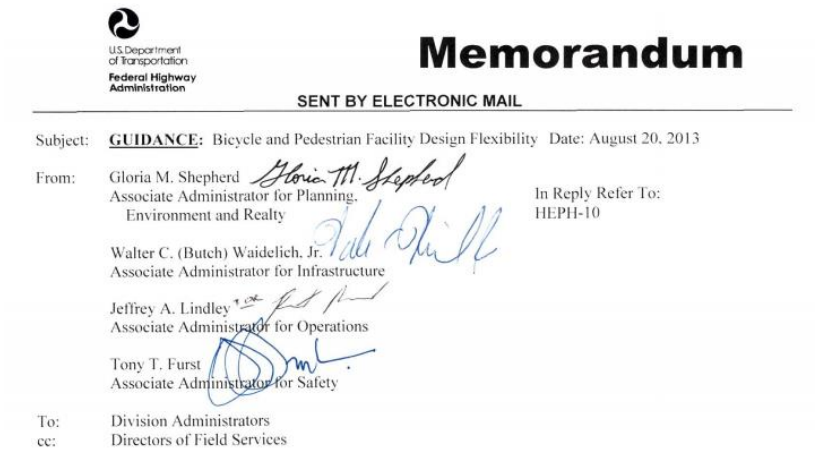
Your Bikeway Infrastructure Toolbox (Tool guide)

Illinois Bike Summit
September 19, 2016

Nathan Roseberry, P.E.

Bikeway Tools – How to Use Design Guides



U.S. Department of Transportation
Federal Highway Administration

Memorandum

SENT BY ELECTRONIC MAIL

Subject: **GUIDANCE:** Bicycle and Pedestrian Facility Design Flexibility Date: August 20, 2013

From: Gloria M. Shepherd
Associate Administrator for Planning, Environment and Realty

In Reply Refer To:
HEPH-10

Walter C. (Butch) Waidelich, Jr.
Associate Administrator for Infrastructure

Jeffrey A. Lindley
Associate Administrator for Operations

Tony T. Furst
Associate Administrator for Safety

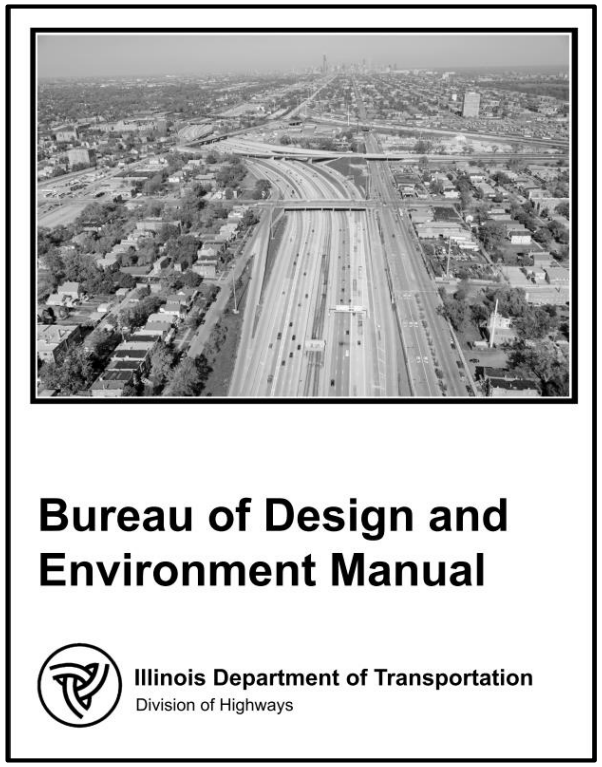
To: Division Administrators
cc: Directors of Field Services

Federal Highway Administration

Federal Highway Administration's (FHWA) support for taking a **flexible approach** to bicycle and pedestrian facility design. The American Association of State Highway and Transportation Officials (AASHTO) bicycle and pedestrian design guides are the primary national resources for planning, designing, and operating bicycle and pedestrian facilities. The National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide and the Institute of Transportation Engineers (ITE) Designing Urban Walkable Thoroughfares guide builds upon the flexibilities provided in the AASHTO guides, which can help communities plan and design safe and convenient facilities for pedestrian and bicyclists. FHWA **supports the use of these resources** to further develop nonmotorized transportation networks, particularly in urban areas.

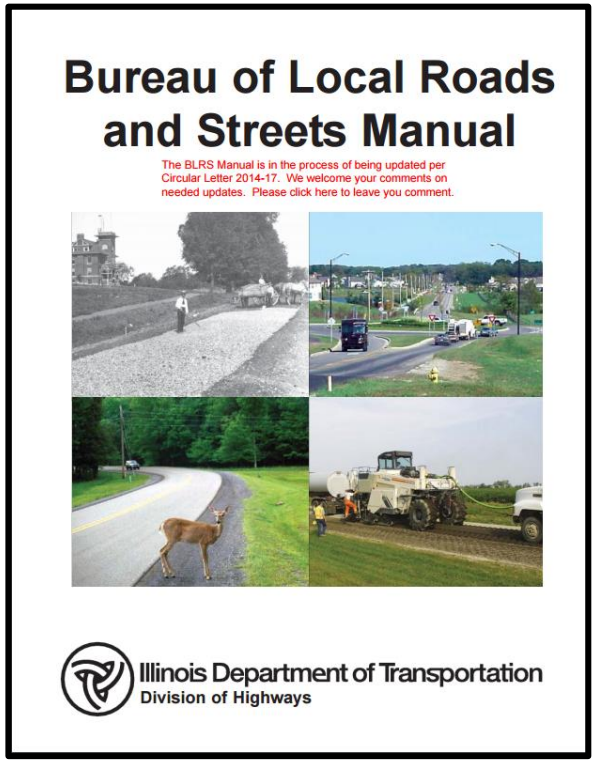
Bikeway Tools – How to Use Design Guides

State Routes



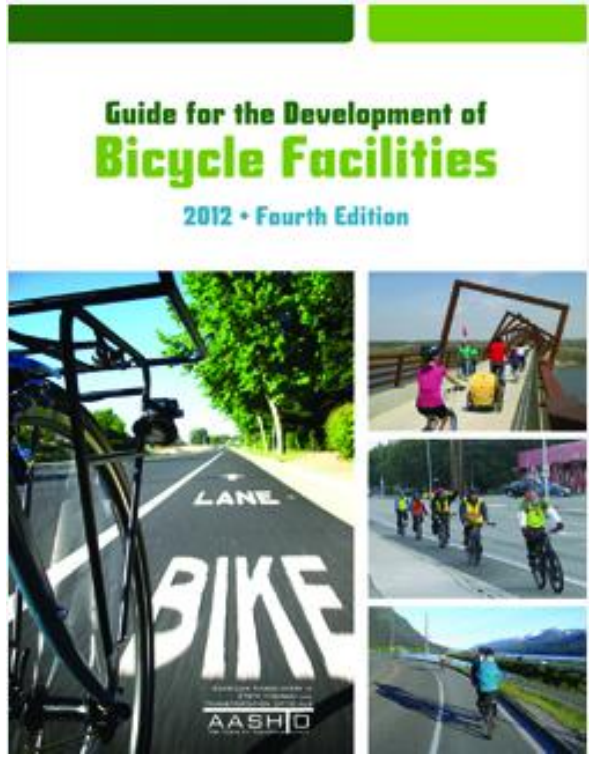
Chapter 17 and others

Local Routes (Fed, State $)



Chapter 42 and others

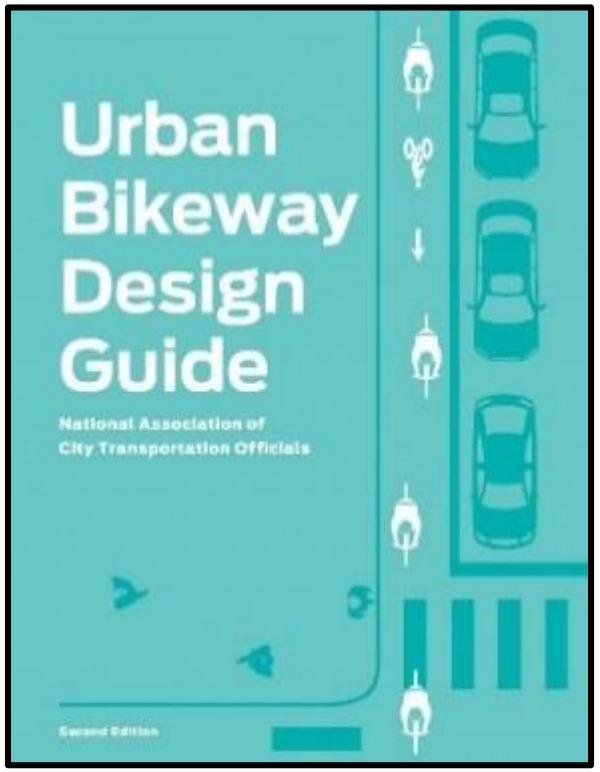
All Routes



On Street, Off Street

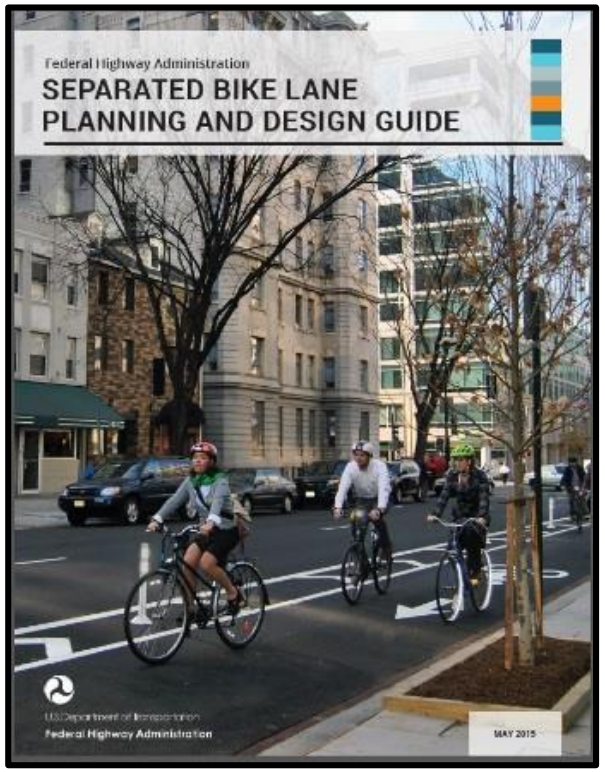
Bikeway Tools – How to Use Design Guides

Urban Bikeways



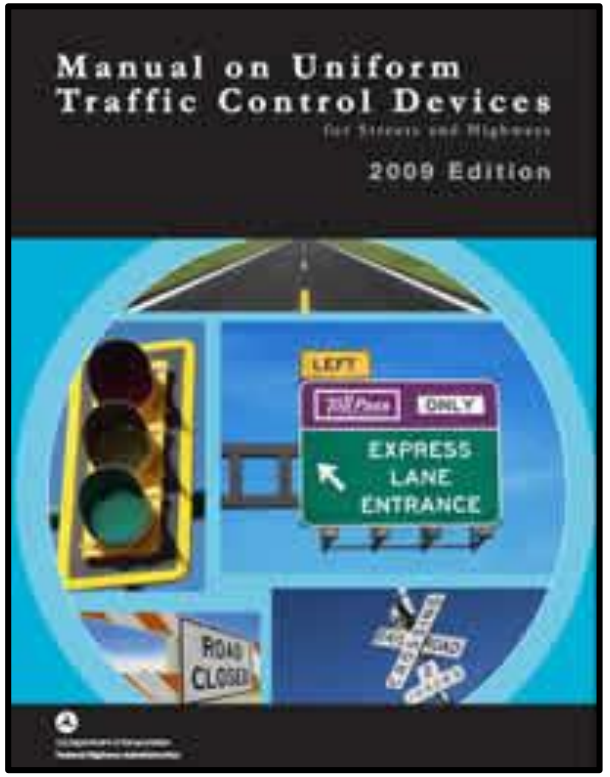
Neighborhood and Arterial

Separated Bike Lane



Arterials

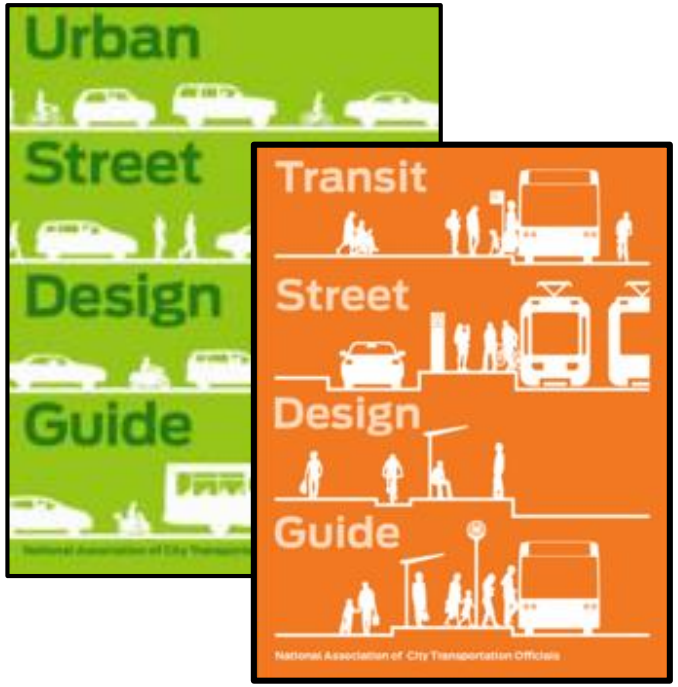
Traffic Control Devices



Part 9 and others
Interim Approvals, RFEs

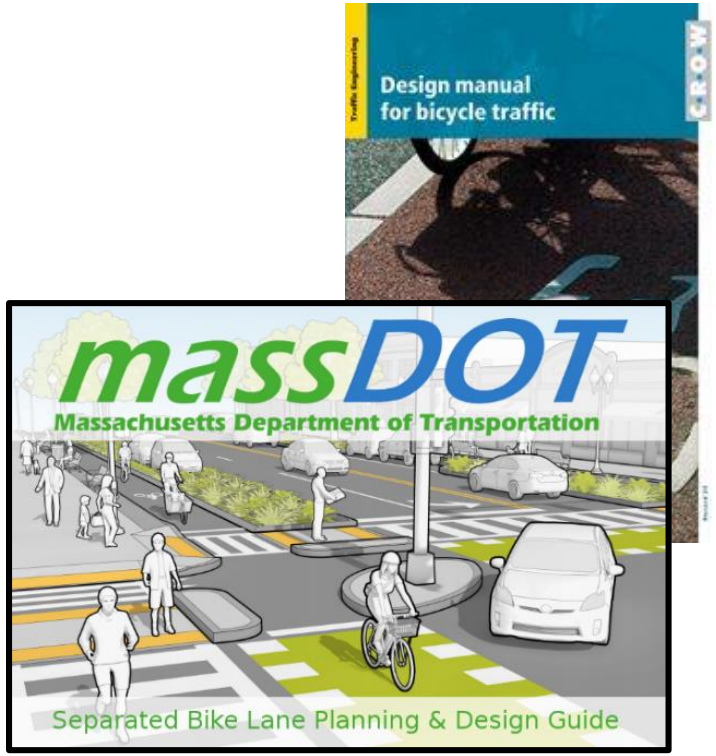
Bikeway Tools – How to Use Design Guides

Other Urban Guides



Ped and Traffic Calming Design Guides

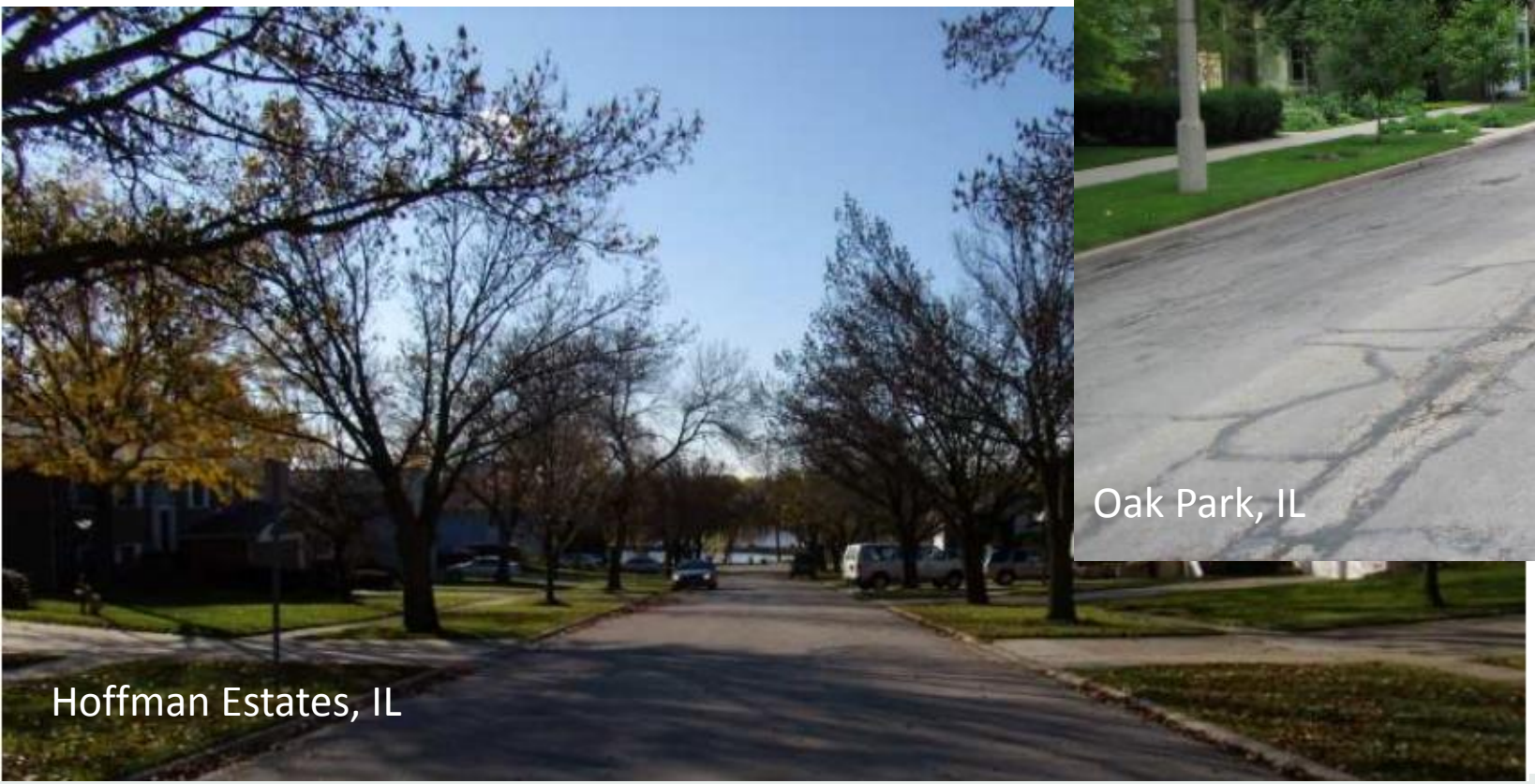
Other Country and State DOT Design Guides



What does a comfortable neighborhood street design for bikes look like?

Chicago, IL

Chicago, IL



Hoffman Estates, IL

Oak Park, IL

Complete Streets Coalition

Bikeway Tools – Neighborhood Streets

How do I make it comfortable?

1. Speed
2. Volume
3. Crossings

Volume / Speed	< 1,500	>1,500
< 20 MPH	Street is already comfortable	Consider volume management
> 20 MPH	Consider speed management	Consider both volume and speed management

Guides: Local Roads Manual, NACTO UBDG, Traffic Calming Design Guides

Bikeway Tools – Neighborhood Streets (Speed)

Vertical Speed Management:
Speed Humps, Tables, Cushions
Raised Crosswalks

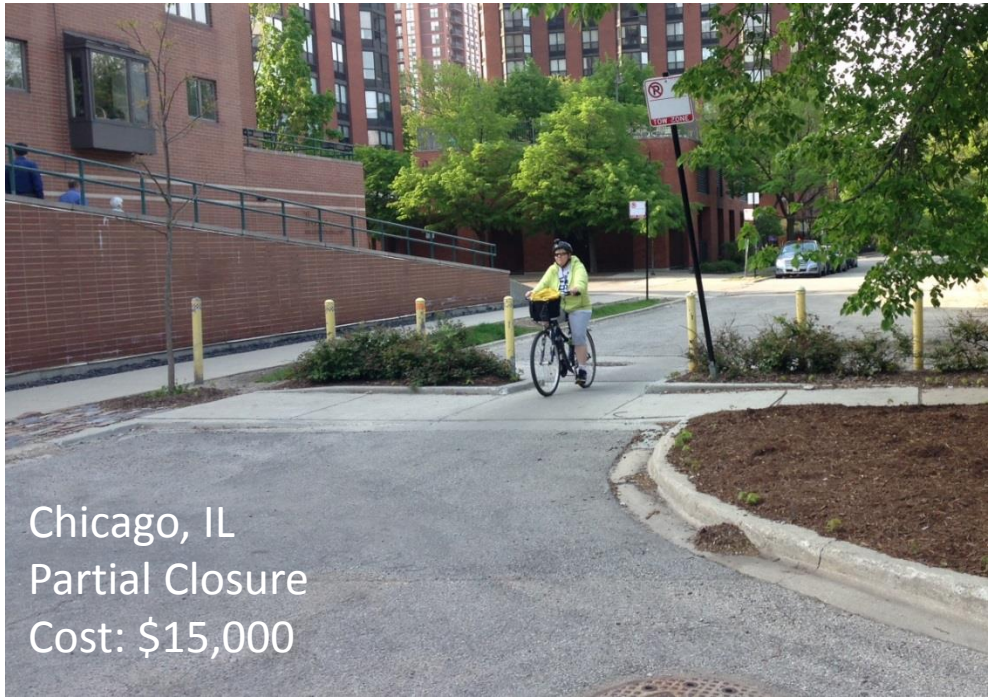
Horizontal Speed Management:
Traffic Circles, Chicanes, Chokers,
Neckdowns, Curb Extensions,
Skinny Streets…..On Street Parking

Chicago, IL
Speed Humps
Cost: $3,000

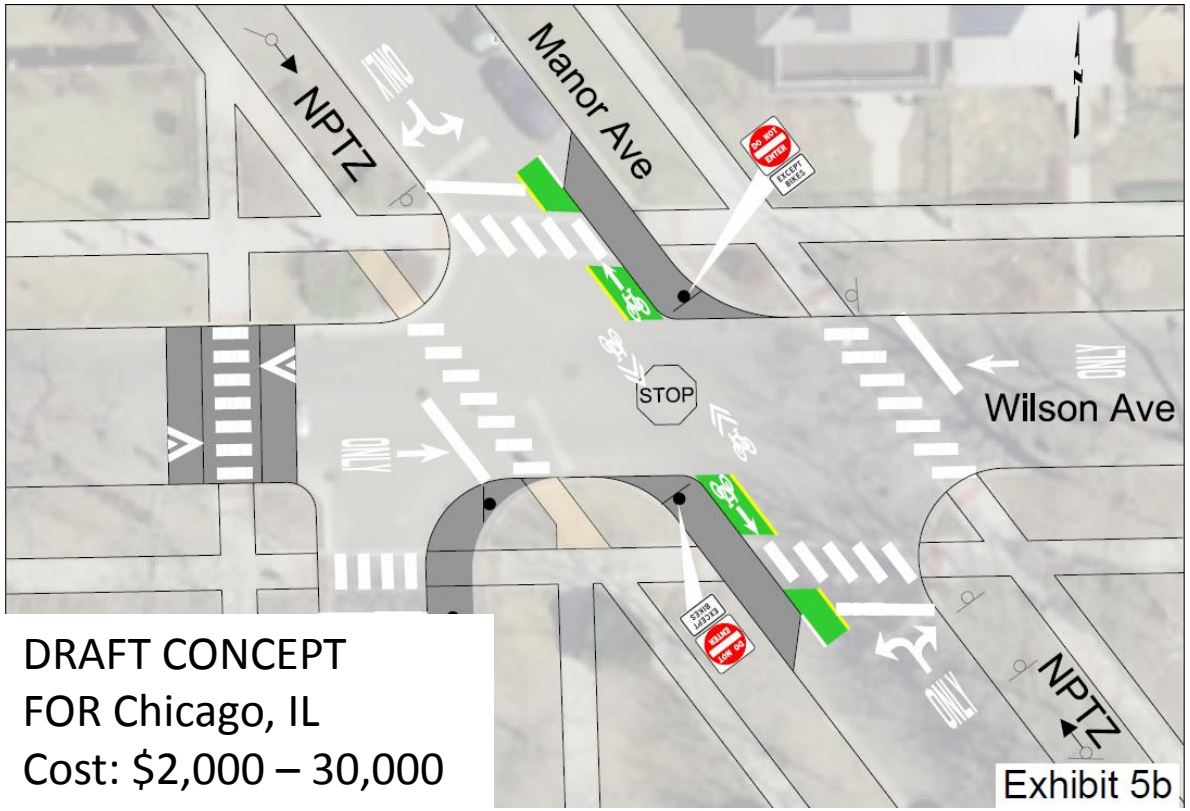
Chicago, IL
Chicane
Cost: $15,000

Bikeway Tools – Neighborhood Streets (Volume)

Partial Closures



Diverters / Movement Restrictions



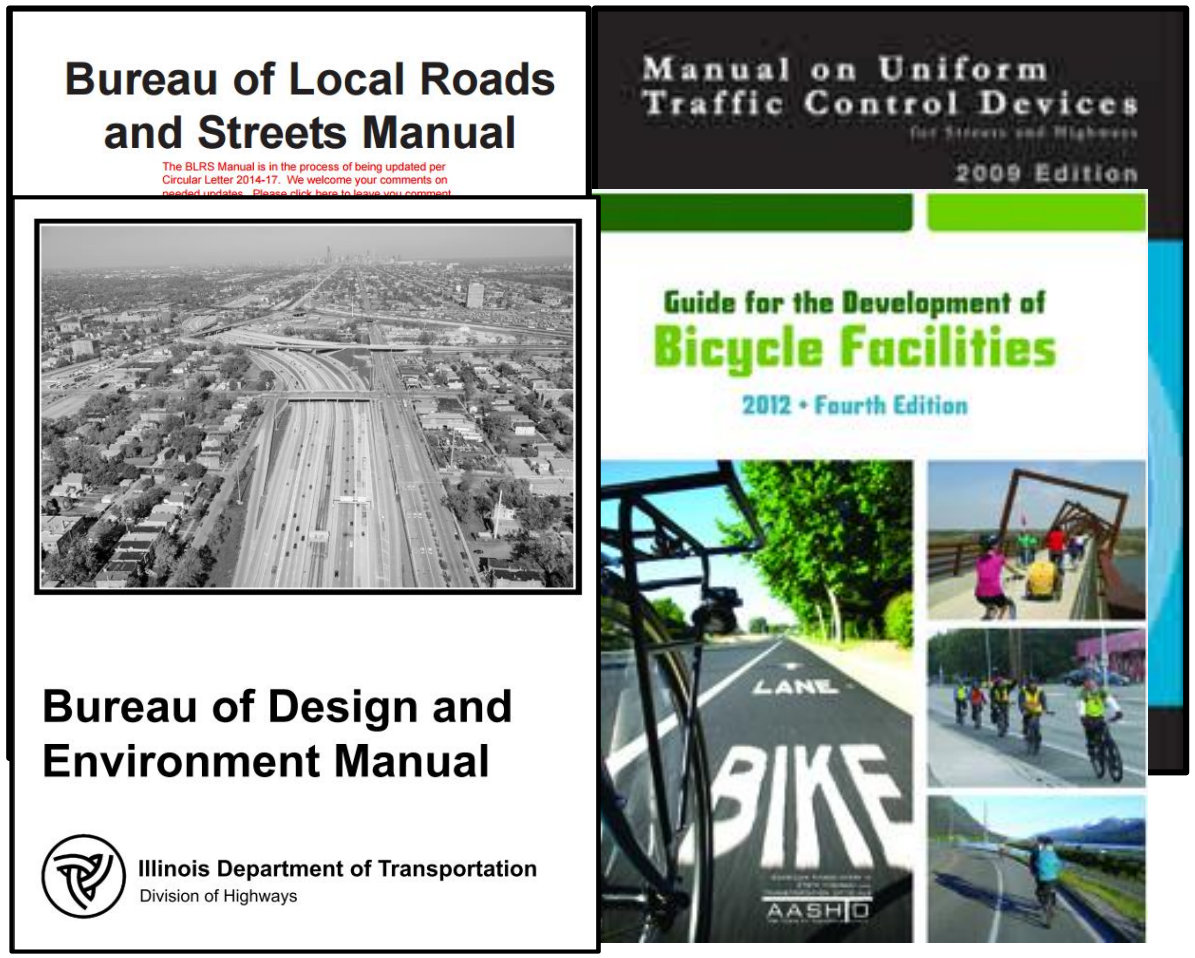
DRAFT CONCEPT
FOR Chicago, IL
Cost: $2,000 – 30,000

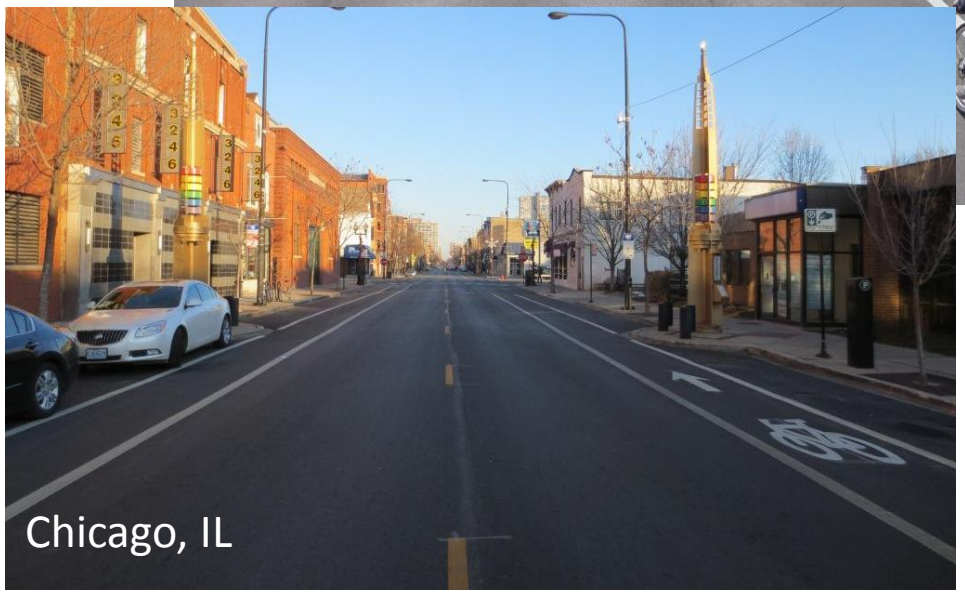
Bikeway Tools – Neighborhood Streets (Crossings)

Unsignalized
Refuge Islands, Markings, Signage, Curb Extensions
RRFB, HAWK, All-Way Stops

Signalized
Use Existing Signals, Modify with Bike Signals

Bikeway Tools – Arterial Streets (Conventional)





Bikeway Tools – Arterial Streets

Allowable in 2009 MUTCD

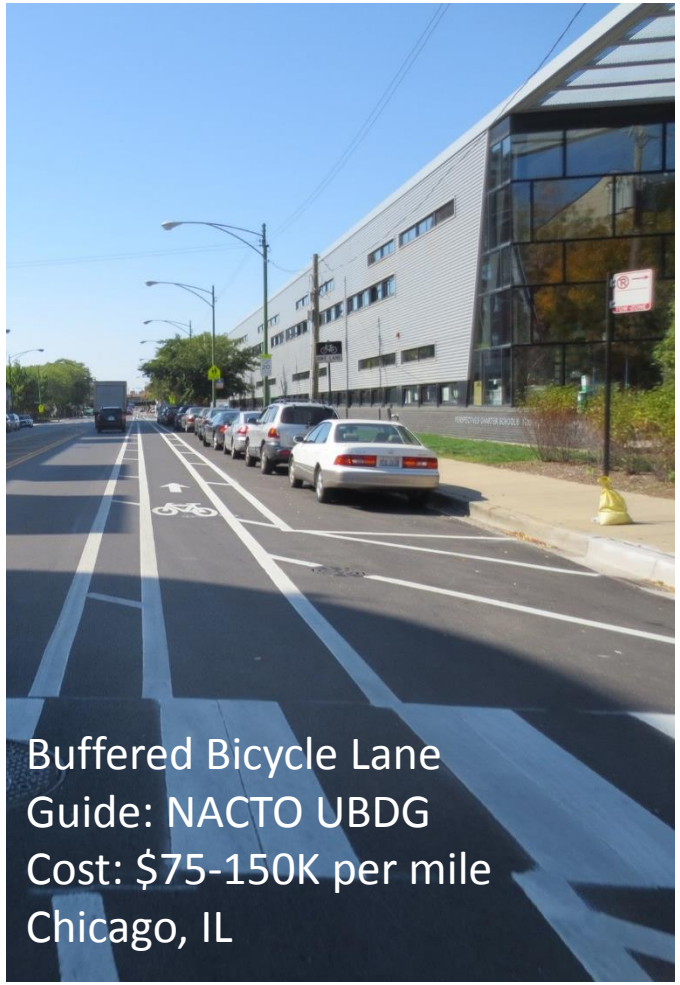
- Continuation of Bicycle Lanes up to Intersections
- Extensions of Bicycle Lanes through Intersections
- Counter-flow Bicycle Lanes
- Buffer-Separated Bicycle Lanes
- Bicycle Lanes on the Left-Hand Side of One-Way Streets
- Two-stage turn box Jughandle movement at a T-intersection
- Shared-Lane Markings
- Shared-lane markings in exclusive turn lanes
- Rotated bicycle symbols in bicycle lanes or separated bikeways at intersections and driveways oriented towards turning or entering motorists

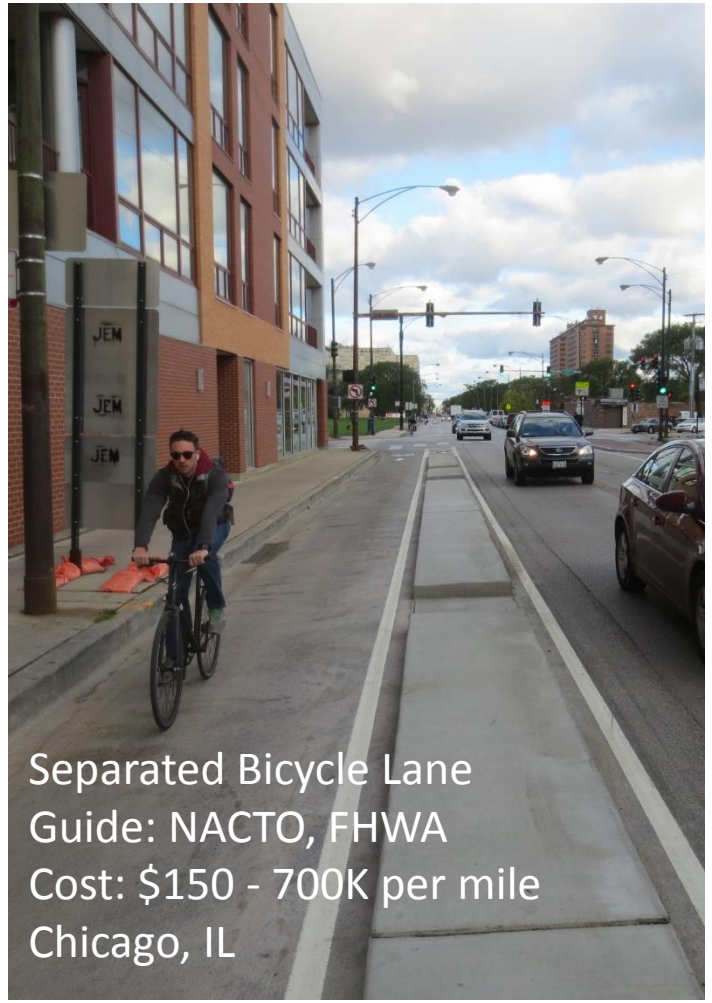
Other treatments that are not traffic control devices, so no MUTCD restriction on their use

- Separated bikeways
- Convex mirrors at conflict points to improve visibility
- Bicycle networks
- Median or refuge island for bikeway crossings

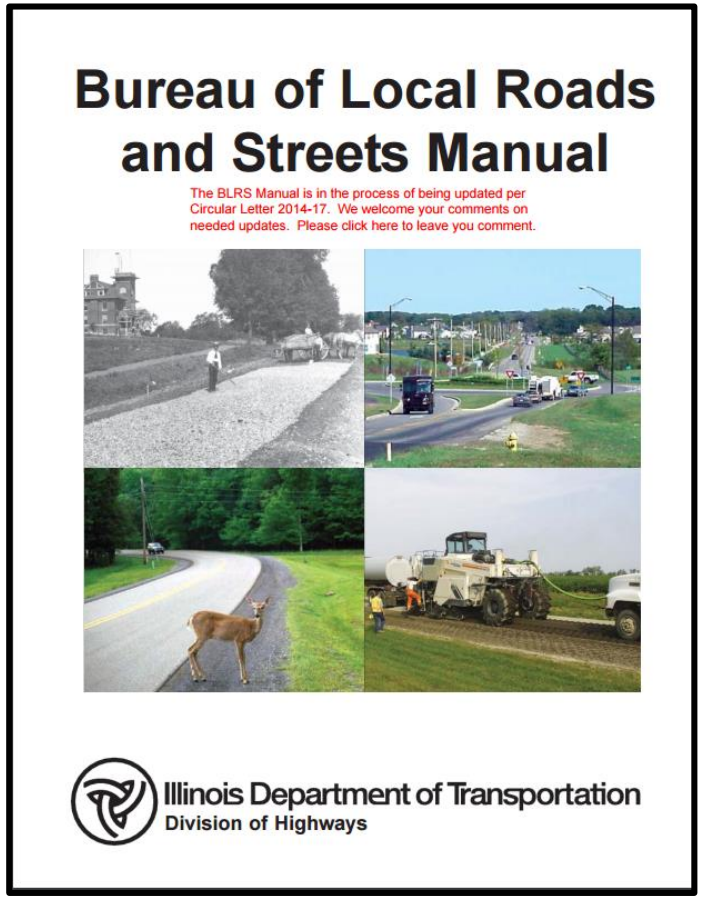
Source: FHWA (http://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/mutcd/index.cfm)

Bikeway Tools – Arterial Streets (Separated)



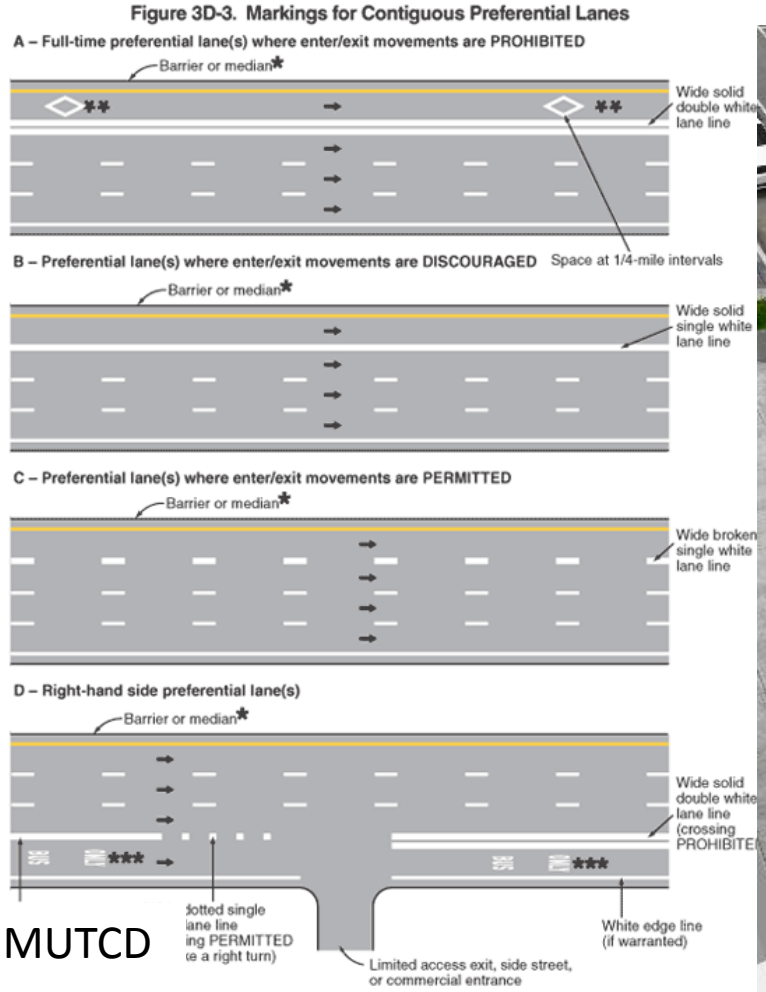


Bikeway Tools – Arterial Streets

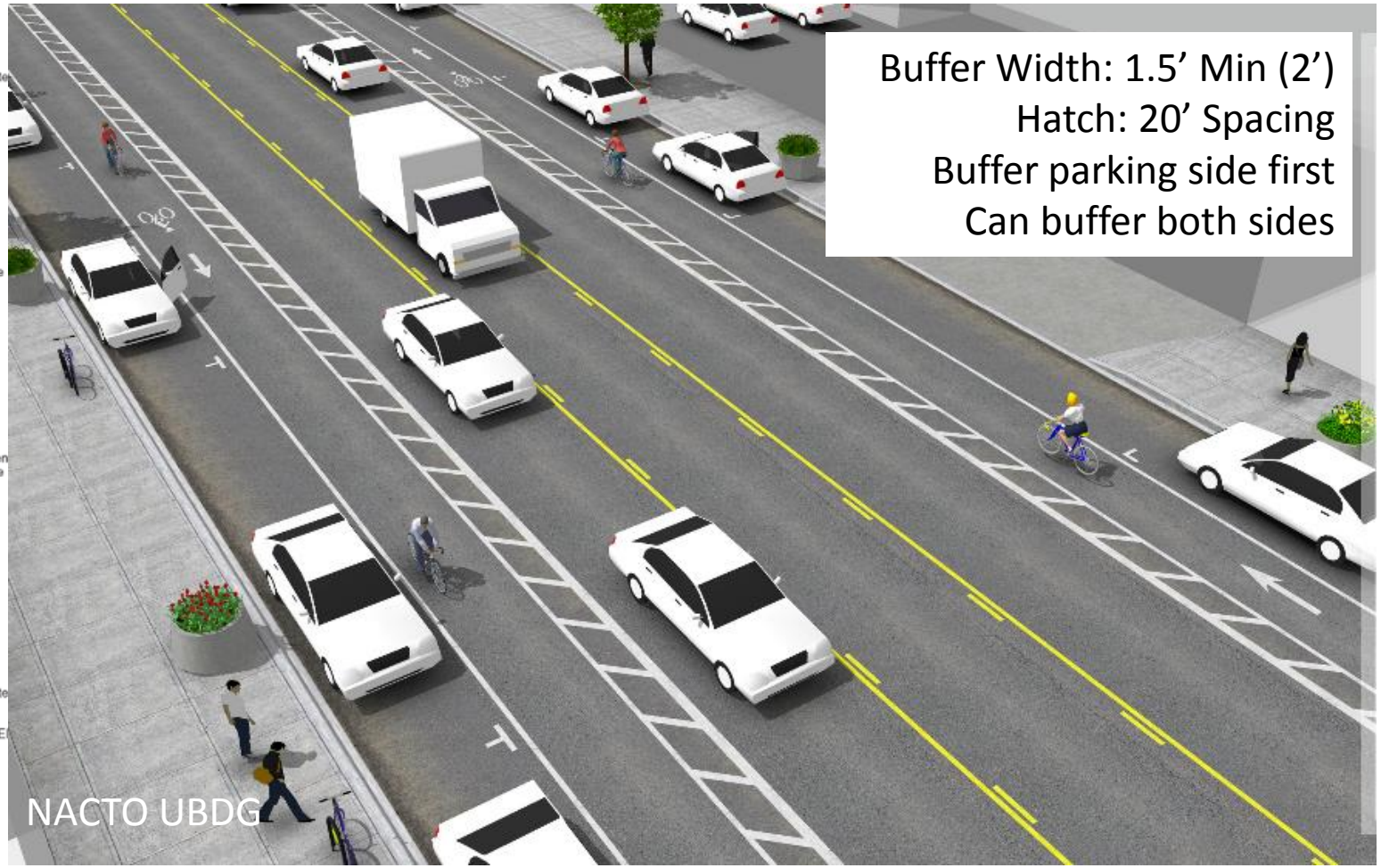


Section 42-3.03(c): “On highways with ADT greater than 10,000 consider a minimum width of 6 ft that may include an optional 2 ft striped buffer zone”

Bikeway Tools – Arterial Streets

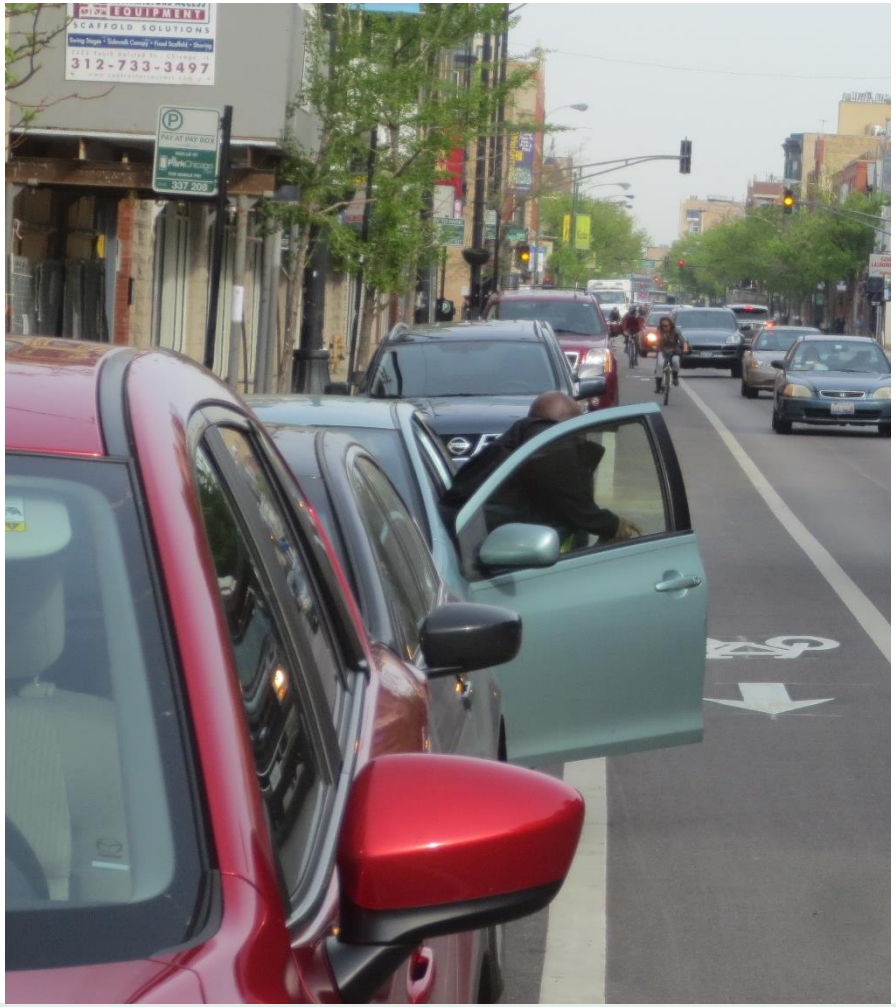


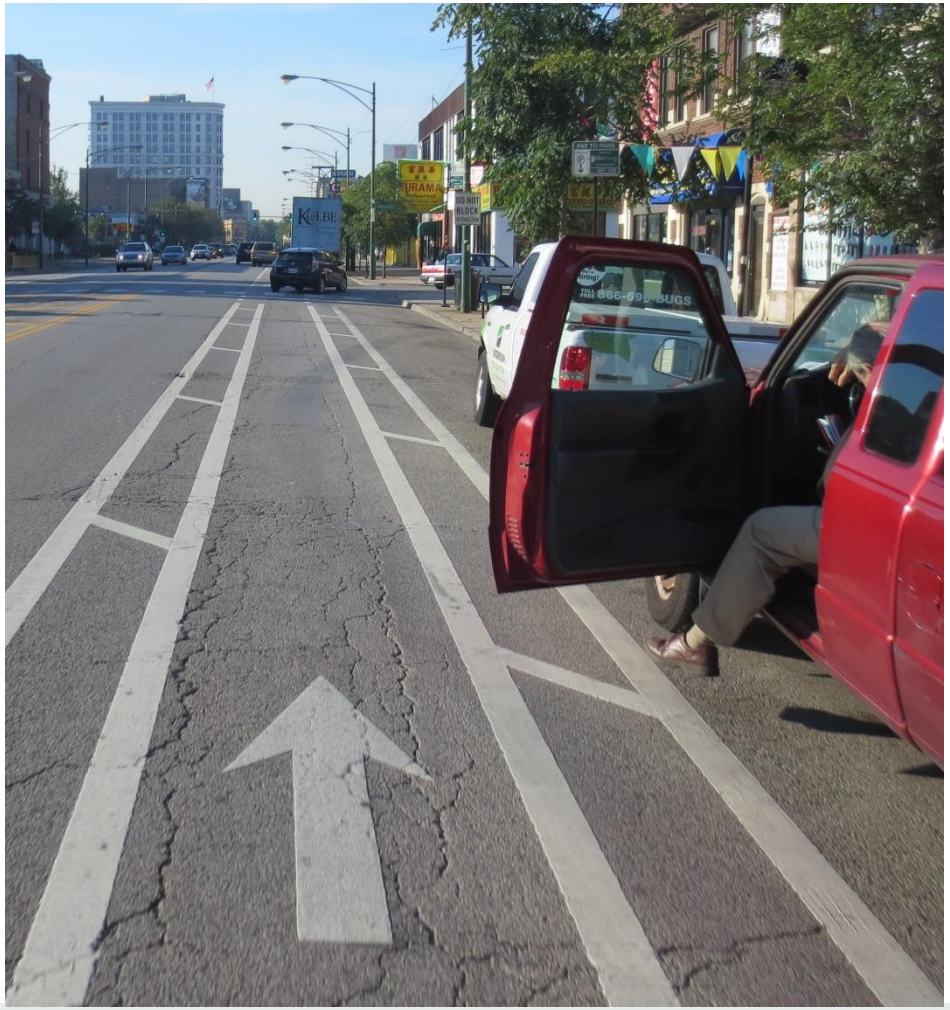
MUTCD

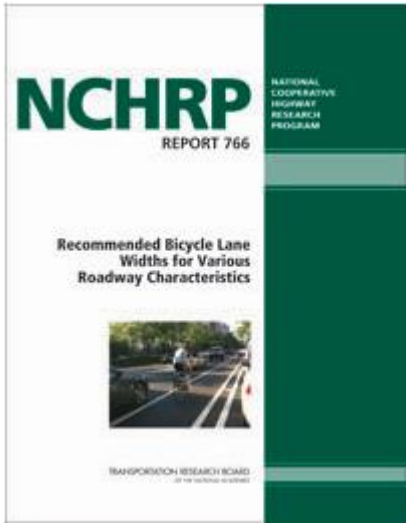


NACTO UBDG

Bikeway Tools – Arterial Streets







NCHRP 766:

- If you have space, add buffers
- Stripe lanes at minimum widths and buffer in between

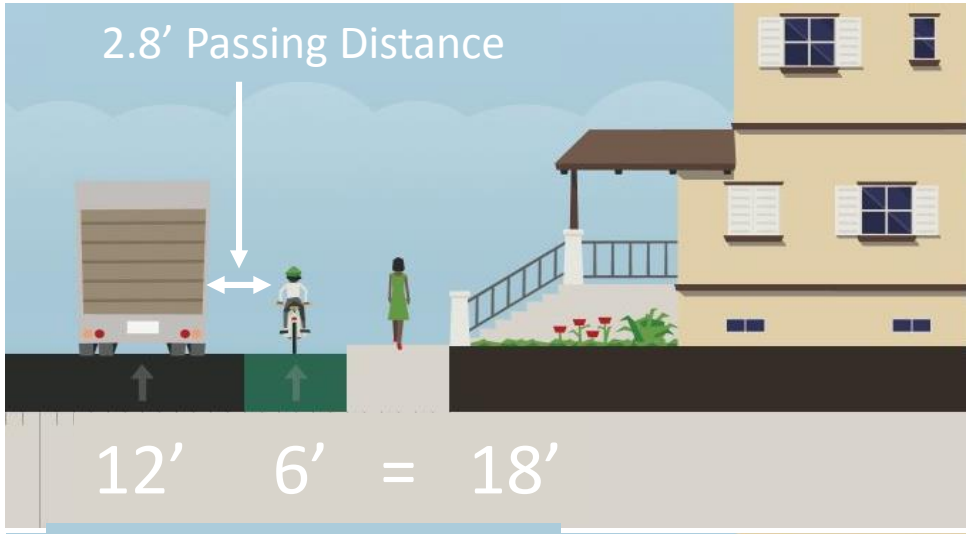
Bikeway Tools – Arterial Streets

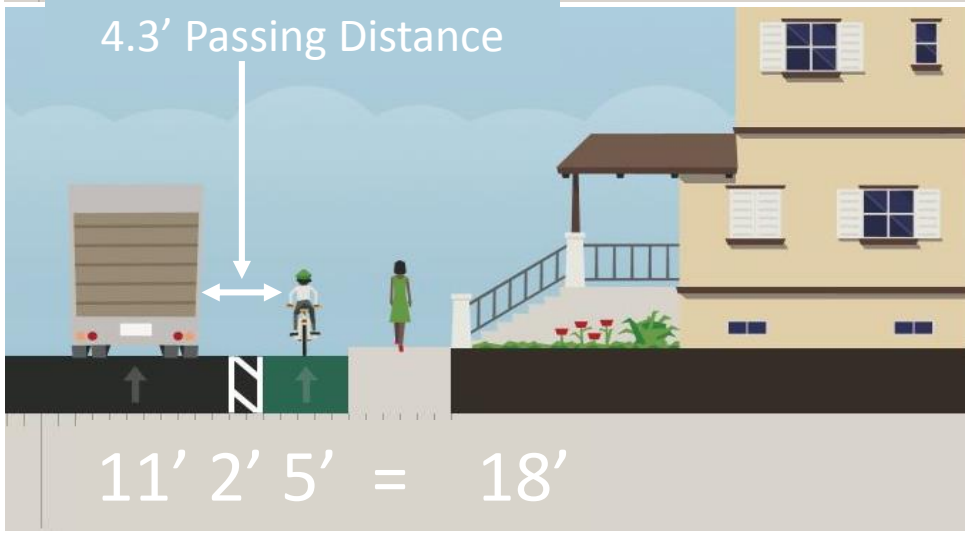
How to Implement – Reduce Widths

<u>Travel Lanes 10’ – 12’</u>
BLR – 10’ min from edge of pavement
BDE – 11’ Min (10’ with design exception)
10’ Lane + 2’ Buffer Accommodates larger vehicles

<u>Parking Lane 7’ – 9’</u>
BLR / BDE – 8’ min from face of curb (7’ with design exception)
7’ Lane + 2’ Buffer better accommodates door zone

Bike Lane 4’ – 6’
BLR / BDE – 4’ Min (5’ next to parking)
Wider isn’t necessarily better
Buffer is counted in width next to parking





Bikeway Tools – Arterial Streets

How to Implement - Road Diet

<u>Safety Improvement for all</u>

29% Reduction in Crashes

Easier to cross

Allows for left turn lanes

Allows for pedestrian refuge islands

<u>Cars per day</u>

< 10K – Easy

10-15K – Likely

15K + Do a Study

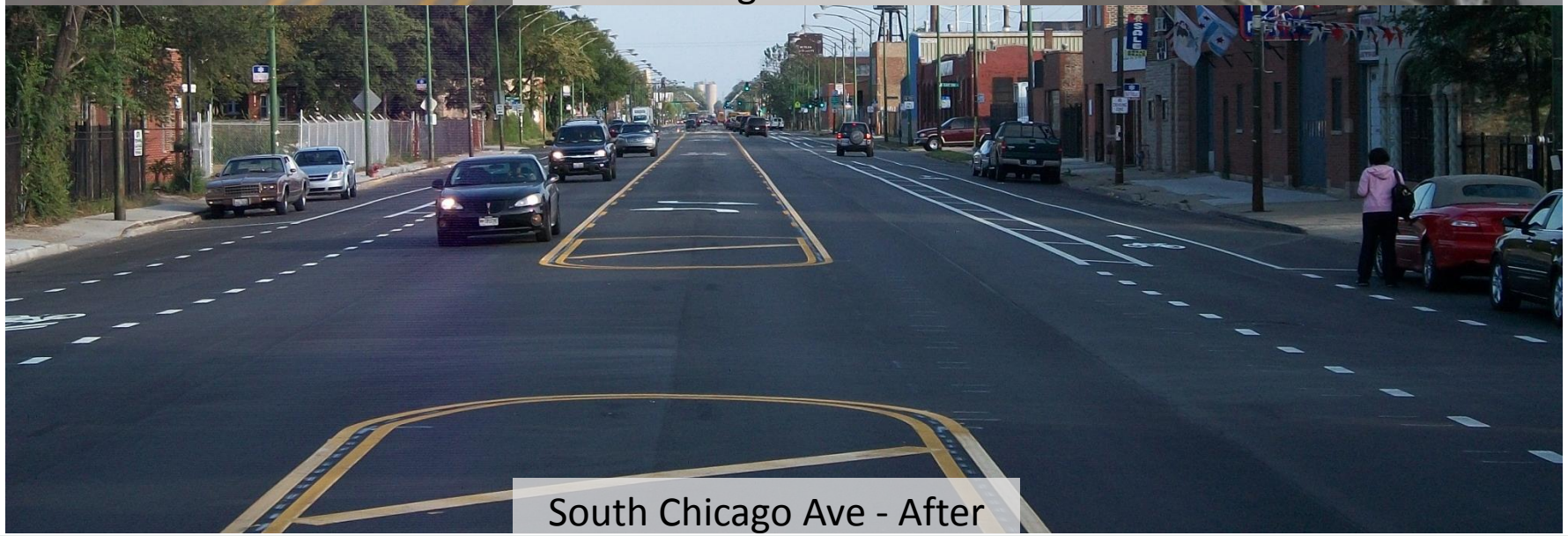
<u>Important for capacity:</u>

Peak Volumes

Directionality

Traffic Control

South Chicago Ave - Before

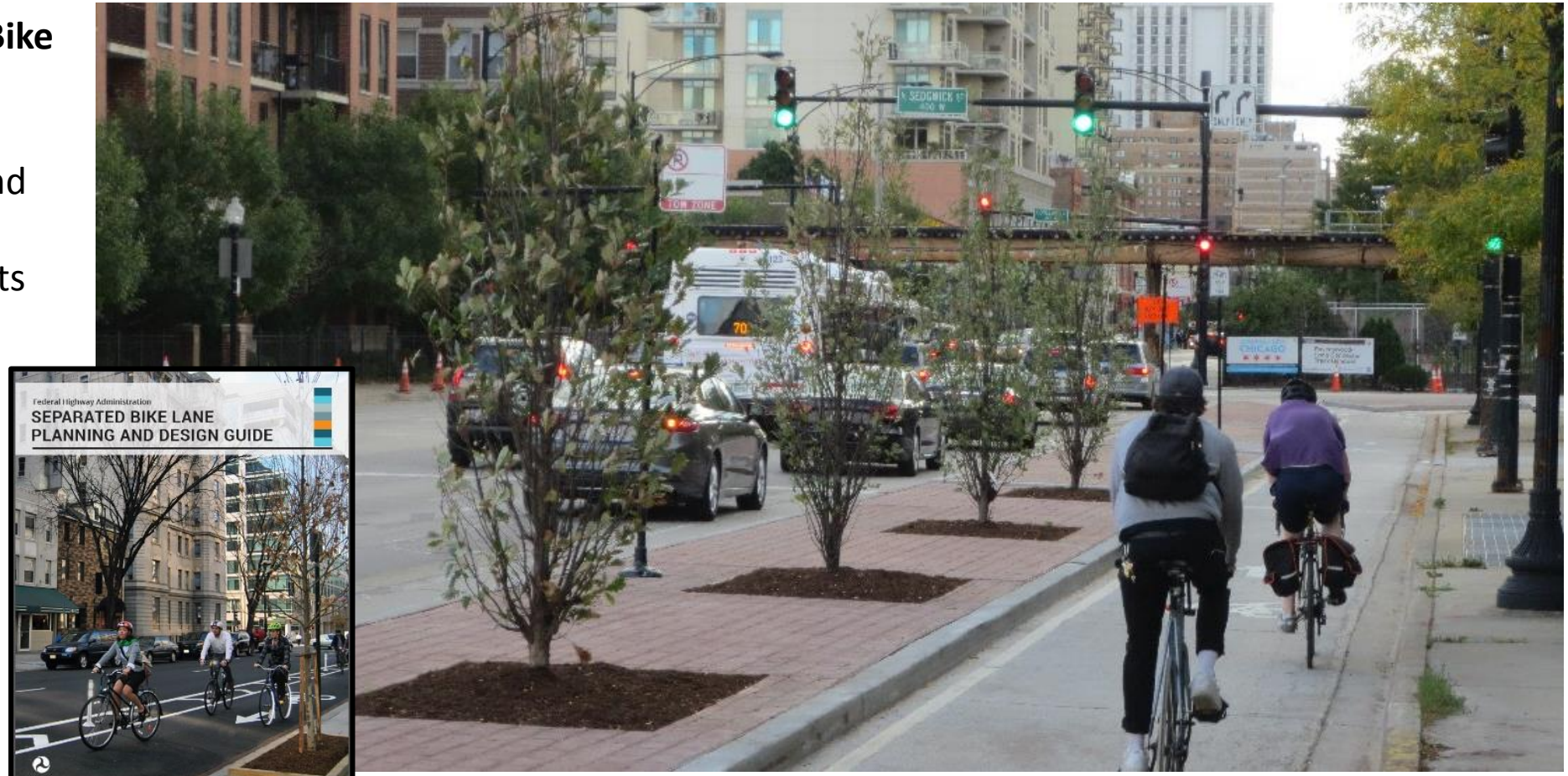


South Chicago Ave - After

Bikeway Tools – Arterial Streets

Clybourn Avenue Separated Bike Lane Pilot Study

- IDOT / CDOT Joint Study
- Used National Guidance and Chicago Local Experience
- Evaluating Many Treatments
  - Concrete Separation
  - Landscaping
  - Parking / Non Parking Separated
  - Bicycle Signals
  - Drainage
  - Modal Changes



Bikeway Tools - Intersections

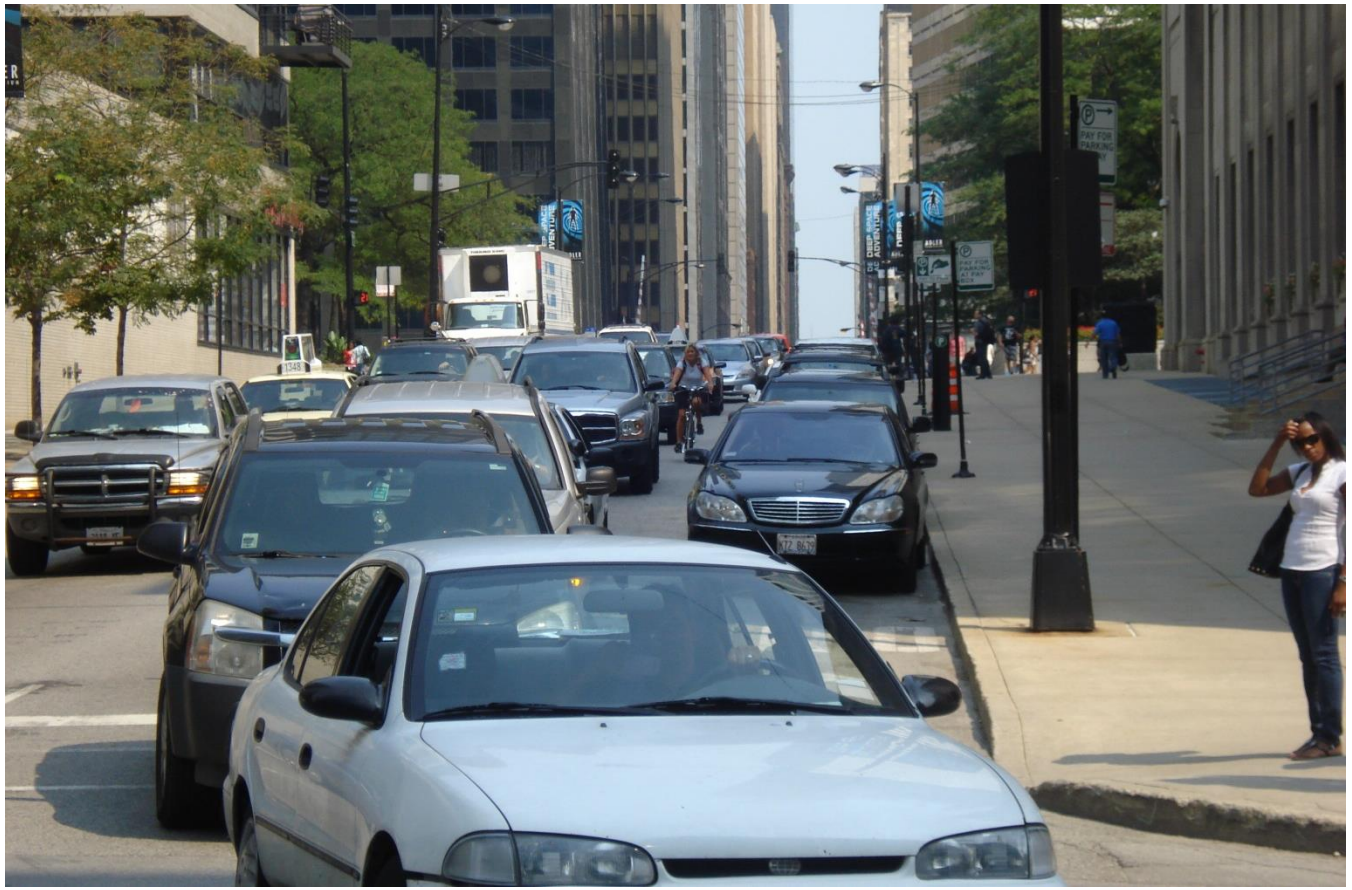
Design Challenges

- Conflicts between users
- Competing needs for roadway space
- Where many crashes occur
- Where bikes feel uncomfortable

Goals

- Reduce Right Hook Conflict
- Facilitate turns for bikes
- Balance design for all modes

- Provided dedicated space for bikes
- Manage vehicle turn speeds



Bikeway Tools - Intersections

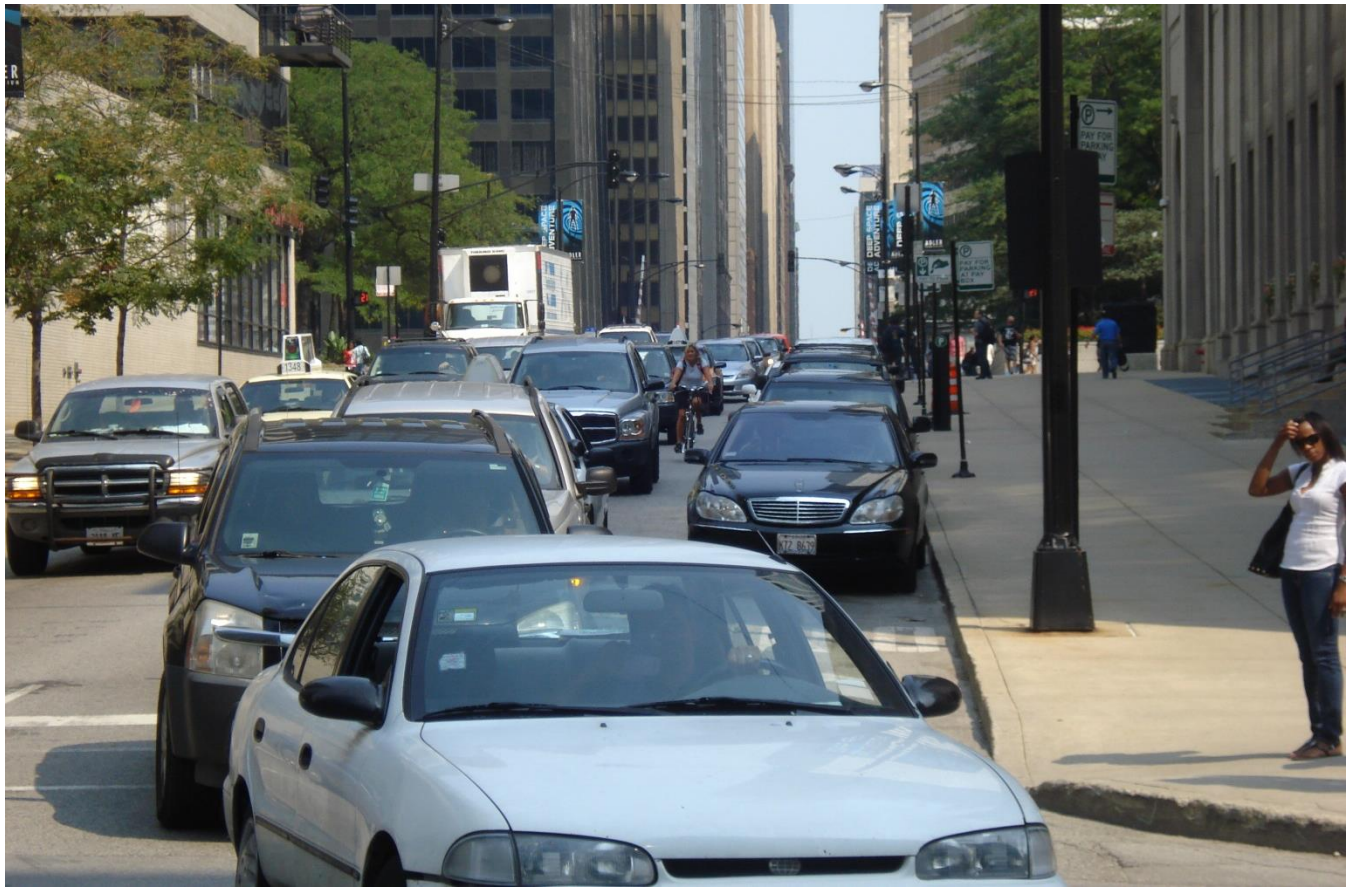
Design Challenges

- Conflicts between users
- Competing needs for roadway space
- Where many crashes occur
- Where bikes feel uncomfortable

Goals

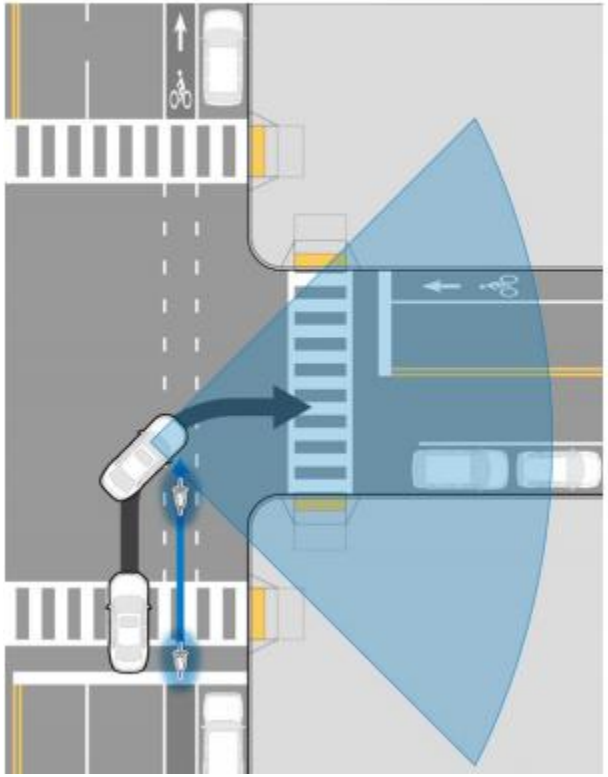
- Reduce Right Hook Conflict
- Facilitate turns for bikes
- Balance design for all modes

- Provided dedicated space for bikes
- Manage vehicle turn speeds



Bikeway Tools – Intersections
What is a right hook?

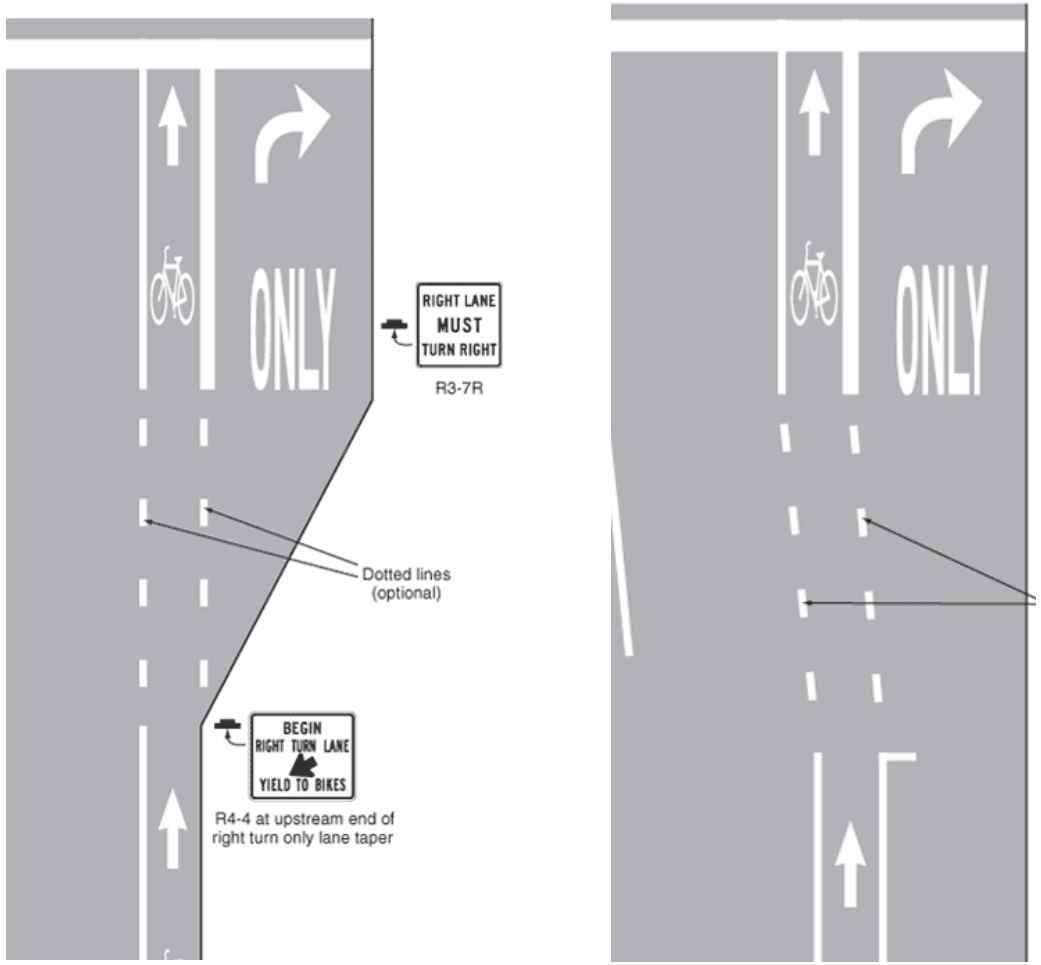
EXHIBIT 2B: MOTORIST'S VIEW AT CONVENTIONAL BIKE LANE



Bikeway Tools - Intersections

Intersection Markings
Allowable per 2009 MUTCD
Guide: NACTO
Cost: $1,000 - $3,000 per intersection

Bikeway Tools – Intersections



Right Turn Lane
MUTCD Part 9
Guide: MUTCD
Cost: $1,000 - $3,000 per intersection

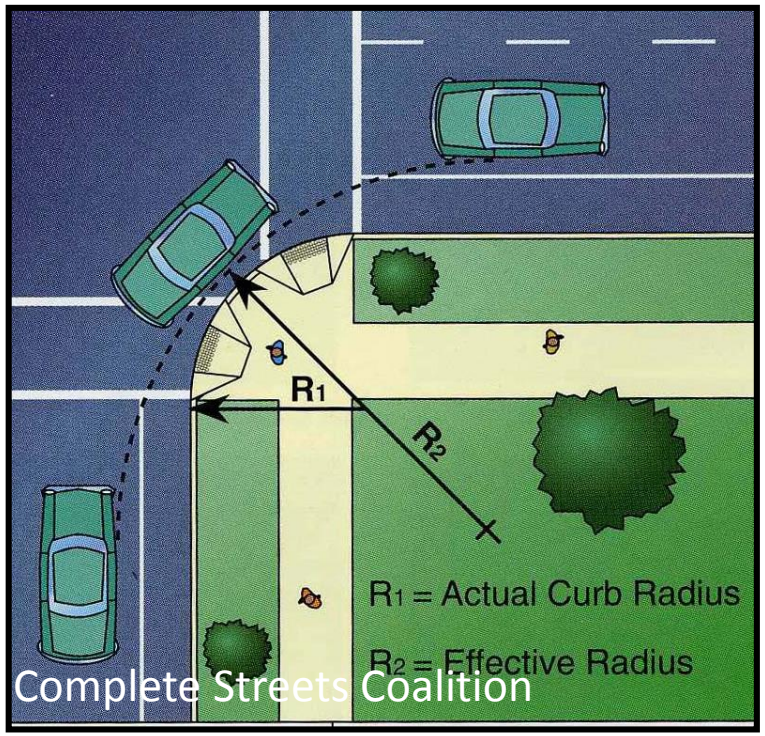
Bikeway Tools - Intersections

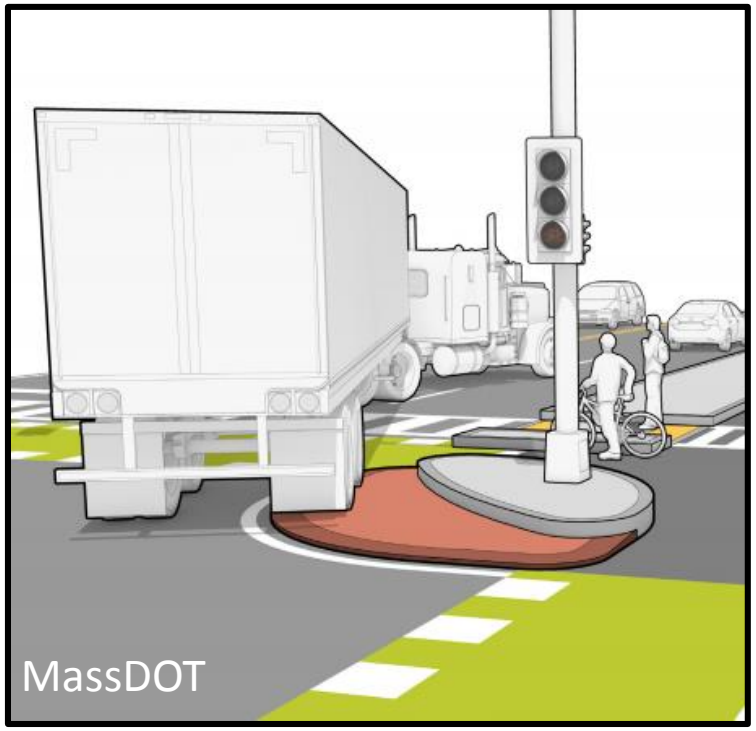
Bicycle Signals
Interim Approval Status
Guide: NACTO
Cost: $12,000 - $20,000 per intersection

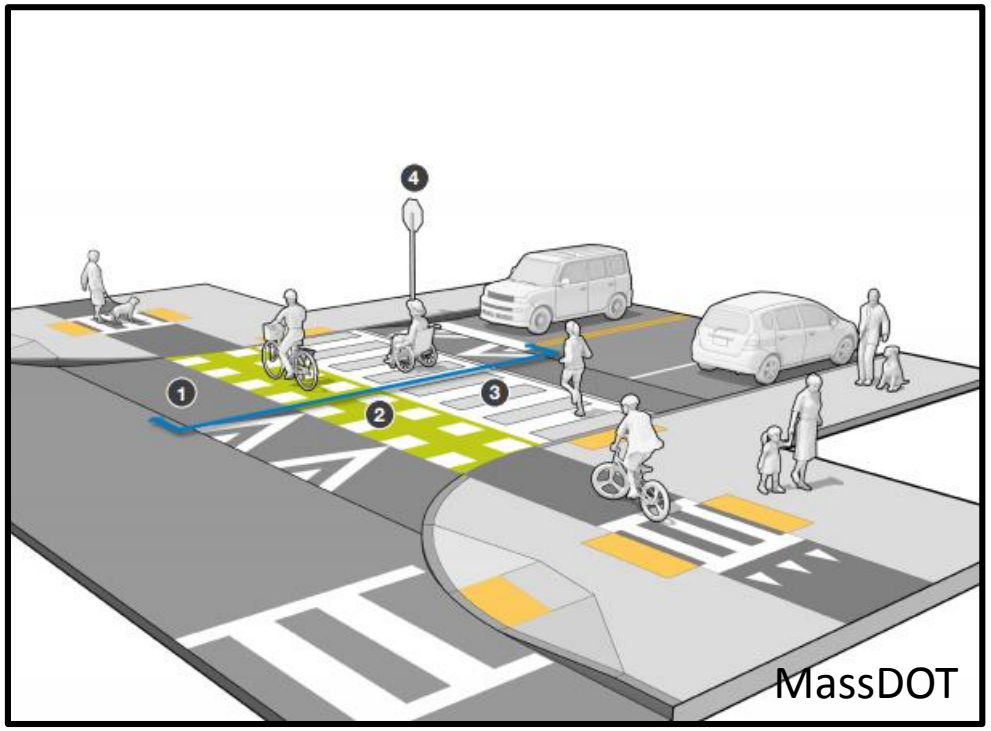
Bikeway Tools - Intersections

Chicago, IL
Protected Intersection
Not Governed by MUTCD
Guide: MassDOT, FHWA
Cost: $20K + per intersection

Bikeway Tools - Intersections



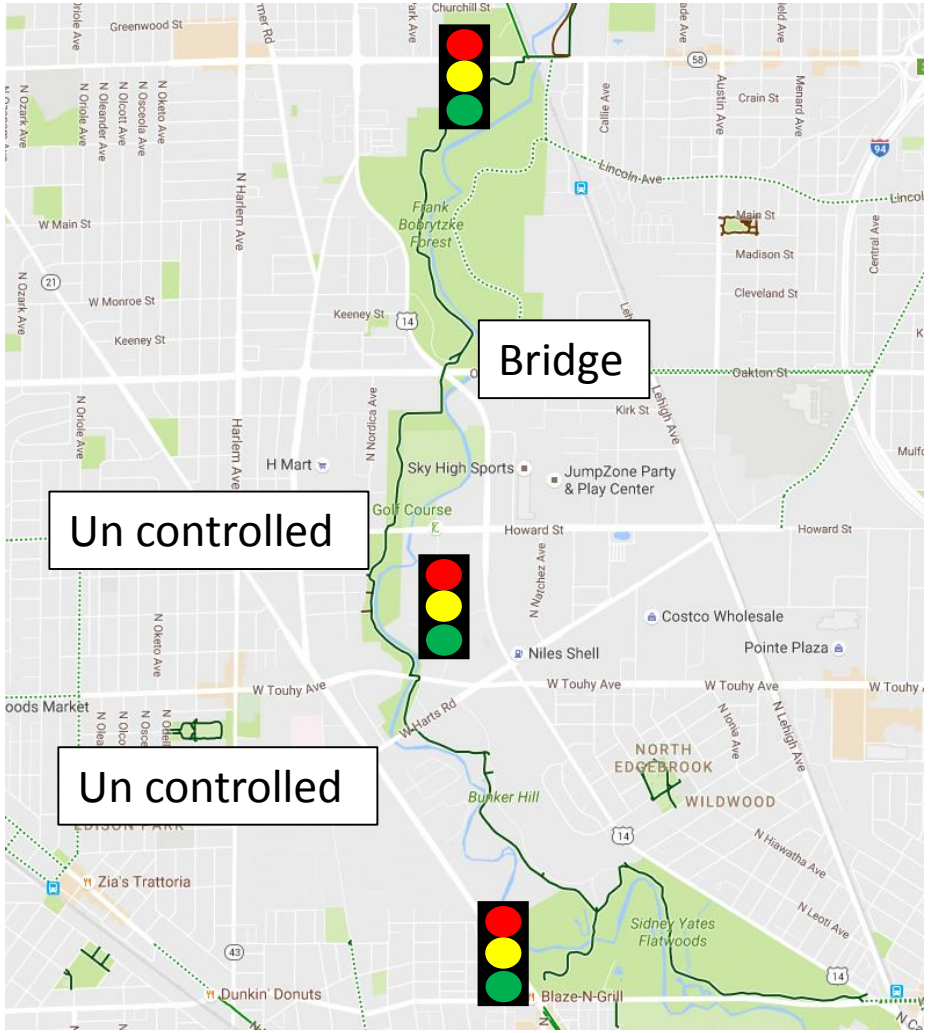


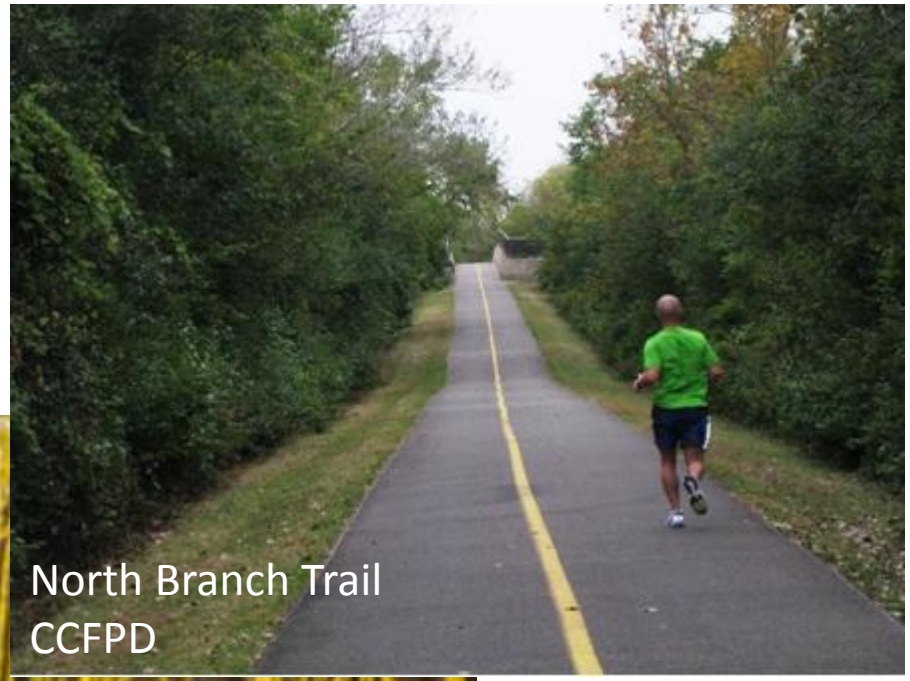


Manage turn speeds with geometry

- Horizontal – tighten curb radius, curb extension, truck aprons
- Vertical – Raised crosswalks

Bikeway Tools – Trail Crossings





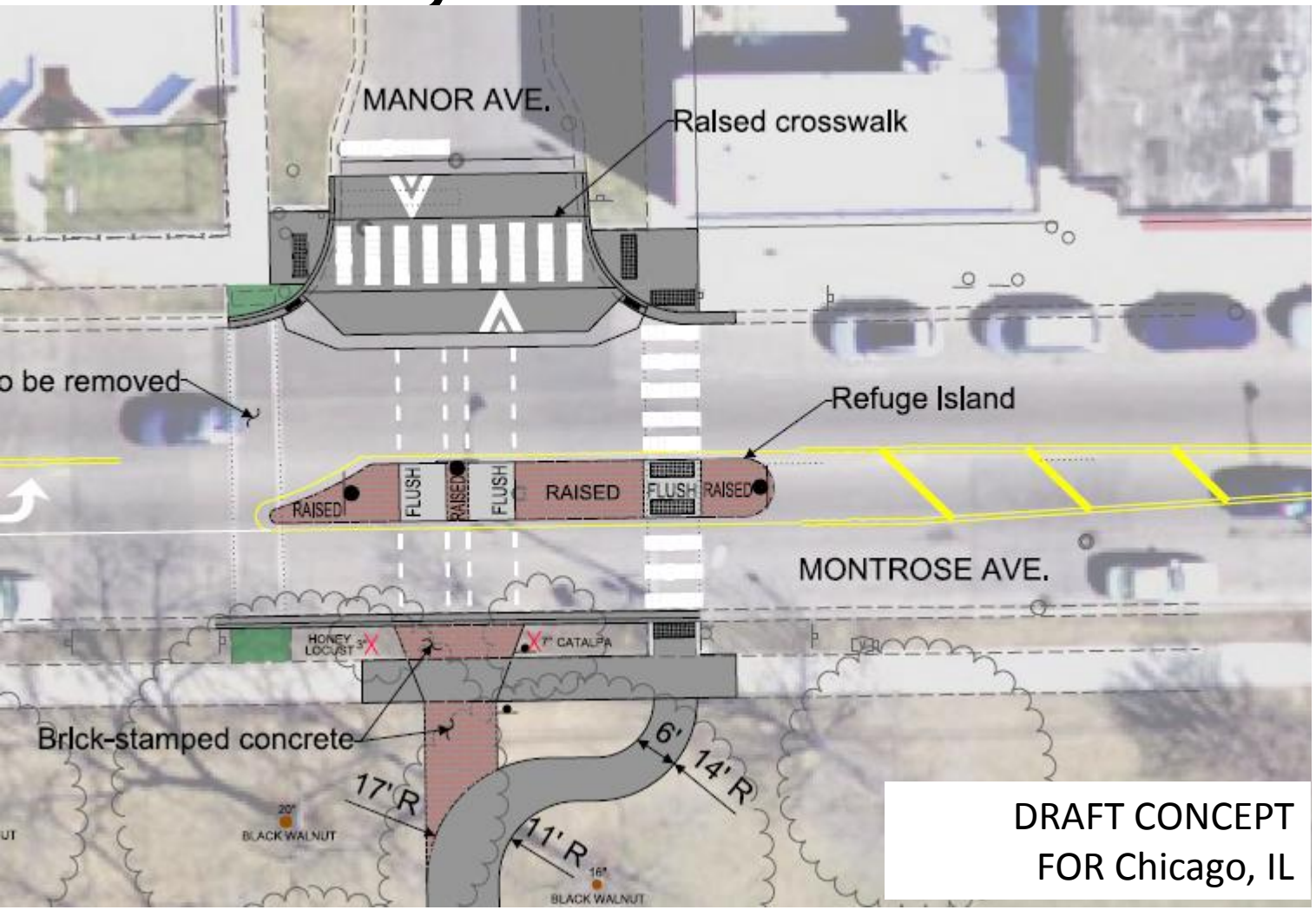
Bikeway Tools – Trail Crossings

North Branch Trail - Morton Grove, IL

Bikeway Tools – Trail Crossings

North Branch Trail - Niles, IL

Bikeway Tools – Trail Connections



Recommendations

- Locate crossings at existing signals if possible
- Align with existing intersections if possible
- Manage Speed of Bikes (S-Curve)
- If un-signalized, need to understand crossing conflicts
  - Number of Lanes
  - Traffic Speed / Volumes
- Unsignalized Recommendations
  - Provide Markings and Signage
    - Crosswalks
    - Warning Signs
    - In-street Signs
  - Provide Refuge Space (reduce lanes)
  - Add Beacons as needed (RRFB and Hawk)

Bikeway Tools – Trail Crossings

HAWK
$150,000
MUTCD
Orchard Lake Village, MI

RRFB
$20,000
Interim Approval
Kalamazoo, MI

Thank You!

Nathan Roseberry
nathan.roseberry@tylin.com
(312) 742-6288