



## **Toolbox Tuesdays - SCAG**

February 22, 2011 | Los Angeles, CA

### **Road Diets**

**West Hill Studies Road Diet:  
Reducing Lanes for a Community**

# West Hill Study Reducing Lanes for a Community

PRESENTED BY

**Eric Shimizu, P.E., PTOE / DKS Associates**

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# Introduction

- Context – how it shapes our view
- History and background
- A focus on “one” of the corridors
- Problem assessment
- Selected alternative
- Closing Thoughts



**Context.....**

Change the roman numeral “VII” to eight with one line?



**Context.....**

Now change nine “IX” to a 6 with one line?

**Context.....**

Now change nine “IX” to a 6 with one line?

You can turn it upside down, cover up the bottom and you have the number VI.

OR

**Context.....**

Add the letter S

The most common answer is SIX. *A change in context* from Roman numerals to English.

What's another solution?

**Context.....**

Another *change in context* is needed...

1 x 6

A change of the “X” now used as a multiplication symbol.

## West Hill Time History

- Community Advisory Group Established (9/2000)
- CAG worked with King County for improvements
- West Hill Corridor Study (5/2002)
  - Rainier Avenue South
  - Renton Avenue South
- Construction Completed (11/2004)

# Introduction

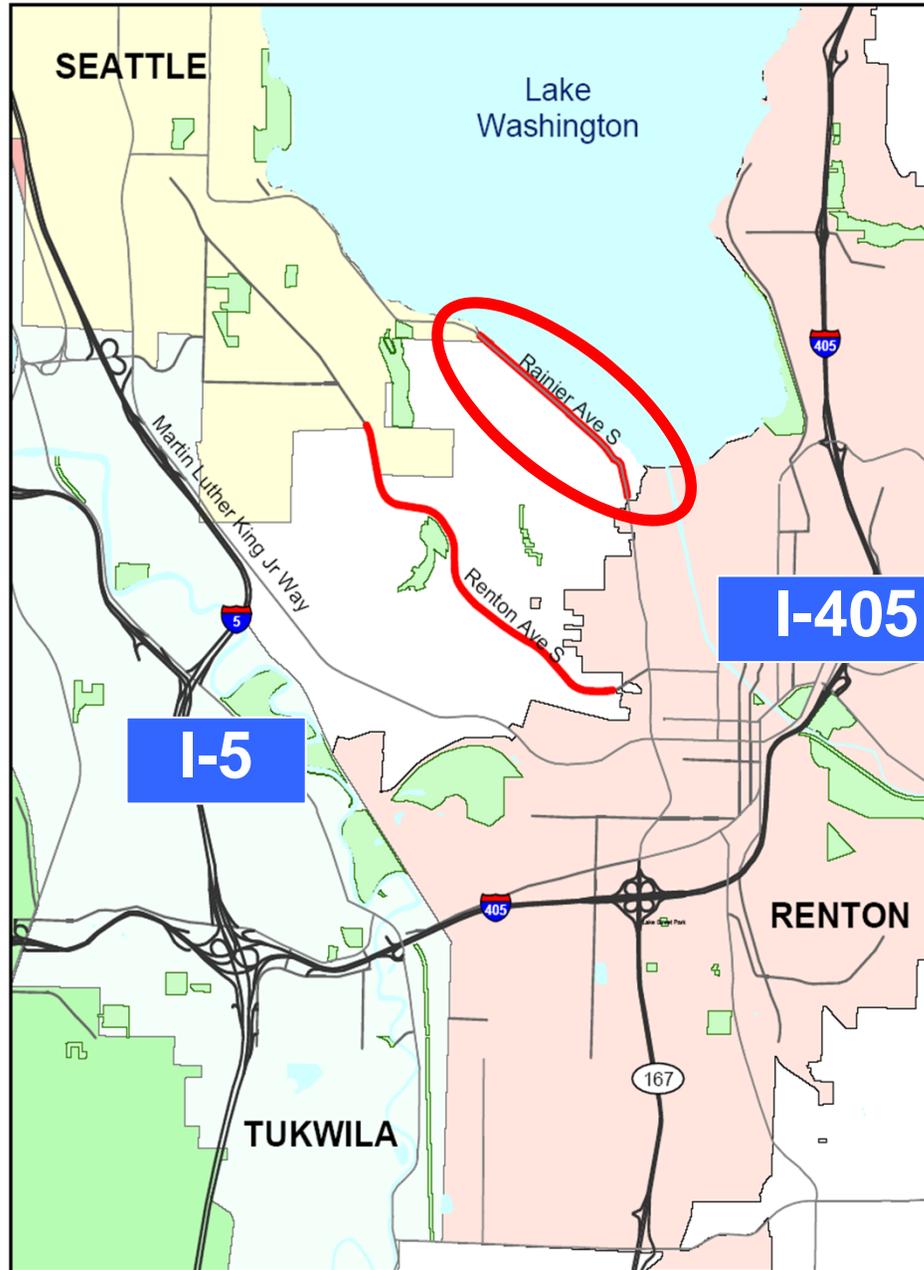
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# Vicinity Map

## Rainier Avenue





west hill study



## conceptual design

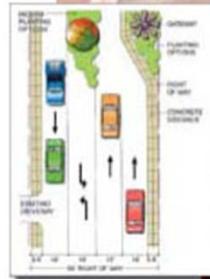
# Goals and Objectives

### Goals

**Create conceptual design solutions that**



- Provide a **safe** and **efficient** transportation corridor for vehicles, buses, bicycles and pedestrians.
- Balance the needs of the transportation system with the interests of the surrounding **community** and the environment.
- Create a transportation facility that is an **asset** to the community.



### Objectives

- **Improve** safety and utility for local residents by connecting sidewalks and creating bicycle lanes.
- **Enhance** neighborhood character and improve citizen access to businesses, transit facilities, and other resources.
- **Preserve** and improve environmental conditions throughout the project limits by reducing pavement area and treating water runoff.



# Rainier Avenue Background

- 4-lane roadway section (1 mile segment)
- 35 MPH speed limit
- Passes through residential and commercial
- Regional Link prior to Interstate System
- 2002 ADT                      18,000 - 19,000 VPD
  - Peak Hour                      900 SB & 770 NB



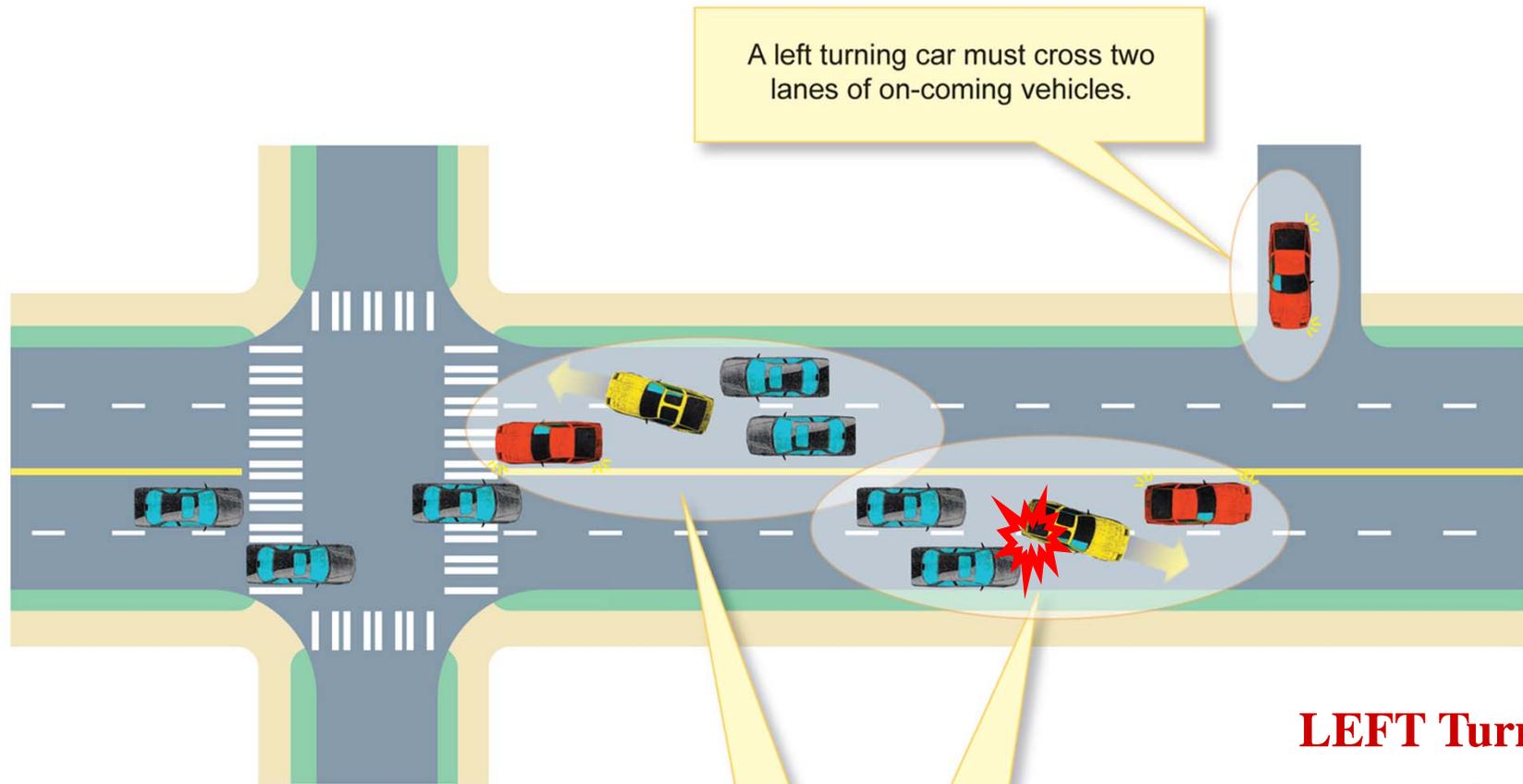
**Existing**

## Corridor Problems

- Speeding / Safety
- Poor side street sight distance
- Access Issues – High number of access points
- Hostile environment for pedestrians
- Accidents

# Sample 4-Lane Roadway Section

Four-lane roads such as Rainier and Renton Avenue are designed to accommodate vehicles travelling *through*. Large multi-lane roads can encourage speeding, and can be hazardous places for pedestrians and vehicles.



Left turning cars stop traffic in their lanes. Trailing cars must stop, or change lanes - causing disruption or hazards. Left turning cars must cross two lanes of on-coming traffic.

**LEFT Turns**  
**THRU Cars**  
**Impatient Ones**



# Issues Legend



**Pedestrian Caution** areas are places where the pedestrian may be exposed to potential hazards. This includes areas along the corridor without sidewalks.



**Bus Zones** refer to locations that have the highest transit activity along the corridor.



**Sight Distance** refers to locations where conditions can prevent the driver from seeing potential hazards such as oncoming vehicles or pedestrians.



**Sharp Angle Intersections** can create Sight Distance problems for drivers turning onto the main street. Generally lengthens the time and distance for left turning vehicles.



**Accident Areas** refer to sections of the corridor which historically have the highest number of accidents.



**Access Points** are areas where there are a high number of intersections. Too many access points can slow traffic through the corridor and create potential safety problems.



# Corridor Challenges



High left turn volumes conflict with through volumes.



Sharp-angle intersection creates sight distance issues for turning vehicles.



Too frequent sharp-angle intersections can create traffic conflicts.



Sharp-angle intersection creates sight distance issues for turning vehicles.



Sharp-angle intersection creates sight distance issues for turning vehicles.

## Existing Corridor Elements

- 4-lane principal arterial
- Primarily residential area
- Sidewalks
- On-street parking
- No bus service



### Legend

See *Issues Legend* for additional information

- Business District
- Pedestrian Caution
- Bus Zone
- Sight Distance
- Sharp Angle Intersections
- Accident Area
- Access Points

## Alternative Selection Process

- Numerous alternatives analyzed
- 3 - lane alternative selected

Stakeholder Response:

Won't taking a lane reduce capacity?

Our analysis indicated, no.

It actually improved operations.

## **A bit counter intuitive for Engineers. So how can we help the public understand?**

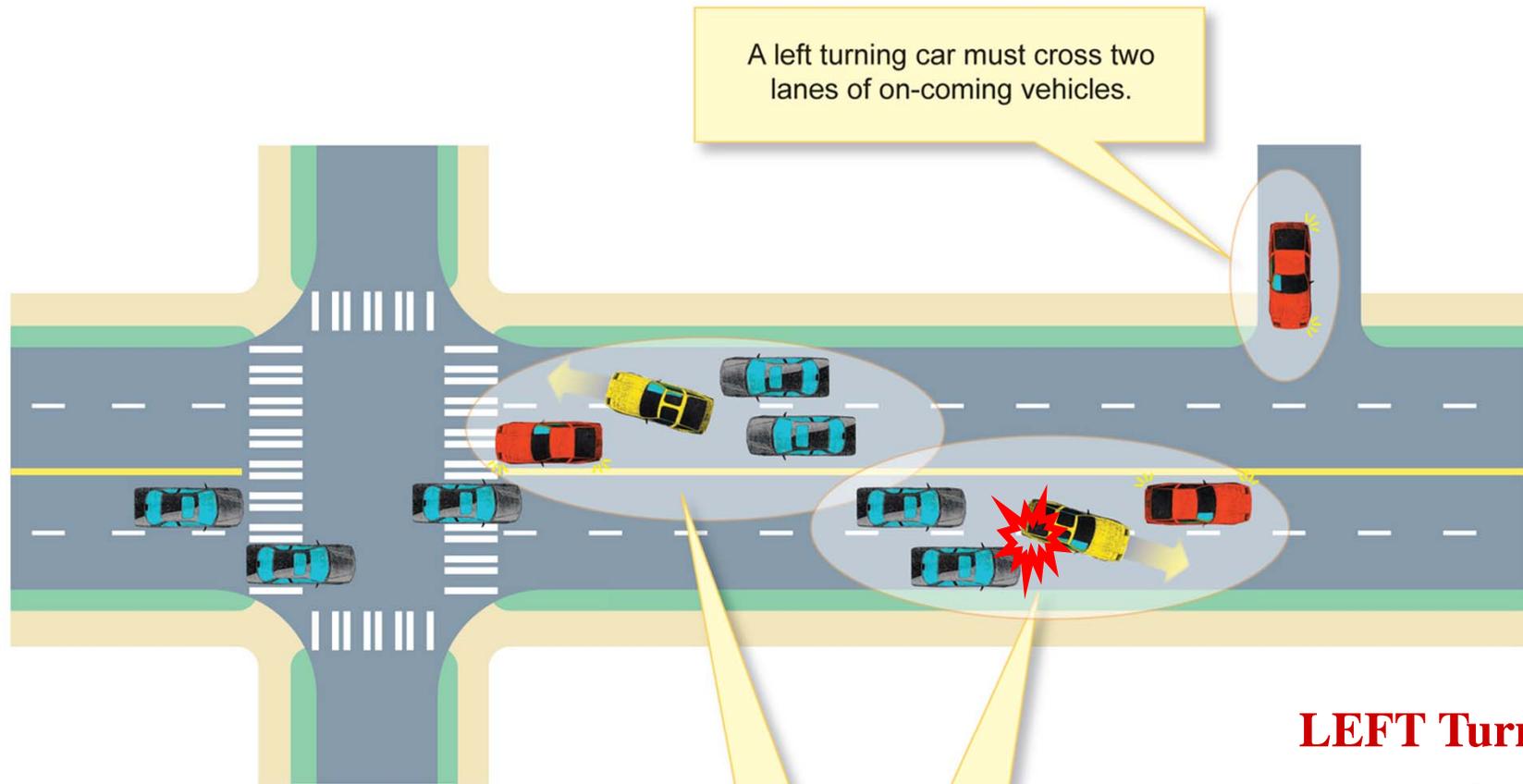
- 2002 ADT                      18,000 - 19,000 VPD
  - Peak Hour                      900 SB & 770 NB
  
- 2025 ADT                      26,600 - 27,000 VPD
  - Peak Hour                      1,300 SB & 1100 NB

## **Well unfortunately, not with numbers**

- Some other conversion projects
  - 1998 Kirkland (LK WA Blvd 30,000 ADT)
  - 1994 Seattle (MLK 15,000 ADT)
  - 1972 Seattle ( N. 45th Street 20,000 ADT)

# Sample 4-Lane Roadway Section

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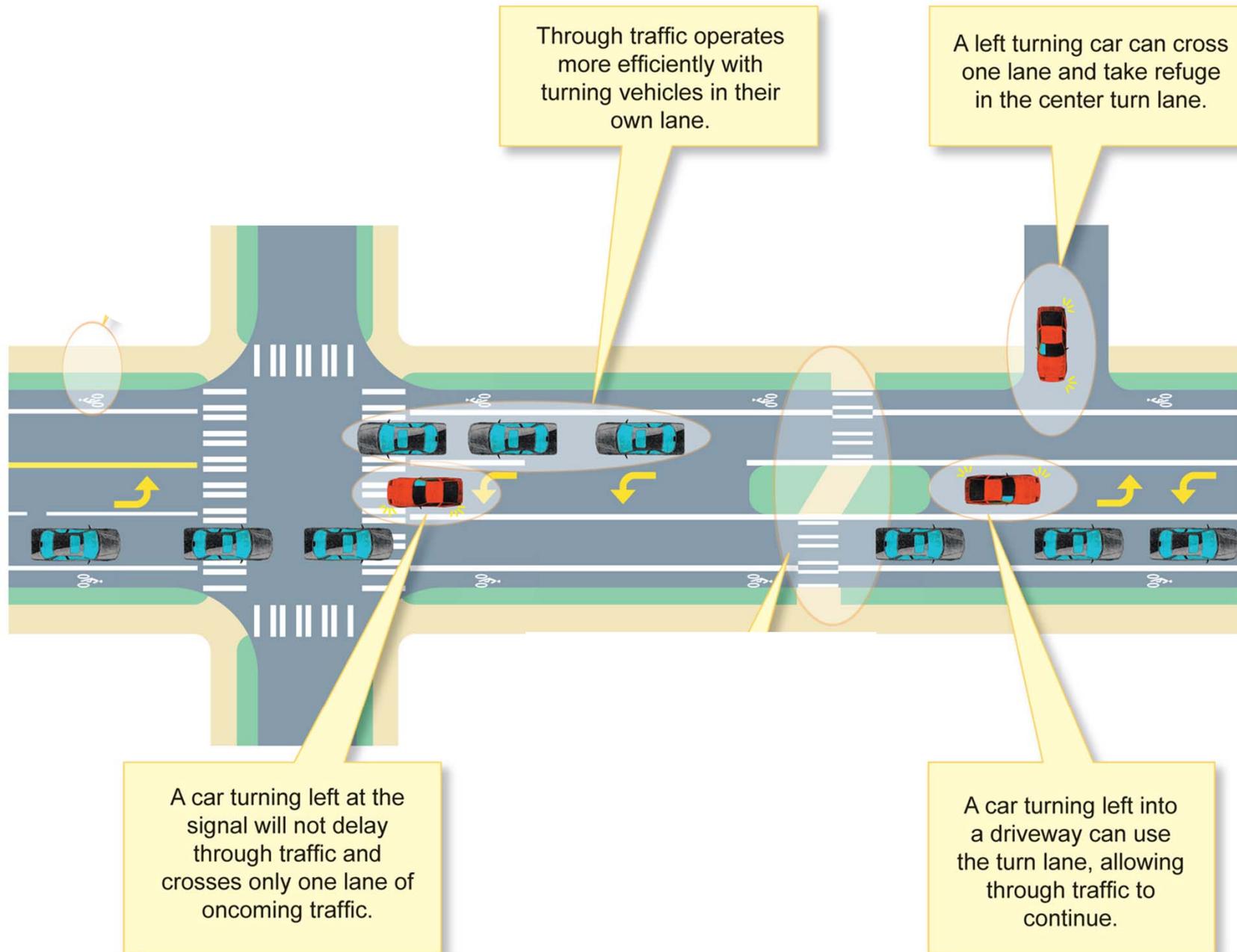
A left turning car must cross two lanes of on-coming vehicles.

Left turning cars stop traffic in their lanes. Trailing cars must stop, or change lanes - causing disruption or hazards. Left turning cars must cross two lanes of on-coming traffic.

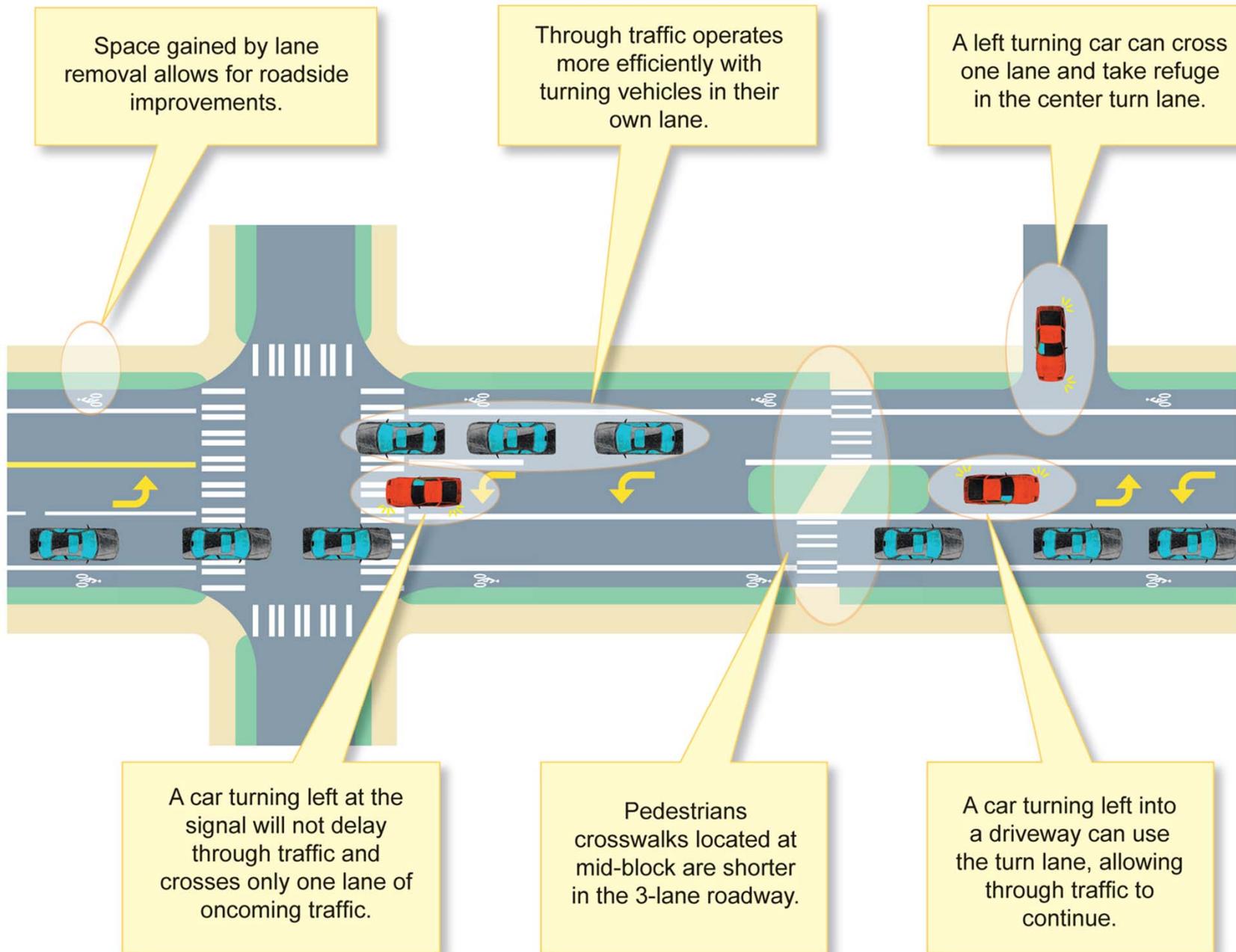
**LEFT Turns**  
**THRU Cars**

**Impatient Ones**

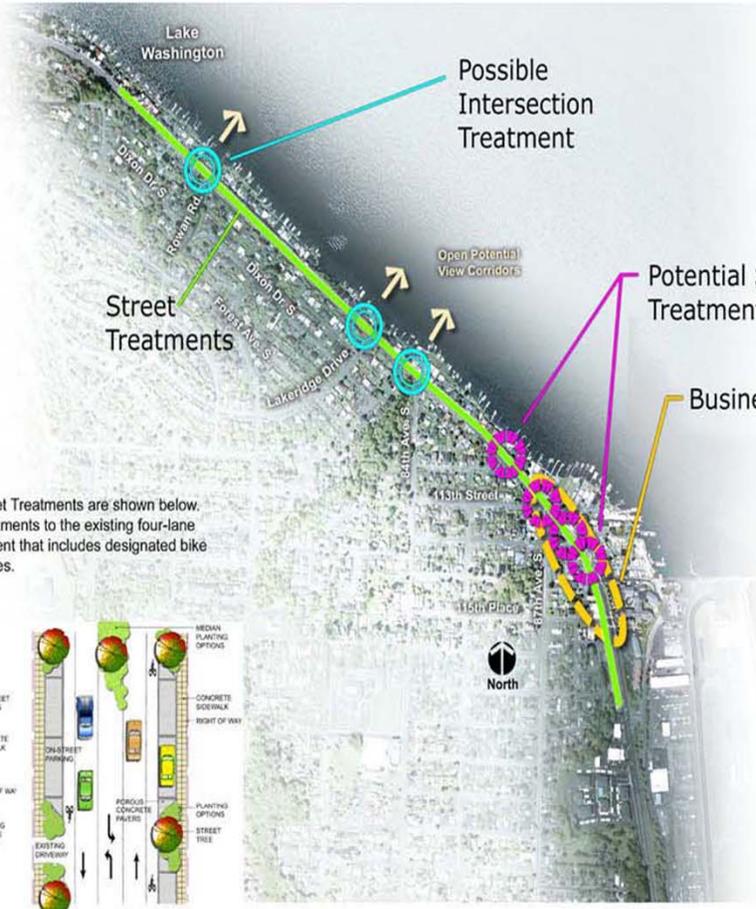
# Sample 3-Lane Roadway Section



# Sample 3-Lane Roadway Section

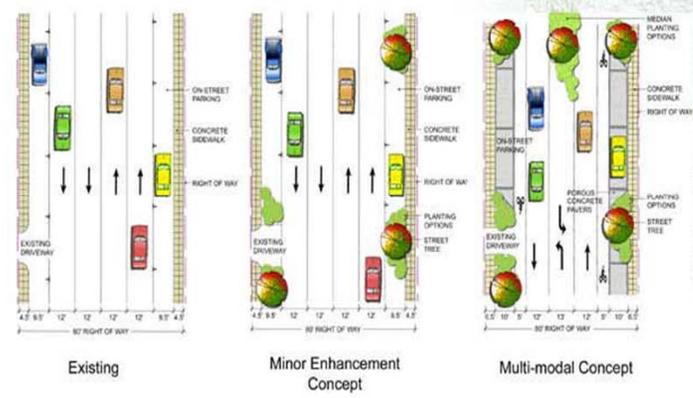


# Corridor Plan



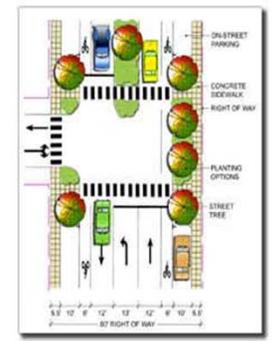
## Street Treatments

The existing conditions, as well as two concepts of Street Treatments are shown below. The *Minor Enhancement* concept adds landscape treatments to the existing four-lane roadway. The *Multi-Modal* concept is three-lane alignment that includes designated bike lanes in both directions and enhanced landscape features.



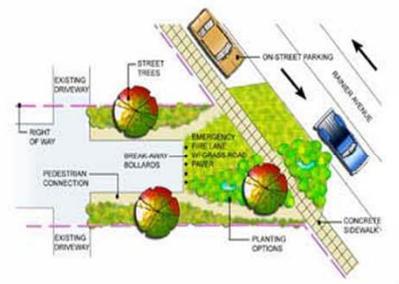
## Intersection Treatment

An example of one type of Intersection Treatment is shown below. The use of landscape features helps to alert pedestrians, drivers and bicyclists to the presence of the intersecting street.

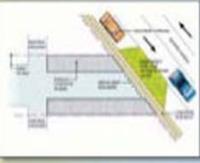
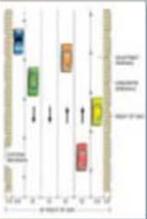
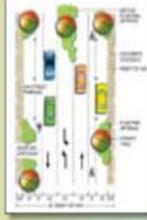
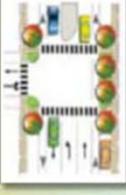
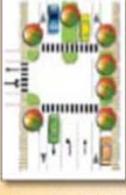


## Street-end Treatments

An example of one type of Street-End Treatment is shown below. Street end-closures can include rain gardens (below) for stormwater treatment, trees and other planting options that buffer the neighborhood from adjacent traffic.



# Option Comparison

corridor options	features			evaluation			
	Street-End Treatments	Street Treatments	Intersection Treatments	Operations	Environment	Safety	Cost
1	 <p>Porous pavement Street-End Treatment</p>	 <p>Minor enhancements to existing roadway</p>	 <p>Four-lane option with landscaped crosswalk area</p>	<p><b>Good</b> Operations are impacted by four-lane road characteristics. Lack of center turn-lane creates disruption and delay when vehicles wait to turn left onto cross-streets or in and out of driveways. A single Street-End Treatment would reduce turning vehicles, improving operations.</p>	<p><b>Good</b> This option keeps the original four lanes of pavement along the corridor. Limited planting strips and trees along the corridor would be installed, to absorb stormwater runoff.</p>	<p><b>Good</b> Sidewalks and planter strips create a buffer zone between pedestrians and adjacent traffic. Crosswalk length is reduced at intersections. Bicyclists would utilize the existing wide parking lanes of the corridor.</p>	<p><b>Lowest Cost</b> Minimal property impacts for improvements to sidewalks, crosswalks, and landscaping help to keep the costs down.</p>
2	 <p>Cul-de-sac Street-End Treatment</p>	 <p>3-lane configuration with bike lane</p>	 <p>Three-lane option with bike lanes and landscaped crosswalk area</p>	<p><b>Best</b> Center median and turn-lanes allow left-turning vehicles to wait outside of the flow of traffic, improving roadway efficiency. Two Street-End Treatments would result in improved performance along Rainier Avenue.</p>	<p><b>Better</b> Porous pavement for on-street parking, trees and landscaped areas would aid in absorbing runoff. Two intersections would be improved with landscaping.</p>	<p><b>Better</b> In addition to improved sidewalks and crosswalks, this option provides a bike lane for cyclists through the corridor in both directions.</p>	<p><b>Moderate Cost</b> The addition of bike lanes, a center median/turn lane, and two street-end treatments would result in a moderate cost among the options.</p>
3	 <p>Rain garden Street-End Treatment</p>	 <p>3-lane configuration with bike lane</p>	 <p>Three-lane option with bike lanes, landscaped crosswalk area and tree-lined median</p>	<p><b>Better</b> Center median and turn lanes allow left-turning vehicles to wait outside of the flow of traffic, improving roadway efficiency. Street-End Treatments at four intersections along Rainier Avenue would benefit corridor traffic, but affect local traffic patterns.</p>	<p><b>Best</b> Porous pavement for on-street parking, trees and landscaped areas would aid in absorbing runoff. Two intersections would be improved with landscaping. Street-End Treatments at four selected intersections would provide additional drainage areas.</p>	<p><b>Best</b> This option features a wide buffer zone, shielding pedestrians from adjacent traffic. Street-End Treatments would provide local residents with a physical buffer from Rainier Avenue traffic. Bike lanes in both directions are provided.</p>	<p><b>Highest Cost</b> Construction of four Street-End Treatments, a center median/turn lane, pedestrian amenities and four intersection treatments would increase property impact and cost.</p>

RATINGS KEY:  Lowest → Highest



**Existing**



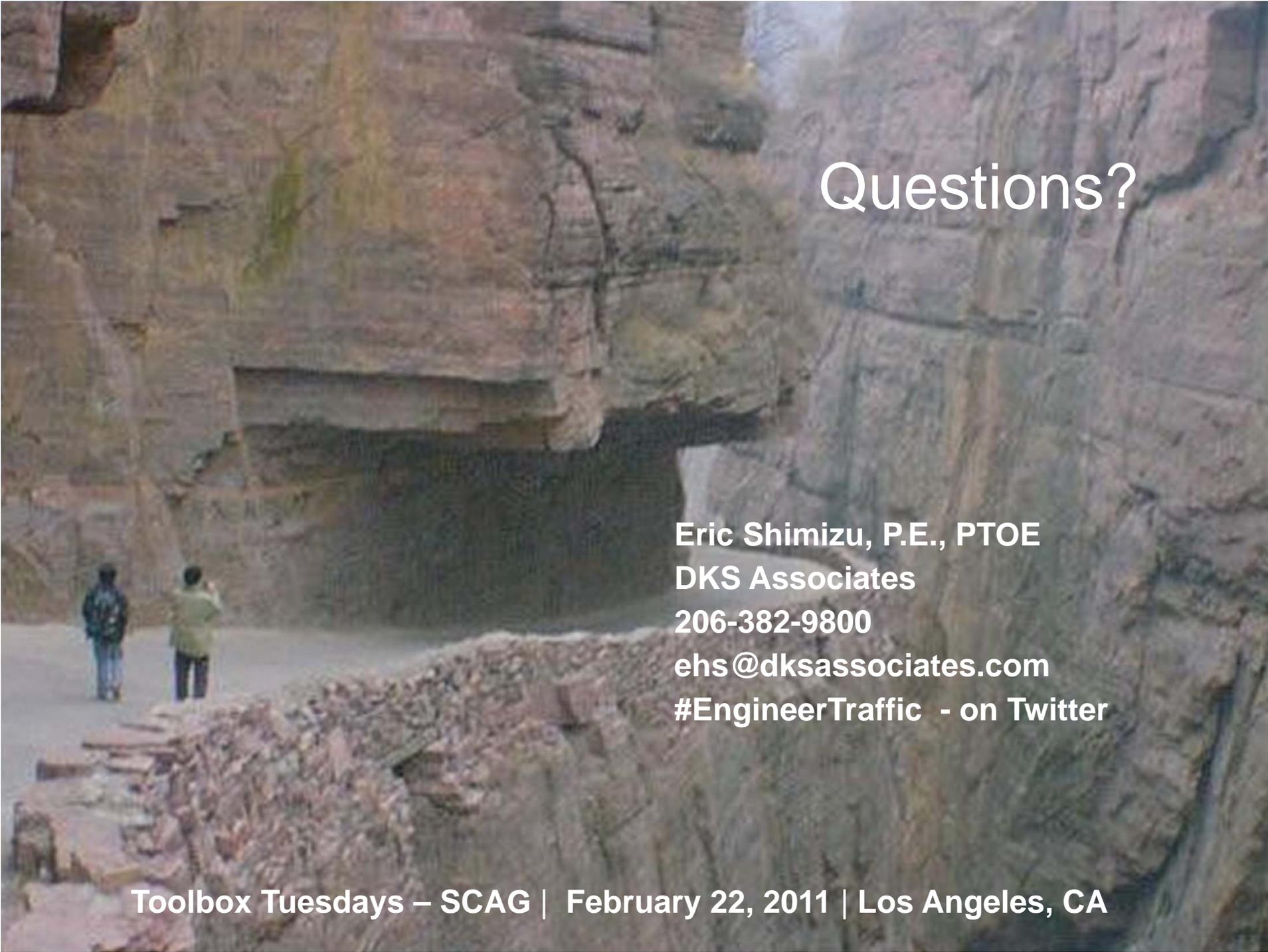
**Proposed**



**Built option**

# Closing Thoughts

- Improvements with the lane reduction
  - LOS improved
  - Improved access to driveways
  - Improved bicycle corridor
  - Speed dictated by average driver
  - Safe refuge for turning vehicles
  - Coordination between agencies
  
- Potential Challenges
  - Frequency of signalized I/S
  - Steep Grades: Impact to Transit and Heavy Vehicles
  - Passing in the TWLTL
  - Introducing this change to the regular users



Questions?

Eric Shimizu, P.E., PTOE  
DKS Associates  
206-382-9800  
ehs@dksassociates.com  
#EngineerTraffic - on Twitter

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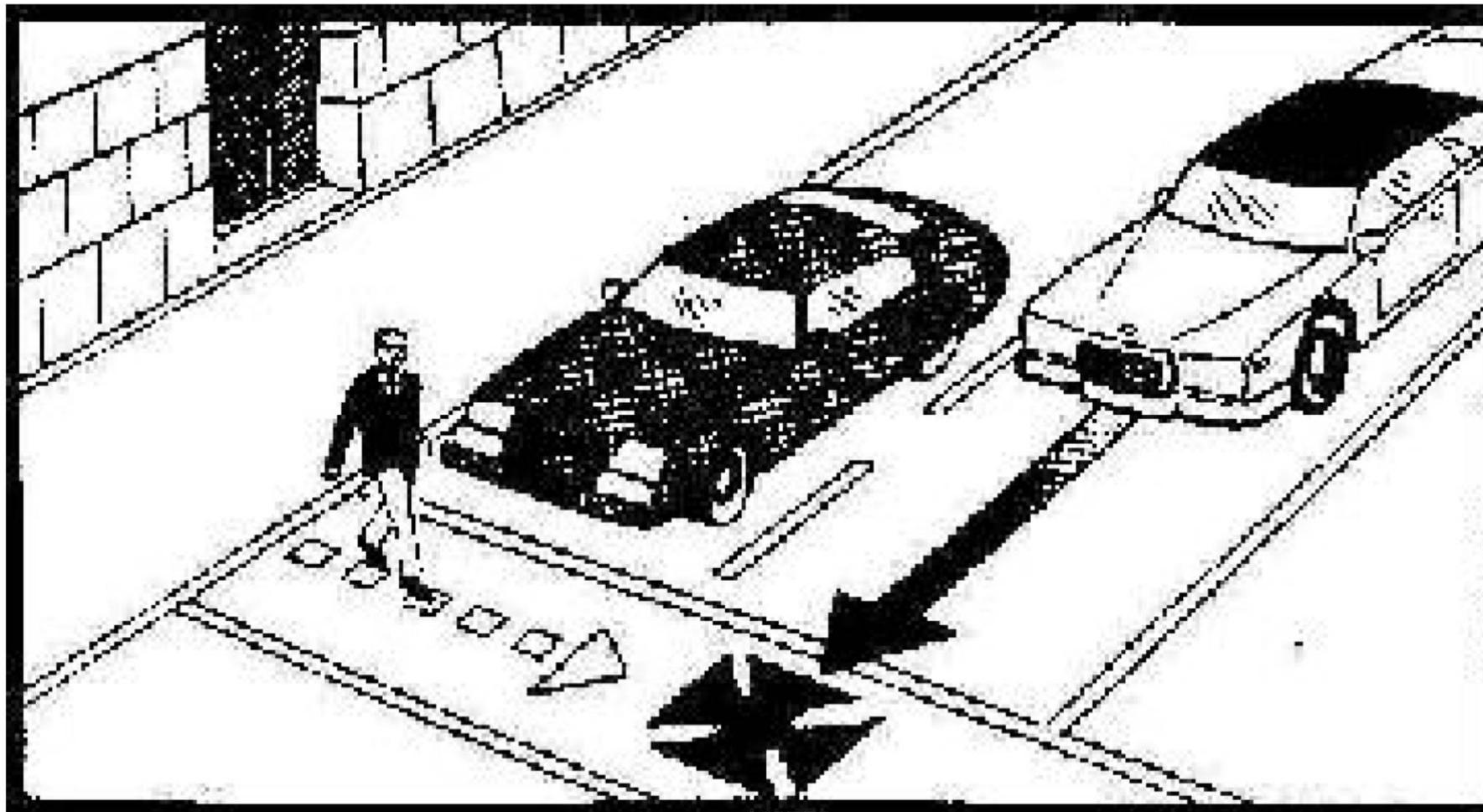
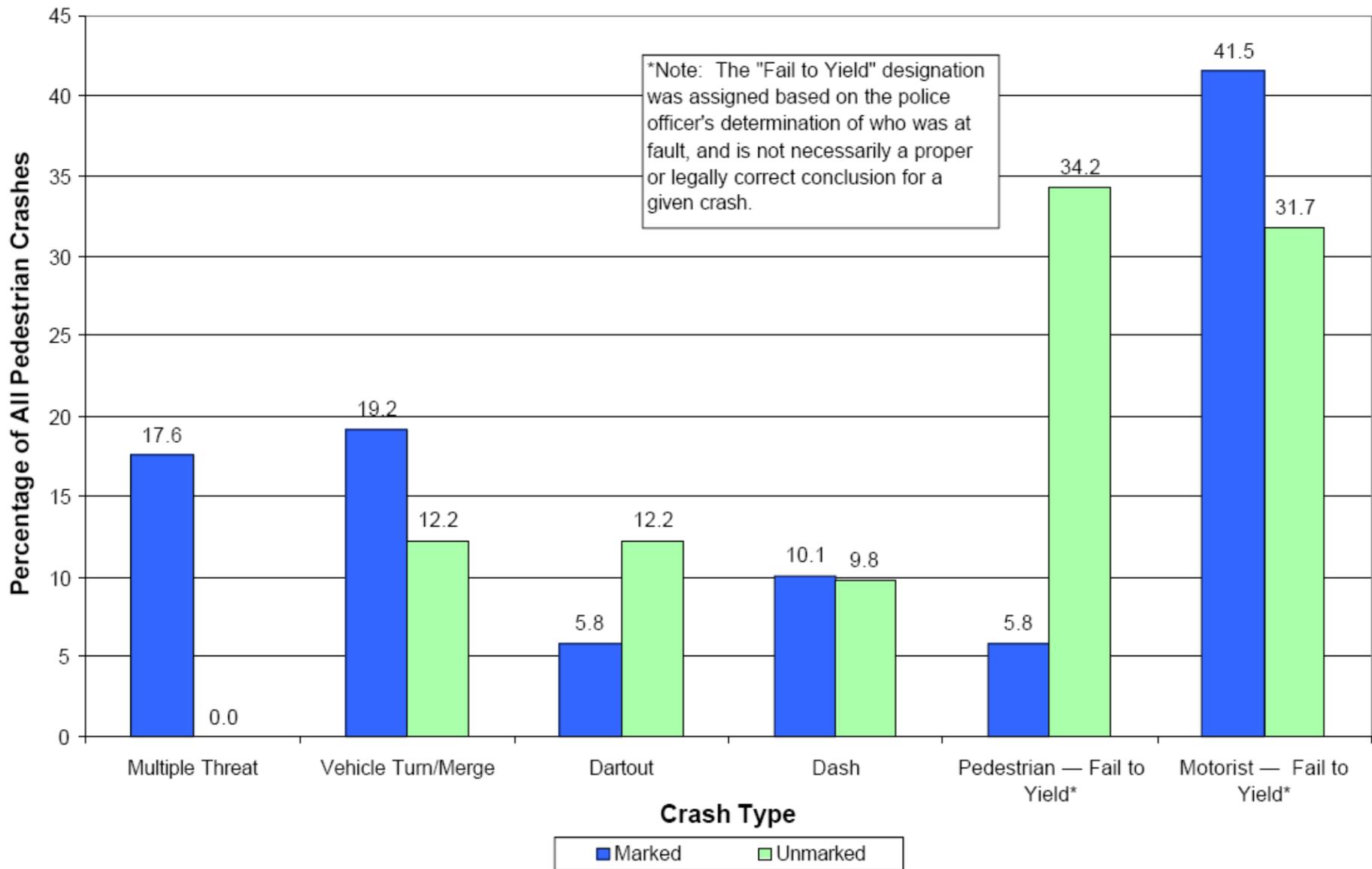


Illustration of multiple-threat pedestrian crash.

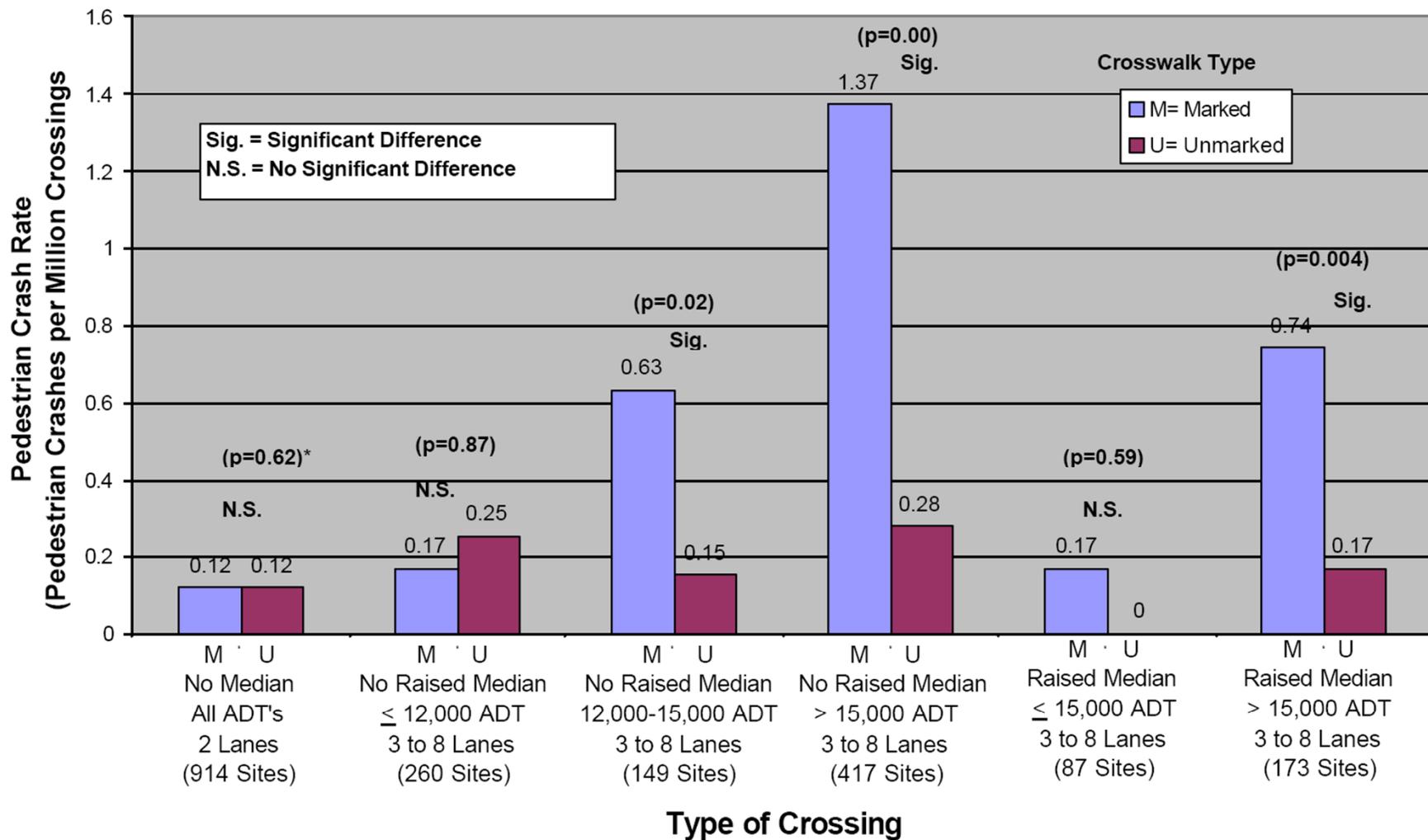
# Recommendations for Considering Marked Crosswalks and Other Needed Pedestrian Enhancements at Uncontrolled Locations

Traffic Volume (ADT)	Speed	Roadway Type			
		2 lanes	3 lanes	4 lanes, raised median	4 lanes, no median
Less Than or Equal To 9,000	30 mph or less	Candidate Site	Candidate Site	Candidate Site	Candidate Site
	35 mph	Candidate Site	Candidate Site	Candidate Site	Consider Enhancements
	40 mph or higher	Consider Enhancements	Consider Enhancements	Consider Enhancements	Enhancements Required
9,000 To 12,000	30 mph or less	Candidate Site	Candidate Site	Candidate Site	Consider Enhancements
	35 mph	Candidate Site	Consider Enhancements	Consider Enhancements	Consider Enhancements
	40 mph or higher	Consider Enhancements	Consider Enhancements	Enhancements Required	Enhancements Required
12,000 To 15,000	30 mph or less	Candidate Site	Consider Enhancements	Consider Enhancements	Enhancements Required
	35 mph	Candidate Site	Consider Enhancements	Consider Enhancements	Enhancements Required
	40 mph or higher	Enhancements Required	Enhancements Required	Enhancements Required	Enhancements Required
Greater Than 15,000	30 mph or less	Candidate Site	Consider Enhancements	Enhancements Required	Enhancements Required
	35 mph	Consider Enhancements	Enhancements Required	Enhancements Required	Enhancements Required
	40 mph or higher	Enhancements Required	Enhancements Required	Enhancements Required	Enhancements Required

Source: Adapted from *Safety Analysis of Marked Versus Unmarked Crosswalks in 30 Cities*, ITE Journal, January 2004; Zegeer, Esse, Stewart, Hunag, Lagerwey

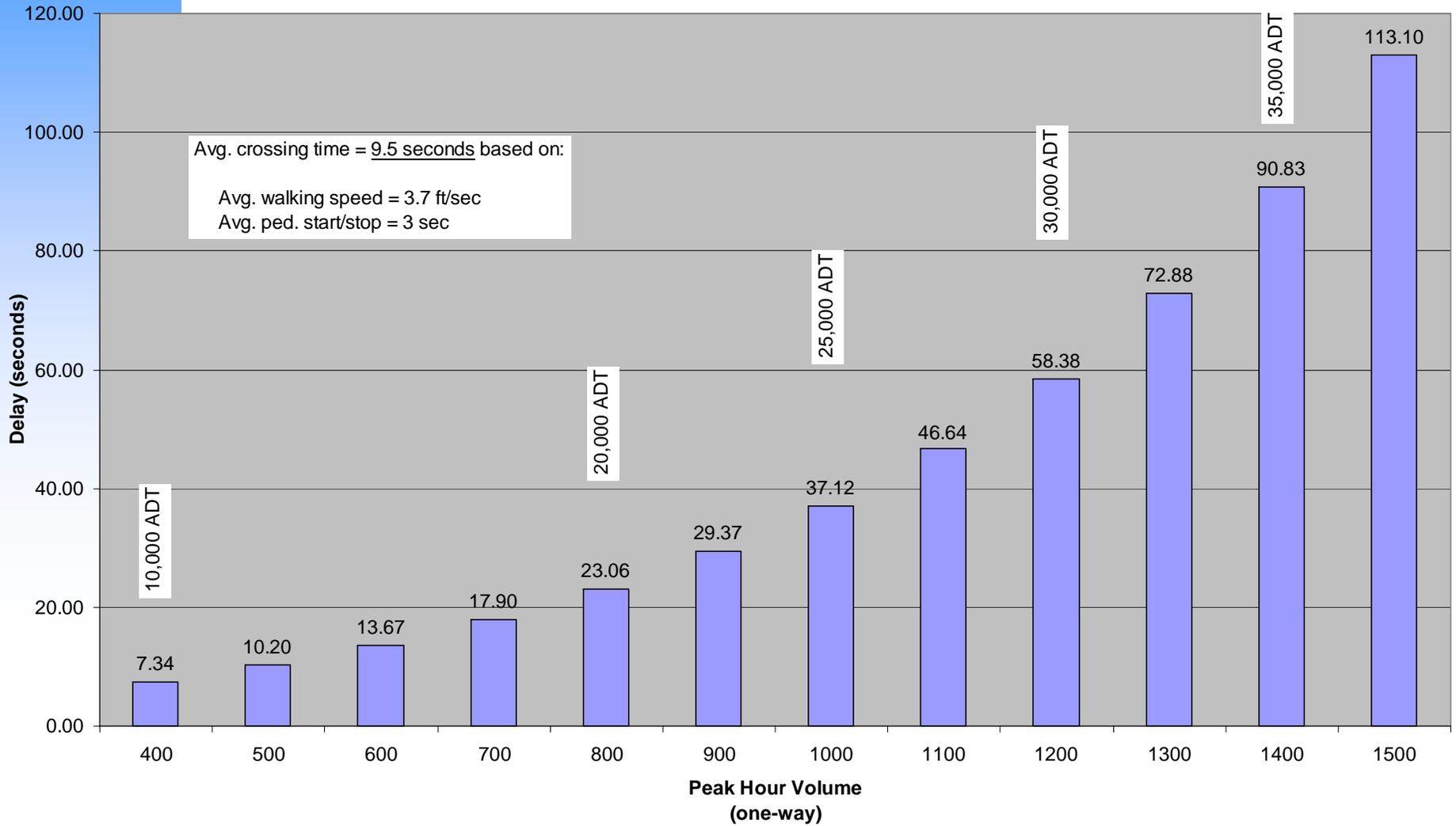


## Pedestrian crash types at uncontrolled marked and unmarked crosswalks



## Pedestrian crash rate vs. type of crossing

## Pedestrian Delay (Based on 24-foot crossing to pedestrian island)



Treatment Type	Application	Approximate Cost	Description
Crosswalk Markings	Marked crosswalks	\$400 - \$500 per crossing	Ladder or zebra-style crosswalk markings
Raised Crosswalk	Crossings on lower speed residential streets	\$3,00 - \$4000 per crosswalk	A modified speed hump with a flat area on top to control traffic speeds approaching and traversing the crosswalk
Advance placement of stop bars	Crossings on higher volume multilane roads	\$250-\$300 per crosswalk	Stop bar is placed typically 50' in advanced of uncontrolled crosswalk to encourage drivers to stop a greater distance from the marked crosswalk.
Pedestrian Flags	Crossings on higher volume multilane roads	\$300 per crossing – excluding maintenance	Peds pick up flag from those posted on each side of crosswalk and flag traffic to let drivers know they wish to cross.
Curb extensions	Crossings where there is a need to shorten the length of the crosswalk	\$5,000 - \$25,000 depending on materials used	The sidewalk extends across the parking lane to the edge of the travel lane to narrow the distance the ped has to cross
Overhead signs	Crossings on higher volume multilane roads	\$15,000 - \$25,000 per overhead sign	Warning signs are placed overhead using mast arms to improve the visibility of the sign
Refuge Islands	Crossings on higher volume multilane roads	\$20,000 - \$40,000 per island	Raised islands placed in the center of the roadway to provide a sheltered place for peds so they can cross the street in two stages.
In-pavement flashers	Crossings on higher volume multilane roads	\$25,000-\$35,000 per crossing	Both sides of crosswalk are lined with durable, encased strobe lighting. Lights are activated by push button and alert drivers that they are approaching an occupied crosswalk.
Midblock pedestrian activated signal	Mid-block locations in high pedestrian activity areas	\$100,000-\$150,000	Traffic signals are placed to control traffic at midblock locations to provide pedestrian a signal-protected opportunity to cross.
Intersection pedestrian signals (half signals)	Locations with heavy ped demand to cross the major street but the side street traffic on the minor approach is light	\$100,000-\$150,000	Signals installed to control traffic on the major street. The side street is controlled by STOP sign to provide a crossing that is protected by signals while minimizing delay to major street traffic by retaining the stop control on the side street