Safety Improvement Strategies

Sacramento Vision Zero Action Plan Update
Working Meeting 2

June 18, 2025

VISION ZERO SACRAMENTO | Fehr & Peers

Agenda

1

Welcome

- Introductions
- Project schedule
- Purpose of today's meeting

2

How do we improve safety?

3

Safety Wins with Signals

4

Small Group Activity

5

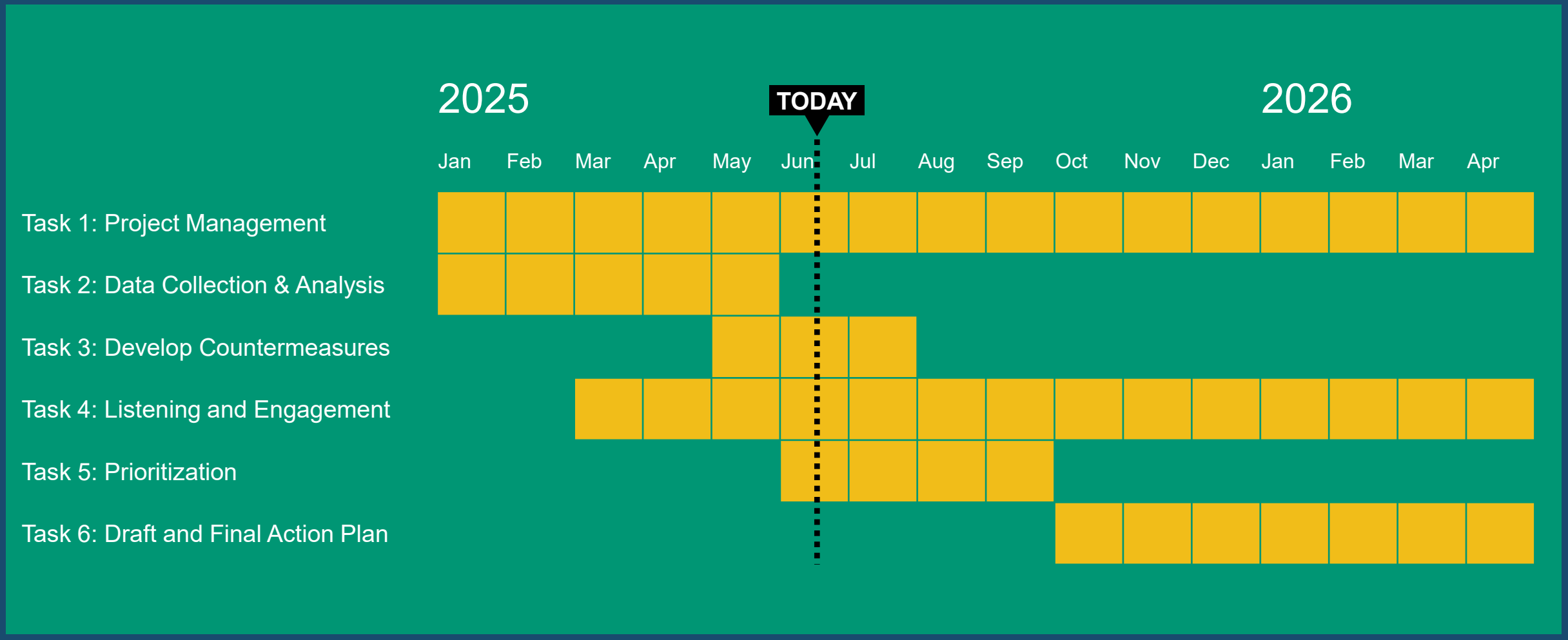
Next Steps

Introductions

What's your name & organization?

What's your favorite street in Sacramento?

Project Schedule



Purpose of Today's Meeting

- Connecting!
- Discussing ways to improve safety
- Learning about success stories


How do we improve safety?

How do we improve safety?

Align policies, planning & resources

- General Plan Policies
- Plan to Implement
- Resources to Implement

M-1.2 **User Prioritization.** The City shall prioritize mobility, comfort, health, safety, and convenience for those walking, followed by those bicycling and riding transit, ahead of design and operations for those driving.


Reducing Kinetic Energy Risk

Reducing Kinetic Energy Risk

1

Exposure

Where and how far people travel

2

Likelihood

Where conflicts occur

3

Severity

Speed, mass, and vulnerability in a conflict

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How Do We Reduce Exposure?

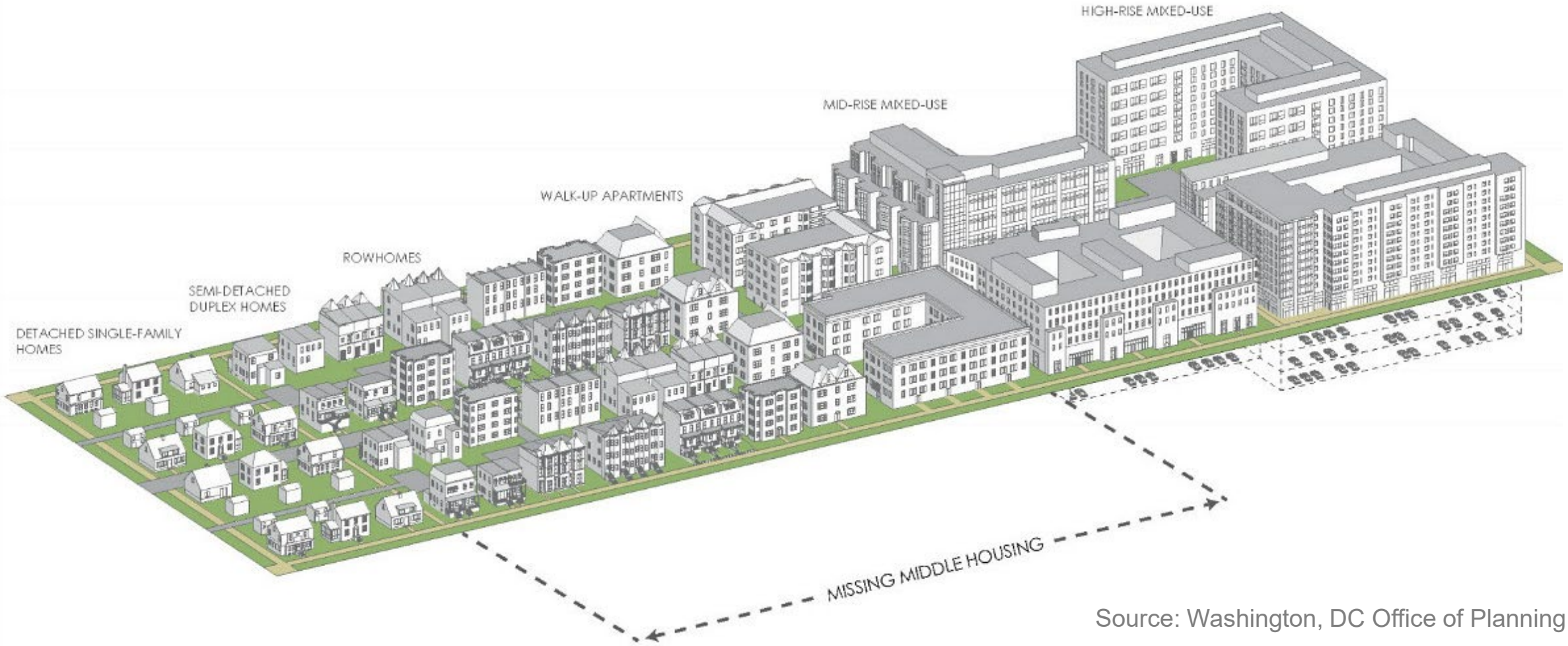
Enable People to Travel by Different Modes

US 101 San Francisco

SR 123 Albany

How Do We Reduce Exposure?

Mix Land Uses to Shorten Travel Distances



Source: Washington, DC Office of Planning

Reducing Kinetic Energy Risk

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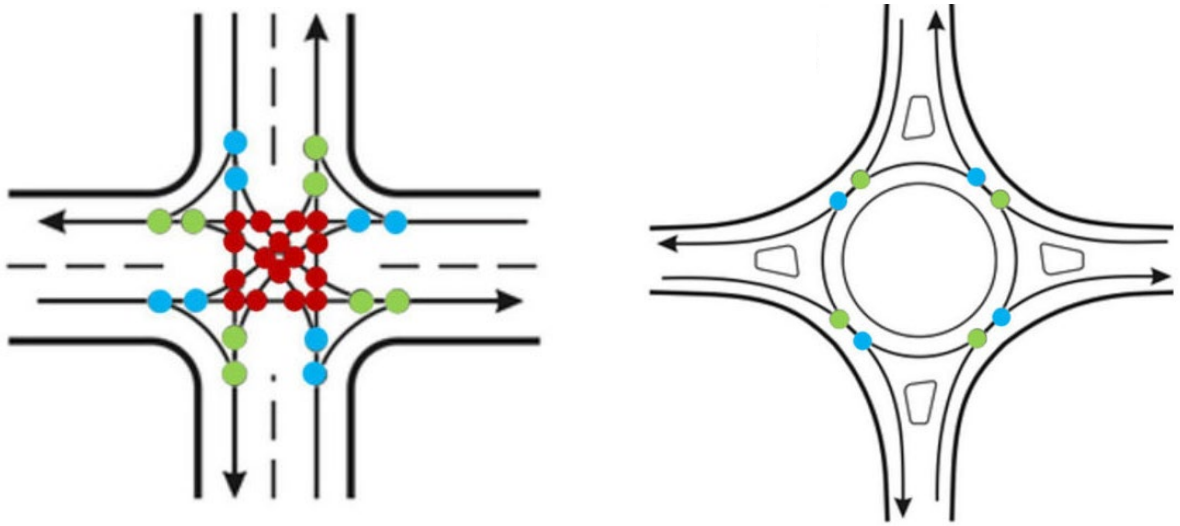
Speed, mass, and vulnerability in a conflict

Locations Where Paths of Travel Cross Are Called “Conflict Points”

Some conflict types are more likely to have severe outcomes

- Diverging (least severe)
- Merging
- Crossing (most severe)

Street design and operations decisions can help manage or eliminate conflicts



Source: Mike Mamlouk, Arizona State University

How Do We Reduce the Likelihood of Collisions?

Proactively Manage Conflict Points

Prioritize design decisions that remove severe conflicts

- Roundabouts
- Road diets
- Separated areas for walking and biking

Prioritize operational decisions that manage conflicts in time

- Protected left-turn phasing
- Prohibiting right-turn on red
- Rest in red

Source: FHWA

Reducing Kinetic Energy Risk

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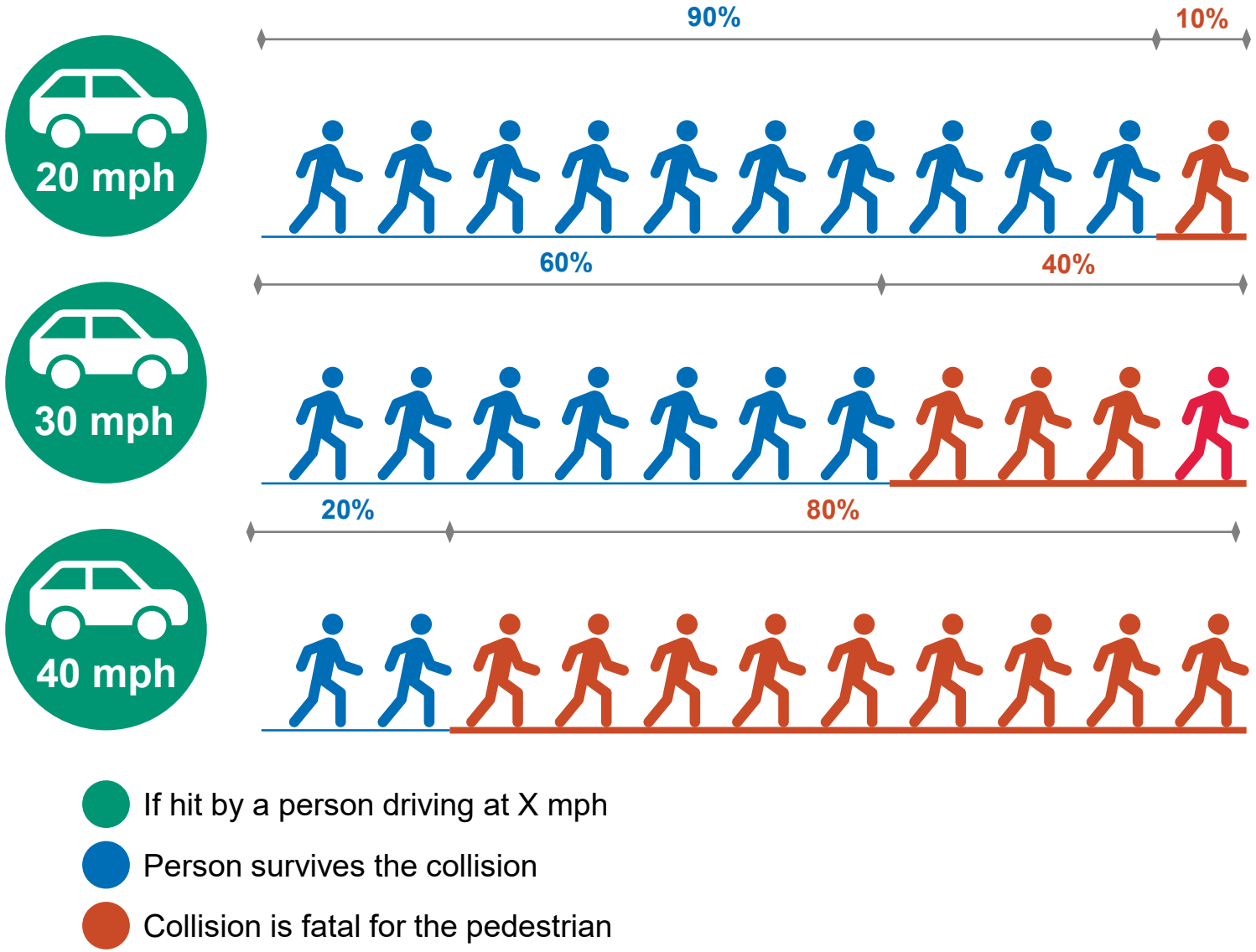
Speed, mass, and vulnerability in a conflict

How Do We Reduce Severity?

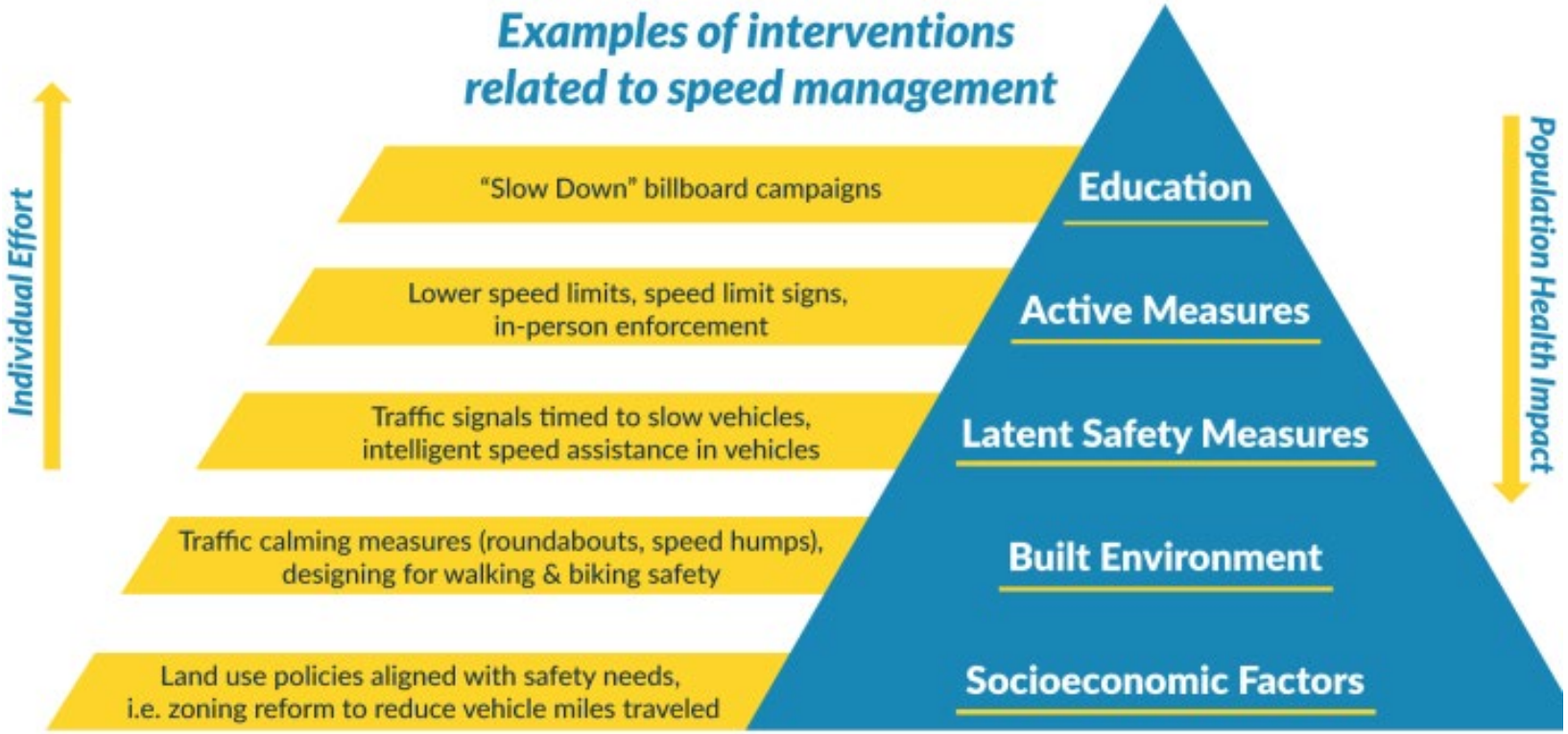
Slow Down Vehicle Speeds!



Source: FHWA & AAA Foundation for Traffic Safety

How Do We Reduce Severity?

The Most Successful Strategies to Slow Speeds are at the Base of the Pyramid



Source: Vision Zero Network; Adapted from Ederer, et al

Implementing the Safe System

Safe System Foundation	Local Access Street	Transition Street	Mobility Street
1. Safe Road Users: Reduce Exposure	Demand Management	Demand Management	Demand Management
2. Safe Speeds: Reduce Severity	Speed Management	Speed Management	Access Control and Conflict Management
3. Safe Roads: Reduce Conflicts	Conflict Management	Conflict Management	Access Control and Conflict Management
4. Safe Vehicles and 5. Post Crash Care: Ensure Redundancy	Technology, Policy, and Post Crash Care	Technology, Policy, and Post Crash Care	Technology, Policy, and Post Crash Care


Safety Wins with Signals

Safety Wins with Signals

Signal Timing 101

Signal Principles for Safety

Safety Wins with Signals

Signal Timing 101

Signal Principles for Safety

Traffic signals assign right-of-way to conflicting movements to increase the safety and control of all users

- Influence orderly traffic flow
- Reduce crashes
- Increase traffic-handling capacity of the intersection

www.fhwa.dot.gov/publications/fhwahop08024/chapter4
Signal Timing Manual – Second Edition/4B.01 Traffic Control Signals
Source: Peter Koonce

What are the Objectives of Signal Timing?

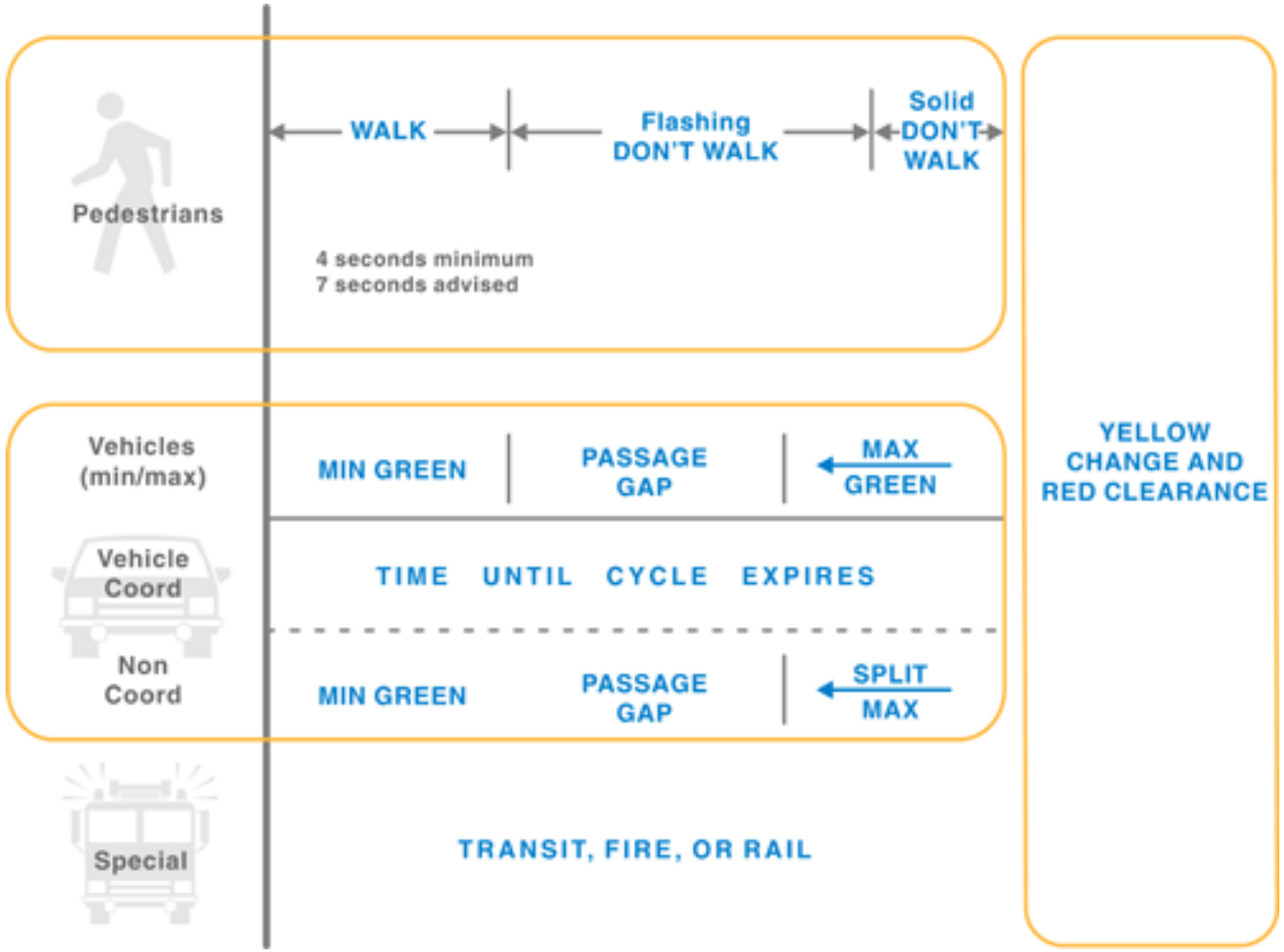
Signal timing strives to move traffic and people through an intersection safely and efficiently

Modern traffic signal controllers provide some ease of use that dated infrastructure may not

www.fhwa.dot.gov/publications/fhwahop08024/chapter1.htm
Signal Timing Manual –Second Edition/Chapter 1/1.1.3 Objectives of Basic Signal Timing Parameters and Settings
Source: Peter Koonce

What are Phases and Movements?

“A Traffic Signal Phase is Defined as the Green, Change, and Clearance Intervals in a Cycle Assigned to Specified Movement(s) of Traffic.”



Signal Timing Manual –Second Edition/4.2.1 Definitions and Terminology
Source: FHWA

What is Signal Coordination?

Coordination synchronizes multiple intersections to enhance the operation of one or more directional movements in a system

Coordination has focused on "continuous movement," but in many instances it can also be used for speed management

Source: Peter Koonce

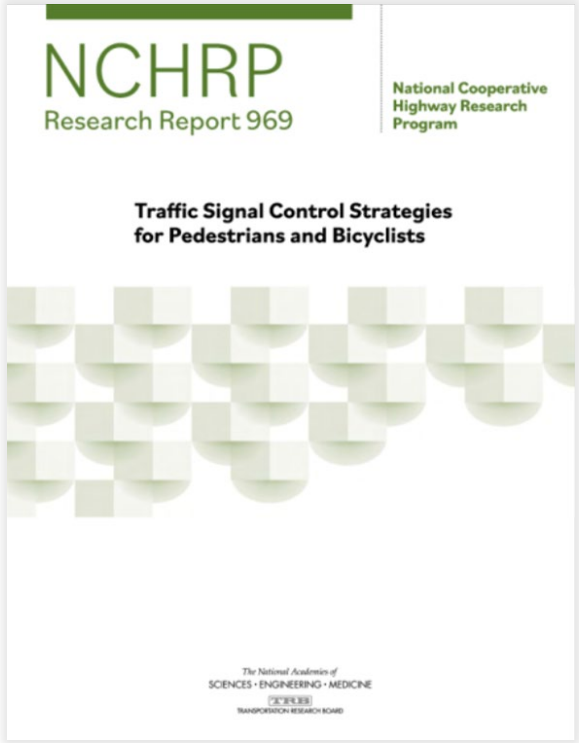
Safety Wins with Signals

Signal Timing 101

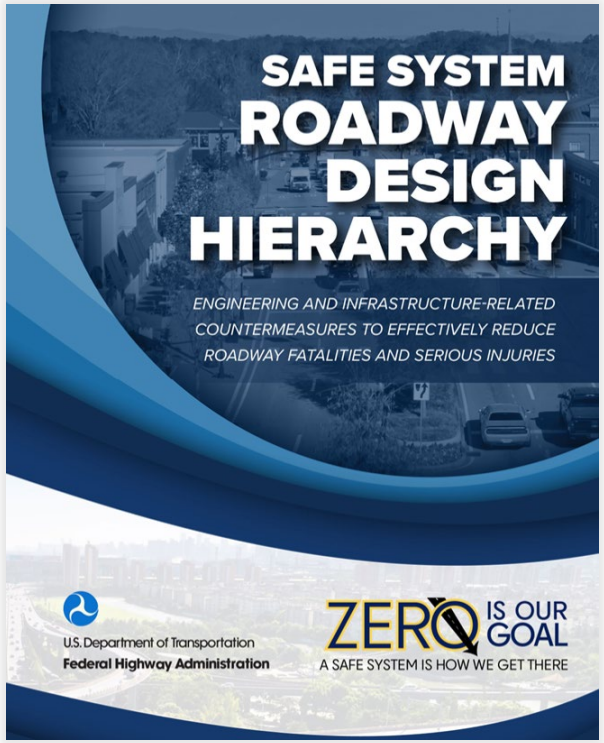
Signal Principles for Safety

Resources for Safety

NCHRP 926



NCHRP 969



FHWA Safe System Roadway Design Hierarchy

How Do We Reduce the Likelihood of Collisions?

Safe System Design in Signal Operations

Tier 1 Prohibit movements to reduce potential for conflicts

Tier 2 Signal progression and similar strategies (discussed here)

Tier 3 Separate users in time (protected turns, etc.)

Source: FHWA

Safety and Comfort

- Systemic safety recognizes the importance of both risk and comfort
- Comfort for non-motorized users is perceived safety
- Uncomfortable interactions may include potential for conflict or undesirable experiences

Source: Peter Koonce

Design and Accessibility

Pedestrian design and accessibility must be considered in concert with:

- Potential for conflicts
- Speed differential of users
- Presence of separation
- Visibility of and for users

Source: Peter Koonce

Pedestrian Comfort

- Adequate crossing time or available gaps are key
- Treatments to reduce exposure to traffic include:
  - Pedestrian refuge islands
  - Leading pedestrian intervals
  - Turn restrictions to reduce conflicts
  - Other treatments

Source: Peter Koonce

Bikeway Design

- Design users are an important consideration
- Standards may vary based on community policy, but should consider human factors such as:
  - Physical ability
  - Experience with conflicts
  - Perceptions of risk
  - Level of comfort

Source: Peter Koonce

Cyclist Comfort

- Width and connectivity of bicycle facilities are important for user comfort
- Separation from traffic provides some level of comfort on the segment level but may increase complexity at the intersection

Source: Peter Koonce

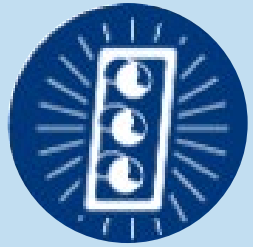
Supporting Measures

- Turn restrictions, especially No Right on Red
- Well-designed signing and marking

Source: FHWA

FHWA Proven Safety Countermeasures

Appropriate speed limits



Backplates with retroreflective borders

Variable speed limits

Dedicated turn lanes at intersections

Signal Timing to Manage Speeds

Klamath Falls, OR

This **MUTCD I1-1** sign shows that signals are synchronized to maintain safe vehicle travel speeds and discourage speeding

Source: Peter Koonce

Bicycle Green Wave

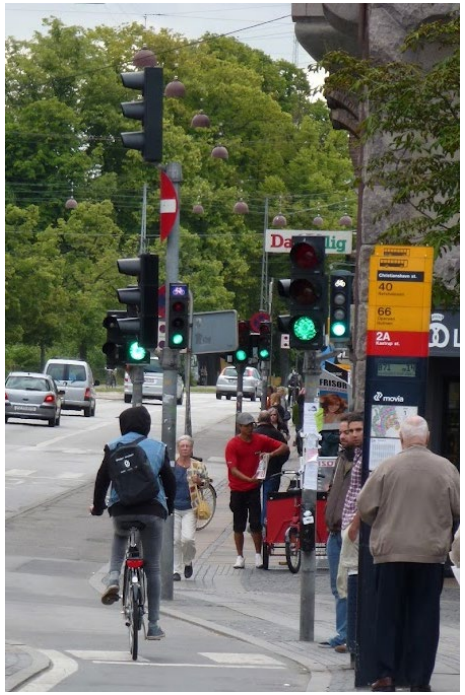
SFMTA has set offsets for traffic signals to encourage 15 mph on corridors that meet these criteria:

- More than 3 signals
- On City bike network with bike lane
- Same signal cycle length
- Outside center city grid

Source: Peter Koonce

Signal Progression for Bicycles

City	Progression Speed	Progression Direction
New York, NY	15 mph	One-way
Portland, OR	12-19 mph	One-way due to block spacing
Copenhagen, Denmark	13 mph	Varies by time of day



Copenhagen, Denmark

Source: Peter Koonce

Hawthorne Boulevard Case Study

Portland, OR

Source: Peter Koonce

2009

Source: Google

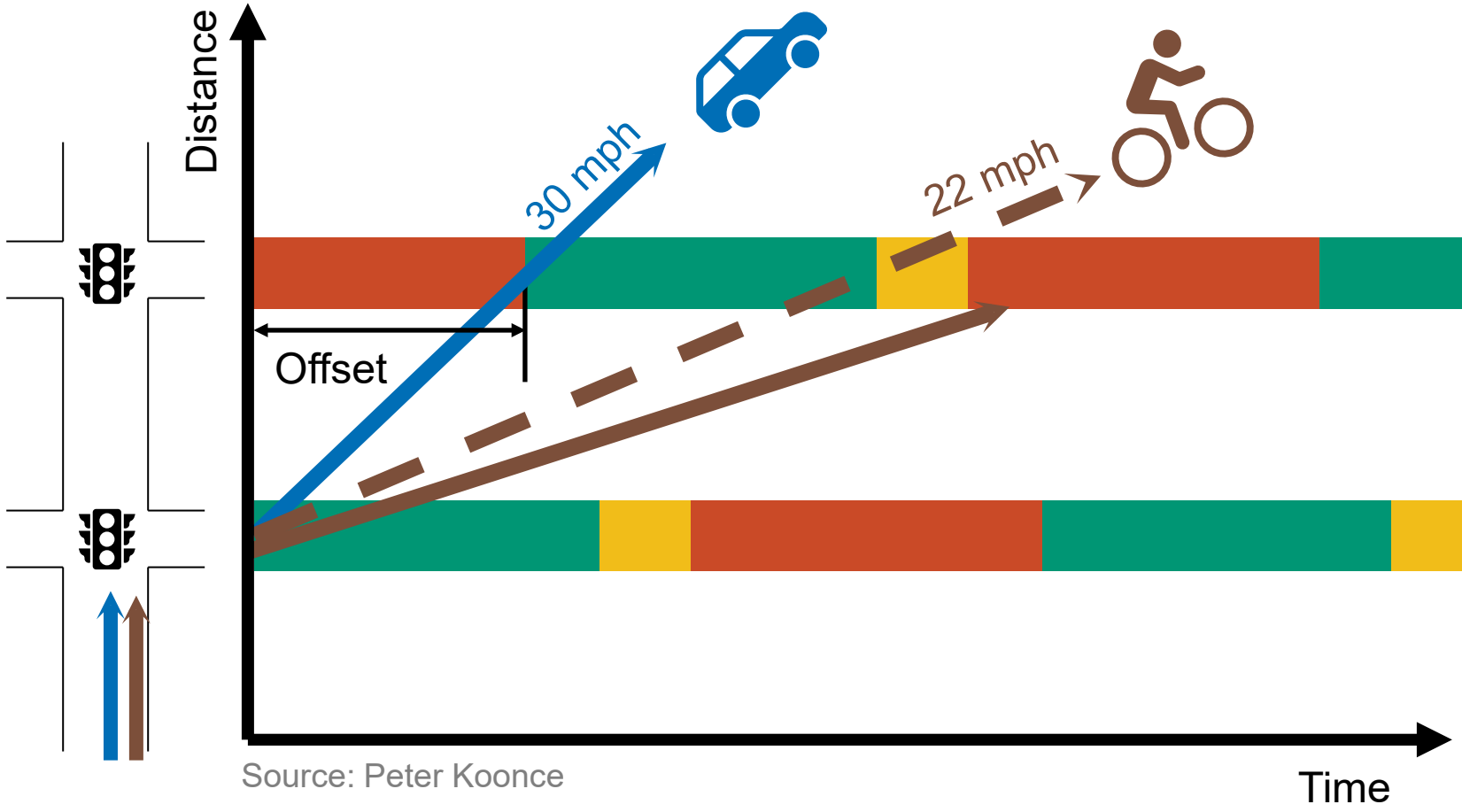
2012

Source: Google

Progression Speed and Cycling

Portland, OR

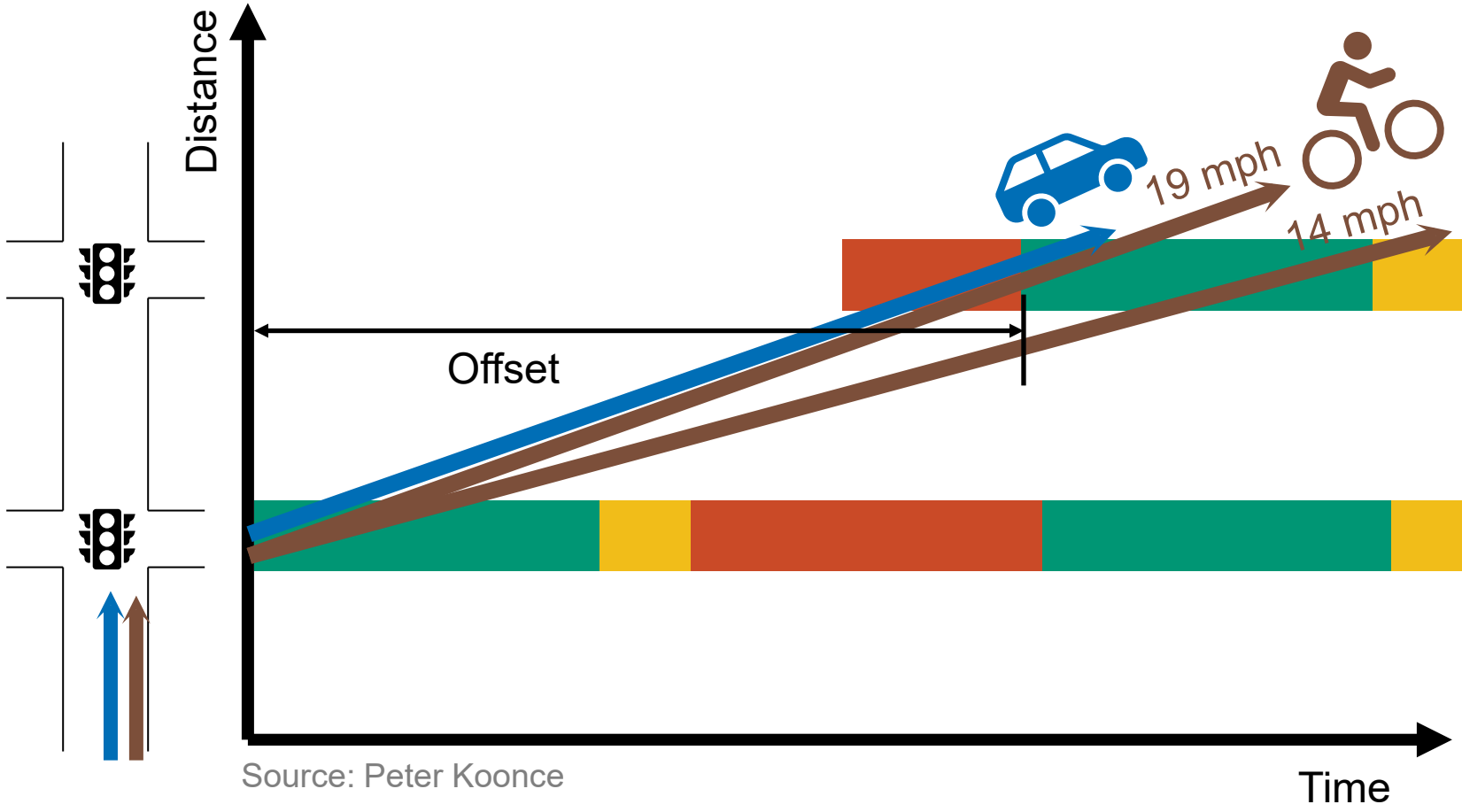
- Signal timing originally used offsets for 30 mph (speed limit)
- Bicyclists “could” get through without stopping, if they rode at 22 mph (quite a high speed for cycling)…
- …but cars didn’t even go 30 mph due to on-street parking friction, etc.



Source: Peter Koonce

Offsets Adjusted for Safety & Cycling

- New offsets use progression for measured bike speed (14-19 mph)
- This is safer for auto traffic, too



Source: Peter Koonce

2023

Source: Google

Signal Phasing and Protected Turns

- Improved safety by separating movements
- Can improve vehicle turning capacity
- Potential to increase person delay
- Agency guidance is emerging to address need for protected turn phasing

Source: Peter Koonce

Left Turn Criteria for Consideration

Revisions to Existing Criteria		Safety	Pedestrian
Number of opposing lanes of traffic	*Include bike lanes*	◑	
Crash history involving left-turn movements	*Consider severity*	●	
Speed of opposing traffic	*Lower speed (e.g., 35+ mph)*	●	
High pedestrian volumes	*Add value (e.g., 100+)*		●
New Criteria		**Safety**	**Pedestrian**
Crash history involving pedestrians		●	●
Proximity to a school		●	
“Vision Zero” corridors		●	
Safety concerns		●	
Community support		●	
Pedestrian districts		●	●
Major city bikeways		●	
Product of conflicting pedestrian and left-turn hourly volumes		◑	●
Vehicle delay			
Queues exceed left-turn pocket			
Transit cycle failures			

Source: Portland Bureau of Transportation

Turning Traffic and Bike Conflicts

Separated Bike Lane Operation	Motor Vehicles per Hour Turning across Separated Bike Lane			
	Two-way Street			One-way Street
	Right Turn	Left Turn across One Lane	Left Turn across Two Lanes	Right or Left Turn
One-way	150	100	50	150
Two-way	100	50	0	100

EXHIBIT 6A: Considerations for Time-separated Bicycle Movements

Source: Massachusetts Department of Transportation

Leading Pedestrian Intervals (LPI)

FHWA Proven Safety Countermeasure:

- Increase visibility of pedestrians
- Reduce pedestrian conflicts with turning vehicles
- Increase likelihood of motorist yielding to pedestrians
- Enhance safety for pedestrians who are slower to start crossing

Safety Benefit

13%

Reduction in pedestrian-vehicle crashes at intersections

Safety Evaluation of Protected Left-Turn Plashing and LPI on Pedestrian Safety, Report No. FHWA-HRT-18-044, October 2018.
Source: FHWA

LPI Implementation Criteria

- Crash history (frequency, severity)
- Volume of people walking
- Proximity to school
- Activity of elderly residents
- Impacts on vehicle delay
- Visibility issues
- Intersections with challenging geometry
- High turning volumes

Source: Lo, 2015 & Sharma, 2017

LPIs and Accessibility

PROWAG Guidelines

Public Right-of-Way Accessibility Guidelines (PROWAG), September 2023

ADA Requirements

Americans with Disabilities Act (ADA)

Infrastructure Considerations

Pedestrian signals, APS, LPI, bike lanes, detection

Relevant NHI/ FHWA Courses

380089 – Designing for Pedestrian Safety
142045 – Pedestrian Facility Design

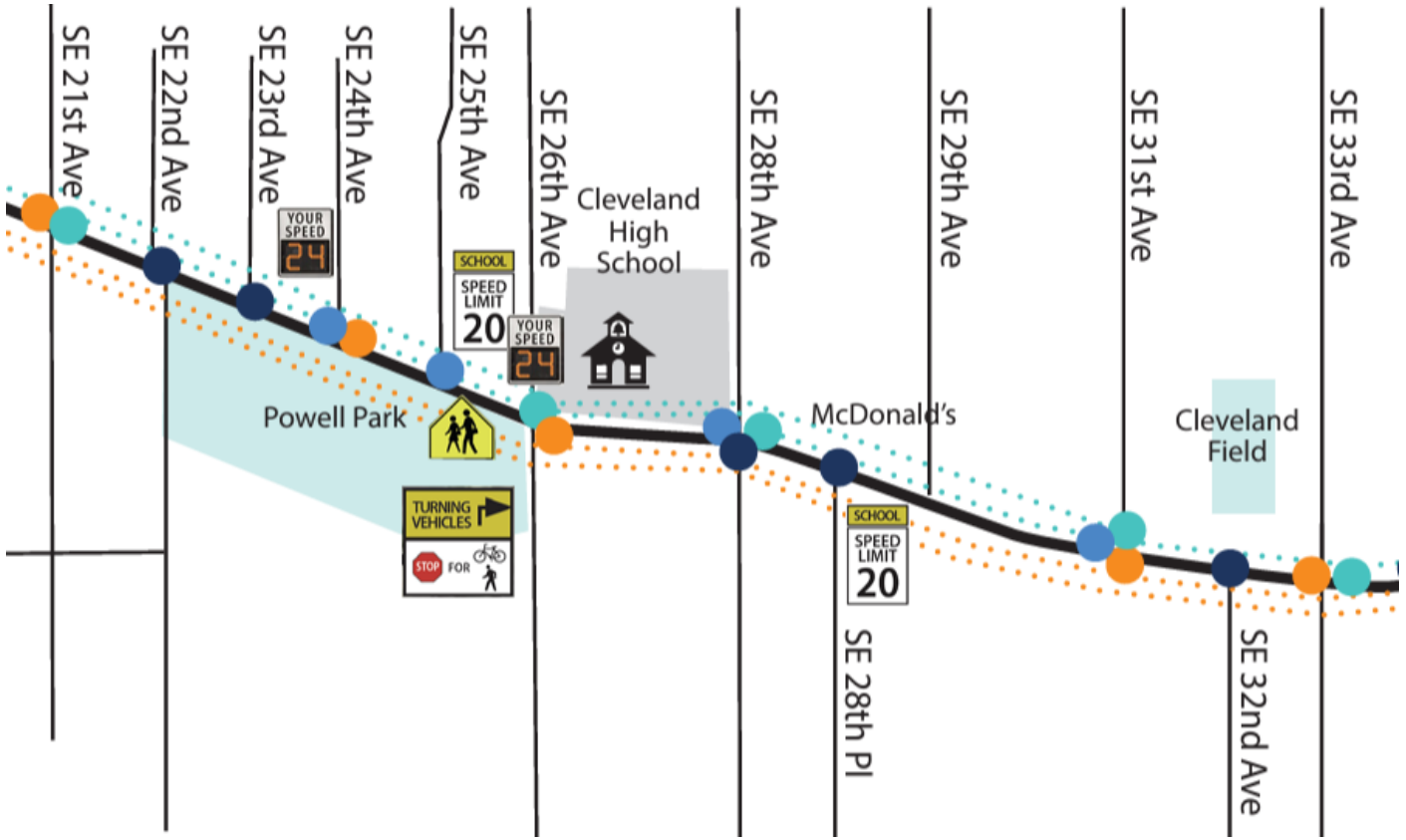
SE Powell Boulevard Case Study

IMPROVEMENT PROJECT	TIMELINE	RESPONSIBLE AGENCY
Initiate study to reallocate traffic lanes on Powell (e.g. travel lane reductions and other ideas).	Ongoing	ODOT + PBOT
Replace signal heads for visibility, paint high-visibility stop bars and trim vegetation for improved sight lines and visibility at 20+ locations between SE 8th and 88th Avenue.	Completed 2023	ODOT
Give pedestrians a walk signal before vehicles get a green light (leading pedestrian interval) and install traffic detection on Powell.	SE 7th to 31st: Complete; East of 31st: Complete	ODOT + PBOT
Photo radar for speed zone enforcement.	In progress, first speed zone anticipated summer 2024	ODOT + PBOT
Permanent speed feedback signs.	Summer 2024	ODOT + PBOT

Source: Oregon DOT

Complete “Network” to Address Safety

- Added traffic signal at SE 28th Avenue to provide additional connection
- Signal provides crossing and speed management opportunities
- Rest in Red implementation



Source: Oregon DOT

LADOT Rest in Red Operations

- Signal rests in red until a vehicle places a call
- Depending on active calls, the signal turns green immediately
- Detector may be placed at safe stopping distance for desired speed

https://ladot.lacity.gov/docs/traffic-signal-design-guidelines
Source: Peter Koonce

LADOT Rest in Red Detection Example

- Rest in red detectors are used to cause motorists to decelerate on the approach to a signal, where there is a documented crash pattern with excessive speed as the primary factor
- Signal rests in red for all directions when no call
- “Engineering Team is hesitant to trigger red if speed is excessive”

Conditions for Application
Add detection and reduce Ped Recall
Applications with high speed/isolated operations
Example Intersections
Beverly Glen Blvd at Rochester
Olympic at Foster, Century Park West

Source: LADOT

Beyond Signals

Striping, signing, and additional measures can be used to manage speeds

Feedback warning signs provide information to drivers

IMPROVEMENT PROJECT	STATUS	
Update painting and striping to improve visibility of existing crosswalks and advance stop bars at SE 26th, 28th and 31st Avenue intersections.	Complete	
Encourage slower turns using striping at SE corner of 26th at SE Powell.	Complete	
Install "Turning vehicles STOP for pedestrians and bicycles" signs at SE 26th, both northbound and southbound.	Complete	
School Speed Zone with permanent signing on SE Powell Boulevard. These will reduce speed to 20 mph from 7 a.m. – 5 p.m. near Cleveland High School.	Complete	
Install temporary speed feedback signs to remind drivers to slow down.	Complete	

Source: Oregon DOT


Small Group Activity

Small Group Activity

1

Review the images and information you have for each of your streets

2

Review the countermeasure playing cards and decide which countermeasures you want to apply to each street

3

Share back group's thoughts and discussion

Next Steps

Next Steps

Engagement

Community engagement at summer events & neighborhood activities

Safety Strategies

Project team identifying safety strategies specific to Sacramento