October 10, 2023 TSD-TRP-23-012

Appendix B: Bicycle Facility Screening Exercise

Duke Street Cycling Improvements (College Street to Frederick Street)

Cycling Facility and Screening Results

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Cycling Facility Types

- There are 10 facility types listed in OTM Book 18 (2021).
- NACTO also provides guidance for a Shared Bus-Bike Lane.
- Within some of the facility types, there are variations depending on placement and how the facility might best fit in the Duke Street context.

The goal of this exercise was to review all possible bicycle facility types and assess their feasibility for application along Duke Street within the constrained section (College Street to Frederick Street).

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Cycling Facility Types

1. Physically Separated Bike Lanes:
   A. Unidirectional;
   B. Bidirectional on north side;
   C. Bidirectional on south side.
2. Cycle tracks:
   A. Unidirectional;
   B. Bidirectional north side;
   C. Bidirectional south side.
3. Boulevard multi-use trail (BMUT):
   A. North side;
   B. South side.
4. Painted bike lanes:
   A. Unidirectional;
   B. One lane pairing.
5. Buffered Bike Lanes (unidirectional only).
6. Contraflow Bike Lanes.
7. Advisory bike lanes.
8. Neighbourhood Bikeways / Transit Mall.
9. Shared Use/Mixed Traffic Operation.
10. Paved shoulders.
11. Bus and Bike Only Lanes.

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OTM Book 18: Facility Types (1 of 3)

Table 4.1 – Overview of Types of Cycling Facilities

Physically Separated Bikeways		
Physically Separated Cycling Lanes (Section 4.3.2)		A portion of a roadway which has been designated for the exclusive use of cyclists, and which is separated from adjacent motor vehicle lanes by a horizontal buffer and separation elements that restrict encroachment of traffic. Separation techniques are detailed in **Section 4.3.1**.
Cycle Tracks (Section 4.3.3)		A physically separated bikeway that is horizontally and vertically separated from the travelled portion of the roadway by a curb and buffer. Cycle tracks are designated exclusively for use by people riding bikes, and often travel parallel to a sidewalk.
In-Boulevard Multi-Use Paths (Section 4.3.4)		A two-way path that is horizontally and vertically separated from the travelled portion of the roadway by a curb and buffer. Multi-use paths are shared by cyclists and pedestrians. In-boulevard multi-use paths are distinct from multi-use trails, which run in a dedicated corridor separate from the road right-of-way.

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OTM Book 18: Facility Types (2 of 3)

Bicycle Lanes		
Conventional Bicycle Lanes (Section 4.4.1)		A portion of a roadway that has been designated by pavement markings and signage for preferential or exclusive use by people riding bikes. Bicycle lanes are separated from motor vehicle lanes solely by a white painted line. This facility type is for one-way bicycle travel only. A typical configuration on a two-way roadway includes a conventional bicycle lane on each side.
Buffered Bicycle Lanes (Section 4.4.2)		Similar to a conventional bicycle lane, but adds a painted buffer to create additional horizontal separation between the bicycle lane and the adjacent motor vehicle lane. No vertical separation elements are used.
Contraflow Bicycle Lanes (Section 4.4.3)		A bicycle lane that operates in the opposite direction of motor vehicle traffic, enabling two-way bicycle travel on a roadway that has one-way operation for motor vehicles. Contraflow bicycle lanes can be separated from motor vehicle lanes by a painted line only, by a buffer or by a form of physical separation.

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OTM Book 18: Facility Types (3 of 3)

Shared Cycling Facilities		
Advisory Bicycle Lanes (Section 4.5.1)		A shared roadway facility that visually delineates space for cycling by dashed lane lines. The roadway contains no centreline, and motor vehicles share the centre roadway space for two-way travel.
Neighbourhood Bikeways (Section 4.5.2)		Low-volume, low-speed streets that prioritize bicycle travel using treatments such as traffic calming, traffic reduction, signage, pavement markings and intersection crossing treatments. These treatments encourage through movements for people riding bikes while discouraging or prohibiting similar through trips by motorized traffic.
Mixed Traffic Operation (Section 4.5.3)		Unless cycling is specifically restricted, people riding bikes are permitted to travel on all roadways, whether designated as a bicycle route or not. Designating a route where cyclists operate in mixed traffic is generally undesirable, unless the street is low-speed and low-volume. Where appropriate conditions are present for mixed traffic operation, supportive signs and pavement marking treatments can be added to the route to support wayfinding and promote safer interactions between cyclists and motorists.
Paved Shoulders (Section 4.5.4)		A portion of a roadway which is contiguous with the travelled way, and is used to accommodate stopped motor vehicles, emergency uses, pedestrians and cyclists, as well as for lateral support of the pavement structure. On higher-speed and higher-volume roads, paved shoulders should typically include a buffer zone to provide greater separation between motorists and people riding bikes travelling in the same direction.

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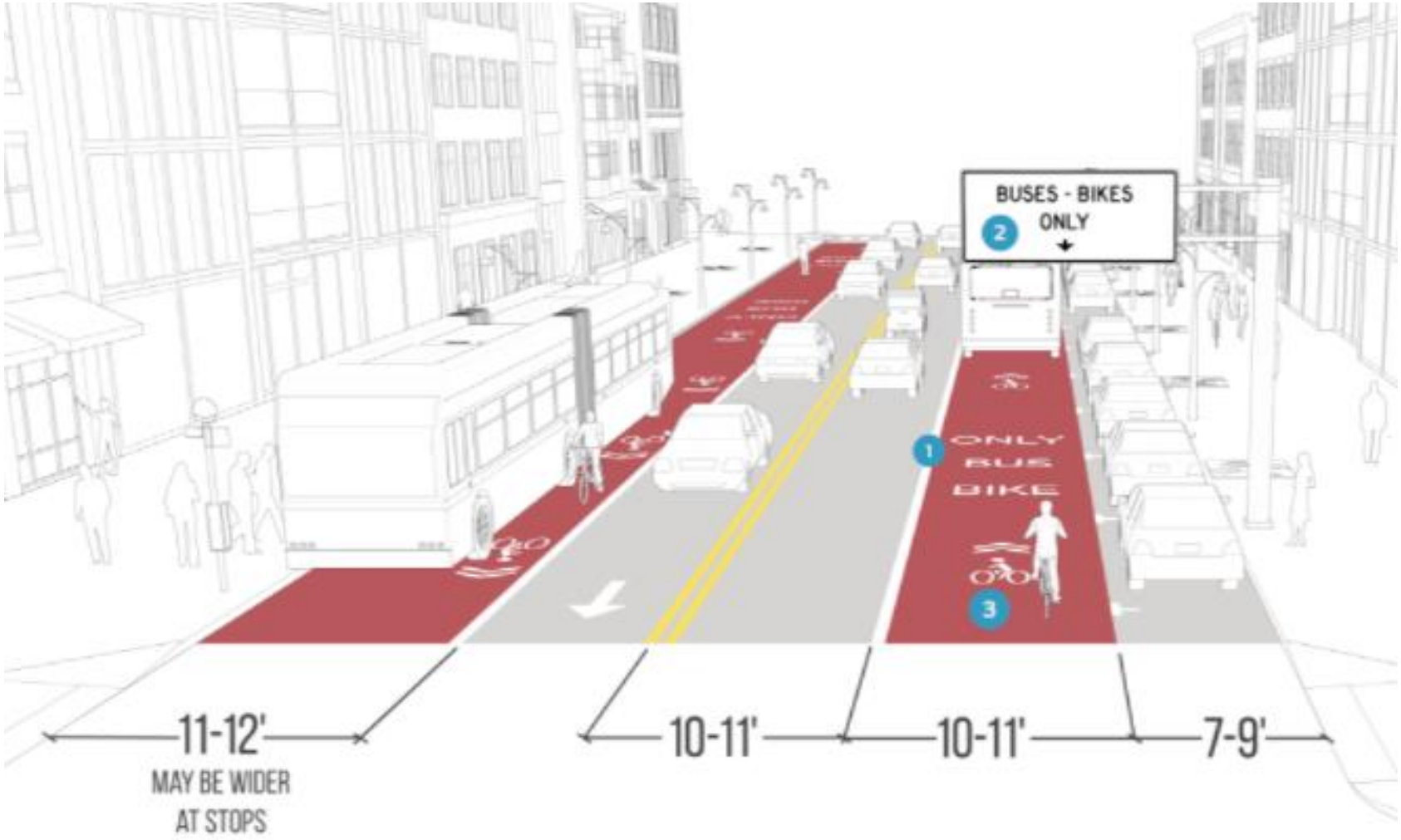
Shared Bus-Bike Lane



- *NACTO Transit Street Design Guide*
- The shared bus-bike lane is not a high-comfort bike facility, nor is it appropriate at very high bus volumes. However, buses and bicycles often compete for the same space near the curb. On streets without dedicated bicycle infrastructure, curbside bus lanes frequently attract bicycle traffic, prompting some cities to permit bicycles in bus lanes.
- Shared bus-bike lanes can accommodate both modes at low speeds and moderate bus headways, where buses are discouraged from passing, and bicyclists pass buses only at stops. In appropriate conditions, bus-bike lanes are an option on streets where dedicated bus and separate high-comfort bicycle facilities cannot be provided.

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Primary Criteria for Evaluation of Facility Types

The following criteria was used as an initial screening of facility types.

Factor	Description
Constructability	Available right-of-way space, utility conflicts, etc. (It is assumed that the LRT corridor is not to be moved and expropriation is not feasible due to property line buildings)
Cycling quality	Connectivity, consistency, safety, comfort, stress for cycling, with goal of being attractive to All Ages and Abilities (AAA)
Pedestrian impacts	Safety and comfort for pedestrians
Transit impacts	Impact to transit service levels, current routes, station amenities
Transit user impacts	Comprehension of new routing, station connections, etc.
Traffic impacts	Impact to motor vehicle traffic capacity on street and surrounding street network
Truck route/ loading/deliveries	Impact to goods movement and loading/deliveries
Emergency services	Impact to Fire and EMS response times

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Evaluative Method

Red = Desired criteria is not met

Orange = Desired criteria is partially met and/or some significant drawbacks

Yellow = Desired criteria is mostly met and/or some acceptable drawbacks

Green = Desired criteria is fully met and/or no significant drawbacks

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Facility Evaluation Summary (1 of 3)

	Facility Type	Constructability	Cycling quality	Pedestrian impacts	Transit impacts	Transit user impacts	Traffic impacts	Truck/loading impacts	Emergency Services	Status
1A	Physically separated bike lanes (unidirectional)									Ruled out
1B	Physically separated bike lanes (bidirectional north side)									Ruled out
1C	Physically separated bike lanes (bidirectional south side)									Ruled out
2A	Cycle tracks (unidirectional)									Ruled out
2B	Cycle tracks (bidirectional north side)									Ruled out
2C	Cycle tracks (bidirectional south side)									Ruled out

Facility Evaluation Summary (2 of 3)

	Facility Type	Constructability	Cycling quality	Pedestrian impacts	Transit impacts	Transit user impacts	Traffic impacts	Truck/loading impacts	Emergency Services	Status
3A	Boulevard multi-use trail (north side)									Ruled out 
3B	Boulevard multi-use trail (south side)									Ruled out 
4A	Painted bike lanes (unidirectional)									Ruled out 
4B	Painted bike lanes (one lane pairing)									Ruled out 
5	Buffered Bike Lanes (unidirectional)									Ruled out 
6	Contraflow Bike Lanes									Ruled out 

Facility Evaluation Summary (3 of 3)

	Facility Type	Constructability	Cycling quality	Pedestrian impacts	Transit impacts	Transit user impacts	Traffic impacts	Truck/loading impacts	Emergency Services	Status
7	Advisory Bike Lanes									Ruled out 
8	Neighbourhood Bikeways / Transit Mall									Further study
9	Shared Use/Mixed Traffic Operations									Ruled out 
10	Paved shoulders									Ruled out 
11	Shared Bus – Bike Lanes									Ruled out 

Facility Screening Results (1 of 3)

1. Physically Separated Bike Lanes
   A. Unidirectional
   B. Bidirectional on north side
   C. Bidirectional on south side

   Ruled out due to space constraints and the need to maintain two-way transit.
2. Cycle tracks
   A. Unidirectional
   B. Bidirectional north side
   C. Bidirectional south side

   Ruled out due to space constraints and the need to maintain two-way transit.
3. Boulevard multi-use trail (BMUT)
   A. North side
   B. South side

   Ruled out since BMUTs would be substandard and wouldn't support high levels of walking and cycling.
4. Painted bike lanes
   A. Unidirectional
   B. One lane pairing

   Ruled out due to space constraints and the need to maintain two-way transit.

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Facility Screening Results (2 of 3)

5. Buffered Bike Lanes (unidirectional only)

   Ruled out due to space constraints and the need to maintain two-way transit.

6. Contraflow Bike Lanes

   Ruled out due to space constraints and the need to maintain two-way transit.

7. Advisory bike lanes

   Ruled out since the intersection spacing would only allow for very short advisory bike lanes, i.e. lack of meaningful improvement for cyclists.

8. Neighbourhood Bikeways / Transit Mall

   Carried forward for further study.

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Facility Screening Results (3 of 3)

9. Shared Use/Mixed Traffic Operation

   Ruled out due to lack of meaningful improvement for cyclists.

10. Paved shoulders

    Ruled out due to space constraints and the need to maintain two-way transit.

11. Bus and Bike Only Lanes

    Ruled out due to the need for maintaining vehicle access to addresses along Duke Street.

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