Confessions of a Traffic Engineer: the Misuse of Level of Service

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Conversations with an Engineer

Our intentions are to be as sustainable a city as possible. That means socially, that means environmentally and that means economically. The bike is great on all three of those factors. You just can’t get a better transportation return on your investment than you get with promoting bicycling.

– Mayor Sam Adams
Policy Directive

- Regional Transportation Plan, Metro
  - TSMO Plan
- Climate Action Plan
- City Transportation Plan
  - Bicycle Master Plan
  - Freight Master Plan
- Transit Investment Plan, TriMet

Mode Split Targets
Portland Climate Action Plan

Urban Form and Mobility
- Create vibrant 20-minute neighborhoods (90%)
- Reduce VMT by 30% from 2008 levels
- Improve efficiency of freight movement
- Other non-transportation operations objectives

Transportation Hierarchy
Background

- Traffic Engineering is a part of the Civil Engineering Discipline
  - Structural Engineering – Bridges
  - Hydraulics – Water & Sewer Systems
  - Geotechnical – Soil & Foundations
  - Traffic – Roads & Rail

Overarching Philosophy of Civil Engineering Curriculum

- Houston, we have a problem
- Failure is not an Option
TRAFFIC LOS 101

Highway Capacity Manual defines failure as the breakdown of flow; this is the threshold where you reach failure at signalized intersections.
What is a Failure?

- Delays of 80 seconds per vehicle

Problem Statement

- Today’s methodology doesn’t consider \textit{person delay}
- Transit, pedestrian crossing, or bikes are largely forgotten in these traditional methodologies/measures.
Vehicles or People

- Standards do not accept <80 seconds of delay per vehicle
- No procedure to consider >80 seconds of delay for pedestrians

Congestion is...
Congestion is...

a) Bad, it must be mitigated
b) Inevitable and a result of poor planning by the travel model, underestimating demand
c) Something that we can build our way out of
d) A tool that can be used to make active transportation more competitive
e) D, and the opposite of a, b, & c.

Erosion of Cities
Jane Jacobs, Death and Life, Ch.18

“the more space provided cars in cities, the greater becomes the need for use of cars, and hence for still more space for them.”
Commentary on the Focus of Highway Capacity Manual

- Highway projects over the past 60 years
- Applied in suburbs where most development has occurred
- People moved to get away from congestion resulting in sprawl, etc.

A Few More Thoughts on the Highway Capacity Manual

- Pedestrians are modeled as “impediments” to traffic, impacting flow
- The pedestrian perspective delay is not considered in the sole performance measure
- Common practice of eliminating crosswalks is a result of insensitivity to importance of this mode
Evolution of the Highway Capacity Manual

- Why is it this way?
  - Roger Rabbit or anti-Streetcar conspiracy?
  - Represents suburban Experience
  - Engineers and Academics were just trying to make their own experiences better
  - If 95% of the population drives, why not

Evolution of the Highway Capacity Manual

- It's happening...
  - Multimodal Level of Service
  - Are we there yet?
  - Represents best practices in research from Florida
What Do the Dutch Do?

- Land use is tightly controlled
- Design over demand
  - Transportation networks are laid out to prioritize bicycles
  - Transit is competitive
  - Driving is not subsidized

Is it the Engineers Fault?

- Traffic Demand Models for 2030 consider unconstrained demand
  - What’s the cost of gas in 2030?
  - Do young people still want to drive?
- Localized environmental modeling tries to eliminate congestion to reduce emissions
  - Limited assessment on impact of sprawl
  - 1 – 10-mile trip is equal to 10 - 1-mile trips are
Problems with our Analysis

- Fails to consider completeness of the system
- Vehicle-centric performance measures
- Peak 15-minute period focused
- Limited tools for engineers to make “improvements”
Case Study #1: Hawthorne Bridge

- Level of Service focused analysis would not have allowed bicycle flow to be prioritized
Case Study #2: Development Review

Developer with building plans for downtown
Traffic engineering standards suggest LOS D for signalized intersections
  45 seconds of delay per vehicle would trigger “need” for mitigation

Development Review

Traffic analysis suggested that an additional lane was needed in downtown Portland to mitigate LOS deficiency
This “improvement” would have been a significant loss of building space

Link to Google Map
Central City Transportation Management Plan Policy

Promote transit to carry 75% of the passenger trips to and through the core, i.e., fast, economical, convenient, and comfortable.

Give maximum accommodation to walking in the core.

Promote use of bicycles as an alternative mode of transportation.

Maintain a circulation pattern which responds to the Downtown Plan.

Case Study #3: Exclusivity at Signals

• Cyclists weave through right turning traffic in the upstream block to use the bike lane located between the shared and exclusive right-turn lanes

Photo: J. Maus, Bikeportland.org
Intersection Lane Configuration

Previous Lane Configuration

Note: Traffic analysis model does not consider bicycle lanes explicitly
Bicycle Signal Phase Solution

This configuration would require separating the signal phases.

Analysis Results

<table>
<thead>
<tr>
<th>Period</th>
<th>Dual Right-Turn Lanes</th>
<th>With Westbound Bike Phase</th>
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</thead>
<tbody>
<tr>
<td>Weekday AM Peak Hour</td>
<td>0.69</td>
<td>0.88</td>
</tr>
<tr>
<td>Weekday PM Peak Hour</td>
<td>0.59</td>
<td>0.80</td>
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</tbody>
</table>
N Broadway & Williams
Signal Characteristics

Lane Configurations:
- 1 Streetcar/thru lane
- 1 thru lane
- 2 right-turn lanes (no turn on red)
- 1 bike lane (with bike signal)
N Broadway & Williams Improvements

12" yellow heads on bike signal
Thru green arrows

Right turn arrows

Bike signal sign

12" yellow heads on bike signal

CONSIDERING RED LIGHT RUNNING CAMERA

Use 4" signal and mount at cyclists height

Advance Loops

Visibility limited signal farside

Bike signal on recall initially
Summary

• Prioritize by mode
• Plan for what you want
• Design for safety
Thank you for your Time

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