Vélo Québec

Paradigm Shift

Enabling Winter Cycling through Better Design and Maintenance

Presentation Overview

1. Introduction
2. Street Design
3. Maintenance Priorities
4. Maintenance Techniques

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Introduction

How to design and operate a high quality four season cycling network

About Vélo Québec

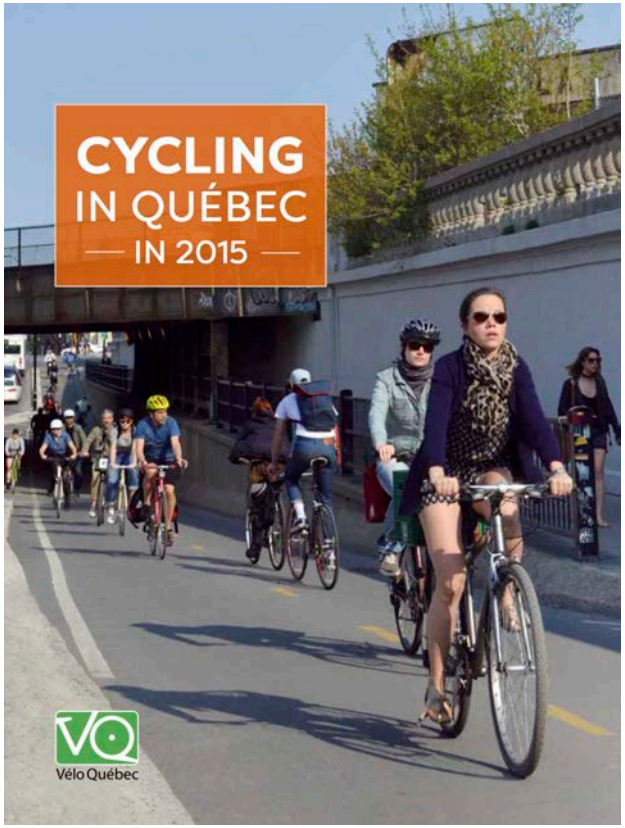
- Founded in 1967
- Largest cycling organization in North America
- Four divisions
  - **Association**
  - Events
  - Travel agency
  - Publishing

Photo: Blake Gumprecht

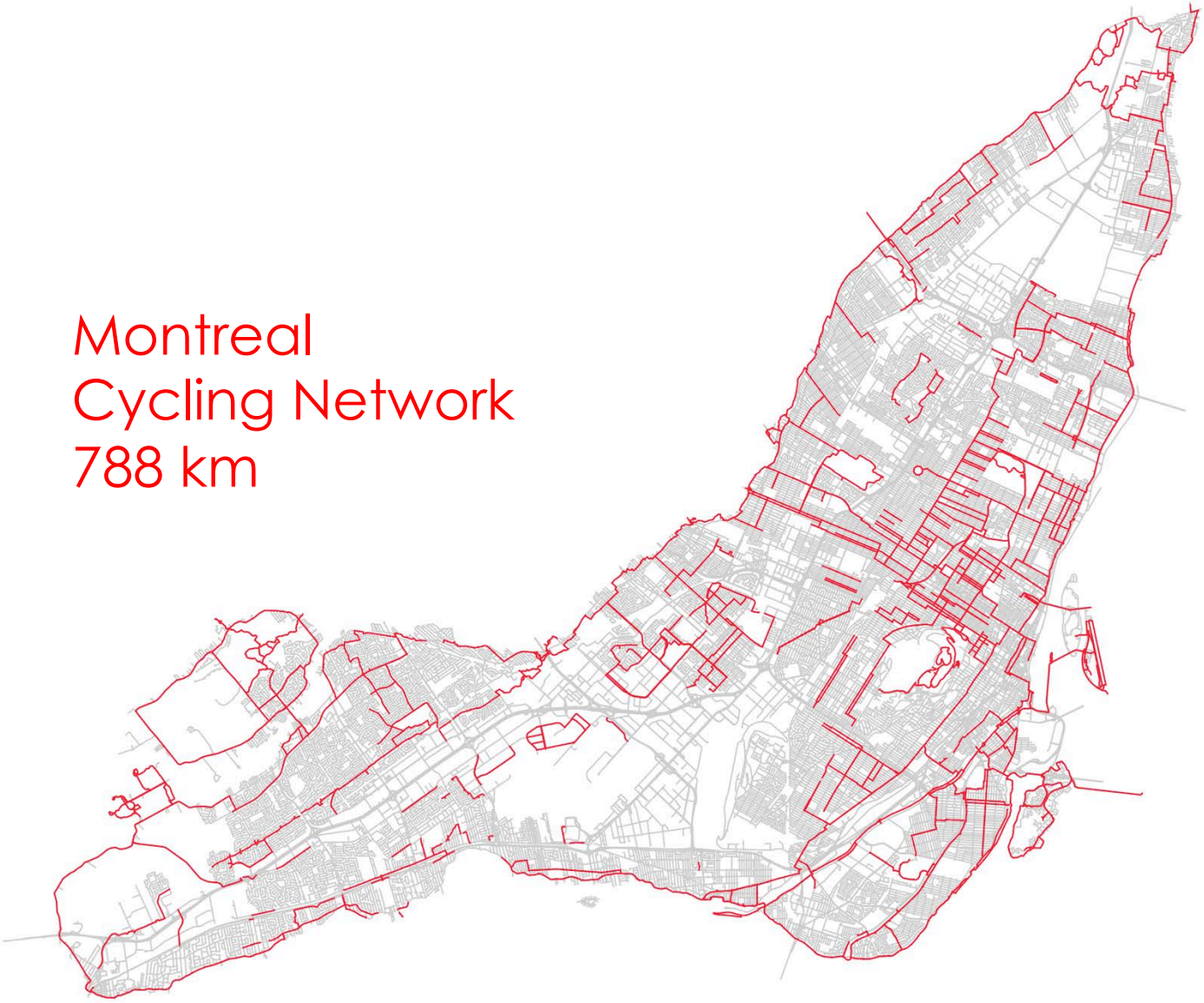
About Vélo Québec

Vélo Québec Association:

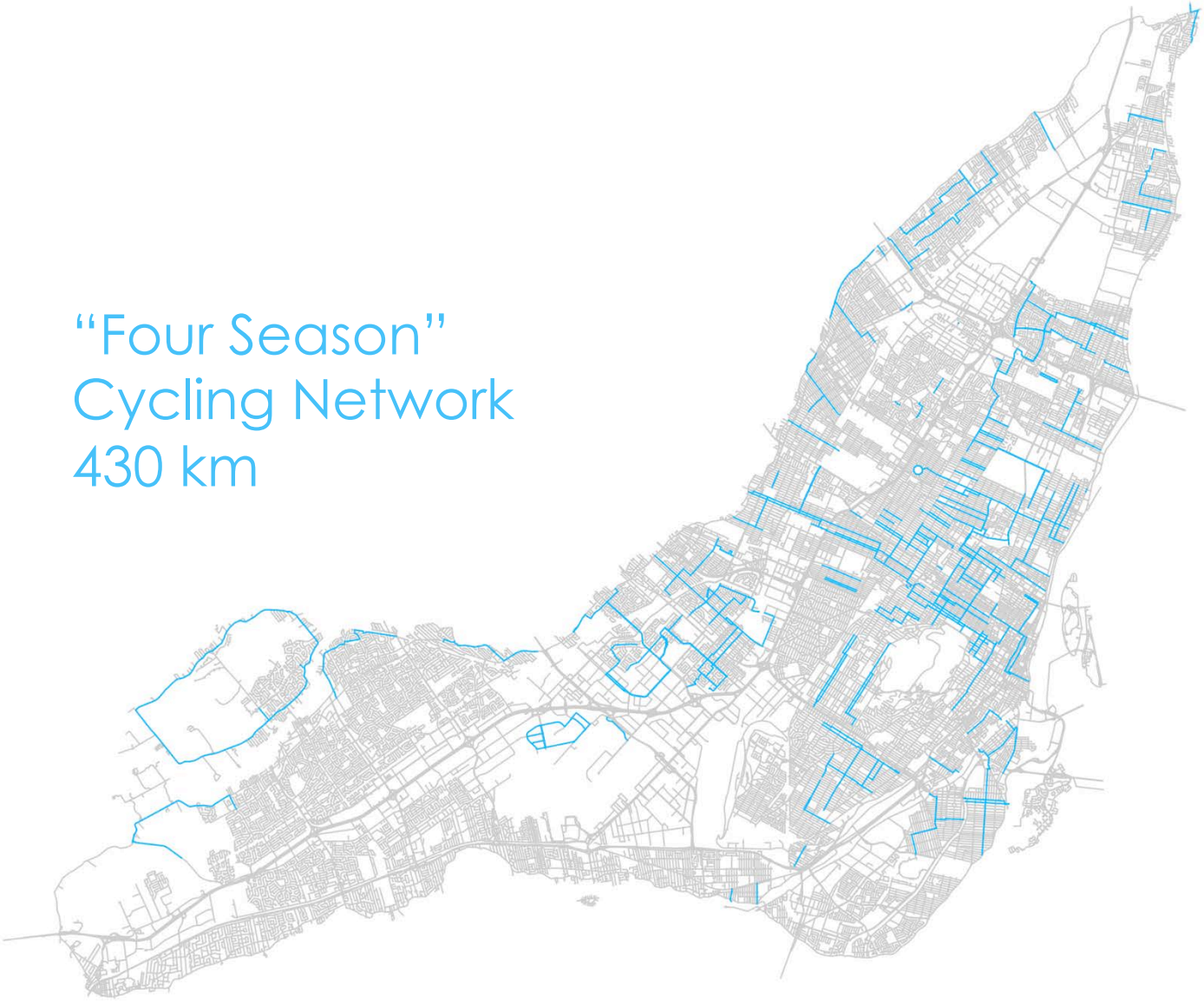
- **Research and consulting**
- Oversight of 5,300 km *La Route verte* cycling network
- Bike to work and bike to school programs
- Bicycle friendly municipality program



Montreal
Cycling Network
788 km



“Four Season” Cycling Network 430 km



“Four Season” Network

“Four Season” Network

“Four Season” Network

“Four Season” Network

Key Issues

- Design practices ignore winter operation
- Maintenance priorities focused on roads
- Maintenance techniques not appropriate for bikeways

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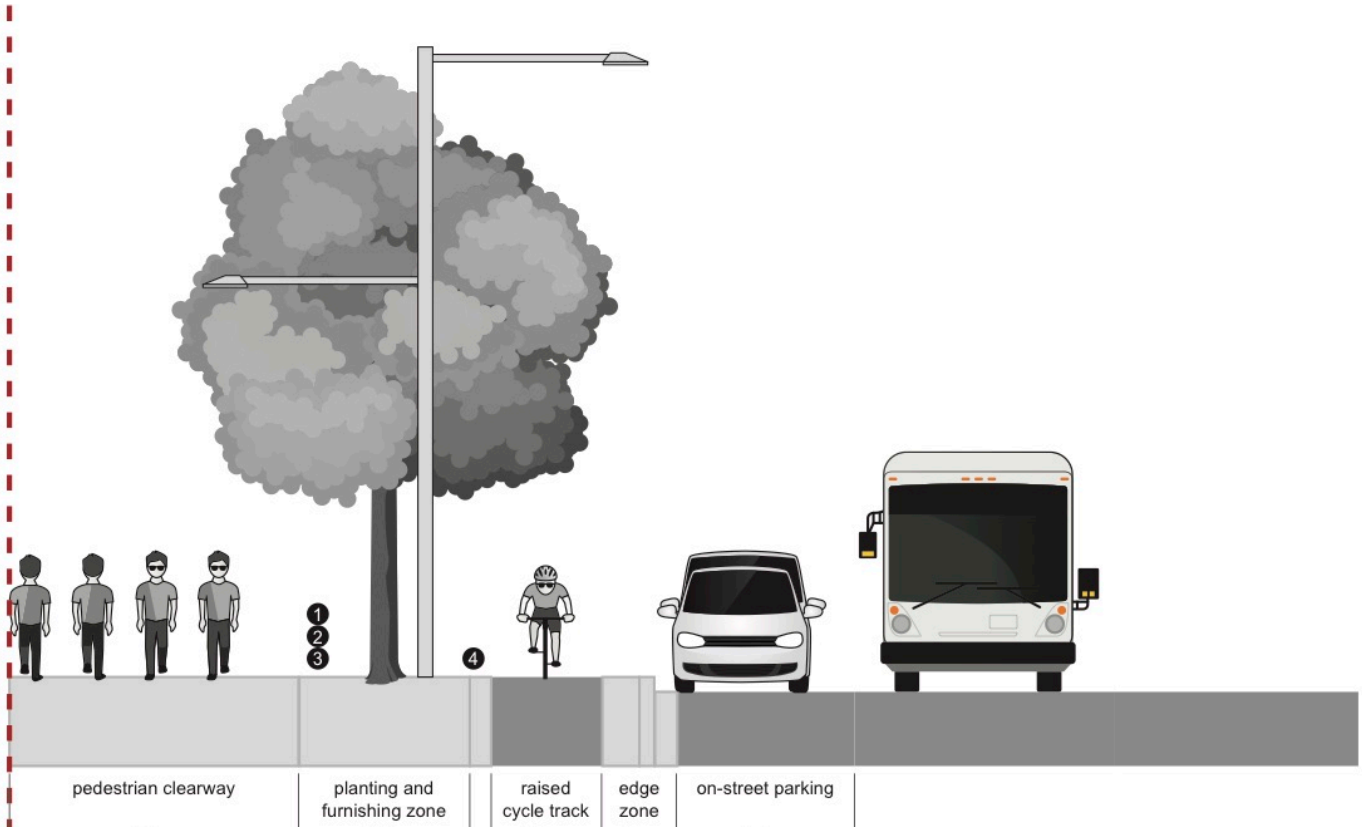
Paradigm Shift
Street Design

From Bicycle Lanes to Cycle Tracks

~~Bike Lanes~~
Cycle Tracks



Why Cycle Tracks?

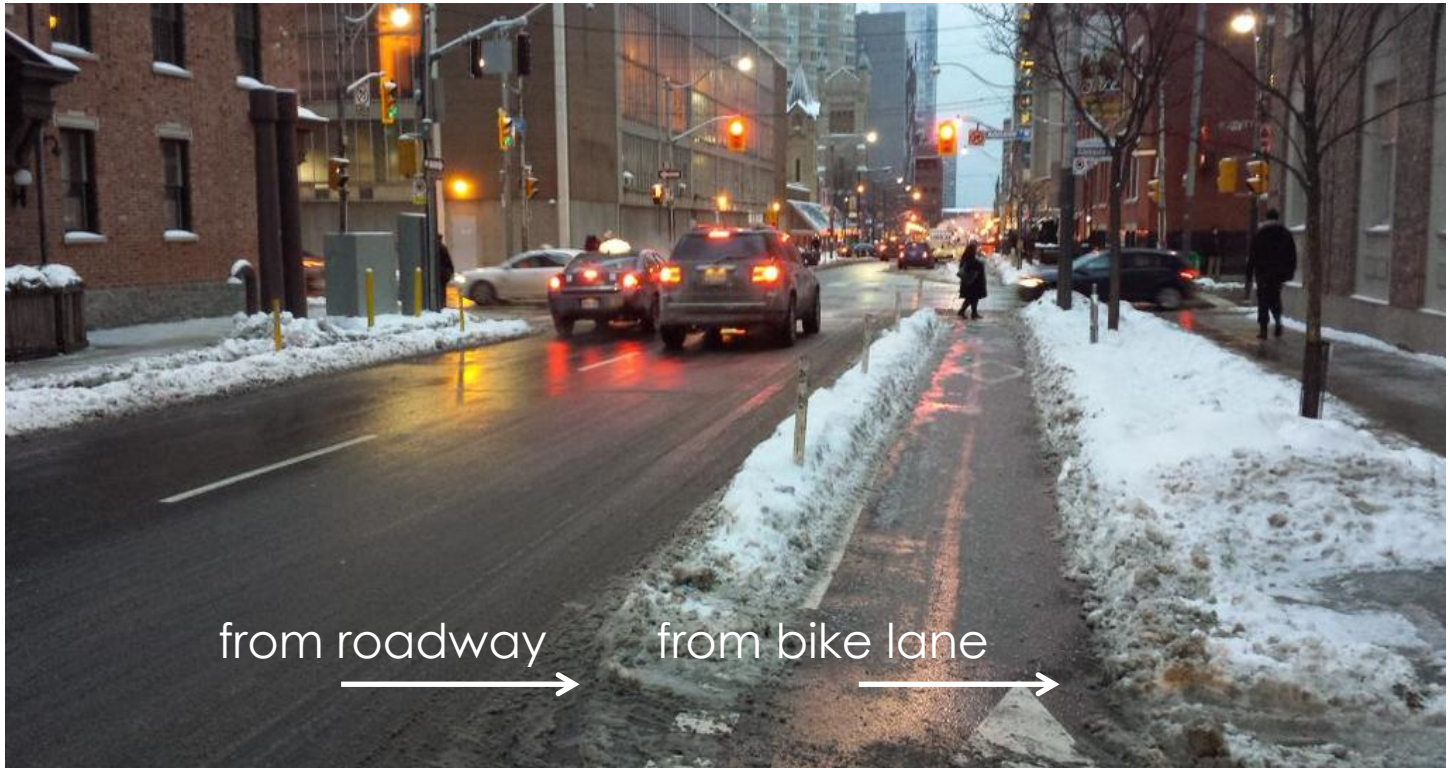
- More comfortable
  - Appeal to broader population
  - Induce more bicycle use
- Allow better winter level of service
  - Easier to keep free of snow
  - Allow distinct prioritization and methods from road maintenance

Photo: Copenhagenize Design Co.

Design Considerations

For winter maintainability:

- Snow storage
- Snow removal
- Consistency
- Efficiency

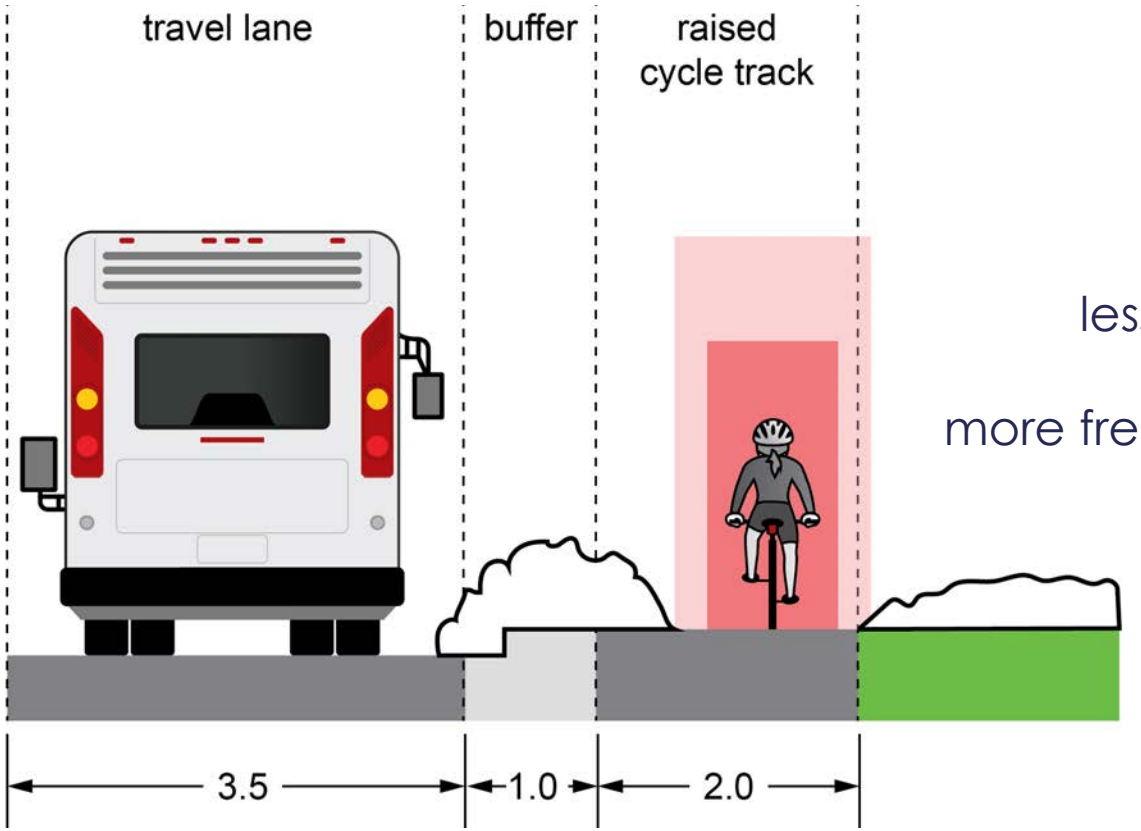


Design Considerations Snow Storage

Sufficient linear space to store snow plowed from:

- Sidewalk
- Bike lane
- Roadway

Design Considerations
Snow Storage



less snow storage
=
more frequent snow removal

Design Considerations Snow Removal

Constraints:

- Trees and vegetation
- Curbs and medians
- Fences and barriers
- Delineator posts

Design Considerations
Snow Removal

Design Considerations
Snow Removal

Rachel Street East, Montreal

Design Considerations
Snow Removal

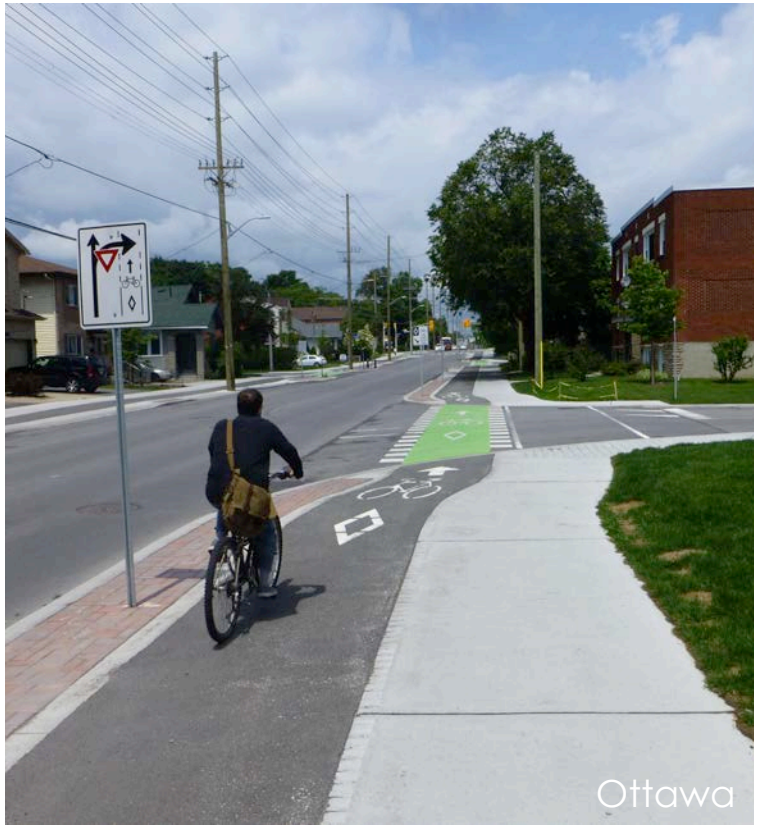
Design Considerations
Consistency

- Fewer types of maintenance machines
- Fewer maintenance procedures for operators to master

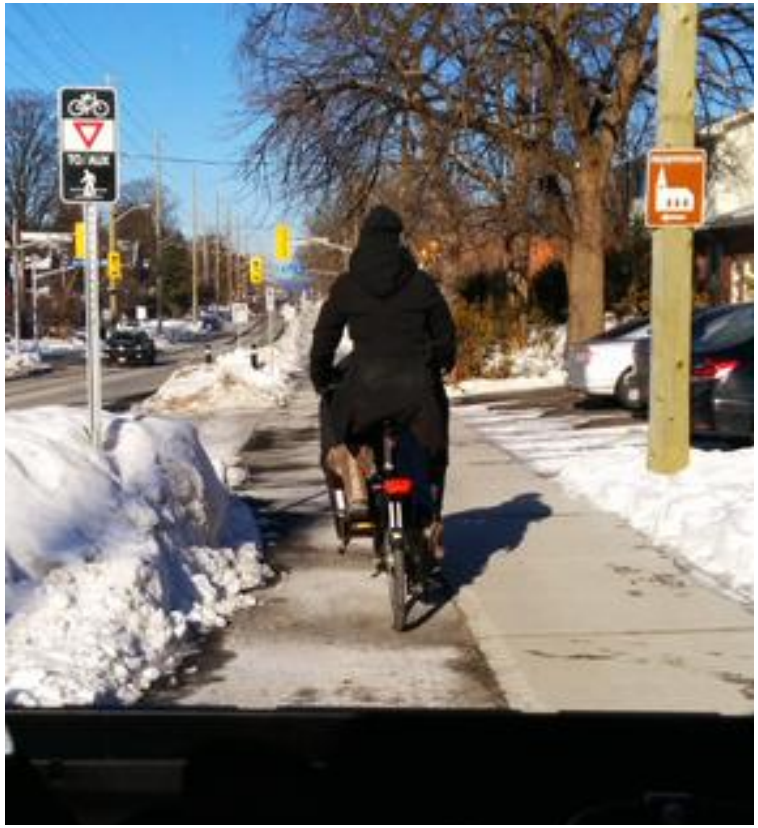
Design Considerations
Efficiency

Fewer passes for snow removal and ice control:

- fewer vehicles
- fewer person-hours



Design Considerations
Efficiency



Source: Ottawa Bike Lanes Project

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Paradigm Shift
Maintenance Priorities

Separating Roadway and Bikeway Maintenance

Maintenance Priorities
Conventional Approach

- On-street bikeways maintained piecemeal
  - at same time as road
  - priority based on road class
- Off-street bikeway maintenance not coordinated with on-street maintenance

Result:

- Inconsistent level of service across network
- Fragmentation of the bikeway network

Maintenance Priorities
Conventional Approach

Maintenance Priorities
Best Practice

- Maintenance priority based on whole bike routes
  - Independent of road maintenance priority
  - Integration/coordination of on-street and off-street maintenance
- Have machinery and crews dedicated to bikeway maintenance

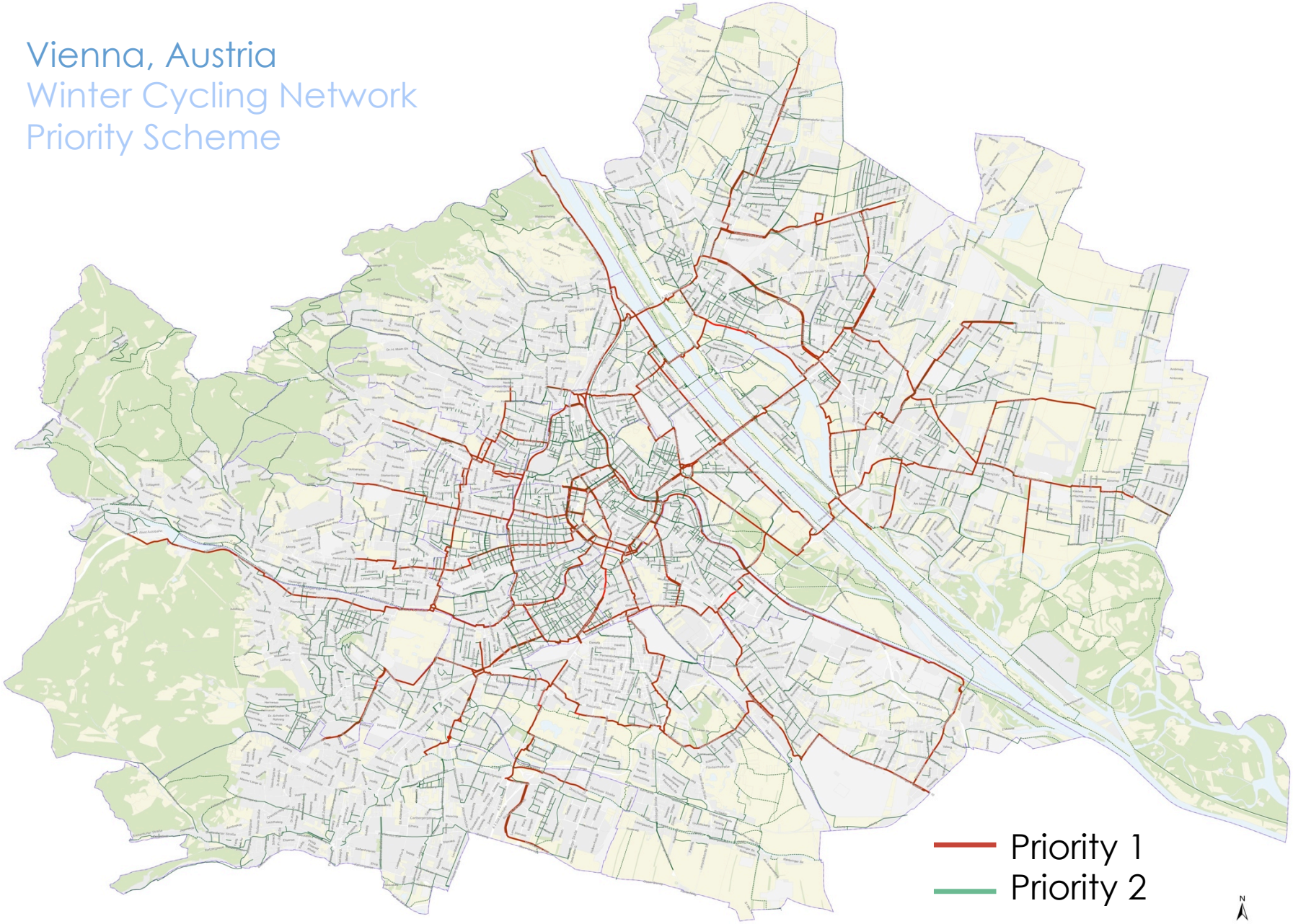
Result:

- Consistent, predictable level of service along bike routes
- Coherent winter bikeway network

Maintenance Priorities
Best Practice

Boyer Street, Montreal

Vienna, Austria
Winter Cycling Network Priority Scheme



Service Standards

Examples of service standards

- Calgary
  - Priority 1 : completed within 24 hours of the start of snowfall
  - Priority 2 : completed within 72 hours of the start of snowfall
- Oulu
  - Priority 1 : started after 3 cm snowfall, completed before 7 AM the following day
  - Priority 2 : started after the Priority 1 network maintenance completed, only after 5 cm snowfall

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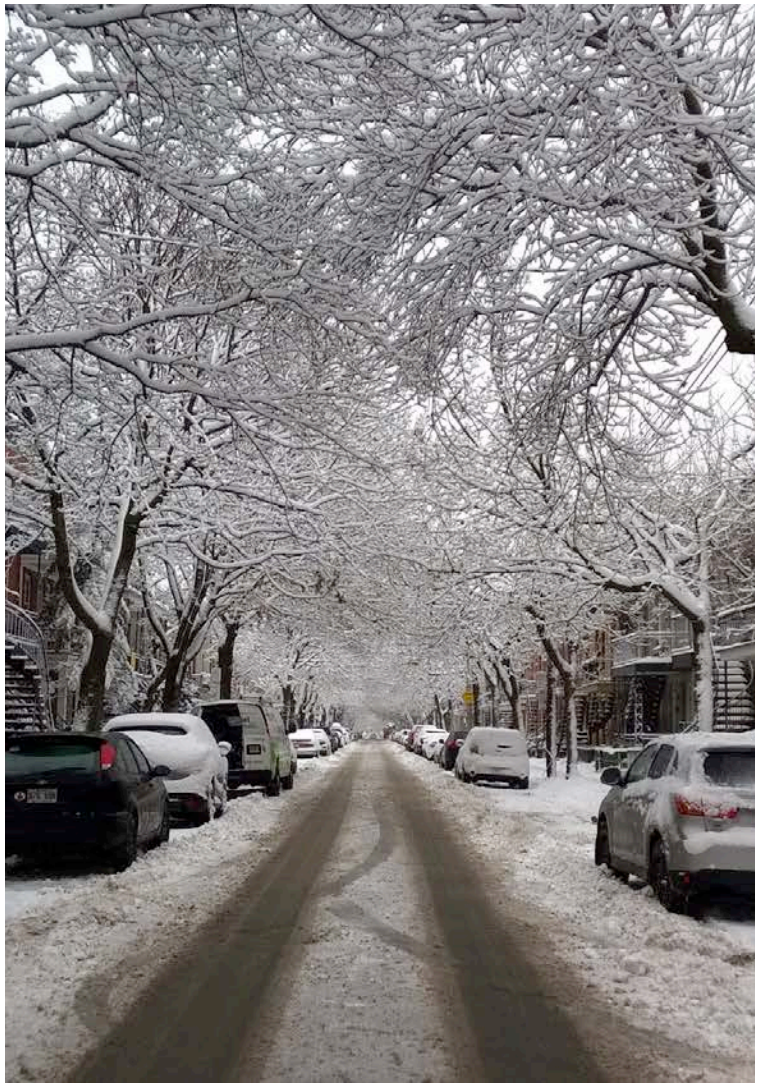
Paradigm Shift
Maintenance Techniques

From Plowing to Sweeping

Considerations

Bicycles are not cars

- Are lighter and have narrow wheels
  Do not crush road salt granules
- Do not generate heat
  Do not activate salt and dissipate residual snow left by plows



Maintenance Conventional

Ice control:

- Rock salt
- Abrasives (crushed stone)

Snow clearing:

- Plows

Maintenance Conventional

Maintenance Best Practice

Ice control:

- Mainly brine
- Rock salt if needed

Snow clearing:

- Mainly sweepers
- Plows or snowblowers if needed

Maintenance Best Practice

Maintenance

Plow and rock salt

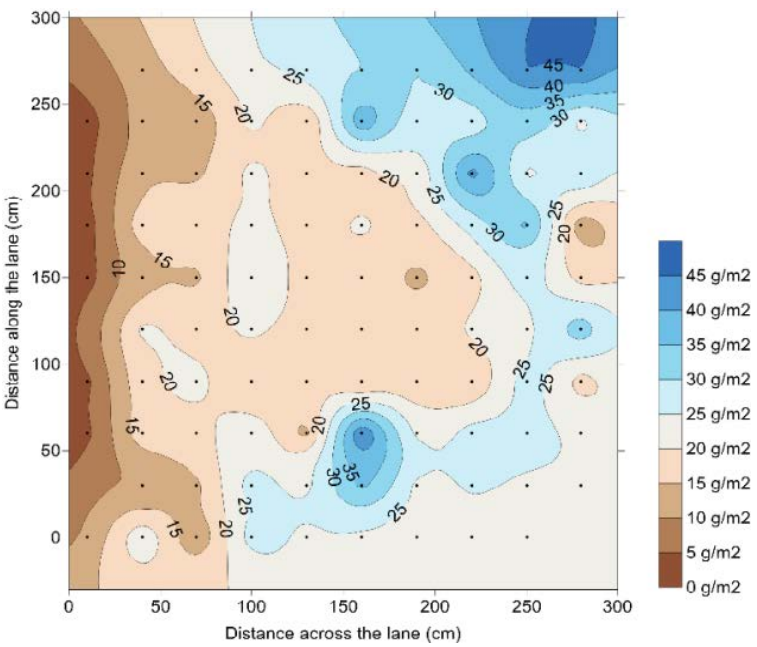
Sweeper and brine

Brine Advantages

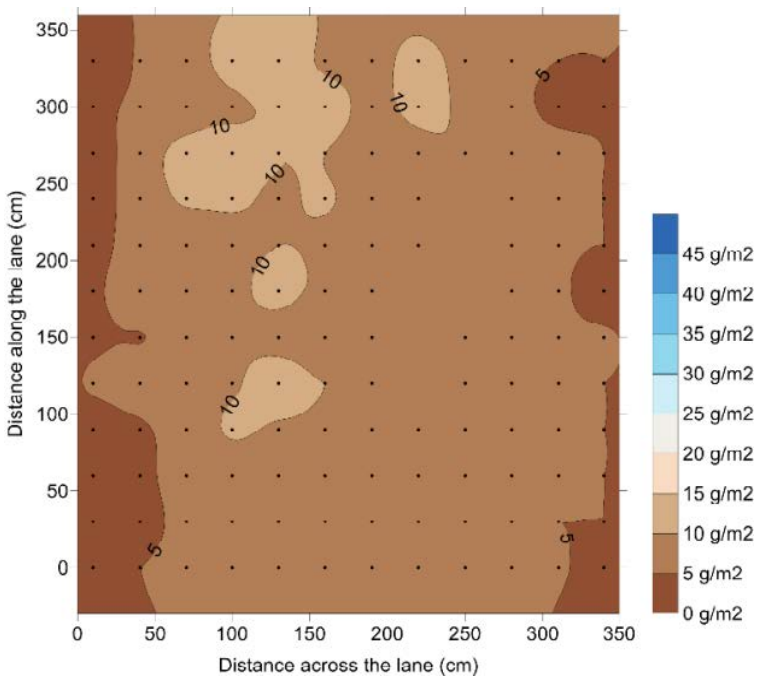
- More precise and uniform application
- Does not require heat or pressure for activation
- Reduces salt usage by 15 to 30%
- Eliminates need for abrasives
- Reduces impacts on:
  - Vegetation
  - Infrastructure
  - Bicycles
- Increases the effectiveness of snow sweepers

Brine Advantages

Salt



Brine



Source: Swedish National Road and Transport Research Institute (VTI)

Brine Advantages

Source: Swedish National Road and Transport Research Institute (VTI)

Brine Disadvantages

- Equipment and labour required to prepare brine
- Visual inspection difficult
- Ineffective with high precipitation due to dilution

Brine Best Uses

For prevention of:

- Ice formation
- Compaction – snow sticking to surface

Mix of chemicals adjusted according to temperature

Rock salt may be needed in case of high precipitation

Sweepers Advantages

- Brushes conform to surface irregularities
- Leave bare surface
  - No salt needed
  - No grit needed
- Can be mounted on most existing equipment

Sweepers Disadvantages

- More expensive than plows
  - Rotating mechanisms need maintenance
  - Brushes need regular replacement
- Not effective for clearing large volumes of heavy snow

Sweepers Best Uses

- For removing modest layers of snow
- For finishing after other machines
  - Plows
  - Snowblowers
- Vehicles can be outfitted with both plow and sweeper

SVEVIA

Sweeper + Brine Result

Thank you!

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