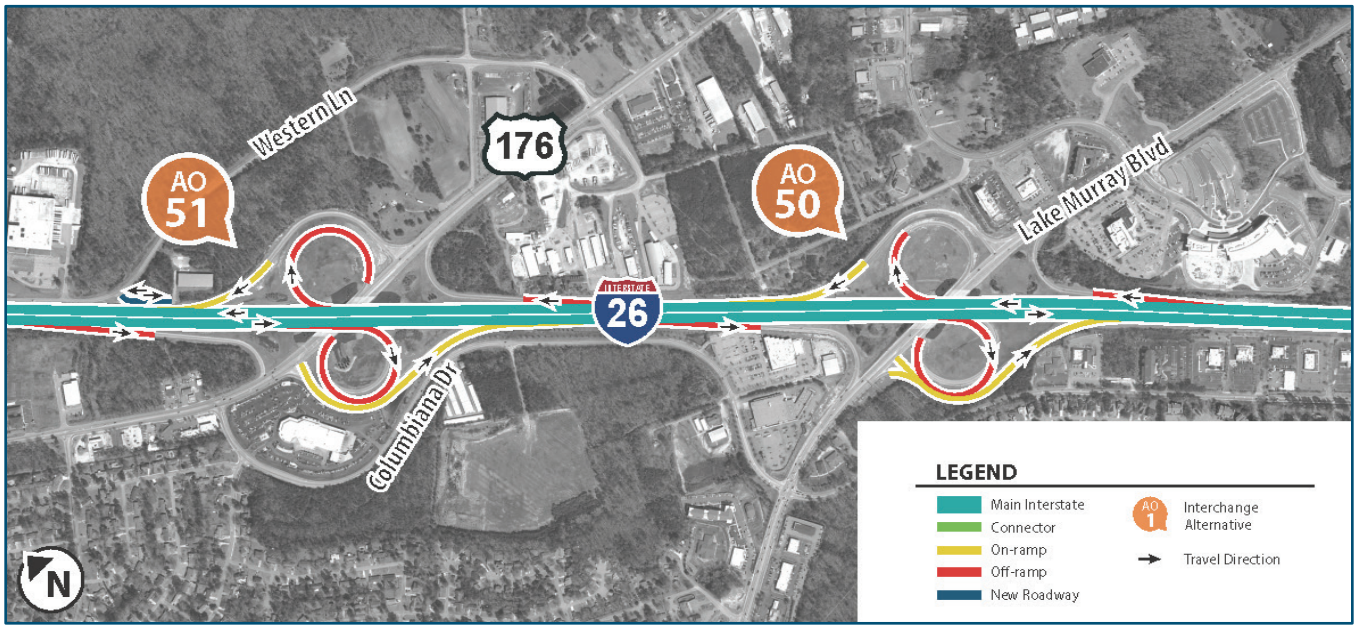


2. Development of Alternatives

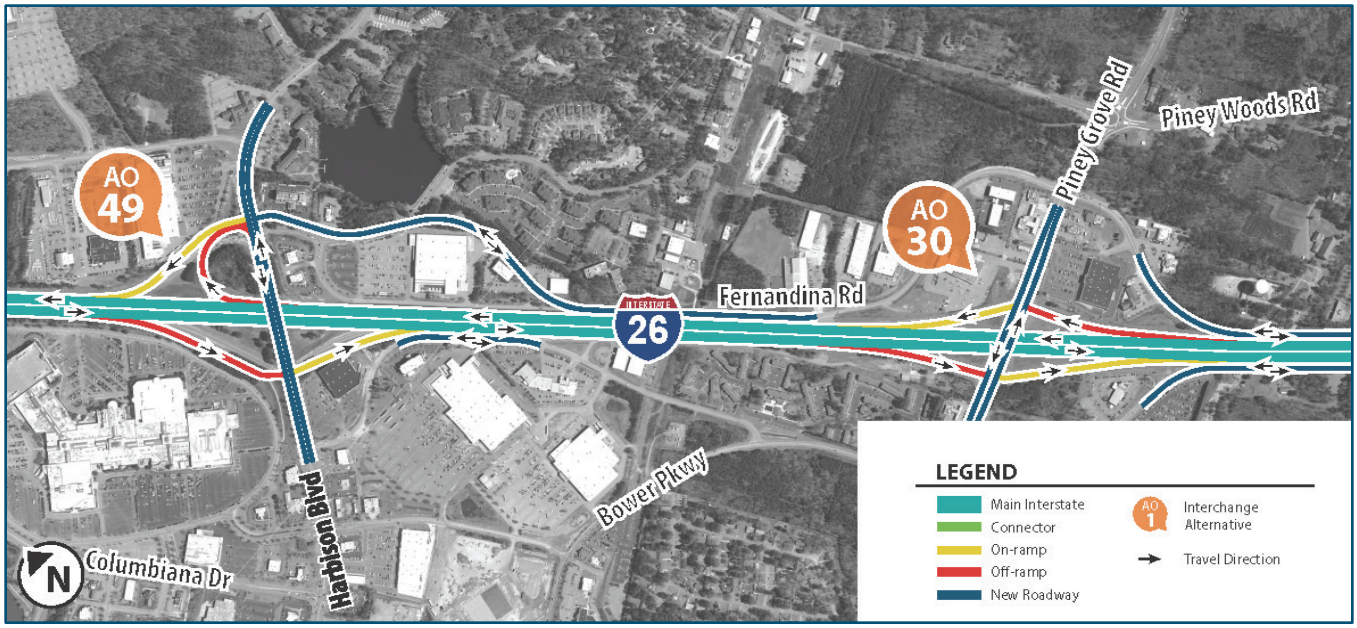
Representative Alternative 7 (RA7) – E-W Connector:

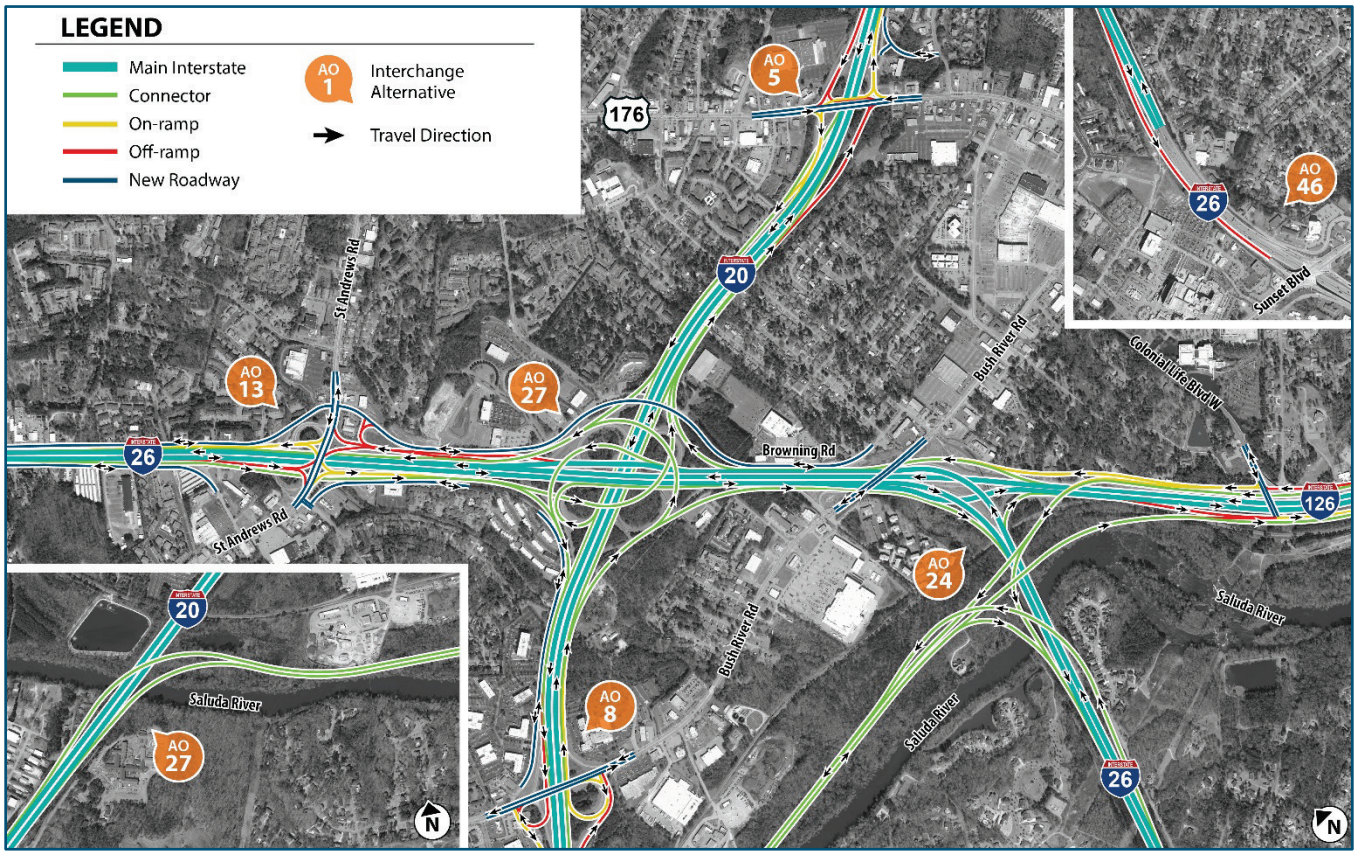


- Widening of I-26 with one additional lane in each direction from US 176/Broad River Road to US 378.
- New collector-distributor lanes, and interchange improvements at each interchange from: Harbison Boulevard to I-126 on I-26, from Bush River Road to Broad River Road on I-20, and from I-26 to Colonial Life Boulevard on I-126.
- Proposed new interchange would be added at I-126 and Colonial Life Boulevard and a new offset interchange via ramp highway would be proposed paralleling the Saluda River.
- Proposed directional interchange with a loop from I-20 westbound to I-26 eastbound at the I-26 and I-20 junction as well as a new location four-lane ramp highway extending from I-20 west of Bush River Road to I-26 just south of the I-26/I-126 interchange.
- Relocation of the existing interchange at I-26 and Bush River Road and providing access to Bush River Road from a new full-access interchange at Colonial Life Boulevard to eliminate traffic conflict points and weaving maneuvers between Bush River Road and the I-20/I-26 interchange. The proposed improvements to the existing I-26 and I-126 interchange would require new I-26 bridges over the Saluda River.
- Along I-26 south of I-126, AO 46 would significantly lengthen the I-26 eastbound exit ramp, separating the exit ramp from mainline traffic lanes and providing an additional exit lane on I-26 eastbound to US 378 to provide additional queuing storage (dual lane exit).



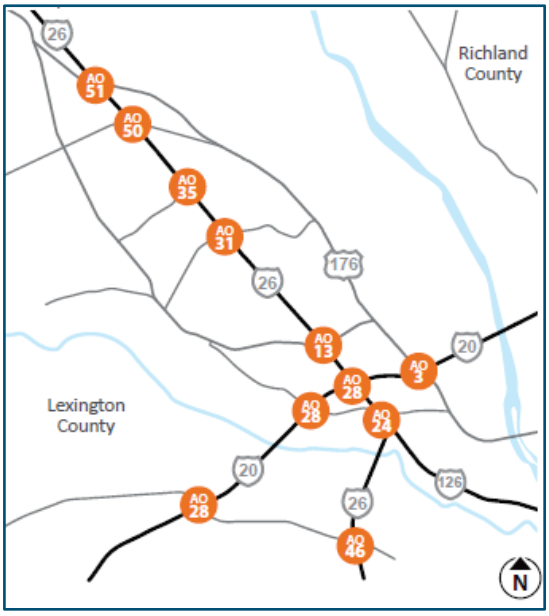
2. Development of Alternatives





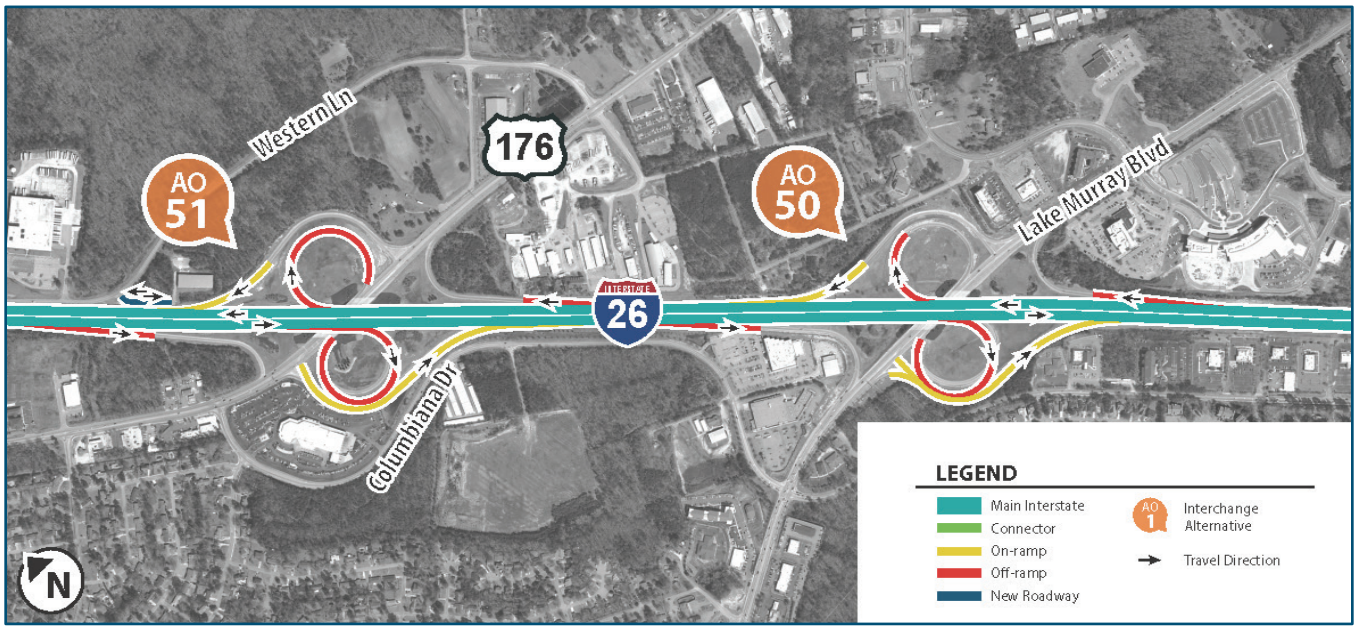
2. Development of Alternatives

Representative Alternative 8 (RA8) – E-W Connector Bush River:

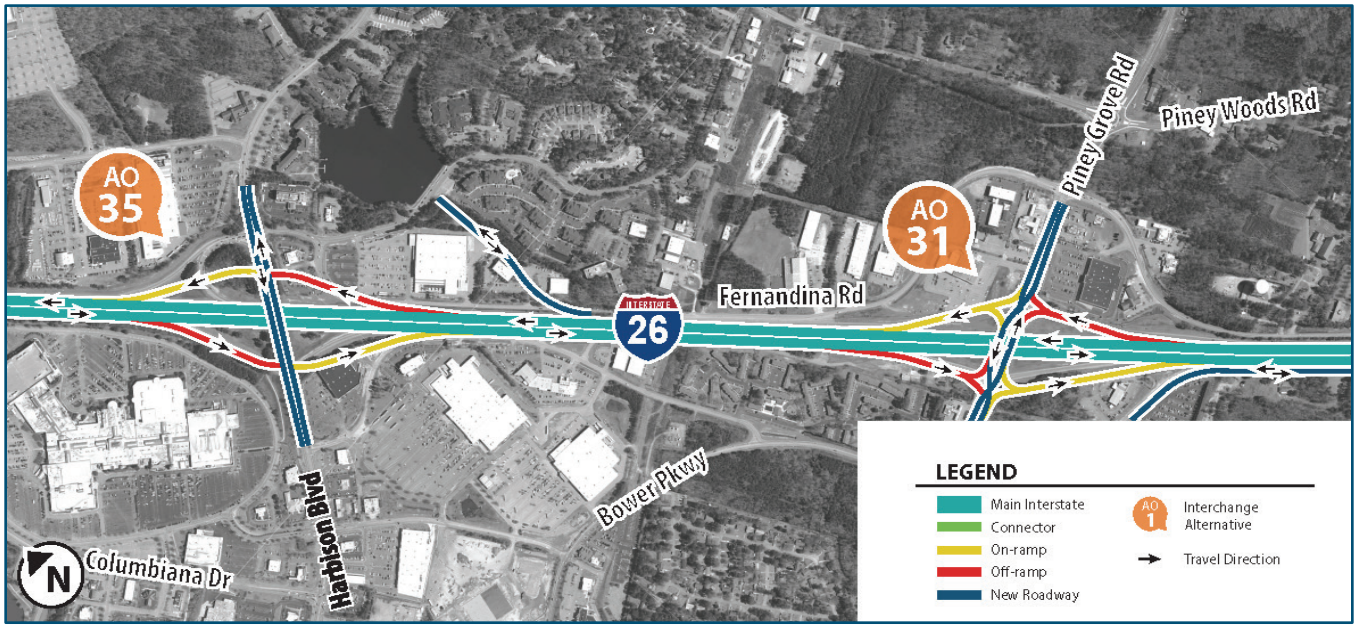


Widening of I-26 with one additional lane in each direction from US 176/Broad River Road to US 378, new collector-distributor lanes, and interchange improvements at each interchange from: Harbison Boulevard to I-126 on I-26; from Bush River Road to Broad River Road on I-20; and from I-26 to Colonial Life Boulevard on I-126.

- Proposed new interchange would be added at I-126 and Colonial Life Boulevard and a new offset interchange via ramp highway would be proposed paralleling the Saluda River.
- Include a new location four-lane roadway (east-west) extending from I-20 west of Bush River Road to I-26 just south of the I-26/I-126 interchange with a new interchange at Bush River Road. The new location east-west roadway parallel the Saluda River provides connections between I-20 and I-26 without having to travel through the proposed directional interchange at I-20 and I-26.
- Modification of the existing interchanges of Bush River Road at I-26 and I-20. The existing I-26 westbound to I-126 eastbound ramp would be relocated south of its current location. Access to I-126 from I-20 would be provided by the new location roadway interchange.

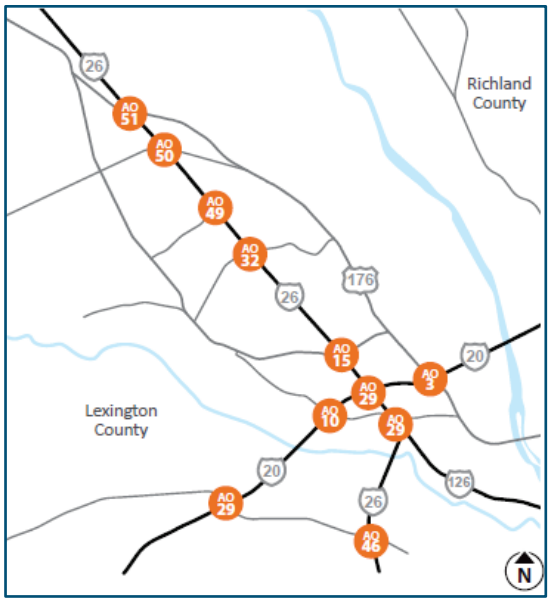


2. Development of Alternatives

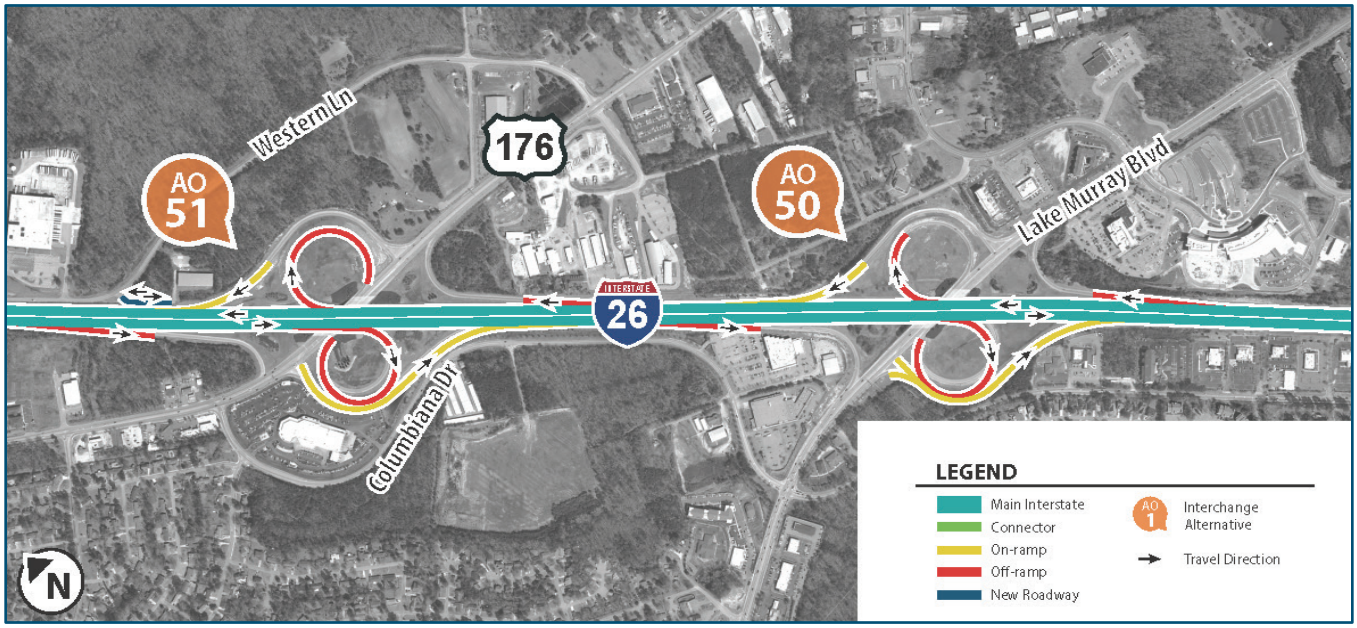


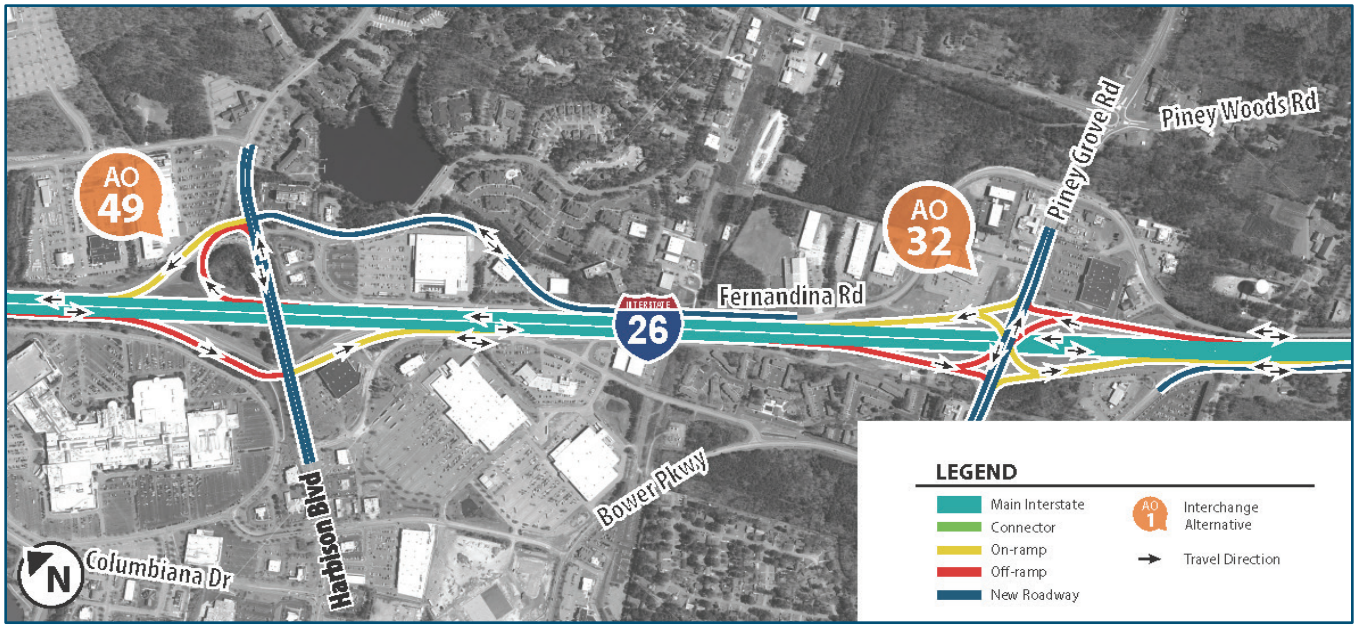
2. Development of Alternatives

Representative Alternative 9 (RA9) – Southern Connector:



- Widening of I-26 with one additional lane in each direction from US 176/Broad River Road to US 378 and interchange improvements at each interchange from: Harbison Boulevard to I-126 on I-26; from US 378 to Broad River Road on I-20; and from I-26 to Colonial Life Boulevard on I-126.
- Proposed new interchange would be added at I-126 and I-26 and a new location I-126 would be proposed paralleling south of the Saluda River along with the elimination of the existing cloverleaf interchange at the I-20 and I-26 junction.
- Elimination of the existing cloverleaf interchange at the I-20 and I-26 junction and proposed new interchange at I-126 and I-26 along with a proposed new location four-lane freeway between I-20 and I-126.
- Modification of the existing interchange at I-26 and Bush River Road. Additionally, I-20 traffic can access I-126 via the new location east-west roadway.




AO 49
AO 32
Piney Grove Rd
Piney Woods Rd
Fernandina Rd
INTERSTATE 26
Bower Pkwy
Harbison Blvd
Columbiana Dr
N
LEGEND
Main Interstate
Connector
On-ramp
Off-ramp
New Roadway
AO 1
Interchange Alternative
Travel Direction


LEGEND
Main Interstate
Connector
On-ramp
Off-ramp
New Roadway
AO 1
Interchange Alternative
Travel Direction
176
AO 3
20
AO 46
26
Sunset Blvd
AO 15
AO 29
26
Bush River Rd
Browning Rd
Columbia Lake Blvd W
St Andrews Rd
AO 29
Saluda River
126
20
Saluda River
AO 10
Bush River Rd
Saluda River
AO 29
N
26
N

2.2.5.2 How were the Representative Alternatives evaluated in the Level 1B screening process?

The nine representative alternatives (RAs) that were developed based on screening of AOs in Level 1A were carried forward into Level 1B and put through additional screening, this time analyzing more detailed traffic capacity and traffic operations information with comparison to the No-Build alternative (RA10) and the primary purpose and need of the proposed project – reducing congestion by improving peak-period travel time in the corridor and improving local mobility. Microsimulation models were developed for each RA to simulate conditions for comparison. All RAs were evaluated based on their benefit to LOS on the interstate mainline segments in both the AM and PM peak period, as well as LOS across each interstate, merge and diverge ramps, and intersections at or near the interchanges. Travel time through the interstate corridors, speed, and driver delay also were evaluated as measures of effectiveness (MOEs).

In addition to quantitative metrics derived from microsimulation, each RA was also assessed against other known contributing factors of congestion found in the existing configuration(s). Those geometric factors include the presence of high-volume weaving maneuvers, mainline through lane shifts, service interchange movements within the system interchanges (i.e., the Bush River Road service interchange on I-26 is located within system interchanges of I-26, I-126 and I-20), and left-side exits.

This Level 1B screening process is detailed in the *Final Alternatives Development and Screening Report for Carolina Crossroads I-20/26/126 Corridor Improvement Project*,[17] in Table 3 in Appendix C. The table includes LOS, travel time, through speed, and geometry metrics.

The cumulative results of the Level 1B Screening are shown in Table 2.2.

Based on this analysis, **RA1** overall had the highest improvement on traffic and operations (LOS), improvement to through travel times, improvement to through speed, and reduced or eliminated many geometric deficiencies that currently exist. This was due to the elimination of loop ramps at the I-26 and I-20 junction and the elimination of traffic conflict points. Thus, it was carried forward for further analysis.

RA2 was eliminated because it showed the least improvement in LOS and performance when compared to the No-Build alternative. RA2 had the least reduction in travel time, and would result in overall decreases in speed in the corridor, particularly along westbound I-20. For these reasons, RA2 was determined not to be practicable and eliminated in the Level 1B screening.

RA3 was eliminated because it had a moderate improvement over the No-Build and below average improvement when compared to the other alternatives. Travel time improvement projections through the corridor are marginal. Speed improvement through the corridor is moderate and traffic projections actually show a decrease in average travel speeds on I-20 and stay the same on I-126 resulting in a worsened overall condition. In addition, RA3 would have 22 mainline weaving movements – the most of all the RAs. Thus, it was

[17] SCDOT. 2018. Final Alternatives Development and Screening Report for Carolina Crossroads I-20/26/126 Corridor Improvement Project. Prepared by HDR, STV, and Mead & Hunt.

determined that RA3 was not practicable and eliminated from further analysis. These reasons justify the conclusion that RA3 is not a practicable alternative.

RA4 was determined not to be practicable and was eliminated because significant safety and weaving issues with the existing condition would not be resolved even though it operates above average for overall LOS and performance.

RA5 was retained for additional analysis because it shows significant improvement to travel time and corrects geometric deficiencies while moderately improving overall LOS and speed through the corridor, thus it was carried forward for further analysis.

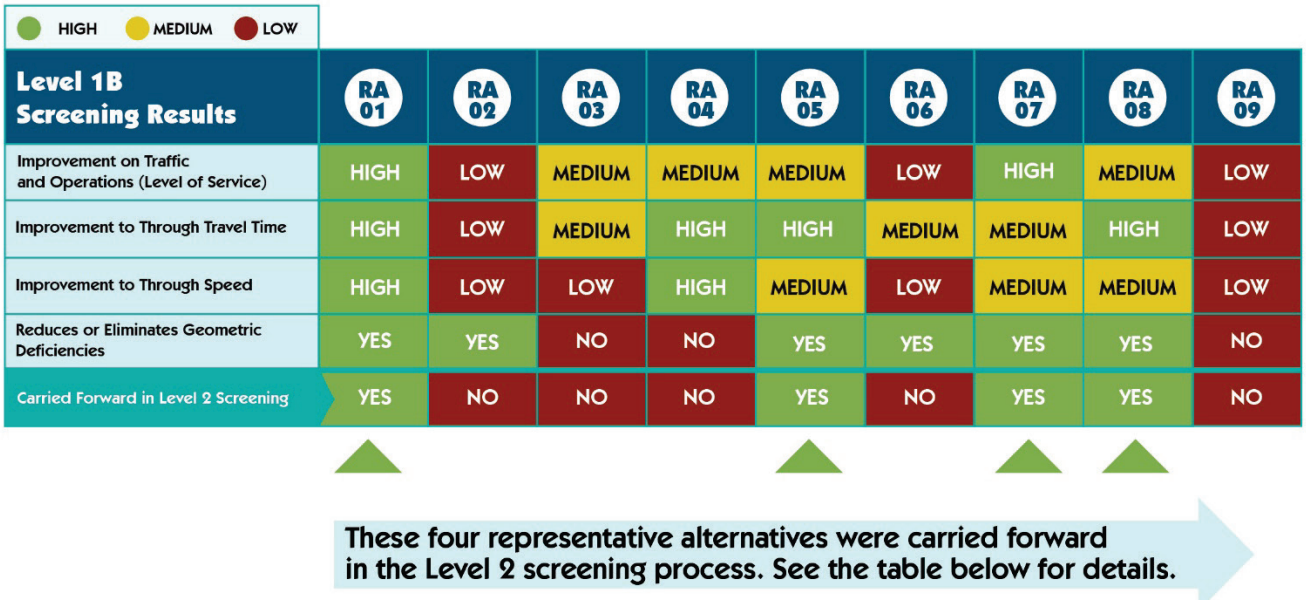
RA6 was eliminated because it had a moderate improvement to vehicle density over the No-Build and below average improvement when compared to the other alternatives also yielding improvements over the No-Build. Additionally for RA6, travel time and speed improvement projections through the corridor are marginal for all freeway sections and traffic projections actually show a decrease in average travel speeds indicating that while density has improved, this benefit to drivers is limited by the fact that average travel speeds are worse than No-Build. RA6 had the second lowest LOS improvement amongst the RAs, as well as the second lowest improvement in travel times, and the lowest average through speed. Thus, RA6 was determined not to be practicable, and eliminated from further analysis in the Level 1B screening.

RA7 was retained for additional analysis because it significantly improves overall operational performance due to the direct connection of I-126 with I-20; reduces merge/diverge points on I-26; improved the existing roadway with more driver friendly designs; deviates traffic volumes from portions of the mainline and intersections; and minimizes traffic disruptions. RA7 was carried forward for further analysis.

RA8 was retained for additional analysis because it provides a moderate improvement to operational performance and significant improvement to the overall travel through the corridor. The addition of a connection to Bush River Road as a feature of the new alignment connecting I-126 and I-20 and removal of connections to the mainlines are contributors to the improvement. RA8 was carried forward for further analysis.

RA9 was eliminated and determined not to be practicable because it was deemed fatally flawed in terms of its ability to meet purpose and need due to critical traffic choke points in the design that could not be resolved.

Table 2.2 Level 1B Screening Criteria



In summary, a total of nine RAs were compared against the No-Build (RA10) and five representative alternatives were eliminated in Level 1B screening. The eliminated RAs include RA2, RA3, RA4, RA6, and RA9. These five RAs were eliminated due to their low to medium improvements with traffic capacity and operations or because they did not reduce or eliminate geometric deficiencies. Four representative alternatives (**RA1, RA5, RA7, and RA8**) were carried forward into the Level 2 screening due to their medium to high improvements with traffic capacity and traffic operations.

2.2.6 WHAT WAS 'LEVEL 2 SCREENING'?

Alternatives that advanced past Level 1B to Level 2 screening were evaluated in comparison to one another against environmental constraints, constructability, cost and the secondary purpose and need components, which include the ability to improve safety, improve freight mobility, and improve system linkages, while minimizing community and environmental impacts.

During the Level 2 screening process, it was determined that none of the alternatives would avoid affecting the natural and built environment. The project study area contains urban and suburban areas, wetlands and streams.[18] Because of the high density of these community and natural resources, the project team found that, in all situations, avoiding one resource would cause additional impacts to other resources. Given that no alternatives would avoid affecting the natural and built environment, each of the alternatives was evaluated to determine which alternatives would best meet the purpose of and need for the project with the lowest overall levels of impacts to the natural and built environment.

[18] USFWS. 2017. National Wetlands Inventory. Accessed on July 27, 2017, at http://128.104.224.198/wetlands.aspx

For purposes of the Level 2 screening, wetlands and streams were identified through use of US Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) and US Geographic Service (USGS) National Hydrography Dataset (NHD), both national, publicly-available Geographic Information System (GIS) datasets. In evaluating impacts to Waters of the US (WOUS) for Level 2 screening, the GIS data was used to quantify potential impacts associated with each RA. All impacts to these resources were considered as fill, except for the Saluda River. While NWI data is accepted as reliable for planning purposes, it may not reflect actual conditions in the field and thus estimated impacts evaluated are not exact. In one case, the NWI and NHD provided overlapping information that was adjusted to better reflect the potential impacts to wetland and stream resources. The NWI data classifies the Saluda River as a Riverine wetland, while the NHD classifies the Saluda River as a river. Potential impacts to the Saluda River were quantified using the NHD only.

In addition to the amount of wetlands and streams that would be impacted, the quality of those resources was also assessed by the project team. Higher quality wetlands and streams are generally valued for their function, aesthetics, and wildlife habitat. 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. For the purposes of the Level 2 screening, quality characteristics were assigned by the project team to NWI wetlands and NHD streams in ArcGIS based on understanding of the aquatic resources in the project area, NWI classification, and an interpretation of aerial photographs. Wetland and stream quality were 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: Bottomland Hardwoods and Riverine systems, including headwaters and riparian zones.
- 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 include mixed pine-hardwood wetlands, scrub-shrub wetlands, segmented, and/or ditched wetlands.
    - Type: Seeps and bogs, depressions, pocosins and bays, savannahs 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 include stormwater basins, clear-cut wetlands, and permanently cleared utility corridors.
    - Type: Man-made lakes and ponds, impoundments.

Streams

- High quality:

    - Existing Condition: Fully functional streams that appear to be primarily undisturbed with stable, vegetated stream banks, and riparian buffers. Streams with listed species, trout streams, and streams identified as highly diverse are considered fully-functional.
    - Type: Headwater streams (1st and 2nd Order) designated as blue lines on USGS topographic maps
- Medium Quality:
    - Existing Condition: Partially impaired streams that appear to the delineators to have limited human-influence or natural disturbance, resulting in a partial loss of one or more functions. Some channelization and piping may be present.
    - Type: All other streams and rivers designated by solid or dashed blue lines on USGS topographic maps.
- Low Quality:
    - Existing Condition: Impaired or very impaired streams that appear to the delineators to have unvegetated stream banks and severe loss of function. Streams with significant human-influence or natural disturbance. Primarily piped or channelized tributaries, or tributaries with minimal to no riparian buffer.
    - Type: Streams designated by dashed blue lines on USGS topographic maps.

Additionally, for purposes of the Level 2 screening, floodplains were identified through review of existing floodplain mapping and a GIS analysis of the project study area to determine crossings or encroachment of floodplains, by zone, for each of the four remaining RAs. Refer to Appendix C for details on what floodplain zones are located within the project study area and were considered for impact analysis.

The Level 2 Screening Matrix presented in Table 2.3 summarizes the Level 2 screening metrics and results for each of the four remaining RAs, including total number of property acquisitions (full and partial acquisitions), community resources, natural resources, project costs, traffic considerations, consistency with local/regional land use plans, and other considerations. Many of the Level 2 screening results for traffic considerations were similar for all of the alternatives evaluated. Generally, the environmental impact categories that show the greatest variance among the remaining RAs were property acquisitions, wetlands, streams/rivers, and floodplains.

In addition, the public comments received after the public meeting on October 4, 2016, were largely focused on concerns for property acquisition impacts and natural resources impacts. Therefore, the potential impacts each of the RAs to properties, wetlands, stream, and floodplains were compared to determine which had the least overall environmental impacts. In addition, the degree for which the primary purpose and need was met, compatibility with land use plans, and costs were also considered.

2.2.6.1 What were the Results of the Level 2 Screening?

A summary of the Level 2 screening results for the most prominent resource categories among RAs 1, 5, 7, and 8 is provided in Table 2.3**.** The full discussion of the Level 2 screening process can be found in Section 4.6 of the *Alternatives Development and Screening Report* (Appendix C).

Table 2.3 Summary of Results for Level 2 Screening

LOW MEDIUM HIGH ✓ Moderate ✓✓ High — Marginal

Level 2 Screening Results		RA 01	RA 05	RA 07	RA 08
How many properties does this alternative impact?	Full Acquisitions*	41	34	61	44
	Partial Acquisitions*	240	257	251	237
How many acres of wetlands does this alternative impact?	Total Acres**	3.97	3.75	12.67	9.7
	% High Quality	19%	20%	32%	39%
How many linear feet of streams are impacted?	Total Linear Feet**	15,384	15,182	15,477	18,116
	% High Quality	9%	9%	14%	19%
How many acres of floodplains are crossed?	Total Acres***	67.71	68.17	125	121
	% Zone AE Floodway	39%	38%	68%	47%
What is the estimated project cost? (billions)		$1.46	$1.54	$1.95	$1.97
How many acres of public open space and parks are impacted?		2.84	2.84	1.3	0.35
Does this meet local/ regional land use plans?		YES	YES	NO	NO
Improvement on Traffic and Operations (Level of Service)		✓✓	✓	✓✓	✓
Improvement to Through Travel Time		✓✓	✓✓	—	✓✓
Improvement to Through Speed		✓✓	✓	✓	✓
Reduces or Eliminates Geometric Deficiencies		YES	YES	YES	YES
Carried Forward to Level 3 Screening – DEIS		YES	YES	NO	NO

* Property impacts in the Level 2 Matrix reflect desktop level review

** Stream and wetland impacts in Level 2 Screening are dependent on NHD and NWI datasets

***Floodplain impacts in Level 2 Screening represent all floodplains within the proposed right-of-way

Representative Alternatives 1 and 5 move forward

Representative Alternatives 7 and 8 are eliminated

Following completion of Level 2 screening and reviewing of the outputs, natural breaks in the data were apparent.

RA7 – Not prudent or practicable, highest property impacts, highest wetlands impacts, second highest impacts to streams/rivers, highest impacts to floodplains from construction of new alignment alternative within the Saluda River floodway; not compatible with land use plans; visual impacts to state scenic river (Saluda); second most expensive RA.

RA8 – Not prudent or practicable, second highest property impacts including significant impact to businesses along Bush River Road and to CSX Railroad; second highest wetlands impacts, highest impacts to streams/rivers, second highest impacts to floodplains from construction of new alignment alternative within the Saluda River floodway; not compatible with land use plans; visual impacts to state scenic river (Saluda); most expensive RA.

Based on the impact assessment results, it was recommended that RA7 and RA8 be eliminated. Reasonable Alternatives recommended to be carried forward into the Level 3 Screening were RA1 and RA5, as well as RA10 (No-Build) for comparison purposes.

RA1 and **RA5** were presented to the public at the Reasonable Alternatives Public Information Meeting on September 19, 2017. Following the public meeting, the project team began to further evaluate RA1 and RA5 in consideration of public comments received. In addition, the design team went through a process to refine RA1 and RA5 in an attempt to achieve more functional traffic operations and/or refine designs to minimize impacts. While refinements did not seek to holistically modify an entire alternative, the process did result in minor adjustments to RA5. Through the Level 3 screening process, RA1 Modified was determined to be outperformed by the base RA1, and therefore eliminated. Additionally, RA5, henceforth referred to as RA5 Modified, was adjusted to use a diverging diamond interchange design at the I-20/Bush River Road interchange, instead of a partial cloverleaf design. The modified version of RA5 showed greater benefits than the base RA5, and therefore the modified version replaced the original version of RA5 in all further screenings. Section 2.2.5.1 includes a full description and layout of RA1 and the following section includes a full description and layout of RA5 Modified.

In addition, a bridge across I-26 at Tram Road/Beatty Road, between the Piney Grove Road and St. Andrews Road interchanges was added to both RA1 and RA5 Modified. This proposed overpass was added due to public and stakeholder request for enhanced connectivity across I-26.

Tram Road/Beatty Road Connection

There are three general groups of traffic that may benefit from connecting Jamil Road and Fernandina Road adjacent to Tram Road and Beatty Road. The first is the traffic with origins and destinations located along Jamil Road and Fernandina Road. The second is residential traffic located along Tram Road and Beatty Road near Jamil Road and Fernandina Road. The third is longer distance through traffic traveling between St. Andrews Road and Broad River Road that would be provided with an alternative connection via Tram Road and Beatty Road.

To some extent, all three of these groups may benefit from an additional crossing over I-26 that would allow them to avoid traveling to either Piney Grove Road or St. Andrews Road to cross the interstate. Currently, more traffic traveling on Jamil Road past Tram Road comes from the north in the direction of Piney Grove Road during both weekday peak hours. Along Fernandina Road at Beatty Road, more of the morning peak hour traffic comes from Piney Grove Road while more of the afternoon peak hour traffic comes from St. Andrews Road. During both peak hours, more traffic turning to or from Tram Road and Beatty Road are coming from (or going to) Piney Grove Road, though in the morning peak hours the proportion of traffic is closer to being even.

For traffic with origins and destinations along both Fernandina Road and Jamil Road, the proposed bridge could be attractive by providing a shorter route and result in a reduction of local vehicle-miles traveled along those roads. The bridge could be used to cross I-26 instead of traveling from one street up to Piney Grove Road or down to St. Andrews Road and then back along the other street. The distances between the intersections of Jamil Road with Tram Road and Fernandina Road with Beatty Road are approximately 2.5 miles via either Piney Grove Road or St. Andrews Road. Providing a crossing over I-26 connecting Tram Road and Beatty Road will shorten these trips. These trips are anticipated to have minimal traffic impacts to Tram Road or Beatty Road, but could reduce travel along Piney Grove Road and St. Andrews Road through the Exit 104 and Exit 106 interchanges.

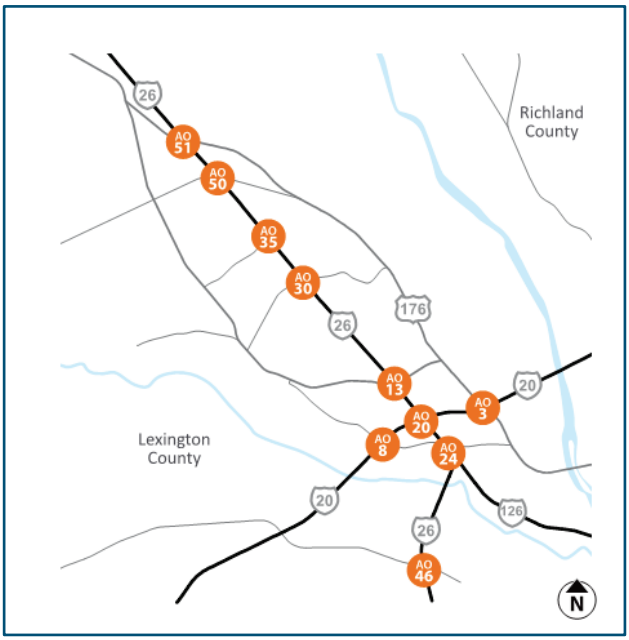
Given the orientation towards I-26 of Tram Road in the northeast direction and Beatty Road in the northwest direction away from St. Andrews Road, a bridge connecting Jamil Road and Fernandina Road will be more likely to attract traffic oriented towards Piney Grove Road than towards St. Andrews Road. This is consistent with current traffic data. For the residential traffic that use Tram Road or Beatty Road to reach Jamil Road or Fernandina Road, the proposed bridge would likely divert a portion of existing traffic to the bridge. The effect is likely to be higher on the west side of I-26, since the Whitehall neighborhood, which accesses Tram Road, is substantially larger than the residential areas accessing Beatty Road east of I-26. However, not all portions of the Whitehall neighborhood would be attracted to the proposed bridge crossing. For example, the traffic generated by the portion of Whitehall between Piney Grove Road and Townes Road are more likely to use Piney Grove Road due to closer access and would be less likely to travel through the neighborhood to reach Tram Road.

It is likely that shorter non-work and commuting trips would tend to be diverted away from traveling through Exit 104 and Exit 106 towards the proposed bridge, but longer distance trips would still access those interchanges much as they do today without the bridge. An example would be a resident of Whitehall living near Tram Road wanting to travel to the Costco located on the northeast quadrant of the intersection of Piney Grove Road and Fernandina Road. Currently, this resident is most likely to turn left from Tram Road onto Jamil Road, travel to Piney Grove Road, turn right, cross through the Exit 104 interchange, and turn left onto Fernandina Road to reach Costco. With the bridge, this resident would be more likely to take a more direct route that crosses I-26 on the proposed bridge, turns left onto Fernandina Road, and continues through Piney Grove Road to reach Costco. For a longer distance commuting trip, it may still be easier for the resident to use Jamil Road to reach Piney Grove Road or St. Andrews Road than to cross the interstate on the proposed bridge and double back to access I-26 at Exit 104 or Exit 106.

The proposed bridge is not likely to increase longer distance through traffic between St. Andrews Road and Broad River Road along Tram Road and Beatty Road. Traffic traveling south/east on Broad River Road are likely to continue finding Piney Grove Road a better alternative to reach St. Andrews Road due to the more direct connection, higher speeds, and increased capacity. Traffic traveling south/east on St. Andrews Road to Broad River Road will likely continue to use St. Andrews Road through Exit 106 since it is a more direct route and less time consuming even with peak hour congestion at the interchange. Traffic traveling to the north/west on Broad River Road will continue to find quicker, more direct access along St. Andrews Road than by using Beatty Road and Jamil Road. One exception to this, which could provide additional benefits, is the ability for the bridge to offer another connection point between Fernandina and Jamil during emergency conditions. The connection would allow movement between frontage roads in the case of a collision/mainline road closure on I-26. Traffic would be able to use the connection during an I-26 mainline event and could easily be rerouted onto local streets to mitigate traffic back-ups.

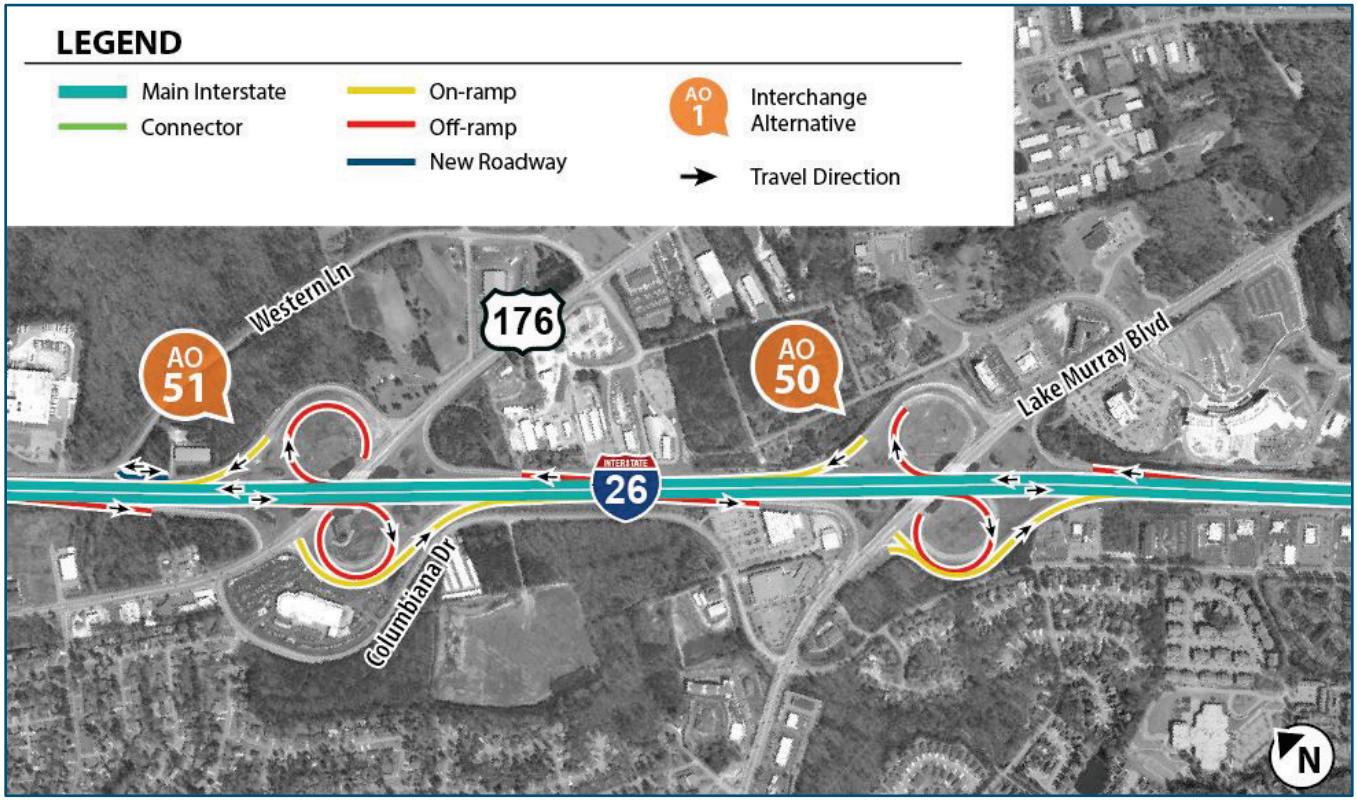
Essential elements of RA5 Modified are outlined on the following pages.

2. Development of Alternatives

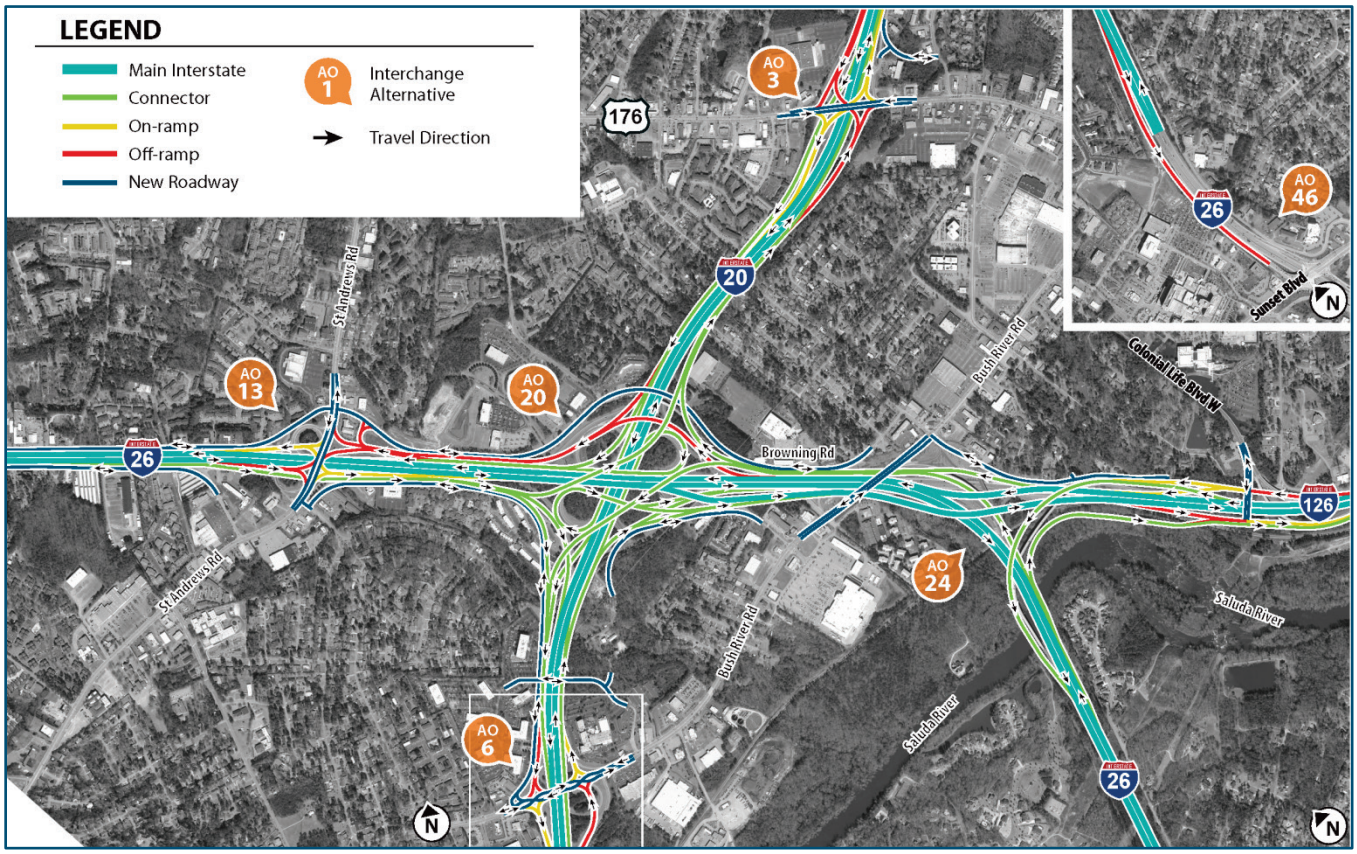


Representative Alternative 5 Modified –Directional Interchange with Diverging Diamond at I-20/Bush River Road

- The widening of I-26 with one additional lane in each direction from US 176/Broad River Road to US 378.
- New collector-distributor lanes.
- Interchange improvements at each interchange from: Harbison Boulevard to I-126 on I-26; from Bush River Road to Broad River Road on I-20; and from I-26 to Colonial Life Boulevard on I-126.
- Improve Tram Road by providing overpass of I-26.
- The proposed directional interchange at the I-26 and I-20 junction, which eliminates 2 loop ramps and recon-gures the other loop ramps in the interchange. A proposed directional interchange consists of three roadway levels that traverse around a central bridge. The third level is the directional ramps from I-26 to I-20.
- The relocation of the existing interchange at I-26 and Bush River Road and instead providing access to Bush River Road from the full-access interchange at Colonial Life Boulevard. By removing the direct connection between Bush River Road and I-26, traffic conflict points and weaving maneuvers between Bush River Road and the I-20/I-26 interchange would be eliminated, thereby reducing traffic congestion/disruption and improving traffic flow on I- 26.



2. Development of Alternatives



2.2.7 WHAT WAS THE 'LEVEL 3' SCREENING ANALYSIS'?

As part of the Level 3 screening, the two Reasonable Alternatives (RA1 and RA5 Modified) were further assessed through more detailed traffic analysis and more detailed environmental impact analysis that involved actual field evaluations. The Level 3 screening process also served to help identify whether minor modifications made to each RA helped improve conditions or not. This allowed the team to eliminate a modified concept of RA1 early in the process. This also helped the team understand that the RA5 Modified concept provided more overall benefits than the base RA5 concept. Level 3 considered both operational metrics as well as environmental impacts. In addition to the Level 2 environmental screening criteria, Level 3 also considered historical impacts, community impacts, hazardous materials sites, noise impacts, and environmental justice impacts. This process is described in detail within the *Alternatives Development and Screening Report for Carolina Crossroads I-20/26/126 Corridor Improvement Project*,[19] found in Appendix C.

A wetland and stream delineation was also completed for the Reasonable Alternatives during the Level 3 screening process. A delineation study determines the location and extent of wetlands and streams within the project study area by conducting field reviews of soils, vegetation, and hydrology, thus providing more complete and accurate information than NWI and NHD data. For this screening, all wetland impacts were considered as fill except for the Saluda River. The detailed studies identified more WOUS in the Level 3 screening due to better accuracy of ground-truthed data than were accounted for in the GIS data used in Level 2 screening. These WOUS would be similar for all alternatives given the topography and the similarity of alternatives. The USACE has provided a Preliminary Jurisdictional Determination (PJD) that identified approximate locations and boundaries of on-site wetlands and streams that are presumed to be subject to regulatory jurisdiction.

As the screening process was ongoing, each alternative was being refined as well. The overall project footprints increased to account for probable locations for stormwater retention ponds. This process resulted in an overall increase in affected properties from Level 2 to Level 3 due to more accurate design files.

In addition, during the ongoing screening process floodplain impacts were reduced in Level 3 Screening from Level 2 Screening due to refinement of alternatives and the application of proposed construction limits. For purpose of accounting for anticipated erosion control measures, a 30-foot buffer was added to the proposed construction limits for areas around the Saluda River; a 20' buffer was added for all other locations within the project study area.

The two Reasonable Alternatives were analyzed based on traffic MOEs and their ability to meet the primary purpose and need of the proposed project. These MOEs included level-of-service, travel time benefits, and delay time (Table 2.4 and Table 2.5). Through the detailed traffic analysis, it was determined that RA1 would best meet the purpose and need to reduce congestion and improve mobility. In addition, while environmental impacts would be very similar, RA1 would have the least property impacts in regards to full acquisitions, the least wetland impacts (acres), and the lowest construction cost compared to RA5 Modified (Table 2.6 and 2.7).

[19] SCDOT. 2019. Alternatives Development and Screening Report for Carolina Crossroads I-20/26/126 Corridor Improvement Project. Prepared by HDR, STV, and Mead & Hunt.

2. Development of Alternatives

When comparing the detailed traffic analysis, detailed environmental analysis, input from the public and from elected officials, input from resource and regulatory agencies, constructability factors, and construction costs, the Reasonable Alternative that would best satisfy the public need while minimizing impacts was determined to be RA1. The full discussion of the Level 3 screening process can be found in Section 4.6 of the *Alternatives Development and Screening Report* (Appendix C).

Table 2.4 Summary of Results for Level 3 Screening – Average Travel Time

Level 3 Screening Criteria		No-Build	Alternative 1 Turbine with DivergingDiamond at I-20/Bush River Road		Alternative 5 (Modified) Directional with Diverging Diamond at I-20/Bush River Road	
	Average Travel Time Through Corridor	Minutes and Seconds	Difference from No-Build	Minutes and Seconds	Difference from No-Build	Minutes and Seconds
Improve Mobility and Enhance Traffic Operations	I-26 from Exit 101 to Exit 110 EB AM	28:25	13:55	14:30	13:57	14:28
	I-26 from Exit 101 to I-126 End EB AM	28:19	08:41	19:39	08:39	19:40
	I-26 from Exit 101 to I-20 Exit 68 EB AM	29:48	06:50	22:59	08:45	21:03
	I-26 from Exit 101 to I-20 Exit 61 EB AM	29:12	12:04	17:08	12:11	17:01
	I-20 from Exit 68 to I-26 Exit 110 EB AM	13:13	02:15	10:58	02:46	10:27
	I-20 from Exit 61 to Exit 68 EB AM	14:57	00:16	14:41	00:38	14:19
	I-20 from Exit 61 to I-126 End EB AM	15:12	01:18	13:54	00:04	15:08
	I-26 from Exit 101 to Exit 110 EB PM	22:18	09:10	13:07	09:07	13:11
	I-26 from Exit 110 to Exit 101 WB PM	26:36	12:44	13:51	12:27	14:09
	I-126 End to Exit 101 WB PM	26:53	09:18	17:36	08:00	18:53
	I-20 from Exit 68 to I-26 Exit 101 WB PM	24:26	03:52	20:34	04:23	20:02
	I-20 from Exit 61 to I-26 Exit 101 WB PM	20:25	02:32	17:54	02:45	17:41
	I-26 from Exit 110 to I-20 Exit 68 WB PM	18:56	08:43	10:13	09:19	09:37
	I-20 from Exit 68 to I-26 Exit 110 EB PM	24:43	10:45	13:58	10:38	14:05
	I-20 from Exit 68 to Exit 61 WB PM	17:36	02:46	14:51	02:28	15:08
	I-126 End to I-20 Exit 61 WB PM	22:05	08:08	13:56	06:31	15:34

Alternative with most improvement

Table 2.5 Summary of Results for Level 3 Screening – Average Speed

	Level 3 Screening Criteria	No-build	Alternative 1 Turbine with DivergingDiamond at I-20/Bush River Road		Alternative 5 (Modified) Directional with Diverging Diamond at I-20/Bush River Road	
Improve Mobility and Enhance Traffic Operations	Average Speed Through Corridor	MPH	Difference from No-Build	MPH	Difference from No-Build	MPH
	I-26 from Exit 101 to Exit 110 EB AM	29	28	57	28	57
	I-26 from Exit 101 to I-126 EB AM	31	16	47	16	47
	I-26 from Exit 101 to I-20 Exit 68 EB AM	32	11	43	12	44
	I-26 from Exit 101 to I-20 Exit 61 EB AM	33	23	56	24	57
	I-20 from Exit 68 to I-26 Exit 110 EB AM	41	13	54	11	52
	I-20 from Exit 61 to Exit 68 EB AM	45	4	49	2	47
	I-20 from Exit 61 to I-126 End EB AM	41	6	47	3	44
	I-26 from Exit 101 to Exit 110 EB PM	37	26	63	26	63
	I-26 from Exit 110 to Exit 101 WB PM	31	29	60	28	59
	I-126 End to Exit 101 WB PM	33	19	52	16	49
	I-20 from Exit 68 to I-26 Exit 101 WB PM	38	9	47	8	46
	I-20 from Exit 61 to I-26 Exit 101 WB PM	49	7	56	8	57
	I-26 from Exit 110 to I-20 Exit 68 WB PM	27	27	54	26	53
	I-26 from I-20 Exit 68 to Exit 110 EB PM	22	20	42	17	39
	I-20 from Exit 68 to Exit 61 WB PM	38	10	48	6	44
	I-126 End to I-20 Exit 61 WB PM	30	18	48	13	43
	Vehicle miles traveled	476,429	158,343	634,772	145,633	622,062
	Vehicle hours traveled	16,865	399	17,264	269	17,134
	VMT/VHT	28.2	8.5	36.8	8.1	36.3

Alternative with most improved speed

Table 2.6 Summary of Results for Level 3 Screening – Environmental Impacts

	Level 3 Screening Criteria		No-Build	Alternative 1 Turbine with DivergingDiamond at I-20/Bush River Road	Alternative 5 (Modified) Directional with Diverging Diamond at I-20/Bush River Road
Minimize Environmental Impacts / Implementation	**Property Impacts**				
	Full Acquisitions	Single Family	-	20	20
		Multi-Family (# of units)	-	90	164
		Commercial	-	48	53
		Institutional	-	4	4
	Partial Acquisitions	Residential	-	36	39
		Commercial	-	190	197
	Section 4(f) Sites Impacted		-	0 (de minimis)	0 (de minimis)
	Historic Impacts		-	0	0
	Wetland Impacts*	Fill (acres)	-	6.55	6.89
		Ponds	-	0.02	0.02
	Stream Impacts* (linear feet)		-	15,750	16,600
	Floodplains** (acres)	Zone AE	-	15.94	16.64
		Zone AE - Floodway	-	6.97	7.05
	Water Quality	High Quality Streams	-	14%	17%
		Wetlands	-	36%	34%
	Community Impacts				
	Columbiana				
	Seven Oaks				
	Saluda				
	Riverbanks				
	Harbison				
	St. Andrews				
	Broad				
	Environmental Justice		-	No	No
	Census Blocks (# of blocks)		-	25	24
	Potentially Impacted Noise Receivers***	Residential (NAC B)	-	1,864	1,827
		Business (NAC C/D)	-	4	6
		Other (NAC E)	-	24	25
	Hazardous Material Sites		-	18	18

*Wetland and stream calculations made using preliminary jurisdictional determination
*Wetland and stream calculations reflect impacts from proposed project and do not include existing impacts
**Floodplain impacts in Level 3 Screening are based on proposed project construction limits + 30' buffer at Saluda and 20' buffer in all other locations
***RA5 has less noise impacts because it relocates more noise sensitive receptors than RA1

Alternative with fewer impacts
Low Impact
Medium Impact
Mobility, Access and Safety
Land Use
Visual/Aesthetics
Noise (# impacted receptors)
Neighborhoods
Community Services

Table 2.7 Summary of Results for Level 3 Screening – Construction Cost

Level 3 Screening Criteria	No-Build	Alternative 1 Turbine with Diverging Diamond at I-20/Bush River Road	Alternative 5 (Modified) Directional with Diverging Diamond at I-20/Bush River Road
Cost	-	$1.461 Billion	$1.543 Billion

Alternative with fewer impacts

2.2.7.1 Traffic Operations in the Level 3 Screening Analysis

RA1

Microsimulation analysis was performed for the RA1 network using the same forecasted trip tables, derived from the SCSWM, that were used in the 2040 No-Build microsimulation analysis. The 2010 Highway Capacity Manual (HCM) defines freeway LOS using vehicle density (vehicles per mile) as the primary measurement.

Microsimulation Analysis

- **Refers to a traffic engineering / transportation planning tool that simulates real world conditions using predictive driving behavior algorithms to model vehicles in a roadway system**

Compared to the 2040 No-Build network, RA1 would result in LOS improvements to all eastbound and westbound movements in the I-26 corridor. The I-20 corridor LOS would also generally improve for AM and PM peak movements. The I-126 corridor would generally realize LOS improvements except for the eastbound AM peak which would result in higher vehicle density and a reduction in LOS. Refer to the *Roadway Impact Summary* section that follows Section RA5 Modified for comparisons between alternatives.

Geometric benefits of RA1 are found in the reduction in weaving sections around the interchange of I-26 and I-20. Weaving sections with high-volume traffic are present where I-20 eastbound traffic enters I-26 eastbound traffic flow and where I-20 eastbound traffic exits I-26 westbound, at the Bush River Road interchange with I-26 in both directions on the freeway mainline, and at the point on I-26 westbound where traffic from I-126 westbound enters the mainline, among others. Weaving sections contribute to system congestion and act as bottlenecks to traffic flow; they can also be areas where crash risk is elevated. Slow moving traffic, vehicle maneuvers requiring one or more lanes of traffic to cross (weave), and impatient drivers can all contribute to a more frequent rear end and sideswipe crash tendency. RA1 uses collector-distributor lanes and individual flyover ramps to remove these problematic weave segments, thereby improving traffic flow and driver's safety.

As seen in the results of the Level 3 screening process in Tables 2.8 and 2.9, key trips made along the freeway corridors would realize an increase in speeds and a decrease in travel times. More information regarding individual travel times for each roadway segment and the methodology used to model those times can be found in the *Alternatives Traffic Analysis Technical Memo* in Appendix D.

RA5 Modified

Microsimulation analysis was performed for the RA5 Modified network using the same forecasted trip tables, derived from the SCSWM, that were used in the 2040 No-Build microsimulation analysis. The 2010 HCM defines freeway LOS using vehicle density (vehicles per mile) as the primary measurement.

RA5 would result in LOS improvements to all eastbound and westbound movements in the I-26 corridor except for the segments from Exit 104 (Piney Grove Rd.) to 106 (St. Andrews Rd.) in the eastbound AM peak and the segment from Exit 102 (Lake Murray Blvd.) to 104 (Piney Grove Rd.) in the westbound PM peak. The I-20 corridor would generally realize an overall LOS improvement in both eastbound and westbound movements

except for westbound PM peak between Exits 68 to 63. The I-126 corridor would generally realize LOS improvements in all movements except for the eastbound AM peak, and westbound PM peak densities would improve some over the No-Build condition while remaining at a density corresponding to LOS F between Greystone Boulevard and Colonial Life Boulevard. Refer to following *Roadway Impact Summary* section for comparisons between alternatives.

Geometric benefits of RA5 are found in the reduction in weaving sections around the interchange of I-26 and I-20. Weaving sections with high-volume traffic are present where I-20 eastbound traffic enters I-26 eastbound traffic flow and where I-20 eastbound traffic exits I-26 westbound, at the Bush River Road interchange with I-26 in both directions on the freeway mainline, and at the point on I-26 westbound where traffic from I-126 westbound enters the mainline, among others. Weaving sections contribute to system congestion and act as bottlenecks to traffic flow; they can also be areas where crash risk is elevated. Slow moving traffic, vehicle maneuvers requiring one or more lanes of traffic to cross (weave), and impatient drivers can all contribute to a more frequent rear end and sideswipe crash tendency. RA5 uses collector-distributor lanes and individual flyover ramps to remove these problematic weave segments, thereby improving traffic flow and driver's safety.

As seen in the results of the Level 3 screening process in Tables 2.8 and 2.9, key trips made along the freeway corridors would realize an increase in speeds and a decrease in travel times. More information regarding individual travel times for each roadway segment and the methodology used to model those times can be found in the *Alternatives Traffic Analysis Technical Memo* in Appendix D.

Roadway Impact Summary

Tables 2.8 through 2.10 display a comparison of the levels of service for the No Build and two Reasonable Alternatives.

Table 2.8 2040 I-26 Mainline LOS During Peak Hours[1]

Segment	RA10 (No-Build)		RA1		RA5 Modified	
	AM peak LOS[2]	PM peak	AM peak	PM peak	AM peak	PM peak
I-26 Eastbound						
Exit 101 to Exit 102	F	C	D	C	D	B
Exit 102 to Exit 103	F	D	E	C	E	C
Exit 103 to Exit 104	F	D	D	C	D	C
Exit 104 to Exit 106	F	F	E	C	F	C
Exit 106 to Exit 107	F	F	E	C	D	B
I-126 Diverge to I-126 Merge	E	F	E	B	D	C
Exit 108 to Exit 110	F	F	C	C	C	C
I-26 Westbound						
Exit 110 to Exit 108	D	F	B	C	C	D
I-126 Diverge to I-126 Merge	E	F	B	B	B	B
Exit 107 to Exit 106	D	F	B	C	C	D

Segment	RA10 (No-Build) AM peak LOS[2]	RA10 (No-Build) PM peak	RA1 AM peak	RA1 PM peak	RA5 Modified AM peak	RA5 Modified PM peak
Exit 106 to Exit 104	E	F	C	E	C	D
Exit 104 to Exit 103	D	E	C	D	C	E
Exit 103 to Exit 102	D	E	C	E	C	F
Exit 102 to Exit 101	B	C	B	D	B	D

[1] Carolina Crossroads I-20/26/126 Corridor Improvement Project *Alternatives Traffic Analysis Technical Memo*

[2] Per HCM 2010 criteria for density on Basic Freeway Segments.

Table 2.9 2040 I-20 Mainline LOS During Peak Hours[1]

Segment	RA10 (No-Build) AM peak LOS[2]	RA10 (No-Build) PM peak	RA1 AM peak	RA1 PM peak	RA5 Modified AM peak	RA5 Modified PM peak
I-20 Eastbound						
West of Exit 61	F	B	E	C	E	B
Exit 61 to Exit 63	F	C	D	C	D	C
Exit 63 to Exit 64	C	B	B	A	B	A
Exit 64 to Exit 65	D	C	B	A	B	A
Exit 65 to Exit 68	E	D	E	E	F	D
I-20 Westbound						
Exit 68 to Exit 65	E	F	E	F	E	F
Exit 65 to Exit 64	F	F	A	A	E	F
Exit 64 to Exit 63	E	C	A	A	E	F
Exit 63 to Exit 61	B	E	B	E	A	A
West of Exit 61	B	C	B	C	B	E

[1] Carolina Crossroads I-20/26/126 Corridor Improvement Project *Alternatives Traffic Analysis Technical Memo*

[2] Per HCM 2010 criteria for density on Basic Freeway Segments.

Table 2.10 2040 I-126 LOS During Peak Hours[1]

Segment	RA10 (No-Build) AM peak LOS[2]	RA10 (No-Build) PM peak	RA1 AM peak	RA1 PM peak	RA5 Modified AM peak	RA5 Modified PM peak
I-126 Eastbound						
I-26 to Colonial Life Blvd	D	B	E	B	D	B
Colonial Life Blvd to Greystone Blvd	B	A	E	C	F	C
Greystone Blvd to Huger St	D	B	F	B	F	B
I-126 Westbound						
Huger St to Greystone Blvd	B	F	B	D	B	D
Greystone Blvd to Colonial Life Blvd	B	F	B	E	B	F
Colonial Life Blvd to I-26	C	F	A	D	A	D

[1] Carolina Crossroads I-20/26/126 Corridor Improvement Project *Alternatives Traffic Analysis Technical Memo*
[2] Per HCM 2010 criteria for density on Basic Freeway Segments.

Also noted in the Level 3 Screening Table 2.5, values of Vehicle Miles Traveled (VMT) and Vehicle Hours Traveled (VHT) are reported as measures of effectiveness. With RA1 and RA5, the total number of VMT rises greatly over the RA10 No Build condition. With this project, this is to be expected due to the volume of vehicles that can use the corridor under either RA1 or RA5 Modified conditions. Within the Transmodeler simulations, there is a metric called "Denied Entry Vehicles" which is a count at the end of a simulation of how many vehicles within the total demand volume that did not enter the system due to slow moving traffic and congestion. With improvements to the corridor, more vehicles can enter the system as a result of higher average speeds, therefore increasing the number of vehicles on the corridor over the simulation period. This results in higher VMT and VHT values. The row in Table 2.5 representing VMT/VHT is essentially a measure of the miles per hour for every car in the system across the simulation. This value indicates an overall increase in network speeds in RA1 and RA5 Modified scenarios, signifying improved conditions for motorized traffic over the No-Build scenario.

2.2.8 WERE FACILITIES FOR HOV CONSIDERED IN THE DEVELOPMENT OF THE REASONABLE ALTERNATIVES?

FHWA's *Program Guidance on HOV Facilities* (2016) and the NCHRP, Report 414, *HOV Systems Manual* (1998), identify the following key criteria for HOV lanes:

1. Anticipated Use of the HOV Lane: prefer 400 to 800 vehicles per hour per HOV lane during operating hours of the HOV in order to avoid underutilization.
2. Travel Time Savings: the HOV lane should result in travel time savings of 1 minute per mile over mixed-use lanes and have an overall travel time savings of at least 5 minutes, preferably 8 minutes or more.
3. Congestion Levels: if congestion results in a LOS D or E and average speeds are less than 30 mph, an HOV lane may be warranted.

4. Constraints: if the corridor is either at or near capacity and the physical and/or financial feasibility of expanding the roadway capacity is limited, an HOV lane may be justified.

As detailed in the *Carolina Crossroads Alternatives Development and Screening Report* in Appendix C, the alternatives being considered for the corridor are anticipated to provide improved LOS, speeds and travel times equal to or greater than those an HOV facility could provide in the 2040 design year, and therefore negate the need for an HOV alternative. Key findings from the report include:

1. Regarding anticipated use of an HOV lane, there could be 400 to 800 vehicles per hour (VPH) usage, but this is highly subject to the exceptions associated with the types of vehicles and the occupancy requirements imposed for the HOV lane. Beyond vehicle occupancy of 2+ or 3+, other exceptions may include electric vehicles, transit vehicles, over-the-road buses, energy efficient vehicles, motorcycles, low-emission vehicles, etc. These exceptions can be added or subtracted in order to get the proper amount of lane use, but management of the lane and exceptions is subject to FHWA oversight, requires annual reporting, and requires dedicated staffing.
2. Regarding travel time savings, the projected travel time savings for RA1 and RA5 Modified would meet or exceed the suggested travel time savings benefit of an HOV lane.
3. Regarding congestion levels, the projected LOS in the design year 2040 for RA1 and RA5 Modified would generally be LOS C/D during the AM and PM peak on I-26. In addition, average projected speeds would be approximately 50mph on I-26 during the peak periods, which will not meet the minimum criteria noted above.
4. Regarding physical or financial constraints, the I-26 corridor is currently not unduly limited physically from being expanded as preliminary designs have shown, and the current project budget is capable of supporting the proposed alternatives.

Based on this preliminary analysis, further examination of the inclusion of an HOV lane as a part of the Reasonable Alternatives within the project corridor was not warranted. The benefits to LOS, travel time, and speeds derived from the planned improvements to the corridor via the Reasonable Alternatives, including the Selected Alternative, are projected to offset the need or benefit of including an HOV lane at this time.

2.2.9 WERE OTHER CONGESTION MANAGEMENT PROCESS (CMP) STRATEGIES INCORPORATED INTO THE REASONABLE ALTERNATIVES?

Much of the discussion of the CMP strategies that are defined in the COATS CMP and Columbia Corridors Study is found in Section 2.2.2.1 of this document. A full detailed description of the evaluation of CMP strategies is found in Appendix F, within the *Congestion Management Process Technical Memorandum for Carolina Crossroads I-20/26/126 Corridor Improvement Project.*

Travel Demand Management

The use of Travel Demand Management strategies, while helpful, was not determined to be affected by the scope of this project. TDM approaches were considered in the Level 1 screening step and it was determined that these strategies alone would not be enough to offset growing traffic congestion and other elements outlined in

the project's Purpose and Need. However, SCDOT would implement a congestion management tool/commuter services application to improve mobility during construction and mitigate congestion by informing commuters of available options such as carpooling, ridesharing, vanpools and other transit oriented options.

Mass Transit

Transit within the region has been studied in multiple individual studies, with the conclusions being that CMRTA should focus on local transit route improvements. A dedicated transit system along I-26, I-20, or I-126 is not a part of the RPA; however, SCDOT will further evaluate existing park-and-ride facilities in the study area and will develop a plan to identify and recommend preliminary sites for future implementation to service rideshare commuters. Park-and-ride express routes are also being considered by CMRTA which would utilize the region's interstate highway network to service major employment sites and events. The Northwest (I-26) Express and East (I-20) Richland Express routes are among the park-and-ride express routes to be evaluated by CMRTA.

SCDOT is prepared to assist COMET/CMRTA efforts through such measures as accommodating transit (bus) stops at interchange locations, which may include bus turnouts. Additionally, Amtrak operates a long-distance rail system within the project area and these services will be not be affected by the preferred alternative. In addition, SCDOT would work with CMRTA to monitor bus operations and capacity during construction, and in the event that capacity is reached, SCDOT would provide some funding for enhanced bus service during construction, based upon a framework to be agreed upon with CMRTA.

Alternatives Modes: Bicycle and Pedestrian Transportation

As mentioned in Chapter 1, there is a need for additional bicycle and pedestrian infrastructure within the study area. The proposed Carolina Crossroads project provides an opportunity to enhance existing facilities by creating new connections, primarily found in the City Columbia and the CMCOG plan, *Walk Bike Columbia.*

Construction of any of the alternatives could disrupt bicyclists or pedestrians using existing facilities. However, the impacts would be temporary because all crossings will be accommodated to maintain continuity and access after construction. During construction, SCDOT will coordinate with the local municipalities and/or trail groups to post information on temporary sidewalk or bicycle facility closures or detours. The design of connections to pedestrian and bicycle facilities and the accommodations for planned facilities will be determined as design progresses. Prior to final design, SCDOT will coordinate with the City of Columbia and CMCOG to ensure that existing and planned facilities and their connections identified in the local and regional plans are accommodated where located within the limits of the Carolina Crossroads Project where feasible.

Park-and-Ride

CMRTA completed a *Park-and-Ride Study* in 2010 to determine which areas and specific locations would be best suited for such facilities. Many locations were evaluated within the Carolina Crossroads project corridor, including the I-26 and Broad River Road interchange and the I-26 at St. Andrews Road interchange, which were recommended for implementation.

The COATS 2015 *Congestion Management Plan* (CMP) provides information on the performance of the transportation system within the Columbia metropolitan area, and provides strategy recommendations to manage congestion and enhance mobility and safety. Regional objectives in the CMP include the addition of transit park-and-ride facilities at location(s) on Lake Murray Boulevard between SC 6 and Broad River Road, which crosses I-26; and at Bush River Road in a location(s) between St. Andrews Road and Broad River, which crosses I-20 and I-26.

As part of the proposed Carolina Crossroads project, SCDOT completed a park-and-ride study to identify and recommend preliminary sites for future implementation to service rideshare commuters (Appendix F). Commitments related to park-and-ride are also outlined in Section 2.2.2.2 of this Chapter.

2.3 What was the Recommended Preferred Alternative in the DEIS?

Both Reasonable Alternatives would meet the purpose and need of the project. When comparing the detailed traffic analysis, detailed environmental analysis, input from the public and from elected officials, input from resource and regulatory agencies, constructability factors, and construction costs, the Reasonable Alternative that would best satisfy the public need while minimizing impacts would be RA1.

RA1 meets the purpose of the proposed Carolina Crossroads project, meaning lower average travel time through corridor and higher average speed through corridor compared to RA5 Modified.

Geometric benefits of RA1 are found in the reduction in weaving sections around the interchange of I-26 and I-20. Weaving sections with high-volume traffic are present where I-20 eastbound traffic enters I-26 eastbound traffic flow and where I-20 eastbound traffic exits I-26 westbound, at the Bush River Road interchange with I-26 in both directions on the freeway mainline, and at the point on I-26 westbound where traffic from I-126 westbound enters the mainline, among others. Weaving sections contribute to system congestion and act as bottlenecks to traffic flow; they can also be areas where crash risk is elevated. Slow moving traffic, vehicle maneuvers requiring one or more lanes of traffic to cross (weave), and impatient drivers can all contribute to a more frequent rear end and sideswipe crash tendency. RA1 uses collector-distributor lanes and individual flyover ramps to remove these problematic weave segments, thereby improving traffic flow and driver's safety.

RA1 would have the least property impacts in regards to full acquisitions, the least stream impacts (linear feet), the least wetland impacts (acres), and the lowest construction cost compared to RA5 Modified.

For these reasons, RA1 was identified as the RPA in the DEIS. The full discussion of the Level 3 screening process can be found in Section 4.6 of the *Alternatives Development and Screening Report* (Appendix C). A map of the RPA is provided as Figure 2-5.

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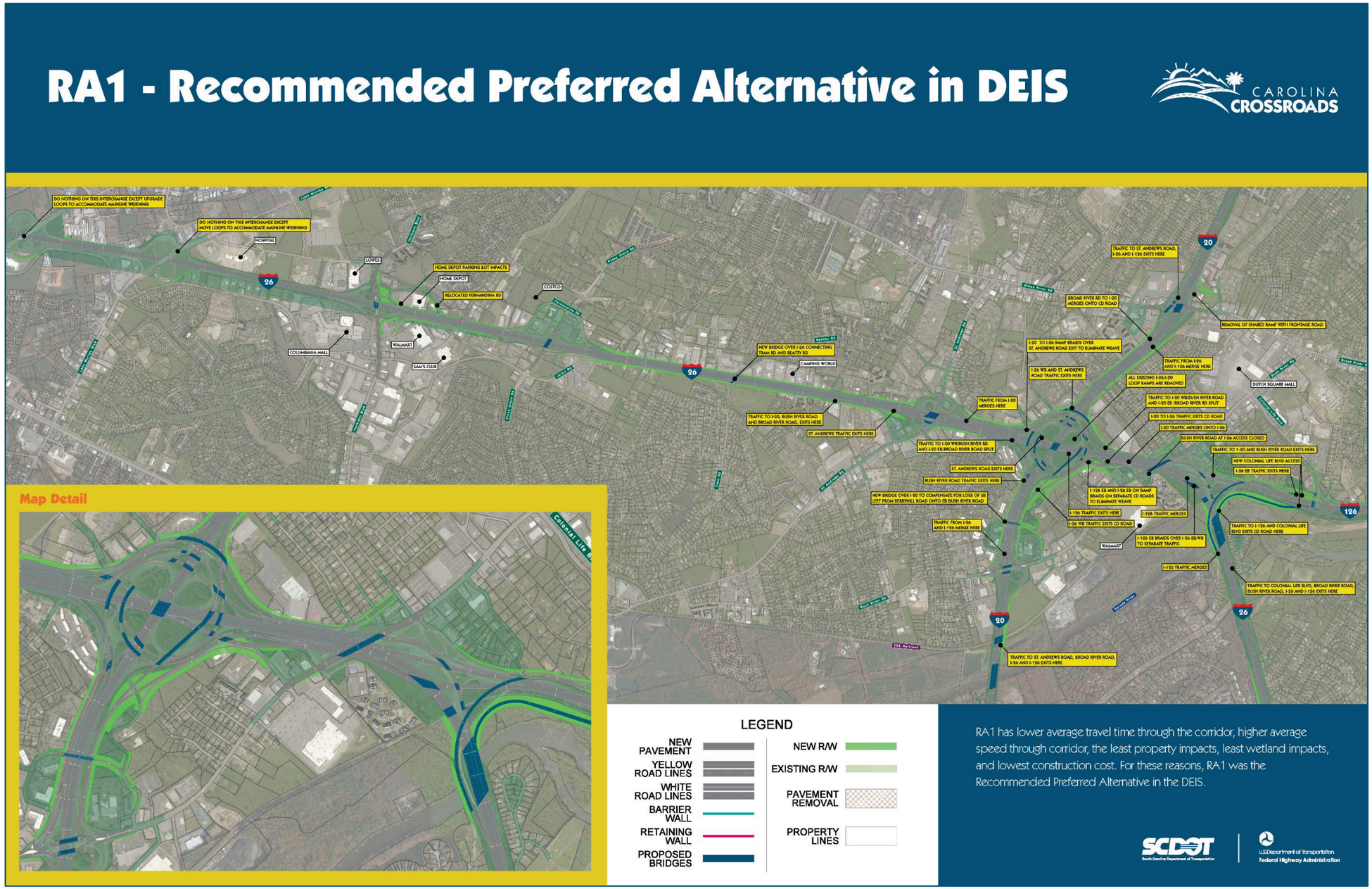

Figure 2-5 Recommended preferred alternative map

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2.4 What changes have been made to the Recommended Preferred Alternative since the DEIS and Public Hearing?

SCDOT and FHWA completed a DEIS detailing the alternatives studied and the potential impacts. The DEIS was issued on July 26, 2018, and a public hearing was held on August 23, 2018. RA1 was presented as the RPA in the DEIS and at the public hearing, and comments were accepted between July 26, 2018 and September 24, 2018.

There was significant public feedback opposing the overpass bridge connecting Tram Road to Beatty Road during the public hearing comment period. Those who were opposed to the bridge did not want it due to the potential for bringing additional traffic in their neighborhoods. While the bridge does not affect the ability of the RPA to meet the primary purpose and need of the project to reduce congestion and improve mobility in the corridor, the removal of this feature would also not significantly affect the ability of this alternative to meet the purpose and need. Therefore, SCDOT elected to refine the RPA and remove the Tram Road/Beatty Road overpass (see Figure2-6B).

Since the DEIS, the overall alignment and footprint of the RPA has not substantially changed. Besides the removal of the Tram Road/Beatty Road overpass, minor refinements have been made, primarily due to minor linework, geometrics revisions and updates to right-of-way lines. In some cases, these further refinements to design elements avoided, reduced, and/or minimized impacts to proposed right-of-way, and are discussed in the following (see Figure 2.6 for reference).

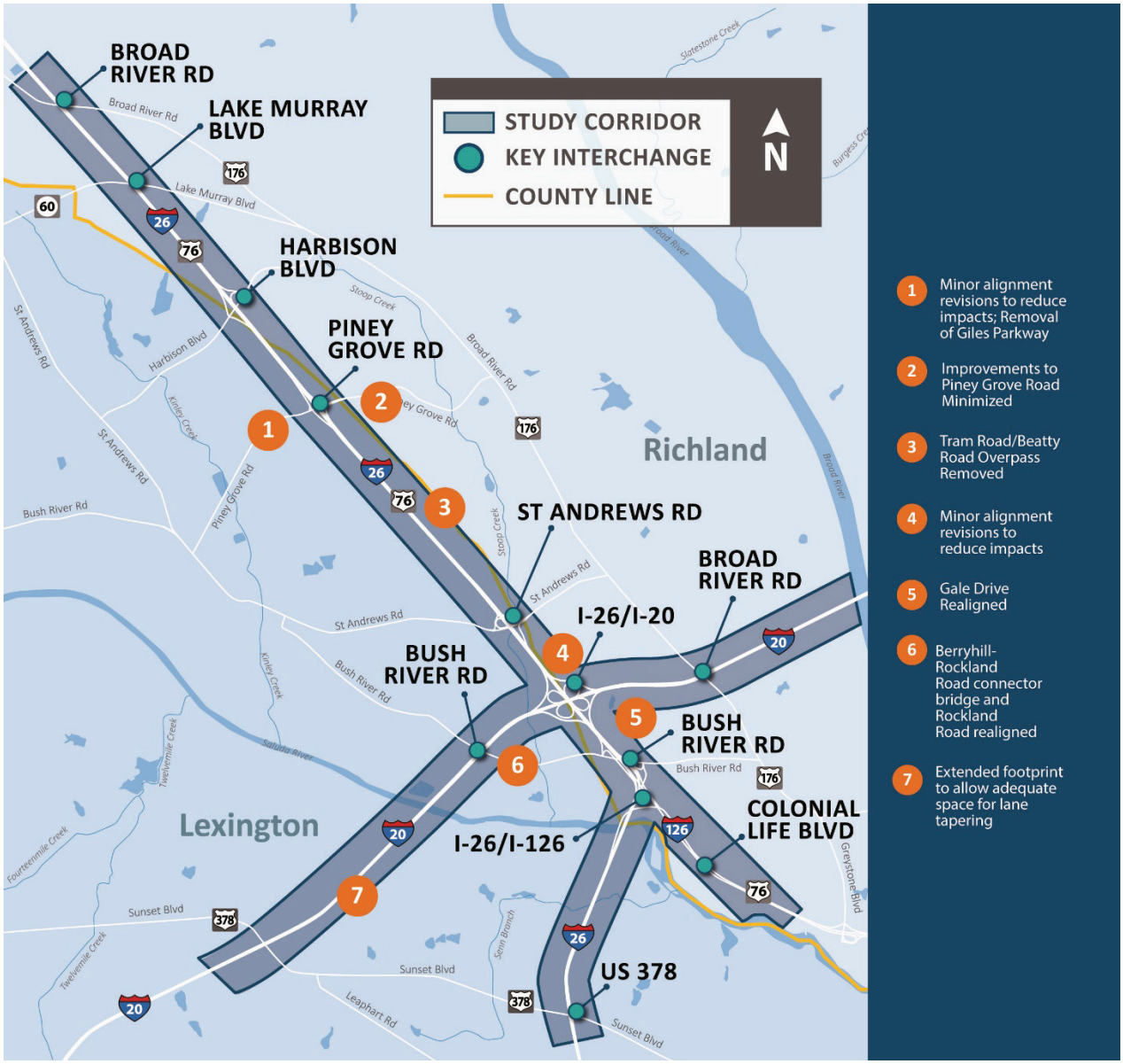

Figure 2-6 Design changes to RA1

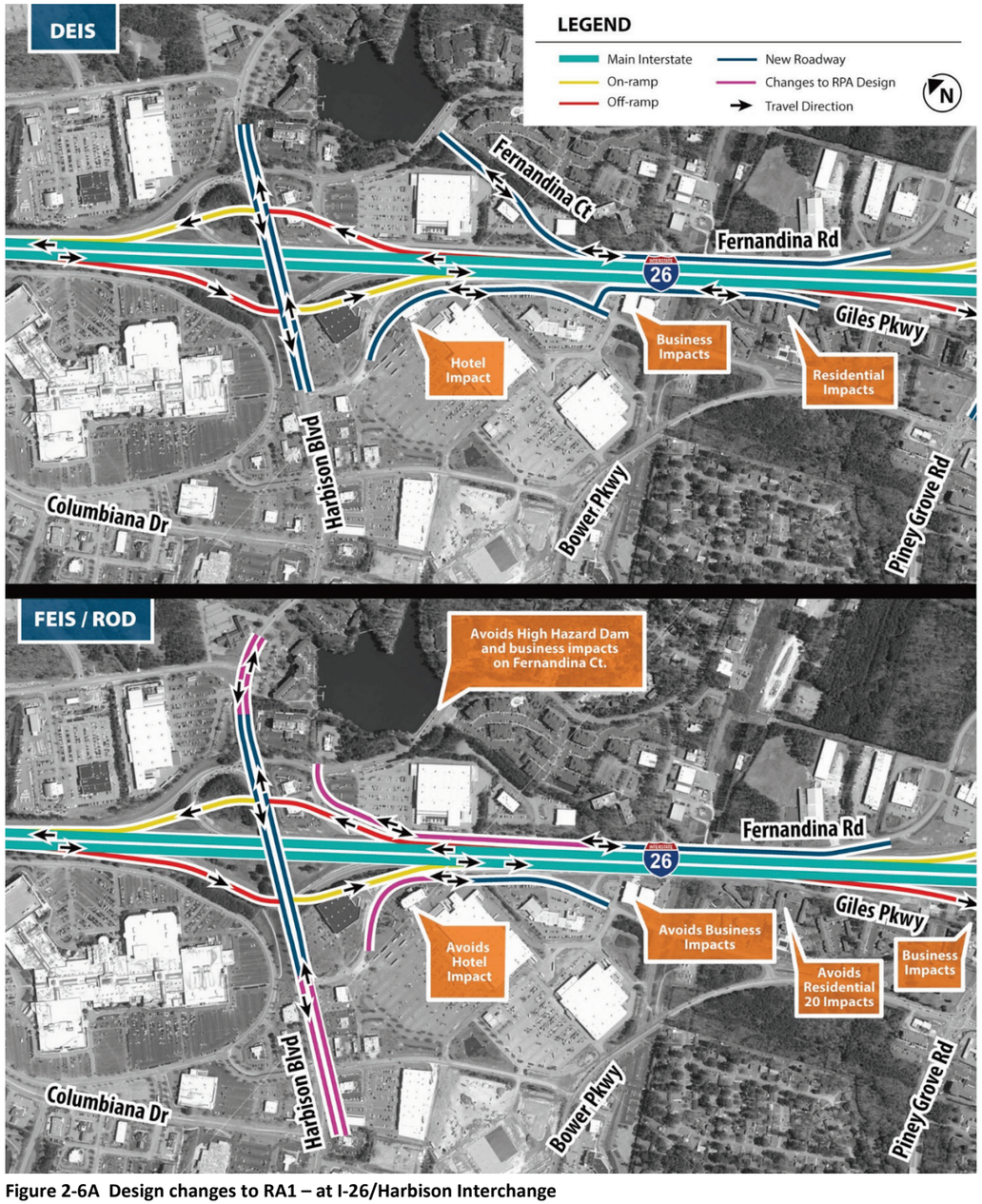

Figure 2-6A Design changes to RA1 – at I-26/Harbison Interchange

1. **Harbison Boulevard:** The following adjustments were made in the vicinity of the Harbison Boulevard Interchange (refer to Figure 2-6A):
    a. Saturn Parkway: Saturn Parkway was shifted to the northeast towards I-26 to avoid relocation of the Comfort Suites Hotel at 750 Saturn Parkway.
    b. Giles Parkway: With the RPA, Giles Parkway was moved farther west to accommodate the new travel lanes on I-26. This resulted in relocation of one strip mall containing up to five businesses at 735 Saturn Parkway, as well as two apartment buildings (20 units total) at the Country Walk Apartments, located between Giles Parkway and Saturn Parkway. In addition, there would be a drainage feature impacted as well as some relocation of utilities needed to maintain Giles Parkway. The purpose of maintaining Giles Parkway was to provide access to Giles Auto Repairs at 609 Giles Parkway. However, it was determined that removal of Giles Parkway would result in one less business and 20 less residential relocations overall, and access would be maintained to the strip mall at 735 Saturn Parkway and Country Walk Apartments via Saturn Parkway. Thus, the RPA was refined to remove Giles Parkway.
    c. Fernandina Road: With the RPA, Fernandina Road was realigned and located between the Home Depot and the 34 Crestmont Apartments along Fernandina Court connecting to Woodcross Drive. However, there is a high-hazard dam adjacent to the intersection of the Fernandina Road with Woodcross Drive. To avoid any potential impacts to this high-hazard dam, the RPA was refined to keep Fernandina Road in its current location until it crosses west over and would impact some parking at Home Depot. This resulted in four less non-residential relocations along Fernandina Court.

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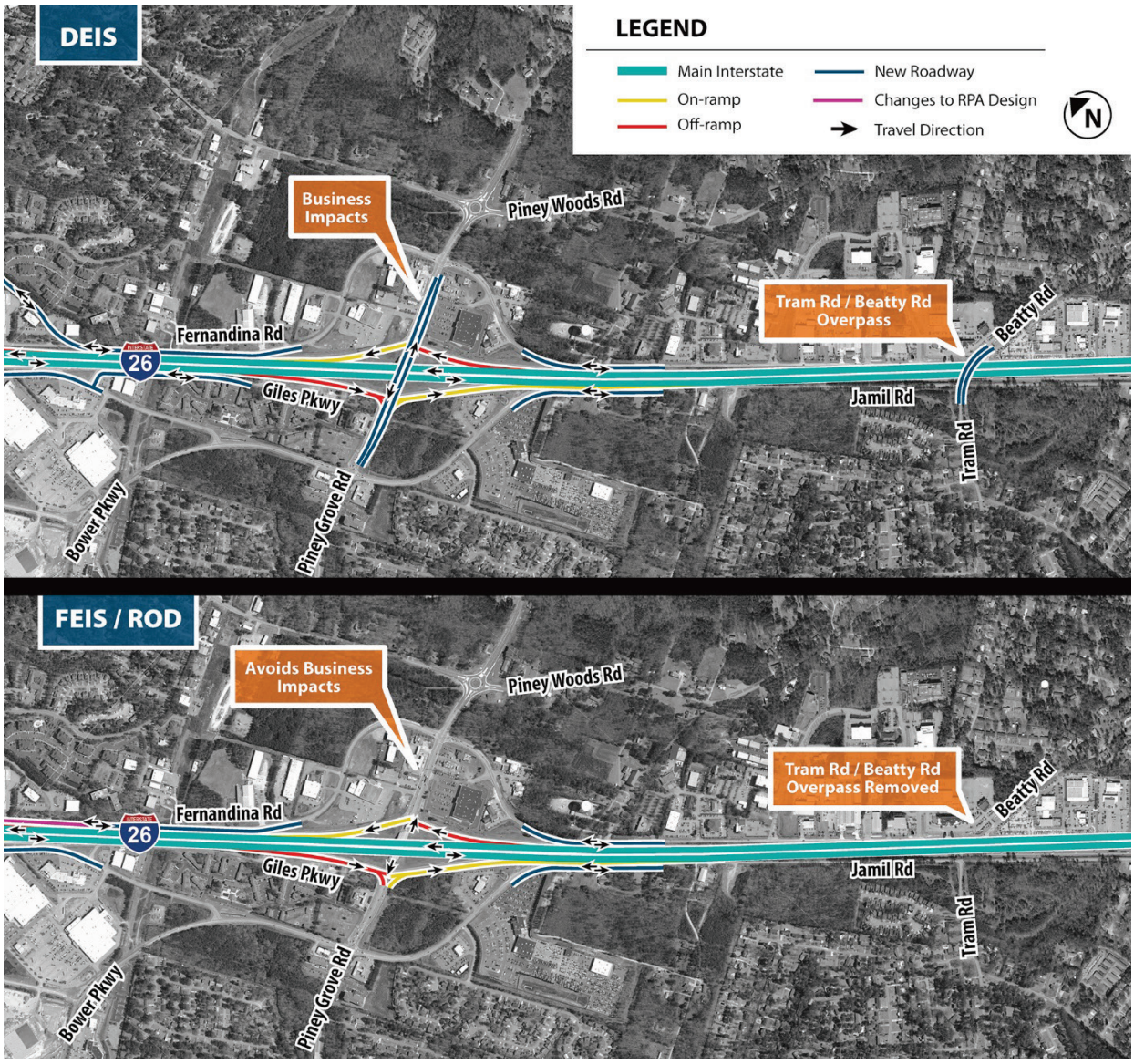

Figure 2-6B Design changes to RA1 – at I-26/Piney Grove Interchange

2. **Piney Grove Road Interchange Adjustments:** At the Piney Grove Road interchange (refer to Figure 2.6B), the RPA had proposed improvements on Piney Grove Road that extended past the I-26 on and off ramp intersections with Piney Grove Road. This included the addition of a second left turn lane for traffic going onto I-26 eastbound. In addition, due to access control, right-of-way acquisition was required on the northeast side of the interchange, requiring the relocation of both the Spinx Gas Station and Waffle House. After the public hearing, control of access was fully evaluated at the Piney Grove Road interchange and it was determined that access control was not needed, and the RPA was refined to remove the access control. This resulted in avoidance of relocating the Spinx Gas Station and Waffle House.

4. **St. Andrews Road Interchange** (refer to Figure 2.6C):

a. In the vicinity of the St. Andrews Road Interchange with I-26, Berryhill Road was realigned (refer to Figure 2-6C). The RPA proposed realigning Berryhill Road further south from the I-26 mainline, resulting in right-of-way impacts to a business as well as Stoney Creek Apartments and Peachtree Place Apartments. With the Refined RPA, the Berryhill Road alignment would be shifted to the north closer to the I-26 mainline thus reducing the overall roadway footprint and impacts to land, parking lots, and other property features along on Berryhill Road.

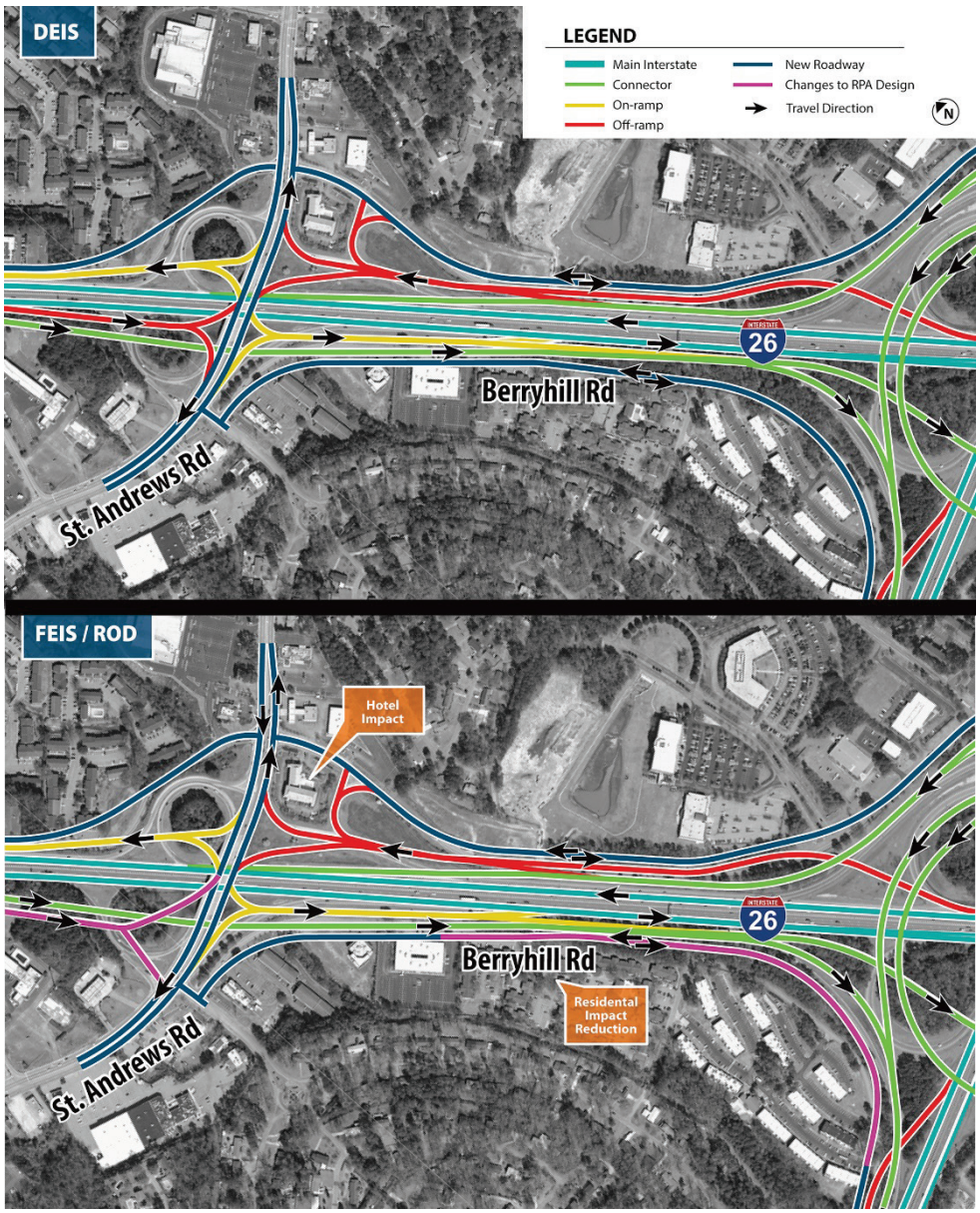

Figure 2-6C Design changes to RA1 – I-26/ St. Andrews Road and Berryhill Road

b. Control of access limits and guidelines were applied to the interchange requiring a full access driveway for the Motel 6 parking lot in the southeast corner of the interchange to be revised to a right-in/right-out driveway. This, in conjunction with significant vertical differences between the surrounding roadways and the parking lot surfaces at the Motel 6, would likely result in significant impacts to the business. Therefore, it was determined that this property would be acquired.

5. **I-20 Mainline in the eastbound direction** (refer to Figure 2.6D):

a. The I-20 westbound alignment near the Broad River Road interchange was adjusted slightly to reduce impacts outside of the existing footprint. These minor shifts reduced actual property impacts but not with respect to relocations or access.

b. Gale Drive Realignment (refer to Figure 2.6D): With the RPA, Gale Drive would have been impacted by the widening of eastbound I-20, which would have eliminated connectivity between Fairhaven Drive, Luster Lane and Morninghill Drive. Gale Drive is being realigned in the Refined RPA to maintain connectivity within the neighborhood road network.

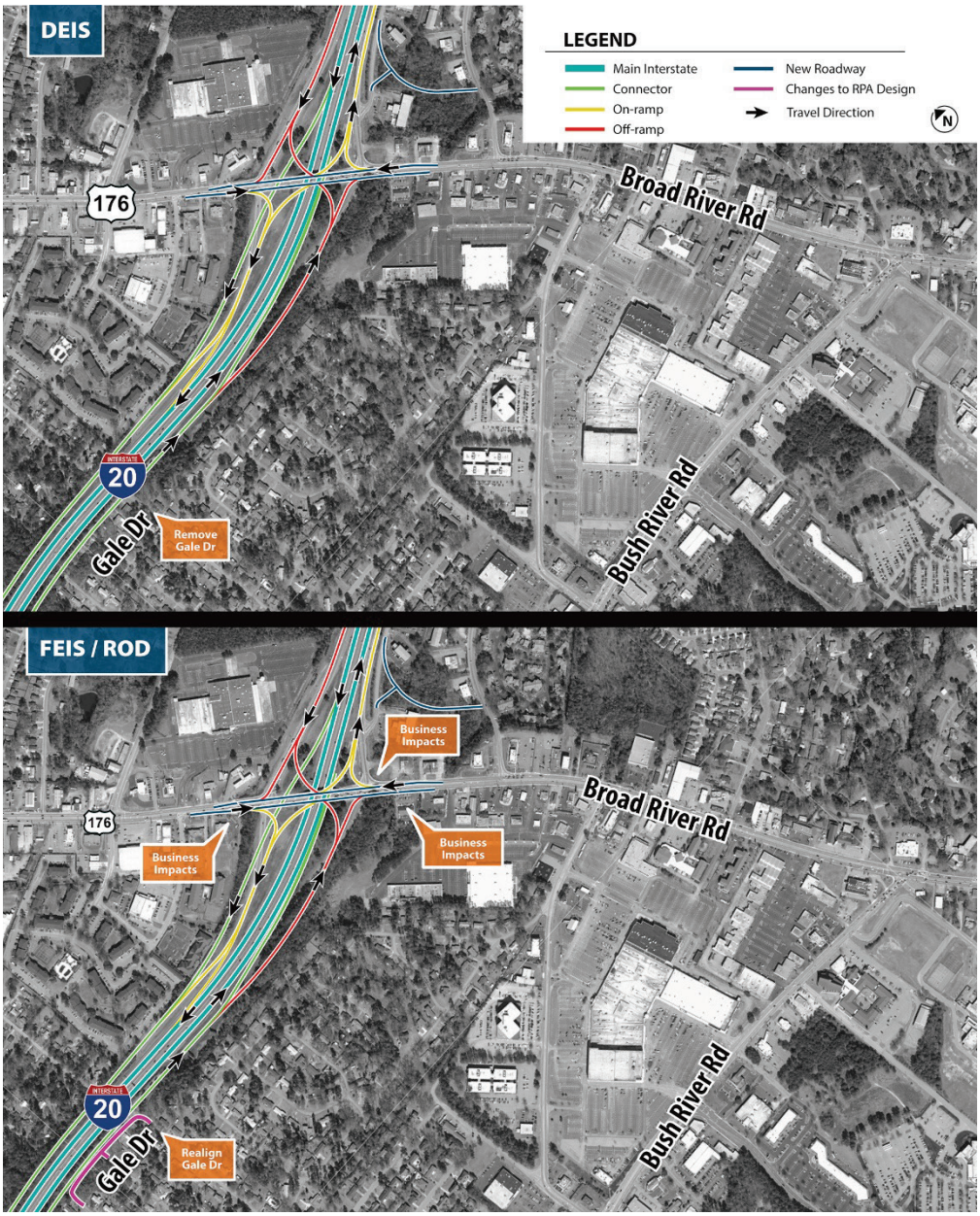

Figure 2-6D Design changes to RA1 – I-20/Broad River Road and Gale Drive Realignment

c. Control of access guidance was applied to the interchange design resulting in additional property relocations. Specifically, access to two vacant gas stations on the southeast quadrant of the interchange would be restricted prohibiting access to Broad River Road. In addition, access to one vacant business in the northwest quadrant would also be restricted. Therefore, it was determined that these properties would be acquired.

6. **I-20/Bush River Road interchange** (refer to Figure 2.6E):

a. In the vicinity of the I-20/Bush River Road interchange area, the connection bridge between Berryhill and Rockland Road has been realigned to the west in order to provide better vertical and horizontal geometric alignment with Berryhill Road. Property impacts to businesses along Berryhill Road would be reduced based on potential vertical restrictions along parking areas and internal business park driveways.

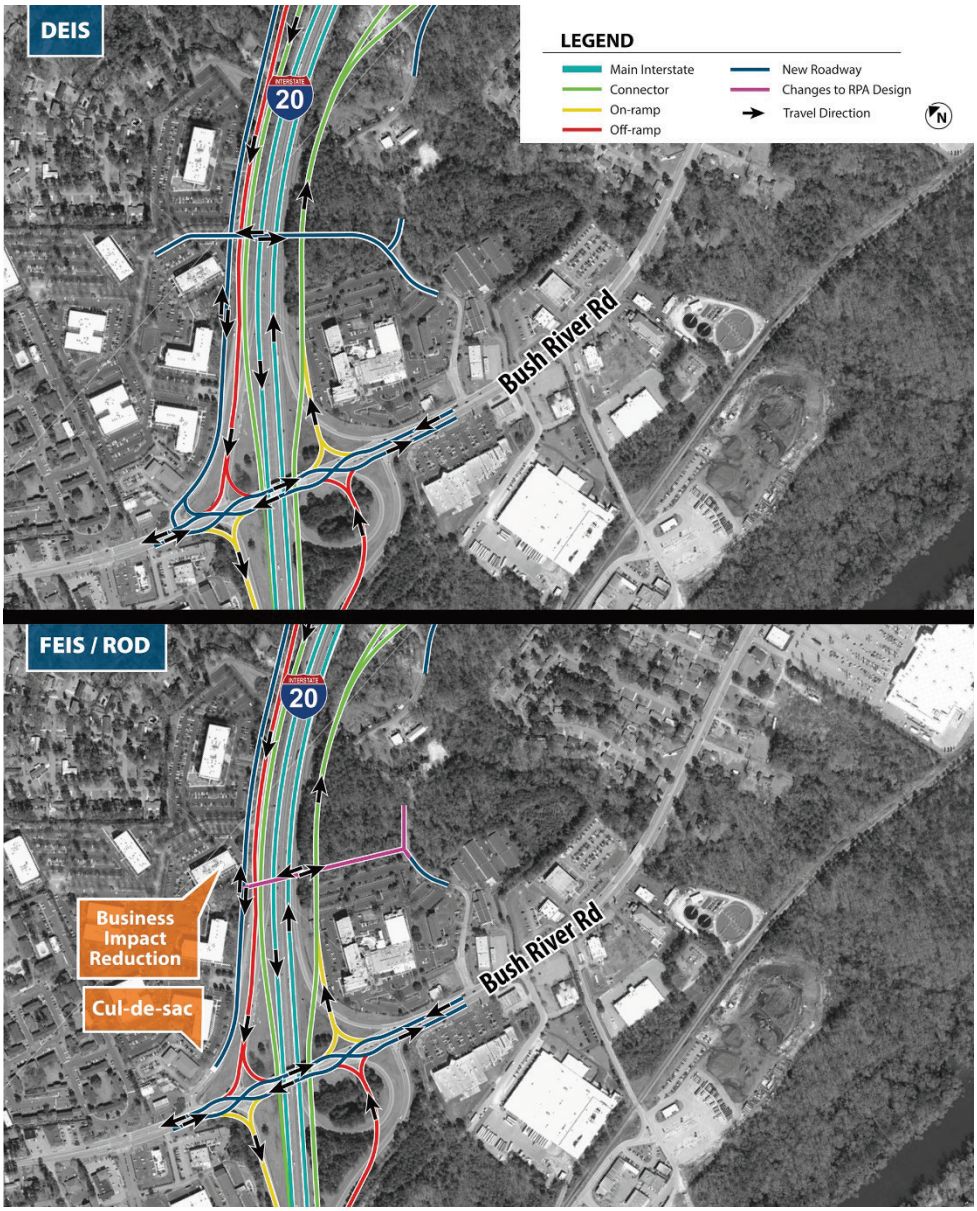

Figure 2-6E Design changes to RA1 – I-20/Bush River Road Interchange

b. Berryhill Road has been revised to provide a cul-de-sac near the current intersection with Bush River Road. This cul-de-sac is required based on geometric constraints with the proposed Bush River Road / I-20 interchange improvements which would not permit access to Berryhill Road without significant property and relocation impacts to the businesses on the northeast side of the interchange. Traffic along Berryhill Road will now access Bush River Road by way of the Berryhill Road and Rockland Road connector bridge and be redirected to a full-access intersection on the southeast side of the interchange at Rockland Road and Bush River Road.

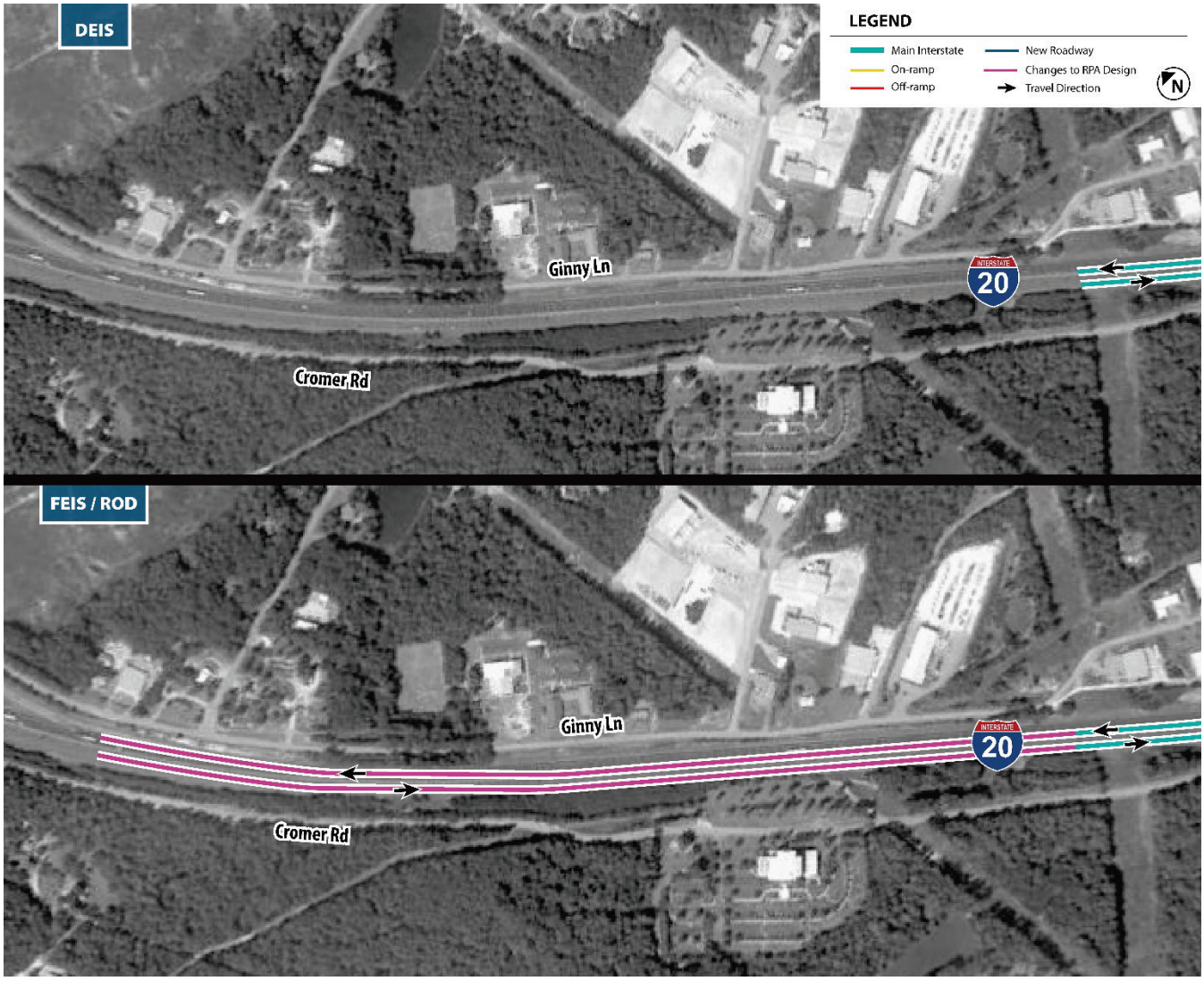

Figure 2-6F Design changes to RA1 – I-20/US 378

7. **I-20 Mainline** in the eastbound direction (refer to Figure 2.6F):
   a. Adjustments to the interstate alignment and ramps between US 378 and I-26 along I-20 have been updated to provide better access to and from I-20. The construction limits within the Refined RPA right-of-way footprint along I-20 eastbound has been extended to provide for additional lane tapers and additional acceleration/auxiliary lane lengths in order to meet current design guidance. Although it does extend the overall construction footprint, no additional right-of-way impacts are associated with this revision.

2.5 What is the Refined Recommended Preferred Alternative?

Although minor adjustments have been made to refine the RPA since the DEIS based on public input and additional technical analysis, the changes are not substantial and the general alignment and function remain the same. Having considered the environmental records (i.e., the Carolina Crossroads DEIS and all associated technical reports), the mitigation measures, the written and oral comments offered by agencies and the public, and the written responses to the comments, it has been determined that RA1, the RPA in the DEIS, with the aforementioned minor refinements is the Refined RPA in the FEIS. The Refined RPA best meets the purpose and need of the project and has been chosen based on its overall benefits to traffic flow throughout the region and on findings of a comprehensive environmental impact evaluation. The revisions to the RPA from the DEIS to the FEIS avoided, reduced and minimized impacts to residences and business by adjusting roadway alignments, interchange configurations, and other geometric elements. A summary of the environmental impacts is shown in the following Table 2.11. Chapter 3 of this FEIS provides a detailed comparison of impacts from the No-build Alternative, the RPA from the DEIS, and the Refined RPA.

Table 2.11 Summary of Environmental Impacts of the RPA and Refined RPA

Minimize Environmental Impacts

		No-Build	Recommended Preferred Alternative from DEIS	Refined RPA
Property Impacts				
Full Acquisitions	Single Family		20	21
	Multi-Family (# of units)	-	90	74
	Retail/Commercial/ Office/Industrial	-	46	47
	Storage (business/units)	-	2 / 1,050	2 / 1,050
	Institutional	-	4	3
	Billboards	-	4	27
Partial Acquisitions	Residential	-	36	36
	Commercial	-	190	190
Section 4(f) Sites Impacted		-	0 (de minimis)	0 (de minimis)
Historic Impacts		-	None	None
Wetland Impacts*	Fill (acres)	-	6.55	6.88
	Ponds	-	0.02	0.01
Stream Impacts* (linear feet)		-	15,750	16,251
Floodplains** (acres)	Zone AE	-	15.94	17.18
	Zone AE - Floodway	-	6.97	7.37
Water Quality*	High Quality Streams (linear feet)	-	2,182	2,567
	Wetlands (acres)	-	2.38	2.39
Hazardous Material Sites		-	18	18
Community Impacts				
Columbiana				
Seven Oaks				
Saluda				
Riverbanks				
Harbison				
St. Andrews				
Broad				
Environmental Justice		-	No	No
Census Blocks (# of blocks)		-	20	19

*Wetland and stream calculations made using preliminary jurisdictional determination
*Wetland and stream calculations reflect impacts from proposed project and do not include existing impacts
**Floodplain impacts in Level 3 Screening are based on proposed project construction limits + 30' buffer at Saluda and 20' buffer in all other locations

Low Impact
Medium Impact
Mobility, Access and Safety
Land Use
Visual/Aesthetics
Community Services
Neighborhoods

2.5.1.1 Traffic Operations for the Refined Recommended Preferred Alternative

Microsimulation analysis was performed for the Refined RPA network due to minor adjustments and refinements made to the microsimulation networks after the completion of the *Alternatives Traffic Analysis Technical Memo* (Appendix D). This microsimulation analysis for the Refined RPA used the same forecasted trip tables, derived from the SCSWM, that were used in the 2040 No-Build and Reasonable Alternatives microsimulation. The 2010 HCM defines freeway LOS using vehicle density (vehicles per mile) as the primary measurement. Tables 2.11 through 2.13 below summarize the 2040 LOS along the mainline interstate segments for the Refined RPA and the No-Build Alternative. In general, the Refined RPA will improve the LOS along the mainline interstate segments for 2040.

Table 2.12 2040 I-26 Mainline LOS During Peak Hours[1]

Segment	RA10 (No-Build)		Refined RPA in the FEIS		RPA from the DEIS[3]	
	AM peak LOS[2]	PM peak	AM peak	PM peak	AM Peak	PM Peak
I-26 Eastbound						
Exit 101 to Exit 102	F	C	E	C	D	C
Exit 102 to Exit 103	F	D	E	C	E	C
Exit 103 to Exit 104	F	D	E	C	D	C
Exit 104 to Exit 106	F	F	D	C	E	C
Exit 106 to Exit 107	F	F	E	C	E	C
Exit 107 to Exit 108	F	F			-	-
I-126 Diverge to I-126 Merge	E	F			E	B
Exit 108 to Exit 110	E	F	C	C	C	C
I-26 Westbound						
Exit 110 to Exit 108	C	F	B	C	B	C
I-126 Diverge to I-126 Merge	E	F	B	B	B	B
Exit 108 to Exit 107	F	F	C	D	-	-
Exit 107 to Exit 106	F	F			B	C
I-26 Merge to Exit 106	-	-			-	-
Exit 106 to Exit 104	F	F	D	F	C	E
Exit 104 to Exit 103	D	F	C	D	C	D
Exit 103 to Exit 102	D	E	C	E	C	E
Exit 102 to Exit 101	C	C	C	D	B	D

[1]Carolina Crossroads I-20/26/126 Corridor Improvement Project ***Interchange Modification Report***

[2] Per HCM 2010 criteria for density on Basic Freeway Segments.

[3]Carolina Crossroads I-20/26/126 Corridor Improvement Project *Alternatives Traffic Analysis Technical Memo*

Table 2.13 2040 I-20 Mainline LOS During Peak Hours[1]

Segment	RA10 (No-Build)		Refined RPA		RPA from the DEIS[3]	
	AM peak LOS[2]	PM peak	AM peak	PM peak	AM Peak	PM Peak
I-20 Eastbound						
West of Exit 61	F	C	E	C	E	C
Exit 61 to Exit 63	F	C	D	B	D	C
Exit 63 to Exit 64	C	D	C	A	B	A
Exit 64 to Exit 65	D	F			B	A
Exit 65 to Exit 68	E	D	F	E	E	E
I-20 Westbound						
Exit 68 to Exit 65	F	F	D	E	E	F
Exit 65 to Exit 64	F	F	A	A	A	A
Exit 64 to Exit 63	F	F			A	A
Exit 63 to Exit 61	C	D	B	F	B	E
West of Exit 61	B	C	B	C	B	C

[1]Carolina Crossroads I-20/26/126 Corridor Improvement Project *Interchange Modification Report*
[2] Per HCM 2010 criteria for density on Basic Freeway Segments.
[3]Carolina Crossroads I-20/26/126 Corridor Improvement Project *Alternatives Traffic Analysis Technical Memo*

Table 2.14 2040 I-126 Mainline LOS During Peak Hours[1]

Segment	RA10 (No-Build)		Refined RPA		RPA from the DEIS[3]	
	AM peak LOS[2]	PM peak	AM peak	PM peak	AM Peak	PM Peak
I-126 Eastbound						
I-26 to Colonial Life Blvd	D	B	D	A	E	B
Colonial Life Blvd to Greystone Blvd	C	B	E	B	E	C
Greystone Blvd to Huger St	D	B	F	B	F	B
I-126 Westbound						
Huger St to Greystone Blvd	B	F	B	D	B	D
Greystone Blvd to Colonial Life Blvd	B	F	B	D	B	E
Colonial Life Blvd to I-26	C	F	B	D	A	D

[1]Carolina Crossroads I-20/26/126 Corridor Improvement Project *Interchange Modification Report*
[2] Per HCM 2010 criteria for density on Basic Freeway Segments.
[3]Carolina Crossroads I-20/26/126 Corridor Improvement Project *Alternatives Traffic Analysis Technical Memo*

2.6 How were the USACE Public Interest Review factors considered?

The USACE's Public Interest Review Factors shown in Table 2.14 below were used to evaluate potential impacts upon the WOUS and how this impact would affect the interests of the public. Many of the USACE's Public Interest Review Factors were quantified and compared during evaluation of the reasonable alternatives, the RPA, and ultimately the Refined RPA, including: land use; consideration of property ownership; wetlands; fish and wildlife; water quality; floodplains; historic properties; and recreation. Some factors, such as shore erosion and accretion, will not be impacted by the project. This information is further detailed in the FEIS as noted in Table 2.15.

Table 2.15 USACE Public Interest Review Factors

Public interest review factor	Reference
Conservation	Chapter 3, Section 3.9, 3.17
Economics	Chapter 3, Section 3.3; Appendix H
Aesthetics	Chapter 3, Section 3.3; Appendix G
General environmental concerns	Chapter 3, Section 3.12
Wetlands	Chapter 3, Section 3.7 and Section 3.9; Appendix L
Historic properties	Chapter 3, Section 3.10 and Section 3.11; Appendix M
Fish and wildlife	Chapter 3, Section 3.9; Appendix L
Flood hazards	Chapter 3, Section 3.8
Floodplains	Chapter 3, Section 3.8; Appendix K
Land use	Chapter 3, Section 3.1
Navigation	Chapter 3, Section 3.18
Recreation	Chapter 3, Section 3.3
Water supply	Chapter 3, Section 3.0 and Section 3.7
Water quality	Chapter 2; Chapter 3, Section 3.6, 3.7, and 3.15; Appendix L
Energy needs	Chapter 3, Section 3.14
Safety	Chapter 1
Food and fiber production	Chapter 3, Section 3.2
Mineral needs	Chapter 3, Section 3.17
Consideration of property ownership	Chapter 3, Section 3.3; Appendix I