Appendix 1

Downtown Active Transportation Network – Technical Report

City of Saskatoon
Transportation Division
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Authorization

Prepared By:

Danae Balogun, MCIP RPP

Active Transportation Program Manager

Mariniel Flores, P.Eng

Transportation Engineer

Jay Magus, P.Eng.

Director of Transportation

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2 EXECUTIVE SUMMARY

2.1 PROJECT OVERVIEW

Following the conclusion of the Downtown Protected Bike Lane Demonstration in November 2017, the Administration began the Downtown All Ages and Abilities (AAA) Cycling Network study to determine the 'right streets' for a complete and connected AAA cycling network in downtown Saskatoon. This study has been rebranded the Downtown Active Transportation (AT) Network study as it is has become evident that significant improvements to the pedestrian realm would also be realized through the project, resulting in a series of Active Transportation corridors.

To ensure that the most appropriate streets host active transportation facilities, the assessment took into consideration how active transportation facilities connect to Saskatoon's wider active transportation network, integration with other key downtown projects, and the impacts to all users in the downtown. The study also took into consideration key active transportation network principles. A discussion of these principles can be found in Section 3: Study Process.

To ensure that the most appropriate streets host active transportation, including AAA facilities, downtown streets were assessed using several factors:

Bicycle Network	Cyclist Safety	People Driving	Transit	Business	People Walking
• Connections to surrounding areas, with other cycling facilities, and to key destinations	• Conflict with motor vehicles • Merit of segregation	• Automobile travel time • Automobile Level of Service	• Transit stop conflicts and operations	• Parking • Street environment	• Pedestrian improvements • Accessibility

Image 1: Assessment Factors

The assessment did not weigh any category above another. It was used to understand the tradeoffs among all road users that could result from the inclusion of an active transportation facility, including a AAA facility. Detailed results from the analysis are discussed in Section 4: Network Assessment.

After reviewing all of the factors and constraints for each street the following active transportation network configuration is proposed:

North-South route[1]:

- 3rd Avenue

East-West routes:

- 19th Street, and
- 23rd Street.

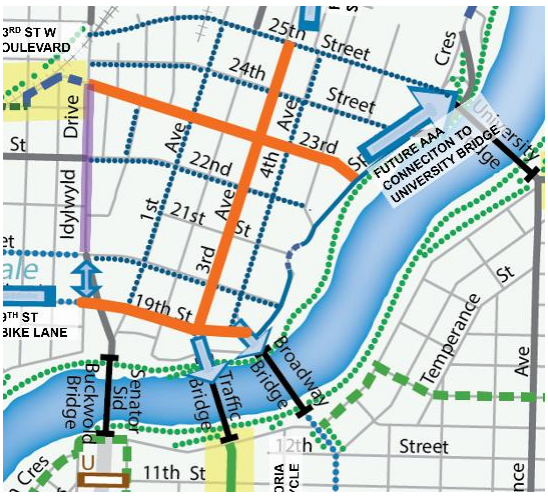

Image 2: Map of Recommended Downtown Network

These streets were selected based on a detailed understanding of trade-offs between the variety of users and functions that these downtown streets serve, striving to achieve a balance amongst all users.

Improvements to connections outside of the study area have been identified and will be addressed through detailed design to ensure high-quality connections and seamless transitions. These connections, along with an overview of the network decision making process can be found in Section 5: Proposed Network.

Two types of cycling facilities are proposed for the downtown network: along 3rd Avenue and 23rd Street, unidirectional (one-way) protected bike lanes are proposed. Along 19th Street, a bidirectional facility is proposed. Both facility types have some common design elements such as crossrides, bike boxes, and buffer areas. A detailed discussion of these features can be found in Section 4: Design Elements.

A potential strategy for implementation and a cost estimate breakdown of the downtown network has been prepared. The strategy utilizes a phased approach to implementing the network over 4 years.

[1] Idylwyld Drive will also have an active transportation facility. A raised cycle track and multi-use pathway were recommended through the Imagine Idylwyld project. While this proposed facility connects to the downtown network it is not a part of this study.

Table 1: Implementation Strategy & Cost Estimates

Year	Implementation Details	Cost Estimate
2019	Continue to develop conceptual designs	-
2020	Complete detailed design for all corridors.	$0.435M
2021	Implement 3rd Avenue active transportation corridor with the exclusion of the curb extensions at the following intersections: • 19th Street and 3rd Avenue, • 22nd Street and 3rd Avenue, and • 23rd Street and 3rd Avenue. These intersections would be completed once the detailed design for BRT has been determined. Planters would be used in the interim to delineate future curb extension area.	$0.7M
2022	19th Street Implementation 3rd Ave: 19th/3rd Ave intersection completed	$0.6M
2023	23rd Street Implementation 3rd Ave: 22nd Street and 3rd Avenue, and 23rd Street and 3rd Avenue intersections completed.	$2.4M
Total Estimated Cost		$4.051M
Annual Operating Costs (once all three corridors are completed)		$0.4M

A detailed implementation strategy and cost estimate breakdown is included in Section 7: Implementation Strategy.

A variety of public and targeted stakeholder engagement events have been conducted for the Downtown Active Transportation Network study. Engagement efforts included three Active Transportation Advisory Group Meetings, four stakeholder information sessions, one community open house, one pop up event, and meetings with the Downtown Business Improvement District. A detailed summary of the engagement events is contained within the Downtown Active Transportation Network Engagement Summary.

3 Study Process

3.1 Study Scope

Following the conclusion of the Downtown Protected Bike Lane Demonstration in November 2017, the Administration began the Downtown Active Transportation Network study to determine the 'right streets' for a complete and connected AAA cycling network in downtown Saskatoon.

Image 3: Downtown AAA Cycling Network Study Area

The study area included all streets within the Central Business District neighbourhood, which is bound by Idylwyld Drive to the west, Spadina Crescent to the east, 25th Street to the north, and 19th Street to the south. All streets within the study area were assessed for suitability for hosting active transportation, including AAA facilities. AAA facilities offer practical route options for people who are interested in cycling, but who may not be comfortable riding on busy streets with high traffic volumes and speeds.

The following foundations were established to guide the Downtown Active Transportation Network study:

- The network must take into consideration how active transportation facilities connect to Saskatoon's wider active transportation network;
- The network must integrate with other key downtown projects; and,
- The network must consider the impacts to all users in the downtown to ensure that the most appropriate streets host active transportation, including AAA, facilities.

The study used a three-phase approach to determine suitability:

- Pre-screening to eliminate any street that did not meet the active transportation network principles and project foundations;
- Detailed assessment of suitable streets to consider the impacts to all users when introducing an active transportation, including AAA, facility; and
- Following endorsement of the recommended corridors by City Council, detailed design will proceed on each corridor.

3.2 Active Transportation Network Design Principles

3.2.1 City Wide Active Transportation Network Principles

A well-designed active transportation network needs to be visible, intuitive and provide connections between destinations and neighbourhoods.

Ideally, an active transportation network serves users of all ages and abilities – in other words, people from age 8 to age 80 – offering practical route options for those who are interested in cycling, but who may not be comfortable riding on busy streets with high traffic volumes and speeds.

The design and development of a long-term active transportation network for Saskatoon is based on five network planning principles:

1. Provide an interconnected system of facilities that is comfortable and attractive for all users.
2. Increase coverage to ensure all residents are within 400m of a designated bicycle route. The designated route may include both AAA and non-AAA facilities.
3. Focus on high-quality connections to and from downtown with all areas of the city and create a downtown network.
4. Provide a network that provides direct access to major shopping centres, key employment areas, schools, and recreational areas/facilities.
5. Improve and connect to existing active transportation routes.

3.3 All Ages and Abilities (AAA) Bicycle Network Principles

Building on the city-wide active transportation network principles, there are three key principles of developing and designing cycling facilities that offer options for people of all ages and abilities: safety, comfort and connectivity. The facility must:

1. **Safety:** Be safe because cyclists are vulnerable road users;
2. **Comfort:** Be comfortable in order to attract new cyclists; and
3. **Connectivity:** Connect not only to other facilities but also to key destinations in order to be practical.

Table 2: AAA Cycling Network Principles

Safety	Comfort	Connectivity
• Minimize and consolidate conflict points between modes (for example, at intersections or driveway crossings). • Reduce speed and enhance visibility at intersections and conflict points. • Provide each mode with a clearly defined space for travel. • Provide consistent treatments to promote predictable behavior for all users. • Ensure facilities are easy to maintain to facilitate safe cycling conditions.	• Separate bicycles from motor vehicles when speeds are over 30 km/hr and traffic volumes exceed 1,500 vehicles per day. • Ensure the amount of delay for people riding bikes is reasonable and balanced with other users. • Minimize encounters between people riding bikes, driving vehicles and walking. • Accommodate side by side cycling and passing movements, where feasible. • Provide smooth vertical transitions and pavement surfaces free from obstructions.	• Provide direct and convenient connections that minimize detours. • Connect to local and city-wide destinations. • Integrate into the larger multimodal transportation network. • Provide seamless transitions between different types of cycling facilities. (For example: from a raised cycle track to a multi-use pathway). • Ensure key destinations and regional routes are interconnected with the bicycle network.

3.4 Pre-Screening of Streets

As part of the initial phase of the process, six downtown streets were pre-screen and eliminated from consideration as they did not integrate to the wider active transportation network beyond the study area.

Table 3: Streets Eliminated from Detailed Downtown Active Transportation Network Assessment

Streets Eliminated	Reason for Elimination
5th Avenue (Between 22nd Street and 25th Street)	• Does not connect well to the south end of the study area • Highly residential in nature with a low number of city-wide destinations
6th Avenue (Between 24th Street and 25th Street)	• Only extends for one block within the study area
21st Street E	• Low connectivity on west and east ends as it terminates at 1st Avenue and Spadina Crescent
Ontario Avenue, Wall Street, Pacific Avenue	• Streets do not connect well to the north and south ends of study area • Potential in the future to serve as a secondary cycling connection to provide local access

These streets have been excluded from the detailed assessment of streets suitable for supporting active transportation and AAA connections to the city-wide network. The exclusion of these downtown streets does not preclude them from being a part of the local cycling network circulation. The exclusion of these streets from the overall active transportation and AAA network were presented at the first stakeholder meeting and generally supported by attendees.

3.5 Integration with Key Downtown Projects

The proposed network takes into consideration the Bus Rapid Transit (BRT) route identified through downtown, the recommendations included within the Imagine Idylwyld project, and the Traffic Bridge replacement. Discussions occurred with the respective project managers throughout the development of the Downtown Active Transportation Network study.

4 NETWORK ASSESSMENT

Downtown streets support a number of different land uses through a variety travel of modes. When assessing the appropriate streets for an active transportation facility, it is important to consider the impacts to all users in the downtown. The factors used for the assessment relate to one or more of the Principles outlined earlier. The factors used to complete the assessment and the findings are outlined on the following pages.

Table 4: Summary of Evaluation Criteria

Summary of Evaluation Criteria	
Bicycle Network • **Linkages to surrounding areas:** Corridors providing better linkages across major barriers such as busy streets and river crossings should be preferred. • **Linkages with other cycling facilities:** Corridors that offer a strong potential for interconnection with existing and planned City bicycle facilities should be preferred. • **Current and potential bicycle traffic:** Corridors where a large number of existing and potential bicycle trips originate and terminate should be preferred. **Cyclist Safety** • **Conflict with motor vehicles:** Corridors with fewer number of turning movements at intersections, driveways, and lanes should be preferred. • **Merit of segregation:** Corridors with higher overall traffic volumes, higher truck traffic volumes, higher traffic speeds, and that have a higher potential for illegal stopping should be strongly preferred. Separation on such corridors will provide the greatest benefit to cyclists. **People Walking** • **Pedestrian improvements:** Corridors that have potential to improve the pedestrian safety should be preferred. For example, pedestrian separation from motor vehicles and cyclists or changes to crossing distances at intersections improve conditions for people waking. • **Accessibility:** Corridors where implementation of the bicycle facility will have lowest relative impact on users with mobility needs should be preferred.	**People Driving** • **Automobile travel time:** Corridors with the least impact on automobile delay and travel time should be preferred. **Transit** • **Transit stop conflicts:** Corridors with fewer bus stops and lower frequency of bus service should be preferred because there will be fewer conflicts between cyclists and passengers entering or exiting buses. • **Transit operations:** Corridors with the least impact on transit travel time should be preferred. **Business** • **Parking:** Corridors where implementation of the bicycle facility will have the lowest relative impact on the total parking supply should be preferred. • **Street environment:** Implementation of the cycling facility will increase the distance between the sidewalk and moving automobiles, with likely benefits for street-level commerce. Corridors with a significant amount of street-level commerce should therefore be preferred.

4.1 Summary of Assessment

Table 5: Summary of Assessment

North-South Streets	
Idylwyld Drive 20th Street to 25th Street	• The Imagine Idylwyld project recommends the inclusion of a raised cycle track through the downtown, facilitating connections between major downtown attractions such as TCU, River Landing, Farmers' Market, and major retail destination in Downtown and Riversdale. • The Downtown Active Transportation Network study supports this recommendation.
1st Avenue 19th Street to 25th Street	• 1st Avenue, while having good connectivity beyond the study area, does not connect well with existing or planned active transportation or AAA facilities. • Adding an active transportation facility to 1st Avenue had the largest negative impact to motor vehicles, increasing corridor travel time and decreasing LOS at key intersections such as 22nd Street. • This impact to traffic was deemed to be too great a trade-off to consider 1st Avenue for the active transportation network.
2nd Avenue Spadina Crescent to 25th Street	• 2nd Avenue has excellent connectivity beyond the study area, great downtown coverage, a number of destinations along it, and limited impact to motor vehicle travel time and LOS at intersections. • However, 2nd Avenue, being a retail oriented street, also possesses the highest number of parking spaces and therefore would incur the highest number of parking losses (nearly half of the current spaces would be removed) with the inclusion of a cycling facility. • This impact to parking was deemed to be too great a trade-off to consider 2nd Avenue for the active transportation network.
3rd Avenue Spadina Crescent to 25th Street	• 3rd Avenue has excellent connectivity beyond the study area, great connections to the Traffic Bridge to the south, and smooth transitions north at 25th Street. • The Street has excellent coverage through the downtown, and serves a number of destinations. • Adding an active transportation facility to 3rd Avenue does impact motor vehicles, increasing corridor travel time and decreasing LOS at 20th Street, however the impact to motor vehicles along this corridor are less than the impacts to motorist vehicles on 1st Avenue. • The addition of an active transportation facility does reduce the number of parking spaces, but the impacts to parking are significantly less along 3rd Avenue than 2nd Avenue. • The presence of centre medians reduces the number of conflict points improving the safety of the street. • In comparing the trade-offs between the available north-south streets, 3rd Avenue was selected as an active transportation network street as it offered the most balanced impact to all users.
4th Avenue 19th Street to 25th Street	• 4th Avenue has good connectivity beyond the study area, with some challenges noted at the connection to the Broadway Bridge that should be addressed through intersection improvements. • The street is fairly central to downtown providing decent coverage, and there are city-wide destinations along this street. • Adding an active transportation facility to 4th Avenue does impact motor vehicles, increasing corridor travel time and decreasing LOS at key intersections such as 22nd Street. The impact to motor vehicles along this corridor are less than the impacts to motorist vehicles on 1st Avenue but more than the impacts on 3rd Avenue.

	• The addition of an active transportation facility does reduce the number of parking spaces, but the impacts to parking are significantly less along 4th Avenue than 2nd Avenue. • While 4th Avenue is a viable option for an active transportation cycling facility, 3rd Avenue is technically preferred.
Spadina Crescent 20th Street to 25th Street	• Spadina Crescent was found to have good connectivity beyond the study area but, due to its location on the edge of downtown, the coverage and destinations served by Spadina Crescent are not as ideal as other streets more central to the downtown. • As Spadina Crescent does not have signalized intersections, impacts to motor vehicle LOS and corridor travel time would be minimal with the addition of an active transportation facility. • An additional constraint with Spadina Crescent is the available width from curb-to-curb due to the wide promenade with mature trees. Due to the lack of pavement width, more than 80% of the parking along Spadina Crescent would need to be removed. • This impact to parking and lack of available width removed Spadina Crescent from consideration for the active transportation network.
East-West Streets	
19th Street Avenue A to Spadina Crescent	• 19th Street was found to have good connectivity, but limited coverage due to its location at the edge of the study area. • However, the connections to Traffic Bridge and Broadway Bridge make it an excellent candidate to serve the city-wide active transportation network. 19th Street west of Avenue A is also proposed to have an active transportation facility through the 19th Street Corridor Review Project. • The inclusion of an active transportation facility had minimal impact to motor vehicle intersection LOS and corridor travel time. • Additionally, no parking would need to be removed to add an active transportation facility to 19th Street. • 19th Street was selected as an active transportation network street.
20th Street Idylwyld Drive to Spadina Crescent	• 20th Street has good connectivity, and ok coverage of the downtown. • The street does not connect directly to any bridges, but does connect to the proposed active transportation facility on Idylwyld Dr. • 20th Street has a number of retail shops and restaurants west of Idylwyld Drive, but less though downtown. • Adding an active transportation facility to 20th Street does impact motor vehicles, increasing corridor travel time and decreasing intersection LOS at all intersections. • Introducing an active transportation facility to 20th Street also reduces parking opportunities on the street. • 20th Street was not selected as an active transportation network street.
22nd Street Idylwyld Drive to Spadina Crescent	• 22nd Street has decent connectivity and great coverage of the downtown due to its central location. It does not connect directly to any bridges. • Adding an active transportation facility to 22nd Street does impact motor vehicles, increasing corridor travel time, however, there were no impacts to intersection LOS, with the exception of 3rd Avenue and 22nd Street. • 22nd St was not selected as an active transportation network street.
23rd Street Idylwyld Drive to Spadina Crescent	• 23rd Street has great connectivity and the highest coverage of downtown. It connects directly with the existing Blairmore Bikeway to the west, and connects indirectly with University Bridge to the east. • Adding an active transportation facility to 23rd Street had negligable impact motor vechiles, with no increases to corridor travel time and no impact to intersection LOS. • Additionally, the inclusion of an active transportation facility had minimal impact to parking, with a reduction of 13 spaces.

	• Transit is currently operating on 23rd Street, but with the implementation of BRT, transit is not expected to stay on 23rd Street, which would remove the existing transit terminal. • Due to the excellent connectivity and coverage, and minimal impact to other downtown users, 23rd Street was selected for the active transportation network.
24th Street Idylwyld Drive to Spadina Crescent	• 24th Street has good connectivity beyond the study area, a better connection to the University Bridge than 23rd Street, and decent coverge of the downtown, though less-so than 23rd Street. • Adding an active transportation facility to 24th Street does impact motor vechiles, increasing corridor travel time, however, there were no impacts to intersection LOS, with the exception of 4th Avenue and 24th Street. • Introducing an active transportation facility to 24th Street also reduces parking opportunities on the street by nearly 50%. • 24th Street was not selected an active transportation network street.
25th St Idylwyd Dr to Spadina Crescent	• 25th Street has good connectivity on either end of the study area, but has limited coverage due to its proximity on the edge of the study area. It connects directly to the University Bridge to the east, and to the West/Central Multi-Use Corridor at Idylwyld Drive. • 25th Street was removed from consideration for the downtown active transportation network at this time.

4.2 Active Transportation Network

4.2.1 Linkages to surrounding areas

Corridors providing better linkages across major barriers such as busy streets and river crossings should be preferred. To determine how well each corridor connected to the surrounding area each downtown street was assessed for:

- **Connections beyond downtown**: How well does the street connect beyond the study area?
- **Coverage:** What percentage of downtown falls within 400 m of the street?[2]

[2] The AT Plan recommends that cycling facilities be installed at 400 m spacing to provide balanced access to cycling facilities.

Table 6: Active Transportation Network - Linkages to Surrounding Areas for N-S streets

	Idylwyld Drive	1st Avenue	2nd Avenue	3rd Avenue	4th Avenue	Spadina Crescent
Connections – North	Extends beyond 25th Street.	Extends beyond 25th Street.	Extends beyond 25th Street.	Extends beyond 25th Street.	Extends beyond 25th Street.	Extends north of 25th Street. Connects with Meewasin Trail system.
Connections - South	Terminates at 20th Street. Connects through Avenue A to 19th Street.	Southbound terminates at 19th Street. Northbound begins at 20th Street due to Idylwyld Freeway Ramps.	Terminates at Spadina Crescent.	Terminates at Spadina Crescent.	Intersection improvements are planned that will improve the connection to the Broadway Bridge.	Terminates at 2nd Avenue. Connects with Meewasin Trail system.
Coverage	40%	65%	75%	75%	70%	55%

Table 7: Active Transportation Network - Linkages to Surrounding Areas for E-W streets

	19th Street	20th Street	22nd Street	23rd Street	24th Street	25th Street
Connections – East	Terminates at 4th Avenue.	Terminates at Spadina Crescent.	Terminates at Spadina Crescent, but deflects south at 5th Avenue.	Terminates at Spadina Crescent.	Terminates at Spadina Crescent.	Terminates at Spadina Crescent.
Connections - West	Continues to Avenue M.	Continues to Vancouver Avenue.	Continues to City Limits.	Continues to Vancouver Avenue with a slight deflection at Jamieson Street.	Terminates at Idylwyld Drive.	Terminates at Idylwyld Drive.
Coverage	35%	50%	65%	70%	60%	40%

4.2.2 Linkages with other active transportation facilities

Corridors that offer a strong potential for interconnection with existing and planned bicycle facilities should be preferred. To assess how well each corridor connected to existing and future active transportation facilities, downtown streets were assessed for:

- **Bridges**: How well does the corridor connect to the existing bridge infrastructure?
- **Existing active transportation and AAA facilities**: How well does the corridor connect to existing active transportation and all ages and abilities cycling facilities?
- **Proposed active transportation and AAA Facilities**: How well does the corridor connect to future active transportation and all ages and abilities cycling facilities?

Table 8: Active Transportation Network: Linkages with other Facilities for N-S streets

	Idylwyld Drive	1st Avenue	2nd Avenue	3rd Avenue	4th Avenue	Spadina Crescent
Bridges	Direct connection to Sid Buckwold Bridge but the link to walkway is challenging.	Direct connection to Sid Buckwold Bridge but the link to walkway is challenging.	Indirect connection to Traffic Bridge and Broadway Bridge by way of 19th Street.	Direct connection to Traffic Bridge. Connection to Broadway Bridge by way of 19th Street.	Northbound connection from Broadway Bridge to 4th Avenue is adequate. (Intersection improvements are planned.)	Direct connection to University Bridge and Traffic Bridge. Does not connect with Broadway Bridge.
Existing Active Transportation Facilities	Connects with Blairmore Bikeway and WC Multi-Use Corridor.	None	2nd Avenue becomes 3rd Avenue to connect with 33rd Street Multi-Use Pathway	Direct connection to Traffic bridge and Cycle Track on Victoria Avenue.	None	Connects to Meewasin trail system.
Proposed Active Transportation Facilities	Connects through Avenue A to proposed 19th Street protected bike lane (Avenue A - Avenue H).	None	None	None	None	None

Table 9: Active Transportation Network: Linkages with other Bicycle Facilities for E-W streets

	19th Street	20th Street	22nd Street	23rd Street	24th Street	25th Street
Bridges	Direct connection to Traffic Bridge and Broadway Bridge.	No bridge connections.	No bridge connections.	Indirect connection to University Bridge.	Indirect connection to University Bridge	Direct connection to University Bridge.
Existing Active Transportation Facilities	None	None	None	Connects to Blairmore Bikeway	None	Connects to W/C Multi-Use Corridor
Proposed Active Transportation Facilities	Connects to proposed 19th Street protected bike lane (Avenue A - Avenue H).	Connects to proposed raised cycle track on Idylwyld Drive.	Connects to proposed raised cycle track on Idylwyld Drive.	Connects to proposed raised cycle track on Idylwyld Drive.	Connects to proposed multi-use pathway on Idylwyld Drive.	Connects to proposed multi-use pathway on Idylwyld Drive.

4.2.3 Current and potential bicycle traffic

Corridors in which a large number of existing and potential bicycle trips originate and terminate should be preferred. To assess the potential for bicycle trips, downtown streets were assessed for:

- **Key destinations served**: How many city-wide destinations would be served by an active transportation facility on this corridor?

Table 10: Active Transportation Network: Key Destinations Served for N-S streets

	Idylwyld Drive	1st Avenue	2nd Avenue	3rd Avenue	4th Avenue	Spadina Crescent
Key Destinations Served	• Midtown Plaza • TCU Place	• Gov't of Canada Building • Midtown Plaza • Scotia Centre	• Remai Modern • River Landing • Scotia Centre • Lots of retail • Lots of restaurants	• Francis Morrison Library • City Hall • Sturdy Stone • Some retail shops • Some restaurants • Educational intuitions	• Francis Morrison Library • City Hall • Sturdy Stone • More office than retail • Some restaurants	• Remai Modern • River Landing • Court of Queen's Bench • Medical Offices • General Offices

Table 11: Active Transportation Network: Key Destinations Served for E-W streets

	19th Street	20th Street	22nd Street	23rd Street	24th Street	25th Street
Key Destinations Served	• River Landing • Remai Modern • Farmer's Market • Prov. Court • Midtown Plaza	• Midtown Plaza • Several retail shops west of Idylwyld Drive	• TCU Place • Sturdy Stone • Some office /retail	• Francis Morrison Library • City Hall • Medical Offices	• Kinsmen Park • City Hall	• Kinsmen Park • Police Station

4.3 Cyclist Safety

4.3.1 Conflict with motor vehicles:

Corridors with fewer number of turning movements at intersections, driveways, and lanes should be preferred. Two metrics were used to assess each street:

- **Average Daily traffic volume:** How many vehicles, on average, use this street on a daily basis?
- **Number of driveways and rear lanes per block:** How many potential conflict points are present along each block face of this street?

Table 12: Cyclist Safety: Conflicts with Vehicles for N-S streets

	Idylwyld Drive	1st Avenue	2nd Avenue	3rd Avenue	4th Avenue	Spadina Crescent
Motor Vehicles per Day	28,000 – 31,000 (2016 AADT[3])	13,000 – 22,000 (estimated[4])	5,000 - 16,000 (estimated)	7,000 – 9,000* (estimated)	12,000 – 22,000* (estimated)	6,000 – 9,000 (2016 AADT)
Number of driveways and lanes per block	TOTAL 19 20th to 22nd 7 22nd to 23rd 7 23rd to 24th 6 24th to 25th 3	TOTAL 24 20th to 21st 4 21st to 22nd 5 22nd to 23rd 3 23rd to 24th 5 24th to 25th 7	TOTAL 13 19th to 20th 2 20th to 21st 2 21st to 22nd 2 22nd to 23rd 2 23rd to 24th 1 24th to 25th 4	TOTAL 22 19th to 20th 6 20th to 21st 4 21st to 22nd 4 22nd to 23rd 2 23rd to 24th 2 24th to 25th 4	TOTAL 28 19th to 20th 3 20th to 21st 4 21st to 22nd 4 22nd to 23rd 3 23rd to 24th 6 24th to 25th 5	TOTAL 19 19th to 20th 3 20th to 21st 1 21st to 22nd 4 22nd to 23rd 5 23rd to 24th 3 24th to 25th 3

Table 13: Cyclist Safety: Conflicts with Vehicles for E-W streets

	19th Street	20th Street	22nd Street	23rd Street	24th Street	25th Street
Motor Vehicles per Day	17,000 – 25,000* (estimated)	13,000 – 20,000* (estimated)	15,000 – 30,000* (estimated)	7,000 – 12,000* (estimated)	8,000 – 13,000* (estimated)	23,000 – 43,000 (2016 AADT)
Number of driveways and lanes per block	TOTAL 8 1st to 2nd 3 2nd to 3rd 3 3rd to 4th 2	TOTAL 13 Idylwyld to 1st 3 1st to 2nd 1 2nd to 3rd 0 3rd to 4th 3 4th to Spadina 6	TOTAL 15 Idylwyld to Pacific 2 Pacific to 1st 5 1st to 2nd 2 2nd to 3rd 2 3rd to 4th 2 4th to Spadina 1	TOTAL 16 Idylwyld to Wall 3 Wall to Pacific 3 Pacific to 1st 3 1st to 2nd 0 2nd to 3rd 4 3rd to 4th 0 4th to 5th 2 5th to 6th 4	TOTAL 35 Idylwyld to Wall 3 Wall to Pacific 1 Pacific to Ontario 4 Ontario to 1st 5 1st to 2nd 3 2nd to 3rd 4 3rd to 4th 1 4th to 5th 3 5th to 6th 4 6th to Spadina 7	TOTAL 23 Idylwyld to Ontario 3 Ontario to 1st 5 1st to 2nd 3 2nd to 3rd 4 3rd to 4th 1 4th to 5th 3 5th to 6th 4 6th to Spadina 7

4.3.2 Merit of segregation

Corridors with higher overall traffic volumes, higher truck traffic volumes, higher traffic speeds, and which have a higher potential for illegal stopping should be strongly preferred. Separation on such corridors will provide the greatest benefit to cyclists.

When speeds are over 30 km/hr and traffic volumes exceed 1,500 vehicles per day, active transportation facilities should be separated from motor vehicles. As was noted previously the downtown streets considered for detailed review exceed this volume and speed, and therefore merit segregation.

[3] 2016 Average Annual Daily Traffic (AADT) from City of Saskatoon
[4] Estimated based on PM peak hour projections

4.4 People Walking

4.4.1 Pedestrian improvements

Corridors that have potential to improve pedestrian safety should be preferred. For example, pedestrian separation from motor vehicles and cyclists or changes to crossing distances at intersections improve conditions for people waking. Downtown streets were assessed for existing pedestrian conditions (such as streetscaping) and whether inclusion of a cycling facility could provide any additional benefit for pedestrians.

- **Opportunity for improvements**: Does adding an active transportation facility to this corridor improve conditions for pedestrians?

Table 14: People Walking: Opportunity for Pedestrian Improvements to N-S streets

	Idylwyld Drive	1st Avenue	2nd Avenue	3rd Avenue	4th Avenue	Spadina Crescent
Opportunity for Improvements	Imagine Idylwyld proposes crossing modifications and streetscape amenities.	Opportunity for better crossings for pedestrians north of 22nd Street.	Already a pedestrian priority street with significant pedestrian amenities and short crossing distances.	Streetscape conditions exist south of 22nd Street. Opportunity for additional improvements north of 22nd Street.	Already streetscaped but offer Increased buffer from vehicle traffic.	East side has promenade. West side could benefit from sidewalk enhancements.

Table 15: People Walking: Opportunity for Pedestrian Improvements to E-W streets

	19th Street	20th Street	22nd Street	23rd Street	24th Street	25th Street
Opportunity for Improvements	Increased buffer from motor traffic.	Increased buffer from motor traffic.	Increased buffer from motor traffic.	Increased buffer from motor traffic.	Increased buffer from motor traffic.	Already streetscaped but offer Increased buffer from motor traffic.

4.4.2 Accessibility

Corridors in which implementation of the bicycle facility will have lowest relative impact on users with mobility needs should be preferred. Accessibility needs are an essential part of ensuring that the needs of all users can be accommodated on downtown streets. Accessibility needs, such as accessible parking or raised curb treatments, can be applied to all of the candidate corridors and will be addressed through detailed design. Additional details on accessible design treatments can be found in Section 6 of this report.

4.5 TRANSIT

4.5.1 Transit stop conflicts

Corridors with fewer bus stops and lower frequency of bus service should be preferred as there will be fewer conflicts between cyclists and passengers entering or exiting buses. Downtown streets were assessed for the number of transit stop conflicts:

- **Current number of stops**: How many transit stops exist along this corridor today?

Table 16: Transit: Transit Stop Conflicts for N-S streets

	Idylwyld Drive	1st Avenue	2nd Avenue	3rd Avenue	4th Avenue	Spadina Crescent
Current # of Transit Stops	0	6	2	12	3	0

Table 17: Transit: Transit Stop Conflicts for E-W streets

	19th Street	20th Street	22nd Street	23rd Street	24th Street	25th Street
Current # of Transit Stops	5	3	4	9	2	9

4.5.2 Transit Operations

Corridors with the least impact on transit travel time should be preferred. Downtown streets were assessed for whether a transit route was present or planned:

- **Current transit route:** Does transit currently operate along this corridor?
- **Future transit route:** Has Transit identified this corridor as a future BRT route?

Table 18: Transit: Transit Operations for N-S streets

	Idylwyld Drive	1st Avenue	2nd Avenue	3rd Avenue	4th Avenue	Spadina Crescent
Current Transit Route	No	Yes	Yes	Yes	Yes	No
Future Transit Route	Not Identified	Possible BRT Route	Not Identified	Possible BRT Route	Not identified	Not identified

Table 19: Transit: Transit Operations for E-W streets

	19th Street	20th Street	22nd Street	23rd Street	24th Street	25th Street
Current Transit Route	Yes	Yes	Yes	Current transit terminal conflict from 2nd Avenue to 3rd Avenue	Yes	Yes
Future Transit Route	Possible BRT Route	None identified	Possible BRT Route	None identified	None identified	Possible BRT Route

4.6 BUSINESS

4.6.1 On-Street Parking

Corridors where implementation of an active transportation facility will have the lowest relative impact on the total on-street parking supply should be preferred. Parked cars near intersections and driveways limit motor vehicle driver visibility of approaching cyclists and motor traffic. The number of parking spaces along a street were quantified to understand the number of parking spaces that would be removed by the installation of an active transportation facility on the corridor.

The current number of parking spaces identified below are from the 2016 Parking Study.

- **Current number of parking spaces**: How many spaces are currently available along this corridor?
- **Number of parking spaces with active transportation facility**: How many spaces are available with an active transportation facility along this corridor?
- **Change in number of parking spaces**: How many spaces are removed when an active transportation facility is added to this corridor?

Table 20: Business: Impacts to On-street Parking with Addition of Active Transportation Facility for N-S streets

	Idylwyld Drive	1st Avenue	2nd Avenue	3rd Avenue	4th Avenue	Spadina Crescent
Current number of Spaces	0	120	322	156	152	92
Number of Spaces with Active Transportation	0	72	146[5]	102	94	12[6]
Change in Number of Spaces	0	-48	-176	-54	-58	-80

[5] Angle parking converted to parallel parking
[6] Parking on west side removed

Table 21: Business: Impacts to On-street Parking with Addition of Active Transportation Facility for E-W streets

	19th Street	20th Street	22nd Street	23rd Street	24th Street	25th Street
Current number of Spaces	17	118	96	103	124	58
Number of Spaces with Active Transportation	17	80	63	90[7]	66[8]	50
Change in Number of Spaces	0	-38	-33	-13	-58	-8

4.6.2 Street environment

Implementation of an active transportation facility will provide sidewalks with additional buffering from automobiles and improve the pedestrian environment, with likely benefits for street-level commerce. Corridors with a significant amount of street-level commerce should therefore be preferred. Generally, the higher number of building entrances the more active the street level environment will be. The numbers were outlined below were obtained from inventory gathered in phase one of the City Centre Plan: Public Spaces, Activity + Urban Form Strategic Framework.

- **Number of building entrances:** How much street-level activity is there along each corridor?

Table 22: Business: Number of Building Entrances for N-S streets

	Idylwyld Drive	1st Avenue	2nd Avenue	3rd Avenue	4th Avenue	Spadina Crescent
Number of building entrances	35 (3.8 per block face)	54 (4.5 per block face)	124 (8.8 per block face)	96 (6.8 per block face)	41 (3.4 per block face)	28 (4.6 per block face)

Table 23: Business: Number of Building Entrances for E-W streets

	19th Street	20th Street	22nd Street	23rd Street	24th Street	25th Street
Number of building entrances	7 (1.2 per block face)	23 (2.3 per block face)	31 (3.1 per block face)	21 (1.5 per block face)	33 (2.0 per block face)	24 (1.6 per block face)

4.7 People Driving

Corridors with the least impact on automobile delay and travel time should be preferred. Downtown streets were evaluated to determine the streets that have spare existing capacity and could accommodate reducing the number of vehicle lanes and replacing them with protected bike lanes.

For each street in the downtown, two street configurations were compared:

- **Existing street configuration:** Does not include the changes made to 23rd Street and 4th Avenue as part of the Downtown Protected Bike Lane Demonstration Project.

[7] On-street parking added in transit terminal

[8] Parking removed on south side between Ontario Avenue & Idylwyld Drive

- **Active Transportation facility configuration:** Traffic lanes and parking adjusted to make room for an active transportation facility.

The traffic volumes used to conduct this analysis are consistent with Saskatoon at a population of 300,000 with Bus Rapid Transit (BRT) implemented. Specific assumptions include:

- Traffic Bridge is open.
- Parcel YY in River Landing is built out (increase in traffic due to development).
- Transit terminal on 23rd Street is no longer present. Through traffic movements along 23rd Street have been added.
- BRT reduces traffic lanes and prohibits turning movements. All analyses consider the changes in travel pattern in the downtown.
- No change in mode share from private motor vehicle toward transit, walking or cycling.
- Idylwyld Drive was not included in this assessment because the Imagine Idylwyld included extensive traffic capacity analysis.

4.7.1 Right-of-Way Width Constraints

Downtown streets have varying Right-of-Way (ROW) widths. As well, the pavement width between curbs are different depending on streetscaping and traffic controls. All downtown streets were determined to have adequate space with the exception of Spadina Crescent, which was ruled out for an active transportation facility because of limited available ROW due to the wide promenade on the east side with mature trees and elevation differences between the sidewalk and boulevard on the west side.

Table 24: People Driving: Available Right-of-Way and Pavement Width for N-S streets

	1st Avenue		2nd Avenue		3rd Avenue		4th Avenue		Spadina	
	Pavement (m)	ROW (m)	Pavement (m)	ROW (m)	Pavement (m)	ROW (m)	Pavement (m)	ROW (m)	Pavement (m)	ROW (m)
19th to 20th	ramp	ramp	22.9	30.2	22.9	30.2	20.7	30.2	13.7	40.0
20th to 21st	22.9	30.2	22.9	30.2	22.9	30.2	20.7	30.2	13.7	40.0
21st to 22nd	22.9	30.2	22.9	30.2	22.9	30.2	20.7	30.2	12.2	22.9
22nd to 23rd	22.9	30.2	22.9	30.2	22.9	30.2	20.7	30.2	12.2	22.9
23rd to 24th	22.9	30.2	22.9	30.2	22.9	30.2	20.4	30.2	12.2	19.1
24th to 25th	22.9	30.2	22.9	30.2	22.9	30.2	16.8	30.2	12.2	40.0

Table 25: People Driving: Available Right-of-Way and Pavement Width for E-W streets

	19th Street		20th Street		22nd Street		23rd Street		24th Street	
	Pavement (m)	ROW (m)	Pavement (m)	ROW (m)	Pavement (m)	ROW (m)	Pavement (m)	ROW (m)	Pavement (m)	ROW (m)
Idylwyld to 1st	19.0	31.6	24.1		22.9	30.2	22.9	30.2	13.4	20.1
1st to 2nd	19.0	30.2	23.9	30.2	22.9	30.2	22.9	30.2	22.9	30.2
2nd to 3rd	22.9	30.2	21.4	30.2	22.9	30.2	22.9	30.2	22.9	30.2
3rd to 4th	22.9	30.2	20.1	30.2	22.9	30.2	transit	30.2	16.8	30.2
4th to Spadina			20.1	30.2	22.9	30.2	16.8	30.2	12.2	30.2

4.7.2 Motor vehicle traffic flow assessment

Synchro and SimTraffic traffic analysis software programs were used to model the downtown street network. This program includes traffic information, roadway configuration information, and traffic signal design and timing information as inputs. Program outputs include traffic performance measures and parameters that can be used to set signal timing and change or optimize traffic signal performance. Synchro can be readily used to forecast traffic changes through a change in the street configuration to add an active transportation facility or reassign vehicle traffic lanes. It can readily predict changes in traffic performance and may suggest minor changes in signal timing to alleviate potential problems.

The Synchro model was adjusted to remove one vehicle lane or turn lanes and add turn lanes where necessary to accommodate protected bike lanes and manage conflicts. All downtown streets were determined to have spare capacity.

4.7.2.1 Intersection delay (Level of Service)

Delay is defined as "the additional travel time experienced by a driver" in the Highway Capacity Manual (HCM). This includes time spent decelerating, waiting at a signal, and accelerating. Intersection delay is the average control delay for all approaching vehicles based on the amount of volume within each lane approaching the signal. Typically, the Level of Service (LOS) within a central business district during the peak hours should be better than LOS E.

Table 26: Motor vehicle Level of Service (LOS) Thresholds at Signalized Intersections

LOS	Average Delay per vehicle (seconds)
A	≤ 10
B	> 10-20
C	> 20-35
D	> 35-55
E	> 55-80
F	> 80

4.7.2.2 Automobile travel time

Travel time through the signalized corridors of each street was evaluated using SimTraffic to account for accumulated delays and queues between intersections. 3rd Avenue was not reconfigured for the traffic analysis because the evaluation assumes that BRT has been implemented and traffic diversion has occurred through the rest of downtown.

Table 27: People Driving: Intersection LOS and travel time with the addition of active transportation facility for N-S streets

	1st Avenue		2nd Avenue		3rd Avenue[9]		4th Avenue[10]	
	Existing	AT	Existing	AT	Existing	AT	Existing	AT
19th	C	E	B	B	C	C	B	B
20th	B	E	A	A	B	C	B	C
21st	B	C	A	A	B	B	B	C
22nd	D	F	B	B	C	C	B	C
23rd	B	B	B	B	B	B	B	B
24th	B	B	B	D	B	B	B	B
Travel time (min)	3.70	7.00	1.90	3.40	3.14	4.67	2.20	4.50
Change (min)		+ 3.30		+ 1.50		+1.53		+ 2.30
Peak direction		Southbound		Northbound		Southbound		Southbound

Table 28: People Driving: Intersection LOS and travel time with the addition of cycling facility for E-W streets

	19th Street		20th Street		22nd Street		23rd Street		24th Street	
	Existing	AT	Existing	AT	Existing	AT	Existing	AT	Existing	AT
Ontario									B	B
Pacific					B	B	A	A	B	B
1st	C	C	B	D	D	D	B	B	B	B
2nd	B	B	A	B	B	B	B	B	B	B
3rd	C	C	B	D	B	C	B	B	B	B
4th	B	B	B	C	B	B	B	B	B	C
Travel time (min)	1.7	2.6	1.8	3.7	2.2	3.8	2.0	2.0	1.7	2.7
Change (min)		+ 0.9		+ 1.9		+ 1.6		negligible		+ 1.0
Peak direction		Eastbound		Westbound		Westbound		None		Eastbound

[9] Analyses take into account the changes in travel pattern in the Downtown with Bus Rapid Transit on 1st Avenue.
[10] Analyses take into account the changes in travel pattern in the Downtown with Bus Rapid Transit on 3rd Avenue.

5 PROPOSED NETWORK

5.1 OVERVIEW OF NETWORK DECISION MAKING

As illustrated in the assessment, downtown streets support a number of different land uses through a variety travel of modes, and it is important to consider the impacts to all users. The assessment did not weigh any category above another, rather, it was used to understand the trade-offs among all road users that could result from the inclusion of an active transportation cycling facility.

Table 29: Summary of Decision Making for North-South Streets

Factor	Summary
Cycling Network	All streets provide decent connectivity beyond the study area. 3rd Avenue provides the best connectivity beyond the study area and the greatest coverage of the downtown.
Impact to Motorists	All streets experienced impacts to LOS and corridor travel time. 1st Avenue had the highest negative impact.
Parking	There are reductions in parking supply for all streets.
Transit	There is insufficient right-of-way width to include an active transportation facility and a dedicated BRT runningway on the same street.

Table 30: Summary of Decision Making for East-West Streets

Factor	Summary
Cycling Network	All streets provide decent connectivity beyond the study area. 23rd Street provides the most coverage of downtown.
Impact to Motorists	All streets experienced impacts to LOS and corridor travel time. 20th Street and 22nd Street had the highest negative impacts.
Parking	There is no impact to parking supply along 19th Street and minimal impact to parking along 23rd Street.
Transit	22nd Street is not an ideal choice for an active transportation facility because BRT stations are planned for this street.

5.2 RECOMMENDED DOWNTOWN NETWORK

Through conducting the assessment it became clear that certain streets within downtown serve specific functions and possess unique constraints. By reviewing all of the factors and constraints, the Administration arrived at the proposed active transportation network configuration:

- North-South route[11]:
  - 3rd Avenue
- East-West routes:
  - 23rd Street; and
  - 19th Street.

[11] Idylwyld Drive will also have an active transportation facility. A raised cycle track and multi-use pathway were recommended through the Imagine Idylwyld project. While this proposed facility connects to the downtown network it is not a part of this study.

These streets were selected based on detailed understanding of trade-offs between the variety of users and functions that these downtown streets serve, striving to achieve a balance amongst all users. The network takes into consideration other downtown initiatives, integrating the impacts of those projects where applicable, and with the city-wide cycling network. Below is a discussion of each street selected for the downtown network.

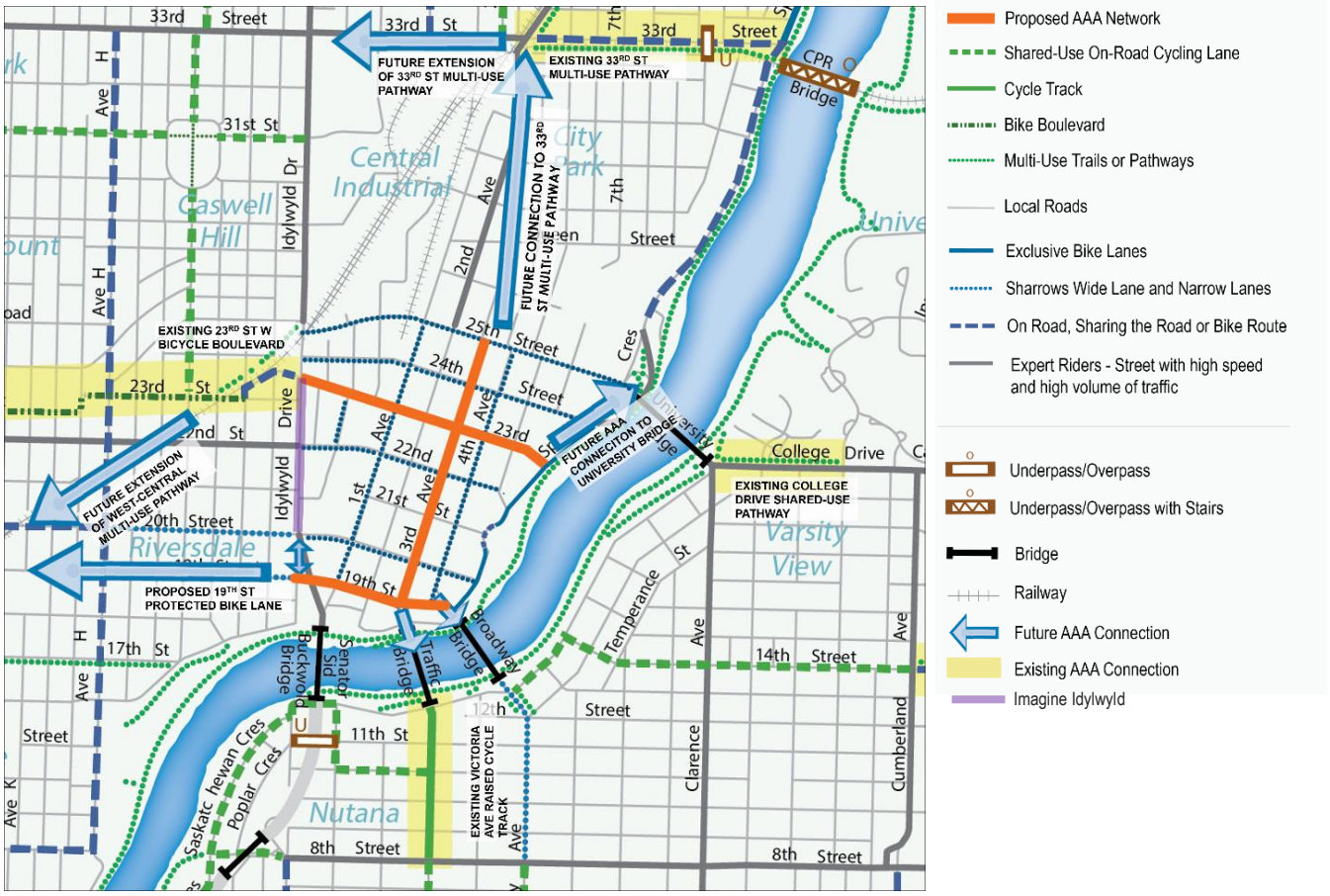

Image 4: Proposed Downtown Active Transportation Network Configuration

The network supports the City-Wide Cycling Network Principles discussed in Section 3:

- The proposed streets introduce a network of active transportation cycling facilities in the downtown, providing an interconnected system of facilities that is comfortable and attractive for all users.
- The streets chosen achieve the desired coverage of 400m, and provide connections to and from downtown with all areas of the city.
- The proposed streets provide good connections beyond the downtown to all areas of the city.
- The proposed streets provide access to a major downtown attractions, key employment areas, and recreational areas.

5.2.1 3rd Avenue

A unidirectional protected bike lane is recommended along 3rd Avenue, between 19th Street and 25th Street.

The assessment conducted early in 2018 concluded that 3rd Avenue was the preferable north-south route for an active transportation facility through the downtown. However, it was determined that the presence of centre-

running BRT did not leave enough right-of way for an active transportation facility to be located along this street in conjunction with BRT.

Following the June 20, 2018 Special Meeting of Governance and Priorities Committee (GPC), the Administration was directed to further review 3rd Avenue as a potential option for the active transportation network in the event that BRT be relocated to 1st Avenue. The additional analysis confirmed that 3rd Avenue is both the technical preference and the community preference for north-south route.

A summary of the key factors considered for 3rd Avenue is provided:

Table 31: Key Factors Considered for 3rd Avenue

Key Factor	Impact on Proposed Active Transportation Streets
Bicycle Network	• Is the most central north-south street in the Downtown • Connects to the Traffic Bridge, which connects to the raised cycle track on Victoria Avenue.
Motor Vehicles	• Adding an active transportation facility to 3rd Avenue increases travel time (+1:32). • The intersection of 20th Street changes from LOS B to LOS C. There is no change in LOS at any other intersections along the corridor.
Parking	• Adding an active transportation cycling facility reduces parking by 54 spaces (156 to 102).
Transit	• If the active transportation route is located on 3rd Avenue, it is assumed that BRT is located on 1st Avenue. • Presently, there are 12 transit stops.

Notable benefits for an active transportation facility on 3rd Avenue include:

- Left turn bays are already developed on 3rd Avenue, which helps clarify motor vehicle movements and lane designations;
- Concrete centre median and existing landscaping in the median are retained;
- 3rd Avenue has a consistent right-of-way width, which provides for a single configuration, design and consistent operations through the length of the facility; and,
- 3rd Avenue has a significant amount of street-level activity due to more storefronts, which can be more attractive for pedestrians and cyclists.

5.2.2 23rd Street

A unidirectional protected bike lane is recommended along 23rd Street, between Idylwyld Drive and Spadina Crescent. A summary of the key factors considered for 23rd Street is provided:

Table 32: Key Factors Considered for 23rd Street

Key Factor	Impact on Proposed Active Transportation Streets
Bicycle Network	• Provides good coverage of Downtown, and connects with the existing Blairmore Bikeway west of Idylwyld Drive.
Motor Vehicles	• Has negligible impact to travel time and no change to LOS.
Parking	• Adding an Active Transportation facility reduces parking by 13 spaces (from 103 to 90).
Transit	• Not identified as a future BRT route. • Presently, there are 9 transit stops and the bus terminal. • It is important to note that the existing downtown transit terminal is removed with the implementation of BRT, opening 23rd Street to bicycle and motor vehicle traffic.

5.2.3 19th Street

A bidirectional cycling facility is recommended along 19th Street, between Avenue A and 4th Avenue. A summary of the key factors considered for 19th Street is provided:

Table 33: Key Factors Considered for 19th Street

Key Factor	Impact on Proposed Active Transportation Streets
Bicycle Network	• Connects directly with Traffic Bridge and Broadway Bridge, and is adjacent to the access to the Sid Buckwold Bridge. • Connects to the proposed unidirectional protected bike lanes on 19th Street, from Ave A to Ave H.
Motor Vehicles	• Has an impact to travel time of +0:52, with no change to existing LOS.
Parking	• Adding an Active Transportation cycling facility on 19th Street results in no loss of parking.
Transit	• 19th Street is identified as an option for a future BRT route. Depending on final route selection for BRT, one transit station may be proposed for 19th Street. • Presently, there are 5 transit stops.

5.3 Network Connections

A key part of building a successful network is to ensure high-quality connections between facility types and across key intersections. Improvements to connections outside of the study area were identified through the study process. Below is a discussion of the network connections beyond the study area.

5.3.1 West of Idylwyld Drive @ 23rd Street

At the intersection of 23rd Street and Idylwyld Drive, the protected bike lane on 23rd Street transitions to the Blairmore Bikeway, the West-Central Multi-use Corridor, and the future Imagine Idylwyld.

The Blairmore Bikeway is a bicycle boulevard, which is an all ages and abilities cycling facility. Improvements are planned for the Blairmore Bikeway, and include making some of the temporary traffic calming installations permanent and installing bicycle and pedestrian actuated corridors where 23rd Street crosses Avenue H and Avenue P. The Blairmore Bikeway connects to a multi-use pathway at Circle Drive, and continues west to Betts Avenue.

The West-Central Multi-Use Corridor is a planned three kilometre multi-use pathway adjacent to the CP right-of-way extending from Idylwyld Drive to Avenue W South. A functional plan has been completed for the corridor and construction is anticipated to begin in 2019.

Imagine Idylwyld is a redesign of Idylwyld Drive, between 25th Street East and 20th Street. The redesign recommends the installation of a cycling facility along the length of this stretch of Idylwyld Drive. Imagine Idylwyld recommends a multi-use pathway on the west side of Idylwyld Drive from 23rd Street to 25th Street and a raised cycle track between 20th Street and 23rd Street. Timing for the implementation of Imagine Idylwyld has not been determined.

5.3.2 Spadina Crescent @ 23rd Street

At the intersection of 23rd Street and Spadina Crescent, the protected bike lane transitions to an on-street painted bike lane along Spadina Crescent. At 24th Street and 25th Street, cyclists can transition to the Meewasin trails along the river valley to head north or south, or to the University Bridge pathways to continue east. An all

ages and abilities connection may be desirable in the future to complete the connection from 23rd Street to University Bridge.

5.3.3 Ave A @ 19th Street

At the intersection of 19th Street and Avenue A, the bidirectional bike lane will transition to a unidirectional protected bike lane until Avenue H. Conceptual plans are completed for the design of the 19th Street between Avenue A and Avenue H, and a report will be brought forward to City Council recommending the installation following the endorsement of the downtown network.

At the intersection of 19th Street and Avenue A, a northern connection is identified between Avenue A and 20th Street, connecting cyclists to the raised cycle track recommended through Imagine Idylwyld. An all ages and abilities cycling design for this leg of Ave A has not been completed.

5.3.4 Intersection of 19th Street & 3rd Avenue

Intersection upgrades are planned for 19th Street and 3rd Avenue. Detailed design for improvements to the southwest corner of the intersection have already begun. Additional design work at this location cannot proceed until the detailed design and routing have been confirmed for BRT. Once the alignment and design for BRT is completed the detailed intersection design can continue.

5.3.5 South of 19th Street @ 3rd Avenue

A short connection is needed between 19th Street and Spadina Crescent to connect the protected bike lanes on 3rd Avenue to the Meewasin trails and the 3.0m multi-use pathways on both sides of the Traffic Bridge. Preliminary design work has begun and will continue upon the confirmation of a cycling facility on 3rd Avenue. On the south side of the Traffic Bridge, the pathways transition to a raised cycle track which continues south to 8th Street. A future all ages and abilities connection along Victoria Avenue south of 8th Street has been identified as a priority for implementation within the next five years.

5.3.6 Intersection of 19th Street & 4th Avenue

The intersection at the bottom of the Broadway Bridge, where Broadway Avenue, 19th Street and 4th Avenue intersect, has been identified for improvements. Preliminary designs have been drawn up but progress cannot be made on these designs until the routing and design for BRT has been confirmed.

5.3.7 North of 25th Street @ 3rd Avenue

Extending the cycling connection along 3rd Avenue through City Park has been identified as a priority for implementation within the next five years. High-level exploration around the appropriate cycling facility type for this connection has occurred, but design has not begun. Achieving a connection through City Park to the 33rd Street multi-use pathway is important part of connecting the downtown network to the north part of Saskatoon.

6 Design Elements

6.1 Potential Active Transportation Street Configurations

Three types of active transportation facilities are typically used in urban, retrofit settings, such as downtown Saskatoon. Each facility type is context specific, and must be considered in the context of the street. This includes understanding the types of land uses present, number of driveways, presence of parking, and volume of traffic. As such, there is no "one-size-fits-all" approach. Table 34 describes the cycling facilities considered for the downtown network.

Table 34: Active Transportation Facility Types

Facility Type	Description
Unidirectional (one-way) protected bike lane	These bike lanes are located at street level and use a variety of methods for physical protection from passing traffic. Cyclists ride in the same direction as traffic on either side of the roadway.
Unidirectional (one-way) raised cycle track	These bike lanes are located at sidewalk level, and are often paired with a furnishing zone between the cycle track and motor vehicle travel lane and/or sidewalk area. Cyclists ride in the same direction as traffic on either side of the roadway.
Bidirectional (two-way) protected bike lane	These bike lanes are located at street level and are buffered from traffic using a variety of methods. Cyclists ride in both directions on one side of the street.

In considering the streets selected for the downtown network (19th Street, 23rd Street, and 3rd Avenue), two facility types were selected:

- One-way protected bike lane along 23rd Street and 3rd Avenue; and,
- Bidirectional protected bike lane along 19th Street.

One-way protected bike lanes were selected for 23rd Street and 3rd Avenue for the following reasons:

- There are destinations on both sides of the street;
- Parking is present on both sides of the street;
- Sidewalks are narrower than recommended in certain locations which means an on-street facility is preferable to separate pedestrian and cyclist traffic; and,
- Provides a predictable design as cyclists travel in the same direction as motorists.

A bidirectional protected bike lane was chosen for 19th Street for the following reasons:

- More cycling connections are on the south side, reducing the need to cross the street;
- Extra pavement width is available by standardizing traffic lane widths;
- Space is available on the south side under the Idylwyld Drive and 1st Avenue overpasses to connect with the Farmer's Market;
- There are few conflicts on the south side, such as driveways or lanes;
- There is no impact on current parking supply; and,
- The intersection of 19th Street and 3rd Avenue is scheduled for signal and intersection reconstruction.

A raised cycle track was not selected due to space and roadway reconstruction constraints.

6.2 Design Criteria

Further to the street context, each facility type has different minimum allowable design dimensions. The minimum design criteria used for active transportation facility design were based on guidelines[12] provided by the Transportation Association of Canada (TAC), Federal Highway Administration (FHWA), National Association of City Transportation Officials (NACTO), and American Association of State Highway and Transportation Officials (AASHTO). Where existing pavement width was too constrained to meet these design criteria, very modest reductions were made to the protected bike lane widths and/or the buffer along the parking lane.

6.2.1 Bike Lane Design Criteria

Minimum recommended widths used were:

- One-way protected bike lane width: 2.1 m
- Two-way protected bike lane width: 3.4 m
- One-way raised cycle track width: 2.6m
- Buffer from traffic lane: 0.5 m
- Buffer from parking lane: 1.0 m
- Buffer from sidewalk (raised cycle track): 0.5 m

6.2.2 Sidewalk Design Criteria

Sidewalk widths were to be maintained at existing dimensions or possibly widened to try to achieve the dimensions outlined in the City of Saskatoon's Complete Streets Design and Policy Guide (2017) as follows:

- Furnishing zone: 0.5 m minimum, 1.75 m recommended
- Sidewalk: 1.8 m minimum, 2.5 m recommended
- Frontage zone: 1.0 m minimum

6.2.3 Traffic Lane Design Criteria

The number of lanes could vary depending on available pavement width.

- Traffic lanes: 3.0 m to 3.6 m depending on presence of transit routes
- Right turn lanes: 2.5 m minimum
- Two-Way Left-Turning Lane: 3.6 m but could vary
- Left Turn bays: 3.0 m to 3.6 m
- Parking lanes: 2.2 m (plus 0.25 m gutter width if adjacent to a curb)

[12] Design criteria for the protected bike lanes are based on five main sources:

- TAC Geometric Design Guide for Canadian Roads (2017)
- FHWA Separated Bike Lane Planning and Design Guide (2015)
- NACTO Urban Bikeway Design Guide (2014)
- AASHTO Guide for Development of Bicycle Facilities (2012)

6.3 Conceptual Designs

6.3.1 3rd Avenue

The configuration of 3rd Avenue would change from what exists today:

- Motor vehicle travel lanes will be reduced to one in each direction;
- Left turn bays and will remain at intersections;
- Parking on both sides of the street will remain with a reduction of 54 spaces; and

The protected bike lanes will be directly adjacent to the sidewalk and separated from the motor vehicle travel lanes by a buffer and parked vehicles.

Image 5: Rendering of 3rd Avenue, between 22nd Street and 23rd Street, looking north

6.3.3 23rd Street

The configuration of 23rd Street will operate largely as it does today:

- Parking will remain on both sides of the street with a reduction of 13 spaces; and
- Two motor vehicle travel lanes are provided in each direction between Idylwyld Drive and 4th Avenue, where it reduces to one travel lane in each direction from 4th Avenue to Spadina Crescent.

The protected bike lanes will be directly adjacent to the sidewalk and separated from the motor vehicle travel lanes by a buffer and parked vehicles. It is important to note that the existing Downtown Transit Terminal is removed with the implementation of BRT, opening 23rd Street to bicycle and motor vehicle traffic.

Image 6: Rendering of 23rd Street, between 1st Avenue and 2nd Avenue, looking east

6.3.5 19th Street

The existing configuration of 19th Street remains largely the same as it is today:

- Parking will remain on the north side of the street with no impact to supply;
- Two motor vehicle travel lanes are provided in each direction; and
- Left turn bays are provided at intersections.

The bidirectional protected bike lane will be added directly adjacent to the south sidewalk and separated from the motor vehicle travel lanes by a buffer. Intersections along 19th Street will also be equipped with bicycle traffic signals to separate cyclists travelling through the intersection from turning motorists.

Image 7: Rendering or 19th Street, between 1st Avenue Ramp and 2nd Avenue, looking east

6.4 Design Elements

A number of other design elements are utilized along with bike lane itself. Below is a discussion of these elements.

6.4.1 Accessible Parking Design Treatment

Designing for accessibility is an essential part of ensuring that the needs of all users can be accommodated on downtown streets with bike lanes. Currently, loading zones double as accessible parking spaces under Traffic Bylaw 7200. Accessible parking design treatments will be applied to all existing loading zones along 23rd Street and 3rd Avenue, as well as introducing a few additional spaces where it was determined more may be needed. The breakdown of current inventory and proposed inventory can be found in Table 35 and Table 36. The spaces will remain operational just as they are today, allowing vehicles with a placard to park in a 15 minute loading zone for up to three hours in the downtown. There are three types of accessible parking space treatments that will be utilized:

End-Block Parking

- Access to sidewalk via the existing pedestrian ramp or a new pedestrian ramp
- Widened painted buffer to accommodate side-loading vehicles and slow cyclists
- Signs and pavement markings to advise cyclists to yield to pedestrians
- No posts or other obstructions are placed in the accessible parking space buffer

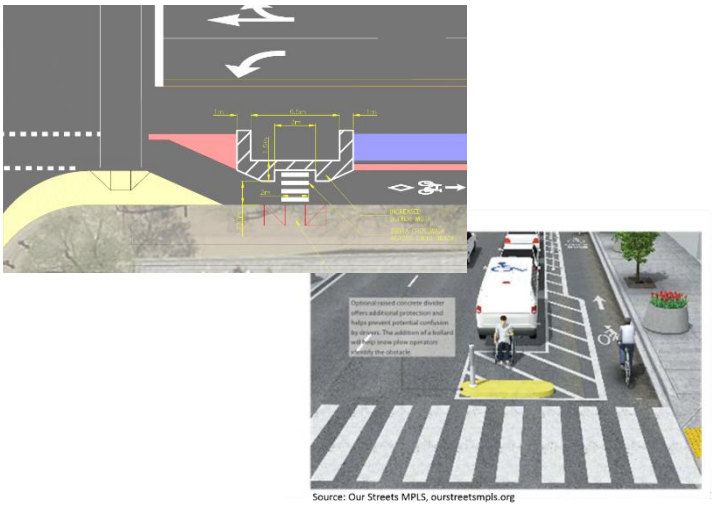

Image 8: Illustration of End-Block Parking/Loading Zone

Mid-Block Parking

- An access aisle at street level connects to a pedestrian access route and mid-block curb ramp
- Additional space is provided at the front and rear of the parking space to facilitate ease of access
- A crosswalk and pedestrian ramp connect the access aisle to the sidewalk
- Signs and pavement markings to advise cyclists to yield to pedestrians
- No posts or other obstructions are placed in the accessible parking space buffer

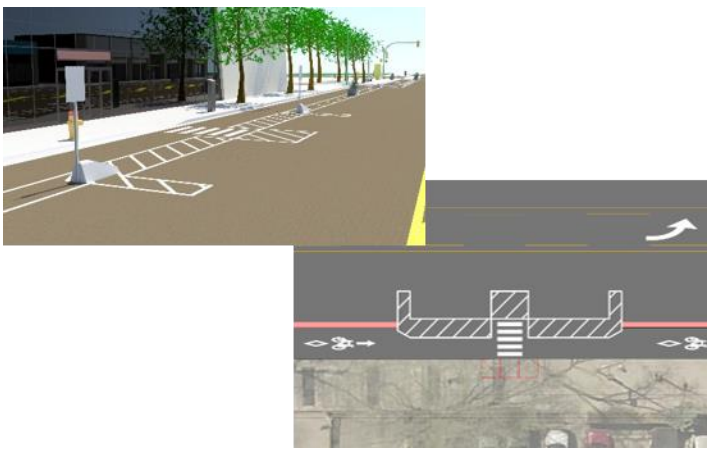

Image 9: Illustration of Mid-Block Parking/Loading Zone

Adjacent Block Parking

- Designate the parking space on the side street nearest to the intersection as a loading/accessible parking space
- Designating this space would not require a person using this space to cross the protected bike lane, as the street with the designated accessible parking space would not have an active transportation facility on it

Image 10: Illustration of Adjacent Block Parking/Loading Zone
Source: New Urban Streets, newurbanstreets.com

Below is the existing and proposed loading zone/accessible parking inventory along 3rd Avenue and 23rd Street. Image 11 shows a map of the locations of the proposed accessible parking/loading zones.

Table 35: Inventory of 3rd Avenue Parking/Loading Zones

3rd Avenue Inventory			
	Total Existing	Additional Proposed	Total Proposed
Adjacent Block Loading Zone	5	1	6
Mid-Block Loading Zone	17	0	17
End-Block Loading Zone	1	1	2
Accessible Parking Space	0	0	0

Table 36: Inventory of 23rd Street Parking/Loading Zones

23rd Street Inventory			
	Total Existing	Additional Proposed	Total Proposed
Adjacent Block Loading Zone	2	4	6
Mid-Block Loading Zone	5	2	7
End-Block Loading Zone	0	0	0
Accessible Parking Space	1	0	1

Image 11: Map Illustrating Existing and Proposed Parking/Loading Zones

6.4.2 Transit Stop Design Treatment

To accommodate transit riders at bus stops, a transit stop design treatment will be used where a transit stop and bike lane intersect. 3rd Avenue and 23rd Street are not proposed to have Bus Rapid Transit but may have secondary transit routes. When these routes are confirmed, the following design will be implemented at the stop locations. It is not recommended to make the investment in the stop design until the secondary routes are confirmed.

Transit Stop Design Treatment

- Separates cyclists and buses to improve cyclist comfort and bus operating speeds
- A raised platform enables easier, more accessible passenger boarding and alighting
- Signs and pavement markings to advise cyclists to yield to pedestrians
- Raised crossing to slow cyclists who must yield to pedestrians

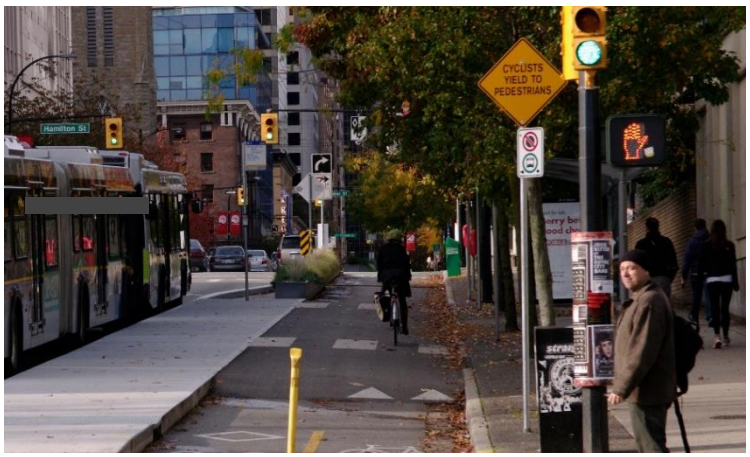

Image 12: Example of Raised Transit Stop Design
Source: Paul Krueger, flickr.com

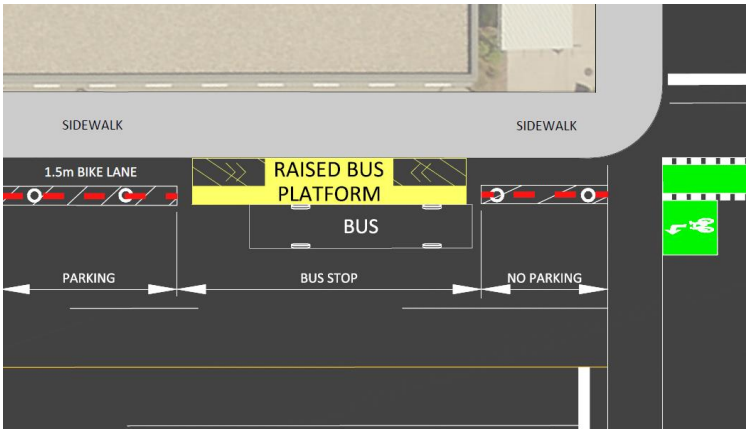

Image 13: Illustration of Raised Transit Stop Design

There may be a BRT station location along 19th Street should the final approved routing be along Broadway Avenue to 1st Avenue. Should this be the case, a design treatment would be looked at for integrating a station design with the bike lane treatment at that location.

6.4.3 Intersection Treatments

Intersection design is important as this is where the majority of conflict points between all road users occur. To ensure that all users can proceed safely through an intersection and understand who has the right-of-way, a number of design treatments are utilized.

Crossrides provide a dedicated space at an intersection for cyclists to legally ride their bicycle through an intersection without dismounting. They are comprised of solid green paint and white elephant's feet line markings and will be applied to all intersections and driveways along all streets with bike lanes.

Image 14: Crossride

Bike Boxes improve a cyclist's ability to safely and comfortably make left turns by reducing turning conflicts between cyclists and motor vehicles at signalized intersections. Bike boxes will be used at every signalized intersection.

Image 15: Bike Box
Source: Google, Image Capture July 2015

Bend-in shifts the bike lane closer to motorized traffic so motorists and cyclists can see each other better. The bend-in design will be used along 3rd Avenue and 23rd Street to improve visibility at intersections. Because there is no parking adjacent to the 19th Street bike lane, a bend-in is not required.

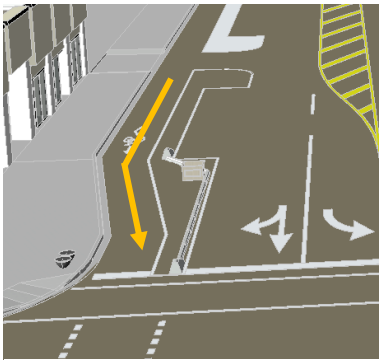

Image 16: Bend In

Raised Curb Extensions reduce the crossing distance for pedestrians and make them more visible at intersections. Raised curb extensions are proposed along 3rd Avenue and 23rd Street in all locations where they currently do not exist.

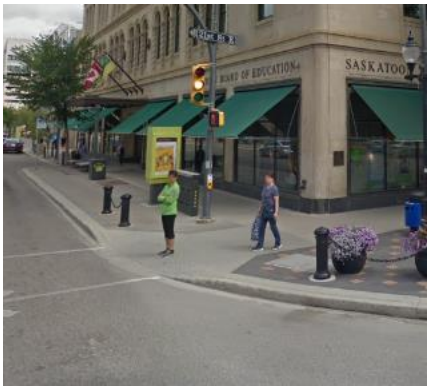

Image 17: Curb Extension
Source: Google, Image Capture July 2018

Planters will be used at intersections to help delineate the bike lane as well improve the overall aesthetics of the street.

Image 18: Planters
Source: Sybertech, swrl.com

Clear Zones approaching the intersection will be delineated with parking curb and planters. These zones are important to ensure visibility between cyclists and motorists at intersections.

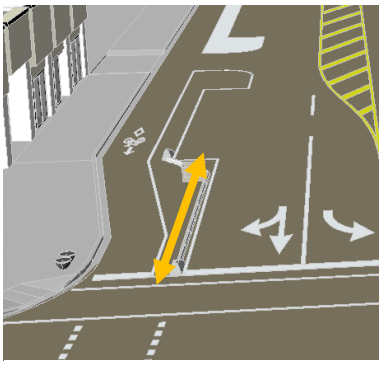

Image 19: Clear Zone

Low Profile Transition Barriers will be used to delineate the start and end of the bike lane at either end of the intersection. These barriers add further protection for cyclists, guidance for drivers making right turns, and provide a place to install signs adjacent to the motor vehicle travel lane.

Image 20: Low Profile Transition Barrier

Pinned Curb will be used at intersections to delineate the clear zone and to assist with parking guidance.

Image 21: Pinned Curb

Right-turn yield to cyclists sign reminds drivers that cyclists have the right-of-way through the intersection and right-turning vehicles must yield.

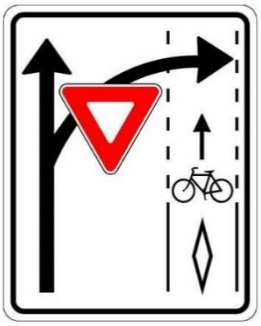

Image 22: Motorists Yield to Cyclists Sign

Bicycle signals in coordination with turn arrows for motorists manage conflicts between cyclists and turning motorists. Bicycle presence is conveyed to the signal by passive bicycle detectors. Signs and traffic signals are oriented toward cyclists traveling in the contra-flow direction.

Bicycle signals are only proposed for 19th Street at this time, as cyclists will be traveling in the opposite direction of traffic.

Image 23: Example of Bicycle Signal
Source: SDOT, sdotblog.seattle.gov

6.4.4 Protected Intersection

A protected intersection extends the physical barrier of the protected bike lane into the intersection to provide a setback bicycle crossing. A protected intersection is recommended at the intersection of 3rd Avenue and 23rd Street. Many of the same features described above are utilized for the protected intersection, with the addition of a few key features noted below.

1. **Corner Islands** slow motorists turning right around the corner where they yield to cyclists heading through the intersection. These corner islands may be formed concrete, pinned curb, or planters.

2. **Forward Stop Bars** offer a protected place for cyclists to wait when crossing or turning.

3. **Pedestrian Islands** reduce the crossing distance for pedestrians.

Image 24: Protected Intersection

6.4.5 Driveway Treatments

Clear Zones on either side of driveways will be delineated using white hatched paint. Parking and No Parking signs will also be installed to further clarify where parking is not permitted.


Image 25: Pavement Markings at Driveways
Source: Google, Image Capture May 2017

Low Profile Transition Barriers will be used to delineate the start and end of the bike lane at either end of the driveway and provide a place to install Parking and No-Parking signs adjacent to the parking area.


Image 26: Low Profile Transition Barrier at Driveway

6.4.6 Buffer Area

Buffer areas separate cyclists from parked vehicles and moving traffic. They also provide a landing area and door-swing area for passengers exiting vehicles. The buffer area for 23rd Street and 3rd Avenue will be comprised of white paint with hatching as well as two planters per block face. For 19th Street, as there is no parking adjacent to it, pinned curb, paint, and planters are proposed for the buffer area.

Image 27: Proposed Buffer Area Treatment for 19th Street

Image 28: Proposed Buffer Area Treatment for 23rd Street and 3rd Avenue

7 IMPLEMENTATION STRATEGY & PRELIMINARY COST ESTIMATES

7.1 IMPLEMENTATION STRATEGY

A strategy for implementation and a cost estimate breakdown of the downtown network has been prepared. The strategy utilizes a phased approach to implementing the network. The table below provides a summary of the implementation strategy and cost estimates. Detailed discussion is contained in the following sections.

Table 37: Implementation Strategy & Cost Estimates

Year	Implementation Details	Cost Estimate*
2019	Continue to develop conceptual design	-
2020	Complete detailed design for all corridors.	$0.354M
2021	Implement 3rd Avenue with the exclusion of curb extensions at the following intersections: • 19th Street and 3rd Avenue, • 22nd Street and 3rd Avenue, and • 23rd Street and 3rd Avenue. These intersections would be completed once the detailed design for BRT has been determined. Planters would be used in the interim to delineate the future curb extension area.	$0.7M
2022	19th Street Implementation 19th Street & 3rd Avenue intersection completed	$0.6M
2023	23rd Street Implementation 22nd Street and 3rd Avenue intersection completed 23rd Street and 3rd Avenue intersection completed	$2.4M
Total Estimated Cost		$4.105M
Estimated Annual Operating Costs (once all three streets are completed)		$0.4M

*all cost estimates contain a 25% estimate buffer.

7.1.1 Phase 1 | 2020 - Detailed Design

Significant work has been completed on the conceptual designs for the downtown network; the next step is to complete detailed designs for 19th Street, 23rd Street, and 3rd Avenue. The detailed design for all three streets would be completed at the same time in order to ensure continuity of design features, smooth transitions where the facilities connect, and achieve cost savings under a single contract. It is anticipated the detailed design would take approximately one year to complete, given procurement timelines and project scope. The estimate for this work is approximately $350,000.

7.1.2 Phase 2 | 2021 – Implementation of 3rd Avenue

Upon completion of the detailed design, 3rd Avenue would be implemented with the exception of three intersections:

- 19th Street and 3rd Avenue;
- 22nd Street and 3rd Avenue; and
- 23rd Street and 3rd Avenue.

These intersections would be completed once the detailed design for BRT has been confirmed and the Parcel YY development complete. Planters would be used in the interim to delineate future curb extension areas. It is anticipated that Phase 2 could be completed in one summer of construction.

A detailed breakdown of cost estimate for the implementation of 3rd Avenue is as follows:

Table 38: Phase 3 Cost Estimates

Item	Cost Estimate
Curb Extensions & Pedestrian Ramps	272,800
Accessible Parking	90,300
Pinned Linear Curb	39,000
Low Profile Transition Barriers	30,800
Paint	17,100
Signs	26,000
Planters	43,200
Subtotal	**519,200**
Contingency (25%)	**129,800**
Total Estimated Cost	**$ 649,000**

Annual operating costs for 3rd Avenue post-installation are estimated at $150,000.

7.1.3 Phase 3 | 2022 – Implementation of 19th Street, including 3rd Avenue and 19th Street Intersection

The next phase of implementation would involve the installation of 19th Street. It is assumed by 2022 that detailed design for BRT will be complete, and that Parcel YY construction will have concluded. Given these assumptions, the construction of 19th Street, along with the intersection of 19th Street and 3rd Avenue can take place. The cost estimate for the intersection of 19th Street and 3rd Avenue has not been included in the project costs as there are too many unknowns about the design at this time. It is also anticipated that the costs for improvements to this intersection will not be borne solely by the downtown active transportation network as there are improvements needed to this intersection beyond the scope of the cycling facility. It is anticipated that construction could be completed in one summer.

A detailed breakdown of cost estimate for the implementation of 19th Street is as follows:

Table 39: Phase 2 Cost Estimates

Item	Cost Estimate
Curb Extensions & Pedestrian Ramps	14,000
Pinned Linear Curb	11,830
Low Profile Transition Barriers	3,200
Paint	5,700
Signs	7,000
Planters	7,200
Raised Cycle Track	72,720
Signals	120,000
Embankment	250,000
Subtotal	**491,650**
Contingency (25%)	**122,913**
Total Estimated Cost	**$ 614,563**

Annual operating costs for 19th Street post-installation are estimated at $45,000.

7.1.4 Phase 4 | 2023 – Implementation of 23rd Street, Intersection of 22nd Street and 3rd Avenue, and Intersection of 23rd Street and 3rd Avenue.

The final phase of implementation would be the permanent installation of 23rd Street, including the remaining intersections of 22nd Street and 3rd Avenue, and 23rd Street and 3rd Avenue. The implementation of Phase 4 assumes that BRT is operational on 1st Avenue, resulting in the removal of the transit terminal and the extension of the bike lanes and on-street parking on this restored section of 23rd Street. A significant number of curb extensions are proposed for 23rd Street, and it may need to be phased over two construction seasons.

A detailed breakdown of cost estimate for the permanent installation of 23rd Street is as follows:

Table 40: Phase 4 Cost Estimates

Item	Cost Estimate
Curb Extensions & Pedestrian Ramps	1,425,500
Accessible Parking	30,100
Pinned Linear Curb	24,500
Linear Curb	58,500
Low Profile Transition Barriers	40,000
Paint	25,650
Signs	28,000
Planters	64,800
22nd St & 23rd St Intersection	135,400
23rd Street & 3rd Avenue Intersection	107,200
Subtotal	**1,939,650**
Contingency (25%)	**484,913**
Total Estimated Cost	**$ 2,424,563**

Annual operating costs for 23rd Street post-installation are estimated at $171,000.