# Appendices

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# A - Project Evaluation

*The following provides a summary of the project evaluation criteria and methodology used in evaluating and prioritizing recommended /candidate improvement projects identified in the LRTP planning process.*

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## Table A-1: Project Evaluation Summary Matrix

| Evaluation Criterion (Percent Weight) | | Key Variable(s) | Data Source | Methodology | Measure | Scoring |
|---|---|---|---|---|---|---|
| 1 | CONGESTION RELIEF (20%) | - Peak midblock traffic volumes<br>- Peak midblock traffic volume-over-capacity (V-C Ratio) | CHATS Travel Demand Model | - Development of project groupings or scenarios based on geographic proximity and traffic competitiveness (see Table A-2)<br>- Application of model for project scenarios under 'No Build' and 'Build' conditions | Average change in V-C ratio (delta) between 'No Build' and 'Build' conditions | - Positive impact (i.e. decreased level of congestion) scored high<br>- Negative impact (i.e. increased level of congestion) scored low<br>- Normalized on a 1-10 point scale |
| 2 | SUPPORTS TRANSIT (10%) | - Transit fixed route service type and frequency (buses/peak hour)<br>- Future recommended transit service | - CARTA/TCL fixed route service<br>- LRTP future transit service recommendations | Spatial analysis of existing and recommended transit service intersected by projects | Transit service type and maximum transit service frequency (buses/peak hour) intersecting project | Fixed Route Service:<br>- < 2 buses per peak hour (2 points)<br>- 2-4 buses per peak hour (3 points)<br>- 4-8 buses per peak hour (4 points)<br>- 8-12 buses per peak hour (5 points)<br>- 12+ buses per peak hour (6 points)<br>Express Service:<br>- Existing or recommended express corridor (7 points)<br>Recommended High Capacity Transit service:<br>- BRT Lite corridor (8 points)<br>- BRT corridor (9 points)<br>- LCRT corridor (10 points) |
| 3 | IMPROVES FREIGHT MOBILITY (10%) | - Peak period travel time and Travel Time Index (TTI)<br>- Daily truck volumes | CHATS Travel Demand Model | - Development of project groupings or scenarios based on geographic proximity and traffic competitiveness (see Table A-2)<br>- Application of model for project scenarios under 'No Build' and 'Build' conditions | - Average change in peak travel time index (delta) between 'No Build' and 'Build' conditions<br>- Average daily truck volume on project<br>- Ranked change in TTI [A]; decrease in TTI reflects a positive impact or improvement to freight mobility and vice-versa<br>- Ranked daily truck volume [B] | - Composite score of [A] + [B]<br>- Normalized on a 1-10 point scale |
| 4 | IMPROVES EXISTING INFRASTRUCTURE (10%) | Pavement Quality Index (PQI) | SCDOT Pavement Quality Index (PQI) | Analysis of roadway network PQI data | Average PQI value of proposed project | - Rated Poor 2.4 ≤ PQI ≤ 2.64 (10 points)<br>- Rated Fair 2.65 ≤ PQI ≤ 3.34 or existing roadway facility w/o PQI data (5 points)<br>- Rated Good 3.65 ≤ PQI ≤ 4.69 (3 points)<br>- New roadway facility (1 point) |
| 5 | ADDRESSES SAFETY (8%) | - Vehicular crashes<br>- Pedestrian and bicycle crashes | SCDPS Crash Data (2014-2016) | Spatial analysis of crash data in proximity of project | - Number of vehicular crashes in project proximity; ranked and normalized on 1-5 point scale [A]<br>- Number of bike and pedestrian crashes in project proximity; ranked and normalized on 1-5 point scale [B] | - Composite score of [A] + [B]<br>- Normalized on 1-10 point scale |
| 6 | EVACUATION ROUTE (4%) | Resiliency Score | CommunityViz Model* – Composite Resiliency and Resource Efficiency Analysis | Spatial analysis of composite Resiliency grid score in proximity of project | Average composite Resiliency grid score | - Ranked project average composite Resiliency grid score<br>- Normalized on scale a 1-10 point scale |
| 7 | FINANCIAL VIABILITY (10%) | Project planning level cost estimate | LRTP project cost estimates | Individual project cost divided by total/summed project cost (by project group) | Project cost ratio | - Ranked project cost ratio<br>- Normalized on 1-10 point scale<br><br>*(Projects with a larger cost ratio scored low and vice-versa)* |

**Table A-1: Project Evaluation Summary Matrix (cont.)**

| Evaluation Criterion (Percent Weight) | | Key Variable(s) | Data Source | Methodology | Measure | Scoring |
|---|---|---|---|---|---|---|
| **8** | ENVIRONMENTAL IMPACT MITIGATION (8%) | - Concentration of Vulnerable Population Score<br>- Natural resources features (wetlands, major waterways, streams/rivers, parks) | - CommunityViz Model* – Concentration of Vulnerable Population Analysis (CVP)<br>- National Hydrography Dataset ( NHD) | - Spatial analysis of composite CVP grid score in proximity of project<br>- Spatial analysis of natural resources features intersected by project | - Average composite CVP grid score, ranked and normalized on 1-3 point scale [A]<br>- Natural resources features impacted by project score. Based on sum of impact to wetlands (2 points), major waterways (2 points), parks (2 points) and rivers/streams (1 point) [B] | - Composite score of [A] + [B]<br>- Normalized on a 1-10 point scale<br><br>*(Projects with a higher composite environmental impact scored lower and vice-versa)* |
| **9** | SUPPORTS BICYCLING (3%) | - Existing bicycle facilities<br>- BCD WalkBike Plan recommended bicycle projects | BCD WalkBike Plan | Spatial analysis of existing bicycle infrastructure and recommended bicycle projects in proximity of project | Number of intersecting facilities or recommended projects | - Zero intersecting facilities or projects (0 points)<br>- Intersects with 1 or more existing facility (5 points)<br>- Intersects with 1 or more recommended bicycle project (10 points) |
| **10** | SUPPORTS WALKING (3%) | - Existing pedestrian facilities<br>- BCD WalkBike Plan recommended pedestrian projects | BCD WalkBike Plan | Spatial analysis of existing pedestrian facilities and recommended pedestrian projects in proximity of project | Number of intersecting facilities or recommended projects | - Zero intersecting facilities or projects (0 points)<br>- Intersects with 1 or more existing facility (5 points)<br>- Intersects with 1 or more recommended pedestrian project (10 points) |
| **11** | SUPPORTS LAND USE (7%) | - Land Suitability Analysis Score<br>- Plan Support | - CommunityViz Model* - Land Suitability Analysis (LSA) 2040<br>- Existing Land Use/ Development Plans | - Spatial analysis of LSA 2040 grid score in proximity of project<br>- Project included/supported in existing plans | - Average LSA grid score, ranked and normalized on 1-5 scale [A]<br>- Plan Support score based on if project directly supports existing plan (2 points), somewhat / indirectly supports existing plan (1 point), not mentioned in any plan (0 points), and normalized on 1-5 scale [B] | - Composite score of [A] + [B]<br>- Normalized on a 1-10 point scale |
| **12** | SUPPORTS ECONOMIC DEVELOPMENT (7%) | Employment Density | CHATS Travel Demand Model | Spatial analysis of 2040 TAZ Employment Density (jobs/square mile) supported by project (by proximity) | Maximum 2040 TAZ Employment Density supported by project | - Maximum Employment Density<br>- Normalized on a 1-10 point scale<br><br>*(Projects supporting TAZ with higher employment density scored higher)* |

*Note - (*) See Appendix C for more information on the CommunityViz Model and Land Suitability Analysis conducted as part of the LRTP*

# Scenarios for Evaluating Congestion Relief and Freight Mobility

Utilizing the CHATS Travel Demand Model, this LRTP process engaged in evaluating project scenarios to determine the impact candidate capacity enhancement projects would have on congestion. Each scenario constituted a combination of widening and new facility projects. Widening projects represent adding: new midblock lane(s), new median to an existing lane-configuration or new turning movement lane/s at an intersection. New Roadway projects represent building an all-new: roadway segment, at-grade intersection, or grade-separated interchange.

In order to effectively evaluate candidate projects at an individual project level and to efficiently utilize the capacity of the CHATS Travel Demand Model, a two-dimensional approach was developed to group projects based on these key factors: proximity and competitiveness. *Proximity* represents nearness of projects within a particular subarea while *competitiveness* reflects relative attractiveness of candidate projects to traffic within a larger geography. This approach was established exclusively for midblock roadway improvement projects given their dependency on the application of the model for ascertaining future traffic volumes.

Individual projects that closely interacted among themselves were identified first corresponding to each factor to create exclusive Project Subsets. Each subset was defined in such a way that the influence on individual projects by other concurrent project(s) was minimized. However, some projects were considered to perform independently of other projects and were analyzed as stand-alone and not part of any specific subset. Second, projects in each subset were selectively chosen to comprise different combinations of projects known as Project Schemes. A total of eight schemes were developed and modeled to facilitate evaluation of candidate projects for Congestion Relief. Table A-2 presents Project Scenarios and their respective composition of projects indicated by "X". In the table, alternating shaded rows of multiple projects represent a Project Subset while columns lettered A through H represent Project Schemes.

**Table A-2: Project Scenarios**

| ID | Location | Project Type | Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | A | B | C | D | E | F | G | H |
| **P-1** | Bell Wright Rd Extension | New Roadway | X | | X | | X | X | | |
| **P-7** | Frontage Rd | New Roadway | X | | X | | X | X | X | |
| **P-2** | Bear Island Rd | New Roadway | X | | X | | X | | X | |
| **P-125** | US-78 / 5th St | Widening | X | X | | X | | | X | |
| **P-3** | Black Tom Rd | Widening | X | X | | | X | | | |
| **P-4** | Cane Bay Blvd | Widening | X | X | X | X | | | | |
| **P-16** | Clements Ferry Rd | Widening | X | X | | X | | | | |
| **P-14** | St. Thomas Island Dr | Widening | X | X | | | X | | | |
| **P-6** | College Park Rd Extension | New Roadway | X | | X | | X | | X | |
| **P-11** | Nexton Pkwy | New Roadway | X | | X | X | | X | | |
| **P-9** | Jedburg Rd | Widening | X | X | | | X | | X | X |
| **P-10** | Jedburg Rd | Widening | X | X | | | X | | X | |
| **P-15** | Wildgame Rd | Widening | X | X | | X | | | | X |
| **P-112** | Mallard Rd | Widening | X | X | | | X | | X | |

## Table A-2: Project Scenarios *(cont.)*

| ID | Location | Project Type | Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | A | B | C | D | E | F | G | H |
| **P-31** | All-American Blvd Extension | New Roadway | X | | X | X | | | X | |
| **P-32** | All-American Blvd Extension | New Roadway | X | | X | X | | X | | |
| **P-59** | Ashley Phosphate Rd | Widening | X | X | | X | | | | |
| **P-34** | Cross County Rd | Widening | X | X | | | X | | | |
| **P-35** | Cross County Rd | Widening | X | X | | | X | | | |
| **P-36** | Folly Beach Rd | Widening | X | X | | X | | X | | |
| **P-37** | Folly Beach Rd | Widening | X | X | | X | | | X | |
| **P-38** | Folly Rd | Widening | X | X | | X | | | | |
| **P-39** | Folly Rd | Widening | X | X | | | | X | | |
| **P-42** | Harbor View Rd | Widening | X | X | | | X | | X | |
| **P-40** | Glenn McConnell Pkwy Extension (Phase I) | New Roadway | X | | X | X | | | X | X |
| **P-110** | Glenn McConnell Pkwy Extension (Phase I) | New Roadway | X | | X | X | | | X | |
| **P-111** | Glenn McConnell Pkwy Extension (Phase II) | New Roadway | X | | X | X | | | | X |
| **P-57** | West Bridge Connector Rd | New Roadway | X | | X | X | | | | X |
| **P-123** | Wright Rd | Widening | X | X | | X | | | | X |
| **P-47** | Michaux Parkway | Widening | X | X | | X | | X | | |
| **P-48** | Michaux Pkwy Extension | New Roadway | X | | X | X | | | X | |
| **P-45** | Maybank Highway | Widening | X | X | | X | | | | |
| **P-52** | Sea Island Pkwy/Greenway | New Roadway | X | | X | | X | | | |
| **P-54** | US-17 & Houston Northcutt Blvd Intersection | New X'change | X | | X | | X | | | |
| **P-55** | US-17 / Ravenel Bridge Northbound Off-Ramp | Widening | X | X | | X | | | X | |
| **P-56** | US-17 / Ravenel Bridge Southbound Approach | Widening | X | X | | X | | X | | |
| **P-51** | Sandlapper Pkwy Extension | New Roadway | X | | X | | X | | X | |
| **P-58** | Windsor Hill Pkwy | New Roadway | X | | X | | X | | | X |
| **P-124** | Ladson Rd | Widening | X | X | | | X | | X | |
| **P-115** | Old Fort Dr Extension | New Roadway | X | | X | | X | | | |
| **P-118** | Patriot Blvd | Widening | X | X | | X | | X | | |
| **P-122** | Wescott Blvd | Widening | X | X | | X | | | | |
| **P-107** | Delemar Highway / SC-165 | Widening | X | X | | X | X | X | | |
| **P-108** | Delemar Highway / SC-165 | Widening | X | X | | X | X | | | |

## Table A-2: Project Scenarios *(cont.)*

| ID | Location | Project Type | Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | A | B | C | D | E | F | G | H |
| **P-106** | Central Ave | Widening | X | X | | X | | | | |
| **P-117** | Parsons Rd | Widening | X | X | | | X | | | |
| **P-119** | Summers Corner Connector | New Roadway | X | | X | | X | | | |
| **P-120** | US-17A | Widening | X | X | | X | | X | X | |
| **P-121** | US-17A / Walterboro Rd | Widening | X | X | | X | | X | | |
| **P-113** | Miles Jamison Rd | Widening | X | X | | | X | | | |
| **P-126** | US-78 / 5th St | Widening | X | X | | X | | | | |
| **P-44** | Mall Drive Extension | New Roadway | X | | X | | X | | | |
| **P-43** | Mall Drive | Align Roadway | X | | X | | X | | | |
| **P-33** | Ashley Phosphate Rd Extension | New Roadway | X | | X | X | | X | | |
| **P-5** | College Park Rd | Widening | X | X | | X | | | X | |
| **P-8** | Henry Brown Blvd Extension | New Roadway | X | | X | | | X | X | |
| **P-12** | North Rhett Ave | Widening | X | X | | X | | X | | X |
| **P-13** | Old Mount Holly Rd | Widening | X | X | | X | | | | |
| **P-17** | Old US-52 / Old Fort Rd | Widening | X | X | | X | | | X | |
| **P-18** | US-17A / North Main St | Widening | X | X | | X | X | | | |
| **P-46** | Memorial Dr Extension | New Roadway | X | | X | X | X | | | |
| **P-53** | US-17 | Widening | X | X | | X | X | | | |
| **P-41** | Hagood Ave Extension | New Roadway | X | | X | X | X | | | |
| **P-50** | Remount Rd | Widening | X | X | | X | | | | |
| **P-104** | Beech Hill Rd | Widening | X | X | | | X | | | |
| **P-105** | Boone Hill Rd | Widening | X | X | | X | X | | | |
| **P-109** | Dorchester Rd | Widening | X | X | | X | | X | | |
| **P-114** | North Gum St | New Roadway | X | | X | X | X | | | |
| **P-116** | Old Orangeburg Rd | Widening | X | X | | X | | X | X | |
| **P-49** | Montague Ave | Widening | X | X | | X | | | | |

*Note - Projects grouped in same color represent project subsets and are located in close proximility of each other. Projects with no group color are evaluated as stand-alone or independent projects.*

Note - One page illustrative project description sheet to be
added for each of the fiscally-constrained projects identified in the LRTP.

# B - Implementation Toolkit

*While the transportation improvement project recommendations themselves make up the most essential portion of this plan, the implementation of projects with best practices in mind will make them the most successful.*

*The following resources shared in this section provide general guidance on select "tools" that should be used to implement the proposed LRTP project improvements identified in this Plan. Individual jurisdictions and agencies responsible for implementing projects, are encouraged to adopt the policies or apply the best practices outlined for each of the tools identified in the design and construction of projects.*

# B1 - Complete Streets

# Complete Streets: Preserving Mobility and Providing Balanced Transportation Options

***Why It's Important:***
The design of the region and the downtowns of many of its smaller communities have great potential to provide an interconnected and multi-modal transportation system that includes every type of user. Young, old, zero-car, and disabled/mobility-challenged users will be supported by the network.

***Issues and Barriers to Success:***
While the cost of providing transit services, sidewalks, bicycle facilities, greenways, and safety countermeasures can be prohibitive, often the biggest challenge is internal. Developing a mindset within the people who execute plans, designs, and construction is crucial to successful project implementation. Adoption of a Complete Streets resolution is the first step to demonstrate a commitment to evolve a new approach to planning. The South Carolina Department of Transportation (SCDOT) passed a resolution in 2003 to empower counties and municipalities to"make bicycling and pedestrian improvements an integral part of their transportation planning" when state or federal funding is used.

***Strategies for Improvement:***
There are helpful examples of both policies and standards, such as those published by NACTO (National Association of City Transportation Officials), that the CHATS area can use to develop a Complete Streets program and build on a resolution to support complete streets. The following are some additional "next steps":

***Create and pass a resolution to support Complete Streets.***
Using resolutions passed by SCDOT and the City of Charleston for guidance, adopt a resolution to support Complete Streets.

***Create, adopt, and implement a complete streets planning and design process.***
When evaluating a potential street project, approaching it from the perspective of the community, travelers, economics, community resource enhancement, and other angles besides traffic level-of-service standards is crucial. The chapter in this plan devoted to complete streets policy and standards provides sample language for such a process approach that CHATS could adopt.

***Get trained.***
The National Complete Streets Coalition offers both resources and training for cities that want to take their game to another level. But that training won't help if the decisions that stem from more multi-modal and user perspectives aren't supported by elected officials and top staff. These decisions often involve trade-offs that don't optimize, and may even hurt, vehicular traffic mobility. The decision-making process depends on a sound relationship with the communities and state partners such as SCDOT to recognize that other factors have to compete with vehicular speed and volume. Annual reviews need to include introspective, performance measure-driven reviews of accomplishments and progress towards enacting complete streets objectives.

**Safer Streets, Stronger Economies:**

**Smart Growth America & National Complete Streets Coalition**
This 2015 study lays out a whooping 37 precedent projects that show complete street policies being put into action and positively impacting local economies. A must read for any advocate and policy maker.
*https://www.smartgrowthamerica.org/app/legacy/documents/safer-streets-stronger-economies.pdf*

## *Complete Streets Guidelines*

The number of design guidelines available to the transportation practitioner has greatly increased in recent years. The USDOT (Federal Highway Administration) Manual on Uniform Traffic Control and American Association of Highway and Transportation Officials **(AASHTO)** A Policy on Geometric Design of Highways and Streets have been joined by a plethora of guidance documents prepared by these and other agencies. The following is not a comprehensive listing, but help identify the major guidance for complete street planning and design in common use in North America, and additional resources that are notable in coastal and urban environments like the CHATS planning area.

### American Association of Highway and Transportation Officials (AASHTO)

- A Guide for Achieving Flexibility in Highway Design
- Guide for the Development of Bicycle Facilities
- Guide for the Planning, Design, and Operation of Pedestrian Facilities
- Roadway Lighting Design Guide
- Drainage Manual

### USDOT (Federal Highway and Federal Transit Administrations)

- Revision of Thirteen Controlling Criteria for Design and Documentation of Design Exceptions
- Mitigation Strategies for Design Exceptions
- AASHTO Roadside Design Guide
- Americans with Disabilities Act (ADA) Accessibility Guidelines and Detectable Warnings
- Designing Sidewalks and Trails for Access, Part II, Best Practices Design Guide
- Manual on Pedestrian and Bicycle Connections to Transit

### National Association of City Transportation Officials (NACTO)

- Urban Street Design Guide
- Global Street Design Guide
- Urban Bikeway Design Guide
- Transit Street Design Guide

Additional resources include PedBike.net, National Complete Streets Association, Pedestrian and Bicycle Information Center, National Center for Safe Routes to School, and the book, *"Greenways: A Guide To Planning Design And Development."*

Security resources often fall under the rubric of Crime Prevention through Environmental Design **(CPTED)**, and are available for transit (American Public Transportation Association **(APTA)** recommended practice SS-SIS-RP-007-10) and the book, *"Crime Prevention Through Environmental Design,"* by C. Ray Jeffries. CPTED also offers great design and tips to making the urban environment more secure. The ideal of making better transportation systems loses much of its value when people are afraid to walk outside, navigate through a dark parking lot, or leave their car in on-street parking to patronize businesses. Finally, accessibility standards for those with impaired personal mobility are provided by Americans with Disability Act Accessibility Guidelines and proposed Public Rights of Way Accessibility Guidelines.

The following pages are provided to help the region address some of the more common place situations confronting complete street implementation. Material is arranged simply for linear treatments - "Along the Street" or "spot" treatments - "Across the Street."

In an environment as fundamentally rich and varied as the CHATS planning area the best way to implement complete streets is through a collaborative and consistent process undertaken and led by planning staff, accompanied by the strong participation of SCDOT and partnering entities. To this end, there is one final section on special topics that the region can undertake to more generally support complete street development.

## Complete Streets Context Overview

The Complete Streets Context Overview presents a high-level overview of the functional considerations of Complete Streets design elements; a strong, proactive process must also be the foundation for a consistent application of complete streets principles.

### Context Zone

- Defined by the overall environment and framework of the corridor and surrounding network of streets and adjacent land uses
- Stresses context-specific treatment for three primary areas:
  - Building form and massing
  - Pedestrian space and design treatments
  - Travelway modal integration (bike, walk, transit, & vehicular)

### Travelway Zone

- Defined by the edge of pavement or curb line that traditionally accommodates the travel or parking lanes needed for vehicles in the transportation corridor
- Recommendations focus on modes of travel and medians
- Travelway zone focuses on two objectives:
  - Achieve balance between travel modes sharing the corridor
  - Promote human scale for the street and minimize pedestrian crossing distances and vehicular conflict points / speeds

### Pedestrian Zone

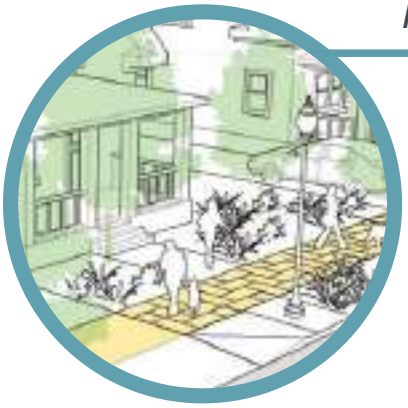
- Extends between the outside edge of the sidewalk and the face-of-curb located along the street
- Quality of the pedestrian realm is achieved through four primary channels:
  - Continuous pedestrian facilities (on both sides of the road if possible) to maximize safety and mobility needs
  - High-quality buffers between pedestrians and moving traffic
  - Safe and convenient opportunities to cross the street
  - Consideration for shade, lighting, and amenities

### Building Zone

- Define and frame the roadway and its purposes
- Streets should serve these adjacent uses, unless the roadway is primarily used for through travelers (focus on reducing or managing conflict points)
- Building scale and massing focus on two areas:
  - Orientation (setbacks, accessibility, etc.)
  - Design & architectural character (height, wall/void ratio, etc.)
  - Ground floor activities, seating, shops, restaurants

## Typical Bike & Ped Treatments to Support Complete Streets

Shown here are typical treatments for both bicycle and pedestrian facilities. These are not all-inclusive, but represent commonplace treatments that align with the issues found most frequently in urban environments. Images and some descriptive elements are provided by the National Association of City Transportation Officials (NACTO) published guidelines, which serve as an excellent resource to policymakers, planners, engineers, and the concerned public (https://nacto.org). Guidance does not replace engineering discretion, common sense, or a complete street mentality: pedestrians and cyclists win any safety-related argument with vehicular performance.



### *Residential Sidewalk*

- Design for a buffer of equal width to the sidewalk
- Standard is five feet in width
- Use colors or textures to demarcate conflict points, intersections
- Permeable pavements and plantings help mitigate stormwater runoff

### *Widen Curb / Painted Sidewalk (Temporary)*

- NACTO describes an extruded curb to buffer pedestrians
- Painted curblines are sometimes used (Eg. Fayetteville, NC) on local streets, but should be considered temporary and signed or plant gateway curb extensions at each intersection to caution and protect pedestrians and motorists
- Construct a permanent sidewalk as funds allow

### *Curb Extensions / Extrusions / Bulb-Outs*

- On-Street parking should extend 1' to 2' beyond edge of curbline
- Useful as gateways to caution motorists of changing conditions, speeds, or levels of pedestrian activity
- Combine curb extensions with stormwater mitigation measures such as bioswales, raingardens

# Typical Bike & Ped Treatments to Support Complete Streets (cont.)

## *Buffered Bike Lanes*

- More appropriate for areas with high crash rates
- Helps to mitigate sideswipe crashes - including with other cyclists
- Nearly 9 in 10 cyclists prefer buffered lanes, and these appeal to wider range of cyclists with varying skill levels
- Needs adequate right of way to avoid door opening-related conflicts with on-street, parked vehicles

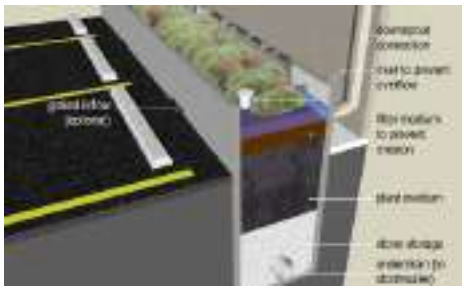
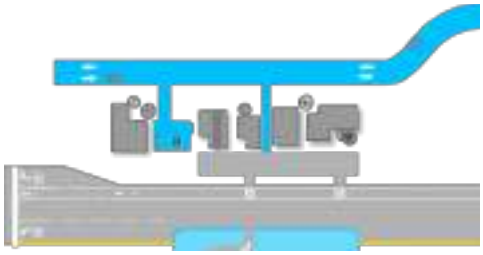
## *Intersection Crossings*

- On-Street bicycle facilities need specialized intersection treatments
- "Elephant's Feet" markings (shown here) or green paint highlighting conflict points with through and turning vehicles reinforce space sharing
- Increases visibility of cyclists and provides additional assurance to cyclists in the delineated space for their travel

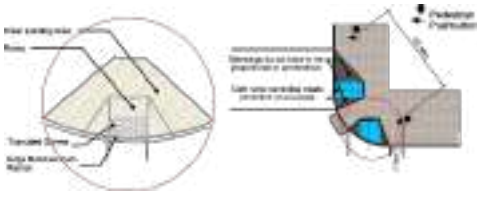
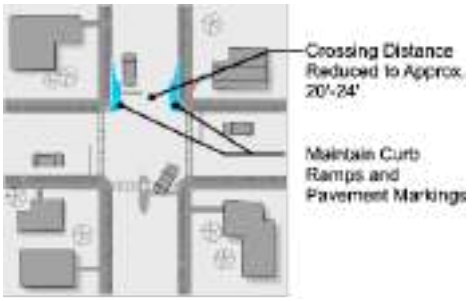
## *Painted Bike Lanes*

- Useful for conflict points such as on-street parking door swing areas, intersection approaches, turning areas, and busy driveways
- Highlights use of space, slows some traffic, discourages illegal parking
- Budget for additional, minor maintenance costs

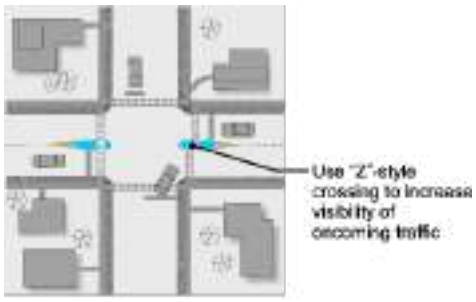
## Along the Street Practices

| What | Where | How | Figure |
|---|---|---|---|
| **Pedestrian and Sidewalk Gaps Infill** | Any street with missing or poorly maintained sidewalk | Fill the gap, replace broken or uneven sidewalk | |
| **Why** | Gap infill Increases connectivity, and offers an opportunity to improve design if cross-slopes (e.g., more than 2%) or substandard conditions are present – but it requires a dedicated funding pool and proactive identification of problems "bundled" into cost-effective repair and construction contracts. Don't prioritize, except for doing low-cost projects first. | | |
| **Improve Management of Stormwater and Street Flooding** | Low-lying areas or streets with historically poor drainage | Storm sewer improvements, raingardens, on-site runoff management, and permeable pavements (note additional maintenance requirements) |  |
| **Why** | Tree canopy and raingardens provide an excellent buffer for the first ½-inch of rainfall, but also creates the attractive streetscape that favors pedestrians and reduces urban heat island effects. Expect and budget for additional maintenance expense. | | |
| **Strong Access Management Policy and Program** | High-crash areas where the frequency and design of driveways create many conflict points for drivers, cyclists, and pedestrians | Close secondary driveways, require side-street access and rear parking in walkable commercial areas; be prepared to compensate loss of driveway access |  |
| **Why** | An ounce of prevention is worth pounds of cure: access management is easier to accomplish in locations where there are no or few developed parcels or existing driveways. Policies that require shared access, backage roads, and full or partial median controls (see graphic) are individually minor but collectively enormous in their impact on safety and reducing traffic congestion (over 25% of traffic delay is caused by crashes in urban areas). | | |

## Across the Street Practices

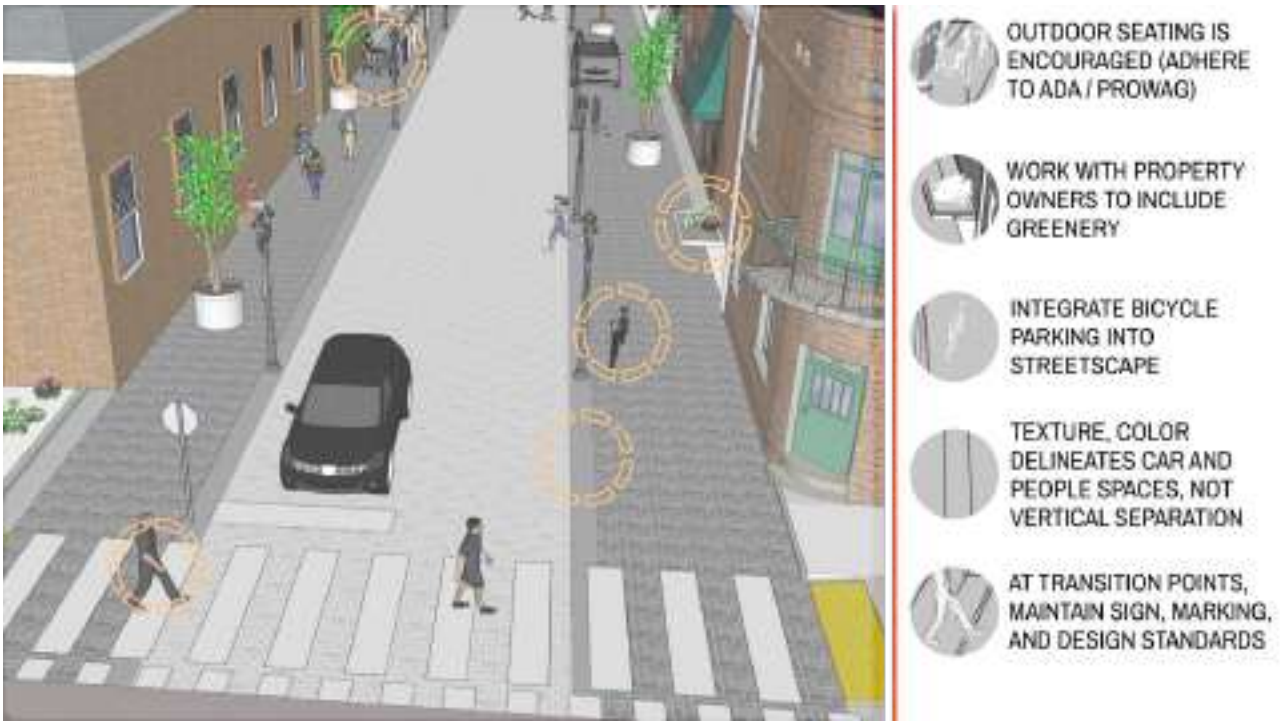
| What | Where | How | Figure |
|---|---|---|---|
| **Ensure Accessibility** | Any street intersection crossing, including freeway ramps | Assess intersections, prioritize improvements, integrate improvements with utility or street maintenance actions |  |
| **Why** | Cities have proactively turned to creating ADA accessibility evaluations, reports, and programs to help populations that are mobility challenged navigate intersections. High numbers of tourists, occasional legal actions, and aging populations add to the urgency of improving accessibility for all populations. | | |
| **Better Access to Public Transportation** | Known high-crash transit stops; any stops with high ridership; stops on busier main streets | Improve lighting, surrounding bike/ped networks, station design elements | <br>1. Taper (25’ – 30’)<br>2. Clearance to Crosswalk (10’)<br>3. Bike Lane to left of bus loading area<br>Source: NACTO |
| **Why** | Incomplete networks of sidewalks, unfavorable stop locations relative to crossings, and other design problems pose threats to riders and translate into lower ridership. The issues are especially problematic on multi-lane roadways where multiple and blind threats present several potential obstacles or hazards to safe access. | | |
| **Curbs that Support Pedestrians** | High-Speed corners in residential areas, schools, or other places where pedestrians often cross | Reduce curb radii to 15’-20’ or use curb extrusions (bulb-outs) to shorten crossing distances and reduce speeds of turning vehicles |  |
| **Why** | Lower speeds at corners translate typically into more rear-end crashes but fewer high-energy turning-type crashes with pedestrians and cyclists. Free-flow right-turn “slip lanes” should be used never or only when necessary to prevent a severe and dangerous queuing condition upstream. | | |

## Across the Street Practices *(cont.)*

<table>
<tr><th>What</th><th>Where</th><th>How</th><th>Figure</th></tr>
<tr><td>Good Intersection Control (choose the right pedestrian crossing option)</td><td>Street crossings, including freeway ramps; assign in part by crash types or crash potential suggested by substandard design elements</td><td>See below</td><td> 
</td></tr>
<tr><td>Why</td><td colspan="3">Pedestrians are told repeatedly to cross at intersections, so the provisions at these locations need to respect their importance since it is the location where pedestrians and cars interact directly. Consider the following ideal minimum standards for identifying crossing treatments:</td></tr>
<tr><td rowspan="6">How</td><td>Crossing Type</td><td>Traffic Volumes</td><td>Primary Design Considerations</td></tr>
<tr><td>Parallel Stripes</td><td>Low</td><td>Signal or STOP control; low pedestrian volumes</td></tr>
<tr><td>High-Visibility Ladder</td><td>Moderate</td><td>Wide, multi-lane crossings; high turn volumes</td></tr>
<tr><td>Median Refuge (see image)</td><td>High</td><td>Ideally use with “Z” crossing to improve visibility</td></tr>
<tr><td>Mid-Block Crossing</td><td>Low-Moderate</td><td>Seldom, high-pedestrian traffic, off-road paths</td></tr>
<tr><td>Traffic Signal</td><td>High</td><td>Meets warrants, improves vehicular traffic operations</td></tr>
</table>

## Specialized Situations - Woonerf

| What | Where | How |
|---|---|---|
| **Woonerf (streets that accommodate cars and people together)** | Highly pedestrian-focused streets that still have to serve very low-speed car traffic (less than 15mph). | Pilot project first; consult with other places that have already gone through the process. |




| | |
|---|---|
| **Why** | While true woonerf streets are rare in the U.S., the concept of mixing pedestrians and (very low-speed) car traffic, including at "naked" (uncontrolled) intersections has application in open street marketplaces and event spaces. |

| | | |
|---|---|---|
| **Complete Street Design Process and Standards** | This program is applicable to every street up to major arterials and freeway classifications. | Additional elements, such as design guidance, should be added after an initial resolution and detailed process have been adopted and put into place. |
| **Why** | The physical elements of complete streets are important to understand, but they are generally well-understood. Adherence to consistent planning and design steps is the soul of making headway in maximizing complete streets in for the area. The City of Charlotte, NC has become renowned for its six-step process and guidance document; this process and many other resources are located on the Complete Streets Coalition section of Smart Growth America *(https://smartgrowthamerica.org/program/national-complete-streets-coalition/).* | |

# complete streets policy development

A ***Complete Streets Policy*** is a formal statement of a commuity's intent to plan, design, improve and maintain streets so they are safe for all users. The policy directs transportation planners and engineers to design and construct the right-of-way to commodate all anticipated users.

The creation of a complete streets policy could be explored initially during a detailed process, preferably embedded within a transportation plan update or as an individual effort focused on complete streets and related policies. This effort ideally should include the inputs of citizens, technical staff, elected/appointed officials, business interests, real estate developers, and other members of the public to ensure a policy tailored to the specific interests and needs of the community.

A "study team" comprised of municipal staff and (possibly) private consulting staff is assumed to be present and technically competent to perform the necessary work that the policy implies. Note also that, since complete streets are part of an overall design objective that includes land use and other elements of the public realm the study team should represent public works, planning/zoning, law enforcement, and other departments within the municipality.

The following is a suggested starting point, and one that is borrowed from established, proven resources such as the Charlotte, NC Complete Streets Policy and National Complete Streets Coalition. The latter is the best starting point for staff to undertake development of their own policy, as well as identifying training, samples of complete streets policies from around the country, and other resources to help communities understand the importance, development, and effects of a complete streets policy.

**The National Complete Streets Coalition notes that the following are ten vital components of a policy framework to ensure that streets are designed for everyone, at every age, at every level of physical ability.**

1. ***Vision:*** The policy establishes a motivating vision for why the community wants Complete Streets: to improve safety, promote better health, make overall travel more efficient, improve the convenience of choices, or for other reasons.
2. ***All users and modes:*** The policy specifies that "all modes" includes walking, bicycling, riding public transportation, driving trucks, buses and automobiles and "all users" includes people of all ages and abilities.
3. ***All projects and phases:*** All types of transportation projects are subject to the policy, including design, planning, construction, maintenance, and operations of new and existing streets and facilities.
4. ***Clear, accountable exceptions:*** Any exceptions to the policy are specified and approved by a high-level official.
5. ***Network:*** The policy recognizes the need to create a comprehensive, integrated and connected network for all modes and encourages street connectivity.
6. ***Jurisdiction:*** All other agencies that govern transportation activities can clearly understand the policy's application and may be involved in the process as appropriate.
7. ***Design:*** The policy recommends use of the latest and best design criteria and guidelines, while recognizing the need for design flexibility to balance user needs in context.
8. ***Context sensitivity:*** The current and planned context—buildings, land use, transportation, and community needs—is considered when planning and designing transportation solutions.
9. ***Performance measures:*** The policy includes performance standards with measurable outcomes.
10. ***Implementation steps:*** Specific next steps for implementing the policy are described.

# sample process guidance

## COMPLETE STREETS ARE STREETS FOR EVERYONE

*"This Complete Streets Policy shall direct the [Town/City/County] to develop and provide a safe and accessible, well-connected, and visually attractive surface transportation network that balances the needs of all users, including motorists, pedestrians, bicyclists, public transportation users, emergency vehicles, freight carriers and land uses, and promote a more livable community for people of all ages and abilities, including children, youth, families, older adults and individuals with disabilities."*

***Sample Vision Statement (Park Forest, IL)***

*Note - Refer also to existing Complete Streets documents published by Charlotte, NC; Nashville, TN, and the National Complete Streets Coalition.*

A commitment to Complete Streets acknowledges that each street is unique and should be designed in response to the needs of the community and land uses that it serve. For successful implementation, complete streets should be integrated into the routine planning, design, operation and maintenance of our street network at all levels. The following provides a general approach to how Complete Streets can be applied as a core, guiding principle in how transportation improvements are identified, evaluated and developed with all users and all modes of travel in mind. This process reflects the ten concepts identified previously, and is intentionally condensed to make it as simple and as broadly applicable as possible. This general process can be applied in the development of all transportation improvement projects including capacity enhancement, intersection improvement and access managment projects, as well as corridor studies identified in the LRTP.

### Step 1.0

Technical Inventory of the Street and Surroundings. The study team will develop a description of the project area/corridor that includes at a minimum the building types, densities, character, setbacks, and historic properties on adjacent lands as well as nearby and connected sidestreets. The subject corridor will be described in terms of geometry (lane widths, speed limits, design speed, cross-section(s), volumes of users by mode, signalization, crossing treatments, accommodations / demand for public transportation, walking, and bicycle users), crash histories from the most recent 3-to-5-year period, and a conditions analysis that includes safety/security, mobility/performance, and maintenance elements. A brief synopsis of the demographics of workers and residents in the corridor that includes comparisons to the larger geography (e.g., municipality or county) will also be included, mentioning age, race/ethnicity, language spoken at home, and income levels, at a minimum.

***Technical Products:*** Crash mapping; aerial photography underplaying labeled buildings/ structures; zoning / land use map; transit stop locations; multimodal level-of-service analysis using accepted methods such as MUTCD and Florida DOT Quality/Level-of-Service. Future demand and automobile performance measures may also be available through travel demand model outputs. A summary of the existing conditions, including adopted plans, policies, and "pipeline" actions, will complete this step but remain internal to the study team pending completion of Step 2.0.

## Step 2.0

Community Context. The study team will work with representatives of the community, preferably in a collaborative process (e.g., workshop or charrette) to enhance the understanding of the corridor and its strengths, challenges, and opportunities. The output of this public exercise will include the following:

- Barriers, including poor access, lighting, inadequate street crossings, dangerous conditions, and lack of capacity for users such as transit stops, turning lanes, and pedestrian crossing distances greater than 1,000 feet apart;
- Opportunities and Resources, such as parks, schools, office complexes, shopping centers, underutilized spaces, and underutilized parking areas; and
- Aesthetics, especially elements that support alternative modes of travel as well as businesses/customers, such as streetscaping, street furniture, pedestrian-scale lighting, wayfinding.

The public forum will also work to identify and weight community objectives that reflect the importance of answering concerns about mobility, access, safety, security, environment, economics, and other impact areas that the street may directly or indirectly influence through its design.

***Technical Products:*** SWOT (Strength, Weakness, Opportunity, Threat) mapping generated by the public stakeholders; and a set of technical performance metrics that specifically address those issues.

Examples include: car/bus travel time ratio; travel time/average speeds; intersection delays crossing the street; auto/pedestrian/ bicycle/transit Q/LOS values (see Step 1.0); economic return-on-investment; vacancy rates; ADAAG / PROWAG (mobility-challenged user requirements) accessibility issues; maintenance concerns per 1,000 feet; crash / injury rate compared to comparable streets elsewhere; conflict points per 1,000 feet; estimated emissions; mode shares; ratings by residents and business owners on satisfaction with street characteristics (e.g., freight/delivery, bike/walk access, aesthetics, parking, etc.), incidence of violent and non-violent crimes, ratio of sidewalks to street centerline miles (2.0 maximum). Other performance metrics are described here, and in many other places.

The final product of this step is a draft Existing Conditions+Directions Report summarizing both the technical assessment (Step 1.0) and public-driven assessment (Step 2.0); the final section should contain specific "directions" for the remainder of the project, including design criteria, performance measures/targets, and specific preservation, enhancement, and avoidance goals. Ideally, this entire "report" is less than five pages in length, including 1-2 maps and written in clear, accessible language (translations to languages other than English may be warranted depending on the demographics of those residing and working in the corridor).

## Step 3.0

Selection of a Preferred Option. Unlike other practices narrowly defined by the street itself, the preferred option in a complete street study should (1) include actions outside the street right-of-way, including development, zoning, and other policy actions; and (2) clearly identify options that were considered and why they were not chosen based on performance measures, alignment with current plan/policy, and/or alignment with public/stakeholder input from Step 2.0. At a minimum, documentation describing the selection process should answer

the following questions:

- How does the preferred option compare to other considered options in terms of the performance measures selected for the project and public inputs?
- What were the public comments on the preferred option, and how did the study team respond to each of the main categories of commentary? How did the comments change the design, policy, or other recommendations contained in the project plan? In order to answer this question a public forum has to be held specifically to review the preferred option, effectively and inclusively getting public input from the affected communities.
- A conceptual corridor map should be created on an aerial map (1 inch=200 feet) describing the structures, design features, resources, aesthetic/streetscape improvements, and multimodal treatments throughout the corridor. A separate map and accompanying text may contain descriptions of cross-access between properties and other access management treatments; suggested land use/design recommendations/policies; wayfinding/ gateway treatments, and other suggestions that support identified economic and community goals.
- Any changes to adopted plans, policies, ordinances, or other existing documentation to bring them into compliance with the recommendations should also be briefly identified.

***Technical Products:*** The total report, building on the Existing Conditions+Directions report from Step 2.0, will be as brief as possible without sacrificing a thorough response to the above elements; no more than 10-20 pages in length is suggested.

Additional details that may lengthen the final report include the following:

(1) The most important aspects of the report are contained in an explicit set of design criteria that will be carried forward into final design and construction bid documentation to ensure that the major elements of the study that are important to the community are fairly reflected in the ultimate product; and

(2) Specific design elements, such as crossing treatments, on-road bicycle facilities, signal improvements, intersection improvements, ADAAG/PROWAAG-related improvements, cross-access / access management features, and the like have to be clearly identified so that they can be implemented during private development actions as well as during street reconstruction, maintenance, and utility actions taken by the local and state governments.

# B2 - Access Management

# Managing Access

The proactive management of vehicular access points to land parcels from various roadway types promotes safe and efficient use of the transportation network. *Access Management* maintains mobility or preserves the functional integrity, and overall operational viability of street and road systems (USDOT/FHWA). The resources in this chapter are intended to serve as a framework for access management policies that should be adopted by local agencies in the region, and applied in the development and implementation or roadway improvement projects.

To the extent these guidelines conflict with state law, or rules, regulations or ordinances adopted by the agencies, the state law or adopted municipal law controls.

One of the many jobs of transportation professionals is to preserve and, where possible, enhance roadway capacity. Often, roads that are intented to provide access to quiet residential areas can, over time and if not well managed, be negatively affected by through traffic. The same happens to large roadways that were designed to carry many cars and trucks quickly over long distances when there are too many driveways and cross-streets that increase the interaction of competing users, through stopping and turing movements, which ultimately impede mobility. Many of the issues encountered in many areas within the region can be traced back to this issue of roads no longer serving their intended function well.

It is therefore good practice to (a) recognize a hierarchy of streets that preserve their function as mobility carriers of through traffic, and other roads that principally serve or provide connection to adjacent land uses such as homes, shopping centers, and businesses; and (b) proactively manage access to and from these roads to preserve their capacity, reduce user conflicts, improve safety, and decrease vehicular delay.

The intent of the access management guidelines that follow is to provide basic requirements and language that can be adopted by local agencies. It is recommended that planning agencies adopt mandatory ordinances so that ordinances are reasonably convenient and provide suitable access to land abutting the road system. Appropriate access management will protect the substantial public investment in the area roadway system and reduce the future need for construction measures that are costly to taxpayers, the environment, and local residents and businesses.

Requests regarding access locations and /or new median openings requested as part of a development application will be coordinated between planning agencies and SCDOT (South Carolina Department of Transportation).

## *Definitions*

The terms defined in the local municipal ordinances are binding and control. The terms set forth by SCDOT Manual for Constructing Driveway Entrances on State Highways and SCDOT Region Office also control to the extent applicable. If not defined therein, these definitions apply. To the extent these definitions conflict with Zoning or Subdivision Ordinances, or SCDOT Manuals, the definitions set forth in such documents shall control.

***Access*** – A public or private roadway used to enter or leave a public highway from adjacent land using an on-road motor vehicle. An access may be a driveway or a street.

***Access Point*** – The intersection of an existing or proposed access with the public right of way.

***AADT (Average annual daily traffic)*** – The total two-way yearly traffic volume on a section of roadway, divided by 365; often referred to as the average daily traffic (ADT).

***Change of Land Use*** – Any proposed property use that is different from the current use of the property, or current use that is different than the use identified in a preexisting driveway permit.

***Connectivity*** – A term used to infer connections between adjoining properties for vehicular and/or pedestrian usage.

***Corner Clearance*** – The minimum distance, measured parallel to a highway, between the nearest curb, pavement or shoulder line of an intersecting public way and the nearest edge of a driveway excluding its radii.

***Cross-Access*** – A service drive providing vehicular access between two or more continuous properties so that the driver need not enter the public street system to travel between adjacent uses.

***Directional Median Opening*** – An opening in a restrictive median which provides for U-turns and or left-turn ingress or egress movements.

***Driveway*** – An entrance used by vehicular traffic to access property abutting a street. As used in this guideline, the term includes private residential, non-residential, and mixed-use driveways.

***Driveway Throat*** – The portion of a driveway between the public road and the internal circulation system or area where parking maneuvers occur.

***Frontage*** – The length along the street right-of-way line of a single property tract or roadside development area between the edges of the property lines.

***Full Median Opening*** – An opening in a restrictive median that allows all turning and through movements to be made.

***ITE*** – Institute of Transportation Engineers.

***Joint Driveway*** – A single access point connecting two or more contiguous sites to a public roadway that serves more than one property or development, including those in different ownership or in which access rights are provided in legal descriptions.

***Major Intersection*** – An intersection with high volumes exceeding the MUTCD warrants for signalization.

***Median*** – The portion of a divided highway separating the traveled ways for traffic in opposing directions.

***MUTCD*** – Manual on Uniform Traffic Control Devices.

***SCDOT*** – South Carolina Department of Transportation.

Posted Speed – The speed limit set and maintained by the SCDOT or Charleston.

***Sight Distance*** – This is the area that establishes a clear line of sight for a waiting vehicle to see on-coming traffic and make turning movements into or out of a street or driveway connection safely or for traffic to see entering or waiting vehicles.

***Storage Length*** – Additional lane footage added to a turning lane to hold the maximum number of vehicles likely during a peak period so as not to interfere with through travel lanes.

***Throat Length*** – The distance between the edge of the nearest travel lane to the near edge of an internal drive interior to the site that represents the first opportunity for a car to make a turn into a parking lot.

All connections in the area should aim to, subject to provisions in the zoning code, subdivision code, and municipal code, exceed the minimum connection spacing requirements as specified in the table below. Spacing between driveways or medians shall be measured along the right-of-way line between the tangent projection of the inside edges of adjacent driveways, opposite street driveways or median openings.

Regional municipalities may reduce the connection spacing requirements for situations where they prove impractical, but subject to adopted ordinances, in no case shall the permitted spacing be less than 85% of the standard.

For sites with insufficient road frontage to meet minimum spacing requirements, consideration should first be given to providing access via connection to a side street, utilization of a joint or shared driveway with an adjacent property that meets the recommended spacing requirement, or development of a service road to serve multiple properties.

**Table B-1: Recommended Minimum Spacing Requirement**

| Posted Speed Limit | Signal Spacing | Full Median Spacing | Directional Median Opening | Adjacent Driveway Spacing | Opposite Street Driveway |
|---|---|---|---|---|---|
| > 45MPH | 2,000 ft | 2,000 ft | 1,000 ft | 500 ft | 500 ft |
| 26-44 MPH | 1,200 ft | 1,200 ft | 600 ft | 100 ft | 100 ft |
| < 25 MPH | 600 ft | 600 ft | 300 ft | 100 ft | 100 ft |

Local agencies in coordination with the SCDOT, may grant access approval for a permanent use not meeting the spacing requirements of these guidelines on an interim basis if an access plan is submitted that demonstrates how spacing requirements will ultimately be met and appropriate assurances in the form of a recordable and enforceable easement of access agreement will be provided insuring future provision of a conforming access. Deviation from these spacing standards may be permitted at the discretion of municipalities in cooperation with the SCDOT where the effect would enhance the safety and operation of the roadway. Examples might include a pair of one-way driveways in lieu of a two-way driveway, or alignment of median openings with existing access connections.

All road and driveway connections to a single parcel should be brought into compliance with the minimum connection spacing requirements set forth in the guidelines when the lane use(s) on the single parcel is modified or expanded.

The SCDOT may additionally prohibit, restrict, or modify the placement of any connection, at any time, to a single property in the interest of public safety and mobility on state-maintained roadways.

### *Corner Clearances*

Corner clearance is the distance between an intersection and the first point of ingress or egress to a corner property's driveway. The purpose of corner clearance is to remove conflicting movements from the functional area of intersections and provide sufficient stacking space for queued vehicles at intersections so that the driveways are not blocked. No driveway will be permitted to enter directly into an intersection. Driveways should turn traffic into the traffic stream of the highway and/or intersecting road or street before it is permitted to pass through the intersection.

*The minimum corner clearance for entrances* should be established by a queuing analysis or 100 feet for unsignalized intersections and 125 feet for signalized intersections, whichever is larger. Approved exceptions at intersections without provisions for sight distance or clear vision areas (flared right-of-way) should prohibit driveway connections within 50 feet of the highway, crossroad, or street from the outside shoulder of the adjacent street and access will be a right-in/right-out. Exceptions may be approved if as a result of the action the property would become landlocked. No part of a driveway entrance or exit should be permitted within a corner radius.

Near a signalized intersection, the location for a full movement driveway connection may be required to exceed the minimum spacing requirements set forth in the guidelines to avoid interference with the operations of the traffic signal and resulting traffic queues. The radius of a full movement driveway connection shall not encroach on the minimum corner clearance.

The minimum lot size for any new corner lot created through the subdivision process should be of adequate size to provide for the minimum corner spacing as specified in the guidelines.

## *Joint and Cross Access*

### *Non-residential and Mixed-Use Projects*

Adjacent land uses classified as major traffic generators should provide a cross access drive and pedestrian access to allow circulation between sites. Major trip generators attract a minimum of 100 additional vehicle trips during the peak of the adjacent roadway or a development.

A system of joint use driveways and cross access easements should be established if deemed feasible by the municipal agencies and the building site should incorporate the following:

1. A continuous service drive or cross access corridor extending the entire length of the property frontage and to provide driveway separation in order to provide the minimum spacing requirements as contained in the guidelines.
2. A design speed of ten miles per hour and sufficient width to accommodate two-way travel aisles designed to accommodate automobiles, service vehicles, and loading vehicles.
3. Stub-out connections and other design features that make it visually obvious that the abutting properties may be tied-in to provide cross access via a service drive.
4. A unified access and circulation system plan that includes coordinated or shared-use parking areas wherever feasible.
5. The property owner shall record an easement with the deed for the property that allows cross access to and from other properties served by a joint use driveway, cross-access, or service drive.
6. The property owner shall record a joint maintenance agreement with the deed for the property defining maintenance responsibilities of the adjacent property owners.

### *Residential Projects*

Residential subdivisions with fronting along the primary roadway system shall be designed with combined access points, alley access, or derive access from the side streets to the highway. Normally a maximum of two access points shall be allowed regardless of the number of lots served.

The property owner shall enter in to a written agreement with the agency, recorded with the deed for the property, that pre-existing connections along the frontage will be closed and eliminated after construction of joint use driveways.The agency may modify or waive the requirements of this section where the characteristics of abutting properties would make joint use driveways or a shared access circulation system impractical, provided that all the following requirements are met:

1. Joint access driveways and cross access easements are provided wherever feasible.
2. The site plan incorporates a unified access and circulation system.

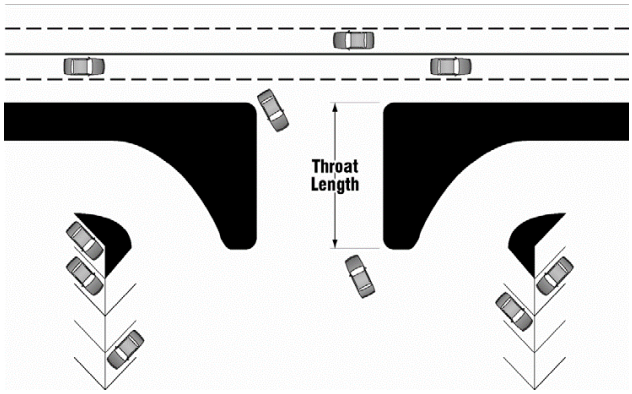
## *Median Openings*

No new median openings should be allowed along roadways with an existing center median unless it is in conformance with latest edition of the Access Management guidelines published by the South Carolina DOT or in conformance with the generally applicable ordinances adopted by the municipalities, where applicable.

In all circumstances, new median openings shall not encroach on the functional area of an existing median opening or intersection. Approval of any new opening lies ultimately with the SCDOT Traffic Engineering Branch or with local agencies, where applicable.

Minimum criteria for evaluating a request for a new median opening should attempt to include at least the following:

1. Median openings shall not be located where intersection sight distance (both vertical and horizontal) cannot meet current design criteria required by the SCDOT or AASHTO Green Book.
2. Median openings shall not be placed in areas where the grade of the crossover will exceed five percent. Special consideration should be given to the vertical profile of any proposed new median opening that has the potential for future signalization.




| SITE ACTIVITY | THROAT LENGTHS | |
|---|---|---|
| | Minor | Major |
| Regional Shopping Centers (Malls) | 250′ | 250′ |
| Community Shopping Center (Supermarket, Drug Store) | 80′ | 100′ |
| Small Strip Shopping Center | 30′ | 100′ |
| Regional Office Complex | 250′ | 250′ |
| Office Center | 80′ | 100′ |
| Small Commercial Developments | 30′ | 100′ |

3. A median opening shall not be provided where the median width is less than sixteen feet.
4. Median openings that require a traffic signal, or where one may be expected in the future, should be avoided.
5. It is the responsibility of the property owner to provide the justification for new median openings.

## *Sight Distance Requirements*

Subject to adopted ordinances, driveways should not be permitted to connect with any highway, road, street or frontage road at a location if it does not meet the minimum stopping sight distance criteria, based on vertical or horizontal alignment, terrain or other reasons which will cause an undue hazard to the traveling public.

Any driveway application that does not provide adequate sight distance as outlined in the South Carolina Roadway Design Guidelines should be denied. In order to provide adequate sight distance in both directions when entering the should be at a 90 degree angle. Angles less than 90 degrees should not be constructed unless justified by an engineering analysis and should not be less than 60 degrees with the highway.

## *Additional Design Criteria*

***Throat Length Distances:*** The connection depth of a driveway (throat length) as measured from the edge of the abutting roadway to the near edge of the internal circulation road or buffer area should be of sufficient length to allow a driver to enter the site without interfering with the mainline of traffic. The Figure below shows the minimum throat lengths based on both site activities as well as the category of adjacent roadway (either minor or major thoroughfare).

***Offset Access Connections:*** On undivided roadway segments, access connections on opposing sides of the highway should be offset at an adequate distance to minimize overlapping left turns and other maneuvers that may result in safety hazards or operational problems.

***Auxiliary Lanes:*** Auxiliary lanes (left or right turn lanes) should be required for new driveways where they meet the SCDOT or ITE warrants.

***Out-Parcel Access:*** All access to an out-parcel shall be internalized using the shared circulation system of the principle development. Access to out-parcels shall be designed to avoid excessive movement across

parking aisles and queuing across surrounding parking and driving aisles.

***Minimum On-Site Vehicle Storage Area:*** Adequate storage must be provided within the internal circulation system for properties that include either a drop-off loop or drive-through facility so that vehicles do not queue onto the highway system. Specific storage areas will be determined by the applicable local agencies in cooperation with the SCDOT on a case-by-case basis during the development review process. However, the following minimum storage lengths are recommended for specific development types:

1. For single-lane drive-in banks, storage to accommodate a minimum queue of six vehicles will be provided. Banks having several drive-in service windows will have storage to accommodate a minimum of four vehicles per service lane.
2. For single-lane drive-through full service car washes, storage to accommodate a minimum of twelve vehicles will be provided. Automatic or self service car washes having a multi-bay design will have a minimum vehicle storage length of three vehicles per bay.
3. For fast-food restaurants with drive-in window service, storage within the site to accommodate a minimum of eight vehicles per service lane from the menu board/ ordering station will be provided.
4. For service stations where the pump islands are parallel to the pavement edge, a minimum setback of 35 feet between the pump islands and the public right-of-way will be provided. For service stations where the pump islands are not parallel to the pavement edge, minimum vehicle storage of 50 feet in length between the pump islands and the public right-of-way will be provided.
5. For land uses that require an entry transaction or have service attendants, gates or other entry control devices, the vehicle storage will have an adequate length so that entering vehicles do not queue back on the adjacent right-of-way. No portion of a parking area, attendant booth, gates, signing or parking activity shall encroach on the public right-of-way.
6. For schools, adequate storage for parental drop-off and pick-up areas should be provided entirely on the school campus site.

***Crossroad Access Spacing at Interchanges:*** Minimum access spacing on crossroads for freeway interchange areas is an option for avoiding traffic backups and providing safe maneuvering distances for turning and weaving vehicles to enter the appropriate lanes. It is recommended that no driveway intersection, or median opening, should be allowed less than 500 feet from the end of the taper of the ramp furthest from the interchange. If the proposed distances are less than the minimum spacing then a written justification demonstrating why the recommended distances cannot be met should be submitted to the agency and SCDOT for approval as an exception.

***Traffic Study:*** A traffic study may be required by local ordinances or the SCDOT to evaluate one or all access locations proposed in a development application. The estimated trip generation shall be based on the latest edition of the ITE Trip Generation Report. If required, the traffic study shall be completed in conformance with the minimum rules and procedures set forth in the Access Management Guidelines (SCDOT) or in local standards, as applicable.

***Business Impact Mitigation:*** An important aspect of minimizing the impact of access management projects and medians is to maintain open access to businesses during the construction phase. Potential actions to mitigate construction impacts include:

1. Clearly sign business entrances from the roadway;
2. Provide temporary and/or secondary business access points, where feasible;
3. Schedule construction during after business hours or during times of low usage for seasonally oriented businesses;

4. Avoid blocking business entrances with construction equipment or construction barriers;
5. Provide alternative parking, if possible and avoid taking or blocking parking spaces;
6. Establish a single point of contact in the agency about the construction project to communicate with property and business owners; and
7. Provide regular project progress reports to business and property owners.

# B3 - Stormwater BMPs Design Guidelines

# Stormwater BMPs

## *(Best Management Practices)*

The CHATS planning area is surrounded by natural and manmade barriers, none more prevalent then water. In fact, most of what is now called the Peninsula is actually built on reclaimed land, a lot of which was formally mashland and old creek beds. As such, stormwater issues prevail throughout the area. During heavy rain or storm events (hurricanes) mass flooding persists. Even light rains can create problems without positive flow and drainage relief. The topography of this area provides little relief from one area to the other which also poses a challenge to area drainage. In addition to the relatively flat topography, the area's downstream systems are inadequately sized to handle significant storm events. The result of which is both roadway and ditch/yard flooding along key corridors and area streets.

### *Recommendations and Best Practices*

An important factor in the design of our streets is the impact that stormwater has on their operations and safety, as well as that of nearby homes and businesses. The Stormwater Best Management Practices (BMPs) summarized in this section provide a collection of generic stormwater BMPs for potential use along flood-prone roadways within the area. The proposed stormwater BMPs provide a range of stormwater volume and pollution control tools. Many BMPs have the potential to be scalable to match the discharge volumes, pollutant loads, and anticipated site conditions.

Development of a BMP Infrastructure Plan is encouraged which emphasizes structural BMPs and incorporates both Green-Infrastructure ("GI") and Low-Impact Development ("LID") techniques. This document could be incorporated within the development document standards for the local agencies, and used by the Town/City/County during private development site plan reviews and municipal capital improvement projects. The BMP Infrastructure Plan should be updated as new regulations and guidelines are implemented and accepted by SC DHEC and the engineering community.

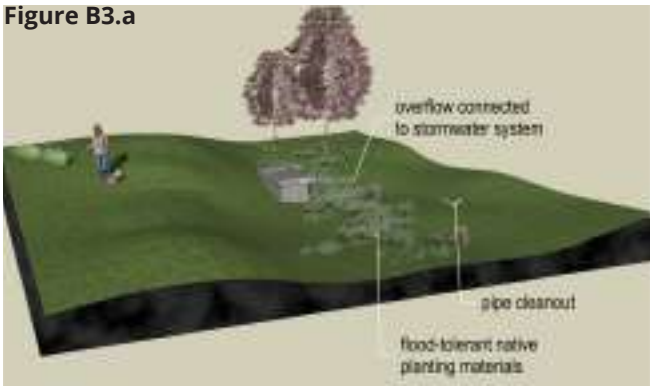
Integrating BMPs into new development and redevelopment begins at the planning level. Careful site planning includes reducing the amount of directly connected impervious areas, fitting the proposed improvements to the site terrain, preserving and using the natural drainage systems, and planning to replicate pre-development hydrology. Developers and contractors can do even more during site construction to help manage quality and volume of stormwater flows. Minimizing site disturbance and compaction; retaining natural vegetation, minimizing parking areas and curb-and-gutter internal drainage controls in favor of vegetated swales, and maintaining natural buffers and drainage ways typically provide as great an impact as post-construction BMPs.

### *Examples of Common Stormwater Management Measures*

The following descriptions and images help describe three of the more commonplace categories of BMP measures recommended for area streets.

**Dry Stormwater Detention Ponds:** Dry Stormwater Detention Ponds provide temporary storage of stormwater runoff. Dry

**Figure B3.a**



ponds have an outlet structure that detains runoff inflows and promotes the settlement of pollutants. Unlike wet ponds, dry detention ponds do not have a permanent pool. A dry pond is designed as a multistage facility that provides runoff storage and attenuation for both stormwater quality and quantity. The lower stages of a dry pond are controlled by outlets designed to detain the stormwater runoff for the water quality volume for a minimum duration of 24 hours, which allow sediment particles and associated pollutants to settle out. The example in Figure B3.a includes overflow drainage connected to the stormwater system as well as a pipe cleanout box. These areas may be connected to greenways, but visually separated with a berm and signage since the downslope areas are obviously associated with periodic flooding.

**Planter Boxes:** Planter Boxes are bioretention treatment control measures that are completely contained within an impermeable structure with an underdrain (they do not infiltrate). The boxes can be comprised of a variety of materials, such as brick or concrete, and are usually chosen to be the same material as the adjacent building or sidewalk. Planter boxes are filled with gravel on the bottom to house an underdrain system, planting soil media, and vegetation. As stormwater passes down through the planting soil, pollutants are filtered, adsorbed, and biodegraded by the soil and plants. Figure B3.b includes drainage to the stormwater system as well as inlets from an adjacent parking area and building downspout.

**Subsurface Infiltration Systems:** Subsurface Infiltration Systems are underground systems that capture and infiltrate runoff into the groundwater through highly permeable rock and gravel. It is usually not practical to infiltrate runoff at the same rate that it is generated; therefore, these facilities generally include both a storage component and a drainage component.

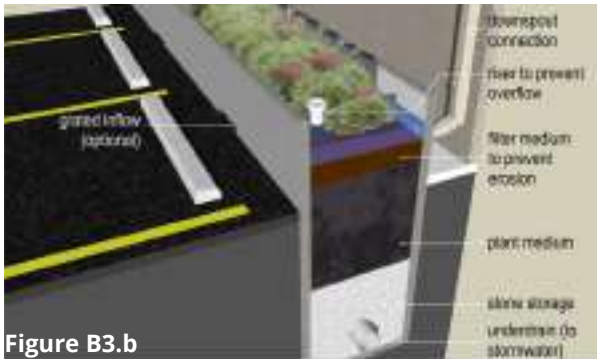


Figure B3.b

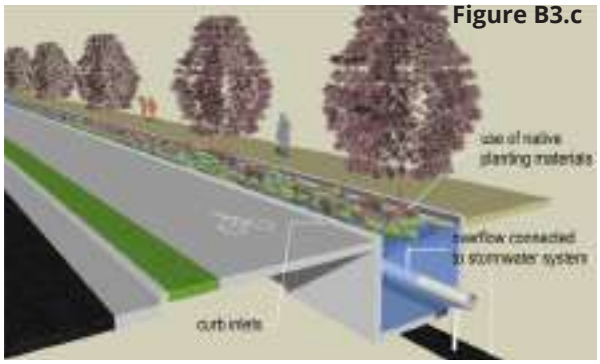


Figure B3.c

Typical subsurface infiltration systems that can be installed to enhance groundwater recharge include pre-cast concrete or plastic pits, chambers (manufactured pipes), and perforated pipes. Figure B3.c shows the use of impervious surfaces in the form of an adjacent cycletrack as well as wide sidewalks.

The BMPs Typologies in Table B-2 provides a decision matrix used to determine which BMPs measure(s) will work best along specific problematic roadways.

## Table B-2: BMP Typologies Table

| Best Management Practice Type | Target Pollutants | | | | Applicability | | | | | | | Unit Process | | | | Construction Cost Range |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Nutrients | Bacteria | Metal | TSS Removal | Suitable for Redevelopment | Provides Ground Recharge | Land Requirement | Maintenance Needs | Requires Pretreatment | Soil Requirements | Drainage Area (Acres) | Volume Reduction | Peak Flow Reduction | Sedimentation | Filtration & Absorption | |
| Bioretention | M | H | H | H | • | • | M | H | • | None | 1–2 | M | L | H | H | $5–$30 per SF |
| Constructed Stormwater Wetland | M | L | H | H | | | H | L | | None | Varies | L | H | H | M | Varies |
| Disconnect Impervious Areas | H | L | L | H | • | | M | L | | None | Varies | H | M | H | M | $20–$30 per SF |
| Dry Stormwater Ponds | L | L | M | M | | | VH | M | | None | Varies | L | H | M | M | Varies |
| Dry Wells | L | L | L | H | • | • | L | H | | Perm. | 0–1 | H | M | H | M | $500–$1K ea. |
| Enhanced Swales | L | L | M | H | • | • | H | L | • | Perm. | 5 Max | L | L | H | L | $10 per LF |
| Green Roofs | H | L | L | L | • | | N/A | M | | None | N/A | H | M | L | L | Varies |
| Infiltration Basins | H | H | H | H | • | • | M | H | • | Perm. | 5 Max | H | M | H | H | Varies |
| Infiltration Trenches | H | M | M | H | • | • | M | H | • | Perm. | 5 Max | H | L | M | M | $50–$80 per LF |
| Manufactured Separator Devices | L | L | L | M | • | | L | H | | None | N/A | L | L | M | L | $8K–$15K ea. |
| Open Vegetated Conveyance | M | L | M | M | • | | M | M | | None | 5 Max | L | M | L | M | $10–$30 per LF |
| Planter Box | M | H | H | H | • | | M | M | • | None | 0–1 | M | L | M | H | $24–$32 per SF |
| Porous/Permeable Pavement | M | L | H | H | • | • | H | M | | Perm. | Varies | H | M | H | M | $8–$15 per SF |
| Sand Fillers | M | M | H | H | • | | H | H | • | None | 5 Max | L | L | M | H | $10K–$50K per Acre |
| Subsurface Infiltration Systems | L | L | L | H | • | • | M | M | • | Perm. | Varies | H | M | H | M | Varies |
| Tree Box | H | H | M | H | • | | L | M | | None | 0–1 | L | L | M | M | $50–$100 per LF |
| Underground Detention Structures | L | L | L | H | • | | L | M | • | None | Varies | L | H | L | L | Varies |
| Vegetative Filter Strips | L | L | L | M | • | | M | L | | None | 2 Max | M | M | M | M | $50–$100 per LF |
| Wet Stormwater Ponds | H | H | H | H | | | VH | L | | None | Varies | H | H | M | L | Varies |

*Notes - [1] Unit Process adopted from The South Carolina DHEC Storm Water Management BMP Field Manual.*
*[2] Construction Cost Ranges are based on construction installation cost. It does not account for cost associated with design or permitting.*
*[3] Maintenance Needs are based on how often it either requires cleaning or refurbishing. It based on Appendix A from South Carolina DHEC Storm Water Management BMP Handbook.*
*[4] Target Pollutant based on pollutant removal efficiencies as stated in Appendix A from South Carolina DHEC Storm Water Management BMP Handbook.*
*[5] SF - Square Feet; LF - Linear Feet; ea. - Each; Perm. - Permeable*

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# C - Land Suitability Analysis

# CommunityViz and Land Suitability Analysis

CommunityViz is an extension of ESRI's ArcGIS desktop software that facilitates the visualization and comparison of alternative growth scenarios. It was originally developed by the Orton Family Foundation, a non-profit group that focuses on technology and tools for more informed decision-making. The software was used for the scenario planning initiative to support Our Region, Our Plan (OROP) in 2013, and there was the opportunity to use the data, analysis tools and partnering processes from OROP to support development of the CHATS 2040 Long Range Transportation Plan.

One of the most powerful applications of CommunityViz is site-suitability analysis: the process of determining which locations are best suited for certain uses. The user specifies the factors they want to consider (for example, proximity to roads and overlap with floodplains) and the Suitability Wizard sets up a complete analysis. Once the analysis has been created, the maps symbology can be set up according to which sites are most suitable, and you can dynamically change the weighting of each factor and see the results. Once appropriately symbolized, the map often looks like a heat map with warmer areas reflecting areas of great suitability and cooler areas reflecting areas of lower suitability.

The Scenario 360 Suitability Wizard helps the user set up an analysis that scores features based on their suitability or desirability for a particular application. For example, the user can calculate which parcels are best for building, or which tracts are most important to preserve, or which locations are most likely to attract retail business.

The Scenario 360 Suitability Wizard allows the user to set up a weighted suitability analysis (sometimes referred to as multivariate suitability). Suitability combines multiple factors having to do with location – such as proximity, overlap, slope, or value – and comes up with a combined rating or score for each place (feature) on the map. "Weighted" suitability analysis places more importance on some factors and less on others, so that the combined rating more fairly represents the relative importance of each location criterion. This technique was used for the land suitability and resiliency analyses in the BCDCOG region.

There are two main parts to a suitability analysis. The first is the rating, in which features in your layer are rated according to their own attributes or to their relationship to other features or layers on the map. For example, with BCDCOG land suitability analysis rated each grid cell based on its proximity to the region's metropolitan center in downtown Charleston. The wizard sets up a dynamic formula which calculates the distance from the grid cell to the point representing the metropolitan center. The further away the cell is from the metropolitan center, the higher the distance value. This distance is then rescaled using a numerical formula and the result is that the furthest grid cell receives the score of 0 and the closest receives a score of 100. Other factors are similarly scaled 0-100 but may use other spatial operations, for example amount of overlap with another feature. The rescaled scores for each factor in the analysis are then added together and again rescaled between 0-100. This yields a final suitability score for the combined factors.

The second, optional part of a suitability analysis, is weighting. Here the user can place more importance on some factors (e.g., proximity to metropolitan center) and less importance on others (e.g., proximity to intersections). The Suitability Wizard sets up variable assumptions that control the weight of each factor, typically between 0-10. Once the Wizard has been run, the user can change the variable assumptions to weigh some factors more than others. Values assumed for the factors were derived from similar studies in Greenville, SC (Shaping Our Future); Charlotte, NC (CONNECT Our Future); Raleigh-Durham, NC (Imagine 2040); and Fredericksburg, VA (George Washington Region Scenario Planning Initiative).

Focus group meetings in each of the regions — representing real estate and development, local planning official, and utility service provider interests — were used to identify and rank the factors for influencing future development by relative importance. Viewpoints represented in the meetings matched the participants' general experience with site selection criteria for business recruitment, project feasibility criteria for starting and financing new development, known government policies or incentives, and current/future year infrastructure availability.

The Suitability Wizard does not perform any calculations internally. Rather, it creates formulas and analysis components that run within CommunityViz. If a user wishes, they can inspect and/or change the formulas, assumptions, and charts created by the Wizard.

### *Suitability Analysis Terminology*

Scenario 360 uses the following terminology:

- ***Suitability analysis:*** The suitability analysis is a set of CommunityViz components that collectively measure the suitability, desirability or some other weighted overlay analysis (e.g., resiliency). The suitability analysis components include attributes in the suitability layer and CommunityViz assumptions that act as weights.

- ***Suitability layer:*** Layer containing features whose suitability is being rated or analyzed. In BCDCOG, this was a custom grid layer.

- ***Suitability factor:*** One of potentially many considerations contributing to a suitability measure. Some examples of suitability factors include proximity to roads, overlap with sensitive lines, and property value.

- ***Normalized suitability score:*** A suitability measure scaled so that the smallest value in the analysis is 0 and the largest value in the analysis is 100. For example, a suitability score based on proximity might range from 0 miles to 4.7 miles. The normalized version of the same factor would range from 0 (corresponding to 0 miles) to 100 (corresponding to 4.7 miles). The Scenario 360 Suitability Wizard normalizes suitability measures so that they can be fairly compared.

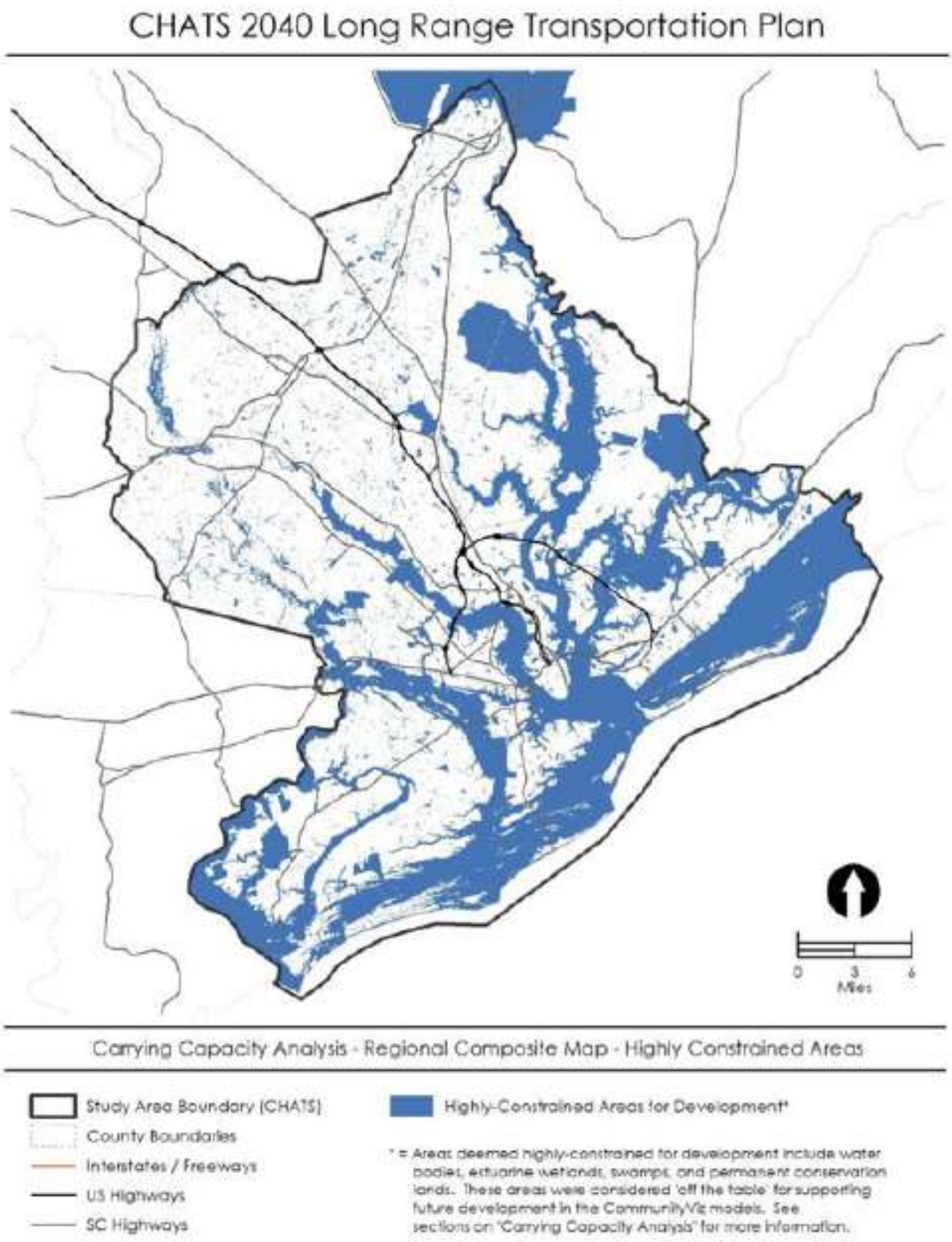
- ***Suitability weighting factor:*** A number used to give more or less relative importance to a suitability factor compared to other suitability factors in a given measure. The Scenario 360 Suitability tool allows you to assign weighting factors between 0 and 10 using variable assumptions during analysis. A smaller weighting makes a suitability factor less important in the overall measure, while a larger weighting makes a factor more important. By default, weighting factors are weighted equally and assigned the value of 5.

Table C-1 provides a summary of the map outputs generated for use in the CHATS 2040 Long-Range Transporation Plan as a result of the Suitability Analysis. Outputs include regional composite maps, contributing factor maps and technical analysis summary tables that provide the key assumptions used in CommunityViz.

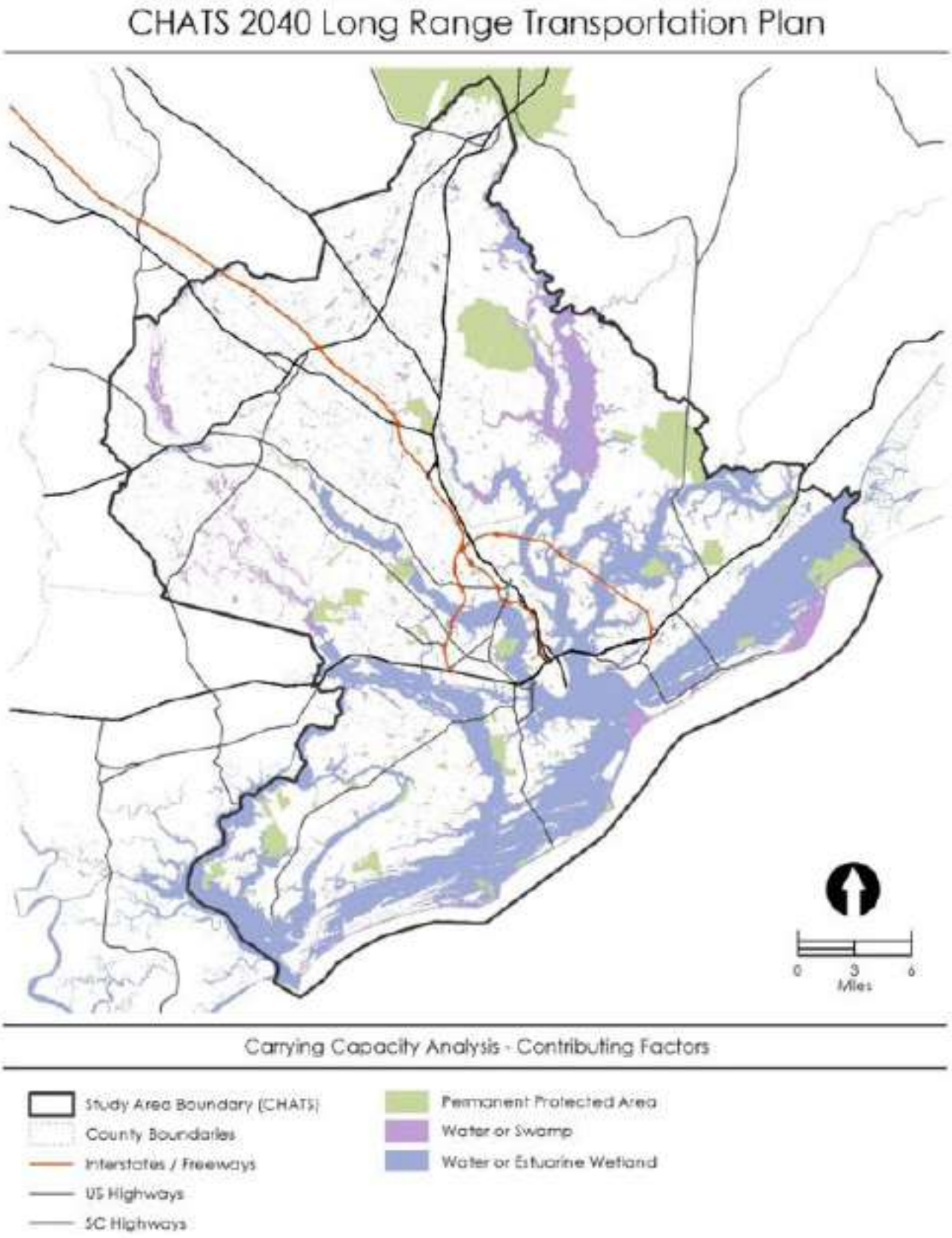
## Table C-1: Summary Suitability Analysis Map Outputs

| Contributing Factors Maps | Factors Considered | Regional Composite Maps |
|---|---|---|
| **MAP C-2** Carrying Capacity Analysis Contributing Factors | *Highly Constrained Areas for Development (water bodies, estuarine wetlands, swamps, and permanent conservation lands)* | **MAP C-1 Carrying Capacity Analysis (Highly Constrained Areas)** |
| **MAP C-7** Development Activity Centers | *Proximity to:*<br>*- Metropolitan Center*<br>*- Town Center*<br>*- Existing Growth Area*<br>*- Emerging Growth Area* | **Land Suitability Analysis (Scenarios)**<br>**MAP C-3 Existing (2015)**<br>**MAP C-4 Future (2020)**<br>**MAP C-5 Future (2030)**<br>**MAP C-6 Future (2040)** |
| **MAP C-8** Transit | *Proximity to:*<br>*- Regional Bus Service Corridors*<br>*- Bus Rapid Transit Corridors* | |
| **MAP C-9** Floodplain & Shoreline Proximilty | *- Distance to Shoreline*<br>*- Overlap with Floodplain* | |
| **MAP C-10** Transportation Elements | *Proximity to:*<br>*- Highway Network*<br>*- Major Intersections*<br>*- Interchange Locations* | |
| **MAP C-11** Water & Sewer | *Overlap with:*<br>*- Water Service Area*<br>*- Sewer Service Area* | |
| **MAP C-12** Highly Constrained Areas | *- Overlap w/Development Constraints (protected areas, open water, swamp or estuarine wetlands)* | |
| **MAP C-14** Growth Activity Centers & Transit Corridors | *Grid Cell Evaluation:*<br>*- % within 1/4 mile of Designated Growth Activity Center (DESTINATION)*<br>*- % within 1/4 mile of a Transit Corridor (DISTANCE)*<br>*- City or County Future Land Use Category (DESIGN)* | **MAP C-13 5D Transportation Assessment** |
| **MAP C-15** Population Density | *Population Density (persons/acre) (DENSITY)* | |
| **MAP C-16** Mean Income | *Mean Household Income (DIVERSITY)* | |
| **MAP C-18** Emergency Facilities | *Proximity to:*<br>*- Street Connectivity*<br>*- Fire Stations*<br>*- Health Care Facilities*<br>*- Hurricane Shelters*<br>*- Public Schools* | **MAP C-17 Resiliency & Resource Efficiency** |
| **MAP C-19** Evacuation Routes | *Proximity to:*<br>*- Street Connectivity*<br>*- Evacuation Routes*<br>*- Park & Ride Lots*<br>*- Shoreline Area of influence (1-mile)* | |
| **MAP C-20** SLOSH Zones | *- Proximility to Street Connectivity*<br>*- Overlap w/Surge Flooding Zones* | |

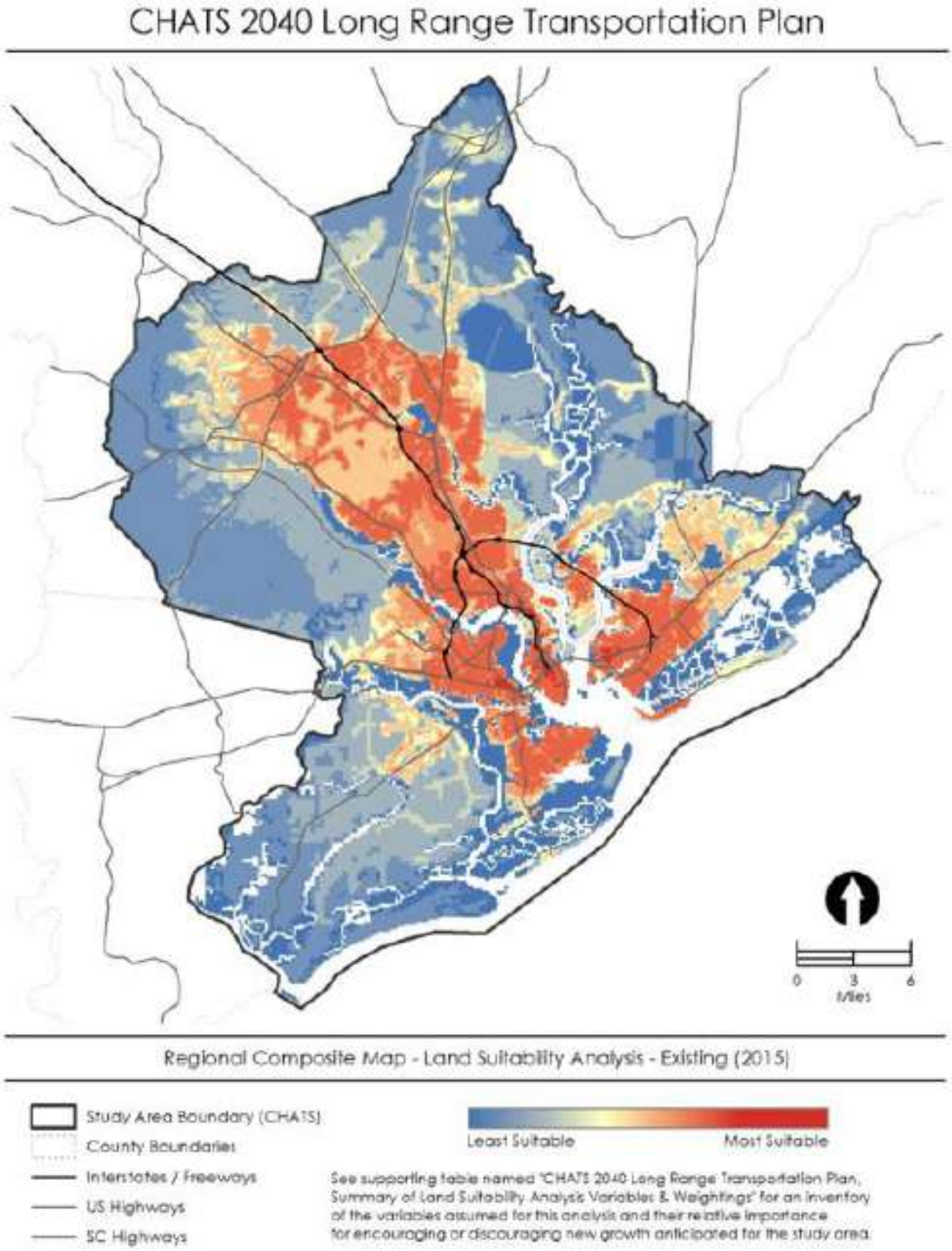
**Map C-1: Carry Capacity Analysis - Regional Composite Map - Highly Constrained Areas**



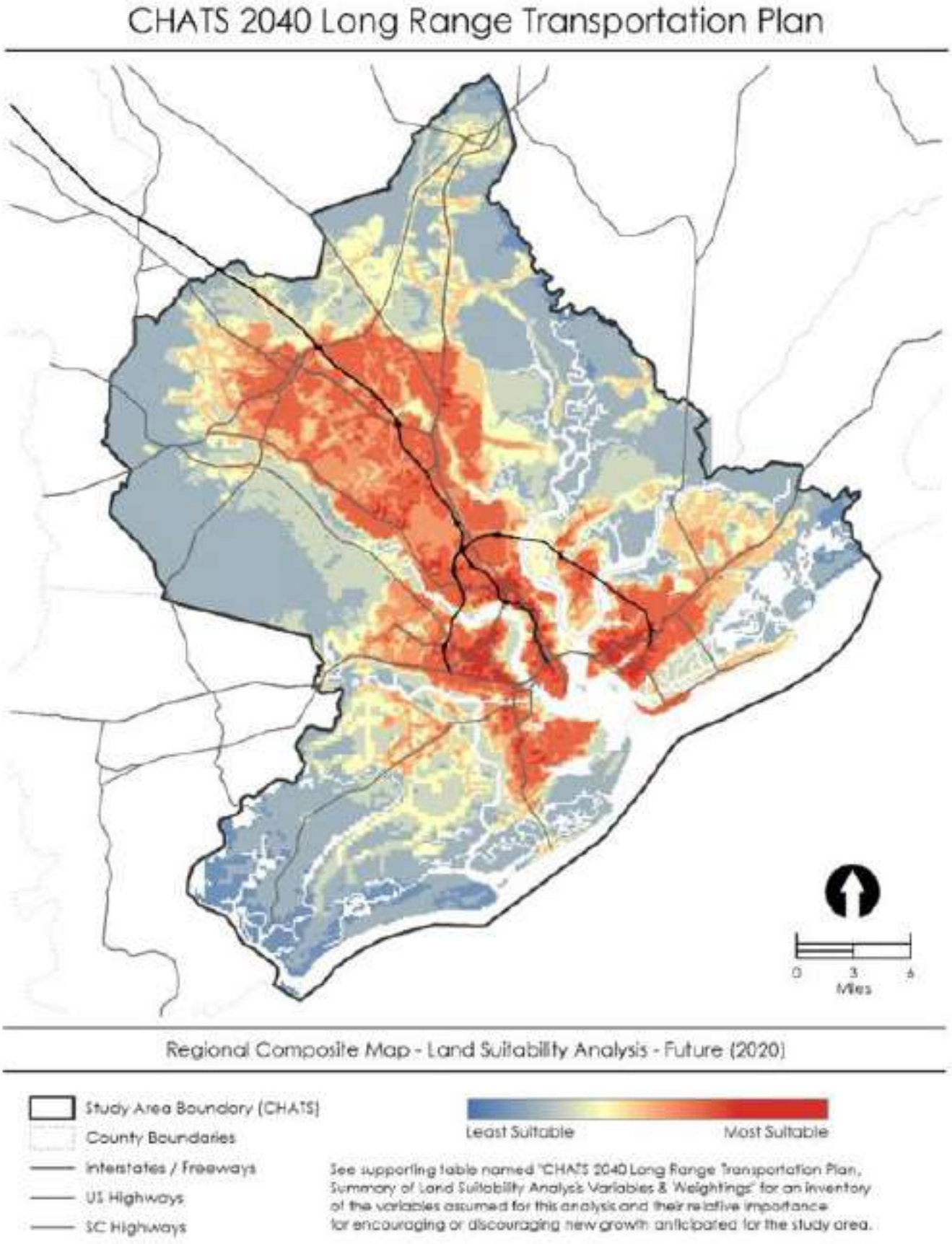
**Map C-2: Carry Capacity Analysis - Contributing Factors**



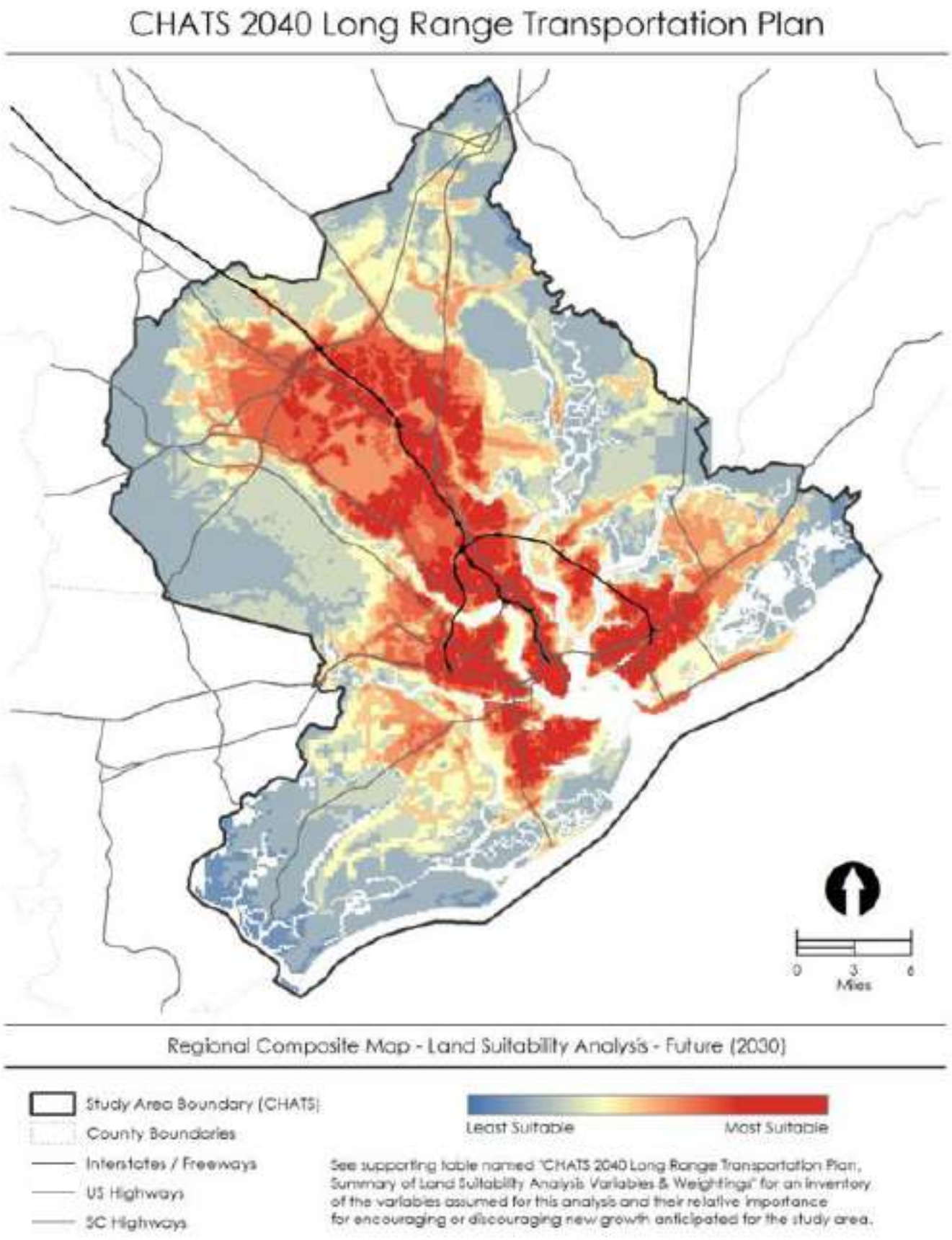
**Map C-3: Land Suitability Analysis - Regional Composite Map - Existing (2015)**



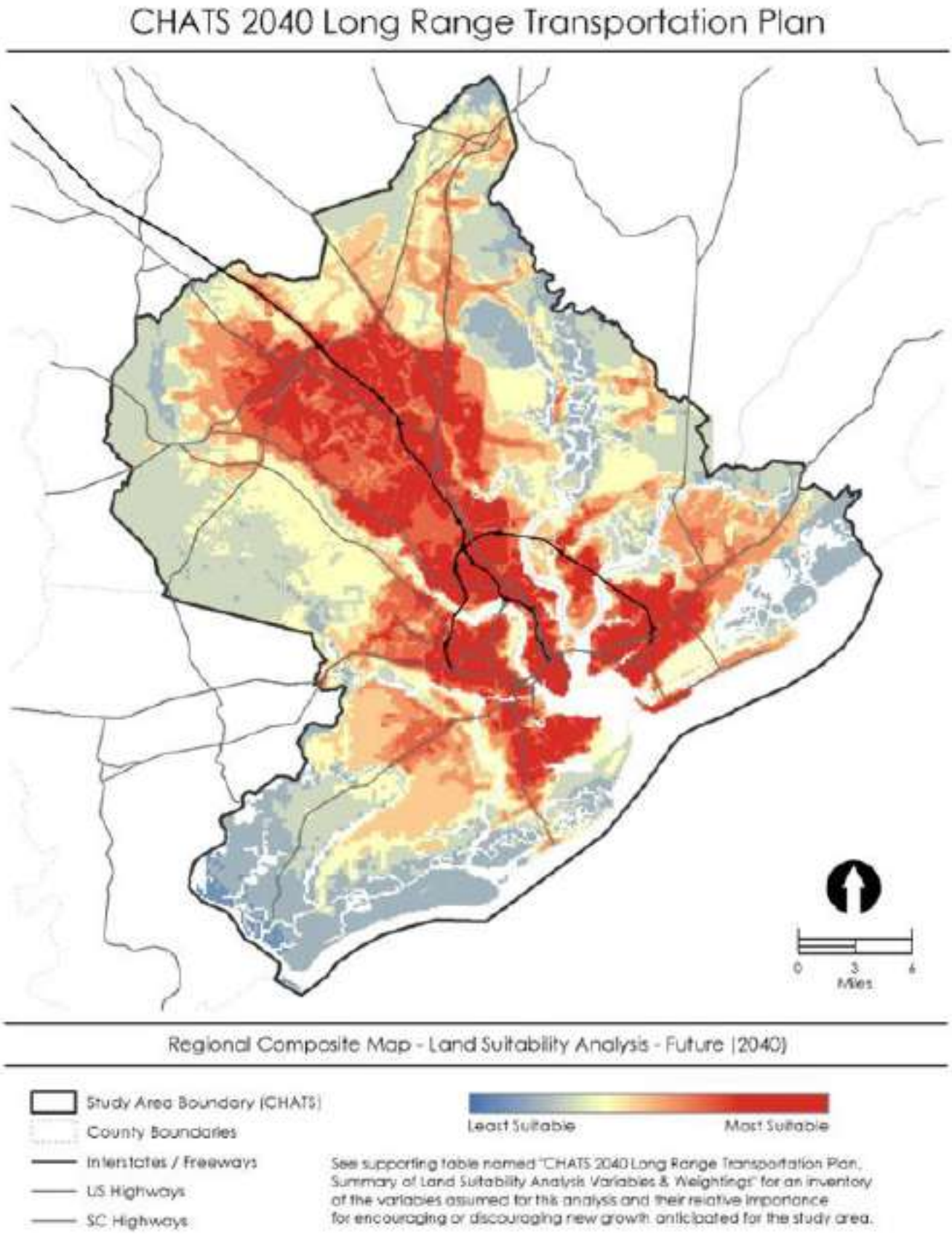
**Map C-4: Land Suitability Analysis - Regional Composite Map - Future (2020)**



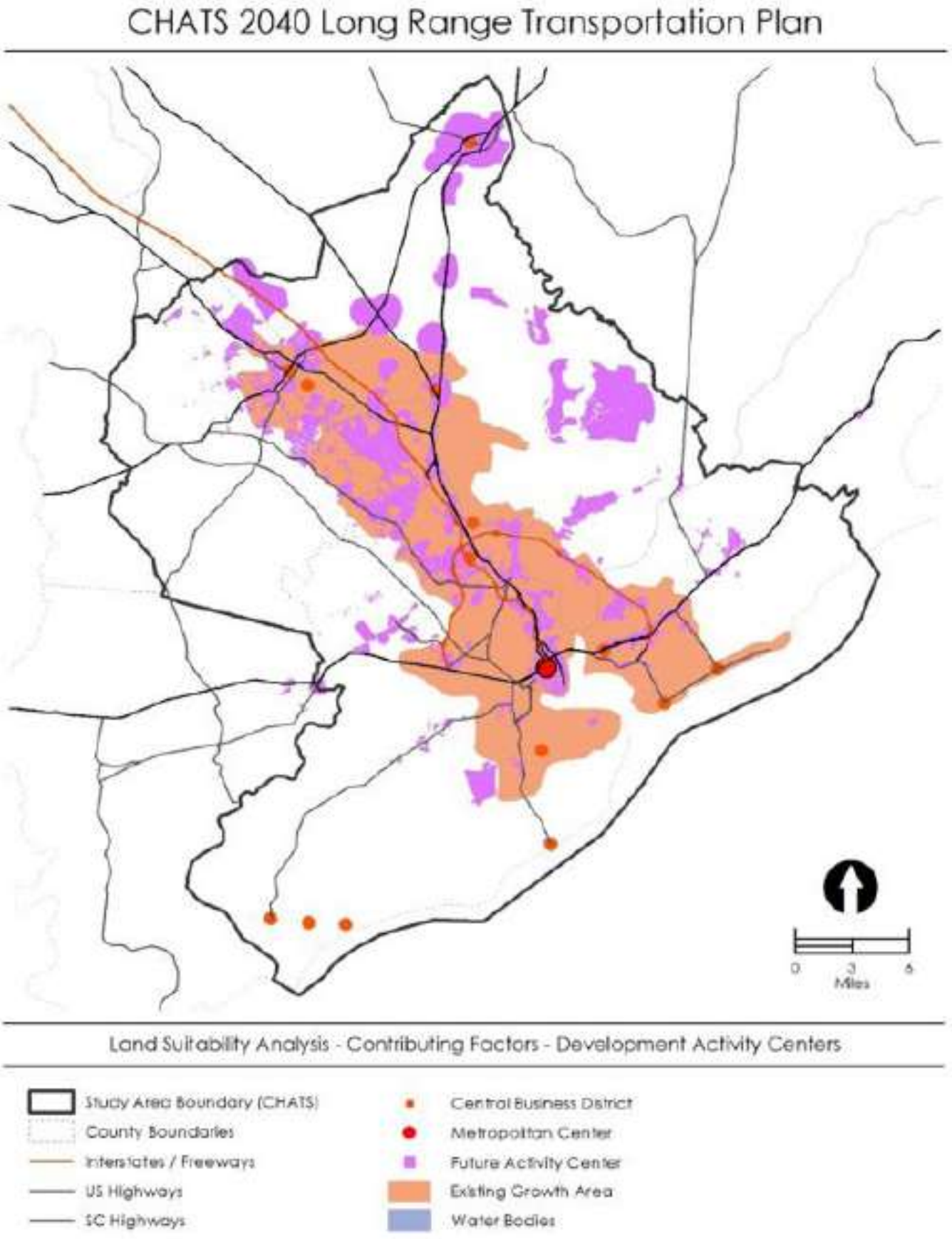
**Map C-5: Land Suitability Analysis - Regional Composite Map - Future (2030)**



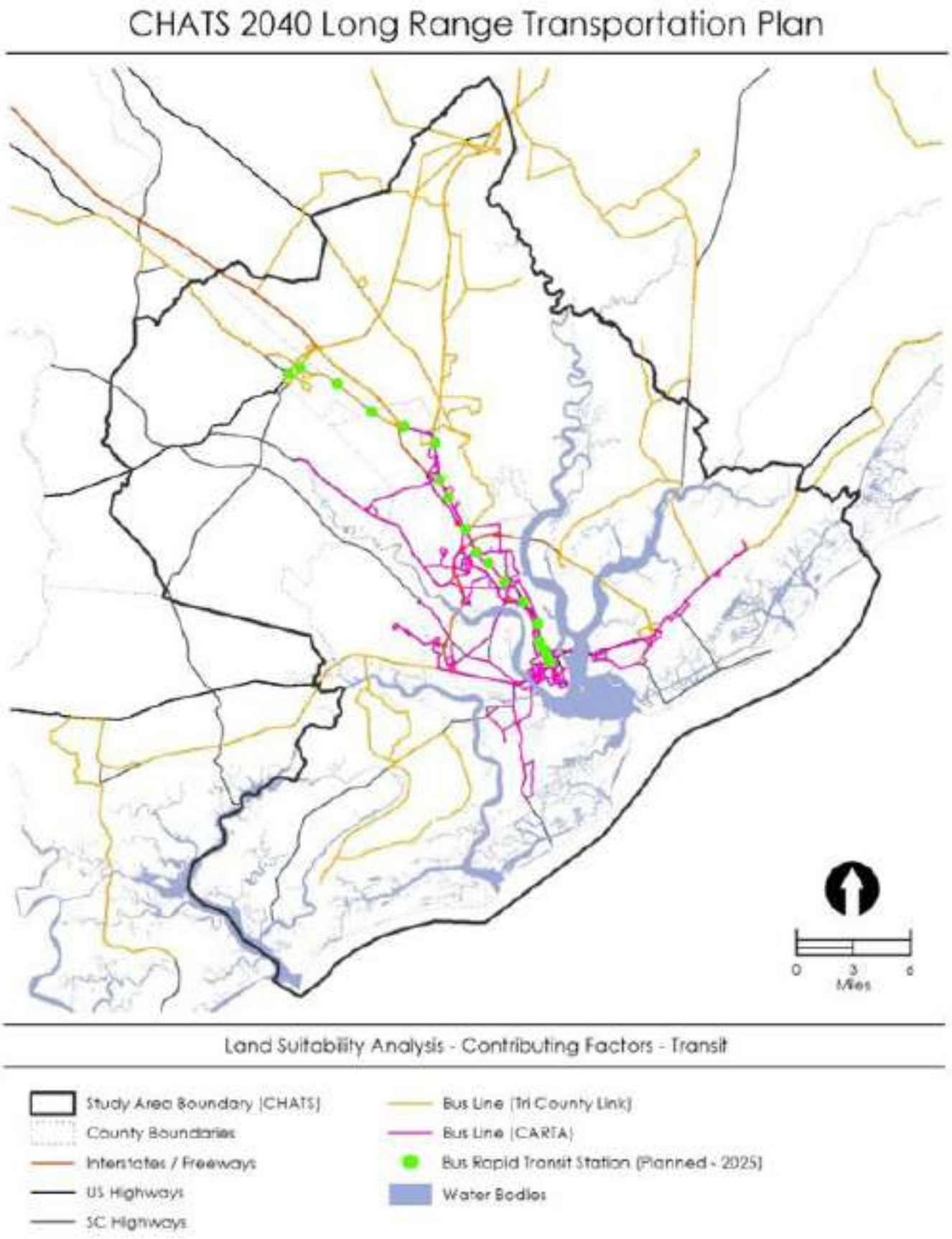
**Map C-6: Land Suitability Analysis - Regional Composite Map - Future (2040)**



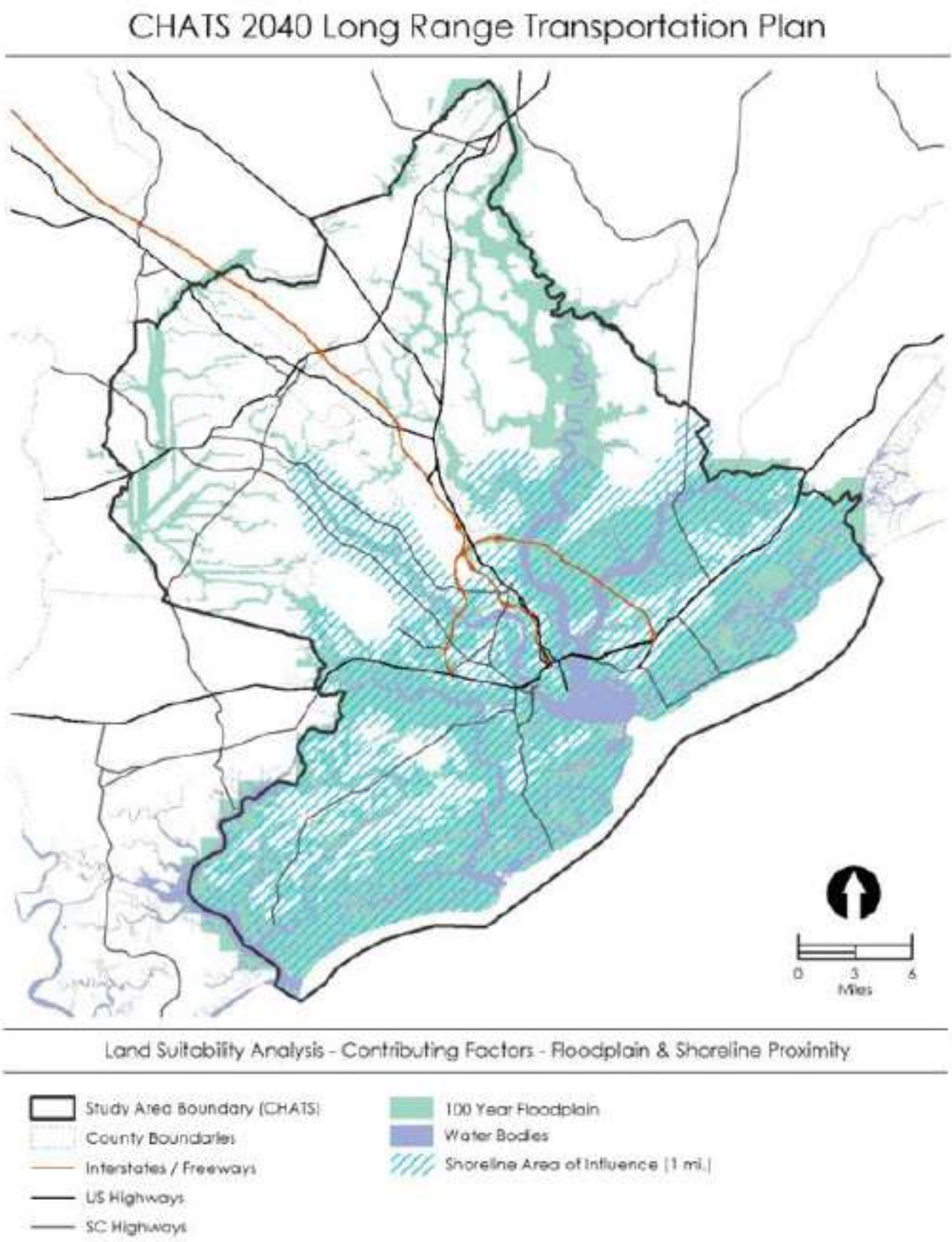
**Map C-7: Land Suitability Analysis - Contributing Factors - Development Activity Centers**



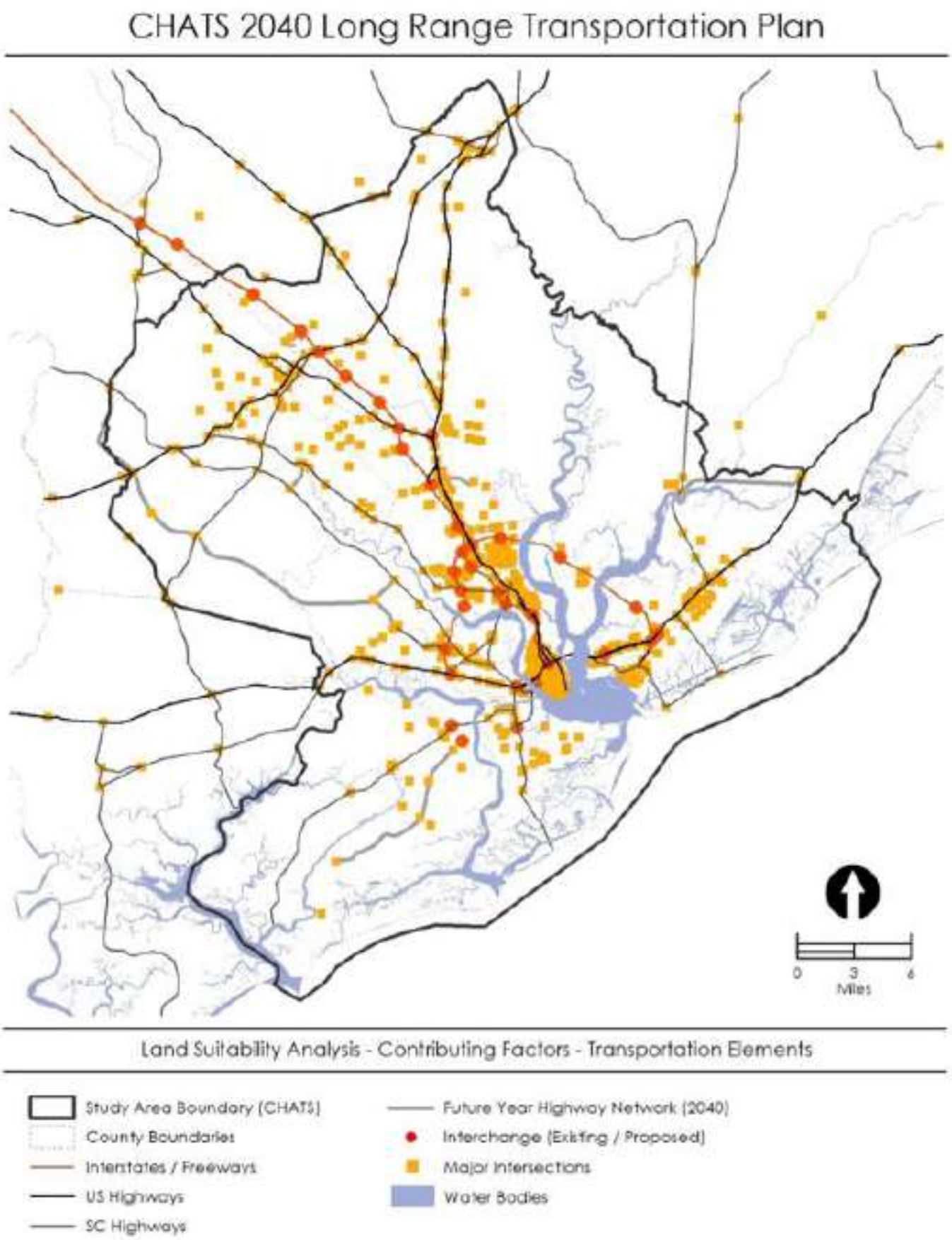
**Map C-8: Land Suitability Analysis - Contributing Factors - Transit**



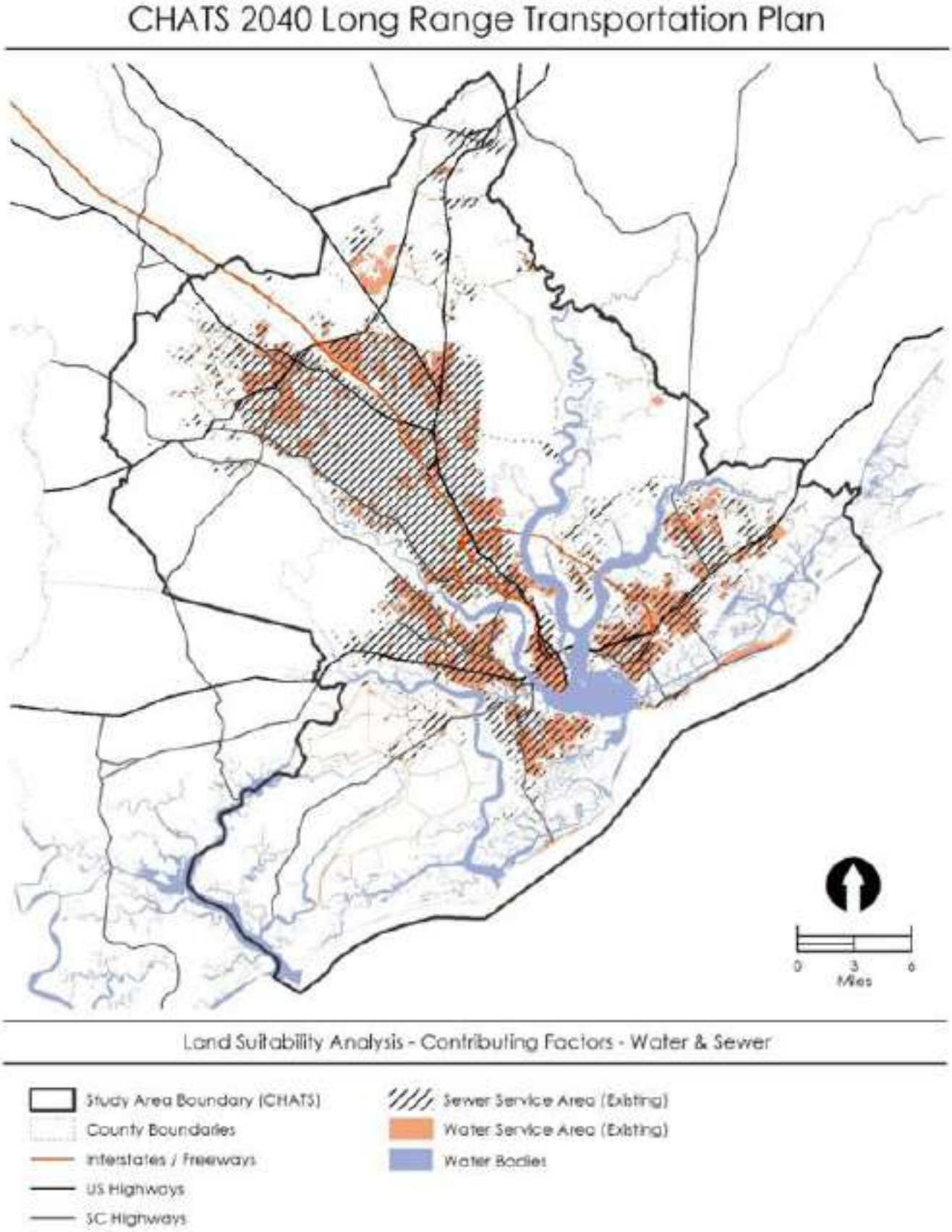
**Map C-9: Land Suitability Analysis - Contributing Factors - Floodplain & Shoreline Proximity**



**Map C-10: Land Suitability Analysis - Contributing Factors - Transportation Elements**



**Map C-11: Land Suitability Analysis - Contributing Factors - Water & Sewer**



**Map C-12: Land Suitability Analysis - Contributing Factors - Highly Constrained Areas**

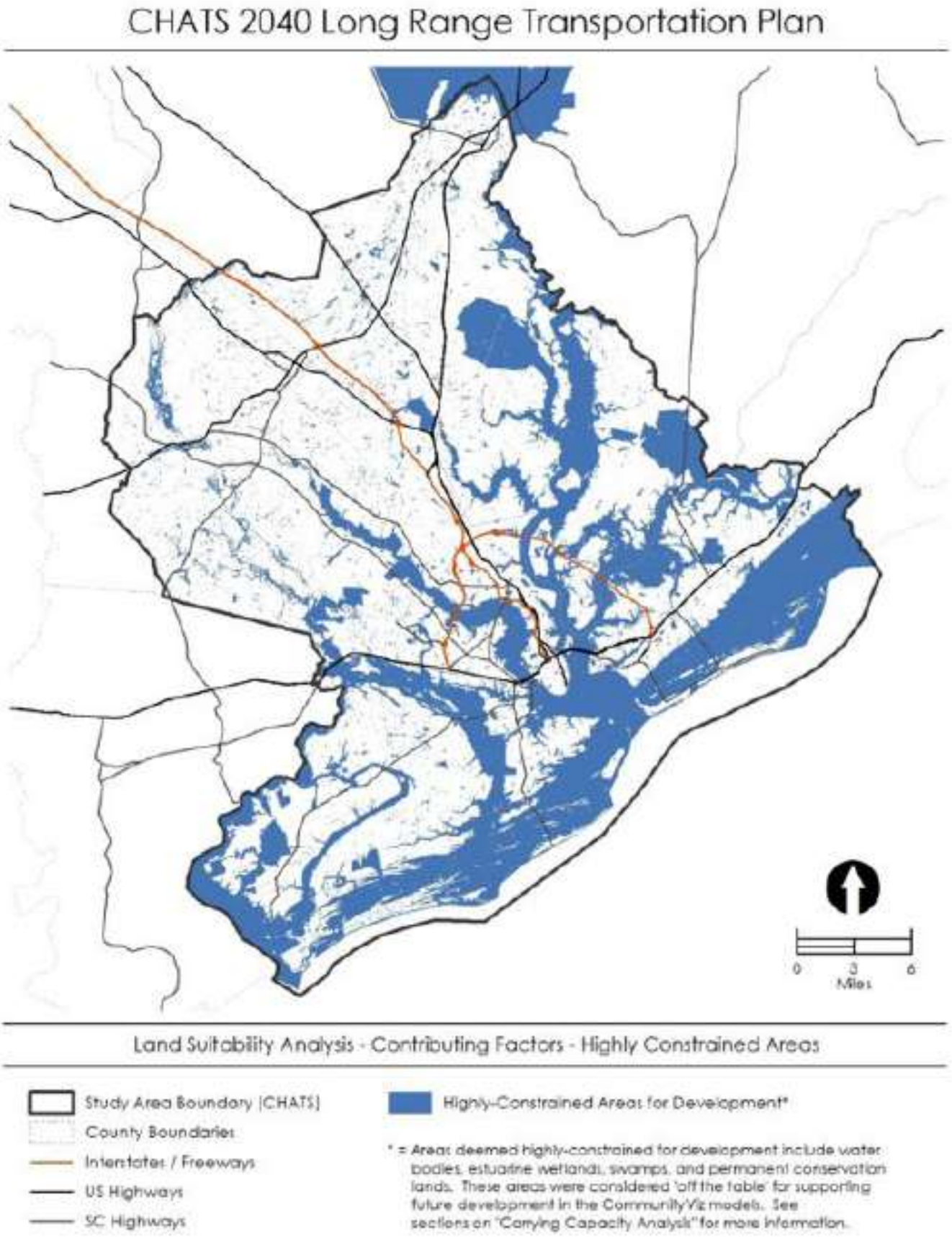
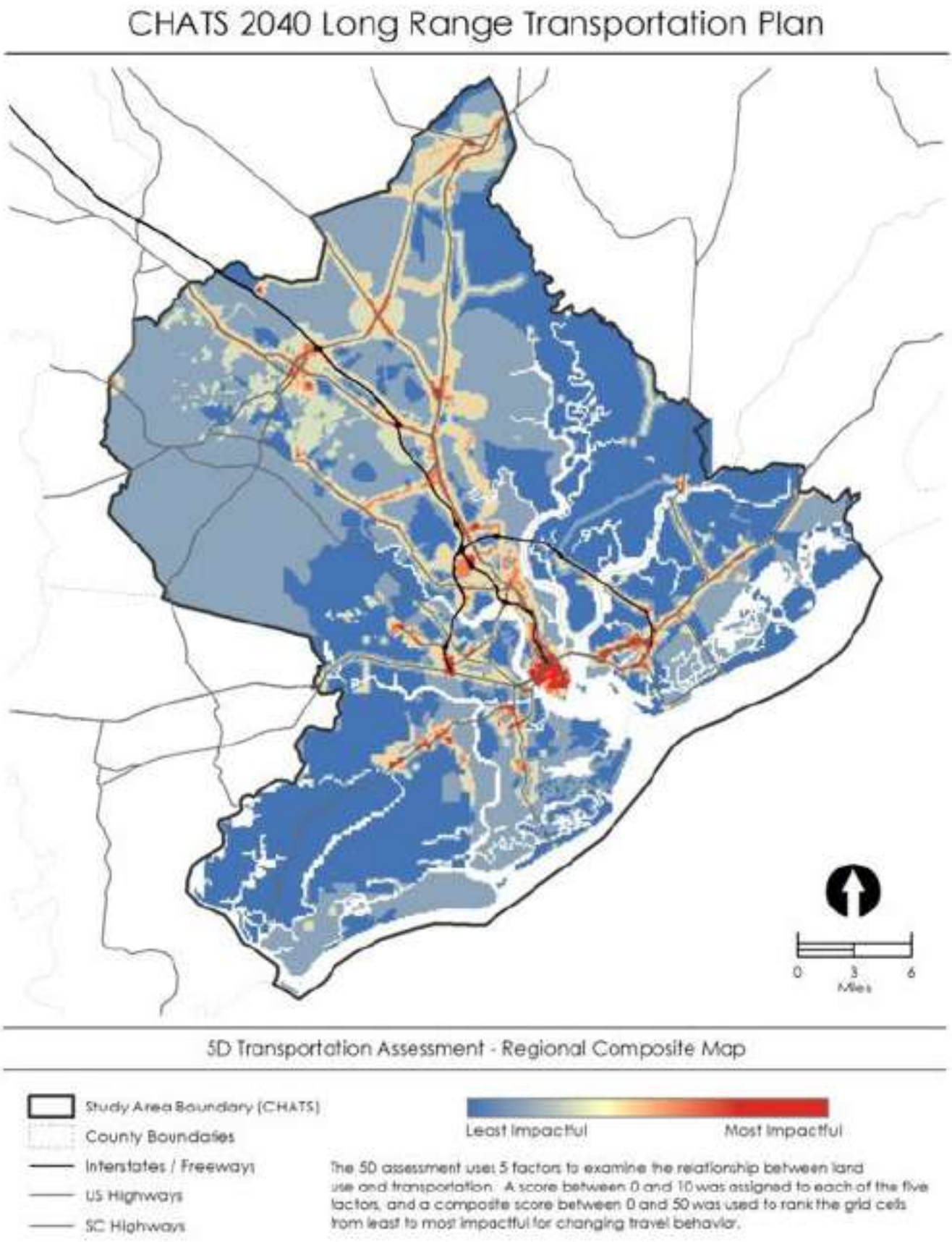


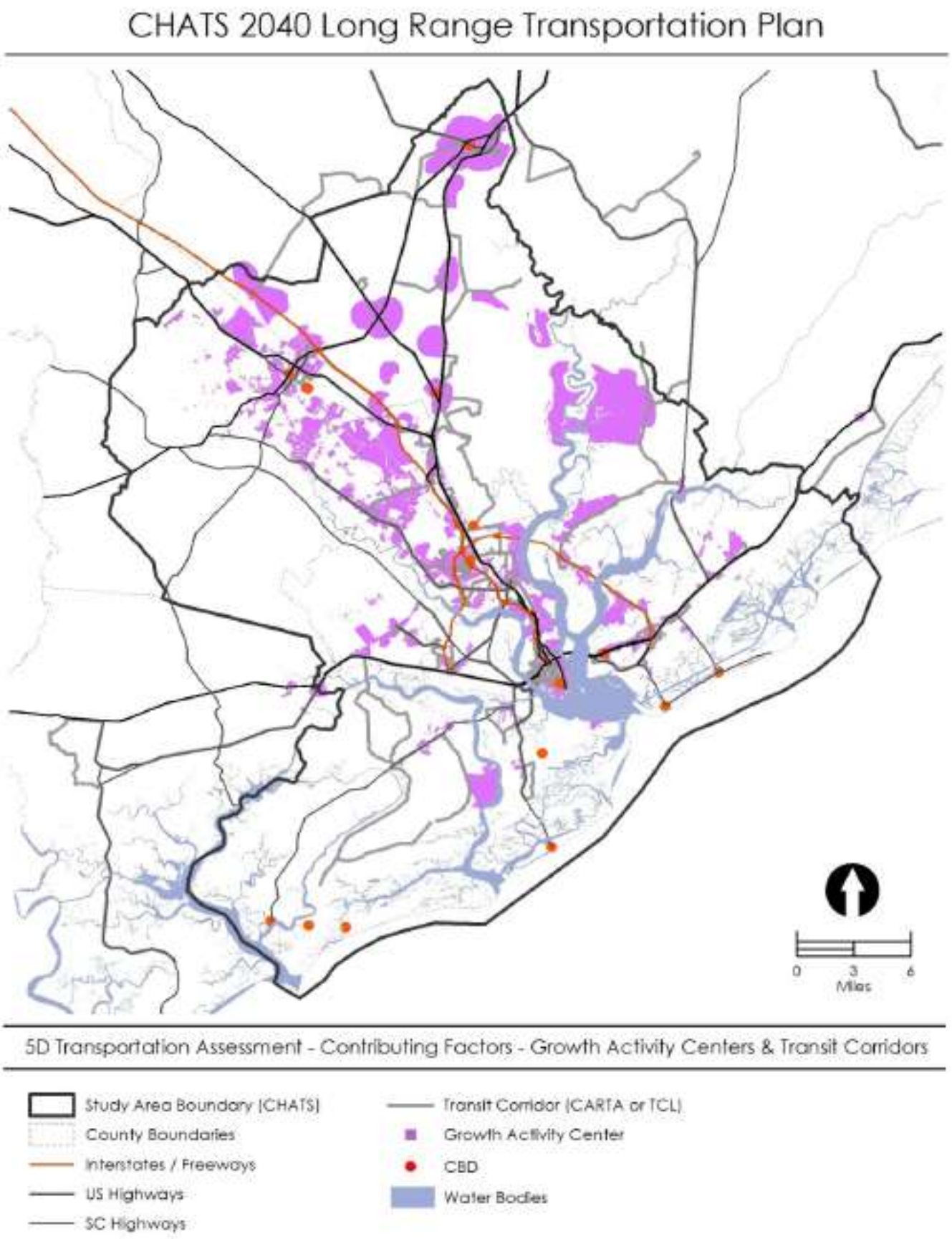
**Table C-2: Factors Considered for Running the Development LSA for the CHATS CommunityViz Model**

| Factor | Weighting (out of 10) | Description |
|---|---|---|
| ***Transportation Factors*** | | |
| Major Intersections | 5 | Proximity to major intersections produces higher scores. Major intersections include junctions from arterial, collector and in some cases local roads. |
| Interchange Locations | 5 | Proximity to freeway interchanges produces higher scores. |
| ***Transit Factors*** | | |
| Regional Bus Service Corridors | 3 | Proximity to transit corridors produce higher scores. |
| Bus Rapid Transit Corridors | 3 | Proximity to the planned BRT line produce higher scores. Construction dates intended for the 2023-2025 time frame. Does not apply to 2015 or 2020 horizons. |
| ***Utility Service Factors*** | | |
| Water Service Areas | 10 | Overlap with water service corridors produce higher scores. Modeling assumes a gradual increase in service areas in future horizons. |
| Sewer Service Areas | 10 | Overlap with sewer service corridors produce higher scores. Modeling assumes a gradual increase in service areas in future horizons. |
| ***Land Use Factors*** | | |
| Metropolitan Center (Charleston's CBD) | 8 | Proximity to Charleston's CBD produces higher scores. |
| Town Center | 8 | Proximity to municipal CBD produces higher scores. If a town does not have a well-defined CBD, the location of the town or city hall was used as a surrogate. |
| Existing Growth Areas | 10 | Proximity to areas of existing development, as indicated by the region's current development footprint. |
| Emerging Growth Areas | 10 | Proximity to areas of existing and future growth development, as indicated by county land use plans. Only higher intensity land use classifications are used here: town and village centers, commercial and high density mixed use. Emerging growth areas with greater proximity to existing development and infrastructure were assigned earlier horizon dates. |
| ***Conservation Areas*** | | |
| Distance to Shoreline | 8 | Proximity to the area's shorelines and estuary produces higher scores. |
| Overlap with Floodplain | 3 | Overlap with 100 year floodplain produces lower scores. |
| Overlap with Development Constraints | 10 | Overlap with development constraints produces lower scores. Development constraints include protected areas, open water, swamp or estuarine wetlands. |

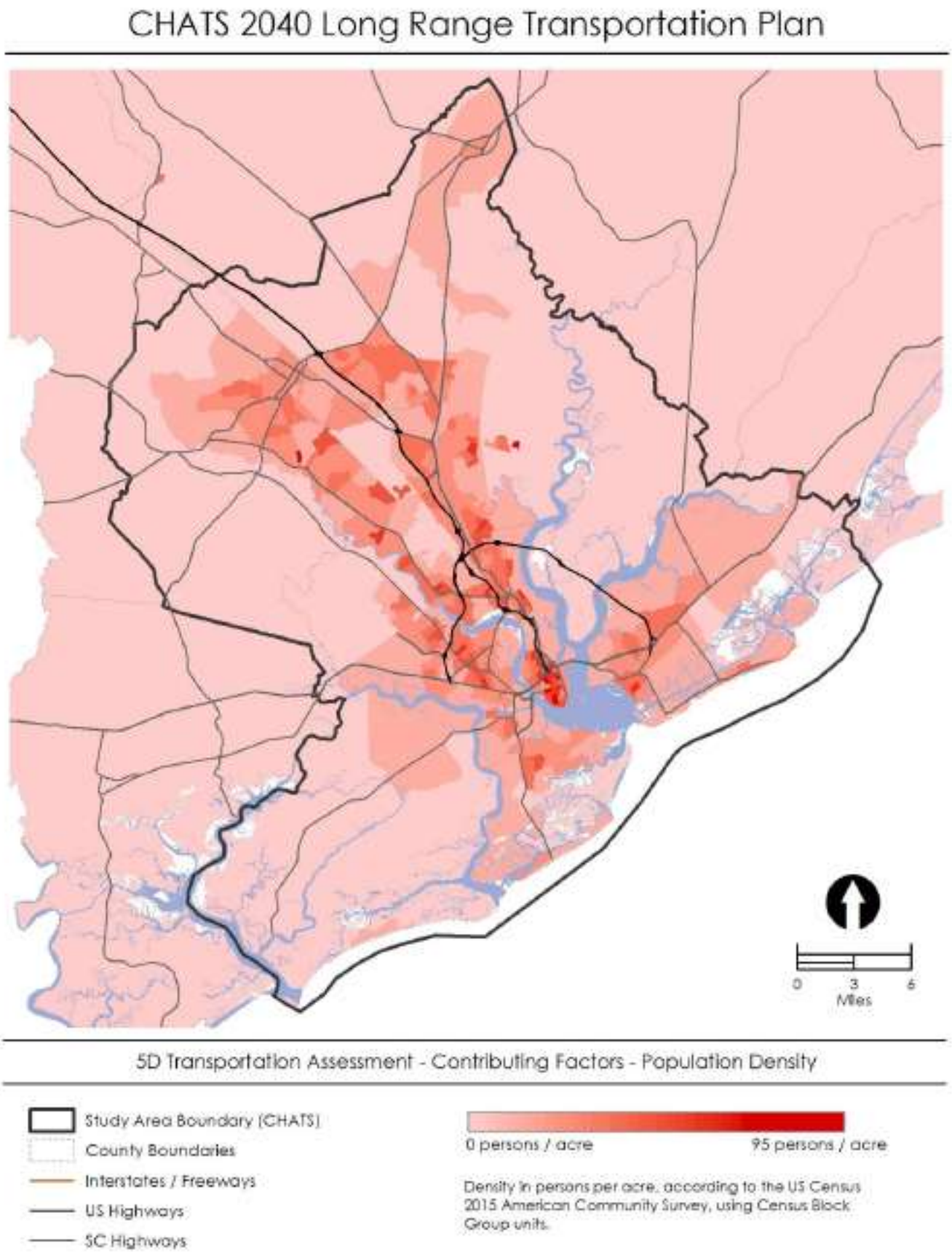
**Map C-13: 5D Transportation Assessment - Regional Composite Map**



**Map C-14: 5D Transportation Assessment - Contributing Factors - Growth Activity Centers & Transit Corridors**



**Map C-15: 5D Transportation Assessment - Contributing Factors - Population Density**



**Map C-16: 5D Transportation Assessment - Contributing Factors - Mean Income**

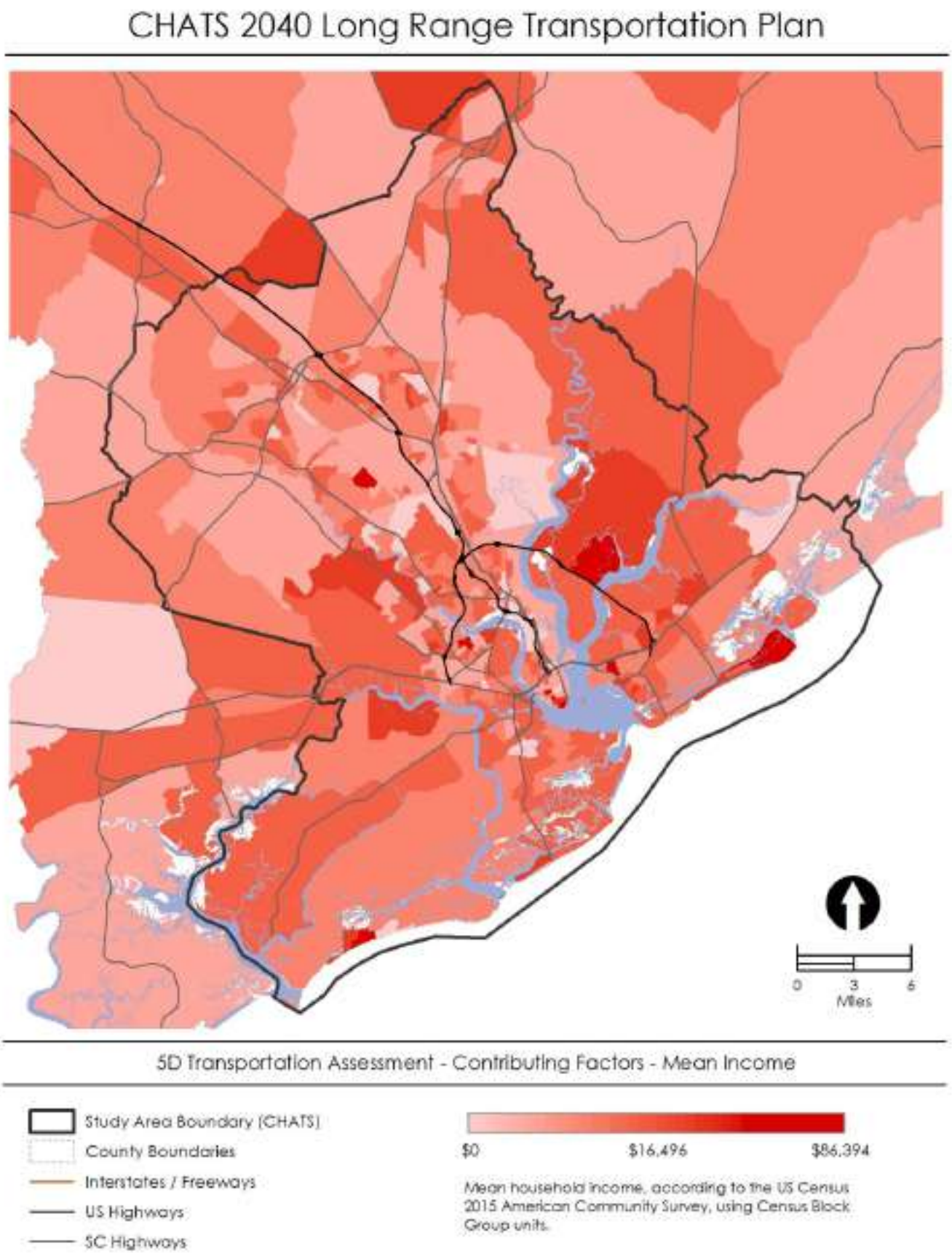


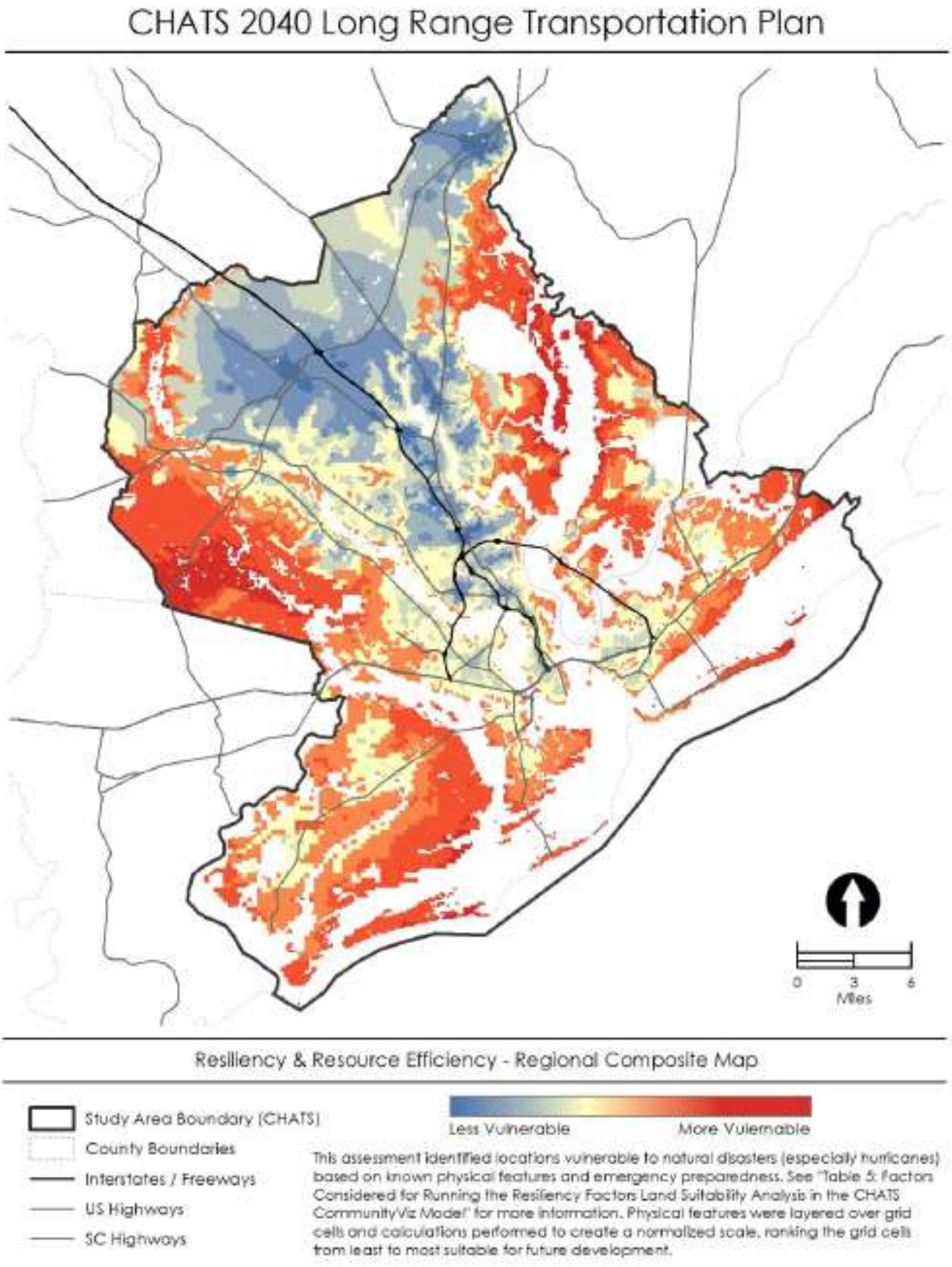
**Table C-3: Factors Considered for the 5D Transportation Assessment in CommunityViz**

| Factor | Unit | Point Value Criteria | | |
|---|---|---|---|---|
| | | Low Impact (0 Pts) | Medium Impact (5 Pts) | High Impact (10 Pts) |
| Density | Persons per Acre | Less than 30.00 | 30.01 to 50.00 | Greater than 50.01 |
| Design | Future Land Use Category | Single-Use, Low-Density Land Use Categories | Medium-Density, Walkable Land Use Categories | High-Density, Walkable Land Use Categories |
| Destination | % of a Grid Cell within ¼-Mile of a Designated Growth Activity Center | Less than 25% | 26% to 75% | 76% to 100% |
| Distance | % of a Grid Cell within ¼-Mile of a Transit Corridor | Less than 25% | 26% to 75% | 76% to 100% |
| Diversity | Median Household Income | Greater than $35,000 | $15,001 to $35,000 | Less than $15,000 |

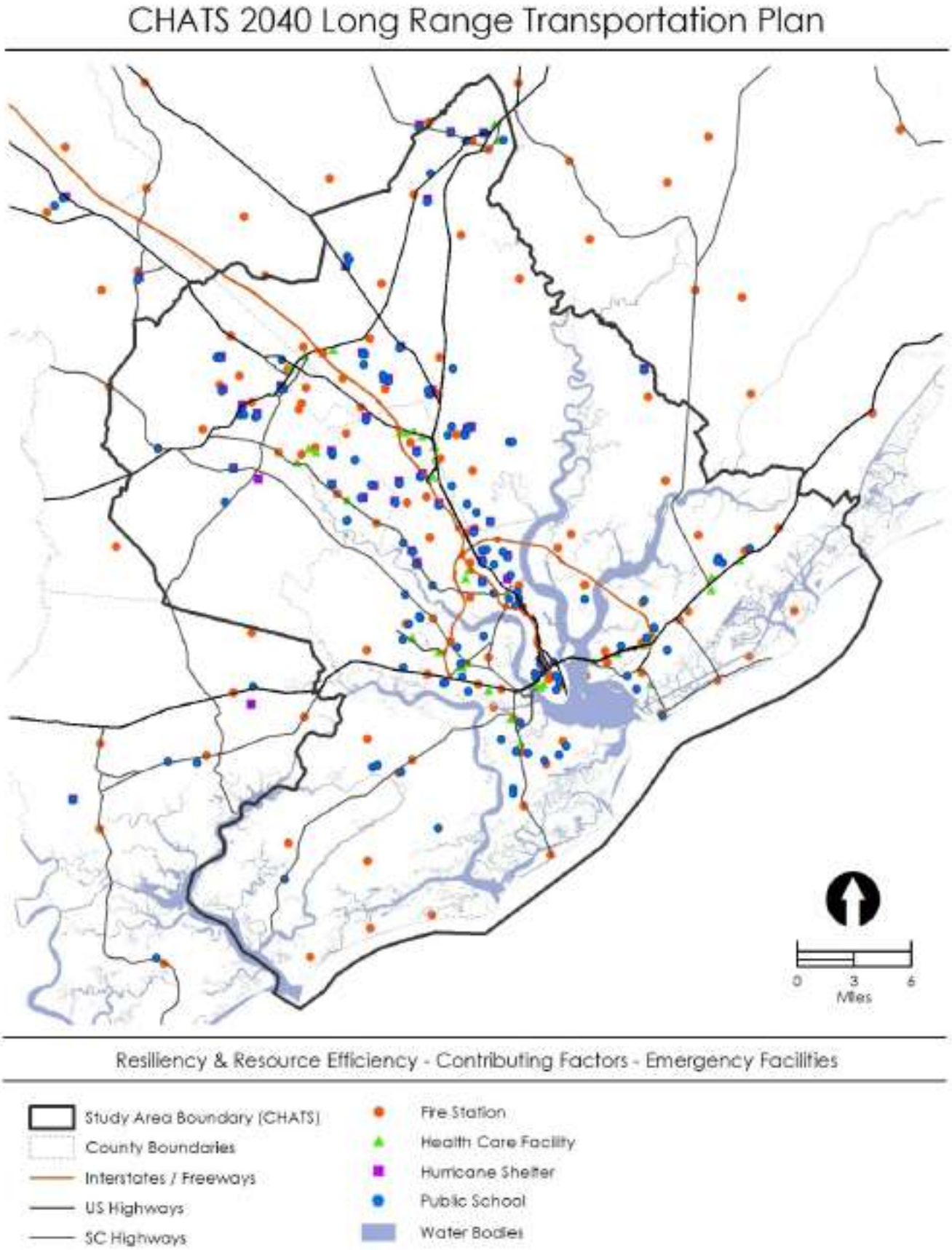
**Table C-4: Factors Considered for Running the Resiliency Factors LSA in the CHATS CommunityViz Model**

| Factor | Weight (out of 10) | Description |
|---|---|---|
| SLOSH | 8 | Overlap with surge flooding zones produces lower resilience scores. |
| Street Connectivity | 5 | Overlap with intersections produces higher scores. Intersections from all road functional classes are included. |
| Shore | 10 | Proximity to shoreline produces lower resilience scores. |
| Park n' Ride Lots | 2 | Proximity to park and ride facilities produces higher resiliency scores. |
| Evacuation Routes | 8 | Proximity to designated evacuation routes produces higher resiliency scores. |
| Fire Stations | 5 | Proximity to fire stations produces higher resiliency scores. |
| Health Care Facilities | 5 | Proximity to health care facilities produces higher resiliency scores. |
| Hurricane Shelters | 5 | Proximity to hurricane shelters produces higher resiliency scores. |
| Schools | 2 | Proximity to schools produces higher resiliency scores. |

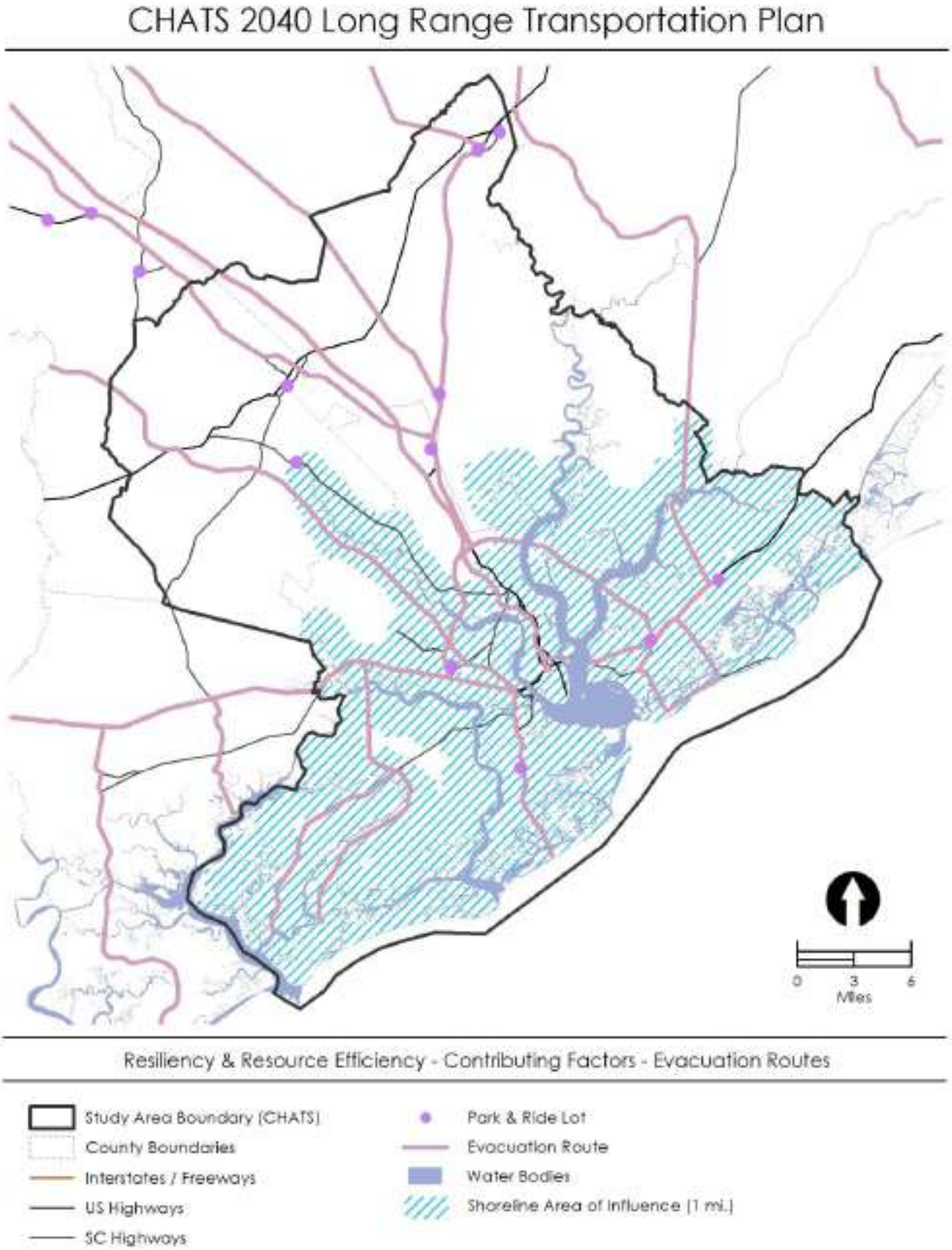
**Map C-17: Resiliency & Resource Efficiency - Regional Composite Map**



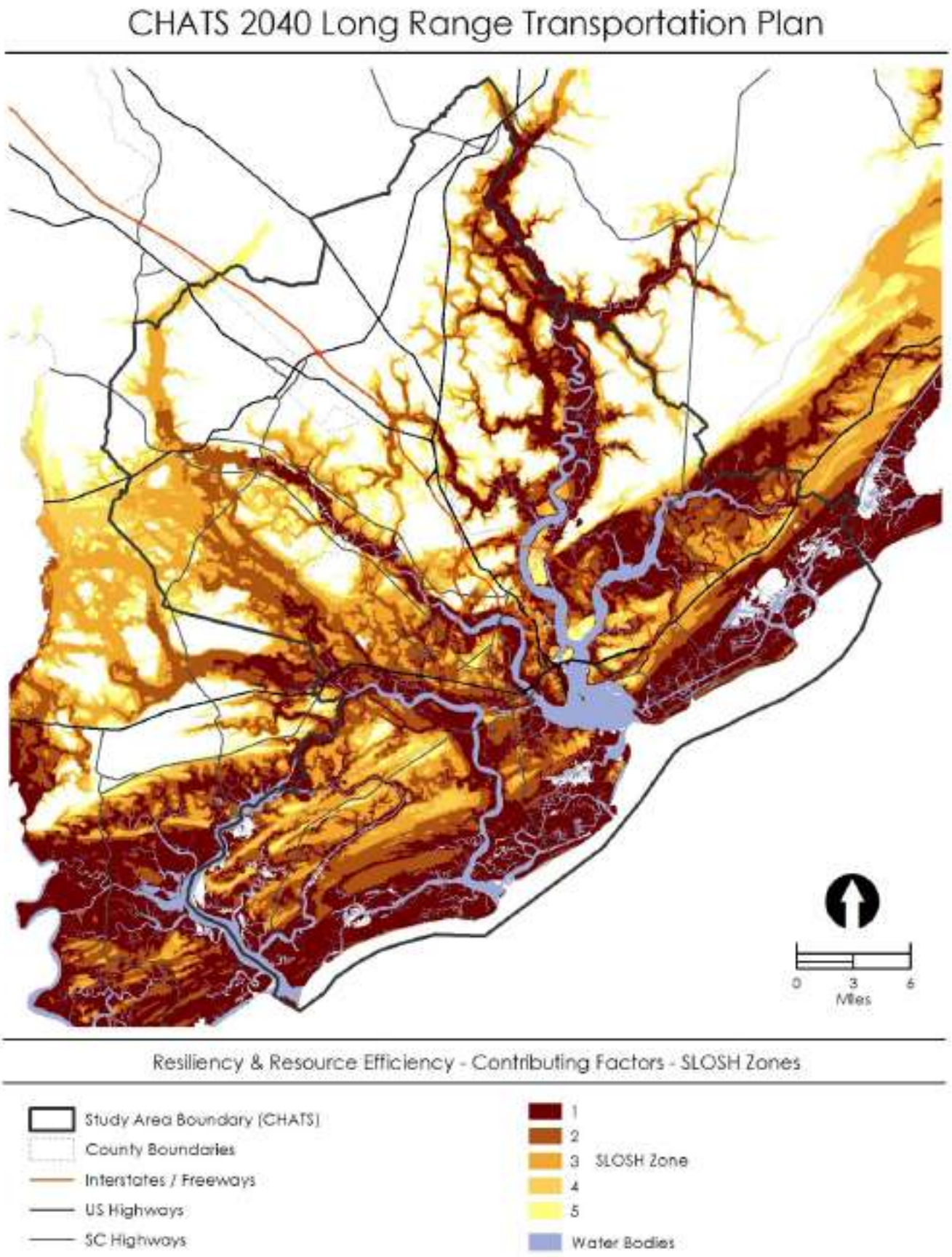
**Map C-18: Resiliency & Resource Efficiency - Contributing Factors - Emergency Facilities**



**Map C-19: Resiliency & Resource Efficiency - Contributing Factors - Evacuation Routes**



**Map C-20: Resiliency & Resource Efficiency - Contributing Factors - SLOSH Zones**



# D - Transit Needs Assessment

# 1.0 Introduction

This report provides an overview of the existing public transit services in the Charleston Area Transportation Study (CHATS) planning area and an assessment of long-range transit needs for the region. Public transportation services in the BCD region are primarily provided by two agencies: the Charleston Area Regional Transportation Authority (CARTA) and the Berkeley-Charleston-Dorchester Regional Transportation Management Association (RTMA, d.b.a. TriCounty Link). CARTA primarily serves the urban core of the region with fixed route, commuter bus, and paratransit services, while TriCounty Link (TCL) serves the rural areas of the region with deviated fixed route and commuter services. Figure 1 illustrates the CARTA and TCL route networks within the CHATS planning area.

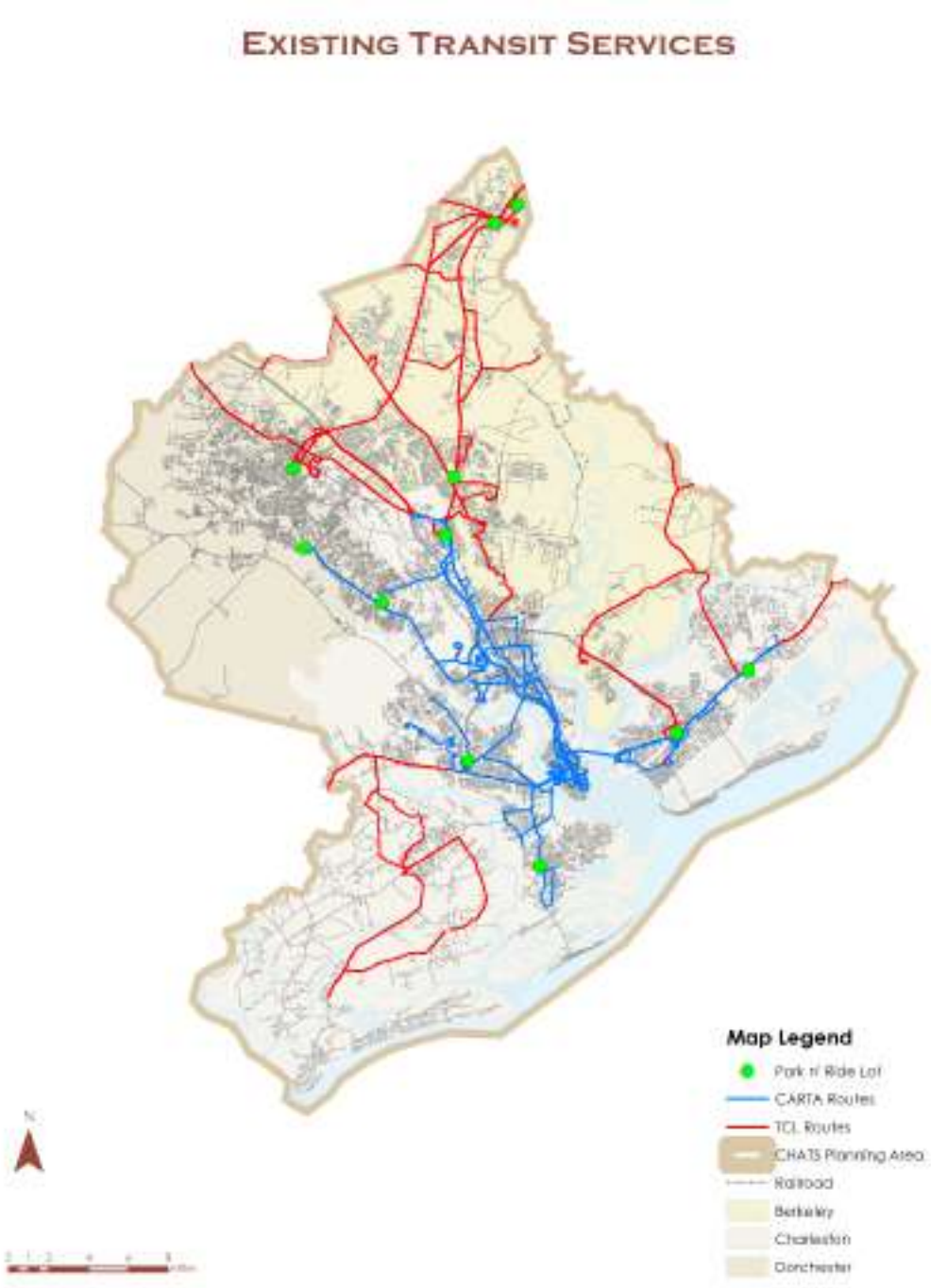



**Figure 1: Existing CARTA and TCL Route Networks and Park-and-Ride Lots**

# 2.0 Existing Transit Conditions in the Charleston Region

This section provides an overview and description of the existing transit conditions in the Charleston region. The demographic and socioeconomic factors that influence demand for transit and the funding and governance, operational, and performance characteristics of CARTA and TCL are discussed below.

## *2.1 Drivers of Transit Demand*

There are several key determinants that predict where transit will be successful, including population and employment density and socioeconomic characteristics. Population and employment densities influence how many people are able to access transit and ultimately influence the level of service that can be supported in a given area. Socioeconomic characteristics such as household income, access to automobiles, age, physical disabilities, and minority status are also significant drivers of demand for public transportation. Areas with higher concentrations of these indicators tend to have the best success at generating transit ridership.

To assess these key determinants of transit demand, demographic data for the counties of Berkeley, Charleston, and Dorchester were collected and analyzed via cartographic visualization in GIS. Population and employment density and percent change for the years 2015 and 2040 are shown in Figures 2 through 7. Additionally, demographic groups that tend to demonstrate high propensity for transit use were mapped, revealing locations throughout the region where transit access is especially important to the local population. These indicators are presented as percentages of total population in Figures 8 through 12, and include households below the poverty threshold, minority population, households with no access to a vehicle, working age (20 to 64) population with a disability, and population less than 18 or greater than 64 years of age. This analysis led to several key observations, outlined below.

- In 2015, the greatest population density is in Downtown Charleston. Some additional areas with moderate population density exist just outside of downtown, in North Charleston and West Ashley. Hanahan, Goose Creek, and the Rivers Avenue corridor also show some pockets of relatively high population density.

- By 2040, nearly the entire region is expected to increase in population. The greatest percentage increases will be in downtown Charleston, North Charleston, West Ashley, Mount Pleasant/ East Cooper, and the portions of the northern areas of the study area in and around Goose Creek, Ladson, and Hanahan.

- Areas of high employment density in 2015 include Downtown Charleston, The Citadel Mall area, and Mount Pleasant/Patriots Point. North of downtown, the City of North Charleston, Charleston International Airport, and the Ashley Shores areas all have concentrated employment. The Rivers Ave corridor has long stretches of employment density as well.

- Transitioning into 2040, employment is expected in increase across the study area almost universally. The largest areas of employment increase by percent change are in downtown Charleston, West Ashley, and the I-26 corridor from North Charleston to Summerville.

- There is a clear trend of households below the poverty threshold in Downtown Charleston, extending north to North Charleston and along I-26. There is also a large section of southwestern Dorchester County that has a high percentage of households in poverty.

- There are several areas of concentrated minority populations throughout the region. Most of the northernmost section of Charleston County, north of Ashley River, has a high percentage of minority population. This trend continues towards, but does not include, the southern portion of Downtown Charleston.

- Most block groups in the three-county study area have a high percentage of households with access to vehicles. Small pockets of concentrations of zero-vehicle households exist near Patriots Point in Mount Pleasant, North Charleston, and near the Citadel Mall in West Ashley.

- The highest concentrations of persons with disabilities exist in North Charleston, with small pockets of high percentages of disabled populations near Moncks Corner, Summerville, Johns Island, and West Ashley.

- Populations with a high percentage aged less than 18 or greater than 64 are generally evenly dispersed throughout the study area. Some small areas with high percentage of this group are located in the Neck Area and along Dorchester Road in North Charleston, near Summerville, Goose Creek, Moncks Corner, and Mount Pleasant, and on Isle of Palms.

In general, most areas showing high percentages of traditionally transit-dependent populations are currently served by either CARTA or TCL, especially when density is taken into consideration. For example, while some large block groups in rural parts of the CHATS planning area show high incidences of certain transit dependent populations, the total population in those areas tends to be low and thus difficult to efficiently serve with fixed route transit.

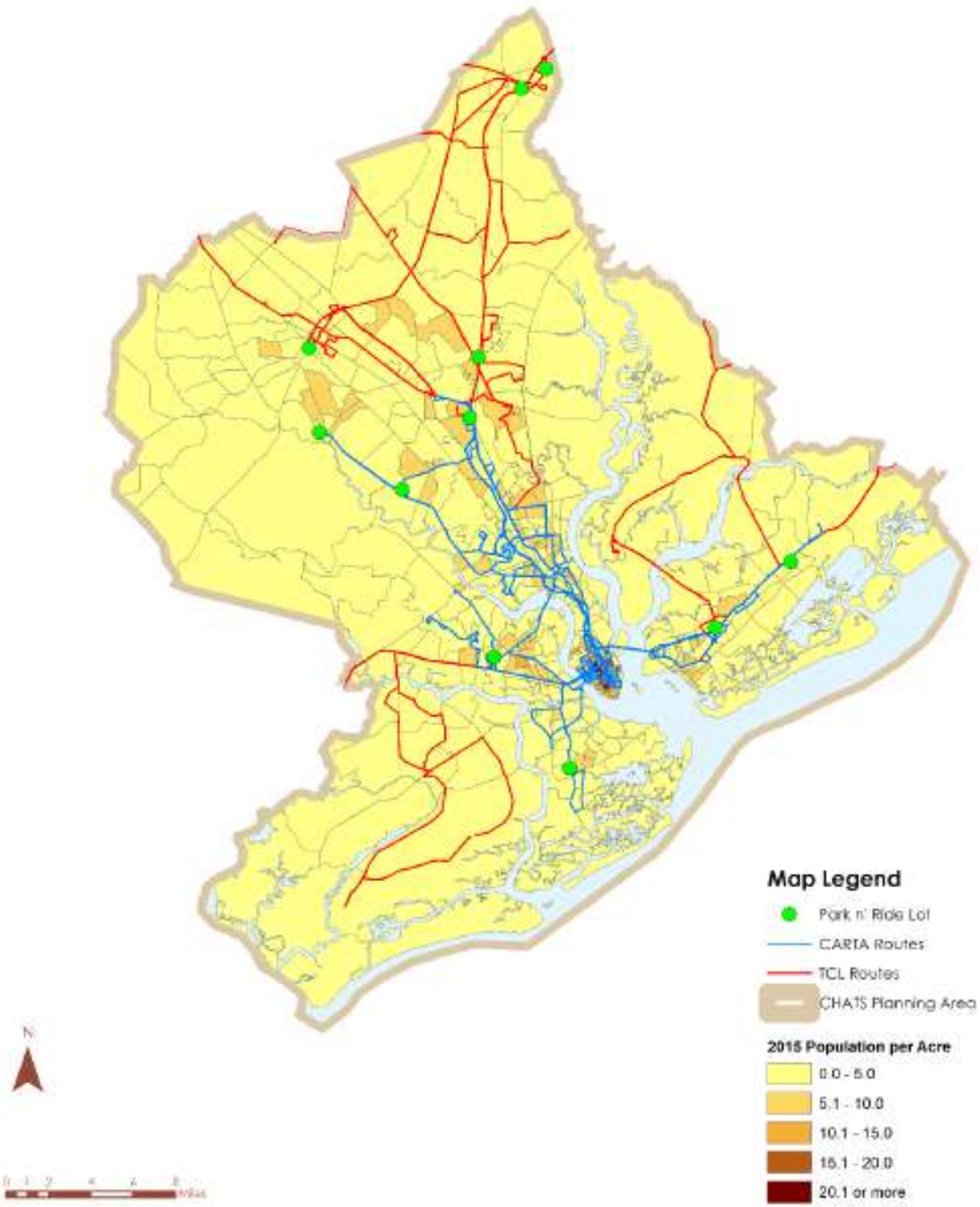



**Figure 2: 2015 Population Density**
*(Source: BCDCOG)*

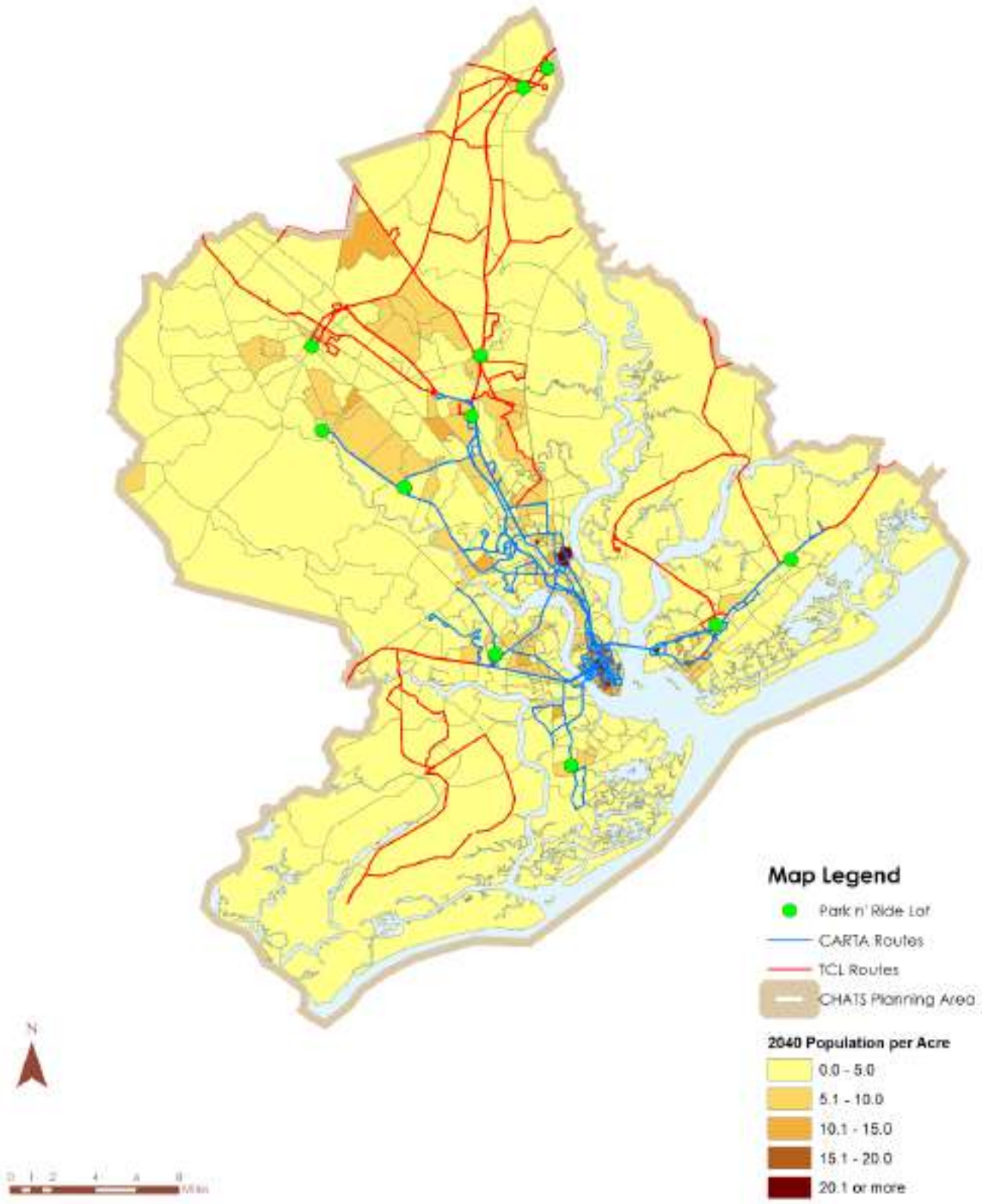



**Figure 3: 2040 Population Density**
*(Source: BCDCOG)*

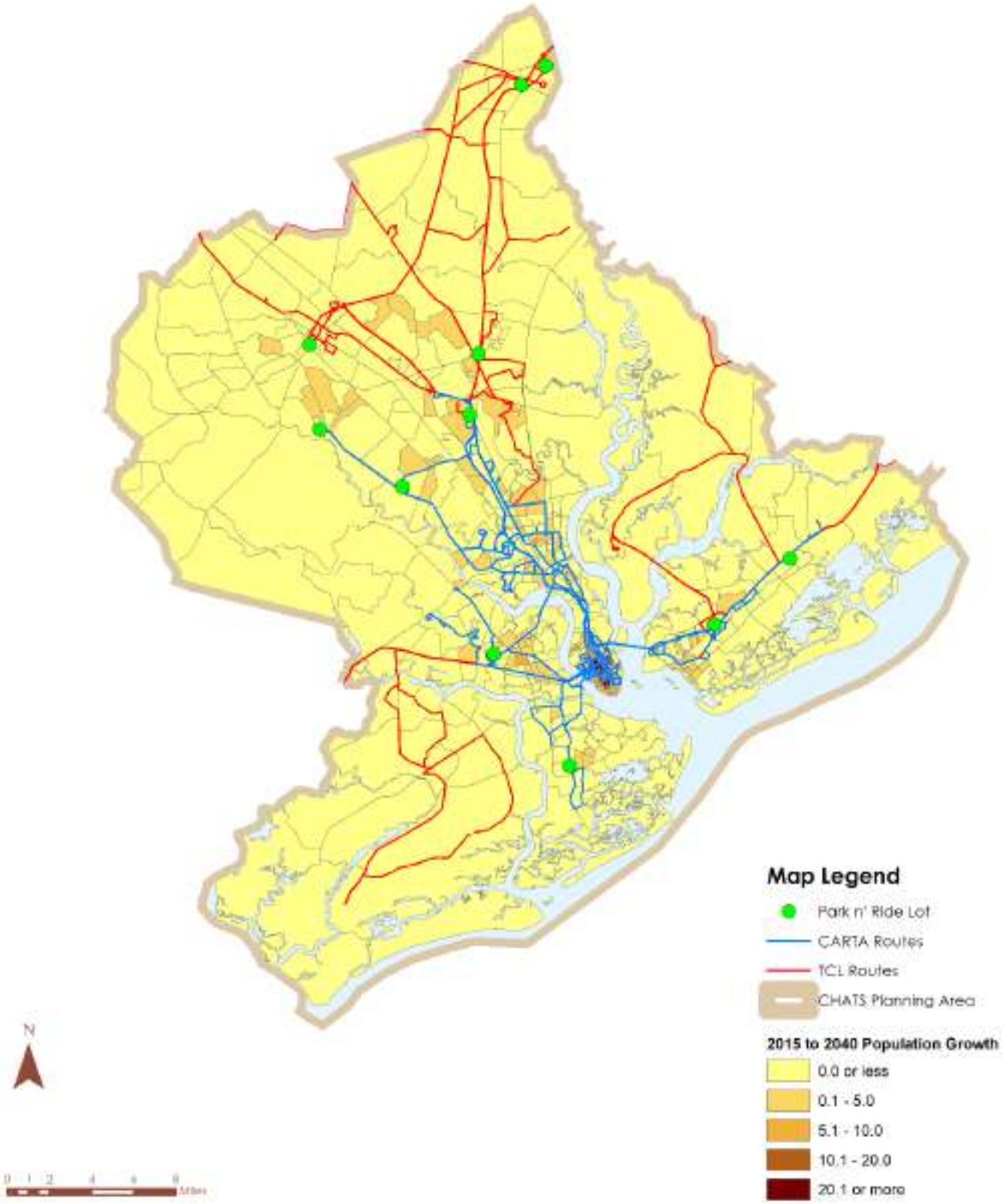



**Figure 4: Estimated Percent Change in Population, 2015-2040**
*(Source: BCDCOG)*

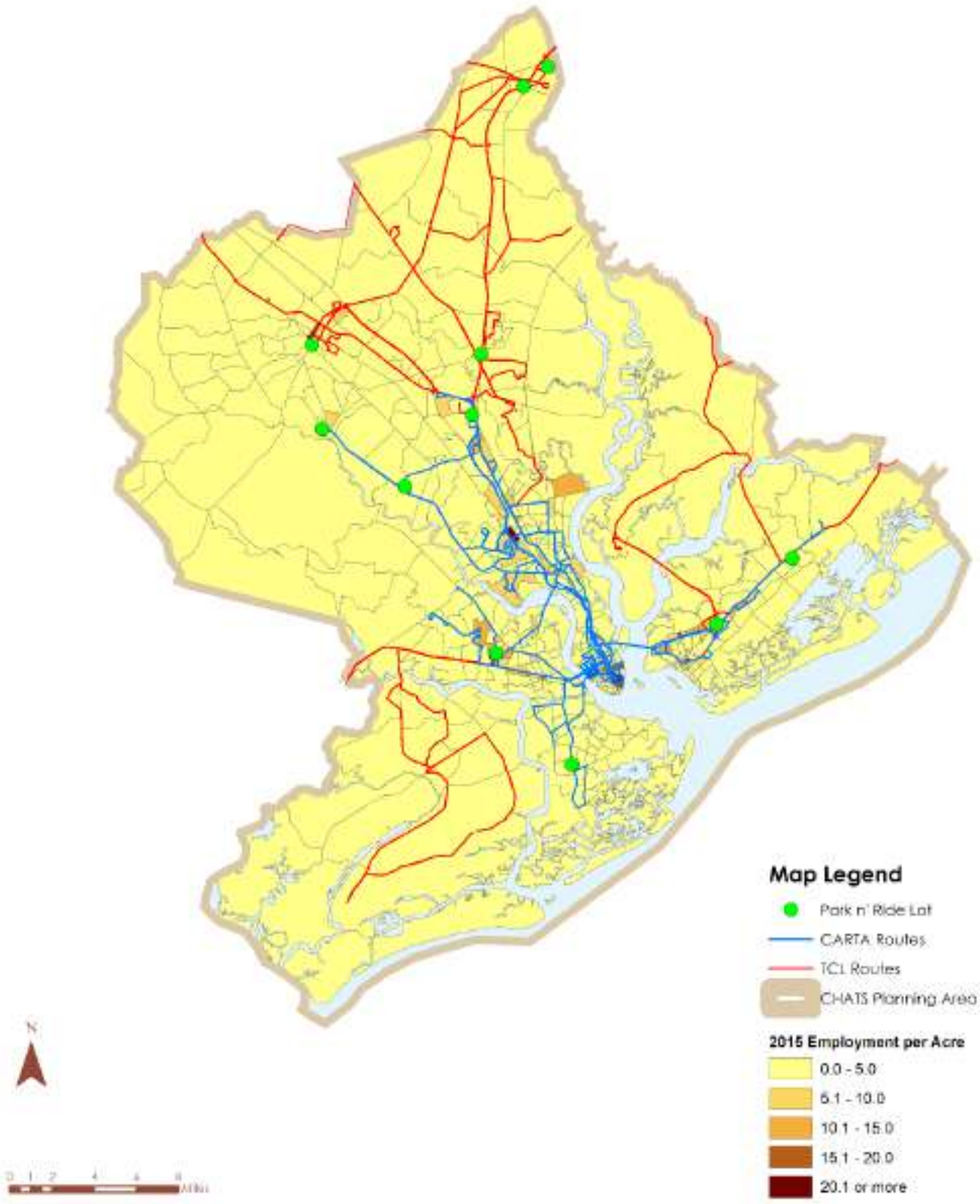



**Figure 5: 2015 Employment Density**
*(Source: BCDCOG)*

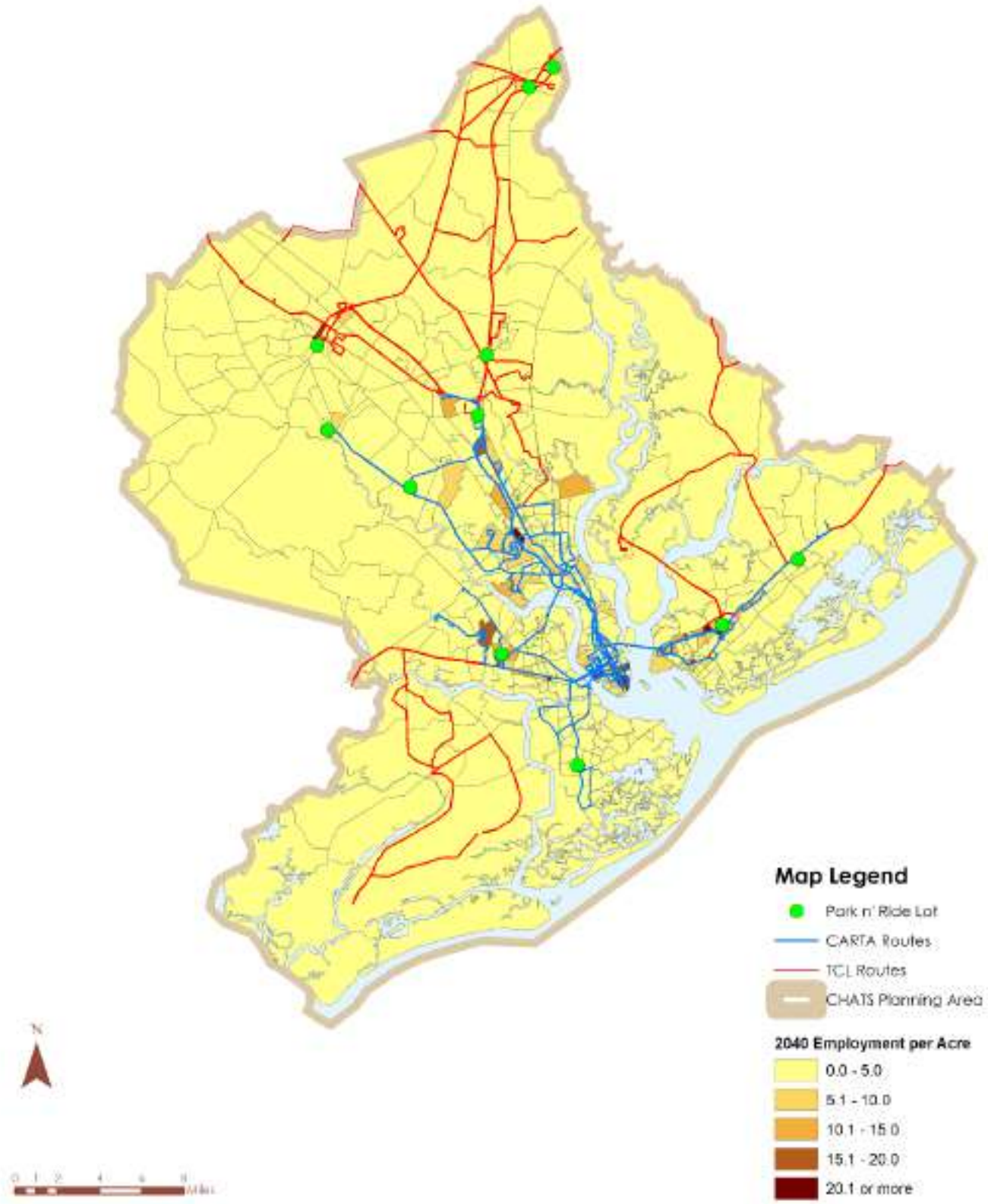



**Figure 6: 2040 Employment Density**
*(Source: BCDCOG)*

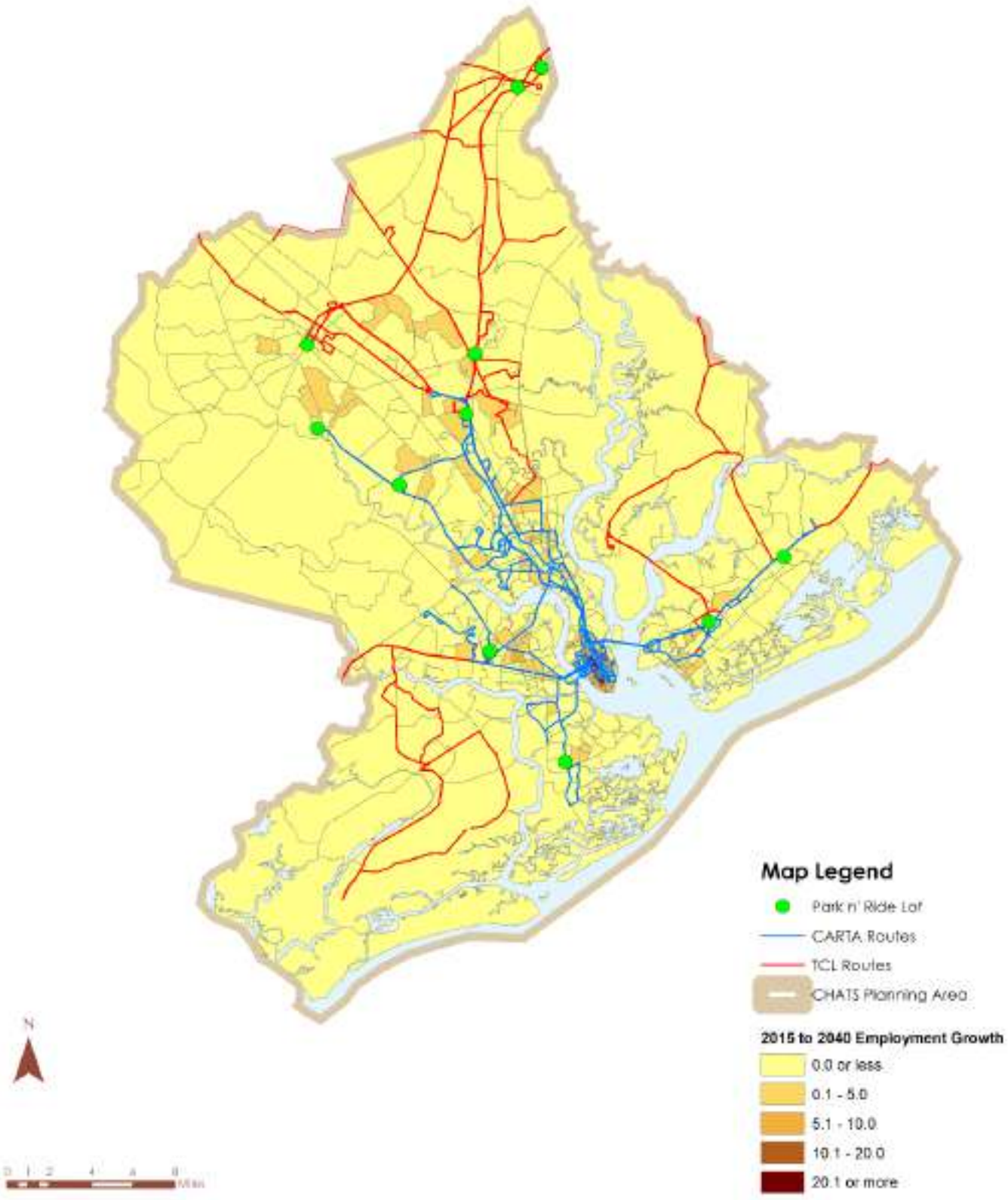



**Figure 7: Estimated Percent Change in Employment, 2015-2040**
*(Source: BCDCOG)*

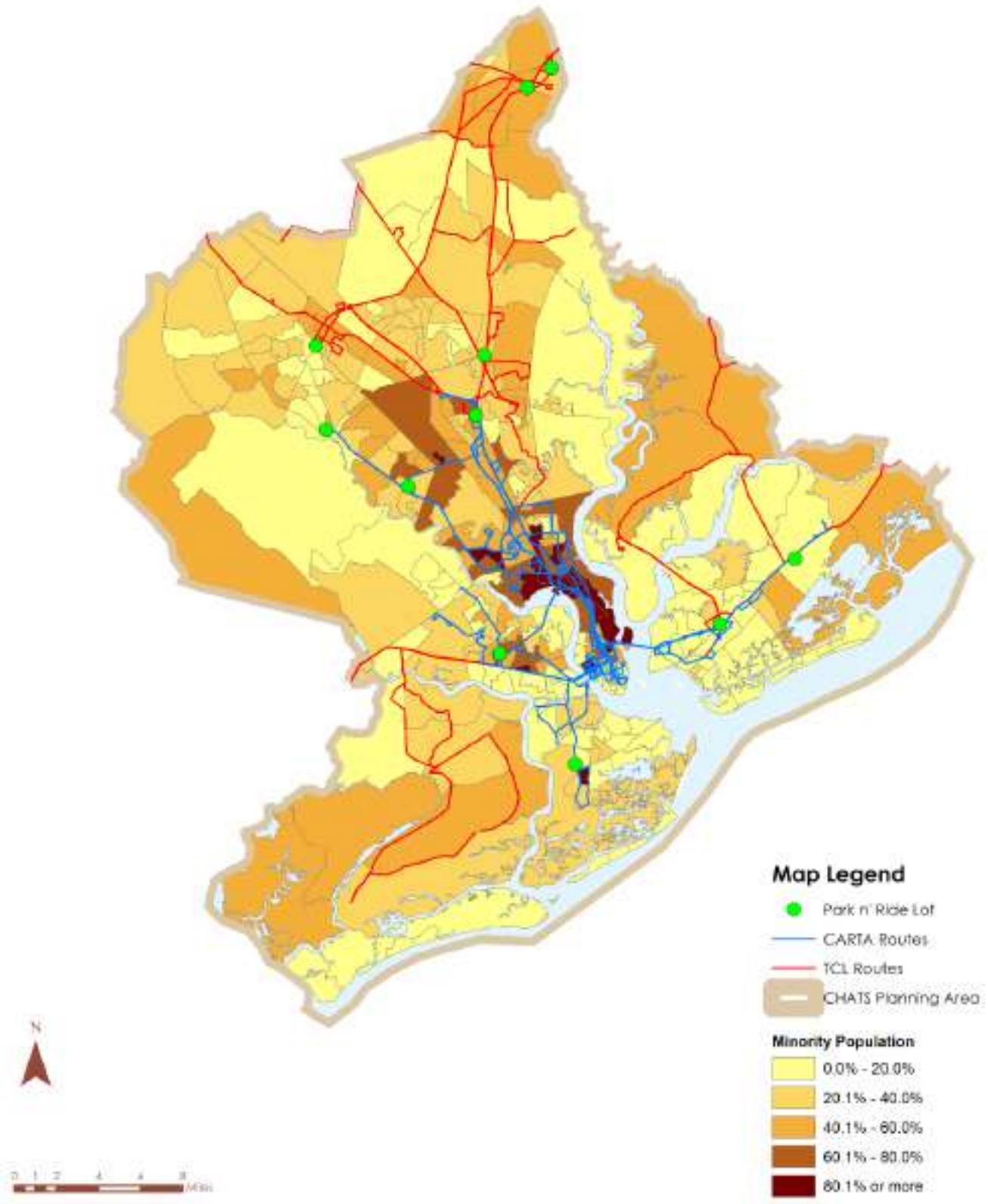



**Figure 8: Minority Population as Percent of Total Population**
*(Source: 2011-2015 ACS)*

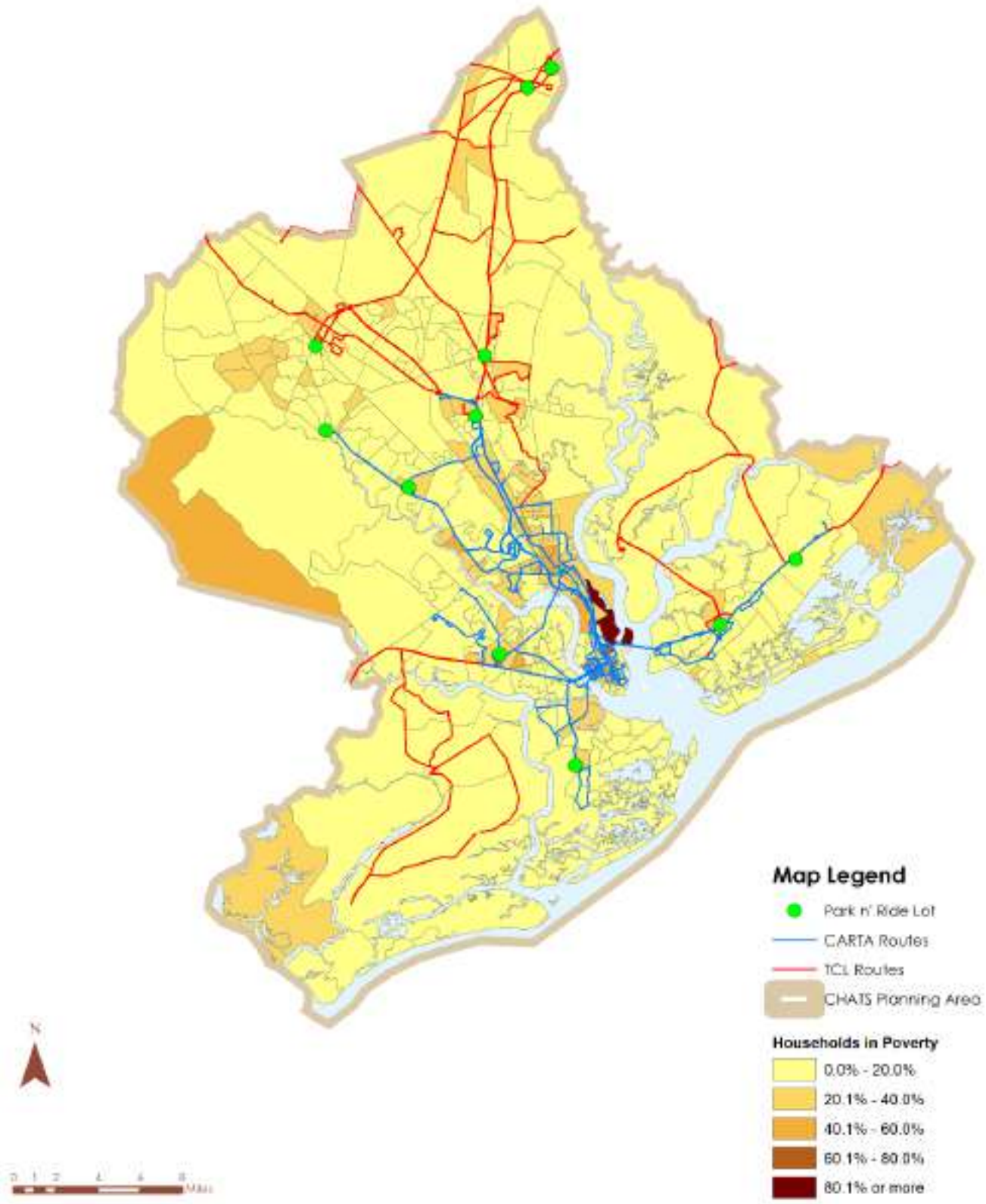



**Figure 9: Households Under Poverty Threshold as Percent of Total Households**
*(Source: 2011-2015 ACS)*

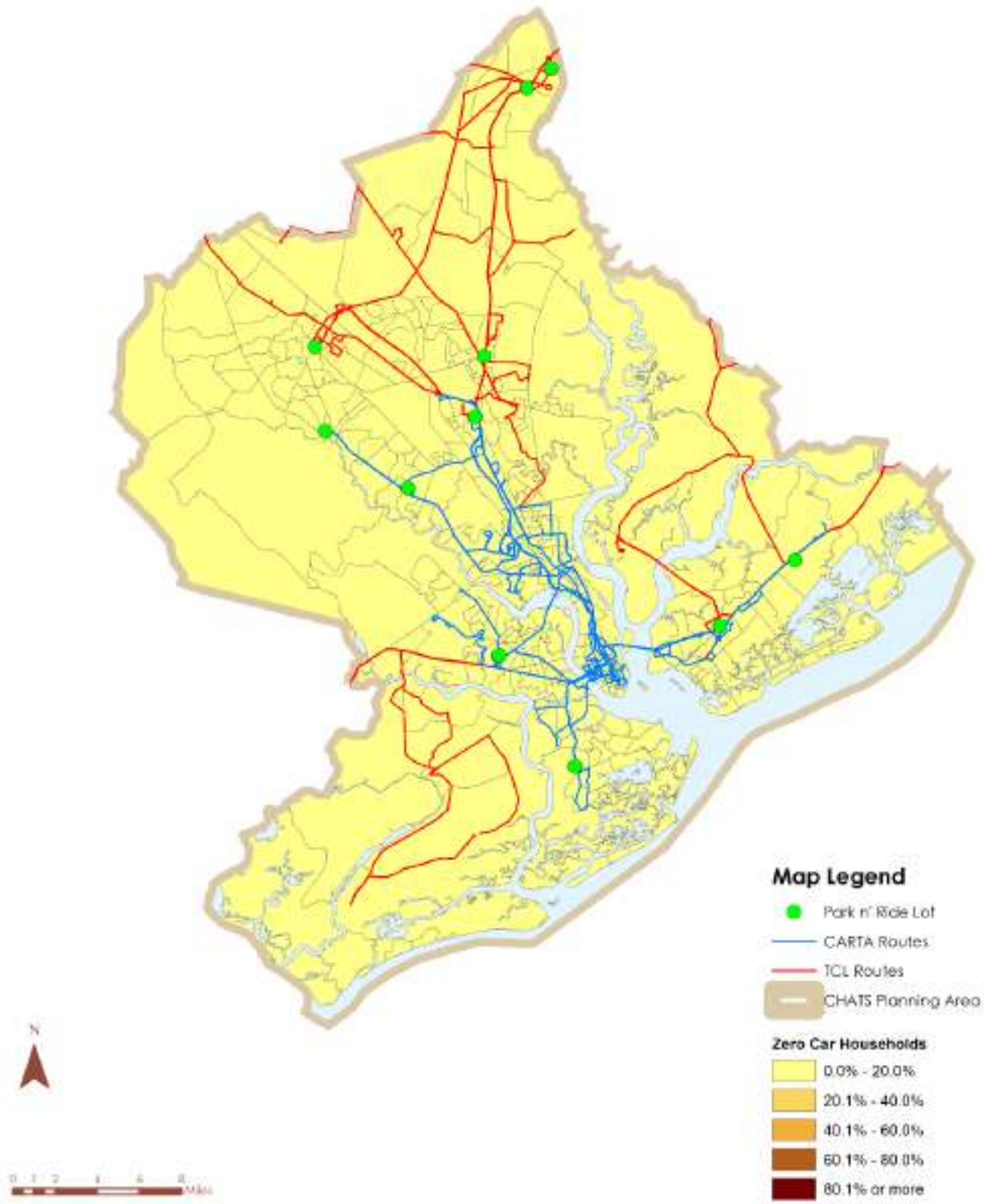



**Figure 10: Zero Car Households as Percent of Total Households**
*(Source: 2011-2015 ACS)*

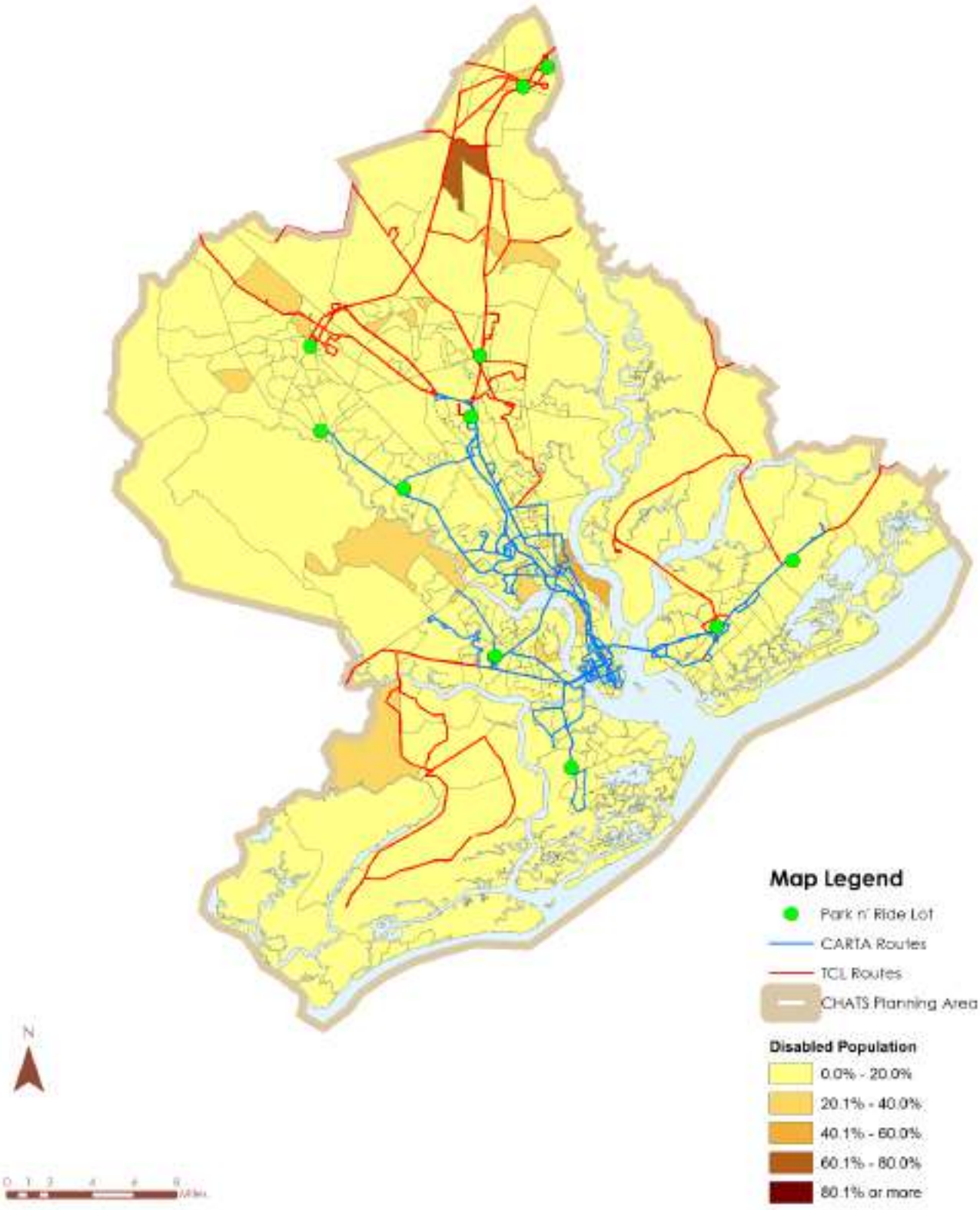



**Figure 11: Disabled Population as Percent of Total Population**
*(Source: 2011-2015 ACS)*

**Figure 12: Elderly Population (> 65 years of age) as Percent of Total Population**
*(Source: 2011-2015 ACS)*

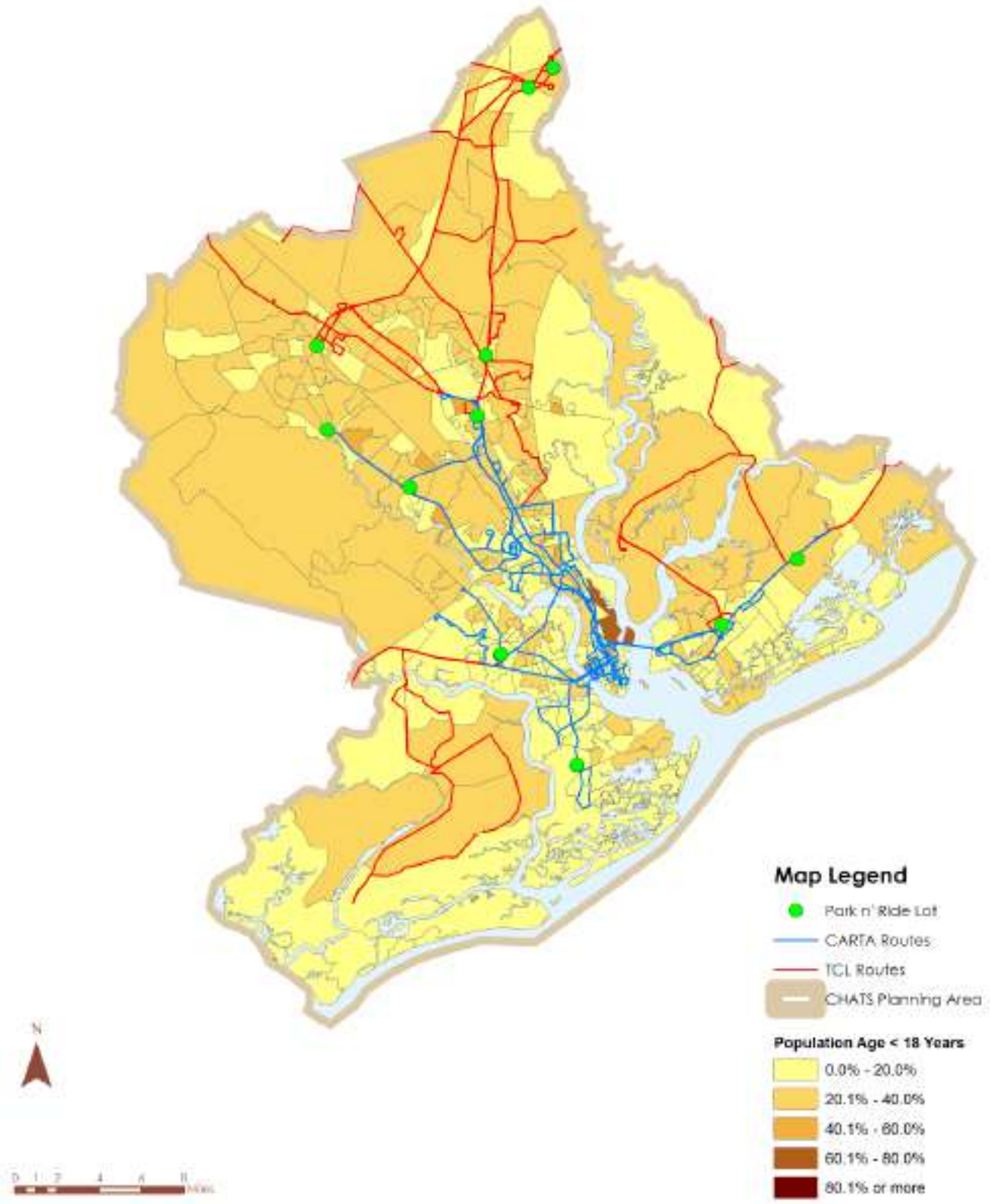



**Figure 13: Youth Population (< 18 years of age) as Percent of Total Population**
*(Source: 2011-2015 ACS)*

## 2.2 CARTA

Like many communities throughout the United States that once had streetcar service, public transportation in the Charleston region was originally provided by the local electric company, the South Carolina Electric & Gas Company (SCE&G). SCE&G retained control of the system throughout the eventual transition from streetcars to buses, but incrementally reduced service beginning in the 1970's until operations were transitioned to the City of Charleston in 1996. CARTA was subsequently formed in 1997 as a regional governmental entity charged with providing public transportation services throughout the Charleston region. In this role, CARTA provides local bus, commuter bus, and demand response/paratransit services to a population of nearly 550,000.[1]

### *Governance and Organization*

CARTA is governed by an 18-member Board of Directors representing the Authority's eight member jurisdictions, including: Charleston County, the City of Charleston, the City of North Charleston, the Town of Mount Pleasant, the City of Hanahan, the City of Isle of Palms, the Town of Sullivan's Island, and the Town of Kiawah Island. The CARTA board is responsible for setting policy and providing oversight of the agency. The Berkeley Charleston Dorchester Council of Governments (BCDCOG) provides administration, contract management, finance and accounting, data reporting and compliance, planning, and scheduling functions for CARTA. Operations and maintenance functions are carried out through a contract with Transdev, a private transportation company. Transdev is responsible for staffing and managing vehicle operators and maintenance technicians.

### *Funding*

The South Carolina Department of Transportation (SCDOT) Division of Intermodal and Freight Programs, Office of Public Transit is responsible for developing, coordinating, and implementing public transit programs and policy for the state and distributing Federal Transit Administration (FTA) formula funds and state funding contributions. In addition to administering federal funding programs including Section 5311 (Non-Urbanized Area), 5310 (Elderly and Individuals with Disabilities), 5339 (Bus and Bus Facilities), and 5311 (c) and (b)(3) (Public Transportation on Indian Reservations and Rural Transit Assistance Program), the Office of Public Transit distributes proceeds from a statewide one-quarter cent per gallon tax on gasoline to public transportation recipients. The BCDCOG is the designated recipient of FTA urbanized area formula funds (5307), and CARTA is a direct recipient of those funds.

Funding for CARTA's capital program is provided through a mix of local, state, and federal sources, while its operations are funded through local, state, and federal sources, fare revenues, and various other sources. As shown in Figure 14, approximately half of CARTA's operating revenue in 2015 came from local sources. CARTA's local funding contribution primarily comes from the Charleston County half-cent transportation sales tax originally instituted in 2004, which in 2015 accounted for approximately 40%

1 Source: 2015 National Transit Database, Service Area Population

of total operating revenues.[2] A second half-cent sales tax was passed in 2016 which identified an additional $600 million in funding for transit capital programs and operations. The balance of its local funding contributions came from partners including the City of Charleston, College of Charleston, and the Medical University of South Carolina. Approximately 28% of CARTA's 2015

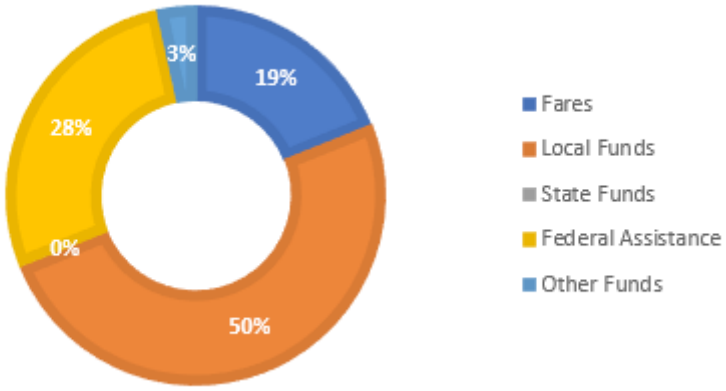



**Figure 14: CARTA Operating Funding Sources** *(Source: 2015 National Transit Database)*

operating funds were derived from federal Section 5307 (Urbanized Area Formula Program) funds, 19% came from fare revenue, and the remaining 3% came from other directly generated sources such as advertising. It should be noted that while CARTA typically receives approximately $600,000 annually in State Mass Transit formula funds, it received an advance during a prior fiscal year and thus did not report state funding in 2015.[3]

### *Service Profile*

CARTA currently operates 21 fixed routes, which include 18 local routes and three Downtown Area Shuttle (DASH) routes, and four commuter express routes serving seven park and ride facilities. CARTA's Tel-a-Ride (ADA paratransit) provides demand response service to qualifying individuals within ¾-mile of a fixed route alignment. CARTA operates 365 days a year. Its local routes generally operate from approximately 6:00 am to 9:00-10:00 pm, with peak frequencies ranging from 10 minutes to 105 minutes. CARTA's express routes generally operate at 30-minute headways within the same span of service as the local routes; however, no mid-day service is provided except for Route 4, which provides hourly service to the airport throughout the day.

2 Source: 2015 National Transit Database
3 In SFY12-13, CARTA waived SMTF for four years in exchange for supplemental unobligated Small Urban Section 5307 funds.

**Table 1: CARTA Routes** *(Source: CARTA)*

| Local Routes | Frequency (mins) | Weekday Span of Service |
|---|---|---|
| Route 10 Rivers Ave. | 20 | 5:50 AM - 12:48 AM |
| Route 11 Dorchester/Airport | 40 | 5:49 AM - 9:20 PM |
| Route 12 Upper Dorchester/AFB | 60 | 5:40 AM - 10:22 PM |
| Route 13 Montague/Remount/Spruill Road | 60 | 6:30 AM - 8:54 PM |
| Route 20 King St. | 25 | 6:02 AM - 8:57 PM |
| Route 30 Savannah Hwy | 60 | 6:00 AM - 9:24 PM |
| Route 31 Folly Road | 105 | 6:00 AM - 9:33 PM |
| Route 32 North Bridge | 60 | 6:00 AM - 8:55 PM |
| Route 33 St. Andrews/Ashley River Rd. | 60 | 6:00 AM - 8:50 PM |
| Route 40 Mt. Pleasant | 60 | 6:20 AM - 9:45 PM |
| Route 41 Coleman Blvd | 90 | 6:00 AM - 8:50 PM |
| Route 42 WANDO Circulator | 60 | 6:10 AM - 6:02 PM |
| Route 102 North Neck/Rutledge | 80 | 6:00 AM - 8:34 PM |
| Route 103 Leeds Ave. | 60 | 6:00 AM - 5:56 PM |
| Route 104 Montague Ave. | 60 | 6:00 AM - 9:21 PM |
| Route 203 Medical Shuttle | 10[a] | 5:02 AM - 12:32 AM |
| Route 204 MUSC/Calhoun Circulator | 40 | 9:00 AM - 2:56 PM |
| Route 301 Glenn McConnell Circulator | 60 | 6:20 AM - 9:38 PM |
| DASH Shuttle 210 Aquarium/ C of C | 14 | 6:28 AM - 10:16 PM |
| DASH Shuttle 211 Meeting/King | 15 | 7:16 AM - 9:19 PM |
| DASH Shuttles 213 Lockwood / Calhoun | 45 | 6:20 AM - 9:15 PM |
| **Express Routes** | **Frequency (mins)** | **Span of Service** |
| Route 1 North/South (North Charleston/James Island) | 30[a] | 5:19 AM - 8:06 PM |
| Route 2 East West Express (Mt. Pleasant/West Ashley) | 30[a] | 5:35 AM - 8:21 PM |
| Route 3 Dorchester Rd/Downtown | 30[a] | 5:15 AM - 8:33 PM |
| Route 4 NASH Express | 60 | 8:00 AM - 8:58 PM |

[a] *Peak-periods only*

According to the most recently available data reported to the National Transit Database (NTD), CARTA provided over 5 million passenger trips in 2015 across its three service modes. Local bus ridership accounted for over 4.7 million trips in 2015, while commuter bus and demand response accounted for approximately 200,000 and 79,000 trips, respectively. Total system-wide ridership increased 15% between 2011 and 2015. General service supply metrics including revenue hours, miles, and peak buses also increased since 2011, as did the operating budget and fare revenues earned, reflecting an overall growth of the system during this period. CARTA's total operating budget in 2015 was approximately $19 million and the agency earned approximately $3.6 million in fare revenues during the same year.

**Table 2: CARTA Operating Statistics, 2011-2015** *(Source: National Transit Database)*

| Local Bus | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|
| Passenger Trips | 4,300,680 | 4,832,138 | 4,793,021 | 4,635,086 | 4,748,310 |
| Fare Revenues<?> | $2,695,600 | $3,577,474 | $3,985,376 | $2,923,641 | $2,717,380 |
| Operating Expenses | $14,017,944 | $14,330,763 | $15,926,503 | $15,539,804 | $15,319,028 |
| Revenue Hours | 207,057 | 207,562 | 209,535 | 205,833 | 206,088 |
| Revenue Miles | 2,909,657 | 2,848,262 | 2,928,999 | 2,825,153 | 2,794,908 |
| Peak Buses | 66 | 81 | 81 | 74 | 73 |
| **Commuter Bus** | **2011** | **2012** | **2013** | **2014** | **2015** |
| Passenger Trips | N/A | N/A | N/A | 208,874 | 202,829 |
| Fare Revenues | N/A | N/A | N/A | $26,670 | $217,389 |
| Operating Expenses | N/A | N/A | N/A | $1,005,380 | $987,650 |
| Revenue Hours | N/A | N/A | N/A | 10,881 | 10,956 |
| Revenue Miles | N/A | N/A | N/A | 190,406 | 192,240 |
| Peak Buses | N/A | N/A | N/A | 7 | 7 |
| **Total Fixed Route (Local + Commuter)** | **2011** | **2012** | **2013** | **2014** | **2015** |
| Passenger Trips | 4,300,680 | 4,832,138 | 4,793,021 | 4,843,960 | 4,951,139 |
| Fare Revenues | $2,695,600 | $3,577,474 | $3,985,376 | $2,950,311 | $2,934,769 |
| Operating Expenses | $14,017,944 | $14,330,763 | $15,926,503 | $16,545,184 | $16,306,678 |
| Revenue Hours | 207,057 | 207,562 | 209,535 | 216,714 | 217,044 |
| Revenue Miles | 2,909,657 | 2,848,262 | 2,928,999 | 3,015,559 | 2,987,148 |
| Peak Buses | 66 | 81 | 81 | 81 | 80 |
| **Demand Response** | **2011** | **2012** | **2013** | **2014** | **2015** |
| Passenger Trips | 69,283 | 72,342 | 73,277 | 75,607 | 78,921 |
| Fare Revenues<?> | $242,491 | $250,292 | $256,470 | $264,624 | $688,402 |
| Operating Expenses | $2,419,867 | $2,530,417 | $2,916,382 | $2,980,676 | $2,851,378 |
| Revenue Hours | 41,570 | 39,371 | 40,671 | 42,111 | 42,064 |
| Revenue Miles | 613,501 | 591,482 | 641,996 | 641,134 | 589,009 |
| Peak Buses | 18 | 23 | 23 | 21 | 20 |
| **SYSTEM TOTAL** | **2011** | **2012** | **2013** | **2014** | **2015** |
| Passenger Trips | 4,369,963 | 4,904,480 | 4,866,298 | 4,919,567 | 5,030,060 |
| Fare Revenues | $2,938,091 | $3,827,766 | $4,241,846 | $3,214,935 | $3,623,171 |
| Operating Expenses | $16,437,811 | $16,861,180 | $18,842,885 | $19,525,860 | $19,158,056 |
| Revenue Hours | 248,627 | 246,933 | 250,206 | 258,825 | 259,108 |
| Revenue Miles | 3,523,158 | 3,439,744 | 3,570,995 | 3,656,693 | 3,576,157 |
| Peak Buses | 84 | 104 | 104 | 102 | 100 |

*Note: Commuter bus statistics not reported separately to NTD until 2014. Prior to 2014, commuter bus statistics were included in local bus reports.*

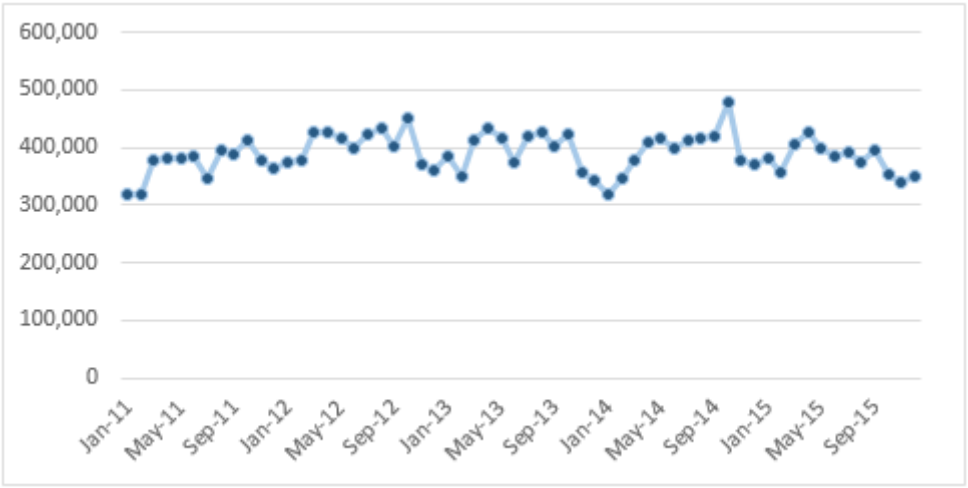



**Figure 15: CARTA Fixed Route (Local + Commuter Bus) Monthly Ridership, Jan 2011 – Dec 2015**
*(Source: 2015 National Transit Database)*

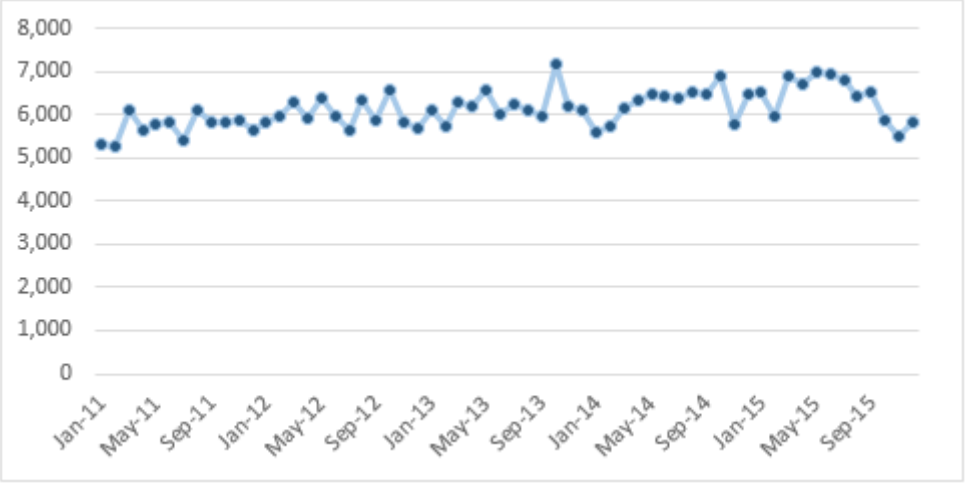



**Figure 16: CARTA Demand Response Monthly Ridership, Jan 2011 – Dec 2015**
*(Source: 2015 National Transit Database)*

### *Performance Summary*

Several key performance measures were reviewed to determine CARTA's service productivity and cost efficiency and effectiveness between 2011 and 2015. CARTA's fixed route bus service productivity (local bus and commuter bus) increased during the five-year period, with passenger trips per revenue hour up 10% and passenger trips per revenue mile up 12%. Despite steady gains in productivity, overall cost efficiency decreased due to increasing operating costs, with cost per revenue hour and mile increasing by 11% and 13%, respectively. Cost effectiveness also declined slightly, with operating cost per passenger trip up 1% and farebox recovery down 1%.

CARTA's demand response performance followed similar trends between 2011 and 2015 as its fixed route services. Productivity increased, with passenger trips per revenue mile and hour up 13% and 19%, respectively, while cost efficiency and effectiveness declined. Operating cost per revenue hour increased 16%, cost per revenue mile increased 23%, and cost per passenger trip increased 3%. The large improvement in cost recovery is likely due to a change in revenue reporting methodology beginning in 2015.

According to the SCDOT Public Transit Data Report for SFY2015-16, CARTA's service productivity was above the statewide average for large urban transit systems in terms of both passenger trips per revenue mile and revenue hour. Compared to its statewide peers, CARTA is also more cost efficient and effective in terms of operating expenses per passenger trip, revenue hour, revenue mile, and farebox recovery.

**Table 3: CARTA Performance Measures, 2011-2015** *(Source: National Transit Database)*

| **Local Bus** | **2011** | **2012** | **2013** | **2014** | **2015** |
|---|---|---|---|---|---|
| Passenger Trips per Revenue Hour | 20.8 | 23.3 | 22.9 | 22.5 | 23.0 |
| Passenger Trips per Revenue Mile | 1.48 | 1.70 | 1.64 | 1.64 | 1.70 |
| Operating Expense per Revenue Hour | $67.70 | $69.04 | $76.01 | $75.50 | $74.33 |
| Operating Expense per Revenue Mile | $4.82 | $5.03 | $5.44 | $5.50 | $5.48 |
| Operating Expense per Passenger Trip | $3.26 | $2.97 | $3.32 | $3.35 | $3.23 |
| Farebox Recovery Ratio | 19% | 25% | 25% | 19% | 18% |
| **Commuter Bus** | **2011** | **2012** | **2013** | **2014** | **2015** |
| Passenger Trips per Revenue Hour | N/A | N/A | N/A | 19.2 | 18.5 |
| Passenger Trips per Revenue Mile | N/A | N/A | N/A | 1.10 | 1.06 |
| Operating Expense per Revenue Hour | N/A | N/A | N/A | $92.40 | $90.15 |
| Operating Expense per Revenue Mile | N/A | N/A | N/A | $5.28 | $5.14 |
| Operating Expense per Passenger Trip | N/A | N/A | N/A | $4.81 | $4.87 |
| Farebox Recovery Ratio | N/A | N/A | N/A | 3% | 22% |
| **Total Fixed Route (Local + Commuter)** | **2011** | **2012** | **2013** | **2014** | **2015** |
| Passenger Trips per Revenue Hour | 20.8 | 23.3 | 22.9 | 22.4 | 22.8 |
| Passenger Trips per Revenue Mile | 1.48 | 1.70 | 1.64 | 1.61 | 1.66 |
| Operating Expense per Revenue Hour | $67.70 | $69.04 | $76.01 | $76.35 | $75.13 |
| Operating Expense per Revenue Mile | $4.82 | $5.03 | $5.44 | $5.49 | $5.46 |
| Operating Expense per Passenger Trip | $3.26 | $2.97 | $3.32 | $3.42 | $3.29 |
| Farebox Recovery Ratio | 19% | 25% | 25% | 18% | 18% |
| **Demand Response** | **2011** | **2012** | **2013** | **2014** | **2015** |
| Passenger Trips per Revenue Hour | 1.67 | 1.84 | 1.80 | 1.80 | 1.88 |
| Passenger Trips per Revenue Mile | 0.11 | 0.12 | 0.11 | 0.12 | 0.13 |
| Operating Expense per Revenue Hour | $58.21 | $64.27 | $71.71 | $70.78 | $67.79 |
| Operating Expense per Revenue Mile | $3.94 | $4.28 | $4.54 | $4.65 | $4.84 |
| Operating Expense per Passenger Trip | $34.93 | $34.98 | $39.80 | $39.42 | $36.13 |
| Farebox Recovery Ratio | 10% | 10% | 9% | 9% | 24% |

### *Summary of Capital Assets*

CARTA operates an active fleet of 136 revenue vehicles, as summarized in Table 4. The fixed route diesel fleet consists of a mix of seven (7) 30-foot buses, twenty-nine (29) 40-foot buses, forty (40) 35-foot buses, seven (7) 22-foot cutaway buses, and 12 trolleys. The paratransit service operates an active fleet of twenty-one (21) 22-foot cutaway buses and 20 vans, all of which are ADA-accessible. CARTA's non-revenue fleet includes 12 support vehicles and maintenance trucks. In 2015, CARTA's commuter bus fleet had an average vehicle age of 21 years and its local bus fleet an average age of 15 years, both of which are well above industry average and beyond the typical useful life benchmarks for transit vehicles. In light of this, CARTA is in the process of phasing out its older vehicles and replacing them with newer models. Recently, CARTA purchased seven new 30' MIDI buses to replace its fleet of trolleys assigned to the DASH routes.

**Table 4: CARTA Revenue Vehicle Inventory and Estimated Replacement Needs through 2030**

*(Source: CARTA)*

| Year | Make | Model | Count | Total Vehicles | Daily Service Need | Spares (spare ratio) | Estimated Replacement Need through 2030 |
|---|---|---|---|---|---|---|---|
| **DASH** | | | | | | | |
| 2016 | NEW FLYER | MIDI (30') | 7 | 7 | 7 | 0 (0%) | 9 |
| **Commuter** | | | | | | | |
| 1994 | FLXIBLE | METRO (40') | 19 | 27 | 19 | 8 (40%) | 27 |
| 2003 | NABI | 416 40SDF (40') | 5 | | | | |
| 2015 | NEW FLYER | D40LF (40') | 3 | | | | |
| **Local Fixed Route** | | | | | | | |
| 1996 | NEW FLYER | D35HF (35') | 24 | 49 | 32 | 10 (30%) | 46 |
| 2010 | NEW FLYER | D35LFR (35') | 11 | | | | |
| 2012 | NEW FLYER | D35LFR (35') | 5 | | | | |
| 2014 | NEW FLYER | XDE40 (40') | 2 | | | | |
| 2016 | GOSHEN | E450 (22') | 7 | | | | |
| **Paratransit** | | | | | | | |
| 2007 | FORD | CUTAWAYS (22') | 7 | 41 | 20 | 4 (20%) | n/a |
| 2009 | CHEVROLET | CUTAWAYS (22') | 7 | | | | |
| 2010 | CHEVROLET | CUTAWAYS (22') | 7 | | | | |
| 2016 | VPG | MV-1 (van) | 10 | | | | |
| 2016 | AMERIVANS | (ORDERED) | 10 | | | | |
| **Non-Revenue Support & Maintenance** | | | | | | | |
| 2006 | CHEVROLET | COLBOLT | 6 | 12 | 11 | 1 (9%) | n/a |
| 2009 | FORD | FOCUS | 1 | | | | |
| 2006 | FORD | CROWN VIC | 1 | | | | |
| 2013 | TOYOTA | PRIUS | 2 | | | | |
| 2013 | DODGE | RAM2500 | 1 | | | | |
| 1986 | CHEVROLET | 3500 | 1 | | | | |

CARTA's facility assets include administrative and maintenance facilities, a superstop, bus stops and shelters, and park-and-ride lots. While CARTA owns its maintenance facility and North Charleston superstop, it leases many of its park-and-ride lots from private owners and operates out of the Mary Street Transfer Center through an agreement with the City of Charleston. CARTA's facility inventory described below:

- ***CARTA Administrative Offices:*** Co-located with BCDCOG administrative offices at 1362 McMillan Avenue, Suite 100, North Charleston.
- ***Leeds Avenue Maintenance Facility:*** Located in North Charleston at 3664 Leeds Avenue and houses the operations and maintenance departments, a fueling area, and vehicle storage. This facility is at capacity for any additional parking, and CARTA currently leases an adjacent area for vehicle parking.
- ***Mary Street Transfer Center:*** Located one block north of the Downtown Transit Mall / Charleston Visitor Reception and Transportation Center on Mary Street between King Street and Meeting Street in downtown Charleston and serves as a connection point for six bus routes.

- ***North Charleston SuperStop:*** Located at the intersection of Rivers Avenue and Cosgrove Avenue and serves as a connection point for eight bus routes.
- ***Park-and-Ride Lots:*** CARTA provides express service to and from several park-and-ride locations throughout its service area, including:
  - North Charleston: Former Super K-Mart parking lot on Rivers Ave and Ontranto Road; Festival Centre at Dorchester Road and Ashley Phosphate
  - Mount Pleasant: Walmart parking lot at Wando Crossing; Walmart at Oakland Plantation
  - West Ashley: Citadel Mall
  - James Island: Walmart on Folly Road
  - Summerville: Dorchester Village Shopping Center
- ***Bus Stops and Shelters:*** There are approximately 1,371 bus stops within the CARTA service area, around 80 of which have passenger shelters.

## 2.3 TriCounty Link

TriCounty Link (TCL) was established in 1996 to connect citizens residing in the rural areas of Berkeley, Charleston, and Dorchester Counties with services and employment opportunities throughout the region. Today, TCL provides deviated fixed route and commuter express bus service throughout the BCD region, serving both the general public through scheduled service and human services agencies and employers through contracted operations.

### *Governance and Organization*

TriCounty Link is governed by a nine-member Board of Directors, with three members from each county appointed by the respective county councils. TCL is a non-profit organization and is guided through By-Laws approved in 2010. TCL directly employs a staff of public employees who perform all operations and maintenance functions for the system. Like CARTA, BCDCOG provides administrative, finance, and planning support for TCL and is also responsible for maintaining its regional human services transportation plan in coordination with SCDOT.

### *Funding*

TriCounty Link is primarily funded through local, state, and federal contributions, with the remainder of its operating revenues coming from fares and other sources. As illustrated in Figure 17, in 2015 approximately 44% of TCL's operating revenue came from FTA formula funding programs, including Section 5311 (Formula Grants for Other Than Urbanized Areas) and Section 5310 (Transportation for Elderly and Persons with Disabilities). TriCounty Link's second-largest source of operating revenue comes from local sources (24%), which includes a contribution from Charleston County's half-cent transportation sales tax proceeds and local partnership agreements. The balance of TCL's operating revenue comes from state funding (16%), fare revenue (8%), and contract revenue (8%).

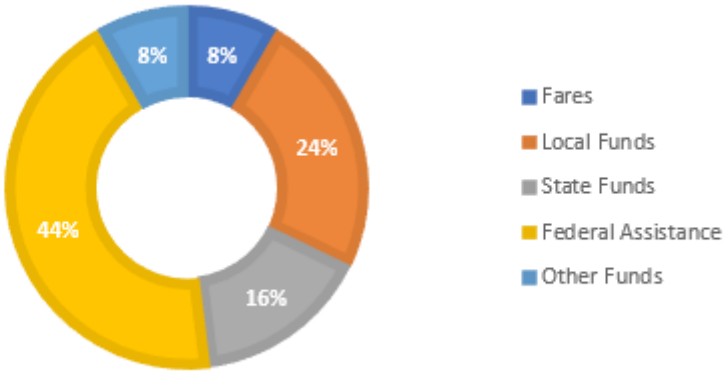



**Figure 17: TriCounty Link Operating Funding Sources**
*(Source: 2015 National Transit Database)*

### *Service Profile*

The TriCounty Link system is comprised of nine deviated fixed routes and nine commuter routes. The deviated fixed routes follow a published schedule and operate as a "flag-stop" service, picking up customers between the scheduled stops along the fixed routes. Each route also offers a route deviation option that allows the driver to go off the route up to ¾-mile to pick up customers that cannot meet the bus at designated stop locations. This is primarily a pre-scheduled curb-to-curb service, which allows TCL to meet Americans with Disabilities Act (ADA) requirements. Tri-County Link's commuter express routes operate between a network of park-and-ride lots and other key points throughout the service area and interface with CARTA services at coordinated transfer locations. TriCounty Link has a transfer agreement with CARTA, allowing passengers to pay one fare each way when transferring between agencies.

**Table 5: TriCounty Link Routes** *(Source: TriCounty Link)*

| Deviated Fixed Routes | Frequency (mins) | Weekday Span of Service |
|---|---|---|
| B101 Moncks Corner | 2 total trips[a] | 5:30 AM - 5:20 PM |
| B102 Moncks Corner-North Charleston-Hanahan | 2 total trips[a] | 5:45 AM - 5:45 PM |
| B104 St. Stephen – Bonneau – Moncks Corner | 2 total trips[a] | 6:00 AM - 6:25 PM |
| B105 Moncks Corner – Mt. Pleasant | 2 total trips[a] | 5:45 AM - 6:30 PM |
| C201 Edisto Island – Charleston | 2 total trips[a] | 6:00 AM - 6:35 PM |
| C203 McClellanville – Awendaw – Mt. Pleasant | 4 total trips | 5:15 AM - 7:42 PM |
| C204 Blue John's Island Blue Route | 4 total trips | 6:15 AM - 6:15 PM |
| C204 Green John's Island Green Route | 5 total trips | 5:45 AM - 6:30 PM |
| D305 Moncks Corner – Summerville – Lincolnville | 2 total trips | 6:25 AM - 7:15 PM |

**Table 6: TriCounty Link Commuter Routes** *(Source: TriCounty Link)*

| Commuter Route | Frequency (mins) | Weekday Span of Service |
|---|---|---|
| #1 Berkeley | 30[a] | 5:30 AM - 7:25 PM |
| #2 Dorchester | 30[a] | 5:15 AM - 7:35 PM |
| #3 Dorchester Santee Cooper | 80[a] | 6:05 AM - 6:20 PM |
| #4 Berkeley Santee Cooper | 4 total trips[a] | 5:00 AM - 7:10 PM |
| #5 Berkeley Santee Cooper | 4 total trips[a] | 5:55 AM - 6:55 PM |
| #6 Dorchester Connector | 60 | 6:00 AM - 6:55 PM |
| Link to Lunch | 15 | 10:14 AM - 1:15 PM |
| Dorchester Connector Shuttle | 60 | 9:00 AM - 2:55 PM |
| Weekend Express | 60 | 4:00 PM - 11:00 PM |

[a] *Peak periods only*

[b] *Weekday service on Fridays only*

BCDCOG began oversight of TCL in 2012 and implemented more rigorous data collection and reporting procedures than had previously been in place. As such, ridership and operating statistics prior to TCL's first annual report to NTD in 2013 are unreliable and not reviewed as part of this analysis. According to 2015 NTD data, TCL has shown an overall decrease in ridership since 2013 subsequent to the discontinuation of Medicaid service in 2012. However, TCL posted a slight gain in ridership in 2015 over 2014 figures for both its deviated fixed route and commuter bus services. Other service statistics including operating expenses, fare revenue, and revenue miles and hours reflect a similar pattern.

**Table 7: TriCounty Link Operating Statistics, 2013 – 2015** *(Source: National Transit Database)*

| Deviated Fixed Route Bus | 2013 | 2014 | 2015 |
|---|---|---|---|
| Passenger Trips | 5,201 | 5,975 | 8,299 |
| Fare Revenues | $0 | $0 | $0 |
| Operating Expenses | $43,540 | $16,486 | $18,883 |
| Revenue Hours | 1,560 | 1,126 | 1,183 |
| Revenue Miles | 18,200 | 12,746 | 16,637 |
| Peak Buses | 2 | 2 | 2 |
| **Commuter Bus** | **2013** | **2014** | **2015** |
| Passenger Trips | 134,837 | 97,947 | 105,272 |
| Fare Revenues | $188,639 | $181,532 | $188,774 |
| Operating Expenses | $2,578,274 | $1,965,282 | $2,253,254 |
| Revenue Hours | 92,276 | 39,986 | 42,769 |
| Revenue Miles | 1,280,412 | 1,006,556 | 1,032,095 |
| Peak Buses | 27 | 22 | 22 |
| **Total** | **2013** | **2014** | **2015** |
| Passenger Trips | 140,038 | 103,922 | 113,571 |
| Fare Revenues | $188,639 | $181,532 | $188,774 |
| Operating Expenses | $2,621,814 | $1,981,768 | $2,272,137 |
| Revenue Hours | 93,836 | 41,112 | 43,952 |
| Revenue Miles | 1,298,612 | 1,019,302 | 1,048,732 |
| Peak Buses | 29 | 24 | 24 |

### *Performance Summary*

Based on the three years of available data, TCL's deviated fixed route and commuter bus service productivity measures increased significantly due to reductions in the amount of service provided. Deviated fixed route productivity per revenue hour and revenue mile increased 110% and 75%, respectively, and commuter bus productivity per revenue hour increased 68%. Commuter bus productivity per revenue mile decreased slightly. The service reductions and corresponding budget cuts resulted in positive gains in cost efficiency and effectiveness for the deviated fixed route services. Cost per revenue hour decreased 43%, cost per revenue mile decreased 53%, and cost per passenger trip decreased 73%. The opposite trend was observed on the commuter bus side, with cost per revenue hour increasing 89%, cost per mile increasing 8%, and cost per passenger trip increasing 15%.

Because TCL is a recipient of both small urbanized area and rural funds, its service productivity and cost performance metrics are broken out in SCDOT's annual Public Transit Data Report. In SFY2015-16, TCL's service productivity ratios were below the statewide average for both small urbanized and rural reporters. Its cost performance, on the other hand, was mixed compared to the state peers, with cost per passenger trip above average and cost per revenue hour and mile below average.

**Table 8: TCL Performance Measures, 2013-2015** *(Source: National Transit Database)*

| Deviated Fixed Route Bus | 2013 | 2014 | 2015 |
|---|---|---|---|
| Passenger Trips per Revenue Hour | 3.33 | 5.31 | 7.02 |
| Passenger Trips per Revenue Mile | 0.29 | 0.47 | 0.50 |
| Operating Expense per Revenue Hour | $27.91 | $14.64 | $15.96 |
| Operating Expense per Revenue Mile | $2.39 | $1.29 | $1.14 |
| Operating Expense per Passenger Trip | $8.37 | $2.76 | $2.28 |
| Farebox Recovery Ratio | 0% | 0% | 0% |
| **Commuter Bus** | **2013** | **2014** | **2015** |
| Passenger Trips per Revenue Hour | 1.46 | 2.45 | 2.46 |
| Passenger Trips per Revenue Mile | 0.11 | 0.10 | 0.10 |
| Operating Expense per Revenue Hour | $27.94 | $49.15 | $52.68 |
| Operating Expense per Revenue Mile | $2.01 | $1.95 | $2.18 |
| Operating Expense per Passenger Trip | $19.12 | $20.06 | $21.40 |
| Farebox Recovery Ratio | 7% | 9% | 8% |

### *Summary of Capital Assets*

According to data provided by TCL, TCL operates an active fleet of 34 vehicles, all of which are ADA-equipped cutaway buses or vans. As with CARTA, TCL owns a fleet of 12 support vehicles including sedans and maintenance trucks.

**Table 9: Tri-County Link Revenue Vehicle Inventory** *(Source: TriCounty Link)*

| Year | Model | Count | Spares |
|---|---|---|---|
| Revenue Fleet | | | |
| 2008 | 5500 | 6 | 7 |
| 2009 | 5500 | 3 | |
| 2010 | STAR | 8 | |
| 2013 | E450 | 3 | |
| 2016 | E450 SD | 7 | |
| Support Vehicles | | | |
| 1995 | PICKUP | 1 | 2 |
| 1996 | THOMAS | 1 | |
| 1999 | BLAZER | 1 | |
| 1999 | JEEP CHEROKEE | 1 | |
| 2005 | K3500 | 1 | |
| 2006 | IMPALA | 1 | |
| 2006 | TRAIL BLAZER | 1 | |
| 2007 | IMPALA | 1 | |
| 2017 | ESCAPE | 2 | |

TCL's facility assets include a maintenance facility, which houses its operations and maintenance department. TCL also provides service to approximately 130 bus stops and eight park-and-ride lots, four of which are shared with CARTA.

## 2.4 Other Public Transportation Providers

### *Human Services Transportation*

In accordance with federal and state guidelines, BCDCOG maintains a Coordinated Public Transit-Human Services Transportation Plan that establishes goals, objectives, and strategies for addressing the transportation needs of low-income, elderly, and disabled populations in the Charleston region. In addition to the paratransit services provided by CARTA and TCL, a number of public and private entities, including non-profit human service agencies, hospitals, senior centers, school districts, and universities, provide mobility services to their clients throughout the region. Examples of such providers and partnerships include:

- Berkeley Citizens operates vehicles and contracts with TCL for services in Berkeley County
- The Dorchester Senior Center operates vehicles between meal sites in St. George and Summerville
- The SC Department of Health and Human Services contracts out Emergency Medical Transportation in the Charleston region, including Medicaid transportation

- Sea Island Comprehensive Health Care Corporation provides transportation on Johns Island
- The Independent Transportation Network (ITN) provides transportation for the elderly and disabled using volunteer drivers and private automobiles
- Head Start operates vehicles on Edisto and Kiawah Islands for children of migrant families
- The Trident AAA operates transportation for elderly individuals throughout the region
- The Disabilities and Special Needs Boards for Berkeley, Dorchester, and Charleston Counties operate transportation services to and from care facilities and provide vehicles to respite homes throughout the region
- The Trident Area Agency on Aging provides transportation coordination services for seniors

The Coordinated Public Transit-Human Services Transportation Plan estimates that the demand for mobility services in 2010 was approximately 5.7 million one-way trips. By 2040, the demand is forecast to increase to 6.9 million one-way trips. Approximately 80% of the demand was met in 2010 through existing services. The Plan set a target of meeting 90% of estimated demand, which would require an additional 1.7 million trips be provided by 2040 over the 2010 baseline across the region.

### *Intercity Bus and Rail*

Intercity rail service is provided by Amtrak (Silver Meteor and Palmetto lines) and intercity bus service is provided by Southeastern Stages. Southeastern Stages' regional bus terminal is located on Dorchester Road in North Charleston. The region's Amtrak station is also located in North Charleston at Gaynor Street and Rivers Avenue. A new passenger intermodal facility, the North Charleston Intermodal Transportation Center, located adjacent to the current Amtrak station on Gaynor Street is currently under construction and is scheduled to open in 2018. The new facility will serve as a hub for Southeastern Stages, Amtrak, and CARTA.

# 3.0 Summary of Previous and Ongoing Planning Activities

Several planning initiatives pertaining to transit have been undertaken in recent years by BCDCOG and other entities throughout the Charleston region. The transit needs and opportunities identified as a result of these efforts provide the foundation for the regional long-range transit needs assessment. A summary of relevant transit planning activities since the last LRTP update is provided in the remainder of this section.

## *3.1 CARTA Comprehensive Operations Analysis (2016)*

In 2016, BCDCOG completed a Comprehensive Operations Analysis (COA) of the existing CARTA transit system. The COA provides an in-depth review of the CARTA network and includes a detailed market, service, and operational analysis to develop short-range and mid-range transit recommendations. The objectives of the COA were to enhance reliability, increase efficiency, respond to changing travel patterns, and provide the foundation for future investment in upgraded equipment, facilities, and system expansions. The short-range recommendations involved route realignments, schedule adjustments, and route elimination, resulting in a proposed systemwide reduction of service hours by 8.6% and a net reduction in operating costs of $1.4 million. The purpose of restructuring service in the near team was to build capital reserves for state-of-good-repair investments and future system upgrades.
The mid-range recommendations are proposed for a five to ten-year implementation horizon in conjunction with the proposed Lowcountry Rapid Transit (Bus Rapid Transit) project along US78/ Rivers Avenue. The mid-range recommendations are focused on improving frequencies and connections across the system, and include five new feeder routes, one express route, and two seasonal trolleys.

## *3.2 Lowcountry Rapid Transit*

The I-26 Corridor between Summerville and Charleston is a key thoroughfare in the Charleston region linking major employment and retail centers, military installations, and transportation hubs including the Charleston International Airport and the Port of Charleston. Multiple plans and studies over the years identified transit alternatives in the I-26 corridor as a key regional transportation need. The I-26 Alternatives Analysis (i-26 ALT) was conducted over 15 months beginning in 2014 to consider the effects of alternative transit investments in the corridor. Multiple alignments and mode technologies were considered, with a locally preferred alternative (LPA) of Bus Rapid Transit (BRT) along Rivers Avenue/US 78 connecting downtown Charleston, North Charleston, and Summerville selected as the final outcome of the study. The CHATS/ BCDCOG Board approved the LPA.  Referred to as Lowcounty Rapid Transit, the proposed BRT project isis moving forward to start project development and environmental review under FTA's Capital Investment Grant program in 2018. Service is anticipated to beginby 2025.

## *3.3 Regional Park-and-Ride Study (ongoing)*

BCDCOG is sponsoring a regional park-and-ride study to develop a plan that will identify current and future needs for park-and-ride facilities, develop site section criteria to identify sites that meet those needs, and apply those criteria to specific sites to develop an implementation strategy for the agency to invest in park-and-ride facilities. The park-and-ride study is planned to begin in late 2017.

## 3.4 TCL Route Study (2014)

BCDCOG sponsored a Route Study for TCL in 2014 to review the existing TCL route network to and provide recommendations for optimizing service to better serve the needs of the communities it serves. The study offered near-term and long-term recommendations for modifying existing service and adding new routes, along with policy recommendations concerning planning, capital, and organizational issues. The key recommendations involved adding four new routes, eliminating three routes, modifying alignments and/or schedules of six routes, and making capital investments in bus stop signage and amenities.

## 3.5 Transit Consolidation Feasibility Analysis (2013)

In 2013, BCDCOG initiated a study to evaluate the potential of consolidating CARTA and TCL into a unified system to more effectively serve the BCD region. The Transit Consolidation Feasibility Analysis was a collaborative effort between CARTA, TCL, and BCDCOG and identified and evaluated options regarding consolidation. The four options considered, ranging from lowest to highest level of commitment were: Connection, Coordination, Collaboration, and Consolidation. The study identified the main financial, operational, and governance barriers and benefits of consolidation. The findings of the study pointed towards full consolidation as a viable and potentially beneficial long-term goal from a service coordination and delivery standpoint. However, it was determined that consolidation would not result in any significant cost reductions given that there are relatively few areas of duplicative service between the two agencies. The final recommendation was to keep the agencies legally separated in the near time, but to work towards consolidation over time through a phased approach.

## 3.6 Our Region Our Plan and the Regional Transit Framework (2012 & ongoing)

As part of the Our Region Our Plan (OROP) process, the 2040 Transit Vision Plan set a policy objective to establish a comprehensive transit system that attracts new riders, connects major centers, reduces congestion on major arterials, enhances affordability, protects the natural environment, provides for sustainability of the region, and provides a viable alternative to personal automobile travel. OROP proposed a set of rapid transit corridors linking key activity nodes throughout the Charleston region.

To advance this vision, OROP proposed the development of a Regional Transit Framework (RTF) plan to study the viability of the various high capacity corridor alternatives and help guide long range transit decisions in the future. BCDCOG is sponsoring the RTF, which is planned to begin in fall 2017 and will be completed in 2018. The RTF will serve as a companion piece to the transit component of this Long Range Transportation Plan update.

## 3.7 Partnership for Prosperity: A Master Plan for the Neck Area of Charleston and North Charleston (2014)

The Partnership for Prosperity: A Master Plan for the Neck Area of Charleston and North Charleston is a transportation and development framework developed in 2014 to guide public and private investments in the Neck Area of Charleston and North Charleston. The plan includes a multimodal transportation element that proposes a phased approach to enhancing transit in the Neck Area. The first phase involves improving coverage and frequency of existing services, followed by implementation of BRT along Rivers Avenue to form a high capacity spine between downtown Charleston, through the Neck Area, and to points northward. Local feeder bus service is planned to connect neighborhoods and activity centers to BRT stations to form an integrated

network along with express routes connecting to other regional destinations. The third phase envisions development of transit-oriented-development nodes along the BRT spine. The final phase, if development warrants, contemplates replacing the BRT with light rail transit (LRT).

## *3.8 Waterway Transit Initiative (ongoing)*

Prior to the construction of highways and bridges in the 20th century, water shuttles and ferries were a common mode of passenger transportation providing access throughout the Charleston region. Construction of the Grace Memorial Bridge between Charleston and Mount Pleasant led to the discontinuation of ferry service in the late 1930's, after which no waterborne passenger transportation services existed in the region until the mid-1990's when a private operator began service between Market Street and Patriots Point. Several private operators initiated service for brief periods in the late 1990's and 2000's, but all ultimately went out of business.

Today, limited waterway service is provided by two private water taxi / ferry operators, Charleston Water Taxi and Fort Sumter Tours (operated under contract to the National Park Service). These operators are geared towards the tourist market and provide service between select attractions around Charleston Harbor, including the Aquarium Wharf/Maritime Center, Liberty Square, Charleston Waterfront Park, Patriots Point, Charleston Harbor Resort, and Fort Sumter. During the peak season, Charleston Water Taxi provides hourly service at each of its departure points and Fort Sumter Tours provides seven daily trips between downtown and Fort Sumter. There are also several tourism-focused private operators providing harbor tours and sailing tours.

### *Summary of Waterway Transit Planning Activities To-Date*

In recent years, movement towards expanding the region's waterway transit services has gained traction, with interest expressed in waterway transportation between Charleston, North Charleston, Mount Pleasant, Daniel Island, and West Ashley that could serve as a public transportation option for commuters and tourists alike. The National Park Service (NPS) conducted a study in 2004 to explore the viability of an expanded waterborne transportation network in Charleston Harbor, ferry and water taxi services were identified as part of the region's vision for a multimodal transportation system as part of OROP in 2012, and a working group was recently initiated to assess the feasibility of a regional ferry service oriented towards the commuter market. These initiatives are described in the following sections

#### *Fort Sumter National Monument Alternative Transportation Study (2004)*

This study was completed by the NPS to assess water shuttle systems that would facilitate visitation to Fort Sumter. The water shuttle service evaluated was intended to complement the visit to Fort Sumter by providing alternative public transportation to reach the departure sites at Liberty Square and East of the Cooper River.

While the emphasis of this study was on tourism-based water shuttle service, it laid the groundwork for current commuter ferry efforts. Of particular relevance is its examination of operational characteristics and recommendations -- such as the vessel operating environment in Charleston Harbor, potential landing sites, docking and landside facility upgrades, and vessel requirements – as well as potential costs.

#### *Our Region Our Plan (2012)*

The 2040 Regional Transit Vision established in OROP calls for the development of a more robust multimodal transportation system serving the BCD region, and outlined five strategies. The fifth

strategy is the establishment of additional ferry and water taxi services that take advantage of the region's waterways and provide transportation options for commuters and visitors. More specifically, the Cooper and Ashley Rivers were identified as corridors for waterway transit service connecting the Peninsula with Hanahan and the Charleston International Airport and its employment centers.

### *Current Commuter Ferry Initiative*

In early 2017, the City of Charleston created a Commuter Ferry Working Group to review the feasibility of a regional commuter ferry system. Private water taxis and tour boats are currently operating between various points around the bay. The water taxi industry is interested in seeing a commuter ferry system established, providing an alternative to driving by using larger and faster vessels than a traditional water taxi. This type of service would complement water taxi services, but serve a different purpose and market. The goal of such a service would be to reduce auto traffic flow into downtown and the lower peninsula area for commuters, as well as provide a convenient form of transportation to day trippers via a high speed, convenient ferry service with several origination points.
Early action elements of the group's work program include:

- Identifying funding sources for planning, capital, and operating expenses,
- Identifying priority sites that are good candidates for establishing service, and
- Advancing a feasibility study of commuter ferry service.

With regards to potential ferry dock sites, the group has examined approximately 20 locations. While there are several potential dock options along the Ashley River, there are vessel size restrictions on this river due to bridge heights. Many of the dock sites being examined are in close proximity to existing CARTA routes, which would facilitate intermodal connections.

### *Peer Analysis*

To gain an understanding of commuter ferry services operating in cities similar to Charleston, a peer analysis was completed using information for ferryboat operations available from the National Transit Database (NTD). The NTD is the only comprehensive source of validated operating and financial information reported by transit systems nationwide, and is updated annually. A total of 20 agencies reported operating ferryboat service in 2015, the most recent year for which data is available. Of these, three were selected as peers to examine. Each peer operates limited commuter oriented Passenger Only Ferry (POF) services in a city with significant port and/or naval military operations. The peer agencies, their ferryboat service, and locations are:

- Kitsap Transit (KT), Fast Ferry and Foot Ferry, Bremerton, WA
- King County Ferry District, King County Water Taxi, Seattle, WA
- Hampton Roads Transit (HRT), Elizabeth River Ferry, Norfolk, VA

Table 10 compares the peers' Urbanized Area (UZA) population, area size, and population density with the Charleston UZA. While Charleston is small compared to the peer average in terms of population and size, its population density is relatively comparable to these peer cities.

**Table 10: Urbanized Area Comparisons of Commuter Ferry Peers, 2015**
*(Source: National Transit Database)*

| Urbanized Area (UZA) | Bremerton (WA) | Seattle (WA) | Virginia Beach (VA) | Peer Average | Charleston (SC) |
|---|---|---|---|---|---|
| Population | 198,979 | 3,059,393 | 1,439,666 | 1,566,013 | 548,404 |
| Size in Square Miles | 136 | 1,010 | 515 | 554 | 293 |
| Population Density | 1,463 | 3,029 | 2,795 | 2,429 | 1,872 |

Overviews of the selected peer ferryboat systems as operated today are provided below. Most of this information was gathered from the agencies' websites.

### *Kitsap Transit Foot Ferry and Fast Ferry*

Kitsap Transit (KT) serves Kitsap County, WA, located on the Kitsap Peninsula across the Puget Sound from Seattle. Port Orchard is the county seat, but Bremerton, across the Sinclair Inlet from Port Orchard, is its largest city. Bremerton is home to the Puget Sound Naval Shipyard (PSNS) and the Bremerton Annex of Naval Base Kitsap. In addition to local and commuter fixed-route bus, demand response bus and taxi, and vanpool services, KT also operates Passenger Only Ferry (POF) services.

KT has been involved in POF service since the agency's inception in 1982, initially only to ensure that the foot ferry across the Sinclair Inlet between Bremerton and Port Orchard continued to run. In the early 1990's, KT initiated a fare subsidy program with the private operator integrating the foot ferry with bus service. In 2008, KT purchased the Port Orchard-Annapolis-Bremerton Foot Ferry service from Horluck Transportation. Operated for KT by Kitsap Harbor Tours, the Foot Ferry has been in continuous, successful operation since 2008.

The Foot Ferry serves the Port Orchard Ferry Dock, Bremerton Ferry Dock, and Annapolis Ferry Dock and Park & Ride, and charges the same fare as KT bus service (one-way cash fare is $2). KT owns two vessels, the historic Carlisle II (143 passengers) and the Admiral Pete (120 passengers). The Foot Ferry

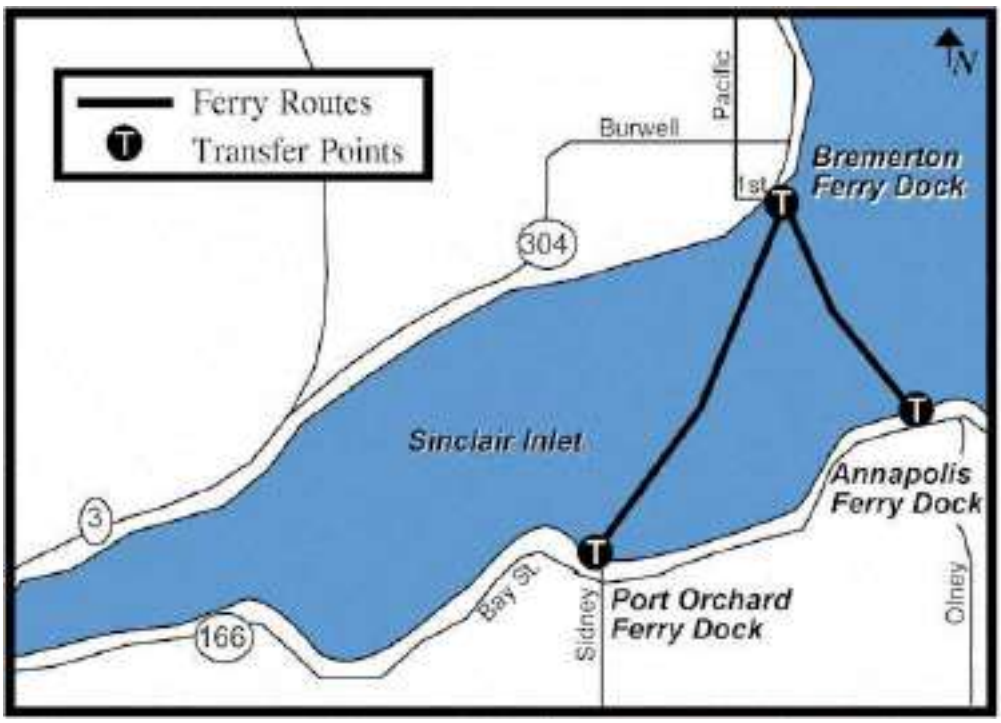



**Figure 18: Kitsap Transit Foot Ferry Routes**

routes and vessels are shown in Figure 18. Ferry service between Bremerton and Port Orchard operates every 30 minutes all-day on weekdays and Saturdays, with 15-minute service from Bremerton to Port Orchard on weekdays between 5:15 a.m. and 6:15 p.m. Ferry service between Bremerton and Annapolis operates every 15 minutes during weekday peak periods only.

In 2015, the Foot Ferry carried over 490,000 passengers with a farebox recovery rate of 45%. The farebox recovery rate is somewhat inflated because of the PSNS Transportation Incentive Program (TIP), which increases revenue for the foot ferry because there are so many shipyard riders going primarily to Annapolis from Bremerton. Table 11 provides key operating and performance characteristics for the Foot Ferry over the last three available years.

**Table 11: Kitsap Transit Foot Ferry Operating and Performance Characteristics, 2013-2015**

*(Source: National Transit Database)*

| Kitsap Transit Foot Ferry | 2013 | 2014 | 2015 |
|---|---|---|---|
| Operating Characteristics | | | |
| Passenger Trips | 450,732 | 458,604 | 492,857 |
| Fare Revenues | $780,087 | $762,084 | $834,621 |
| Operating Expenses | $2,176,747 | $2,193,816 | $1,872,411 |
| Revenue Hours | 6,189 | 6,235 | 5,907 |
| Revenue Miles | 47,174 | 46,834 | 44,634 |
| Peak Vessels | 3 | 3 | 3 |
| Performance Characteristics | | | |
| Passenger Trips per Revenue Hour | 72.83 | 73.55 | 83.44 |
| Passenger Trips per Revenue Mile | 9.55 | 9.79 | 11.04 |
| Operating Expense per Revenue Hour | $351.71 | $351.86 | $316.98 |
| Operating Expense per Revenue Mile | $46.14 | $47.84 | $41.95 |
| Operating Expense per Passenger Trip | $4.83 | $4.78 | $3.80 |
| Farebox Recovery Ratio | 36% | 35% | 45% |

In July 2017, KT began operating its first Fast Ferry passenger-only route across Puget Sound to downtown Seattle. This ferry route, as well as two additional routes to downtown Seattle proposed for implementation in the near future, was made possible by a referendum passed in November

**Figure 18: Kitsap Transit Foot Ferry Vessels**

2016 adding three tenths of one percent to the Kitsap County sales tax. Figure 19 shows the three fast ferry routes and the anticipated crossing times for each. Fast Ferry service is slated to begin in summer 2018 between Kingston and Seattle and summer 2020 between Southworth and Seattle.

Fast ferry service POF service between Bremerton and Seattle was operated from 1986-2003 by WSF, but was discontinued after wake damage to the shoreline and bulkheads in the Rich Passage connecting Bremerton to Puget Sound resulted in a class-action lawsuit to slow the ferries down, as well as major cuts to state ferry funding.

KT then turned its attention to establishing a Kitsap-based cross-sound POF service. After a decade of work to develop stable funding for service, wake and marine life research, designing, testing, and optimizing a highspeed low-wake vessel for POF service through Rich Passage, and development of a solid business plan, the sales tax referendum was approved by Kitsap County voters in 2016.

**Figure 20: Kitsap Transit Fast Ferry Routes Proposed for November 2016 Referendum**

The sales tax increase is dedicated to KT's ferry operations (fast and foot), and also frees up $1.5 million annually for bus service improvements. With those resources, KT has implemented improvements to existing routes and added new express routes to better serve the ferry docks.

The initial Fast Ferry route between Bremerton and Seattle and its vessel are shown in Figures 20 and 21. The Fast Ferry trip time is 28 minutes compared to the Washington State Ferries (WSF) car ferry service, which takes 60 minutes. Ridership figures are not yet available.

The Rich Passage I is a catamaran designed to create a very low wake while operating at high speeds, and seats 118 passengers. KT is exploring options to add a back-up vessel, as there have been issues with the vessel's reliability. The agency's future routes call for the purchase of a 150-passenger catamaran for delivery in 2018, two 250-passenger bow loading catamarans for delivery in 2020 and 2021, and an additional 118-passenger high-speed, low wake catamaran to be delivered in 2022.

**Figure 21: Kitsap Transit Fast Ferry Route**

**Figure 22: Kitsap Transit Fast Ferry Vessel: Rich Passage I**

Fast Ferry service is currently operated during weekday peak periods (three a.m. trips and three p.m. trips) and all-day on Saturdays. The schedule was developed to balance public input, dock availability in Seattle, and crossing conflicts in Rich Passage. Starting in 2018, additional service on weekdays and Friday and Saturday evenings is anticipated to be operated from May to September. Up to three-quarters of the seats during peak periods can be reserved in advance.

A single-ride fare is $2 eastbound (to Seattle) and $10 westbound (from Seattle). The price of a monthly fast-ferry pass is $168, while a monthly combined bus/fast-ferry pass is $196. Seniors, disabled, youth and low-income who show a current reduced-fare permit pay half price. Transfers credits when ORCA e-purse is used for payment can be used to transfer from KT buses or foot ferries.

On the Seattle side, the Fast Ferry serves the Pier 52 Ferry Dock (also known as Colman Dock). Easy connections to King County Metro Transit, Sound Transit, and Link Light Rail can be made within a quarter-mile walk. Aerial walkways, including the Marion Street Ferry Walkway, provide pedestrian connections from the ferry terminal. The Fast Ferry service will move to Pier 50 in late 2018 and share a new terminal with King County Water Taxi, as discussed further below. For all of KT's ferry services, paid parking is available at the Annapolis Ferry Dock Park & Ride. This lot has 81 parking spaces, and a parking fee of $5.00 is payable daily, Monday through Friday. Passengers may also purchase monthly parking permits for $80.00. Parking is free for registered carpools with two people in the vehicle at the time they park. Parking is not available at either the Port Orchard or Bremerton Ferry Docks, although paid parking is available in the downtown areas.

Connecting bus service is provided at each ferry dock in Kitsap County. The Bremerton Transportation Center (BTS) at the Ferry Dock provides connections to ten KT routes, including two new "fast ferry

express" routes implemented in July 2017 with resources freed up by the sales tax for ferry service, as well as one Mason County route. It is also served by several worker/driver routes, which are commuter routes operating like large carpools between various points in Kitsap County and either PSNS or Naval Submarine Base Bangor. BTS is located at the Ferry Dock and has 15 bus bays. A transfer center at the Port Orchard Ferry Dock provides connections to five fixed-route and one deviation service route operated by KT, while the Annapolis Ferry Dock only serves one KT commuter route. One of the routes connecting to the Port Orchard Ferry Dock was also improved with resources freed up by the ferry sales tax.

### *King County Water Taxi*

The King County Water Taxi is a passenger-only fast ferry service owned and operated by King County, Washington. While called water taxi service, it uses larger and faster vessels than is typically associated with water taxi service. Currently, there are two water taxi routes. Both originate in Downtown Seattle, with one route serving Vashon Island and the other serving West Seattle.

King County Water Taxi has been in operation since 2008, about a year after the County created the King County Ferry District (KCFD), a special-purpose district funded through a property tax levied on all property in the county. The KCFD took over the operations of two existing POF routes and rebranded them the King County Water Taxi in 2008 (from West Seattle) and 2009 (from Vashon Island). In 2014, the King County Council voted to consolidate the ferry district into county government. As of 2015, the King County Water Taxi became a service of the Marine Division of the King County Department of Transportation.

The Vashon Island-Seattle Water Taxi route serves the Heights Dock on the north end of Vashon Island, while the West Seattle Water Taxi route serves the Seacrest Dock in the Alki neighborhood of West Seattle. Both routes currently dock at Pier 52 on the downtown Seattle waterfront, but this is only temporary while the passenger facility at Pier 50 is being renovated. Once complete in the fall of 2018, riders will be able to enjoy a covered, 8,000-square-foot terminal that will serve both King County Water Taxi and Kitsap Fast Ferry service. It will also eventually offer access to an elevated pedestrian walkway that will connect riders to WSF's Colman Dock terminal.

Vessels operated include two new water taxis built with FTA grant money in 2014-2015, the Sally Fox and the Doc Maynard. Both of these new vessels are 104-foot long, high speed, low wake catamarans carrying up to 278 passengers and traveling at a service speed of 28 knots. Cost to build these vessels was $6.25 million for each. The Spirit of Kingston serves as the back-up vessel, and is a smaller catamaran that holds 147 passengers. One of the new vessels at the temporary King County Water Taxi terminal at Pier 52 is shown in Figure 23.

The Vashon Island-Seattle Water Taxi route operates during the weekday peak periods in both directions, with three sailings for the morning commute and three for the evening commute. Each crossing takes approximately 22 minutes. At the Vashon Island Ferry Terminal, connecting services include King County Metro bus routes 118 and 119 and Washington State Ferries with routes to both the city of Southworth in Kitsap County and the Fauntleroy terminal in West Seattle.

**Figure 23: King County Water Taxi Vessel at Seattle Pier 52**

The West Seattle–Seattle Water Taxi route operates on weekdays during peak periods year-round every 35 minutes. From April to October, the route operates seven days a week, with weekday midday and weekend service every 60 minutes. Evening service every 60 minutes is provided on Friday and Saturday nights, as well as weeknights and Sunday nights when there is a Mariners, Sounders, or Seahawks game. Its crossing time is approximately 10 minutes during weekday commute hours and approximately 15 minutes at all other times.

King County Metro operates two shuttle bus routes that take passengers to and from the dock at Seacrest Park. Route 773 connects to the West Seattle Junction and route 775 connects to the Admiral District and Alki Beach. The one-way fares for King County Water Taxi are shown in Table 12. The King County Water Taxi does not accept reservations.

**Table 12: King County Water Taxi Fares**

| Fare Type | Vashon Island | West Seattle |
|---|---|---|
| Adult | | |
| Cash or TVM Ticket | $6.25 | $5.25 |
| ORCA Card | $5.25 | $4.50 |
| Youth (6-18) | | |
| Cash or TVM Ticket | $6.25 | $5.25 |
| ORCA Youth Fare Card | $4.00 | $3.50 |
| Other | | |
| Low Income (ORCA LIFT card) | $4.00 | $3.50 |
| Senior/Disabled | $2.75 | $2.25 |
| Children (5 and under) | Free | Free |

In 2015, the Water Taxis carried over 515,000 passengers with a total operating cost of nearly $5.5 million and a farebox recovery rate of 36%. Table 13 provides key operating and performance characteristics for the Water Taxi over the last three available years.

**Table 13: King County Water Taxi Operating and Performance Characteristics, 2013-2015**

*(Source: National Transit Database)*

| King County Water Taxi | 2013 | 2014 | 2015 |
|---|---|---|---|
| Operating Characteristics | | | |
| Passenger Trips | 445,110 | 467,119 | 515,207 |
| Fare Revenues | $1,625,208 | $1,764,299 | $1,982,612 |
| Operating Expenses | $5,193,701 | $5,099,325 | $5,478,705 |
| Revenue Hours | 5,010 | 4,992 | 5,003 |
| Revenue Miles | 50,060 | 49,724 | 50,868 |
| Peak Vessels | 2 | 2 | 2 |
| Performance Characteristics | | | |
| Passenger Trips per Revenue Hour | 88.84 | 93.57 | 102.98 |
| Passenger Trips per Revenue Mile | 8.89 | 9.39 | 10.13 |
| Operating Expense per Revenue Hour | $1,036.67 | $1,021.50 | $1,095.08 |
| Operating Expense per Revenue Mile | $103.75 | $102.55 | $107.70 |
| Operating Expense per Passenger Trip | $11.67 | $10.92 | $10.63 |
| Farebox Recovery Ratio | 31% | 35% | 36% |

### *Hampton Roads Transit (HRT) Elizabeth River Ferry*

Hampton Roads Transit (HRT) serves the Hampton Roads area of southeastern Virginia. Hampton Roads is known for its large military presence, shipyards, coal piers, and miles of waterfront property and beaches. The body of water known as Hampton Roads is one of the world's largest natural harbors, and incorporates the mouths of the Elizabeth River, Nansemond River, and James River with several smaller rivers that empty into the Chesapeake Bay near its mouth leading to the Atlantic Ocean. The land area includes a collection of cities, counties and towns on the Virginia Peninsula and in South Hampton Roads.

HRT contracts with each of the six cities in Hampton Roads that it currently serves: Norfolk, Virginia Beach, Chesapeake and Portsmouth in South Hampton Roads and Newport News and Hampton on the Virginia Peninsula. Current services include bus service (local, express routes, seasonal Virginia Beach, and commuter work routes), paratransit service, the Elizabeth River Ferry, and ride-matching services.

HRT contracts the operation of three 150-passenger paddle wheel ferries on the Elizabeth River between Norfolk and Portsmouth, providing an alternative to crossing in a vehicle via either the I-264 bridge or the US 58 tunnel. The paddlewheel does not provide propulsion and only serves as a nostalgic addition to the vessel. They travel between the North Landing Ferry Dock and the High Street Landing Ferry Dock in Portsmouth and downtown Norfolk at the Waterside Ferry Dock and the Harbor Park Ferry Dock. Boarding and de-boarding occurs via floating docks at each of the dock locations. Harbor Park is only serviced during Norfolk "Tides" baseball home games. The Elizabeth River Ferry routes and one of its vessels are shown in Figures 24 and 25.

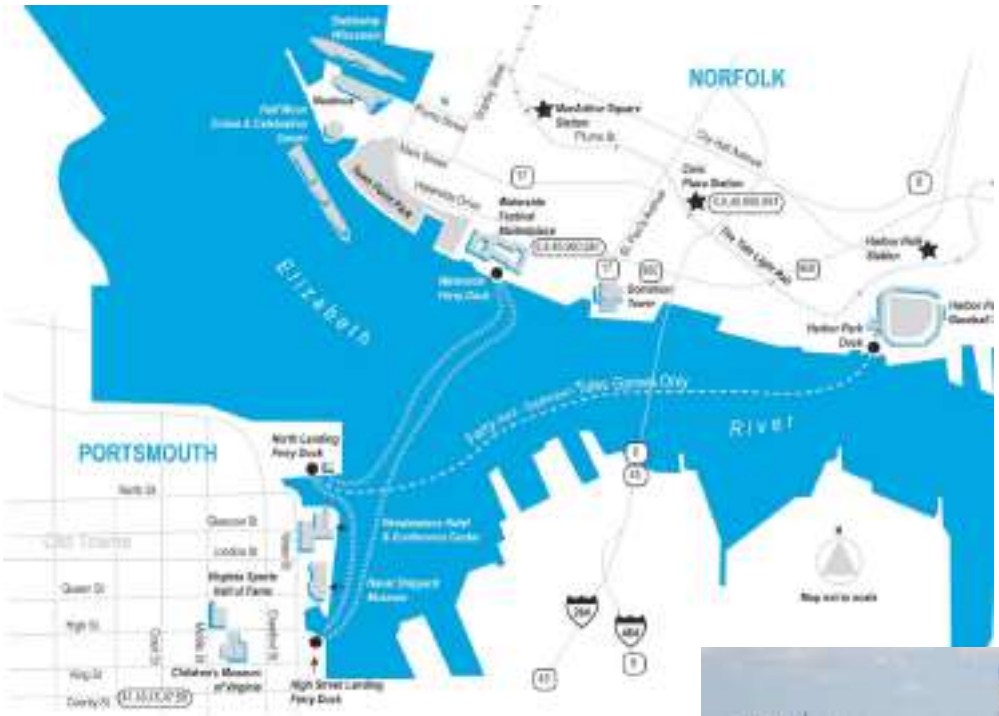



**Figure 24: HRT Elizabeth River Ferry Routes**

**Figure 25: HRT Elizabeth River Ferry Vessel (Elizabeth River III)**

Each of the three ferry routes (connecting North Landing and High Street, North Landing and Waterside, and High Street and Waterside) operates every 30 minutes year-round, seven days a week. From Memorial Day to Labor Day, they operate with 15-minute service at peak times on weekends (Friday evenings, Saturday afternoons and evenings, and Sundays afternoons). It takes approximately 10 minutes to cross the river between Portsmouth and Norfolk. Service between North Landing in Portsmouth and Harbor Park in Norfolk from April to September during "Tides" home baseball games runs every 30 minutes beginning one hour before game time and continues just after the game ends.

The Ferry is wheelchair accessible and allows boarding passengers to board with their bicycles. As of October 2014, the cost to board the ferry is $1.75 for adults, and $0.75 with eligibility ID for youth (age 17 and under), seniors (age 65 and older), and disabled patrons. Children age 17 and under may ride for free with a Student Freedom Pass or if accompanied by an adult fare-paying passenger. HRT GoPass options are also available, including one-day ferry passes at $4.00 for adults and $2.00 for youth, seniors, and disabled patrons with eligible ID.

The current operation uses three vessels, one during normal weekday operations, two on weekends, and three on weekends with special events. During the off season, a single vessel is stored at Portsmouth High Street overnight; at peak times, a spare or ready vessel is also kept at Portsmouth. A total of five docking locations are available: two at Waterside, two at North Landing, and one at High Street. There is no landside activity or equipment associated with the ferry service other than docks and signage. Docks are maintained by the cities.

In Portsmouth, connections to two local bus routes can be made at a stop one block from the High Street dock, and to three additional routes at downtown Portsmouth's bus transfer area at County Street and Court Street about a quarter of a mile away. The North Landing dock is located a little over a half of a mile away from the bus transfer area.

In Norfolk, the Waterside ferry dock is located approximately a half mile from the heart of downtown Norfolk and the nearest two Tide Light Rail Transit Stations, MacArthur Square and Civic Plaza. A bus stop on Waterside Drive is just a short walk from the ferry dock, providing connections to three local routes and two express routes which, combined, provide service that loops through downtown approximately every 5 minutes in the peak periods.

A Park & Sail program is available to those who work in Norfolk and take the ferry from Portsmouth at least three days a week. Under this program, riders may park free of charge in their own designated parking spaces at the Park & Sail lot located at the intersection of Bart Street and Court Street in Portsmouth. The Park & Sail Lot is located about a half of a mile from the High Street dock and about three-quarters of a mile from the North Landing dock. In downtown Norfolk, ample parking is available at market rate along Waterside Drive, both in parking structures and on-street.

In August 2015, HRT approved the acquisition of one additional ferry vessel and the option to buy three additional ones. These vessels will replace those in HRT's aging ferry boat fleet, which have required continuous structural and mechanical repairs. The first of these, the Elizabeth River Ferry IV, was put into service on July 12, 2017. The new vessel is similar in design and carries 150 passengers like its predecessors, but has two hatches on each side to allow for faster boarding and de-boarding.

In 2015, the Elizabeth River Ferries carried nearly 295,000 passengers with a total operating cost of approximately $1.7 million and a farebox recovery rate of 21%. Table 14 provides key operating and performance characteristics for the Elizabeth River Ferry over the last three available years.

**Table 14: HRT Elizabeth River Ferry Operating and Performance Characteristics, 2013-2015**

*(Source: National Transit Database)*

| Elizabeth River Ferry | 2013 | 2014 | 2015 |
|---|---|---|---|
| Operating Characteristics | | | |
| Passenger Trips | 336,838 | 332,028 | 294,625 |
| Fare Revenues | $313,314 | $567,744 | $355,408 |
| Operating Expenses | $1,705,130 | $1,300,350 | $1,701,947 |
| Revenue Hours | 6,161 | 6,341 | 6,606 |
| Revenue Miles | 14,048 | 18,264 | 18,978 |
| Peak Vessels | 3 | 3 | 3 |
| Performance Characteristics | | | |
| Passenger Trips per Revenue Hour | 54.67 | 52.36 | 44.60 |
| Passenger Trips per Revenue Mile | 23.98 | 18.18 | 15.52 |
| Operating Expense per Revenue Hour | $276.76 | $205.07 | $257.64 |
| Operating Expense per Revenue Mile | $121.38 | $71.20 | $89.68 |
| Operating Expense per Passenger Trip | $5.06 | $3.92 | $5.78 |
| Farebox Recovery Ratio | 18% | 44% | 21% |

Historically, Hampton Roads had more robust ferry services. The Chesapeake Ferry Company provided service between Norfolk and Newport News on the Virginia Peninsula from 1912 until 1957. Service was discontinued shortly after the Hampton Roads Bridge Tunnel was completed.

From 1999 to 2002, a ferry service called Harbor Link operated between the Nauticus Museum in downtown Norfolk and the public pier in downtown Hampton. Operated privately, the system relied on farebox revenue, HRT operating assistance, and a Congestion Mitigation and Air Quality (CMAQ) Improvement Program grant awarded on the basis of a ridership estimate of 450 riders a day. Ridership was far lower than expected, averaging 110 riders per weekday, with very high seasonal peaks in July and August. Harbor Link fares for the trip from Hampton to Norfolk were $5.

While Harbor Link service was originally intended to be operated with a higher-speed passenger ferry at speeds of 25-30 knots, the actual Harbor Link equipment was capable of only 20 knots. The impact of vessel's own speed restrictions was further complicated by the speed restrictions of the Elizabeth River no-wake zone, with speed being cited as a major reason for the service's end of operations. Fast ferry service connecting multiple points in the area (e.g., downtown Norfolk, downtown Newport News, Naval Station Norfolk and Ft. Eustis) has been examined several times since the Harbor Link service ended, but has never been implemented.

### *Commuter Ferry Market Analysis Recommendations*

As discussed above, there is a growing interest in passenger ferry transit service in the Charleston region. With increasing congestion, passenger-only ferry service may be a feasible option to provide a convenient and competitive alternative to driving or CARTA and TCL bus services. Two types of ferry service are under consideration:

- Point-to-point service (e.g., Patriots Point to downtown Charleston) and
- Linear multiple-stop services (e.g., Daniel Island to Remley's Point to downtown Charleston).

A number of potential landing sites and ferry routes have been identified in past plans and studies,

including the 2035 CHATS LRTP, OROP and the Fort Sumter National Monument Alternative Transportation Study. The Commuter Ferry Working Group organized by the City of Charleston is now actively examining the feasibility of various landing sites.
Like any other form of transit, commuter ferry service must link areas of significant travel demand. An analysis of travel demand between districts is needed to identify significant travel markets that cross the region's bodies of water. This analysis will help inform the identification of routes.

For commuter ferry service to be successful, it would need to offer travel times that are competitive with other modes of travel. For this reason, a second piece of the market analysis should be travel time comparisons of ferry service, bus transit service and driving.

One component of travel time is the time spent on the water, which is a function of the vessel used, as well as any speed restrictions on the waterway itself, including no-wake zones and busy shipping lanes. Passenger boarding and de-boarding times must also be considered.

Because ferries can only take passengers to the water's edge, the other component of travel time is the time required on both ends of the ferry trip, that is, between the passenger's origin and the boarding ferry dock on one end and between the de-boarding ferry dock and the passenger's final destination on the other end. Intermodal transfers are required at one and often, both ends of the ferry trip. Options for providing this transfer include park-and-ride lots and feeder bus service.

# 4.0 Summary of Stakeholder and Public Input

Public and stakeholder input was collected throughout the course of the LRTP update process through a variety of methods, including a series of public symposiums, stakeholder interviews, and an online survey. The results of these outreach activities relevant to transit needs and priorities in the region are summarized in the following sections.

## *4.1 Summary of Stakeholder Input*

A set of key transit stakeholders were identified and interviewed in July 2017 to gain insight into the needs and opportunities regarding transit in the Charleston region. The following stakeholders were interviewed:

- Town of Summerville – Mayor, Town Administrator, Public Works Director, Director of Administration and Economic Development, Planning Director and key staff
- City of North Charleston – Assistant Director of Public Works, Deputy Director of Planning and Zoning, Project Manager, Office of the Mayor, and key staff
- City of Charleston –Transportation Director, Planning Director, Director of Civic Design, and key staff
- City of Goose Creek – Mayor and City Administrator
- Town of Mount Pleasant – Transportation Director, Planning Director, and key staff
- CARTA and TCL - Executive Director
- Commuter Ferry Working Group

The stakeholders were asked a series of open ended questions regarding their opinions on existing service in the region, existing and future unmet needs, and suggestions for improving the regional transit network. The feedback received during these interviews is summarized below according to reoccurring topics and categories of transit needs that were brought forward in multiple interviews.

- Commuter Ferry Working Group
- Passenger Amenities: The quality of bus stops was noted as a deficiency throughout the region, for both CARTA and TCL services. In particular, more bus shelters were noted by several interviewees as a key need given the region's climate.
- Regional Connections and Access to Employment Centers: Regional connections to major activity and employment centers were noted as a key need. Specific corridors that were mentioned as candidates for transit service investments included:
  - Dorchester Road
  - Central Avenue
  - Orangeburg Road
  - Old Trolley Road
  - Miles Road
  - Highway 17A
  - Rivers Avenue
  - Glenn McConnell Parkway
  - US17/Savannah Highway
  - Highway 176 (Goose Creek)
  - Coleman Boulevard
  - Interstate 526, US17, and Interstate 26 corridors (for regional connections)
- Expanded Park-and-Ride / Commuter Service: Expanded commuter service from more park-and-ride lots was mentioned during several interviews as a need to connect the

region's relatively low density residential areas with employment centers. This could also help alleviate parking challenges downtown.

- Technology/ITS Improvements: Long transit travel times and poor on-time performance were noted as a deficiency. Several interviewees proposed technology improvements such as signal priority/preemption and timing enhancements to help alleviate these issues.

- Activity Center Circulators: Circulator service, similar to the existing DASH service, was suggested to help address mobility needs within/between core urban areas and activity centers. Areas suggested as candidates for circulator service include:
  - Summerville, connecting areas including Nexton, Downtown Summerville, and Oakbrook
  - Upper Peninsula
  - Downtown Charleston
  - West Ashley – MUSC – Avondale
  - Downtown Mount Pleasant

- Capital Facilities: Depending on expansion plans, CARTA will likely need another maintenance facility in the future and/or layover/storage yard(s) to reduce deadhead.

- Regional Waterway Transit: There is an interest in establishing ferry service geared towards the commuter market. Feasibility of regional waterway transit is currently being assessed and potential departure points are being identified.

- Policy: Several recommendations were made concerning policy and regional coordination issues, including:
  - Zoning regulations should be revised to encourage density/TOD around planned transit nodes, especially along Rivers Avenue corridor in advance of BRT. Development regulations should also compel developers to provide set-asides for transit amenities such as bus stops.
  - Land use and transit planning should be more closely linked. Future transit investments should be oriented around future areas of density.
  - Public outreach and communications strategies to educate both the general public and elected officials regarding the benefits of transit and available services should be developed and implemented.
  - Strategies to incentivize transit use should be explored, including subsidized transit passes, increased parking pricing.
  - Opportunities for a full or partial consolidation of CARTA and TCL should continue to be explored, especially in areas where services overlap or are redundant.
  - The municipalities throughout the region could benefit from better coordination, especially with regard to maintenance of bus stops and property acquisition for stops/shelters.

## *4.2. Summary of Public Input*

Input from the public pertaining to long range transit needs in the region was gathered through a series of symposiums held throughout the CHATS planning area in June 2017. The project symposium provided an opportunity for the public to participate in collaborative activities and share input on how the region's transit services can be improved for the future. Participants were asked questions to solicit feedback regarding issues identification and priorities for transportation investment. At each of the three symposiums, enhanced mobility, congestion relief, increased transit alternatives including Bus Rapid Transit, and infrastructure condition were identified by participants as key priorities. In addition to the public symposiums, a public survey utilizing WikiMaps was made available online to allow participants to identify specific transit needs, including new bus routes and corridors that

should be served, bus stop locations, park-and-ride locations, and other service improvements such as expanded service hours. A summary of survey results is presented in Table 15 and illustrated in Figure 26.

**Table 15: Summary of Public Comments Received for Transit Services**

| **Bus Routes / Corridors** |
|---|
| Downtown to Folly Beach |
| Limited stop service from Windermere to Folly Beach on Folly Road |
| Downtown to West Ashley with later service |
| Harbor View Road corridor to Folly Beach |
| Carolina Bay to Downtown |
| Boeing to Carolina Bay |
| Express bus on Harbor View to downtown |
| Johns Island to downtown - local and commuter service |
| Service from Hwy 17 to Isle of Palms beach |
| Hwy 61 from Summers Corner to Downtown |
| Summerville to Downtown |
| Local service from downtown Summerville to Berkeley County via Main St. |
| West Ashley to North Charleston |
| DASH service on West Ashley loop (St. Andrews/Ashley River Rd to Sam Rittenburg and then back down Savannah Hwy) |
| Limited stop service from Park Circle area in North Charleston to Downtown |
| Express service on 526 corridor from North Charleston to Daniel Island and Mount Pleasant |
| More frequent service on Hwy 17 and 61 in West Ashley |
| Routes from Johns Island/West Ashley to the airport |
| **Bus Stop Locations** |
| Fort Moultrie |
| Sullivans Island |
| East Copper Hub |
| Summerville Hub |
| Isle of Palms |
| Stono River Ferry area |
| Trident Medical Center |
| Maybank and Main Rd in Johns Island |
| Seaside Farms |
| Harbor View area |
| **Park and Ride Lots** |
| Summerville PnR lots - downtown and at fairgrounds on US78 |
| Trident Medical Center |
| Glenn McConnel/Bees Ferry |
| Johns Island at Maybank Hwy and River Road |
| **Other Comments** |
| Add more evening service |
| Add more mid-day service to the James Island Express |
| Commuter ferry |
| Add more service hours on Express Route 3 |

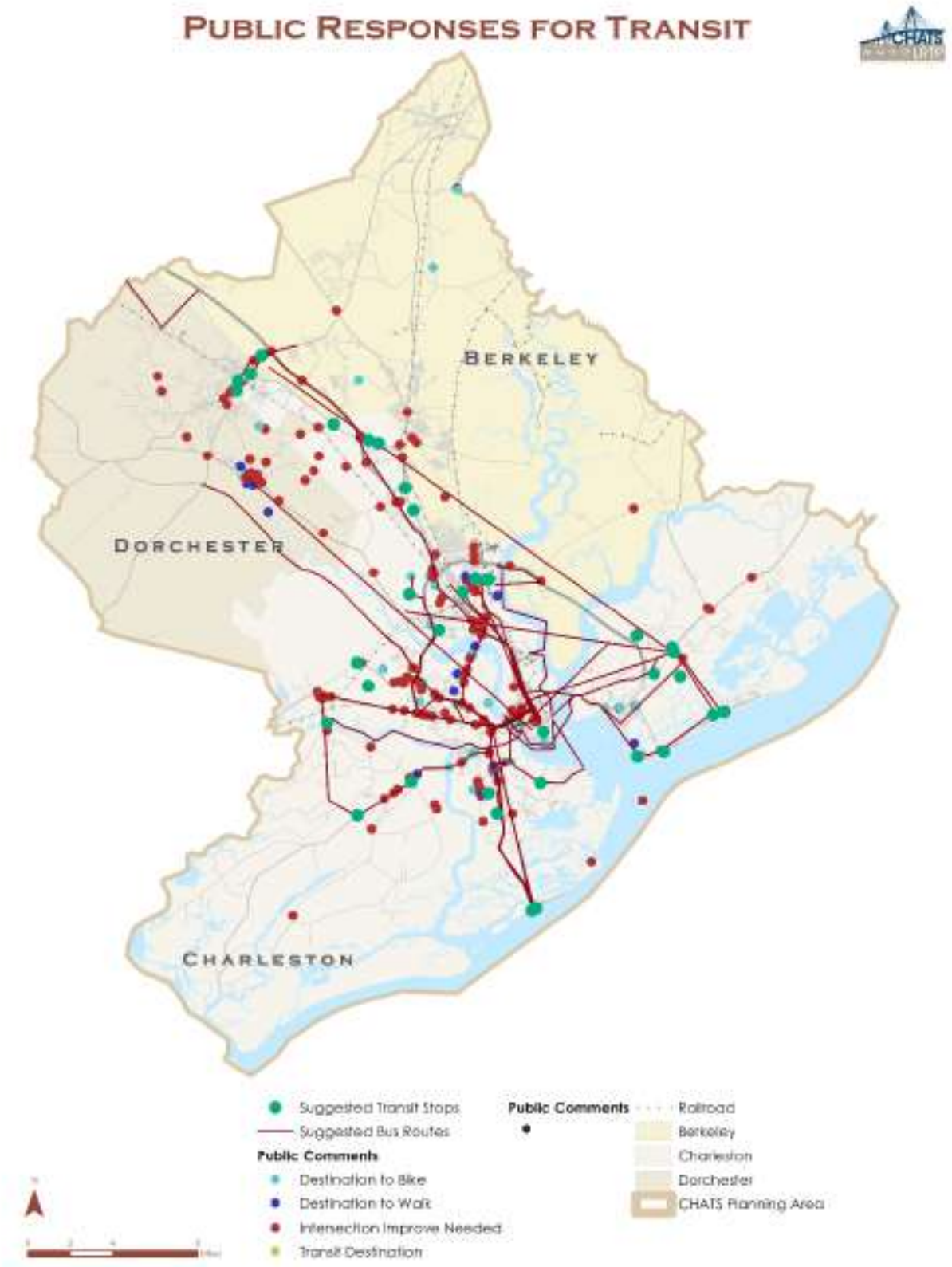



**Figure 26: WikiMaps Public Responses for Transit**

# 5.0 Transit Needs Assessment

An assessment of transit needs for the Charleston region was developed based on the analysis of existing transit conditions, a review of previous and ongoing transit planning initiatives, and public and stakeholder input. Transit needs were identified using the following methodology and sources:

- Projected population and employment growth and other demographic trends identified in Section 2.1
- Performance data of existing transit services in the region as summarized in Sections 2.2 and 2.3
- Transit projects identified through the prior LRTP update and other previous and ongoing studies and internal agency plans as summarized in Section 3
- Public and stakeholder input as summarized in Section 4

Based on this analysis, general strategies were developed regarding improvements to existing service, implementation of new modes and corridor expansion projects, and transit supportive policies, as discussed below. From these strategies, specific long-range transit needs for the region were identified, as defined in Table 16.

### *Service Improvements*

- Improve transit access to major employment centers: The Charleston region is home to many major employers in the defense, health care, manufacturing, and tourism sectors. Connecting workers to employment centers is critical to sustaining economic growth into the future. Improved transit access to employment is a key need that can be addressed through enhanced local and express service, including the development of new park-and-ride lots throughout the region.
- Enhance local service to provide improved frequency and travel times: Travel time competitiveness is a key component that influences one's decision to use public transportation versus other modes, especially in the case of "choice" riders who have access to a personal automobile. For choice and transit dependent riders alike, however, transit trip times that are competitive with other modes enhance customer satisfaction and ultimately serve as a catalyst to attracting ridership to the system. Improvements in local service frequency should be prioritized along with technology enhancements to the roadway network to reduce delay such as signal timing modifications and transit signal priority on key routes.
- Build upon success of DASH circulator service to expand activity center circulators into new markets: CARTA's DASH service has proven to be a successful model for providing mobility in Charleston's urban core. As neighborhoods in the Upper Peninsula, Neck Area, and West Ashley continue to develop and add density, similar service models should be explored as viable transportation alternatives. Other activity centers such as major retail and employment centers, colleges and universities, and tourist destinations such as the beaches could benefit from activity center circulators or trolley service that tie into the core network.
- Continue investment in fleet modernization and state-of-good-repair needs: CARTA is actively working towards modernizing its aging local and express bus fleet. As the CARTA and TCL systems expand in the future, emphasis should be placed on maintaining an asset

management and fleet replacement program in accordance with FTA regulations and industry standards to ensure system safety and reliability.

- Enhance bus stop amenities and pedestrian access to transit network: A relatively small percent of bus stops throughout the region are equipped with shelters and many are lacking in adequate pedestrian access facilities. Such amenities enhance safety, system usability, and customer satisfaction, and should be prioritized to the extent possible, especially at high-volume stops.

### *New Modes & Technologies / Corridor Expansion Projects*

- Implement the Lowcountry Rapid Transit BRT and explore new corridors for rapid transit implementation: The region's first rapid transit corridor, the Lowcountry Rapid Transit BRT (formerly i26 Alt), is an important first step in developing a network of high capacity public transportation lines in the Charleston region. The project is moving forward into project development. As a next step, BCDCOG is currently studying the viability of additional corridors through its Regional Transit Framework plan. The outcome of this effort should inform the identification and programming of new rapid transit corridors to support current and projected areas of transit supportive land use.

- Explore commuter ferry as a viable transportation mode: The Charleston region's waterways present an opportunity to add commuter ferry as an alternative transportation mode within the overall transportation network. An initiative is currently underway to study the viability of commuter ferry between various points throughout the region, including downtown Charleston, North Charleston, West Ashley, Mount Pleasant, James Island, and Daniel Island. The outcome of this effort should inform the identification and programming of new commuter ferry routes, as well as the supporting local service improvements necessary to ensure its success.

### *Policy Strategies*

- Public outreach and marketing: As evidenced in data and comments received through public and stakeholder input, the commuting habits of residents in the Charleston region is overwhelmingly auto-centric, with many transit riders relying on the service out of need rather than choice. A general lack of awareness of available transit services, coupled with a lack of incentives to explore alternative forms of travel, perpetuates this trend. CARTA and TCL and other regional stakeholders should explore opportunities to expand marketing and public outreach efforts to promote the various benefits of public transportation, especially to niche markets such as commuters, universities, and visitors. Further engagement with local elected officials and major employers to explore opportunities to develop programs that incentivize transit use, such as subsidized transit passes, is another key strategy to encourage ridership among choice riders.

- Continue to strengthen coordination between CARTA and TCL: The 2013 Transit Consolidation Feasibility Analysis identified opportunities for closer coordination between the CARTA and TCL. While full consolidation is potentially a viable long-term outcome, the study recommended an incremental approach with increased levels of coordination phased in over time. In the near-term, CARTA and TCL should seek to identify further opportunities for service coordination to enhance mobility throughout the region.

- Coordinate land use and transportation policy at the regional and local levels: As the Charleston region moves forward towards implementing its first BRT corridor, it is imperative that supportive land use policies are in place at the local level to fully capitalize on this transportation investment. Effective Transit Oriented Development (TOD) land use policies that encourage higher density, mixed use development around planned BRT stations and intermodal hubs will serve as a catalyst for attracting and retaining ridership. To achieve this goal, local zoning regulations should be reviewed and updated as necessary to incorporate TOD design principles around station-area nodes to the extent possible within the local planning context. While emphasizing TOD is a key objective along rapid transit corridors, an opportunity also exists to further incorporate transit-supportive amenities such as set-asides for bus stops or shelters, park-and-ride lots, and pedestrian access facilities into site plan review processes in jurisdictions throughout the entire service area. At the regional level, land use and transit planning initiatives should be closely coordinated to ensure that future development patterns are served by appropriate levels of transit investment.

## Table 16: Summary of Regional Long-Range Transit Needs

| Need Type | Need Description | Source |
|---|---|---|
| Service Improvements - Operating | | |
| Express Bus Service Improvements - CARTA | Improvements to existing express service and one new express route along I-526 from West Ashley to Mount Pleasant via Charleston International Airport. | -2016 COA Mid-Range Service Recommendations<br>-Public & stakeholder input |
| Local Bus Service Improvements – CARTA | Improvements to existing local service and new routes to support implementation of Lowcountry Rapid Transit BRT as proposed in 2016 COA Mid-Range recommendations. Provides frequency improvements on select existing routes and new routes along the following corridors: 1) DASH service from MUSC to Meeting/Line via Calhoun & King; 2) BRT feeder service from Rivers/Otranto to Rivers/Remount; 3) BRT feeder service from US-17A and I-26 to Rivers/Otranto; 4) BRT feeder service along US-17A & Old Trolley between US-176 and Dorchester Road PnR; 5) BRT feeder service from Trident Health/ Rivers to Dorchester Road/Cross County Road; 6) Folly Beach trolley from Walmart PnR on Folly Road to Folly Beach; 7) Isle of Palms trolley from Walmart PnR (Wando Crossing) to Charleston County Park on IOP | -2016 COA Mid-Range Service Recommendations<br>-Supports implementation of Lowcountry Rapid Transit BRT<br>-Public & stakeholder input |
| Service Improvements – TCL | Improvements to expand TCL service footprint and improve mobility in non-urbanized areas of region. | -2014 TCL Routes Study<br>-Public & stakeholder input |
| Service Improvements - Capital | | |
| Bus Stop Upgrades | Upgrades to existing bus stops throughout CARTA and TCL systems to provide amenities including signage, benches, and/or shelters as warranted by demand. | -Public & stakeholder input |
| Park-and-Ride Lots | Park-and-ride (PnR) network expansion. | -2016 COA Mid-Range Service Recommendations<br>-Public & stakeholder input |
| Fleet Replacement - State of Good Repair / Modernization | Planned fleet replacement needs to achieve state-of-good-repair targets. | -CARTA Fleet Replacement Plan |
| Fleet Expansion - New Service and Corridor Capital Expansion Projects | Fleet expansion needs to accommodate service improvements and new corridor expansion projects. | -2016 COA Mid-Range Service Recommendations<br>-Supports implementation of Lowcountry Rapid Transit BRT and other corridor expansion projects |
| CARTA Maintenance and Storage Facility Expansion | Expansion of the CARTA maintenance and storage facility to accommodate future system expansion and/or consolidation of services with TCL. | -2013 CARTA/TCL Consolidation Study<br>-Public & stakeholder input |
| New Modes and Corridor Expansion Projects | | |
| Rapid Transit Corridor | Peninsula/Summerville - Rivers Ave/US-78 Corridor (Lowcountry Rapid Transit) | - i26ALT Study<br>- Our Region Our Plan Vision Corridor<br>- Public & stakeholder input |
| Rapid Transit Corridor | Summerville/Ridgeville - US-78 Corridor | - Our Region Our Plan Vision Corridor<br>- Public & stakeholder input |

**Table 16: Summary of Regional Long-Range Transit Needs** *(cont.)*

| Need Type | Need Description | Source |
|---|---|---|
| Rapid Transit Corridor | Peninsula/West Ashley/Folly Beach - Folly Road Corridor | - Our Region Our Plan Vision Corridor<br>-Folly Road Corridor Study<br>- Public & stakeholder input |
| Rapid Transit Corridor | Peninsula/Moncks Corner - US-52 Corridor | - Our Region Our Plan Vision Corridor<br>- Public & stakeholder input |
| Rapid Transit Corridor | Peninsula/Daniel Island/East Cooper/West Ashley - I-526/US-17 Loop | - Our Region Our Plan Vision Corridor<br>- Public & stakeholder input |
| Rapid Transit Corridor | Peninsula/Mount Pleasant/East Cooper - US-17 Corridor | - Our Region Our Plan Vision Corridor<br>- Public & stakeholder input |
| Rapid Transit Corridor | Moncks Corner/Summerville/East Edisto - US-17 Alt Corridor | - Our Region Our Plan Vision Corridor<br>- Public & stakeholder input |
| Commuter Ferry | Feasibility and implementation planning. | - Our Region Our Plan<br>- Public & stakeholder input |
| Commuter Ferry | Commuter ferry service – North Charleston to downtown Charleston; Daniel Island to downtown Charleston; James Island to downtown Charleston, Patriots Point to downtown Charleston (routes to be modified or expanded pending commuter ferry analysis) | - Our Region Our Plan<br>- Public & stakeholder input |