

# Making Protected Intersections Work in North America

## Lessons from Western Canada

Brian Patterson, MCIP, RPP

[bpatterson@urbansystems.ca](mailto:bpatterson@urbansystems.ca) | [@pattersonbri](https://twitter.com/pattersonbri)

European Inspired Emerging Best Practices in Bicycle  
Facility Design

August 26, 2019

**URBAN**  
systems

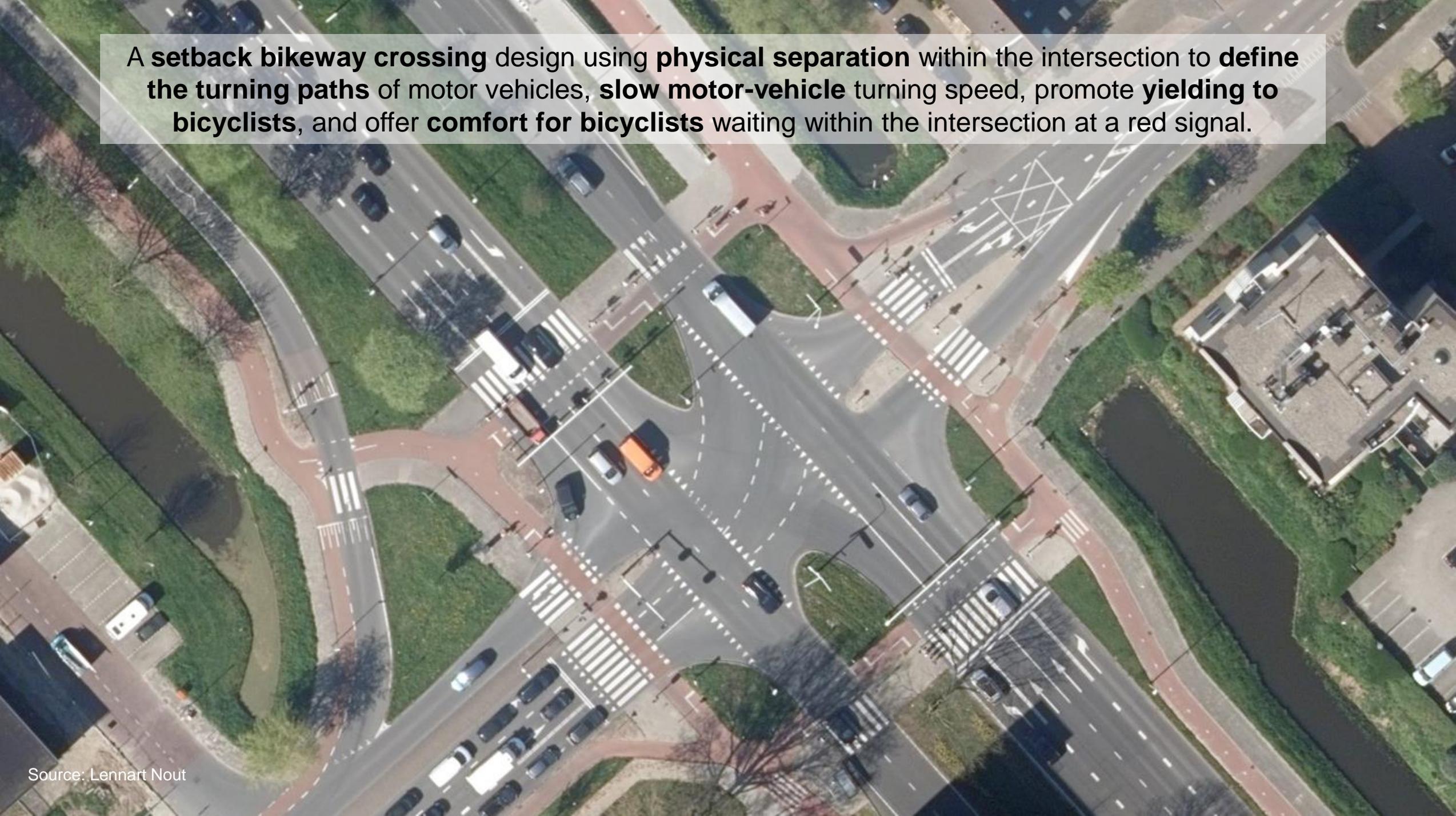


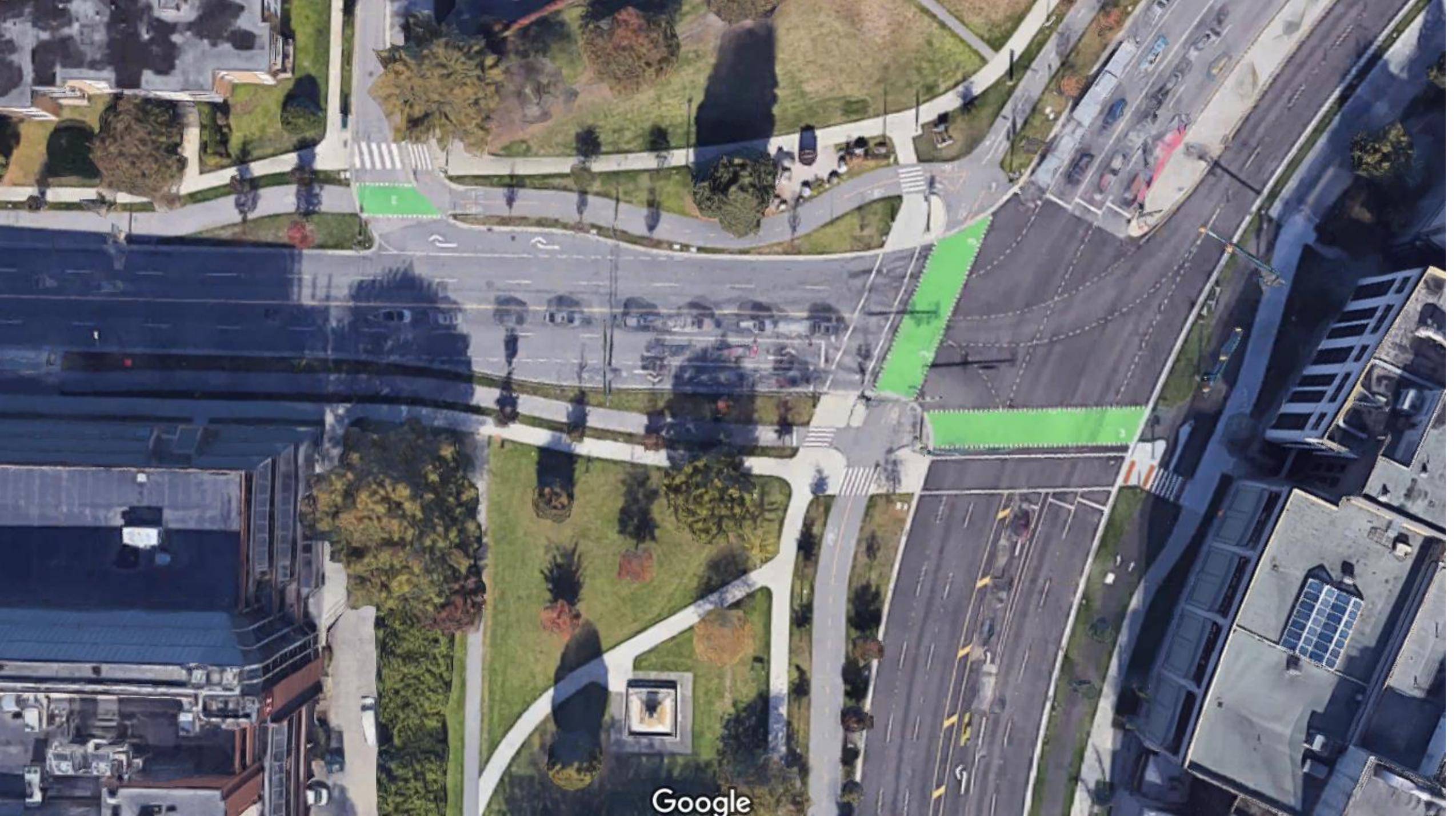
# Agenda

1. Protected Intersection Overview
2. Design Guidance
3. Case Study
4. Design Issues and Challenges
5. Lessons Learned



A **setback bikeway crossing** design using **physical separation** within the intersection to **define the turning paths** of motor vehicles, **slow motor-vehicle** turning speed, promote **yielding to bicyclists**, and offer **comfort for bicyclists** waiting within the intersection at a red signal.





Google

# The increase in protected facilities



Source: Green Lane Project



Matt' Johnson, AICP @Tracktwentynine · Jul 19

I've created a google sheet to keep track of protected intersections in North America. If you know of others that are built, in construction, or in design, let me know.

[docs.google.com/spreadsheets/d/...](https://docs.google.com/spreadsheets/d/16MtGjVDTI3_0CLFfKYmmK_FzqoDVW1MrzTAv6sk66pao/edit#gid=0)

I also made a map.

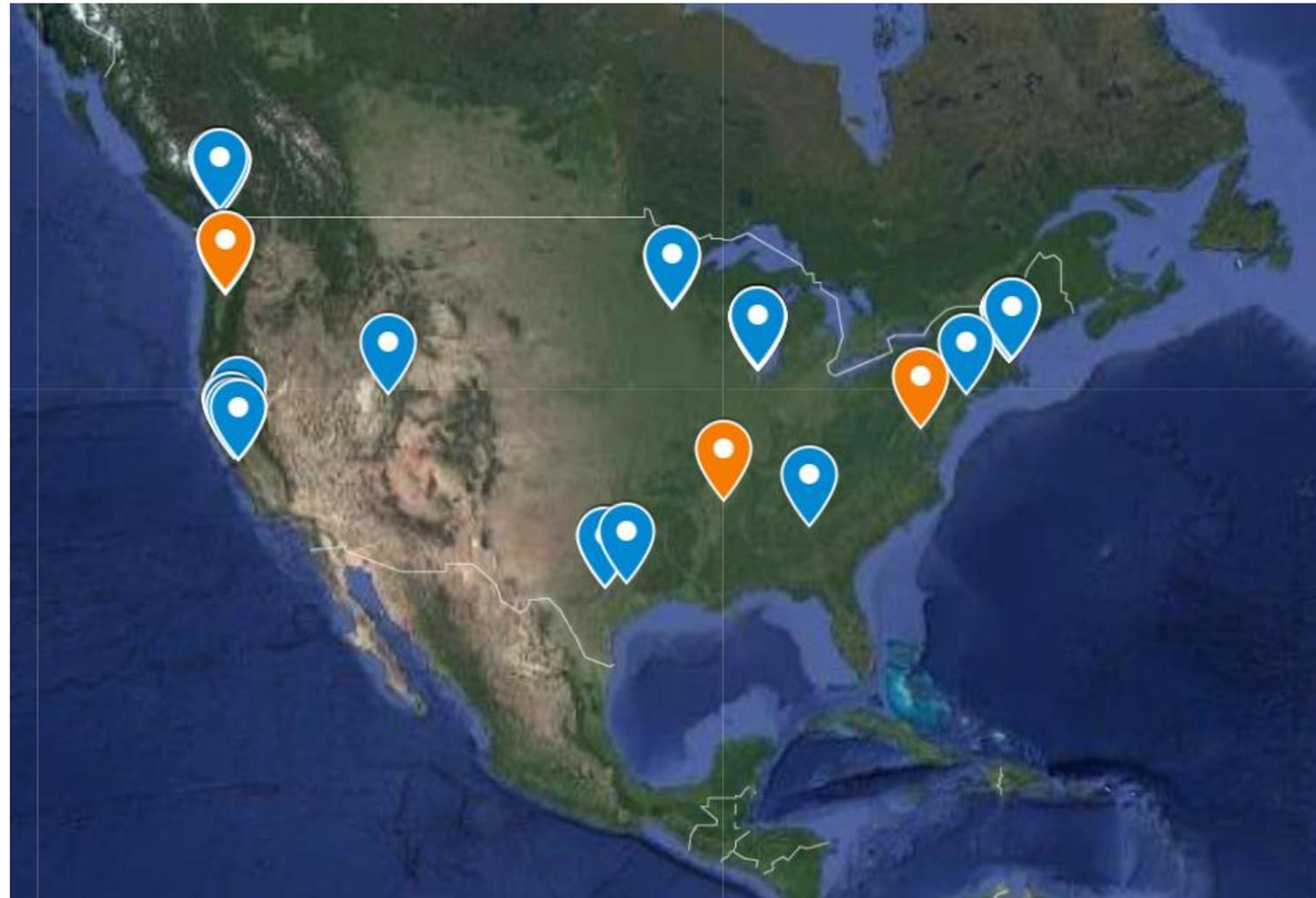


North American Protected Intersections - Google My Maps  
Map shows the protected intersections built or under construction in North America.  
google.com

9 comments, 8 shares, 39 likes

Locale	State/Province	Intersection	Status	Constructed Year	Designed by	Constructing Agency	Added to Map?	Info updated	Notes
Google Map of locations: <a href="https://drive.google.com/open?id=1c-Vg3Yy_kjClmH0S9BXJwJG5K4wSTFb&amp;usp=sharing">https://drive.google.com/open?id=1c-Vg3Yy_kjClmH0S9BXJwJG5K4wSTFb&amp;usp=sharing</a>									
Vancouver	BC	Burrard St & Cornwall Av	Open				Yes	7/19/19	
Vancouver	BC	First Av & Quebec St	Open				Yes	7/19/19	
Berkeley	CA	The Alameda at Hopkins	Open	2016			Yes	7/19/19	
Davis	CA	Covell Bl & J St	Open	2015			Yes	7/19/19	
Fremont	CA	Civic Center Dr at BART Way					Yes	7/19/19	
Oakland	CA	Lakeside Dr at Harrison St					Yes	7/19/19	
Oakland	CA	Madison St at 8th St					Yes	7/19/19	
Oakland	CA	Madison St at 9th St					Yes	7/19/19	
Pleasanton	CA	Valley Av at Stanley Bl	Open	2017			Yes	7/19/19	
Richmond	CA	Central Ave at Rydin Rd					Yes	7/19/19	
Richmond	CA	Tewksbury at Castro	Open	2019	Fehr & Peers		Yes	7/19/19	
San Francisco	CA	9th St at Division St	Open	2016			Yes	7/19/19	
Atlanta	GA	Peachtree Center Av & John Portman Bl	Open	2016			Yes	7/19/19	
Chicago	IL	Dearborn St & Randolph St	Open	2016			Yes	7/19/19	
Chicago	IL	Washington St & Franklin St	Open	2016			Yes	7/19/19	
Chicago	IL	Washington & Dearborn	Open	2016			Yes	7/19/19	
Chicago	IL	Randolph & Canal	Open	2016			Yes	7/19/19	
Silver Spring	MD	Second Ave at Spring St	Construction	2019	Stantec	Montgomery County DOT	Yes	7/19/19	
Austin	TX	Manor Rd & Tilley St	Open	2014			Yes	7/19/19	
Austin	TX	Tilley St & Zach Scott St	Open	2015			Yes	7/19/19	

[https://docs.google.com/spreadsheets/d/16MtGjVDTI3\\_0CLFfKYmmK\\_FzqoDVW1MrzTAv6sk66pao/edit#gid=0](https://docs.google.com/spreadsheets/d/16MtGjVDTI3_0CLFfKYmmK_FzqoDVW1MrzTAv6sk66pao/edit#gid=0)



[https://www.google.com/maps/d/viewer?mid=1c-Vg3Yy\\_kjClmH0S9BXJwJG5K4wSTFb&ll=40.44926838759357%2C-97.09835824999999&z=3](https://www.google.com/maps/d/viewer?mid=1c-Vg3Yy_kjClmH0S9BXJwJG5K4wSTFb&ll=40.44926838759357%2C-97.09835824999999&z=3)

# Design Guidance



## Don't Give Up at the Intersection

Designing All Ages and Abilities  
Bicycle Crossings



May 2019

## Protected Intersections

### No Stopping / No Standing Zone

Motor vehicle parking and stopping are prohibited on the approach to the intersection.

### Pedestrian Islands

Islands reduce crossing distances and improve visibility by keeping the intersection clear. Wider islands support high volumes of people walking and biking, raising the capacity of the intersection. In some cases, islands can reduce the signal time needed for pedestrians.

### Bikeway Setback

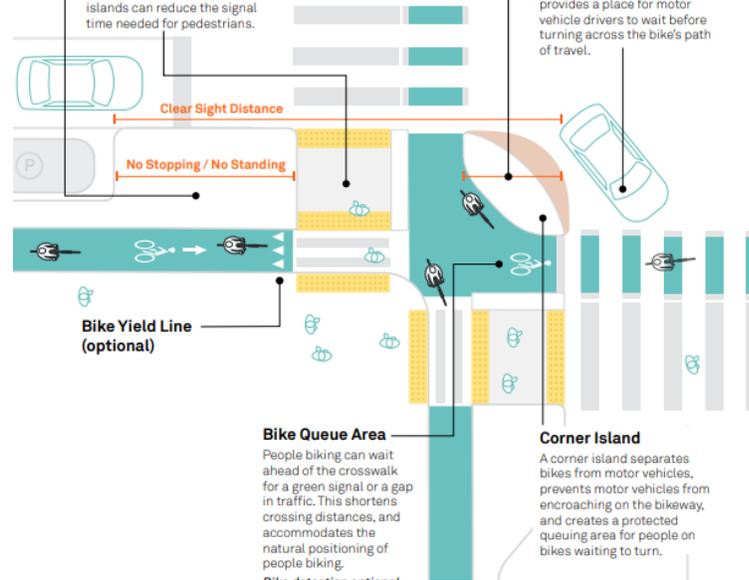
The setback determines how much room will be available for drivers to wait and yield, and the angle at which they cross the bikeway. Larger setbacks provide better visibility and give people bicycling more time to notice and react to turning vehicles.

### Crossbikes / Intersection Crossing Markings

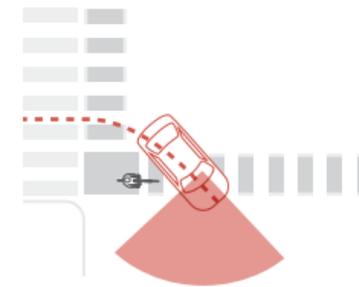
Markings provide conspicuity and directional guidance to bikes in the intersection. They are marked with dotted bicycle lane line extensions and may be supplemented with green color or bike symbols between these lines.<sup>11</sup>

### Motorist Waiting Zone

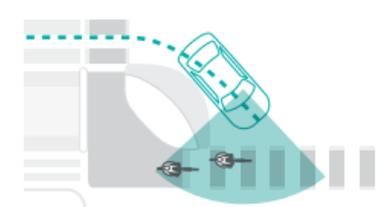
The space between the motor vehicle lane and the crossbike provides a place for motor vehicle drivers to wait before turning across the bike's path of travel.



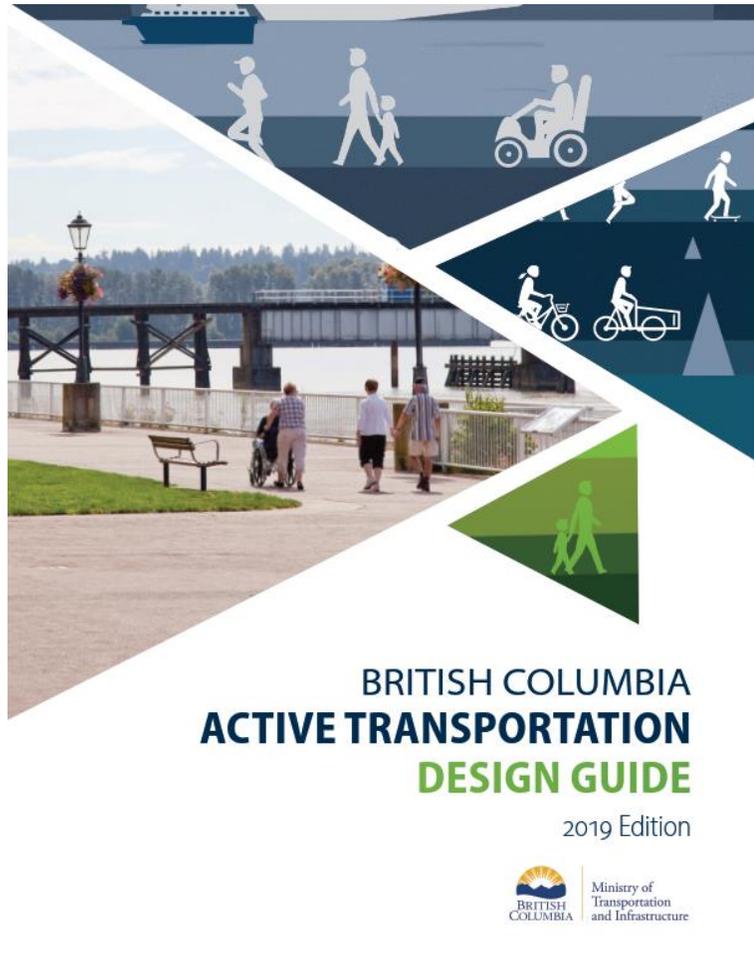
### Conventional Intersection



### Protected Intersection



# Design Guidance



**A. OVERVIEW + CONTEXT**

**B. SETTING THE CONTEXT**

**C. PEDESTRIAN FACILITIES**

**D. CYCLING FACILITIES**

**E. MULTI-USE FACILITIES**

**F. CONTEXT SPECIFIC APPLICATIONS**

**G. INTERSECTIONS + CROSSINGS**

**H. AMENITIES + INTEGRATION**

**I. POST IMPLEMENTATION**

<https://www2.gov.bc.ca/gov/content/transportation/funding-engagement-permits/funding-grants/cycling-infrastructure-funding/active-transportation-design-guide>

# Design Principles



Design for all ages and abilities



Reduce speed at conflict points



Minimize conflicts between users



Ensure clear sightlines



Ensure clarity of right-of-way



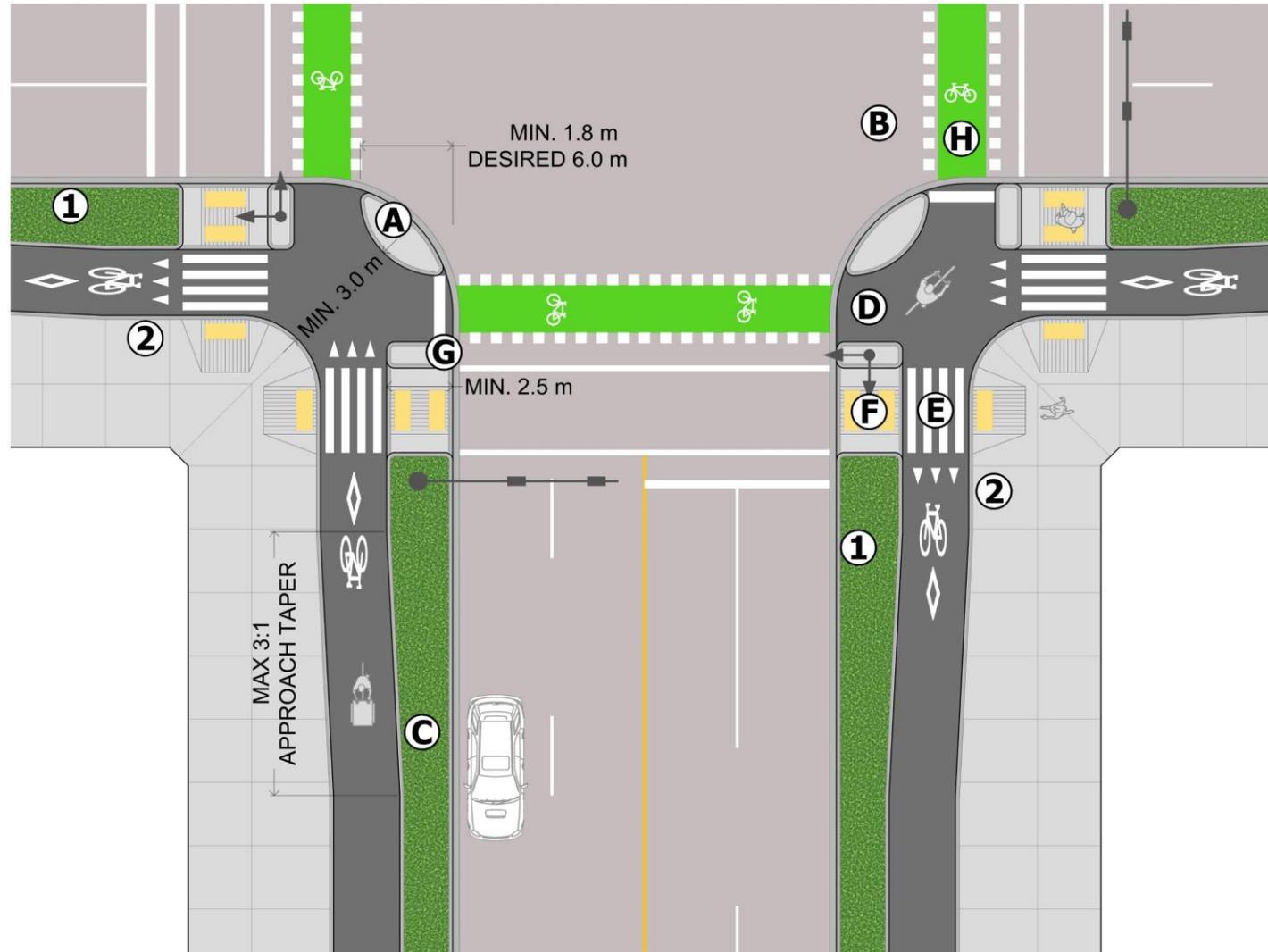
Make intersection as compact as possible

# Key Features



- ① Crossing Setback
- ② Corner Island
- ③ Bicycle Queuing Area
- ④ Pedestrian Waiting Areas
- ⑤ Crosswalk Markings
- ⑥ Signal Phasing
- ⑦ Amenity Zone

# Design Guidance



- (A)** CORNER REFUGE ISLAND
- (B)** SETBACK OF BICYCLE AND PEDESTRIAN CROSSINGS
- (C)** TAPERED APPROACH TO INTERSECTION
- (D)** FORWARD BICYCLE QUEUEING AREA
- (E)** PEDESTRIAN CROSSWALK OVER BICYCLE FACILITY
- (F)** PEDESTRIAN REFUGE ISLAND
- (G)** SIGNAL OPERATION  
\* BICYCLE SIGNAL WITH OPTIONAL COUNTDOWN TIMER
- (H)** CROSS-RIDE PAVEMENT MARKING

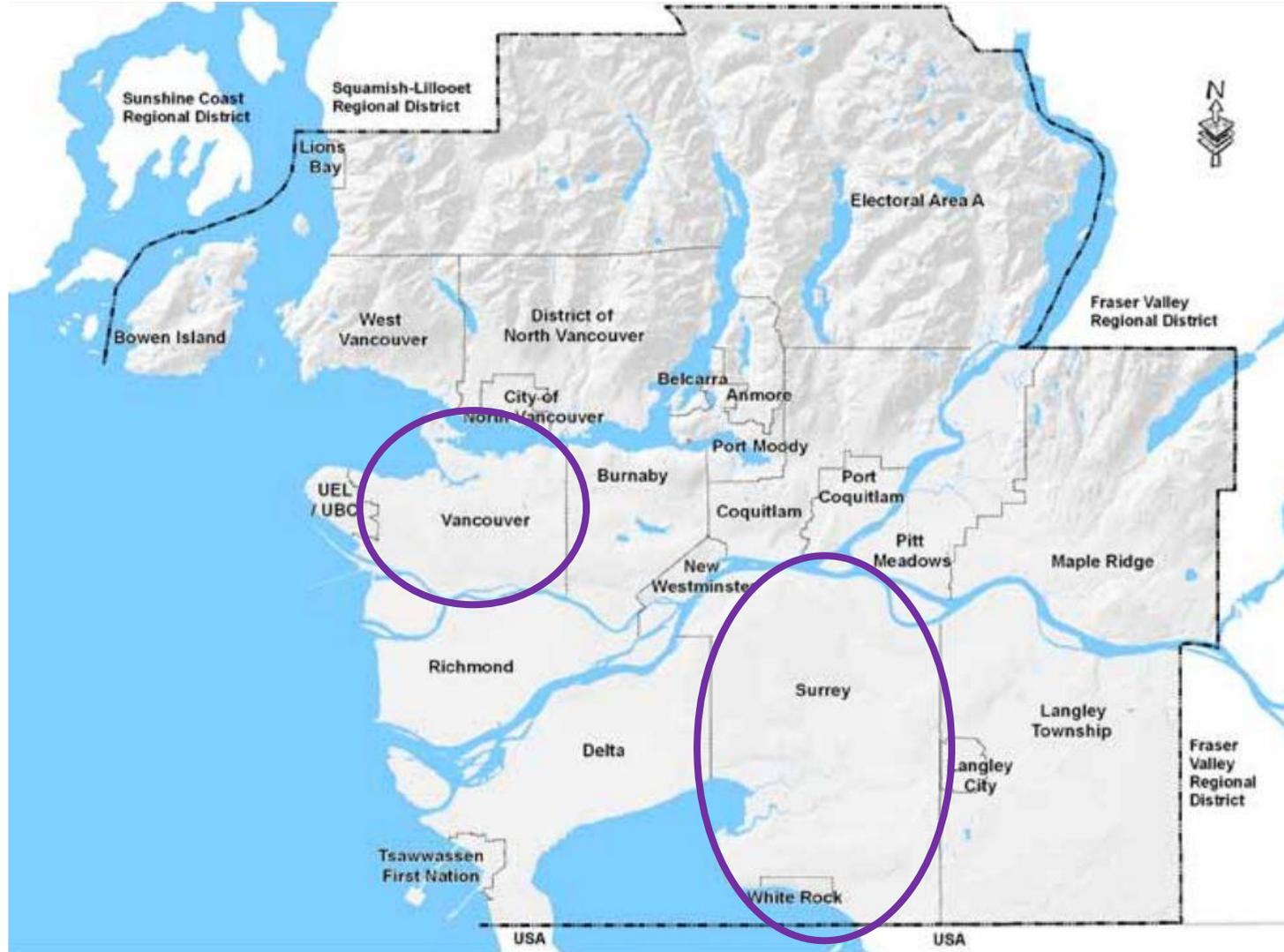


# Benefits of Protected Intersections

- High level of safety and comfort
- Clearly indicate right-of-way
- Promote predictable movements
- Reduce the distance and time of exposure



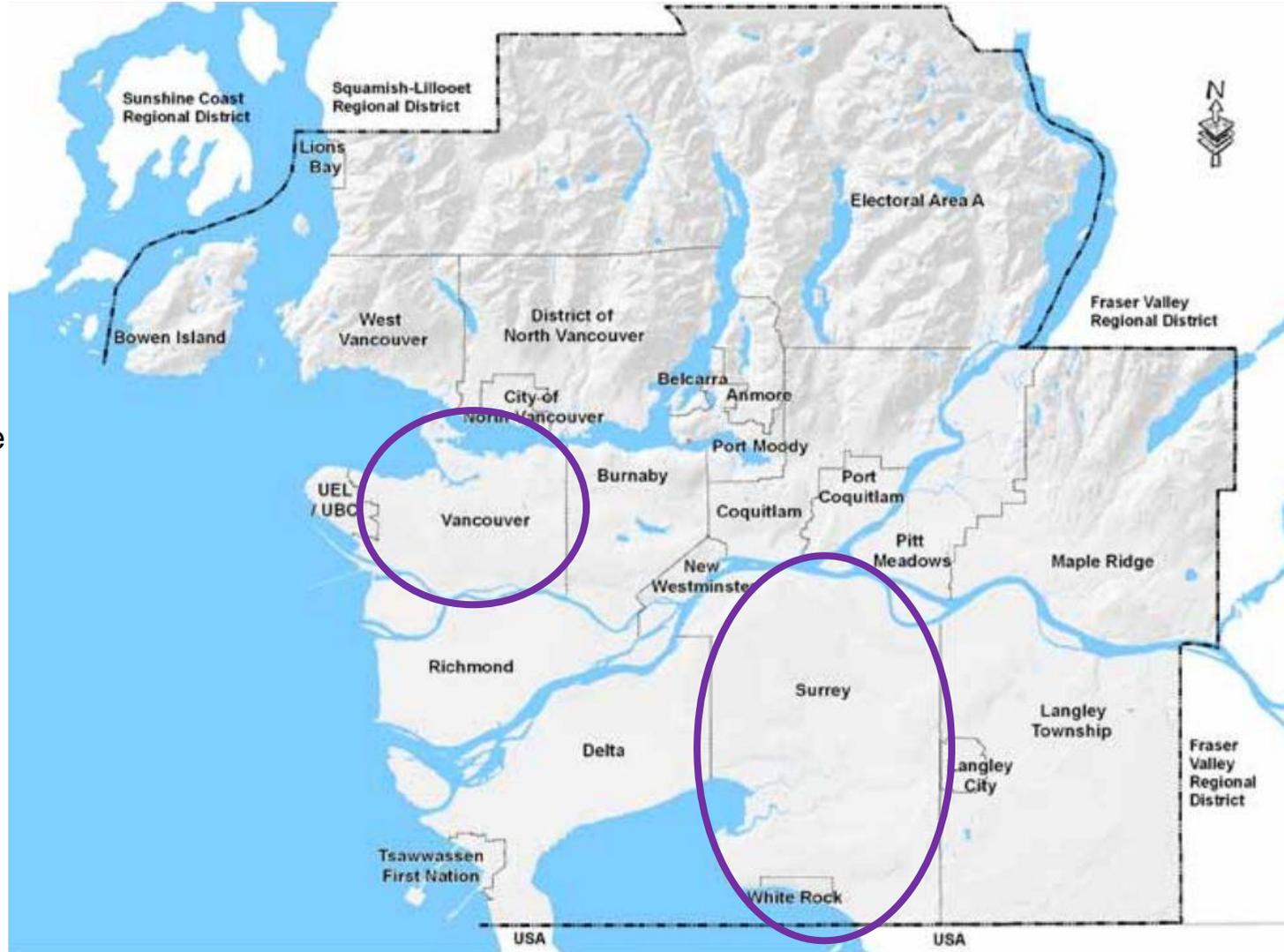
# Case Study: Vancouver & Surrey, BC



# Case Study: Vancouver & Surrey, BC

## Vancouver

- 630,000 residents
- 115 sq. km. (44 sq. miles)
- Urban context
- 6.1% bicycle mode share
- **3 protected intersections**



## Surrey

- 520,000 residents
- 315 sq. km. (122 sq. miles)
- Suburban context in transition
- < 1% bicycle mode share
- **4 protected intersections**

# Vancouver

- Route Legend**
- AAA Network
  - Protected Bike Lane
  - Local Street Bikeway
  - Painted Bike Lane
  - Shared Use Lane

**City Core Inset**

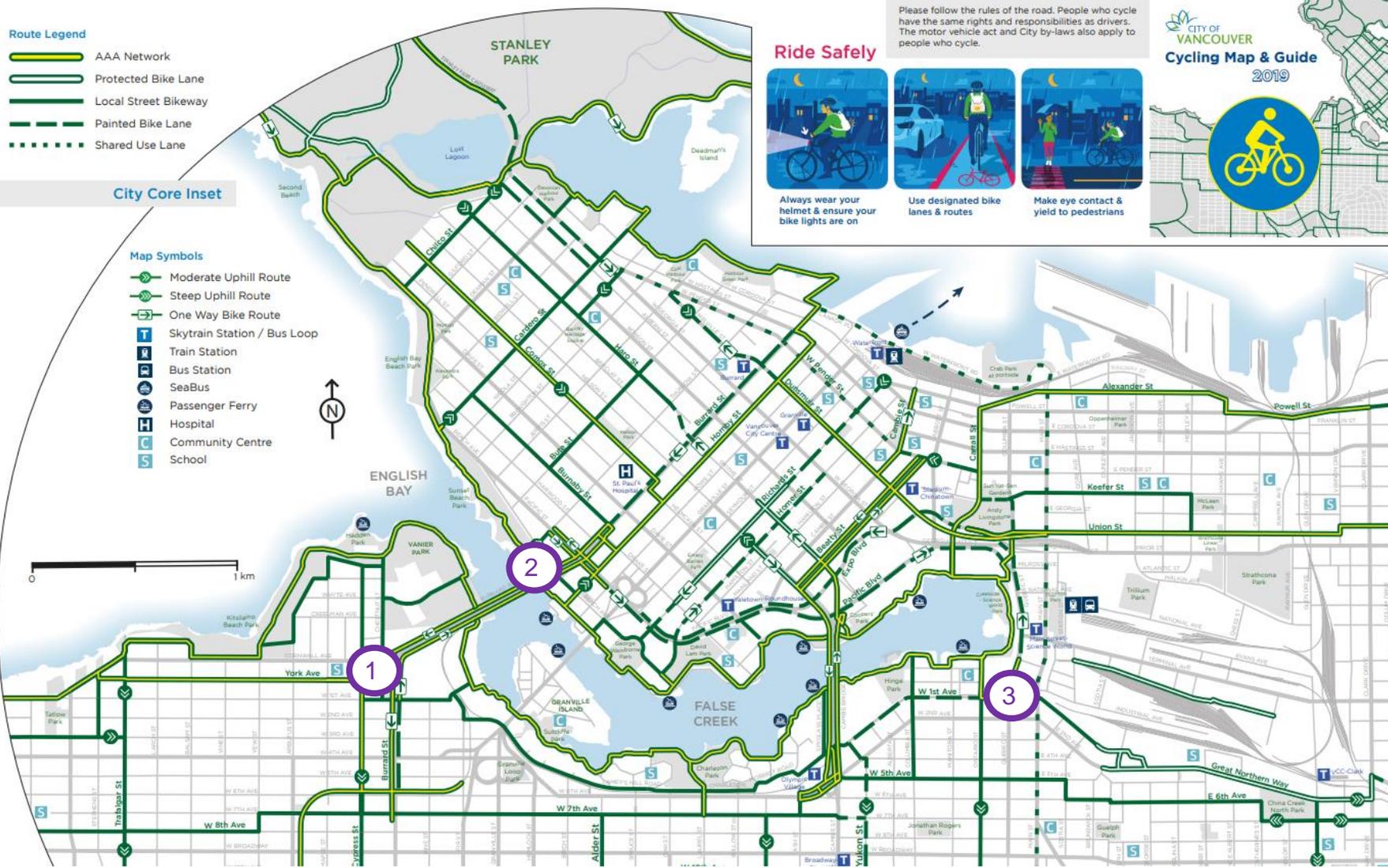
- Map Symbols**
- Moderate Uphill Route
  - Steep Uphill Route
  - One Way Bike Route
  - Skytrain Station / Bus Loop
  - Train Station
  - Bus Station
  - SeaBus
  - Passenger Ferry
  - Hospital
  - Community Centre
  - School

**Ride Safely**

Please follow the rules of the road. People who cycle have the same rights and responsibilities as drivers. The motor vehicle act and City by-laws also apply to people who cycle.

- Always wear your helmet & ensure your bike lights are on
- Use designated bike lanes & routes
- Make eye contact & yield to pedestrians

**CITY OF VANCOUVER**  
**Cycling Map & Guide**  
 2019



1 Burrard & Cornwall

2 Burrard & Pacific

3 Quebec & First

# Vancouver

- Highly constrained urban environment makes implementation challenging in many contexts
- Implementation to date through road reconstruction and redevelopment
- Ties into AAA bicycle network
- Several partial protected intersections



# Surrey

1

King George Blvd & Bridgeview Drive

2

105 Ave & 140 St

3

100 Ave & Whalley Blvd

4

100 Ave & 140 St



# Surrey

- Plans to install protected bicycle lanes on all major City Centre streets through development
- Starting at intersections and extending outwards
- “Making it fit” strategy - interim treatments recognized need to balance existing priorities, with retrofits in the future



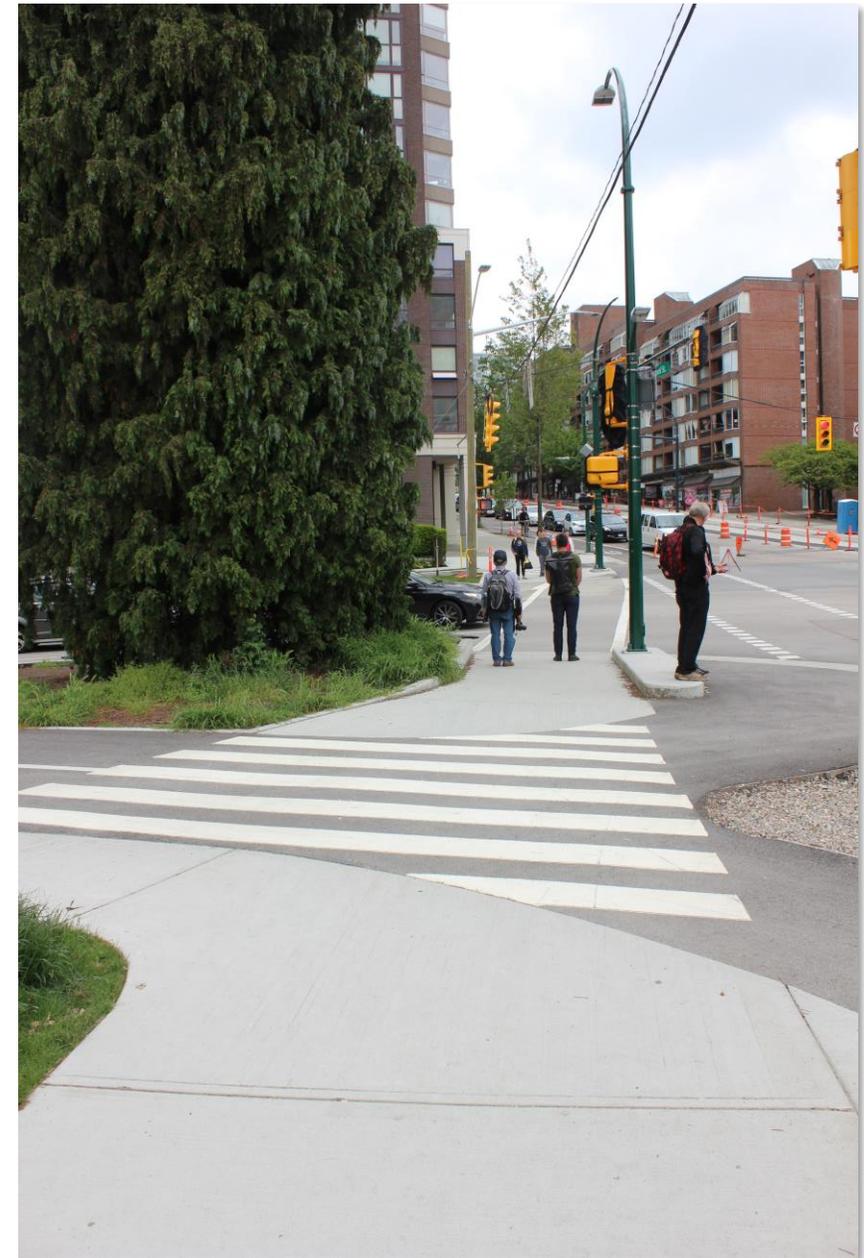
# Design Issues and Challenges

1. Accessibility
2. Balancing Trade-Offs
3. Pedestrian Refuge Islands
4. Bicycle Queuing Areas
5. Approach Treatments
6. Pavement Markings Thru Intersections
7. Pedestrian Crossings
8. Amenity Zone

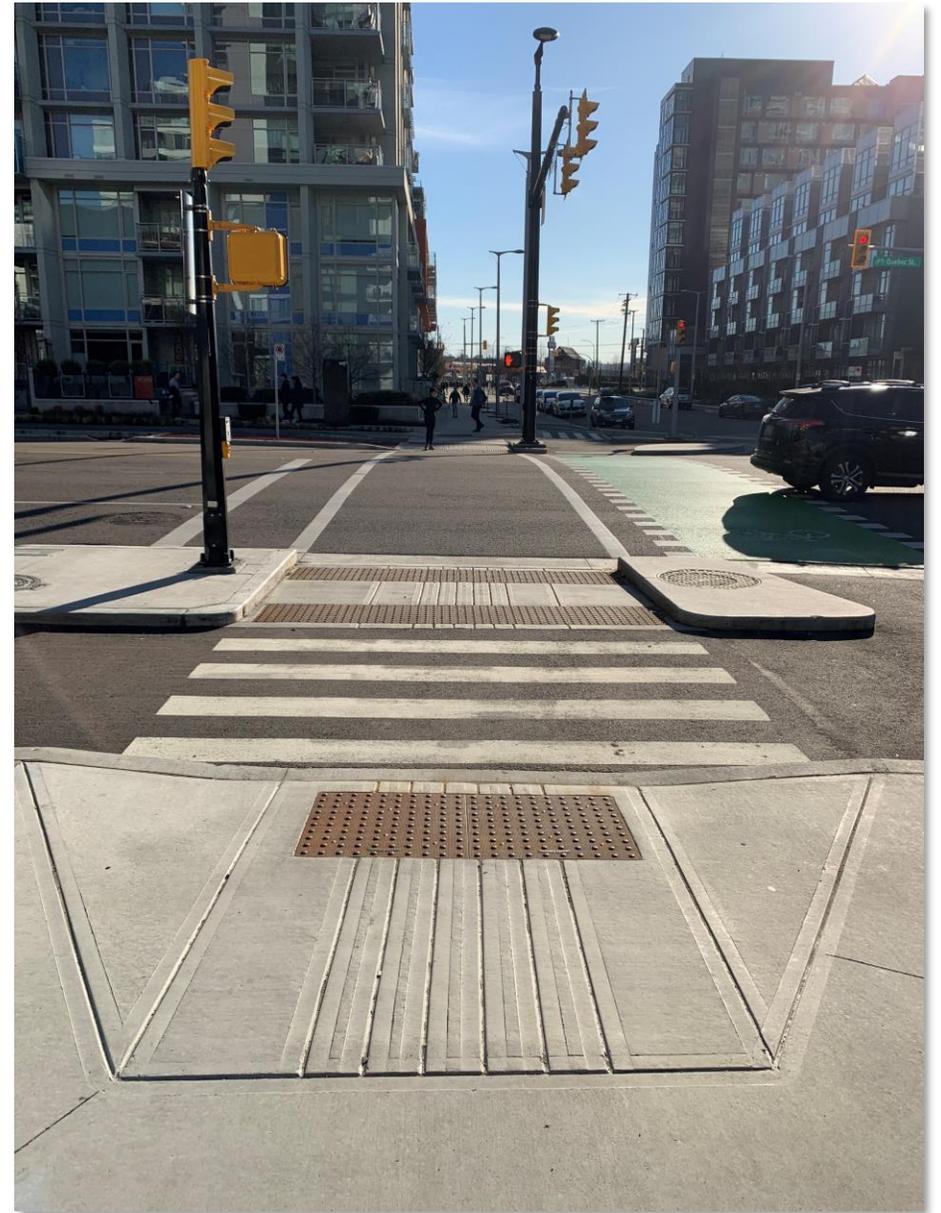


# Accessibility

- One of the most important and complex design considerations
  - Tactile attention indicators
  - Vertical elements
  - Directional score lines
  - Pedestrian locator tones



# Accessibility



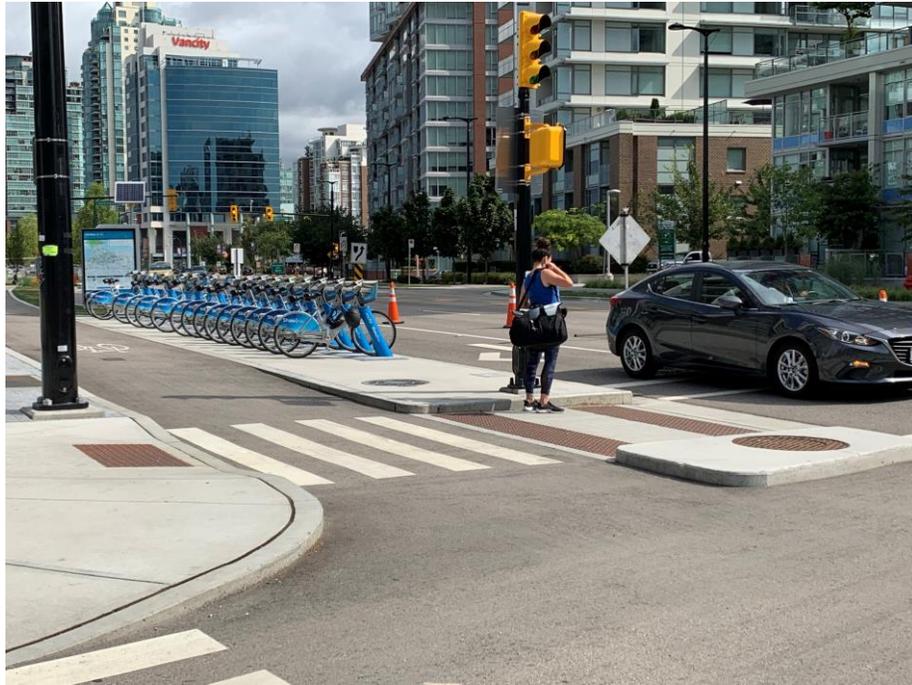
# Balancing Trade-Offs

- Consider design vehicle and control vehicle
- Balance trade-offs between turning movements and setback crossing



# Pedestrian Refuge Islands

- Design should include cues to encourage pedestrians to wait in refuge area
- Desired width of 2.5 metres (1.8 metres minimum)
- Pedestrian push button located in refuge area and provide visual and audible cues
- Shortens pedestrian crossing distance and improves signal timing

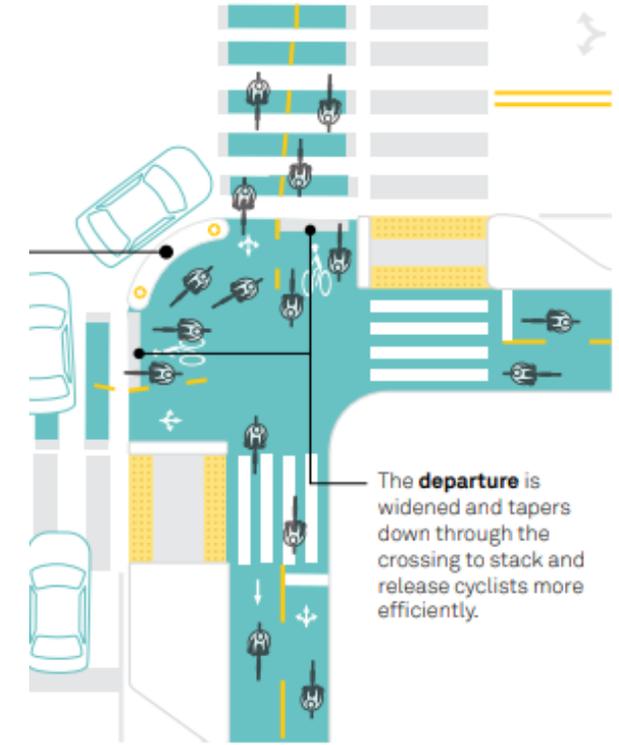


# Pedestrian Refuge Islands



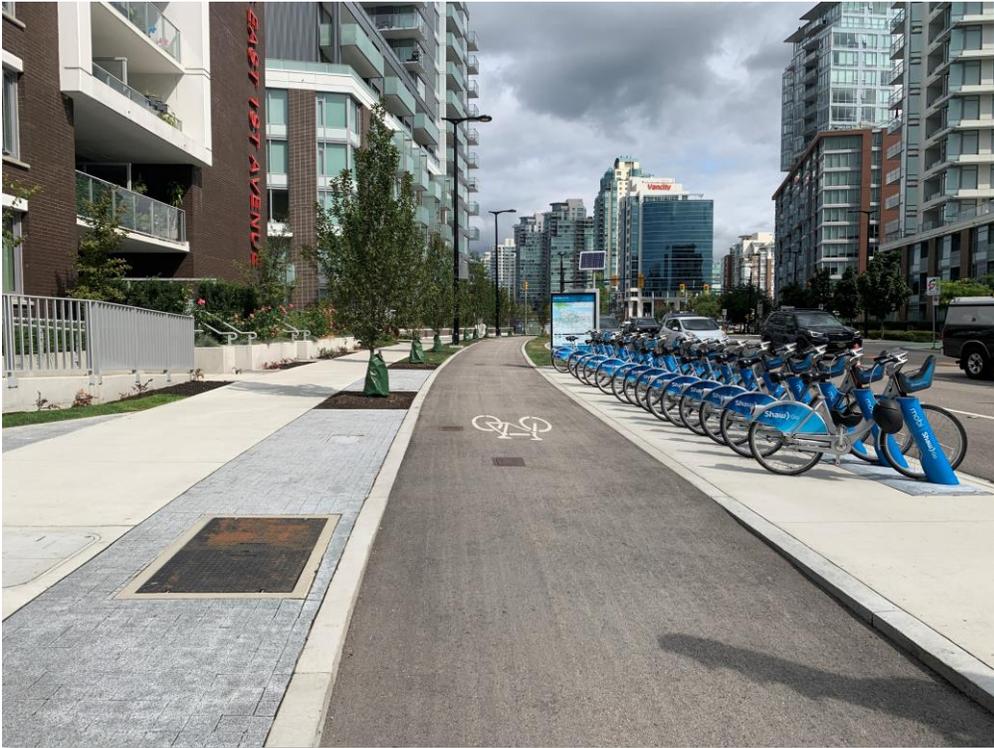
# Bicycle Queuing Areas

- Minimum 1.8 metres deep
- Design to accommodate volumes and types of users



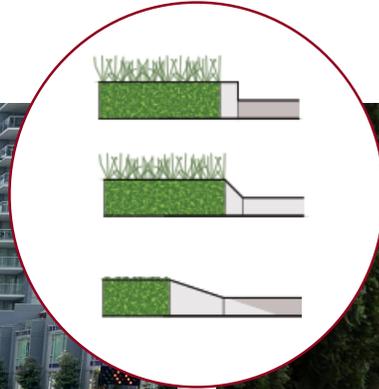
# Approach Treatments

- Extend protected bicycle lane or transition to other facilities
- Boulevard or median separation is desirable



# Approach Treatments

- If separation is not possible, intermediate level protected bicycle lane is preferred



# Pavement Markings Thru Intersection

- Inconsistent application in Vancouver and Surrey
- Surrey avoids 'over use' of green pavement markings
- Vancouver uses green pavement markings to ensure high awareness, even if no conflict exists



# Pedestrian Crossings

No Markings



Shark's Teeth



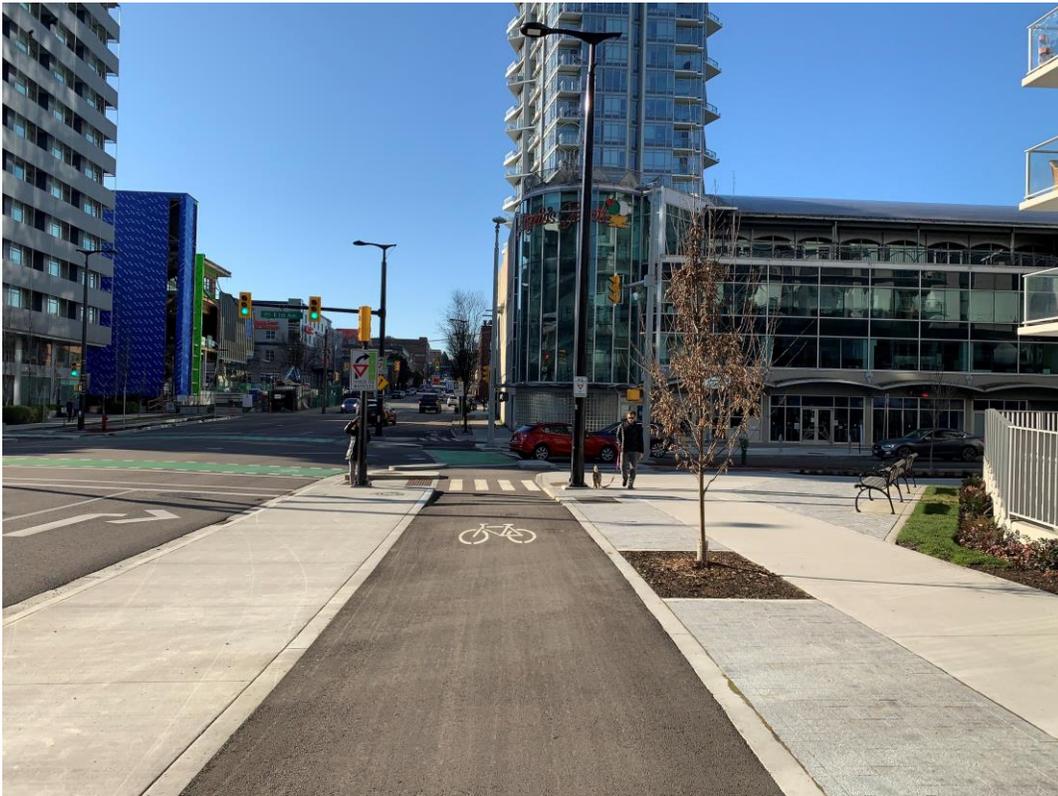
Marked Crosswalk



# Amenity Zone

- Opportunity for bike parking, bike share, and other amenities
- Ensure sightlines are maintained

Before

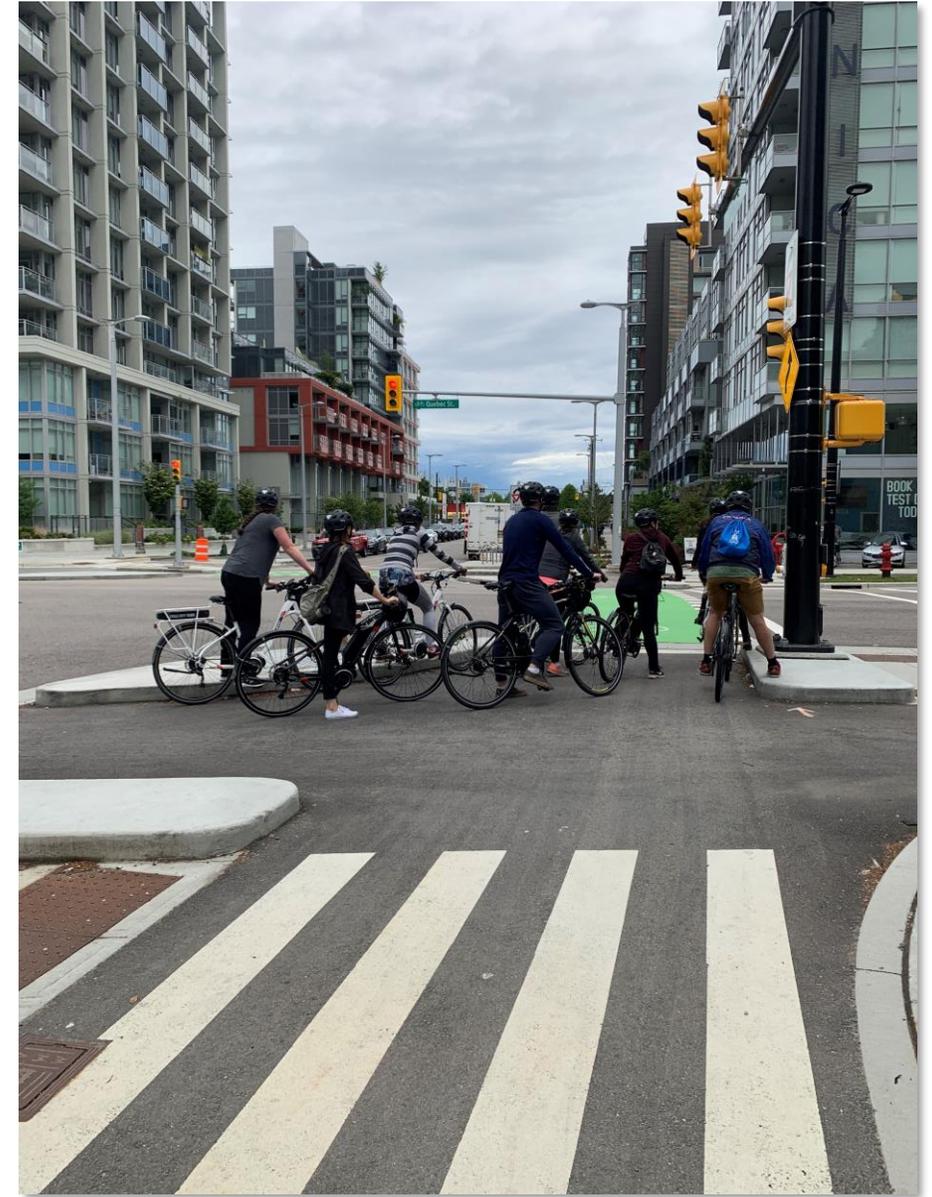


After



# Lessons Learned

- Working with accessibility community is critical
- Trade-offs need to recognize context and priorities
- Partial protected intersections
- Temporary vs quality
- Minimalist and monitor
- Lack of consistency
- Lack of design guidance means designs are evolving



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