INCORPORATING BICYCLE LEVEL OF TRAFFIC STRESS INTO PERFORMANCE BASED PLANNING FOR SMALL MPOs

FHWA Measuring Multimodal Connectivity Pilot Grant Program
New Hampshire Regional Planning Commissions & Plymouth State University

EXECUTIVE SUMMARY

Transportation planners with smaller MPOs and rural regional planning agencies often lack the rich datasets used by their larger urban counterparts to assess quality and connectivity of bicycle facilities. The vision of this pilot project has been to improve bicycle network planning for New Hampshire's Metropolitan Planning Organizations (MPOs) and rural regional planning commissions through further development and refinement of a shared model for evaluating Bicycle Level of Traffic Stress (BLTS) and application of that model for both regional and municipal bicycle planning. Beyond consistent multi-region data collection and model refinement, a key project objective has been incorporating BLTS analysis into performance-based planning as part of project identification and prioritization and tracking progress toward a more extensive network of low stress bicycle facilities.

1. Regional Data Collection & New Hampshire BLTS Model Refinement

Bicycle Level of Traffic Stress is a measure of the suitability of a given stretch of roadway for bicycling, recognizing that people have differing levels of tolerance for riding a bicycle in proximity to automobile traffic. The original BLTS model, developed at the Mineta Transportation Center in 2012 by Mekuria et al., provides a straightforward measure of traffic stress that was less data intensive and easier to understand than previous measures of bicycle network quality. Inputs include the number of traffic lanes in each direction, posted and prevailing speed, type and width of bicycle infrastructure, presence and width of on-street parking, frequency of bike lane blockage, presence and characteristics of turning lanes, and presence and characteristics of unsignalized crossings. While less data intensive than measures such as Bicycle Level of Service (BLOS), some of the inputs to the Mekuria model are not available in statewide GIS road layers or municipal databases for smaller cities and towns. Examples include on-street parking, bicycle lane presence and blockage frequency, and intersection characteristics. Beginning in 2016 faculty and graduate students at Plymouth State University (PSU) have worked to develop a more streamlined version of the Mekuria model using the more limited dataset of road attributes available in many rural and small urban areas.

Developing input data was the most time intensive element of the project; and began with review of data available in the NHDOT road layer followed by collection of data on road attributes missing from the statewide road layer. Data collection was conducted largely with Google Street view together with field spot checks and integration of local and regional datasets. The PSU

model was then run to establish a baseline set of BLTS ratings for all public roads in the study area covering five planning regions and 92 communities.
These baseline BLTS ratings were brought out for public feedback through a series of public forums and an interactive online map. Public feedback was then considered in making refinements to input data and in some cases model code.

2. Performance Measures & Network Analysis

A series of network analyses were completed assessing the potential for bicycle travel via low stress route between residential areas and different destination types including educational institutions, employment centers, community facilities and a combined category aggregating all three initial destination groups. Selection of analyses to include was shaped by the *FHWA Guidebook for Measuring Multimodal Network Connectivity* as well as a series of interviews with public agencies around the country including state DOTs, regional commissions and MPOs, and municipalities. Of the five core components of multimodal network connectivity described in the *FHWA Guidebook*, analyses focused on Access to Destinations (what key destinations can be reached via a low stress network), and Network Quality (how does the network support users of varying levels of experience and comfort with bicycling). Analyses were completed for each planning region and two sample municipalities per region.

Measures for each geography included: 1) the percentage of trips completable by low-stress route; 2) origin scores identifying the percentage of destinations accessible from a given origin point; 3) destination scores identifying the percentage of origin points that can access the given destination by low-stress route; and 4) segment centrality identifying the number of possible origin-destination routes that traverse a given road segment. Data from regional Title VI Civil Rights plans and the Social Vulnerability Index were also overlaid on origin score maps to assist in Environmental Justice analysis.

3. Findings & Next Steps

The Bicycle Level of Traffic Stress (BLTS) tool, as adapted for New Hampshire by Plymouth State University (PSU) and applied to five planning regions as part of this pilot project, offers a highly useful quantitative approach for regional planning agencies to characterize the quality of bicycle accommodation on the region's road networks and identify connectivity gaps to be prioritized for improvement. Key findings for future model improvement and application for performance based planning include the following.

<u>Model Refinements</u> – The public input process identified several opportunities for model refinement. While not universal, several reviewers pointed out a tendency to under-rate stress on: 1) corridors with frequent intersections and consequent turning movements; 2) corridors with wide shoulders but with high traffic volumes and speeds, and 3) road segments with blind corners, steep grades or lighting issues. These were accounted for through manual adjustments

for specific corridors as part of this project but will need to be addressed more systematically as part of future model updates.

<u>Data Challenges</u> – The MPOs currently envision updating BLTS analysis on a four to five year cycle, corresponding to updates in Metropolitan Transportation Plans. Several changes to current practice in road and traffic data collection will greatly facilitate future updates and ensure BLTS analysis remains a useful tool for New Hampshire regional planning agencies on an ongoing basis. The first of these changes is incorporating shoulder width, parking and bicycle lane data as part of routine statewide road inventory work. Using Google Street View to estimate this information was viable but very time-consuming making routine update a challenge. These are critical data for bicycle and pedestrian planning and should be collected by default. A second improvement with uses far beyond bicycle network planning would be a joint multi-region or statewide purchase of cell phone-based data on prevailing speed and AADT. These data are already available for state highways as part of the National Performance Road Management Data Set (NPRMDS), but not available for local roads. While costly, access to reliable data on prevailing speed for all roads would improve the reliability of LTS model output as well as general regional road network modeling. A third need will be access to ESRI Network Analyst for all RPC regions, several of which do not currently have access to that ArcGIS extension.

<u>Performance Measures for Disparate Communities</u> – The connectivity measures assessed were seen by regional planning staff as having the greatest value at the municipal level. Performance measures tracking say the percentage of employment trips of <2 miles achievable via low stress bicycle route are somewhat more challenging when applied to large multi-jurisdictional regions with wide variations in population density and municipal commitment to bicycle network development. A challenge with regional application identified here is the difficulty of achieving meaningful movement of the needle for such a measure on the 20-year time horizon of a regional MTP given funding constraints. Significant investment by a relatively dense urban community that greatly improved connectivity locally would have limited impact in moving the needle on a regional measure that is also influenced by many rural communities with less well-connected networks, fewer resources and/or priority placed on trails or other recreational routes vs. connectivity for utilitarian trips. The fallback regional performance measure likely to be used by the participating MPOs is progress in programming and constructing a list of top 20 regional network connectivity projects identified through LTS analysis.

<u>Project Prioritization for Disparate Regions</u> – While a key project objective was to develop a consistent multi-region approach to incorporating LTS data in project prioritization, this similarly proved to be a greater challenge than initially envisioned, particularly identifying a consistent approach acceptable to all the participating planning agencies. Ultimately each agency developed tailored approaches to incorporating LTS data into project prioritization. These reflect differences among planning regions including overall development densities, differences between regions with a single primary urban center vs. multiple centers, and varying priorities placed on regional inter-town recreational and commuting routes vs. in-town connections.

Completing Rural Analysis - A key next step toward statewide use of BLTS in New Hampshire will be completion of BLTS data collection and analysis for the state's other four rural planning regions. The PSU model was used by Alta Planning & Design to characterize state highways and other state maintained roads in the other four rural planning commission regions as part of an update to the State Pedestrian and Bicycle Plan. However any effort to incorporate BLTS as a criterion for statewide project prioritization, whether for the Transportation Alternatives Program (TAP), Congestion Mitigation/Air Quality (CMAQ) program or flexible Surface Transportation Block Grant (STBG) funding, will require an expansion of the BLTS analysis for the rural RPCs to include municipal roads so there is comprehensive coverage for all roads in the state

The data collection, analysis and review processes and visualizations presented here provide new opportunities to improve regional and local bicycle network planning in New Hampshire. Hopefully these examples, including discussion of challenges encountered, solutions applied and planned future refinements, can help facilitate similar opportunities elsewhere in other small urban and rural areas of the country.