Analysis Summary – Existing roadway characteristics / LTS for SCDOT Regional Bike/Ped Plans
CMCOG - LSCOG

Takeaways:

- Most roadways (60-70% of total roadway miles) are considered to be category LTS 1-2 for both COG jurisdictions, however, these roadway segments represent short, local, two-lane roadways that do not connect regionally.
  - These roadways may be most important for local government improvements to enhance walkability or bikeability within communities.
- LTS 3 category roads are primarily regional connector roads, offering most direct walking or biking opportunities _between_ communities.
  - These roadways may be the most important corridors for SCDOT mobility accommodations at a regional level.
- LTS 4 category roadways are clustered around larger cities in our study areas (Columbia, Aiken, Orangeburg), and probably influenced by higher daily traffic volumes and more than three lanes of travel.
  - These roadways may be candidates for Complete Streets redesign / retrofit opportunities to better balance mobility within a jurisdiction.

Context / Summary:

Methodology for data management and preparation for Bicycle LTS analysis, Task 3a.

Level of Traffic Stress (LTS) evaluates the general level of comfort for bicyclists with different skill levels (from beginners to advanced) along a given roadway segment, corridor, or entire network. This data-informed tool for multimodal planners utilizes existing roadway characteristics data (Geographic Information Systems GIS), notably posted speed limit, number of lanes, shoulder widths, and the number of vehicles (average daily traffic). The combination of these data along a roadway segment will inform the LTS criteria classifies into one of the follow levels of traffic stress:

- **LTS 1** represents roadways where bicyclists of all ages and abilities would feel comfortable riding. These roadways are generally characterized by low volumes, low speeds, no more than two travel lanes, and traffic control measures at intersections. These roadways may have bicycle facilities; separated shared use paths for bicycles also fall into this category.

- **LTS 2** represents slightly less comfortable roadways where adults would feel comfortable riding, but generally not comfortable for children or beginners.

- **LTS 3** represents moderately uncomfortable roadways where most novice or experienced bicyclists would feel comfortable.

- **LTS 4** represents high-stress roadways where only advanced bicyclists would feel comfortable riding. These roadways are generally characterized by high volumes, high speeds, several travel lanes, and complex transitions approaching and crossing intersections.

- **LTS 5** represents interstate highways or access control roadways where biking is <u>prohibited</u>.

Our initial data needs request memo was assembled in December 2023. Assembly of data resources occurred over the months of January – May 2024, and provided within several deliverables. Each round involved an initial screening and assessment of data received followed by discussion of the benefits or potential limitations during our monthly client logistics calls.

- **LRS Highways**: containing AADT, lanes, and shoulder information
  - contains 19,971 roadway segments, totaling 9,893 miles (both COGs)
- **Speed Limit Highways**: containing the regulatory speed limit information
  - contains 1,753 roadway segments, totaling 2,563 miles (both COGs) – 26% of total centerline miles contain a speed limit value
- **Other Roads**: containing local roadways, both paved and unpaved county roads
  - contains 48,132 roadway segments, totaling 7,546 miles (both COGs); this dataset <u>*does not*</u> include attributes for AADT, lanes, shoulder information, or speed limits

Identification of appropriate fields

This LTS analysis requires a combination of attributes that relate with posted speed limits, average annual daily traffic (AADT), number of travel lanes, shoulder type and width, and urban/rural location.

Several GIS datasets exist within the State of South Carolina that contain <u>*some*</u> of these necessary data fields, however, there is not a single linear referencing system (LRS)

dataset that contain all these fields. Geospatial processing to merge, union, or spatial join attributes is therefore required to assemble a single dataset with all necessary fields. For future considerations, these attributes should be added to the LRS Highways dataset (SCDOT).

LTS Analysis:

Utilizing ArcGIS software, the project team performed the following geospatial steps to assemble one roadway dataset that contains all appropriate fields:

- **Planarize Lines** tool: split all features where they intersect, and remove any overlapping line segments (removing duplicate line segment length).
- **Join – Spatial Join**: appending two datasets and their attributes into one, new feature class
- **Manual Review**: of Posted Speed limits = <NULL> values, and copy-paste from adjacent segments along the same roadway. Dual segments (one-way pair roadways) were reviewed to assign the same posted speed to both segments.
    - Review 'Interstates' separately for one-way pair roadways
    - Review 'US Highways' separately for one-way pair roadways
    - Review 'SC Highways' separately for one-way pair roadways
    - Upon completion, a total of 3,407 miles of roadways contain a posted speed limit value (not null), an increase of 844 miles (+33%) from the original dataset
- **Dissolve** tool: aggregates features based on identical attributes, to re-merge segments after the initial Planarize tool disaggregated features
- **Select by Location:** for line segments that have their centroid within the boundary of a municipality (Town or City), and code these as "Urban" road segments. Switch selection, and code the other segments as "Rural" road segments. The urban/rural attribution was assigned based on the geographic location of municipal boundaries, and does not reflect actual roadway or land use conditions. Discussions with COG partners suggest that driveway density (distance between driveways) is one of their preferred methods for determining a roadway is to be considered 'urban' or 'rural.' This method was not possible for a regional, data-driven project like ours.

Assumptions must be made to account for the 74% of roadway miles that do not have a posted speed limit value. Our team chose to assign these values according to urban / rural locations:

- Urban areas with <Null> speed limit: assumed to be 34 mph, to be distinctive from all '35' values
    - Total of 1,410 miles (14% of total miles)
- Rural areas with <Null> speed limit: assumed to be 44 mph, to be distinctive from all '45' values
    - Total of 5,562 miles (56% of total miles)

Discussion with COG partners suggested that rural roadway segments could be considered for 55 mph posted speed limit as a default. The project team acknowledges that this is likely more accurate, however, the LTS speed thresholds are between 30-40 mph, and the potential attribute change from 45 to 55 will not change the LTS assessment for rural roadways.

Shoulder width attributes were observed to be an unreliable attribute (inaccurate, misleading, or very short segments of roadway that otherwise contained consistent attributes for lanes, speed, and volume).

This LTS analysis applied the following category thresholds:

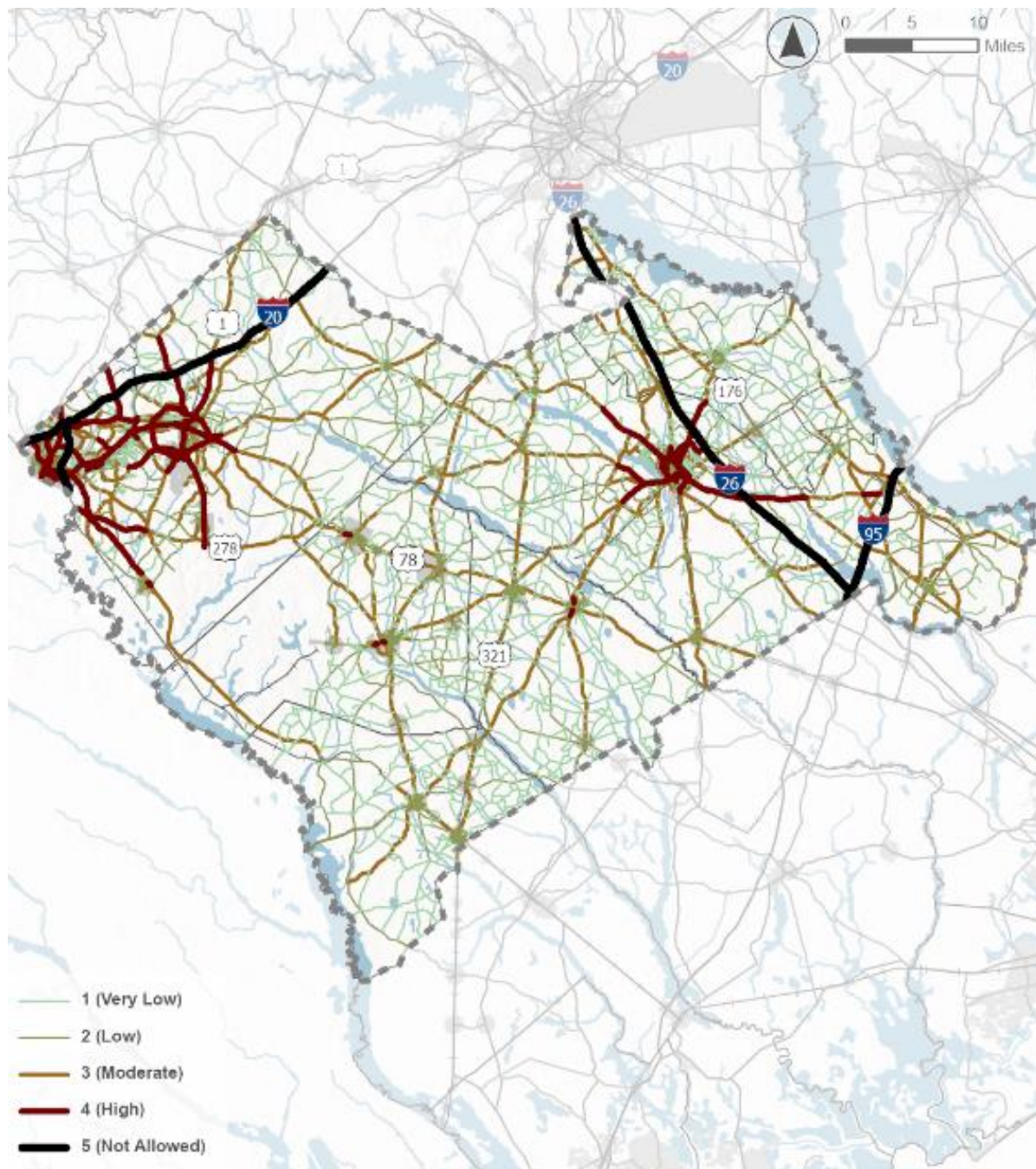|		LTS CATEGORY	
Posted Speed	Volume (AADT)	1-2 Lanes	3+ Lanes
<= 30 mph	<= 500	LTS 1	LTS 1
35 - 40 mph	500 – 1,000	LTS 2	LTS 2
>= 45 mph	1,000 – 4,500	LTS 3	LTS 4
>= 45 mph	> 4,500	LTS 4	LTS 4

Maps:

LTS maps were prepared and shared with the Project Steering Committee at PTS#1 (August 2024), and PSC#2 (December 2024) meetings.
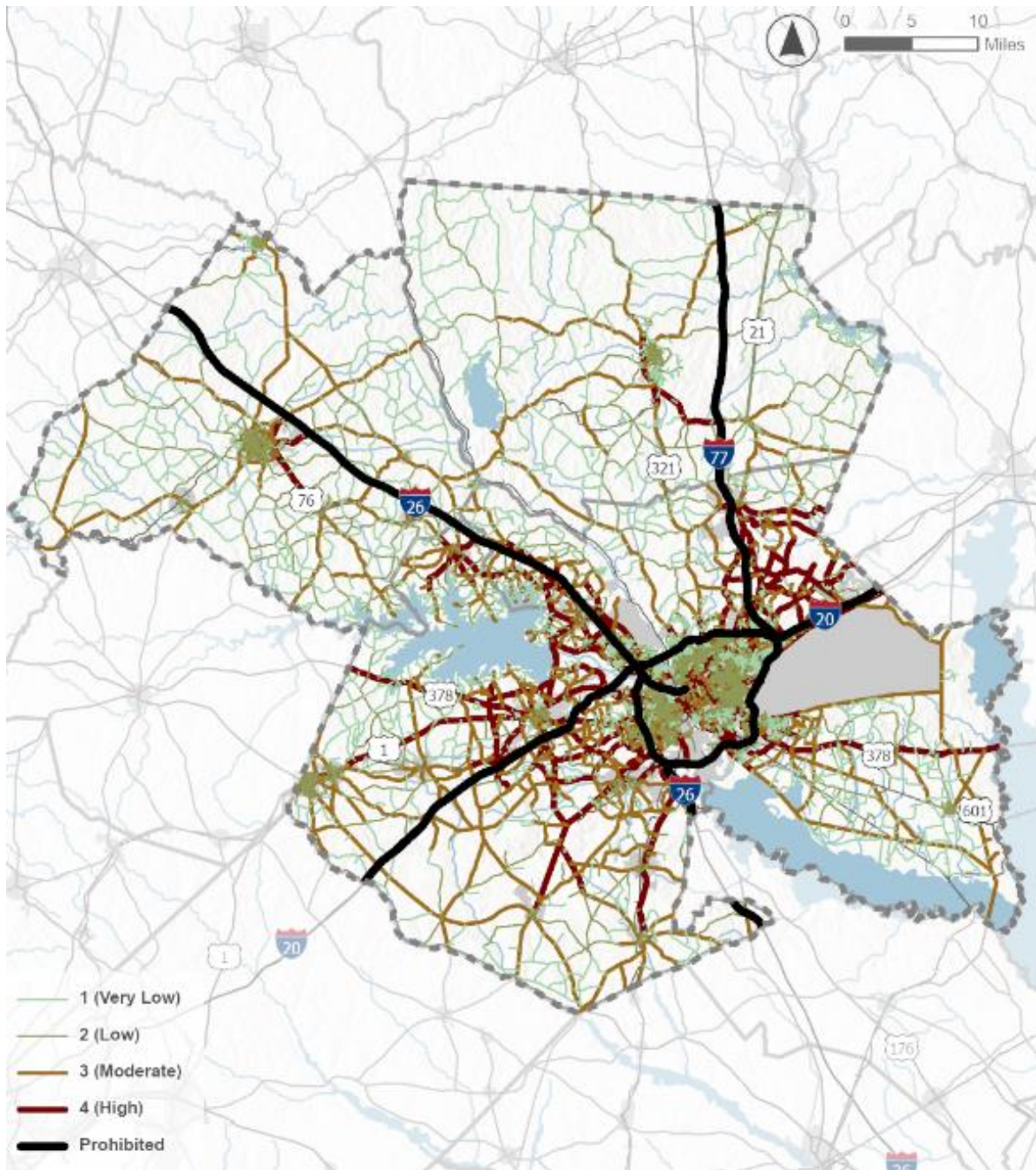
CMCOG – Bicycle LTS Map

LSCOG – Bicycle LTS Map

Table Summary:

The review and refinement of data attributes yielded a great total number of roadway miles for each COG by conflating attributes from dualized segments (one-way; access control facilities) that were previously lacking sufficient data for LTS (i.e., <null> values).

A summary of the assembled roadway attributes is provided below.

		CMCOG		LSCOG	
LTS		Miles	% Total	Miles	% Total
1	Very Low Stress - All Users	1,601	33%	2,348	43%
2	Low Stress - Many Users	1,318	27%	1,627	30%
3	Moderate Stress - Novice Users	1,088	22%	1,053	19%
4	High Stress - Advanced Only	581	12%	245	4%
5	Prohibited	328	7%	215	4%
	Subtotal of Miles for LTS Analysis	**4,917**		**5,489**	