

A group of cyclists is riding down a city street. In the foreground, a cyclist wears a yellow vest with a circular logo. Behind them, another cyclist has a white child seat on their bike. The street has a white lane line. To the left, a silver car is parked. In the background, there are multi-story buildings, trees, and a construction vehicle. Street signs on the right include "EXIT ONLY" and "NO TURN ON RED".

Innovations in Bicycle Planning & Facility Design



Phil Goff
New England Planning Director

MAST Annual Meeting
January 11, 2018

Agenda

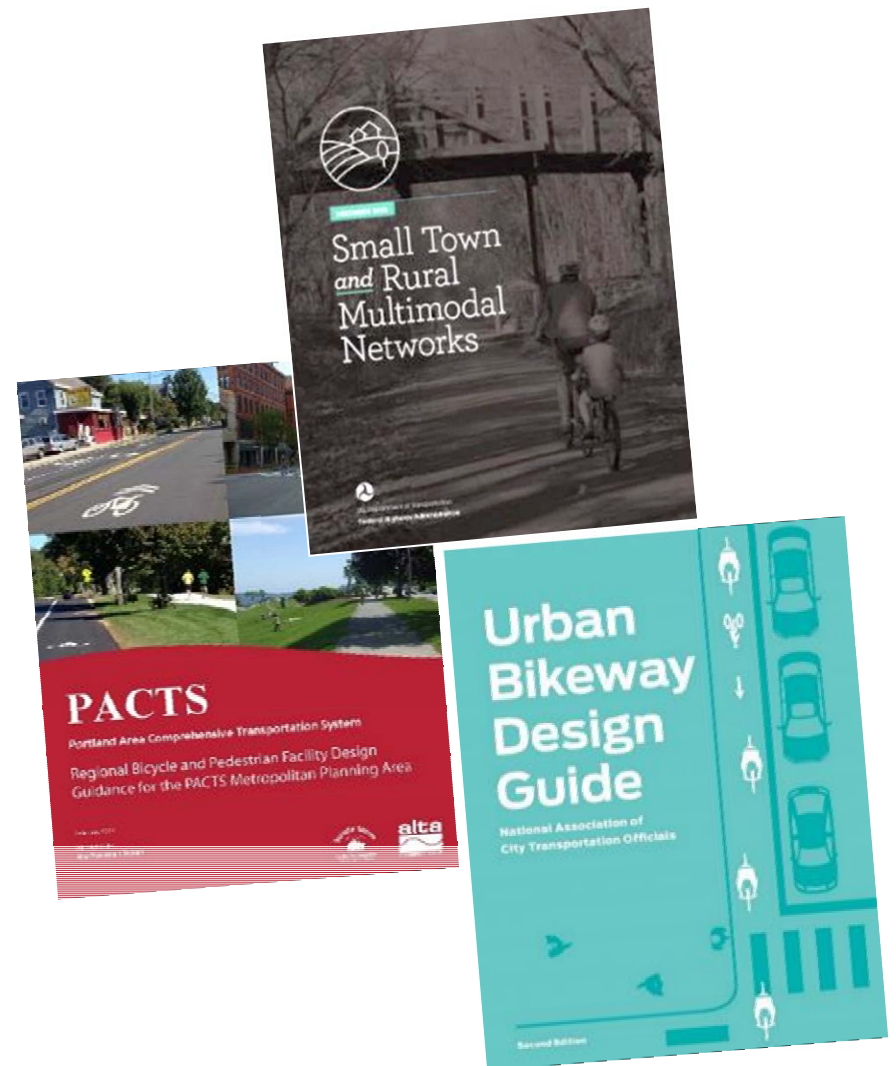
- Introduction
- What are Complete Streets
- Bicycle Network Planning
- Bicycle Facility Design Toolkit
- Conclusion: If You Build it, Will They Come?



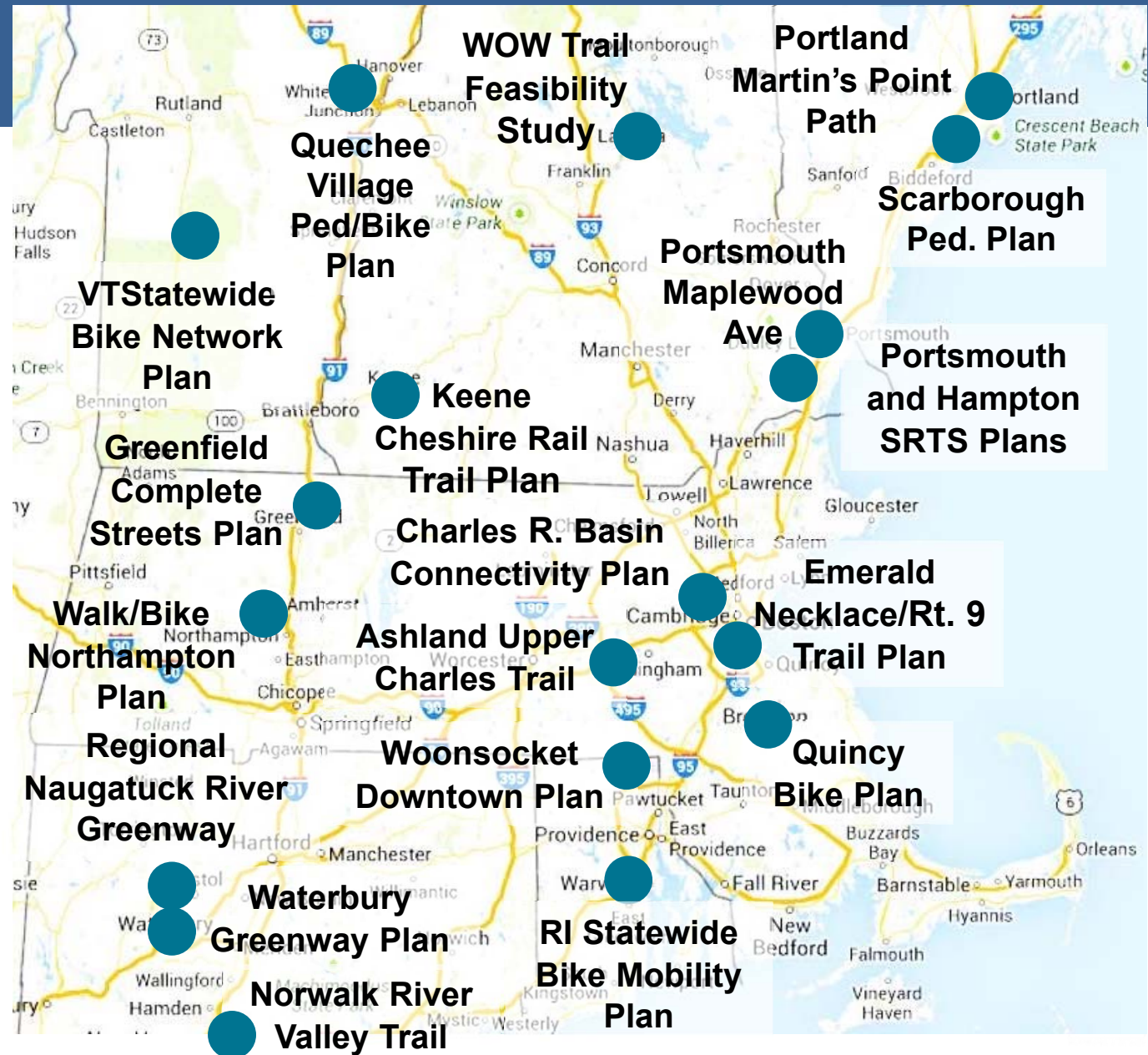
Alta Planning + Design

Leaders in Pedestrian/Bike Planning and Design since 1996

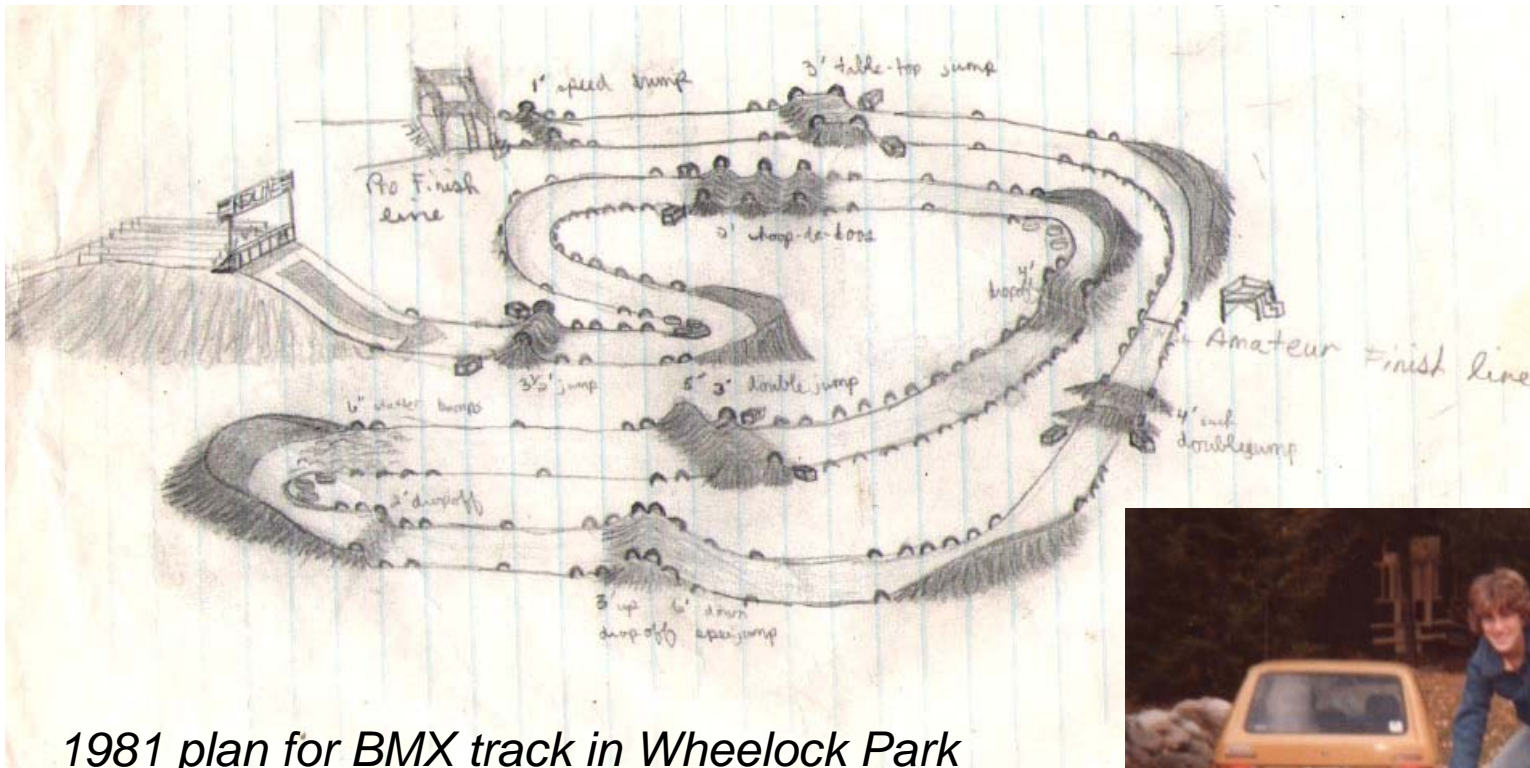
- ❖ ~200 staff in 30 offices (Cambridge since 2009)
- ❖ Authors of numerous regional and national design guides, manuals and white papers
- ❖ Bicycle Master Plans in over 50 cities/regions and 12 states



Alta's New England Experience



My Keene Experience!



1981 plan for BMX track in Wheelock Park



Complete Streets



A Complete Street is safe, comfortable and convenient for travel via foot, bicycle, transit and automobile for anyone regardless of age or ability.



Complete Streets are Safe Streets

Percentage Fewer Crashes

PEDESTRIANS

- ↓ **88%** with sidewalks
- ↓ **69%** with hybrid beacon
- ↓ **39%** with medians
- ↓ **29%** with road DIETS

Source: National Complete Streets Coalition and FHWA

BICYCLISTS



Source: NYC DOT (2010) The New York City Pedestrian Safety Study & Action Plan.

Accommodating All Cyclists



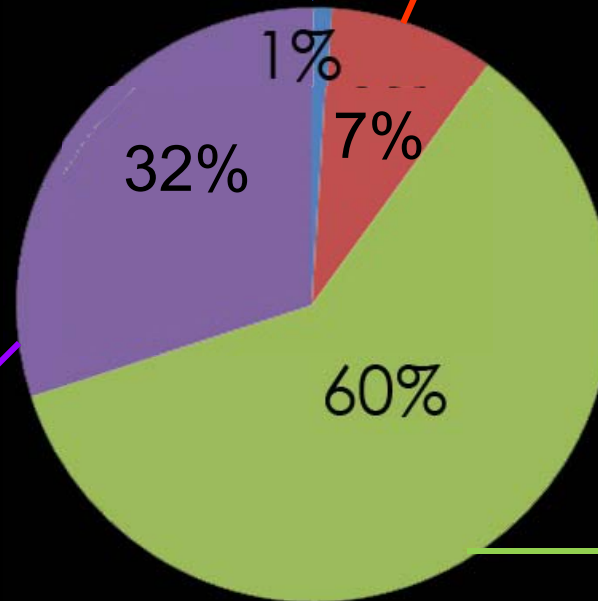
1: Strong and fearless



2: Enthused and confident



"No way, no how"



4: Those who bike out of necessity



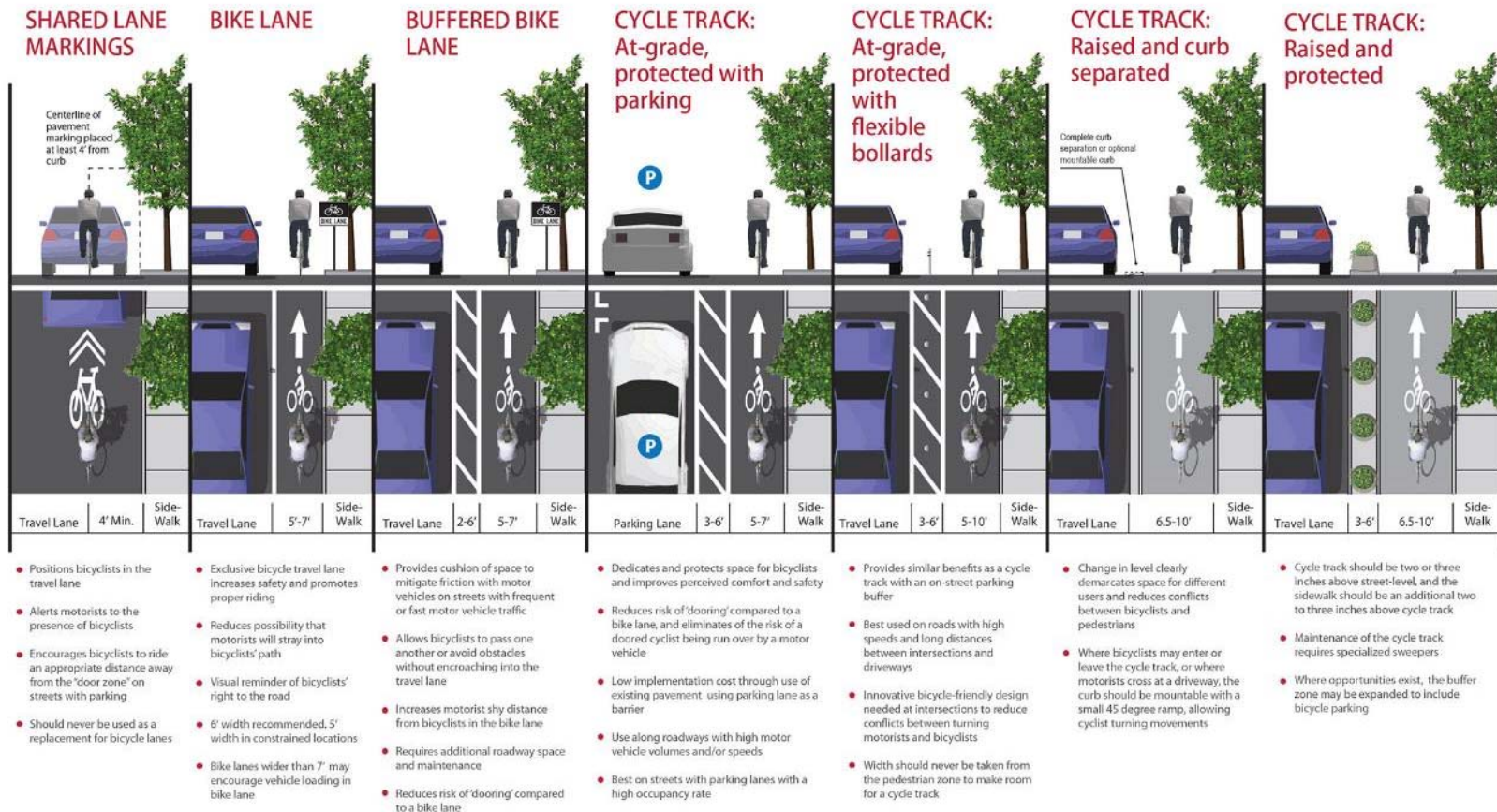
3: Interested but concerned

Accommodating All Cyclists

On-Street Marked Bikeway Continuum

least protected

most protected



Bike Network Characteristics

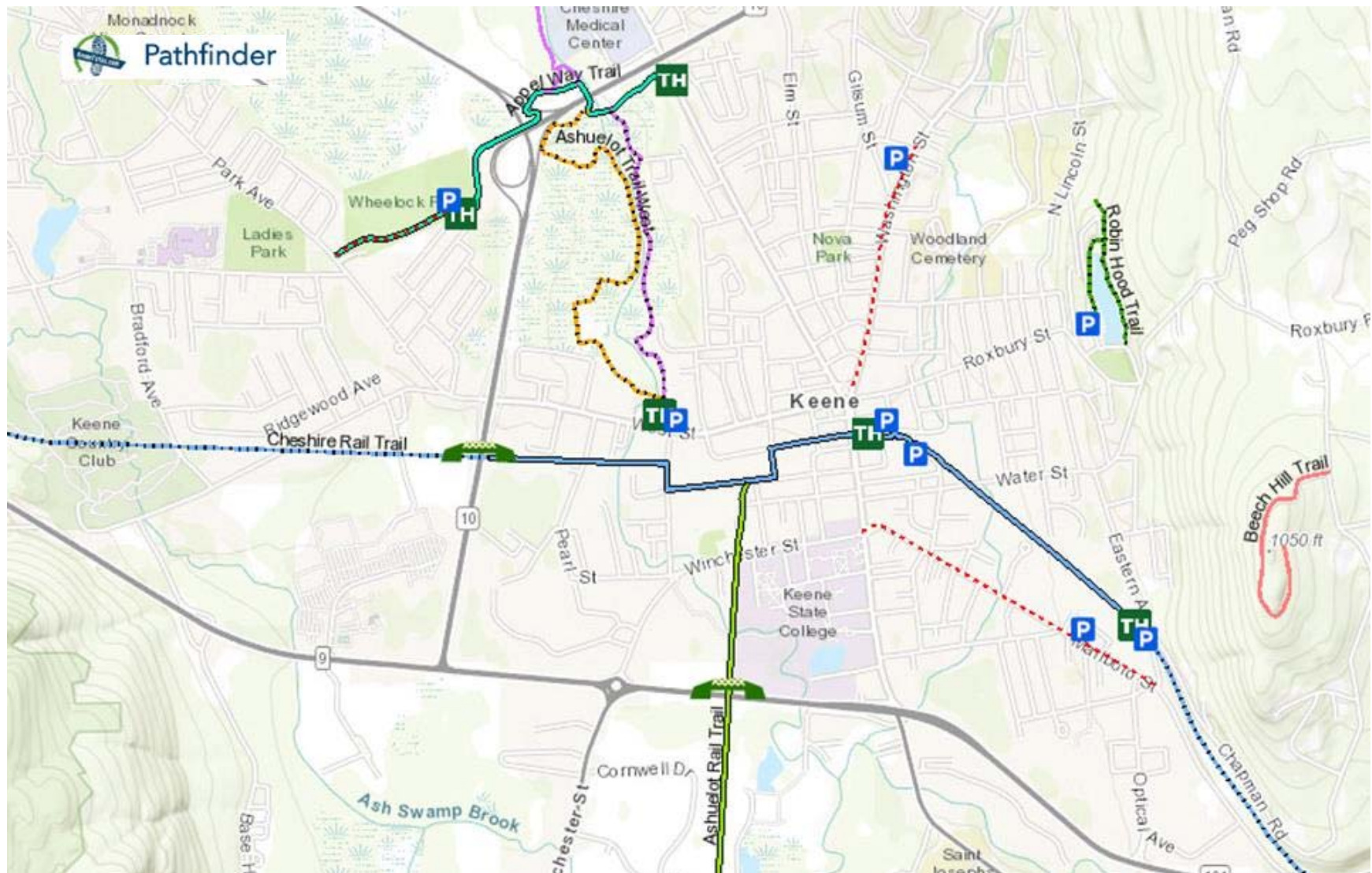
4 “C’s” of Bike Network Planning

- ❖ Connectivity
 - Linking gaps
 - Improving intersections
- ❖ Conspicuous
 - Clarity of route (wayfinding)
- ❖ Comfort
 - Separation from cars
- ❖ Coherent
 - Logic of the network
 - Consistency of design

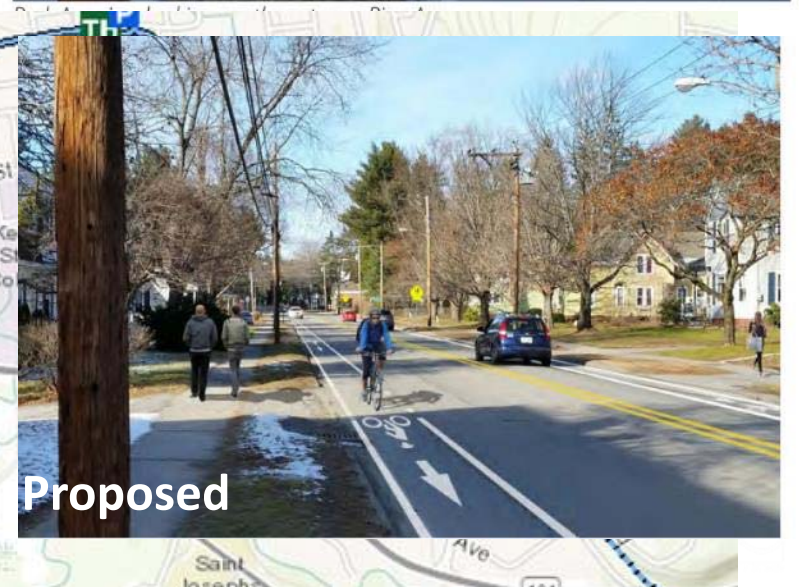
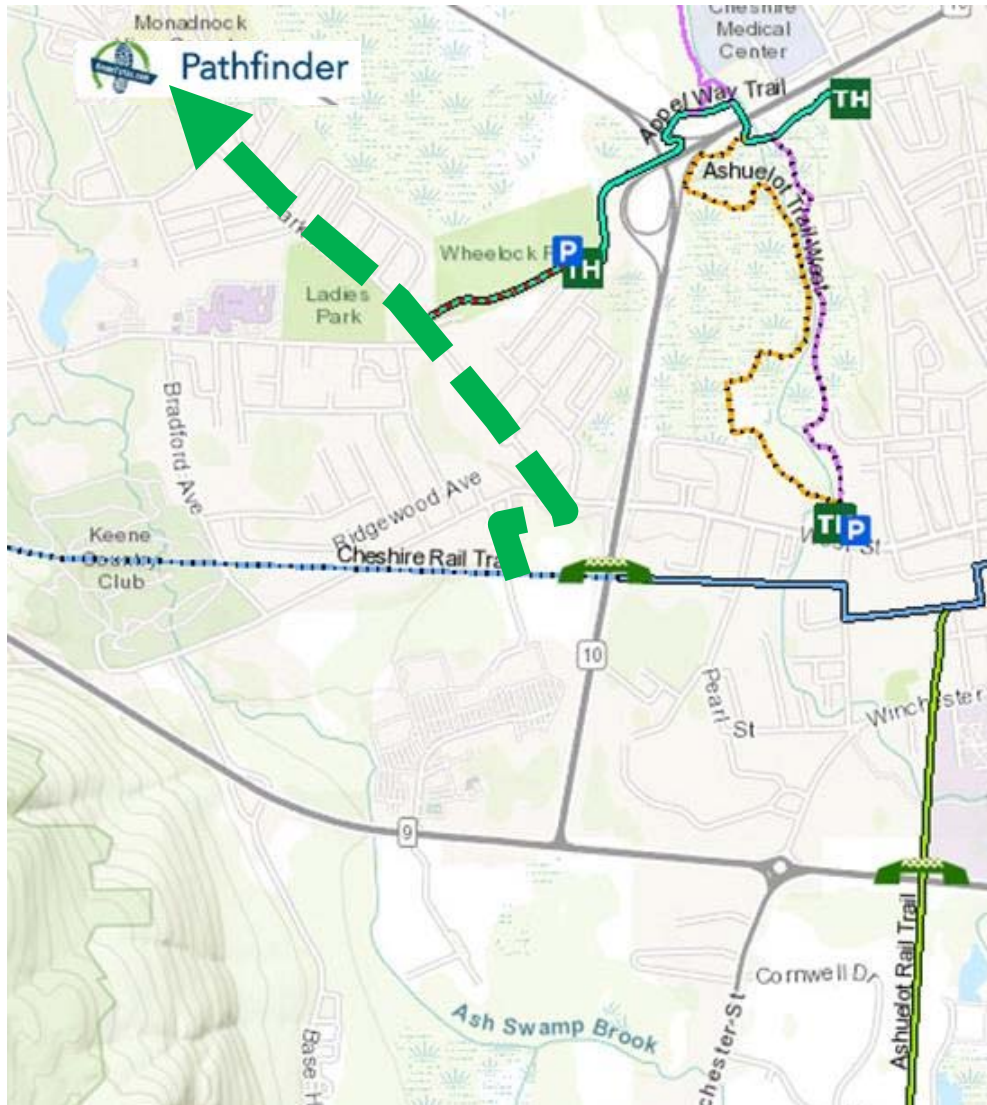


Boulder CO Bike Network Map

Keene Trail Network



Keene Trail Network



Agenda

- Introduction
- What are Complete Streets
- Bicycle Network Planning
- **Bicycle Facility Design Toolkit**
 - Variety of Bike Lane Design Options
 - Intersections
 - Shared Roadways



Bike Lane Design Options

Standard Striped Bike Lane



Bike Lane Design Options

Standard Striped Bike Lane w/ Reverse Angle Parking

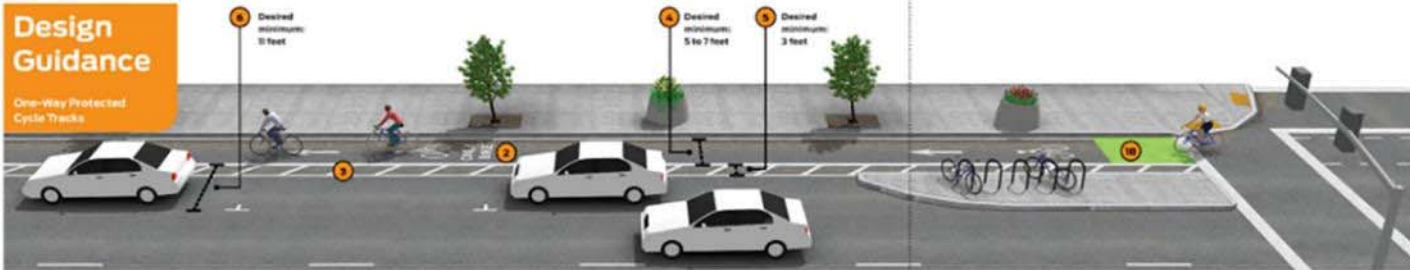


Bow Street, Somerville MA

Bike Lane Design Options

Design Guidance

One-Way Protected Cycle Tracks



Required Features

- 1 A cycle track, like a bike lane, is a type of preferential lane as defined by the MUTCD.¹⁶
- 2 Bicycle lane word, symbol, and/or arrow markings (MUTCD Figure 9C-3) shall be placed at the beginning of the track and at intervals.

Recommended Features

- 3 The minimum desired width for a cycle track should be 5 feet. In areas with high bicycle volumes or uphill situations, a minimum of 6 feet is recommended.

- 4 Driveways and minor street crossings are a unique challenge to cycle track design. A review of existing facilities and design practice has shown that the following guidance may improve safety at crossings of driveways and minor intersections:



- 5 The cycle track is parking prohibited. Parking should be prohibited near the intersection to improve visibility. The desirable no-parking area is 30 feet on each side of the crossing.¹⁷

- 6 Motor vehicles attempting to enter the cycle track from the left or driveway, street and/or turnings and/or other should accommodate a right of 20 feet to the cycle minor street crossings, from driveway crossing.

- 7 "Yield to Bikes" may be used to identify the cycle track and make it clear that the cycle track has priority over motor traffic.¹⁸

- 8 Motor vehicle traffic crossing the cycle track should be contained or channeled to make turns at sharp angles to reduce travel speed prior to the crossing.

- 9 Outer seams, drainage inlets, and utility covers should be configured so as not to impede bicycle travel and to facilitate run-off.

- 10 Sidewalk curbs and furnishings should be used to prevent pedestrian use of the cycle zone.

- 11 Cycle track width should be larger in locations where the gutter seam extends more than 12 inches from the curb.¹⁹

Optional Features

- 12 Tubular markers may be used to protect the cycle track from the adjacent travel lane. The color of the markers should be consistent with the color of the cycle track.

- 13 Cycle tracks may be shifted more closely to the travel lanes on minor intersection approaches to put bicyclists clearly in the field of view of motorists. See Cycle Track Intersection Approach for other methods of transitioning a cycle track to an intersection.²⁰

- 14 A raised median, bus bulb, or curb extension may be configured in the cycle track buffer area to accommodate transit stops. Bicyclists should yield to pedestrians crossing the roadway at these points to reach the transit stop.

- 15 At transit stops, consider wrapping the cycle track behind the transit stop zone to reduce conflicts with transit vehicles and passengers. Bicyclists should yield to pedestrians at these areas. At intersection bus stops, an extended moving zone may be provided with signage directing bicyclists to yield.

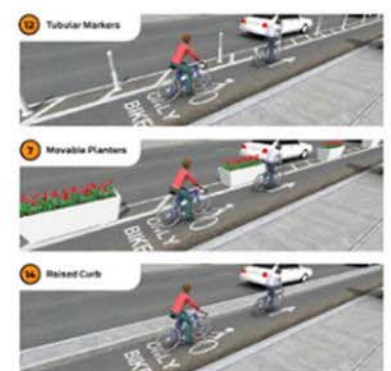
- 16 Cycle tracks may be configured on the left side of a one-way street to avoid conflicts at transit stops.

- 17 A "Bike Lane" sign (MUTCD R3-17) may be used to designate the portion of the street for preferential use by bicyclists. A supplemental "No Cars" selective exclusion sign may be added for further clarification.

- 18 "Bike Only" legend (MUTCD 3D-01) may be used to supplement the preferential lane word or symbol marking.²¹

- 19 Colored pavement may be used to further define the bicycle space.

Alternate Protection Strategies



NACTO

Urban Bikeway Design Guide

April 2011 Edition

Separated Bike Lanes

One-way Cycle Track

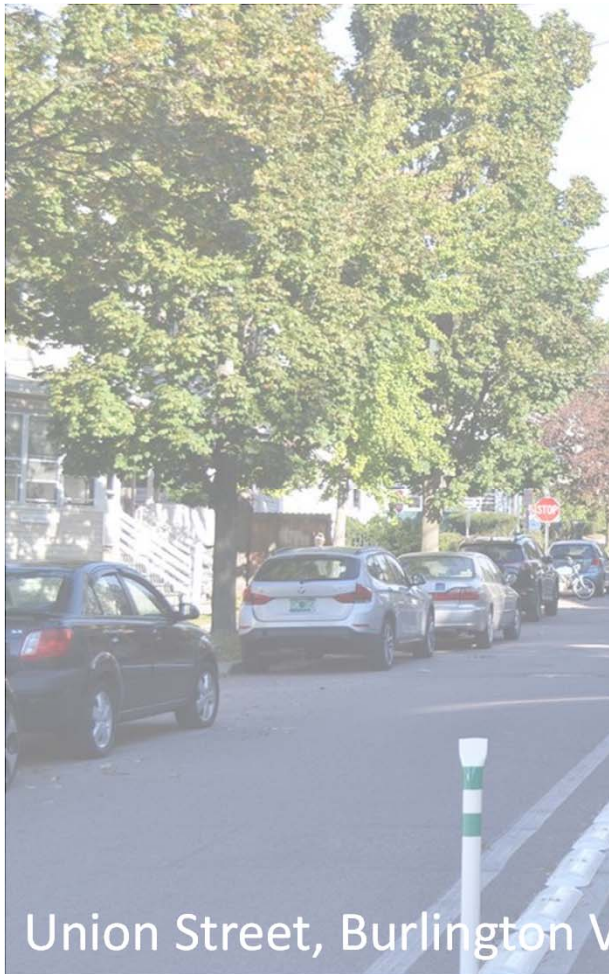


Union Street, Burlington VT



Separated Bike Lanes

One-way Cycle Track



Separated Bike Lanes

First Anticipated Cycle Track in New Hampshire



Middle Street, Portsmouth



Example of parking protected cycle track

Separated Bike Lanes

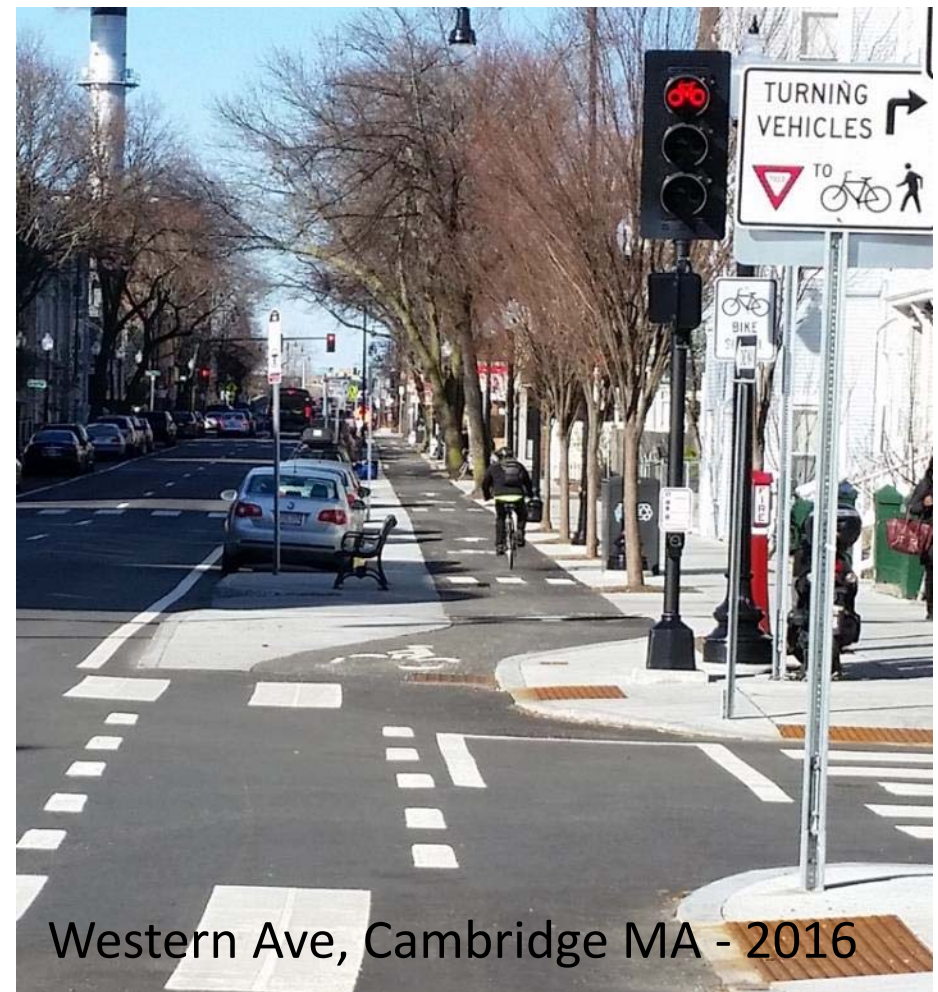
Buffered Bike Lane



Huron Street, Cambridge MA

Separated Bike Lanes

One-way Cycle Track – Sidewalk level



Separated Bike Lanes

Two-way Cycle Track



Brattle Street, Cambridge MA

Bike Lane Design Options

Contra-flow Bike Lane



Washington Street, Middle Falls RI



Bike Lane Design Options

Contra-flow Bike Lane



Williams Avenue, Portland OR



Intersection Design

Bike Lane Ends



Source: John Allen web site

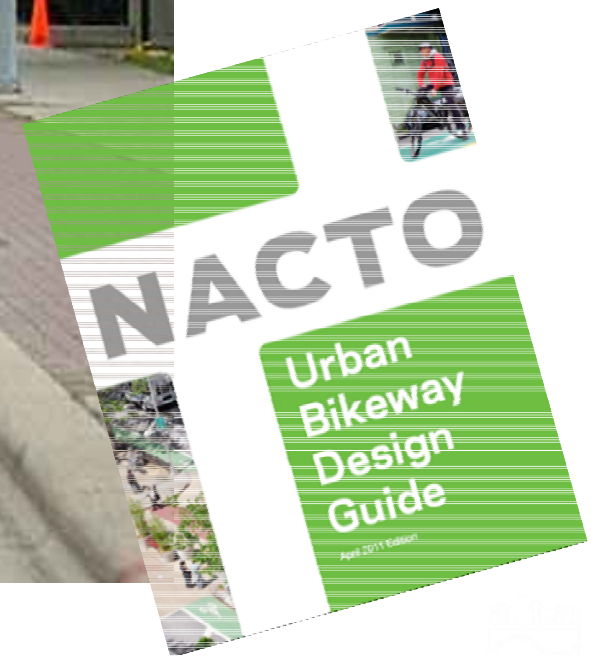


Intersection Design

Bike Lane Ends

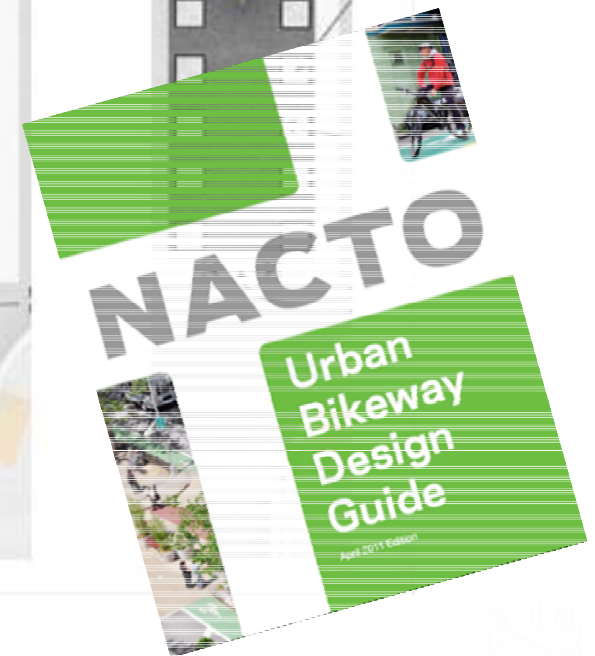
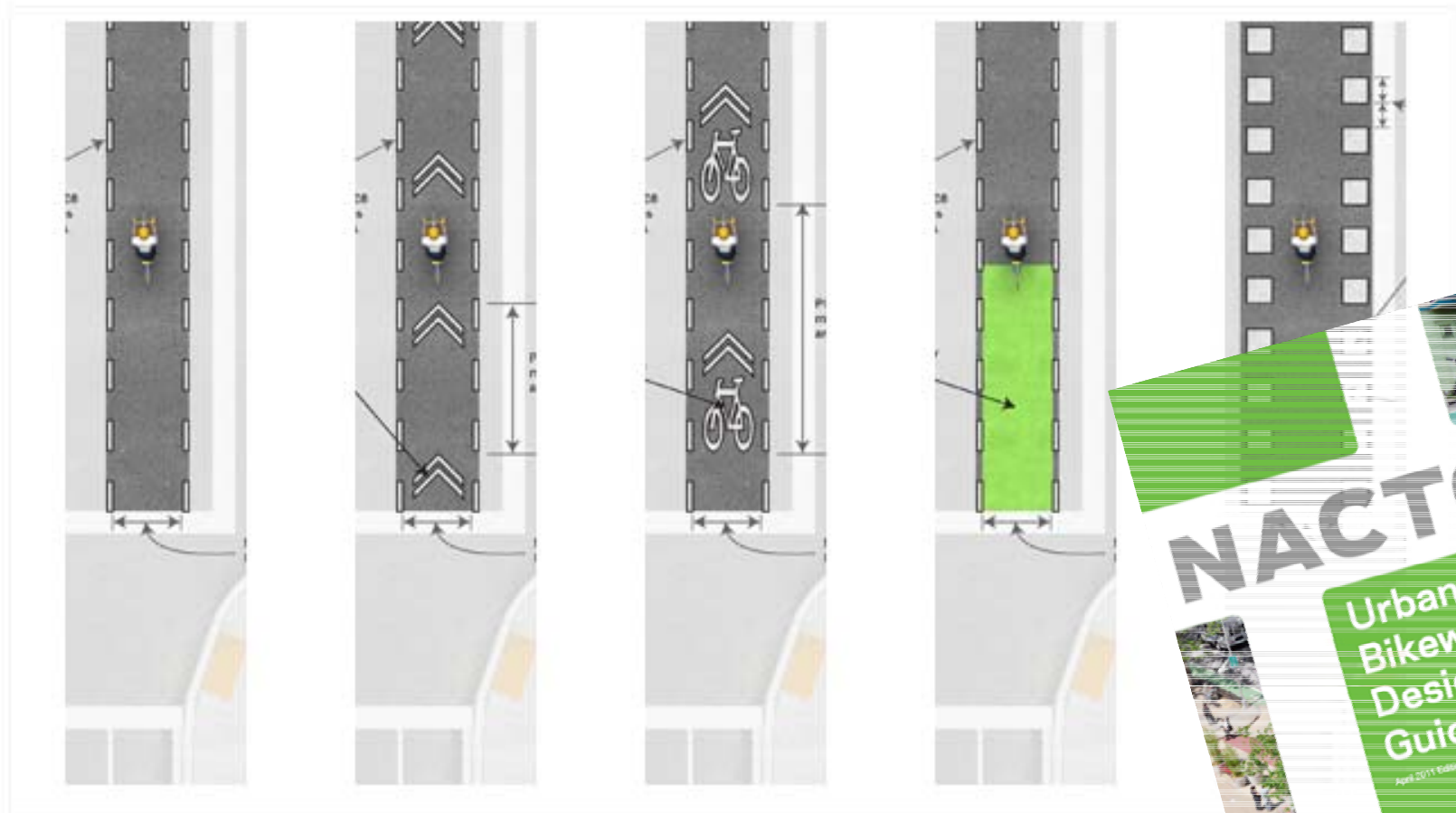


Source: John Allen web site



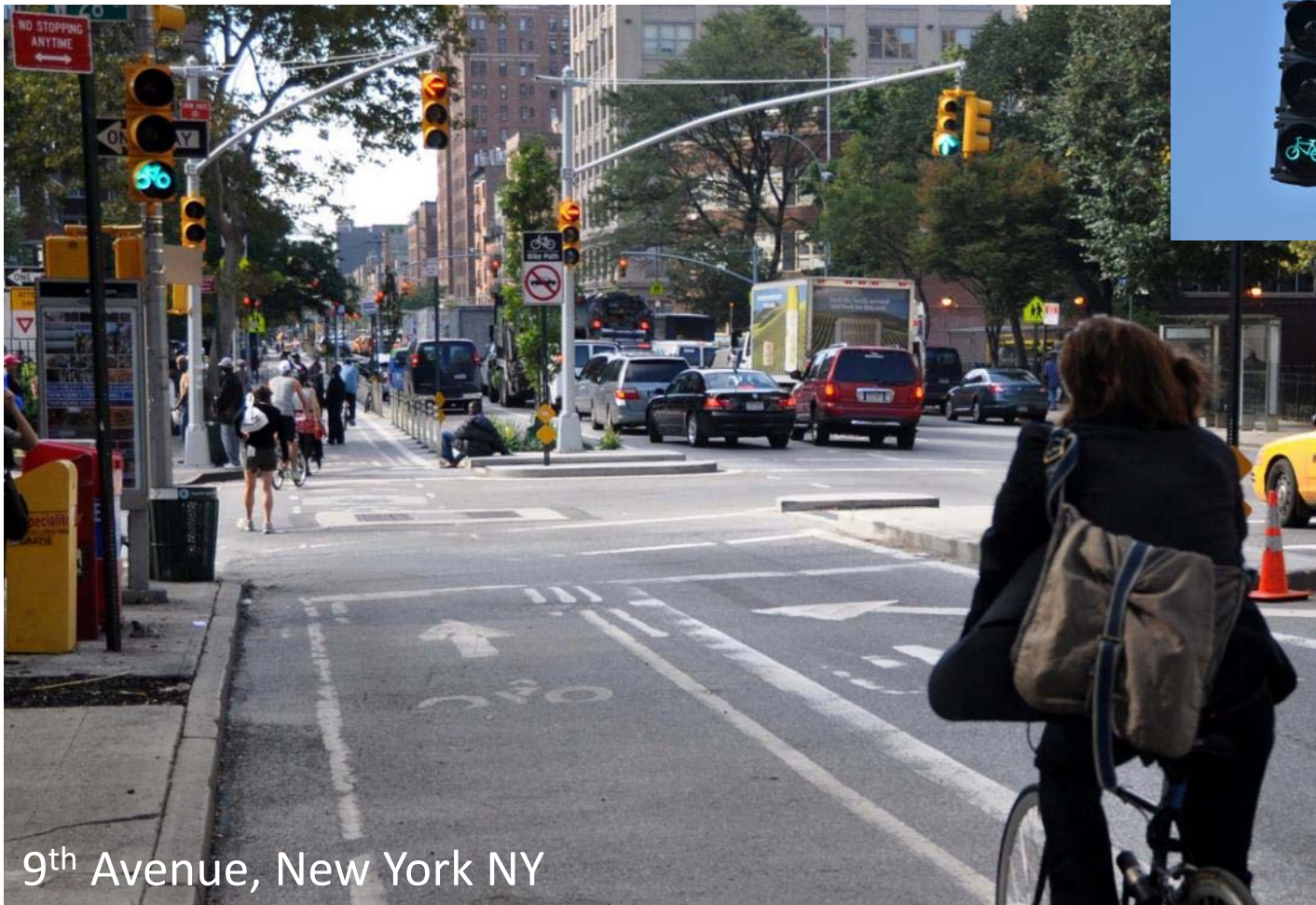
Intersection Design

Bike Lane Extension Thru Intersection Options



Intersection Design

Bicycle Signals



Intersection Design

Bicycle Signals



Diagonal Crossing with Bike Signal in Portland OR



Intersection Design

Green Pavement Markings



Green colored
intersection crossing
examples from
Cambridge MA



Intersection Design

Green Pavement Markings



Somerville Avenue, Somerville MA



University Avenue,
Syracuse NY



Intersection Design

Bike Boxes



Hawthorne Blvd, Portland OR



Somerville Avenue,
Somerville MA

Intersection Design

Two-Stage Left Turn Queue Box



Somerville Avenue,
Somerville MA

Intersection Design

Two-Stage Left Turn Jug Handle



Porter Square, Cambridge MA

What if there is no space for bike lanes?



What if there is no space for bike lanes?

Uphill Bike Lane with Downhill Sharrows



Dane Street, Somerville MA

What if there is no space for bike lanes?

Advisory Shoulder/ Bike Lanes

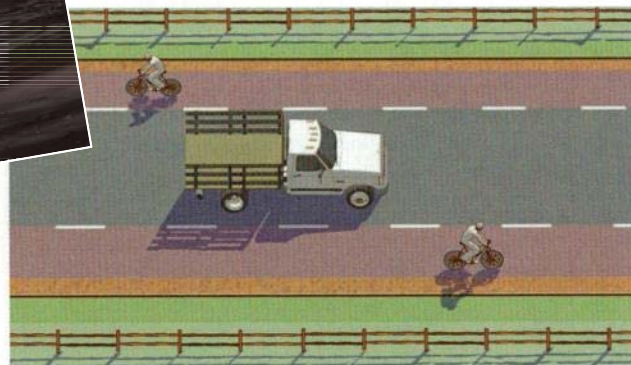
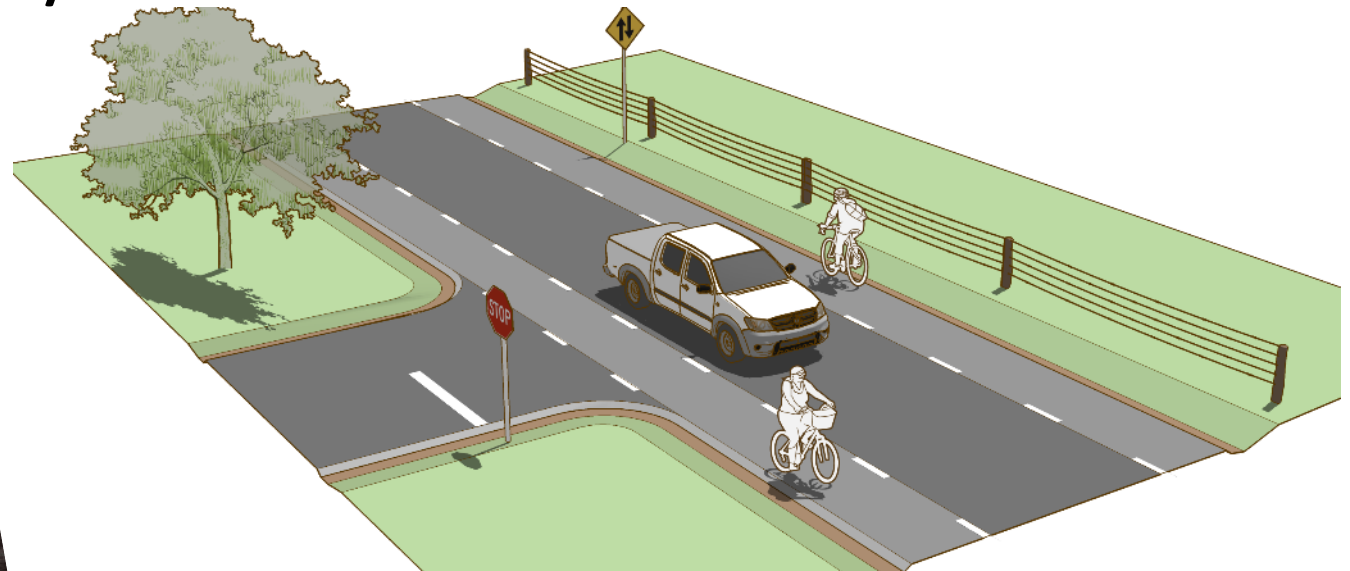
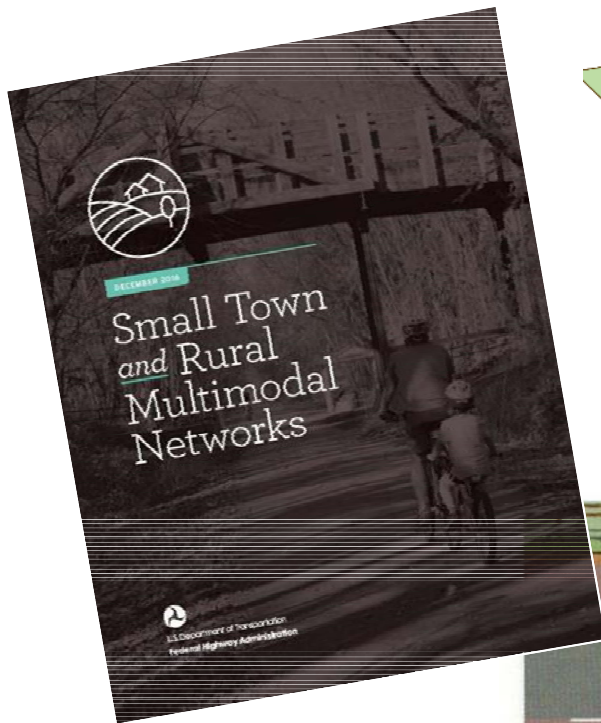


Figure 2-10. Motorists travel in the center two-way travel lane. When passing a bicyclist, no lane change is necessary.

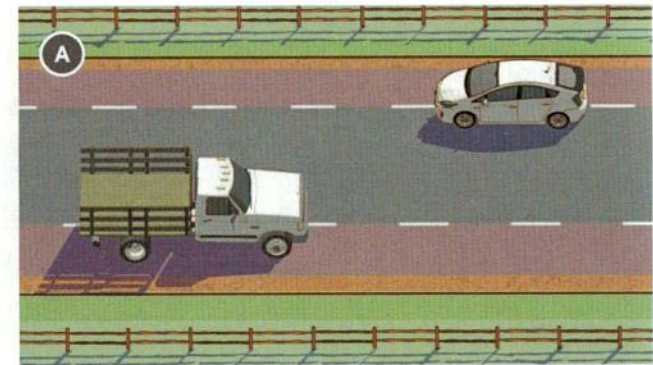


Figure 2-11. When two motor vehicles meet, motorists may need to encroach into the advisory shoulder space.

What if there is no space for bike lanes?

Advisory Shoulder/Bike Lanes



Valley Road, Hanover (image: www.theDartmouth.com)

What if there is no space for bike lanes?

Advisory Shoulder/Bike Lanes



Irving Street, Cambridge MA

What if there is no space for bike lanes?

**Designate a Nearby Roadway
as a Bicycle Boulevard!**



**Traffic
Calming**

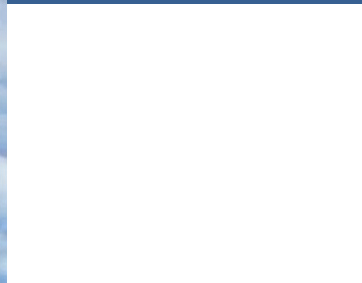


**Traffic
Diversion**

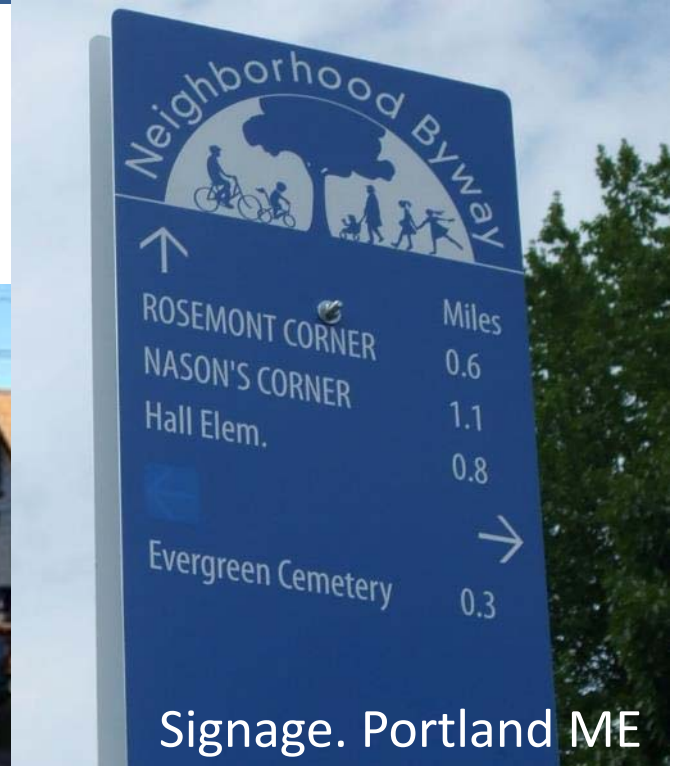


Bike Boulevard Design: Branding

Street Sign Medallion, Berkeley CA



Sharrows & Speed Humps, Portland OR



Signage. Portland ME

Bike Boulevard Design: Crossing Arterials



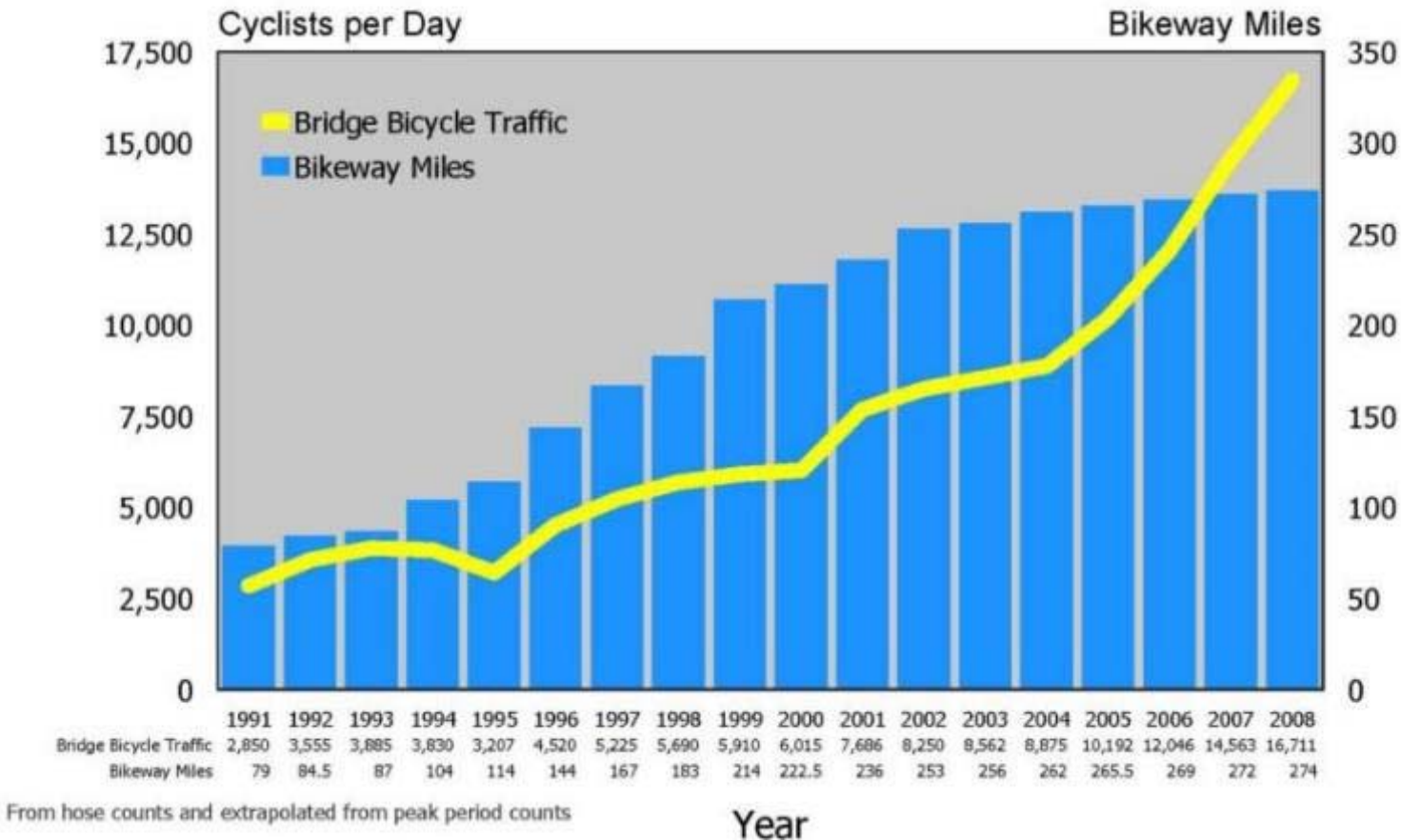
Median Bicycle Slip Lanes, Portland OR



Entry Restrictions, Portland OR

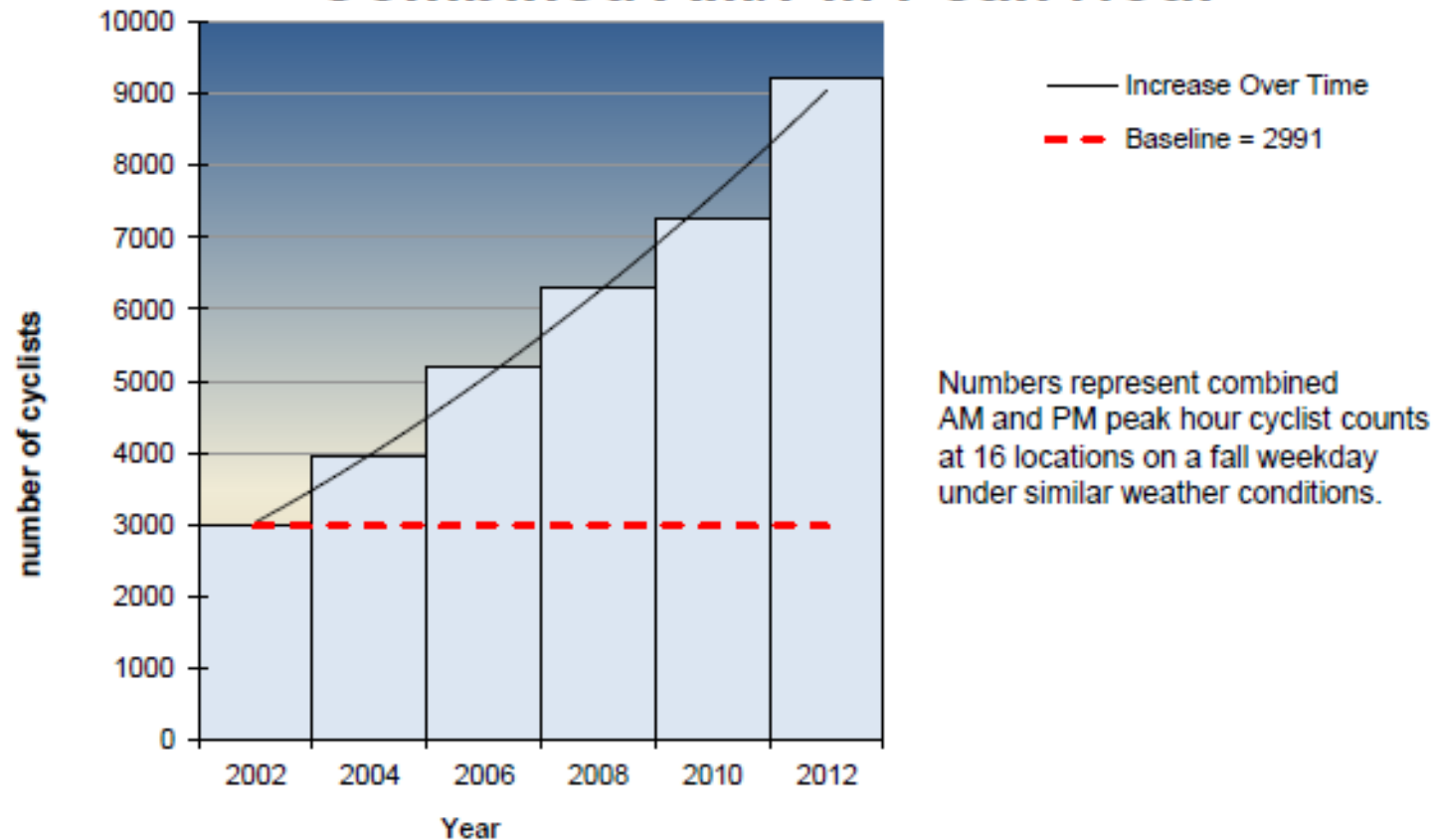
If You Build It, Will They Come?

Combined Bicycle Traffic over Four Main Portland Bicycle Bridges Juxtaposed with Bikeway Miles



If You Build It, Will They Come?

Cambridge Bicycle Counts 2002-2012 Combined AM/PM Peak Hour





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