Modeling improvements in bicycle mobility

Project evaluation and prioritization for Bike/Ped Pool Projects

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Topics

• Brief intro to Level of Traffic Stress (LTS)
• Bicycle Mobility/ Network Connectivity Concepts
• Bicycle Travel Modeling
• 2020 NCC Prioritization Results
• Solving a ‘real’ problem
Level of Traffic Stress

- A metric of suitability of a roadway for cycling
- Each level relates to a **type of rider**
- Allows us to view mobility from perspective of casual cyclists and understand **barriers** to a useful, connected network

**Level of Traffic Stress**

- **LTS1**: 12-year-old child
- **LTS2**: typical person able to bike
- **LTS3**: enthusiastic and willing to tolerate some stressful roadways and intersection
- **LTS4**: aggressive and willing to bike anywhere

**INCREASING LEVEL OF COMFORT, SAFETY, AND INTEREST IN BICYCLING FOR TRANSPORTATION**

**LTS 4**
No bike lane on a busy street

**LTS 3**
Narrow bike lane or shoulder on a busy street

**LTS 2**
Buffered bike lane on a calm street

**LTS 1**
Separated bike lane
Only route across town is on roadways at intersections.
Towards a Common Operational Picture of Bicycle mobility

Problem

• Households, within bikeable distances to common destinations, are unable to reach them directly on low stress streets, pathways, or intersections.

• Bicycle mobility is suppressed because people do not feel comfortable riding to their destination.

Solution

• Create new connections to facilitate potential bike trips on the low stress bicycle network

• Provide a lower stress riding experience on existing streets (roadway improvements, traffic interventions)

• Leverage places with existing low-stress connectivity
Quantify improvement to cycling mobility

Goals and Objectives

Goal 1: Develop a Complete, Comfortable, Connected Bicycle Network

1.1 Increase the number of homes and destinations connected entirely by the low-stress bicycle network.
• **Shortest Path**
  - 2.5 miles
  - ~12 minute bike ride
• **Shortest Path**
  - 2.5 miles
  - ~12 minute bike ride
- Shortest LTS 4 Path
  - 2.5 miles
  - ~12 minutes

- Shortest LTS1 Path
  - Does not exist!
Propensity Score

For $L_{\text{LTS1}} < 3$ mi, and relative detour $> 20$

$$P = e^{-1.4 \times 10^{-3} (L_{\text{LTS1}} - L_{\text{shortest}})}$$

For $L_{\text{LTS1}} > 3$ mi, and relative detour $> 20$

$$P = e^{-1.4 \times 10^{-3} (L_{\text{LTS1}} - 1.2 \times L_{\text{shortest}})} \left( \frac{D_{\text{max}} - D_{\text{LTS1}}}{D_{\text{max}} - D_{\text{min}}} \right)$$

- **Shortest LTS 4 Path**
  - 2.5 miles
  - ~12 minutes

- **Shortest LTS2 Path**
  - 4.2 miles
  - 68% detour
  - ~21 minutes
  - $P = 0.359$

- **Shortest LTS1 Path**
  - Does not exist!
  - $P = 0$
• Shortest LTS 4 Path
  • 2.5 miles
  • $P = 1$

• Shortest LTS3 Path
  • 3.9 miles
  • 56% relative detour
  • $P = 0.496$

• Shortest LTS2 Path
  • 4.2 miles
  • 68% detour
  • $P = 0.359$

• Shortest LTS1 Path
  • Does not exist!
  • $P = 0$

$P_{\text{weighted}} = P_{\text{LTS1}} \times 1 + P_{\text{LTS2}} \times 0.75 + P_{\text{LTS3}} \times 0.5$

• Weighted Propensity score for this O-D pair
  • $P_{\text{weighted}} = 0.496$ out of 2.25 potential points

• Detour is a KILLER to bicycle/pedestrian mobility. Directness is crucial
Build Accessibility to School by LTS_Project 1
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2020 New Castle County Priority Projects, from WILMAPCO
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School Lane Trail

**Project Challenges:** Potential wetland impacts.

**Programmatic Factors:** A relatively straightforward project with a mature concept. Feasibility study conducted from Delaware Bicycle Council Innovation Grant.

**Ranking:** 4th out of 7. Modest connectivity improvements, localized around the Penn Acres, Penn Acres South, and Wilmington Manner Gardens neighborhoods. This area is separated from New Castle by LTS2 or greater intersections, so aside from the directly adjacent neighborhoods, most connectivity gain is in the LTS2 and LTS3 network.

**Recommended DelDOT Path Forward:** Initiate wetland delineation study to further explore feasibility.
Augustine Cutoff Pathway

**Project Challenges:** Grading challenges at intersection approaches. ROW needs to be verified near intersections. Potential impacts to private property situated in the ROW. Potential impacts to the typical section of Augustine Cutoff.

**Programmatic Factors:** Feasibility Study was conducted from a Delaware Bicycle Council Innovation Grant. No public workshops were held. Believed to be a contentious project concept.

**Ranking:** 1st out of 7. This project creates a significant direct connection between the North Delaware Greenway/ Blue Ball Properties Pathway Network, Alapocas, and the Forty Acres Neighborhood. Reduces the stressful elevation changes of riding the North Delaware Greenway along the Brandywine.

**Recommended DelDOT Path Forward:** Conduct public workshop to finalize concept study and initiate project development.
Why does it matter?

• A narrative, meaningful, and quantitative way to approach bicycle mobility at an institutional level
• Allows us to compare the value of bicycle related projects
• Creates a process for managing public and legislative project requests
• A great tool for assisting in local planning
Things we are not currently doing

• Comprehensively developing a 100 yr statewide bicycle masterplan
• Modeling pedestrian travel (goal for 2021-2022)
• Prioritizing projects based on bicycle access to Wawa
... a pathway to connect my neighborhood to the Wawa
... a pathway to connect my neighborhood to the Wawa

Existing LTS2 Connectivity to New Castle County Wawa locations
7 Wawas in a 3 mile radius... but no one in here can reach one??

... a pathway to connect my neighborhood to the Wawa

Claymont has BEST LTS2 connectivity to Wawa locations

- Surrounded by densely populated, relatively well-connected low-stress streets
- But it’s an island...
... a pathway to connect my neighborhood to the Wawa

\[ P_u = \text{Unrealized Potential} \]

\[ P_u = \text{Highest Possible Connectivity Score – Existing LTS2 Connectivity Score} \]

\text{Red} = \text{Lots of potential, but poorly connected}

\text{Blue} = \text{Well connected, realized potential (or low potential)}
Questions?

Path forward:

- **School Lane Trail** – initiate wetland study, begin project development
- **Augustine Cutoff** – finalize concept study and continue project development from there