GSATS 2040 METROPOLITAN TRANSPORTATION PLAN UPDATE

APPENDIX D

Technical Memorandum

LEVEL OF SERVICE STANDARDS AND ROAD FUNCTIONAL CLASSIFICATIONS

Prepared for:

Waccamaw Regional Council of Governments

Prepared by:

CDM Smith

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1. INTRODUCTION

This technical memorandum discusses several key concepts relating to the update of the GSATS Metropolitan Transportation Plan. The concepts of level of service and functional classification have implications for goal and objective setting as well as understanding existing and future conditions within the GSATS region. Understanding and employing these concepts is key to meeting the transportation needs of the region's population.

1.1 INTRODUCTION TO LEVEL OF SERVICE (LOS)

Level of Service (LOS) is a measurement used to determine the level with which transportation infrastructure is functioning. LOS is stratified into six letter grades of A through F. From a user's perspective, a LOS of A is preferred with a LOS of F being least preferred. LOS is used across all modes as it provides a generalized and conceptual planning measure that assesses multimodal service inside the roadway environment (inside the right-of-way).

There are a variety of factors and concepts important in understanding how LOS is calculated for the various modes of transportation and facility types. For roadways, the primary factor to consider is the volume to capacity ratio or the number of vehicles using the facility to the capacity of the facility. The capacity of a roadway facility varies and is dependent on factors such as the functional classification of the roadway, the number of lanes, the number and spacing of intersections, and the presence of turn lanes, etc. For transit, bicycle and pedestrian facilities, LOS is based on factors such as transit headways, the width of the outside through lane, and the existence of sidewalks. These measures are designed to reflect the quality of the user's experience rather than a numerical threshold or capacity ratio.

Figure 1-1: Level of Service by Mode

Source: Florida Department of Transportation, 2013 Q/LOS Handbook

LOS and other related measurements are often used as performance measures and metrics to gauge progress towards the goals and objectives of transportation plans. It is particularly useful as a performance measure due to the ease with which transportation models can calculate it for existing and projected future conditions. LOS is being defined in this document for the use of goal setting in the GSATS MTP Update.

1.1.1 LOS Use in South Carolina

LOS is used in the South Carolina (SCDOT) 2040 Multimodal Transportation Plan to analyze existing and future conditions of the Interstates and transit service. Specifically, LOS is used to measure progress towards established goal 5.2 of the plan which is to “Provide mobility and system reliability.”

While LOS is not specifically called for as a performance measure in the Act 114 prioritization process, some of the measurements used to calculate LOS and other related measurements are. These measurements are grouped by respective project type below:

- Bridge Replacements
  - Average Daily Traffic
- Interstate Mainline Capacity Projects
  - Volume to Capacity
- Interstate Interchange Projects
  - Passenger Vehicle Travel Time
  - Truck Vehicle Travel Time
  - Passenger Travel Delay
  - Truck Travel Time
- Resurfacing Projects
  - Average Daily Traffic
  - Average Daily Truck Traffic

1.1.2 LOS Use in North Carolina

The North Carolina Department of Transportation has a Strategic Transportation Investments (STI) process to prioritize transportation projects in partnership with local governments. A key part of this process includes utilizing project prioritization criteria for project selection. One of the primary criteria used for highway widening and interchange/large intersections improvements is traffic volume and congestion, which are both directly related to LOS.

2. Level of Service (LOS)

LOS goals have been established for each facility and user type in the GSATS region and will be used to evaluate progress towards meeting the goals and objectives of this plan. These LOS standards will be used to evaluate both existing and future conditions and help identify where improvements are needed.

2.1 Roadways

2.1.1 Goals and Priorities

SCDOT has established the LOS goal of C when measured as a Peak Season Daily LOS for state roads. NCDOT has established the target LOS goal of D for system level planning analysis. Like the state DOTs, roadway LOS goals are also used by GSATS to establish the desired operating conditions of the roadway network. A LOS goal of D is proposed for this MTP update and is further described in section 2.1.3.

The appropriate degree of congestion (or LOS) to be used in planning and designing highway improvements is determined by considering a variety of factors. These factors include the desires of motorists, adjacent land use type and development intensity, environmental factors, and aesthetic and historic values. These factors must also be weighed against the financial resources available for infrastructure improvements.

The numerical calculation of LOS is expressed as a ratio of the volume of traffic present during peak season peak hour conditions and the capacity of the roadway segment in question. Roadway capacity is dependent on a variety of variables such as, functional classification, the number of lanes, speed limits, and the presence of medians and intersections. The resultant Volume to Capacity (V/C) ratio is used in conjunction with the six LOS letter grades to describe the operating condition of a roadway. **Table 2-1** provides the proposed roadway V/C ratios and their corresponding LOS category.

Table 2-1: Proposed Volume to Capacity Ratios and LOS Standards

LOS	Volume to Capacity (V/C) Ratio
A	< 0.5
B	> 0.49 and ≤ 0.74
C	> 0.74 and ≤ 1.0
D	> 1.0 and ≤ 1.15
E	> 1.15 and ≤1.34
F	> 1.34

Source: HCM, 2010

2.1.2 Intersections

Intersection and roadway LOS are intrinsically related. An intersection that does not move traffic sufficiently, limits the number of vehicles that can be accommodated during peak hours and contributes to roadway congestion. Intersection level of service is often measured by vehicle delay at the intersection. Vehicle delay is based on a number of factors including, lane group volume, lane group capacity, cycle length and green time. Safety factors are also important to consider in and around intersections due to the amount of vehicular conflict points and converging modes such as pedestrian crossings. Setting an intersection planning goal of LOS D is proposed for this MTP update, maintaining consistency with the proposed roadway LOS. **Table 2-2** provides the seconds of vehicle delay associated with each intersection LOS.

Table 2-2: Motor Vehicle LOS Thresholds at Signalized Intersections

LOS	Control Delay per Vehicle (seconds per vehicle)
A	≥10
B	>10-20
C	>20-35
D	>35-55
E	>55-80
F	>80

Source: FHWA

A LOS analysis has been conducted for key intersections in the GSATS region under existing conditions and the 2040 future peak season scenario. **Figure 2-1** and **Figure 2-2** provide the results of this analysis.

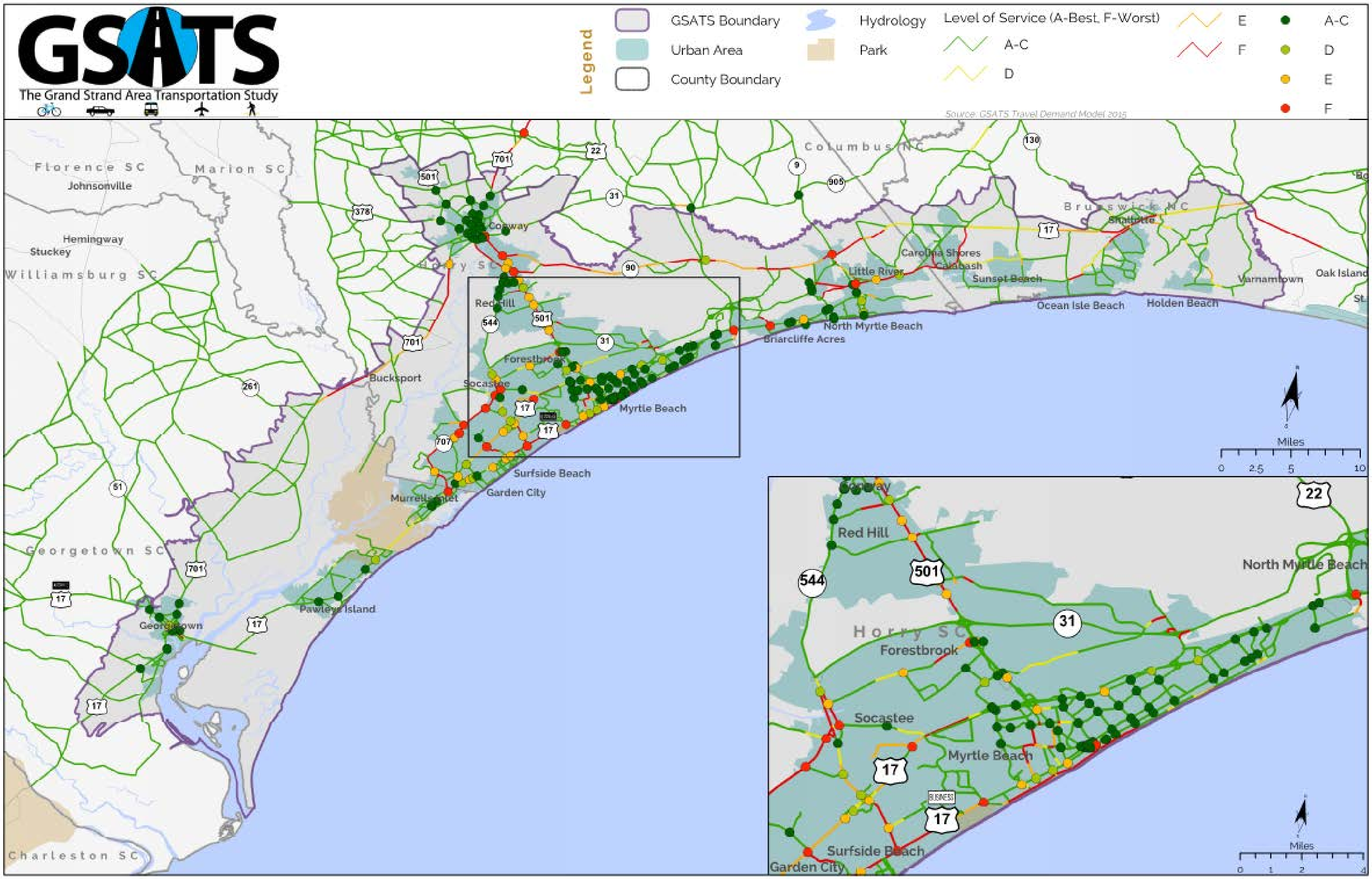
2.1.3 Roadway LOS Recommendations

When establishing a LOS goal, a key factor to consider is the need to balance the provision of adequate infrastructure to serve peak conditions while conserving often limited financial resources. Keeping this balance in mind, setting a planning goal of **LOS D** for the roadways in the GSATS area is proposed.

Figure 2-3 shows the current Peak Season Daily LOS under current conditions.

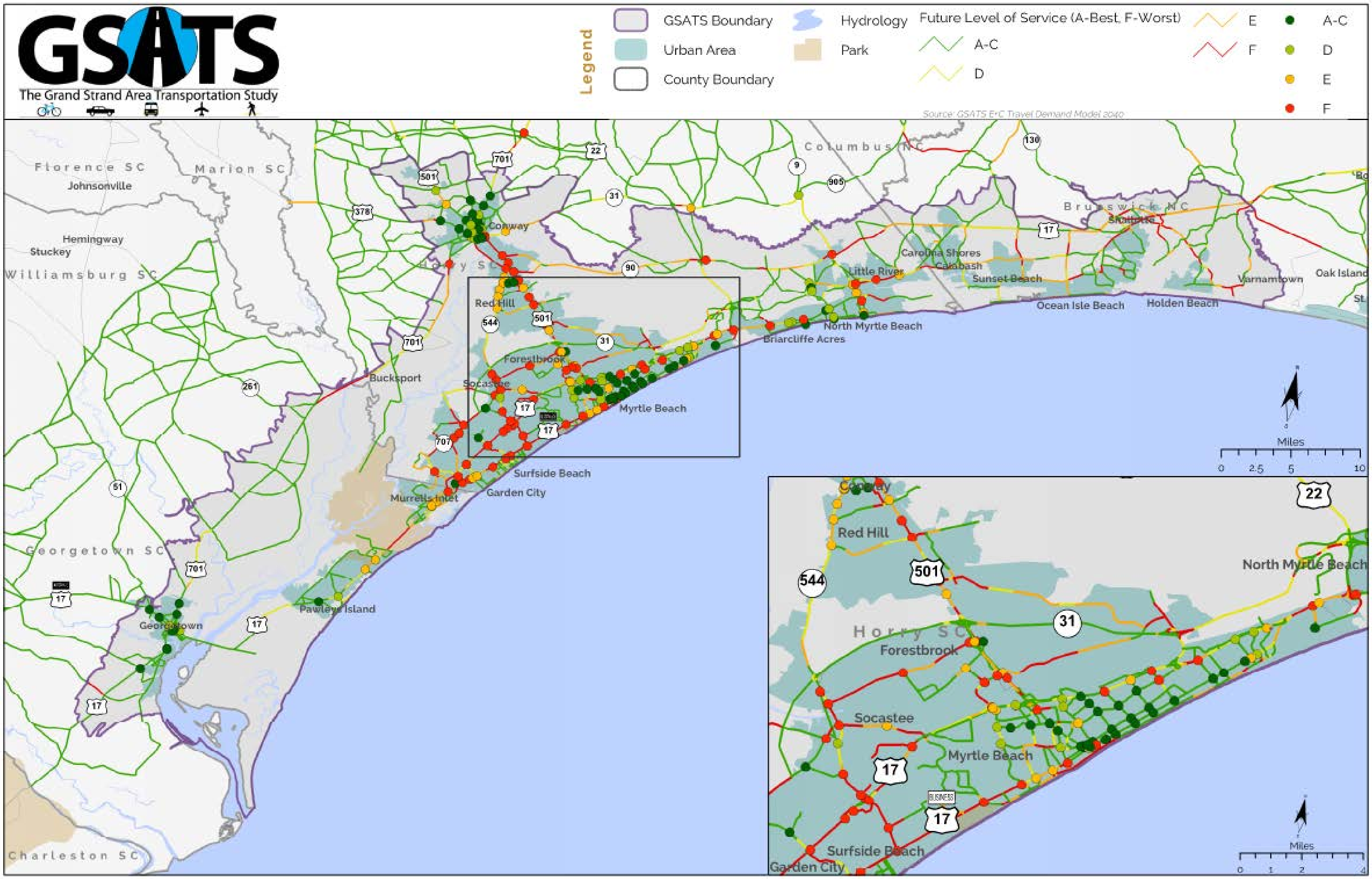
As a means of checking the traffic model used to determine future conditions for reasonableness, historical growth rates were obtained in the study area using SCDOT and NCDOT traffic counts and estimates. **Table 2-3** provides the identified growth rates by roadway for the 6-year period of 2010 – 2015. **Figure 2-4** provides the 2040 future conditions peak season daily LOS. The future conditions are obtained under the assumption that historical traffic growth rates will continue and are based on updated demographic and land use projections conducted as part of the MTP update.

Figure 2-1: Existing (2015) Conditions Intersection LOS



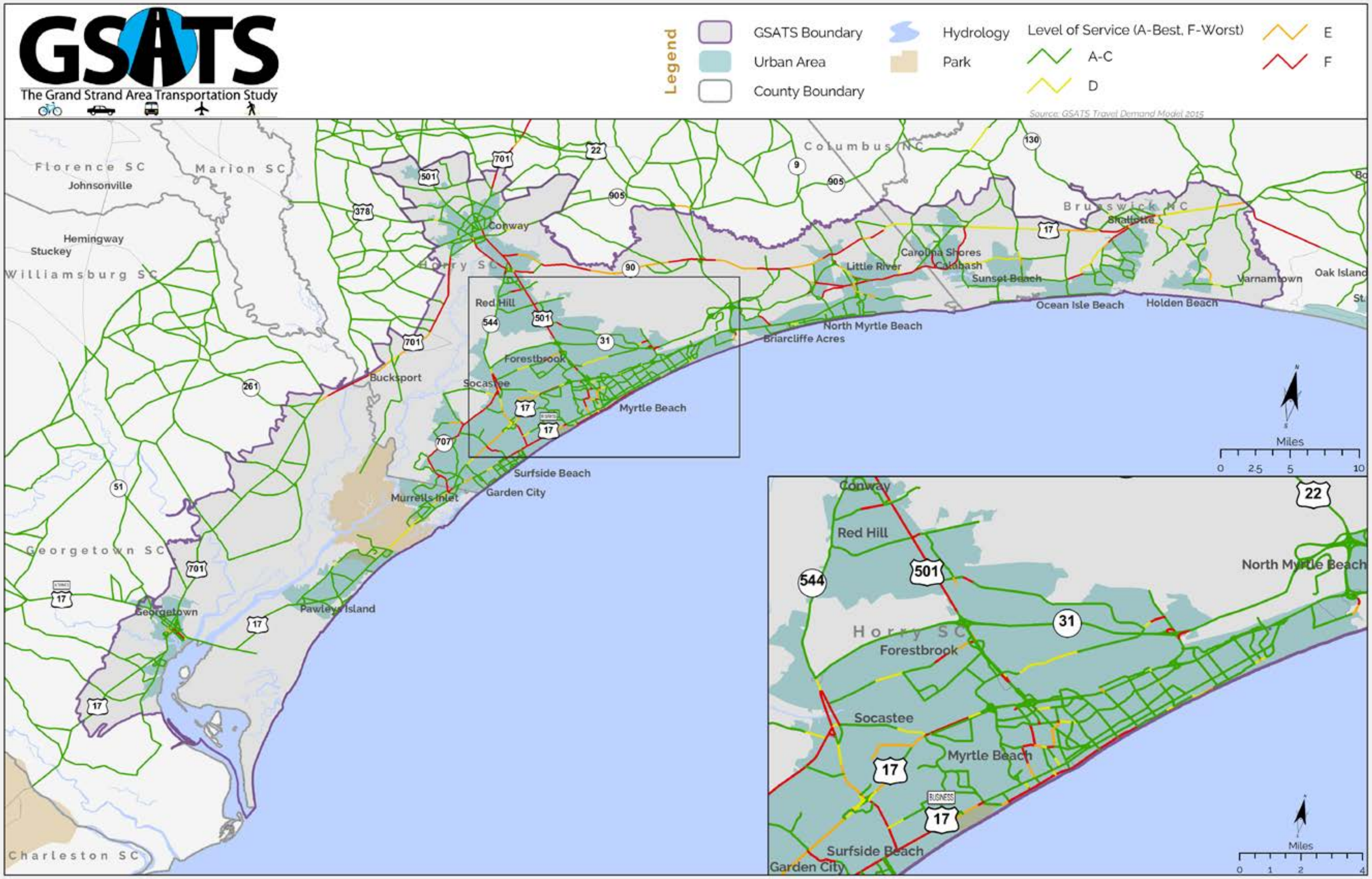
Source: GSATS Travel Demand Model

Figure 2-2: Future (2040) Conditions Intersection LOS



Source: GSATS Travel Demand Model

Figure 2-3: Existing (2015) Peak Season Daily LOS



Source: GSATS Travel Demand Model

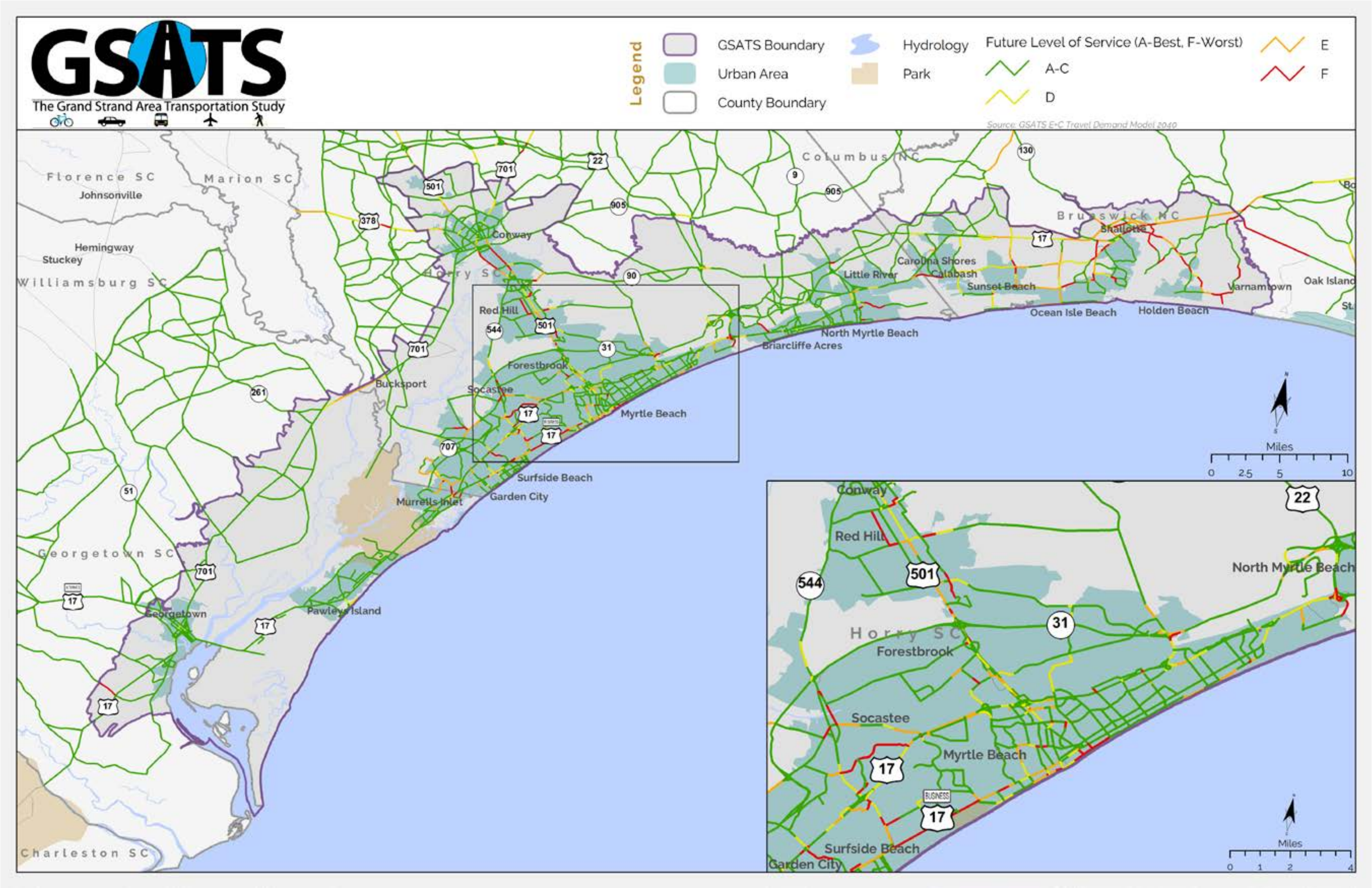
Table 2-3: Traffic Growth in the GSATS Area, 2011-2015

Route	Location	2010 AADT	2015 AADT	10-15 Growth	10-15 Inc / Yr
Horry County					
US 17 Bypass S	Georgetown County Line to SC 544	35,800	35,302	-1.41%	-0.28%
US 17 Bypass S	SC 544 to SC 707	41,700	47,048	11.37%	2.48%
US 17 Bypass S	SC 707 to US 501	56,400	63,824	11.63%	2.54%
N Kings Highway	US 17 BUS to S 469	55,300	63,088	12.34%	2.71%
N Kings Highway	S 469 to S 227	52,600	61,126	13.95%	3.11%
N Kings Highway	S 990 to S 94	45,700	35,426	-29.00%	-4.81%
US Highway 17	SC 179 to North Carolina State Line	15,100	12,866	-17.36%	-3.09%
Carolina Bays Pkwy	US 501 to SC 544	11,300	11,806	4.29%	0.88%
Carolina Bays Pkwy	S 1315 to US 501	18,300	20,897	12.43%	2.73%
Carolina Bays Pkwy	SC 22 to S 1315	27,700	33,326	16.88%	3.85%
Carolina Bays Pkwy	SC 9 to SC 22	21,400	24,881	13.99%	3.12%
State Highway 22	SC 90 to SC 31	16,300	15,641	-4.21%	-0.82%
State Highway 22	US 701 to SC 905	7,900	7,900	0.00%	0.00%
State Highway 22	SC 905 to SC 90	12,100	10,965	-10.36%	-1.93%
State Highway 22	SC 319 to US 701	5,100	6,923	26.34%	6.54%
Sea Mountain Highway	US 17, S 20 to SC 65, S 209	21,800	23,329	6.55%	1.38%
State Highway 9 E	S 20 to US 17, SC 90	25,900	26,911	3.76%	0.77%
US Highway 501	S 1315 to US 17 BUS	21,300	25,146	15.29%	3.44%
US Highway 501	Horry County Line to S 1315	33,500	39,806	15.84%	3.58%
US Highway 501	SC 31 to Horry County Line	65,600	74,412	11.84%	2.59%
US Highway 501	SC 544 to SC 31	48,600	49,437	1.69%	0.34%
Church St	US 501 BUS, S 133 to US 701	28,200	30,240	6.75%	1.42%
Church St	S 165 to US 501 BUS, S 133	29,900	31,938	6.38%	1.34%
US Highway 701	SC 319 to SC 410	10,500	9,369	-12.07%	-2.22%
Main St	US 501 BUS, S 153 to SC 319	20,300	17,576	-15.50%	-2.79%
4th Ave	S 110, L 110 to US 378	12,800	13,649	6.22%	1.30%
Dick Pond Rd	US 17 to US 17 BUS	32,800	37,475	12.47%	2.74%
SC 544	S 616 to SC 707	25,000	27,571	9.32%	2.00%
US Highway 501 Bus	US 501 BUS to S 955	19,200	21,083	8.93%	1.91%
State Highway 707	Georgetown County Line to S 616	18,600	21,195	12.24%	2.69%
State Highway 707	S 616 to US 17	24,600	24,935	1.34%	0.27%
US Highway 17 S	US 17 CON to S 51	27,100	32,918	17.67%	4.06%
US Highway 17 N	S 1240, L 70 to SC 544	30,700	35,931	14.56%	3.26%
S Kings Highway	L 73 to S 326, L 326	24,800	32,367	23.38%	5.65%
N Kings Highway	S 326, L 326 to US 501	24,400	29,506	17.30%	3.96%

Route	Location	2010 AADT	2015 AADT	10-15 Growth	10-15 Inc / Yr
Georgetown County					
S Fraser St	S 23 to S 18	14,100	13,605	-3.64%	-0.71%
Church St	US 17 ALT, US 701 to S 80	22,100	21,439	-3.08%	-0.60%
Church St	S 80 to S 759	23,300	22,312	-4.43%	-0.86%
Highmarket St	S 119 to US 17, US 701	17,900	17,568	-1.89%	-0.37%
N Fraser St	US 17, US 17 ALT to S 514	21,300	24,781	14.05%	3.13%
US Highway 17	S- 266, S 758 to S 449	28,800	32,778	12.14%	2.66%
US Highway 17	S 449 to S 362	32,700	33,878	3.48%	0.71%
US Highway 17	S 392 to Horry County Line	32,400	36,540	11.33%	2.47%
Brunswick County					
Beach Drive	W OF SR 1164	12,000	19,753	39.25%	11.11%
Old Georgetown Road	E OF SR 1164	8,000	11,736	31.83%	8.33%
Old Ocean Highway	N OF SR 1401	6,700	9,268	27.71%	6.97%
Seaside Road	S of SR 1163	11,000	18,857	41.67%	12.12%
Sunset Blvd	W OF SR 1162	6,800	15,996	57.49%	20.59%
US Highway 17	N OF NC 211	20,000	21,706	7.86%	1.67%
US Highway 17	W OF NC 211	27,000	30,450	11.33%	2.47%
US Highway 17	N OF NC 130	21,000	26,340	20.27%	4.76%
US Highway 17 Bus	E OF NC 130	13,000	14,727	11.73%	2.56%
Village Point Road	N OF SR 1145	10,000	23,040	56.60%	20.00%

Sources: SCDOT and NCDOT

Figure 2-4: Future (2040) Peak Season Daily LOS

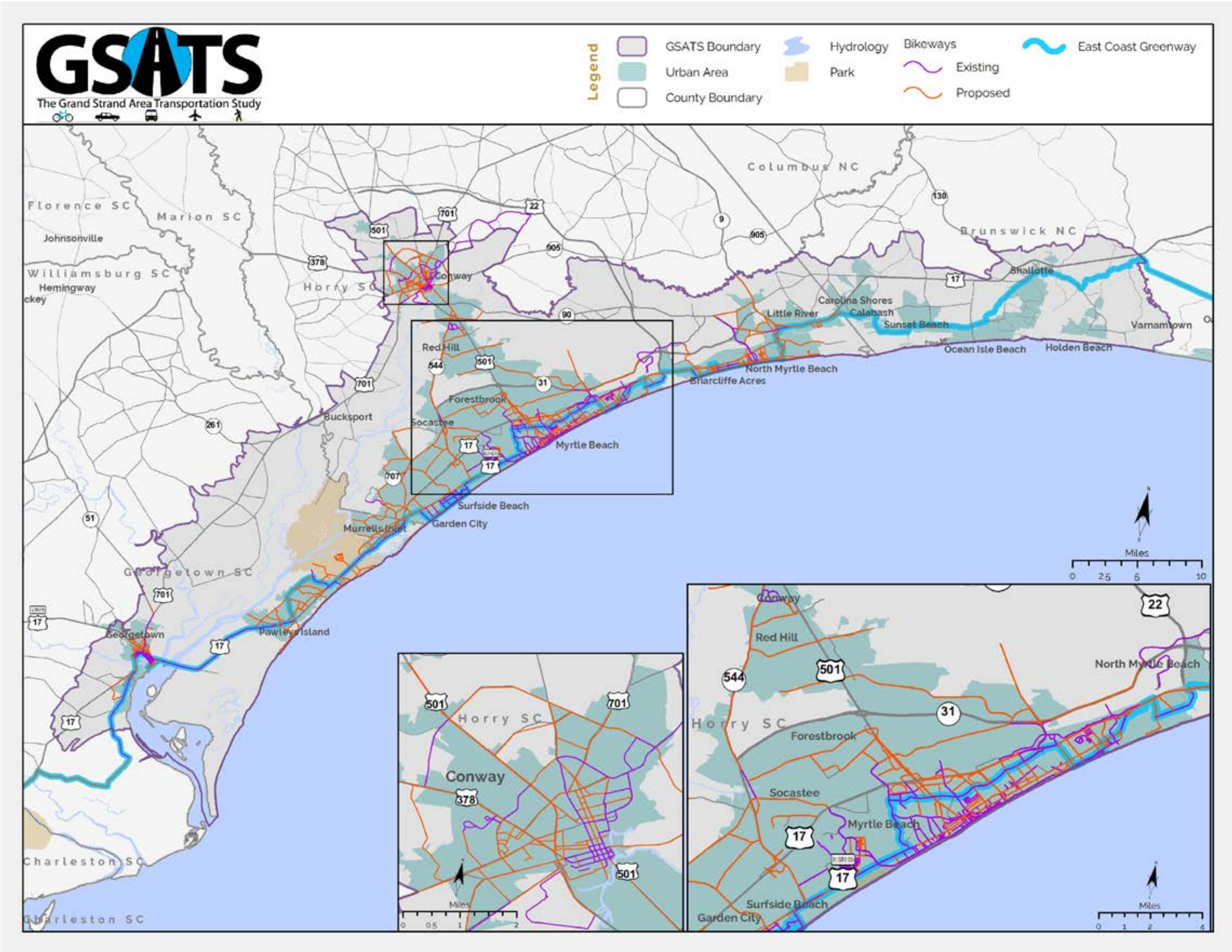


Source: GSATS Travel Demand Model

2.2 Bicycle, Pedestrian and Transit

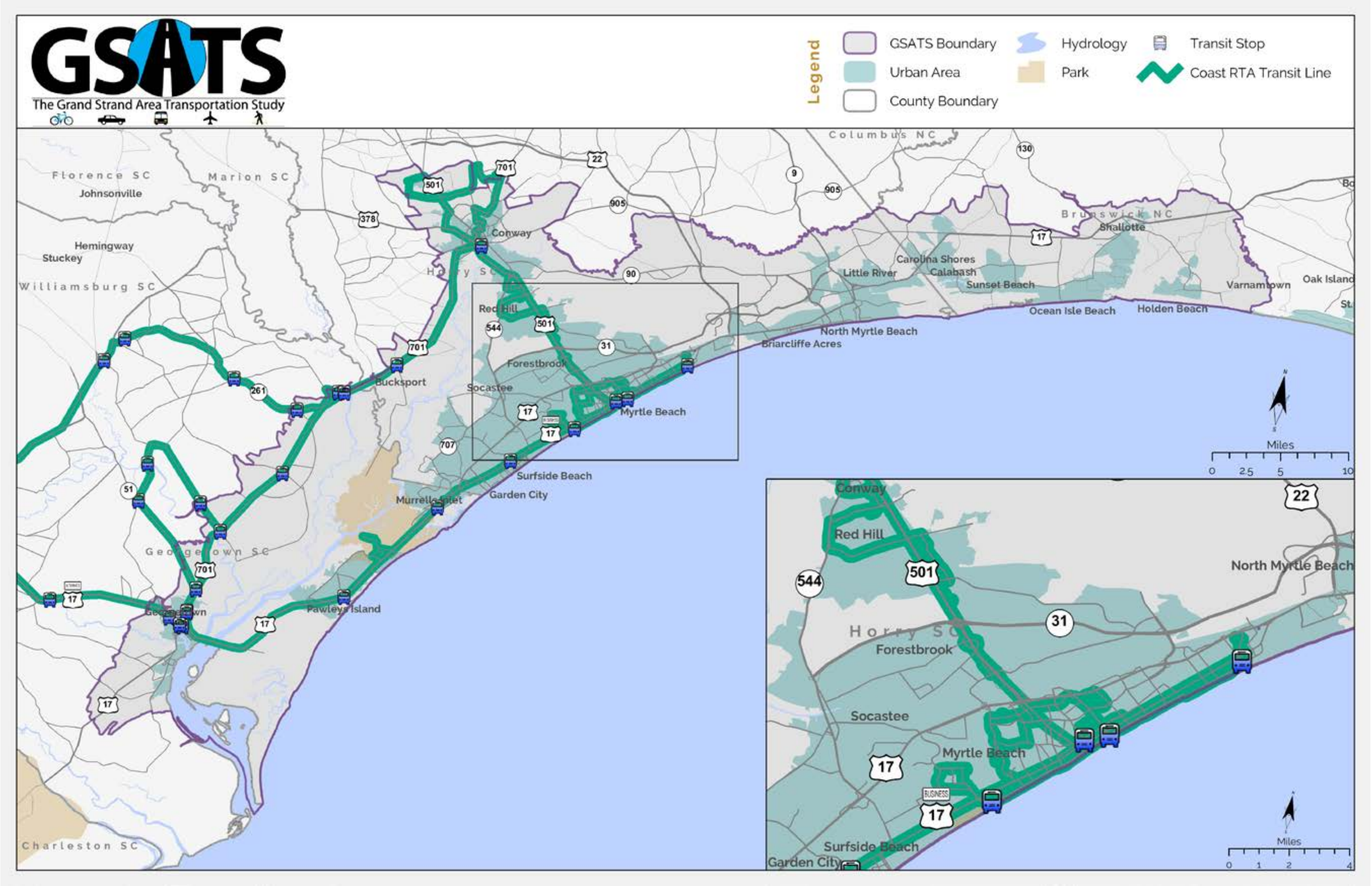
As GSATS plans for accommodating bicyclists, pedestrians, and transit within the region a number of factors must be considered when developing standards. Standards for these three transportation modes may differ based upon the vision and goals setting for communities throughout the region. This section can be used to help establish standards for each user group and determine the appropriate analysis and facilities to best align with the community's goals. The following will begin with considerations during the goal setting process that may influence the standards adopted for bike, pedestrian, and transit modes. Next, several key measures are provided to guide decision making on priority projects to enhance the bike, pedestrian, and transit networks. Lastly, recommendations on facility types and corresponding level of comfort for users will be provided along with resources for analysis of individual roadways or intersections. **Figure 2-5** and **Figure 2-6** show existing bikeways and transit routes respectively.

Figure 2-5: GSATS Area Bikeways



Source: SCDOT

Figure 2-6: GSATS Area Transit Facilities



Source: Coast RTA

2.2.1 Goals and Priorities

Establishing goals and priorities within the local or regional context should drive the standards adopted for bikes, pedestrians, and transit. Key considerations during the goal setting process with respect to transportation are:

- Transportation mode shift goals
- Priority networks for bikes and pedestrians
- Crash data
- Traffic generators
- Existing multimodal networks
- Street classifications
- Priority user goals for networks or individual streets

Each of these considerations will influence the goal setting process. For example, if pedestrians are identified as a priority user for certain networks or streets within an area, the standard for LOS for vehicles may not be as high in order to keep speeds slow and increase visibility and safety for pedestrians. Additionally, goals to see a transportation modal shift or more of a modal split may encourage adopting standards that accommodate all modes equally by encouraging the implementation of complete streets within a community, network of streets, or individual roadway or intersection.

Bicycle routes are another good example as regional bicycle routes are an important part of a connected transportation network within the Grand Strand Area. These routes should be thoughtfully designated based upon the characteristics of roadways to increase comfort and safety for bicyclists. Characteristics such as posted speed limit, shoulder width, percentage of trucks, and frequency of property access (i.e. driveways) should all be considered. Some regional bike route connections may best align with rural roads or roads that have higher posted speed limits. The use of rumble strips on these types of roads is common and can be effective in reducing roadway departure crashes. However, rumble strips can cause damage to bicycles and/or loss of control for a bicycle user. If rumble strips will be applied to roadways that are also bicycle routes, consider the following to increase the safety and comfort of bicyclists:

- Alternative bicycle route options
- Clear signage for bicycle users to make users aware of the location of rumble strips
- Periodic bicycle gaps (i.e., short breaks in the rumble strip to allow the bicycle user to navigate across the rumble strip area)
- More than 4 feet of paved shoulder outside of the rumble strip area
- Narrower rumble strips
- Place the rumble strip on top of the edge of travel lane stripe rather than in the shoulder area
- Targeted location for rumble strip application, specifically areas that have had issues with vehicle roadway departure

Although each community will have goals that are context sensitive, there are several broad goals that encompass more detailed and targeted goals. The Federal Highway Administration's (FHWA) Guidebook for Developing Pedestrian & Bicycle Performance Measures identifies seven community goals along with explanations of each goal that can be used in determining the standards for bikes, pedestrians, and transit. These seven goals, along with short descriptions, are provided below:

1. CONNECTIVITY – interconnected pedestrian and/or bicycle transportation facilities that allow people of all ages and abilities to safely and conveniently get where they want to go.

2. ECONOMIC – describes how transportation decisions impact the economic health of a municipality or region.

3. ENVIRONMENT – environmental measures promote the creation and maintenance of a transportation system that minimizes and/or mitigates impacts to the natural environment. Air quality impacts are the most common type of environmental measure, but others evaluate impervious surface and stormwater and noise pollution.

4. EQUITY – recognizing the disparate costs and impacts of transportation decisions on populations of different income levels, agencies are beginning to calculate equity factors. Households without access to vehicles are not usually well-served by auto-oriented transportation solutions and require walking, bicycling, and transit infrastructure. One component of equity is ensuring that pedestrian facilities along public rights-of-way are accessible so they do not discriminate against people with disabilities and serve people of all ages and abilities.

5. HEALTH – public health impacts of transportation decisions typically include changes to levels of physical activity, safety, and air quality. Increases in walking and bicycling are correlated with higher levels of public health.

6. LIVABILITY – quality of life impacts of transportation systems are evaluated by many local jurisdictions. Livability measures directly acknowledge the trade-offs between the demands of auto travelers passing through an area and those living adjacent to transportation infrastructure. Measures that reflect public opinion are also included within this category.

7. SAFETY - addresses the safety of the transportation system for all users. Safety performance measures typically track crashes, injuries, and fatalities, though some are based on estimated changes in numbers of crashes.

For additional detail the full document can be found at the following link:

https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/performance_measures_guidebook/

It is important to note that these seven FHWA community goals are all consistent with and fall under the eight GSATS 2040 MTP goals. **Table 2-4** identifies which of the seven FHWA community goals can be met or implemented by each of the eight GSATS 2040 MTP goals.

Table 2-4: GSATS 2040 MTP Goals and FHWA Community Goals

GSATS 2040 MTP Goals	FHWA Community Goals
Coordinated Land Use and Transportation	1, 3, 4, 5, 6 and 7
Economic Competitiveness	2
Mobility and System Accessibility	1 and 4
Environmental Stewardship	1 and 3
Modal Choices and Balanced System	1, 4, and 6
Safety and Security	7
Infrastructure Preservation and Maintenance	2
Congestion and Reliability*	1, 2, 3, and 6

**This goal has been added to the previous 2035 goals.*

2.2.2 Measures and Amenities

Along with the community goals, transportation measures and amenities are quantifiable items that can be measured to understand the existing condition of bike, pedestrian, and transit facilities. Additionally, understanding these measures and amenities can help to plan for future enhancements based on the adopted standards of the community. Measures and amenities can be broadly put into the following categories.[1]

- Accessibility
- Compliance
- Demand
- Reliability
- Mobility
- Infrastructure

Within these broader categories are several more specific measurements and amenities that are indicators of the level of comfort of bicyclists, pedestrians, and transit users within the current transportation system. The matrix shown in **Figure 2-7** illustrates the transportation measures and the degree in which it has an impact on the community goals. This measurement is used in the GSATS 2040 MTP Update for identification of opportunities to make improvements to corridors and intersections for users of all modes of transportation, where and as needed.

2.2.3 Recommendations

The following charts describe several facility types and the recommendations for analysis and implementation based upon the goals and standards created and adopted by each community.

[1] FHWA, Guidebook for Developing Pedestrian and Bicycle Performance Measures.
https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/performance_measures_guidebook/

Additional recommendations for facility types within specific community context will be added after the initial public information meetings in November 2016. Public engagement will inform the user types for the bike, pedestrian and transit facilities. Understanding the user groups and the goals of the communities will improve the quality of recommendations for LOS along with the specific types of facility improvements to benefit the communities within the GSATS area. The APPLICATION section of the table will also be completed along with the recommendations after the public engagement. The application of each facility type will be better informed after understanding the users and the goals of the communities.

Figure 2-7: Transportation Measures

MEASURES AND AMENITIES	COMMUNITY GOALS						
	Connectivity	Economic Development	Environment	Equity	Health	Livability	Safety
PEDESTRIAN							
Sidewalk condition							
Sidewalk width							
Buffer type and width							
Bike lane width							
Lighting							
Intersection crossing width							
Median refuge at crossings							
ADA accessibility							
Intersection traffic controls							
Intersection delay							
BICYCLE							
Existing on-street parking							
Posted speed limit							
Average Daily Traffic (ADT)							
Facility type							
Lane widths							
Presence of buffer							
Intersection traffic controls							
Intersection crossing width							
Pavement condition							
TRANSIT							
Headways							
On-time reliability							
Travel times							
Transit stop amenities							
ADA accessibility							
Bike carrying equipment							
Connectivity to pedestrian/bike network							

Bicycle Facility Types

Facility		Description	Application
Shared Use Path		A shared-use path is defined as a trail permitting more than one type of user. Paths serve as part of a transportation circulation system and support multiple recreation opportunities, such as walking, bicycling, and inline skating. A shared-use path is physically separated from motor vehicular traffic with an open space or barrier.	
Side Path		A side path is a two-way path, fully separated from a roadway, open to bicycles, pedestrians, and most other non-motorized uses. This type of path often provides a shortcut around a circuitous, high-stress, or prohibited on-road route. Side paths are typically 10'-12' minimum in width.	
Raised Cycle Track		Raised cycle tracks are bicycle facilities that are vertically separated from motor vehicle traffic. Some may be paired with a furnishing zone between the cycle track and motor vehicle travel lane and/or pedestrian area. Benefits include that motorists are kept from easily entering and it is more attractive to a wider range of bicyclists at all abilities and ages.	

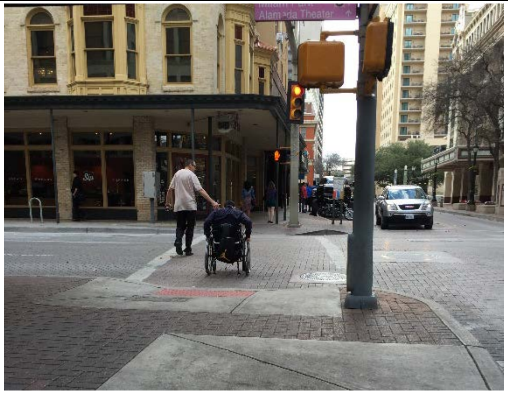
Facility		Description	Application
Bike Lane		Bike lanes designate an exclusive space for bicyclists through the use of pavement markings, striping, and signage. The bike lane is located adjacent to motor vehicle travel lanes and flows in the same direction as motor vehicle traffic. Bike lanes are typically on the right side of the street. Benefits include providing obvious space on the road for cyclists and sending a message to other road users to expect cyclists.	
Buffered Bike Lane		A buffered bicycle lane is a bike lane with additional striping or hatching (buffer) adjacent to it. The buffer may separate the bicycle lane from motor vehicle travel, parking, or both. The buffer width is typically 2’-3’.	
Shared Lane Marking		A shared lane uses street markings to indicate a shared lane for bicyclists and motorists. These markings reinforce to motorists that bicycles belong in the lane. The pavement markings also indicate to bicyclists where to physically position themselves in the lane.	

Facility		Description	Application
Contraflow Bike Lane		Contraflow bike lanes are bicycle lanes designed to allow bicyclists to ride in the opposite direction of motor vehicle traffic. They convert a one-way traffic street into a two-way street: one direction for motor vehicles and bikes, and the other for bikes only. One advantage is that they can provide more direct connections for cyclists.	
Left Side Bike Lane		Left-side bike lanes are conventional bike lanes placed on the left side of one-way streets or two-way median divided streets. They are usually implemented where the majority of bicycle traffic is going straight or accessing streets or other connections more easily from the left side. Benefits include avoidance of potential right-side bike lane conflicts on streets, such as parking or buses.	
Shared Street		A shared street is one where there is no curbed delineation between the roadway and the sidewalk and all users share the space. Vehicle volumes are either low or discouraged. The concept is also known as a "woonerf" (a Dutch term loosely translated to "living street"). Travel zones can be delineated by pavers, bollards (sometimes removable), and/or plantings. Motorists are welcomed as 'guests' in a nonmotorized dominated space.	

Facility		Description	Application
Separated Bike Lane		Separated bike lanes are at street level and can be one- or two-way. A separated bike lane may use a parking lane or other barrier between the bike lane and the motor vehicle travel lane. Benefits include a reduced risk of "dooring," preventing double-parking, reducing risks from motorists entering/exiting parking spaces, and a higher degree of comfort for bicyclists of all abilities and ages.	

Pedestrian Facility Types

Facility		Description	Application
Sidewalk		Sidewalks are typically concrete or asphalt pathways adjacent to roadways for pedestrian travel. Surfaces of sidewalks should be smooth and unobstructed by street furniture or utilities. A 4' unobstructed width is the minimum for a sidewalk while 6' of width is preferred and 8'+ should be used for high-volume areas.	

ADA Compliant Crossing		High visibility striping should be used at crossing areas. A 4’ minimum width should be used for ADA-accessible curb ramps. A push button with audible status should be present at the crossing. A pedestrian countdown signal should be present.	
Curb Extension		A curb extension is an extension of the sidewalk at intersections to reduce pedestrian crossing distances and provide greater visibility to pedestrians attempting to cross a street.	
Leading Pedestrian Interval		Leading pedestrian intervals allow the crosswalk/pedestrian movement to begin 3-6 seconds before a green light is given to motorists.	

Rapid Flashing Beacon		Rapid flashing beacons are used to increase visibility of pedestrians as they cross the roadway at uncontrolled crosswalks. This beacon is pedestrian-activated (i.e., the signal will only flash if a pedestrian has pushed a button, indicating that they need to cross the street).	
High-intensity Activated crossWalK (HAWK) Signal		A High-intensity Activated crossWalK (HAWK) signal is a full traffic signal activated on demand by bicyclists or pedestrians in order to stop motor vehicle traffic. Red signals flash alternately to provide increased visibility to motorists. Yellow signal blinks when the signal is not activated.	
Median Refuge		A median refuge or island provides in-street refuge along the route of a pedestrian crossing. The refuge width is ideally 7'+ to fit bicycles. The approach to vehicle travel lanes must be ADA-compliant.	

Raised Crosswalk		A raised crosswalk is an area of pavement where two streets intersect, raised from street level to sidewalk level. This type of crossing is meant to calm traffic and increase pedestrian priority and visibility.	
Pedestrian Street		A pedestrian street is a street closed to vehicular traffic, used primarily by pedestrians. It is also known as a "Festival Street". Other nonmotorized modes are often allowed, such as bicycles. This type of facility can be designated as pedestrian only year-round or during specific seasons.	

3. ROAD FUNCTIONAL CLASSIFICATION

At its inception, roadway functional classification was developed by the federal government as a framework for identifying the particular role of a roadway. This early framework has expanded to include expectations regarding roadway design, speeds, capacity, and relationship to land use and access management, as well as federal funding implications. Functional classification is now used for many transportation planning purposes within states, MPOs, and local governments.

3.1 FEDERAL USE

Functional classification arose out of the need for the federal government to determine national needs and distribute Highway Trust Fund monies in an equitable manner. The Federal Aid Act of 1921 began the process of determining the functional classification of roadways across the nation. This process was completed in cooperation with state DOTs and local governments in an effort to obtain uniformity. The later Federal Aid Highway Act of 1973 required the realignment of federal aid roads to the standardized classification system and continues in current practice.

Today, functional classification provides important inputs into the Highway Performance Monitoring System (HPMS) program and the apportionment of federal funds, such as for the National Highway System (NHS) and Surface Transportation Program (STP).

3.1.1 Definitions of Functional Classification

The functional classification system is first organized into three main categories of roadways. These categories along with the types of services they provide are shown in **Table 3-1**.

Table 3-1: Roadway Functional Classification Purposes

Functional System	Services Provided
Arterial	Provides the highest level of service at the greatest speed for the longest uninterrupted distance, with some degree of access control.
Collector	Provides a less highly developed level of service at a lower speed for shorter distances by collecting traffic from local roads and connecting them with arterials.
Local	Consists of all roads not defined as arterials or collectors; primarily provides access to land with little or no through movement.

Source: FHWA

Due to the varying service provided by each type, a typical trip will use a combination of two or all three of the categories.

Further distinctions are also made among these three categories. All functional classification categories further classify as either "major" or "minor" as shown in **Table 3-2**. For the purpose of transportation planning and funding, roadways are also classified based on area type as being located in either "urban" or "rural" areas.

Table 3-2: Roadway Functional Classification Details

Functional Categories	Subcategories
Principal Arterial	Interstate Other Freeways and Expressways Other
Minor Arterial	
Collector	Major Collector Minor Collector
Local	

Source: FHWA

3.1.2 Criteria Used to Determine Classification

The FHWA *Highway Functional Classification: Concepts, Criteria and Procedures*[2] manual provides procedures for assigning functional classification to a single roadway or network. One of the primary objectives of the functional classification system is to organize and connect traffic generators with a roadway network that efficiently channels trips to and from the generators. With that end in mind, the procedure to determine classification centers around serving traffic generators and is as follows:

1. **Identify traffic generators.** In rural areas, traffic generators may be population centers (cities and towns); recreational areas such as lakes, national and state parks; military facilities; consolidated schools; and shipping points. In urban areas, traffic generators may be business districts; air, rail, bus and truck terminals; regional shopping centers; colleges and universities; hospital complexes; military bases; industrial and commercial centers; stadiums; fairgrounds; tourist destinations and parks. Regional traffic generators adjacent, but outside of the area of interest, should also be identified.

2. **Rank traffic generators.** Traffic generators should be categorized based on their relative ability to generate trips and be first stratified into urban and rural groupings. Traffic generators thought to be significant enough to be served by a Major Collector or higher should be categorized into five to eight groups (it is better to have too many groups than to have too few, especially toward the lower end of the scale). Traffic generators with similar significance should be placed in the same group. These groups will be used to identify the functional classification of connecting roadways. Population, sales tax receipts, retail trade, visitation and employment are some

[2] FHWA: Highway Functional Classification Concepts, Criteria and Procedures, 2013 Edition. https://www.fhwa.dot.gov/planning/processes/statewide/related/highway_functional_classifications/section00.cfm

examples of factors to consider when ranking traffic generations according to their significance.

3. **Map traffic generators.** Traffic generators should be mapped using graduated symbols of varying sizes and/or colors according to the group to which the generator belongs. This will produce a visual representation of the ranking. For example, the group of generators ranked highest should all be symbolized with the largest symbol.

4. **Determine the appropriate functional classification to connect traffic generators.** To determine the functional classification of roadways, work from the highest mobility facilities first by identifying Interstates, Other Freeways & Expressways, Other Principal Arterials, then Minor Arterials and Collectors (Major, then Minor). Then, by definition, Local Roads will be all of the roadways that were not classified as Arterials or Collectors. In other words, begin with a wide, regional perspective to identify Principal Arterials, then gradually move to smaller, more localized perspectives as Minor Arterials, Major Collectors and Minor Collectors are identified. In this process, consider the size of the traffic generators connected and the predominant travel distances and "travel shed" served.

State DOTs are responsible for maintaining and updating the functional classifications of their roadways. FHWA recommends a continuous process of updating classification as changes occur in the roadway system and adjacent land uses. A review of the functional classification system every ten years coincidental with the census and urban area update cycle is also recommended.

3.1.3 Implications to GSATS 2040 MTP Update

A key task of this GSATS 2040 MTP Update is to identify any discrepancies with the SCDOT, NCDOT and locally published roadway classifications and reconcile them to achieve consistency. This task has broad implications to the MTP Update as functional classification provides two link attribute values to the GSATS Travel Demand Model (TDM) used to analyze existing and future conditions. These link attribute values are free flow speed and 24-hour capacity, both of which can greatly affect model results. **Table 3-3** provides the discrepancies identified during this MTP Update and proposed changes to achieve consistency.

Table 3-3: Identified Differences in Published Functional Classification

Road Name	From	To	GSATS Functional Class	SCDOT Functional Class
State Hwy 319 E	Harris Short Cut Lane	US 701	Undivided Collector	Undivided Major Collector
Road Name	**From**	**To**	**GSATS Functional Class**	**NCDOT Functional Class**
Beach Dr	SC/NC State Line	Shoreline Dr W	Undivided Collector	Undivided Major Collector
Beach Dr	Seaside Rd SW	White Oak Dr SW	Undivided Collector	Undivided Major Collector
Beach Dr	Duck Pond Rd SW	Bricklanding Rd SW	Undivided Collector	Undivided Major Collector
Brick Landing Rd	Beach Dr SW	Village Point Rd SW	Undivided Collector	Undivided Major Collector
Causeway Dr	Beach Dr SW	W 2nd St	Undivided Collector	Undivided Major Collector
Hickman Rd	Smith Ave	NC 130	Divided Minor Arterial	Undivided Major Collector
Holden Beach Rd SW	Seashore Rd SW	Access Rd SW	Undivided Collector/Local	Undivided Major Collector
Holden Beach Rd	Main St	Mt Pisgah Rd SW	Major Collector	Undivided Major Collector
Kirby Rd SW	Holden Beach Rd SW	Seashore Rd SW	Undivided Collector/Local	Undivided Major Collector
Longwood Rd	Pireway Rd NW	Ocean Hwy W (US 17)	Undivided Collector	Undivided Major Collector
Ocean Isle Beach	Old Ocean Hwy W	Beach Dr SW	Undivided Collector/Local	Undivided Major Collector
Old Georgetown Rd	Seaside Rd SW	Ocean Isle Beach Rd SW	Undivided Collector/Local	Undivided Major Collector
Seashore Rd SW	Kirby Rd SW	Holden Beach Rd SW	Undivided Collector/Local	Undivided Major Collector
Seaside Rd	Ocean Hwy W	Sunset Blvd N	Major Collector	Undivided Major Collector
Seaside Rd	Sunset Blvd N	Lula St SW	Undivided Collector/Local	Undivided Major Collector
Shoreline Dr	Beach Dr SW	Sunset Blvd N	Undivided Collector	Undivided Major Collector
Sunset Blvd	Shoreline Dr W	Seaside Rd SW	Undivided Collector	Undivided Major Collector
US 17 Business	Ocean Hwy W	Smith Ave	Divided Minor Arterial	Undivided Major Collector
Village Point Rd	Village Point Rd SW	Main St	Undivided Collector	Undivided Major Collector
Whiteville Rd	US 17 On Ramp	Main St	Major Collector	Undivided Major Collector
Whiteville Rd	Main St	Village Rd	Undivided Collector	Undivided Major Collector

Sources: SCDOT and NCDOT

3.2 SCDOT/NCDOT Functional Classification Maps

3.2.1 Definitions Used

The SCDOT and NCDOT utilize the federal roadway classification system and publish maps showing the following classes by county and cities:

- Freeways/Expressways
- Principal Arterials
- Minor Arterials
- Collector
- Local Roads

Figure 3-1 shows these roadway classifications across the GSATS region.

3.2.2 Update Procedures

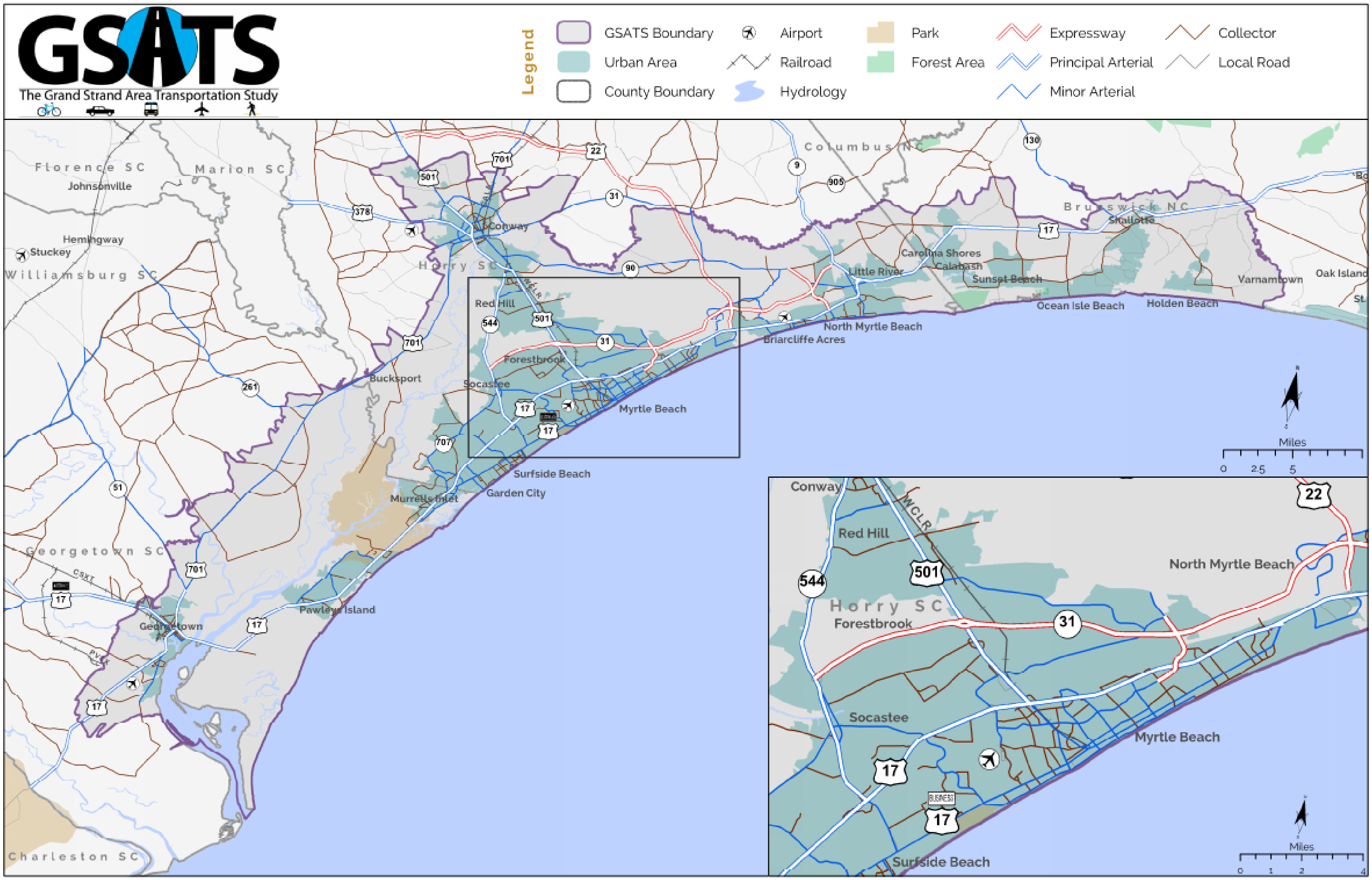
The MPO MTP update process is an ideal time to update and address any identified discrepancies in the functional classification of GSATS study area roadways. If there is no existing local procedure in place, guidance provided by FHWA may prove useful.

This guidance is found in the FHWA's document *The Highway Functional Classification: Concepts, Criteria and Procedures, 2013 Edition*, as it describes the procedures and processes for assigning functional classifications to roadways and adjusting urban area boundaries.

The *FHWA Highway Functional Classification Concepts, Criteria and Procedures* recommends the following procedure for revising the functional classification of a roadway:

> *"MPOs are the primary local contact for the DOTs in Urbanized Areas. MPOs may initiate requests for revising the functional classification of a roadway within their planning area, either on their own initiative or on behalf of member jurisdictions. For requests originating from a member jurisdiction, the MPO may conduct an initial review to ensure compliance with functional classification criteria. Typically, MPOs will forward requests along with their recommendation for approval or disapproval to the State DOT unit responsible for maintaining the functional classification information. In some cases, local governments work directly with the State DOT, with concurrence from the MPO."*

Figure 3-1: Functional Classification of GSATS Roads



Sources: GSATS, SCDOT and NCDOT

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