TRANSPORT 2050 IMPLEMENTATION

Rapid Implementation Design Guide for Bikeways in Metro Vancouver

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TRANSLINK

Land Acknowledgement

TransLink recognizes the rights of Indigenous Peoples and respects and celebrates the Indigenous Nations on whose treaty lands and unceded territories we are fortunate to live, work, and operate, and recognizes that, in planning and managing the region's transportation system, we have a role to play in advancing reconciliation with Indigenous Peoples.

Title: Passing Down Knowledge
Artist: Hailee Stogan from xʷməθkʷəy̓əm (Musqueam)

There are 10 Indigenous Nations with traditional, unceded territories, reserve, and treaty lands located within the TransLink service area:

- q̓íc̓əy (Katzie First Nation)
- q̓wɑ:n̓ƛ̓ ən' (Kwantlen First Nation)
- kwikwəƛ̓ əm (Kwikwetlem First Nation)
- máthxwi (Matsqui First Nation)
- xwməθkwəyəm (Musqueam)
- qiqéyt (Qayqayt First Nation)
- se'mya'me (Semiahmoo First Nation)
- Skwxwú7mesh Úxwumixw (Squamish Nation)
- sc̓ə waθən məsteyəxw (Tsawwassen First Nation)
- sə̓lílwətaʔɬ (Tsleil-Waututh Nation)

It should be noted that Tsawwassen First Nation negotiated a modern treaty with a formalized role in decision-making processes through the TransLink Mayors' Council on Regional Transportation as per the South Coast British Columbia Transportation Authority Act.

Contents

November 2022

The Rapid Implementation Design Guide for Bikeways in Metro Vancouver was created by TransLink with support from Urban Systems. TransLink would like to thank all those involved in the creation of this resource.

All photos courtesy of Urban Systems unless otherwise noted.

Cover Photo: Agnes Greenway, New Westminster

TRANSLINK URBAN SYSTEMS

Foreword

When asked, most people in Metro Vancouver will tell you that they would either like to cycle more or that they would like to start cycling. It's easy to see why: riding a bike is fun, healthy, and inexpensive. At a community level, cycling contributes to a cleaner and quieter environment, and helps to foster social connections.

But why don't more people cycle? While the reasons are many and complex, and often highly individual, one barrier stands out: without access to safe and comfortable bikeways, people are much less likely to cycle. This top barrier is shared through surveys, research, and real-world experiences of places with low-quality infrastructure.

Take myself for example: I'm a regular cyclist because very often it's the best mode for me. It's frequently the fastest option – even faster than driving over medium length distances, especially when I consider the hassle of parking my car. The electric cargo bike has been a game changer for our family. Cycling isn't my only choice, but I choose it often, thanks in part to investments the region has made into active transportation.

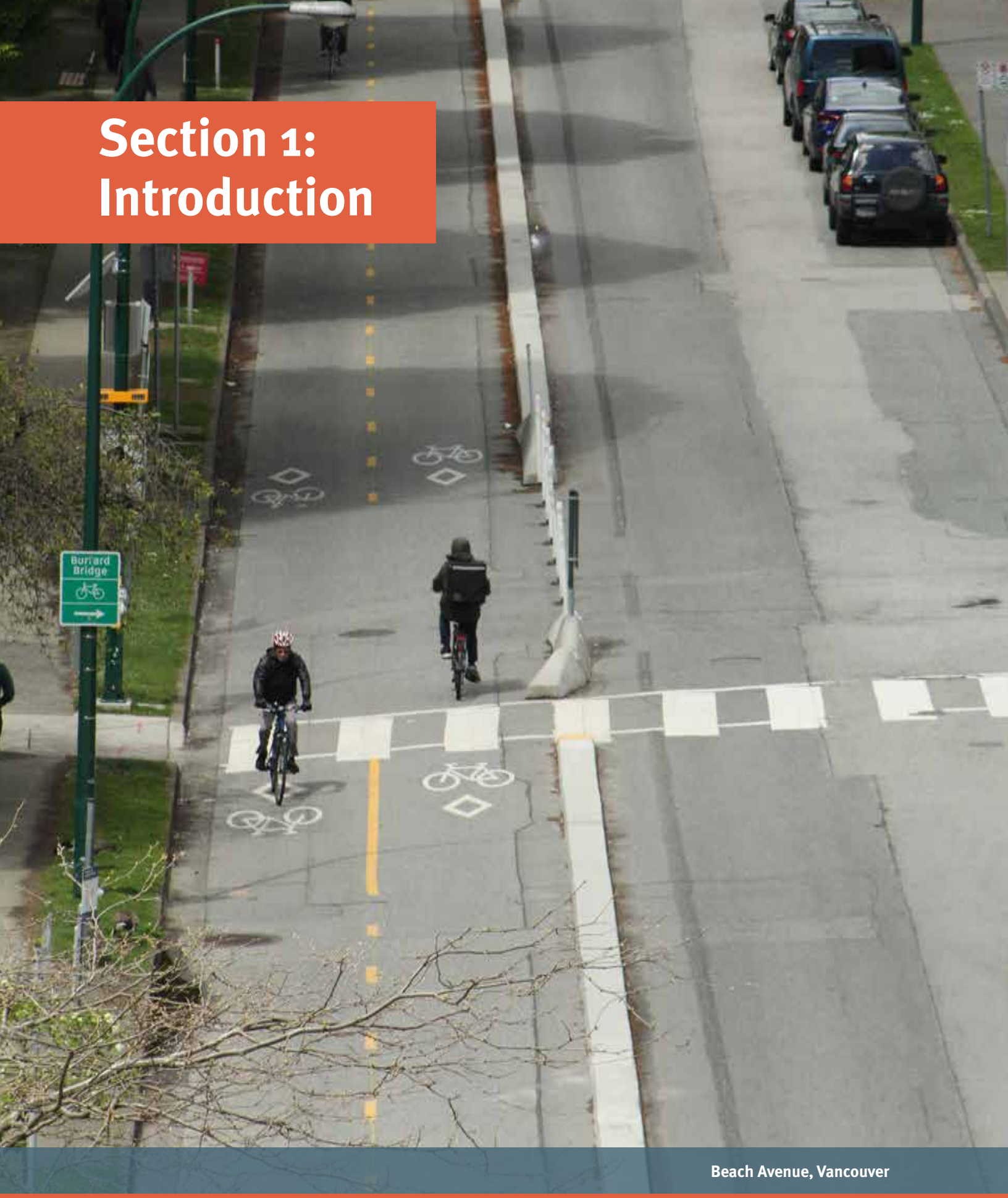
Building safe, comfortable, and connected bikeways is the number one action that road authorities – mainly local and provincial governments – can take to get more people cycling and to get people cycling more often. The scale of the climate emergency, inequities in access to transportation, and road safety risks call on us to act urgently. The benefits are many: of all the transportation modes, very few provide the space, cost-saving, and carbon-free upside of cycling.

But rapidly creating a regional bikeway network is a team game, which is why TransLink led the development of this Rapid Implementation Design Guide for Bikeways in Metro Vancouver. The idea is that cycling facility deployment can be fast, low-cost, and flexible, allowing us to stretch our limited public dollars to achieve greater public benefits. Out of the gates, this infrastructure can be comfortable for most people and allow us to put connected, useful bikeway networks in place faster to help people get where they need to go, by bike. These low-cost approaches also allow for easy modifications and improvements to how they're designed, so the most critical thing is to get out there and try something, learn, and adjust. Cities all around the world – from Calgary to Paris, from Edmonton to Seville – have been successful with rapid deployment, including many closer to home.

Now is the time to build on these experiences, including the lessons from COVID-19 in prioritizing road space for people. TransLink, as a planner and funder of the regional cycling network, is here to help. By working together with local governments, we can rapidly deploy bikeways. This way, everyone will be able to easily connect to the people, places, and opportunities that they need to thrive.

Sarah Ross
Vice President, Transportation Planning and Policy, TransLink

Section 1: Introduction



Beach Avenue, Vancouver

A Time for Action

Over the past several years, cities across Canada and throughout the world have increasingly shifted their approach to delivering bikeways by following a **rapid implementation** or **quick build** approach. This approach enables the delivery of safe and comfortable cycling facilities—as well as comprehensive cycling networks—all at once and at a lower cost than traditional methods. The flexibility embedded in this process also enables fast and responsive design adjustments, ensuring that as facilities are made permanent over time, they meet the needs of a broad range of users and contribute to the creation of vibrant, prosperous, and resilient communities.

We need to act with urgency, and rapid implementation helps make this happen.

Rapid implementation facilitates an urgent response to a range of critical issues facing our communities, including the climate emergency, social inequity, public health, road safety, congestion, and increasingly constrained municipal budgets. For this reason, this approach became a key strategy during the COVID-19 pandemic, with cities around the world re-allocating road space to meet physical distancing requirements and accommodate changing mobility patterns. The pandemic exacerbated many of the critical issues outlined above, exposing widening inequities related to access to safe and convenient transportation options, climate change impacts, and public health. Rapid implementation can help accelerate our response to these urgent issues by delivering convenient, reliable, affordable, and safe mobility choices for everyone—regardless of age or ability—in a rapid, adaptable, and cost-effective manner.

Guide Purpose

The **Rapid Implementation Design Guide for Bikeways in Metro Vancouver** provides guidance for the planning, design, implementation, maintenance, and monitoring of bikeways, through a rapid implementation lens. This guide focuses on treatments using flexible, low-cost materials that are implemented rapidly within the existing roadway and with minimal physical construction requirements. It expands on existing guidance (see below) and includes practical planning and design support for local governments, Indigenous communities, senior levels of government, and other agency staff in Metro Vancouver and beyond. The Rapid Implementation Design Guide for Bikeways in Metro Vancouver features case studies from communities within Vancouver and around the world, as well as lessons learned.

Figure 2 – West 1st Street, City of North Vancouver

TransLink's Role

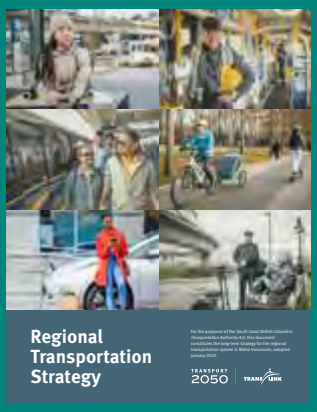
As the integrated, multimodal transportation authority for Metro Vancouver, TransLink is mandated to plan, manage, and provide a regional transportation system that moves people and goods. This includes providing an inclusive and resilient regional transportation system that emphasizes walking, cycling, and transit as the priorities.

TransLink's Regional Cycling Strategy (2011) set out to make Metro Vancouver renowned locally and globally as a cycling-friendly region where cycling is safe, convenient, comfortable, and fun for people of all ages and abilities. The strategy's overarching goals were "more cycling" and "safer cycling," including targets for mode share, gender split, and reductions in collisions involving injury and death. Rapid implementation advances our region towards realizing those goals and targets.

On October 1, 2020, the Mayors' Council on Regional Transportation endorsed a report identifying COVID-19 impacts and opportunities on long-term transportation planning. The report identified three near-term initiatives to support active transportation, including building out infrastructure for active modes; providing e-bike training, sharing, and incentives; and investing in data collection. A subset of the near-term actions detailed in the report relate to supporting increased active transportation, including:

- Rapid deployment of solutions to complete 3-5 Major Bikeway Network (MBN) corridors; and
- Rapid deployment of separated bikeway networks and bike parking in 3-5 Urban Centres.

TransLink engaged regional partners on how to advance near-term actions related to active transportation, including the implementation of a new recovery-focused stream of the Bicycle Infrastructure Capital Cost Share (BICCS) program—a funding program dedicated to funding cycling infrastructure in Metro Vancouver. Associated projects predominantly use lighter, quicker, and cheaper materials and are completed within a shortened timeline relative to more traditional cycling facility projects.



Transport 2050, TransLink's updated 30-year Regional Transportation Strategy, aspires to rapidly complete a well-connected and continuous Major Bikeway Network (MBN) throughout the region (**Figure 2**). The MBN is complemented by Metro Vancouver's Regional Greenway Network (RGN), which connects parks, open spaces, natural areas, and scenic pathways. Together, the MBN and RGN form the 2050 Regional Cycling Network. Transport 2050 aims to implement an 850 km MBN that connects all 26 Urban Centres across the region and encourages doing so by using a rapid implementation approach with lower-cost materials, as outlined in Action 1.1.4:

Rapidly complete a network of bikeways, bike parking, and e-charging stations that make bicycles, scooters, and other electrified or micromobility devices the most direct, and the most convenient, travel option for most trips between 1 and 5 kilometres, as well as longer trips throughout the region.

In Transport 2050, TransLink also committed to fostering a transportation system that connects people to their communities through art, design, landscape, and cultural recognition. We commit to leveraging the transit system as a platform for Indigenous cultural recognition, language revitalization, and education - promoting and celebrating the rich cultural heritage of Indigenous communities from this region through design, Indigenous art, landscaping, and naming of networks, stations, and places.

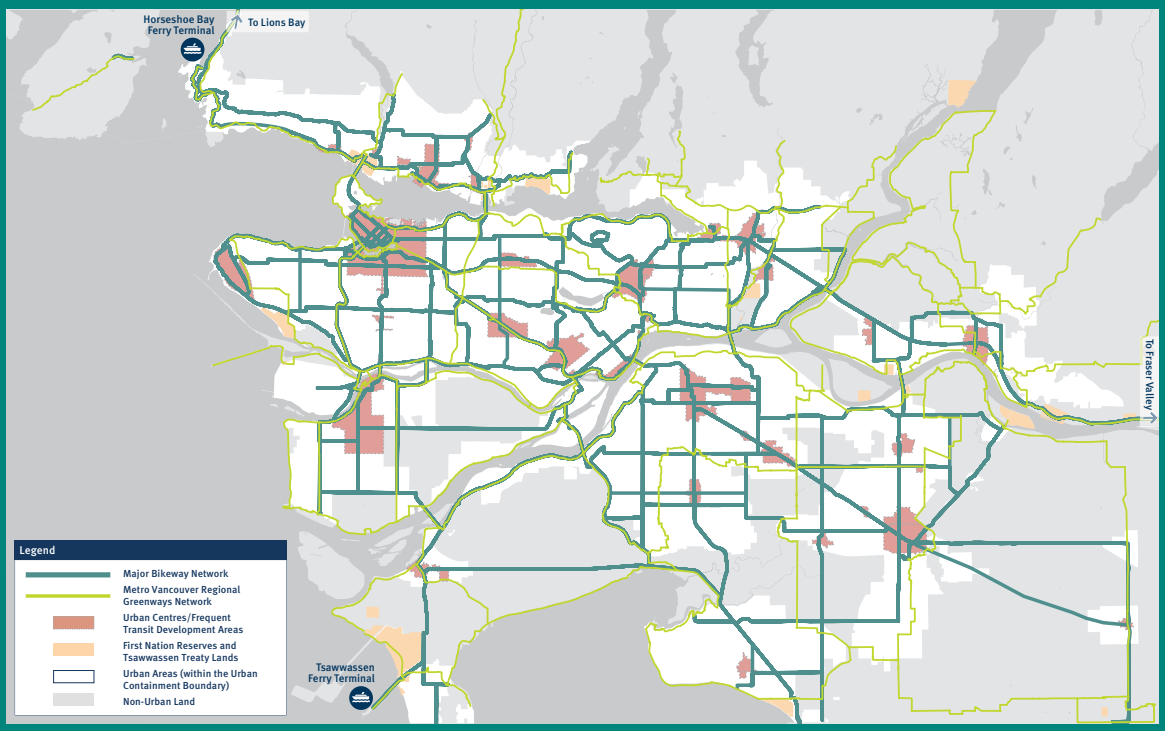


Figure 3 – Regional Cycling Network (Source: Transport 2050)

Reference Material

This guide is intended to complement existing guidance from the following resources:

Federation of Canadian Municipalities
COVID-19 Street Rebalancing Guide (2020):

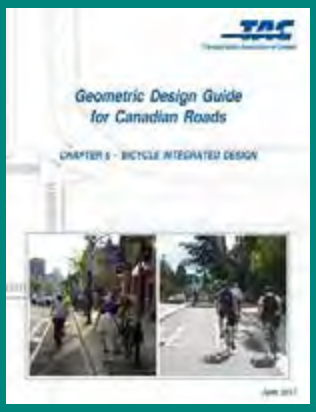
The COVID-19 Street Rebalancing Guide was developed to provide municipalities with tools and guidance for road space reallocation to enable physical distancing. The resource shares strategies and treatments based on case studies that emerged around the world at the early stages of the pandemic.

TransLink
Tactical Urbanism Toolkit (2020):

The Tactical Urbanism Toolkit provides an overview of the tactical urbanism process, including an emphasis on the importance of communication and engagement, project planning, design, implementation, evaluation, and stewardship. It outlines a range of tactical urbanism strategies and tools while providing example projects for inspiration. The toolkit also provides a detailed overview of the materials required for tactical urbanism projects.

BC Ministry of Transportation and Infrastructure
B.C. Active Transportation Design Guide (2019):

The B.C. Active Transportation Design Guide is a comprehensive set of planning and engineering guidelines for the development of active transportation infrastructure across the province. The guide is intended to support communities of all sizes to build consistent, safe, and effective active transportation infrastructure for people of all ages and abilities.



Transportation Association of Canada
Geometric Design Guide for Canadian Roads (2017):

The TAC Geometric Design Guide for Canadian Roads is a foundational reference document for Canadian roadway design practitioners. It provides specific design guidance to meet the needs of various road users while considering the local context, including the integration of pedestrian and cycling infrastructure.

Additional Resources:

There are several other design guides, white papers, and reports that are relevant to rapid implementation, including the following:

- **Demonstration** Project Implementation Guide (MnDOT, 2019)
- **Quick-Build** Guide (Alta Planning + Design, 2020)
- **Slow** Streets Traffic Calming Upgrades: Supplemental Design Guide (City of Vancouver, 2021)
- **Infrastructure** for quick-build cycleways – a research note (Waka Kotahi NZ Transport Agency, 2022)

Guide Navigation

This guide is divided into the following sections:

Section 1

Introduction

Introduces the purpose of the guide, provides an overview of existing guidance, and includes a navigation guide for the document.

Section 2

Rapid Implementation 101

Outlines the basics of rapid implementation, including key elements, guiding principles, and the differences between rapid and traditional approaches.

Section 3

The Case For Rapid Implementation

Explains the rationale and key considerations for rapid implementation projects and profiles examples from across Canada and around the world.

Section 4

Planning and Design Considerations

Summarizes key considerations throughout the planning and design process, including defining the project need, assessing the site and network context, communications and engagement, implementation, operations and maintenance, and monitoring and evaluation.

Section 5

Design Development and Material Selection

Outlines key considerations for how to select among various treatments, provides design guidance for a range of treatments and materials, and summarizes opportunities for activation and beautification of rapid implementation projects.

Section 6

Summary

Provides closing thoughts and next steps, as well as a brief overview of the transition to permanent bikeways—including reporting back on rapid implementation efforts, budgeting, and available funding opportunities.

Navigation Cues

Case Studies

Examples from across Canada and beyond

Idea Spotlights

Highlights key considerations and examples

Section 2: Rapid Implementation 101

West Grand Boulevard, City of North Vancouver (Source: Brandon Green)

What is Rapid Implementation?

Rapid implementation allows for the faster and more cost-effective implementation of complete cycling networks. It also provides more flexible infrastructure that can be quickly adjusted in response to public and stakeholder input. This ultimately contributes to a smoother transition towards permanent bikeways.

Rapid implementation projects:

- **Are typically implemented within the curb-to-curb** width, often by reallocating road space from other uses such as on-street parking and/or motor vehicle lanes to accommodate bikeways.
- **Use adjustable materials that have relatively low costs compared to typical capital projects**. While flexible and adaptable, these materials can be physically affixed to the roadway, giving them more permanence than those used for tactical/demonstration projects. Rapid implementation projects typically have a lifespan ranging from a few months to several years.
- **Are designed to be implemented within days, weeks, or months (rather than years).** Because minimal capital construction is required, there is less need for topographic survey or detailed engineering to consider factors such as changes in grades, detailed drainage design, or relocation or removal of utilities, street trees, or other infrastructure. Instead, the design can often be completed using an orthophoto and cadastral data and can be 'fit in the field' by construction crews. In many cases, installation is relatively simple and can be completed by City crews instead of requiring a tender process.
- **Can be easily modified** throughout their lifespan to respond to issues and user feedback.
- **Can include placemaking elements** such as creative surfaces, pavement markings, street furnishings, and landscaping to enhance aesthetics.

Figure 4 – Agnes Greenway, New Westminster

Key Elements

Rapid implementation projects include several key elements:

Fast

Rapid implementation projects can be implemented relatively quickly, often in a matter of days or weeks. Because they often do not require significant capital construction, they may not require time-consuming design and tendering processes and can often be installed by City crews. This can also help minimize construction impacts on a community.

Low Cost

Rapid implementation projects make use of lower-cost materials such as flexible delineator posts, curbs, landscaped planters, or concrete barriers (see Section 4). These projects also typically occur within the available curb space and require minimal capital construction.

Flexible

Materials used for rapid implementation projects are flexible and adjustable. This approach recognizes that, as design professionals, we do not always have all the answers. This provides the opportunity to pilot, monitor, and adjust designs as needed, based on lived user experience.

Rapid Implementation Does Not Mean Lower Quality

While rapid implementation projects can be implemented relatively quickly using low-cost materials, this does not mean that they are lower quality than traditional projects. These projects follow best practices in bikeway design and should aim to provide facilities that are safe for people of all ages and abilities, or what are often referred to as 'AAA' facilities. At minimum, rapid implementation projects should achieve facilities that are 'Comfortable for Most' as defined in the TransLink and HUB Cycling report Benchmarking the State of Cycling in Metro Vancouver. Depending on the materials selected, rapid implementation can provide a high degree of physical separation using durable materials, creating a cycling facility that can last for several years. Along neighbourhood bikeways, rapid implementation can help reduce motor vehicle speeds and volumes to create a comfortable space for cycling.

These projects can also create opportunities for amenities, activation, and beautification, resulting in more vibrant, attractive, people-first streets. A great example is the Adanac-Vernon Plaza along the Adanac Greenway in Vancouver, which includes table tennis, a skate dot, bike parking, seating, and public art.

Figure 5 – Adanac-Vernon Plaza, Vancouver

Guiding Principles for Rapid Implementation

Rapid implementation is a powerful tool for quick and effective change, but it also has the potential to disruptive or negatively impact certain users and services if not properly planned. The following guiding principles help ensure successful rapid implementation projects:

Social Equity

Rapid implementation projects impact a wide range of street users. Applying an intersectional equity lens during planning, design, and communications is critical for avoiding unintended negative impacts and creating welcoming spaces for all. More detail is provided in the social equity textbox below.

Accessibility

Accessibility is a fundamental consideration for any project, but it is especially important given the rapid nature of the change in these projects. Rapid implementation projects should prioritize universal design considerations at all stages of planning and design to avoid adverse impacts and create universally accessible spaces. Stakeholders representing the accessibility community should be engaged with early and often during the planning and design process.

Safety

Projects should be designed with safety in mind for people of all ages and abilities, and for all road users. Designs need to be context-specific—e.g., on streets with lower traffic volumes and speeds, materials such as flexible delineator posts may be appropriate, whereas streets with higher traffic volumes and speeds need materials that offer greater physical protection.

Predictability

Changes to the street design should be intuitive and predictable. These changes should be clearly defined through appropriate traffic control devices, including physical barriers, signage, and pavement markings.

Essential Access and Services

Corridor selection should consider the needs of all road users, including emergency vehicles, transit, goods movement, waste management, and deliveries. Where possible, rapid implementation projects should avoid conflicts with these other users. If impacts are unavoidable, it is critical to engage with these road users to ensure their operational needs are maintained.

Operations and Maintenance

Operations and maintenance staff—including those handling construction traffic management—are the experts in maintaining roads and bikeways and should be engaged throughout the planning, design, and post-implementation processes.

Communications

Ongoing communications with relevant Indigenous Nations and stakeholders are important through each phase of the planning cycle. Rapid implementation projects serve as a form of communications and engagement, with input received from users helping to inform adaptations and ultimately the permanent design. In addition, marketing and promotion of the completed facilities will encourage the use of the new facilities.

Social Equity

Equity can be defined as "the fair distribution of opportunities, power, and resources to meet the needs to all people, regardless of age, ability, gender, income, education level, or cultural background. This means providing support based on an individual's level of need, instead of providing everyone the same amount of support"([1]). Advancing social equity is a key objective of Transport 2050 and an important lens for rapid implementation.

Whether due to limited travel options, physical safety or barriers, or harassment and discrimination, moving around the region is more challenging for some people than others. Many groups face intersecting barriers travelling around the region, whether caused by age, ability, race, faith, national origin, socio-economic status, sexual orientation, or gender identity. By taking steps to remove barriers and by furthering our understanding of them, we can make it easier for everyone to access the opportunities they need to thrive.

Considering equity as part of the project goals and evaluation and monitoring from the start will ensure meaningful consideration and planning throughout the project. To address social equity, rapid implementation projects can focus improvements in several areas ([2]):

- Areas with less protected and/or less accessible bikeways;
- Areas with lower cycling rates;
- Areas with poor cycling access to key destinations ; and
- Areas with higher rates of equity seeking groups.

Comparison of Implementation Approaches

Table 1 summarizes the spectrum of bikeway implementation, highlighting key differences between tactical urbanism, rapid implementation, and traditional implementation. Each technique has both benefits as well as drawbacks, and they are appropriate in different contexts.

SPECTRUM OF BIKEWAY IMPLEMENTATION			
	Tactical / Demonstration	**Rapid Implementation**	**Traditional Implementation**
	Vancouver , BC 	Abbotsford , BC 	Vancouver , BC 
Delivery Speed	Hours to Days	Weeks to Months	Months to Years
Duration	Hours to Days Pilot project to showcase an idea	Months to Years Stepping stone to permanent infrastructure or end state	Years Permanent infrastructure
Space Required	Within curb-to-curb width	Within curb-to-curb width	May require street reconstruction beyond the existing curb
Materials	Temporary traffic management devices: • Traffic cones • Planters • Water barrels • Paint • Signage	Adjustable materials: • Flexible delineator posts • Curbs • Planters • Quick build surfaces and pavement markings	Permanent infrastructure; may consider: • Green infrastructure and landscaping • Lighting • Underground utilities • Curbside activities and amenities
Safety	Low	Moderate to High	High
Construction Effort	Low	Low to Moderate	High
Cost	Low	Moderate	High

Table 1 – Spectrum of Bikeway Implementation

Rapid vs. Traditional Process

Figure 5 shows a traditional linear design process that can often take several years to complete.

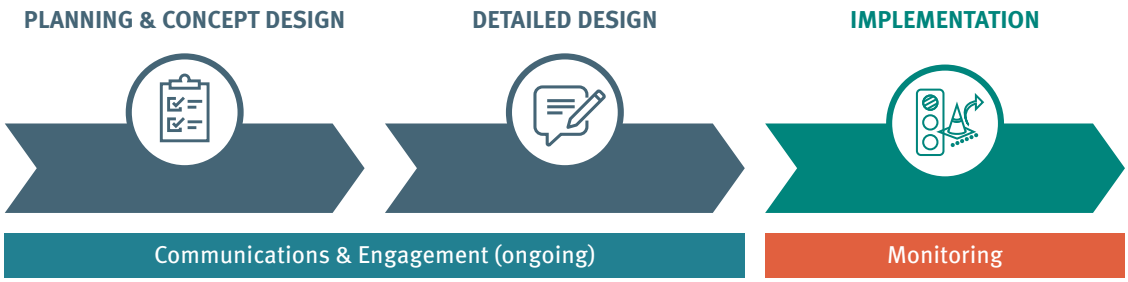


Figure 6 – Traditional Bikeway Design Process

Figure 6 outlines the rapid implementation design process, which is designed to advance projects quickly through targeted engagement and a condensed planning and design process. Public and stakeholder engagement and monitoring typically begins once the infrastructure is in place, as the rapid implementation approach provides community members with an opportunity to experience the project firsthand and can then provide input that can inform design modifications. Adjustable materials allow for ongoing adjustments to the design to be made, and lessons learned may be incorporated into the detailed design of the more permanent facilities in the future. Communities can then budget and plan for permanent upgrades, knowing they have materials in place and are meeting the current transportation needs of the community.

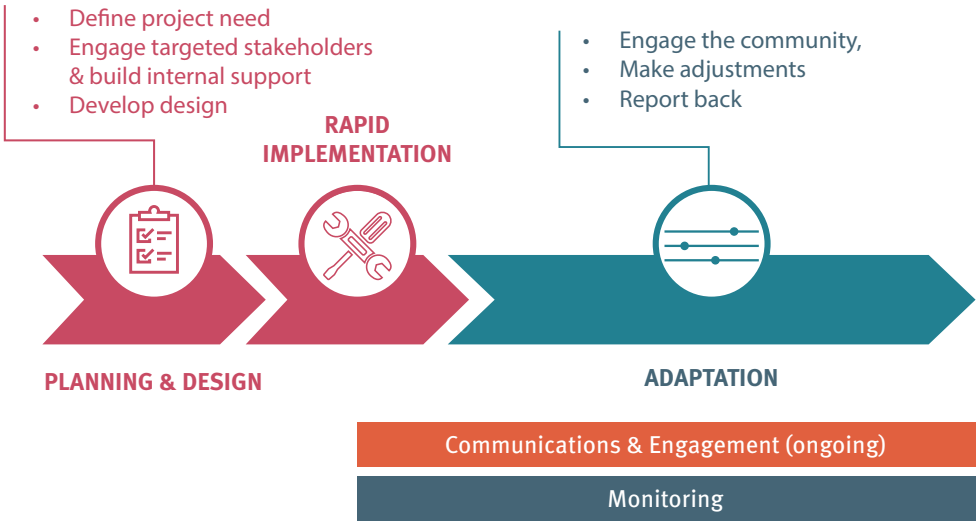


Figure 7 – Rapid Implementation Design Process

Rapid implementation can be a powerful engagement approach

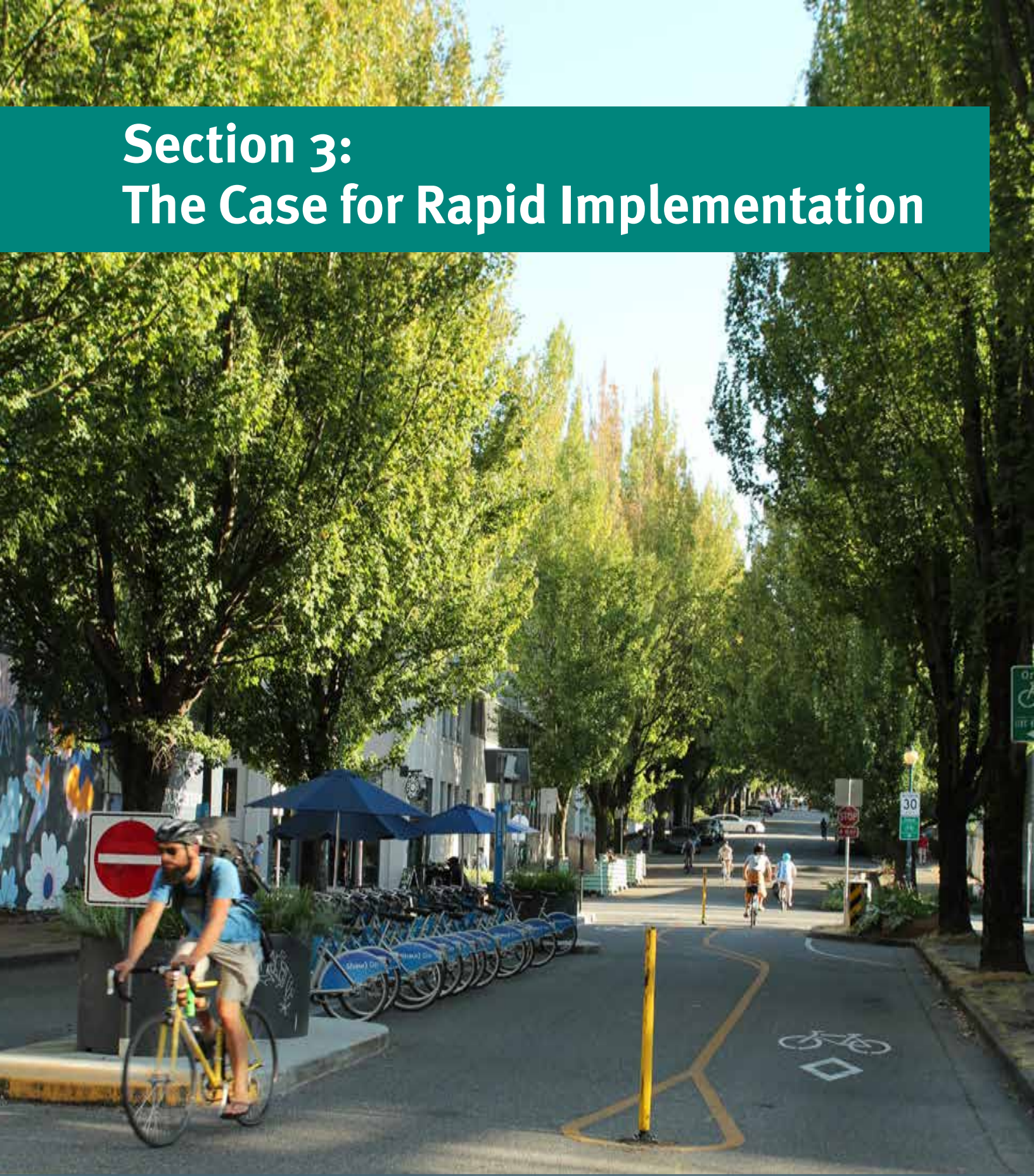
Rapid implementation approaches provide a way to re-imagine how we engage with the community. Unlike traditional projects, which often focus on asking community members to provide input on designs or cross-sections that they may not fully understand, a rapid implementation approach provides people with the chance to experience and interact with the project, leading to more informed input.

As part of the Agnes Greenway Project, the City of New Westminster used rapid implementation as the start of a community conversation. After implementation of the rapid implementation design, the process involved two rounds of engagement to understand how the rapid implementation design was working and to inform the permanent design. This engagement helped the project team identify modifications to improve the operation of the roadway for all road users based on their experience. Following a "try, monitor, and adjust" approach and committing to making changes helped build trust and gave the community a sense of ownership.

Although broad community engagement may not necessarily take place prior to implementation, it is critical to engage with directly impacted stakeholders such as the accessibility community, emergency services, and operations and maintenance staff during the planning and design process.

Figure 8 – Agnes Greenway Engagement, New Westminster

Section 3:
The Case for Rapid Implementation



Ontario Street, Vancouver

Why Rapid Implementation?

As outlined in Section 1, there is an urgent need to address several critical issues facing our communities. This section outlines some of the many reasons to consider a rapid implementation approach.

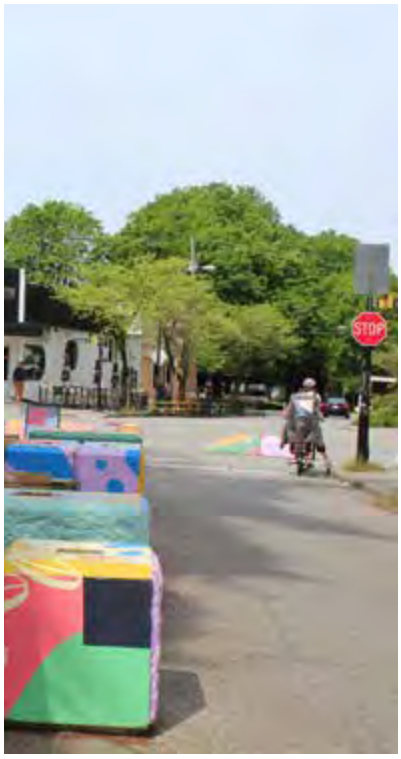


Figure 9 – West 17th St, Vancouver

Taking urgent action on climate change

We are in the midst of an accelerating climate emergency: climate impacts such as floods, heat waves, wildfires, and other extreme weather events are already affecting Metro Vancouver and are expected to intensify. Significant, urgent, and immediate action is required by all levels of government if we are to meet international climate targets and avoid the worst impacts of a destabilized climate. Transitioning to a carbon-free transportation system with an emphasis on active transportation is crucial—on-road transportation is responsible for 35% of greenhouse emissions in Metro Vancouver. Rapidly delivering cycling networks that are Comfortable for Most is critical for encouraging mode shift throughout the region, especially amongst the 'interested but concerned' demographic.

Meeting mode share and GHG emission targets

Government agencies are working to take urgent action on climate mitigation and adaptation. The provincial CleanBC Roadmap to 2030 sets a target to increase the share of trips made by walking, cycling, and transit to 30% by 2030, 40% by 2040 and 50% by 2050 to reduce GHG emissions. TransLink's Transport 2050 also contains climate targets, calling to eliminate carbon pollution from transport by 2050. However, Transport 2050 notes that despite bold targets, the region has barely managed to achieve a 1% reduction in GHG emissions since 2010; as such, incremental changes will not suffice if the region is to come close to meeting these important climate targets. Data collected from rapid implementation networks have shown they can significantly support increases to active transportation usage. The rapid implementation approach enables fast action on GHG emissions reductions, as well as long-term investments towards more resilient and sustainable infrastructure.

Improving safety for all road users

Road safety continues to be a major concern for Canadian cities, with motor vehicle collisions being one of the leading causes of accidental death in the country. Each year, nearly 2,000 people are killed and a further 165,000 are injured (10,000 seriously) while using the transportation network in Canada ([3]). It is estimated that motor vehicle collisions cost Canadians $40.7 billion (2.1% of Canadian GDP) annually ([4]). Cyclists are vulnerable road users and are far more likely to be seriously injured or killed if they are involved in a collision than motorists. While pedestrians and cyclists combined only account for approximately 7% of commuter trips, they account for nearly 20% of traffic fatalities in Canada ([5]). The addition of safe bikeways is critical for reducing serious injuries and fatalities as well as improving road safety outcomes for all road users. Local governments looking to improve road safety outcomes or meet Vision Zero targets can make rapid progress by investing in bikeways that are Comfortable for Most.

Improving public health

Canada is facing a public health crisis, with increasing levels of overweight and obese Canadians—and public health costs—over the past several decades. In 2009, the estimated total health care cost of physical inactivity in Canada was $6.8 billion (6). Only 20% of adults and 10% of children and youth meet the Canadian Physical Activity Guidelines for physical activity per day or week (7). Improving active transportation networks has been shown to improve both physical and mental well-being and to prevent weight gain and obesity. Cycling facilities that are Comfortable for Most help enable a wider demographic of users by creating a safe, comfortable environment, giving more people the chance to ride.

Addressing existing transportation inequities

Through prioritizing improvements in areas with populations that have the greatest need, rapid implementation projects provide the opportunity to address transportation inequities. This can include areas lacking in bikeways and areas with higher populations of equity-priority groups, urban Indigenous Peoples, and Indigenous Nation reserve and treaty lands. Engaging with Indigenous Nations and stakeholders in ways that reduce barriers to participation can create a more inclusive environment and improve project design and implementation efforts.

Figure 1 – Lower Water Street, Halifax (Source: City of Halifax)

Building cost effective infrastructure

Municipalities are being asked to deliver increasing services and facilities within ever more constrained capital budgets. A lack of consistent, stable, and predictable funding for transportation is a major challenge for municipalities. This can be a barrier to advancing priority projects as well as simply meeting the existing transportation network's state of good repair needs. There are cost saving to be achieved through the use of adjustable materials when building out bikeways on the existing roadway surface. This enables many communities to make cost effective decisions, including the choice to investment in more kilometres of bikeways and to plan for permanent bikeways in alignment with servicing or roadway repair timelines.

Showcasing Urban Centre bikeways

Providing a defined and connected cycling network enables a safe and comfortable riding experience, resulting in a wider range of users and increased demand. The rapid implementation of an Urban Centre cycling network using lower cost materials is a cost-effective way to provide safe and comfortable facilities. It also enables the collection of reliable data to demonstrate the project's value, which can help articulate the benefits of having a network in place and lead to a carefully considered permanent design.

Case Studies

If you (rapidly) build it, will they come?

Do rapid implementation projects produce changes in behaviour? In short: yes! Local, national, and international examples have shown that rapid implementation can be a highly successful approach to building out bikeways and increasing cycling mode share.

In Canada , Calgary and Edmonton pioneered the concept of rapidly implementing downtown bicycle networks. The 2015 Calgary City Cycle Track Network project saw cycling trips triple compared to 2014. In 2017, Edmonton's rapidly implemented Downtown Bike Network pilot resulted in an 81% increase in downtown cyclists year over year (8). In Toronto, the ActiveTO project has seen cycling increases of 65% across seven new routes, which led to them being made permanent (9). Richmond Street and its corresponding couplet on Adelaide Street—implemented using rapid implementation—have become the highest volume cycling facilities in Toronto, with over 6,000 daily trips and were made permanent in 2019. In 2021, through the City's StreetARToronto program, a variety of artists painted 353 unique and meaningful murals on concrete barriers along several protected bicycle lanes.

Figure 10 – Richmond Street, Toronto

Rapid implementation has also taken off around the world. European research conducted over the COVID-19 pandemic shows an increase in active transportation rates, including a significant increase (11-48% on average) in cycling where cities added provisional infrastructure (10). Cities such as Paris and Seville stood out as success stories. In Sydney, Australia, two of the six pop-up cycleways installed between 2020 and 2021 were approved to be permanent less than a year after the city observed significant volume increases. The remaining four routes will remain rapid implementation for two more years for further monitoring (11). The Pitt Street pop-up project saw average weekly trip counts surge 500%, surpassing the city's most popular established bike path across Sydney Harbour Bridge (11) (12).

The following pages contain five rapid implementation case studies from across Metro Vancouver, including Surrey, North Vancouver, Vancouver, New Westminster, and Burnaby. These local examples were selected to help demonstrate the rapid implementation projects already underway or completed in the region. Each case study provides an overview of the project purpose, how a rapid implementation approach was applied, and key takeaways.

CASE STUDY

City of Surrey – Surrey City Centre Quick-Build Projects
Project length: 6 km

The City of Surrey has the lowest cycling mode share in Metro Vancouver, and cyclists in Surrey are three to four times more likely to be hit by a vehicle compared to Vancouver. While the City already has an extensive network of cycling routes (1,133 km), these routes are primarily painted facilities or shoulder lanes on high-speed, high-volume roadways. The City is looking to make cycling safer and encourage more residents to cycle by expanding its network of protected bicycle routes, starting in Surrey City Centre. The City received funding from TransLink's BICCS Recovery Stream grant program to rapidly implement a network of protected bicycle facilities.

To improve safety conditions and increase the volume of cyclists in the city, Surrey has committed to the creation of 11 km of protected cycling routes in the City Centre as part of major capital projects in the next five years. To kick-start the implementation of this City Centre network, the City is using a rapid implementation approach to construct an additional 6 km of protected cycling facilities that will be added on five key corridors in 2022, as illustrated in **Figure 11**. The grey lines represent existing and planned protected facilities while the red lines represent the 6 km of quick-build projects.

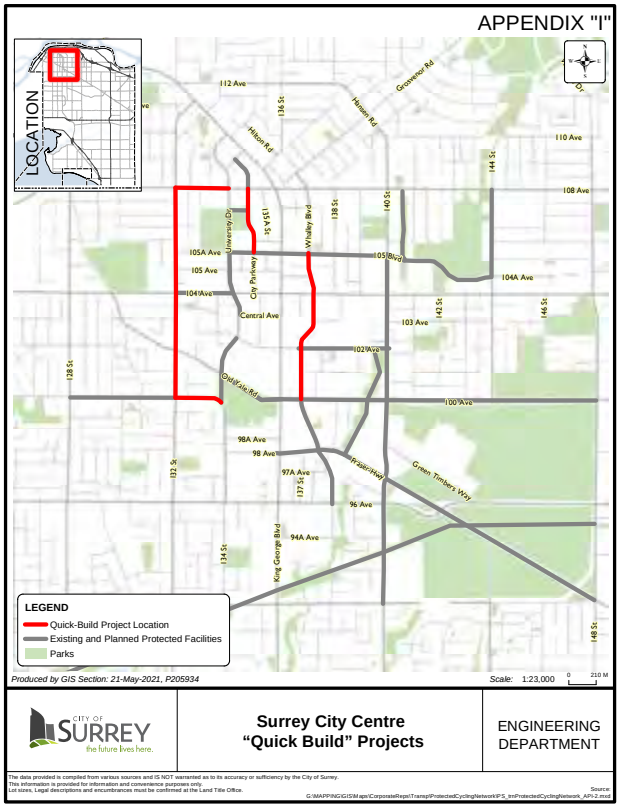


Figure 11 – 26km Protected Cycling Network Plan (Source: City of Surrey)

The quick-build projects are using a variety of construction methods with a focus on extruded curbs and planters. The projects have been designed to minimize impacts to on-street parking, access to local businesses, and transit. In some locations, and for short sections, the consolidation of on-street parking to one side of the street may be required to provide room for the safety components of the cycling route. In all cases where on-street parking is planned to be consolidated, parking studies will be completed to verify sufficient capacity exists to accommodate reductions in on-street parking.

The City conducted focused public and stakeholder engagement to help plan and design the network, including sending out postcards to all residents and business in the City Centre informing them of the project and inviting the public and stakeholders to attend meetings upon request. The City also developed a project webpage that provide information about the key features and high-level impacts of each corridor, including:

- Planned type of physical protection;
- Estimated number of impacted on-street parking stalls; and
- Whether off-street parking is available.

Combining existing facilities, the rapid implementation projects, and other planned cycling projects, will see the creation of 26 km of continuous connected and protected cycling facilities in the City Centre over the next five years. The City will also be developing a marketing and education campaign to promote the use of the quick build cycling network following implementation.

Figure 12 – Surrey City Centre Quick Build Network (Source: Peter Klitz, City of Surrey)

CASE STUDY

City of North Vancouver – 1st Street Mobility Corridor
Project length: 1 km

In 2019, the City of North Vancouver developed a Mobility Network Project that focuses on multi-phase construction of key active mobility corridors. The project includes a multi-phased strategy to implement important north-south and east-west corridors that connect people to key destinations in the City and throughout the region. The 1st Street Mobility Corridor was identified as a Phase 1 priority as part of the Mobility Network Project, as it provides a direct east-west connection between Mackay Road and West 3rd Street and connects with the Spirit Trail (**Figure 13**).

Figure 13 – Mobility Network Project Map - Phase 1 Priorities (Source: City of North Vancouver)

The corridor was scheduled for upcoming utility work, which resulting in prioritizing the selection of rapid implementation materials. The project used a variety of materials, including pre-cast concrete curbs, planter boxes, land markings, and electrical work such as bicycle loop detectors and signal heads. The implementation of this project took three months, with several adjustments and ongoing communications that followed.

Although the COVID-19 pandemic initially delayed engagement, door-to-door engagement was used as part of planning and to build awareness for the project. The ridership of the corridor has doubled, from 300 to 650 per day in the summer months. The City has also noticed a reduction in overcrowding on the Spirit Trail, a more comfortable parallel facility.

The project recently received a 2021 HUB Bike Award for Infrastructure Improvement. A video by Rolling in the City includes a side-by-side comparison of the facility before and after the rapid implementation infrastructure was added.

Figure 14 – 1st Street Mobility Corridor (Source: Brandon Green, City of North Vancouver)

CASE STUDY

City of Vancouver – Beach Avenue Safety and Design Upgrades
Project length: 2 km

In 2020, as part of its COVID-19 response efforts, the City of Vancouver made efforts to increase both safety for people walking and cycling. This involved reshaping and rebalancing modal priority on several key travel routes using a rapid implementation approach. In April 2020, the City repurposed eastbound travel lanes along Beach Avenue from Park Lane to Hornby Street to provide increased cycling space and allow for residents to be able to walk, bike, and roll while keeping physically distanced as part of its Room to Move initiative.

The initial interim design was rapidly implemented as part of the City's immediate COVID-19 response using temporary traffic control devices, such as traffic cones and barrels. Following this interim design, the City launched an online survey to gather public input on the interim configuration and to inform more permanent treatments using a rapid implementation approach. Based on over 2,500 survey responses, the City heard concerns about the one-way traffic and the transit re-routing, which resulted in a modified design that included the return of transit and eastbound travel between Denman and Jervis streets (**Figure 15**).

Figure 15 – Beach Avenue Design Updates in 2021 (Source: City of Vancouver)

In 2021, the temporary materials were replaced with more permanent materials using a rapid implementation approach. The project used a variety of materials, including extruded curbs, delineator posts, accessibility improvements such as pedestrian push buttons and tactile walking surface indicators, and improved pedestrian crossings at key locations such as painted crosswalks and new median islands. The design was created to accommodate full size snow plows for facility maintenance to accommodate year-round use.

In 2020, Beach Avenue became the busiest cycling route in the City, regularly exceeding 10,000 cycling trips per day and peaking at 12,700. By comparison, the counters along the Seawall at Science World hit around 10,000 trips per day and Burrard Bridge sees around 8,000. This increase in use continued into 2021, with a peak daily volume of 13,900 cyclists along Beach Avenue. The City is continuing to monitor and adjust the rapid implementation design. Additional opportunities to share feedback about the longer-term vision for these spaces and whether to make these changes permanent will be available through the West End Waterfront Master Plan engagement and design process.

SPRING 2020

SPRING 2022

Figure 16 – Beach Avenue (Vancouver) cycling upgrades; showing the interim design (left) and rapid implementation design (right)

CASE STUDY

City of New Westminster – Agnes Greenway Project
Project length: 1.2 km

In winter 2020/2021, the City rapidly implemented Phase 1 of a new 1.2 km greenway along Agnes Street in downtown New Westminster to support walking, wheeling, and cycling (**Figure 17**). The second phase involves the construction of the permanent greenway in 2022. This project is part of the City of New Westminster's commitment to sustainable transportation and climate emergency response. First envisioned 10 years ago in the Downtown Community Plan, the greenway has been prioritized in Council's 2019-2022 Strategic Plan and the Downtown Transportation Plan, adopted by Council in August 2020.

Figure 17 – Agnes Greenway Study Area (Source: City of New Westminster)

To launch the Agnes Street Greenway engagement process, the City installed an rapid implementation greenway using adjustable materials to create a two-way protected bicycle lane on Agnes Street consisting of paint, flexible delineator posts, and concrete barriers. Installation of the rapid implementation greenway took place in the winter months primarily by City crews, and most work took place in three non-consecutive days of active work, with the first day focused on applying pavement markings, the second day focused on installing delineator posts, and the third day focused on installing concrete barriers. This rapid implementation greenway was a unique and innovative approach to engagement where residents were invited to try out the rapid implementation greenway and tell the City about their experience.

The project involved two rounds of public engagement, all of which took place during the COVID-19 pandemic and involved various virtual and in-person engagement opportunities, including an online survey, virtual mapping tool, virtual stakeholder meetings, and virtual open houses. The first round of engagement was launched after the installation of the rapid implementation design and focused on obtaining input on the design as well as desired features for the permanent design. The second round of engagement was focused on confirming the recommended permanent design and specific treatments for the permanent design.

The City also conducted creative engagement and activation along the corridor, including installing rain-activated paint, holding pop-up engagement events, engaging with daycare students along the corridor to create art that was installed along the corridor, and holding a community event to apply decorative paint to concrete barriers. The City also installed temporary vegetation and seating along the corridor to animate the corridor and provide community members the opportunity to use the space.

By using flexible, low-cost, temporary materials, the City was able to monitor and adjust the rapid implementation design to respond to community concerns and findings of a comprehensive monitoring program on Agnes Street and throughout the surrounding neighbourhood. Several design changes were made to respond to issues that arose through the engagement, including changes to bus stop routing, parking and loading concerns, and accessibility improvements. The City used this input to inform the permanent greenway design.

Source: Happy Cities

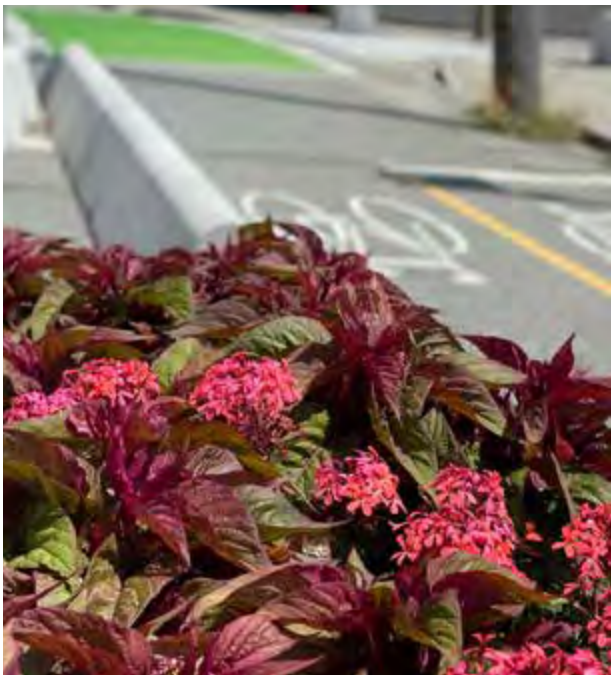


Figure 18 – Agnes Greenway, New Westminster

CASE STUDY

City of Burnaby – Still Creek Avenue Active Transportation Improvements
Project length: 850 m

The Central Valley Greenway is a 25 km regionally significant active transportation corridor in Metro Vancouver connecting the cities of Vancouver, Burnaby, and New Westminster. While most of the Central Valley Greenway is comfortable for people of all ages and abilities, there are a number of critical gaps and areas with identified safety issues along the corridor. One of the most challenging locations along the Central Valley Greenway is an 850-metre section of Still Creek Avenue through an industrial area in the City of Burnaby (**Figure 19**). The City installed a multi-use pathway along the north side of the road in 2014. However, many safety concerns had been raised with that design.

Figure 19 – Still Creek Study Area (Source: City of Burnaby)

In the summer of 2021, the City conducted an in-service road safety review to identify cycling and pedestrian safety issues. Recognizing the safety issues identified, the City subsequently quickly advanced an innovative approach in December 2021 using the rapid implementation of safety improvements, including low-cost, adjustable materials. The design of the rapid implementation facility mainly consisted of concrete barriers and flexible delineator posts.

Focused stakeholder engagement was conducted before the completion of the rapid implementation design in the fall of 2021, with project team members door-knocking and speaking in-person with businesses along the corridor to identify issues and concerns. Following the implementation of the rapid implementation design, the City monitored the rapid implementation measures and conducted broader public and stakeholder engagement to better understand their experiences with the rapid implementation design and to inform modifications. The City heard from users of the rapid implementation cycling facility, local businesses, user groups, and the public over a series of engagement activities, including focus groups with local businesses and user groups, one-on-one meetings with industrial stakeholders, intercept surveys, online feedback forms, emails and phone calls from a range of stakeholders and the general public. The City gathered feedback about:

- Participants' overall level of support for the Still Creek Avenue Active Transportation Improvements project;
- What the participants liked about the rapid implementation cycling facility and what was working; and
- Whether the participants had concerns with the rapid implementation cycling facility and suggestions for improvements.

Based on feedback received, the City has made several modifications to the design, including changes to on-street parking, changes to loading areas, sightline improvements, and traffic signal modifications. Modifications were implemented in the summer of 2022 to address feedback received. The City will use this input to help inform the design of permanent treatments to be constructed through the City's capital planning process.

Figure 20 – Still Creek Upgrades, Burnaby

Section 4:
Planning & Design Considerations

Surrey City Centre Quick Build Network (Source: Peter Klitz)

Key Considerations

Change—especially rapid change—is hard for everyone. To make rapid implementation projects run as smoothly as possible, there are several planning and design considerations to follow. These considerations are important for mitigating risks and ensuring the creation of accessible, safe, and comfortable spaces for all road users. This section provides an overview of the following:

Step 1
Building the case

Step 2
Site and network context

Step 3
Communications and engagement

Step 4
Operations and maintenance

Step 5
Monitoring and evaluation

Step 1

Building the Case

The first step in a rapid implementation planning process is to identify the need for the project. Wherever possible, it is desirable that the project is identified in the community's Cycling Network Plan, Active Transportation Plan, and/or Strategic Transportation Plan, as this will underscore the project's importance.

If the community does not have a Council-approved plan in place, or if the project isn't identified in a Council-approved plan, further rationale and justification should be provided as to why the project is moving forward and why it is following a rapid implementation approach. Outlining the need for the project at the outset is helpful to ensure an effective communications strategy with key messages can be developed and can help shape data collection and monitoring efforts.

Key considerations for **building the case** include:

Purpose and feasibility

- What are the project goals?
- What is the available budget for the project?
- What is the anticipated duration of the rapid implementation project?
- Is there any reason a rapid implementation approach might not be appropriate for this project?

Policy alignment

- Is this project identified in a Council-approved plan or policy, and how will it help to achieve the community's policy goals?
- What are the long-term plans for this corridor? Are there future improvements identified as part of the city's capital planning process or anticipated through development?

Equity

- How does this project address transportation equity? Is it located in an area of high equity need?
- Is the project located in an area of high cycling potential or high latent demand?
- Who will be affected or impacted by the project?
- Are there identified safety issues that can proactively and quickly be addressed following a rapid implementation approach?

City of North Vancouver Quick Build Policy Framework

The City of North Vancouver has adopted both a Mobility Strategy and a Safe Mobility Strategy, which together provide policy guidance to act with urgency with an approach focused on delivering strategies and actions that can be put into place quickly. The focus is on piloting, learning, adapting, and doing more with less.

Building on this foundation, the City is developing a Quick Build Policy Framework that recognizes the need to move faster to deliver interventions and make better use of limited funds to meet its transportation goals. The framework will provide consistent project standards and establish guidance for transitioning from rapid implementation to permanent design. The framework's premise is that all projects should be by default considered for a quick build approach, with the next step to ask whether there is any reason the project should NOT be implemented following this approach.

Figure 21 – 1st Street Mobility Corridor, City of North Vancouver (Source: Brandon Green)

Step 2

Site and Network Context

Once the project need has been defined, it is important to review and assess the site and broader network context, including identifying how the project will connect to the existing cycling network, considering impacts on other road users, understanding what current and future development plans are in the area, and considering any other potential project opportunities or constraints that will inform the project design.

Key considerations for **site and network context** include:

Roadway function

- If in Metro Vancouver, is the project located on the Major Road Network (MRN)?
  - If so, does the project require a reduction in people moving capacity (e.g. removing motor vehicle lanes)?
  - If so, are there other corridors that might be more suitable?
- Has traffic analysis been conducted to understand and quantify operational impacts?
- Have TransLink and other regional stakeholders been consulted?
- Have traffic management plans been put in place? Do the plans identify, implement, and communicate clear rerouting plans with proper signage (ideally avoiding rerouting through residential areas)?
- Have notices been sent to stakeholder and community members in advance of implementation?

Goods movement

- Is the project located on a local or regional truck route?
  - If so, will the project impact the efficient movement of goods along the corridor?
  - If so, are there other corridors that might be more suitable?
- Have stakeholder representing the goods movement industry been consulted?

Transit

- If in Metro Vancouver, is the project located on the Frequent Transit Network?
  - If so, will the project impact existing or planned bus service?
  - If so, how will the project design accommodate transit stops?
  - If so, are there other corridors that might be more suitable?
- Have TransLink and other regional stakeholders been consulted?

Cycling network connections

- How will the project connect with existing and planned cycling facilities?
- Who are the intended users of this facility?
- What are the key destinations that this project serves including schools and parks?

Geometric design and safety

- Does the design meet relevant design guidelines such as the B.C. Active Transportation Design Guide and the TAC Geometric Design Guide for Canadian Roads to ensure appropriate minimum motor vehicle lane widths, bicycle lane widths, buffer widths, and other relevant criteria?
- Have project design criteria been developed?
- What types of physical separation are most appropriate based on existing traffic volumes and speeds?
- How will intersections and conflict locations such as driveways be treated?

Accessibility

- Has the accessibility community been consulted?
- How have the needs of people with accessibility challenges been considered in the design, and how will adverse impacts be avoided?
- Are there opportunities to improve accessibility?
- If there are bus stops along the corridor, how does the design address conflict between cyclists and people with accessibility challenges accessing bus stops?
- How will accessibility be considered throughout the implementation process? Rapid implementation projects can alter the way the street functions and may impact access to services and existing transportation networks. It is critical that these projects maintain accessibility for people of all ages and abilities.

Parking and loading

- If parking removal is required, has a parking utilization study been conducted?
- How does the design accommodate any loading or access requirements?
- Have directly impacted businesses or other stakeholders with operational requirements along the corridor been consulted?

Figure 22 – Danforth Ave, Toronto

Step 3

Communications and Engagement

While rapid implementation projects may not involve broad community engagement prior to implementation, communications are a critical piece throughout the process. Indigenous Nations and stakeholders that will be directly impacted by the project should be engaged early in the process so the project team can understand their needs and concerns.

Key considerations for **communications and engagement** include:

Communications and Engagement Plan

- Define the project by articulating the project need(s) and expectations (facility to be built, potential impacts, etc.)
- Define clear project goals that can be communicated, defined, and reported on transparently to the public throughout the project.
- Explain why the project is being constructed following a rapid implementation approach.
- Explain how the street and community will be impacted.
- Explain how urban Indigenous Peoples or Indigenous Nations might be engaged and how feedback provided will inform decision-making.
- Explain how the project will improve equity or accessibility for Indigenous Peoples or other marginalized peoples.
- Explain that the communications and engagement process will not replace consultation with Indigenous Nation(s) in line with legislative or regulatory requirements.
- Explain how feedback for the project will be received and actioned.
- Revisit this plan throughout the process.

Communication methods

- Identify multiple methods of communication, such as website, social media, newsletters, and/or mailouts.
- Consider tools such as videos, maps, and presentations to be made available for Indigenous Nations and stakeholders to be informed about the project.

Desired level of engagement

- The International Association for Public Participation (IAP2) has developed a spectrum of participation ranging from Inform to Consult, Involve, Collaborate, and Empower (see **Table 2**). Define which level of engagement is desired, recognizing that Indigenous Nations and different stakeholders may have different desired levels of engagement.

	INFORM	CONSULT	INVOLVE	COLLABORATE	EMPOWER
PUBLIC PARTICIPATION GOAL	To provide the public with balanced and objective information to assist them in understanding the problem, alternatives and or solutions.	To obtain public feedback on analysis, alternatives and/or decision.	To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.	To place final decision-making in the hands of the public.
PROMISE TO THE PUBLIC	We will keep you informed.	We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision.	We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.	We will look to you for advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible.	We will implement what you decide.

Table 2: IAP2 Spectrum (Source: Adapted from IAP2 Canada)

Indigenous Nations, Internal and External Stakeholders

- Identify internal and external groups to engage with, such as operations and maintenance staff, TransLink staff, and staff from other departments or agencies.
- Identify Indigenous Nations and directly impacted stakeholders, such as urban Indigenous Peoples, residents and businesses, the accessibility community, and the goods movement industry.
- Identify the desired level of engagement with each group, recognizing that Indigenous Nations and different stakeholders may have different desired levels of engagement; for example, the broader community may be engaged with at an “Inform” level, while directly impacted urban Indigenous Peoples, Indigenous Nations, and stakeholders may be engaged with at a “Consult” or “Involve” level.
- Identify opportunities to engage the community proactively to build support and ownership for the project. This could include partnering with local artists and/or schools to add beautification and/or decorative elements to the project. This is an excellent opportunity for Indigenous cultural recognition, language revitalization, and education.
- Communicate to Indigenous Nations and stakeholders how their input will be used throughout the process, including the design process as well as ongoing monitoring. These can help inform key considerations for the projects design and activate a network of support for the project. It is important that the project team checks in with what the community needs are and demonstrates ongoing listening and understanding.

Regular communication

- Schedule regular project check-in points with decision-makers to ensure they are up to speed and can respond to inquiries about the project.
- Ensure communication materials are regularly updated.

Plan for engagement post-implementation

- While the initiation of these projects requires engagement with Indigenous Nations and stakeholders as identified above, post-implementation engagement efforts should be broader to ensure all those impacted by the project have the opportunity to participate and provide informed input. This engagement is critical as it ensures that effective adjustments are made to the design where warranted.
- Incorporating strong evaluation methods and communicating results throughout the project will help community members and decision-makers understand the impacts of the project.
- Plan celebrations and promotions as part of implementation efforts. This will encourage use of the new facilities and provide opportunities for continued engagement and community feedback.
- Prepare a final report to summarize lessons learned throughout the process (see Section 6 for more details)

Building Political Will

Rapid change can stimulate strong reactions. Public opinion towards rapid implementation projects has been observed to follow the "political valley" path, as shown in **Figure 23** ([13]). At the outset of a project, there is often approval and excitement, but there can be a sharp response of concern immediately preceding and following implementation as disruptive changes are made to the street. When this happens, upset stakeholders and community members may begin voicing their displeasure online, to construction crews, and to their local representatives, which can sway political opinion. However, as the facility opens and people try it out, approval tends to increase, especially if adjustments are made in response to user feedback.

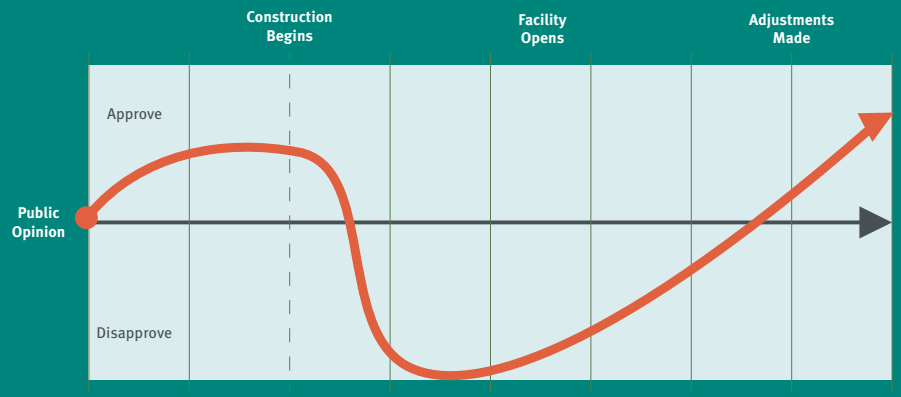


Figure 23 – Public opinion trajectory often follows a "political valley" path (adapted from NACTO 2018)

To avoid having a project steer into the 'disapprove' category, the project team should closely monitor the project and listen to feedback from a diversity of users to understand the project's impacts and determine what design adaptations may be required. While gathering feedback from stakeholders and the broader community is crucial to understanding valid concerns, it is important to ensure that a vocal minority does not dominate the conversation.

It is also hugely beneficial to get decision-makers onboard early in the project. To build this decision-maker support, it is important to explain the nature of the project, help them understand why the preferred method is rapid implementation, and explain how the project will advance the community's goals and policy objectives. Preparing decision-makers for anticipated push back by helping them understand the rapid implementation process will help build political will and ensure decision-makers can effectively respond to public pushback when/if the project enters the 'political valley'. The following key messages should be shared with decision-makers:

- Why this project has been identified
- An explanation of rapid implementation
- Why the project is being advanced using rapid implementation
- How equity, safety, and accessibility are being addressed
- What engagement has been conducted prior to implementation
- What engagement will be conducted during and post-implementation
- How the project will be monitored
- When and what types of changes can be anticipated based on the post-implementation engagement and monitoring

Step 4

Operations and Maintenance

Rapid implementation projects require flexibility and adaptability. Having a strong working relationship with the traffic operations and maintenance staff is integral to this process. This team needs to be resourced appropriately, in terms of both staff and budget. While rapid implementation projects are an opportunity to test new ideas, staff should be comfortable with the materials selected and have sufficient tools and capacity to accommodate operations or maintenance needs (e.g., watering planters, snow/leaf clearing, new equipment requirements, damage to materials, etc.).

Key considerations for **operations and maintenance** include:

Staff engagement

- Has operations and maintenance staff been consulted? Ongoing engagement with operations and maintenance staff should occur throughout project planning, implementation, and post implementation processes. Communicate the intent of the project to set expectations, including the idea that flexibility and adaptation will be part of the process.
  - The level of staff involvement can vary and depends on the materials selected and the number of adjustments that may be required. This can include the need for additional signage, improving visibility and sight lines, improving accessibility, maintaining foliage in planters or fixing/replacing broken materials, clearing debris within the facility and making ongoing adjustments.
- Involve staff in the design of the project, including material selection, identifying traffic impacts, required signage, and any changes to signal timing and activation.

Understand impacts

- What are the impacts of street closures and changing traffic patterns to operations and maintenance? Have these impacts been communicated to operations and maintenance staff?
- Does the type of physical separation or traffic calming/diversion device present any maintenance concerns?
- Does the community have adequate equipment to maintain the facility throughout the year? If not, is there budget for acquiring new equipment?
- How does additional engagement with operations and maintenance staff impact budget?
- How does frequency and duration of maintenance impact traffic operations and budget (e.g. pay workers overtime to work nights rather than close off sections of the road for maintenance)?

Step 5

Monitoring and Evaluation

Data collection and monitoring are critical components of the rapid implementation process and should be budgeted for appropriately. It is important to develop a monitoring strategy that will evaluate changes in behaviour and perceptions along the corridor.

Key considerations for initial data collection and monitoring include:

- Identify if there is any existing data that can be used to form a baseline for existing conditions prior to rapid implementation.
- If no existing data is available, begin monitoring prior to implementation to establish baseline data.
- Ensure all key stakeholders and internal project team members know what metrics are being monitored and how and when data will be collected throughout the project.
- The frequency of data collection will be dependent on the project goals and the duration of the project.

Key performance indicators that can be collected as part of a monitoring and evaluation plan include:

- Traffic volumes on selected corridors
- Bicycle volumes
- Pedestrian volumes
- User demographics, including the proportion of women, children, and seniors as well as any other key metrics. This can include identifying the type of device being used (e.g. bicycle, scooter, skateboard, etc.)
- Average and 85th percentile speeds
- Parking utilization
- Number of reported collisions
- Public life study
- User satisfaction/perception of facilities through online and/or intercept surveys

Figure 24 – Bicycle Counter on Beach Avenue, Vancouver

Monitoring Project Success

Ensuring a strong monitoring and evaluation plan is in place at the outset of the project is helpful for ultimately determining a project's success. In 2014, the City of Calgary approved a pilot project for the development of a 6.5 km City Centre Cycle Track Network, which was then installed in 2015 ([14]). Extensive before and after data allowed many of the benefits and impacts to be quantified. The project's monitoring plan included data collection at ten locations across the network from September 2014 to 2016. Data collection included five key themes: satisfaction; safety; walking, cycling, and driving activities; economic vitality; and demographics. Under each of these themes were nine performance indicators.

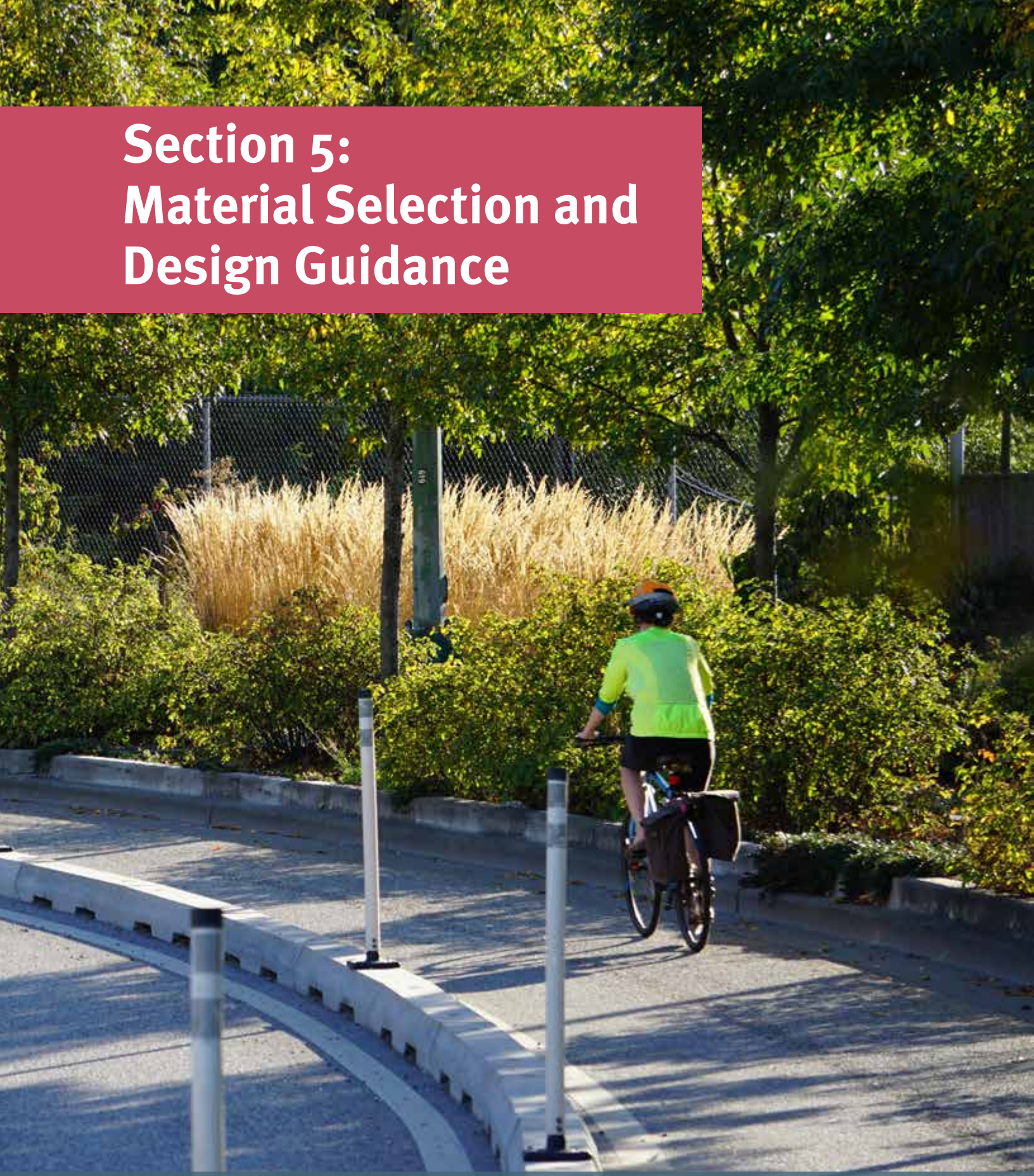
The data was collected through manual and video automated counts, pavement counters, GIS and stopwatch trials, intercept surveys, and a telephone survey. At the close of the pilot project, 70% of the performance measures met or had moved toward their target, including:

- 1.2 million bicycle trips recorded between June 2015 and November 2016, with the number of cyclists increasing 142% between 2014 and 2016.
- The proportion of women cycling downtown increased from 22% to 30% after implementation, showing the importance of building safe and comfortable facilities.
- There was a 12% decrease in the number of collisions involving cyclists.
- Unlawful sidewalk cycling decreased from 16% to 2% with the addition of cycle tracks.
- 100+ adjustments were made to improve traffic, loading, and parking during the pilot.
- 77% of Calgarian cyclists reported that their overall cycling experience was better after having access to the cycle track network.

The robust monitoring program, combined with strong communications that reported these results to the public, helped underscore how successful the pilot project had been and laid the foundation for other cities to pursue similar projects.

Figure 25 – City Centre Cycle Track Network, Calgary

Section 5: Material Selection and Design Guidance



1st Street Mobility Corridor, City of North Vancouver (Source: Brandon Green)

Material Selection Considerations

There are a wide range of treatments and materials that can be used for rapid implementation projects. This section begins by introducing key considerations for material selection. It then provides an overview of treatments and materials for the rapid implementation of the two most common facility types for this approach: **protected bicycle lanes** and **neighbourhood bikeways**. Finally, this section outlines considerations for activation and beautification, which can help take rapid implementation projects to the next level by creating fun, engaging spaces for people of all ages and abilities.

This section outlines key considerations for material selection, including:

- Available Road Space
- Available Capital and Maintenance Budgets
- Traffic Volumes and Speeds
- On-Street Parking and Curbside Access
- Frequency of Driveways and Intersections
- Aesthetics
- Street Drainage

Figure 26 – 1st Street Mobility Corridor, City of North Vancouver (Source: Brandon Green)

Available Road Space

Rapid implementation projects typically do not involve major physical construction to create more space for bikeways. Instead, the available space typically comes from reallocating existing space within the curb-to-curb width of the roadway. This generally consists of reallocating space from motor vehicle travel lanes and/or parking lanes. Assessing the existing motor vehicle lane widths, traffic volumes, parking lane widths, and parking utilization along a corridor is important for gaining an understanding of existing demands on the available road space and determining where and how space can be best reallocated.

Figure 27 shows two examples of possible road space reallocation, with a two-lane undivided roadway with on-street parking on both sides (top) being reallocated to uni-directional protected bike lanes (middle) or a bi-directional protected bike lane (bottom).

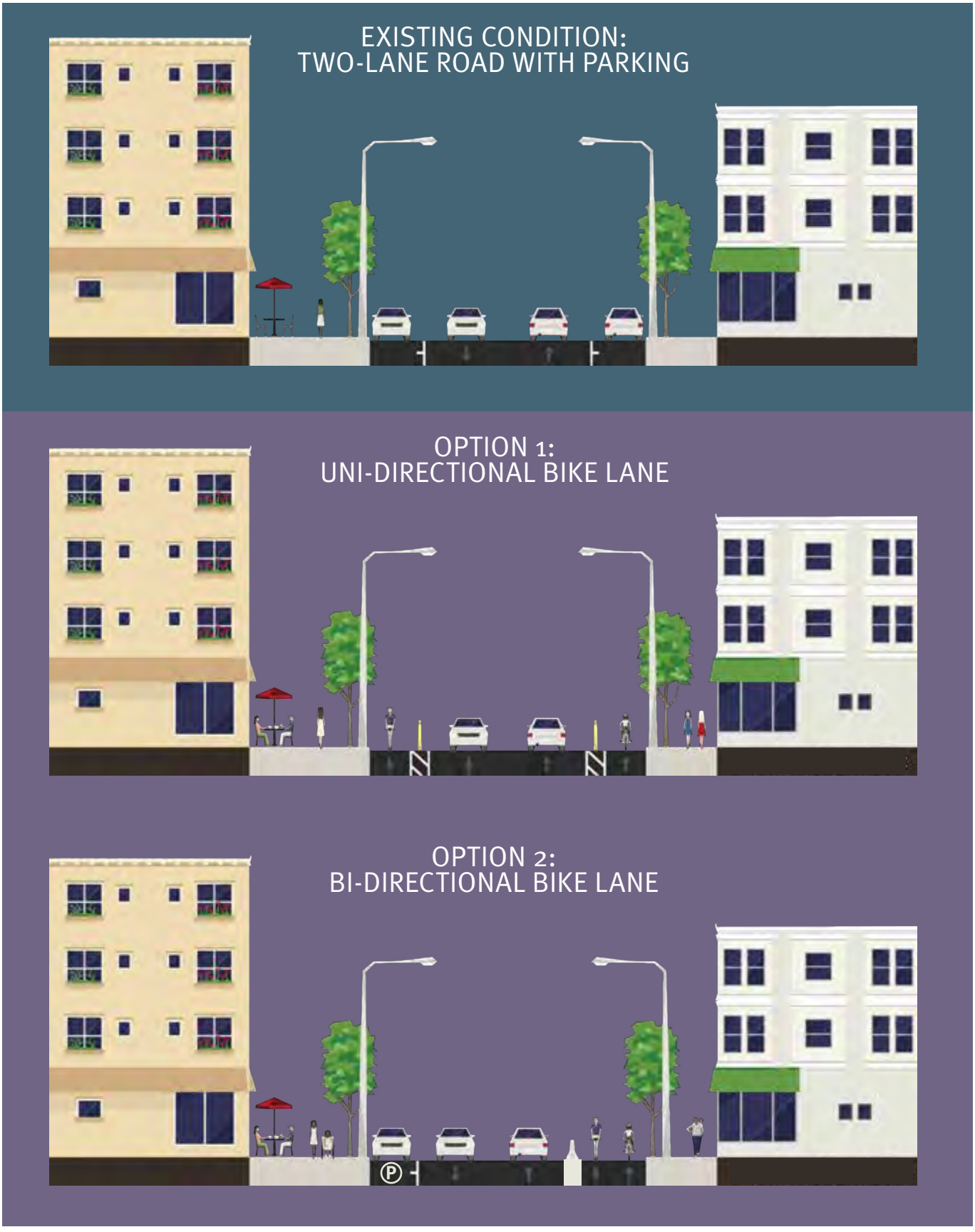


Figure 27 – Example of road space reallocation (Renderings created on StreetMix)

Traffic Volumes and Speeds

Different types of facilities are appropriate in different road environments. The largest safety risk associated with active transportation is the potential for collisions between motor vehicles and people walking, cycling, or using other forms of active transportation. Separation of motor vehicles from cyclists is generally preferred on streets with speeds of 50 km/h or higher and traffic volumes exceeding 1,500 vehicles per day, although this is context dependent. As motor vehicle speeds and volumes increase, there is an increased need for separation and physical protection from motor vehicle traffic (see **Figure 28**).

The level of physical protection offered by various types of materials varies greatly. As such, the selection of materials should consider the roadway context, including existing traffic volumes and speeds. For example, treatments such as flexible delineator posts can be effective at improving cycling comfort by providing clear delineation on roadways with lower volumes and speeds but are less desirable on roads with higher speeds and volumes, where stronger physical protection is required.

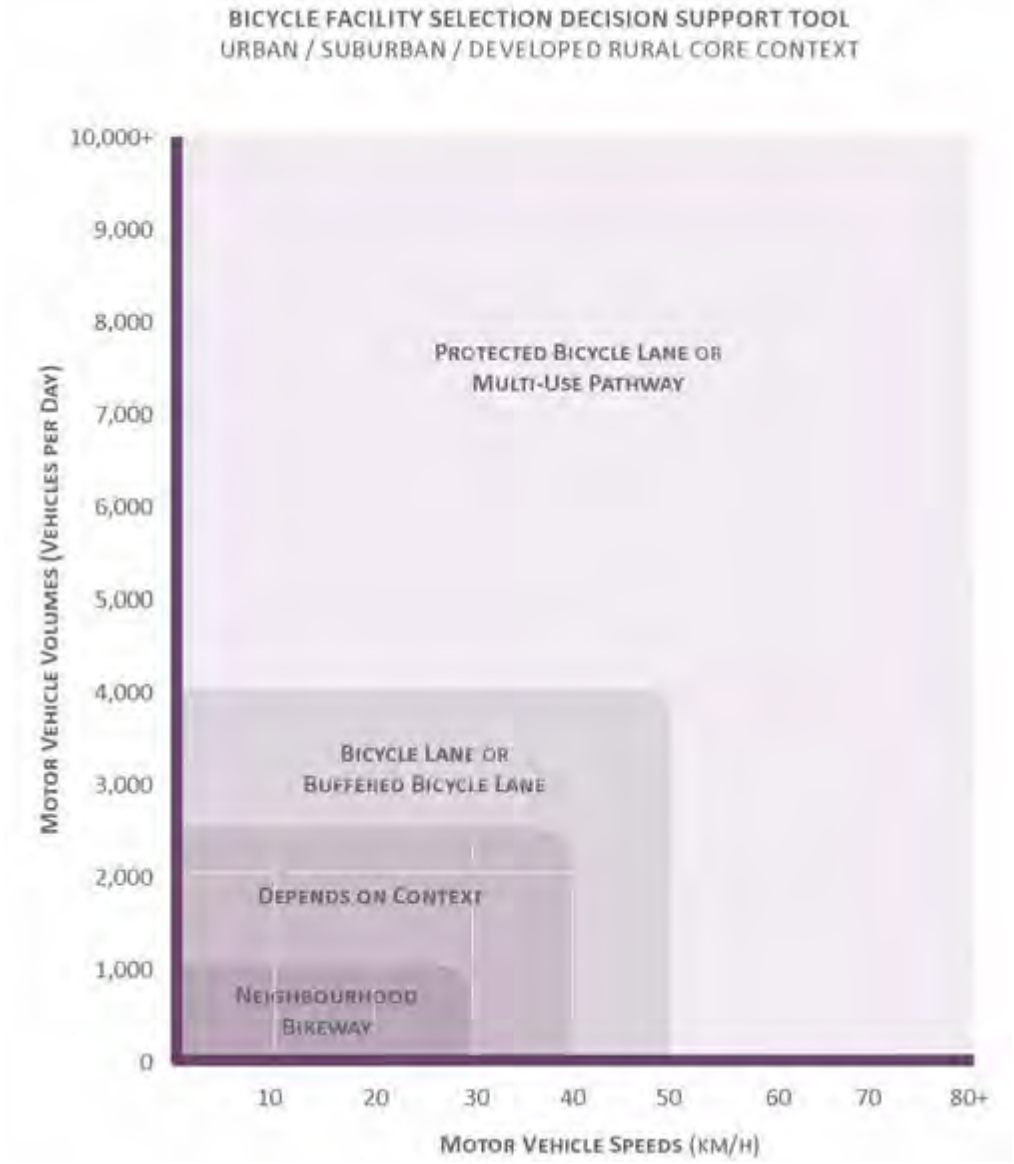


Figure 28 – Bicycle Facility Selection Decision Support Tool, Urban Context (Source: BC Active Transportation Design Guide Figure D-29)

Available Capital and Maintenance Budgets

Budgetary constraints have significant implications on the project type, including whether the project will use rapid implementation treatments and materials. In addition to capital budget considerations, operations and maintenance budgets are also crucial to consider. The long-term operations and maintenance costs required for a facility will differ depending on the treatment and material type.

For example, lightweight materials such as flexible delineator posts may be less expensive to install but tend to be more susceptible to damage and require more frequent re-installations than a more durable material such as concrete curbs. However, the resources required for re-installation of concrete treatments are significantly greater. Finding the right balance of capital and ongoing operating costs through budgetary planning is key to the long-term success of the project.

Frequency of Driveways and Intersections

Intersections and driveways present potential conflict points with motor vehicles. A high percentage of collisions involving people cycling occur at these locations, and careful consideration needs to be given to mitigate these conflicts. Facility selection should be made in consideration of these potential conflict points. For example, bi-directional protected bicycle lanes are less appropriate where there are a high number of driveways or crossing points as the bi-directional travel adds complexity for all users. In these cases, uni-directional bicycle lanes may be more appropriate. The B.C. Active Transportation Design Guide provides additional considerations for when to consider uni-directional vs bi-directional protected bicycle lanes. Providing clear sightlines at all driveways and intersections is an important measure for mitigating the risk of a collision. Another key consideration is providing increased awareness of the cycling facility using signage and pavement markings.

On-Street Parking and Curbside Access

Curbside access for loading, pick up/drop off, or bus stops is another important consideration. Identifying and accommodating these needs is key to the success of the cycling facility. As mentioned above, parking is sometimes reallocated to create space for cycling facilities. In some cases, parking can be maintained and act as a buffer between people driving and people cycling. However, parking adjacent to a cycling facility requires additional considerations to ensure that accessibility needs are met.

For example, if a curb or concrete barrier is installed to provide further protection for the bicycle lane, strategically located gaps in the curb/barrier may be required to provide curbside access for people with accessibility needs. Additionally, a wider buffer is recommended (0.9m) to allow for adequate separation from parked motor vehicles (see B.C. Active Transportation Design Guide Chapter D3 for more details).

Figure 29 – Danforth Avenue, Toronto

Presence of Transit Stops

In some cases, cycling routes will overlap with transit routes. When this occurs, potential conflict points may be introduced between people cycling, people walking, and transit vehicles. Key considerations when managing potential conflicts between bicycle facilities and transit stops include transit frequency and ridership, cycling and pedestrian volumes, and land use context.

If the conflict is one a one-way street, one potential mitigation measure is to provide the bicycle facility on the left side of the street to avoid conflicts with transit vehicles. If that is not possible, the desired treatment is generally to maintain physical protection through the bus stop area using a floating bus stop (see **Figure 30**). The B.C. Active Transportation Design Guide provides guidance on the design of floating bus stops. Another option in constrained locations is to raise the bicycle lane to the sidewalk level, and/or direct people cycling to use the sidewalk as a multi-use facility. Both of these cases may present additional conflict between people cycling, people walking, and transit vehicles and should only be considered in areas of lower transit frequency or ridership and/or lower pedestrian and cycling volumes. Alternatively, the bicycle lane may remain at street level and have physical separation drop at the bus stop to create a mixing zone. This should generally only be considered in areas with lower transit frequency or ridership and is not considered to be a treatment that is comfortable for people of all ages and abilities.

Figure 30 – Quick build floating bus stop Beach Avenue, Vancouver

In all cases, the design of cycling facilities adjacent to bus stops needs to carefully consider the needs of all users and potential conflicts between people walking, people cycling, and transit users. In particular, special attention must be paid to accessibility considerations at bus stops, including people with mobility challenges and reduced vision to ensure the design adequately addresses their needs. Consultation with transit agencies and the accessibility community is a critical part of the design process to ensure the design meets the needs of all users.

Aesthetics

Different rapid implementation materials and treatments provide opportunities for aesthetic improvements. Combining treatment types such that more aesthetically pleasing materials are used in strategic areas is one technique to improve the aesthetics of a corridor. For example, placing planters intermittently along a segment of pre-cast or extruded curbs, installing planters near areas where people congregate such as parks or patios, or using creatively painted concrete barriers. More information on aesthetics is provided below in the Activation and Beautification section.

Street Drainage

In retrofit and rapid implementation scenarios, drainage can be a significant constraint. Altering existing drainage patterns can be costly if it requires relocating or installing new drainage infrastructure. Many of the rapid implementation materials either do not impede drainage or are designed to allow water to pass through built-in channels. When considering materials that do not provide opportunities for drainage, it is important to have a good understanding of drainage patterns to adequately accommodate street drainage. A simple solution is to provide gaps of 0.3-1.0 m between curbed segments at points where existing catch basins exist or at other strategic locations.

Table 31 – Gap in curb protection (see yellow curb area) to accommodate drainage, Vancouver

Treatments and Materials

There are two types of cycling facilities that are Comfortable for Most and generally applicable for rapid implementation projects: **protected bicycle lanes** and **neighbourhood bikeways**. Both facility types can be implemented using a range of materials and each have benefits and costs as described below.

This section provides guidance for the application of different materials that can be used to create each type of cycling facility, including:

- Painted buffers;
- Flexible delineator posts;
- Modular plastic curbs;
- Planter boxes;
- Pre-cast concrete curbs;
- Extruded curbs; and
- Concrete barriers.

Regardless of the treatments and materials selected, all facilities should be designed in accordance with the BC Active Transportation Design Guide, the TAC Geometric Design Guide for Canadian Roads, and other current industry best practices. Design professionals should refer to those documents for more detailed design guidance.

Protected Bicycle Lanes

Protected bicycle lanes provide physical protection for people cycling by providing horizontal and often vertical separation from motor vehicles using a variety of treatments and materials. Rapid implementation treatments typically focus on horizontal separation. All treatments require a horizontal buffer from traffic ranging from 0.3-1.0 m or more.

For each treatment and material, guidance is provided for the following:

- Description;
- Applicability;
- Design considerations;
- Relative cost;
- Relative durability;
- Relative level of protection;
- Aesthetics;
- Installation considerations;
- Maintenance considerations; and
- Drainage considerations.

The most common rapid implementation treatments and materials used to create separated facilities are presented below on a continuum from the lowest to the highest level of protection (**Figure 32**). The list of treatments and materials provided below is not considered exhaustive, but instead highlights some of the most common applications. Furthermore, the materials presented are not necessarily considered exclusive of each other; rather, they are often used in conjunction to provide a complete cycling facility.

TREATMENT		RELATIVE LEVEL OF PROTECTION
Flexible Delineator Posts		Low
Modular Plastic Curbs		Low
Parking Protected Bicycle Lane (Delivered by Shifting Lane Markings)		Low-Medium
Planter Boxes		Medium
Pre-cast Concrete Curbs		Medium
Extruded Curbs		Medium-High
Concrete Barriers		High

Figure 32 – Relative Level of Protection for various Protected Bicycle Lane Treatments

Flexible Delineator Posts

Level of Protection	Low
Capital Cost	$ (›$500k/km)
Maintenance Cost	Medium
Durability	Low
Ease of Implementation	Easy
Pros	Allows pedestrian curbside access Provides delineation of parking lane if present Improves visibility of separation types such as low height barriers and curbs
Cons	Does not provide physical protection from motor vehicles Increased maintenance to replace dislodged or damaged flex-posts Not aesthetically pleasing

Table 3 – Flex Post Design Considerations

Figure 33 – Painted buffer protected bicycle lanes with flexible delineator posts

Description

- Flexible delineator posts (also commonly referred to as flex posts) are vertical posts that are commonly used in conjunction with other treatments to provide added visibility, delineation, and comfort to a cycling facility.
- Are either directly mounted to the roadway within a painted buffer or mounted on top of other separation types, such as pre-cast curbs, that are providing physical protection for the bicycle lane.
- A wide variety of types of flexible delineator posts exist, with varying characteristics. The base of a flexible delineator is typically less than 0.3 m wide, providing flexibility in constrained applications.

Applicability

- When mounted directly to the roadway and not used in conjunction with a higher order separation type, they are only considered on streets with speeds of 50 km/h or less and traffic volumes of less than 6,000 vehicles per day, or as part of a parking protected bicycle lane.
- When mounted on top of other separation types, they can enhance those other materials by providing enhanced visibility and delineation.
- May be used with uni-directional or bi-directional bicycle lanes.

Design Considerations

- Commonly used in conjunction with painted buffers that are typically 0.6-0.9 m wide.
- Does not impede curbside activity and has no impacts for accessibility.
- Typically spaced every 3-6 m. Increased frequency may be desired in areas with vehicle encroachment concerns due to parking or high frequency loading/unloading.

Relative Cost

- Among the lowest-cost options to implement a cycling facility.

Relative Durability

- Low durability as they are easily dislodged and/or damaged when struck by a motor vehicle.

Level of Protection

- Does not provide continuous separation and offers very little physical protection from motor vehicles when not used in conjunction with other separation types. However, they do provide additional visibility of the cycling facility, increased side friction for motorists, and an increased comfort for users as perceived safety is increased.

Aesthetics

- Not generally considered to be very aesthetically pleasing as they have a less 'permanent' appearance and are prominent in the field of vision.
- Dislodged or damaged flex posts are common and further reduce the aesthetics of the roadway.
- A wide variety of styles and colours are available, which provides opportunity to match a community's branding.

Installation Considerations

- Commonly bolted to the pavement or adhered to the surface of the pavement.
- Installation is relatively low effort and can be done very quickly as it does not require large crews or heavy equipment.
- Ideally installed on clean, dry pavement.

Maintenance Considerations

- Requires frequent replacement or reinstallation as they can be easily dislodged and/or damaged by strikes from vehicles.
- Can present maintenance challenges by clearing snow, leaves, and other debris between the posts.
- Can be removed over the winter months to avoid damage and not impede snow-clearing operations.

Drainage Considerations

- Flex-posts have no impact on street drainage.

Modular Plastic Curbs

Level of Protection	Low
Capital Cost	$$ ($500k-$1M/km)
Maintenance Cost	Medium
Durability	Medium
Ease of Implementation	Easy
Pros	Continuous barrier protection Can be installed on a curve Allows stormwater drainage to pass through
Cons	Mountable by vehicles Not aesthetically pleasing

Table 4 – Modular Plastic Curbs Design Considerations

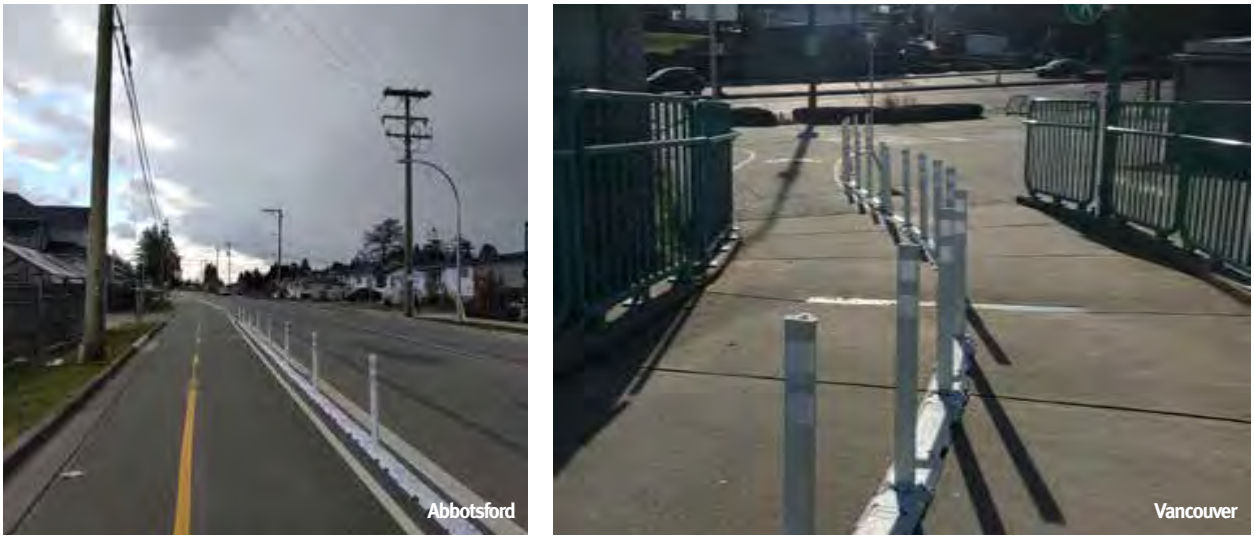


Figure 34 – Protected bicycle lanes with modular plastic curb protection

Description

- Modular plastic curbs are short, prefabricated curb segments that are anchored to the roadway to provide continuous separation of the cycling facility from motor vehicle traffic.

Applicability

- Typically considered mountable by vehicles and, as such, are generally only considered suitable on streets with speeds of 50 km/h or less and traffic volumes of less than 6,000 vehicles per day.
- May be used with uni-directional or bi-directional bicycle lanes.

Design Considerations

- Because they provide continuous separation, they have implications to curbside access and accessibility, as they introduce a potential tripping hazard and create an added obstacle for curbside loading/unloading. However, due to the modular nature of the curbs, adjustments can be made with relative ease as needed to create gaps for curbside access and accessibility.
- Typically 0.3-0.6 m wide; however, regardless of the width of the curbs themselves, it is recommended that a buffer be included to an overall minimum width of 0.6 m.
- Flexible delineator posts are commonly installed atop the curbs along with hazard markers at the upstream ends to increase visibility of the curbs and help delineate the curbs for traffic, parking vehicles, and maintenance vehicles.

Relative Cost

- Moderate-cost technique to implement a cycling facility; however, cost can be dependent on availability and location relative to the suppliers.

Relative Durability

- Able to withstand any climate and are relatively durable; however, they are relatively easily dislodged by strikes from vehicles.

Level of Protection

- Provide continuous physical separation which offers a greater degree of protection compared to flexible delineator posts or painted buffers; however, they are typically low in height and narrower than the desired buffer width.
- Provide increased perceived safety and comfort for users as there is a vertical separator from traffic; however, they are mountable by motor vehicles and do not provide the same degree of physical protection as other types of curbs.

Aesthetics

- Often perceived as temporary and not aesthetically pleasing, particularly as they begin to show wear and tear.

Installation Considerations

- Relatively easy to install, adjust, and/or remove as they do not require a large crew or a lot of equipment.
- Installation is completed by placing the curb in the desired location, marking and drilling holes into the pavement through the curb's anchor holes, and hammering dowels into the pre-drilled pavement to anchor the curbs.

Maintenance Considerations

- Strikes from vehicles may damage or dislodge the curbs, resulting in maintenance costs to replace and/or reinstall curbs.
- It is recommended that municipalities keep a small stockpile of curbs to be able to quickly replace damaged curbs.
- Sand, gravel, leaves, etc. can build up along the curbs and may require additional street cleaning effort.

Drainage Considerations

- Typically designed with drainage slots such that water can pass through underneath the curbs.
- Strategically placed gaps between curb segments are an additional technique that can be applied to ensure that drainage patterns are not impeded.

Parking Protected Bike Lanes

(Delivered by Shifting Lane Markings)

Level of Protection	Low-Medium
Capital Cost	$ (›$500k/km)
Maintenance Cost	Low
Durability	Medium
Ease of Implementation	Easy
Pros	Allows pedestrian curbside access Provides physical separation when parked vehicles are present Painted buffer may be supplemented with flexible delineator posts or other types of physical protection, while ensuring gaps are provided for accessibility
Cons	No physical protection if parked vehicles are not present and if flexible delineator posts or other types of physical protection are not provided Vehicles may encroach while parking/loading unless flexible delineator posts or other types of physical protection are provided

Table 5 – Painted Buffer Design Considerations

Figure 35 – Uni-directional bicycle lane with painted buffer adjacent to protected on-street parking

Description

- Parking protected bicycle lanes consist of a painted buffered bicycle lane between the curb and a vehicle parking lane such that the parked vehicles provide increased separation and physical protection from moving traffic.
- The painted buffer typically consists of two solid longitudinal lines with optional cross-hatching between the lines. The longitudinal lines are dashed at locations where vehicles can cross the bicycle lane, such as at driveways or approaching intersections.
- The painted buffer may be supplemented with flexible delineator posts or other types of physical protection, while ensuring gaps are provided for accessibility.

Applicability

- Applicable in scenarios where protected bicycle lanes are appropriate as per the BC Active Transportation Design Guide and on-street parking is maintained.
- Parking protected bicycle lanes may be used with uni-directional or bi-directional bicycle lanes.
- Other than parking protected bicycle lanes, painted buffers can also be installed directly adjacent to motor vehicle lanes without additional protection. However, painted buffers without additional protection directly adjacent to motor vehicle lanes are not considered a cycling facility that is Comfortable for Most. This treatment should only be considered on streets with speeds of 50 km/h or less and traffic volumes of less than 4,000 vehicles per day.

Design Considerations

- Painted buffer is typically 0.6-0.9 m wide.
- Painted buffer does not impede curbside activity and has no impacts for accessibility.

Relative Cost

- Among the lowest-cost options to implement a cycling facility.
- Cost can vary depending on the type of pavement marking used, such as paint, thermoplastic, or methyl methacrylate (MMA).

Relative Durability

- The durability of a painted buffer depends on the type of pavement marking used, the condition of the road, and whether traffic commonly encroaches on the paint.
- Painted buffers can be expected to last 1-2 years before requiring re-application, whereas thermoplastic pavement markings would be expected to last 3-6 years and methyl methacrylate (MMA) markings can last up to 10 years.

Level of Protection

- Parked vehicles provide physical protection from moving motor vehicles.
- When parked motor vehicles are not present, painted buffers provide only horizontal separation from motor vehicles.

Aesthetics

- Painted buffers do not have a significant impact on aesthetics.

Installation Considerations

- Installation of the longitudinal lines can be completed quickly. Stencils and cross-hatching within the bicycle lane and buffer require moderate effort as these are typically installed using hand equipment.
- Painted buffers, using standard paint, MMA markings, or thermoplastic markings, are ideally installed on clean, dry pavement, and in mild temperatures of 10°C or higher. However, it is possible for MMA mixtures to be customized to allow for quick installation in hot, cold, and freezing temperature conditions.
- Thermoplastic pavement markings are melted onto the pavement surface. Thermoplastic pavement markings may be applied within prepared grooves cut into the pavement surface such that the marking is protected from snowplow damage.
- MMA pavement markings are applied in a similar fashion to regular paint.

Maintenance Considerations

- Generally, the only maintenance requirement for painted buffers is reapplication when the markings wear away. This is commonly done in conjunction with a municipality's annual line painting program.

Drainage Considerations

- Painted buffers have no impact on street drainage.

Planter Boxes

Level of Protection	Medium
Capital Cost	$$ ($500k-$1M/km)
Maintenance Cost	High
Durability	Medium
Ease of Implementation	Medium
Pros	Physical protection Very aesthetically pleasing
Cons	Significant ongoing maintenance for watering, replanting, etc. Require more width

Table 6 – Planter Box Design Considerations

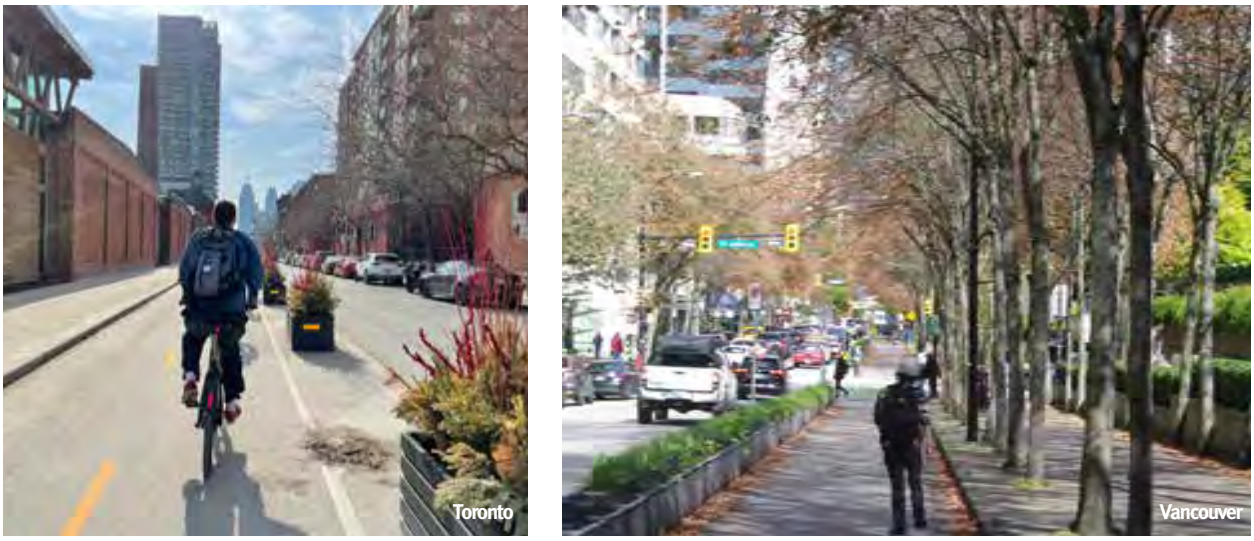


Figure 36 – Planter boxes used as standalone protection (left) or in conjunction with concrete curbs to provide additional protection

Description

- Planter boxes can provide a physical barrier between a bicycle lane and a motor vehicle lane while providing beautification of the roadway.
- Planter boxes used as protection for bicycle lanes are typically low height, with low height plantings, and are typically approximately 0.6 m by 1.2 m in size (dimensions can vary).

Applicability

- Typically used in lower-speed environments (50 km/h or less) unless they are placed on top of a concrete median or protected by a curb.
- Planter boxes are used in a variety of contexts from dense urban settings to suburban 'main streets' to provide beautification and an enhanced streetscape.
- May be used with uni-directional or bi-directional bicycle lanes.

Design Considerations

- Planter boxes can be placed together to provide continuous separation.
- In lower speed environments, planter boxes may be placed periodically or intermittently; however, care needs to be taken to not create roadside hazards.
- Recommended buffer width for the use of planter boxes is 1.0 m to provide an offset from both the bicycle lane and the vehicle lane.
- May be an impediment to curbside access if placed continuously; however, strategic placement with gaps between planted boxes can provide access to/from parking and loading areas as needed can mitigate this issue.
- Planter boxes have a variety of styles and materials. Crash attenuation may need to be a consideration for larger concrete planters.
- Object markers should be placed on the planters at the upstream end of the row, facing oncoming traffic.
- Planters should be placed so as to not impede sightlines at driveways and intersections.

Relative Cost

- Moderate cost, which can range depending on the style, size, and material of planter.
- Ongoing maintenance costs associated with planter boxes to replant each spring and replace planters when damaged. However, self-watering planters are an option to reduce maintenance costs.

Relative Durability

- Range in durability dependent on the material chosen, i.e. plastic as compared to concrete.

Level of Protection

- Planter boxes provide a moderate level of protection from vehicles when placed in a continuous line or spaced such that vehicles reaching the bicycle lane is unlikely, and when used in conjunction with other separation types. Depending on the size and material, a vehicle striking a planter box could shift its position.

Aesthetics

- Offer a high level of aesthetic appeal as they add greenery and colour to the roadway.
- Commonly used in conjunction with concrete barriers or pre-cast concrete curbs to provide a softer, more appealing aesthetic.
- The style of planter box can be chosen based on the characteristics of the surrounding environment or be painted by local artists, students at neighbouring schools, etc.

Installation Considerations

- Simple to install as they are not anchored to the road. However, proper placement of the planter box is important as they require heavy equipment to move them due to their size and weight.

Maintenance Considerations

- Require ongoing maintenance to care for and water the plants and to replant each spring. However, self-watering planters are an option to reduce maintenance costs.
- There is potential for damage from being struck by vehicles and may require replacement as a result.

Drainage Considerations

- Planter boxes placed in a continuous line may have implications to drainage unless they are designed such that they have drainage slots at their base.
- When spaced intermittently, there are no drainage implications.

Pre-cast Concrete Curbs

Level of Protection	Medium
Capital Cost	$$ ($500k-$1M/km)
Maintenance Cost	Medium
Durability	High
Ease of Implementation	Medium
Pros	Physical protection Allows stormwater drainage to pass through Quick installation May be suitable for higher speed roadways
Cons	Limits curbside access

Table 7 – Pre-cast Curb Design Considerations

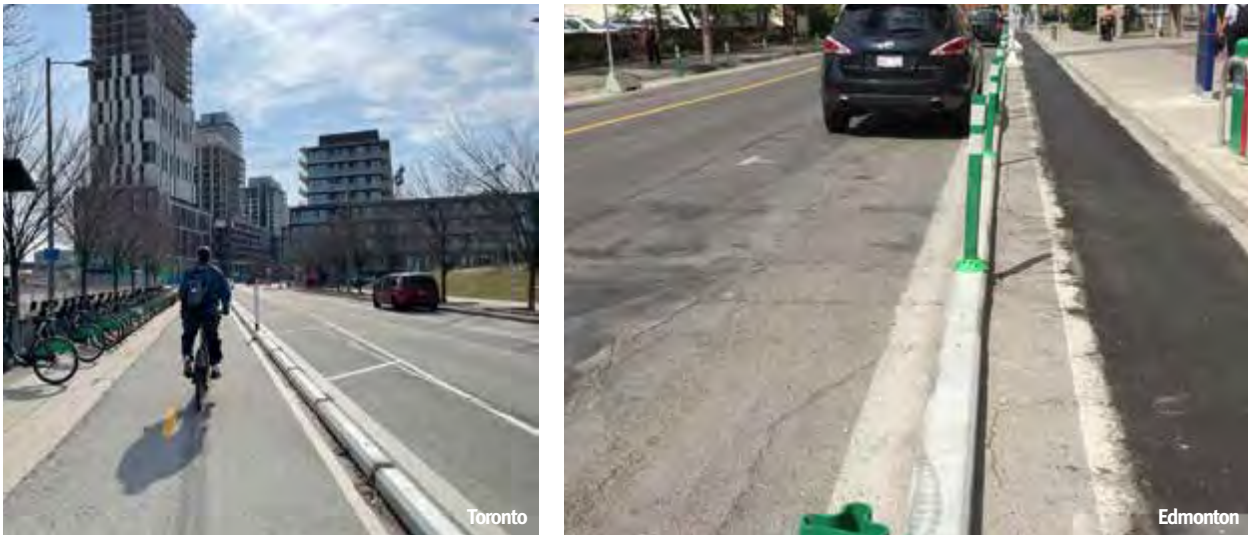


Figure 37 – Pre-cast curb protected bicycle lanes with flexible delineator posts atop the curbs

Description

- Pre-cast concrete curbs are short curb segments that are anchored to the roadway to provide physical separation of the cycling facility from motor vehicle traffic.
- Share many similarities to modular plastic curbs; however, they are more robust and durable.
- Vary in width from 0.3-0.6 m and are typically 2.0-2.5 m long.

Applicability

- Less mountable for vehicles than modular plastic curbs and therefore are considered acceptable for use on higher volume and higher speed roads.
- May be used with uni-directional or bi-directional bicycle lanes.

Design Considerations

- Because they provide continuous separation, they have implications to curbside access and accessibility as they may introduce a potential tripping hazard and create an added obstacle for curbside loading/unloading. However, due to the modular nature of the curbs, adjustments can be made as needed to create accessible parking and loading spaces.
- Provide some flexibility for installation on flat curves. On sharper curves, there is increased risk of maintenance vehicles catching the edge and dislodging the curbs because the gap between curbs on the outside of the curve is increased.
- Some jurisdictions include pre-cast concrete bullnoses with the precast curbs that provide a more robust end at the upstream end of a line of curbs.
- Flex-posts are commonly installed atop the curbs as well as hazard markers at the upstream ends to increase visibility of the curbs and help delineate the curbs for traffic, parking vehicles, and maintenance vehicles. In winter climates, consideration should be given to using coloured flex-posts to delineate the curb lines so that they are easily noticed by snow-clearing vehicles.

Relative Cost

- Moderate cost technique to implement a cycling facility; however, cost can be dependent on availability and location relative to suppliers.

Relative Durability

- Durable treatment and can typically withstand minor strikes from vehicles without being dislodged or significantly damaged.

Level of Protection

- Provide a medium degree of protection.
- Provide increased safety and comfort for users as there is a constant vertical separator from traffic.

Aesthetics

- Tend to be perceived as less temporary than modular plastic curbs and, although they are not aesthetically pleasing, they stand out less and blend into the streetscape.
- Curbs that become dislodged negatively affect the aesthetics of the site.

Installation Considerations

- Relatively easy to install, adjust, and/or remove as they do not require a significant amount of time or resources. They do, however, require some machinery to install, such as a flatbed truck with a crane arm to lift and lower the curbs into place.
- Installation is completed by placing the curb in the desired location, marking and drilling holes into the pavement through the curb's anchor holes, and hammering dowels into the pre-drilled pavement.

Maintenance Considerations

- Durable treatment and can withstand minor strikes from vehicles; however, it is possible for them to become dislodged and require reinstallation. Due to the size and weight of the curbs, heavy machinery is necessary to reinstall the curbs.
- It is recommended that municipalities keep a small stockpile of curbs to be able to replace damaged curbs.
- Sand, gravel, leaves, etc. can build up along the curbs and may require additional street cleaning effort.

Drainage Considerations

- Typically designed with drainage slots such that water can pass through underneath the curbs.
- Strategically placed gaps between curb segments are an additional technique that can be applied to ensure that drainage patterns are not impeded.

Extruded Curbs

Level of Protection	Medium-High
Capital Cost	$$$ ($1-2M/km)
Maintenance Cost	Low
Durability	High
Ease of Implementation	Hard
Pros	Physical protection Customizable width Suitable for higher speed roadways
Cons	Limits curbside access Requires gaps to accommodate stormwater drainage High cost

Table 8 - Extruded Curbs Design Considerations

Figure 38 – Extruded curb protected bi-directional bicycle lanes

Description

- Extruded curbs are like pre-cast curbs, except they are cast-in-place rather than pre-cast.
- Share many similarities to pre-cast concrete curbs.
- Vary in width from 0.4-0.6 m.

Applicability

- Are acceptable on higher volume and higher speed roadways because they are one of the more durable options and provide physical protection from traffic.
- May be used with uni-directional or bi-directional bicycle lanes.

Design Considerations

- Hazard markers should be placed at the upstream ends to increase visibility of the curbs and to help delineate the curbs for traffic, vehicle parking, and maintenance vehicles. In winter climates, consideration should be given to using coloured (as opposed to white) flex-posts to delineate the curb lines so that they are easily noticed by snow-clearing vehicles.
- Because they provide continuous separation, they have implications to accessibility and curbside access as they may introduce a potential tripping hazard and create an added obstacle for curbside loading/unloading.
- These curbs are not adjustable, so care needs to be taken at the design stage to ensure accessibility needs are met.
- Provide flexibility for installation on curves.

Relative Cost

- One of the higher-cost techniques to implement a cycling facility; however, maintenance costs are less than that of the modular plastic curbs and pre-cast concrete curbs because of the added durability.

Relative Durability

- Durable treatment and can withstand strikes from vehicles without being significantly damaged.

Level of Protection

- Provide a medium-high degree of protection .
- Provide increased safety and comfort for users as there is a constant vertical separator from traffic.

Aesthetics

- Do not provide an aesthetic improvement because they look like a typical curb or narrow median and as a result they blend into the streetscape.

Installation Considerations

- The installation of an extruded curb barrier requires a higher level of effort than pre-cast curbs as they are installed using specialized machinery.
- Specialized curbing machines may be used to install the extruded curbs to remove the need to construct forms for the concrete. This can significantly increase the speed of installation.

Maintenance Considerations

- Sand, gravel, leaves, etc. can build up along the curbs and may require additional street cleaning effort.

Drainage Considerations

- Extruded curbs have implications to drainage and are not adjustable, so care needs to be taken at the design stage to ensure drainage is accommodated. It is important to have a thorough understanding of drainage patterns prior to design and implementation of extruded curbs.
- Strategically placed gaps between curb segments are the recommended method to ensure that drainage patterns are not impeded.

Concrete Barriers

Level of Protection	High
Capital Cost	$$ ($500k-$1M/km)
Maintenance Cost	Medium
Durability	High
Ease of Implementation	Medium
Pros	Enhanced physical protection Not fixed to the roadway surface Provides opportunity for public art Suitable for higher speed roadways
Cons	Reduces the effective width of the bike lane Significant impact to curbside access High cost

Table 9 - Concrete Barrier Design Considerations

Figure 39 – Concrete barrier protected bicycle lanes

Description

- Concrete barriers can be used to create a continuous vertical separation, with gaps provided as necessary.
- Concrete barriers come in various sizes. Low-height barriers are typically 0.46 m high and 0.46 m wide at the base. Standard height concrete barriers are either 0.69 m high and 0.56 m wide at the base, or 0.81ms high and 0.61 m wide at the base.
- Barriers are connected using a hook and eye system.

Applicability

- Most suitable on high speed and high-volume roadways with infrequent intersections and driveways.
- May be used with uni-directional or bi-directional bicycle lanes.

Design Considerations

- Hazard markers are recommended at the upstream ends of the barriers. Reflective taping is recommended at intervals along the barriers to increase awareness and visibility of the barriers.
- Consideration should be given to installing end treatments or crash cushions to mitigate the risk of head-on collisions with the end of the barrier.
- The barriers have implications to curbside access as they block pedestrians and curbside loading/unloading. However, since they are precast segments, adjustments can be made to provide gaps as needed.
- Designers should be aware that due to the height of the barrier, the effective width of the bicycle lane will be reduced since they introduce a pedal strike hazard.

Relative Cost

- A moderate cost technique to implement a cycling facility, but with some low to moderate maintenance costs.

Relative Durability

- Very robust and durable.

Level of Protection

- Provide a high level of protection for cyclists as strikes from vehicles typically do not cause significant damage to the curbs.

Aesthetics

- Concrete barriers generally do not provide aesthetic value; however, they provide opportunity for public art when painted.

Installation Considerations

- The barriers do not get fixed to the roadway. As a result, installation and adjustment is straightforward, but heavy machinery is required for installation due to the weight of the barriers.

Maintenance Considerations

- Sand, gravel, leaves, etc. can build up along the curbs and may require additional street cleaning effort.

Drainage Considerations

- Consideration needs to be given for stormwater drainage unless the barrier is designed to allow water to pass through channels in the base of the barrier. If drainage channels are not present, gaps should be left between the barriers across from existing catch basins such that existing drainage patterns are not impeded.

Hybrid Solutions

In many cases, a roadway selected for a rapid implementation cycling facility may have differing characteristics, opportunities, and constraints along the corridor. In these cases, it may be advantageous to use a combination of treatments and materials. For example, planters may be advantageous to enhance the streetscape in specific areas along a corridor where people congregate, along urban parks, or along sidewalk patios, but aren't the preferred separation technique elsewhere.

Figure 40 shows another example: extruded curbs may be the preferred treatment for the corridor, but there may be segments that require additional considerations for emergency vehicles, truck turning movements, or access for events or seasonal activities. This may necessitate the use of mountable modular plastic curbs or removable flex-posts in these segments.

Figure 40 – Hybrid solution with extruded curbs, flexible delineator posts, and concrete barriers to provide a bi-directional protected bicycle lane (Beach Avenue, Vancouver)

Treatment Summary

Table 10 summarizes the rapid implementation protected bicycle lane treatments discussed throughout this section (**Table 10** is a combination of **Tables 3 to 9**). This table compares the treatments relative to one another on a 5-point scale in terms of level of protection, durability, maintenance cost, and ease of implementation to guide decision making in different contexts. Capital cost compares both the relative costs of rapid implementation treatments ($ - $$$) as well as the cost of traditional implementation, which is typically far more expensive ($$$$).

	Flexible Delineator Posts	Modular Plastic Curbs	Parking Protected Bicycle Lanes (Delivered by Shifting Lane Markings)	Planter Boxes	Pre-cast Concrete Curbs	Extruded Curbs	Concrete Barriers
Level of Protection	Low	Low	Medium-Low	Medium	Medium	Medium-High	High
Capital Cost *	$	$$	$	$$	$$	$$$	$$
Maintenance Cost	Medium	Medium	Low	High	Medium	Low	Medium
Durability	Low	Medium	Medium	Medium	High	High	High
Ease of Implementation	Easy	Easy	Easy	Medium	Medium	Hard	Medium

* Capital Cost: $ = ›$500k/km, $$ = $500k-$1M/km, $$$ = $1-2M/km, $$$$ = ›$2M/km

Table 10 – Protected Bicycle Lane Rapid Implementation Treatments – Relative Rankings

Neighbourhood Bikeways

Neighbourhood bikeways are streets with low traffic volumes and speeds that are comfortable for people cycling to share the road with motor vehicles. Signage, pavement markings, and intersection treatments are used to enhance these facilities and provide wayfinding. The B.C. Active Transportation Design Guide outlines the context – including motor vehicle speeds and volumes – where neighbourhood bikeways are applicable. To achieve the desired thresholds for traffic volumes and speeds, design interventions such as traffic calming and diversion are often needed. Examples of these include:

- Traffic diversion features (volume reduction)
  - Full road closures
  - Conversion to one-way
  - Diagonal diverters
  - Median islands
- Traffic calming features (speed reduction)
  - Reduced speed limits
  - Speed humps or tables
  - Raised crosswalks
  - Chicanes
  - Curb extensions

These features may be used in conjunction with each other throughout a neighbourhood bikeway. The range of options for both traffic diversion and traffic calming have varying impacts and associated costs.

The application of traffic calming and diversion should be consistent with the TAC Canadian Guide to Traffic Calming – Second Edition (2017), which provides guidance for the planning, design, installation, operation, and maintenance of traffic calming measures. More details about traffic calming and diversion are provided below.

Figure 41 – Ontario Street, Vancouver

Traffic Diversion

Figure 42 – Traffic diversion along neighbourhood bikeways in New Westminster (left) and Vancouver (right)

Description

- Features involve physical barriers that restrict motor vehicle access while allowing people walking and cycling to travel through.
- Features can be installed using a variety of materials such as traffic barricades, flexible delineator posts, planters, rigid bollards, and concrete barriers.
- Features are typically installed following a study of neighbourhood travel patterns to ensure other streets are not overly burdened by traffic being redirected.
- There are a variety of diversion techniques to reduce traffic volumes, such as full road closures, diagonal diverters, conversion to one-way, and median islands.
  - Full closures are when a segment of a street is completely closed off to traffic. These are generally in areas where houses do not front the street and/or no accesses are present on the street segment.
  - Diagonal diverters typically stretch diagonally across an intersection, restricting through traffic and creating two ninety degree turns for traffic.
  - Conversion to one-way involves restricting through motor vehicle travel for one direction of traffic while allowing the other direction to pass through. This can be for entire street lengths or just at small segments as necessary to reduce traffic volumes.
  - Median islands are used at intersections along a neighbourhood bikeway to restrict through traffic crossing an intersection as well as left turns onto the major street. The median island may also act as a refuge for cyclists and pedestrians travelling through on the neighbourhood bikeway.

Applicability

- Traffic diversion features are a tool to use along neighbourhood bikeways to reduce traffic volumes while encouraging active transportation along the corridor. They are typically used when daily traffic volumes exceed 1,000 vehicles per day.
- Careful consideration needs to be given to neighbourhood traffic patterns and access requirements to ensure that a traffic diversion does not cause significant traffic problems on adjacent streets or impede access to properties.

Design Considerations

- Traffic diversion requires vertical features to provide clear guidance to traffic and impede traffic from passing through and, as such, consideration needs to be given to ensuring the visibility of the diversion at all times of day.
- When considering diagonal diverters, care should be given to ensuring that the resulting turning movements are passable by two-way traffic .
- It is important to consult with emergency services, waste management, and other departments to ensure that services can still be provided. In some cases, the diversion may need to be designed such that emergency vehicles can drive through if needed.

Relative Cost

- The cost of traffic diversion features varies with the materials used. The materials commonly used are those that are discussed above.

Relative Durability

- The durability of traffic diversion features varies with the materials used. The materials commonly used are those that are discussed above.

Level of Protection

- Generally, the more robust the material used to create the diversion, the higher the level of protection for active transportation users. Neighbourhood bikeways are shared facilities, but the use of diversion features can have a significant impact on traffic volumes and create a safer, more comfortable environment for pedestrians and cyclists.

Figure 43 – Traffic diversion with bikeshare station in Toronto

Aesthetics

- Traffic diversion features provide opportunity for neighbourhood placemaking using planters, public art, etc. within the road space that is blocked off by the diversion. However, in pilot situations, depending on the materials used, the installation may be viewed as temporary and aesthetically unpleasant.

Installation Considerations

- The installation considerations are dependent on the materials used and will be like those discussed above.

Maintenance Considerations

- Maintenance operations should be consulted with prior to installation to provide opportunity to plan for new routes, snow-clearing techniques, etc. and mitigate potential maintenance issues or damages post-installation.

Drainage Considerations

- Consideration needs to be given for stormwater drainage to ensure that existing drainage patterns are not impeded.

Figure 44 – Concrete barriers, flex post, and signage used to divert motor vehicle traffic along W 17th St, Vancouver

Traffic Calming

Figure 45 – Traffic calming examples in Portland (left) and City of North Vancouver (right)

Description

- Traffic calming features range from speed limit signage to vertical and/or horizontal deflection in order to reduce traffic speeds and volumes.
- Common traffic calming features include speed humps, speed tables, raised crosswalks, chicanes, and curb extensions. These may be used in conjunction along a corridor.
- These features typically do not impede vehicle access along a corridor, but instead limit speeds and thereby deter traffic from using the streets over long distances.
- Vertical deflections such as speed humps, speed tables, and raised crosswalks are commonly installed using asphalt pavement. Horizontal deflections such as curb extensions and chicanes may be installed using cast-in-place curbs, flexible delineator posts, modular plastic curbs, pre-cast curbs, or concrete barriers. The City of Calgary has developed a design for Temporary Traffic Calming Curbs, which are pre-cast traffic calming curbs that are larger and have curved sides to help create the radius of a curb extension.

Applicability

- Features are typically used on streets with traffic volumes exceeding 1,000 vehicles per day and vehicle speeds of 30 km/h or greater.
- Features may be considered more desirable to area residents as they do not impede through travel of vehicles and do not require re-routing of vehicles but discourage cut-through traffic and high speeds along the corridor.
- Speed humps and speed tables are commonly used on streets with long straight stretches that allow vehicles to get up to high speeds.

- Raised crosswalks are commonly used at pedestrian crossings that have high volumes of pedestrians such that they indicate priority to the pedestrian and vehicles are required to slow down to traverse the crosswalk.
- Curb extensions can be placed at intersections to reduce pedestrian crossing distances, improve vehicle delineation, and slow vehicles by narrowing the roadway as the approach the intersection. They may also be placed at mid-block locations to narrow the roadway and slow vehicles.
- Chicanes are generally located at mid-block locations to narrow the road and create a lateral shift for traffic, thereby slowing vehicles down as the approach and traverse the chicane.

Design Considerations

- Designers need to consider the vehicles that are required to traverse the street, such as transit buses. For example, speed tables are more commonly used on transit streets rather than speed humps as speed humps can be difficult for a bus to traverse.
- Raised crosswalks are generally considered a more permanent feature as they may require accommodations for street drainage, such as new catch basins.
- Chicanes and curb extensions may be installed using modular plastic curbs, pre-cast curbs, concrete barriers, or flex-posts. In these instances attention needs to be given to ensure the materials are visible to motorists and cyclists at all times of day using hazard markers and/or reflective tape.
- Curb extensions installed using temporary materials need to consider the accessibility implications as the existing curb ramp will be set back from the crossing location. Generally, if sightlines are maintained to the curb ramp, the setback is not an issue.

Relative Cost

- The cost of traffic calming features varies by treatment. Signage is very low cost; speed humps can have a moderate cost and varies based on municipality; and chicanes, curb extensions, and raised crosswalks can be a more moderate cost depending on the drainage implications and materials used.

Relative Durability

- The durability of the traffic calming feature will depend on the material used.
- Speed tables, speed humps, and raised crosswalks are all highly durable as they are typically installed with asphalt pavement.
- If curb units or concrete barriers are used to create chicanes or curb extensions, the durability will be dependent on the material used.

Level of Protection

- Since neighbourhood bikeways have cyclists sharing the road with vehicles, there is no physical protection from vehicles. However, speed reductions and volume reductions reduce the risk and severity of a collision.

Aesthetics

- Traffic calming features generally have little impact on aesthetics. However, the use of flex-posts, modular curbs, and/or barriers, may give the appearance of a temporary installation and be considered aesthetically unpleasant.

Installation Considerations

- The installation considerations are dependent on the materials used and will be like those discussed above.

Maintenance Considerations

- Speed humps, speed tables, raised crosswalks, and signage generally do not require a significant amount of ongoing maintenance, but the use of modular curbs, barriers, or flex-posts for chicanes and curb extensions may require maintenance if the materials become dislodged or damaged.

Drainage Considerations

- Consideration needs to be given for stormwater drainage to ensure that existing drainage patterns are not impeded.

Activation and Beautification

In addition to the treatments and materials described above, rapid implementation projects present unique and exciting opportunities for activation and beautification of the street. Examples include decorative paint, furniture, patios and parklets, and other creative elements, as described in the section below. These elements can make projects more vibrant and inviting to diverse community members and can be developed while working with community members and other partners to create more support and ownership for the project. For more information on adding low-cost activation and beautification elements, see TransLink's Tactical Urbanism Toolkit.

Decorative Paint

When combined with other materials, decorative paint is a low-cost way to make projects more engaging. Painting the pavement surface within the bicycle lane or painting the barrier treatments are both ways to draw some attention to and enhance the cycling facility as well as the streetscape. Decorative paint can be designed and installed while working with local First Nations and local partners such as schools, community organizations, artists, and/or business groups.

Key Considerations

Universal design needs to be considered, such as selecting colours and designs that are safe for people with visual impairments and are not confused for regulatory pavement markings. Another consideration is the type of paint and its impact on the texture of the resulting surface. If decorative paint is used, it is important to have a plan to either clean up and remove these projects when they begin to wear, or to have a maintenance plan in place to ensure your project remains visible and vibrant over time.

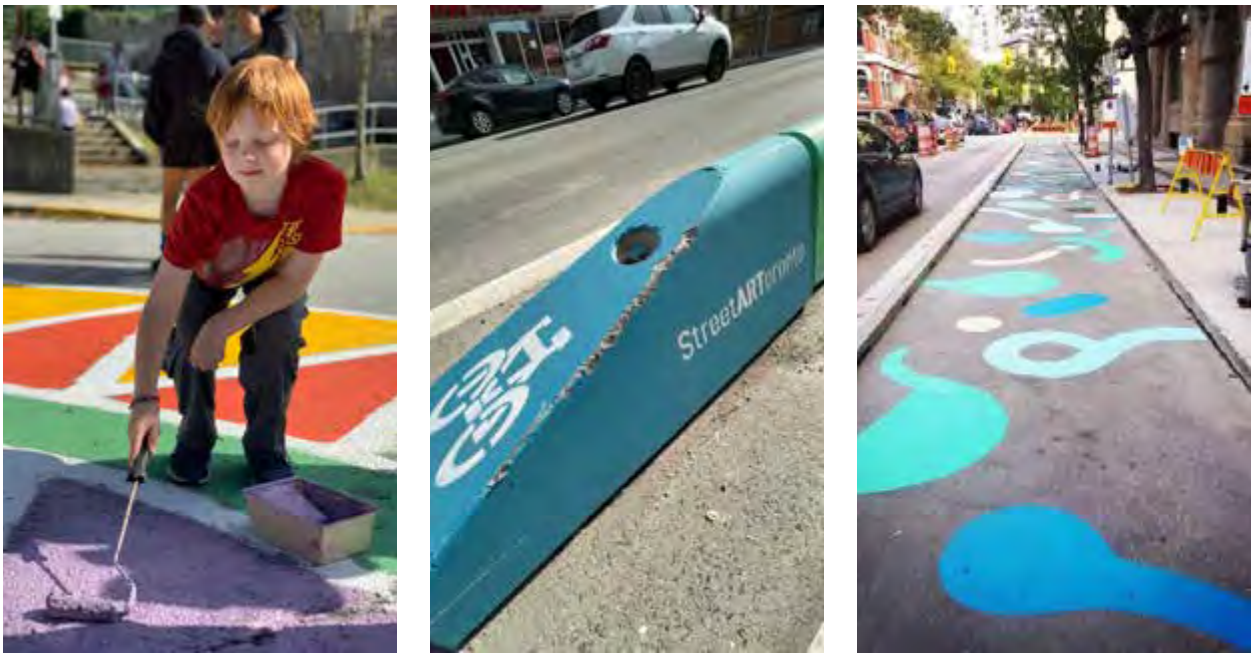


Figure 46 – Examples of beautification projects in the District of North Vancouver (left), Toronto (middle), and Winnipeg (right)

Furniture

Installing street furniture as part of the cycling project is another way to enliven public spaces by providing seating and resting spaces. Examples include benches, picnic tables, concrete boxes, and shipping pallets. Umbrellas can also be used to provide shade and protection from the rain but need to be properly anchored in place.

Figure 47 – Plaza seating, planters, and other furniture along bikeways in New Westminster (left) and Vancouver (right)

Patios and Parklets

Patios and parklets can also be incorporated into rapid implementation projects to increase vibrancy and encourage people to interact and linger. Patios are associated with specific businesses while parklets are intended to be public spaces for multiple uses. A continuous barrier can be created between motor vehicles and patios and parklets using traffic cones, construction markers, flexible delineator posts, fencing, or other materials. Fixed or heavier traffic control devices such as concrete barriers or flexible bollards should be considered to reduce maintenance requirements.

The City of Vancouver has several neighbourhood plazas spread throughout the City that were built using rapid implementation and tactical urbanism approaches to creating public space. The intent is to transform underutilized spaces into spaces for people using incremental design upgrades. Many of these plazas are located along local street bikeways and are integrated with the bicycle facility and act to divert motor vehicle volumes. Dedicated spaces are provided for through-moving cyclists to avoid mixing with people sitting and socializing on benches and picnic tables. Public bike share stands, bike racks, planters, and public art are frequently included in these spaces.

Examples of Activation and Beautification

Figure 48 – East Hastings Street and Kamloops St, Vancouver

Figure 49 – Main Street and East 14th Avenue, Vancouver

Figure 50 – Cambie Street and West 17th Avenue, Vancouver

Section 6: Summary

Ontario Street, Vancouver

Next Steps for Rapid Implementation

As outlined in the previous sections, rapid implementation projects can take many shapes and forms. They are designed to last, but also to adapt as needed. These projects can evolve over time as feedback is received, usage patterns change, or budgets increase to a point where a more permanent facility is desired. The section below provides a summary of final reporting, transitioning to a more permanent facility, and funding mechanisms.

Final Reporting

Once the rapid implementation project is fully implemented, a final report should be produced. This can include an overview of the project, lessons learned, and key outcomes. Data collected during the monitoring and evaluation phase can be highlighted in the report, including user counts, observations, injury and collision data, and community feedback from surveys, pop-up events, and social media feedback . If the project is successful, the report can help make the case for permanently adopting the changes and developing more rapid implementation projects at other sites.

Developing interim and final reports increases transparency and can help gain support from stakeholders for future projects. In 2017, the City of Edmonton developed 7.8 km of protected bike lanes, shared roadways, and paths through a rapid implementation process. The City produced a report documenting the background, goals, and outcomes of the rapid implementation network. This includes cycle trips, gender equity, cyclist-related reported injures, user experiences and safety information collected from surveys, social media impressions, emails, and phone calls. The report notes that the ongoing monitoring and feedback will be used to ensure the Downtown Bike Network, as well as other existing and planned routes in the City, continues to improve and provide a positive cycling experience.

Figure 51 – City of Edmonton - Downtown Bike Network Interim Report (2017)

Permanent Design and Costing

Although rapid implementation projects can last years, there may be a desire to make the project more permanent if it proves successful and gains the support of the public and elected officials. The permanent detailed design will build on the final reporting and lessons learned through the rapid implementation project.

Once a local government agency decides to transform a rapid implementation design into a permanent project, detailed design and capital planning processes should begin. This involves the creation of a detailed design that considers key factors such as:

- Stormwater management
- Lighting
- Underground utilities
- Curbside activities and amenities (bike parking, public seating, accessibility improvements, etc.)
- Landscaping
- Scheduled roadway improvements and sidewalk upgrades

This phase of work also involves costing out the permanent design, identifying funding sources for construction, and building this into the capital planning budget. Pairing the project with utility, servicing, or roadway upgrades is an effective way of creating a more cost-effective project.

Figure 52 – Arbutus Street, Vancouver

The Agnes Greenway project in New Westminster (see Case Study in Section 3) is one example of a local rapid implementation project that was installed, monitored, and adjusted before a final design was created. The permanent design included several changes, as outlined in **Table 11.** These changes were communicated to residents on the project website, helping people see how their input impacted the final design. Construction on the permanent Agnes Greenway facility began in Summer 2022.

What We Heard	What We Did
Survey respondents preferred a design that would close off Blackwood Street at Agnes Street and add additional landscaping.	Blackwood Street will be closed off at Agnes Street. This will provide additional space for public amenities including seating, a water fountain, and a dog parklet.
A top theme from the survey feedback was "Prioritize Safety." We also heard suggestions for crosswalk improvements at Blackwood Street. Additionally, we heard a desire for more permanent barriers.	In addition to the numerous safety features that have been introduced in the temporary greenway, a raised crosswalk will be added across Agnes Street at Blackwood Street. The permanent greenway will also include permanent medians to replace the flexible delineators used in the temporary installation.
Vehicle flow was one of the top three design priorities heard in round one of public engagement.	There are no changes to traffic flow from the current configuration on Agnes Street.
Street trees and landscaping were identified as one of the top priorities. Participants in round two of engagement also said "more greenery, more scenery" was a desired design feature.	A rain garden will be added at the north curb extension opposite Blackwood Street, and a stormwater tree trench feature will be added between Fourth and Sixth streets that will reduce impacts on our sewer network.
Pedestrian comfort was one of participants' top three design priorities, including a desire for more benches.	The final design includes seating, bike racks and other furnishings.

Table 11 - Agnes Greenway: How User Impact Shaped the Permanent Design (Source: City of New Westminster)

Available Funding

Having the detailed design and project costs identified enables communities to seek additional implementation funding where necessary to support the transition to permanent design. There are several funding sources available to local government agencies for active transportation projects, as outlined in **Table 12**. Each of these funds has distinct criteria, but in general they all provide opportunities for rapid implementation projects if they meet the requirements.

Source	Fund	Description
TransLink	**Municipal Funding Program**	Cost-sharing programs with local government agencies that fund cycling infrastructure across Metro Vancouver, including specific funding towards rapid-implementation cycling projects.
Province of British Columbia	Active Transportation Infrastructure Grant Program	Funding for municipalities, Indigenous governments, and regional districts to complete network plans and develop infrastructure.
Infrastructure Canada	Active Transportation Fund and Canada Community-Building Fund	Funding for municipalities, provinces, Indigenous governments, and non-profits to plan and develop infrastructure.
Federation of Canadian Municipalities	Green Municipal Fund	Funding for municipalities to develop sustainable transportation infrastructure and other green infrastructure.

Table 12 - Available Funding Sources for Bikeway Implementation

Summary

This design guide began with a focus on the need to take action: **we need to act with urgency, and rapid implementation helps make this happen.** With so many critical issues facing our communities, there is no time to waste in implementing proven solutions such as cycling networks that are Comfortable for Most. Implementing active transportation facilities is just one of the many actions required to meet key climate targets, create resilient communities, and improve social equity. However, by applying rapid implementation approaches, cycling networks can be installed quickly and efficiently, and with strong public buy-in, making them an important tool for local governments interested in making rapid improvements to their communities.

This guide provided a high-level overview of rapid implementation elements, guiding principles, and planning and design considerations, along with a snapshot of various treatments and materials. It is important to always apply sound professional judgement that considers the unique context of each project – there is no one-size-fits-all solution to the design of active transportation facilities. There is ample room for design flexibility in this design guide. Design professionals should adhere to other established guidelines and standards and apply sound judgement, with the safety and comfort of all users of paramount importance.

Rapid implementation provides the opportunity to experiment with new designs for cycling and then allow the community to test out the facilities in real life. The designs will not always be perfect; however, by using adjustable materials and closely monitoring and evaluating the design, the rapid implementation facility can be adjusted based on user feedback and even made permanent if desired. This approach therefore encourages innovation and community engagement – ultimately, it can result in a design that better meets the needs of the community.

Use this guide to make rapid, positive changes that will encourage safe and comfortable active transportation facilities – and while you are at it, create fun, vibrant communities!

Figure 53 – Beach Avenue, Vancouver

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