

Bike Boxes

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November 18, 2015



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Today's webinar presenter

Peter Koonce, P.E., is Manager for the City of Portland Bureau of Transportation's Signals, Street Lighting, and ITS Division. He has served as an adjunct professor at Portland State University teaching graduate level courses in transportation engineering. He is currently past president of the Oregon Chapter of the Institute of Transportation Engineers and was Chair of the Transportation Research Board's Committee on Traffic Signal Systems.



Bike Boxes



Peter Koonce

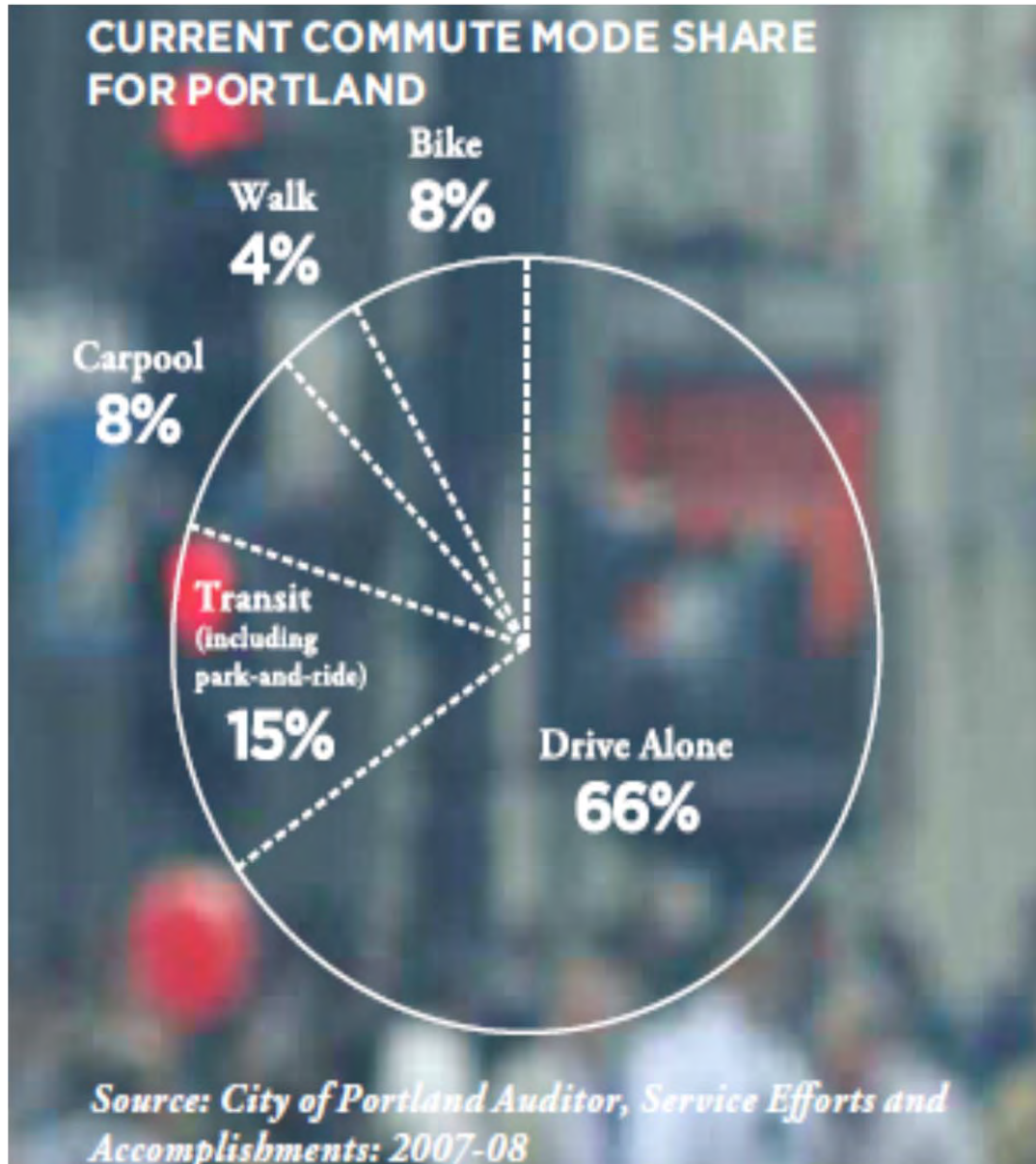
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Presentation Outline

- **Motivation**
- **Engineering Design**
- **Education & Enforcement**
- **Evaluation**
- **Examples**

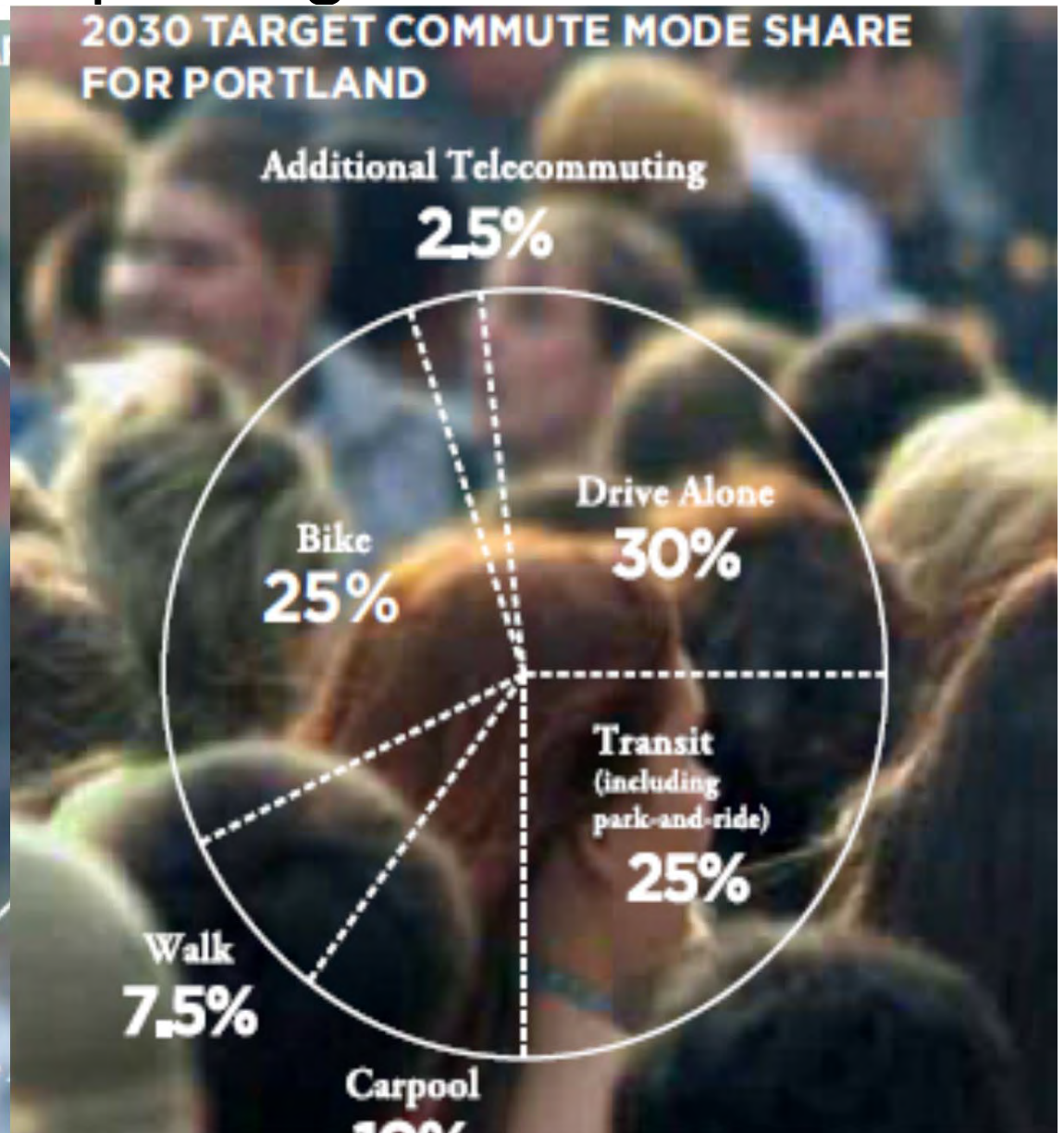
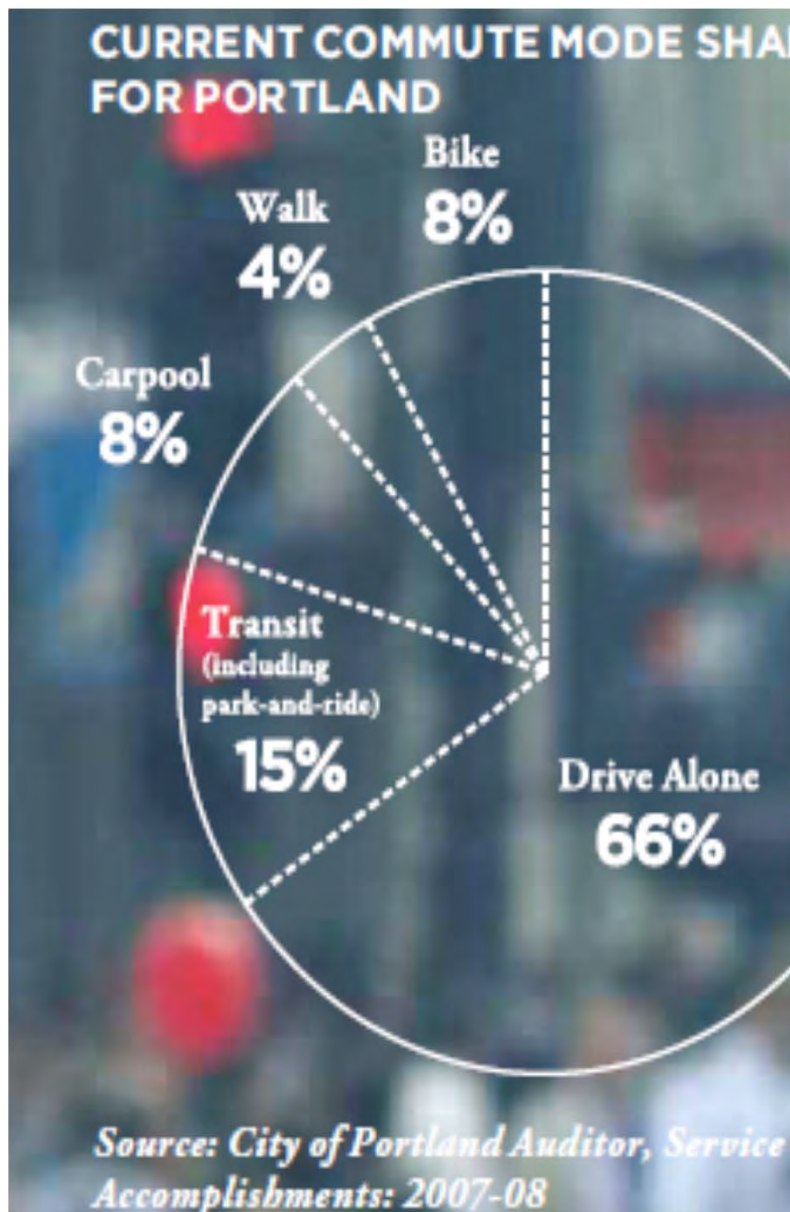
Why Bike Boxes?

One Tool to Grow Cycling in our Community

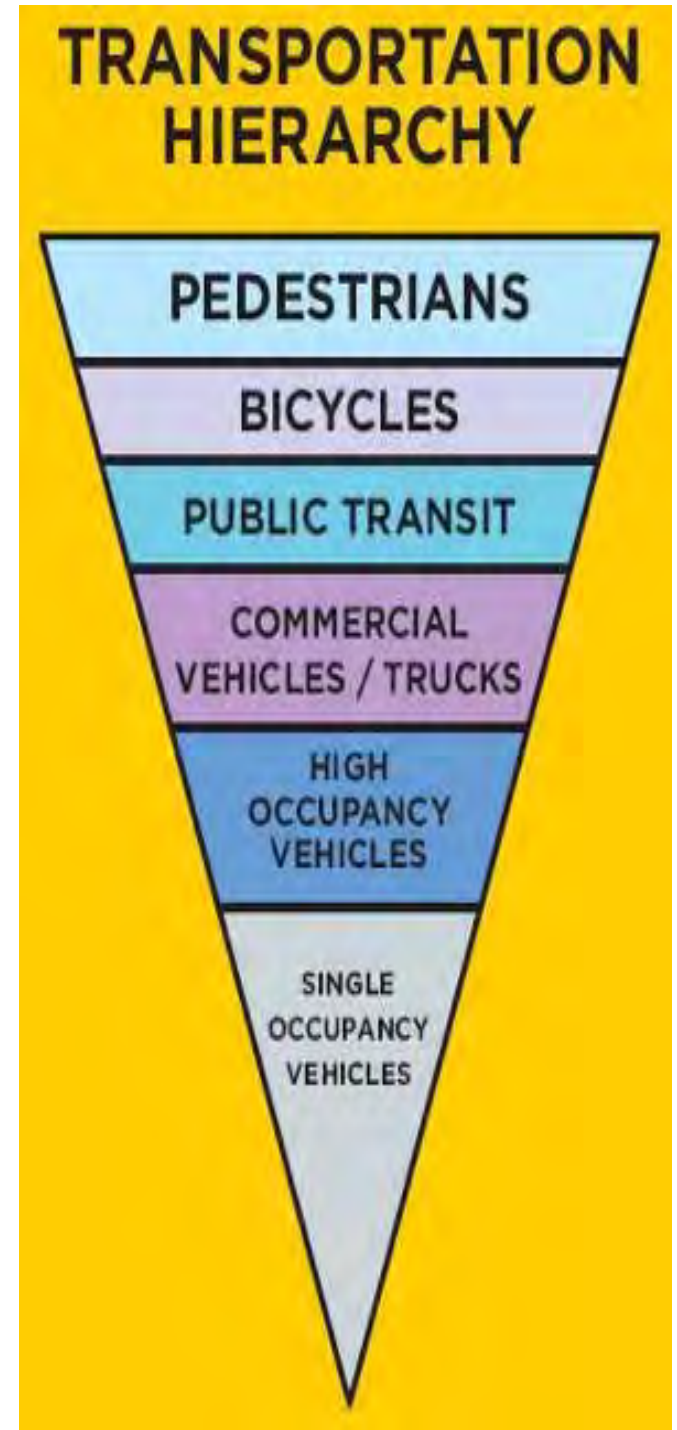


Why Bike Boxes?

Meet Future Mode Split Targets



Implementing Multimodal Intersections



Unlocking People Capacity







Four Uses for Bike Boxes:

Provide priority for cyclists ✓

Assist with turning movements

Prevent right-hooks ✓

Clear the queue ✓

Portland's interim bike box criteria

Used on approaches to **signalized intersections** when:

- 1. Cross-product** of peak hour right-turns and through and right-turning bicycles equals 5,000 or more
- 2. Crash history** indicates an average of two or more reported crashes over 5-years that could be corrected by bike box
- 3. Bike priority** is desired in the form of a queue jump on a shared lane roadway
- 4. Engineering judgment** indicates improved safety due to complexity of geometry, high percentage of right-turning autos or other factors.

Bike Boxes

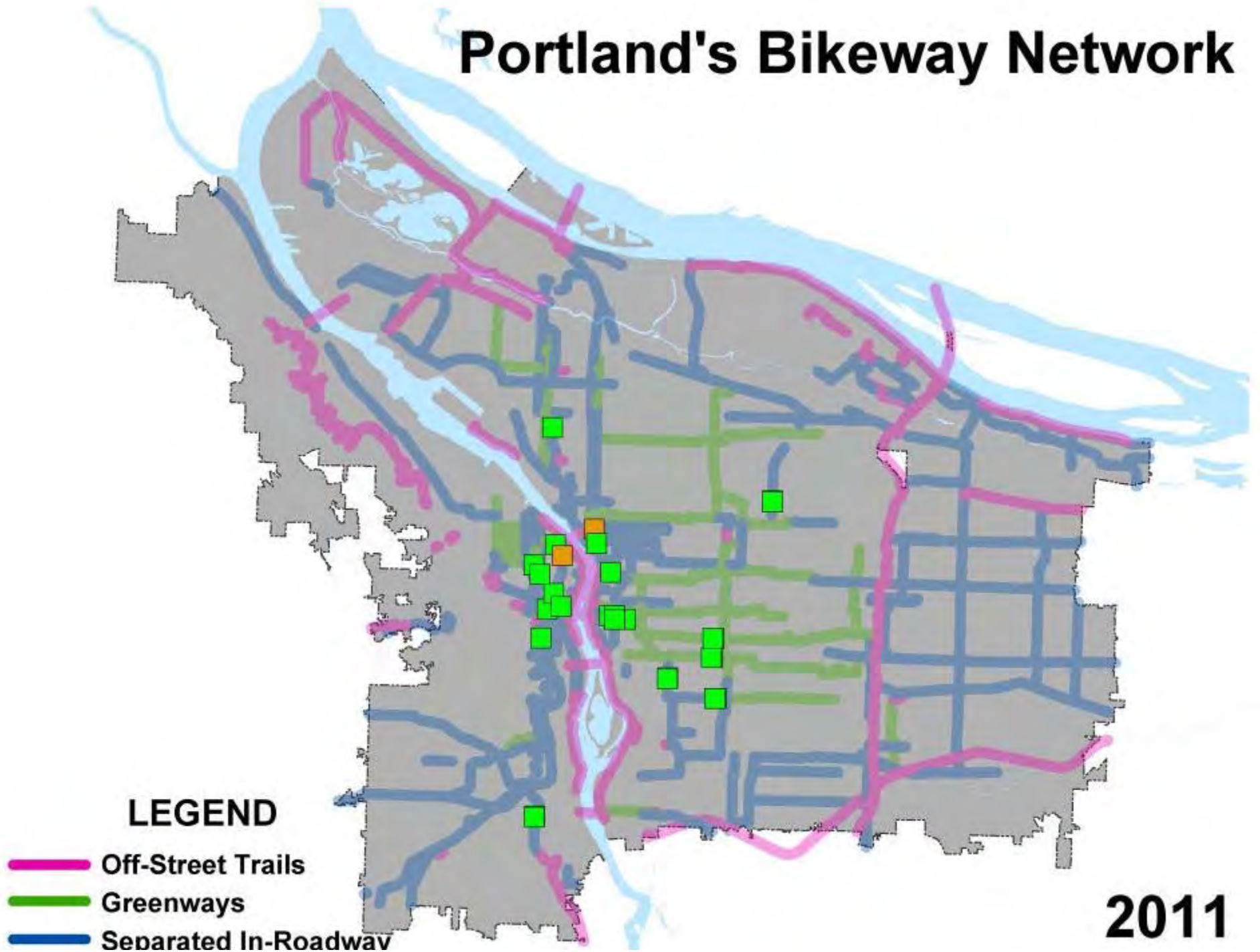
- They work
- High motorist compliance
- High cyclist compliance
- Greater sense of safety

Bike Boxes: Research Conclusions



(Dill-Monsere-McNeil)

- **Generally positive**
- **Compliance & understanding high**
- **Less encroachment into crosswalks**
- **Reduced conflicts**
- **Increased motorist yielding**
- **Greater sense of safety**

Portland's Bikeway Network



LEGEND

-  Off-Street Trails
-  Greenways
-  Separated In-Roadway

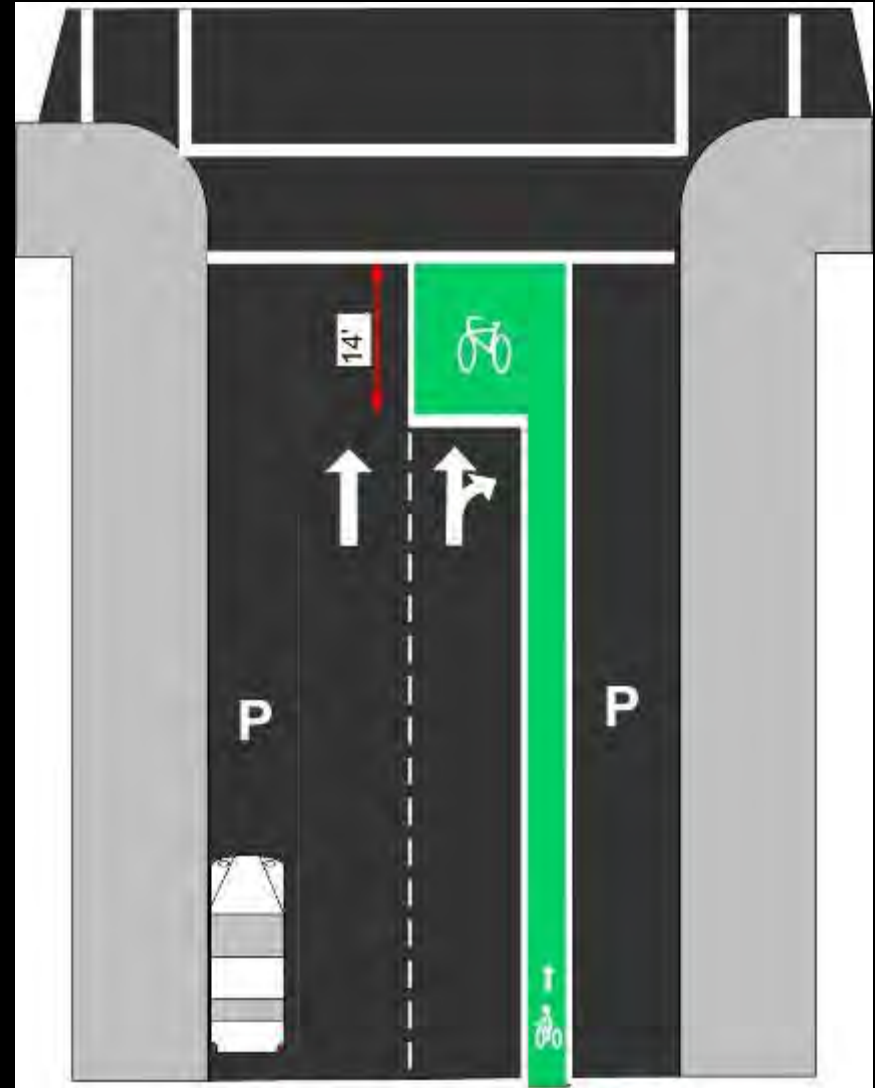
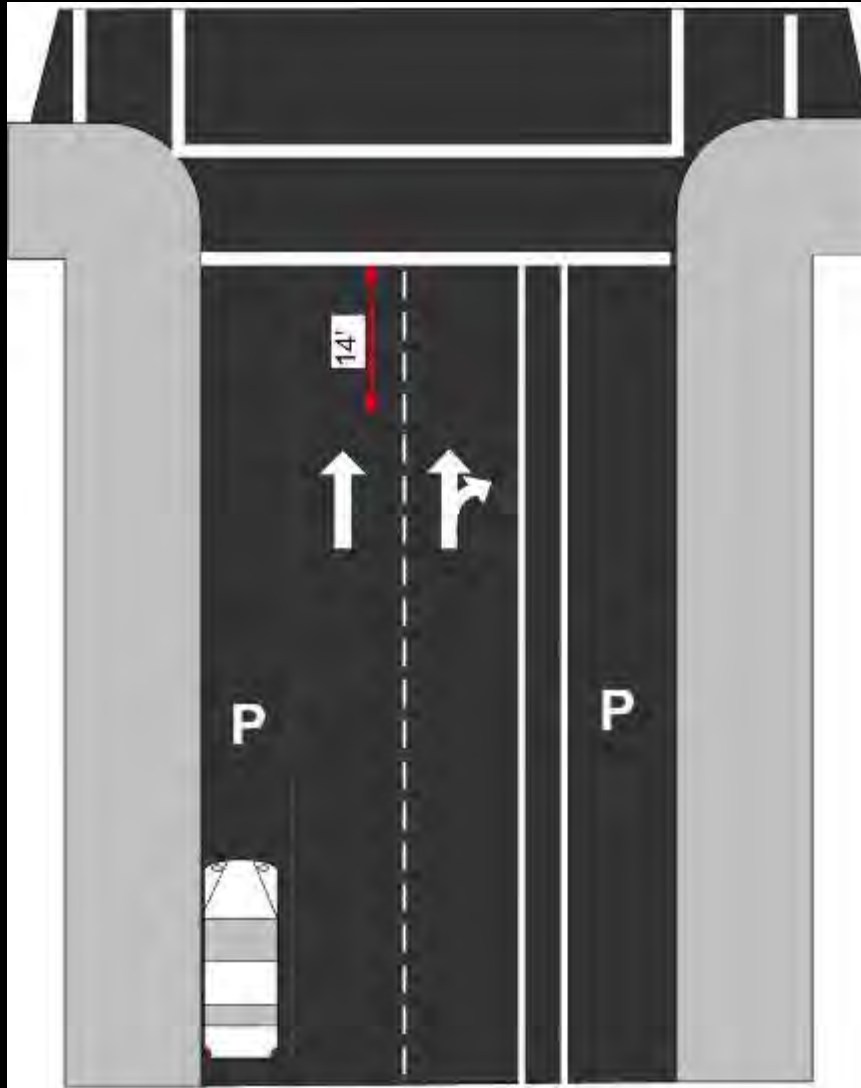
2011

A couple of general design principles

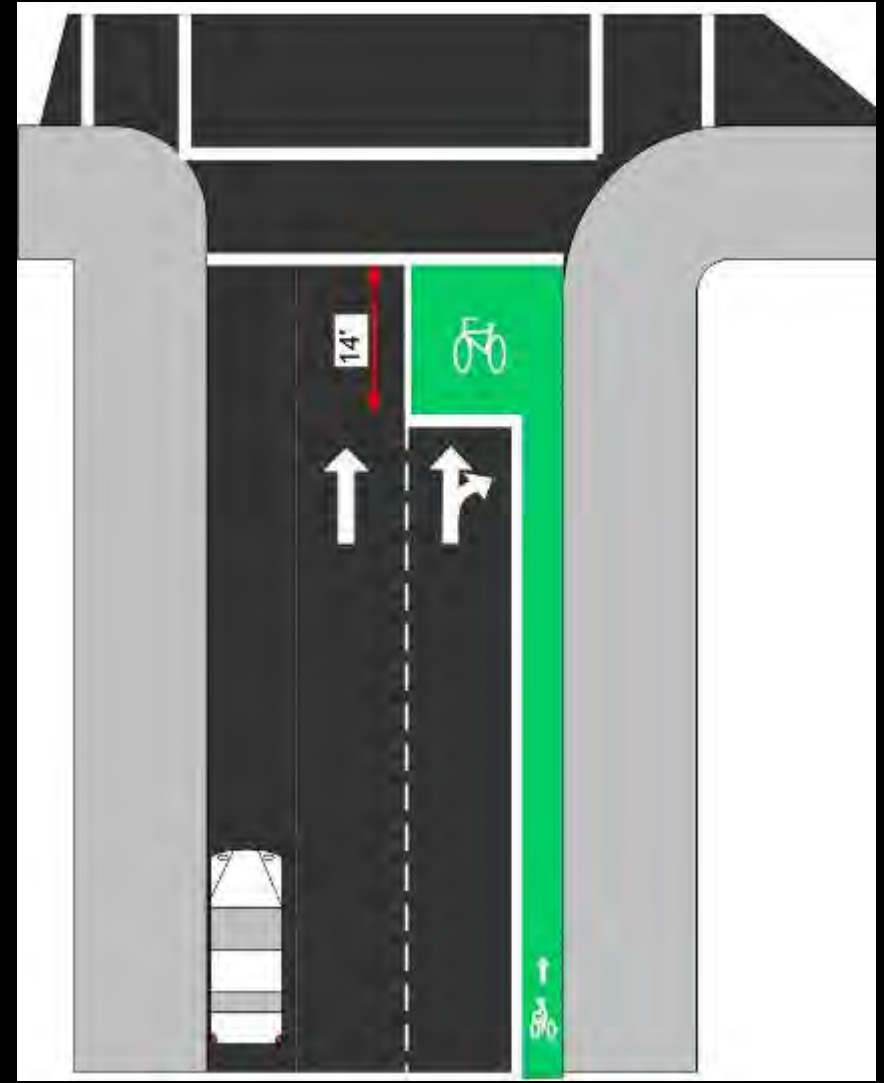
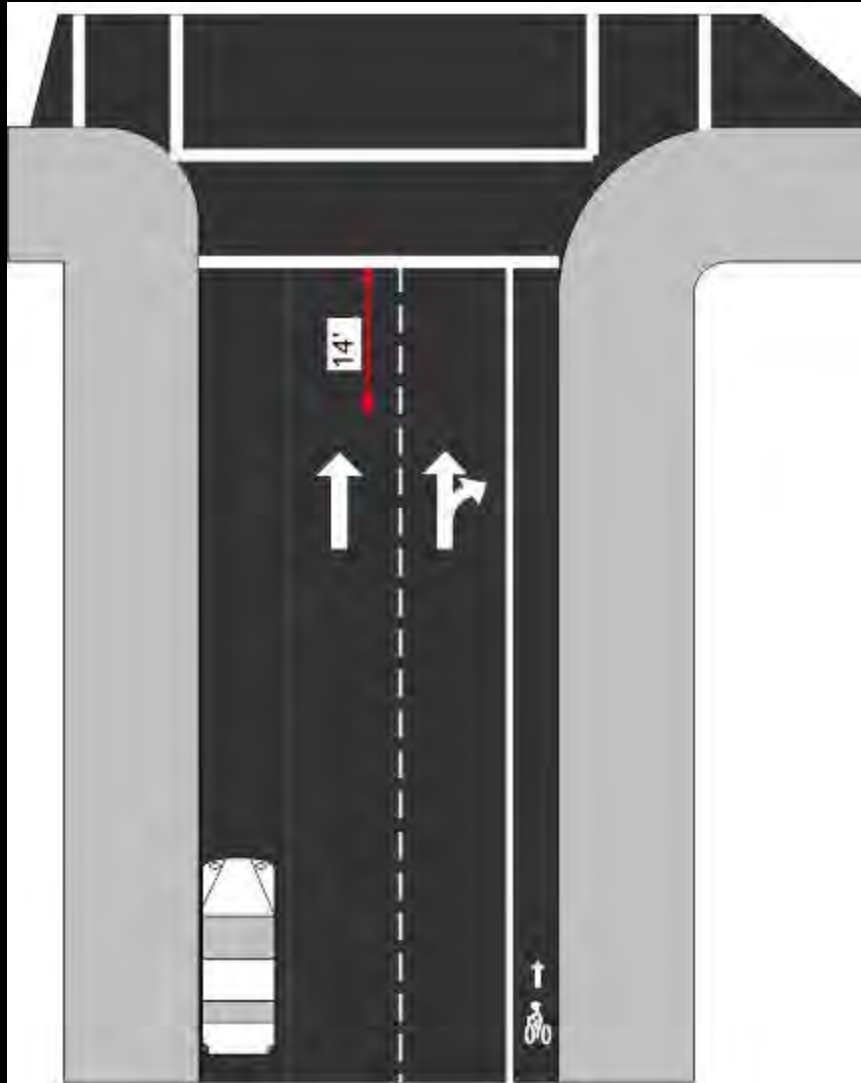
Make cycling and cyclists as **visible** as possible

Use the **pavement** to communicate expectations for behavior

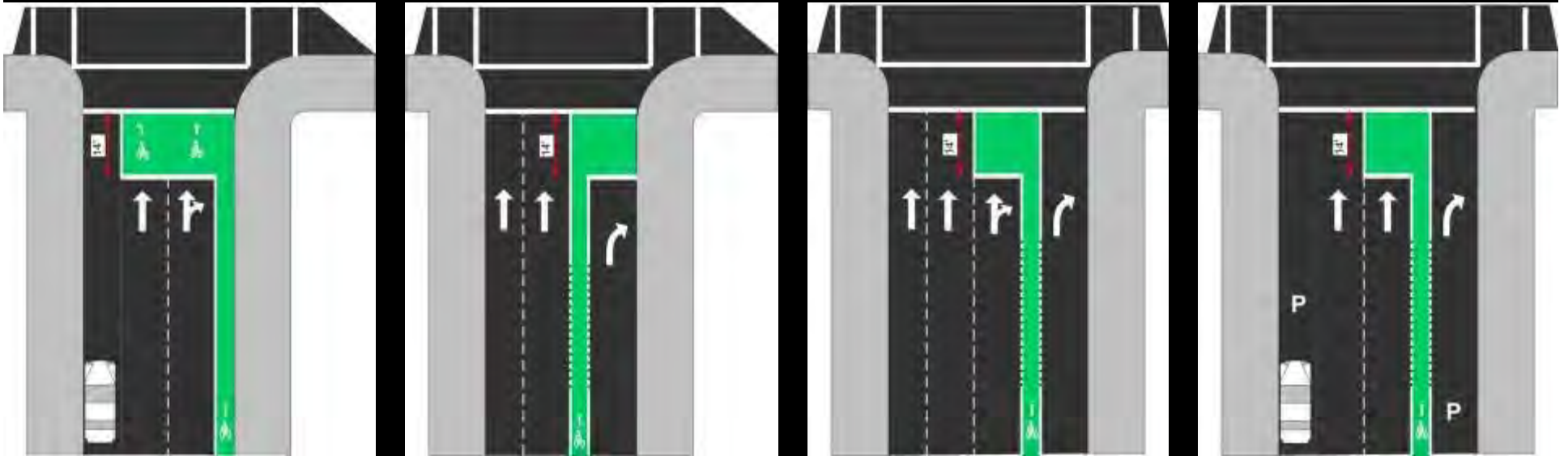
Intersection Designs: Type 1 through-right lane with on-street parking



Intersection Designs: Type 2 through-right lane no on-street parking



Intersection Designs: Other Types



Amsterdam Bike Box



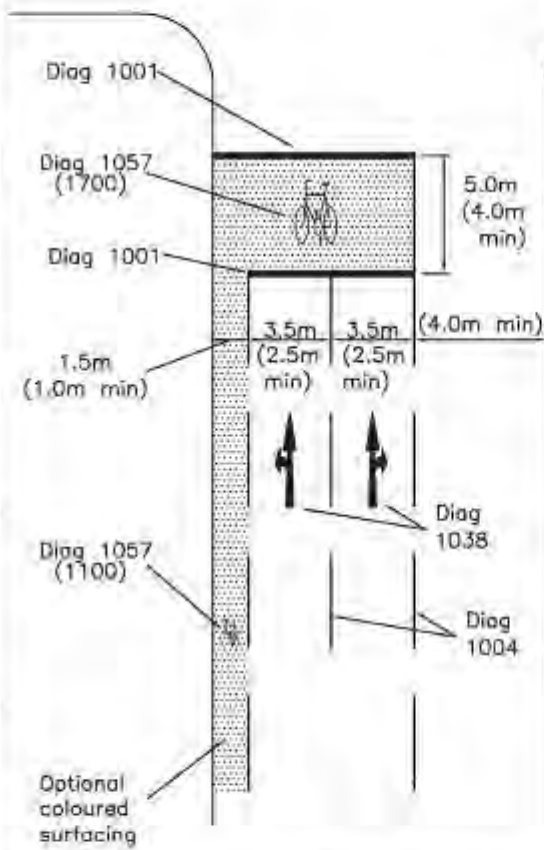
London Design (Transport for London)

Notes

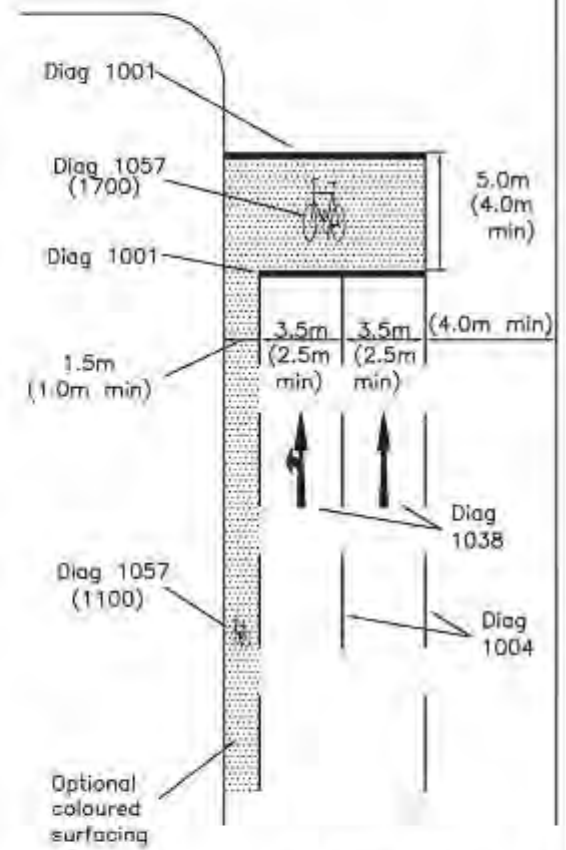
1. All dimensions in mm unless otherwise stated.
2. It is recommended that cycle lanes be continued across the junction where the alignment is difficult and where left turners may cut across cyclists, see CCE/B21.
3. Kerbside feeder lanes may be mandatory.
4. See CCE/B5 for 'gate' entries.
5. Coloured surfacing recommended for all ARL boxes.



Windsor House
42-50 Victoria Street
LONDON SW1H 0TL
Telephone 020 7343 5000



ALL TRAFFIC MOVEMENTS



NO RIGHT TURN

Date	Drawn	Checked	Approved	Title	Scale	Drawing no.	Rev.
JAN 2005	DSB	AGB	JL	ADVANCED STOP LINES WITH TWO TRAFFIC LANES	NTS	CCE/B3	

Dutch Design (C.R.O.W. Manual)

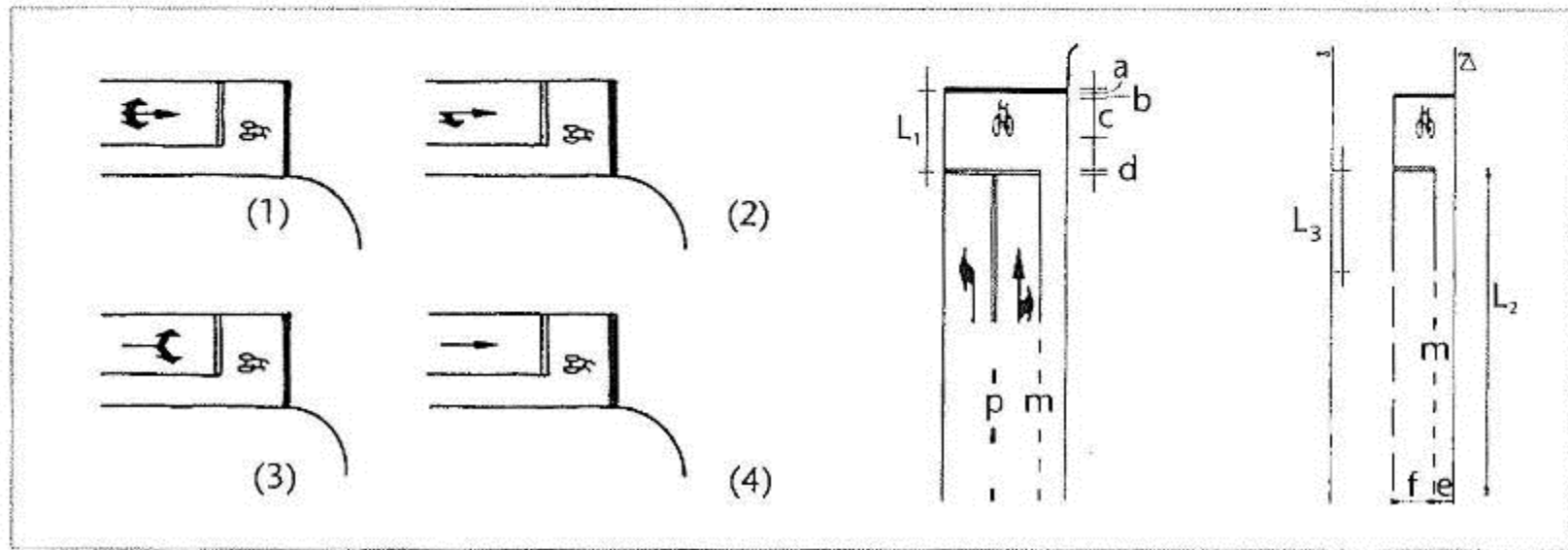
V 53

Description

ECSL (expanded cycle stacking lane) (continued)

Combination options

- cycle lane or suggestion lane
- free right-turn past red
- cyclists free to turn right



Bike Box Material

Pre-formed cold thermoplastic (CTP)

Expensive

High skid resistance (“ViziGrip”)

Color: PMS 375

Supplier: Flint Trading (North Carolina)

Now Ennis-Flint

Essential Design Elements

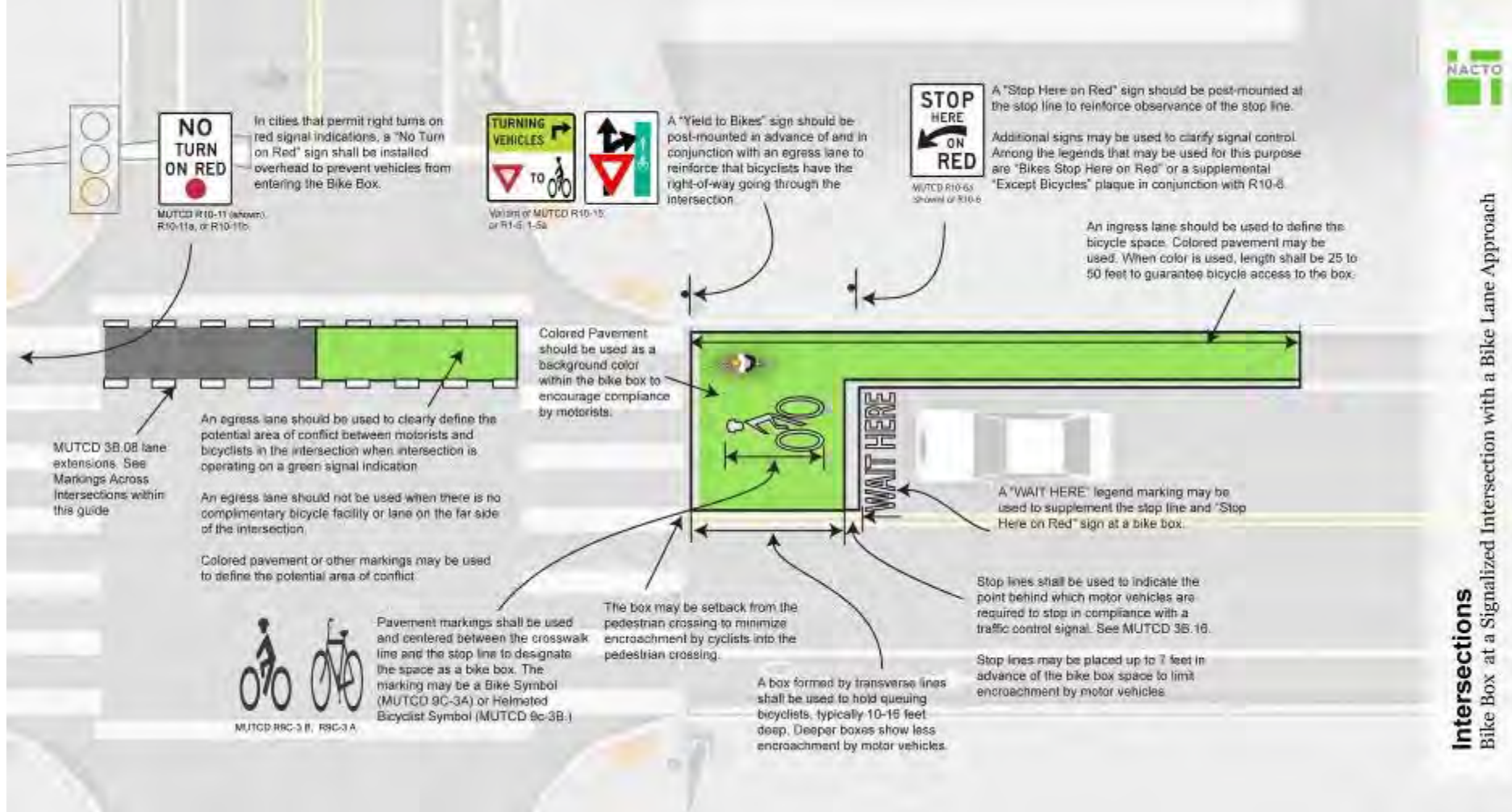
Deep Reservoir

Bright Color

Prominent Marking

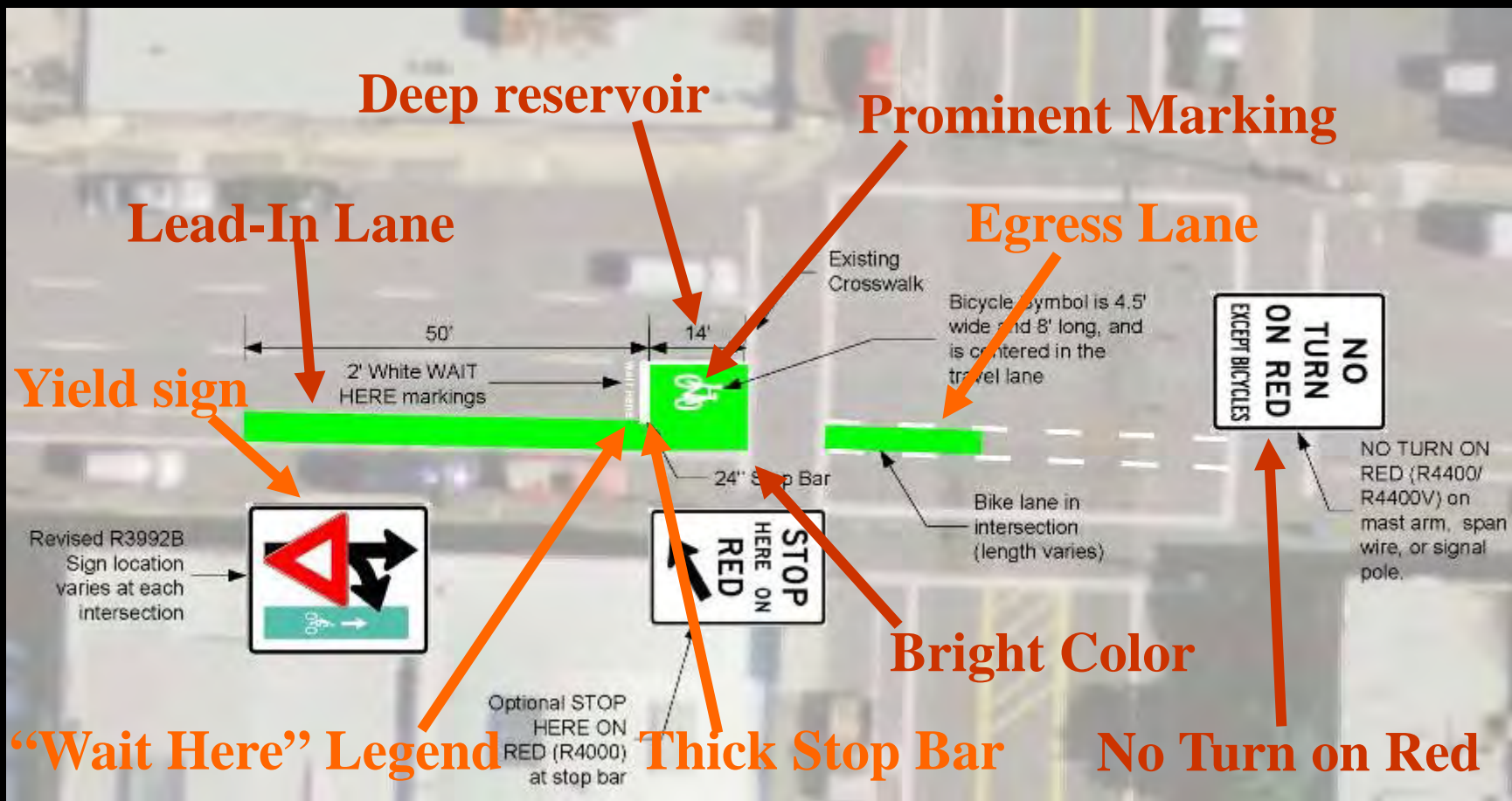
Lead-in Lane

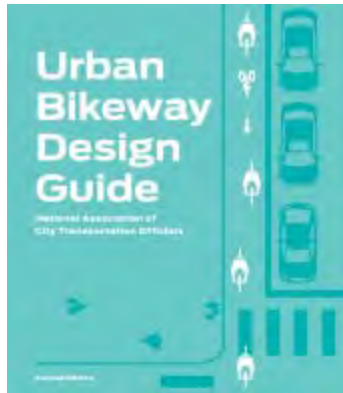
NACTO UBDG Bike Box



Intersections
Bike Box at a Signalized Intersection with a Bike Lane Approach

Portland Design Elements





No Turn on Red sign **shall** be installed overhead to prevent vehicles from entering the Bike Box



Concerns with providing a bicycle box include motorist violation of existing stop line, a lack of uniformity with other intersections, and a need for right-turn-on-red prohibitions. Users are not yet familiar with this application, so *heavy education* may be required.

Caltrans design



Caltrans design





Vancouver, BC





Turning movements



Boston, MA



Vancouver, BC





Bike Boxes: Incorporating the “E’s”

- **Engineering**
- **Education**
 - billboards
 - intersection signs
 - brochures
 - postcards
 - media
- **Enforcement**
 - working closely with Portland Police Bureau
- **Evaluation**
 - PSU Initiative for Bicycle & Pedestrian Innovation



Education

Sign appeared at every project intersection

Education

Get Behind It THE BIKE BOX

Portland's new
green space



Billboard and bus sides posted
throughout project area (and city wide).

Education

WHAT IS A BIKE BOX?

The bike box is an intersection safety design to prevent bicycle/car collisions, especially those between drivers turning right and bicyclists going straight. It is a green box on the road with a white bicycle symbol inside. It includes green bicycle lanes approaching and leading from the box.

WHY GREEN?

Although Portland is known for its blue bike lanes, federal transportation officials thought blue could be confusing since it is also the color used to indicate disabled parking. A national committee that works on such issues has recommended that green be the standard color for bicycle lanes and boxes.



If you have questions, comments or feedback about bike boxes, please contact the Portland Bicycle Hotline at (503) 823-CYCL (2925) or visit www.GettingAroundPortland.org

Please be safe and courteous. There's a lot riding on it.



Get Behind It THE BIKE BOX



Portland's new green space



Brochure

Enforcement



Evaluation

- Literature review
- Data Analysis
 - Video data
 - Survey data

Dill-Monsere-McNeil Research

(Portland State University Center for Transportation Studies)

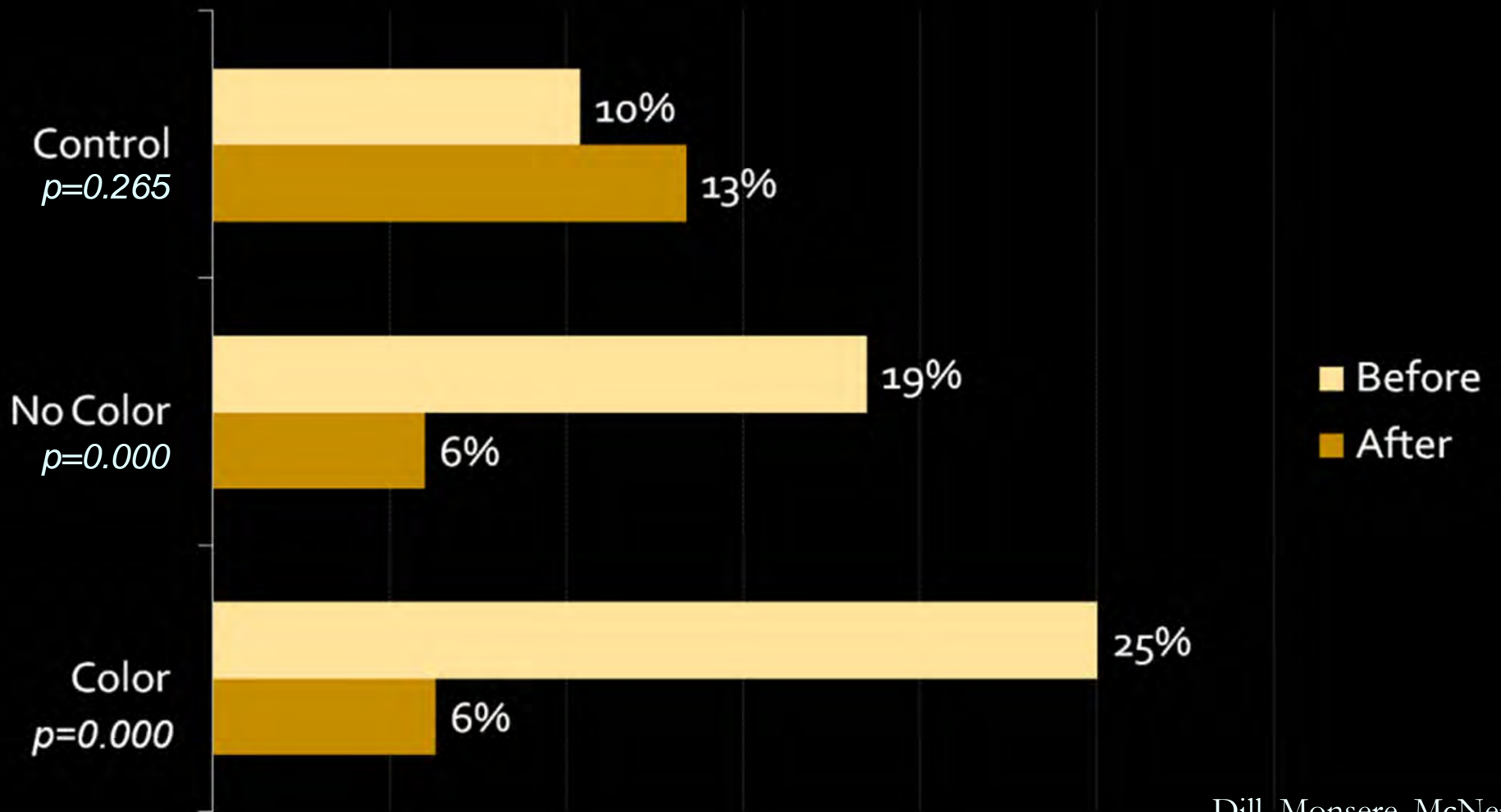
- Do road users (motorists and cyclists) understand the markings?
- Do road users behave as intended?
- Are the markings improving safety?
- Does color (green vs. no color) matter?

Methods: Video Data

- 936 hours of video collected
 - ~48 hours per location
 - Before video: Jan to March 2008
 - After video: April to June 2009
- Both Pre & Post video
 - 10 bike box (7 green, 3 uncolored)
 - 2 control
- Analysis
 - 2 peak and 1 off-peak hour per location

Motor Vehicle Encroachment in Crosswalk

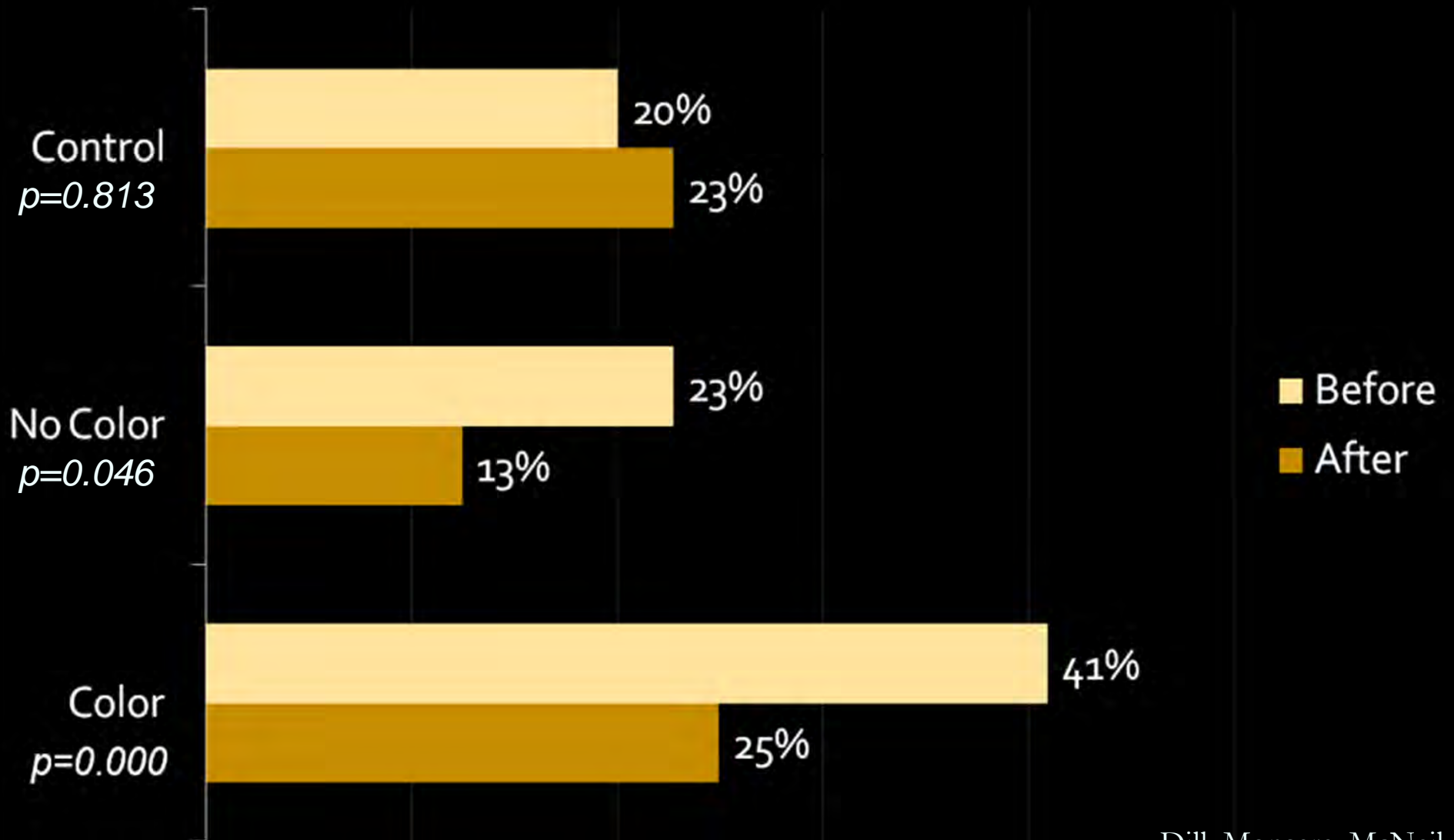
% of motor vehicles arriving on red signal encroaching in the crosswalk



Dill, Monsere, McNeil

Cyclist Encroachment in Crosswalk

% of cyclists arriving on red signal encroaching in the crosswalk



Dill, Monsere, McNeil

Conflicts between motor vehicles and bicycles



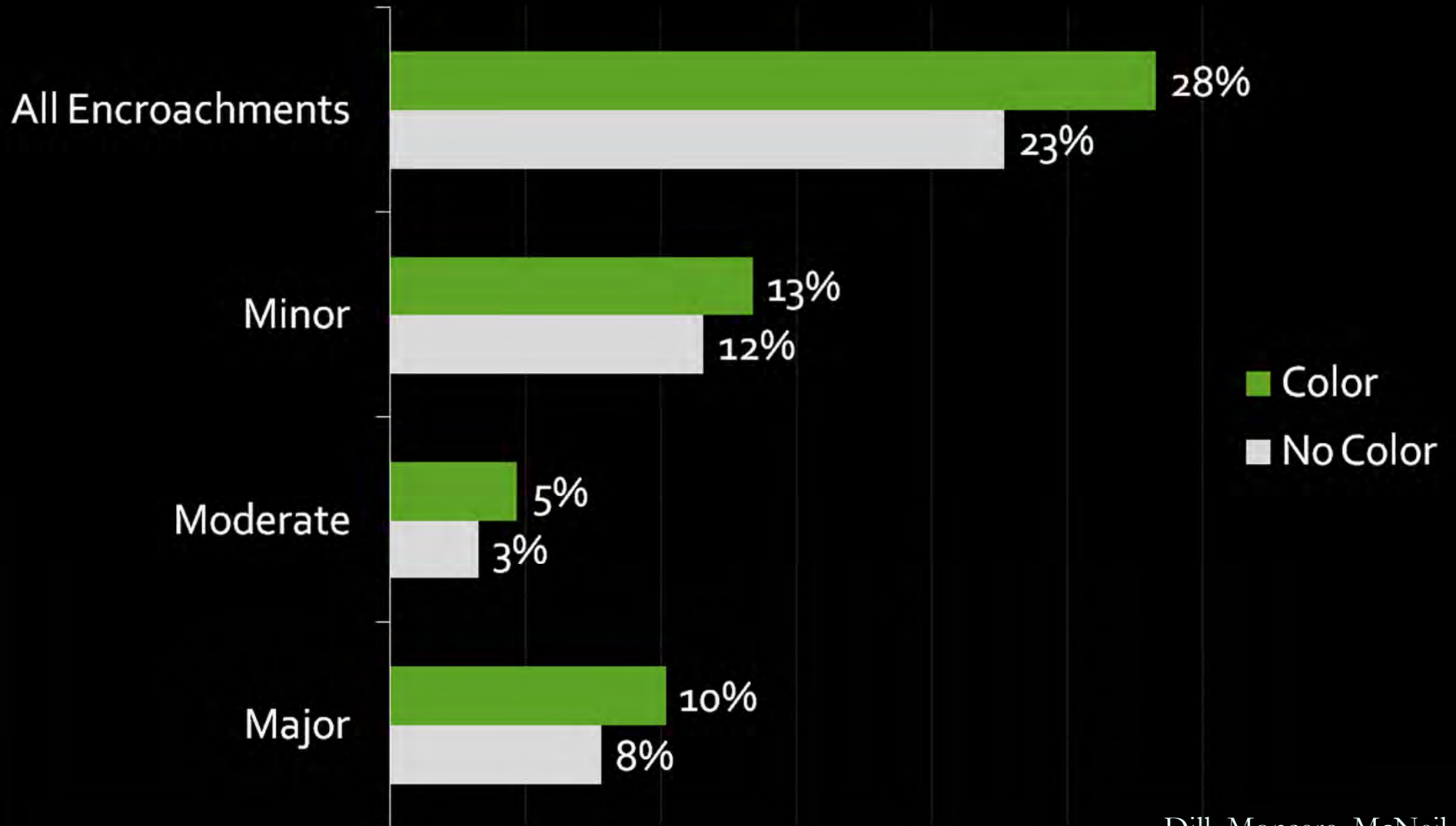
No conflicts before or after at three bike box intersections and both control intersections.

Yielding Behavior

Intersection	Percent Change, Before to After						
	Number of Bicycles	Number of Rt. Turning Motor Vehicles	No Interaction	Yielding			
				Motorist to Cyclist	Motorist to Other	Cyclist to Motorist	Motorist Fails to Yield
NW Broadway & NW Hoyt	59%	8%	-1%	71%	43%	100%	-20%
SE Hawthorne & SE 7th	37%	5%	-10%	68%	0%	-	100%
NE Weidler & NE 7 th (control)	-14%	-1%	0%	-50%	0%	-	-

Motorist Encroachment in the Bike Box

% of motor vehicles arriving on red signal encroaching in the bike box



Dill, Monsere, McNeil

Motorist Survey

As a driver, do you think one of the pavement marking designs is better than the other?



6%



89%

Dill, Monsere, McNeil

Conclusions

- **Findings supporting boxes**
 - Compliance and understanding is high
 - Pedestrians are benefitting from reduced crosswalk encroachment
 - Conflicts fell
 - Yielding behavior increased
 - Improved perceptions of safety
- **Unclear findings**
 - Increase in bike lane encroachment
 - Benefits of color

Examples of Bike Boxes



Bus-Bike Queue Jump



Bike Box for increased Capacity



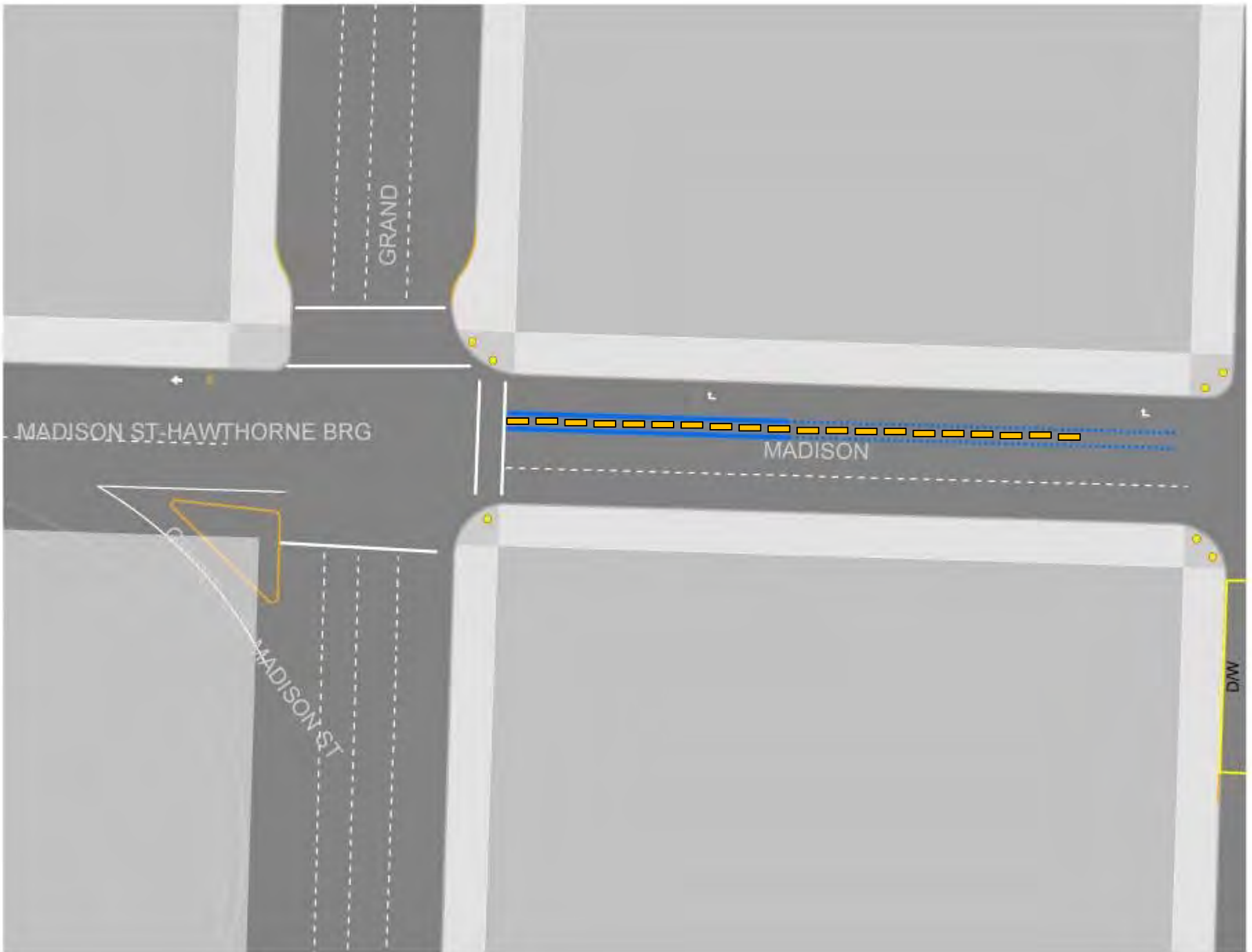


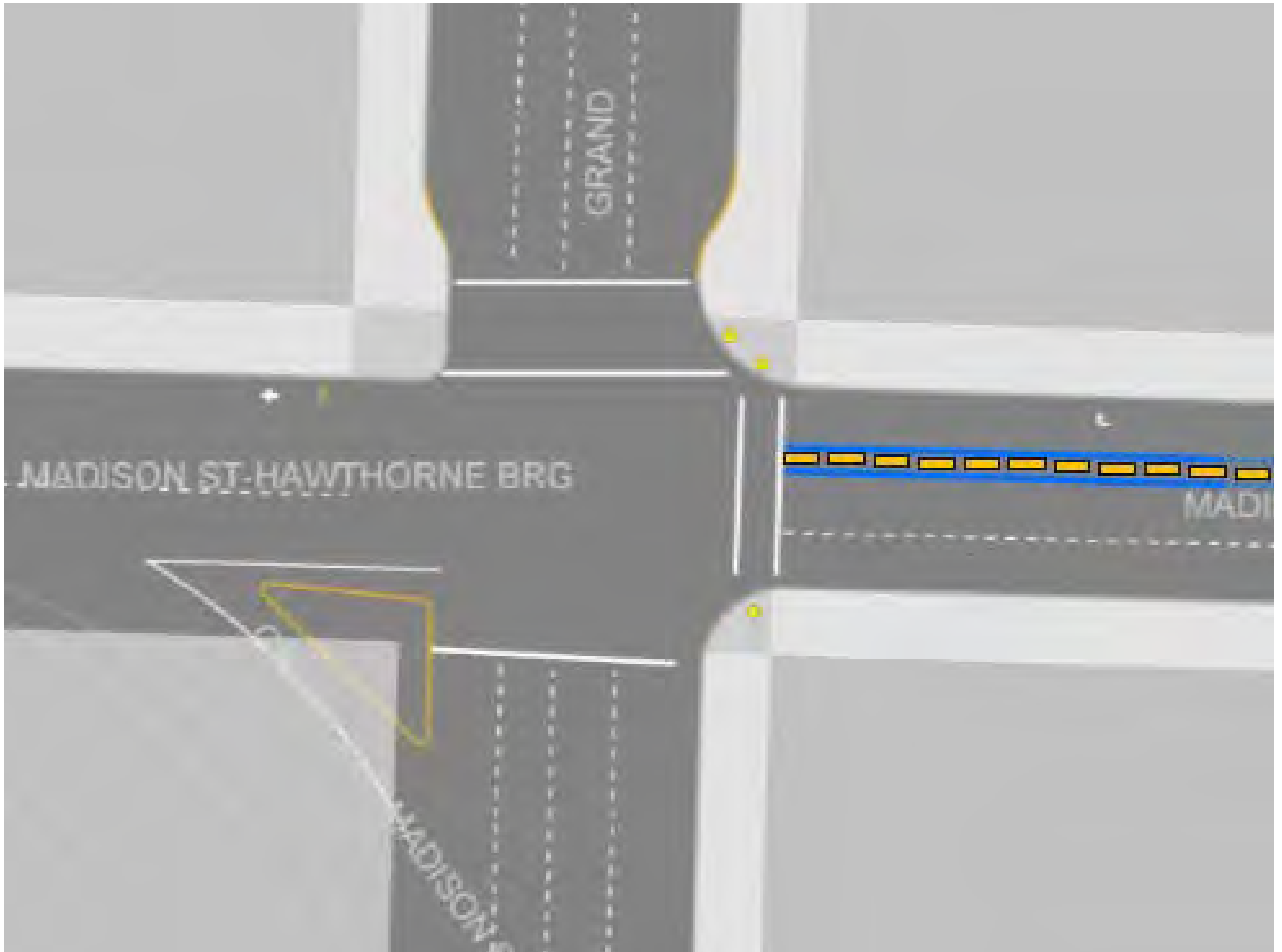
Bike over Bus Queue Jump

































Problems and counter-measures

Bike boxes



Name

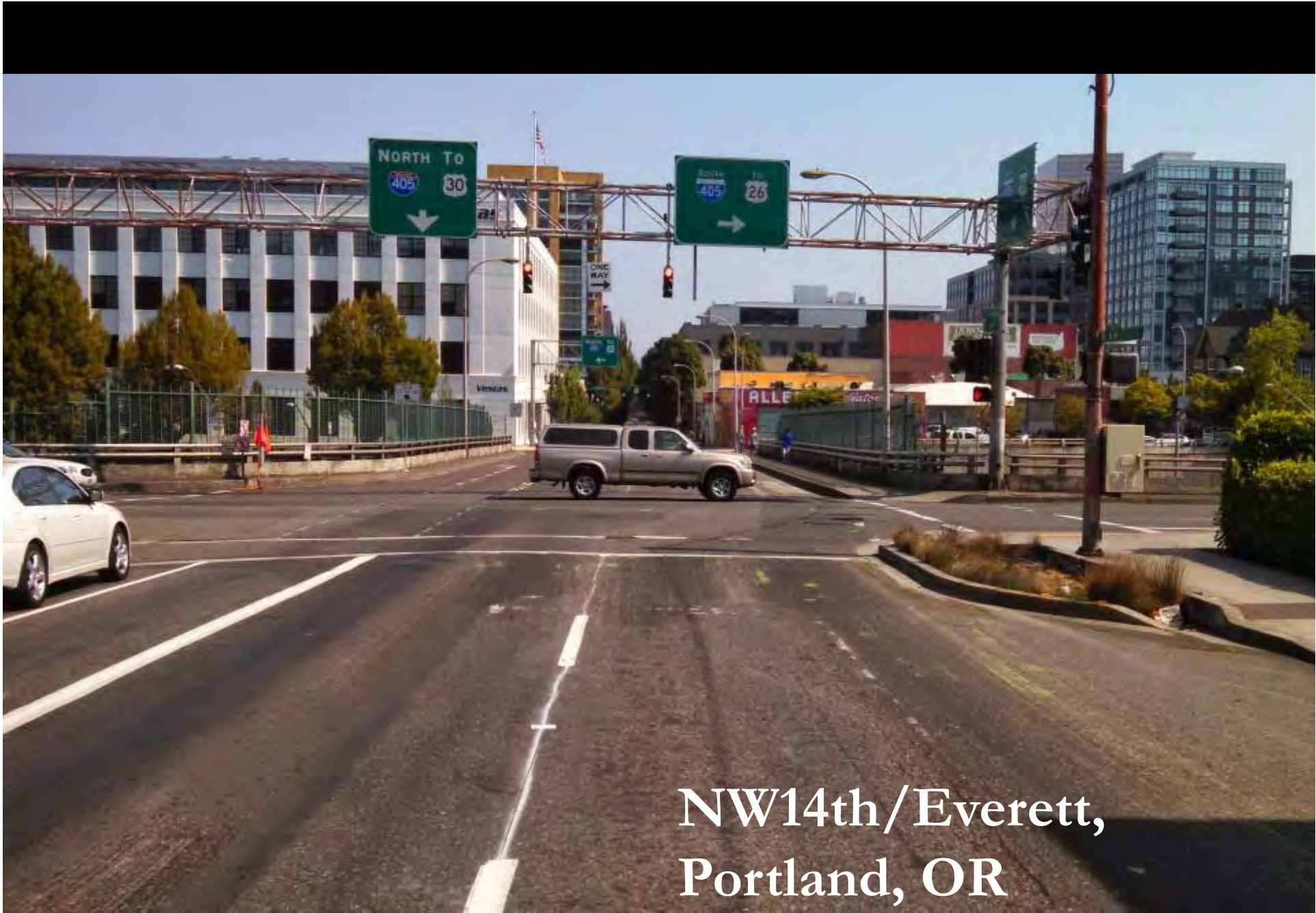
Date



NW14th/ Everett,
Portland, OR



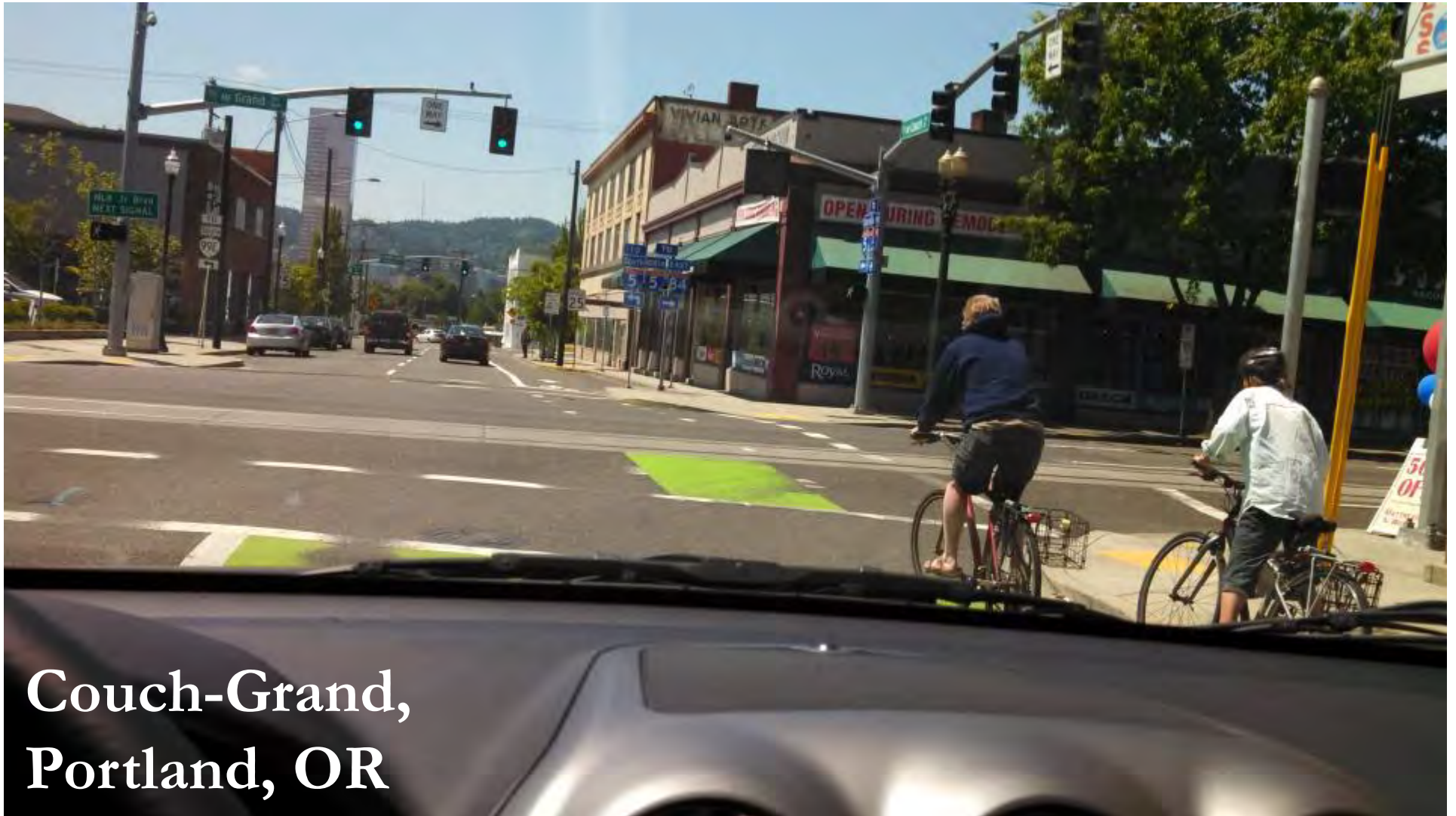
NW14th/ Everett,
Portland, OR



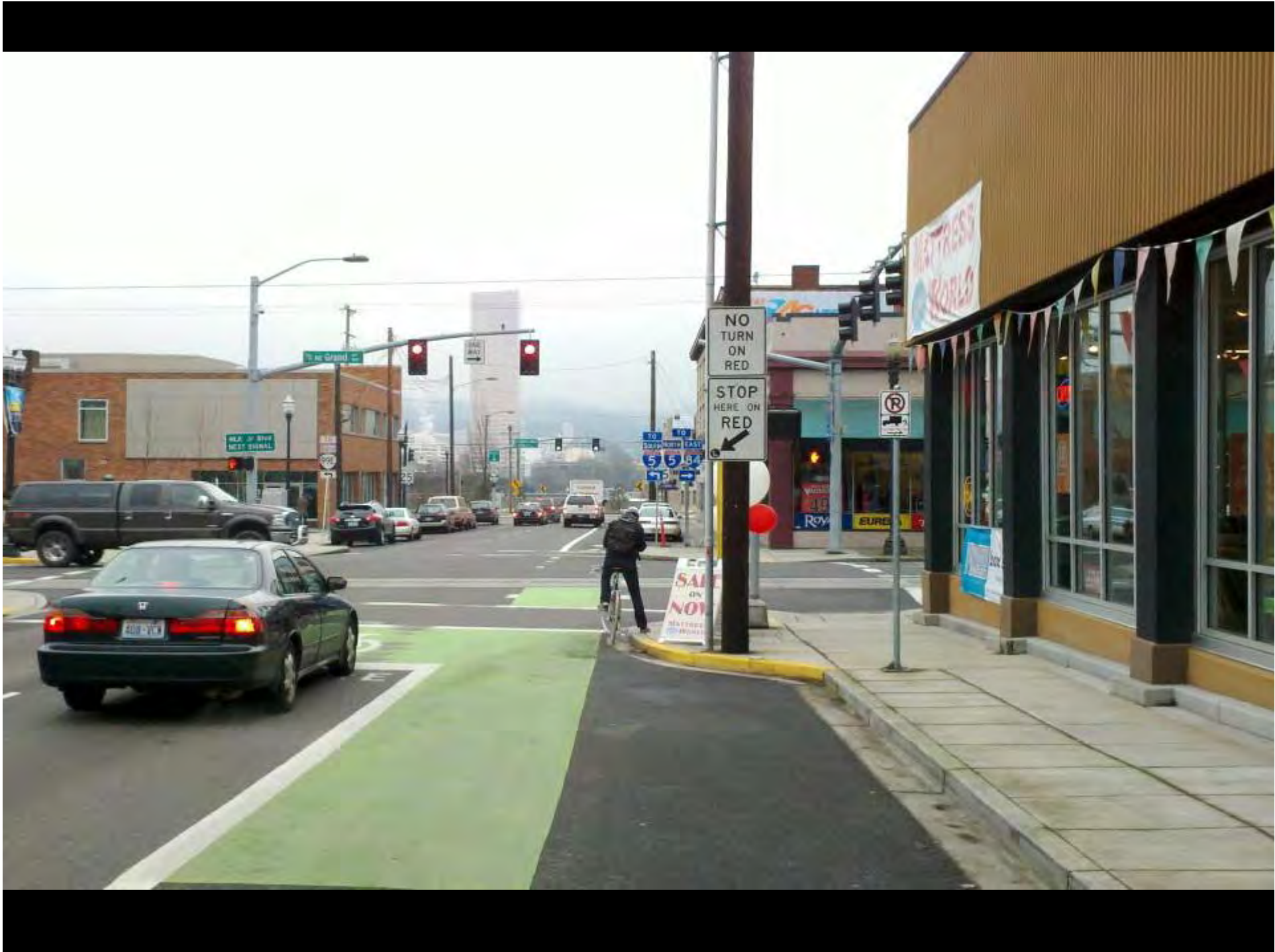
NW14th/ Everett,
Portland, OR



NW18th/ Everett,
Portland, OR



Couch-Grand, Portland, OR

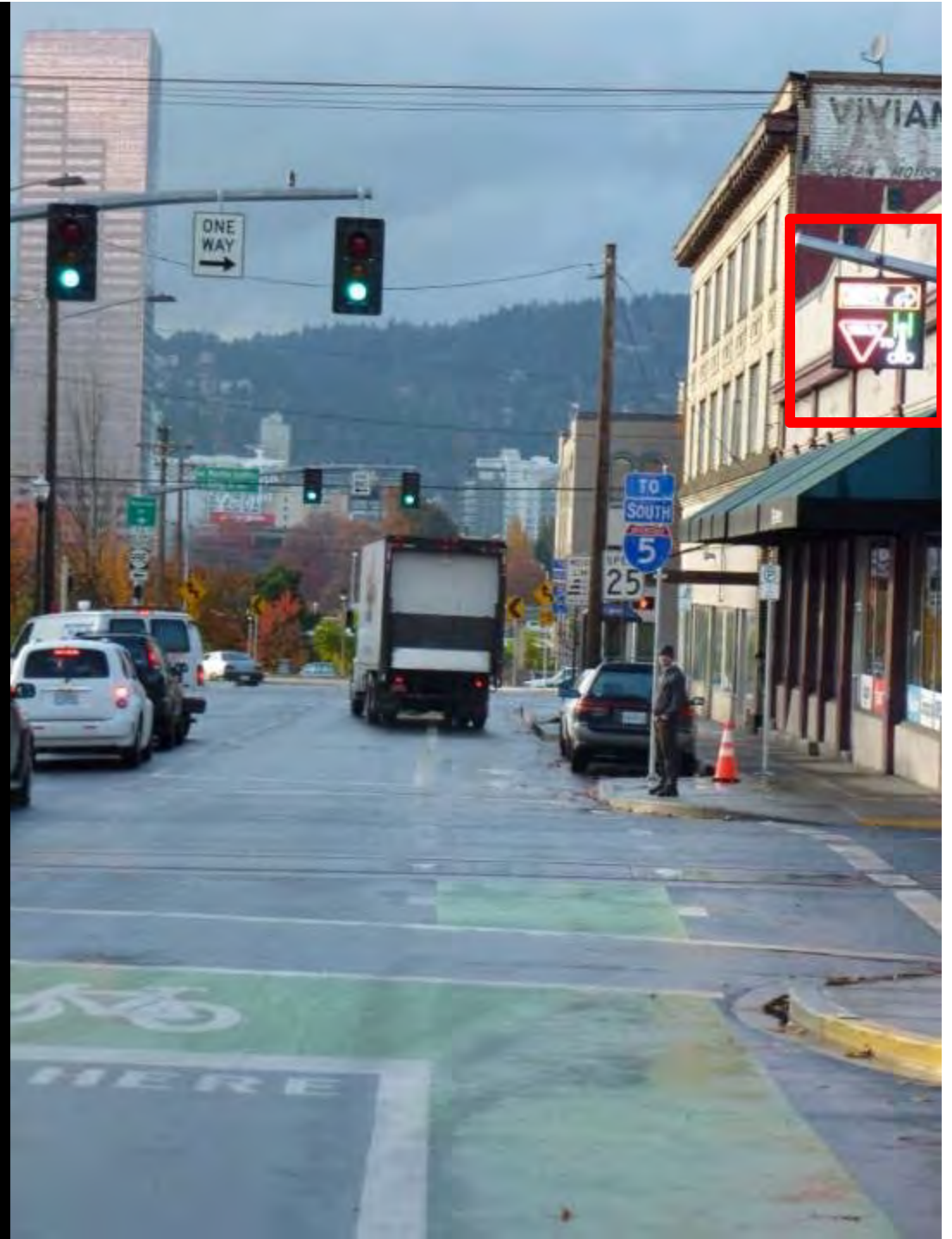


Couch-Grand, Portland, OR



Couch-Grand, Portland, OR





Couch-Grand, Portland, OR

Questions & Comments

