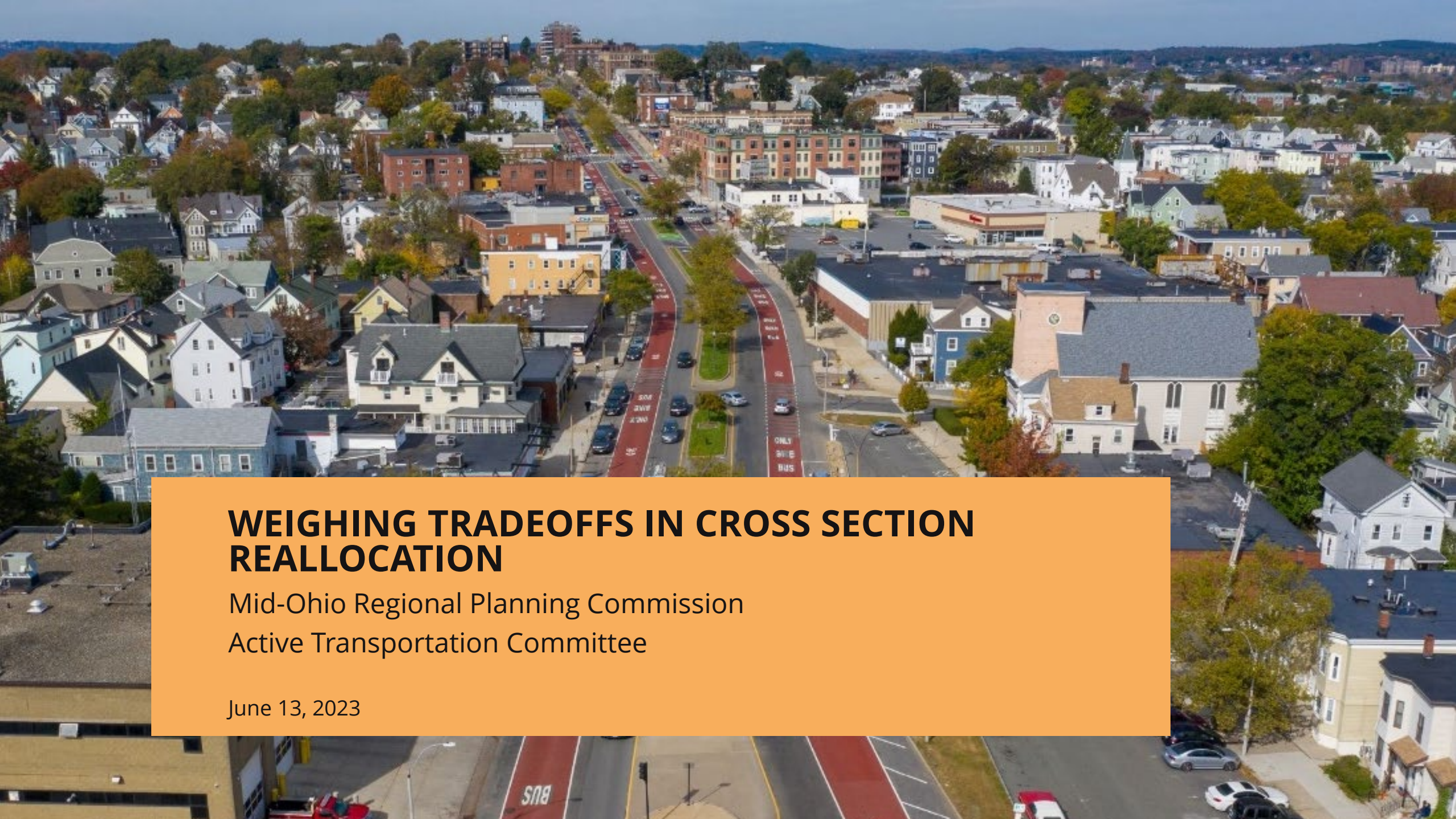


WEIGHING TRADEOFFS IN CROSS SECTION REALLOCATION

Mid-Ohio Regional Planning Commission

Active Transportation Committee

June 13, 2023

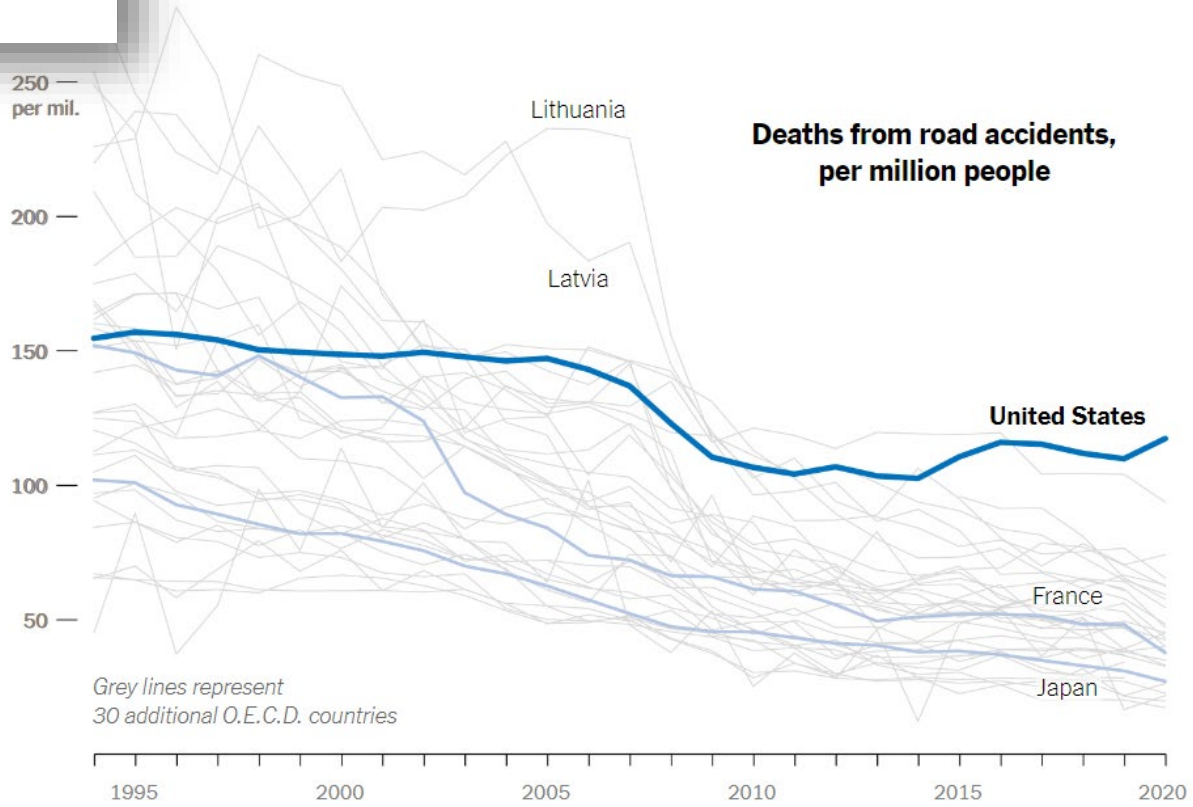
Raising the Floor For Safety – Guide for Cross Section Reallocation (aka NCHRP 1036)

- Why + Who
- What: Three key takeaways
  - Daylighting decision making
  - Raising the floor for safety
  - All day operations
- How could you use this research?

Nov. 27, 2022 The New York Times

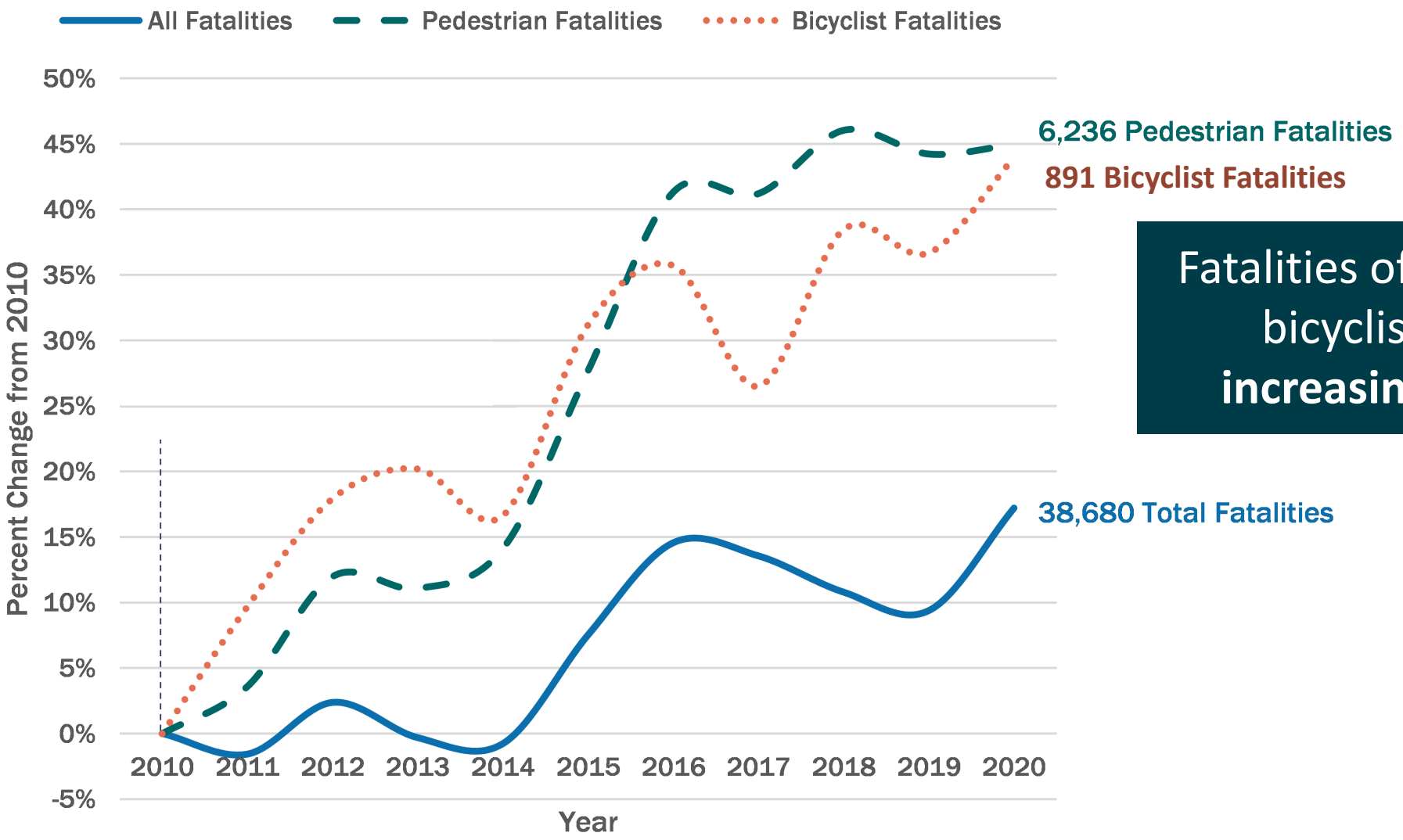
The Exceptionally American Problem of Rising Roadway Deaths

Why other rich nations have surpassed the U.S. in protecting pedestrians, cyclists and motorists.



Source: Organization for Economic Cooperation and Development • The New York Times

WE HAVE A NATIONAL ROADWAY SAFETY PROBLEM – AND IT IS GETTING WORSE… ESPECIALLY FOR PEOPLE WALKING AND BIKING



Fatalities of pedestrians and bicyclists have been **increasing even greater**

Source: US DOT

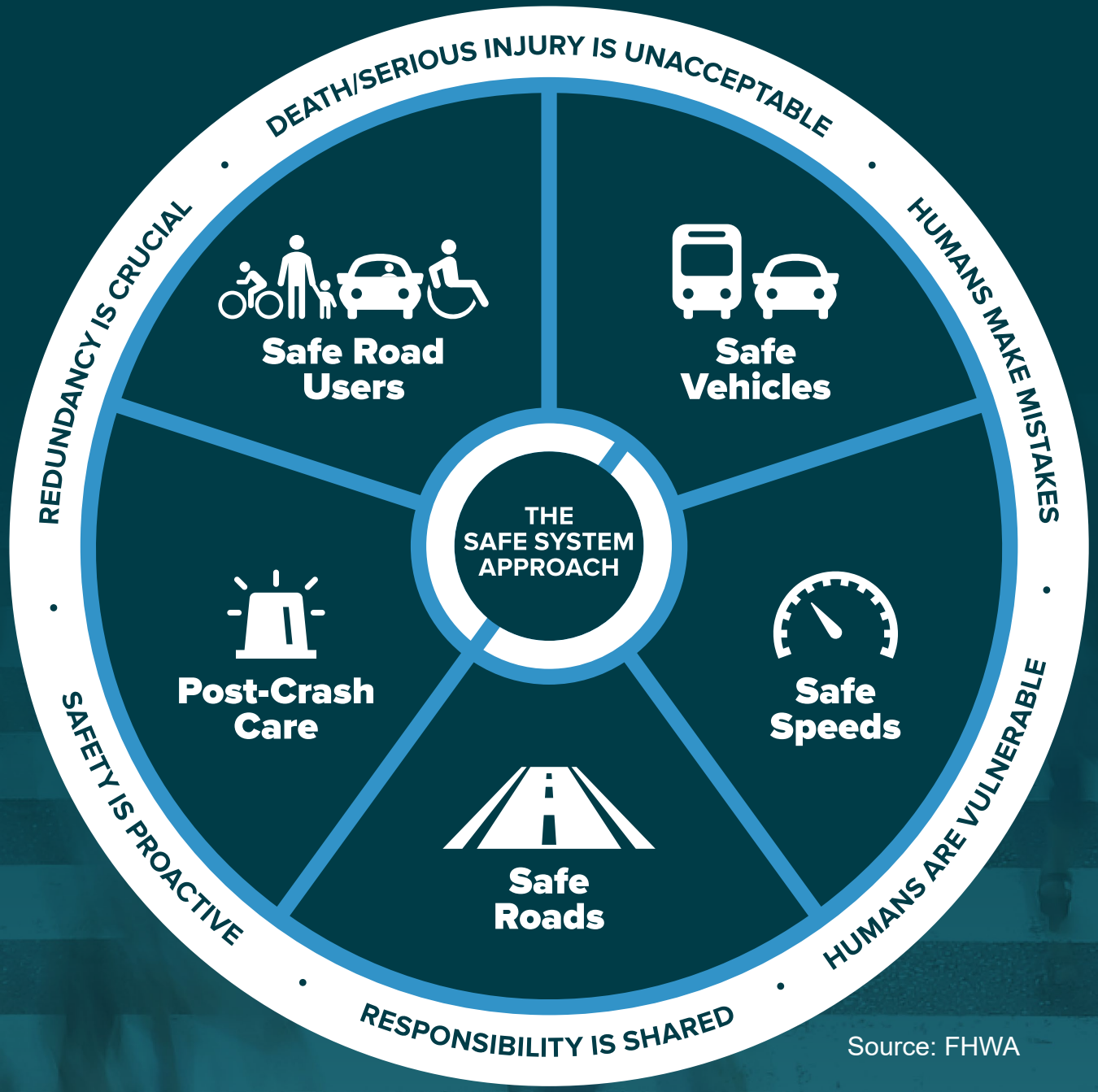
FHWA IS LEADING THE SHIFT – TO THE SAFE SYSTEM APPROACH

The **Safe System Approach** aims to eliminate fatal and serious injuries for all road users by:

Accommodating human mistakes

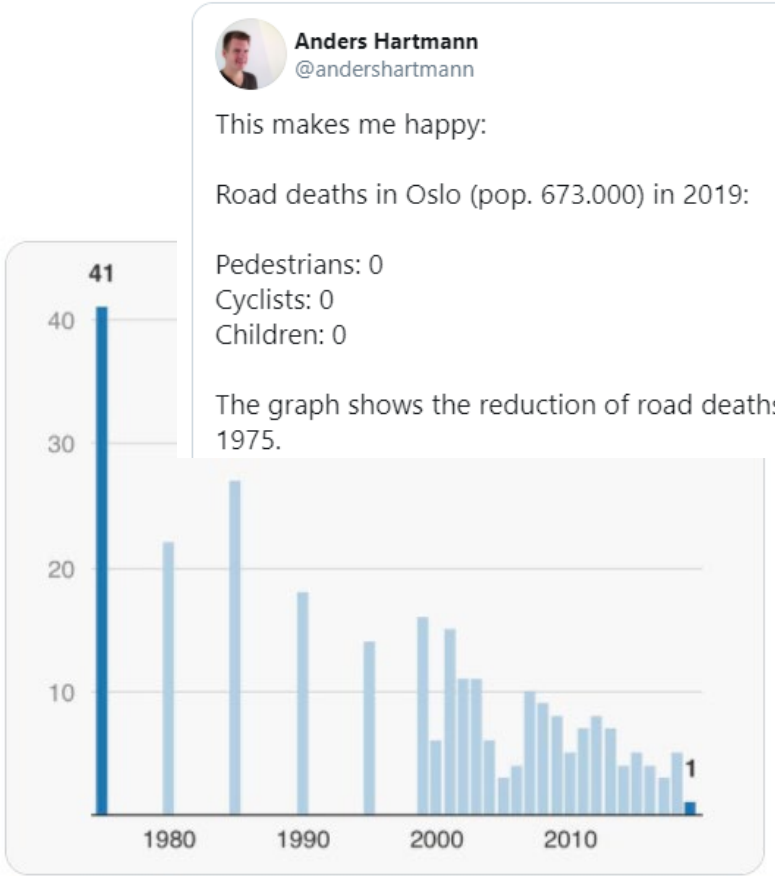
Keeping impacts on the human body at tolerable levels

THE SAFE SYSTEM APPROACH



Source: FHWA

ZERO IS POSSIBLE – OSLO, NORWAY



HOBOKEN VISION ZERO

CURBED

GETTING AROUND | JUNE 17, 2022

Hoboken Hasn't Had a Traffic Death in Four Years. What's It Doing Right?

By Christopher Robbins

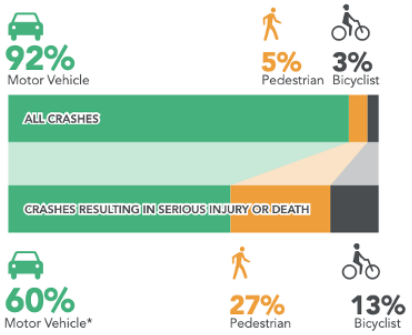
Photo: Chris Robbins

WHY DOES HOBOKEN NEED VISION ZERO?

PREVENTABLE CRASHES ARE OCCURRING ON HOBOKEN'S STREETS

There were 4,451 total crashes, 13 of which resulted in serious injury or death, between 2014 and 2018 on the streets of Hoboken. Many of these occurred at specific 'high crash frequency intersections' at major gateways to Hoboken. Most crashes involve vehicles, but people walking or biking are much more likely to be injured or killed in crashes.

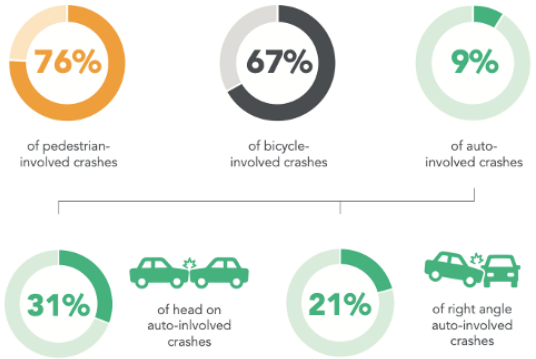
VULNERABLE TRAVELERS



People walking and bicycling are involved in 8% of all crashes but 40% of those resulting in serious injury or death.

CRASHES THAT RESULT IN SERIOUS INJURY OR DEATH

People walking and bicycling are more likely to be severely injured or killed than those in a car.



COMMON CRASH CAUSES AND LOCATIONS

Driver inattention caused 71% of preventable crashes .

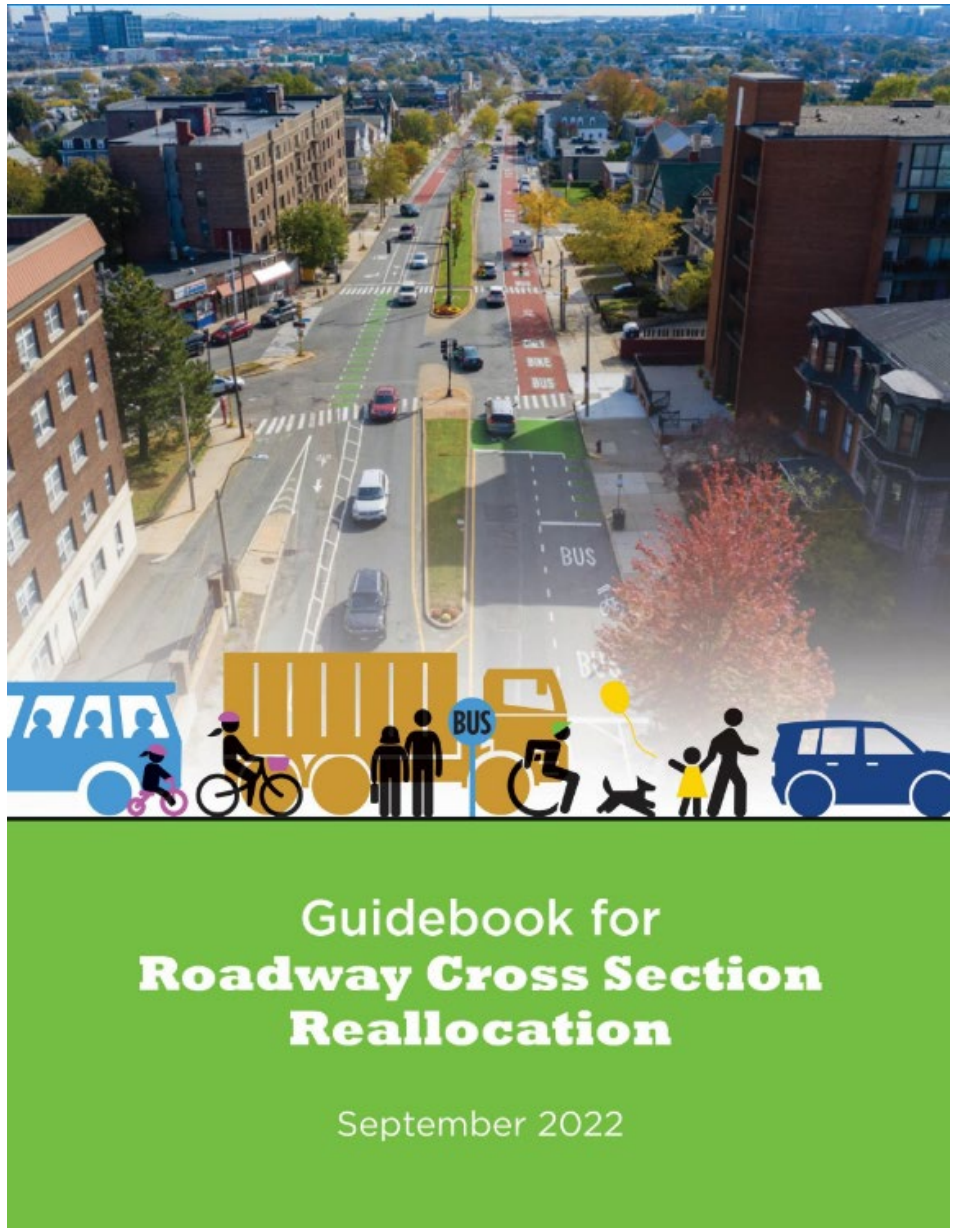
A large majority of bicycle and pedestrian crashes occurred in crosswalks at intersections.

Most bicycle crashes occurred on a bicycle facility.

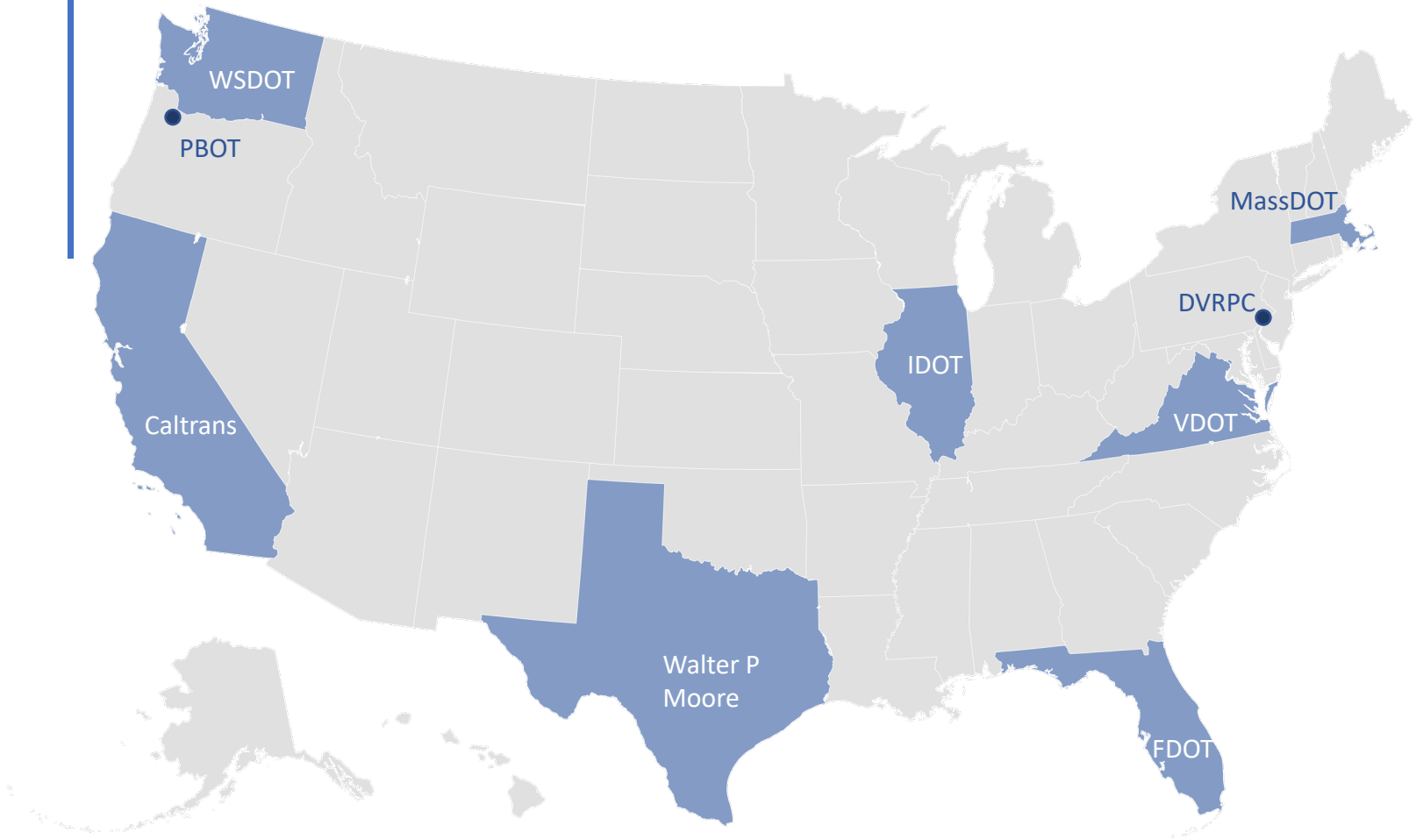
Vehicles hitting parked cars accounted for 30% of all crashes.

A NEW PARADIGM

- **NCHRP 1036**: Roadway Cross Section Reallocation – A Guide
- A new framework for allocating roadway space
- Daylighting decision-making
- Raising the floor on safety
- Connecting decisions to outcomes



WHO WAS INVOLVED?



NCHRP Research Panel

Agency (Current Role)	Panel Member
Caltrans	Antonette Clark
Delaware Valley Regional Planning Council (CALSTART)	Al Beatty
Florida DOT	Jeremy Fletcher
Illinois DOT	Jonathan McCormack
Massachusetts DOT (Toole Design)	Michelle Danila
Portland Bureau of Transportation	Karla Kingsley
Walter P Moore	April Eke
Washington DOT	Celeste Gilman
FHWA	Clayton Wellman
AASHTO	Patricia Bush
NCHRP	Dianne Schwager

Project Team

Kittelson, Mobycon, Safe Streets, ITRE

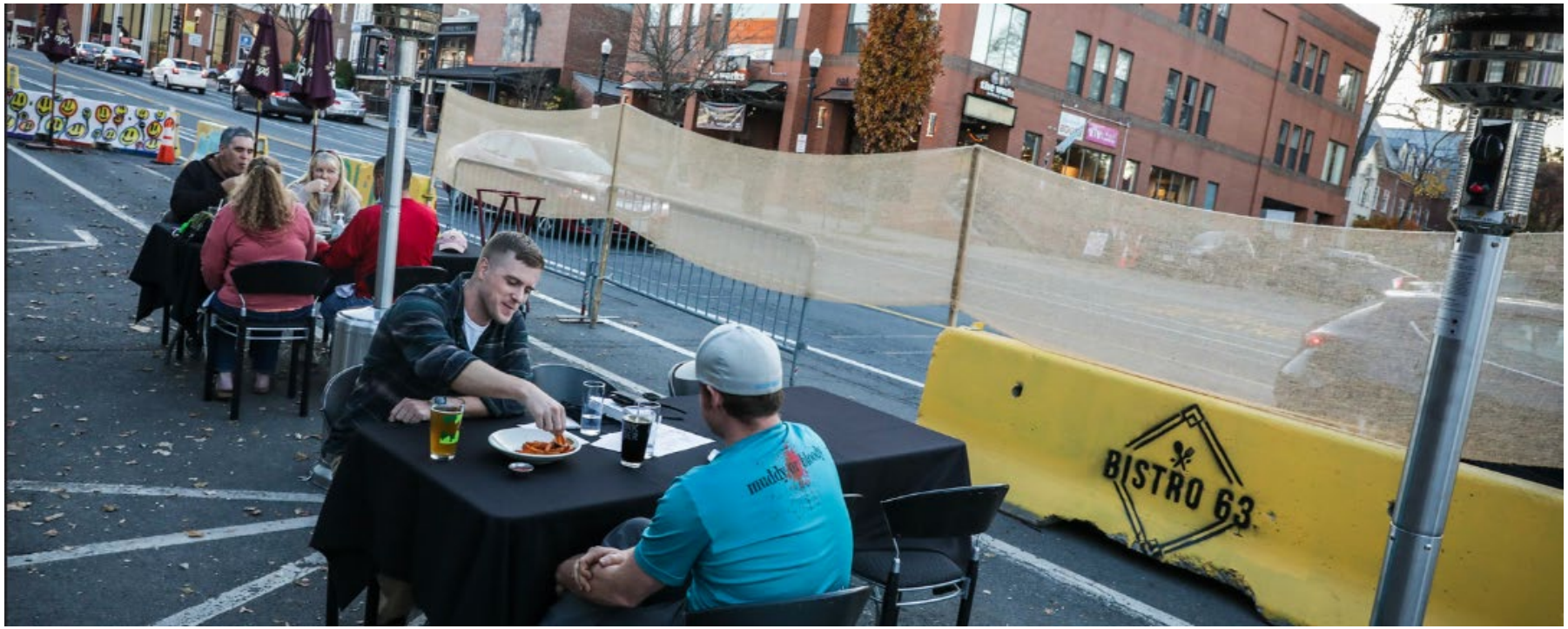
DAYLIGHT DECISION-MAKING

WM
WASTE MANAGEMENT

SERVING OUR CLIENTS NEEDS

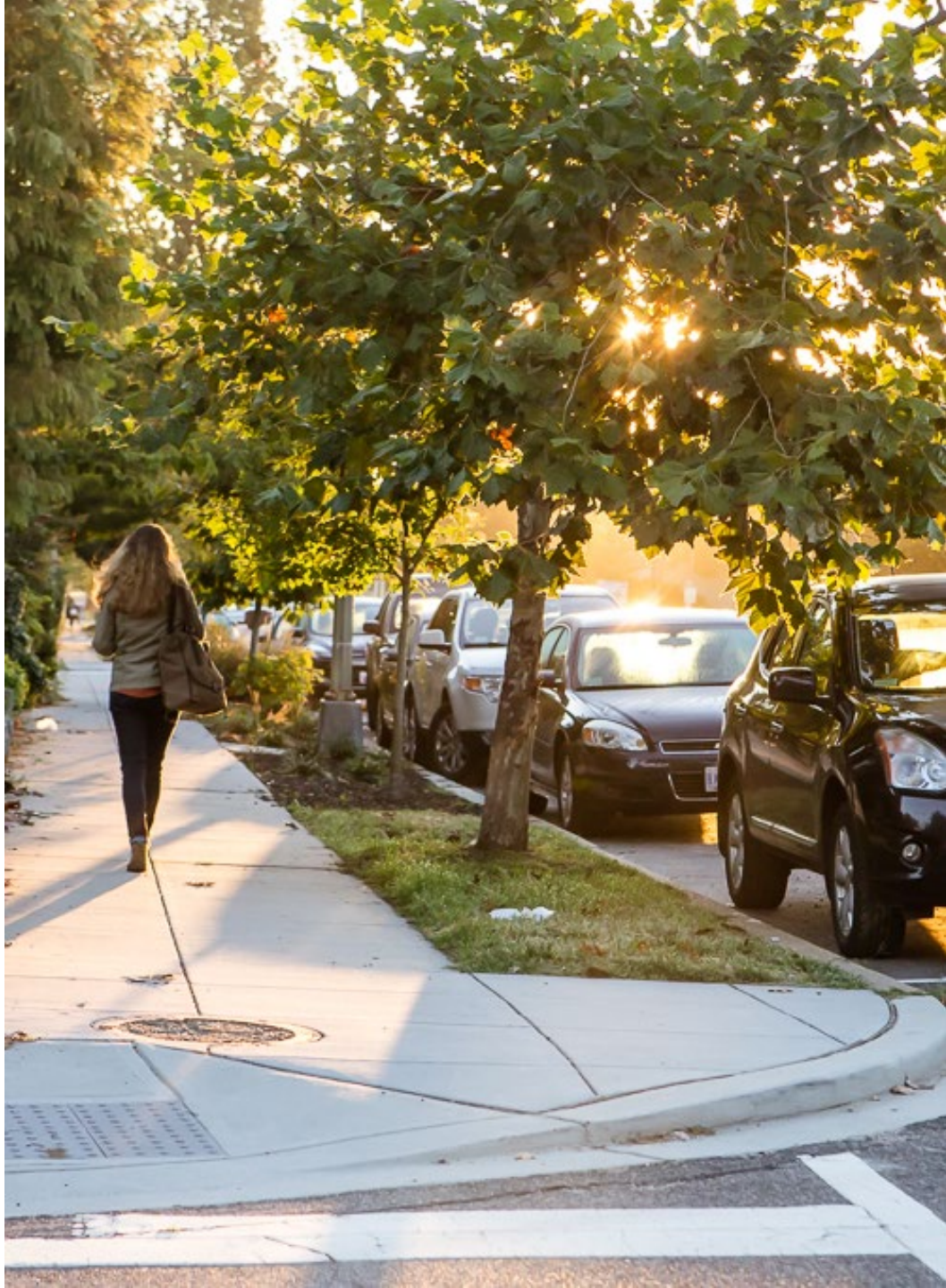
- MassDOT Mission Statement

  "Our mission is to deliver excellent *customer service* to the people who travel in the Commonwealth and to provide our nation's *safest* and most *reliable* transportation system in a way that strengthens our economy and quality of life."



BARRIERS TO SAFE STREET DESIGN

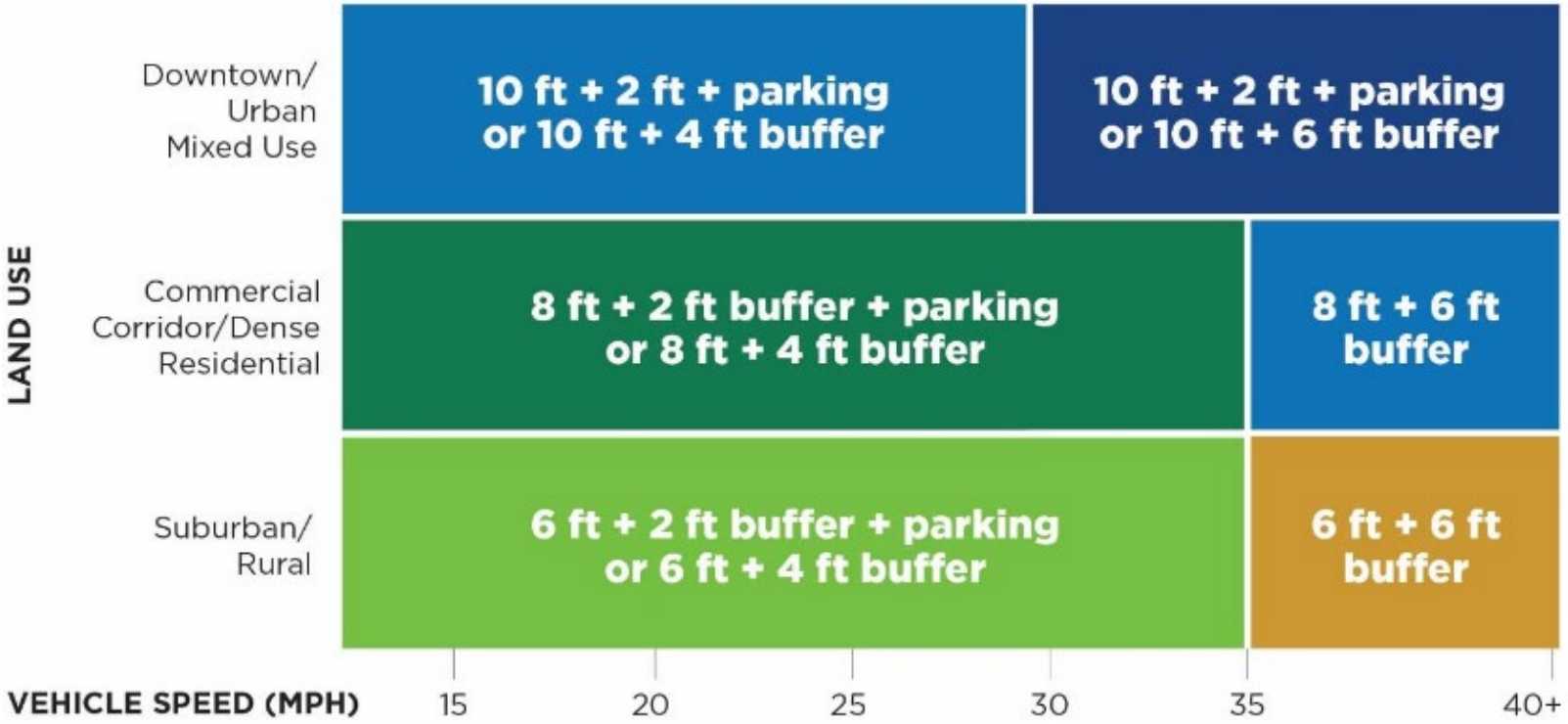
- Agencies are looking for information to support changes to the cross section
- Peak hour intersection operations limit cross section opportunities
- Lack of transparency in the decision-making process
- In practice, safety has not always been the top priority

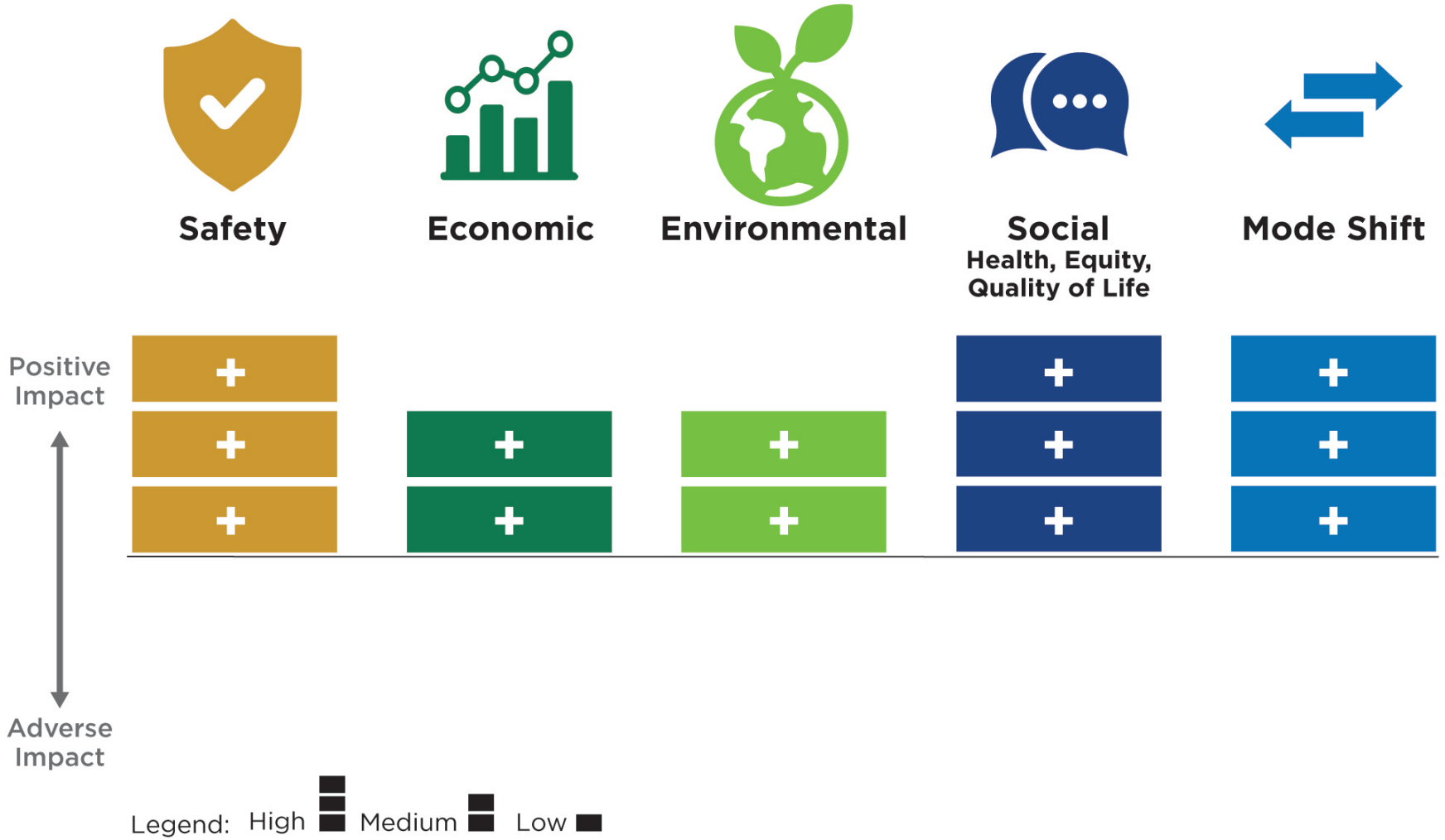


RETHINKING HOW WE USE OUR STREETS

RAISING THE FLOOR ON TRANSPORTATION SAFETY

RAISING THE FLOOR ON TRANSPORTATION SAFETY

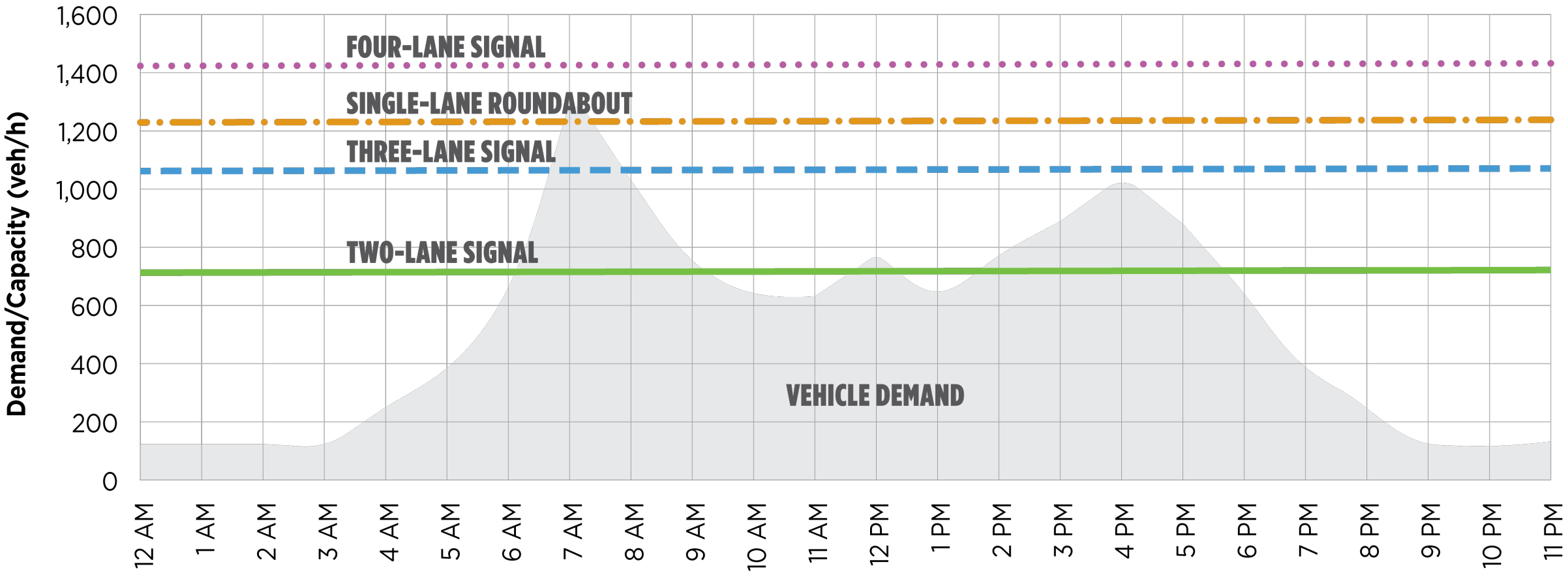




Outcomes of adding bicycle lanes

“That won’t work.”

ALL-DAY INTERSECTION ASSESSMENT



4 LANE

7AM

NOON

7PM

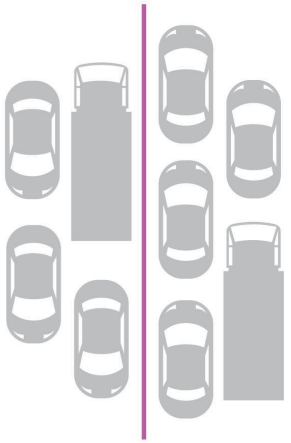
WHAT'S WRONG WITH UNUSED CAPACITY?

UNDER CAPACITY = HIGHER SPEEDS

WHICH ARE ASSOCIATED WITH INCREASED AND MORE SEVERE CRASHES

OVERDESIGNING FACILITIES

FOR CARS MAKES THEM LESS SAFE FOR PEOPLE WALKING AND BIKING



THE MORE TRAVEL LANES, THE

LONGER WAIT TIMES

FOR ALL MODES

STREETS MAKE UP MORE THAN

OF PUBLIC SPACES IN CITIES AND TOWNS

THE 24-HOUR CAPACITY FRAMEWORK

HOURLY DEMAND-TO-CAPACITY (D/C) RATIO

allows practitioners to assess whether demand exceeds capacity at any time during the day and, if so, for how long

16hr EFFICIENCY

The percentage of the hours between 5:00 a.m. and 9:00 p.m. the street utilizes at least 60% of its potential capacity

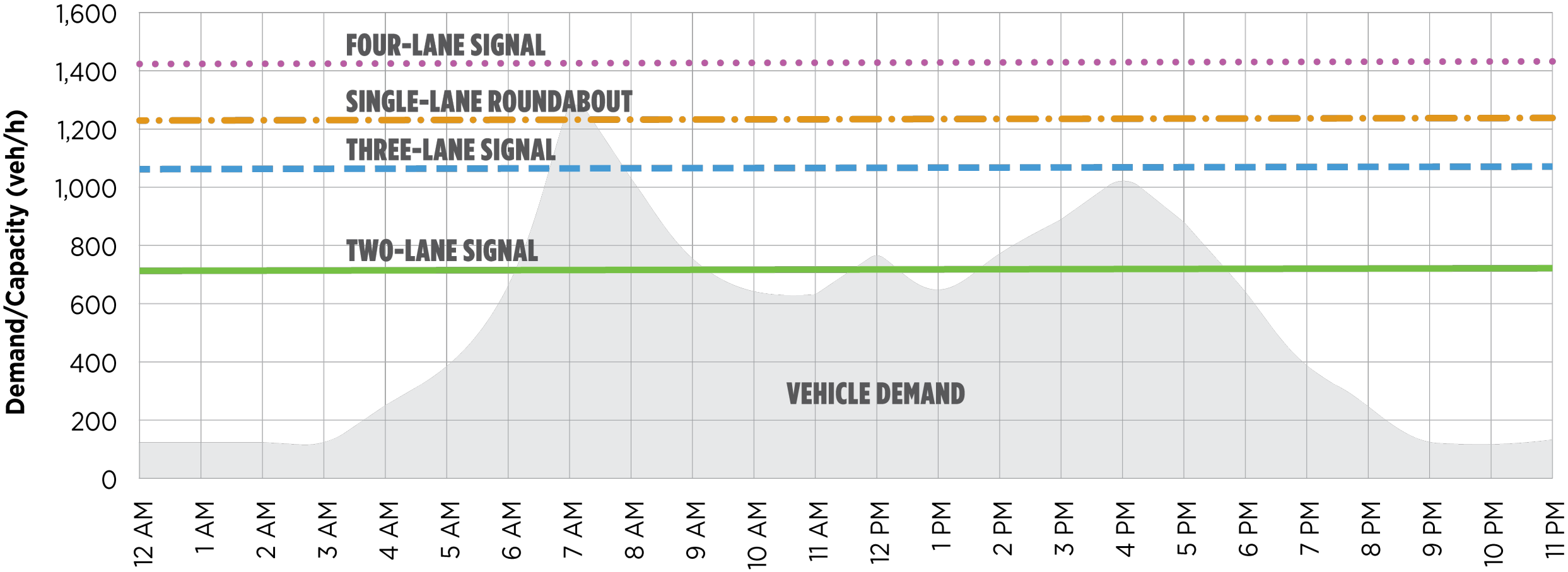
16hr EXCESS LANE-CAPACITY

The lane-capacity provided for but unused during that 16-hour period

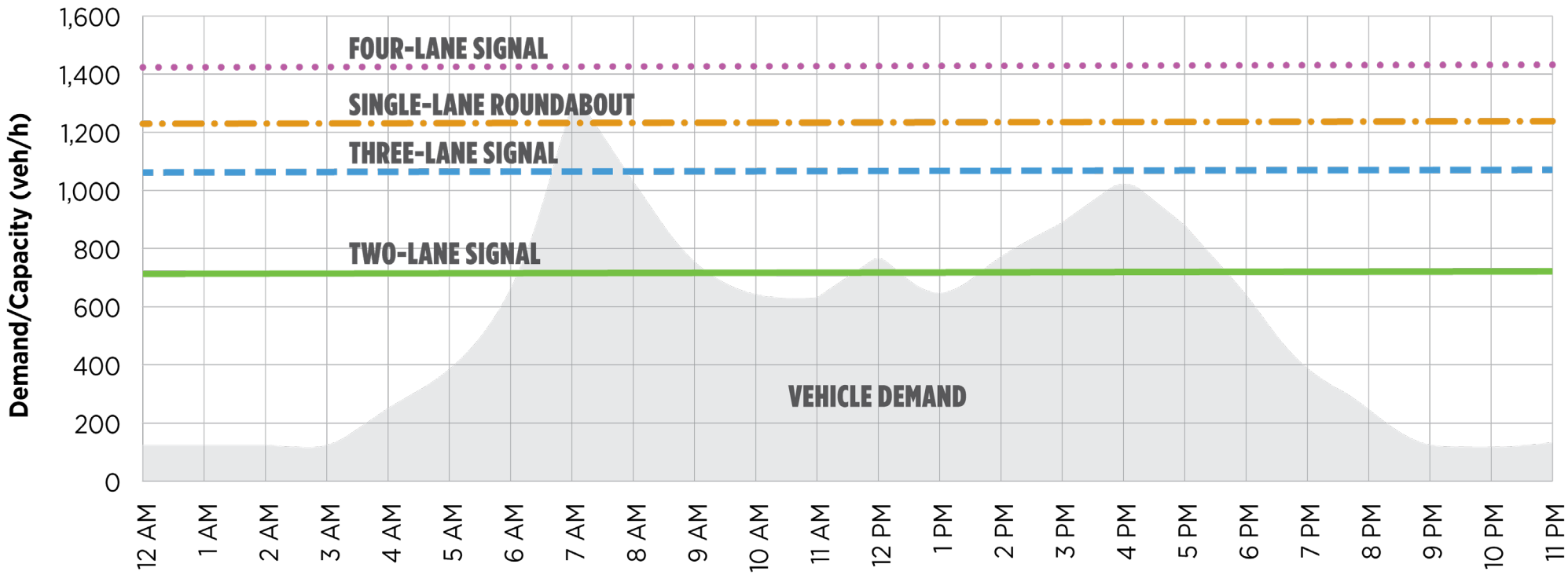
TOTAL HOURS BELOW CAPACITY

The number of hours (out of 24) during which the street is operating below capacity

ALL-DAY INTERSECTION ASSESSMENT



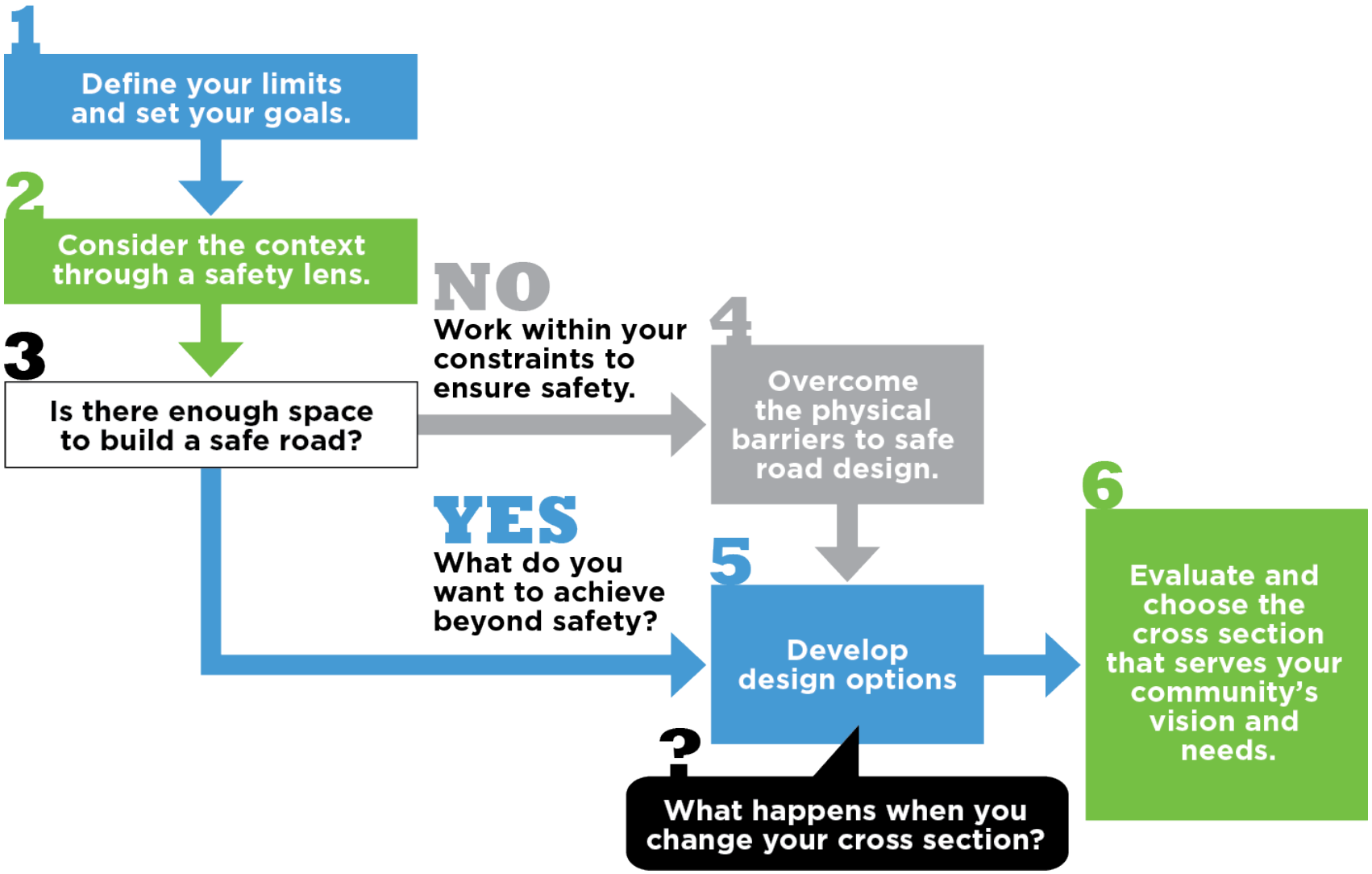
ALL-DAY INTERSECTION ASSESSMENT



Intersection Control	Max Demand-to-Capacity Ratio (d/c)	16-Hour Efficiency	16-Hour Excess Capacity (Lane Hours)	Total Hours Below Capacity
FOUR-LANE SIGNAL	0.89	31.3%	15.9	24
THREE-LANE SIGNAL	1.18	50.0%	8.2	23
TWO-LANE SIGNAL	1.77	81.3%	2.2	16
SINGLE-LANE ROUNDABOUT	1.02	50.0%	6.7	23

	7AM	NOON	7PM
4 LANE			
3 LANE			

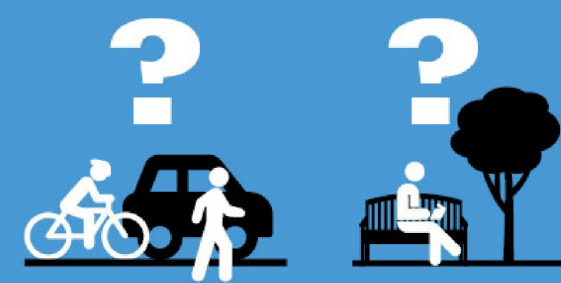
A NEW DECISION-MAKING FRAMEWORK



1 Define your limits and set your goals.

How much space do you have to work with?

What purpose does the road serve?



What are your community's priorities?

1 Define your limits and set your goals.

2022 PAVING PLAN & PROPOSED STRIPING MODIFICATIONS

Annandale Road

BEFORE

Speeding Concerns

AFTER

Top speeds virtually eliminated

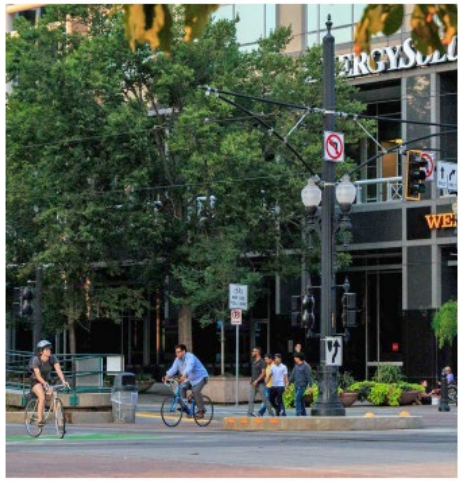
1 Define your limits and set your goals.

1 Define your limits and set your goals.

Salt Lake City

STREET AND INTERSECTION TYPOLOGIES DESIGN GUIDE

PERSON MOBILITY:



GREENING:

PLACEMAKING:

CURBSIDE USES:

VEHICLE MOBILITY:

2 Consider the context through a safety lens.

Determine the **minimum safe travel space** for people walking, bicycling, riding transit, and driving.

2 Consider the context through a safety lens.

DESIGNING FOR “8 TO 80”

BUILD IT FOR ISABELLA

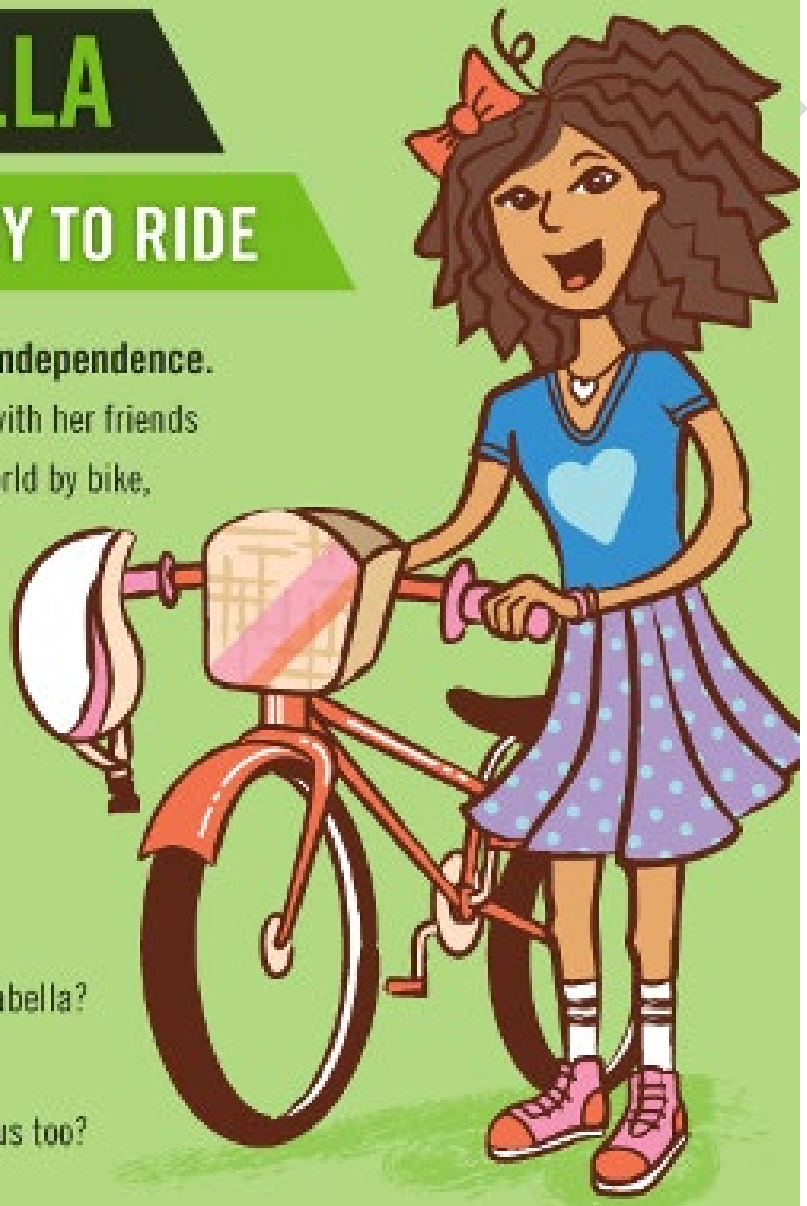
ISABELLA: 12 YEARS OLD AND READY TO RIDE

Meet Isabella. Like most girls her age, she is exploring her independence. She just started 7th grade and loves doing cartwheels in the grass with her friends and sharing her life through Instagram. She is ready to travel her world by bike, but is the network ready for her? Isabella wants to bike to school, the library and the ice cream shop, but her mom worries about her getting across or along busy streets. Isabella likes to ride, but she's still small and her skills aren't fully developed. She's sometimes a little wobbly and it's hard for her to see over parked cars near intersections.

What does Isabella need to ride safely around her world?

- Are we planning low-stress, connected networks that work for Isabella?
- What if every project was designed with Isabella in mind?

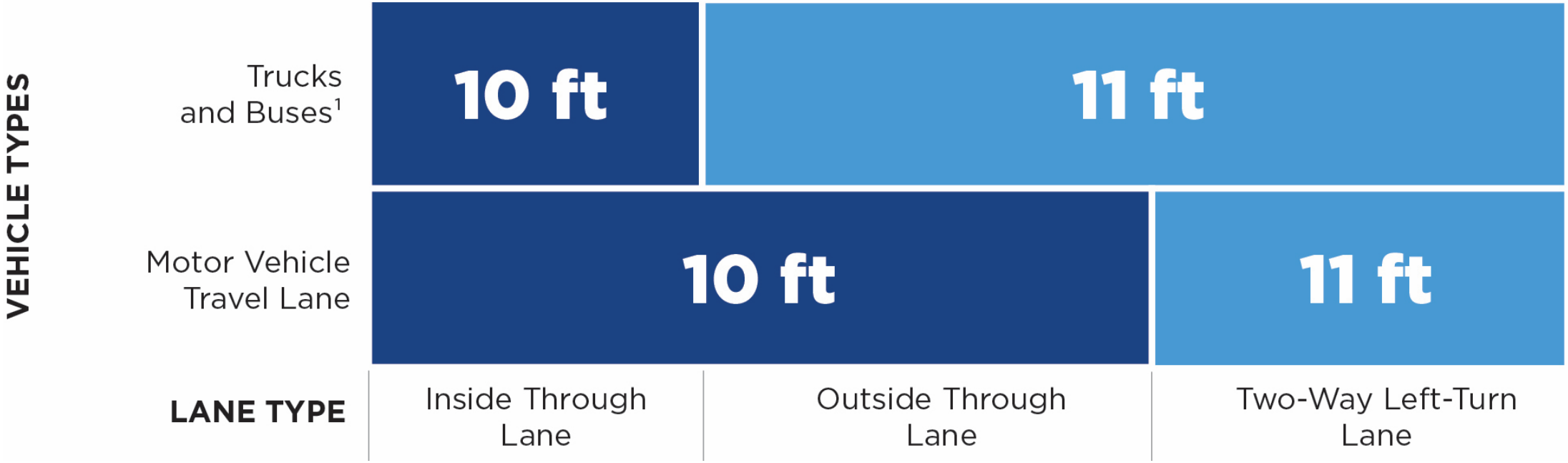
If we build it for Isabella, wouldn't it work beautifully for the rest of us too?



Source: The Green Lane Project

2 Consider the context through a safety lens.

Recommended general-purpose lane widths



*The recommended width for bus lanes is 11 feet in all contexts

2 Consider the context through a safety lens.

Recommended bike lane and buffer widths

≤20 MPH

Vehicle Volume (ADT)	# of Travel Lanes	Facility Type (Width)	Street Buffer Type (Width)	On-Street Parking Location (Additional Buffer Width)	Supported By
<2000	No centerline	Mixed traffic (15-19 feet)	Not applicable (Not Applicable)	Curbside (Not Applicable)	MassDOT*, CROW
2000-4000					
>4000		Bike lane (5.5 feet)	Paint (Not Applicable)		FHWA, MassDOT, CROW

*FHWA = Schultheiss et al. 2019; NACTO = NACTO 2014; MassDOT = MassDOT 2015; CROW = Koster 2016

25 MPH

Vehicle Volume (ADT)	# of Travel Lanes	Facility Type (Width)	Street Buffer Type (Width)	On-Street Parking Location (Additional Buffer Width)	Supported By
<1500	No centerline	Mixed traffic (15-19 feet)	Not applicable (Not Applicable)	Curbside (Not Applicable)	NACTO, MassDOT
1500-3000	1 lane per direction	Bike Lane (5.5 feet)	Paint (Not Applicable)	Curbside (1 foot)	NACTO, MassDOT, CROW
3000-6000		Buffered bike lane (5.5 feet)	Paint (1 foot)	Curbside (1 foot)	FHWA, NACTO, MassDOT, CROW
>6000	2 lanes per direction	Separated bike lane (6 feet)	Light separation* (1 foot)	Floating (2 feet)	NACTO, MassDOT, CROW
		Raised bike lane (6 feet)	Light separation (2 feet)		
		Two-way bike lane (10 feet)	Light separation (2 feet)	Floating (1 foot)	

*Light separation includes flexposts, some rigid bollards, plastic planter boxes, rubber curbs, or precast concrete curbs/parking stops.

30 MPH

Vehicle Volume (ADT)	# of Travel Lanes	Facility Type (Width)	Street Buffer Type (Width)	On-Street Parking Location (Additional Buffer Width)	Supported By
<6000	Any	Separated bike lane or raised bike lane (6 feet) Two-way bike lane (10 feet)	Light separation (1 foot)	Floating (2 feet)	NACTO, MassDOT, CROW
>6000			Light separation (2 feet)		

35 MPH

Vehicle Volume (ADT)	# of Travel Lanes	Facility Type (Width)	Street Buffer Type (Width)	On-Street Parking Location (Additional Buffer Width)	Supported By
Any	Any	Separated bike lane or raised bike lane (6 feet) Two-way bike lane (10 feet)	Heavy separation* (5 feet)	Floating (2 feet)	FHWA, NACTO, MassDOT, CROW

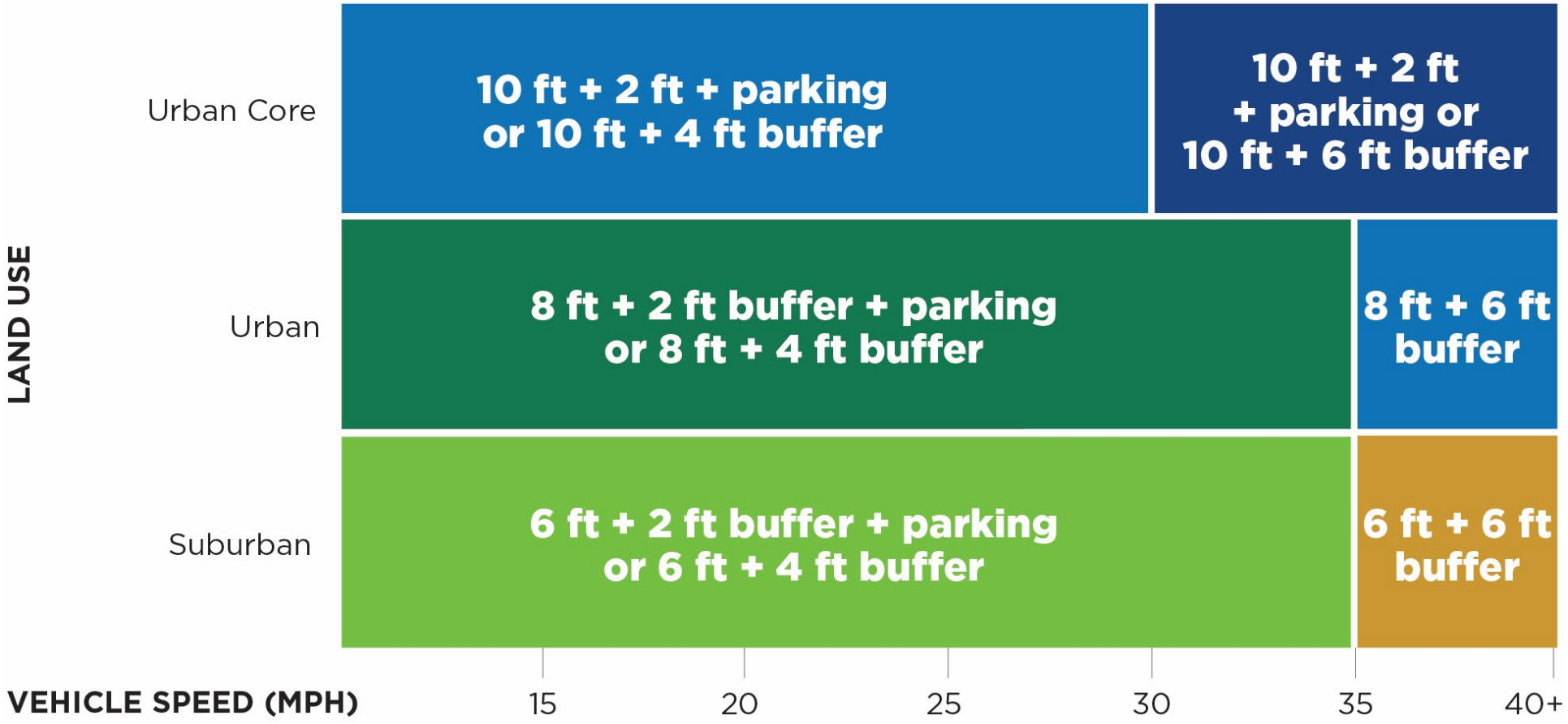
*Heavy separation includes vehicle parking, concrete planter boxes, reinforced rigid bollards, cast-in-place concrete curbs, concrete barriers, or guide rails. Should have half-meter clearance between bike and object.

>35 MPH

Vehicle Volume (ADT)	# of Travel Lanes	Facility Type (Width)	Street Buffer Type (Width)	On-Street Parking Location (Additional Buffer Width)	Supported By
Any	Any	Raised bike lane (6 feet) Raised two-way bike lane (10 feet) Multiuse path (12 feet)	Heavy separation (6 feet)	Not applicable (Not applicable)	FHWA, NACTO, MassDOT, CROW

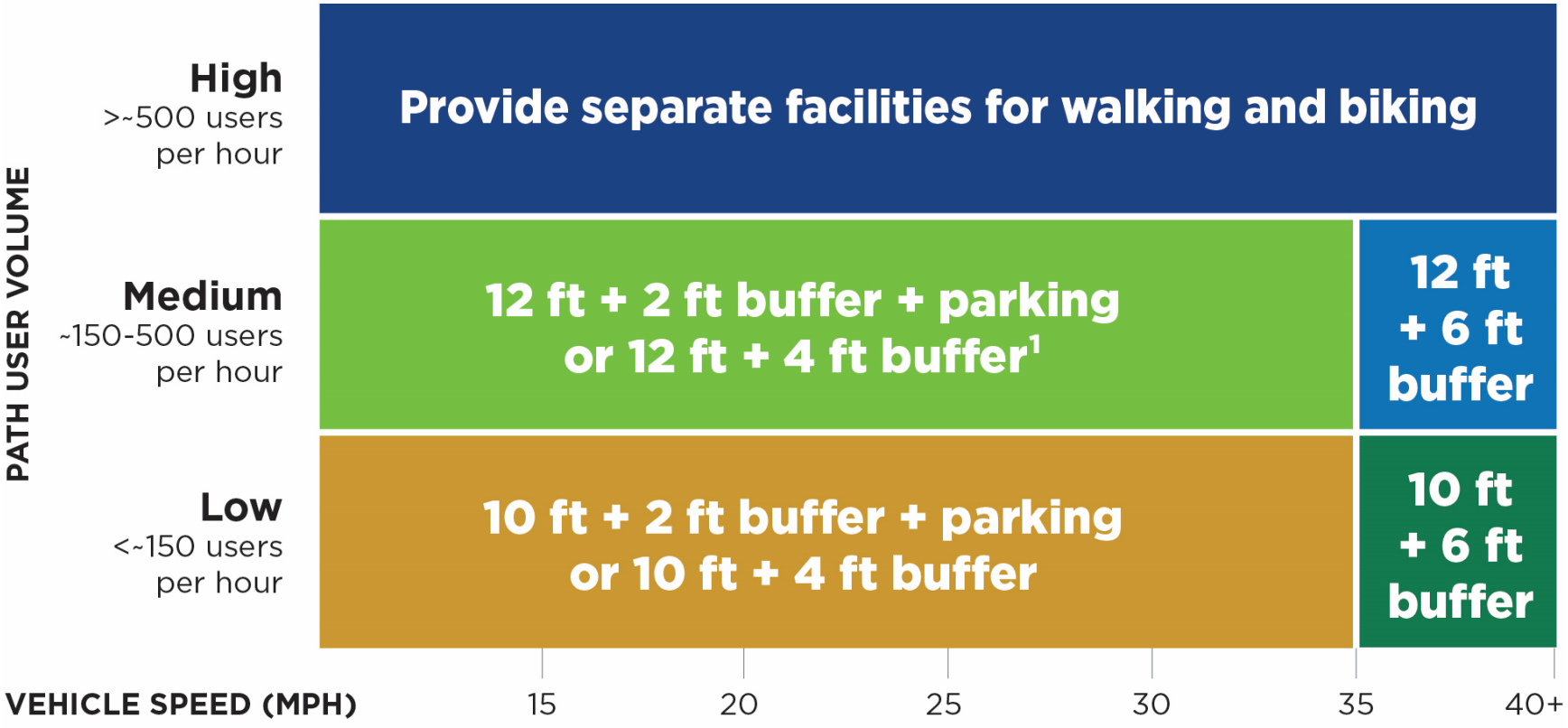
2 Consider the context through a safety lens.

Recommended sidewalk and buffer widths



2 Consider the context through a safety lens.

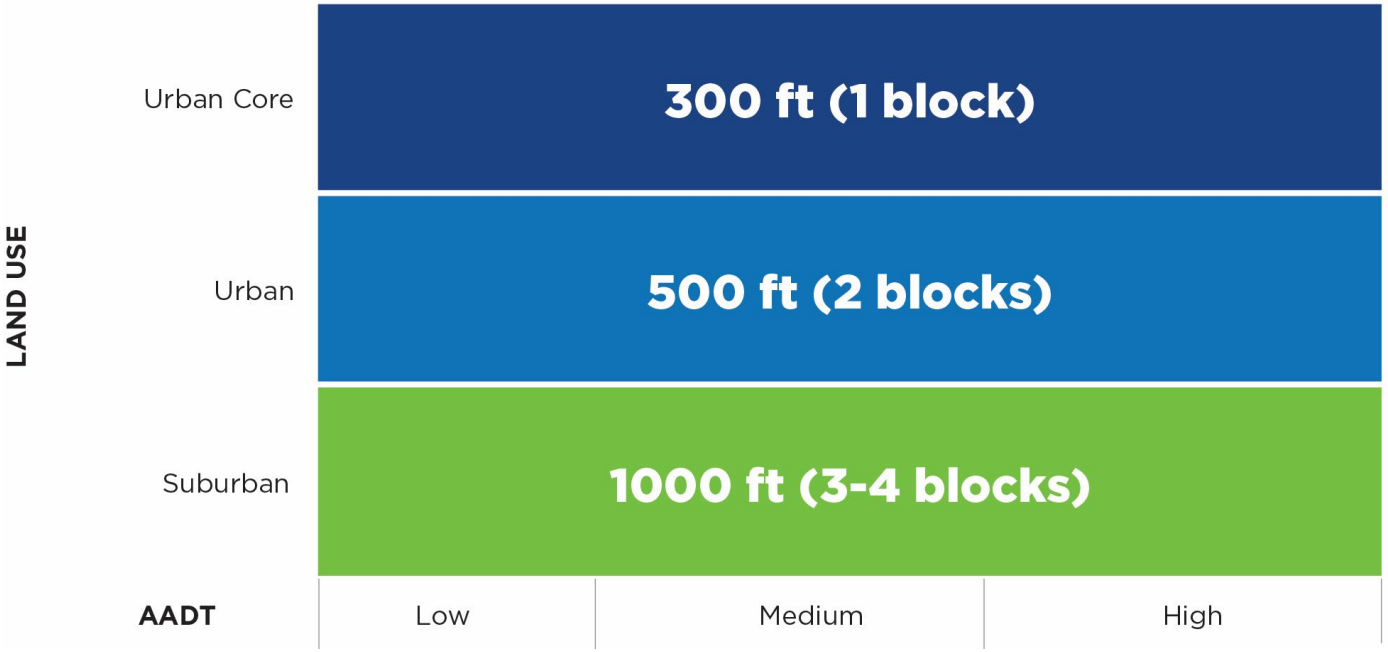
Recommended sidepath and buffer widths

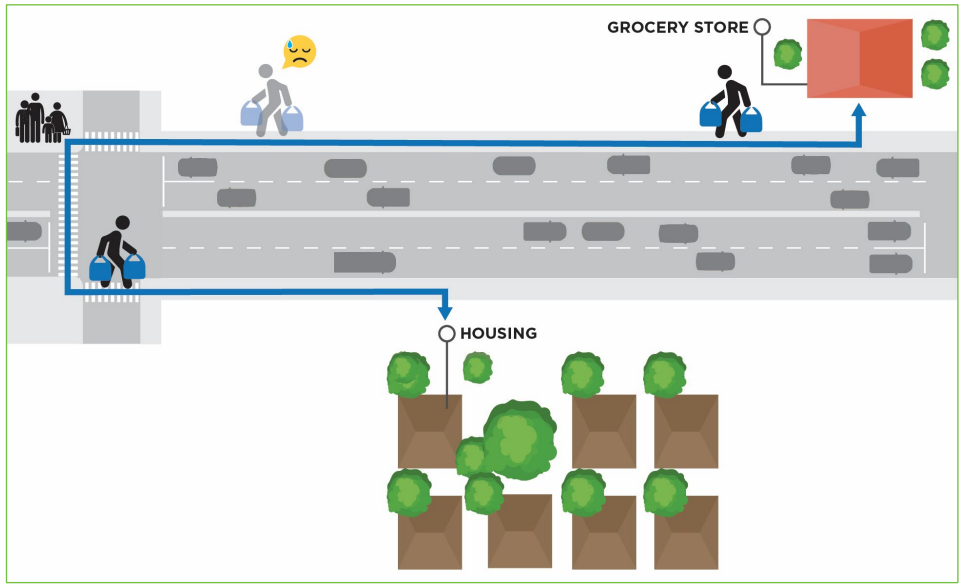


[1]Wider path preferred as volumes increase past 300 users per hour

2 Consider the context through a safety lens.

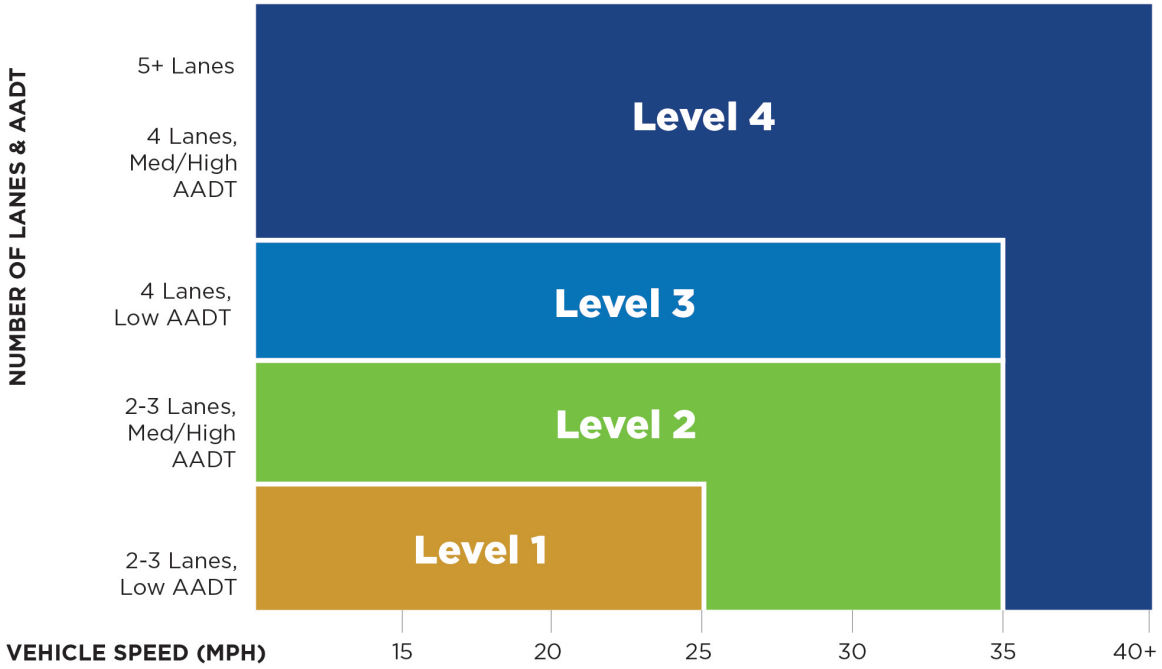
Recommended maximum crosswalk spacing



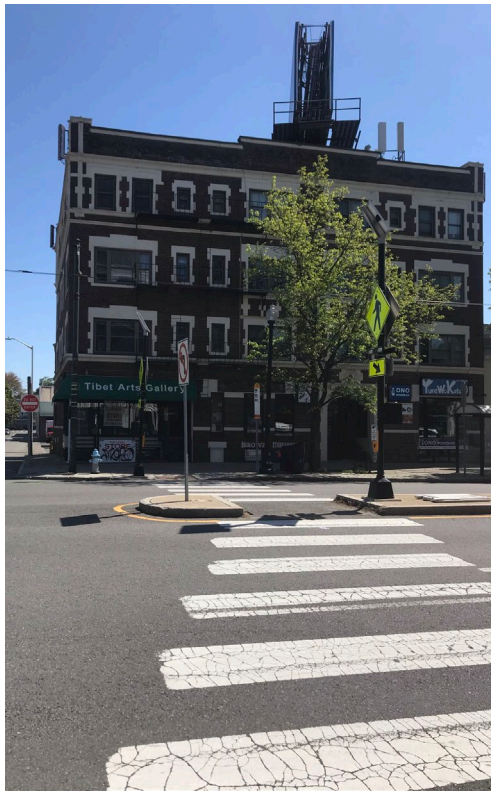


2 Consider the context through a safety lens.

Recommended crossing treatments



Level 1	Traffic context generally supports motorists yielding
Level 2	Traffic context generally requires intervention to induce motorist yielding (e.g., median island, pedestrian warning signs)
Level 3	Traffic context generally requires enhanced intervention to induce motorist yielding (e.g., RRFB)
Level 4	Traffic context generally requires intervention to require motorists to stop or to physically separate pedestrians and bicyclists from traffic (e.g., traffic signal)



2 Consider the context through a safety lens.

Recommended parking lane widths*

*Parking lanes are recommended to be 7 - 9 feet wide

3 Is there enough space to build a safe road?

NO

Work within your constraints to ensure safety.

4 Overcome the physical barriers to safe road design.

Reduce dimension needed for driving

Reduce dimension needed for bicycling/walking

Lower speed

Reduce vehicle volumes

Safe parallel facility

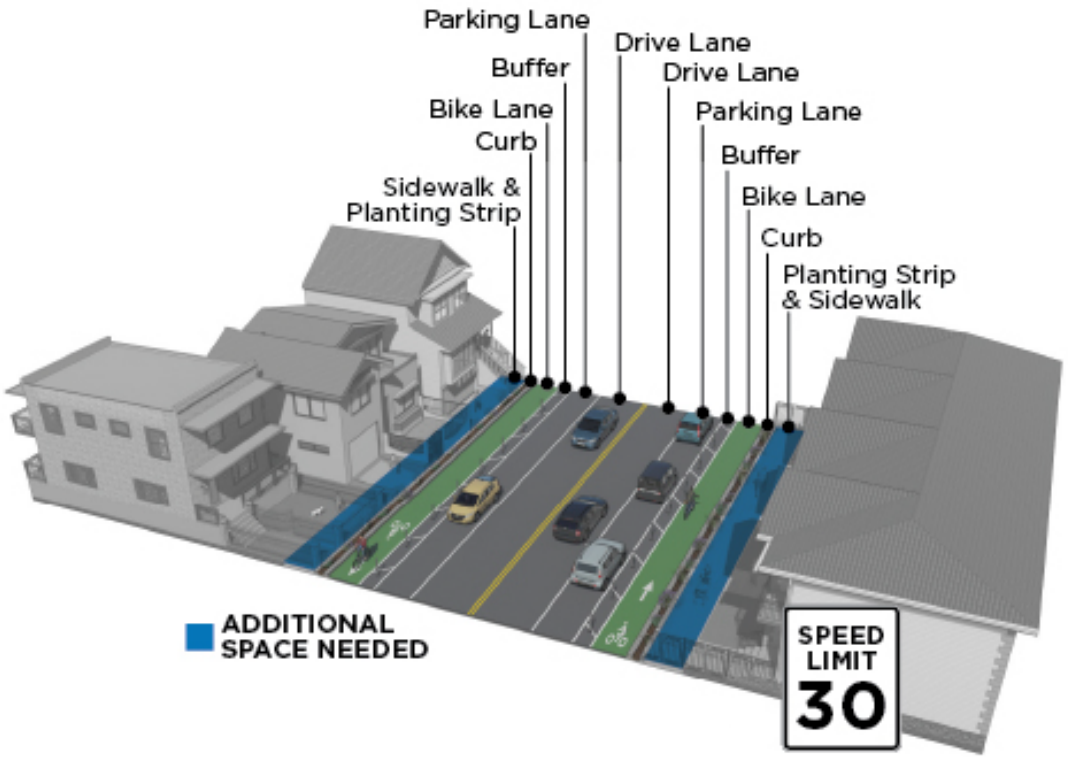
Convert

Close street to traffic

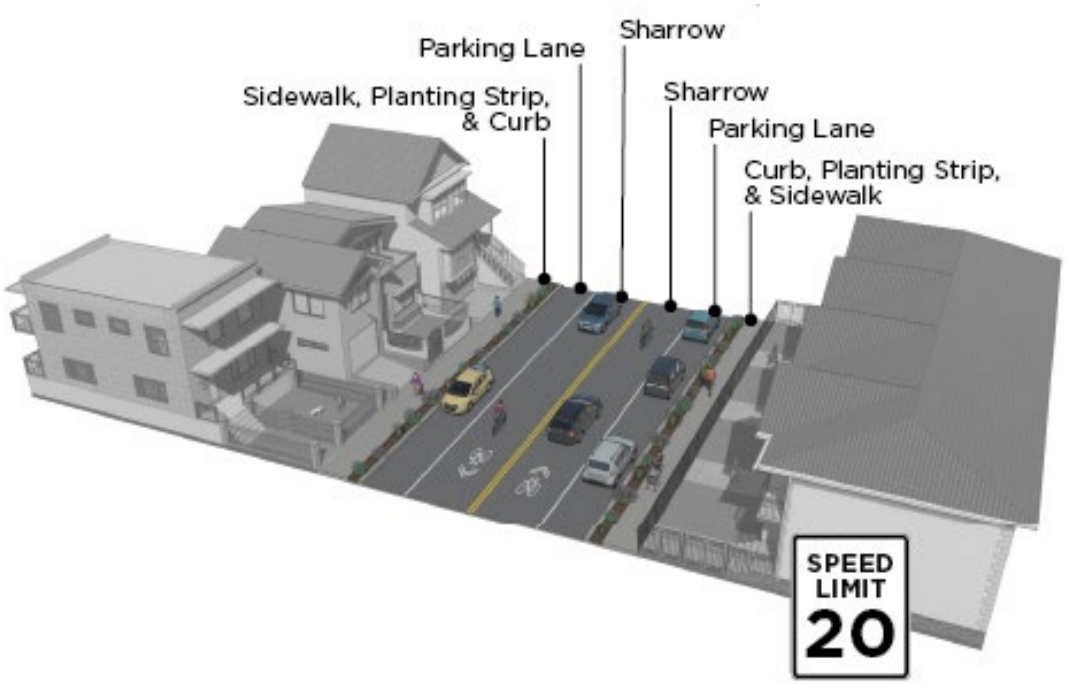
Convert to shared street (woonerf)

4 Overcome the physical barriers to safe road design.

Lower Speeds



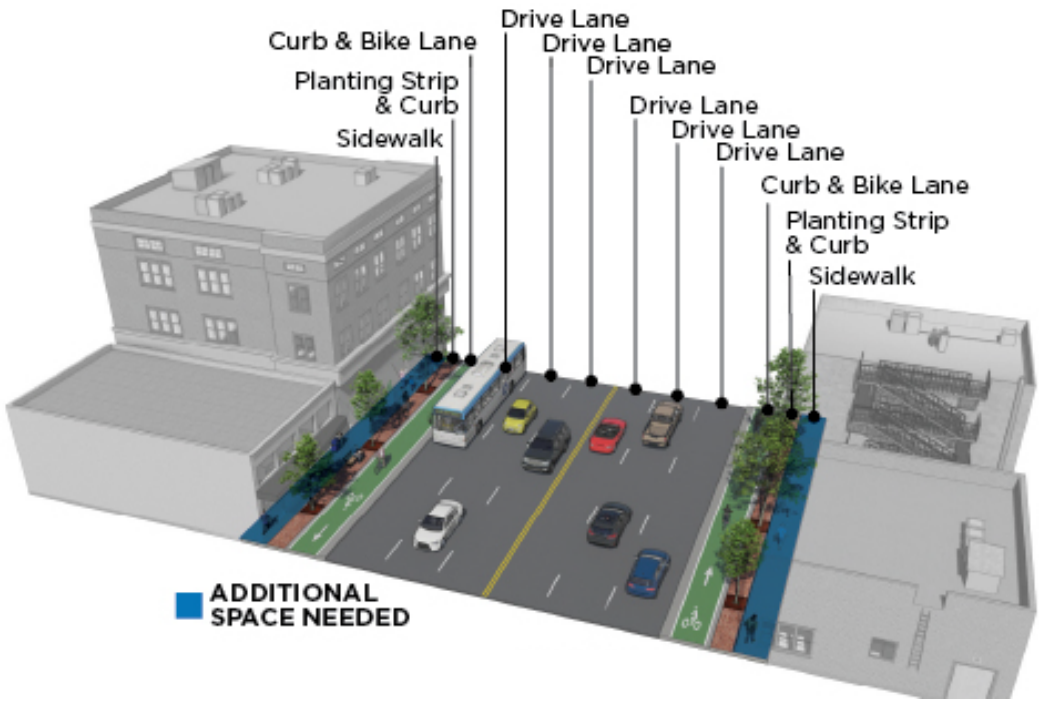
~35+ mph design speed

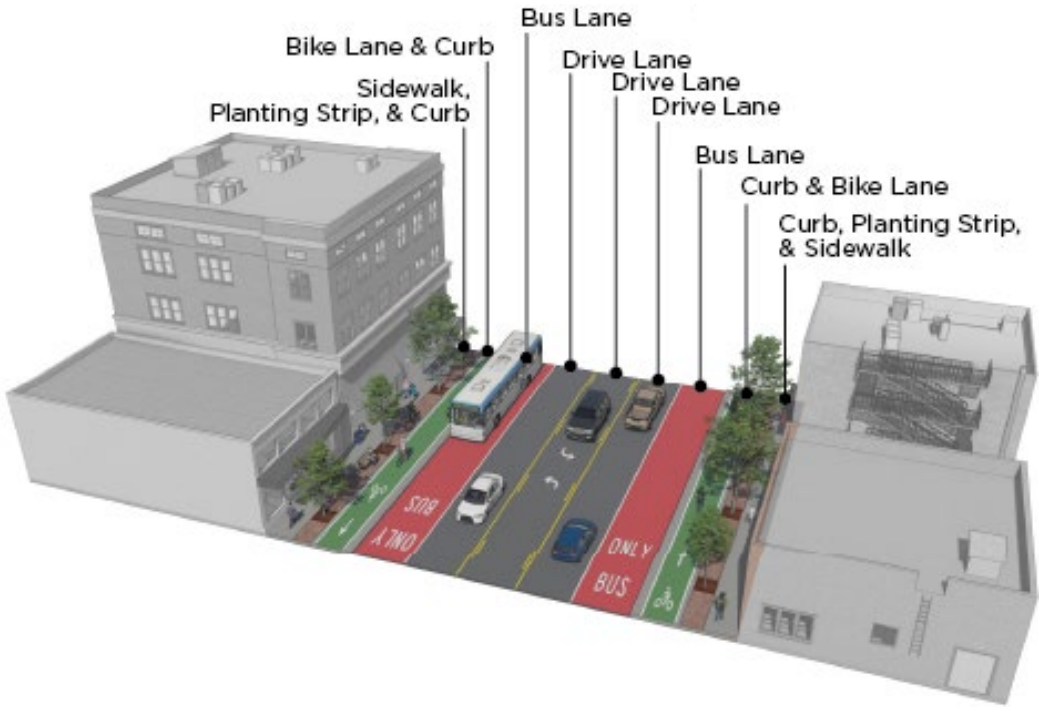


~20 mph design speed

4 Overcome the physical barriers to safe road design.

Reduce Vehicle Volumes



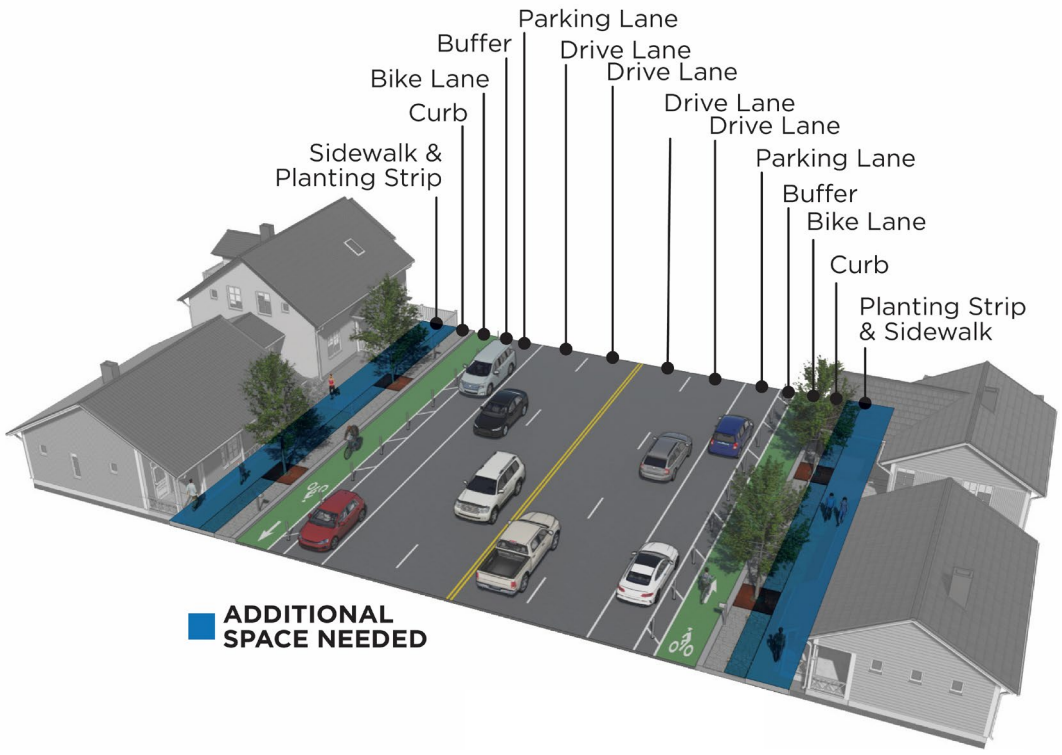


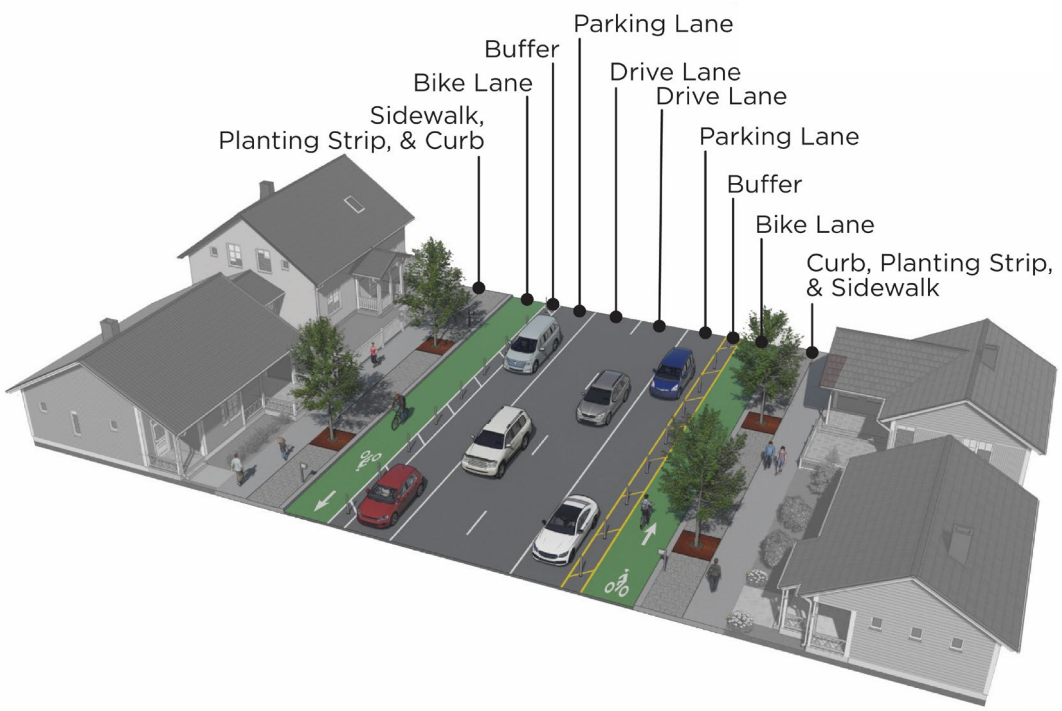
4 Overcome the physical barriers to safe road design.

Safe Parallel Facility

4 Overcome the physical barriers to safe road design.

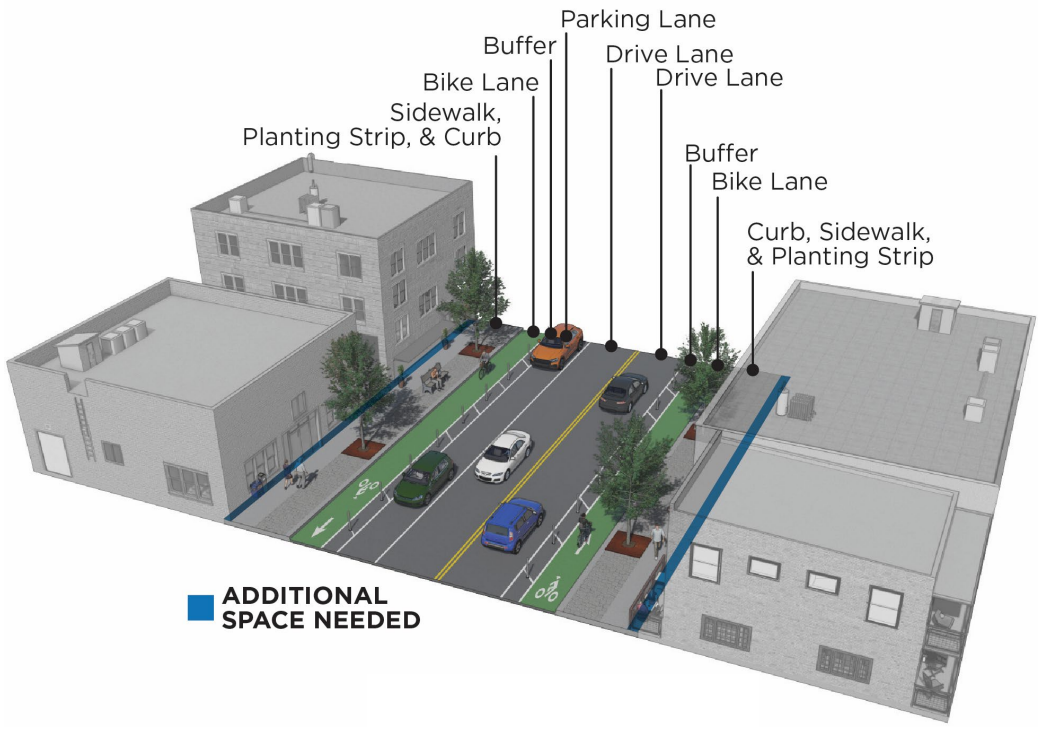
Convert Two-Way to One-Way

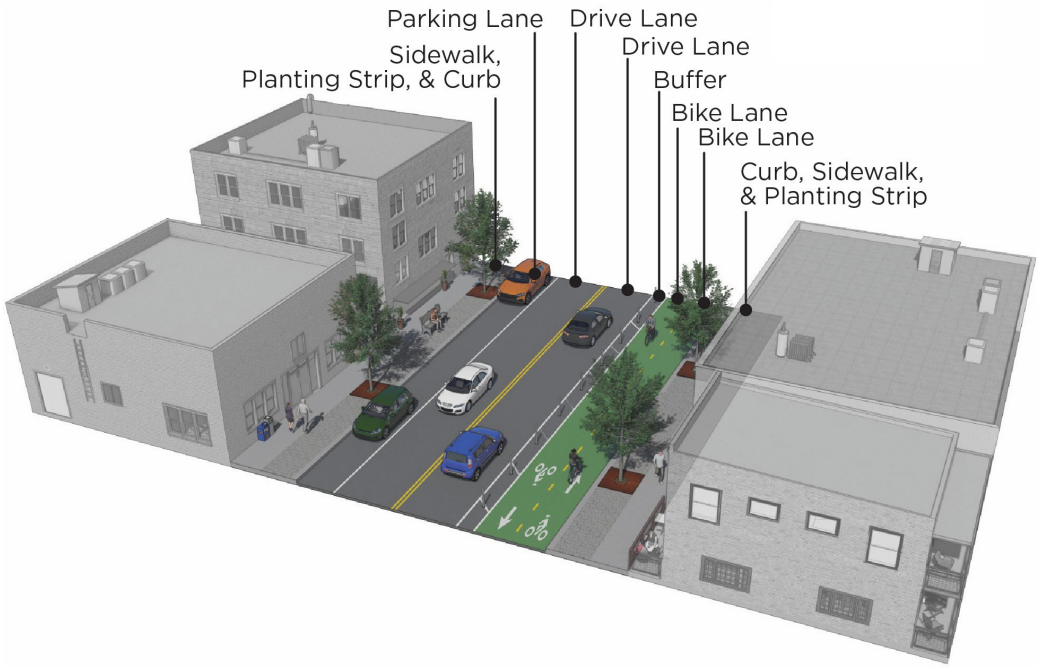




4 Overcome the physical barriers to safe road design.

Two-Way Bicycle Facilities





3 Is there enough space to build a safe road?

YES

What do you want to achieve beyond safety?

5 Develop design options: what happens when you change your cross section?

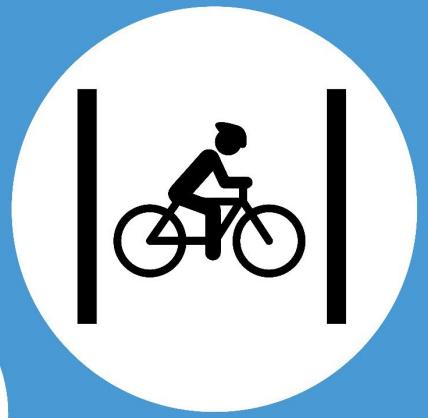
Choose a few suitable alternatives to evaluate. The community priorities from Step 1 may make some options more desirable.

Wider Sidewalk

Bus-Only Lanes

On-street parking

Add Traffic Lanes



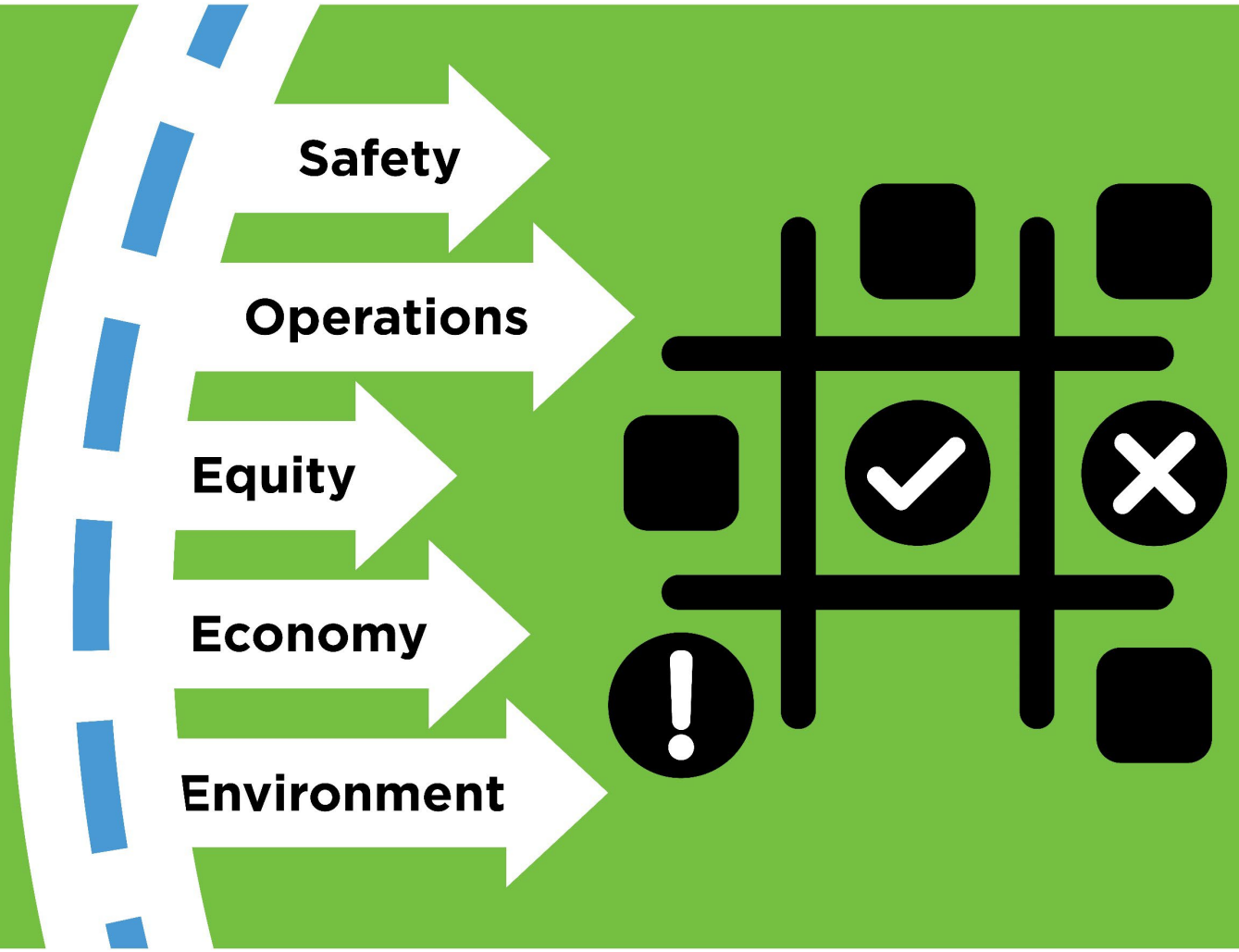
Wider Bike Lanes

Medians

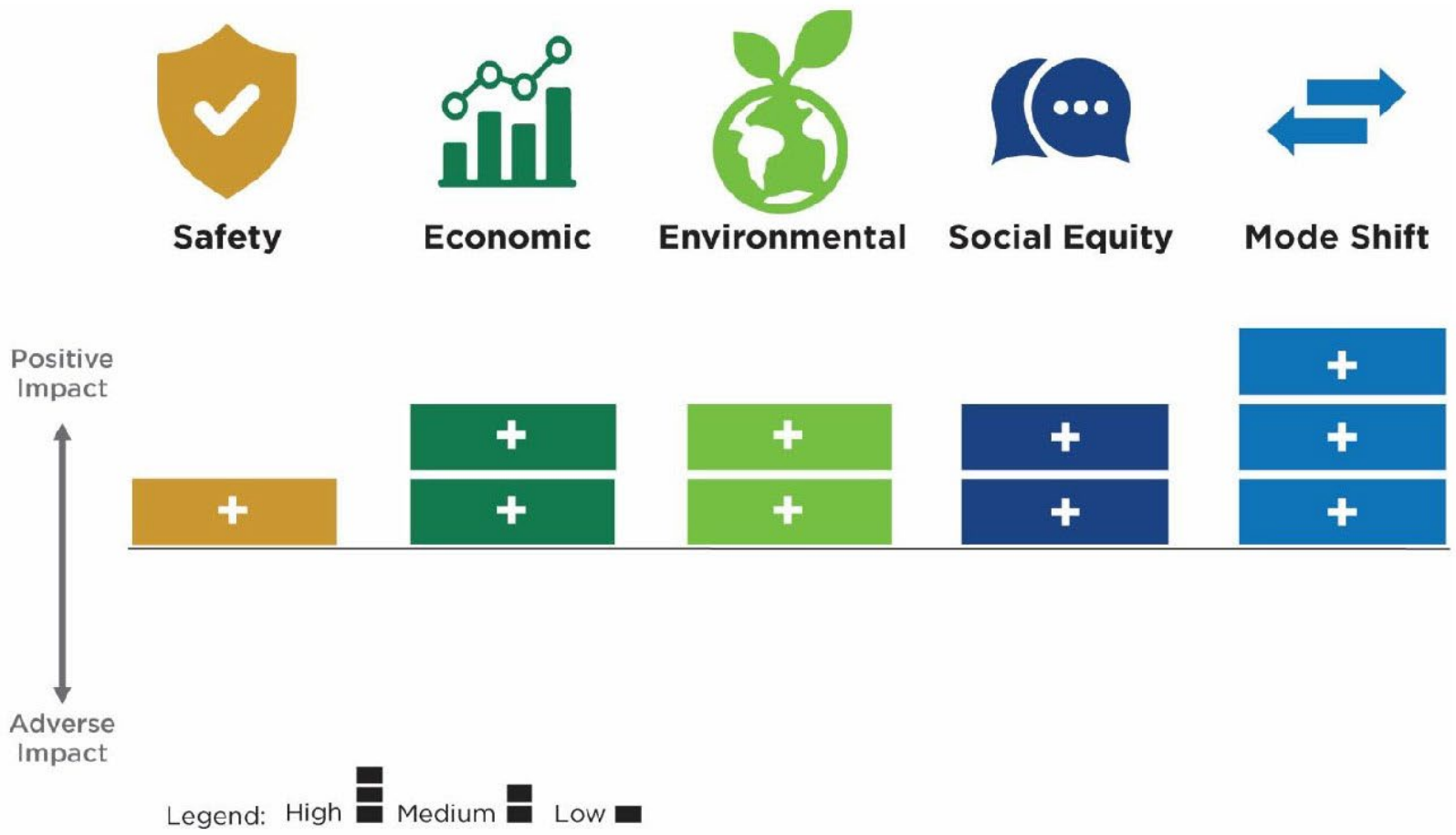
5 Develop design options: what happens when you change your cross section?

6 Evaluate and choose the cross section to serve your vision and needs.

Compare the likely outcomes of the alternatives you developed in Step 5.



6 Evaluate and choose the cross section that serves the community's vision and needs.



Outcomes of Adding Bicycle Lanes

SAFETY

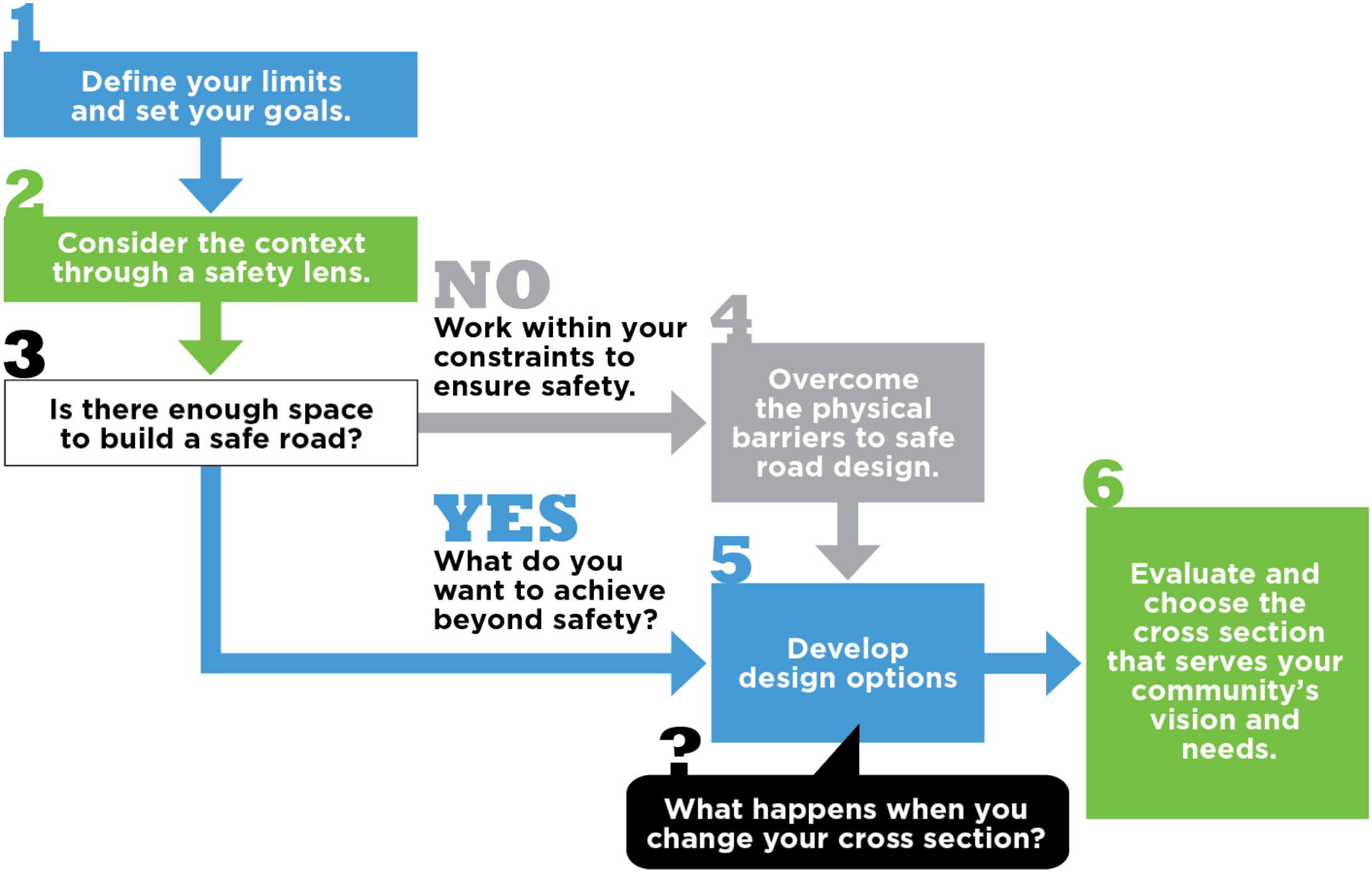
MODE SHIFT

ECONOMY

HEALTH

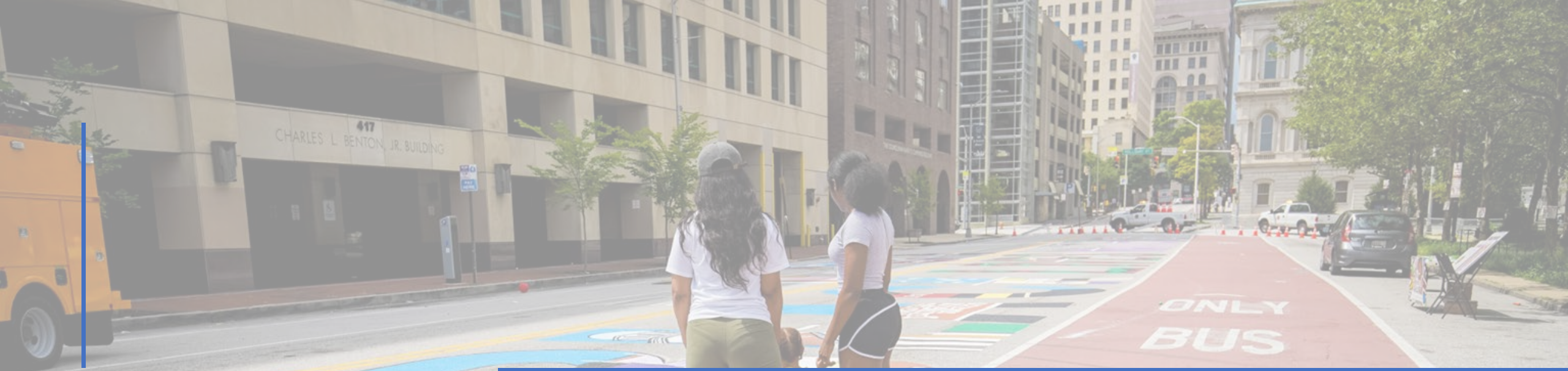
EQUITY

ENVIRONMENT


1
Define your limits and set your goals.
2
Consider the context through a safety lens.
3
Is there enough space to build a safe road?
NO
Work within your constraints to ensure safety.
4
Overcome the physical barriers to safe road design.
YES
What do you want to achieve beyond safety?
5
Develop design options
?
What happens when you change your cross section?
6
Evaluate and choose the cross section that serves your community's vision and needs.

How could you use this research?

- How could you see yourself applying this approach?
- What about this approach is exciting? What about it makes you feel queasy?
- What challenges/opportunities do you expect when balancing traffic operations with other goals?



THANK YOU!

Conor Semler
csemler@kittelson.com

Meredyth Sanders
msanders@kittelson.com