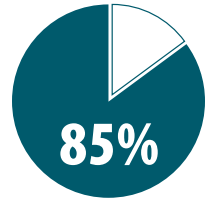




Approaches for Setting Speed Limits

Four General Approaches



Engineering Approach



Optimization Approach



Injury minimization/Safe system philosophy



**Expert System Approach
(USLIMITS2)**

How Approaches are Applied

Street by street basis

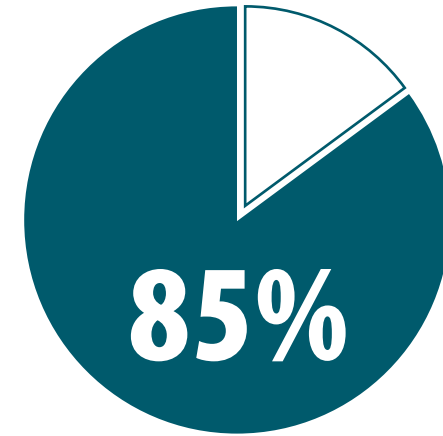
- Engineering
- Optimization
- Expert Systems

Adjust system-wide

- Injury
Minimization/Safe
System Philosophy

Engineering Approach

- A two-step process
- Speed limit is set according to the 85th percentile speed
- Adjusted based on other criterion
 - Traffic and infrastructure conditions such as pedestrian use, median presence, etc.
- Relies on engineering judgment



The **85th percentile speed** is defined as, “the **speed** at or below which **85** percent of all vehicles are observed to travel under free-flowing conditions past a monitored point.” Another way to consider this is the **speed** at which only 15% of traffic violate on average.

Optimization Approach

- Set Optimal Speed Limit to Minimize Societal Costs
- To determine optimal speed limit examines:
 - Travel Time
 - Vehicle Operating Costs
 - Crash History
 - Emissions and Fuel Consumption
- No specific approach, model must be developed each time
- Time and data intensive



Expert Systems

- Computer Based Evaluation
- Uses USLIMITS2 to simulate judgment of speed limit experts
- Created by Federal Highway Administration (FHWA) through the National Cooperative Highway Research Program (NCHRP)
- Contains accumulated knowledge and experience and set of rules for applying knowledge
- Can be a bit of a “black box” feel



Injury Minimization/Safe System Philosophy

- Maximize Road Safety
- Examines:
 - Road Types
 - Crash History
 - Injury Rates
 - Emphasis on non-motorized users
- Based on link between travel speeds and serious crashes/injuries
- Can result in speed limits lower than those traditionally used
- May be more applicable to urban rather than rural



Use in Minnesota

Statutory Speed Limits

OR

Regulatory Speed Limits



Engineering Approach

- Existing Speeds
- Crash History
- May consider other factors
- MUTCD guidance = Speed Limit should be within 5 mph of the 85th percentile speed
- In MN, City has statutory ability to set speed limit based on their own engineering approach.

Traditionally Speed limits are set by Statute or by Engineering Study



Use in the U.S.

1) Engineering Approach

Widely used in US

2) Optimization Approach

3) Injury minimization/Safe system philosophy

4) Expert System Approach (USLIMITS2)

Gaining use in US
urban areas

Use in the U.S.



2018 Survey Conducted by National Committee on Uniform Traffic Devices (NCUTCD)

Respondents included engineering consultants, state, and local agencies

- Over 50% stated most important factors for speed limit setting = speed of vehicles, crash history, context (location)
- Top-most relied upon measure: 85th percentile speed (88%), design speed (21%), pace speed (17%)
- Related to speed limit and rounding, most frequent response was to round up or down 5mph from the 85th percentile
- When given option to choose how they “would” do it if given the choice offered the following.....

Broadening the Engineering Approach Beyond 85th Percentile

- 2017 National Transportation Safety Board (NTSB) Report, “Reducing Speeding-Related Crashes Involving Passenger Vehicles”, recommended to the FHWA to revise the Manual on Uniform Traffic Control Devices (MUTCD)
 - Revise the MUTCD to remove the guidance that speed limits should be within 5 mph of the 85th percentile speed
 - Incorporate the safe system approach for urban roads to strengthen protection for vulnerable road users.



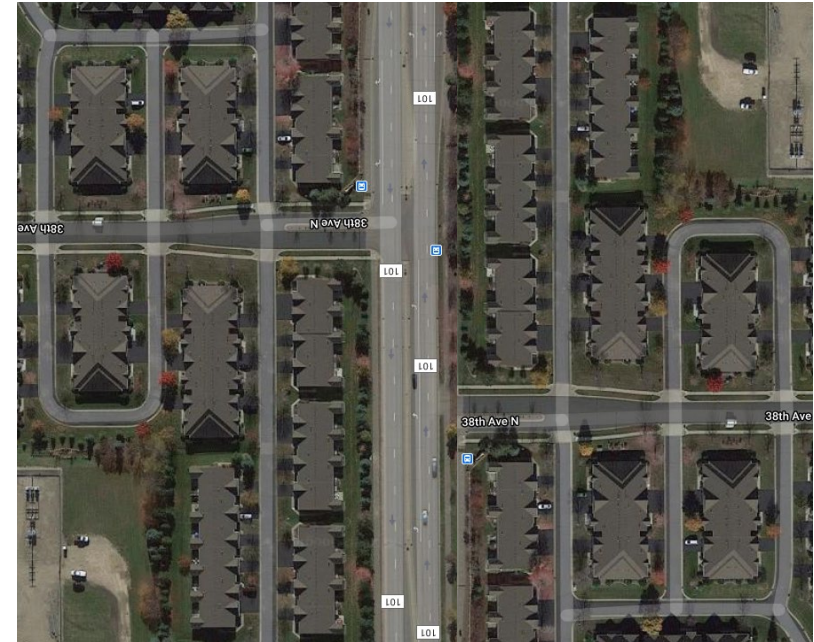
Broadening the Engineering Approach Beyond 85th Percentile

- In 2019 the NCUTCD, in response to 2017 NTSB report, proposed changes to the MUTCD:
 - Emphasize role of other factors in setting speed limits in addition to 85th percentile speed
 - Retain reference to 85th percentile as factor for freeways, expressways, and rural areas
 - Leave setting of speed zones broad to allow state/local authorities to establish their own criteria
- In early 2021, FHWA proposed changes to the MUTCD to reinforce the understanding that other factors, in addition to the 85th-percentile speed, have a role in setting speed limits. These changes would allow agencies to establish detailed criteria based upon national guidance or research, outside the MUTCD.
- Anticipated Mid 2021, NCHRP 17-76 “Guidance for the Setting of Speed Limits”
 - A national speed limit guide and tool for practitioners to set speed limits on a street by street basis based on roadway context/use

Case Examples of Each Speed Limit Setting Approach

- Urban Example

- 4-lane divided minor arterial
- Posted Speed Limit 40 MPH
- Surrounded by single and multi-family residential, neighborhood commercial
- Transit Route



Case Examples of Each Speed Limit Setting Approach

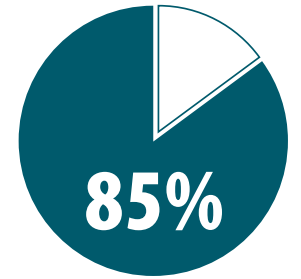
- Suburban/Rural Example

- 3-lane minor arterial with paved shoulders
- Posted Speed 40 MPH
- Surrounded by farmland with some residential



Engineering Approach

Operating Speed



Context	Existing Posted speed limit	Data Collected			Recommended Speed Limit using Engineering Approach
		50th percentile	85th percentile	10 mph pace	
Urban	40 mph	40 mph	44 mph	38-47 mph	40 or 45 mph
Rural	40 mph	41 mph	48 mph	35-44 mph	45 mph



Optimization Approach

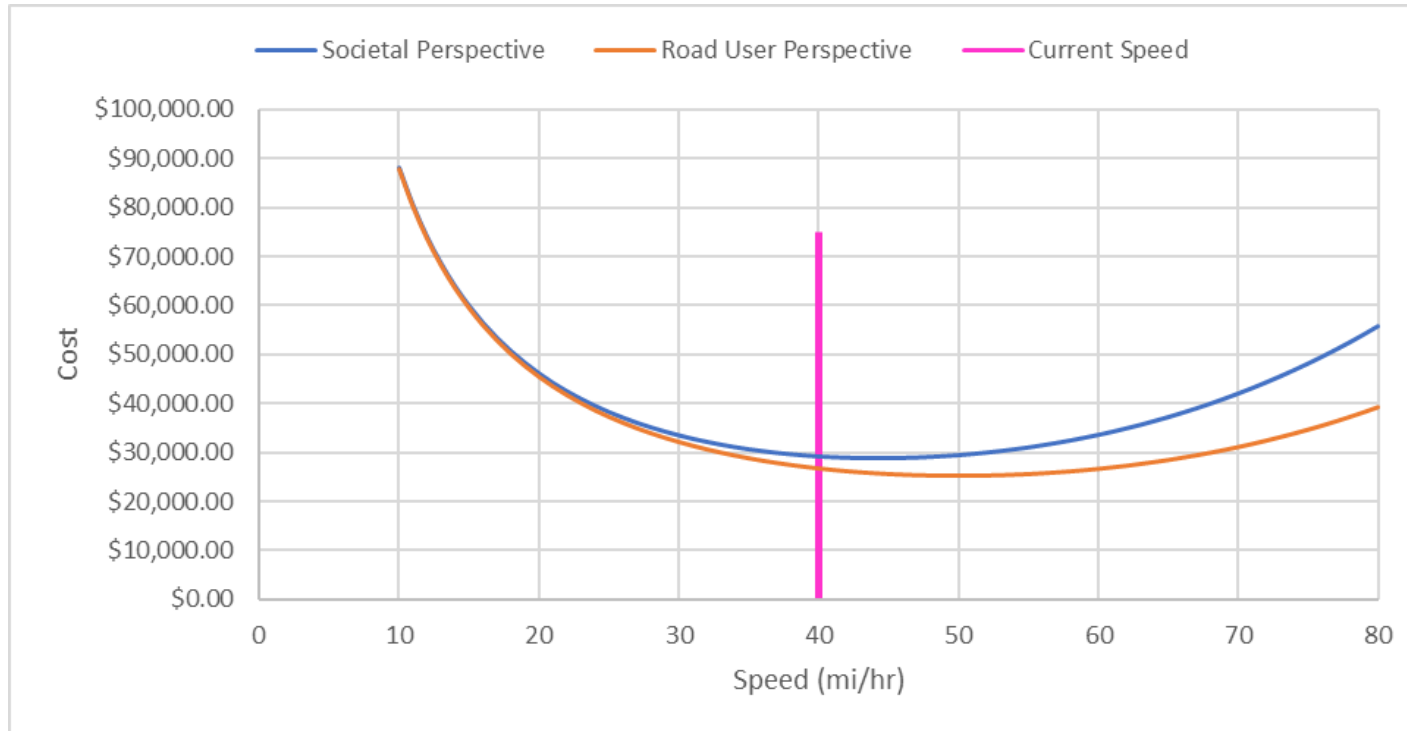
Uses Economic Analysis to determine:

- Crash Cost
- Travel Time Cost
- Fuel Consumption Cost
- Cost of Emissions

This approach takes 8 to 10 times as long to complete as the other approaches

Optimization Approach

URBAN



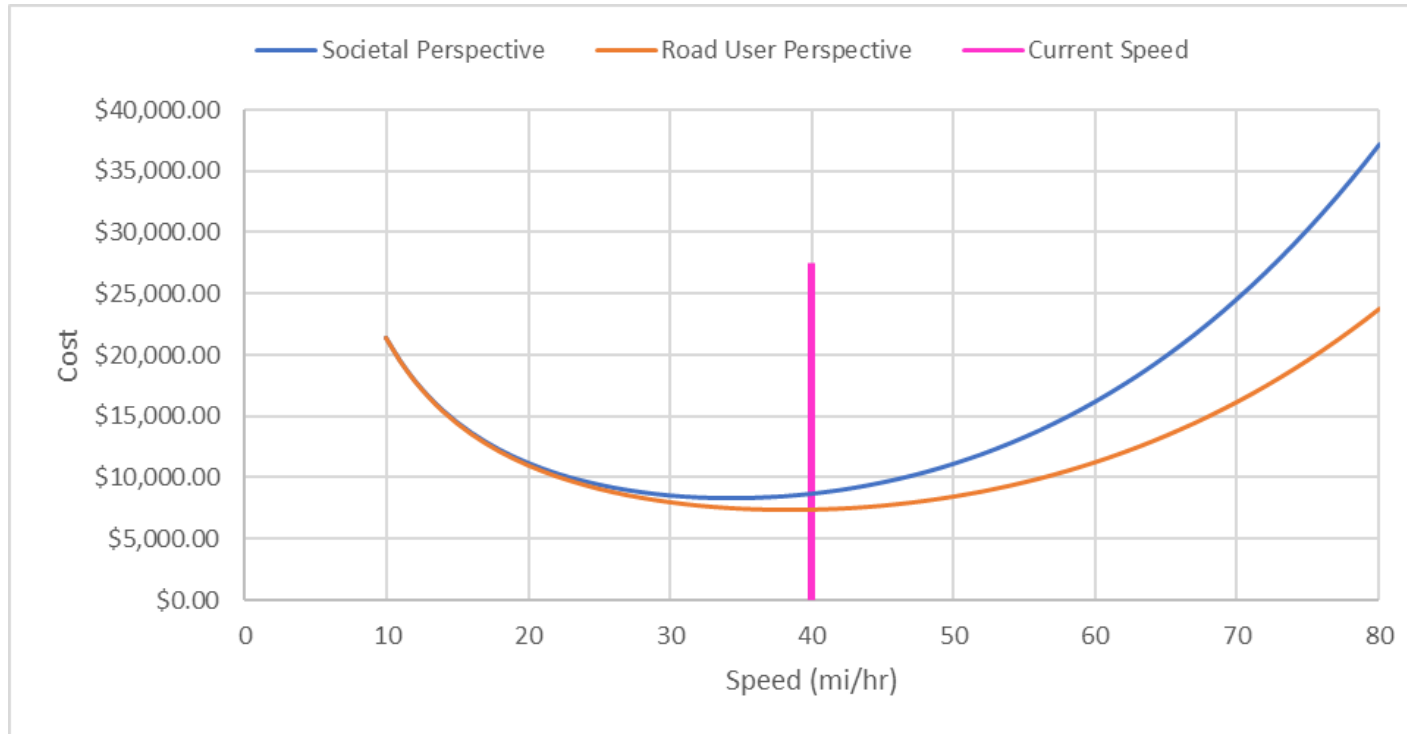
**Recommended
Speed Limit
using
Optimization
Approach =
45 MPH**

Optimal Society	44	mph
Optimal Users	50	mph
Average	47	mph

Look at optimal speed between cost to society and cost to users

Optimization Approach

RURAL



**Recommended
Speed Limit
using
Optimization
Approach =
35 MPH**

Optimal Society	34	mph
Optimal Users	38	mph
Average	36	mph

Look at optimal speed between cost to society and cost to users

Expert System Approach (USLIMITS2)



Context	Existing Posted speed limit	Recommended Speed Limit using Expert Systems
Urban	40 mph	45 mph
Rural	40 mph	50 mph

USLIMITS2 Speed Zoning Report

Project Name: Peony Lane North of High School NB

Analyst: Mitchell Wall

Date: 11-06-2019

Basic Project Information

Route Name: Peony Lane
 From: North of High School
 To: Lawndal Ln
 State: Minnesota
 County: Hennepin County
 City: Plymouth city
 Route Type: Road Section in Developed Area
 Route Status: Existing

Crash Data Information

Crash Data Years: 10.00
 Crash AADT: 7831 veh/day
 Total Number of Crashes: 17
 Total Number of Injury Crashes: 7
 Section Crash Rate: 63 per 100 MVM
 Section Injury Crash Rate: 26 per 100 MVM
 Crash Rate Average for Similar Roads: 234
 Injury Rate Average for Similar Roads: 70

Roadway Information

Section Length: 0.95 mile(s)
 Statutory Speed Limit: 30 mph
 Existing Speed Limit: 40 mph
 Adverse Alignment: No
 One-Way Street: No
 Divided/Undivided:
 Number of Through Lanes: 3
 Area Type: Residential-Collector/Arterial
 Number of Driveways: 3
 Number of Signals: 0

Traffic Information

85th Percentile Speed: 48 mph
 50th Percentile Speed: 41 mph
 AADT: 7831 veh/day
 On Street Parking and Usage: Not High
 Pedestrian / Bicyclist Activity: Not High

Recommended Speed Limit:



Injury Minimization/Safe System Philosophy



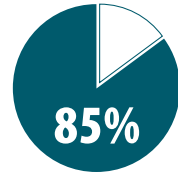
Context	Existing Posted Speed Limit	Data Collected							Recommended Speed Limit using Injury Min./Safe System
		Roadway	50th percentile	85th percentile	10-MPH Pace	% Injury Crashes	% Ped/Bike Injury	NCHRP Rpt. 855	
Urban	40 mph	Minor Arterial	40 mph	44 mph	38-47 mph	41%	100% (3 Minor, 2 Possible)	30-45 mph	40 mph
Rural	40 mph	Minor Arterial	41 mph	48 mph	35-44 mph	41%	100% (1 serious, 1 minor)	> 45 mph	45 mph

No specific framework in place for this philosophy. Must pair together many references and studies to draw conclusion.

Table 1. NCHRP Report 855 Suggested Target Speed for Context/Roadway

Roadway	Context				
	Rural	Rural Town	Suburban	Urban	Urban Core
Freeways	Not addressed in 855 since "designs are based on federally developed standards with little flexibility". Assumed to be High				
Principal Arterial	High	Low / Med	Med / High	Low / Med	Low
Minor Arterial	High	Low / Med	Med	Low / Med	Low
Collector	Med	Low	Med	Low	Low
Local	Med	Low	Low	Low	Low
Suggested target speeds: Low (<30 mph), Med (30 to 45 mph), high (> 45 mph)					

Summary – Recommended Speed Limit



Context	Existing Posted Speed Limit	Engineering Approach Operating Speed	Optimization	Expert Systems	Injury Min./Safe System
Urban	40 mph	40/45 mph	45 mph	45 mph	40 mph
Rural	40 mph	45 mph	35 mph	50 mph	45 mph

Difference is not too great, but each approach does vary in its results