

FINAL REPORT

HIGH LEVEL BRIDGE PEDESTRIAN AND CYCLING SAFETY REVIEW

AUGUST 2016



PREPARED FOR
CITY OF EDMONTON

URBAN
systems

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1.0 Introduction

The City of Edmonton is Alberta's vibrant Capital City, and is one of Canada's largest municipalities, with over 800,000 residents. The City recognizes the need to balance the needs of all road users – including people walking, cycling, driving, and using transit. In 2011, the Canadian National Household Survey found that, while private vehicles accounted for the majority of commute trips made by Edmonton residents, walking, cycling and transit accounted for more than one out of five commute trips to work. To manage the impacts of growth on the City's transportation system and to provide mobility choices for all Edmontonians, the City is committed to encouraging and promoting walking, cycling and transit as attractive, safe, convenient, and viable forms of transportation.

The High Level Bridge is an important and well-used pedestrian and cycling connection in the City of Edmonton. The High Level Bridge was originally opened in 1913 as a steel truss multi-function bridge with a total of 28 spans, set on a combination of concrete piers and steel legs. The High Level Bridge is approximately 780 metres long and accommodates two lanes of southbound motor vehicle traffic as well as separated pathways shared by cyclists and pedestrians both the east and west sides of the bridge. The bridge also includes an elevated deck that is used by the High Level Bridge Streetcar.

The High Level Bridge provides an important north-south connection over the North Saskatchewan River (see **Figure 1**). The bridge is an important connection within Edmonton's active transportation network for a number of reasons, including the minimal elevation change required to cross the river valley at this location and the connections to destinations including downtown Edmonton and the University of Alberta. In fact, it is one of the busiest routes for people walking and cycling within the city, with an average of approximately 3,500 pedestrians and cyclists using the bridge per day during peak summer months between May and August.

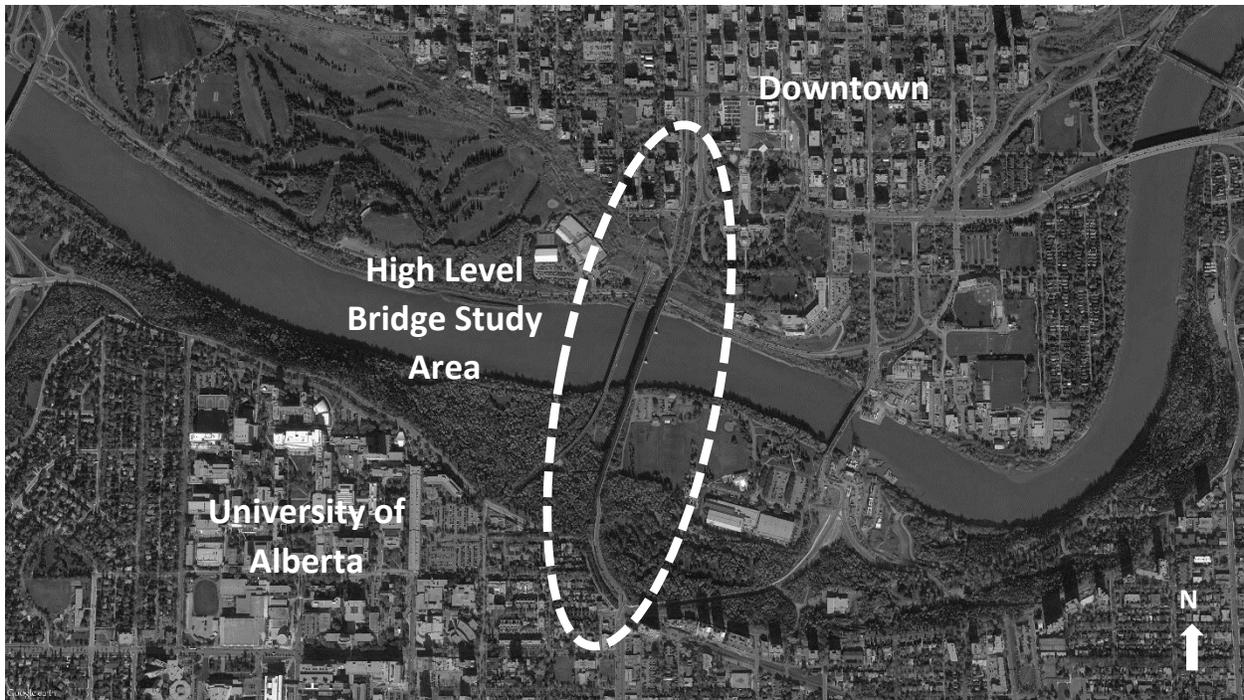


Figure 1: High Level Bridge Study Area Context Map

Suicide is a leading cause of death in the City of Edmonton and is a significant public health issue facing the City. In 2014, 124 people committed suicide in Edmonton.¹ The City has committed to taking steps to prevent suicides throughout the city and is currently developing a Suicide Prevention Strategy. One of the City's key actions to reduce the number of suicides was to install a deterrent barrier on the High Level Bridge, which is one of the most common locations for suicides and suicide attempts in the City. The Edmonton Police Service (EPS) has responded to over 40 suicide-related calls from the bridge in the past two years.²

In late 2014, after making a request to City staff, Edmonton City Council were presented with three protective fence concepts that would result in higher fencing on both the east and west sides of the bridge to prevent suicides. The City approved a concept to install protective fencing on the inside of the existing fences on both sides of the bridge. The installation of the new fences began in September 2015 and was completed in July, 2016. Construction started on the west side of the bridge and work switched between the two sides of the bridge throughout the construction period. During installation, each of the respective pathways were closed for construction, leaving only one pathway open for people walking and cycling over the bridge. As noted, installation of the protective fences was completed in July 2016 and the pathways on both sides of the bridge are now fully operational.

¹ City of Edmonton. "High Level Bridge barriers significant step to reduce suicides in Edmonton": <https://transformingedmonton.ca/high-level-bridge-barriers-significant-step-to-reduce-suicides-in-edmonton/>

² Edmonton Journal, July 20, 2016. "Misinformation feeds rumour mill on Edmonton's High Level Bridge": <http://edmontonjournal.com/news/local-news/misinformation-feeds-rumour-mill-on-edmontons-high-level-bridge>

The protective fence design option that was selected by City Council on August 18, 2014 resulted in the new protective fences being installed on the inside of the existing bridge parapet. Prior to installation, the width of the pathways were approximately 2.6 metres on the east side of the bridge and approximately 3.1 metres on the west side (measured from the face of the parapet to the face of the steel truss). The installation of the new protective fences has had an impact on the width of the pathways, reducing the pathways widths by approximately 0.3 metres on both sides of the bridge to approximately 2.3 metres on the east side pathway (as shown in **Figure 2**) and 2.8 metres on the west side pathway. As a result, concerns have been raised by some pathway users that the narrowing of the pathways has resulted in increased safety concerns for people walking and cycling on the High Level Bridge.



Figure 2: East Side Pathway

The purpose of this study is to conduct an in-service stage Road Safety Audit (RSA) of the pedestrian and bicycle pathways on the High Level Bridge following the installation of the protective fences on the east and west sides of the bridge. The scope of this RSA focuses on the existing bicycle and pedestrian pathways along both the east and west sides of the High Level Bridge.

It should be noted that this study does not include an assessment or discussion of the alternative protective fence options that had been presented to the City, and only includes an assessment of the safety issues associated with and resulting from the design that was selected and implemented by the City of Edmonton.

For the purpose of this report, the High Level Bridge runs in the north-south direction. All other elements of the design are referred to relative to the orientation. This report includes an assessment of safety issues along with suggested mitigation measures over the short-term as well as potential longer term solutions.

2.0 Existing Conditions

2.1 Cross-Section

Following the installation of the protective fences, the typical pathway widths are 2.3 metres on the east side pathway, and 2.8 metres on the west side pathway, as shown in **Figure 3**.

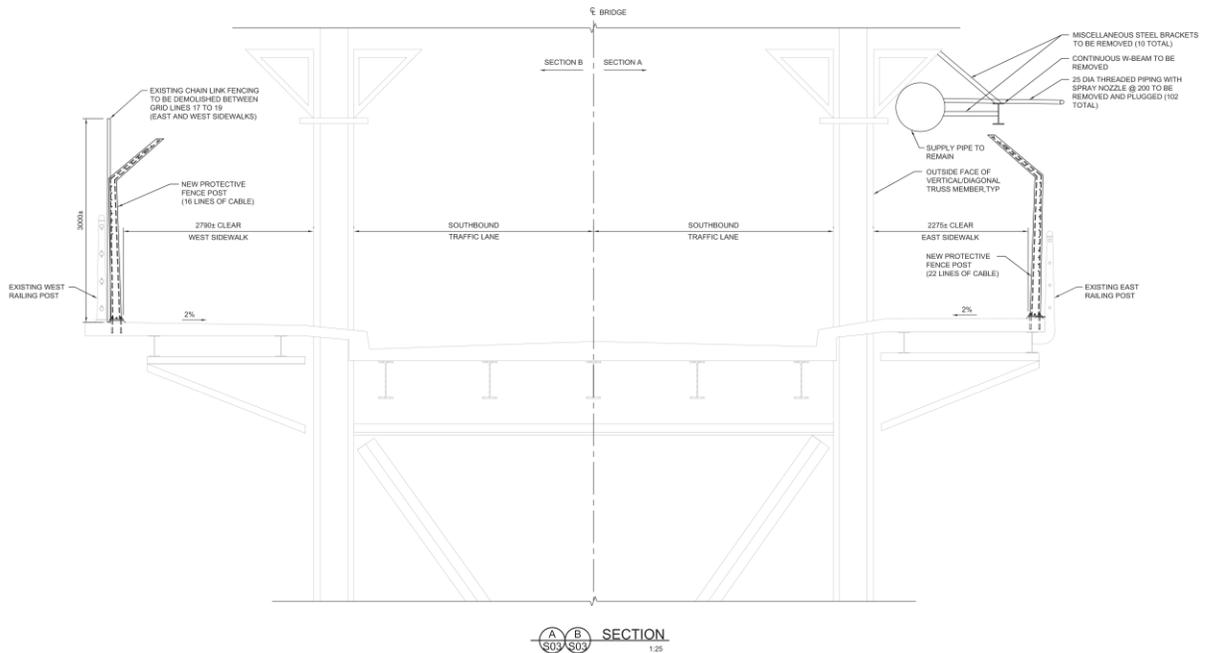


Figure 3: High Level Bridge Typical Cross-Section
Source: City of Edmonton High Level Bridge Tender Drawings

2.2 Pedestrian and Cyclist Volumes

The High Level Bridge has some of the highest volumes of people walking and cycling within Edmonton's active transportation network. The City of Edmonton has installed automatic pedestrian and bicycle counters on both side of the High Level Bridge and has provided data between July 2014 and March 2016. This data reflects pedestrian and cycling volumes prior to the installation of the protective fences.

a. Monthly Distribution

As shown in **Figure 4**, there are significant seasonal variations in bicycle and pedestrian volumes on the High Level Bridge pathways, with the highest volumes generally experienced between the months of May and August. Between May and August 2015, total volumes ranged from approximately 3,200 to 3,700 people walking and cycling across the pathways per day, with an average of approximately 3,500 people walking and cycling across the pathways per day.

As shown in **Figure 4**, the west side pathway consistently experiences higher usage. On average, the west side pathway tends to accommodate at least two-thirds of total pathway users. During peak months between May and August, 2015, this resulted in approximately 2,000 – 2,500 users per day on the west side pathway, and approximately 1,000 – 1,200 users per day on the east side pathway. There is a relatively even distribution of pedestrians and cyclists on both pathways.

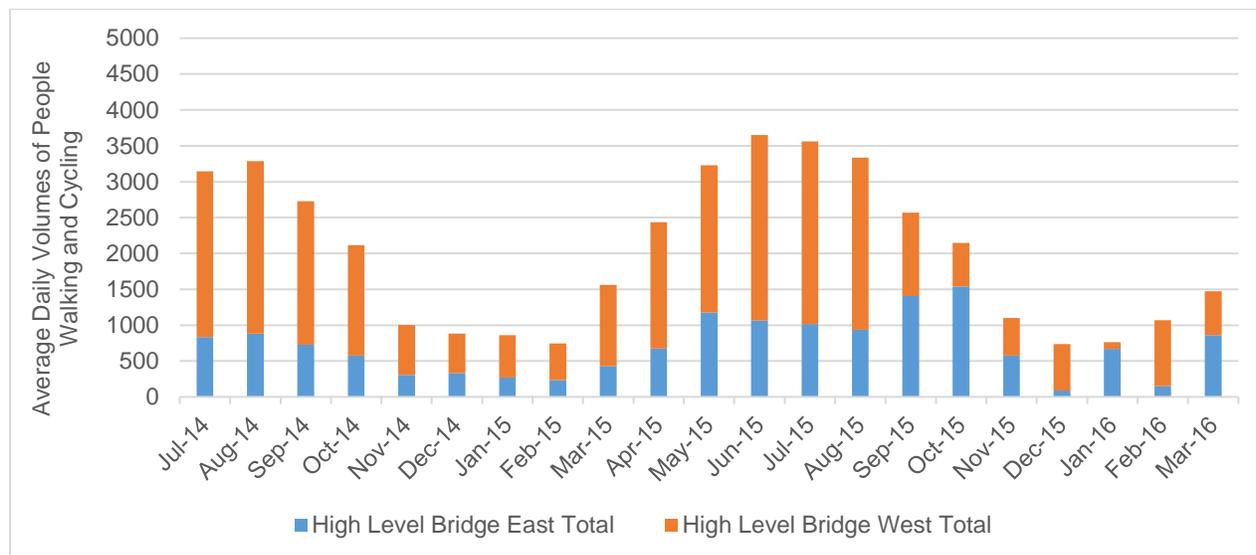


Figure 4: High Level Bridge Average Daily Pedestrian and Cyclist Volumes by Month (July 2014 to March 2016)

b. Daily Distribution

Based on a review of one week of count data in July 2015 (July 6 to July 12, 2015), the volumes of people walking and cycling over the High Level Bridge were higher on weekdays compared to weekends, which suggests that the bridge is often used as a commuter route (**Figure 5**). Monday, Tuesday, and Wednesday were found to be the days with the highest volumes of people walking and cycling.

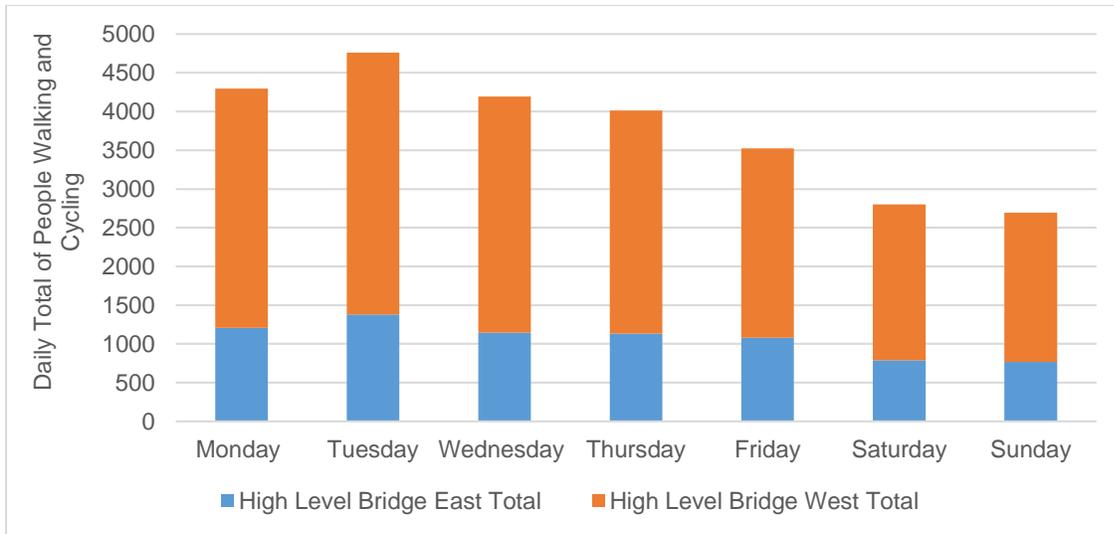


Figure 5: High Level Bridge Daily Pedestrian and Cyclist Volumes by Day (July 6 to July 12, 2015)

To provide further insights into the design volumes for both the east and west side pathways, average daily usage was also reviewed based on the one week of count data from July 2015 (July 6 to July 12, 2015). As shown in **Figure 6**, the east side pathway typically experienced total volumes of at least 1,000 people and cycling, with a relatively even distribution of people walking and cycling. Average volumes dropped slightly to approximately 800 users per day on weekends.

As shown in **Figure 7**, the west side pathway typically experienced total volumes of at least 3,000 people and cycling between Monday and Thursday, with a slightly higher proportion of people cycling than people walking. Average volumes dropped slightly to approximately 2,000 users per day on weekends.

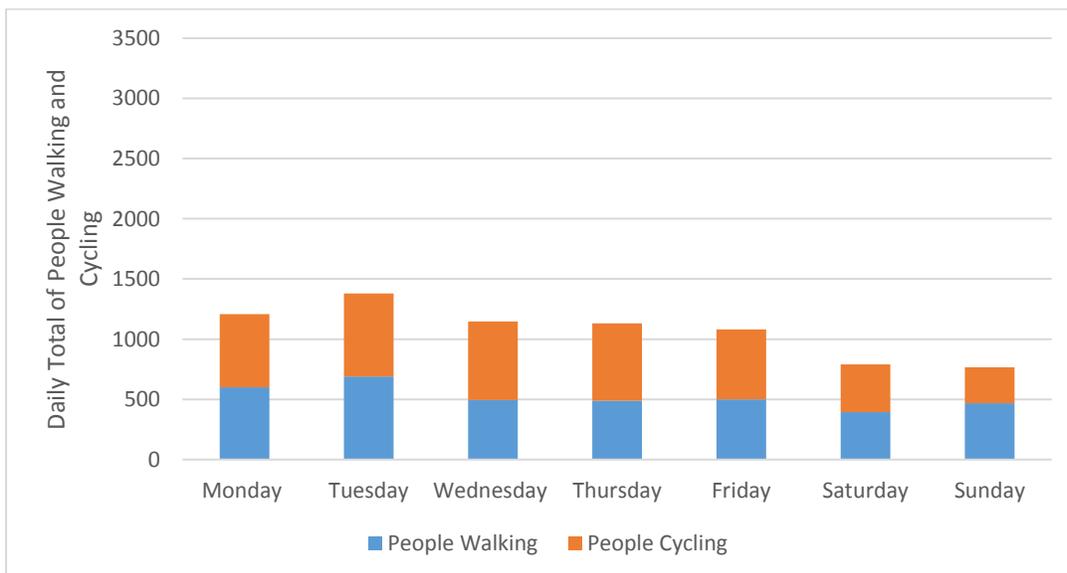


Figure 6: East Side Pathway Daily Volumes (July 6 to July 12, 2015)

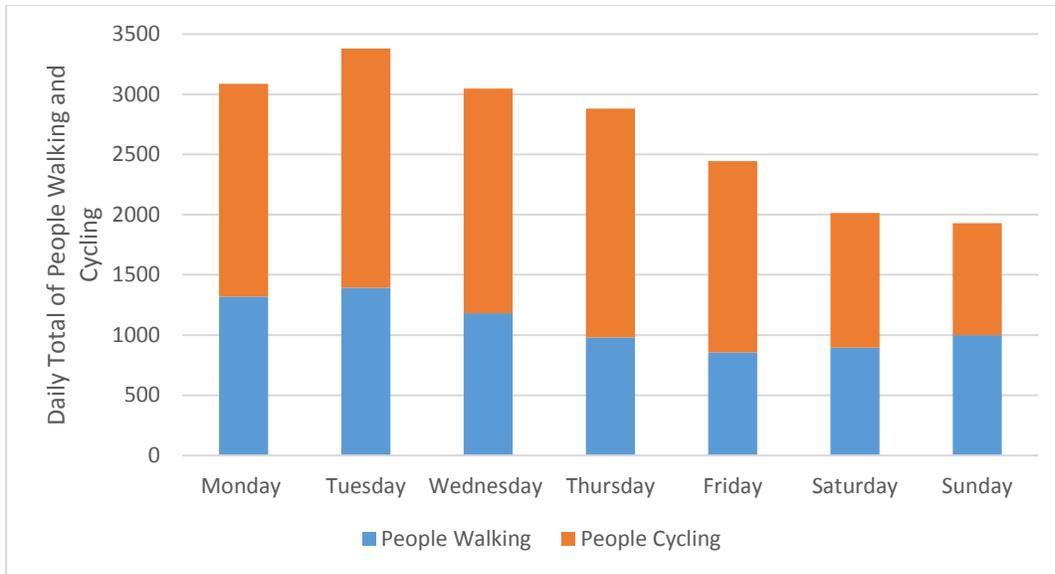


Figure 7: West Side Pathway Daily Volumes (July 6 to July 12, 2015)

c. 24-Hour Distribution

The count data also allows for an understanding of the average volumes on an hourly basis on both sides of the bridge. **Figure 8** below shows the hourly average number of people using the east and west side pathways. The counts have been extracted from a three week period between July 5, 2015 and July 25, 2015. Counts from July were used as they most closely correspond to conditions seen at the time of this study and they would represent the peak of usage as seen in **Figure 8**. The results show that the highest pedestrian and cycling volumes typically occur during the PM peak period (4 pm to 6 pm), followed by the AM peak period (7 am to 9am). During the AM peak period, the average volumes of people walking or cycling across the High Level Bridge were between approximately 200 to 220 people per hour on both sides, including approximately two thirds of users on the west side pathway. During the PM peak period, there were approximately 300 to 320 people walking and cycling across the High Level Bridge per hour, again with approximately two thirds of users on the west side pathway. More generally, the volumes of people walking and cycling across the bridge appear to be highest in the afternoon and evening.

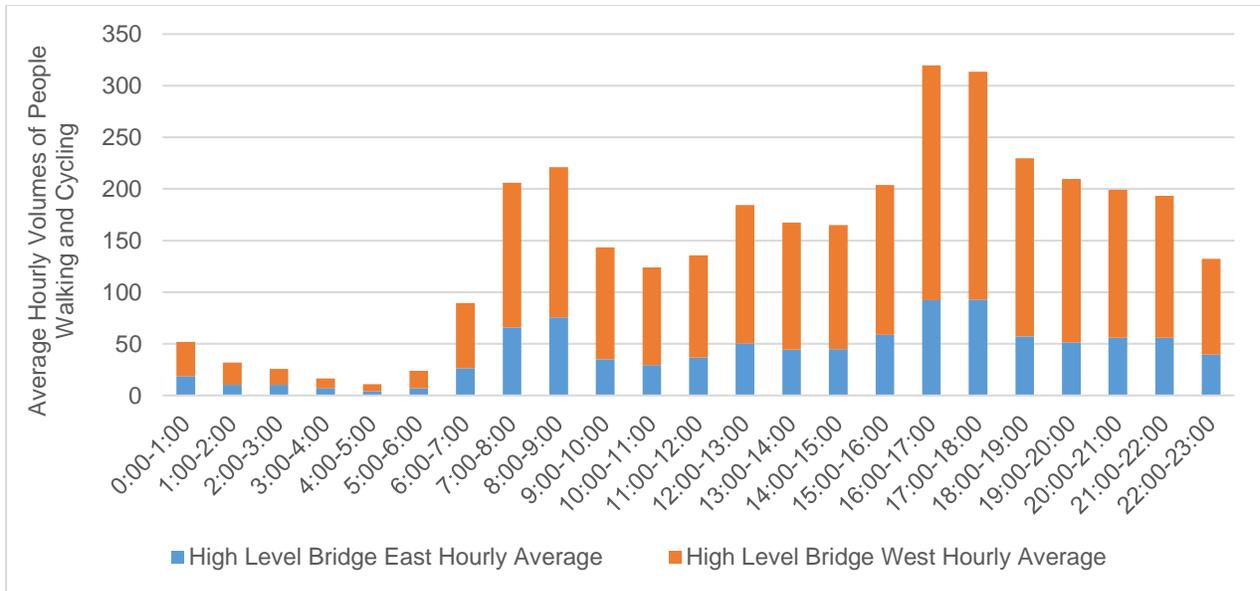


Figure 8: High Level Bridge Average Hourly Pedestrian and Cyclist Volumes (July 5, 2015 to July 25, 2015)

d. Post-Installation Counts

During a site visit on Tuesday July 19, 2016 the RSA Team conducted counts for a 30-minute period between 4:30 pm and 5:00 pm on both the east and west side of the bridge (post-implementation with both pathways fully operational). The purpose of this count was to observe pedestrian and bicycle usage once both pathways returned to being fully operations. The counts were conducted at one of the highest anticipated times of usage (peak season, peak day of week, and peak time of day). The results of the counts are presented below in **Table 1**. While they only provide a snap shot of the volume of people walking and cycling during a 30-minute segment of the PM peak period on one day, they help to indicate and confirm the following:

- The number of people walking and cycling over the bridge is still high following the installation of the protective fences;
- Compared to previous count data, it appears that pedestrian and cycling volumes are continuing to increase, as these counts would be significantly higher than one-hour counts from July 2015 during the same peak period if extrapolated to a one-hour count;
- The proportion of people using the west side pathway compared to the east side pathway is similar to pre-installation, with nearly two-thirds (62%) of users using the west side pathway;
- The proportion of bicycles using the pathways at this time of the day was significantly higher than pedestrians; and
- During the PM peak period, the majority of people were travelling southbound.

Table 1: West Side and East Side Counts (July 19, 2016 – 4:30 pm to 5:00 pm)

West Side Counts				East Side Counts			
Mode	NB	SB	Total	Mode	NB	SB	Total
Walking	29	11	40	Walking	5	22	27
Biking	33	80	113	Biking	8	58	66
Other	2	3	5	Other	2	0	2
Total	64	94	158	Total	15	80	95

e. Summary of Observations

Based on a review of the count data provided by the City of Edmonton, the following conclusions can be drawn:

- There is a seasonal variation in the number of people walking and cycling over the High Level Bridge. Volumes are the highest in summer months and lowest in the winter months.
- Volumes are highest on weekdays (particularly on Tuesdays), indicating the bridge is being used as a commuter route in addition to recreational use.
- The west side pathway is continuously more well used by both people walking and cycling, and this trend has continued post-installation.
- The 24 hour travel patterns are typical commuting pattern with the highest volumes during the PM peak.

2.3 Self-Reported Pedestrian and Cycling Incidents

The Edmonton Bicycle Commuters recently conducted an on-line survey to gather an understanding of the types of safety issues that pathway users have experienced on the High Level Bridge. The survey was made available online during the time the fencing was installed and there were pathway closures. The survey asked specifically if respondents have witnessed or been involved in a near-miss or collision, and if they have been injured or witnessed an injury on the High Level Bridge. The RSA team reviewed 50 responses that involved an incident on the bridge pathway or on one of the approaches to the bridge deck. A summary of the results can be found below:

- The majority of reported incidents (74%) occurred on the pathways directly on the bridge deck. Among those, over two thirds (68%) were reported on the east side pathway (**Table 2**).

Table 2: Incident Location Count (Edmonton Bicycle Commuters Survey Results)

Incident Location	Count
East Side	25
West Side	12
Northeast Approach	2
Northwest Approach	2
Southeast Approach	4
Southwest Approach	5

- The majority of incidents (35) were felt by respondents to have been a result of the width of the pathways.
- The majority of incidents (33) were felt by respondents to have been a result of conflicts between road users. Most of these comments were from bicycle riders who experience conflicts with other people on bikes or with people walking.
- Other factors involved in reported incidents included: collisions with obstructions (such as girders and fencing), CPTED concerns, lack of lighting, and travel speeds.

3.0 Road Safety Audit Process

3.1 Road Safety Audit Objectives

A road safety audit is a process for systematically checking the safety of road transportation projects, based on sound road safety engineering principles and undertaken from the road users' perspective. An in-service stage road safety audit provides an independent assessment of the "anticipated" safety performance of a road transportation project as inspected by road safety specialists. It is duly noted that the City of Edmonton remains ultimately responsible for the facility. A road safety audit is defined as follows:

A road safety audit is a formal and independent safety performance review of a road transportation project by an experience team of safety specialists, addressing the safety of all road users.

The objectives of the road safety audit are to identify features or elements which may have a negative impact on safety performance of the facility and to suggest corrective measures for consideration by the project owner. The corrective measures suggested in a road safety audit report are not prescriptive and should be regarded as indicative of the nature of a solution, which may or may not be adopted by the project owner "as is". The responsibility for the facility, and hence for the selection of specific solutions to the identified safety issues, rests with the City of Edmonton, and not with the road safety auditors.

3.2 Road Safety Auditors

The Road Safety Audit was undertaken by an independent team of road safety auditors (the RSA Team) comprising of the following professionals:

- Brian Patterson, MCIP, RPP – Pedestrian and Cycling Safety Specialist
- Sarah Freigang, MEdes – Pedestrian and Cycling Specialist

A road safety specialist was also retained to provide expert advice to the RSA Team:

- Geoff Ho, P.Eng. – Road Safety Specialist Advisor

It is confirmed that none of the members of the RSA team and the Advisor were involved in any aspects of the design, operation and maintenance of this project.

3.3 Audit Process

The safety audit was carried out following the procedures set out in the Transportation Association of Canada's (TAC) Canadian Road Safety Audits Guide, December 2001. The road safety audit included the following steps:

1. **Start-up Meeting** – A meeting was held in-person between the City of Edmonton and Brian Patterson and Sarah Freigang on Tuesday June 28, 2016. Background information concerning scope of the project was provided at this time.

2. **Site Inspection** – The RSA team (Brian Patterson and Sarah Freigang) undertook the first site inspection on Tuesday June 28, 2016. At the time of this meeting, only the east side pathway was operational and the focus of this visit was on reviewing the safety of the east side pathway after the fencing had been installed and the west side pathway was closed. The project site was inspected on foot and in a motor vehicle.

The RSA team (Brian Patterson and Sarah Freigang) undertook a second site inspection on Tuesday July 19, 2016 following the opening of the west side pathway. At this time, the pathways on both sides of the bridge were operational for people walking and cycling. The project site was inspected on foot and by bicycle.

Video and photo documentation of safety issues was collected during both site visits.

3. **Project Team Workshop** – The RSA team held an independent workshop with the Road Safety Specialist Advisor to assess safety issues and identify mitigation measures.
4. **Road Safety Audit Report** – This report was prepared to document the findings of the study.
5. **Stakeholder Consultation** – The RSA team will present the findings of the study to stakeholders.
6. **Completion Meeting** – If necessary, a completion meeting will be held to discuss the audit findings and suggestions.
7. **Response Report** – A Road Safety Audit Report should be responded to in a formal written response which documents the actions to be taken by the City of Edmonton to address the safety issues identified by the RSA Team. The response report would then become part of the overall project documentation. A decision to reject an audit finding or suggestion should always be accompanied by justification or substantiating reasons detailed in the response report. Where a finding is accepted, the City of Edmonton should also document the specific solution/action to be taken to correct the identified safety issue/s, if different from the auditor's suggestion.

The City of Edmonton is under no obligation to accept all the audit findings and/or its suggestions. Also, it is not the role of the auditor to agree or approve of the City of Edmonton's responses to the audit. Rather, the audit provides the opportunity to highlight potential safety issues and have them formally considered by the City of Edmonton, in conjunction with all other project considerations.

4.0 Audit Findings and Suggestions

This section summarizes the identified pedestrian and cycling safety issues and suggested improvements. Issues were identified along the bridge structure itself, along the approaches to the bridge, and at the connections to the pathways, as summarized below:

Bridge Structure:

- Issue 1: Pathway Width on Bridge Deck
- Issue 2: Lack of Barrier Between Pathway Users and Motor Vehicles
- Issue 3: Obstructions and Pinch Points
- Issue 4: Centre Line on Pathways
- Issue 5: Fence Design
- Issue 6: Speeding
- Issue 7: Lighting

Approaches:

- Issue 8: Narrow Pathway Approaching and Exiting the Bridge Deck (South End)
- Issue 9: Narrow Pathway Approaching and Exiting the Bridge Deck (North End)

Overall Pathways:

- Issue 10: Wayfinding and Etiquette Signage
- Issue 11: Pavement Quality and Uneven Surfaces

Connections:

- Issue 12: Connectivity and Intersection Treatments

Education and Awareness

- Issue 13: Shared Pathway Etiquette

These issues are described in further detail below along with suggested improvements.

Issue 1: Pathway Width on Bridge Deck

The installation of the protective fences has resulted in a reduction of the width of the pathways on both the east and the west sides of the bridge by approximately 0.3 metres.

According to the design drawings provided by the City of Edmonton, the resulting typical width of the east side pathway is currently approximately 2.3 metres between the outside face of the vertical/diagonal truss members and the new protective fence posts (**Figure 9**). Widths were confirmed with on-site measurements. The east side pathway is further narrowed at two specific locations with additional obstructions, reducing the width to as narrow as 1.8 metres at these constrained locations (this issue is discussed in further detail below in **Issue 3**).

According to the design drawings, the resulting typical width of the west side pathway is currently approximately 2.8 metres between the outside face of the vertical/diagonal truss members and the new protective fence posts. Widths were confirmed with on-site measurements. The west side pathway is further narrowed at the south end of the bridge deck at the approach to the transition to 109 Street NW (this issue is discussed in further detail below in **Issue 3**).

The effective widths are marginally narrower than stated above as a result of the presence of the concrete base constructed to support the posts.

On-site observations indicated that these widths resulted in some conflicts (near collisions) between users of the pathways on both sides of the bridge. In particular, the most significant conflicts were observed along the east pathway due to limited width and the pathway being used as a two-way facility shared between pedestrians and bicycle users. There were minimal separations between road users, especially between cyclists, travelling in opposite directions on the east pathway due to the narrow width. Issues were observed when cyclists engaged in a passing maneuver and crossed to the opposite of the pathway, which created conflicts with pedestrians who may not be aware of the passing, as well as oncoming bicycle users. Similar issues were observed on the west side pathway. Although the west side pathway is wider, similar issues were experienced due to the higher pedestrian and cycling volumes on this side of the bridge.

The Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads ("Guide") specifies minimum widths for off-street pathways (**Table 3**). The Guide recommends that the minimum width of a two-way pathway shared by pedestrians and bicycles should be between 3.0 to 4.0 metres and that increases to the minimum width would be warranted if:

- There are substantial bicycle volumes;
- Cyclists are likely to ride two abreast;



Figure 9: East Side Pathway

- Pedestrians or joggers are likely to share facilities;
- There are steep grades; and/or
- If the pathway is used by maintenance vehicles.

Table 3: Recommended Width for Pathways (Source: The Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads)

Classification	Width (m)
One-Way, Bicycles Only	1.5 – 2.0m
One-Way, Pedestrians & Bicycles	2.0 – 3.0m
Two-Way, Bicycles Only	2.5 – 3.5m
Two-Way, Pedestrians & Bicycles	3.0 – 4.0m

The Guide further states that a 0.6 metre horizontal clearance be maintained from lateral obstructions. However, this lateral clearance is seldomly constructed for bridges due to the high additional cost. The existing widths provided on the east and west pathways are clearly substandard to the dimension (minimum 3.0 metres) recommended by the Guide for two-way operation with both people walking and cycling. It should be noted that, prior to the installation of the protective fences, the east side pathway did not satisfy the minimum width of 3.0 metres recommended by the Guide.

The safety issue of the narrow pathway width is exacerbated by the relatively high bicycle and pedestrian volumes as discussed in **Section 2.0** of this report, as the high volumes would increase the probability of collisions. It is also important to note that, as the City continues to promote and encourage both walking and cycling as transportation options within Edmonton, it is possible that in coming years these volumes will continue to increase. Lastly, the Guide indicates that the widths recommended in **Table 3** should be wider on pathways with higher volumes although it does not specify what the volume may be.

Suggestions:

Given the existing conditions, to ensure the safe operation of the pathways, it is suggested that the pathway operations be modified, and it would be desirable that the resulting operations and widths would be in accordance with the Guide, i.e. meeting minimum design guidelines.

As shown in **Table 4**, the resulting width of the west side pathway meets TAC guidelines for one-way operation either as a shared use pathway or as an exclusive bicycle pathway, and also meets TAC guidelines for a two-way exclusive bicycle facility. Although the west side pathway does not meet the guidelines for a two-way shared use pathway, the RSA team feels this is acceptable operation given that it is close to 3.0 metre minimum width guideline, and given the significant constraints imposed on the pathway due to the bridge’s historic character and structural requirements.

In contrast, the resulting width of the east side pathway does not meet TAC guidelines for two-way operations, either in shared use or exclusive operation. However, the east side pathway does meet TAC guidelines for one-way shared use or exclusive operations.

Table 4: Existing High Level Bridge Pathway Width and TAC Guidelines Comparison

Operation	TAC Guidelines	Meets TAC Guidelines?	
		West Side (2.8 metres)	East Side (2.3 metres)
Two-Way, Pedestrians and Bicycles	3.0 – 4.0m	No*	No
Two-Way, Bicycles Only	2.5 – 3.5m	Yes	No
One-Way, Bicycles and Pedestrians	2.0 – 3.0m	Yes	Yes
One-Way, Bicycles Only	1.5 – 2.0m	Yes	Yes

*2.8 metres can be considered acceptable given the existing conditions and use

Two options are presented below to mitigate the identified safety issue:

- Option 1: Convert Both Pathways to One-Way Shared Use Operation.** This option would involve allowing shared use operation on both pathways in one direction. Following normal traffic patterns, change the east side pathway to northbound only operation, and the west side pathway to southbound only operation. The pathways would be shared with two-way pedestrian traffic on both sides. This option operating as a one-way shared use facility meets the TAC guidelines for both the west side and the east side pathways. However, it is recognized that changes to directional operations would present connectivity challenges that would need to be addressed on both the north and south sides of the bridge, and may result in some collision migration (as discussed further in **Issue 3**).
- Option 2: Maintain Shared Use Two-Way Operation on the West Side, and Convert East Side Pathway to Two-Way Pedestrian and One-Way Bicycle Operation.** This option would maintain current operations on the west side pathway, which is the more heavily used pathway as noted in Section 2.0, and which is also more desirable for connections on both the north and south side. Although two-way shared use operation does not meet TAC guidelines of 3.0 metres, this may be considered acceptable given that this is a constrained retrofit situation with significant structural constraints. For the east side pathway, two-way pedestrian operations could be maintained, but bicycle traffic is restricted to one-way operations. The direction of operation on the east side of the bridge would be determined by the City through a more detailed review of existing operations and through discussions with stakeholders. Based on the direction of operations connectivity improvements would be required to facilitate the additional crossings required due to directional restrictions for people cycling, these issues are discussed further in **Issue 12**. This is the preferred option because it provides the minimal disruption to the existing travel patterns, and reduces the probability of collision migration.

It is suggested that the City review the safety performance of the west side pathway *prior to* the installation of the protective fence with the previous width of 3.1 metres. If the safety performance was acceptable to the City under previous conditions prior to the installation of the protective fencing, then Option 2 would be the preferred option. Otherwise, if there were identified safety issues before the installation of the protective fences, it is suggested that the City consider the implementation of Option 1, with remedial measures to convert the connections to one-way operations for bicycles.

Given the high usage of this bridge as a walking and cycling route, over the long-term, the City could explore other options, which could include:

- Widening the east and west side pathways to a more generous width that would provide adequate separation for two-way shared use operation;
- Providing a pathway on the upper deck;
- Removing one lane of vehicle traffic on the bridge deck and reallocating this space to pedestrians and/or cyclists; and/or
- Constructing a new dedicated pedestrian and bicycle bridge.

It should be noted that the provision of a pathway on the upper deck to create a 'high level' crossing has been suggested by stakeholders. This suggestion is not supported by the operators of the streetcar that currently runs along the upper deck. This would also require additional investment in protective fencing, and may not be feasible based on the potential usage of the rail line for streetcar operations and/or a future LRT route. Further investigation and engineering work would be required by the City in conjunction with stakeholders to determine the feasibility of this solution.

Issue 2: Lack of Barrier Between Pathway Users and Motor Vehicles

The gaps between the truss members along the bridge deck on both pathways present a potential safety risk particularly for people cycling if they were to lose control of their bicycle or fall from it. In addition, the crossfall is greater in the areas of the truss members, and the deck slopes towards the roadway, which could present a further safety risk. A recent incident was noted on social media (not observed during the site visit) of a bicycle user falling into the motor vehicle carriageway (as shown in **Figure 10**).



Figure 10: Witnessed Safety Issue
 Source: @edmontonbicycle twitter account, posted June 30, 2016.

Suggestion:

- Install enhanced physical separation between the carriageway and the west side and east side pathways to prevent pathway users from entering into the carriageway (example: additional cables).

Issue 3: Obstructions and Pinch Points

As noted previously, the typical width of the pathways are 2.8 metres on the west side and 2.3 metres on the east side based on the cross-section drawings provided. However, there are several pinch points along the pathways which have constrained widths. The location of these obstructions and pinch points can be seen in **Figure 11** and are illustrated in photos below. At each of these locations the pathway narrows, creates an obstruction for pathway users, and is a potential safety hazard.

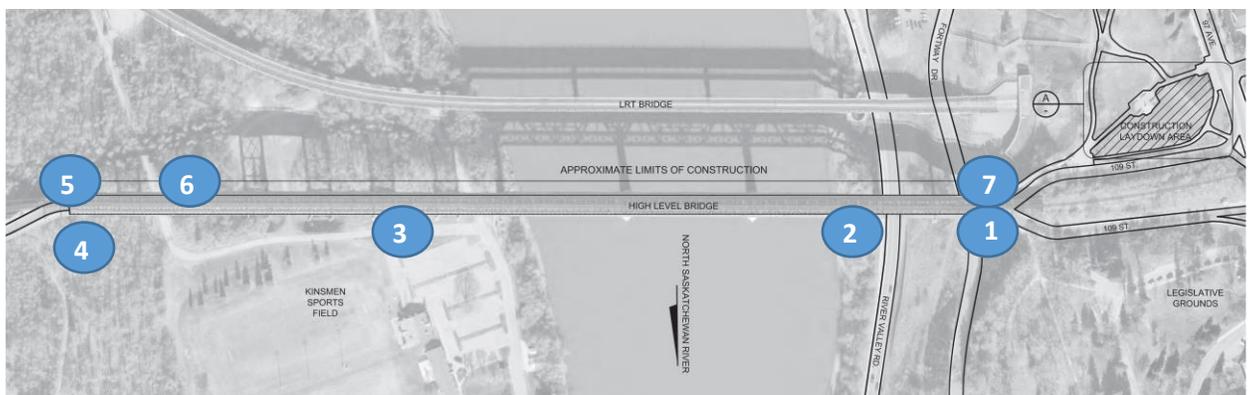
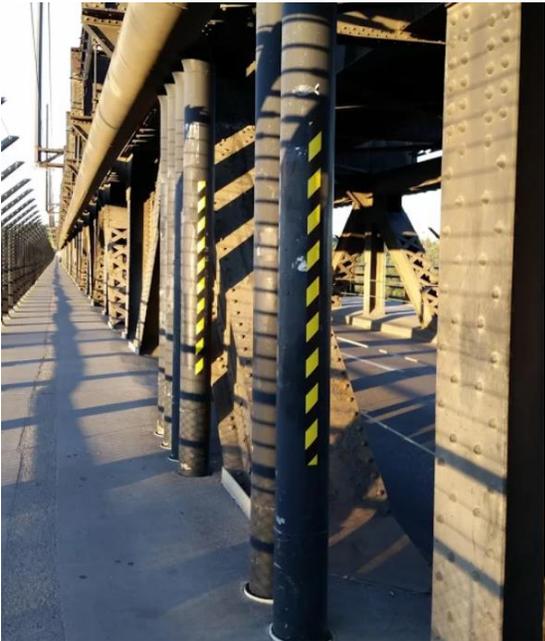


Figure 11: Location of Obstructions and Pinch Points

Location 1: East Side – North Entry/Exit



Location 2: East Side – Waterfall Piping



Width: 1.8 metre (Source: City of Edmonton)

Location 3: East Side - Bridge Column



Width: 2.0 metres hand rail to face of the new post
(Source: City of Edmonton)

Location 4: East Side – South Bridge Entry/Exit



Width: 2.0 metres (Source: City of Edmonton)

Location 5: West Side – South Entry/ Exit



Width: 2.9 m at the narrowest

Location 6: West Side - Bridge Column and Vertical Obstructions



Width and Openings:

Vertical Height - 2.3 metres

Pathway width on either side of the bridge columns - 1.2 metres and 1.7 metres

Location 7: West Side – North Entry/ Exit



Suggestions:

- Install reflective hazard markings on all obstructions.
- Consider the installation of obstruction pavement markings as outlined in TAC guidelines.
- Consider installing additional warning signage at pinch points, ensuring the location of the signage does not create an additional obstruction but informs users that pathway narrows and to slow down and use caution.
- Consider adding advance warning signs for pinch points.
- Consider removing where applicable the metal barrier located on the southeast approach pathway to provide some additional width (as seen in the photos for **Location 4**).

Issue 4: Centre Line on Pathways

Prior to the installation of the protective fencing, a yellow centre line ran down the centre of the pathway on both the east and the west side of the pathway. During the installation of the fencing on the east side of the bridge the yellow line was removed. The yellow centre line on the west side is still in place, but it is no longer located in the centre of the pathway due to the installation of the fencing. As a result, the same space is provided for users travelling northbound, while approximately 0.3 metres is reduced for users travelling southbound on the west side of the bridge.

Suggestion:

a. For Option 2 (Issue 1)

- On the west pathway, realign the yellow centre line in the centre of the existing pathway to provide equal space for both northbound and southbound users.
- On the east pathway, add a new white solid line to separate users (one-way bicycle to the left and two-way pedestrians to the right).

b. For Option 1 (Issue 1)

- Add a new white solid line to separate users on both pathways (one-way bicycle to the left and two-way pedestrians to the right).

Issue 5: Fence Design

The design of the fencing along both sides of the bridge is a potential safety hazard as a person cycling may catch their handlebars on the posts if they travel too close to the fencing.

Suggestion:

- Consider installing rub rails, but ensuring that a design is selected that doesn't further narrow the width.

Issue 6: Speeding

The review of the incident reports from the Edmonton Bicycle Commuters Survey identified that there were concerns about the speed people cycling were travelling across the bridge deck, there were also a few incidents of people cycling travelling at relatively high speeds for the volume of people using the pathway. As users are focusing on passing other users they may not be paying attention to other obstacles or other users outside their immediate cone of vision.

Suggestion:

- Consider adding signage indicating that pedestrians and cyclists should travel slow and use caution especially when passing and at pinch points. Signage should also be provided at the beginning and end of the pathway, and at regular intervals in both directions along the pathway (suggested spacing of 100 metres). Signage could be enhanced with temporary "SLOW" pavement markings. Signage should be implemented to ensure it does not pose an additional safety risk to users.

Issue 7: Lighting

Like speeding, lighting and personal safety concerns were identified in the incident reports collected through the Edmonton Bicycle Commuters Survey. Lighting of the pathway specifically could help to illuminate obstructions and jogs in the pathway itself. Additional lighting could also help enhance personal safety and visibility in the evening. At the time of the evening site visit the lighting on the bridge deck was rotating colours and thus brightness. While this was visually appealing, it was found that depending on the colour of the lights being used pathway visibility varied (**Figure 12**).

Suggestion:

- Consider installing additional pedestrian scale overhead lighting where feasible on the bridge pathway itself ensuring that any additional light does not obstruct the pathway itself.

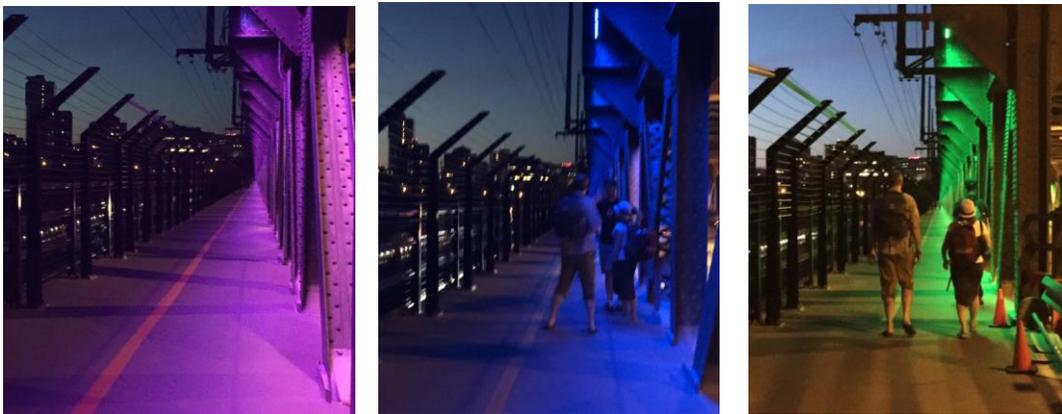


Figure 12: High Level Bridge at Night (West Side)

Approaches

Issue 8: Narrow Pathway Approaching and Exiting the Bridge Deck (South End)

a. South End / East Side

The pathway on the south end of the bridge on the east side currently operates as a shared use pathway with two-way operations (**Figure 14** and **Figure 13**). The current width of this pathway does not meet TAC's minimum width guidelines. Further, the pathway is constrained by vertical obstacles on both sides, including a wooden fence on one side and a retaining wall with a black guard rail on the other side (separating the pathway from motor vehicle drivers) which creates a confined space. The presence of the fence and the guard rail could potentially result in people cycling getting their handlebars caught in the railing.



Figure 14: South End/East Side Bridge Deck Approach



Figure 13: South End/East Side Bridge Deck Approach

b. South End / West Side

The pathway south of the bridge on the west side is currently being used as a shared use pathway with two-way operations (**Figure 16** and **Figure 15**). The current width of this pathway does not meet TAC's minimum width guidelines. Further, the pathway is confined by a fence separating the pathway from the rail tracks. However on this side of the bridge approach, there is no fence separating people walking and cycling from motor vehicles. Some utilities are also located within the pathway, resulting in further constraints at some locations. This lack of separation could create a situation where if a person walking or cycling were to lose control and fall off of the pathway they could be struck by moving motor vehicles. There is a shared use pathway that runs parallel to the narrower sidewalk (**Figure 17**). The limited lighting, overgrown vegetation and lack of visibility from the street can make this route less appealing due to personal safety concerns, resulting in more people cycling on the narrower pathway.

The safety issues at both ends of the bridge approach are exacerbated by the vertical profiles, which creates distinct issues in the uphill and downhill directions as follows:

- **Downhill:** high speeds could strike other users same and opposite directions, potentially resulting in significant injury
- **Uphill:** Cycling uphill needs more width due to the "wobble" factor. May result in more conflicts with other users.



Figure 16: South End/West Side Bridge Deck Approach



Figure 15: South End/West Side Bridge Deck Approach

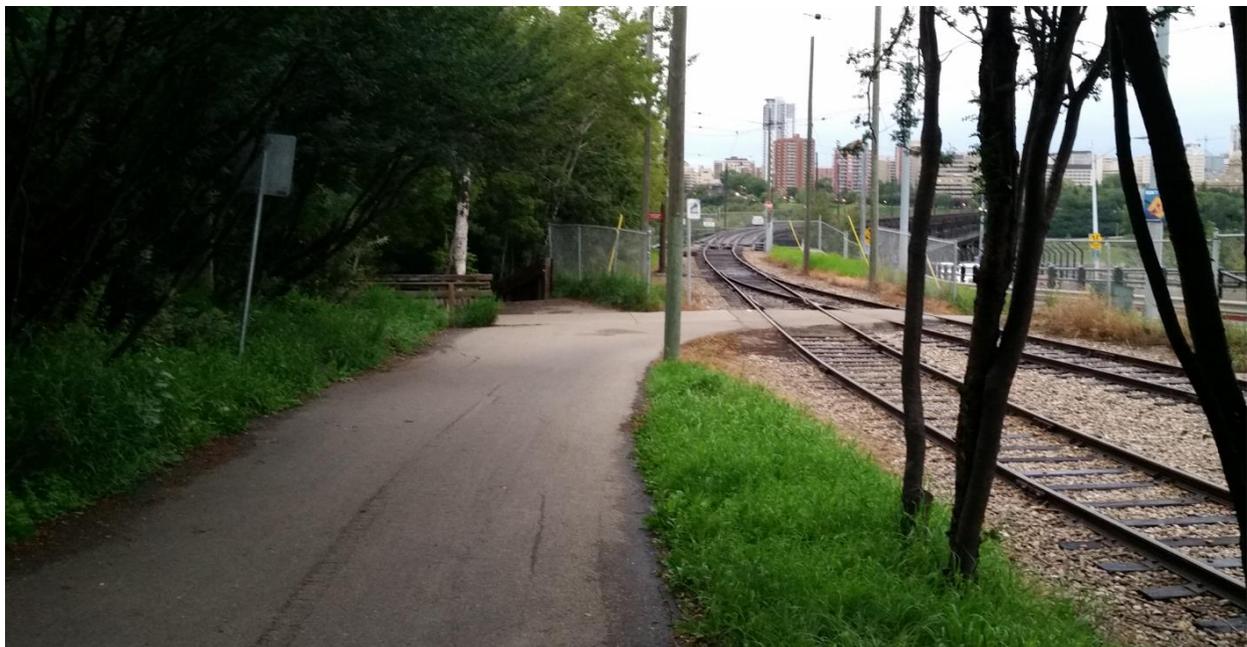


Figure 17: South End/West Side Parallel Multi-Use Pathway

Suggestions:

a. South End / East Side

- Consider widening the east side pathway by relocating the wooden fence further east to provide more space, subject to structural and geotechnical requirements.

- Consider adding a rub rail on the existing railing on the approach to the east side of the bridge or consider replacing the type of separation currently being used.
- “Narrow pathway” signage should be placed early at the start of the approach to the bridge to advise users of the constrained conditions.
- Consider installing signage advising users that tandem riding and walking is not permitted through this narrow stretch.

b. South End / West Side

- Consider widening the west side pathway, subject to structural, geotechnical and/or property constraints. This may require working with other stakeholders to acquire additional space from the rail right-of-way if required.
- Consider installing a guard rail to prevent pedestrians and cyclists that fall from being struck by moving motor vehicles (**Figure 18**)
- Consider providing more lighting and additional vegetation maintenance on the designated multi-use pathway that runs parallel to the roadway on the west side of the bridge.



Figure 18: Example of Fencing Options (Recently installed along the Stanley Park Causeway – approach to the Lions Gate Bridge)

Issue 9: Narrow Pathway Approaching and Exiting the Bridge Deck (North Side)

On the north end of the High Level Bridge on both the east and the west sides, sidewalks provide people walking access to the bridge crossing adjacent to the motor vehicle lane (**Figure 19** and **Figure 20**). These sidewalks were observed to be used by people cycling as well as people walking, and are operating as shared use facilities. On the west side of the bridge, there is an additional multi-use pathway that runs parallel through the park, although it should be noted that this pathway was closed during the time of the site observations. On both sides, aside from a curb, there is no physical separation between the pathway and motorized vehicles. Similar to the potential safety issue identified on the south/west approach, this lack of separation could create a situation where if a person walking or cycling were to lose control and fall off of the pathway they may fall into the carriageway. There is a shoulder in the carriageway, which could minimize the risk of collision with a motor vehicle; however, the narrow sidewalk combined with lack of physical protection and two-way operation by both cyclists and pedestrians increases the risk of collision.

Additionally, the width of the existing pathway, particularly on the east side, is constrained at peak periods when the volumes of people walking and cycling are greater and may result in potential conflicts. Overgrown vegetation also resulted in some localized choke points along the pathway.

As noted, during the RSA team’s site visit, the parallel existing multi-use pathway on the west side was closed as it is currently being used as the construction laydown area. As a result all users travelling on the

west side were using the pathway adjacent to the road which made conditions feel constrained. However, upon the reopening the pathway these issues will likely be alleviated. On both the east and the west approach there is a wide shoulder between the motor vehicle lane and the pathway.



Figure 19: North End / East Side



Figure 20: North End / West Side

Suggestions:

- Widen the pathway on the east side of the bridge approach utilizing space within the roadway shoulder and/or additional right of way.
- For the west side, consider installing guard rail to prevent pedestrians and cyclists who fall from being struck by moving motor vehicles. Alternatively, reallocate the road space, and provide a wider shoulder as per the east side.
- Ensure vegetation is well maintained and cut back

Overall Pathways

Issue 10: Wayfinding and Etiquette Signage

Signage has been installed at various locations on the approaches to the bridge and on the bridge structure; however, the type of signage and spacing is inconsistent. Some of the issues identified specific to wayfinding and signage which have a potential impact on the safety of the facility include:

- It is unclear how the pathway should be used and if users are to travel by mode or direction, which could result in confusion and conflicts between pathway users.
- Wayfinding signage for people cycling is unclear, which has the potential to result in confusion. As an example, a person cycling was observed having to walk their bicycle off of the bridge deck after travelling in the carriageway instead of on the pathway, and two people were observed to be cycling

within the carriageway. Although this is legal, people cycling should be encouraged to use the pathways.

- Ring bell before passing signage is already provided at the beginning and end of the pathway; however, this is not located on the bridge itself, and should be added at regular intervals in both directions along the pathway (suggested spacing of 100 metres) (**Figure 21**).



Figure 21: Examples of Existing Ring Bell before Passing Signage

Suggestions:

- Ensure route wayfinding is accurate to prevent user confusion and to encourage people walking and cycling to use the pathways instead of the carriageway. This suggestion should be considered in conjunction with suggestions with **Issue 1**.
- Consider providing guidance signage and pavement markings indicating how the pathway should be used (i.e. Keep right except to pass) and that it is a shared use pathway. Consider providing signage and pavement markings at regular intervals along the pathways.
- It is suggested that the type of signage used on the facility is consistent.
- Place additional signage such as “Bell or Yell” and/or “Cyclists Slow Down to Pass Pedestrians” signs and/or stencils in advance of entering the bridge crossing and at pinch points.

Issue 11: Pavement Quality and Uneven Surfaces

There were some locations along the pathways where poor pavement quality was observed, including cracks in the pavement and uneven seams between the pathway and the bridge joints, which could be tripping hazards (**Figure 22** and **Figure 23**). There was also the presence of debris from cracked concrete. Debris, hazards and poor pavement quality presents a safety hazard for both people walking and cycling.



Figure 22: Example of Debris, Cracks and Uneven Pavement on the Pathway



Figure 23: Example of Uneven Surface - Bridge Joint

Suggestion:

- Ensure that the pathways are a smoothly paved surface and kept free of debris.

Issue 12: Connectivity and Intersection Treatments

Connections to the High Level Bridge on both the north and the south side are important for overall network connectivity but also have important safety considerations particularly with the suggestions for **Issue 1**, which have implications for connectivity improvements if implemented.

In addition to collected count data, which provide information regarding usage at specific locations and times of day, bicycle and pedestrian GPS data provided by Strava presented below in **Figure 24** also helps to provide additional insights regarding the cycling connections on either side of the bridge. **Figure 24** below shows that on the north side of the bridge, some of the more popular cycling connections include the multi-use pathway that runs parallel to 109 Street NW, the pathways through the Legislature grounds, 111 Street NW, and the River Valley pathway network. On the south side of the bridge, Strava data indicates that the most well used cycling routes include Saskatchewan Drive NW, 88 Avenue and again the River Valley Trail Network. However, Strava data does not provide information about where these individuals are travelling to and from or the purpose of the trip.

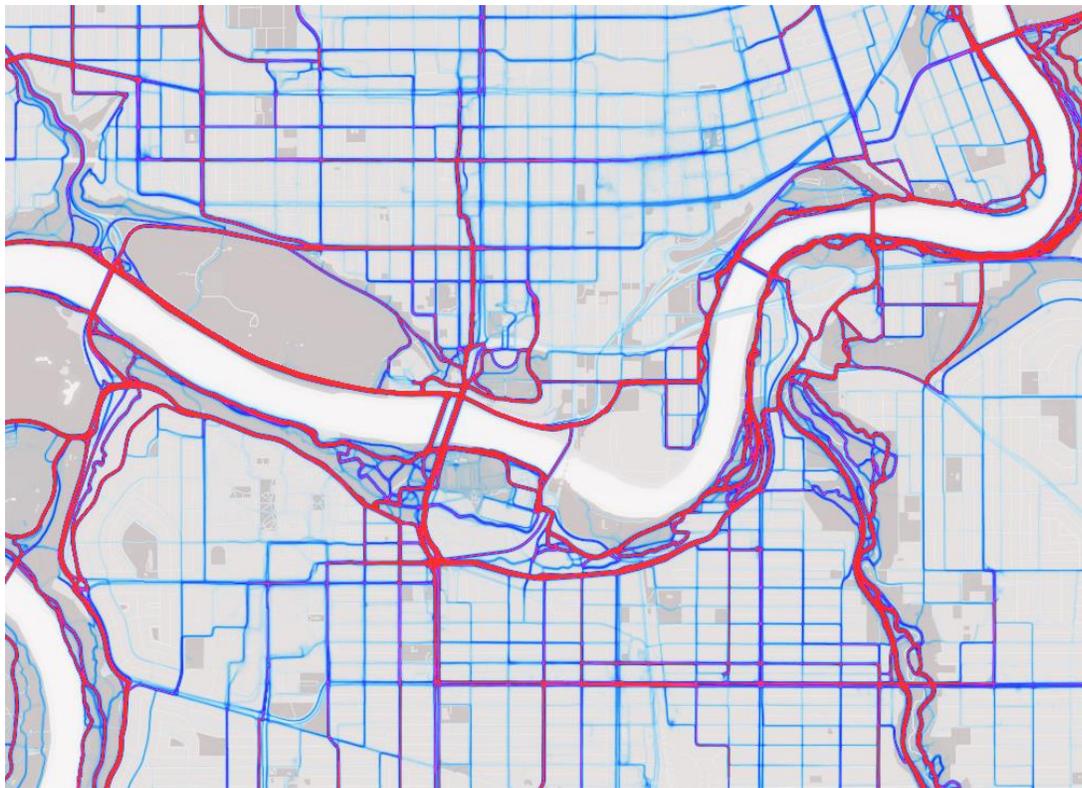


Figure 24: Well Used Bicycle Routes (Strava Data)

a. North Side Connections

As seen in **Figure 25** below, there are a number of different routes and destinations that often influence which side of the bridge individuals will travel on. The west side of the bridge provides more direct access to the popular north-south multi-use pathway that runs parallel to 109 Street, 104 Avenue and MacEwan University. There is also a designated bicycle route on 110 Street and the west side also provides access to the River Valley Pathway network. The east side of the bridge provides direct access to the Alberta Legislature Buildings, and many people walking and cycling were travelling through the Legislature grounds to access 107 Street or 99 Avenue to provide a more direct route to their destinations downtown. It is important to note that is not permitted on the Legislature Grounds, there are signs throughout the grounds noting this restriction. As a result this pathway and connections through the Legislature grounds are not discussed in any further detail in this report.

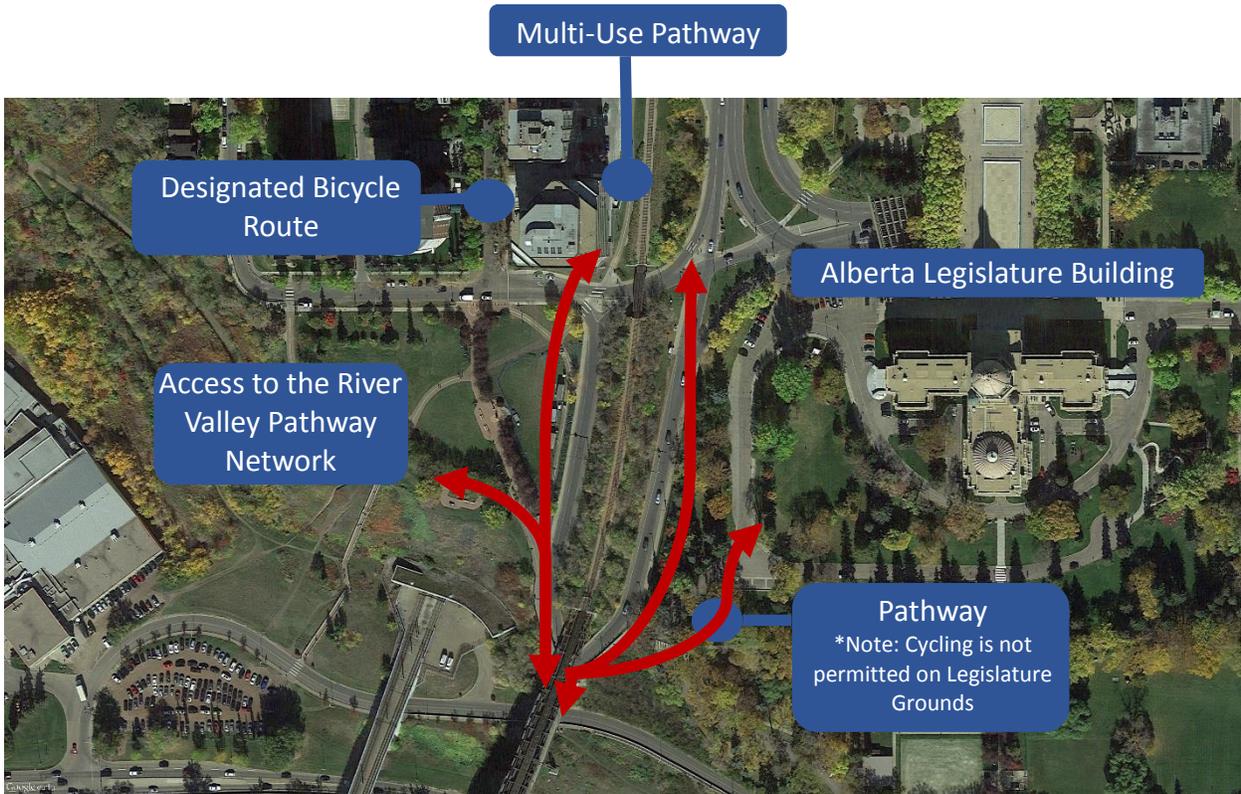


Figure 25: North Side Connections

As seen in **Figure 27** below, there are a number of intersections that a person walking or cycling needs to cross to access the connections on either side of the bridge. People walking and cycling are sharing the sidewalk and crosswalk space, which can be uncomfortable and pose a safety risk to both user groups. It is also unclear if people cycling are permitted to share the sidewalks and crosswalks with people walking, as existing signage indicates that the shared use facility designation ends and there are no multi-use crossing (elephant's feet) markings or signage permitting cycling at crosswalks (**Figure 26**).



Figure 26: Bicycle Route Ends Signage

The number of times a person walking or cycling needs to cross motor vehicle travel lanes also results in additional time spent waiting and may result in more risky behaviours. Each additional crossing also increases the risk of conflict between motor vehicles. This will be exacerbated if usage is restricted on the east side pathway and without enhancements to the intersections on the north side of the bridge there is the potential of higher rates of non-compliance of the restrictions.

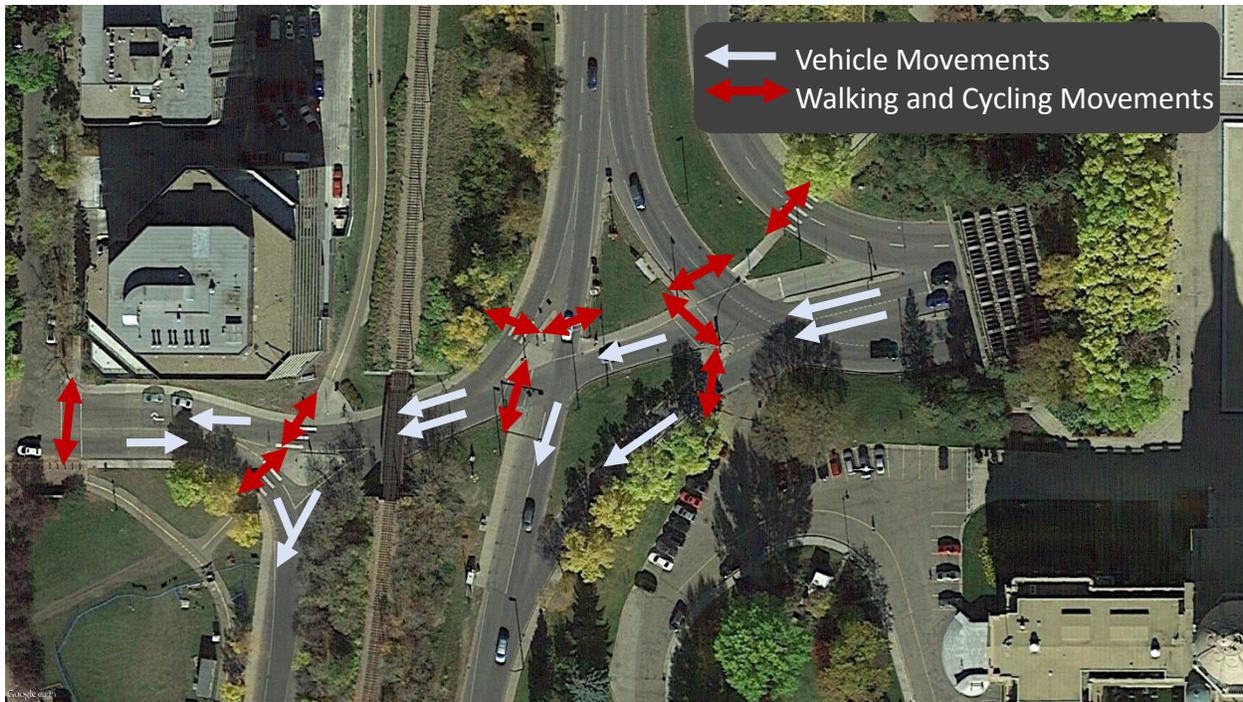


Figure 27: North Side Intersection Permitted Movements

b. South Connections

On the south side of High Level Bridge, important connections that provide access to the crossing include the multi-use pathway on Saskatchewan Drive, 109 Street, streets that provide access to the University of Alberta, and the River Valley pathways (**Figure 28**).



Figure 28: South Side Connections

Similarly to the north side, there are a number of different ways people walking and cycling can access the different sides of the bridge as seen in **Figure 29**. While not as complex as the intersections on the north side, the crosswalks and refuge islands still are functioning as a shared space for people walking and cycling and can create confusion as well as space constraints as both users are travelling through the intersection (**Figure 30**).

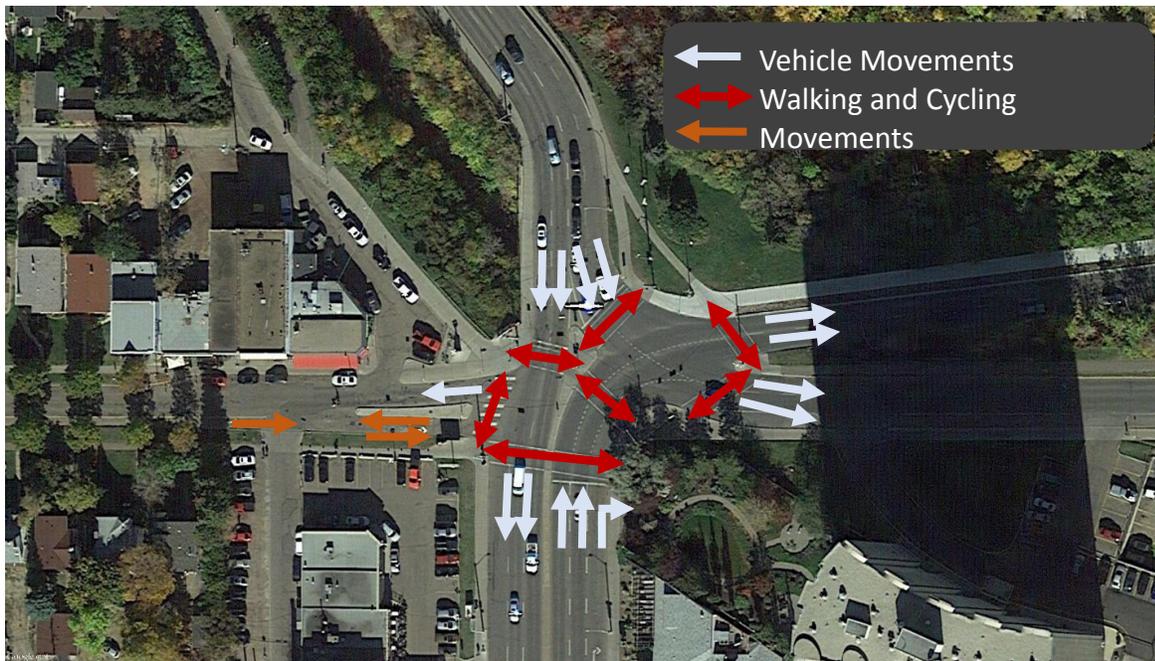


Figure 29: South Side Intersection Permitted Movements



Figure 30: Refuge Island at 109 Street

Suggestions:

- If Options 1 or 2 to Issue 1 are implemented, investigate improvements to network connections to accommodate the resulting travel patterns.
- Consider enhancing the connections to the desired routes on the north and south side of the bridge to reduce potential conflict between all road users. Some examples of how this could be done include designing and improving the intersection transitions, reducing the number of required crossings or providing a designated bicycle route on 109 street allowing a more seamless transition from High Level Bridge

- Provide guidance on how people cycling should be travelling through the intersection. If crosswalks are multi-use, consider using elephant's feet pavement markings to designate this as a shared space. However, over the long term, it is suggested that crossings for people walking and cycling are separated and additional space is provided at refuge islands to avoid conflict, particularly if the volume of users increases.
- Provide general wayfinding and signage to designated bicycle routes.
- Consider implementing physically separated bicycle and pedestrian facilities on roadways extending from the bridge on both the north and side, to further extend the user experience to ensure the connections are comfortable for people of all ages and abilities. This could include considering protected bicycle lanes on connecting roads, including Saskatchewan Drive and 109 Street on the south side of the bridge, and 109 Street and 97 Avenue on the north side of the bridge. This could also include extending the existing protected bicycle lane on 88 Avenue at the approach to 109 Street through the intersection to facilitate transitions across this intersection. The City could also investigate improved connections through the Alberta Legislature Grounds.

Education and Awareness

Issue 13: Shared Pathway Etiquette

Most people cycling, walking and jogging across the bridge were observed to be respectful and courteous, slowing speeds to adjust for the higher volumes and people cycling were ringing their bell to pass. There were however, some incidents where users were travelling at speeds that did not feel comfortable or suitable for the constrained conditions. There were also incidents where people did not use their bell to pass when cycling or were passing when it was not safe to do so. It was also observed that there is no clear direction for how to use the pathway. All users are expected to use the right side of the pathway for their direction of travel, regardless of whether they are pedestrians or cyclists. However, there is little indication or direction as to the desired operation of the pathway in this manner.

Suggestions:

- Consider the signage recommendations identified for **Issue 10: Wayfinding and Etiquette Signage**
- Beyond engineering measures, the City can consider developing an education and communications campaign to ensure users know how to properly use the High Level Bridge and other shared pathway facilities. The City could consider a “positive re-inforcement” campaign that provides prizes or other incentives for people walking and cycling that were observed to be using the pathway properly.

4.1 Summary of Audit Findings and Suggestions

Issue	Location	Suggested Mitigation Measures
<p>Bridge Structure</p> <p>Issue 1: Pathway Width on Bridge Deck</p> <ul style="list-style-type: none"> The installation of the protective fencing has resulted in a reduction of the width of the pathways on both the east and the west sides of the bridge by approximately 0.3 metres. On-site observations indicate that these widths resulted in some conflicts (near collisions) between users of the pathways on both sides of the bridge. There is minimal separation between road users between cyclists, travelling in opposite directions on the east pathway due to the narrow width. 	<ul style="list-style-type: none"> Both sides of the bridge but particularly on the east side pathway as it is the narrower of the two sides and does not meet TAC guidelines for two-way multi-use operations. 	<ul style="list-style-type: none"> Given the existing conditions, to ensure the safe operation of the pathways, it is suggested that the pathway operations be modified <ul style="list-style-type: none"> Option 1: Convert Both Pathways to One-Way Shared Use Operation. Option 2: Maintain Shared Use Two-Way Operation on the West Side, and Convert East Side Pathway to Two-Way Pedestrian and One-Way Bicycle Operation Longer Term Options to Consider: <ul style="list-style-type: none"> Widening the east and west side pathways to a more generous width that would provide adequate separation for two-way shared use operation; Review feasibility of providing a pathway on the upper deck; Removing one lane of vehicle traffic on the bridge deck and reallocating this space to pedestrians and/or cyclists; and/or Constructing a new dedicated pedestrian and bicycle bridge.
<p>Issue 2: Lack of Barrier Between Pathway Users and Motor Vehicles</p> <ul style="list-style-type: none"> The gaps between the truss members along the bridge deck on both pathways present a potential safety risk. Crossfall is greater in the areas of the truss members, and the deck slopes towards the roadway. 	<ul style="list-style-type: none"> The length of the bridge structure. 	<ul style="list-style-type: none"> Consider installing enhanced physical separation between the carriageway and the west side and east side pathways (example: additional cables).
<p>Issue 3: Obstructions and Pinch Points</p> <ul style="list-style-type: none"> There are several pinch points along the pathways which have constrained widths. At these pinch points the pathway narrows and creates an obstruction for pathway users, this is a potential safety hazard. 	<p>Map of Pinch Point Locations (pg. 18)</p> 	<ul style="list-style-type: none"> Consider installing reflective hazard markings on all obstructions. Consider the installation of obstruction pavement markings. Consider installing additional warning signage at pinch points. Consider adding advance warning signs for pinch points. Consider removing where applicable the metal barrier located on the southeast approach.

Issue	Location	Suggested Mitigation Measures
<p>Issue 4: Centre Line on Pathways</p> <ul style="list-style-type: none"> The centre line on the east side of the bridge was removed. <ul style="list-style-type: none"> The lack of centre line makes it more unclear how the space should be used. The centre line on the west side of the bridge is no longer located in the centre of the pathway <ul style="list-style-type: none"> Approximately 0.3 metres of space is reduced for users travelling southbound on the west side of the bridge. 	<ul style="list-style-type: none"> The length of the bridge structure. 	<ul style="list-style-type: none"> Consider relocating the west centre line. <p>Suggested mitigation on the east-side is based on the options presented for Issue 1.</p> <p>For Option 2 (Issue 1)</p> <ul style="list-style-type: none"> On the west pathway, realign the yellow centre line in the centre of the existing pathway. On the east pathway, add a new white solid line to separate users (one-way bicycle to the left and two-way pedestrians to the right). <p>For Option 1 (Issue 1)</p> <ul style="list-style-type: none"> Add a new white solid line to separate users on both pathways (one-way bicycle to the left and two-way pedestrians to the right).
<p>Issue 5: Fence Design</p> <ul style="list-style-type: none"> The design of the fencing along both sides of the bridge. <ul style="list-style-type: none"> A person cycling may catch their handlebars on the posts if they travel too close to the fencing. 	<ul style="list-style-type: none"> The length of the bridge structure. 	<ul style="list-style-type: none"> Consider installing rub rails, but ensuring that a design is selected that doesn't further narrow the width.
<p>Issue 6: Speeding</p> <ul style="list-style-type: none"> Incidents of people cycling travelling at relatively high speeds for the volume of people using the pathway. <ul style="list-style-type: none"> As users are focusing on passing other users they may not be paying attention to other obstacles and users outside their immediate cone of vision. 	<ul style="list-style-type: none"> The length of the bridge structure but particularly at pinch points. 	<ul style="list-style-type: none"> Consider adding signage indicating users should travel slowly and use caution especially when passing and at pinch points. Signage should also be provided at the beginning and end of the pathway, and at regular intervals in both directions along the pathway. Enhance signage with temporary "SLOW" pavement markings.
<p>Issue 7: Lighting</p> <ul style="list-style-type: none"> Lighting and personal safety concerns were identified through the EBC Survey. The colour of the rotating decorative deck lighting impacts the brightness and visibility along the bridge deck. Lighting of the pathway specifically could help to illuminate obstructions and jogs in the pathway itself. Additional lighting could also help enhance personal safety and visibility in the evening. 	<ul style="list-style-type: none"> The length of the bridge structure. 	<ul style="list-style-type: none"> Consider installing additional pedestrian scale overhead lighting where feasible on the bridge pathway. Use decorative lighting that enhances visibility.

Issue	Location	Suggested Mitigation Measures
Approaches		
<p>Issue 8: Narrow Pathway Approaching and Exiting the Bridge Deck (South End)</p> <p>South End/East Side</p> <ul style="list-style-type: none"> The current width of this pathway does not meet TAC's minimum width guidelines based on the current operations. The pathway is constrained by vertical obstacles on both sides. The presence of the fence and the guard rail could potentially result in people cycling getting their handlebars caught in the railing. <p>South End/West Side</p> <ul style="list-style-type: none"> The current width of this pathway does not meet TAC's minimum width guidelines based on the current operations. The pathway is confined by a fence separating the pathway from the rail tracks. There is no fence separating people walking and cycling from motor vehicles. Utilities are also located within the pathway. The lack of separation between motor vehicles could create a situation where if a person walking or cycling were to lose control and fall off of the pathway they could be struck by moving motor vehicles. The limited lighting, overgrown vegetation and lack of visibility from the street can make the parallel multi-use pathway less appealing due to personal safety concerns. 	<ul style="list-style-type: none"> South end/east side approach. South end/west side approach. 	<p>South End / East Side</p> <ul style="list-style-type: none"> Consider widening the east side pathway by relocating the wooden fence further east to provide more space. Consider adding a rub rail on the existing railing on the approach to the east side of the bridge or consider replacing the type of separation currently used. "Narrow pathway" signage should be placed early at the start of the approach. Consider installing signage advising users that tandem riding and walking is not permitted. <p>South End / West Side</p> <ul style="list-style-type: none"> Consider widening the west side pathway. Consider installing a guard rail to prevent pedestrians and cyclists that fell from being struck by moving motor vehicles. Consider providing more lighting and additional vegetation maintenance on the designated multi-use pathway that runs parallel to the roadway on the west side of the bridge.
<p>Issue 9: Narrow Pathway Approaching and Existing Bridge Deck (North End)</p> <ul style="list-style-type: none"> Aside from a curb, there is no physical separation between the pathway and motorized vehicles. Overgrown vegetation. Existing multi-use pathway was closed during the time of the site visit constraining conditions further. This lack of separation could create a situation where if a person walking or cycling were to lose control and fall off of the pathway they may fall into the carriageway. 	<ul style="list-style-type: none"> North end approaches on both the east and west side. 	<ul style="list-style-type: none"> Consider the feasibility of widening the pathway on the east side of the bridge approach utilizing space within the roadway shoulder and/or additional right of way. For the west side, consider installing guard rail. Alternatively, reallocate the road space, and provide a wider shoulder as per the east side. Ensure vegetation is well maintained and cut back.
Overall Pathways		
<p>Issue 10: Wayfinding and Etiquette Signage</p> <ul style="list-style-type: none"> Signage is inconsistent. It is unclear how the pathway should be used and if users are to travel by mode or direction, which could result in confusion and conflicts between pathway users. Wayfinding signage for people cycling is unclear, which has the potential to result in confusion. Ring bell before passing signage is already provided at the beginning and end of the pathway; however, this is not located on the bridge itself. 	<ul style="list-style-type: none"> The length of the bridge structure and approaches. 	<ul style="list-style-type: none"> Ensure route wayfinding is accurate to prevent user confusion. Consider providing guidance signage and pavement markings indicating how the pathway should be used at regular intervals along the pathways. It is suggested that the type of signage used on the facility is consistent. Place additional signage such as "Bell or Yell" and/or "Cyclists Slow Down to Pass Pedestrians" signs and/or stencils in advance of entering the bridge crossing and at pinch points.

<p>Issue 11: Pavement Quality and Uneven Surfaces</p> <ul style="list-style-type: none"> Locations with debris and poor pavement quality, including cracks in the pavement and uneven seams between the pathway and the bridge joints, which could be tripping hazards. 	<ul style="list-style-type: none"> Southside approaches specifically but to be considered through the entire study area. 	<ul style="list-style-type: none"> Ensure that the pathways are a smoothly paved surface and kept free of debris.
Issue	Location	Suggested Mitigation Measures
Connections		
<p>Issue 12: Connectivity and Intersection Treatments</p> <ul style="list-style-type: none"> Connections to the High Level Bridge on both the north and the south side are important for overall network connectivity but also have important safety considerations particularly with the suggestions for Issue 1. <p>North Side:</p> <ul style="list-style-type: none"> There are a number of intersections that people need to cross to access the connections on either side of the bridge. People walking and cycling are sharing the sidewalk and crosswalk space, which can be uncomfortable and pose a safety risk to both user groups. It is unclear if people cycling are permitted to share the sidewalks and crosswalks with people walking The number of times a person walking or cycling needs to cross motor vehicle travel lanes also results in additional time spent waiting and may result in more risky behaviours. Additional crossings increase the risk of conflict between motor vehicles. <p>South Side</p> <ul style="list-style-type: none"> The crosswalks and refuge islands still are functioning as a shared space for people walking and cycling and can create confusion as well as space constraints as both users are travelling through the intersection 	<ul style="list-style-type: none"> North and south approaches to the bridge structure 	<ul style="list-style-type: none"> If options from Issue 1 are implemented, investigate improvements to network connections. Enhancing the connections to the desired routes on the north and south side of the bridge by: <ul style="list-style-type: none"> Improving the intersection transitions Reducing the number of required crossings or Providing a designated bicycle route on 109 Street Provide guidance on how people cycling should be travelling through the intersection Provide general wayfinding and signage to designated bicycle routes. Consider implementing physically separated bicycle and pedestrian facilities on roadways extending from the bridge
Education and Awareness		
<p>Issue 13: Shared Pathway Etiquette</p> <ul style="list-style-type: none"> There were some incidents where users were travelling at speeds that did not feel comfortable or suitable for the constrained conditions. People did not use their bell to pass when cycling or were passing when it was not safe to do so. There is no clear direction for how to use the pathway. 	<ul style="list-style-type: none"> The length of the bridge deck and City-Wide Campaign 	<ul style="list-style-type: none"> Consider the signage recommendations identified for Issue 10 Consider developing an education and communications campaign to ensure users know how to properly use the High Level Bridge and other shared pathway facilities and a “positive re-inforcement” campaign.