Southside Core Neighbourhoods Bike Network Feasibility Analysis

Urban Form and Corporate Strategic Development
City Planning Branch
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INTRODUCTION

This report is a technical assessment to support discussion and decisions on a minimum grid of protected bike lanes in central Edmonton to provide bicycle facilities that will attract and support people of all ages and abilities.

Council Motion

At the July 12, 2016, City Council meeting, the following motion was passed:

That Administration, in partnership with Stantec, provide an updated report on a minimum grid for physically separated bike lane infrastructure in the City of Edmonton's core and the report should include the potential use of relatively inexpensive (within existing resources) temporary infrastructure (example: bollards, mobile concrete curbs), as can be found in the City of Calgary's pilot project.

Project History

At the September 28, 2016 Urban planning committee meeting *CR_3890 Minimum Grid for Physically Separated Bike Lane Infrastructure* that responded to the July 12, 2016, City Council motion to report on the feasibility of a minimum grid for physically separated bicycle lane infrastructure within the Downtown portion of the core neighbourhoods was presented. The report recommended development of a 7.1 kilometer network of protected bike lanes be installed on roads in the Downtown. The recommended network placed a bike route within two blocks of most Downtown destinations, and provides cycling opportunities for all ages and abilities to reach these destinations. Council approved funding for the project at the October 11, 2016 Council Meeting and the Downtown Bike Network was implemented in June and July of 2017.

CR_3890 identified a series of next steps associated with fulfilling the July 12, 2016 council motion. This report addresses next step number three which indicated that the administration would work on developing a feasibility analysis for extending the bike grid to adjacent core neighbourhoods. This report summarizes the analysis completed for developing the Southside Core Neighbourhood Bike Network, for the Strathcona and Garneau portions of the core neighbourhoods.

CURRENT PRACTICE REVIEW

City of Edmonton Policies

Many cities across the world have identified bicycling as an important element of their overall approach to land use and transportation planning, and to building a livable city. Edmonton's Bicycle Transportation Plan (2009) envisions Edmonton as a bicycle friendly city (and connected region) where more people cycle more often. To achieve this vision, the Plan, like those of many other cities, identifies conditions for a successful shift to bicycling. For Edmonton these include:

- Create a bicycling network
- Coordinate bike planning and infrastructure investment
- Provide end-of-trip facilities
- Integrate bicycle and transit facilities
- Mitigate construction impact on the network
- Sign the network
- Maintain the network
- Communication and education
- Leverage partnerships
- Promote workplace integration
- Promote tourism aspect of cycling
- Monitor the network

A minimum grid is a distributed network of bike lane infrastructure that provides bicycle access to destinations of different scales along roads and other facilities of differing capacities and attributes. To accommodate the wide-ranging skills of bicycle users, Edmonton's Bicycle Transportation Plan envisions a minimum grid based on a two-level system: a city-wide system and a connector system.

Early implementation of the Bicycle Transportation Plan focused on expanding the network as much as possible by stretching planning and infrastructure investment. Separated or protected bike lanes were not identified as a design option and were not pursued. Early projects included implementation of relatively inexpensive facilities that included painted bike lanes and shared roadways identified by sharrow markings and signage. These facilities did not require any significant roadway reconstruction although the painted bike lanes require reconfiguration of existing roadway space. These projects were met with resistance, from both the driving community and the cycling community and it was felt that some of the routes were implemented in locations that were not well connected to other cycling routes in the bicycle network, which lead to questions about their efficacy to enable cycling in the city.

A few of the bike routes were removed and direction was provided by City Council to focus on developing higher quality bicycle infrastructure in central areas of the city where existing cycling

activity is already higher and to include public engagement in design process associated with implementation of cycling infrastructure. Major bicycle routes on both 83 Avenue and 102 Avenue were pursued with a robust public engagement program. The Engage 106-76 Avenue bike route project emerged through the Queen Alexandra neighbourhood renewal project, and was further coordinated with Belgravia, McKernan, Allendale and Strathcona neighbourhood renewal projects. These bike routes have been developed as all ages and abilities infrastructure with most of the facilities developed as protected bike lanes (separated from vehicular traffic) as either shared-use paths or protected bicycle lanes. A portion of the 83 Avenue route was implemented as a traffic calmed bicycle boulevard.

Current city practices emphasizes network connectivity with a focus on high demand areas, and providing safe and comfortable infrastructure for all users.

LITERATURE REVIEW

Network Principles

As was identified by Stantec in the August 2016 *Bicycle Grid for Downtown Edmonton Feasibility Study: Edmonton Fast Tracks* the minimum grid of protected bike lanes in Downtown Edmonton was developed based on the principles outlined in the Dutch Design Manual for Bicycle Traffic, commonly referred to as CROW. As noted in the Bicycle Grid for Downtown Edmonton Feasibility Study prepared by Stantec, there are five key principles associated implementation of effective cycling network in cities and these principles continue to be relevant to the Southside Core Neighbourhood Bike Network. The factors as summarized in the report are:

- Cohesion: Important destinations and regional routes are interconnected with a complete bicycle network.
- Directness: Directness in terms of distance and travel time, minimizing the number of intersections where cyclists have no right of way, the amount of travel delay, and need for out of direction travel.
- Safety: Avoiding conflicts, managing conflicts through design and operations, and separating bicycles from motor vehicles when speeds are over 30 km/hr.
- Comfort: Encounters between people riding bikes and those driving vehicles are minimized by combining busy cycle connections as little as possible with busy vehicle connections.
- Attractiveness: Busy routes are located in areas where there is sufficient social comfort in the community.

The 2016 version of the CROW manual also provides guidance on route location selection process. Key recommendations taken from this include that a primary cycle network should have a distance of between 300-500 metres between parallel routes in built up areas and a spacing of 1000 - 1500 metres outside of built up areas (CROW, 2016). In addition, CROW indicates that, main cycling routes should preferably not be located within key automobile routes but consideration should be

given to ensuring that the key network principles described above are met by any route designated as a primary cycling route. While the CROW manual recommends that key automobile routes should be avoided, it acknowledges that bicycle friendly streets (bike boulevards) can be used as a complementary facilities in the primary cycle network.

Finally, as was identified in the Downtown Bike Network report, the Southside Core Neighbourhood Bike Network will also consider the ease of construction and all-seasons operation and maintenance (e.g., snow clearing) and operational constraints associated with the routes.

Facility Type Best Practice Summary

Current best practices associated with bicycle facility design that were reviewed through this analysis include:

- Chapter 5 - Integrated Bicycle Design of the the 2017 Transportation Association of Canada Geometric Design Guide For Canadian Roads.
- The Second Edition of the National Association of City Transportation Officials Urban Bikeway Design Guide.
- National Association of City Transportation Officials' 2017 Guideline: Designing for All Ages & Abilities - Contextual Guidance for High-Comfort Bicycle Facilities.
- The 2016 CROW Design Manual for Bicycle Traffic

The following sections provide summaries of key recommendations reviewed with respect to contextual guidance and design and operational considerations associated with implementing bicycle facilities in built-up areas in the above noted documents.

Transportation Association of Canada

In 2017 the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads was updated to include a chapter on bicycle facility design. Chapter 5 - Bicycle integrated Design recommends that bicycle facility selection be aligned with the motor vehicle speed and volumes on the road on which they are being placed. Table 1 summarizes TAC's recommendations for which cycling facility types are best suited based on the posted roadway speed.

Table 1: TAC Bikeway Facilities, by Roadway Posted Speed

Type of Cycling Facility	Posted Roadway Speed Limit (km/h)			
	≤30	>30 ≤50	>50 ≤ 80	>80
Unbuffered or Buffered Bike Lane	Suitable	Depends on context	Not Suitable	Not Suitable
Protected Bike Lane	Depends on context	Suitable	Suitable	Not Suitable
Bike Path /Multi-Use Path	Depends on context	Suitable	Suitable	Suitable
Bicycle Boulevard	Suitable	Depends on context	Not Suitable	Not Suitable
Shared Roadway	Depends on context	Depends on context	Not Suitable	Not Suitable
Shared Lane	Depends on context	Depends on context	Not Suitable	Not Suitable
Advisory Bike Lane	Depends on context	Depends on context	Not Suitable	Not Suitable
Bicycle Accessible Shoulder	Depends on context	Depends on context	Depends on context	Depends on context

(Transportation Association of Canada, 2017)

National Association of City Transportation Officials

In December 2017 the National Association of City Transportation Officials (NACTO) published a reference document called *Designing for All Ages & Abilities - Contextual Guidance for High-Comfort Bicycle Facilities.* This reference provides information for selection of bicycle facilities based on roadway context, with a focus on what is needed to ensure a bicycle facility is an all ages and abilities facility. The guideline provides a definition of all ages and abilities bicycle facilities and provides contextual guidance on there implementation. Table 2 summarizes the information presented in this reference document.

Table 2: NACTO Contextual Guidance for Selecting All Ages & Abilities Bikeways

Roadway Context				All Ages & Abilities Bicycle Facility
Target Motor Vehicle Speed*	**Target Max. Motor Vehicle Volume (ADT)**	**Motor Vehicle Lanes**	**Key Operational Considerations**	
Any		*Any*	*Any of the following:* high curbside activity, frequent buses, motor vehicle congestion, or turning conflicts [1]	Protected Bicycle Lane
< 10 mph (16 km/h)	Less relevant	No centerline, or single lane one-way	Pedestrians share the roadway	Shared Street
≤ 20 mph (32 km/h)	≤ 1,000 – 2,000		< 50 motor vehicles per hour in the peak direction at peak hour	Bicycle Boulevard
≤ 25 mph (40 km/h)	≤ 500 – 1,500			Conventional or Buffered Bicycle Lane, or Protected Bicycle Lane
	≤ 1,500 – 3,000	Single lane each direction, or single lane one-way	Low curbside activity, or low congestion pressure	Buffered or Protected Bicycle Lane
	≤ 3,000 – 6,000			
	> 6,000			Protected Bicycle Lane
	Any	Multiple lanes per direction		
> 26 mph+ (42 km/h)	≤ 6,000	Single lane each direction	Low curbside activity, or low congestion pressure	Protected Bicycle Lane, or Reduce Speed
		Multiple lanes per direction		Protected Bicycle Lane, or Reduce to Single Lane & Reduce Speed
	> 6,000	*Any*	*Any*	Protected Bicycle Lane, or Bicycle Path
High-speed limited access roadways, natural corridors, or geographic edge conditions with limited conflicts		*Any*	High pedestrian volume	Bike Path with Separate Walkway or Protected Bicycle Lane
			Low pedestrian volume	Shared-Use Path or Protected Bicycle Lane

* While posted or 85th percentile motor vehicle speed are commonly used design speed targets, 95th percentile speed captures high-end speeding, which causes greater stress to bicyclists and more frequent passing events. Setting target speed based on this threshold results in a higher level of bicycling comfort for the full range of riders

+ Setting 25 mph as a motor vehicle threshold for providing protected bikeways is consistent with many cities' traffic safety and Vision Zero policies. However, some cities use a 30 mph posted speed as a threshold for protected bikeways, consistent with providing Level of Traffic Stress level 2 (LTS 2) that can effectively reduce stress and accommodate more types of riders

1 Operational factors that lead to bikeway conflicts are reasons to provide protected bike lanes regardless of motor vehicle speed and volume

(National Association of City Transportation Officials, 2017)

CROW

Like TAC and NACTO, CROW also recommends that consideration be given to both the motor vehicle and bicycle operations on the roadway when determining the appropriate cycling facility types in urban environments. Table 3 below summarizes CROW's selection plan for cycling facilities in built up areas.

Table 3 Selection Plan for Cycle Facilities in the Case of Road Sections in Built-Up Areas

<table>
<tr><th rowspan="2">Road Category</th><th colspan="2" rowspan="2">Speed Limit Motorized Traffic (km/h)</th><th rowspan="2">Volume of Motorized Traffic (PCU/24h)</th><th colspan="3">Cycle Network Category</th></tr>
<tr><th>Basic Structure (Bike Volume < 750/24h)</th><th>Main Cycle Network (Bike Volume 500-2,500/24h)</th><th>Bicycle Highway (Bike Volume > 500-2,500/24h)</th></tr>
<tr><td rowspan="3">Residential Road</td><td colspan="2" rowspan="3">Walking pace or 30</td><td>< 2,500</td><td rowspan="2">Mixed Traffic</td><td>Mixed Traffic or Bicycle Street</td><td>Bicycle Street (With Right-of-Way)</td></tr>
<tr><td>2,000 to 5,000</td><td>Mixed Traffic or Cycle Lane</td><td rowspan="2">Cycle Path or Cycle Lane (With Right-of-Way)</td></tr>
<tr><td>> 4,000</td><td colspan="2">Cycle Lane or Cycle Path</td></tr>
<tr><td rowspan="3">Distributor Road</td><td rowspan="2">50</td><td>2x1 lane</td><td rowspan="3">Not Relevant</td><td>Cycle Lane or Cycle Path</td><td colspan="2" rowspan="2">Cycle Path</td></tr>
<tr><td>2x2 traffic lane</td><td>Cycle Path</td></tr>
<tr><td colspan="2">70</td><td colspan="3">Cycle/Moped Path</td></tr>
</table>

(CROW, 2017)

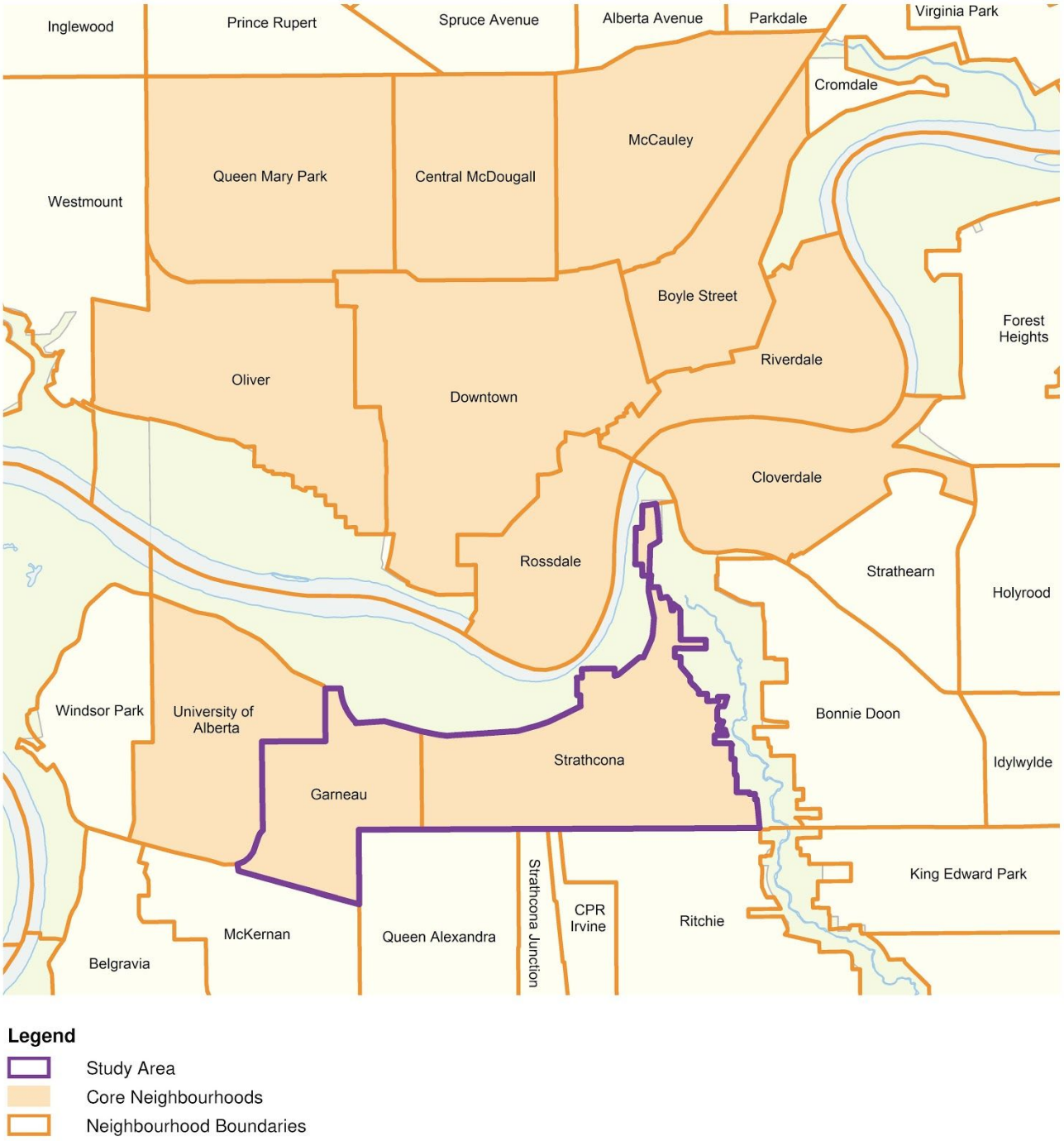
Key takeaways from the best practice review are that the actual travel speed not just the posted on the roadway is a key factor in determining cycling facility type. Where travel speeds exceed 50 km/h dedicated bicycle facilities become a key to ensuring they are all ages and abilities. Further to this, regardless of the speed the volume of motor vehicles also plays a role in the type of cycling facility that should be developed, with higher vehicle volumes being associated with better separation between bikes and motor vehicles. There may be situations where bicycle boulevard or shared on-street facilities may be appropriate as a all ages and abilities facilities but for this to be comfortable for cyclists vehicle volumes and speeds must be low and it may require implementation of traffic calming measures to ensure that cyclists are prioritized on the roadway and that the actual travel speed and volume of vehicles remains below the thresholds associated with cyclist comfort.

CURRENT STATE ANALYSIS

Study Area

The motion by City Council identified the core neighbourhoods as being the area for evaluation. As indicated in the introduction, the feasibility study for the Downtown portion of the core neighbourhoods was completed in August 2016 by Stantec, and approved for implementation by Council in October 2016. This study evaluates the feasibility of implementing an all ages and abilities network of cycling facilities for the Strathcona and Garneau portions of the core neighbourhoods, as illustrated in Figure 1. It is acknowledged that the University of Alberta is identified as a core neighbourhood; however, the City has no jurisdiction over University property and its cycling facilities. The study was completed assuming that the University is a key destination within core neighbourhoods and the City will continue to coordinate with the University to identify opportunities to build on the connected network to and through the North Campus. Details of these connections to University facilities will need to be explored through the project development phase. Cloverdale is also identified as a core neighbourhood on the south side of the river; however, due to its location east of Mill Creek Ravine it was determined that it would be analyzed in subsequent stages of the Core Neighbourhood Bike Network Analysis.

Figure 1: Map of Core Neighbourhoods



Current and Planned Construction Activity

There are a number of construction projects identified to occur within the study area over the next five years. These include both rehabilitation projects and major reconstruction projects.

The Strathcona and Garneau neighbourhoods are currently identified for neighbourhood renewal. The Strathcona project is currently in the public engagement and design stage with construction anticipated to begin in 2019 and be completed in 2021. The Garneau project is anticipated to follow shortly thereafter with public engagement and design beginning in late 2018 and construction occurring in 2021 and 2022. These projects are anticipated to include reconstruction of the all the curb and gutter, roads, and sidewalk on the residential roadways in the neighbourhoods.

A number of arterial roads within the study area have been identified for rehabilitation in 2019 to 2020 including:

- Repaving of 112 Street from 82 Avenue to 87 Avenue (2018)
- Repaving of 109 Street from 82 Avenue to Walterdale Hill (2020)
- Reconstruction of 104 Street from 82 Avenue to Saskatchewan Drive (2023)

In addition, a concept and preliminary design study for Saskatchewan Drive between 109 Street and 99 Street (Scona Road) has been initiated by Integrated Infrastructure Services. The scope of work includes reconstruction of Saskatchewan Drive and widening of the Shared-Use Path between 99 Street (Scona Road) and 109th Street. Objectives associated with this upgrade include providing a higher level of service for cyclists and pedestrians, enhancing usability and safety for vulnerable users, and accommodating motor-vehicle commuters. The design work is scheduled to occur throughout 2018 with the intent of requesting funding approval for portions of the work in the fall of 2018.

The Duggan Bridge over Fort Hill Road (106 A Street), which is also along the Saskatchewan Drive corridor, has also been identified as needing significant rehabilitation or replacement. Design work associated with a replacement facility is currently ongoing and it is currently anticipated that this construction will happen within 5 years.

In addition to capital construction projects, this area of the city is currently seeing a significant number of private redevelopment projects. This includes both major mixed use redevelopment projects and smaller infill development projects. While these projects typically occur on private property, they may include on-street construction and maintenance permits and hoarding requirements that impact right-of-way available for the development of cycling infrastructure.

Current Planning Studies

There are currently three major planning studies being undertaken within the study area including, the Plan Whyte Land Use Study, the Envision 109 Design Study, and the Centre LRT Study.

The Envision 109 Design Study is a streetscape concept design project that is being developed as per the recommendations of the 109 Street Corridor Area Redevelopment Plan. The study will identify streetscape improvements that can be implemented without major infrastructure changes in

the immediate term, and development of a long-term concept design that could be implemented in conjunction with major rehabilitation of 109 Street.

The Plan Whyte Design Study is a focused land use study for the Whyte Avenue Commercial Area portion of the Strathcona Area Redevelopment Plan (ARP). The goal of this study is to better understand how the area's heritage, character and livability can be further strengthened while exploring opportunities for additional development over the next 20 to 25 years. The Study is currently being finalized and will be taken to Urban Planning Committee for approval in April 2018.

The Centre LRT Study is identifying a route and will then develop a concept plan for a new LRT line connecting the west end of Downtown with the University of Alberta and Bonnie Doon, as outlined in the Council approved 2009 LRT Network Plan. The Study is currently in the "evaluating route options" stage, with the intent of completing concept design for the preferred route in the first quarter of 2019. It has been confirmed that the preferred east/west connection for this LRT route will be located on Whyte Avenue. Additional technical analysis and stakeholder engagement is required before other key aspects of the route, such as the preferred location of the river crossing and locations to connect to the Valley Line LRT, are identified. The preferred route will be presented to Council for approval in the first quarter of 2018.

Existing Cycling Activity

Strathcona and Garneau neighbourhoods have some of the highest rates of people choosing to cycle as their main mode of transportation. Results from 2016 Municipal Census revealed that bicycle usage in the Strathcona and Garneau neighbourhoods is higher than the city average with 7.5% of Strathcona and 3.8% of Garneau residents reporting that a bicycle was their primary mode of transportation, while the city average is 1.0%.

The 2015 Edmonton and Region Household Travel Survey indicates that travel mode by bicycle in and out of the University district is in the order of 5% and that bicycle trips represent 8% of travel trips within the University district. This is slightly greater than the percent travel mode by bicycle for the survey's central band (which includes the Downtown, Downtown Fringe, and University districts) at 4% in and out and 4% within, and higher than the 2% of bicycle trips associated with travel within the city as a whole.

Existing Network Analysis

The existing cycling network is illustrated in Figure 2. This existing network analysis summarizes all of the existing bicycle facilities within the study area based on routes identified on the 2017 Bike Map and status of funded construction projects associated with the 83 Avenue Bike Route, and the Queen Alexandra, McKernan and Belgravia Neighbourhood Renewal projects as of December 2017. The network as presented does not include facilities located within the University of Alberta North Campus Lands. It is acknowledged that there is an extensive network of active modes facilities that provide connectivity throughout the North Campus; however, these routes are designated and maintained by the University of Alberta.

Figure 2: Existing Cycling Network

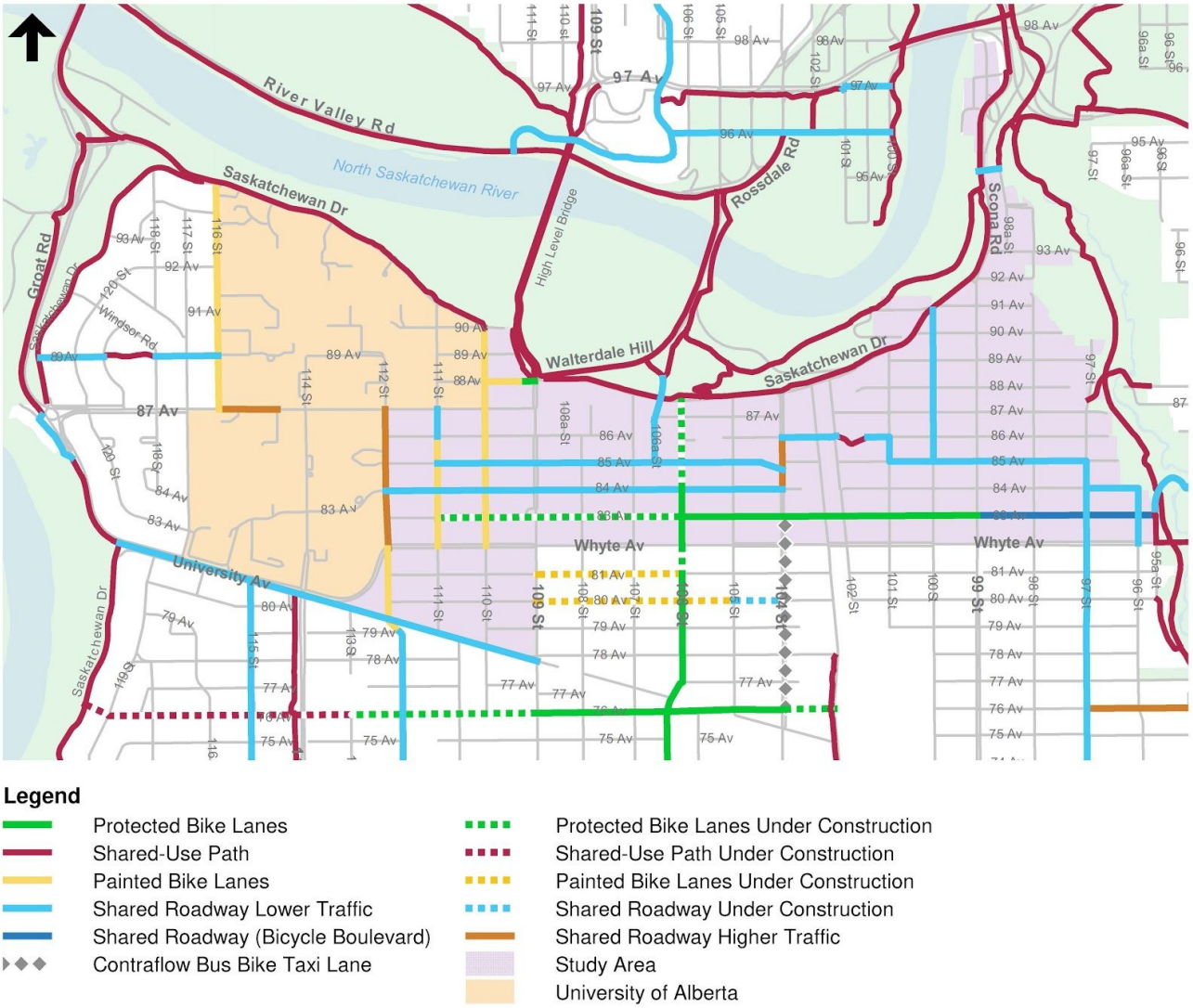


Figure 2 illustrates that the existing cycling network within the study area is a piecemeal network of different types of cycling facilities. It is noted that northbound curb lane on 109 Street is designated as a bus, school bus, taxicab and bicycle only highway, but as this is a isolated piece of the network that serves cyclists that fall into the strong and confident category it has not been included in this assessment.

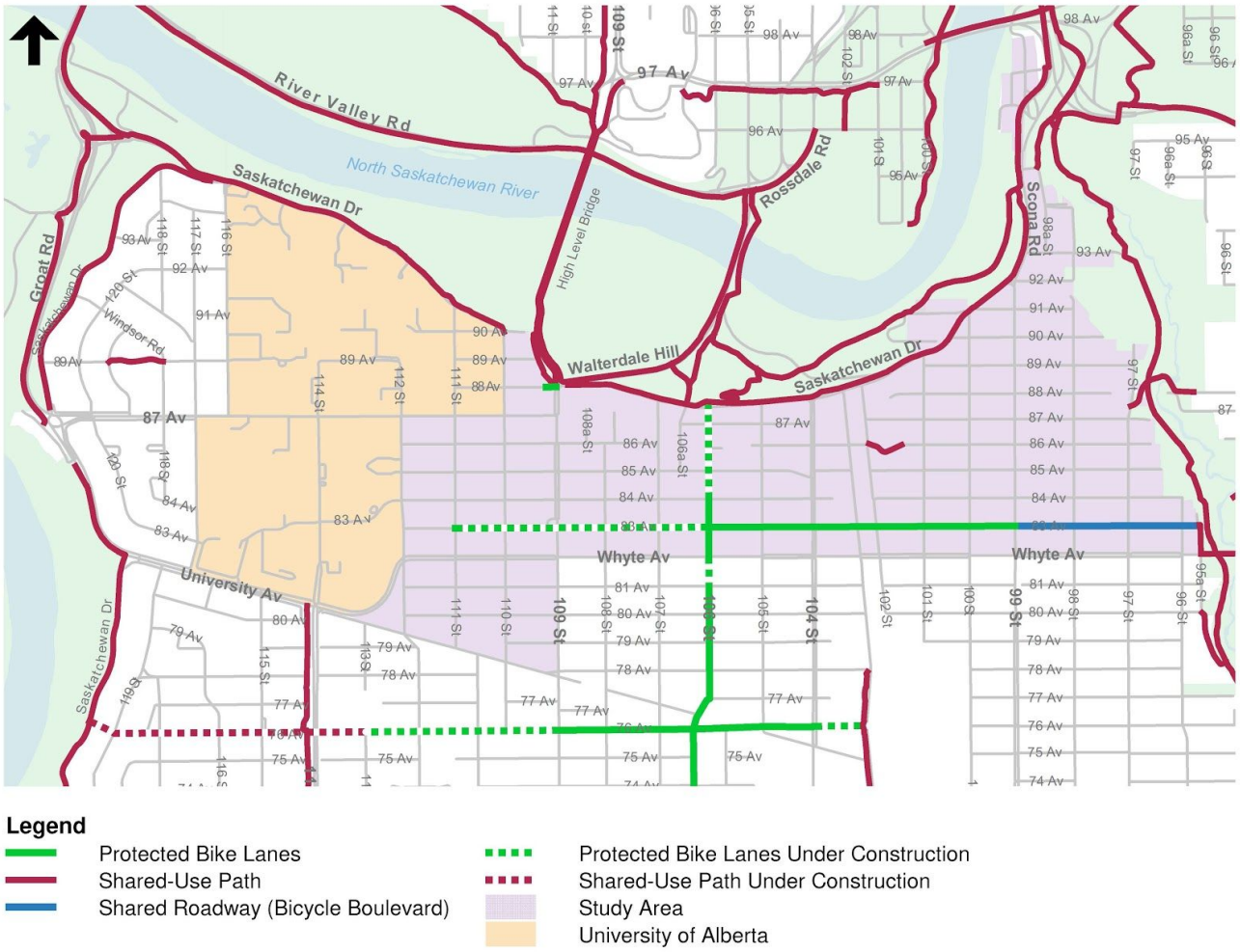
There are numerous on-street cycling facilities that include both painted bike lanes and designated shared roadway routes on both on low and high traffic roads. These on-street facilities do not meet best practice design standards associated with all ages and abilities cycling infrastructure and are not necessarily located such that they help create a direct and connected network.

Protected bike lanes exist or are under construction on 83 Avenue and 106 Street and the existing shared-use path network in this area of the city is well established and fairly contiguous. Although

not within the study area boundary, the 76 Avenue protected bike lanes that are currently under construction are considered part of the connected bike network in this area.

Although Figure 2 illustrates fine-grained coverage of cycling facilities within the study area, there are few facilities suitable for all ages and abilities. Based on the review of literature, the only portions of the existing network that meet all ages and abilities design standards are the shared-use paths and protected bike lanes. These facilities are illustrated in Figure 3.

Figure 3: Existing All Ages and Abilities Facilities



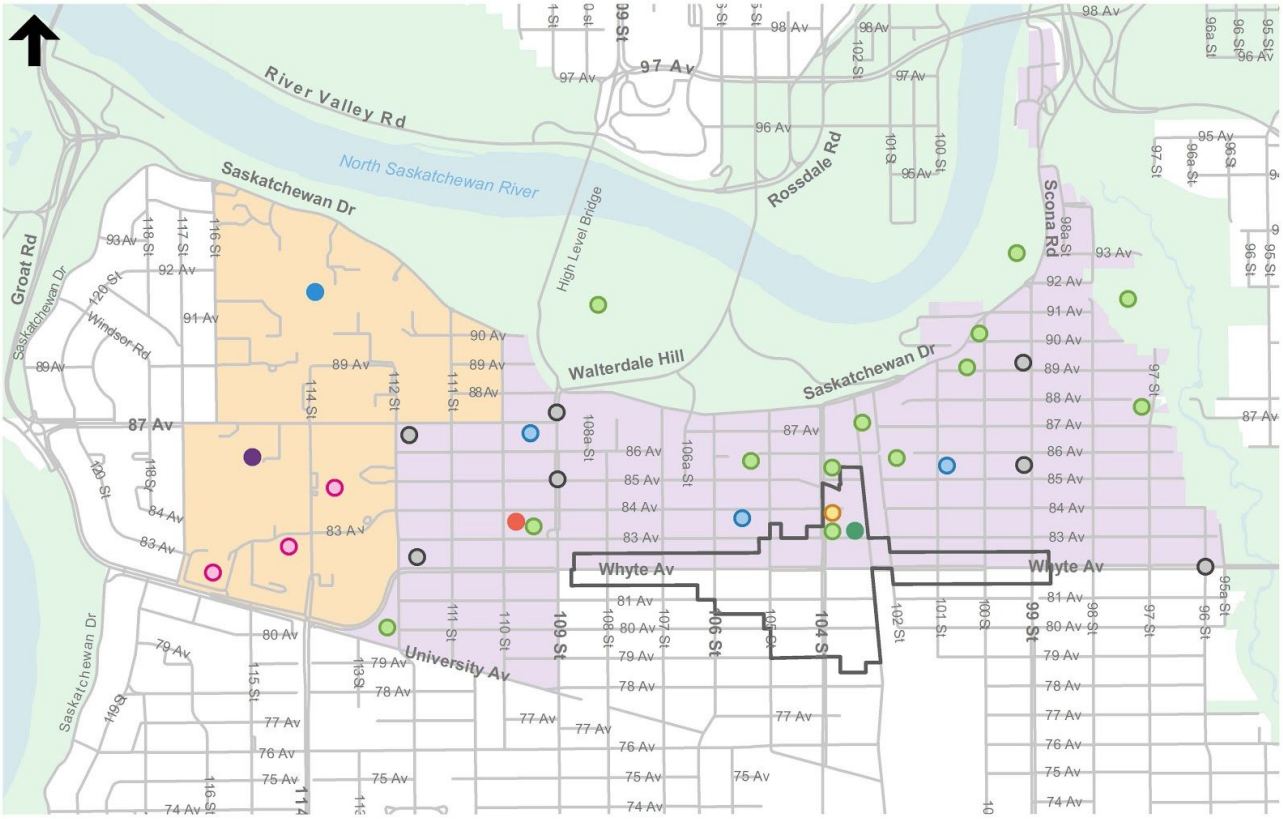
A comparison between Figure 2 and Figure 3 suggests that improvements to the network are required to ensure that the cycling infrastructure in this area of the city provides all ages and abilities access to key destinations within the study area.

Destinations Within the Assessment Area

The Southside core neighbourhoods represents a significant developed area of the city with a mix of residential, commercial and employment land uses. Key destinations are associated with the

University of Alberta and affiliated health facilities (University and Stollery Hospitals, Edmonton Clinic, Mazankowski Heart Institute and Cross Cancer Institute). The Whyte Avenue Commercial Area corridor represents a key employment, commercial and entertainment district within the study area. There are numerous institutional uses including schools, a public library, arts facilities and the Old Strathcona Farmers Market. From a network perspective, the High Level Bridge and Scona Road shared-use paths represent key connection points to the city's Downtown and provide connections across the North Saskatchewan River. Figure 4 presents some of the locations associated with the key destinations identified for the study area.

Figure 4: Key Destinations



The Mill Creek Ravine and River Valley trail networks are key recreational facilities and are important commuting links on the edge of the study area.

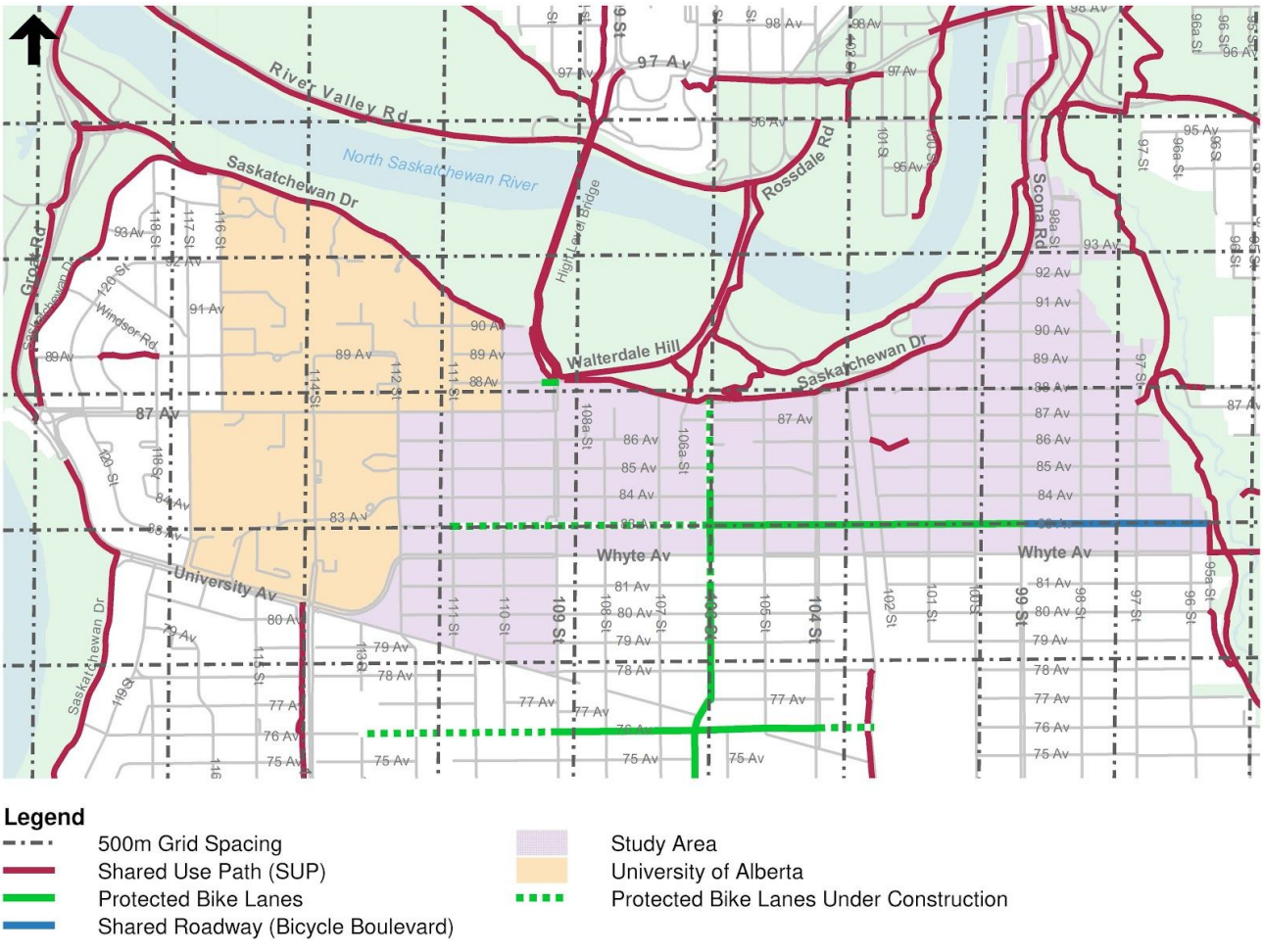
ASSESSMENT OF SUITABLE ROUTES

The assessment of suitable routes for the Southside Core Neighbourhoods Bike Network considered both overall need for an expanded network and the operational impacts associated with implementation of all ages and abilities bike infrastructure.

Network Gap Assessment

The grid network of streets and avenues in this area of the city provides multiple opportunities for further development of the all ages and abilities network. As identified in the best practice review, a connected network of high quality cycling facilities for an area that has this population density and built form should have a spacing between facilities of roughly 500 metres. Figure 5 illustrates a 500 metre grid superimposed on the existing all ages and abilities network illustrated in Figure 3.

Figure 5: 500 m Grid Spacing



Evaluating the network based on this spacing shows that the east-west portions of the network are well developed with the shared-use path on Saskatchewan Drive and the 83 Avenue bike route

generally meeting the 500 metre spacing requirement. Although outside of the study area it is noted that the 76 Avenue protected bike lanes are located approximately 750 metres from 83 Avenue and should still be considered an important element of the connected cycling network in this area.

The grid analysis suggests that the Garneau neighbourhood would benefit from additional north-south route with 109 Street and 112 Street generally aligning with the 500 metre spacing. The 500 metre spacing also suggests an east-west connection between the 109 Street/Saskatchewan Drive intersection and the University is needed in the Garneau neighbourhood. The Strathcona neighbourhood could benefit from additional north-south connections between 106 Street and Mill Creek Ravine as well as an additional east-west connection in the northeast sector of the neighbourhood.

Facility Type Assumptions

Prior to determining where the routes should be located, assumptions associated with appropriate facility types were reviewed. This review confirmed what type of cycling infrastructure should be implemented, the required design standards, and how much space is necessary to support development of additional cycling infrastructure.

Factoring in the the network goals, literature review, and current practice, and due to the volume and speed of motor vehicles on the arterial roads in the study area, it was determined that protected bike lanes are the preferred type of bike facility on arterial roads. On the non-arterial roads i.e. residential roads in the study area the speed and volume of motor vehicles is much less than the arterial roads, and there may be cases where bicycle boulevard type treatments may meet the needs of an all ages and ability cycling facility; however as per the description in the July 12, 2016 motion, it is assumed that protected bike lanes will be developed on the residential roads as well.

With respect to facility type, bi-directional cycling facilities on two-way roads were discounted from this analysis because the road network in this area of the city does not have traffic signals at every intersection like the downtown network does. As a result, the turning movement conflicts and legal implications associated with bi-directional cycling facilities on two-way roads cannot be controlled and therefore bi-directional facilities cannot be implemented.

This analysis assumes that protected bike lanes will be developed as single directional cycling facilities on each side of a two-way roadway, or as bi-directional cycling facilities if the motor vehicle travel is one-way.

Facility Design Assumptions

Table 4 summarises the dimensions assumed in this analysis. These dimensions are updated to reflect what was learned through the design of the Downtown Bike Network and the January 2018 final draft of the City's Complete Streets Design and Construction Standards. The assumed design

standards presented in Table 4 are associated with roadways with design speeds of 50 km/h or less.

Table 4: Assumed Design Standards

Cross-Sectional Element		**Dimension (m)***
Motor Vehicle Travel Lanes (non-bus route, non-truck route with design speed of 50 km/h or less)	Curbside	3.25
	Standard Lane	3.0
Parking	Standard Lane	2.45
Protected Bicycle Lane	Single Direction	2.1
	Bi-directional	3.3
Buffer	Without Parking	0.8
	With Parking	1.0

* dimensions measured to face of curb

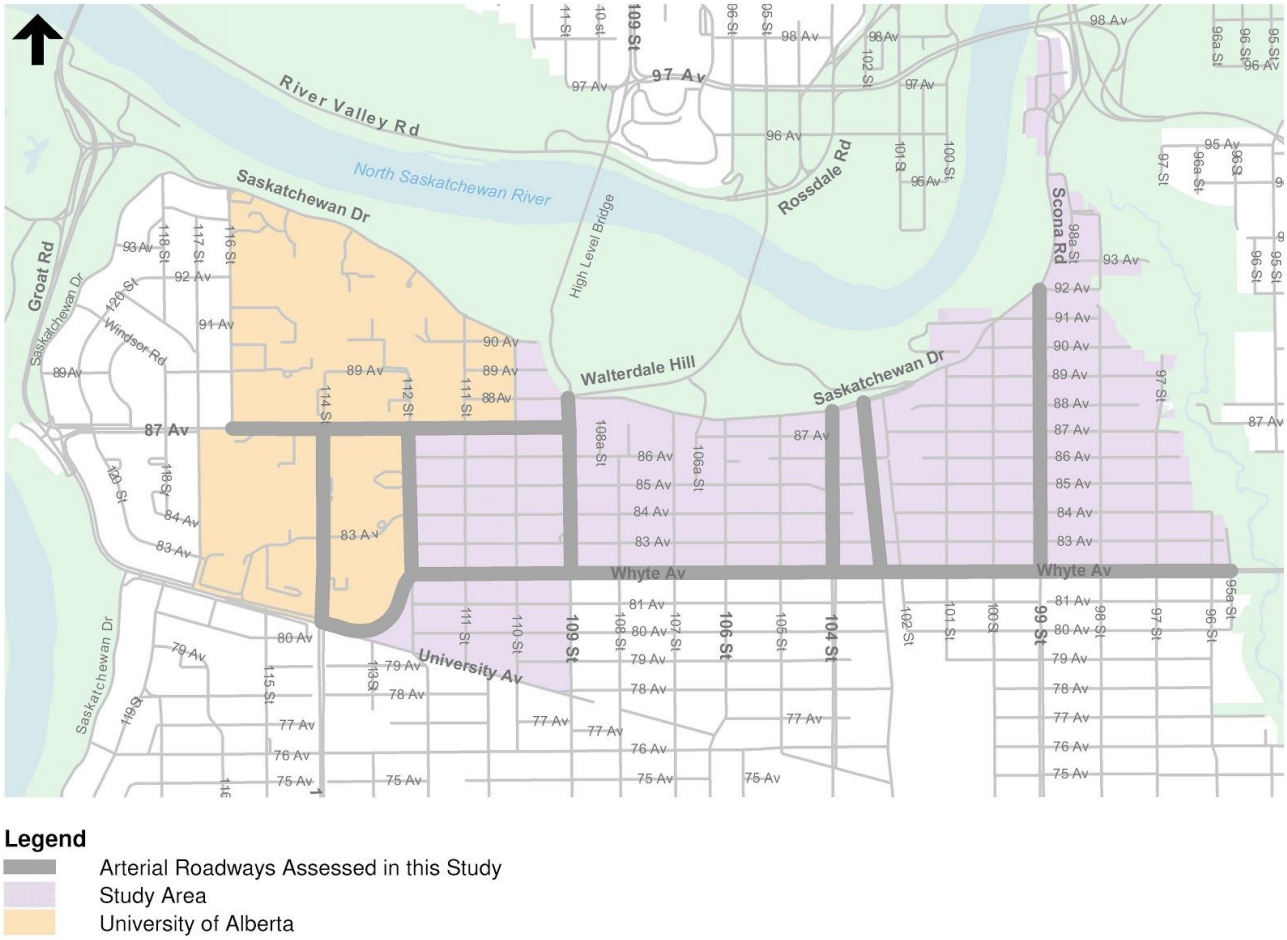
The 0.8 metre buffer identified in Table 4 is higher than the minimum width identified in the complete streets guidelines, and was selected because it reflects the minimum width that accommodates standard sized regulatory signage including appropriate offsets from signs.

Preliminary Route Screening Analysis Summary

An assessment of the impacts of implementing cycling infrastructure was completed similar to the analysis what was completed for the Downtown Bike Network Feasibility Study. Factors reviewed through the assessment include roadway and transit operations, on-street parking, pavement condition, and planned construction projects.

The analysis was completed separately for the arterial road network and the residential road network. Figure 6 illustrates the arterial roads evaluated. Although Saskatchewan Drive is an arterial road in the study area, because the shared-use path is part of the existing all ages and abilities network, it was not included in the arterial roadway preliminary route screening.

Figure 6: Arterial Roadways within the Study Area



Arterial Roadway Preliminary Screening

The preliminary route screening of the arterial roadways focussed on assessing the impacts to motor-vehicle operations associated with the implementation of all ages and abilities infrastructure on these roadways. The analysis completed assessed the impacts of converting the existing curb lanes on these arterial from motor vehicle travel lanes to protected bike lanes, to confirm if the arterial roads within the study area would continue to function appropriately with fewer motor vehicle travel lanes.

Based on the standards summarized in Table 4, a single direction protected bike lane requires a minimum of 2.9 metres on each side of a roadway. This assumes that there is no parking adjacent to the projected bike lane, which is the case on most of the arterial roads in the study area. Given that the network must be installed within the constraints of the existing curb and gutter space, the implementation of 2.9 metre single direction protected bike lanes requires the removal of two existing motor vehicle travel lanes on each arterial road within the study area. The removal of two travel lanes has significant operational impacts on the arterial road network in this area of the city. Table 5 summarizes the results of the analysis.

Table 5: Arterial Roadway Preliminary Screening Analysis Summary

Roadway	Analysis Outcome	Analysis Summary
114 Street*	Eliminate as option	● Conversion of two travel lanes to bike lanes reduces existing 4 lane road to a 2 lane road. Existing traffic volumes cannot be supported on a two lane road. ● Alternative routing exists in close proximity on University Service Road.
112 Street	Eliminate as option	● Conversion of two travel lanes to protected bike lanes reduces existing 4 lane road to a 2 lane road. Existing traffic volumes cannot be supported on a two lane road.
109 Street	Eliminate as option	● Implementing a protected cycling facility has significant impacts on turning movements at the 82 Avenue and 87 Avenue intersections.
104 Street	Advance contraflow lane to Secondary Screening	● Implementing a protected cycling facility has significant impacts on turning movements at the 82 Avenue and 83 Avenue intersections. ● Worthwhile exploring conversion of the contraflow lane.
103 Street	Eliminate as option	● Impact of implementing a protected cycling facility has significant impacts on the 82 Avenue intersection operations. ● Limited benefit to implementing a protected cycling facility on this one-way street when northbound cycling is supported in existing contraflow lane on 104 Street.
99 Street	Eliminate as option	● Conversion of two travel lanes to protected bike lanes reduces existing 4 lane road to a 2 lane road. Existing traffic volumes cannot be supported on a two lane road.
87 Avenue	Eliminate as option	● Portions of the existing 87 Avenue exist as a 3 lane roadway and the impact of implementing protected bike lanes would require conversion to one-way for motor vehicle traffic. This impact to the arterial road network cannot be supported without provision of additional traffic accomodation on other roadways.
82 Avenue	Eliminate as option	● As noted in the Current Planning Studies section, 82 Avenue has been identified for inclusion as the main east-west route for the Centre LRT route was therefore eliminated as an option for the Southside Core Neighbourhood Bike Network. ● 83 Avenue Major Bikeway is 200 m north, offering parallel service.

*114 Street is part of the arterial road network however a portion of the road is developed on titled property this assessment does not address the impacts of this condition.

Residential Roadway Preliminary Screening

After the arterial roadways have been reviewed for bike infrastructure suitability, the remaining roadways in the study area, which are primarily residential roads, were then reviewed.

The roadway network is primarily organized on a north-south, east-west grid. The roadways are largely narrow and tree-lined and it is acknowledged that this layout plays a significant role in the character of the Southside core neighbourhoods. The roads are typically developed on 20 metre

rights-of-way with paved driving surfaces between 7.8 metres and 8 metres wide, and boulevard areas that typically include sidewalks and trees. The roads operate as one or two-way roads with the majority of adjacent properties having vehicle access via rear alleys. The adjacent properties include a significant amount of multi-family residential, however there are also large areas of single family residential, commercial, and institutional uses spread throughout the neighbourhoods.

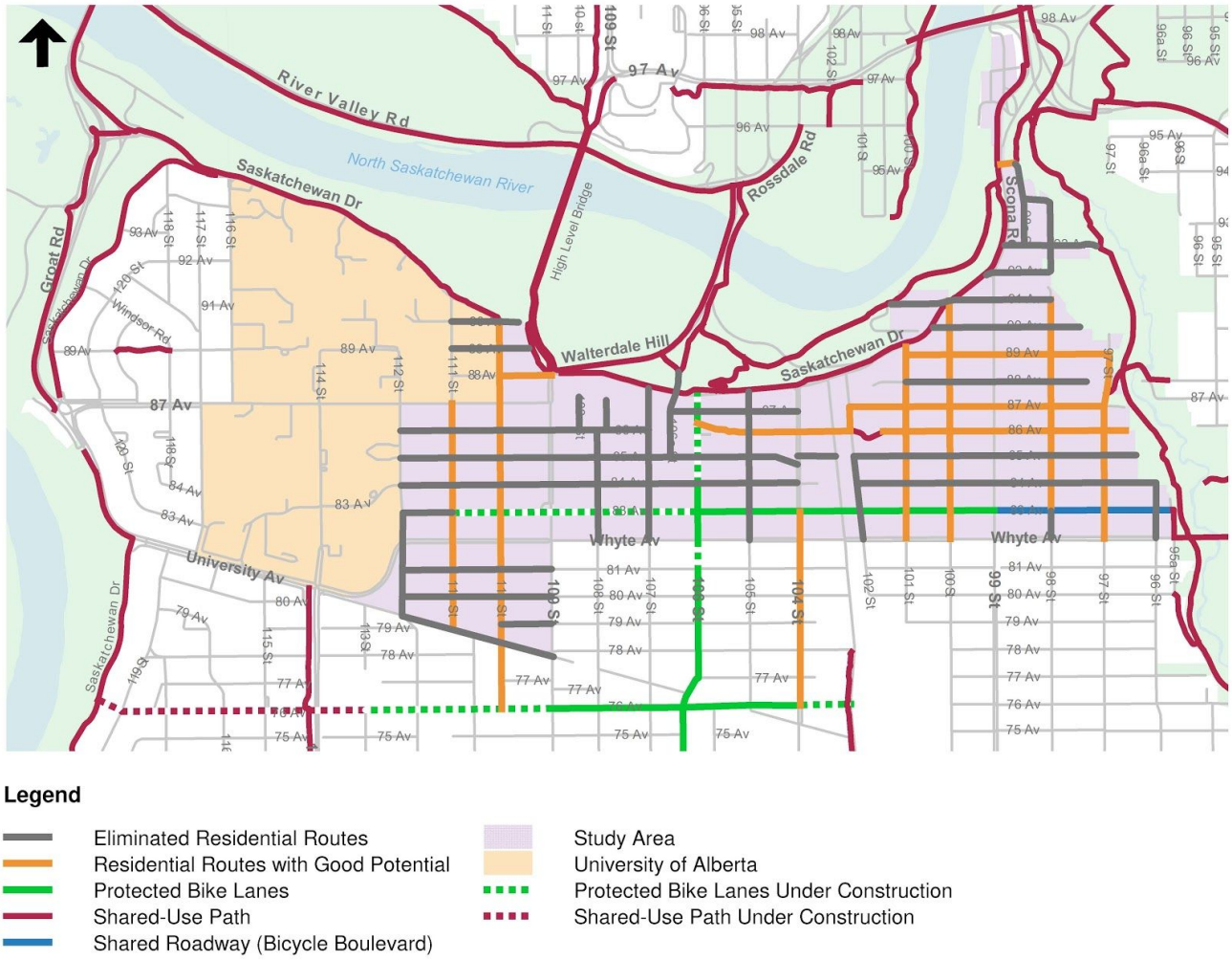
On-street parking is prevalent throughout the study area. Most roadways have on-street parking on at least one side of the road although there are some locations where parking is permitted on both sides of the road. The on-street parking is managed through a variety of methods including, residential parking programs, hourly restricted parking, EPark paid parking, and there are numerous loading zones and designated accessible parking stalls spread throughout the study area. The residential parking program areas are most prevalent within the Garneau neighbourhood, and there is a significant amount of unrestricted on-street parking in the Strathcona neighbourhood outside of the Whyte Avenue commercial area.

Implementation of protected bike lanes on these roads will result in significant operational changes, including the potential for conversion of the roadways to one-way operation for motor vehicle traffic and removal of on-street parking. Therefore, the preliminary screening of the residential roadways was completed by evaluating the residential roadways for network cohesion, directness, connectivity and density. If a roadway did not meet the basic requirements for these factors, it was removed as a potential part of the bike network. The key rationale associated with prioritizing roadways as potential routes for the Southside Core Neighbourhood Bike Network included:

- Routes that provide connections to the existing network
- Routes that provide access to key destinations
- Routes that are direct and straight
- Routes that are spaced appropriately from other primary cycling routes, i.e. roughly 500 metres apart.

Figure 7 summarizes the results of the preliminary screening analysis. Routes that did not pass the preliminary screening are illustrated in grey, while the roadways that were identified as routes with good potential from a network cohesion, directness, connectivity and density requirement are shown in yellow.

Figure 7: Preliminary Screening Analysis Results



Secondary Route Screening Analysis Summary

The secondary screening analysis evaluated the routes that met the network cohesion, directness, connectivity and density requirements for operating impacts, and existing conditions to determine the preferred network for the all ages and abilities cycling network for the Southside core neighbourhoods.

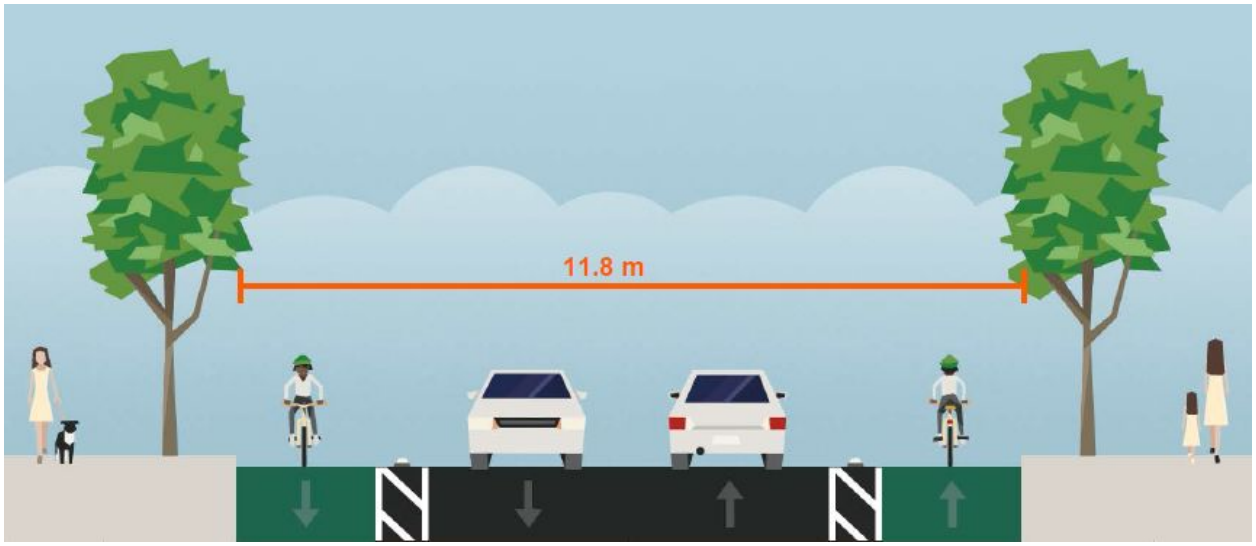
This analysis looked at potential facility designs and associated cross-sections to determine which facility types could be implemented within the constraints of the existing road network which, as described above primarily consists of residential roadways with driving surfaces between 7.8 metres and 8.0 metres wide.

Facility Configuration Options for Residential Roads

Using the assumed design standards identified in Table 2, five potential facility designs were developed to confirm the cross-section width requirements associated with implementing protected

bike lanes on residential roadways. The options developed assume implementation of protected bike lanes as either one-way or two-way cycling facilities in combination with different variations of motor vehicle travel and parking lanes.

Figure 8: Uni-directional Cycle Lanes with Two Vehicle Travel Lanes



As shown in Figure 8, providing single direction protected bike lanes on both sides of the road and maintaining two motor vehicle travel lanes requires almost 12 metres of driving surface. This cross section assumes that there is no on-street parking on these roadways. This width cannot be accommodated within the residential streets being evaluated and thus is not a viable design option for the Southside Core Neighbourhoods Bike Network.

Recognizing that on-street parking is an important element in this area of the city, facility configuration options that include on-street parking were developed.

Figure 9: Uni-directional Cycle Lane with Single Vehicle Travel Lane and On-street Parking

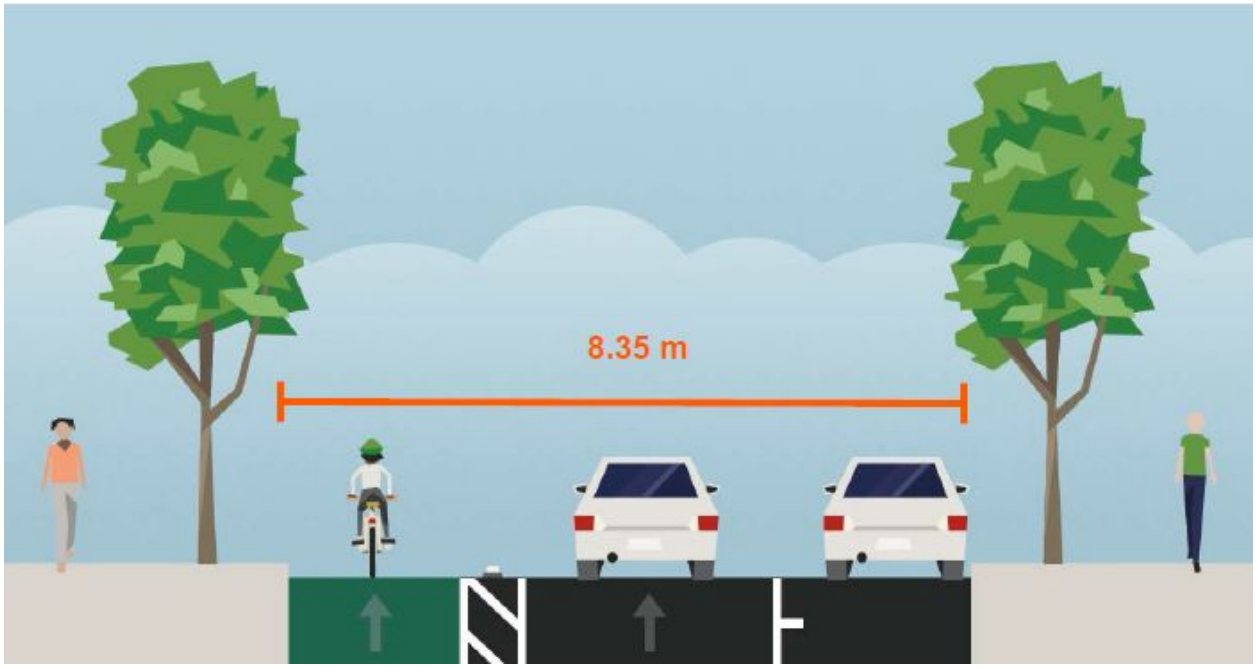


Figure 9 illustrates that almost 8.5 metres of roadway space is required to accommodate single directional lanes for bikes and vehicles and space for on-street parking. The road width required to implement this cross-section is greater than the 8 metre width available on the roads associated with the potential routes and is not considered implementable as part of the Southside Core Neighbourhoods Bike Network.

Figure 10: Bi-directional Cycle Lane with Single Vehicle Travel Lane and On-street Parking

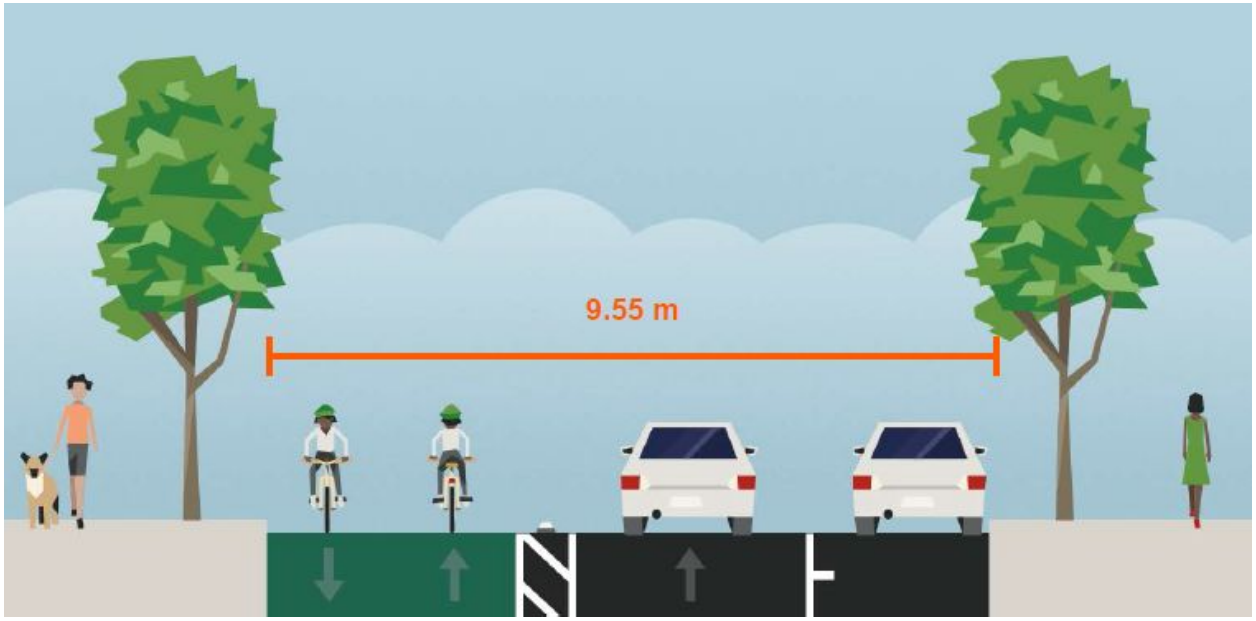


Figure 10 illustrates that more than 9 metres of roadway space is required to accommodate bi-directional facility for bikes, a single direction vehicle lane, and space for on-street parking. Again, the road width required to implement this cross-section is greater than the 8 metres available on the roads associated with the potential routes and is not considered implementable as part of the Southside Core Neighbourhoods Bike Network.

Two additional design options were examined to demonstrate cross-sections associated with protected bike lanes that will fit on roads with less than 8 metres of existing driving surface.

As illustrated in on the following Figures 11 and 12, single or bi-directional cycling lanes can be implemented on roadways with less than 8 metres of available road width, but it requires implementation of single direction travel lanes for motor vehicle traffic and removal of on-street parking.

Figure 11: Bi-directional Cycle Lane with Single Motor Vehicle Travel Lane **(Preferred)**

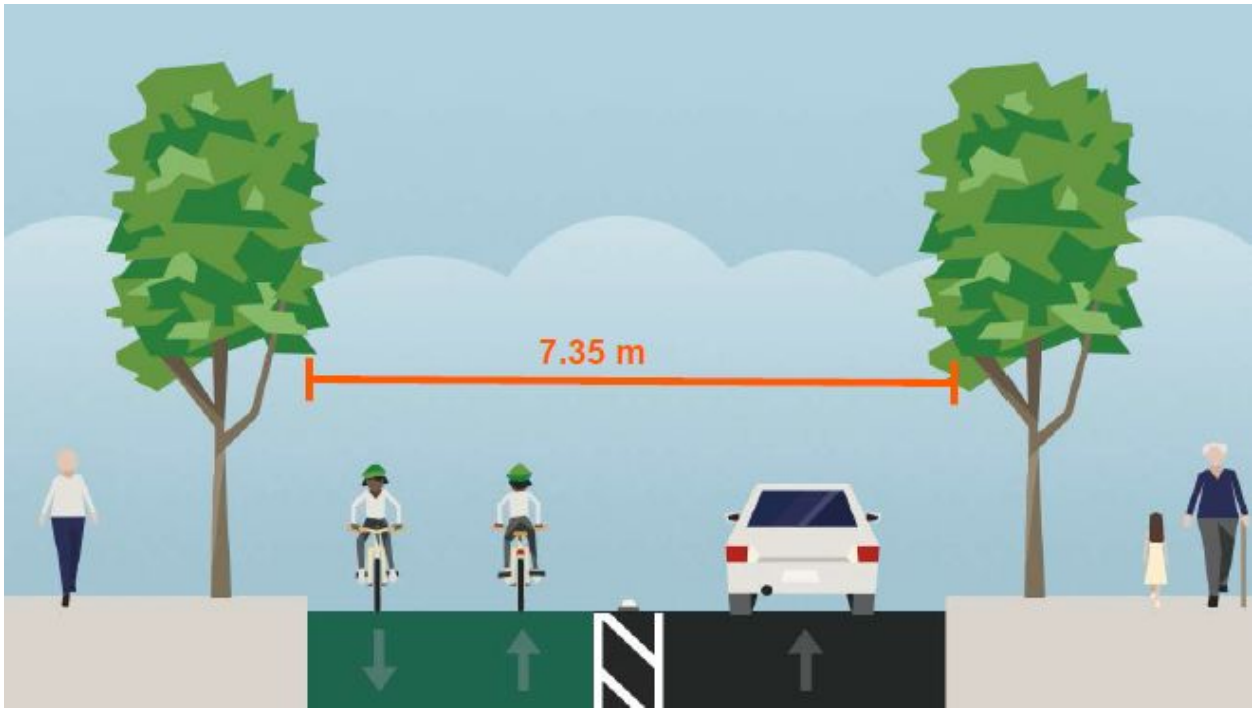
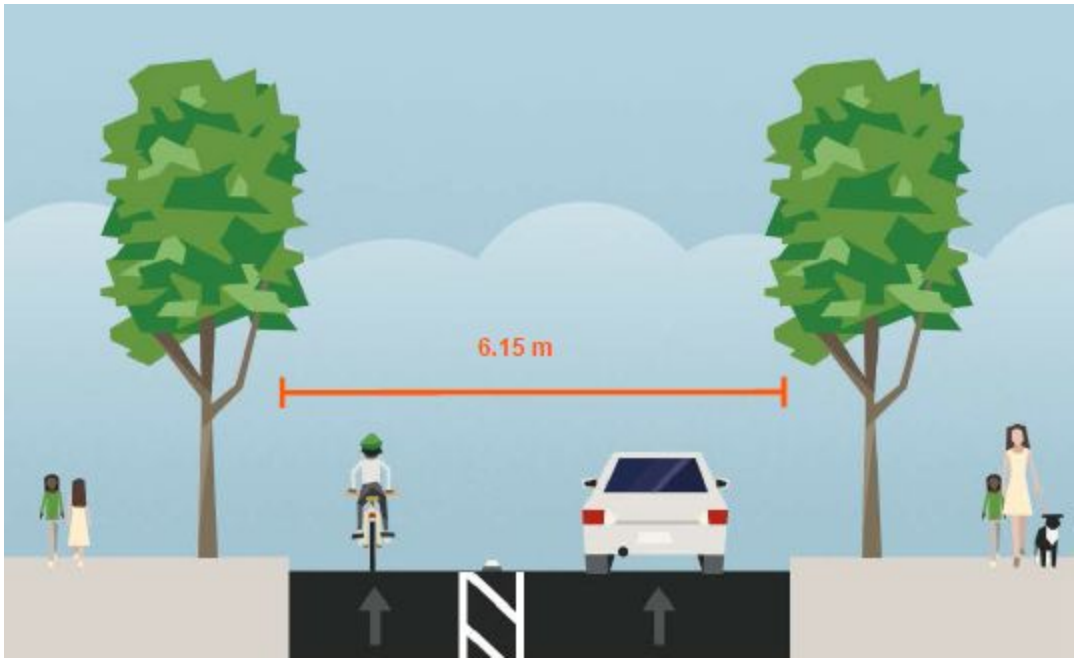


Figure 12: Unidirectional Cycle Lane with Single Motor Vehicle Travel Lane



Based on the 8 metres of available width this analysis confirmed that the cross sections associated with Figures 11 and 12 could be accommodated on the routes with good potential identified in Figure 6.

With respect to the single direction cycling facility illustrated in Figure 11, it is noted that a cohesive and connected network of single direction protected bike lanes requires development of a series of couplet routes whereby one direction of travel is accommodated on one road and the opposite direction of travel is accommodated on a nearby parallel roadway. While the existing grid lay out of the road network in the area would support this concept, implementing a couplet system has more significant impacts on the existing road network than implementation of the bi-directional facility. The couplet system requires removal of on-street parking and conversion to one-way for motor vehicle traffic on multiple roadways; whereas, implementation of a bi-directional cycling facility supports the same connected network while only impacting on-street parking and roadway operations on one roadway.

Facility Configuration and Snow and Ice Control

As with the Downtown Bike Network, Infrastructure Operations has confirmed that bi-directional bike lanes that are a minimum of 3.1 metres wide are the preferred facility configuration from a snow and ice control perspective. This facility configuration allows for prioritized deicing and snow removal using specialized equipment and enhances the ability to deliver a consistent service delivery for bike infrastructure.

As some of the routes with good potential illustrated on Figure 5 are on low volume, low speed roadways that may meet the bicycle boulevard design standards identified in the best practice

review; the snow and ice control impacts of including bicycle boulevard facilities in the network of year round bike routes for the Southside core neighbourhoods were discussed with Infrastructure Operations.

City Operations is in the process of evaluating methodologies for snow and ice control on the current bike network. There is a section of bicycle boulevard on 83 Avenue that is currently being maintained through this process. Preliminary thoughts are that, with the new technology and operating procedures currently being tested, it may be possible to include bicycle boulevard routes in the year round network, however additional analysis is required to confirm if this is realistic. With respect to this, the barrier free design associated with the bicycle boulevard treatment has the benefit of being able to be cleared by larger equipment which offers some efficiency, however as noted through previous maintenance pilots of unprotected bike facilities, without a barrier in place, snow would still accumulate in the space where cyclists ride, leaving a condition that makes winter cycling difficult.

Including bicycle boulevard treatments in the year round cycling network would require improving the service standard and operational procedures applied to these facilities. This would include items such as prioritizing grading on these roads, providing additional anti-icing, de-icing and sweeping, and ensuring snow storage is accommodated through roadway design. It may also require implementation of seasonal parking bans and the impacts of traffic calming measures implemented in conjunction with these designs would need to be coordinated with operating procedures. An alternative may be that bicycle boulevard routes can still be part of the all ages and abilities bike network, but may not be identified as part of the year round priority cycling network. Further work through the Bike Plan update will be required to better understand how bicycle boulevard facilities fit into the City's year round cycling network provide additional policy direction for Infrastructure Operations in the development of maintenance practices for these facilities.

The key takeaway from an Infrastructure Operations perspective is that expanding the network of year round cycling facilities is expected to have impacts to operating budgets and procedures. In conjunction with ongoing concept design, additional review of operating impacts is required to ensure that there is a clear definition of the service standard associated with this network and that the equipment, manpower and operating funds are available to support year round operations of an expanded bike network.

Preferred Facility Configuration

Through the cross-section analysis and review of maintenance impacts it was determined that cross-section illustrated in Figure 11, Bi-directional Cycle Lane with Single Motor Vehicle Travel Lane is the preferred protected bike lane infrastructure associated with the Southside Bike Network analysis.

Operational Impact Review

For this portion of the analysis, the routes with good potential identified in Figure 6 were examined to determine which routes make up the preferred network. Where applicable, potential routes were grouped together and their individual properties were compared to determine which route is the preferred route for the portion of the study area.

With respect to the pavement quality of the routes with good potential assessed in the operational review it is noted that both the Strathcona and Garneau neighbourhoods have been identified for Neighbourhood Renewal. The pavement quality associated with neighbourhoods undergoing neighbourhood renewal is typically poor. The operational impact review addresses operational impacts of implementing all ages and abilities bike infrastructure however the pavement quality impacts on the effectiveness of the infrastructure. As neighbourhood renewal in these areas is imminent there may be opportunities to address specific pavement quality issues through the renewal process.

88 Avenue (109 Street to 110 Street)

Due to 88 Avenue's location within the northwest portion of the study area and the key connections it provides between the University of Alberta Campus and existing cycling facilities on the High Level Bridge and Saskatchewan Drive, it was determined that this route represents an important component of the cycling network in this area of the city and should continue to be part of of the all ages and abilities network as it is developed.

Implementation of protected cycling facility on 88 Avenue will require extending the existing bi-directional protected bike lanes that exist west of 109 Street all the way to 110 Street. This will convert the existing eastbound contraflow bike lane and westbound shared use lane to a protected facility. The data on existing road widths suggests there is enough room on the roadway to accommodate the preferred cross section illustrated in Figure 9; however, there would be impacts on existing roadway operations. Items that need to be addressed in conjunction with further design work on this corridor include:

- Addressing changes to on-street parking. The parking adjacent to the commercial sites is currently subject to hourly parking restrictions and it may be possible to retain some of this parking as this segment of the road has a wider width. The parking adjacent to the residential properties is part of the Garneau Residential Parking Program and would need to be removed in conjunction with implementation of a bi-directional protected bike facility.
- Confirmation that implementation of a two-way protected bike lane will not require changes to existing westbound motor vehicle travel along the corridor.
- Address intersection configuration requirements at 110 Street associated with the 110 Street bike route and cycling access to the University property west of 110 Street.

- Signal upgrades at the 109 Street intersection will be required to incorporate bicycle controls into the traffic controls. In conjunction with this, the intersection configuration will need to be reviewed to confirm if any geometric changes are needed in conjunction with the signal redesign at this intersection.

110 Street and 111 Street (University Avenue to Saskatchewan Drive)

110 Street and 111 Street are existing residential roads in the Garneau neighbourhood with existing road widths of approximately 7.9 metres. Portions of these roadways include designated bicycle facilities and as a result they currently experience in the order of 200 cyclists a day during peak cycling season.

As discussed in the Facility Configuration Option section converting the existing contraflow bike lanes to protected bike lanes would require removal of on-street parking on both 111 Street and 110 Street. It was determined that converting the existing bike lanes on both 111 Street and 110 Street to protected facilities is an undesirable option as it would remove on-street parking on two roadways within the study area; whereas, conversion of one of the existing routes to a bi-directional protected facility would meet the overall cycling network needs while only removing parking on one roadway.

110 Street was determined to be the preferred location because it provides a cohesive connection between Saskatchewan Drive and the southern border of the study area, it provides a connection with 88 Avenue, and its proximity to 109 Street supports cycling access to the commercial nodes along the 109 Street corridor. 110 Street also avoids the operational impacts associated with the two-way operation of 111 Street north of 86 Avenue and complications associated with the private portion of 111 Street through the University Lands north of 87 Avenue. Furthermore unlike 111 Street, 110 Street aligns north and south of University Avenue which provides opportunity to connect directly to the 76 Avenue protected bike lanes. Although implementation of protected bike facilities on 110 Street will have significant impacts to on-street parking, preliminary parking analysis indicated that 110 Street has fewer restricted parking stalls on it and this may make removal of on-street parking more amenable. Through the analysis a number of items were identified that will require further review at the preliminary design stage including:

- Confirmation of design treatments at residential accesses and alley crossings along the corridor.
- Further analysis of the impacts to on-street parking including loading zones, residential parking areas and ePark parking stalls is required. This may require confirmation of usage characteristics associated with these parking areas and if relocation opportunities exist in the neighbourhood.
- Implementation of signal upgrades at the intersections with 82 Avenue and 87 Avenue to support bicycle actuated crossings of these arterial roadways.
- Confirmation of Bus Stop requirements for Bus Stop #2617 (identified as Route 313 bus stop however this route is not currently running in this area.)

This analysis assumes that 110 Street continues to operate with northbound travel for motor vehicle traffic to allow for implementation of a bi-directional protected cycling facility adjacent to the west curb line. This configuration will require conversion of 110 Street south of 82 Avenue from a two-way road to single direction for motor vehicle travel, and will require removal of on-street parking from both sides of 110 Street in this area of Garneau. It is acknowledged that this will significantly change roadway operations on 110 Street in the Garneau neighbourhood.

Implementation of protected bike facilities on 110 Street calls into question the on-going designation of 111 Street as a bike route through the Garneau neighbourhood. Details of this review are summarized in the Considerations for Existing Cycling Routes section of this report.

101 Street/100 Street

As illustrated on Figure 6, 101 and 100 Street were identified as good options for bike routes in the eastern portion of the study area. A portion of 100 Street is currently designated as a shared roadway (lower traffic) route on the City's Bike Map and the 2009 Bicycle Transportation Plan identified it as a potential part of the connector bike network, however, 101 Street provides similar opportunities for bike network development. Analysis was completed to determine which one of these roadways is better suited as a bicycle route.

As the only fully signalized intersection with 82 Avenue in this area of Strathcona, 101 Street operates more as a collector road than a residential street. The two-way operation of this roadway represents an important component of the network operations for the Ritchie and Strathcona neighbourhoods and the impacts of converting the roadway to a single direction for motor vehicle traffic to accommodate a protected cycling facility would significantly alter traffic operations in this quadrant of the neighbourhood. While 100 Street also operates as a two-way roadway through this portion of the study area, the intersection at 82 Avenue is only supported by a pedestrian actuated half signal. The traffic volumes on this roadway are significantly lower than those on 101 Street therefore the impacts of converting this roadway to one-way for motor vehicles are significantly less than along 101 Street. In addition, from future network development perspective 100 Street provides an opportunity to expand further south into Ritchie and connect with 76 Avenue east of the CPR rail corridor.

Due to existing bus loop that operates on 100 Street and 83 Avenue it is recommended that this roadway be converted to one-way northbound for motor vehicle travel and that a bi-directional protected cycling facility be developed adjacent to the west curb line. This also aligns with community preference communicated during the Strathcona neighbourhood renewal public engagement. As with 110 Street, this will require removal of all on-street parking along this roadway. Through the analysis a number of items were identified that will require further review at the project development and delivery stages including:

- Addressing specific on-street parking needs associated with an existing accessible parking stall and loading zone located on the east side of 100 Street north of 89 Avenue.

- Implementation of signal upgrades at the intersections with 82 Avenue and a potential new signal at Saskatchewan Drive to support bicycle actuated crossings of these arterial roadways, including any geometric improvements at Saskatchewan Drive required to support a connection to the Saskatchewan Drive shared-use path.
- Confirmation of design treatments at residential accesses and alley crossings along the corridor.

97 Street/98 Street

Analysis indicated that the eastern portion of the Strathcona neighbourhood would benefit from an additional north-south bike facility to provide a connection into the Mill Creek Ravine trail system. 97 Street and 98 Street were identified as locations with good potential.

Both routes provide a north/south connection while maintaining adequate network spacing. While continuing a route on 97 Street north of 83 Avenue would be the most direct, feedback from the Strathcona neighbourhood renewal public engagement indicated a strong preference towards 98 Street. As 98 Street is a low volume residential roadway with relatively low travel speeds, the best practice review suggests that a bicycle boulevard treatment may be appropriate for this roadway.

Overall the preferred route is a shared bike boulevard on 98 Street north of 83 Avenue and a protected bike lane between 83 Avenue and 82 Avenue that connects into the existing on street bike route in Ritchie and Hazeldean. As 98 Street does not have a direct route into the Mill Creek Ravine, Neighbourhood Renewal will look to influence a connection into the Mill Creek Ravine shared-use path network to the north of 91 Avenue.

As indicated previously, maintenance practices of bicycle boulevard treatments may impact its year round accessibility. If maintenance practices can be developed that support year round access to bicycle boulevards then this is a treatment option worth exploring on this roadway. If maintenance practices dictate that this facility must be developed with protected bike lanes, then there are a few issues that will need to be determined at the project development and delivery stages including:

- Confirming the preferred direction for the single motor vehicle travel associated with implementing a bi-directional protected bike facility on this roadway. The network analysis did not identify a preferred direction associated with this configuration.
- Re-design of the 83 Avenue / 98 Street intersection to support integration between the protected bike facilities on 98 Street and 83 Avenue.
- Design of the transitions at the Mill Creek Ravine shared-use path and the existing shared roadway route on 97 Street south of 82 Avenue.

Any cycling facility on this roadway will require implementation of a traffic signal at the intersection with 82 Avenue to support bicycle actuated crossings of this arterial road.

86 Avenue/87 Avenue/89 Avenue

As illustrated in Figure 6 it was determined that 86 Avenue, 87 Avenue or 89 Avenue would satisfy the network requirements for an east-west connection in this quadrant of the study area. All three roadways currently exist as local roads and the implementation of a bi-directional protected cycling facility on them will have similar impacts to motor vehicle operations and on-street parking. Therefore, the analysis of these corridors focused on the benefits of a cycling facility rather than specific operational impacts.

With respect to 89 Avenue, it was noted that it does provide connectivity to a commercial node along the 99 Street corridor, however the connection to Saskatchewan Drive is not direct and 97 Street at the 89 Avenue is developed as an alley, not a residential roadway. In addition, the commercial node located on 99 Street is currently part of a redevelopment proposal and construction associated with the future development is anticipated to impact opportunities to implement a cycling facility on a portion of this roadway in the short term. Therefore, it was determined that 89 Avenue should not be included as part of the Southside Core Neighbourhood Bike Network.

86 and 87 Avenue were examined next. Feedback from the Strathcona neighbourhood renewal public engagement indicated preference towards a route along 86 Avenue between 106 Street to 102 Street that transitions to 87 Avenue via Tommy Banks Way. This is mainly due to the limited right-of-way and proposed traffic calming on 86 Avenue east of 102 Street, and to limit congestion and minimize conflicts between pedestrians and cyclists at the the King Edward School Campus and community league facilities. This route will also provide opportunities to develop a connection between the 86 Avenue bike lane and the 106 Street bike route through E.L. Smith Park and the right-of-way on which the High Level Bridge Streetcar operates on.

Preliminary analysis suggest this roadway should be converted to one-way westbound for motor vehicle travel with implementation of a bi-directional protected cycling facility adjacent to the south curb line. Through the analysis, a number of items were identified that will require further review at the project development and delivery stages including:

- Implementation of signal upgrades at the intersections with 99 Street, 103 Street and 104 Street to support bicycle actuated crossings of these arterial roadways.
- Addressing removal of on-street parking along 86 and 87 Avenue including developing design alternatives to give additional access into the King Edward School area.

94 Avenue

Through the preliminary screening analysis, using the criteria of network cohesion, connectivity and density analysis, 94 Avenue was identified as a roadway that should also be considered for inclusion in the Southside Core Neighbourhood Bike Network. This roadway is identified as an existing bike route that provides a connection between the Nellie McClung Park trail network and

the Mill Creek Ravine trail network at a signalized crossing of Scona Road and is a well used cycling connection between the two trail systems.

Additional design work is needed to confirm what facility type would best facilitate ongoing use of this roadway as an all ages and abilities part of the network. Introduction of protected bike lanes would require one-way operation for motor vehicles and this may not appropriately support access needs of the residential properties in this area. In addition, a short segment of bicycle boulevard type treatment may be acceptable due to low traffic volumes, or extension of the shared-use path to either side of Scona Road may be possible. With any design option on this segment of 94 Avenue, the pedestrian actuated signal at the intersection with Scona Road will need to be upgraded to support bike actuation.

104 Street Contraflow Lane

As described in the Arterial Roadway Preliminary Screening, it was determined that the contraflow bus/bike/taxi shared lane on 104 Street should be explored in the secondary screening analysis. This facility currently operates as a contraflow bus/bike/taxi shared lane between 76 Avenue and 83 Avenue. Bus Routes 52 (regular all day service), 54 (seasonal service September through April) and 318 (community route) currently run on this roadway between 76 Avenue and Saskatchewan Drive, and it is used by northbound cyclists and taxis. The existing lane is approximately 5.2 metres wide with a 1.0 metre wide concrete median separating the contraflow lane from the existing southbound travel and parking lanes. There are four full signals, two pedestrian actuated signals and two unsignalized intersections on this section of the roadway.

Public engagement associated with the Planwhyte Land Use Study has been exploring options for developing a north-south pedestrian spine on the eastside of 104 Street. The options include the idea of removing the existing contraflow lane to make space for wider sidewalks and patios within the core heritage area and improve pedestrian accessibility and connectivity between the Strathcona and Queen Alexandra neighbourhoods and the River Valley. While this planning study has identified that there may be benefits to converting this space and ETS is aware of the initiative, no detailed analysis has been completed to assess the impacts or requirements associated with rerouting buses and taxis off this contra-flow corridor.

From a cycling facility perspective, at 5.2 metres wide, the existing contraflow lane is wide enough to support implementation of a bi-directional cycling facility and the median width would allow for ongoing utilization of curbside parking adjacent to a bicycle facility. However, as with the Planwhyte initiative this would have significant impacts on bus service through this portion of the Strathcona neighbourhood.

Prior to addressing the design and operational elements (pavement markings, signage and traffic signal upgrades) that would would be associated with implementation of this piece of the network, there are a number of operational impacts and policy impacts that need to be addressed.

The impacts to taxi services that currently use this corridor need to be reviewed to confirm that alternative corridors could appropriately accommodate taxi services. The impacts to Transit need to be addressed to determine the operational impacts of rerouting bus services that currently utilize this contraflow facility and if this change aligns with the City's policy objectives. Items to be addressed include:

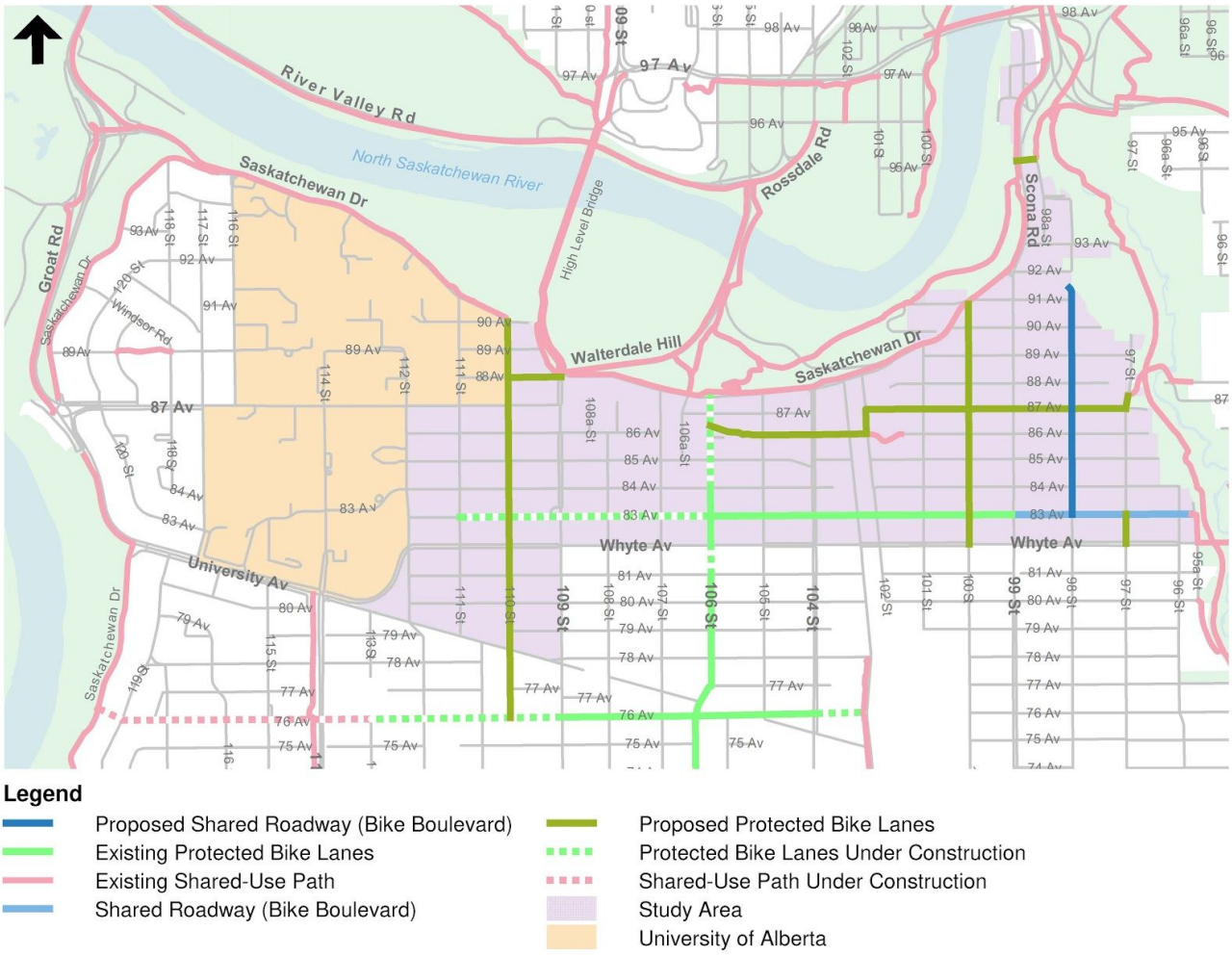
- impacts to service delivery and ridership of changing route locations;
- additional transit infrastructure requirements (e.g. bus stop relocations and signal improvements), and;
- assessing overall alignment of this option with the transit strategy bus network redesign, the Planwhyte land use study and the update to the City's Bike Plan.

Further to this, if this conversion of the 104 Street contraflow lane is going to be explored the benefits of extending this route to connect to Light Horse Park and the Saskatchewan Drive shared-use path should also be explored. The Planwhyte study suggests that there are opportunities for development of a linear park between End of Steel park and 80 Avenue and thus there may be opportunities to develop a north-south cycling connection through that portion of the study area. Based on this it would be immature to implement this connection prior exploring the broader issues associated with this conversion.

Preferred Southside Core Neighbourhood Bike Network

Based on the analysis presented above, the preferred cycling network for the Southside core neighbourhoods is presented in Figure 13.

Figure 13: Preferred Southside Core Neighbourhood Bike Network (all ages and abilities facilities)



Considerations for Existing Cycling Routes

With implementation of new all ages and abilities bike infrastructure illustrated in Figure 12, a review of existing routes presented in the Current State Analysis was completed to confirm how existing bike routes within the study area should be accommodated as the Southside Core Neighbourhood Bike Network is built out.

Existing Shared Roadway Routes

104 Street, 101 Street, 100 Street, 97 Street, 96 Street, 86 Avenue, 85 Avenue

As illustrated on Figure 2, portions of 104 Street, 101 Street, 100 Street, 97 Street, 96 Street, 86 Avenue, and 85 Avenue are currently designated as shared roadway bike routes on the City's Bike Map. As per the preferred network identified in Figure 12, 100 Street and 97 Street and 86 Avenue would continue to be bike routes and be upgraded to all ages and abilities facilities with

implementation of the Southside Core Neighbourhood Bike Network. The remaining routes are associated with historical route designations in this area and generally operate as on-street shared facilities that are primarily identified through standard bicycle route wayfinding signs.

In the western half of the study area, portions of 104 Street between 86 Avenue and 84 Avenue, and 84 and 85 Avenues west of 104 Street are currently designated as shared roadway bike routes. 84 and 85 Avenues operate as a couplet with 84 Avenue accommodating westbound travel and 85 Avenue accommodating eastbound travel. 104 Street provides the connection between these avenues and the eastern half of Strathcona via 86 Avenue. East of 101 Street the shared roadway route meanders through the Strathcona neighbourhood on 101 Street, 84 and 85 Avenues and 96 Street. With the implementation of the preferred bike network, consideration could be given to removing the shared roadway bicycle route designations associated with these roadways as they become redundant routes once a new cycling infrastructure is implemented.

With the implementation of the 83 Avenue bike route, the need for the shared roadway bike routes on both 84 and 85 Avenues west of 104 Street is questionable. It is recommended that options to maintain the on-street bike route on 85 Avenue between 106 Street and 112 Street be explored. Although this would not be considered part of the all ages and abilities network for the area, an on-street bike route through this portion of the study area could provide additional network connectivity in the area during peak cycling seasons and provides a network connection at the south terminus of 106 A Street. In order to facilitate two-way cycling on this section of 85 Avenue, the existing road configuration would need to be modified to support implementation of a contraflow bike lane for eastbound travel alongside the existing westbound shared-use lane. Preliminary review indicates that it is possible to implement this configuration on the existing cross-section although existing pavement quality is questionable. Further analysis of signal upgrade requirements would need to be explored if this option is implemented including introducing cyclist actuation to the pedestrian actuated signal at 85 Avenue and 109 Street intersection, and a new pedestrian bike actuated signal at the 85 Avenue and 112 Street intersection.

With the addition of 86 Avenue, 100 Street and 97 Street as part of the preferred cycling network through the eastern portion of the study area the shared roadway route that meanders through the neighbourhood on 101 Street, 84 and 85 Avenues and 96 Street could also be removed from the existing cycling network.

University Avenue

University Avenue between 109 Street and Saskatchewan Drive is designated as a shared roadway bike route on the 2017 Bike Map. In Garneau, it is a low volume residential roadway with existing traffic calming measures installed between 109 Street and 112 Street. West of 112 Street, the bike route is on the residential service road portion of the roadway. As it is a low speed, low traffic roadway and provides some connectivity between the Saskatchewan Drive and 109 Street at key signalized intersections, it is recommended that it remain designated as a shared roadway lower traffic volume bike route.

106 A Street/Fort Hill Road

106 A Street is identified as an existing shared roadway (lower traffic) bike route and is one of the few roads in quadrant of the study area with a direct connection to the River Valley trail network. Fort Hill Road is identified as a multi-use connection that needs improvement in the Queen Elizabeth Park Master Plan, and is identified for implementation with Phase 5 of the project.

106 A Street between 85 Avenue 87 Avenue operates as a two-way roadway; north of 87 Avenue 106 A Street becomes Fort Hill Road, which operates as a one way northbound maintenance vehicle access for the O'Keefe Yard. As it is a designated bicycle route, cyclists are permitted to travel in two directions on the Fort Hill Road. As a shared roadway bicycle facility this route provides a direct connection to the Fort Hill Road shared-use path that terminates south of O'Keefes Yard, and maintaining its designation as a shared roadway bike route enables maintenance of this facility until such time as it can be upgraded in conjunction with the Queen Elizabeth Park plans.

112 Street

112 Street is a well established on-street bike route in the south-central sector of the city providing a connection between the neighbourhoods in the vicinity of 61 Avenue and 111 Street a direct connection to the University of Alberta. Through the neighbourhood renewal projects in the Parkallen and McKernan neighbourhoods, improvements have been implemented to prioritize it as a shared-use roadway; however, north of 82 Avenue the route remains a shared roadway higher traffic bike route. As identified in the arterial analysis, best practice suggests that a bicycle facility on this roadway should be developed with bike lanes that are protected from traffic. However, it is not possible to implement protected bike lanes on this roadway without significantly impacting the existing operating characteristics of this roadway.

While designation of 112 Street north of 82 Avenue as a shared roadway bike route is not ideal, it provides a direct connection into the University campus and hospital site and is anticipated to experience continued use by cyclists who fall into the "strong and confident cyclists" category. As a result, it is recommended that its designation as an shared roadway higher traffic bike route remain in place. This will support ongoing maintenance of the shared roadway pavement markings and signage that is installed along the corridor and reinforce this as a location where cyclists and drivers will be interacting on the roadway. In the longer term, re-evaluation of the 112 Street corridor and bicycle infrastructure requirements should be incorporated to the arterial renewal process.

116 Street

116 Street is an existing on-street bike route in located on the eastern boundary of the University of Alberta North Campus. It is developed as painted bike lanes without median separation between the vehicle travel lane and the bike lane. This was one of the initial bike lane installations in the city after approval of the 2009 Bicycle Transportation Plan. The route is a key connection between the western quadrant of the University campus and the Groat Road Bridge over the North Saskatchewan River. While best practice would suggest that this facility should be developed as a

separated facility due to the higher volume and speeds of motor vehicles on this road, as it is does not provide extensive network connectivity beyond the University area, it is recommended that it remain in its current configuration for the time being. In the longer term it may be possible to work with the University and explore options for developing a separated facility along this roadway.

At its southern terminus the 116 Street route connects to 87 Avenue. 87 Avenue from 116 Street to the 115 Street University Service Road is currently designated as a shared roadway higher traffic bike route. Similar to 112 Street, best practice would suggest that cycling facilities on this road should be developed as protected bike lanes, however as per the arterial road analysis implementation of protected bike lanes on 87 Avenue will have significant impacts to roadway operations and therefore this upgrade is not recommended at this time. For the time being it is recommended that its designation as a shared roadway higher traffic bike route remain in place, and as with 116 Street the City should explore opportunities to improve the cycling connectivity through this portion of campus with the University.

Continued Designation of 111 Street as a Bicycle Route

111 Street is a designated bike route between 82 Avenue and 87 Avenue. It exists as a northbound contraflow bike lane and a southbound shared use lane between 82 Avenue and 86 Avenue and northbound and southbound shared use lanes between 86 Avenue and 87 Avenue. Due to the limited network connectivity outside of the Garneau neighbourhood, and as 112 Street and 110 Street would support bi-directional cycling in this area, it is recommended that 111 Street be removed from the bicycle network with implementation of 110 Street route as part of the Southside bike network. This removal will require additional review to confirm detailed impacts of the removal and may impact the design details and wayfinding requirements associated with the western terminus of the 83 Avenue bike route.

Saskatchewan Drive Shared-Use Path

While the Saskatchewan Drive shared-use path between 109 Street and Scona Road exists and forms a part of the network today, the shared-use path requires widening in order to better meet service standards for the current volume of activity. As this is a key corridor within the network it is recommended that any reconstruction along this corridor considers shared-use path detours to ensure the route remains accessible even during construction disruptions.

FINANCIAL ASSESSMENT

The following presents a strategic level estimates for the costs of the proposed Southside bike network as presented in Figure 13.

Capital Costs

Infrastructure Costs

Capital costs associated with the implementation of infrastructure required to develop the network of protected bike lanes are presented in Figure 13. The estimates used in this assessment are based on a combination of the costs associated with the implementation of the Downtown Bike Network in 2017, and costs associated with the development of recent bike lanes in the southside core. The cost analysis includes pavement markings, removal of redundant routes, signage, concrete medians, flexposts, traffic signal improvements, design costs, and contingency. The unit costs associated with protected bike lanes is $495 per linear metre. The linear meter costs include pavement marking and signage costs associated with longitudinal and intersection markings, as well as costs associated with the concrete separators and flexposts, and include design and contingency costs. The unit costs associated with bike boulevards is $230 per linear metre, which includes pavement and signage costs.

The costs associated with this network do not include costs of enhanced treatment options that include beautification elements, such as planter boxes. While the enhanced option represented an important element of the downtown network, the beautification requirements associated with residential streets within this study area are different. The preferred Southside network is on roads with treed boulevards and constrained widths which means that the planter boxes cannot be incorporated into the assumed standard facility design. As a result the infrastructure costs presented in Table 4 do not include an enhanced option. It is recommended that opportunities for beautification elements be reviewed at the concept design stage as there may be prominent locations on the network, such as within Business Improvement Areas and community entrance or gathering points, that present opportunities for enhanced design elements on an individual basis.

The linear meter infrastructure costs include the costs associated with the intersection pavement marking and signage requirements but they do not address the intersection costs associated with traffic signal improvements that are required to support the proposed network. To account for the fact that each route in the proposed network has individual signal requirements, the signal costs were determined on a route by route basis. With respect to traffic signal infrastructure improvements, three types of signal improvements were assumed. These include: a new pedestrian bike actuated signal, modifications to an existing pedestrian signal, and implementation of a new full traffic signal.

Table 6 summarizes the costs associated with the individual routes and overall network costs based on 2017 dollars and does not include any inflation factors.

Table 6: Route Cost Summary

Roadway	Quantity (m)	Infrastructure Costs	Signal Costs
110 Street (Saskatchewan Dr to University Avenue)	1230	$609,000	$519,000
100 Street (Saskatchewan Drive to 82 Avenue)	905	$448,000	$575,000
97 Street* (82 Avenue to 83 Avenue)	50	$25,000	$288,000
98 Street* (83 Avenue to 91 Avenue)	815	$188,000	N/A
94 Ave* (Nellie McClung Park to Mill Creek Ravine)	70	$35,000	$231,000
88 Ave (110 Street to 109 Street)	180	$89,000	$438,000
86 Avenue (106 Street to 102 Street, incl Tommy Banks Way)	700	$347,000	$575,000
87 Avenue (102 Street to 97 Street)	1020	$505,000	$288,000
Network Total	**4970**	**$2,245,000**	**$2,914,000**
Combined Signal + Facility Costs		**$5,159,000**	

*assumes implementation as protected bike lanes

The costs presented in Table 6 do not include costs associated with a number of supplementary items that should be considered when evaluation the overall costs associated with implementation of the proposed bike network. These include:

- Extending the 110 Street route beyond the study area boundary to connect to the 76 Avenue protected bike lanes. An additional 260 m of protected bike lanes on 110 Street is estimated to cost in the order of $78,000.
- Developing a portion of the 86 Avenue route between 105 Street and 106 Street as shared-use path as this section of the network passes through E.L. Smith Park and the streetcar right-of-way. Approximately 200 m of shared-use path is required between 105 and 106 Street with an estimated cost of $331,000.
- Removal of existing bike routes as discussed in the Considerations for Existing Cycling Routes section of the report will have associated costs. Largely this involves removal of signage and updating GIS data associated with the existing bike map. The removal of pavement markings and signage associated with the 111 Street through Garneau will have more significant costs associated with it. For this assessment, $50,000 was identified as a estimate to be reserved for removal of existing bike network infrastructure.

Communications, Marketing and Education Programing

The communications, marketing and education programs that were developed to support operations of the Downtown Bike Network represent a critical component of the City's bike program success. While there is current funding that supports communications, marketing and education associated with current bike network development, any significant expansion of the bike network would require additional funding to support an expanded program. The magnitude of communications and engagement resources required to support initiatives associated with expanding the bike network is dependant on the scope of network expansion and associated engagement and communications needs, preliminary estimates of up to $505,000. It is anticipated that this work can not be absorbed into the operating budget and the capital profile developed for these projects should include funds to support ongoing communications, engagement, marketing and educational programing required to support expansion of the bike network. The breakdown of this estimated amount is as follows:

Communications

Communication efforts will be important through the engagement, education and installation phases of the Southside Bike Routes. The two lenses that will be needed include:

- Communicating for public engagement events
- Communicating information (non-event specific, media relations and public information)

Tactics taken for these can include:

- Flyer drops (design and printing)
- Posters/notices (design and printing)
- Display boards (design and printing)
- Social media graphics support
- Social media advertising
- Media relations support (media events)

Staff resources would be required to support Building Great Neighbourhoods communications (1 communications advisor) and Southside Core Bike Network communication (1 communications advisor) and to align both of these together.

To successfully promote all activities, a budget of $30,000 ($5,000 per engagement event) is recommended. This is dependent on the plan outlined through public engagement.

Engagement

Engagement strategy, planning and implementation is directly linked to the City's decision making and the ability of the public to influence those decisions. Depending on the public input required to support the project team in their decision making, the budget and associated engagement activities will vary. The Engagement Branch recommends a thorough engagement strategy and public engagement plan be undertaken to ensure adherence with the City's Public Engagement Policy C-593.

Below is an example of an engagement budget from a past project with associated staffing compliments that might be considered for the Southside Core Bike Network feasibility report. These are useful guideposts but further planning may be need to be undertaken if this project moves forward.

Estimated budget for focused research and engagement support as follows:
Level of Influence: Advise
Engagement Phases: 2
Staff Complement:
1 .25 Senior Engagement Advisor,
1 .25 Comms advisor
1 .25 Research advisor
Cost: $80,000

Marketing and Education
Educating all road users on safe travel along new bike infrastructure is fundamental to the success of implementation and uptake. While the marketing and education strategies are anticipated to be similar to that of the Downtown Bike Network, the residential nature of the area will require some additional tactics beyond what was used for the Downtown. Specifically, implementing additional infrastructure in this area would require outreach that supports residents such as door knocking as well as smaller events partnering with communities.

An estimated budget of $345,000 will be required to ensure a robust Southside Bike Education program can be provided to ensure all road users traveling along the routes in this area understand the new infrastructure and how to navigate safely. This budget will support the bike education efforts required for two years: year 1 - launch year ($280,000), and year 2 - bike education refresh ($65,000). Bike infrastructure is fairly new to Edmontonians and an education refresh is important to remind/reinforce and educate all road users about the “How To’s” and for many, “What’s New” with respect to traveling along bike routes. In doing so, ensuring that education is provided through all the seasons - spring, summer, fall, winter.

Bike education program expenses include:

- Creative design
- Paid advertising and on-street signs
- Printing and mailout to communities
- Outreach activities
- Promotional material
- Education evaluation
- Staffing:
    - Bike Education Outreach team (6 Temp staff, 4 months)
    - 1.25 Market Planner

Project Integration
An important learning from the Downtown Bike Network project was the need for strong project coordination. The communications engagement and education on the Southside Network will need to be synchronized within the project and aligned with other bike route and multi-modal projects.

The project administrator will coordinate the work of the Communications and Engagement team members, ensuring there is alignment and integration between disciplines, managing timelines and budgets, and monitoring and reporting progress.

0.5 Project Integrator = $50,000

Total Capital Costs
Table 7 summarizes the overall costs estimated to implement the bike network including supplementary items.

Table 7: Summary of Costs Associated with the Network

Network Element	**Quantity (m)**	**Cost**
Protected Bike Lane	4155	$ 2,058,000
Bike Boulevard	815	$ 187,500
Signals Improvements	n/a	$ 2,914,000
Extension of 110 Street to 76 Ave	260	$78,000
Removal of Existing Routes	n/a	$50,000
Communications, Marketing and Education	n/a	$505,000
Total	**5230**	**$ 5,792,000**

Operational Programs and Costs Considerations

It is understood that expanding the amount of infrastructure associated with the Southside bike network will have a number of impacts on operational programs and associated funding requirements. The key operational areas that require further examination include: snow and ice management and shoulder season maintenance (gravel and leaf cleaning), signage, pavement marking and barrier maintenance, summer season beautification maintenance, and ongoing education and awareness programming.

Snow and Ice Management

Winter maintenance including snow and ice control represents one of the most significant portions of the overall maintenance program for year round accessibility of an all ages and abilities bike network.

Through the review of City Policy C409I the City's Snow and Ice Control Policy Council has directed administration to *"investigate alternative practices to addressing snow and ice control during the 2017-2018 winter season to achieve the safest conditions and best levels of mobility and return to Committee in summer 2018 with the results including river quality monitoring data and possible policy amendments if applicable in July 2018."*

Through the maintenance activities completed in the 2017-2018 winter season it has been determined that winter maintenance costs associated with the protected bike lane infrastructure are in the order of $15,000 per kilometer of protected bike lane. In conjunction with any expansion of the network operating budget to support year round accessibility of the network.

In addition to snow and ice control, shoulder season maintenance represents an important component of the ongoing infrastructure operations of the cycling network as sand, gravel, and falling leaves represent an impediment to cycling as these elements can make roadway surfaces slippery, introducing another element of complexity that can deter all ages and abilities cycling. The Downtown Bike Network has only experienced one fall shoulder season and limited data is available to address how expanding the network would impact the shoulder season infrastructure operations program.

In conjunction with concept design work, additional analysis of the infrastructure operations impacts of an expanded bike network will need to be addressed.

Signage, Pavement Marking and Barrier Maintenance

Ongoing maintenance of roadway signs and pavement markings represents a typical component of Network Operations' maintenance for every road in the city and is typically absorbed into the ongoing service provisions associated with roadway operations. It has been noted that, due to complexity of the design and operations of the bike network, the number of signs and amount of pavement markings associated with cycling infrastructure is significantly higher than what is implemented with a typical roadway project.

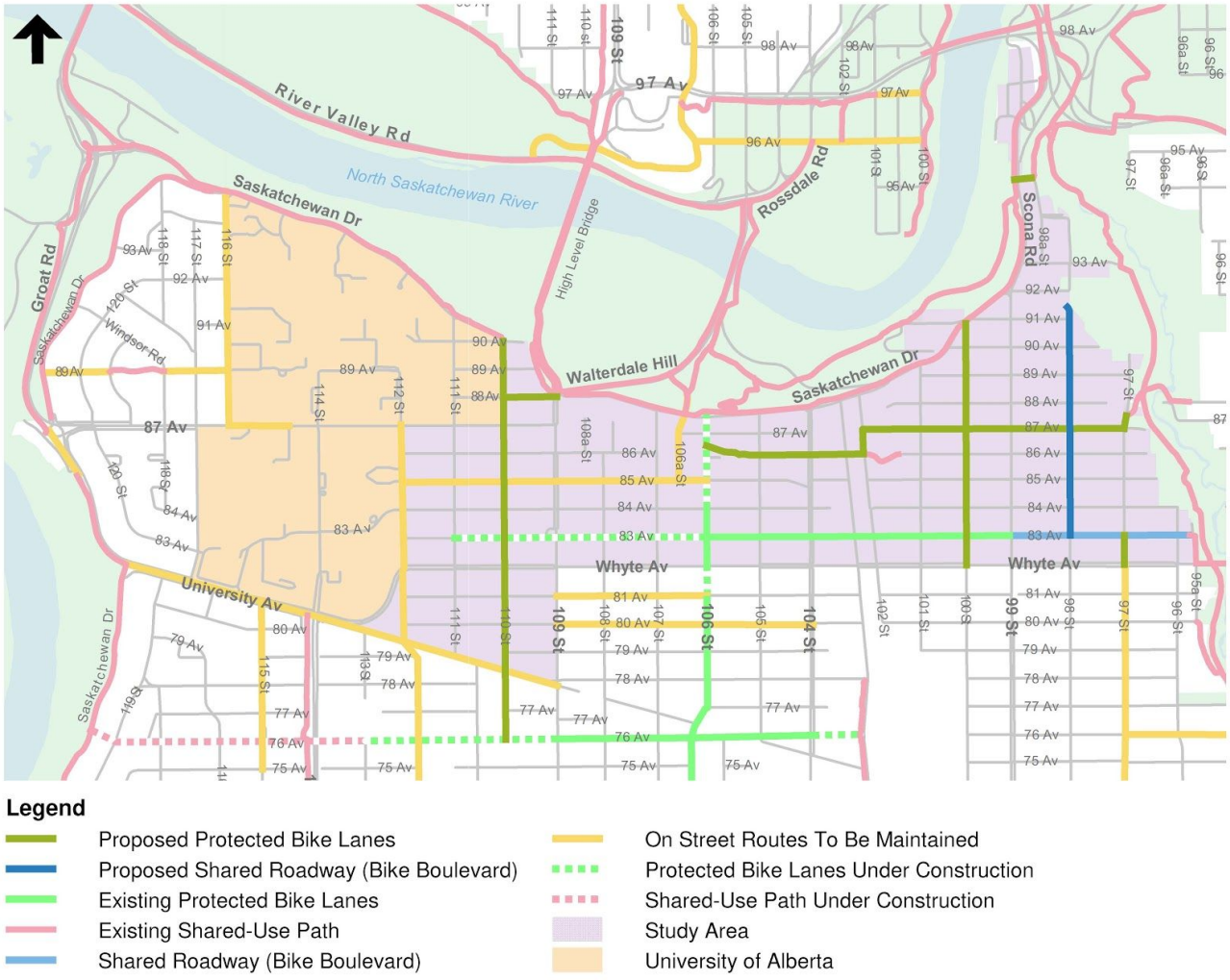
Implementing the bike network through adaptable curb stop and flex post separation infrastructure has larger operational impacts as it requires ongoing resetting of curb stops and flex posts as they are are not fully fixed to the road surface and can be impacted by maintenance equipment and passing vehicles. The details of the higher operating costs associated with these network operational components are still in the process of being captured; however, current estimates are that an additional $30,000 per kilometre per year will be required to support ongoing maintenance associated with adaptable cycling infrastructure.

RECOMMENDATIONS

Recommended Network

As illustrated in Figure 13, the recommended network associated with an expanded protected bike network for the Southside core neighbourhoods includes implementation of an additional 5.2 kilometers of protected bike infrastructure. This network would expand the all ages and abilities network in the area and be complemented by the existing on-street facilities.

Figure 14: Southside Bike Network



While the analysis completed assumes that the majority of the network is implemented as protected bike lanes, as suggested in the secondary screening analysis, there may be opportunities to develop some of this network as bicycle boulevard infrastructure. Further design and analysis

completed through the design development project stage would refine the facility design requirements for the roadways where this facility type may be preferential.

Implementation

It is recommended that the Southside Core Bike Network be implemented as part of the Strathcona and Garneau neighbourhood renewal process. Integrating the two projects will allow for coordinated engagement and project management, aligning with the Public Engagement Policy (C593) and the Capital Project Governance policy (C591).

If instead the Southside Core Bike Network is to be implemented through the same methodology used for the implementation of the Downtown Bike Network, there would be significant challenges and risks. The key risks associated with the Downtown Bike Network implementation methodology include budget, design and public engagement.

The budget risks include over or under-estimating the budget required for a project by creating a capital profile based on network planning level assumptions. For example, the budget associated with the Downtown Bike Network capital profile was based on the network planning level estimate assumptions. These assumptions were based on broad design criteria and included high levels of contingency. These budget assumptions were carried forward through the design and delivery stages of the project even as there was opportunity to refine the budget as more detailed design work was completed.

With respect to design and delivery, on the Downtown Bike Network assumptions associated with the network planning analysis were not vetted through a concept design process and significant design work was required at the preliminary and detailed design stages to address design and operational issues that were not evident at the network planning phase. Further to this to support the rapid implementation of the Downtown Bike Network City Operations lead the implementation phase of that project. This put a significant strain on City Operations resources and would not work within the current Project Development and Delivery Model (PDDM) where project delivery is led by IIS where the project management expertise resides.

Finally, the public engagement with implementation process that was applied to the Downtown Bike Network carried with it significant risk and appreciable effort was applied to mitigate issues that arose through this process. It is predicated that implementing the Southside Core Bike Network as part of the Strathcona and Garneau neighbourhood renewal process would mitigate these risks.

Funding

This analysis identified an overall project cost in the order of $5.8M however, there is no specific funding source identified to support implementation of this infrastructure and no review of funding coordination opportunities were explored through this work. Further, it is understood that implementation of infrastructure projects is to be completed through the IIS Project Development and Delivery Model. This process would support funding for completion of concept and preliminary

design work and allow for appropriate funding approvals to support detailed design and delivery of the infrastructure as it is implemented.

Design

Although the operational impact review completed in this analysis led to the identification of the preferred network and facility type, it also identified a number of design issues that need to be resolved prior to implementation of the facilities. These are issues that would be addressed through the concept and preliminary design stages of the PDDM process.

Public Engagement

Due to the residential nature of the roadways associated with this assessment and residents' interests in how the roads adjacent to their homes operate, public engagement represents a key implementation component that was not as evident in the implementation of the Downtown Bike Network where there is significant commuter and commercial components to the traffic on the road network. Although the analysis indicated that preferred routes could be implemented within appropriate operational and level of service standards, the review did not address the impacts these changes have on the operating habits of residents who use these roadways on a daily basis. Implementation of the preferred cross-section illustrated in Figure 10 will have significant impacts on existing roadway operations and while there may be overarching benefits to changing the operation of roadways associated with the proposed network, implementing this network and associated changes without adequate public engagement represents a significant risk to the project and overall success of the City's cycling program. While implementation of bike infrastructure may positively impact the communities, ensuring residents in impacted neighbourhoods understand the trade-offs associated with implementation of bike infrastructure is a key component to their successful implementation. This understanding can not be adequately addressed through the engagement through implementation process that was utilized on the Downtown Bike Network. Further to this, the preferred route locations identified in Figure 13 will need to be further tested with stakeholders of the public to account for resident knowledge and use patterns and local area requirements. This will occur through the neighbourhood renewal engagement process that is currently underway in the Strathcona neighbourhood, and later in the Garneau neighbourhood.

Impacts to Operational Programs

As identified in the Financial Assessment, expansion of the Southside bike network is anticipated to have additional impacts on operational programs associated with infrastructure and network operations as well as education and communications programs. Work to determine the impacts of these programs as they relate to the Downtown Bike Network are ongoing and time is required to better understand how these impacts are best addressed. In conjunction with analysis of additional design work completed through the PDDM, there would be opportunities to better refine the overall operating needs to support an expanded Southside bike network and identify any additional funding requirements associated with expanding these operational programs prior to delivery.

Recommended Implementation

Based on these factors it is recommended that the Southside Core Neighbourhood Bike Network is implemented as part of the Strathcona and Garneau neighbourhood renewal process. Integrating the two projects will allow for coordinated engagement and project management, aligning with the Public Engagement Policy (C593) and the Capital Project Governance policy (C591). This process will also reduce the risks associated with lack of public engagement and missing design details identified in this analysis. In addition, opportunities for implementation of portions of the network that lie outside of the Strathcona project boundary should be explored prior to the timelines anticipated with the Garneau Neighbourhood Renewal Project.

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