DELAWARE VALLEY REGIONAL PLANNING COMMISSION — dvrpc memo

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To: Matthew Lawson

From: Gregory Krykewycz, Chris Pollard

Subject: Process for Mercer County BLOS project

During FY2009, DVRPC was asked to 1) evaluate and map bicycle levels of service (or bicycle compatibility) for Mercer County roadways, and 2) to work with Mercer County staff in designing a web mapping application to make this information available to the public in an interactive way (with the opportunity for members of the public to share relevant information with one-another and with County staff). This memorandum summarizes the methods applied and decisions made during this project as a record for possible applications elsewhere within or outside the DVRPC region.

The first key decision concerned which bicycle compatibility scoring model would be used for the analysis. Options included the Bicycle Level of Service (BLOS) model developed by Bruce Landis et al for the Florida DOT, the Bicycle Compatibility Index (BCI) developed by the University of North Carolina Highway Safety Research Center for the Federal Highway Administration, and the new Multimodal Level of Service (MMLOS) model developed through NCHRP Project 3-70, which includes a somewhat different version of the Landis BLOS model. For this project, the original BLOS model was chosen for a variety of reasons, chief among them consistency with other DVRPC work and suitability for the use of GIS-derived data (rather than field measurements) for the large-scale county-wide analysis conducted. The BLOS model is a spreadsheet model that calculates a numerical BLOS score and corresponding letter grade (A-F) based on a variety of roadway design and traffic characteristics. In contrast to general roadway/intersection LOS measures, BLOS scores reflect bicyclist comfort/compatibility rather than volumes and throughput.

The second key decision concerned the scale of the project and which roadways were to be analyzed and included. The initial scope of the project anticipated including only “major” roadways (chiefly collector and arterial streets) with an eye on time/budget constraints and a general view that such roadways with significant levels of traffic are 1) important to connectivity/mobility for all modes, 2) will have the most reliable GIS data, and 3) are most challenging for bicyclists to navigate, and will consequently be of greatest interest in the eventual web application. However, once the GIS analysis was completed, DVRPC staff realized that the data available for local streets was more robust than anticipated, and so they could be included in the BLOS dataset at only minimal additional expense.

Relying chiefly on GIS data and calculations (rather than field measurements and individual road segment review by planners) sacrifices some degree of accuracy, but enables an analysis like this to be conducted at a county-wide scale.

The remaining relevant decisions in developing the BLOS dataset related to completing each of the data fields required for the BLOS spreadsheet model for all county road segments. These steps and decisions are detailed below.

PART I: GIS ANALYSIS FOR DATASET CREATION

The base dataset was NJDOT's Linear Referencing System (LRS) road network, which contains road management data for all public roadways throughout the New Jersey portion of the DVRPC region, including road segments of all functional classes in Mercer County. At the beginning of this project, a spot check using 2005 DVRPC orthophotography was conducted for three data inputs (pavement width, lane count, and shoulder width) for 12 random Mercer County road segments, and the data was found to be reliable with roughly 95% accuracy.

Once the viability of the dataset was verified, a new GIS layer was created by newly segmenting the road network wherever one of the BLOS model inputs already in the dataset (number of through lanes, speed limit, pavement width, shoulder width, and AADT) changed along a corridor.

Once this was completed and our base dataset created, staff used a variety of methods to calculate or estimate each of the remaining BLOS input fields, to the greatest practical extent. These various methods used for each input, including those already existing in the LRS dataset, are summarized below. Each of these inputs is one that the BLOS model considers significant to the comfort of on-road bicyclists.

Format:
Data input (variable in spreadsheet model): Explanation of source

Length of segment in miles (Ls): Calculated by GIS

Number of through lanes (L Th #): Existing in LRS dataset

Number of turning lanes (L Tu #): Not available – disregarded

Roadway configuration (Con): Values were left at the default "U" (undivided bidirectional) except where there was only one through lane, in which case "OW" (one-way) values were populated.

Traffic volume (ADT): Existing in LRS dataset for many road segments. Where traffic volumes did not exist in the dataset, they were populated using the average values for each roadway functional class in Mercer County. This was done by dividing daily VMT by functional class mileage using the county-level data provided by the New Jersey Bureau of Transportation Data Development, Roadway Systems Section (2007). For divided roadways (US 130, US 1, etc.), AADT data was reviewed for each segment to ensure that bidirectional volumes were not applied to each direction (which were BLOS scored separately).

Peak/daily ratio (Kd): Not available – left at the default 0.10.

Directional split (D): Not available – left at the default 0.565.

Percent of heavy vehicles in traffic mix (HV %): Populated by functional class using DVRPC average regional values for “heavy trucks” plus buses. Data was provided by DVRPC modeling staff, and is derived from traffic counts and travel surveys over time.

Posted speed limit (SPp): Existing in LRS dataset. Where data was missing, it was populated using reviews of Google Street View imagery.

Combined width of outside lane and shoulder (Wt): Derived from LRS data. For each road segment, Wt = [(pavement width / number of lanes) + shoulder width]

Width of shoulder (Wl): Existing in LRS dataset.

Width of pavement striped for on-street parking (ONLY where this striped area is to the right of a bike lane) (Wps): Not available and a unique circumstance; disregarded.

On-street parking (OSPA, OSPD, OOSP): The BLOS model typically requires a counted number of parked cars in one or both directions, combined with a road segment length and the percentage of the road segment designated for on-street parking, to calculate an occupied on-street parking percentage (which is then factored into the BLOS score calculation). Because of the large geographic scale of this analysis, staff decided to skip a step and simply estimate the portion of a segment occupied by on-street parking. We did this for every road classification higher than local streets for the entirety of Mercer County using aerial photography (Google Earth, DVRPC 2005 orthophotography). This method assumes that these aerial photos were taken on a typical day and that observed parking conditions are typical.

For consistency of data entry and to account for issues of directional configuration (to evaluate average conditions for bicycles along road segments), the following simple rules were developed for documenting on-street parking occupancy:

- For 2+ lane roadways, if there are parked cars only on one side of the road segment BUT there is equivalent space/room for parked cars on the other side, estimate the occupancy % for the combined length of both sides of the road segment.
    - Example: if 50% of the length of one side of the road segment is occupied by cars, enter 25
- For 2+ lane roadways, if there are parked cars only on one side of the road segment AND there is NO space for parked cars on the other side, estimate the occupancy % for only the side of the roadway with parked cars.
    - Example: if 50% of the length of one side of the road segment is occupied by cars, in this case enter 50
- For 1 lane roadways, if there are parked cars on one or both sides of the road segment, estimate occupancy % for the side of the roadway with the most parked cars.
    - Example: if 50% of the length of one side of the road segment is occupied by cars and the other side 35%, enter 50

While we used manual visual surveys to estimate occupied on-street parking for collector and arterial streets, it was impractical to do so for local streets. For local streets (functional classes 9 and 19), staff reviewed a random sample of 15 road segments for each area type (urban, suburban, rural, CBD), calculated an average observed on-street parking percentage for each of these categories, and populated each group of local road segments using these average values.

Pavement condition (PCt): Pavement Quality Index ratings (PQI, ranging from 1 to 5) were taken from NJDOT PMS (Pavement Management System) data, merged with the LRS network. Where values were missing (typically for local streets), a standard value of 3.5 was used as a default.