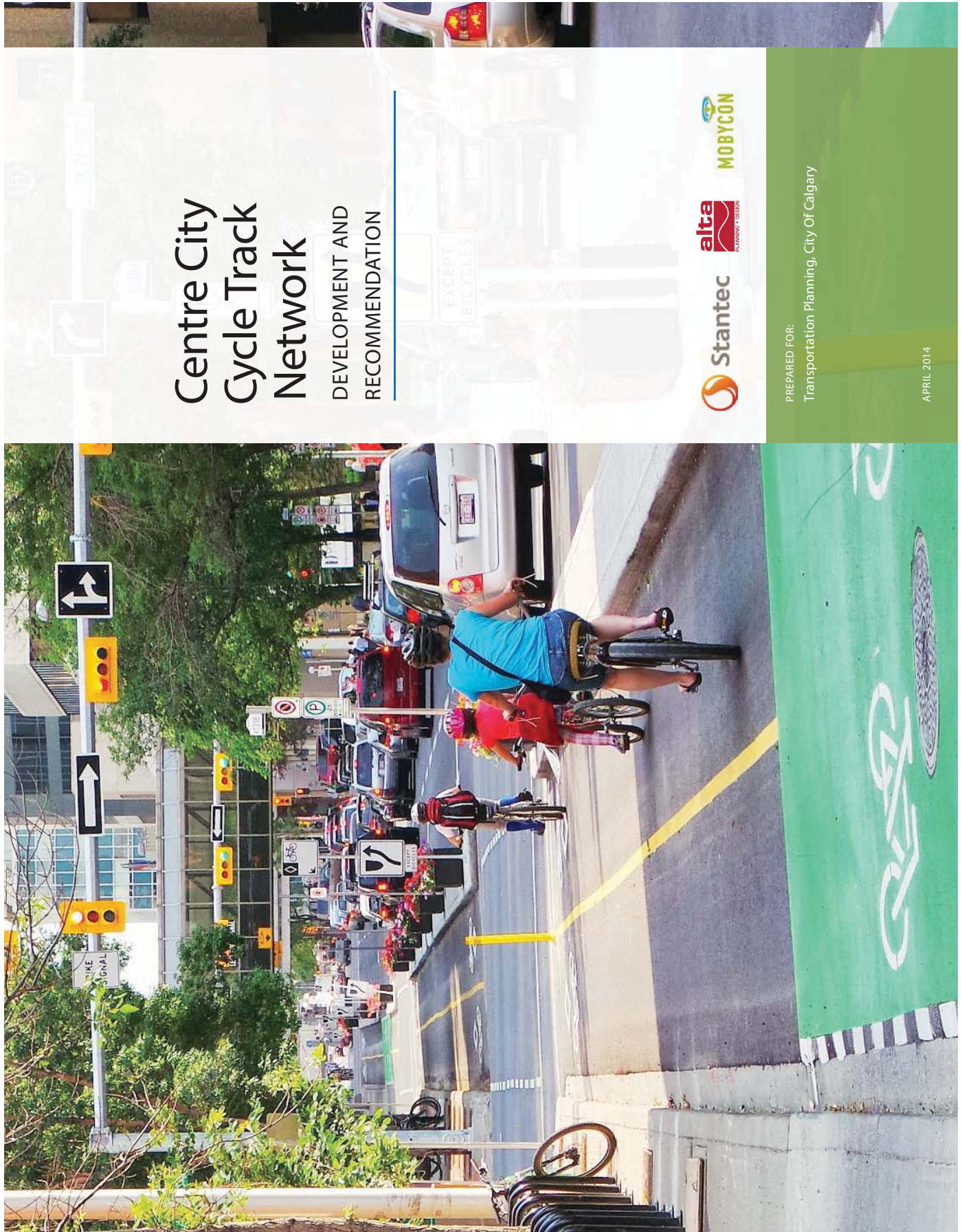




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1.0 Introduction

This report focuses on the identification and delivery of a cycle track network for Calgary's Centre City. The identification of this network was by Calgary's City Council. It is in line with Calgary Transportation Plan and the goals of the Calgary Cycling Strategy, which targets the development of 30 kilometres of cycle tracks by 2020. Presently, the 7 Street SW cycle track, the first in the Centre City, contributes 700 metres towards that target.

The proposed network aims to serve all residents and travelers within the Centre City area through the creation of a safe and effective cycle track network. The report contains details on the identification of key bicycling demographics, the mapping of their demand, and the cycle tracks proposed to serve this demand.



Figure 1-1: Calgary Cycle Track

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2.0 Bicycling Concepts

Around the world, cities that have developed bicycle infrastructure and support programs have seen an increase in the numbers of people bicycling.¹ There are many reasons for communities to promote such a shift; bicycling offers an alternative to the car that can reduce emissions, mitigate congestion and promote physical activity. Bike-friendly cities gain economic advantages, including increased retail activity and a reputation for “livability” that can be a major draw for mobile workers. These benefits are summarized on the right under “Why Bicycling?”

In the past decade, Central Business Districts (CBDs) and other dense urban neighbourhoods have been focal points for bicycle investment—namely, bike-sharing programs and traffic-protected bikeways, or as they are more commonly known, “cycle tracks”. The cycle track provides a dedicated facility for bicycle riders to allow for safe travel on a direct route, even in areas of greater density and traffic congestion.

2.1 Bicycling In Calgary

The City of Calgary envisions itself becoming a North American bicycling leader. To achieve this vision, the Calgary Cycling Strategy (2011) has set goals to get more people bicycling, to make bicycling safer and to increase satisfaction with bicycling in Calgary. These objectives direct support of the goals of the Calgary Transportation Plan (2009), including mitigation of congestion, facilitation of goods movement, reduction of pollution and GHG emissions, and achievement of mode split targets.

Like other cities in Canada and the United States, Calgary plans to focus on bicycle development in its Centre City. The Centre City is an area of Calgary comprised of its Central Business District and the Beltline (a higher-density residential community), encompassing attractions ranging from the Calgary Stampede Grounds to post-secondary institutions. Creating a cycle track network in the Centre City will leverage the high population and employment densities in the area to increase the bicycling mode share

Why Bicycling?

1. More bicycling means **less driving** which means less congestion and GHG emissions.
2. Bicycling helps governments and individuals **reduce transportation costs**.
3. Bicycling is **good for business**—people on bicycles spend more per trip than motorists.
4. **Workers prefer** bicycle-friendly cities.
5. Bicycling **encourages walking** and transit trips.
6. Bicycling is **efficient** in dense, crowded downtown environments.
7. Bicycling **supports** Calgary’s City-Wide goals.
8. Bicycles and bicycle networks are **resilient** to natural hazards (e.g. floods).
9. Bicycling **reduces the need** for costly road improvements and motor vehicle parking facilities.

For details and references, see Appendix A: Why Cycle Tracks?

¹ Pucher, Buehler and Seinen, 2011. Bicycling Renaissance in North America? An update and re-appraisal of policies and trends. Transportation Research Part A, Vol 45:6

2.3 Cycle Tracks In Calgary

The 7 Street SW Cycle Track is the only component of the Centre City Cycle Track Network completed to date. The cycle track, seen in Figure 2-2, is a two-way facility located on the east side of 7 Street SW, a southbound one-way road. The cycle track runs from the Bow River, where it connects with the Peace Bridge and Bow River pathway, to 8 Avenue S.

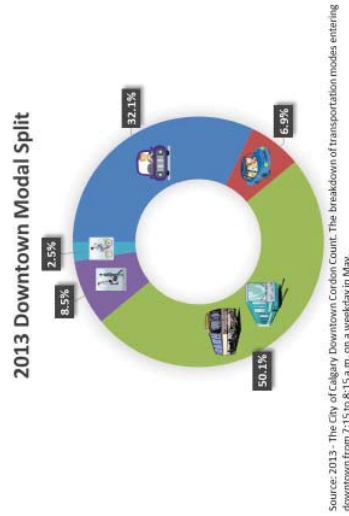


Figure 2-1: 2013 Downtown Modal Split

Why a Cycle Track Network?

1. Cycle tracks draw the “Interested but Concerned” demographic **more effectively** than bike lanes or shared routes.
2. Cycle tracks have a **better safety record** than bike lanes or shared routes.
3. Cycle tracks provide **more direct routes** than off-street pathways.
4. Linking cycle tracks together **creates a “grid”** of route alternatives for bicycle riders.
5. Providing wide coverage in the Centre City **maximizes accessibility** to destinations.
6. Cycle tracks **clarify street operations**, improving predictability, comfort and safety for all street users, including motorists.
7. Cycle tracks **reduce sidewalk riding**, which improves safety and comfort for pedestrians and improves the retail environment

For details and references, see Appendix A: Why Cycle Tracks?

by enhancing the safety and attractiveness of bicycling.

As Figure 2-1 shows, approximately 2.5 percent of trips entering downtown currently occur by bicycle, compared to 50 percent by transit, 39 percent by car, and 8.5 percent on foot. A Centre City cycle track network would create safe and direct bicycle routes to, from, and within downtown, enabling Calgarians to use the bicycle as a transportation option for a wide range of trips.

2.2 What Is A Cycle Track?

Cycle tracks are attractive to a wide range of existing and potential bike riders.² By separating people on bikes from people walking and driving, cycle tracks offer a higher level of comfort than bike lanes or paths shared with pedestrians. Although cycle tracks are mostly separated from vehicle traffic, conflicts with motor vehicles can still occur at intersections, bus stops, and driveways. Care must be taken to design intersections and driveway access points in a way that highlights the presence of people riding bicycles and minimizes conflict in these crossing areas.

² University of British Columbia, 2012. Cycling in Cities. Preferred Route Types.



Figure 2-2: The 7 Street SW Cycle Track

The 7 Street SW Cycle Track piloted a number of innovative design elements that will be featured in the future cycle track network. These included bicycle signaling, green conflict paint, and concrete barriers. The facility is highly popular and it is now the busiest on-street bicycle route in Calgary, averaging more than 1,160 bicycle trips daily in the summer season, as seen in Figure 2-3, an increase of 330 percent in four months. Moreover, the facility has improved the pedestrian realm, with the number of people on bikes using the sidewalks dropping from 25% to fewer than 1%, as shown in Figure 2-4.

As 7 Street SW shows, a single cycle track can be a major draw for people bicycling.³ However, the effectiveness of a bicycle facility is limited by the places and people it links to. An isolated facility is unlikely to take riders from their origins to their destinations. A bicycle network, on the other hand, enables a much wider range of connections. Like a roadway grid, a more robust bicycle network means access to more destinations through enhanced area coverage. Building more links between bicycle facilities generates new route alternatives, with each additional bicycle link increasing the number of potential route options. The result is that people who choose bicycling have a better chance of being able to make a safe, continuous trip from origin to destination. It is these conditions that foster increased participation in bicycling city-wide.

³ Research has shown that people on bikes are willing to detour up to 400 metres to access a safe and comfortable route. Winters and Teschke, 2010. Built environment influences on healthy transportation choices. Journal of Urban Health, 87.

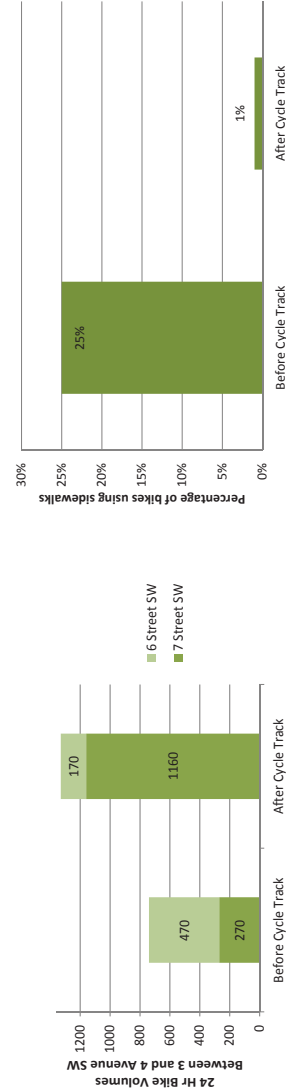


Figure 2-3: Daily Bicycle Trips on 6 and 7 Street SW (2012/2013)

Figure 2-4: Percentage of Bicycle Users using the Sidewalk on 7 Street SW (2012/2013)

CENTRE CITY CYCLE TRACK NETWORK DEVELOPMENT AND RECOMMENDATION

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3.0 A bicycle network designed for all ages, all abilities, all trip purposes

As illustrated in Figure 3-1, the majority of Calgarians are interested in bicycling more but are not comfortable sharing the road with motor vehicles. Evidence from New York, Montreal, Vancouver, Portland, and Washington DC suggests that safe, separated facilities that appeal to the widest range of users are the most effective way to increase participation in bicycling.⁴ Cycle tracks in Calgary's Centre City will respond to the latent demand for bicycling by offering facilities that serve users of all ages, abilities, and trip purposes.

People ride bicycles for a wide variety of reasons. Many ride to work or school while others do so for recreational purposes. The purpose of a bicycle trip affects the distance people are willing to travel and is linked with the demographics of the bicycle rider. Typically, people riding a bicycle are willing to ride approximately 7.5km, or 30 minutes, for a commuting trip and approximately 20 minutes for other trip types.

Given the variety of people riding bicycles and trip types, it is useful to consider the idea of "design rider" archetypes. These archetypes represent the qualities of key groups of riders and the characteristics of the trip that they are taking such as: average and maximum speed, route choice, trip distance and travel purpose. This information gives facility designers an understanding of where cycle tracks should be constructed and what they might look like. The archetypes are discussed on the next page.

4 Alta Planning + Design, June 2013. Cycle Tracks Lessons Learned.

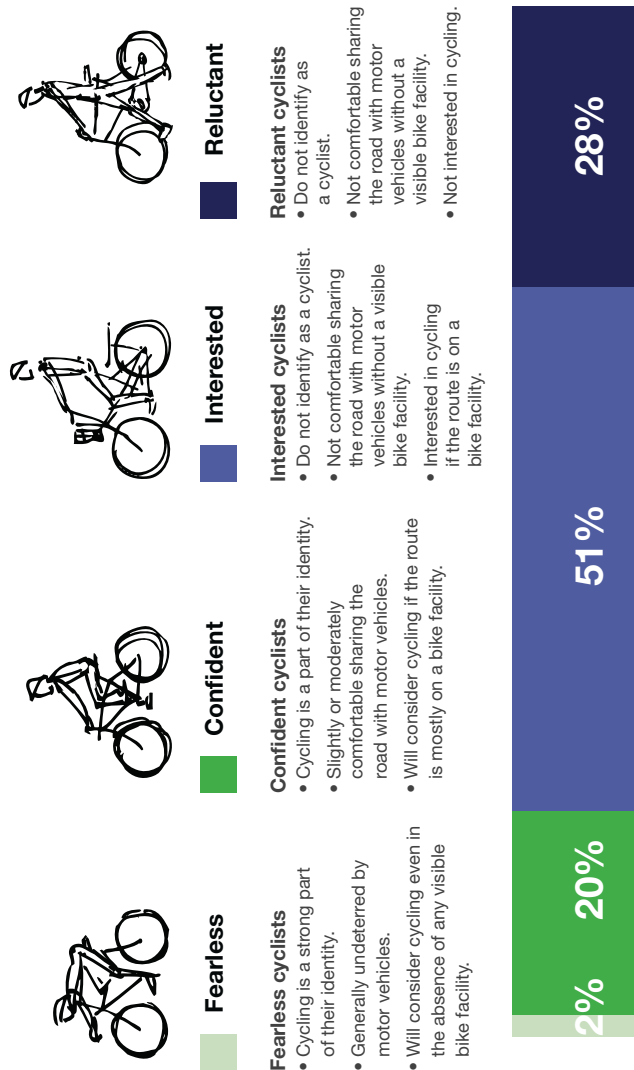


Figure 3-1: Calgary Bicycle Preferences

3.1 Bicycle Commuter

Commuting to work by bicycle is a common trip purpose. Presently, given the small number of dedicated facilities downtown and the volume of competing motor vehicle traffic during peak hours, those who do commute by bicycle are typically higher-confidence riders who are comfortable following direct vehicle routes into the Centre City. Future cycle track facilities must appeal to a broader range of potential commuters, providing those with low experience and confidence an opportunity to commute by bicycle.



Figure 3-2: 7 Street SW Cycle Track Bicycle Commuters

3.2 Social and Recreational Rider

The recreational bicycle rider is one who bikes for personal enjoyment, and may be of any age, skill or fitness level. Social and recreational trips generally take place outside of peak hours—during evenings, weekends, or the lunch hour—and tend to rely upon separated facilities (whether off-street pathways, on-street cycle tracks, or quiet residential streets).

Some social and recreational users of bicycles are relatively well-served by the existing pathways system, since these facilities offer safe off-street routes through scenic areas. Families and visitors are two examples of groups who tend to stick to the off-street path network. Connecting

these existing routes, such as the Bow River Pathway, with a network of cycle tracks would help draw this user group into the Centre City, expanding opportunities for economically-productive tourism and family trips.

A small sub-group of social and recreational riders are fitness users, who often ride in groups and are as likely to travel on-road as they are to use off-street pathways. These individuals value safety as well as speed and directness—needs that are more in line with bicycle commuters than with social and recreational pathway users. A cycle track network enhances these users access to Centre City destinations, inviting them to re-fuel downtown at restaurants, bars, and retail shops.



Figure 3-3: 7 Street SW Cycle Track Social Riders

CENTRE CITY CYCLE TRACK NETWORK DEVELOPMENT AND RECOMMENDATION

3.3 Errand Runner

A currently underserved Bicycling archetype is that of the errand runner. These trips are associated with day-to-day activities (e.g. accessing shops and services and visiting friends and relatives) and cover a wide spectrum of purposes. These trips take place largely outside of peak hours, involve a wide demographic, and are mostly internal within neighbourhoods, involving less than ten minutes of travel. In order to best serve these trips, the cycle track network must link major employment sites, residential districts, shops, and services within and immediately adjacent to the study area. This group would also be particularly inclined to use a cycle track network downtown if a Public Bike Share system were in place.



Figure 3-4: 7 Street SW Cycle Track Errand Runners

3.4 Student

Post-Secondary

Like the commuter, many of the trips taken by post-secondary students occur during or near peak hours, coinciding with motor vehicle traffic. However, this archetype has a greater need for evening travel, due to night classes, studying, social activities and part-time work. Post-secondary students will make longer-distance trips, similar to a bicycle commuter, but also share many of the errand runner's need for bikeways that facilitate short internal trips within neighbourhoods. In the Calgary Centre City, activity for this archetype is concentrated around the University of Calgary downtown campus and Bow Valley College. These destinations are both located north of 9 Avenue S.

Primary/Secondary

Students attending their local schools typically make much shorter trips – closer to 20 minutes than 30 – and are younger, possessing a lower level of confidence while still competing with the same peak vehicular traffic. Similar to the errand runner, this archetype is focused on intra-neighbourhood trips and is best served on quieter streets given the lower confidence levels of school students. Although this trip will not be very common in the downtown area, the Beltline has nine schools and the bicycle network accommodate their needs.

Centre City Cycle Track Network Development and Network Bridging Project Report

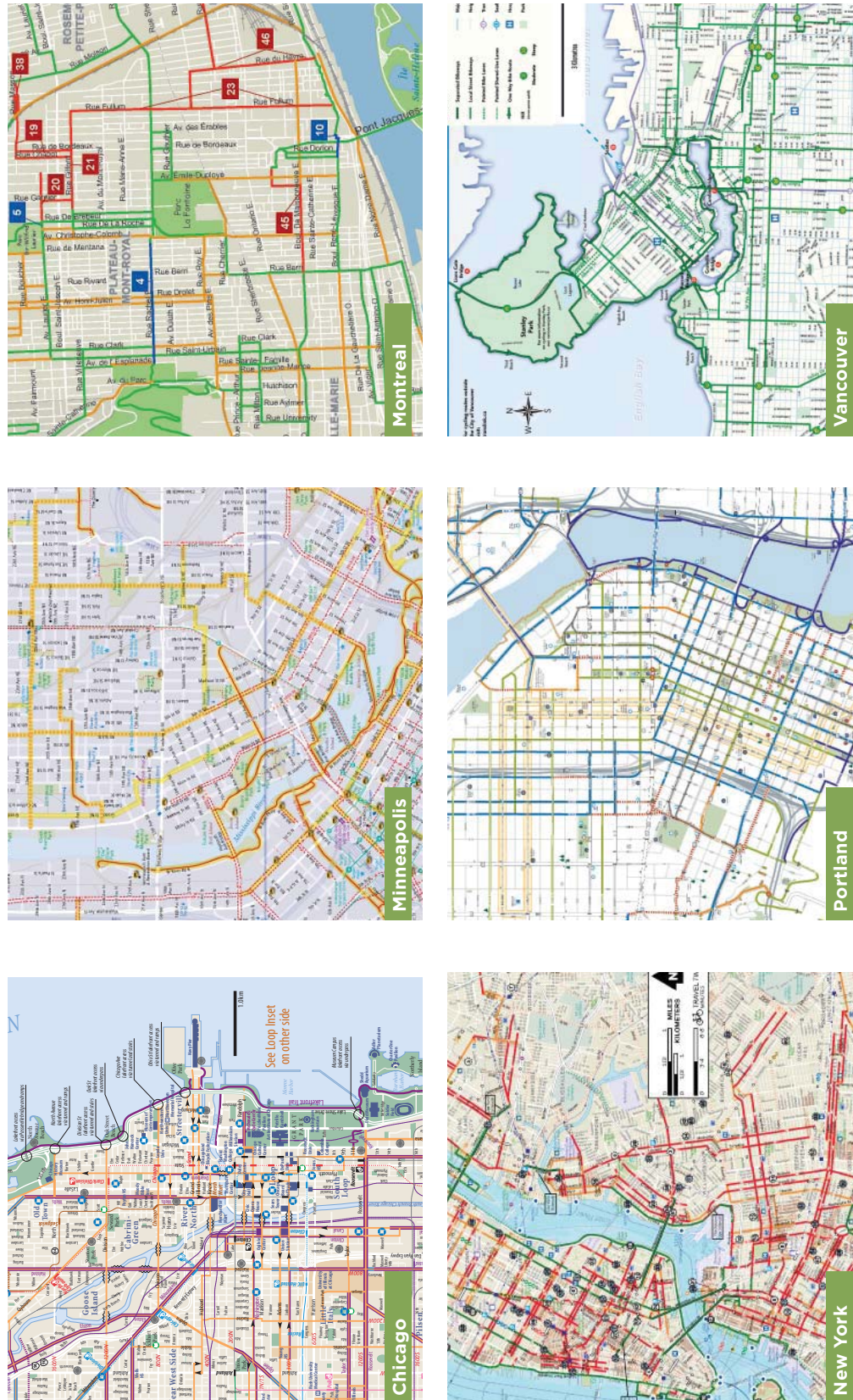


Figure 4-1: Other Downtown Bike Networks

CENTRE CITY CYCLE TRACK NETWORK DEVELOPMENT AND RECOMMENDATION

4.0 Cycle Track Network Planning

The development of a cycle track network for the Calgary Centre City involves the use of processes to identify existing demand and future bicycle growth, explore route and facility options, and deliver a plan capable of meeting future demand. Best Practices and Lessons Learned were drawn from other cities' experience with bike networks, as seen in Figure 4-1 on the next page, and were employed to better execute the development process.

The area of study for the development of the cycle track network is the Centre City, an area consisting of the Downtown and Beltline neighborhoods. Throughout the design process, consideration was given to areas outside of the study area to allow for proper connections to be made, but the emphasis was on cycle tracks in the Centre City.

A number of corridors, or groupings of streets, were identified for the study area based on the idea that a single cycle track within the corridor would be able to appropriately serve the demand for that specific area. For each corridor, a number of potential cycle track alignments

were identified. These alignments were based on current best practices in North American bicycle planning and design, understanding of the local context, and feedback received during the ongoing engagement.

These cycle track alignments (combining a street selection and facility layout) were then evaluated based on a set of technical criteria including connections to key destinations, existing and future bicycle demand, impact on other modes, conflicts at driveways and transit stops, and cost and constructability. In combination with stakeholder feedback and further observations, this analysis enabled the selection of a proposed alignment for each corridor. Not all corridors were chosen for a cycle track if evaluation criteria were not met. These corridors may be re-evaluated once the proposed 5-year network is in place and key objectives are met (e.g. ridership warranting further expansion of the network).

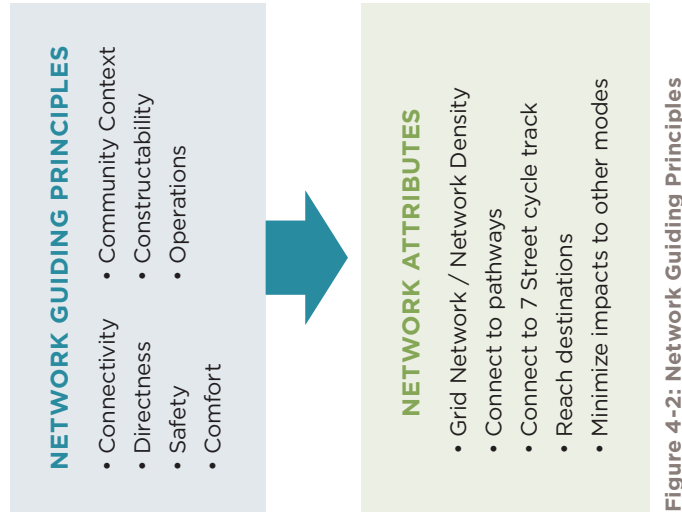


Figure 4-2: Network Guiding Principles

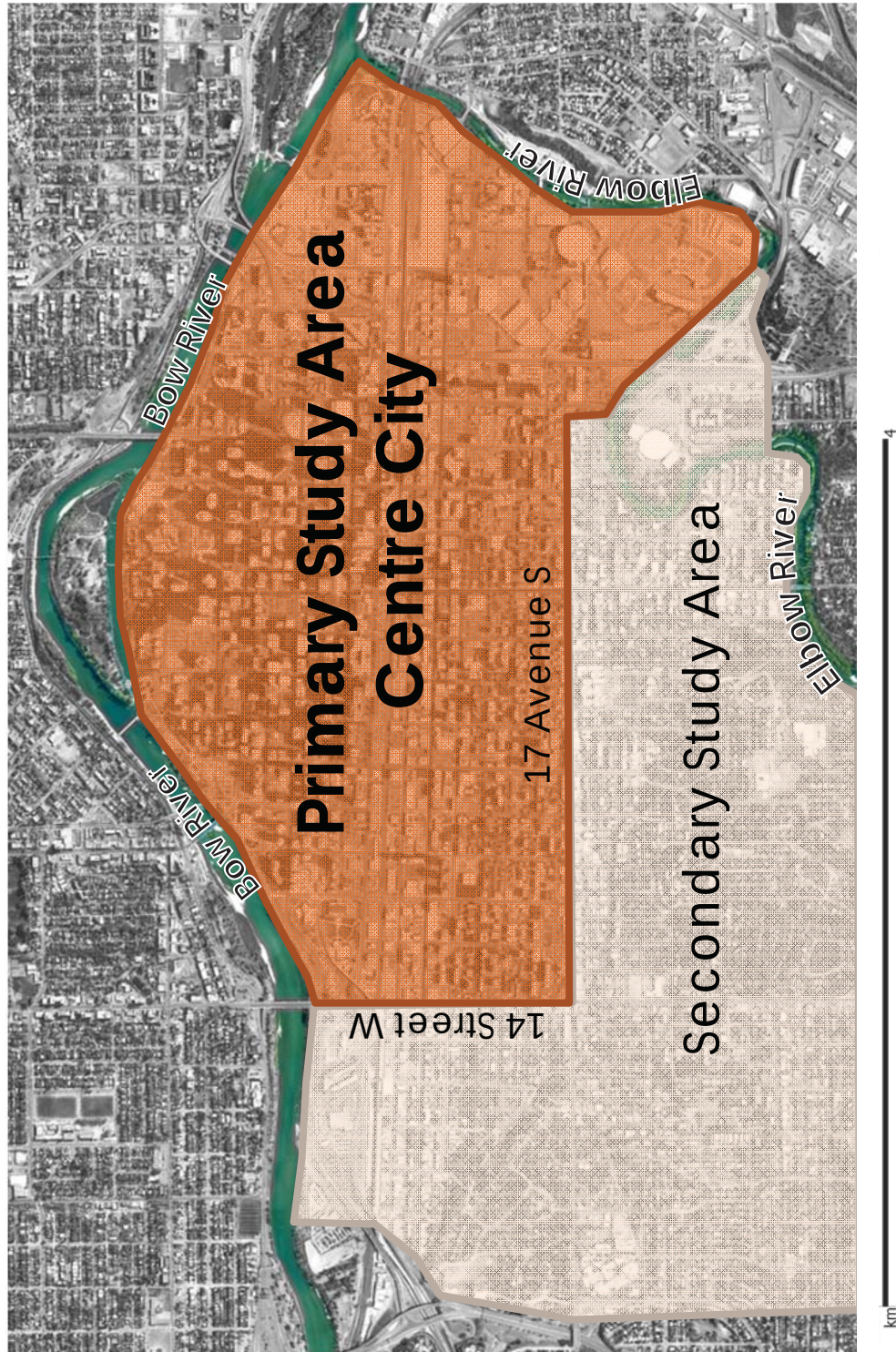


Figure 4-3: Centre City Study Area

CENTRE CITY CYCLE TRACK NETWORK DEVELOPMENT AND RECOMMENDATION

4.1 Network Guiding Principles

Guiding Principles are an important part of the network development process. They establish the priorities of the design team and guide the development of the process itself. Carefully selected principles enable the product of the development process to meet the expectations and desires of various stakeholders. Principles for the project were selected based on a review of relevant literature, meetings with stakeholders, and extensive work between the project team and the City of Calgary. The Guiding Principles are detailed below and in Figure 4-2.

Safety

This principle has five elements: avoiding conflict with crossing traffic, separating vehicle types, reducing speed at points of conflict, allowing for recognizable road categories, and creating uniform traffic situations. Safety for all road users including pedestrians, bicyclists, and drivers is considered. Promoting safety increases the attractiveness of the network and makes it more universally accessible to riders of all skill levels.

Comfort

Comfort is linked to safety and considers both potential conflicts and user perceptions. An option may be safe, but if it is not perceived as comfortable it is less likely to achieve its ridership potential. Emphasizing comfort encourages the creation of an accessible and attractive network, increasing potential ridership.

Directness

This refers to directness in terms of time and distance. By providing as direct a route as possible, with minimal delays, turns, and chokepoints, the attractiveness of the network is increased, encouraging use of the network and bicycling in general.

Connectivity

Connectivity refers to the continuity of the route or trip and the extent to which people riding bicycles can reach their destination without encountering barriers or gaps in the network. By providing as many connections as possible to surrounding bicycle facilities and key destinations, more people can get to where they want to go by way of a bicycle facility. People travelling by bike desire to access the same destinations as people using other transportation modes. The likelihood of future trips being taken by bicycle greatly increases when bicycle riders are able to reach their preferred destinations on the network.

Community Context

This principle ensures each proposed facility is compatible with the texture and nature of its host neighbourhood and enjoys the support of that neighbourhood's residents. The City strives to attain the support of all residents and has a better chance of doing so by emphasizing community context.

Constructability

This principle reflects practical considerations including capital costs, the time required for construction, and the impact of construction on the surrounding area. While sufficient resources would render any design 'constructible', requiring that each component meets constructability standards controls the cost of the network and allows for more facilities to be built within the available resources.

Operations

The operations principle concerns itself with the impact of the cycle tracks on other modes of transportation. Ultimately, the network seeks to improve transportation in the Centre City. By minimizing the impact on other modes of transportation, the network will provide more options for travelers and residents in the city, while preserving the quality of existing transportation options.

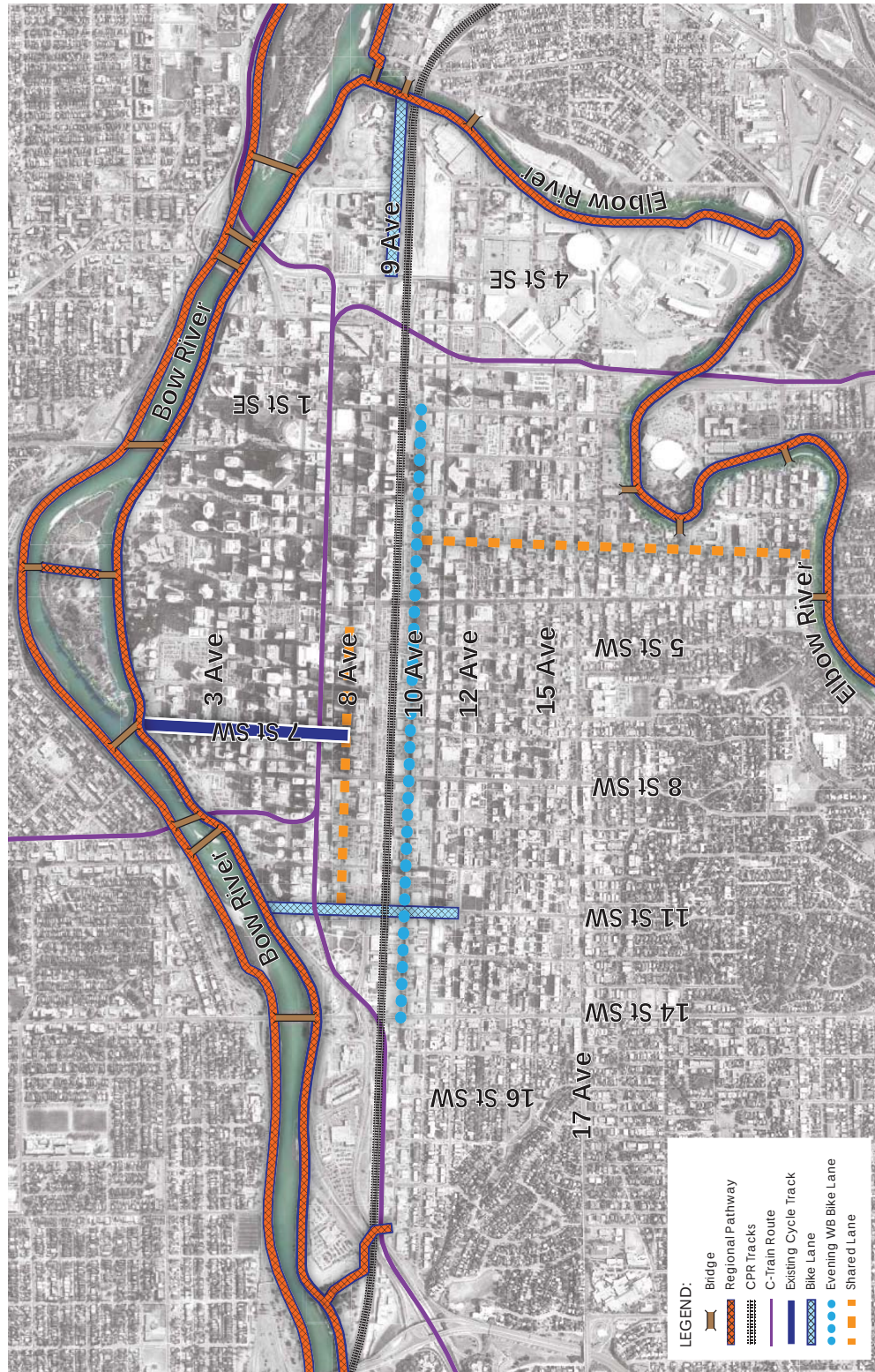


Figure 4-4: Existing Centre City Bicycle Network

CENTRE CITY CYCLE TRACK NETWORK DEVELOPMENT AND RECOMMENDATION

4.2 Network Area

The study area for development of the Centre City cycle track network is divided into secondary and primary study areas. These areas are depicted in Figure 4-3.

The primary study area consists of the Downtown and Beltline neighbourhoods. The area is bordered to the north by the Bow River, to the east by the Elbow River, to the south by the Elbow River and 17 Avenue SW, and to the west by 14 Street SW. The area contains important residential and commercial densities in the Beltline, with the major employment centre of Downtown providing a draw from the rest of the city. Outside of working hours, destinations such as the Saddledome, Calgary Stampede, and Glenbow Museum attract a flow of people through the area. Existing bicycle infrastructure in the area includes the 7 Street SW cycle track, a bike lane on 11 Street SW, and a west-bound peak-hour bike lane on 10 Avenue S. Key regional pathways along the Bow and Elbow Rivers circumscribe the perimeter.

As seen in Figure 4-4, these facilities provide excellent peripheral connections to the rest of the city, but fail to penetrate either the residential communities of the Beltline or the employment centres of downtown. Network development is focused on the primary study area and the emphasis will be on enabling cycle traffic within the area, either for bicycle riders moving to destinations in the Centre City or just passing through. It will be important to enable passage across the CPR rail tracks, which are a significant barrier to bicycle travel.

The secondary study area is located to the south and west of the primary study area, stretching to 19 Street SW to the west and 25 Avenue S to the south. It includes lower-density inner-city neighbourhoods such as Scarboro, Sunalta, and Mount Royal. Network development here will emphasize enabling travel through the area, allowing travelers to reach key destinations within the Centre City.

Bicycle improvements beyond the project's study area will be detailed in the update to the 2000 Pathway and Bikeway Plan, underway in 2014.

4.3 Corridor Identification

The corridor concept is based on the idea that adjacent, parallel streets are capable of serving the same users. Therefore, when planning a bicycle facility, the most suitable street in a corridor can be selected with the expectation that the facility will attract and serve bicycle riders previously spread across other streets in the same area. Similarly, when projecting future ridership with desire lines, demand spread over several individual streets of a single corridor can be assigned to the single facility on one street with that corridor.

In any corridor, movement can be a combination of travelers going to work, school, or on a recreational trip. While each corridor has a different balance, often leaning more towards one use than the other, each is intended to serve all users. Taken together, the collection of corridors enables all trip types within the Centre City area.

To form a corridor, each street had to meet a number of key criteria that would enable success for any potential cycle track facility. Initially, all streets in the Centre City were included in the assessment until criteria narrowed them down into a list of eligible streets. The criteria for north and south roads were different from east and west roads.

For roads running north and south, the 'streets' of the Centre City area, it was important they connected the entire study area. Because of this, it was required that each road cross the rail tracks. This constraint eliminated streets such as 10 Street SW, 9 Street SW, 7 Street SW, 6 Street SW, 2 Street SW, and 3 Street SE. In the case of 3 Street SW, public demand for that street overrode this requirement. The north-south corridors are illustrated in Figure 4-5.

For the east and west roads, the 'avenues' of the Centre City, a similar set of criteria existed. For the avenues, it was required that they stretch across the entire study area. The shorter lengths of 2 Avenue S, 3 Avenue S, and 16 Avenue S were eliminated as they were either cut-off partially across the study area, or too short to begin with. 7 Avenue S was eliminated due to the safety concerns with the existing transit ROW, while 13 Avenue S already has a greenway. 14 Avenue S, located along an almost entirely residential set of land-uses, was removed due to its lack of destinations. 15 Avenue S would be eligible for elimination based on these criteria but was retained due to its proximity to 17 Avenue SW. The resulting east-west corridors are depicted in Figure 4-6.

CENTRE CITY CYCLE TRACK NETWORK DEVELOPMENT AND RECOMMENDATION

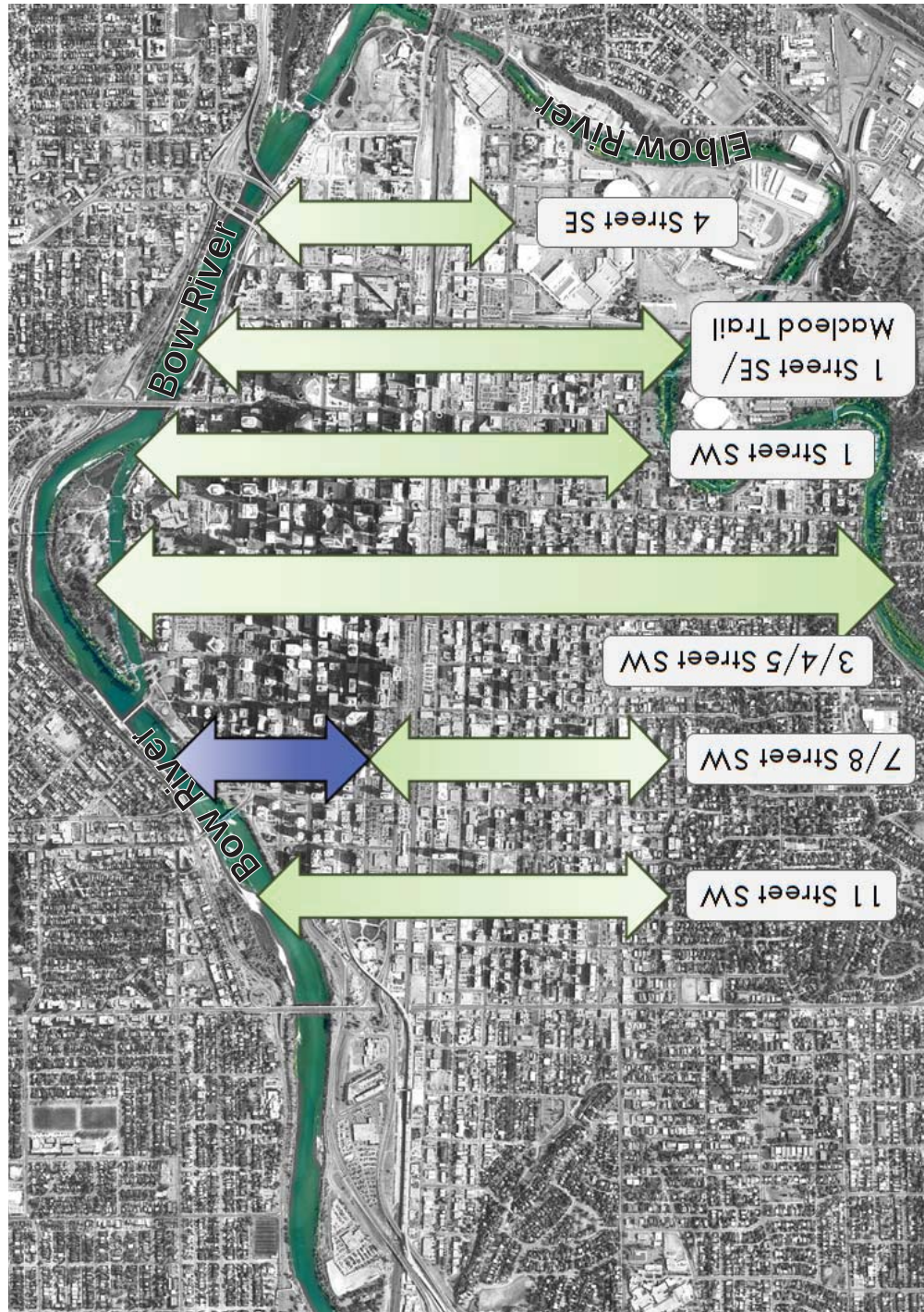


Figure 4-5: North-South Corridors

CENTRE CITY CYCLE TRACK NETWORK DEVELOPMENT AND RECOMMENDATION

4.3.1 North-South Corridors

- **4 Street SE** is a shorter corridor with connections to the Bow River in the north and the Stampede grounds in the south. There are few destinations located along the road presently, but future development of the East Village area will increase the number of potential users living and working in close proximity. In addition, the 4 Street SE underpass is newer than other rail crossings and offers dedicated bicycle facilities.
- **1 Street SE/Macleod Trail** is a long corridor, stretching the length of the study area from the Bow River to the Elbow River. This corridor feeds the downtown core and the low number of traffic signals is a boon for bikes, providing a quick route into downtown. The two streets of the corridor form a one-way couplet and a number of different options for cycle tracks are evident along these routes.
- **1 Street SW** is a centrally located corridor connected to a railroad underpass. The corridor connects central downtown to the Beltline and a growing commercial area along the southern part of 1 Street SW. Bicycle traffic would likely not be able to complete its entire north-south journey on this corridor due to the termination of the road at 17 Avenue SW, but it would still benefit from its railroad underpass.
- **3/4/5 Street SW** stretches the length of the study area in a central location. Downtown's office core is connected to the commercial areas of the 17 Avenue SW and 4 Street SW Business Redevelopment Zones (BRZs) by

this corridor and numerous bicycle riders would be attracted by these destinations. Furthermore, connections to the Bow River and Elbow River pathways are made available by this corridor, enabling access to the Centre City for users from farther afield.

- **7/8 Street SW** already includes a cycle track on 7 Street SW. However, while it does connect to the Bow River pathway and Peace Bridge, this corridor does not presently cross the rail tracks. In the future, an extension of this facility south along 8 Street SW could do so.
- **11 Street SW** is the westernmost corridor in the Centre City and exists to serve the need for travel in the western areas. The rail crossing is at grade and could pose some difficulties during design. Presently, 11 Street SW hosts a bike lane from 6 Avenue S to 15 Avenue S.

4.3.2 East-West Corridors

- **4/5/6 Avenue S** is a busy corridor located in the central Downtown area. All three streets are one-way for vehicle traffic, with major connections to bridges at both ends of 4 Avenue S and the east end of 5 Avenue S. Additionally, the east end of 6 Avenue S becomes Bow Trail, a major connector to downtown. These avenues are important for vehicle traffic and could play an equally important role for bicycle traffic. The roads are convenient due to their central location and connections to the river pathways at either end of downtown.

- **8/9 Avenue S** is a unique corridor due to the inclusion of Stephen Avenue. This area is a major pedestrian mall during the day and is certainly capable of attracting people on bicycles. However, how this facility would operate needs to be explored. 9 Avenue S operates as a one-way eastbound road for most of downtown, switching to two-way operation east of 3 Street SE. Motor vehicle volumes and driveway conflicts are relatively high on 9 Avenue S.
- **10/11/12 Avenue S** is a key Beltline travel corridor, with a one-way couplet on 11 Avenue S and 12 Avenue S. Presently, 10 Avenue S hosts a heavily used 3:30-6:00 PM weekday one-way, westbound bike lane, demonstrating the demand for travel in this area. Like the corridors north of the railway, this corridor benefits from the fact that it stretches across the entirety of the study area, connecting the Sunalta LRT station in the west to the Elbow River pathway in the east.
- **15/17 Avenue S** includes the busy commercial corridor of 17 Avenue S. The number of destinations located along 17 Avenue S means that a bicycle facility in the vicinity would be attractive; unfortunately, vehicle traffic and curbside parking demand in the area are heavy for the same reason.

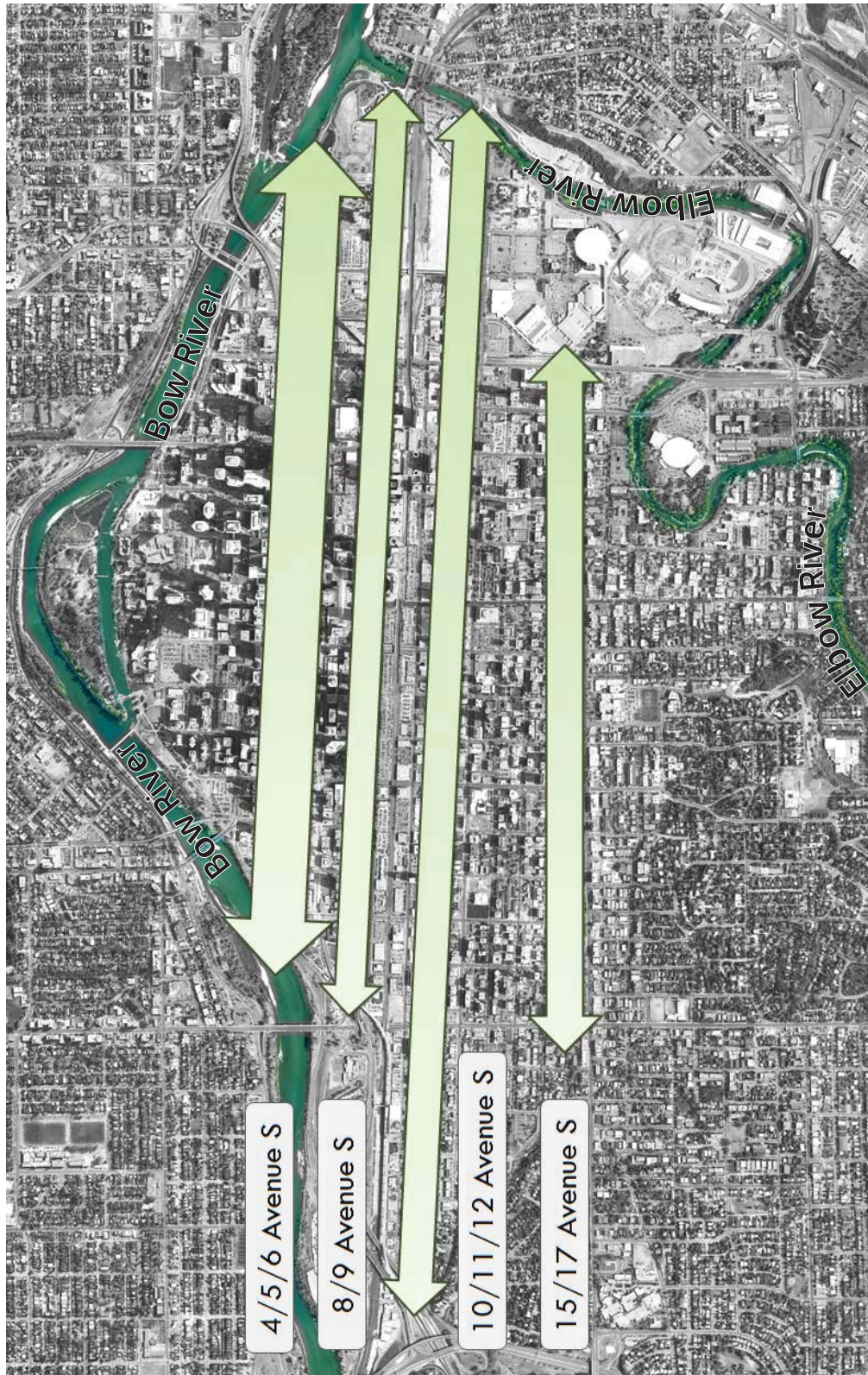


Figure 4-6: East-West Corridors

CENTRE CITY CYCLE TRACK NETWORK DEVELOPMENT AND RECOMMENDATION

4.3.3 Desire Lines

The key to supporting bicycle user demand is to build facilities that serve the trips that people take. To do this, demand is identified by mapping bicycle riders' origins and destinations. The origins and destinations are the same for bicycle users as they are for all other travelers in the city. Once these locations are identified on a map, 'desire lines' are drawn between them, which shows the crow's path bicycling routes. Once the desire lines are weighted by their relative level of demand, the need for various bicycling routes in the Centre City becomes more apparent. For the Centre City, the origins and destinations were 13 'market zones' in a 7.5 kilometre radius from the centre of the study area. These market areas have roughly equal population and are within bike range of the Centre City. Based on the City of Calgary's data, Figure 4-7 was drawn to depict the movement of all modes of traffic within these market zones.

Based on these desire lines, key needs for transportation can be inferred and drawn onto a map. This is seen in Figure 4-8, an abstract characterization of user demand. These levels of demand can be associated with the corridors identified above to determine an approximation of their overall importance.

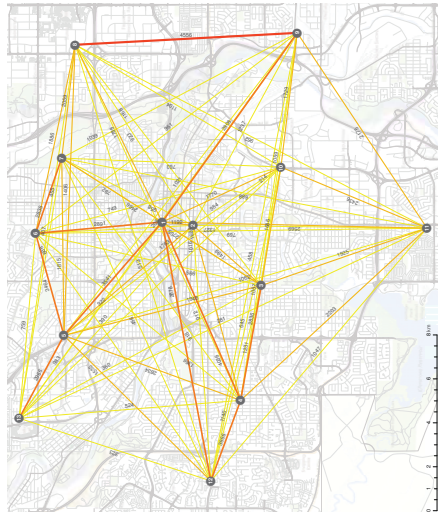


Figure 4-7: Centre City Desire Lines



Figure 4-8: As the Crow Flies Recommended Regional Routes

4.3.4 Network Density

To create a direct, connected network of cycle tracks that allows access to a broad range of origins and destinations, network density, or the proximity of parallel routes, is important to consider. Network density can be calculated as the average distance between parallel north-south and east-west bicycle routes. Setting a standard network density allows planners to determine the number and location of routes required to serve a given area. A properly selected network density allows the cycle track network to provide efficient network coverage while avoiding redundant routes.

The Dutch CROW manual provides guidance on network density standards. The manual recommends a network density of approximately 250 metres in city centres.⁵ Although it does not specify particular route types, its related design guidance presupposes a network of cycle tracks in a centre city context. A number of provincial, regional and local agencies in North America have now begun to develop network density standards to support improved bicycle network design for cities. These standards concur with CROW's recommendations for city centres while introducing coarser-grained standards for suburban areas. TransLink, Metro Vancouver's Regional Transportation Authority, recommends establishing a network of bicycling routes throughout the region with a density that varies depending on land use context. In urban centres and areas of higher bicycling potential, TransLink recommends a fine-grained network

⁵ CROW. 2007. Design manual for bicycle traffic. Centre for Research and Contract Standardization in Civil and Traffic Engineering.

of Class 1⁶ bicycling facilities every 200 to 300 metres that are comfortable for bicycle riders of all ages and abilities.

In North America, cities with existing or planned density-based bicycling networks that are comfortable for a wide range of users include Vancouver, Montreal, New York, Minneapolis, Seattle, and San Francisco. Calgary's proposed cycle track network, described in Section 5.0, is generally consistent with the best practices of these cities, including the network density standard for city centres and the use of high-quality cycle tracks in these areas.

Although there is some variation due to block lengths, road geometry and the presence of physical barriers (e.g. railways), the proposed corridors identified in Figures 4-5 and 4-6 are spaced to a width of approximately 200 to 300 metres.

4.3.5 Initial Corridor Assessment

The first step in the route selection process was to assess suitability on the basis of roadway capacity. By comparing capacity constraints and opportunities across corridors, it was possible to identify routes and corridors that posed particular challenges while flagging corridors with excess capacity for further review.

Figure 4-9 shows the projected impact of cycle track implementation for one-way streets in the Centre City during peak hours, assuming the removal of one lane from each street and

6 For an on-street facility in a city centre context, cycle tracks are usually the only way to achieve a Class 1 or "AAA" (all ages and abilities) standard.

no change in motorist patterns. The Centre City copes well with the removal of traffic lanes, with most streets retaining excess capacity even after losing one general purpose lane. These streets are shown in green in the map, while those streets that would be nearly at capacity (but still under) are shown in yellow. Green and yellow segments are the strongest candidates for cycle track construction, as these streets have excess capacity. Red street segments, on the other hand, would be overcapacity if a travel lane were removed and would likely experience increased traffic congestion given current traffic volumes. It would be challenging to implement cycle tracks on such routes because a reduction in capacity would result in unacceptable congestion and delays. These streets are not necessarily incompatible with cycle track facilities (especially for short distances), but any facilities constructed along these segments should be paired with mitigation strategies (such as signal priority) to aid motor vehicle circulation through congestion points.

To recommend a network of cycle tracks that will benefit a broad spectrum of roadway users, this report tends to avoid recommending introduction of cycle tracks on routes that do not have excess roadway capacity, particularly if network coverage can be achieved using parallel routes and corridors.

As the central east-west Downtown corridor, 4/5/6 Avenue S is a candidate for cycle tracks in the long-term. However, the impact of a cycle track facility on traffic operations along the corridor would be challenging to mitigate at this

time, since choke points exist at key access and exit points to downtown for each route. Unlike other corridor packages (e.g. 1 Street SE and McLeod Trail), each of the component streets in the 4/5/6 Avenue S corridor have significant stretches (four blocks or more) of acute capacity constraints. Moreover, existing routes such as 8 Avenue S, 3 Avenue S and the Bow River Pathway serve a similar east-west desire line in the northern part of Downtown. For these reasons, the entire 4/5/6 Avenue S corridor was eliminated from consideration for the initial phase of cycle track construction.

9 Avenue S and McLeod Trail were also identified as challenging routes for implementation of cycle tracks in the initial phases. These streets are ill-suited for cycle track construction at present due to capacity constraints along significant stretches of each route. Unlike the 4/5/6 Avenue S Corridor, however, these streets are individual components of corridor packages. For this reason, these corridor packages are still evaluated in Section 5.0, using alternative streets such as 8 Avenue S and 1 Street SE.

Two other corridors, 4 Street SE and 11 Street SW, were considered lower priorities for cycle tracks at this time, due to their location on the periphery of the downtown area. These two north-south corridors bracket the Downtown area and have fewer connections to significant destinations. However, each of these corridors can provide important links from the proposed downtown cycle track network to adjacent neighbourhoods and the broader bicycle route network. 11 Street SW has bike lanes today from



6 Avenue S to 12 Avenue S. The Project Team thus recommends that bike lanes or other facility types be considered for implementation or expansion on each of these corridors to support implementation of the cycle track network.

4.4 Route and Facility Selection

Having identified the corridors of the Centre City, the next step in the process was to identify specific facilities that corresponded to each corridor. These options included both a specific street and facility type. Performance for each option is influenced by the route and facility design. The process involved developing combinations based on best practices, then choosing a preferred option after assessing each one.

4.4.1 Route and Facility Assessment

For each corridor, several alternative alignments were considered that featured a range of design options. These options included one-way or two-way cycle tracks, cycle tracks on opposite sides of the same street, and one-way cycle tracks split between two streets as a couplet.

To compare these scenarios with precision, a set of evaluation criteria was developed. These criteria were created to be detailed route-level applications of the broader Guiding Principles introduced in Figure 4-2. Assessing each option against the criteria resulted in a series of relative scores for each account, allowing for a comparison of the alternatives. The criteria are as follows:

- Connectivity & Ease of Use at Intersections
- Demand
- Conflicts
- Impacts on Other Modes
- Cost and Constructability

The criteria were developed based on the guiding principles with input from various stakeholders. This input is visualized in Figure 4-10, an image displaying the relative importance of various criteria to stakeholders. The metrics associated with each criterion are both quantitative and qualitative and are described in Table 4-1. The table explains how each of the criteria was measured. A rationale is also included for each criterion, explaining its relevancy.



Figure 4-10: Feedback from August and September 2013 Feedback Forms

Table 4-1: Criteria and metrics used in route and facility assessment

Criterion	Description	Metrics	Rationale
Connectivity & Ease of Use at Intersections	Does the road connect to the river pathways and reach downtown destinations and workplaces?	- Number of direct connections to other facilities - Restricted turning movements at terminus - Presence of double turn lanes	Continuity was identified as a key network guiding principle—each network component should connect directly with destinations and with other bicycle facilities. The ease with which bicycle users can navigate intersections and other turning movements is a particularly important consideration in creating a continuous, connected network.
Demand	How many people bicycle now and what is the potential in the future?	- Existing demand on potential route - Potential demand based on quantity and size of adjacent destinations	One of the main goals of the Centre City Cycle Track Network is to increase the use of bicycles for all sorts of everyday trips. Selecting routes that have high existing and future demand for bicycle travel is an important strategy in creating more bicycle trips.
Impact on Other Modes	Will pedestrians, public transit, and cars be impacted and, if so, can those impacts be minimized?	- Travel lanes lost or gained - Parking spots lost or gained - Sidewalk space lost or gained - Existing traffic volumes and delays	In the Centre City, a finite width of roadway must accommodate all modes of travel. This criterion considers the relative trade-offs involved with constructing a cycle track, including impacts to travel lanes, pedestrians, and curbside parking spaces.
Conflicts	How many intersections, driveways, alleyways, crosswalks, bus stops, and turning lanes will the cycle track cross?	- Number of driveways (major) - Number of driveways (minor) - Number of bus stops	Conflicts decrease the safety and comfort of riding along the cycle track. Consideration was given to the number and severity of crossing conflicts at alleys, lanes, driveways, loading bays, bus stops, and intersections. This process flagged routes with a high number of conflict points, with particular attention paid to severe conflict points (e.g. access points to major parking lots). Conflicts were also considered in the context of whether riders would be travelling in the same direction as motorists on the approach to the conflict point.
Cost and Constructability	Is the alignment conducive to cycle tracks in terms of traffic signal work, curb work, type of cycle track, and facility length?	- Length of cycle track - Signals requiring reconfiguration - Existing sidewalk configuration	Cost is an important factor in the implementation of this network. Elements that contributed to the cost criteria included material costs, signalization requirements (new signals or modified signals), and the overall length of the proposed cycle track. Constructability is a feasibility measure that considers opportunity costs and construction timeline. Severe constructability challenges are reflected in high material and labour costs, disruption to the neighbouring community, and trade-offs with other (potentially more cost-effective) cycle track investments.

4.4.1.1 Other Assessment

Considerations

The route and facility assessment process identified a number of options suitable for cycle track development in each corridor. Beyond that point, the initial assessment was vetted with site observations, internal and citizen feedback, and best practices in the selection and design of cycle tracks. A graphic summarizing this process is shown in Figure 4-11. Feedback from the public was collected through feedback forms and conversations at open-houses and public events. Additional feedback was collected by meeting with internal and external stakeholders such as bicycle advocacy groups, business groups, community associations, and City departments.

Team members conducted site visits around the Centre City to evaluate street conditions and validate data. Observations included the identification of congestion spots and curbside parking and analysis of roadway geometry not captured by the route and facility assessment.

Combining these elements results in a holistic recommendation for a proposed cycle track network that:

- Is consistent with the Guiding Principles

- Is technically sound from an engineering perspective
- Enjoys broad support among the public and stakeholders
- Reflects (and builds upon) best practices in other cities
- Is deeply in tune with the Calgary Centre City context

4.4.2 Facility Design Considerations

A number of basic facility design considerations help to inform the design of an identified cycle track. These considerations include operational aspects and mitigation points, seen in Table 4-2. Table 4-3 shows the various cycle track treatment options available based on the direction of travel of the motor vehicles and bicycle riders on a street.

Table 4-2: Design Alternatives at Mitigation Points

Mitigation Points	Design Alternatives
Alleys and driveways	1) Avoidance, 2) closure or 3) install high-visibility treatments
Transit stops	Passenger waiting areas 1) on sidewalk side or 2) on roadway side of cycle track
Curb bulges	1) Wrap cycle track around curb bulge or 2) construct straight through and provide a floating island for pedestrians

Table 4-3: Operational Aspects

Motor Vehicle Travel	Cycle Track Travel	Treatment options available
1 way	1 way	Cycle track couplet (Left Hand Side or Right Hand Side)
	2 way	Left Hand Side or Right Hand Side
2 way	1 way	Left Hand Side and Right Hand Side
	2 way	Not recommended

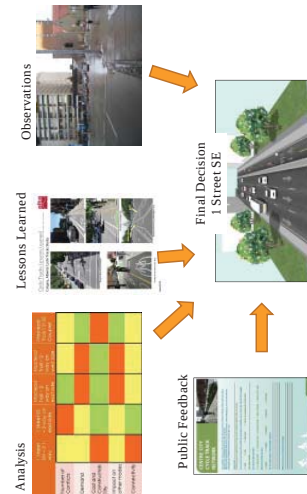


Figure 4-11: Example assessment process



Figure 4-12: An example of the intersection treatment at 7 Street SW and 8 Avenue S (looking Northwest)

Operational Aspects

One-way versus two-way.

Early North American experience in cycle track development shows no clear preference for one-way or two-way cycle tracks, with several cities (e.g. Montreal, Vancouver and New York) choosing to include both types of facilities in their cycle track network. This is consistent with the approach taken in European cities that have more mature networks such as Amsterdam. Selection is done on a per street basis, where based on the context, there may be advantages or disadvantages to each of these configurations. The general considerations are as follows:

- When there is adequate carriageway available (i.e. one traffic lane), a two-way cycle track is often feasible.
- In constrained conditions, a one-way cycle track is preferred.
- On one-way streets that are paired with a parallel one-way street flowing in the opposite direction (i.e. one-way couplets), mimicking this arrangement with two one-way cycle tracks (one per street) can be a relatively space-efficient solution that maintains the balance of motor vehicle capacity on these streets if the space is repurposed from lane widths (e.g. 3.7 metre lanes narrowed to 3.0 metre lanes). However, the couplet will sometimes result in the loss of a travel lane on both streets.

- If one side of a street has significantly better conditions for a cycle track than the other (e.g. no conflicts to mitigate), it is practical to consolidate facilities into a bi-directional cycle track on the best side of the street.

- On a two-way street, dual one-way cycle tracks are preferred to a two-way cycle track on one side. A two-way cycle track in this context requires specialized treatments to make connections across intersections, and these facilities are not preferred in North American contexts at this time. Dual one-way cycle tracks, on the other hand, facilitate simple and safe connections at intersections. Figure 4-12 shows how dual one-way cycle tracks can connect with an existing two-way facility.

Left-side versus right-side. A motorist typically expects to see a bicycle user on the right side of the street, but a bicycle rider has the right to travel in any of the available lanes and often must do so when executing a left turn.⁷ Since cycle tracks are protected from motor vehicle traffic, it is generally acceptable to place them on either side of a one-way street.⁸ Selecting between the left side and the right side of the street involves balancing motorist expectations with opportunities to enhance access and convenience for people on bicycles. The following considerations apply:

- In some circumstances, connectivity has to be balanced against potential conflicts. If destinations are disproportionately on one side of the street, both motor vehicles and bicycle riders will make most of their turns to and from that direction. Placing the cycle track on the destination-heavy side will provide maximum accessibility but will conflict with the turning movements of motor vehicles. Placing the cycle track on the opposite side of the street will reduce the accessibility of these destinations by adding a crossing, but will separate bicycle riders from the turning conflicts occurring on the opposite side of the street, improving safety.

⁷ Alberta Traffic Safety Act - Use of Highway and Rules of the Road Regulation 77(2): "A person who is operating a cycle, other than a motor cycle, on a highway shall operate the cycle as near as practicable to the right curb or edge of the roadway unless that person is in the process of making a left turn with the cycle"

⁸ As explained under Operational Aspects, dual one-way cycle tracks are preferred over bi-directional cycle tracks for two-way streets.

- If curbside motor vehicle parking is disproportionately located on one side of the street, constructing the cycle track on the opposite side will allow for the retention of the majority of parking spaces.
- Within a two-way cycle track, the inner lane (i.e. the lane closest to motor vehicle traffic) should flow in the same direction as motor vehicle traffic to improve comfort for people on bicycles in terms of wind, noise and vibration. The downside of this configuration is that pedestrians may encounter contra-flow bicycle traffic in the outer lane (i.e. the lane nearest the sidewalk), which may run counter to their expectations and lead to conflicts as they step off the curb at crossings.

4.4.2.1 Mitigation Points

Each of the following mitigation points represents an area of conflict where other road users must temporarily cross the cycle track. Generally speaking, minimizing these points is the preferred strategy. As suggested above, this can be accomplished by building the cycle track on the side of the street with fewer conflict points. Remaining conflict points can be mitigated through design techniques and traded off against one another. This section reviews the trade-offs and mitigation opportunities involved in several different types of conflicts.



Figure 4-13: Examples of crossing treatments for bus stops and loading zones across a cycle track

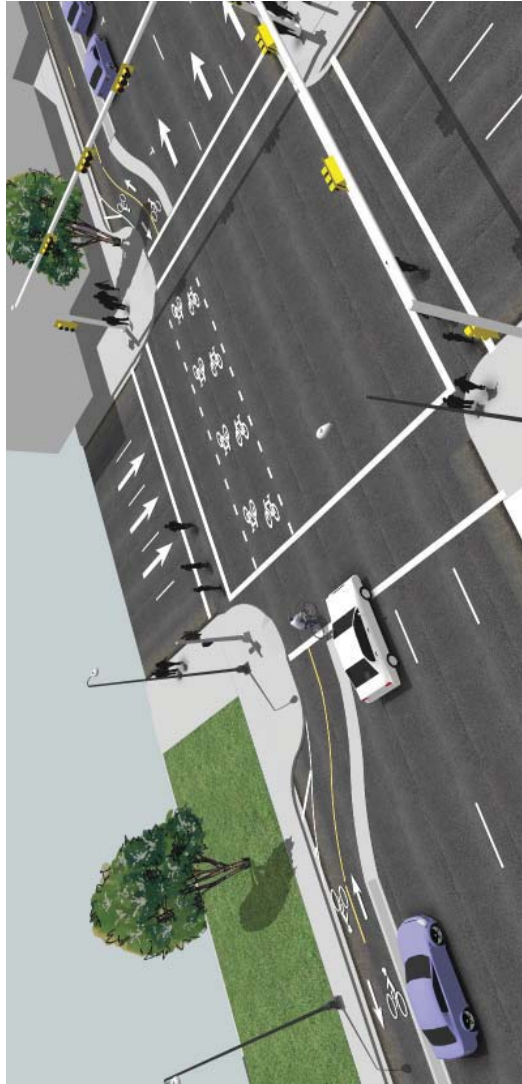


Figure 4-14: Potential cycle track design treatment at curb extensions

Alleys and driveways require special considerations because they are unsignalized conflict points where movements can be unpredictable. When possible, cycle tracks should be prioritized on streets with fewer alleys and driveways, and/or placed on the side of the street with fewer conflicts. When a cycle track does cross an alley or driveway, bright green paint, bicycle stencils, shared lane markings, dashed lane lines, and/or elephant's feet markings (large white squares outlining the path of bicycle users) through the intersection help to alert drivers to the presence of cyclists.

Transit stops require a connection between the roadway and the sidewalk, and cycle tracks can create conflict when they are constructed in this area. When a cycle track must cross a transit stop, there are several approaches available (depending on the street configuration) to clearly demarcate bicycle and pedestrian space and improve safety for both transit and bicycle users at these points, illustrated in Figure 4-13.

Curb extensions are pedestrian-friendly intersection features that extend the curb into the roadway to reduce crossing distances and calm traffic. Curb extensions benefit pedestrians by increasing their visibility to motor vehicle traffic and can increase green time for through traffic, increasing motor vehicle throughput and system efficiency. The preferred configuration when introducing a cycle track is to create a floating curb extension, allowing the cycle track to flow in a straight line along the curb. This design allows pedestrians to cross the cycle track and wait at a floating curb extension

Signalized intersections along a cycle track often involve the introduction of a bicycle signal, to be used in combination with an existing conventional traffic signal. The bicycle signal head should be placed in a location convenient for bicyclists, often at a lower height, directly across from the bicycle facility. Near-sided signals may also be used to improve visibility. Bicycle signals can be used to assist cyclists in making turning movements by giving them an advance green and in clearing the intersection by lengthening the green phase. Signals can be actuated to improve intersection performance during off-peak hours.

before crossing lanes carrying motor vehicle traffic. This design is effective in reducing conflicts and shortening crossing distances.

However, shifting curbs can be costly and implies a more permanent commitment to cycle tracks. Some jurisdictions therefore choose to retain existing curb extensions until a cycle track has been proven effective and popular. Where a cycle track does meet a curb extension, there are several design solutions available. Figure 4-14 shows one possible alternative, where the cycle track "wraps" around the curb extension. Although not ideal, this design is a good temporary option.

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5.0 Recommended Network

In Figure 5-1, the recommended Centre City Cycle Track Network is shown. The network includes routes that already exist and the routes that are proposed for future development.

Some aspects of the network, like 8 Street SW and Stephen Avenue, are contingent on additional construction and planning work. These aspects were accounted for during the

planning process, and the recommendation of these roads comes after consideration of these processes.

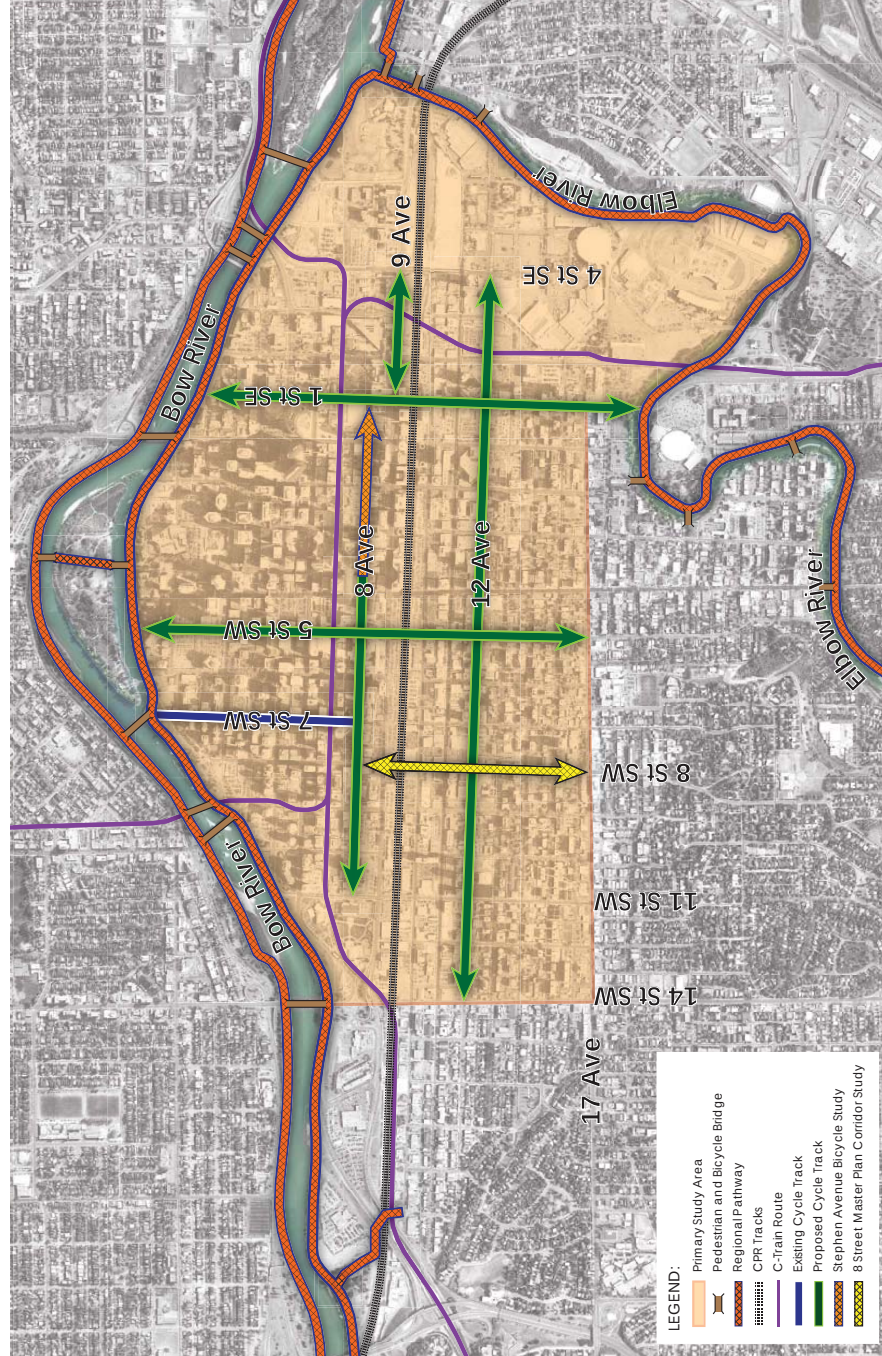


Figure 5-1: Recommended Cycle Track Network

CENTRE CITY CYCLE TRACK NETWORK DEVELOPMENT AND RECOMMENDATION

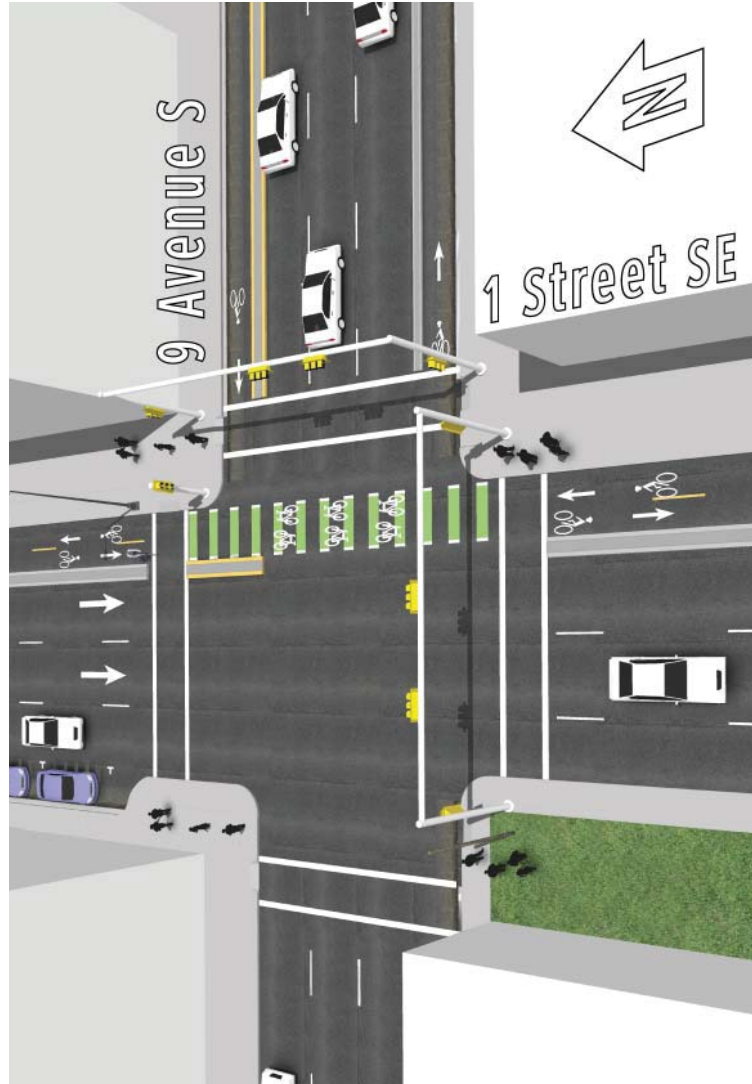


Figure 5-2: Proposed Cycle Track at 9 Avenue S and 1 Street SE looking north

5.1 Recommended Cycle Track Network Components

5.1.1 1 Street SE Cycle Track

1 Street SE is the southbound half of a one-way couplet with Macleod Trail. The two roads are separated at the Elbow River and continue northwards until terminating at the Bow River. 1 Street SE is currently four lanes from Riverfront Avenue to the Elbow River. The street is classified as an Urban Boulevard, a road designed primarily for pedestrians, bicycles and transit, by The City,⁹ emphasizing the importance of the destinations located along it and the importance it plays in the Centre City transportation network.

Proposed Design

A two-way cycle track on the east side of 1 Street SE is recommended. The facility would run the length of the east side of the street, extending from the Bow River to the Elbow River, with connections to the regional pathway network at each end. This cycle track would serve a latent demand for north-south travel in the east area of the Centre City. Implementation of the cycle track would result in the removal of one lane of 1 Street SE. The two-way cycle track minimizes

⁹ Calgary Transportation Plan - 2009

Table 5-1: 1 Street SE Alternatives Analysis

Other cycle tracks considered	Rationale for not being chosen
1 Street SW one-way cycle track	- Narrow street cross-section between 12 Avenue S and 14 Avenue S would maximize impact on vehicle traffic - No direct connection to Elbow River pathway south of 17 Avenue SW - Increased cost for two one-way cycle tracks
Macleod Trail two-way cycle track (east side)	- Fewer adjacent destinations - High vehicle use and congestion currently exists - Synchro¹⁰ analysis revealed significant challenges with removal of lane for cycle track facility
Macleod Trail two-way cycle track (west side)	- Fewer adjacent destinations - High vehicle use and congestion currently exists - Ease of use at intersections more difficult than east side cycle track option due to double turn lanes - Synchro analysis revealed significant challenges with removal of lane for cycle track facility
1 Street SE/Macleod Trail cycle track couplet	- Ease of use at intersections more difficult - Bicycle rider inconvenience - Cost of two one-way cycle tracks is high

impact on vehicle traffic, lessens the parking reduction to less than 10% of total inventory, and is cheaper than some alternatives. 1 Street SE has no double turn lanes and is more easily navigable at intersections.

The cycle track would have a number of connections to existing and future bicycle facilities. The connections of the 1 Street SE cycle track to other bike facilities are listed below.

- Proposed 12 Avenue S Cycle Track
- Proposed 8/9 Avenue S Cycle Track
- 10 Avenue S Bike Lane
- Elbow River Pathway
- Bow River Pathway

As a busy motor vehicle route in the Centre City, the vehicle impacts of the cycle track on 1 Street SE were investigated. The existing vehicle travel time in the PM peak hours along the length of the street is approximately 4.5 minutes. With the exception of the PM peak, which will see travel time increase by approximately 60 seconds per trip along the whole corridor, peak hour travel times are not expected to change. Because the facility is proposed to be on the opposite side of the street from bus stops and special signal timings have been recommended to mitigate potential congestion, it is expected that transit operations will be minimally impacted. Analysis of alternatives is presented in Table 5-1.

¹⁰ Synchro is a traffic engineering software package used to determine the Level-of-Service (LOS) impacts of various road design alternatives.



Figure 5-3: 8 Avenue S and 7 Street SW Conventional Treatment looking northwest

5.1.2 8 Avenue S/Stephen Avenue/ 9 Avenue S Bicycle Facility

8 Avenue S, Stephen Avenue, and 9 Avenue S play distinct roles in the transportation system of the Centre City. 8 Avenue S is a two-lane Urban Boulevard with on- and off-street parking which runs from 11 Street SW to 3 Street SW. The destinations along this route are significant and include: the U of C downtown campus, Bankers Hall, Eighth Avenue Place, and the CORE shopping centre.

Stephen Avenue is unique in Calgary as a pedestrian mall during daytime hours, with high pedestrian activity during lunch hours due to the numerous restaurants and commercial locations situated along its length from 3 Street SW to 1 Street SE. The westbound street includes wide sidewalks as well as a limited vehicle lane in the centre that is used during off-peak, non-daytime hours (6pm-6am). During these off-peak hours, a taxi loading zone exists from 3 Street SW to 1 Street SW, and a regular parking zone from 1 Street SW to 1 Street SE.

9 Avenue S is classified as an Arterial for most of its length, but becomes an Urban Boulevard west of 1 Street SE. For the section of 9 Avenue S east of 1 Street SE, there are four eastbound lanes from 1 Street SE to 3 Street SE, two eastbound and one westbound from 3 Street SE to 5 Street SE, and two lanes in either direction from 4 Street SE to the Elbow River.

CENTRE CITY CYCLE TRACK NETWORK DEVELOPMENT AND RECOMMENDATION

Proposed Design

A number of bicycle treatments are proposed along this corridor. From 11 Street SW to 3 Street SW, the bicycle facility would be comprised of two one-way cycle tracks running along the curb in the same direction as vehicle traffic. The space for the cycle tracks would come from the repurposing of two lanes of curbside parking. Along Stephen Avenue, bikes would share space with pedestrian and vehicle traffic through the centre of the street. On 9 Avenue S from 1 Street SE to 4 Street SE, there would again be two one-way cycle tracks, one on the north side of the street, the other on the south side. The cycle track would jog from Stephen Avenue to 9 Avenue S at 1 Street SE and the transition to bike lanes on 9 Avenue S would occur at 4 Street SE. Space for these cycle tracks would come from the existing vehicle travel lanes. Along 8 Avenue S, the cycle track would be minimally disruptive to transit and vehicle traffic since motor vehicle volumes are low relative to other parallel roadways such as 9 Avenue S or 6 Avenue S. Analysis of alternatives is presented in Table 5-2.

Stephen Avenue, as a recommended pilot shared-use walking and cycling shopping street, will require significant stakeholder involvement to understand the interests for the street and to develop a design, operating principles, and performance indicators. A Stephen Avenue stakeholder committee would be created for this purpose and involve the Calgary Downtown Association, merchants and restaurant owners and managers, property managers, law

enforcement and emergency response organizations, and others. Stakeholder concerns identified to date include the safety of pedestrian-bicycle interaction and reduced capacity for bicycles during events, vendor tent set-ups and busy periods. Preliminary research and a review of twenty case studies in Canada, the United States and Europe by the Centre City Cycle Track Network team indicates that people can be expected to safely walk and ride bikes on Stephen Avenue outside of the busiest pedestrian times such as summer lunch periods and festivals or special events. Further study would

be required before a pilot would begin and a report to deliver recommendations on implementation is underway.

The cycle track would have a number of connections to existing and future bicycle facilities. The connections are listed below.

- Proposed 1 Street SE Cycle Track
- 7 Street SW Cycle Track
- Proposed 5 Street SW Cycle Track
- 11 Street SW Bike Lanes
- Proposed 8 Street SW Bike Lanes

Table 5-2: 8 Avenue S/Stephen Avenue/9 Avenue S Alternatives Analysis

Other cycle tracks considered	Rationale for not being chosen
9 Avenue S two-way cycle track	• High vehicle use and congestion currently exists • Higher volume of vehicle turning movements increases conflicts compared to 8 Avenue S option • Fewer adjacent destinations and key destinations further away • Synchro analysis demonstrated that significant challenges exist with removal of travel lane



Figure 5-4: Proposed 12 Avenue S Cycle Track looking west

5.1.3 12 Avenue S Cycle Track

12 Avenue S is a one-way road from 14 Street SW to the Elbow River. It is classified as an Arterial to the west of 2 Street SW and an Urban Boulevard to the east. It is the eastbound half of a one-way couplet with 11 Avenue S. The road has 2 travel lanes and 2 parking lanes for its entire length, with some sections having 3 or 4 peak hour travel lanes by restricting parking during the AM and PM peak hours.

Proposed Design

This alignment proposes a two-way cycle track on the north side of 12 Avenue S. The cycle track would extend from 14 Street SW to the Elbow River, where it would connect via pathways to both the Bow River and Elbow River regional pathways. Implementation would involve the removal of a single lane of traffic, turning the four-lane eastbound road into a three-lane eastbound road with a two-way cycle track.

Table 5-3: 12 Avenue S Alternatives Analysis

Other cycle tracks considered	Rationale for not being chosen
10 Avenue S one-way cycle track	• Higher number of driveway conflicts • Poor connection at east end • Loss of curbside parking • Cost of two one-way cycle tracks
11 Avenue S two-way cycle track (south side)	• Higher number of driveway conflicts • Fewer destinations than comparison streets
11/12 Avenue S cycle track couplet	• Location of one-way cycle track couplet would create conflict at a significant number of transit stops • Bicycle rider inconvenience • Cost of two one-way cycle tracks

Connections to other facilities would allow people on bicycles from both the Centre City and the surrounding areas to easily access and use the facility. The connections are listed below:

- 11 Street SW Bike Lane
- Proposed 8 Street SW Bike Lane
- Proposed 5 Street SW Cycle Track
- Proposed 1 Street SE Cycle Track
- Elbow River Pathway
- Bow River Pathway

The proposed cycle track has been designed to minimize impact on other modes using the roadway. The existing four-lane roadway would become three lanes, with the mixture of travel, parking, and travel/parking lanes that currently exist affording a great deal of flexibility when designing the cycle track. Because of this mixture, the cycle track could prioritize either the preservation of parking or travel lanes based on feedback from internal and external stakeholders. In addition, the two-way cycle track is cost effective compared to alternative alignments. Transit is unaffected since the bus stops on 12 Avenue S are on the opposite side of the street from the cycle track. Analysis of alternatives is presented in Table 5-3.

5.1.4 5 Street SW Cycle Track

5 Street SW is a one-way southbound Urban Boulevard. It is one-half of a one-way couplet with 4 Street SW. It runs from the Bow River to the Elbow River, with the section south of 17 Avenue SW transitioning to a two-way street with on-street parking. North of 17 Avenue SW, 5 Street SW has three lanes between 17 Avenue SW and 12 Avenue S, four lanes between 12 Avenue S and 6 Avenue S, five lanes from 6 Avenue S to 4 Avenue S, and two travel lanes in both the north and south directions with on-street parking north of 4 Avenue S to the Bow River. The four and five lane segments in the downtown area include some off-peak parking lanes.

Proposed Design

This alignment proposes a two-way cycle track on 5 Street SW. The facility would be composed of a two-way cycle track running parallel to vehicle traffic on the east side of the street. The cycle track would extend from the Bow River to 17 Avenue S, becoming a pair of dedicated bike lanes at 15 Avenue S. The cycle track could connect the regional pathway network of the north with a busy and popular commercial area in the south. The 5 Street SW portion of the cycle track would have its northern terminus at Eau Claire Avenue. From this point, signage would direct bicycle riders to take a jog west



Figure 5-5: Transition of 5 Street SW cycle track at 15 Avenue S looking north

Table 5-4: 5 Street SW Alternatives Analysis

Other cycle tracks considered	Rationale for not being chosen
4 Street SW two-way cycle track (west side)	• Difficulty implementing cycle track south of 17 Avenue SW due to curbside parking demands of retail area • Two-way to one-way cycle track transition at 11 Avenue S would significantly impact vehicle operations • Two-way to one-way cycle track transition would require loss of parking and/or travel lanes for a number of blocks north of 17 Avenue SW
4 Street SW one-way cycle track	• Increased loss of travel and/or parking lane • Cost of two one-way cycle tracks
5 Street SW one-way cycle track	• Increased loss of travel and/or parking lane • Cost of two one-way cycle tracks
4/5 Street SW cycle track couplet	• Increased loss of travel and/or parking lane • Cost of two one-way cycle tracks

along Eau Claire Avenue to 6 Street SW, where a connection to the Bow River Pathway already exists. This cycle track would serve a latent demand for north-south travel in the Centre City, allowing users to traverse the downtown study area on a single facility.

The cycle track would have a number of connections to future and existing facilities in the Centre City, including the Bow River Pathway. The connections are listed below.

- Proposed 12 Avenue S Cycle Track
- Proposed 8 Avenue S Cycle Track
- Bow River Pathway
- Elbow River Pathway
- 10 Avenue S Bike Lane

Ending in 2014, 5 Street SW had one lane closed between 8 Avenue S and 9 Avenue S for the construction of an office tower, demonstrating that the loss of a single travel lane is possible in this area. It is expected that traffic would be managed using similar signal timing changes and implementation of special left- and right-turn phasing. The two-way design of 5 Street SW is both more cost effective and compact than other alternative designs, minimizing impact on vehicle traffic. In addition, the geometry of 5 Street SW lends itself to an easy two-way cycle track to one-way bike lane conversion, seen in Figure 5-5. Analysis of alternatives is presented in Table 5-4.



Figure 5-6: 8 Avenue S and 8 Street SW intersection treatment looking northeast

5.1.5 8 Street SW Cycle Track

8 Street SW is a two-way, four lane Urban Boulevard. It crosses beneath the CPR rail line and 9 Avenue S, reconnecting with downtown at 8 Avenue S. Key destinations located along 8 Street SW include the University of Calgary downtown campus, hotels, 8 Street SW LRT Station, Mountain Equipment Co-op, and a large supermarket.

Proposed Design

This alignment proposes two one-way cycle tracks at sidewalk level on 8 Street SW from 10 Avenue S to 17 Avenue SW. In tandem with the future 8 Avenue S cycle track and existing 7 Street SW cycle track, the 8 Street SW cycle track would allow bicycle riders to traverse the entire north-south extent of the study area in the western side of the Centre City. Construction of this cycle track is contingent on the upcoming renovation of the 8 Street SW underpass and reconstruction of 8 Street SW in accordance with the 8 Street SW Public Realm Master Plan.

Table 5-5: 8 Street SW Alternatives Analysis

Other cycle tracks considered	Rationale for not being chosen
7 Street SW cycle track	• No existing connection across CP Rail • Loss of residential parking south of CP Rail • Cost of new underpass/overpass at this time

The cycle track would have a number of connections to future and existing facilities in the Centre City, including the Bow River Pathway. The connections are listed below.

- Proposed 12 Avenue S Cycle Track
- Proposed 8 Avenue S Cycle Track
- 10 Avenue S Bike Lane

The 8 Street SW cycle track takes advantage of the in-progress 8 Street SW master plan process, which already sets aside room in the road's revised cross section for dedicated facilities. The master plan has also arranged room for bike lanes in the 8 Street SW underpass. This development will enable bicycle access to numerous destinations along 8 Street SW such as the LRT, U of C downtown campus, Mountain Equipment Co-op, and the commercial area of 17 Avenue S. Analysis of alternatives is presented in Table 5-5.

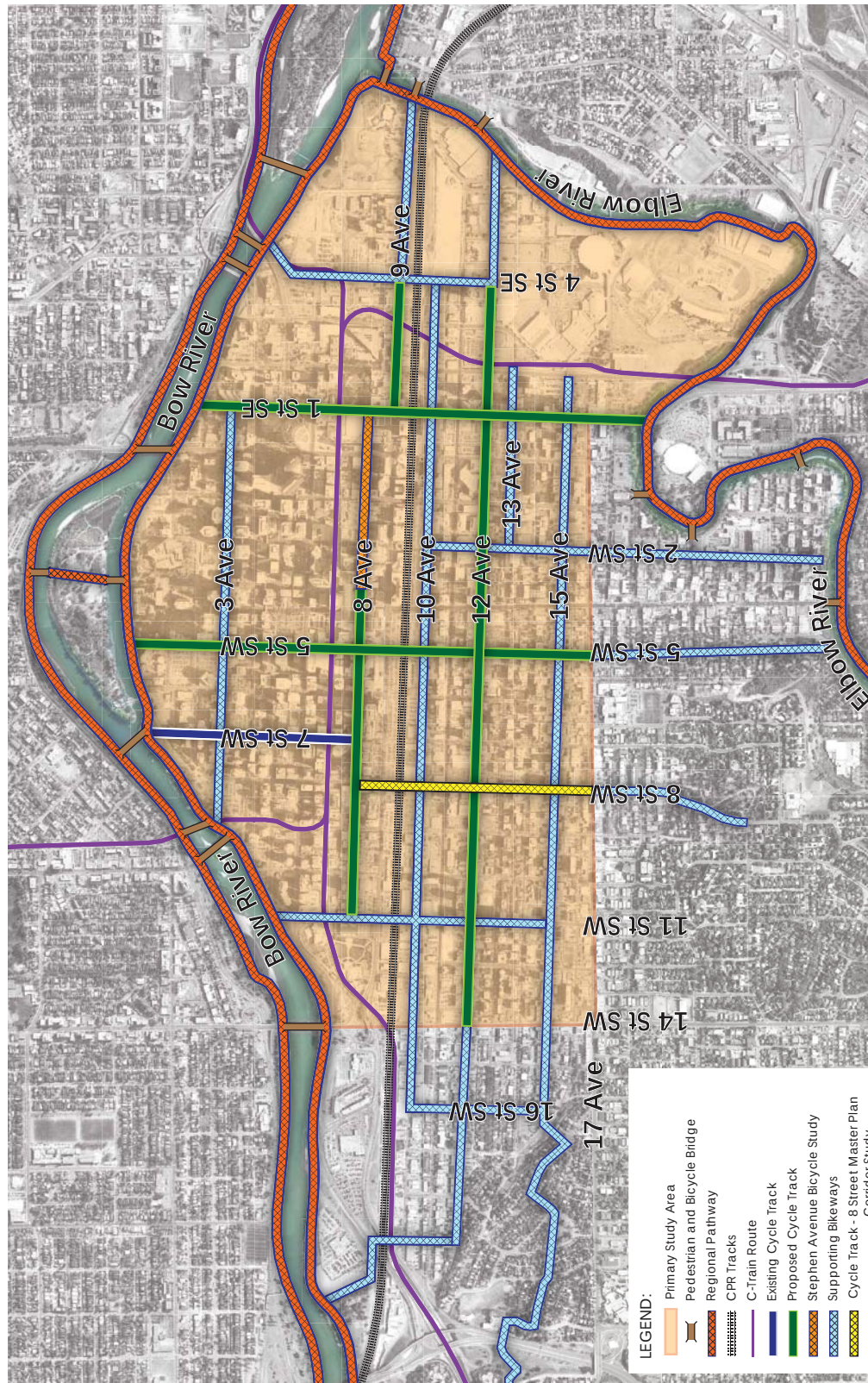


Figure 5-7: Supporting Centre City Bikeways

CENTRE CITY CYCLE TRACK NETWORK DEVELOPMENT AND RECOMMENDATION

5.2 Supporting Network

Cycle tracks will anchor the bicycle network in the Centre City, increasing the ease and comfort of bicycling. Like major regional pathways, these routes intersect with and should have traffic directed to them by other safe and comfortable bicycling facilities.

Some corridors are better-suited to a supporting bikeway facility than a cycle track. For example, low volume, low speed streets in the Downtown would likely be appropriate places for development of a supporting network of bike boulevards and bike lanes, rather than cycle tracks. These facilities have lower costs and do not provide the same level of separation offered by cycle tracks, but are suitable for people of all ages and abilities when traffic speeds and volumes are relatively low.

The Project Team recommends that the Centre City Cycle Track Network be augmented currently with the supporting elements shown in blue on Figure 5-7. These complementary elements are important in providing coverage to the entirety of the Centre City area and greatly enhance the connections and utility of the network. A description of supporting network facilities is presented in Table 5-6.

Table 5-6: Supporting Network Facility Descriptions

Bike Lane and Buffered Bike Lane	Neighbourhood Bikeway (bike boulevard)	Shared lane
An on-street travel lane designated for the exclusive use of bicycles. Identified by a painted line, bicycle, and diamond shaped pavement markings and signs. May also be buffered to improve comfort and safety. 	Residential streets with low volumes of vehicle traffic and low speeds where people bicycling and walking are given priority. Neighbourhood bikeways feature pavement markings, signs, favourable stop sign orientation, traffic calming, and intersections that accommodate bicycle users and pedestrians at busy streets. 	A travel lane on a street that is shared by motor vehicles and bicycles traveling in either single file or side-by-side. A marked shared lane is identified by pavement markings and signs. 

5.3 Effectiveness of the Network

An effective network is one that provides a high level of safety, comfort, directness, connectivity and coverage.¹¹ Coverage refers to the extent to which the proposed network provides access to all locations within a given area.

¹¹ See Section 4.1 - Network Guiding Principles

Figure 5-8 shows the coverage provided by the existing and proposed City Centre Cycle Track Network using a two-block buffer. Several themes are evident:

- With a two-block coverage definition, the combined cycle track, supporting network and regional pathways network provides access to almost all of the Centre City, shown in green.

- Gaps in the cycle track network are mostly at the outskirts of Centre City. These areas are candidates for future network expansion.
- The cycle network follows the most direct lines available. At railway underpasses, protected facilities are provided. Also, only two of the five cycle tracks proposed in the 5-year network have turns (8/9 Avenue S and 7/8 Street SW), creating a relatively direct and understandable network.

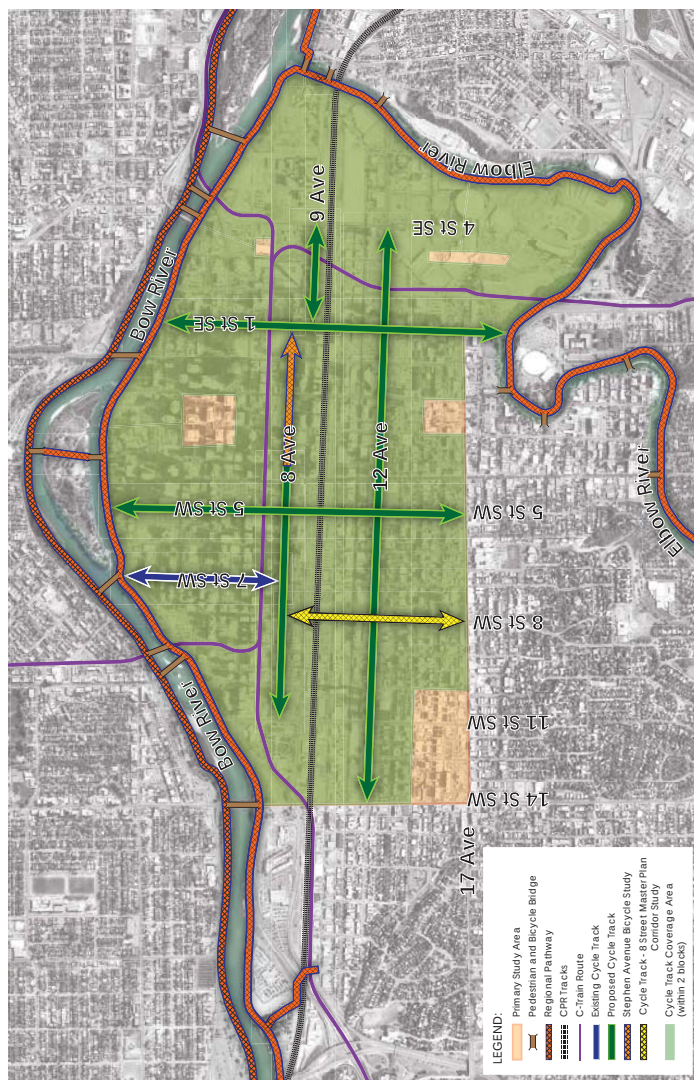


Figure 5-8: Network Coverage

CENTRE CITY CYCLE TRACK NETWORK DEVELOPMENT AND RECOMMENDATION

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Appendix A: Why Cycle Tracks?

1.1 Bicycling Supports Calgary's Citywide Goals

As documented in Calgary's Cycling Strategy, the City has a vision of becoming one of the premier bicycling cities in North America. Doing so will improve the transportation network, provide choice, and mitigate congestion. To achieve that vision, the Cycling Strategy aims to get more people bicycling, to construct more bicycling infrastructure, to make bicycling safer and to increase satisfaction with bicycling in Calgary. One key step in the City's approach is to construct a network of bicycling facilities protected from traffic throughout Calgary's Centre City.

The Centre City is an area of Calgary comprised of its high-employment centre, the downtown, and high density residential area, the Beltline. As seen in Figure 1-1, the daily downtown bicycle modal share is 2.5%. The City has set a goal of 4% bicycle modal share to the downtown area. The development of a cycle track network in the Centre City will take advantage of the high densities of employment and housing in the area to increase the attractiveness and ease of bicycling.

As Calgary's recent experience with the cycle track on 7 Street shows, even an isolated bicycle facility can be a major draw for bicycle riders.¹ Yet a bicycle facility is only as effective as the places and people it links to, and an isolated facility only serves a select few people

¹ Bicycle traffic on 7 St is up 330 percent in one year, owing partly to new cyclists and partly to users drawn from alternative routes. City of Calgary, 2013. Bicycle Program Yearbook.

that have their origins and destinations located in the vicinity of this facility.²

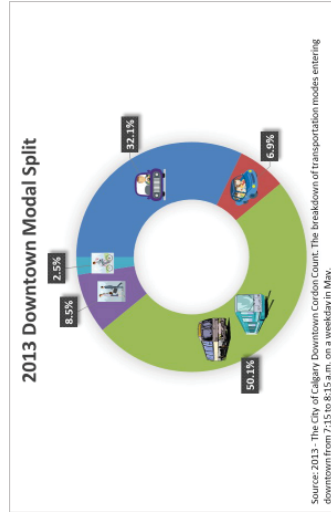
A bicycle network, on the other hand, consists of numerous connected and interlocking bicycle facilities. Like a roadway grid, a more robust bicycle network means access to more destinations through enhanced area coverage and improved mesh width. Building more connections between bicycle facilities generates new route alternatives, with each additional bicycle link increasing the number of potential route options system-wide. The result is that potential bicycle riders have a better chance of being able to make a safe, continuous trip from origin to destination. It is these conditions that foster increased participation in bicycling city-wide.

Table 1-1: Sustainability 2020 Transportation Goal

Objective:	Increase Transportation Choice - Calgary provides more travel choices in strategic locations aligned with land use direction.
Target	By 2020, mode split is 15% walking/cycling, 10% transit, 75% auto (Mode Split [All Purpose/24hrs/Citywide])

The City of Calgary's 2020 Sustainability Direction, Calgary Cycle Plan and Centre City Mobility Plan all value health and increased mode choice and endorse the expansion of cycle paths. Implementing bikeways will reaffirm these values by expanding the existing bicycle network in accordance with the plans.

² Research has shown that people on bikes are willing to detour up to 400 metres to access a safe and comfortable route. Winters and Teschke, 2010. Built environment influences on healthy transportation choices. Journal of Urban Health, 87.



Source: 2013 - The City of Calgary Downtown Count: The breakdown of transportation modes entering downtown from 7:15 to 8:15 a.m. on a weekday in May.

Figure 1-1: 2013 Downtown Modal Split

By making the experience of bicycling the Centre City safer and more comfortable, the number of bicyclists will expand.

Furthermore, in plans such as the Calgary Transportation Plan and Calgary Cycling Strategy, the City has committed to actions that will assist in mitigating congestion, facilitating goods movement, reducing pollution and GHG emissions, and achieving mode split targets.^{3,4} Investing in bicycling helps to achieve each of these goals and more, without the difficult trade-offs associated with new roadway capacity.

1.2 Benefits of Bicycling

Around the world, communities that have developed bicycling infrastructure and support systems have seen an increase in people

³ City of Calgary, 2009. Calgary Transportation Plan.

⁴ City of Calgary, 2011. Calgary Cycling Strategy.

bicycling.⁵ There are many reasons for cities to promote bicycling as a mode of transportation and recreation: it enables people to shift trips from driving, which reduces pollution, minimizes congestion, and promotes healthy lifestyles. Cities that are bike-friendly have experienced other advantages, including economic development and investment, particularly in downtown areas, and increased 'livability' as evidenced by workers choosing to move to particular cities.

1.2.1 Increased bicycling is tied to a reduction in vehicle miles traveled

When people have the option of bicycling for everyday trips, it reduces vehicle miles traveled, which leads to decreased greenhouse gas (GHG) emissions that impact air quality. Because every vehicle trip causes emissions due to cold starts and hot soak conditions, shorter trips generate respectively higher amounts of emissions.⁶ As such, trips that are shorter than 6.5 km are easily ridden if sufficient facilities exist. These shorter trips are also the ones with the rate of GHG emissions due to the cold starts.

Another advantage to reducing vehicle miles traveled is the reduction in congestion. Traffic congestion is a growing problem in Calgary and as housing is developed and the population

grows, traffic congestion will continue to increase. However, this need not be the case. The City of Vancouver has shown that traffic volumes entering downtown can be managed by providing alternatives to driving. Despite the growth in employment and population within downtown Vancouver (up 26 percent and 75 percent in the last 15 years, respectively), motor vehicles entering downtown have decreased by 20 percent within that time period and are now at 1965 levels (roughly 175,000 per day).⁷ During this period, person-trips entering downtown during the peak periods have increased by 15 percent. This increase has been accommodated by a shift to walking, bicycling and transit, which now serve over 52 percent of all work trips to and from downtown Vancouver.

Bicycling competes very effectively with the automobile for trips under 5 km, and could replace many trips to, from and within downtown Calgary. In Downtown Vancouver, 78 percent of trips within the area are made by walking and riding bicycles. In Calgary, over 35 000 people live in the Centre City. In addition, 190,000 cars enter downtown Calgary each day, 32.1 percent of all travelers. If comfortable and safe bicycling facilities were available, a portion of those trips could be made by bicycle.

⁷ City of Vancouver, 2012. Vancouver Transportation Plan Update. 2012 Conference of the Transportation Association of Canada.

1.2.2 Bicycling helps save money

Investments in bicycling infrastructure are cost-effective; bikeways are cheaper to construct on a per-kilometre basis than roadways. Cycle tracks, which are among the most expensive form of bikeways, still only cost between \$0.5 and \$2 million per km,⁸ depending on cycle track configuration (e.g. one-way or two-way) and existing roadway and signal characteristics. To put this figure in perspective, the estimated cost of the Calgary SouthEast Ring Road, at roughly \$769 million, could fund up to 1,500 km of world-class protected bikeways. One percent of that \$769 million—\$7.69 million—would still fund up to 15 km of cycle tracks, enough to construct a substantial network of routes Downtown.

Bikeways also provide an alternative to the high cost of car parking. High demand for parking space in Downtown Calgary means that parking can be expensive and time-consuming (monthly passes at Downtown parkades cost between \$300 and \$500 per month).⁹ Replacing more motor vehicle trips with bicycle trips means less demand and more available spots, easing conditions for motorists.

⁸ Patterson and Steiger, 2013. Shifting Gears: The Emergence of Cycle Tracks in the Canadian Urban Landscape. Plan Canada, Spring.

⁹ Calgary Parking Authority, 2013. Parking Rates.

1.2.3 Bicycling is attractive for businesses

Businesses benefit from increased bicycling through increased customers and revenue. Because cyclists save money on transportation, they have more money to spend at local stores. A 2009 study on Bloor Street in Toronto found that, on average, pedestrians and bicycle riders visited local businesses more often than motorists and spent more money overall.¹⁰ Bicycle tourists tend to spend more money than other types of tourists.

Employees who get more exercise by bicycling to work take fewer sick leaves than other employees. In the U.K., Sustrans found that absenteeism costs employers \$478 per day and that employees who are cyclists take 2.4 sick days per year, compared with 4.5 sick days taken by other employees.¹¹ In Denmark, one study estimated that bicycling saves \$68.7 million in healthcare costs each year.¹² The Centers for Disease Control and Prevention (CDC) found that workplace health programs can increase productivity.¹³

¹⁰ Clean Air Partnership, 2009, Bike Lanes, On-Street Parking and Business.

¹¹ Sustrans, 2009, Cycling halves sick days, boosting productivity by £13 billion, <http://www.sustrans.org.uk/press-releases/cycling-halves-sick-days-boosting-productivity-%C2%A313-billion>

¹² euractiv.com, 2013, 'Bicycle Highways' help save healthcare costs in Northern Europe, <http://www.euractiv.com/health/bicycle-highway-projects-europe-news-518865>

¹³ Centers for Disease Control and Prevention, No Date, Increase Productivity, <http://www.cdc.gov/workplacehealthpromotion/businesscase/benefits/productivity.html>

Bicycling keeps money within the local economy. The U.S. IRS found that 73 percent of the retail price of gas and 86 percent of the retail price of cars leaves the local economy as the "cost of goods sold."¹⁴

Quality Bike Products (QBP), a medium-sized employer in the Great Lakes region, encourages employees to bicycle to work with a credit for use purchasing the products they sell. This "QBP Health Reward" has been found to improve a variety of health measures in employees. The company's health care costs decreased by 4.4 percent from 2007 to 2011, a period during which companies across the United States experienced an average increase of 24.6 percent in health care costs.¹⁵

1.2.4 Workers prefer bicycle-friendly cities

Bicycle-friendly communities are generally considered to be good places to live. Businesses in Calgary want to attract young, healthy, productive and intelligent employees. Research done in the US and Canada shows that young employees have a preference for work places that are located in cities that allow them to be active and fit.¹⁶ While Calgary already leads large Canadian cities in attracting young workers, the competition is stiff. A recent war of words between the mayors of Chicago and Seattle highlighted

¹⁴ Cortright, Joe, 2007, Portland's Green Dividend: A White Paper from CEOs for Cities.

¹⁵ StreetsBlog, 2012, A Bike Company Offers a Prescription for America's Health Care Cost Crisis, <http://www.streetsblog.org/wp-content/uploads/2012/03/Quality-Bike-Products-Health-Reward-Program.pdf>

¹⁶ Florida, Richard, The Creative Class.

the close link between bicycling, young people and the economy. As Rahm Emanuel (Mayor of Chicago) put it, "I expect not only to take all of their [Seattle and Portland's] bikers but I also want all the jobs that come with this, all the economic growth that comes with this, all the opportunities of the future that come with this."¹⁷ In Canada, Calgary can retain its edge over rival cities in attracting young talent by better appealing to progressive young people. Emerging neighbourhoods such as the Beltline and East Village that are in close proximity to Downtown appeal to this demographic and will be further energized by comfortable, safe bicycling infrastructure that better integrates these neighbourhoods with the Downtown.

Bicycling infrastructure can help energize emerging neighbourhoods. In Calgary, the Beltline and East Village are example of areas that currently appeal to young employees. Such neighbourhoods can build upon existing assets, like retail space, restaurants and parks, by improving bicycle connections between these destinations.

Bicycling facilities have been found to increase property values. A report for the State of Delaware Department of Transportation found that properties within 50 m of a bike path were priced generally \$8,800 (USD) or more above other properties, controlling for other factors.¹⁸

¹⁷ Seattle Bike Blog, 2013, seattlebikeblog.com/2013/02/20/mayor-mcginn-to-rahm-emanuel-seattle-will-keep-its-bikers-thank-you/

¹⁸ Racca, D.P. and Dhanlu, A., 2006, Project Report for Property Value/Desirability Effects of Bike Paths Adjacent to Residential Areas, Prepared for the Delaware Center for Transportation and The State of Delaware Department of Transportation, <http://128.175.63.72/projects/DOCUMENTS/bikepathfinal.pdf>

1.2.5 Bicycling supports a dense urban downtown and transit use

Investment in bicycling and transit can be complementary. Bicycling increases the accessibility of transit, providing convenient access to a larger catchment area for each transit stop. If the cycle track network is integrated with transit, more transit users can combine modes to make longer regional trips.¹⁹ And for shorter trips within the Downtown, bicycling investments can actually improve operating conditions for transit by providing a practical alternative for short downtown trips.

1.2.6 Bicycling is beneficial for individuals

Bicycling contributes to personal health through exercise and fresh air, offers economic benefits of lower transportation costs, and allows increased local spending. Bicycling regularly for transportation and recreation helps people lose weight and aids in respiratory health.

Bicycling saves families money by reducing the cost of purchasing fuel and maintaining an automobile. Residents of Portland, Oregon spend about 4 percentage points less of their total household budgets on transportation than other Americans, about 15.1 percent compared to 19.1 percent nationally (Center for Neighbourhood Technology and Surface

¹⁹ Pucher and Buehler, 2012. Integration of Cycling with Public Transportation. In: Pucher and Buehler, City Cycling, MIT Press, Cambridge, MA.

Transportation Policy Project 2005).²⁰

2.0 Benefits of Cycle Tracks

A cycle track is a cycle facility within the road right of way that is physically separated from pedestrians and motor vehicle traffic. Cycle tracks may be one-way or two-way, and may be at street level, sidewalk level or at an intermediate level. If at sidewalk level, a curb or median separates them from motor vehicle traffic, while different pavement color/texture separates the cycle track from the sidewalk. If at street level, they can be separated from motor vehicle traffic by raised medians, on-street parking, bollards, or even planters. By providing dedicated space for people on bikes, walking, and driving, cycle tracks can offer a higher level of comfort than bike lanes or shared use paths and are attractive to a wider range of existing and potential people choosing bicycling. Although cycle tracks are mostly separated from vehicle traffic, conflicts between bicycle riders and drivers can occur at intersections, bus stops and driveways. Special care must be taken to design intersections and driveway access points to highlight the presence of people on bikes and to minimize conflicts in mixing zones.

²⁰ Center for Neighbourhood Technology and Surface Transportation Policy Project (2005). Driven to Spend: Pumping Dollars Out of Our Households and Communities. Washington, DC: Author: 23.

2.1 Cycle Tracks Support Bicycling by Providing Safe, Direct Connections

Cycle tracks provide additional benefits beyond those of bicycling in general. As they are protected and separated from vehicle traffic, bicyclists feel safer and more comfortable using cycle tracks. Cycle tracks also provide more direct access to the downtown and key services, enhancing urban space and promoting a sense of place.

2.1.1 Separated facilities support bicycling more than bike lanes or shared routes

Several studies have shown that separated bicycle facilities have more power to attract new bicycle riders than other types of bike-ways.²¹ In fact, a majority of Calgarians support the construction of a cycle track network.²² Cycle tracks have a unique ability to draw new users because they separate bicycles from traffic while maximizing directness and accessibility to destinations. The 7 Street corridor, home to Calgary's first cycle track, drew a 330 percent increase in Bicycling activity within the first year of cycle track construction.

Cycle track design emphasizes comfort for bicycle riders and makes bicycling more appealing for a wider group, including both younger

²¹ University of British Columbia, 2012. Cycling in Cities, Preferred Route Types.

²² Centre City Cycle Track Network – Spring/Summer 2013 Engagement Feedback Responses

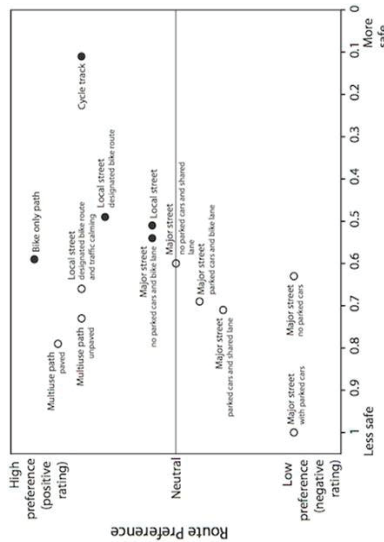


Figure 2-2: Relative Risk of Different Bicycle Facilities

in decreased human and financial costs.

A growing body of peer reviewed evidence suggests that if well designed, cycle tracks reduce collisions involving bicycle riders and other roadway users and generate an increase in bicycling trips when comparing pre and post construction traffic counts. However, apart from the actual collision statistics, cyclists tend to rely on their own perceptions, and those of their peers.

People's perceptions of bicycling facilities are measured in two ways, through stated preference and revealed preference surveys. Stated preference is normally examined through opinion surveys administered in person, over the phone or on-line. Revealed preference is examined by tracking people's behaviour. One recent study²⁹ from the UBC has character-

²⁹ University of British Columbia, 2012. Cycling in Cities. Preferred Route Types.

and older people. Even people who cycle regularly tend to prefer routes that are considered 'low-stress,' researchers from Portland State University used global positioning system (GPS) devices to track the behaviour of 166 bicycle riders in the Portland, Oregon region. The study found that a disproportionate share of utilitarian bicycling trips occurred on streets with separate paths or bicycle boulevards. The findings support the need for a network of well-connected bicycling routes that are protected from motor vehicle traffic as a means to encourage increased use of the bicycle.²³

2.1.2 Cycle tracks reduce collisions & injuries

Cycle tracks provide the highest level of protection and are safer than bike lanes.²⁴ This is a key reason why people prefer separated facilities. Although cycle tracks are relatively new in North America, early evidence from cycle track projects in New York City,^{25,26} Minneapolis²⁷ and Vancouver²⁸ shows decreases in bicycle crashes following construction. Better safety reduces the severity and frequency of crashes, resulting

²³ Broach, J., Dill, J., and J. Gliebe, 2012. Where do cyclists ride? A route choice model developed with revealed preference GPS data. <http://www.sciencedirect.com/science/article/pii/S096585641200164>

²⁴ Lusk, 2011. Risk of injury for bicycling on cycle tracks versus in the street. Injury Prevention.

²⁵ New York City Department of Transportation, 2011. Prospect Park West Bicycle Path and Traffic Calming Update.

²⁶ New York City Department of Transportation, 2012. Measuring the Street.

²⁷ Minneapolis Department of Public Works, 2010. Hennepin Avenue and 1st Avenue Two-Way Conversion Evaluation Report.

²⁸ City of Vancouver, 2011. Downtown Separated Bicycle Lanes Status Report.

2.1.3 Cycle tracks provide direct connections to Downtown

More than other types of "low-stress" bikeways, cycle tracks provide direct access to destinations and services. Although Calgary has an expansive network of separated off-street paths, these facilities tend to be recreational and do not connect directly with office, retail and institutional destinations. Recent evidence from the 7 Street cycle track suggests that

bicycle riders will utilize new downtown links once they become available. Extending the separated network across Downtown facilitates more trips within Downtown and encourages increased usage of the entire system.

For businesses, increased customer accessibility and enhanced placemaking and urban design along cycle track corridors can contribute to higher sales. In Manhattan, businesses along the 9th Avenue cycle track saw a 49 percent increase in sales, compared to three percent borough-wide.³⁰ Cycle tracks can welcome Calgarians into downtown on the weekends and can allow downtown workers to complete short trips during the day, increasing economic activity.

2.2 Cycle Tracks are Wanted and Needed in Calgary

Downtown Calgary has high employment density and a growing residential population. Street level development is dominated by retail, restaurants, and employment sites, higher density housing and educational institutions. The road network is largely comprised of a grid of arterial and collector streets, with some local streets and industrial streets on the outskirts of the downtown core. A network of separated, multi-use paths surrounds the downtown and provides links to surrounding neighbourhoods.

³⁰ New York City Department of Transportation, 2012. Measuring the Street.

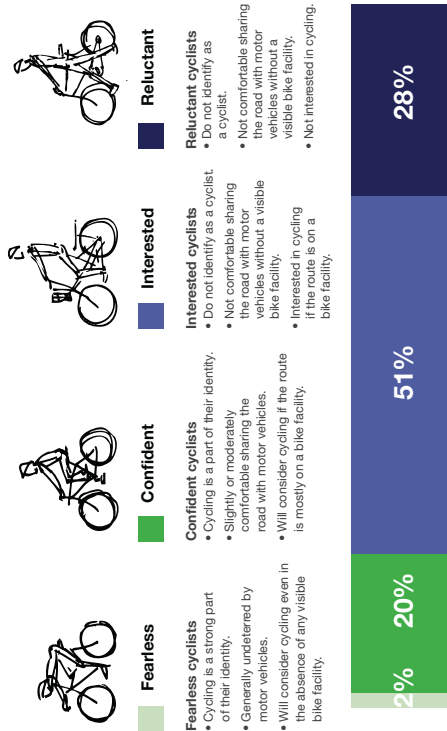


Figure 2-3: Calgary Bicycle Preferences

As illustrated in Figure 2-3, the majority of Calgarians are interested in bicycling more but are not comfortable sharing the road with motor vehicles. When attempting to serve the largest proportion of bicycle riders, it is necessary to design facilities that will provide comfort and perceived safety for a broad range of users.

Currently, there is little on-street bicycle infrastructure in the Centre City, requiring people to ride with traffic, dismount and walk, or ride on the sidewalk. Over the past five years, more people (35% more) have been riding into the Centre City. At the same time, Calgarians have said they don't feel safe bicycling in traffic. This situation suppresses participation in bicycling, since the majority of Calgarians are interested in bicycling, but are not comfortable sharing the road with motor vehicles.

The City is responding by developing plans for a cycle track network that provides a safe and easy way to get around the Centre City. A cycle track network will provide a space that is separated from travel lanes and sidewalks and encourage people who want to ride but have concerns about riding in traffic. An East-West/North-South cycle track network will carry people riding bicycles to within a block or two of their Centre City destination.

Importantly, the plans for a cycle track network are consistent with the values and strategies espoused by the City of Calgary in its 2020 Sustainability Direction, Calgary Transportation Plan, Calgary Cycle Plan, and Centre City Mobility Plan. All of these plans promote community health and increase the availability of mode choice and endorse the expansion of bicycle paths.

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