AGENDA

SPC ON TRANSPORTATION AND TRANSIT

June 26, 2019, 9:30 AM

IN THE COUNCIL CHAMBER

Members

Councillor S. Keating, Chair
Councillor J. Davison, Vice-Chair
Councillor G. Chahal
Councillor S. Chu
Councillor J. Farkas
Councillor J. Magliocca
Councillor E. Woolley
Mayor N. Nenshi, Ex-Officio

1. CALL TO ORDER

2. OPENING REMARKS

3. CONFIRMATION OF AGENDA

4. CONFIRMATION OF MINUTES

   4.1 Minutes of the Regular Meeting of the Standing Policy Committee on the Transportation and Transit, 2019 May 22

5. CONSENT AGENDA

   5.1 Status of Outstanding Motions, TT2019-0798

   5.2 Neighbourhood Speed Limits Update Deferral to 2019 October 23, TT2019-0833

   5.3 The Calgary Goods Movement and Logistics Advisory Group, TT2019-0719

6. POSTPONED REPORTS
   (including related/supplemental reports)

   None

7. ITEMS FROM OFFICERS, ADMINISTRATION AND COMMITTEES

7.1 RouteAhead Update, TT2019-0637

7.2 Calgary Transit At-Grade LRT Crossing Safety, TT2019-0638
Attachment 3 held confidential pursuant to Section 17 (disclosure harmful to personal privacy) of the *Freedom of Information and Protection of Privacy Act*,

Review Date: Confidential Indefinitely

7.3 Review of the Calgary Transit Public Safety Citizen Oversight Committee, TT2019-0684

7.4 Green Line Q2 2019 Update, TT2019-0811

8. ITEMS DIRECTLY TO COMMITTEE

8.1 REFERRED REPORTS
None

8.2 NOTICE(S) OF MOTION
None

9. URGENT BUSINESS

10. CONFIDENTIAL ITEMS

10.1 ITEMS FROM OFFICERS, ADMINISTRATION AND COMMITTEES
None

10.2 URGENT BUSINESS

11. ADJOURNMENT

MINUTES

SPC ON TRANSPORTATION AND TRANSIT

May 22, 2019, 9:30 AM
IN THE COUNCIL CHAMBER

PRESENT:	Councillor S. Keating, Chair Councillor J. Davison, Vice-Chair Councillor G. Chahal Councillor S. Chu Councillor J. Farkas Councillor J. Magliocca Councillor E. Woolley *Councillor G-C. Carra *Councillor D. Farrell *Councillor J. Gondek,
ALSO PRESENT:	Acting General Manager R. Vanderputten Acting City Clerk D. Williams Legislative Advisor L. Gibb

1. CALL TO ORDER

Councillor Keating called the Meeting to order at 9:30 a.m.

2. OPENING REMARKS

Councillor Keating provided opening remarks.

3. CONFIRMATION OF AGENDA

Moved by Councillor Gondek

That the Agenda for the 2019 Regular Meeting of the SPC on Transportation and Transit be confirmed, **after amendment**, as follows:

- by bringing forward item 7.2, 17 Avenue SE Stampede Crossing (17SX), TT2019-0506, to be dealt with immediately following item 6.1, Transportation Bylaw Changes, TT2019-0205.

Against: Councillor Farkas

MOTION CARRIED

4. CONFIRMATION OF MINUTES

4.1 Minutes of the Standing Policy Committee on Transportation and Transit, 2019 April 24

Moved by Councillor Farkas

That the Minutes of the Regular Meeting of the Standing Policy Committee on Transportation and Transit held on 2019 April 24, be confirmed.

MOTION CARRIED

5. CONSENT AGENDA

None

6. POSTPONED REPORTS

6.1 Motion Arising with Respect to Transportation Bylaw Changes, TT2019-0205

That Pursuant to section 6 (1) of the procedure bylaw, Committee, by general consent, suspended section 77(c) and 109 of the Procedure Bylaw, 35M2017, as amended, to allow Members additional time for questions of clarification and debate.

Speaker

1. Larry Heather

Councillor Chu rose on a Point of Order to clarify the ruling of the Chair, and request that there be equality with respect to Members of Committee keeping their questions to Administration relevant to the Recommendations.

Councillor Keating left the chair at 10:59 a.m. and Councillor Davison assumed the Chair.

Councillor Keating resumed the chair at 11:03 a.m. and Councillor Davison returned to his regular seat in Committee.

Moved by Councillor Carra

That with respect to Report TT2019-0205, the following be approved:

That the SPC on Transportation and Transit recommend that Council direct Administration to report back on the following with respect to the Recommendation 1 as contained in the Motion Arising, as required:

1. Direct Administration to work with the Province **to examine** changes to the Traffic Safety Act to allow for bicycles (including power bicycles) to treat stop signs as yield signs.

ROLL CALL VOTE

For: (7): Councillor Davison, Councillor Chahal, Councillor Farkas, Councillor Woolley, Councillor Carra, Councillor Farrell, and Councillor Gondek

Against: (3): Councillor Keating, Councillor Chu, and Councillor Magliocca

MOTION CARRIED

Moved by Councillor Carra

That with respect to Report TT2019-0205, the following be approved:

That the SPC on Transportation and Transit recommend that Council direct administration to report back on the following with respect to the Recommendations 2, 3 and 4 as contained in the Motion Arising, as required:

2. Direct administration to work with the Province to permanently exempt power bicycles from the requirement of having a brake lamp and a side mirror, and the rider requirement to wear a motor cycle helmet for power assist bicycles with a total continuous motor output rating of 750w or less; (currently 500w or less).

3. Direct administration to work with the Province to remove electric scooters from the prohibited miniature vehicles list and allow them to operate as bicycles in terms of their rules, rights and responsibilities, which will allow Calgary to pilot the devices.

4. Direct administration to work with the Province to change the Traffic Safety Act to allow mobility aides (electric scooters/wheelchairs) in bike lanes.

Against: Councillor Magliocca

MOTION CARRIED

Moved by Councillor Carra

That with respect to Report TT2019-0205, the following be approved:

That the SPC on Transportation and Transit recommend that Council direct administration to report back on the following with respect to the Recommendation 5 as contained in the Motion Arising, as required:

5. To encourage the Province to examine formally adopting the Alberta Bicycle Facilities Bike Design Guide, which will give our engineers certainty when designing modern bicycle infrastructure.

Against: Councillor Chu and Councillor Magliocca

MOTION CARRIED

Moved by Councillor Carra

That with respect to Report TT2019-0205, the following be approved:

That the SPC on Transportation and Transit recommend that Council direct administration to report back on the following with respect to the Recommendation 6 as contained in the Motion Arising, as required:

6. To encourage the Province to examine formally adopting the 'Making Alberta Roads Safer for Cyclists' recommended changes to the Traffic Safety Act, as prepared by the Alberta Cycling Coalition.

Against: Councillor Chu and Councillor Magliocca

MOTION CARRIED

Moved by Councillor Carra

That with respect to Report TT2019-0205, the following be approved:

That the SPC on Transportation and Transit recommend that Council direct administration to report back on the following with respect to the Recommendation 7 as contained in the Motion Arising, as required:

7. To encourage the Province to establish the role of Active Transportation Coordinator, to facilitate policy and design work at the provincial level and assist with regional and provincial planning and infrastructure.

ROLL CALL VOTE

For: (7): Councillor Keating, Councillor Davison, Councillor Chahal, Councillor Woolley, Councillor Carra, Councillor Farrell, and Councillor Gondek

Against: (3): Councillor Chu, Councillor Farkas, and Councillor Magliocca

MOTION CARRIED

Moved by Councillor Carra

That with respect to Report TT2019-0205, the following be approved:

That the SPC on Transportation and Transit recommend that Council direct administration to report back on the following with respect to the Recommendation 8 as contained in the Motion Arising, as required:

8. Direct City administration to establish a Bicycle Advisory Committee (or Active Transportation Advisory Committee) to facilitate a regular conversation between staff and citizens and support the work of our various Boards, Commissions, and Committees.

ROLL CALL VOTE

For: (3): Councillor Chahal, Councillor Carra, and Councillor Farrell

Against: (7): Councillor Keating, Councillor Davison, Councillor Chu, Councillor Farkas, Councillor Magliocca, Councillor Woolley, and Councillor Gondek

MOTION DEFEATED

That pursuant to Section 134(a) of Procedure Bylaw 35M2017, as amended Councillor Farrell requested that the lost motion be forwarded to Council for information.

7. ITEMS FROM OFFICERS, ADMINISTRATION AND COMMITTEES

7.1 Capital Project Construction Planning and Management, TT2019-0687

That pursuant to Section 6(1) of the Procedure Bylaw 35M2017, as amended, Section 78(2)(a) be suspended, by general consent, in order to complete the public speakers prior to the scheduled recess.

Speakers

1. Milton Bogoch

2. Larry Heather

Committee recessed at 12:10 p.m. and reconvened at 1:00 p.m. with Councillor Keating in the Chair.

Moved by Councillor Farkas

That with respect to Report TT2019-0687, the following be approved:

That Standing Policy Committee on Transportation and Transit recommends that Council:

1. Receive this report for information.

2. Direct Administration to consider full closures of a major roadway or intersection when there are no additional single lane closures impacting travel on major roads that would be used as the alternative route, with the exception of emergency situations;

3. Direct Administration to provide enhanced communications for emergency vehicle access as required by emergency services for future closures; and

4. Direct Administration to apply the learnings of the cross-departmental construction coordination committee model citywide (as contemplated on Page 2 of Attachment 2).

MOTION CARRIED

7.2 17 Avenue SE Stampede Crossing (17SX), TT2019-0506

A presentation entitled "17 Avenue SE Stampede Crossing (17SX)", dated 2019 May 22, was distributed with respect to Report TT2019-0506.

Speakers

1. Larry Heather

2. David Canada

Moved by Councillor Woolley

That with respect to Report TT2019-0506, the following be approved:

That the Standing Policy Committee on Transportation and Transit recommends that Council receive this report for information.

MOTION CARRIED

8. ITEMS DIRECTLY TO COMMITTEE

8.1 REFERRED REPORTS

None

8.2 NOTICE(S) OF MOTION

None

9. URGENT BUSINESS

None

10. CONFIDENTIAL ITEMS

None

10.1 ITEMS FROM OFFICERS, ADMINISTRATION AND COMMITTEES

None

10.2 URGENT BUSINESS

None

11. ADJOURNMENT

Moved by Councillor Davison

That this meeting adjourn at 2:00 p.m.

MOTION CARRIED

The following items having been forwarded to the 2019 June 17 Regular Meeting of Council:

CONSENT

Motion Arising with Respect to Transportation Bylaw Changes, TT2019-0205

Capital Project Construction Planning and Management, TT2019-0687

17 Avenue SE Stampede Crossing (17SX), TT2019-0506

The next Regular Meeting of the Standing Policy Committee on Transportation and Transit is scheduled to be held 2019 June 26 at 9:30 a.m.

CONFIRMED BY COMMITTEE ON

CHAIR	ACTING CITY CLERK

Transportation Report to
SPC on Transportation and Transit
2019 June 26

ISC: UNRESTRICTED
TT2019-0798

Status of Outstanding Motions

EXECUTIVE SUMMARY

Outstanding motions for the SPC on Transportation and Transit.

ADMINISTRATION RECOMMENDATION:
That the Standing Policy Committee on Transportation and Transit receives this report for information.

PREVIOUS COUNCIL DIRECTION / POLICY

On 2007 February 06, Personnel and Accountability Committee approved PAC2007-05 Status of Outstanding Motions and Directions, directing Administration to bring forward as an item of business to each SPC a list of tabled and referred motions and reports for each committee; such lists to be reviewed by each Standing Policy Committee to be dealt with on a quarterly basis.

BACKGROUND

This report and attachment provides a summary of outstanding motions and directions for the SPC on Transportation and Transit as of 2018 June 7.

INVESTIGATION: ALTERNATIVES AND ANALYSIS

Not applicable.

Stakeholder Engagement, Research and Communication

Not applicable.

Strategic Alignment

Not applicable.

Social, Environmental, Economic (External)

Not applicable.

Financial Capacity

Current and Future Operating Budget:

Not applicable.

Current and Future Capital Budget:

Not applicable.

Risk Assessment

Not applicable.

Transportation Report to
SPC on Transportation and Transit
2019 June 26

ISC: UNRESTRICTED
TT2019-0798

Status of Outstanding Motions

REASON(S) FOR RECOMMENDATION(S):

This is a report for information, to assist the committee in tracking its initiatives over time.

ATTACHMENT(S)

Attachment – Status of Outstanding Motions as of 2019 June 26.

STATUS OF OUTSTANDING MOTIONS AS OF 2019 JUNE 26

ITEM	ANTICIPATED T&T MEETING DATE	OWNER	PAGE
OUTSTANDING REPORTS	JAN-DEC 2019	GM TRANS	1
AT GRADE LRT CROSSING SAFETY	Q2 2019	TRANSIT	2
SPEED LIMIT REDUCTION UPDATE #1	Q2 2019	ROADS/TP	3
ROUTE AHEAD UPDATE – PRIORITIZATION FRAMEWORK	Q2 2019	TRANSIT	3
COMPLETE STREETS AND RESIDENTIAL STREETS UPDATE	Q4 2019	TP	3
SAFER MOBILITY PLAN ANNUAL REPORT	Q4 2019	ROADS	4
BIKE SHARE IN CALGARY UPDATE	Q4 2019	TP	4
SPEED LIMIT REDUCTION UPDATE #2	Q4 2019	ROADS/TP	5
GREEN LINE GARDENS UPDATE	Q4 2019	GL	5
CALGARY GOODS MOVEMENT STRATEGY	Q2 2021	TP	6

ITEMS FOR OTHER COMMITTEES	ANTICIPATED MEETING DATE	OWNER	PAGE
CALGARY TRANSIT PARK AND RIDE REVIEW UPDATE	Q2 2019	TRANSIT	6

ITEM	DATE OF REQUEST	SOURCE	SUBJECT	ANTICIPATED MEETING DATE
OUTSTANDING REPORTS	2007 JUNE	COUNCIL	At its meeting of 2007 June 20, the Personnel and Accountability Committee approved the following (PAC2007-05), That Administration, on a quarterly basis, bring forward as an item of business to each Standing Policy Committee a list of tabled and referred motions and reports for each committee; such lists to be reviewed by each Standing Policy Committee to be dealt with on a quarterly basis.	MAR JUN SEP DEC T&T
AT GRADE LRT CROSSING SAFETY	2018 NOV	NM C2018-1288	Moved by Cllr. Colley-Urquhart, seconded by Cllr. Jones, that with respect to NOM C2018-1288, the following be adopted: Now therefore be it resolved that Council direct Administration to provide an At-Grade LRT Crossing report that includes: Inventory of crossing treatments; inventory of protection measures, what they target, constraints and costs; best practices in design from across the industry; history of incidents; how The City studies, adapts and audits these crossings; and recommendations for Council on additional programs or initiatives that will address and crossing safety. And further be it resolved that Administration report back to the SPC on Transportation and Transit Committee by Q2.	Q2 2019

SPEED LIMIT REDUCTION UPDATE #1	2016 MAY	TT2016-2050	NOW THEREFORE BE IT RESOLVED that City Council directs City Administration to endorse a reduced unposted speed limit for neighbourhood streets, reporting with an implementation plan, as well as affected roadways map and definitions, through the Standing Policy Committee on Transportation and Transit no later than Q4 2019; AND FURTHER BE IT RESOLVED that City Council directs City Administration to provide a recommendation on whether the reduced speed limit should be 30 km/h and/or 40 km/h, as well as to what extent Collector classification streets should receive reduced limits, as part of an interim report as well as an engagement plan through the Standing Policy Committee on Transportation and Transit no later than Q2 2019;	Q2 2019
ROUTE AHEAD UPDATE – PRIORITIZATION FRAMEWORK	2018 JUNE	TT2018-0617	That Council: 2. 'RouteAhead Update to prioritize major transit growth projects' to no later than 2019 Q3.	Q3 2019 T&T
COMPLETE STREETS AND RESIDENTIAL STREETS UPDATE	2018 JUNE	TT2018-0628	That Council direct Administration to report back to Council no later than Q4 2019 on the effectiveness and implementation of the policies.	Q4 2019 T&T

SAFER MOBILITY PLAN ANNUAL REPORT	2018 DEC	TT2018-1315	That the SPC on Transportation and Transit recommends that Council: 1. Receive this report for information; and 2. Direct Administration to report back to the SPC on Transportation and Transit on the Safer Mobility Annual Report by Q4 2019.	Q4 2019 T&T
BIKE SHARE IN CALGARY - UPDATE	2018 JULY	C2018-0934	NOW THEREFORE BE IT RESOLVED, that Council direct administration to initiate a two-year pilot for bike share by September 2018 that will include: • An intake process for interested operators to participate • Data sharing requirements with permitted operators • A pilot consisting of up to 10,000 bicycles, scooters or other personal mobility devices • A performance-based system for permitted operators to gradually increase their fleet size, within set pilot limits • A permit and fee structure that covers administrative costs to regulate and manage the pilot program • Any other permit conditions to be imposed on bike share operators to ensure that the safety and convenience of roadway and sidewalk users is not unduly impacted And report back to Council through Transportation and Transit Committee with an update on the pilot in Q4 2019 and a final report with	Q4 2019 T&T

			potential further recommendations no later than Q4 2020.	
SPEED LIMIT REDUCTION UPDATE #2	2016 MAY	TT2016-2050	NOW THEREFORE BE IT RESOLVED that City Council directs City Administration to endorse a reduced unposted speed limit for neighbourhood streets, reporting with an implementation plan, as well as affected roadways map and definitions, through the Standing Policy Committee on Transportation and Transit no later than Q4 2019; AND FURTHER BE IT RESOLVED that City Council directs City Administration to provide a recommendation on whether the reduced speed limit should be 30 km/h and/or 40 km/h, as well as to what extent Collector classification streets should receive reduced limits, as part of an interim report as well as an engagement plan through the Standing Policy Committee on Transportation and Transit no later than Q2 2019;	Q4 2019
GREEN LINE GARDENS UPDATE	2019 APRIL	TT2019-0429	2. Direct Administration to report back to the SPC on T&T no later than Q4 2019 with a workplan including scope, cost, resources, funding source, engagement and delivery strategy for the Public Gardens Master Planning work and the development of six Public Garden Projects.	Q42019

CALGARY GOODS MOVEMENT STRATEGY	2018 NOV	TT2018-1289	5. Direct Administration to report back with an update on the Goods Movement Strategy implementation to Council through the SPC on Transportation and Transit no later than Q2 2021.	Q2 2021 T&T
ITEMS TO OTHER COMMITTEES				
CALGARY TRANSIT PARK AND RIDE REVIEW UPDATE	2018 MAR	TT2018-0126	That Council: 2. Direct Administration to continue to review intermunicipal transit solutions including regional satellite park and ride lots outside of the Calgary city limits through the Calgary Metropolitan Region Board and report back with an update on the feasibility of such lots by Q2 2019	Q2 2019 IGA

Transportation Report to
SPC on Transportation and Transit
2019 June 26

ISC: UNRESTRICTED
TT2019-0719

The Calgary Goods Movement and Logistics Advisory Group

EXECUTIVE SUMMARY

The Calgary Goods Movement Strategy (GMS) was approved by City Council on December 17, 2018 (TT2018-1289). The strategy was the first comprehensive study on goods movement in Calgary. Through the GMS, Administration has established collaborative partnerships with industry stakeholders. One of the recommendations of the GMS, was to establish an advisory group or task force to guide the implementation of the action items that were recommended in the Strategy. In receiving this report, Council is provided with information on how this recommendation (# 4 from TT2018-1289) will be moved forward by Administration.

Administration has been working with industry and stakeholders to establish an advisory group. This advisory group will provide a forum to continue conversations and collaboration with stakeholders who participated in the GMS project, and other members of the goods movement and logistics industry. It will be comprised of representatives from Administration, members of Council, the goods movement industry, Calgary Economic Development (CED), regional partners, academic institutions and others. The committee is tentatively named, "Calgary Goods Movement and Logistics Advisory Group (The Advisory Group)".

In Q1 2019, City Clerks have circulated Members of Council as to their interest in serving on the Advisory Group. Councillor Chahal, Councillor Davison and Councillor Farkas have expressed interest. Councillor Gondek has also expressed interest and offered to be an alternate, if needed.

The Advisory Group will advise on implementing the Goods Movement Strategy and help improve Calgary's potential as an inland market, focussing on identifying opportunities to benefit the transportation and logistics industries in Calgary. The group will act in an advisory capacity to The City. The advisory group should be included as a stakeholder for engagement on projects and research related to goods movement. The Advisory Group will report as necessary to City Council through the Standing Policy Committee on Transportation & Transit. The Advisory Group will be created in Q3 2019 and maintained by Administration with existing resources.

ADMINISTRATION RECOMMENDATION:

That the Standing Policy Committee on Transportation & Transit Committee recommend that this Report be received for information.

PREVIOUS COUNCIL DIRECTION / POLICY

At the 2018 December 17 Regular Meeting of Council, Council approved The Calgary Goods Movement Strategy as presented in report TT2018-1289. The recommendation #4 from this report was:

"Direct Administration to work with industry and stakeholders to establish a goods movement committee to provide input into the implementation and monitoring of Goods Movement Strategy. Request that the City Clerks circulate Members of Council as to their interest in serving on this committee, to return to Council with the results of the poll and a draft Terms of Reference no later than Q1 2019."

Transportation Report to
SPC on Transportation and Transit
2019 June 26

ISC: UNRESTRICTED
TT2019-0719

The Calgary Goods Movement and Logistics Advisory Group

BACKGROUND

The Calgary Goods Movement Strategy (GMS) was the first comprehensive study on goods movement in Calgary. The GMS highlights the economic importance of goods movement, describes issues and challenges experienced by the industry and provides tools to enhance goods movement for Calgarians. The GMS recommends 26 actions that complement each other and inform land use planning, development approval, economic development, investment decisions and transportation infrastructure planning and operations.

A common outcome of many goods movement strategies is the development of a freight-focused advisory group or forum. These groups are often called freight councils. They help implement the strategy, are effective tools used in many cities to speak for the freight industry with one voice, to promote dialogue between private- and public-sector stakeholders, and to advance or advocate for projects benefiting goods movement. The group can also identify new initiatives, foster collaboration and help set priorities.

A goods movement advisory body is recommended as the first step in implementing the GMS. Other jurisdictions have established similar advisory bodies to implement their goods movement strategies, such as the Goods Movement Task Force in Peel Region, Ontario and TransLink's Urban Freight Council in Vancouver.

INVESTIGATION: ALTERNATIVES AND ANALYSIS

Throughout the development of GMS, Administration has worked closely with Calgary Economic Development's Transportation & Logistics Advisory Committee. This committee was put on hold since Fall of 2018 with the intent to replace it with the new Goods Movement and Logistics Advisory Group.

The Advisory Group will be administered and managed by the Transportation Department. The City, as the largest and central municipality in the region, should be instrumental in enabling the group's activities. The Advisory Group will be made up of Administration, Calgary Economic Development (CED), members of Council, the goods movement industry, regional partners, academic institutions and others.

The Advisory Group will continue its collaboration process to connect stakeholders and use meetings to discuss specific areas of focus. It could also be charged with identifying new needs, updating the GMS on a timely basis and reviewing priorities.

The mandate of the Advisory Group will be as follows:

- To help implement the Calgary Goods Movement Strategy
- To provide a forum to bring together key public and private sector stakeholders, to guide the continuous innovation and improvement to the future of the goods movement
- To facilitate the exchange of information and to develop common messages on issues affecting goods movement;
- To identify investment attraction opportunities to Calgary
- To develop plans to improve Calgary's potential as an inland market
- Engage industry leaders to monitor emerging opportunities and challenges within transportation and logistics, across various sectors of the Calgary economy.

Transportation Report to
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ISC: UNRESTRICTED
TT2019-0719

The Calgary Goods Movement and Logistics Advisory Group

The Advisory Group will have the following responsibilities:

- Monitor, review and provide input and feedback to municipal, regional, provincial and federal initiatives related to goods movement;
- Develop an action plan with achievable goals and the required partnerships, for the implementation of short-term, intermediate and long-term recommendations from the Calgary Goods Movement Strategy
- Inform CED and City Council of economic business sectors that impact logistics needs – as well as specific business opportunities and issues impacting transportation and logistics in general.
- Promote CED and City Council's knowledge and expertise within the logistics sector businesses.
- Promote Calgary region as an Inland Market/Port and enable Calgary to reach its potential as Western Canada's logistics hub.

Although its focus necessarily will be Calgary-specific issues, the Advisory Group can ensure that the regional perspective is included in its membership and mandate. It could serve as the portal for examining specific topics of importance to the goods movement industry as well as for disseminating information to the broader goods movement community.

Stakeholder Engagement, Research and Communication

Several stakeholders were engaged in the process of developing the GMS. It has attracted significant interest and support from the public and private sector, as well as the distribution and logistics communities. Stakeholders want to continue to collaborate with The City to implement the GMS and promote Calgary's attractiveness as a place to grow and invest. The Advisory Group will provide a platform for continued collaboration.

The recommendation for a goods movement forum was put forward as part of the GMS following an extensive research on best practices and a jurisdictional scan. In Q1 2019, City Clerks have circulated Members of Council as to their interest in serving on the Advisory Group. Councillor Chahal, Councillor Davison and Councillor Farkas have expressed interest. Councillor Gondek has also expressed interest and offered to be an alternate, if needed.

Strategic Alignment

The advisory group, as a recommendation of the GMS, aligns with multiple Council approved policies and specifically supports:

- The Calgary Transportation Plan (CTP) by reviewing, enhancing and augmenting the goods movement policies within it. The GMS provides action items to help achieve the goods movement related goals listed in the CTP.
- The Municipal Development Plan by complementing and supporting urban growth policies. The GMS complements The City's growth management and industrial land strategies.
- 2020 Sustainability Directions, "A Prosperous Economy, Smart Growth". The recommendations from the GMS supports the attraction and retention of businesses that need to move goods to markets in Calgary, regionally, nationally and internationally.

The Calgary Goods Movement and Logistics Advisory Group

Social, Environmental, Economic (External)

This report and the recommendations included in this report were reviewed for alignment with The City of Calgary's Triple Bottom Line (TBL) Policy Framework. The Advisory Group shares the same vision as the GMS for a multi-modal system that is safe, economical, reliable, efficient and environmentally sustainable. Below are specific implications:

Social

Implementation of the GMS will support connecting goods and services, locally, regionally, and globally through a safe, efficient, reliable and connective goods movement network. The Advisory Group will help bring public and private-sector members of the transportation industry together with City Administration.

Environmental

The Advisory Group will help in the Implementation of the GMS which is intended to help minimize fuel consumption, greenhouse gas emissions and air pollutant emissions from goods movement activity.

Economic

The GMS was developed in close collaboration with Calgary Economic Development and other industry associations. Implementation of the GMS supports the economic development of Calgary by helping ensure the efficiency of goods movement, in turn making Calgary a more competitive location for businesses to locate. The Advisory Group will help improve the economy of Calgary by bringing together public and private sector stakeholders, to guide the continuous innovation and improvement in the transportation and logistics industry.

Financial Capacity

Current and Future Operating Budget:

The Advisory Group will be administered by City staff with existing resources. No operating budget implications are expected.

Current and Future Capital Budget:

No capital budget implications are expected.

Risk Assessment

The GMS has attracted significant interest and broad support from the private sector, distributors and the logistics community. They are eager to collaborate with The City to promote Calgary's attractiveness as a place to invest and grow. If a platform is not provided for continued conversation and involvement from the stakeholders, there is the potential of losing stakeholder trust.

Transportation Report to
SPC on Transportation and Transit
2019 June 26

ISC: UNRESTRICTED
TT2019-0637

RouteAhead Update

EXECUTIVE SUMMARY

This report provides an update on the status of implementation of RouteAhead, a 30-year strategic plan for public transit in Calgary. The 2019 review shows strong progress on overall transit network infrastructure development and improvements to customer-focus and efficiency of service delivery. The report also recommends the criteria to be used and list of major growth projects for prioritizing the future stages of development of the rapid transit network. Significant funding risks for the sliding scale Low Income Transit Pass program are presented, and a long-term sustainable funding model is required in advance of 2020.

ADMINISTRATION RECOMMENDATION:

That the Standing Policy Committee on Transportation & Transit recommend that Council:

1. Direct Administration to use the framework and list of major transit growth projects in Attachment 1 for prioritizing the future stages of growth of the rapid transit network, and provide an update through the SPC on Transportation & Transit by Q4 2019.
2. Direct Administration to continue advocacy with the Government of Alberta on a long-term funding extension for the Low Income Transit Pass program.
3. Direct Administration to develop recommendations for a long-term sustainable funding model for the Low Income Transit Pass program, and report back through the SPC on Transportation & Transit by Q3 2019.

PREVIOUS COUNCIL DIRECTION / POLICY

At the 2013 January 14 Combined Meeting of Council, report TT2012-0833, RouteAhead: A Strategic Plan for Transit in Calgary, was approved with the recommendation that Council direct Administration to prepare an annual status report on implementation of RouteAhead. Reports providing updates were subsequently prepared annually from 2013-2018.

As the 2018 June 25 Regular Meeting of Council, report TT2018-0617, RouteAhead Update, was approved with the recommendation that Council “Direct Administration to use the attached prioritization framework for major transit growth projects, and provide an update to Council through the SPC on Transportation & Transit by Q1 2019”.

At the 2018 December 06 Regular Meeting of Council, report TT2018-1405, Green Line: Staging and Right-of-way and RouteAhead Update – Deferral Request, was approved with the recommendation that “Council approve Administration’s request to defer the reports on … ‘RouteAhead Update to prioritize major transit growth projects’ to no later than 2019 Q3”.

BACKGROUND

In 2011 Council directed that a new long-term plan for Calgary Transit be created in accordance with the Calgary Transportation Plan (CTP). The RouteAhead strategic plan was developed to guide both operations and investment in transit over the next 30 years. The plan was approved by Council in 2013. RouteAhead establishes a clear vision for transit in Calgary and will be used by City Council and Administration to make informed decisions regarding customer-centric improvements, investments in capital and operating budgets, impacts of fare adjustments, service changes and other major business decisions.

Approval(s): **Michael Thompson** concurs with this report. Author: **Nikhil Lobo**

RouteAhead Update

The next section is organized under the headings of chapters in RouteAhead: Customer Experience, Network and Finances.

INVESTIGATION: ALTERNATIVES AND ANALYSIS

Customer Experience

A key outcome of RouteAhead was to foster greater focus on responding to the opinions, feedback and preferred value characteristics of Calgary Transit customers. Several attributes and supporting actions were developed through the Customer Commitment project, with a focus on measuring and improving Calgary Transit's performance related to Reliability, Safety, Helpfulness, Information, Ease of Use and Cleanliness.

The Customer Commitment performance measurement program underwent significant enhancements over 2018 to provide more frequent customer satisfaction data on a more granular level, as well as more detailed information on customers' travel choices and their underlying reasons.

The general perception of customer satisfaction was 75% in 2018, equivalent to the most recent five-year average. Overall customer satisfaction with recent trips was considerably higher, averaging 88% over 2018 and 87% in Q1 2019. 2018 performance on the specific Customer Commitment measures are as follows:

- Reliability: 88% Bus, 92% CTrain (perceived)
- Safety: 83%
- Helpfulness: 83%
- Information: 78%
- Ease of Use: 82%
- Cleanliness: 76%

More details on the Customer Commitment and Research program enhancements and scores are provided in Attachment 2.

Significant improvements to the waiting, riding and connecting experience have been implemented with the MAX network launch in 2018 November. Customer-focused improvements include amenities such as heated shelters, improved lighting and security features, larger platforms, and real-time bus arrival information displays. A survey conducted in 2019 February showed that 61% of customers in the MAX service area agreed that overall quality of service has improved since launch, and 87% and 67% of customers stated that heated shelters and real-time information displays were a valuable amenity, respectively.

Administration is currently implementing upgrades to payment systems to improve the convenience and flexibility of purchasing transit fares, with specifications and initial testing for the My Fare Mobile Ticketing System currently taking place. The first phase of mobile ticketing will include single fares and regular adult and youth monthly passes, and field testing will take place over Q3 2019. Further mobile fare product options, including other current fare products and expanded options, will be evaluated through future phases. Upgrades to existing Ticket Vending Machines will be complete by Q1 2020, with improvements to displays, transaction software, user-friendliness and accessibility.

RouteAhead Update

Several improvements to customer safety are underway for implementation in 2019. The recruitment for another class of Calgary Transit Peace Officers was completed in 2019 April, bringing the total number officers on the system to 102. The Transit Watch text messaging system was implemented in 2019 April, providing customers with another option to easily and discreetly report immediate safety and security issues using improved technology. The safety of at-grade Light Rail Transit (LRT) crossings and protection measures have also been reviewed in response to Notice of Motion C2018-1288 At-Grade LRT Crossing Safety, with a detailed report on current crossings and treatments, industry best practices, review processes and recommendations for safety improvement opportunities presented in TT2019-0638 Calgary Transit At-Grade LRT Crossing Safety at the 2019 June 26 SPC on Transportation and Transit.

Calgary Transit Access (CTA) customer satisfaction remained strong in 2018, with 91% of CTA bus customers and 85-88% of contracted service (e.g. taxi, accessible mini-vans) customers rating the service as good. 88% of CTA customers also agreed that the service is on time, 92% agreed that the service provided meets their needs, and 91% agreed that it is easy to book a trip. Online trip booking was launched as a pilot in 2018 with full rollout in 2019 January, providing customers with an accessible method to book their trips anytime through their computers or internet-enabled mobile phones. In Q1 2019, CTA also partnered with Calgary Public Library to offer training on how to use the application. Improvements have also been made to automatic customer notification systems and scheduling tools to provide customers with better information and more certainty on different types of trips being requested.

Network

Calgary Transit continues to make strong progress on the planning and construction of RouteAhead 10-year network objectives (Attachment 3). Major construction has been completed on many Bus Rapid Transit Network projects, with service commencing on the MAX Orange, Purple and Teal lines in 2018 November. Roadworks, pedestrian bridge and station construction are ongoing on the southwest MAX line, and it is anticipated that service will begin in late 2019. As part of this implementation, Calgary Transit is reviewing 20 existing bus routes in the southwest to develop a more effective and efficient bus network that supports the MAX rapid transit network. The goals of this review include improving connections to key destinations, providing routes that are more direct and easier to understand, reducing travel time, operating at higher service levels on higher ridership corridors, reducing duplication of service, improving efficiency and productivity of service and increasing ridership. The main public engagement has recently been completed, and feedback is being used to inform potential adjustments to the service proposals.

Construction of Green Line Stage 1, 16 Avenue N (Crescent Heights) to 126 AV SE (Shepard), is planned to begin in 2020.

The Airport Transit Study is underway, examining the full alignment, potential station locations, technology type, project staging and preliminary cost estimates for a transit connection between the Blue Line, Calgary International Airport and Green Line. Phase 1 of public engagement took place between Summer-Fall 2018, and Phase 2 with recommendations on technology, alignment and station locations will be released in mid 2019.

RouteAhead Update

Prioritizing Future Rapid Transit Network Growth Projects

Administration is in the process of updating and evaluating the benefits and costs of RouteAhead rapid transit network growth projects to help inform when and where the next major transit growth projects should be built. The list of projects and guiding framework and criteria for project prioritization are described in Attachment 1. Previously, Council directed the RouteAhead team to develop open and transparent criteria that was easy to understand, easy to apply to a variety of transit capital projects, evaluated relative benefits of various projects across the city and could be replicated in the future with different projects. The general outcomes desired by future projects reflect those in the RouteAhead document:

- Support of Land Use
- Improving the Customer Experience
- Provision to serve high ridership and overall mobility

Indicators and performance measures to quantify the benefits of each outcome (ridership, customer experience, economic, social, environmental) are described in more detail in Attachment 1. These measures can then be compared to the net operating costs, capital costs and additional project characteristics (e.g. transit oriented development, project readiness, strategic alignment) to assess the relative benefits and value of each project. Prioritizing projects across the entire network ensures decisions provide the greatest value to Calgarians. An update will be provided to Council through the SPC on Transportation & Transit by Q4 2019.

Prioritizing State of Good Repair

It is important to note that while funding new projects is important to the growth of the transit system, there remains critical asset replacement and renewal needs to sustain existing service and keep up with current ridership demand. Capital programs that improve the state of good repair of public transit and that support system optimization and efficiency will be essential to fund to ensure that Calgary Transit is able to continue providing reliable, efficient and safe service. Assets in this category include fleet vehicles, buildings, tracks and related equipment, electrical systems, fare systems, and other technology systems. Recent significant reductions in capital funding for lifecycle maintenance have increased the risk of service disruptions and failures of these assets, which will negatively impact the ability to sustain reliable operations. As significant portions of the Red and Blue Lines are greater than 30 years old, reduced capital funding for regular maintenance and lifecycle replacement will increase the likelihood of significant failures and extended unplanned reactive maintenance. Appropriate funding is needed for ongoing maintenance of these critical assets to remain in a state of good repair and support safe and reliable transit service. These requirements will need to be prioritized with network growth as further capital funding streams are identified; one example is the $200 million annual transit capital funding announced in the Bill 32 City Charters Fiscal Framework Act starting in 2027, which remains pending an agreement with the Province.

Other Network Updates

Station refurbishments at six CTrain stations were completed in between 2018 November and 2019 May. These stations were built in the 1980s and required upgrades to improve passenger movements, safety and comfort. Enhancements included improved lighting, security cameras, electrical and mechanical systems, wayfinding, public address systems, pedestrian flow, accessibility, and general repair of interior and exterior finishes.

RouteAhead Update

Stoney Transit Facility in NE Calgary began service in 2019 March. This is the largest indoor Compressed Natural Gas (CNG) facility in Canada, with capacity for 36 maintenance bays and storage of over 450 buses. There are currently 200 buses operating out of the facility, providing service mainly focused in northeast and northwest Calgary. The opening of this facility has enabled indoor storage and maintenance of vehicles previously stored outside at existing facilities, improving the reliability of service delivery.

Calgary Transit On Demand, an on-demand shared public transportation pilot funded by the Council Innovation Fund, is planned to begin service in Q3 2019. This one-year pilot will occur in the actively developing communities of Carrington and Livingston, providing connections from the communities to the rapid transit network and retail and community services near North Pointe bus terminal. Ride aggregation, dispatching and service delivery are being provided by external partners. The results of this one-year pilot will allow Calgary Transit to identify and evaluate further opportunities for providing more cost-effective, scalable and demand-responsive service options in areas or time periods that typically experience lower ridership.

On a regional perspective, the Intermunicipal Servicing Committee of the provincially-mandated Calgary Metropolitan Region Board recently authorized the creation of a Transit Subcommittee. The mandate of this Subcommittee is to develop a background report on intermunicipal transit in the Calgary Metropolitan Region and to provide recommendations for consideration into the Growth Plan and Servicing Plan process. The scope of this report is currently being defined. Discussions are also taking place on the feasibility of transit service connections with the City of Chestermere. These discussions will help further inform the definition of Calgary Transit’s role in the regional transit network.

Finances

Recent economic considerations and budget constraints are influencing the implementation of the RouteAhead plan. Some of the important impacts are highlighted in this section.

Ridership

After three years of ridership declines tied to the economic downturn, overall Calgary Transit ridership increased by 3.4% to 105.4 million trips in 2018. The mode share of commuter transit trips into downtown increased by 4.1% to 44.7%, after a 10-year low in 2017. Improvements in ridership are linked to the economic recovery and improvements made to the transit network in 2018; ridership increased by 7.4% in the catchment area of the 2018 MAX rapid transit network and revised surrounding bus network. Low Income Transit Pass ridership remained the highest growing customer segment over 2018, with regular single fares and monthly passes (adult and youth) showing modest growth over late 2018 and Q1 2019.

Revenues

Funding of transit service in Calgary relies on a combination of municipal taxes, transit fares and other non-fare revenue. Overall transit revenues grew by 2.0% in 2018, although still $9.9 million below the budgeted amount. Non-fare revenue grew by 4.4% year-over-year in 2018, driven by growth in revenues from charters, fines and advertising. The number of parking reservations declined by 4.3% in 2018 compared to the previous year, although demand and waiting lists remained high at specific locations such as 69 Street, Somerset-Bridlewood and Tuscany stations. Parking reservations have grown by 1.2% in Q1 2019 compared to 2018.

Council direction calls for Calgary Transit to achieve a Revenue / Cost (R/C) ratio of between 50 and 55 percent. When considering the above revenues and cost increases attributed to increasing prices for parts, technology, fuel, utilities and contractual services, the R/C ratio was 44% in 2018. In response to pressures on the operating gap between the cost per trip and revenue per trip, significant back-of-house and service-related efficiencies have been implemented over the past three years to reduce costs by approximately $19 million. Further efficiency and effectiveness initiatives are underway in 2019, and described in more detail in Attachment 4. Additional revenue growth is also being pursued through the renewal of traditional advertising contracts in Q3 2019 and exploration of innovative sources such as digital advertising, WiFi, commercial activities on transit property, and naming rights/sponsorships for stations, facilities, transit products and service for special events.

Long Term Funding for the Low Income Transit Pass Program

In partnership with The City, the Government of Alberta is currently contributing $4.5 million per year (plus a 5% contingency) from 2017 to 2019 for the sliding scale fare structure for the Low Income Transit Pass program. In the first 12 months of the sliding scale fare structure (April 2017 – March 2018), pass sales grew 70% compared to the same period a year earlier, with 409,000 passes sold over 2018. Two-thirds of pass sales have been at Band A ($5.30 in 2019), 29% at Band B ($37.10 in 2019) and 4% at Band C ($53.00 in 2019). The number of participants in the program has more than doubled, and it continues to support more than 63,000 low income Calgarians through the economic recovery by making it easier for them to access employment, appointments and services in the community. Low income Calgarians have been clear that the program has made significant positive impacts in their day-to-day lives, and this program has strong alignment with the City's poverty reduction and economic strategies.

However, the current funding model for this program is not sustainable due to significant increases to the City's subsidy costs from program growth and the conclusion of the Provincial grant at the end of 2019. Council approved additional one-time funding of $4 million in 2018 and $6 million in 2019 to manage the revenue impacts of this increased uptake, but funding required to make up this gap has not been identified for 2020 onward. In addition, the Government of Alberta has not provided an update on the status of the funding partnership beyond 2019, although advocacy has taken place over 2018 and 2019, including the YYCMatters campaign. A long-term sustainable funding model for the Low Income Transit Pass program will need to be established in advance of the 2020 budget adjustments in order to cover the estimated approximately $11 million funding gap. This will include scenarios for Low Income Transit Pass price increases to address some or all the funding shortfall, based on program growth and the status of Provincial funding beyond the current year. Post-election advocacy for an extension of the funding partnership will need to continue with the new Provincial government, in coordination with Intergovernmental & Corporate Strategy. More details on the program's background, status, benefits, and funding challenges are provided in Attachment 5.

Service Investments

The key challenge to delivering transit service as envisioned in RouteAhead continues to be operating funding. Higher service levels defined in RouteAhead and progression from introductory service to base service and Primary Transit Network (in some corridors) were established to make transit a more convenient and competitive travel mode. At that time, the operating funding gap to deliver this level of service was estimated to require an additional

$17.7 million per year. Attachment 6 outlines the challenges Administration faces in steering this evolution in Calgary today, and the service investments that would be required to keep pace with development, occupancy, and growing customer demand.

In addition to the southwest MAX line and associated bus service changes, some service improvements previously approved in One Calgary have been implemented in 2019 focusing on rapidly growing actively developing communities and industrial employment areas. Based on ridership growth, development and the Growth Strategy framework for funding direct incremental operating costs of actively developing communities, additional service was implemented in 2019 June in the communities of Nolan Hill/Sage Hill, Redstone/Cornerstone, Walden/Legacy and Mahogany/Cranston. Weekday bus service was introduced to the Stoney Industrial employment area in 2019 March, supplementing service enhancements to other NE and SE industrial employment areas implemented during the 2018 Transit Service Review to support businesses, employees and economic development.

Further service investments in actively developing and established communities were approved in One Calgary in 2020 onward, but will be refined through the annual budget adjustments process based on revised budget targets that are established. In response to recently approved operating budget reductions in 2019 June, Calgary Transit is also currently evaluating service reductions across the network. As part of this process, reductions in base and growth service budgets will impact current service levels, temporal/spatial coverage and implementation timelines in actively developing communities, but will be prioritized using a least-harm approach.

Vehicle Procurement

Procurement of new buses and Light Rail Vehicles (LRVs) for lifecycle replacement and service growth needs is continuing over 2019, funded through Federal and Provincial grants and approved One Calgary capital budget. 20 community shuttles and 32 40-ft CNG buses will be commissioned this year, along with 16 LRVs. The Alberta Community Transit Fund grants announced in 2019 March remain pending a funding agreement with the Province; however, combined with the approved One Calgary capital budget, these funding streams would allow for the procurement of approximately 35 LRVs by 2024. This will enable the retirement of Calgary Transit’s remaining U2 fleet, and will significantly improve the reliability, accessibility, security, and overall customer experience for CTrain service. Discussions and advocacy with the Government of Alberta are ongoing to secure an agreement within the required timelines for this enhanced procurement.

Stakeholder Engagement, Research and Communication

A letter from the Calgary Transit Customer Advisory Group is included in Attachment 7. The letter was written in 2019 June and expresses the priorities of a group consisting of 14 members with eight new members as of fall 2017.

Strategic Alignment

The investments and improvements discussed in this report are aligned with One Calgary 2019-2022, Infrastructure Calgary, RouteAhead, the Calgary Regional Transit Plan (2009), the Municipal Development Plan/Calgary Transportation Plan, the Enough For All poverty reduction strategy, and Calgary’s Economic Strategy.

Social, Environmental, Economic (External)

Providing transit service plays a key role in Calgary's overall mobility plan. In addition to the direct transit customer benefits, investment in public transit benefits the broader community by:

- helping revitalize corridors and main streets,
- providing mobility choice,
- connecting employers to an expanded workforce
- supporting GHG reduction, and
- supporting redevelopment, particularly at Transit Oriented Developments.

Public transit provides choice, expanded opportunity to move and connect with the community, with a more convenient and socially inclusive mode of travel.

The sliding scale fare structure for the Low Income Transit Pass provides fares better aligned to the ability to pay for many low income Calgarians, supporting them during the economic recovery, improving economic resiliency, enhancing their mobility options and enabling them to become more active community members. Furthermore, enhancing affordability improves accessibility to a range of City places, spaces and services, improves formal and informal social connections for low income persons and contributes to improved economic participation and quality of life.

Investments in the rapid transit network and bus connections to growing employment and education centres supports improved economic development, business growth and place-making.

Financial Capacity

Current and Future Operating Budget:

Administration has responded to economic conditions by focusing on improved efficiency and effectiveness of service delivery and support. Moderate strategic investments in the rapid transit network, actively developing communities and industrial employment areas have been implemented. Service reductions in response to recently approved operating budget reduction targets are currently being evaluated. A long-term sustainable funding model will be required for the Low Income Transit Pass program beyond 2019.

Current and Future Capital Budget:

There are no capital budget implications associated with the recommendations in this report.

Risk Assessment

A funding commitment beyond 2019 for the sliding scale Low Income Transit Pass program has not been made by the Government of Alberta. There is a significant risk to the structure of this program if a long-term sustainable funding partnership is not established.

Significant back-of-house and service-related efficiencies have been implemented over the past three years in response to budget pressures and reduction targets. Further reductions in base and growth service budgets as part of the operating budget reductions process will divert from

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TT2019-0637

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the vision outlined RouteAhead and impact current service levels, temporal/spatial coverage and implementation timelines in actively developing communities.

Recent significant reductions in capital funding for maintenance of infrastructure, fleet and technology systems have increased the risk of failures of these assets and extended unplanned service disruptions, which will negatively impact the ability to sustain reliable operations.

REASON(S) FOR RECOMMENDATION(S):

This report provides an update on progress related to RouteAhead, a 30-year Strategic Plan for Transit in Calgary.

Attachment 1 provides the framework that will guide the prioritization of major rapid transit network growth projects as capital funding becomes available.

Given the unprecedented user growth and uncertain status of the funding partnership with the Government of Alberta beyond 2019, a long-term sustainable funding model for the Low Income Transit Pass will be required to continue the program in a sliding scale structure.

ATTACHMENT(S)

1. Attachment 1 – Guiding Framework for Prioritizing Future RouteAhead Capital Projects – TT2019-0637
2. Attachment 2 – Customer Commitment and Research Program Update – TT2019-0637
3. Attachment 3 – RouteAhead Update: Status of Capital Projects – TT2019-0637
4. Attachment 4 – Calgary Transit Efficiency and Effectiveness Improvements – TT2019-0637
5. Attachment 5 – Calgary Transit Low Income Transit Pass Program – TT2019-0637
6. Attachment 6 – RouteAhead Update: Progress Toward Service Goals – TT2019-0637
7. Attachment 7 – 2019 Calgary Transit Customer Advisory Group Letter – TT2019-0637

Guiding Framework for Prioritization of Future RouteAhead Capital Projects

This attachment describes the criteria by which future rapid transit network growth projects identified in Calgary Transit's 30-year strategic plan, RouteAhead, will be evaluated in terms of the relative benefits to customers, the transportation network and Calgarians in general, and overall capital and net operating costs. Any such prioritization could then be advanced to departmental and corporate infrastructure prioritization frameworks to align with other transportation and city needs and make the best match with available funding.

Prioritization of the projects will not change the current approved capital projects in One Calgary 2019-2022 as the projects are outside of the 4-year anticipated capital funding envelope.

Prioritizing Future RouteAhead Capital Projects

Administration is in the process of updating and evaluating the benefits and costs of RouteAhead capital projects to help inform when and where the next major rapid transit network growth projects should be built. Previously, Council directed the RouteAhead team to develop open and transparent criteria that was easy to understand, easy to apply to a variety of transit capital projects, evaluated relative benefits of various projects across the city and could be replicated in the future with different projects

The general outcomes desired by future projects reflect those in the RouteAhead document:

- Support of Land Use
- Improving the Customer Experience
- Provision to serve high ridership and overall mobility

These measures can then be compared to the capital and net operating costs of the project to assess the relative benefits and value of each project.

Prioritizing New Projects with a Focus on Reducing Operating Costs

Operating funding remains a significant constraint for expansion of transit service. One way of reducing required future operating funding is prioritization of future projects by evaluating reduced net operating costs. This would favour new transit capital projects that reduce, or minimize the need for additional operating funding over projects that would require significant new operating dollars. The impacts of this scenario will also be evaluated as part of future prioritization evaluations.

Framework

The table below outlines the prioritization criteria from RouteAhead as well as including Triple Bottom Line criteria that was used in the prioritization of Green Line Stage 1.

RouteAhead Project Prioritization - Project Criteria and Weighting

	Weighting (%)	Criteria		Metric
Benefits	30	Ridership		Passengers per avg. weekday
	20	Customer Experience	Increases travel time advantage	mins / trip
			Overcomes issues of reliability and delay	on time performance
			Increases passenger capacity	capacity / corridor
	20	Economic	Population Opening Day	# Population in 800m radius
			Population Future	# Population in 800m radius
			Jobs Opening Day	# Jobs in 800m radius
			Jobs Future	# Jobs in 800m radius
	20	Social	Community Services	# of Services in 1,000m radius
			Affordable Housing Units	# of Affordable Housing Units in 600m
			Low Income Population Served	Total # of Low Income Pop in 600m radius
	10	Environmental	GHG Emissions Reductions	Tonne CO2/Year
			Proximity to MDP Activity Centres and Corridors	# Stations within Corridor in 800m
Costs		Capital Cost		$ / Million
		Net Operating and Maintenance Cost		$M / Year
Additional Considerations		Additional Considerations and Project Characteristics	Serves high ridership corridors and mode progression	Ridership on existing corridors (supports existing travel patterns and alleviate overcrowding)
			Contributes to lifecycle maintenance and asset management	Broader reconstruction of existing corridors
			Transit Oriented Development	Coordination with other City of Calgary TOD projects, TOD Strategy and priorities
			Coordination with other City Departments	Alignment with other City department capital and operating projects
			Community/Project Readiness	Community and project readiness on project needs and goals
			Strategic Alignment	Alignment with additional approved City strategies
			Future Technology Implications	Alignment with technological advancements and resiliency

Based on feedback from Council and other stakeholders, the highest weight has been placed on Ridership (30%), followed by Customer Experience (20%), Economic (20%), Social (20%) and Environmental (10%) benefits. These signify a focus on maximizing benefits and return on investment for the most customers, as well as highlight associated positive outcomes from rapid transit projects.

Prioritization Approach

The intention of the criteria and weighting presented above will be to produce an assessment of the rapid transit projects based solely on benefits first, independent of capital and operating cost constraints. The second part of the approach will be to compare the projects against the net operating costs and capital costs, to evaluate the relative benefits, value and financial impacts. Additional considerations such as High Ridership Corridors, Transit Oriented Development and Coordination with other City Departments and key City strategies will also be incorporated from a qualitative perspective to account for project readiness and corporate coordination.

This approach provides an objective evaluation of the relative benefits, constraints and value of rapid transit network growth projects across the city, and allows for informed decision-making when considering funding availability. Prioritizing projects across the entire network ensures decisions provide the greatest value to Calgarians.

Ongoing capital investment programs in assets such as bus and train procurement, infrastructure maintenance and station refurbishments will not be prioritized against the rapid transit network expansion projects through this process, but will need to be identified and accounted for as further capital funding streams are identified. Appropriate funding is needed for ongoing maintenance of these critical assets to remain in a state of good repair and support safe and reliable transit service.

Project List

The rapid transit network growth projects listed below have been identified in RouteAhead as well as some additional projects approved by Council after RouteAhead (Westbrook to MRU Transit Connection, in-street MAX improvements to Routes 301 and 302). Some projects (e.g. 162 Ave Transitway, Shaganappi HOV and North Regional Context Study BRT) were previously identified as beyond the RouteAhead timeframe, but are now being included because of advances in approved development adjacent to the project area.

In the case of Green Line North and South, Blue Line NE and MAX Purple extensions, projects have been defined into discrete segments to allow for incremental expansion based on operational and customer requirements, development and consistent with the traditional, successful expansion model of the LRT network. This does not preclude multiple segments from being constructed together if funding is available at the time.

The rail and bus rapid transit (BRT) projects to be included in further evaluation for prioritization are presented below in alphabetical order. An update on project prioritization will be provided to Council through the SPC on Transportation & Transit by Q4 2019.

Rail Programs

Airport Transit Connector	Blue Line to Airport
	Green Line to Airport
Blue Line NE extension	Saddletowne to 88 AV NE
	88 AV NE to 128 AV NE
	128 AV NE to Stonegate
Blue Line W extension	69 ST SW to 85 ST SW
Green Line N extension	16 AV N to 64 AV N
	64 AV N to Beddington BV N
	Beddington BV N to 96 AV N
	96 AV N to North Pointe
	North Pointe to 160 AV N
Green Line S extension	Shepard to McKenzie Towne
	McKenzie Towne to Auburn Bay/Mahogany
	Auburn Bay/Mahogany to Seton
Red Line S extension	Somerset-Bridlewood to 210 AV S
Westbrook to MRU Transit Connection	Blue Line connection to Mount Royal University and Currie Barracks area
8 AV Subway	Red Line/Blue Line downtown separation

BRT Programs

MAX 301 North	In-street improvements to Route 301 BRT North
MAX 302 Southeast	In-street improvements to Route 302 BRT Southeast
MAX Purple extension	Transitway extension: 52 ST SE to 84 ST SE
	Transitway extension: 84 ST SE to City Limits
	Downtown/Green Line tie-in
MAX Teal extension	In-street extension from Douglas Glen to 68 ST SE
North Regional Context Study/144 AV N BRT	New in-street BRT route: Tuscany Station to Nose Creek
NW-HUB/West Campus Mobility	New in-street routes
Route 305 West	In-street improvements to Route 305 BRT West
Shaganappi HOV	HOV lanes: Bowness RD to Stoney TR
52 ST BRT	In-street BRT route from Saddletowne to Seton
162 AV S Transitway	New transitway BRT route: Somerset-Bridlewood to west Providence

Calgary Transit Customer Commitment and Research Update

Overview

Calgary Transit launched its Customer Commitment in September 2015. It is our promise to deliver the six qualities of service that transit customers identified as the most important and was aligned with the corporate customer service approach. Those qualities are being Safe, Reliable, Helpful, Informative, Easy-to-Use, and Clean.

The Customer Commitment stemmed from RouteAhead with further input from the Calgary Transit Customer Advisory Group, customer focus groups and employees.

Our Customer Commitment performance is primarily measured through surveys. At the start of 2018, Calgary Transit implemented a new survey methodology to provide more frequent customer satisfaction data, as well as more detailed information on customers' travel choices and their underlying reasons. This attachment presents recent results from the enhanced customer research program.

New Methodology – The Customer Research Program

The Customer Satisfaction and the Safety, Security and Cleanliness surveys have been the primary sources for Customer Commitment performance measures since its launch. However, these surveys were only conducted on an annual basis, and had seen few changes in content or methodology since their inception in the 1990s. A comprehensive review of this research approach highlighted that there were missed opportunities to better understand customers' needs and experiences, compared to new methodologies and technological capabilities.

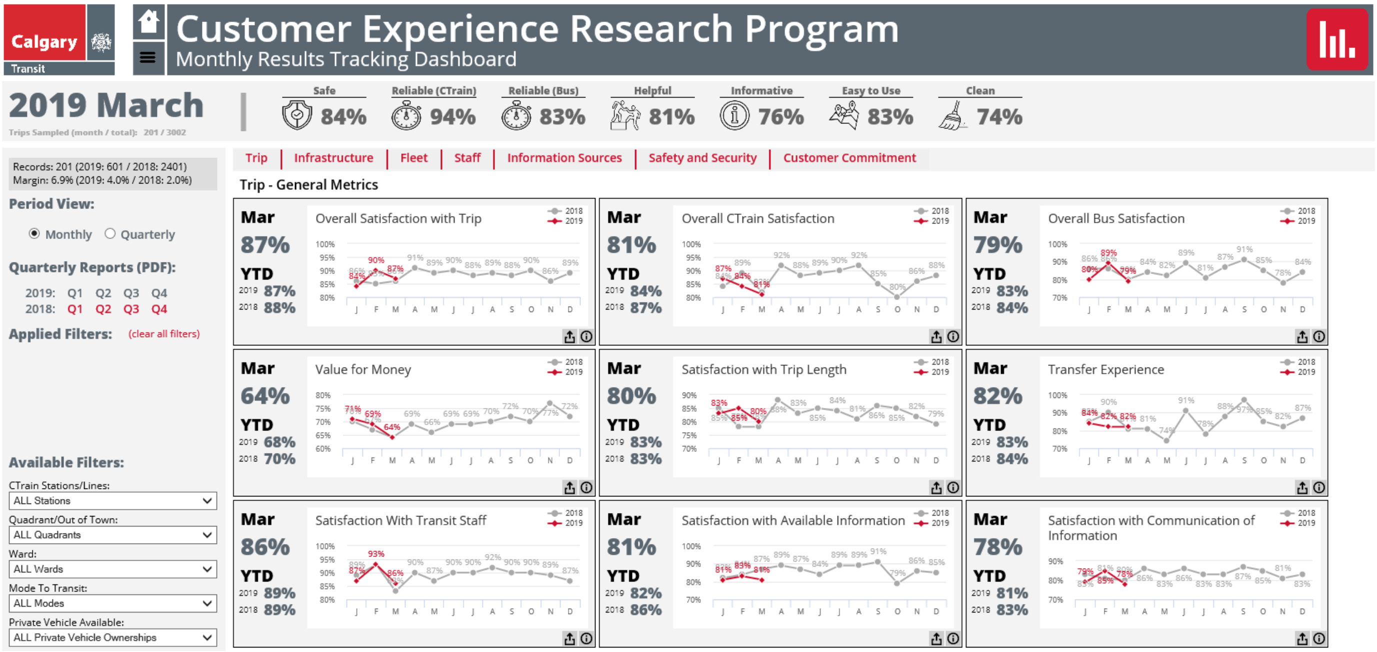
At the start of 2018, both surveys were replaced by a different set of survey tools:

1. A monthly transit performance survey focused on the most recent trip
2. A biennial usage and attitudes survey focusing on general perceptions
3. A choice modelling survey that is conducted as needed to understand customer choices and tradeoffs

<u>Monthly Transit Performance Survey</u>

The new research program has a number of benefits. As with the old annual surveys, it provides a representative understanding of customer needs and satisfaction; however monthly data enables increased responsiveness to changes in customer perceptions based on recent experiences, and better measurement of the effectiveness of adjustments. The new research program also has a stronger focus on actionable outcomes. By collecting information more often based on customers' recent trip, we can respond to service issues in a timely manner.

Monthly data has also allowed Calgary Transit to develop an internal dashboard to share the information with Calgary Transit staff and leaders. A snapshot of the dashboard from March 2019 is shown below.

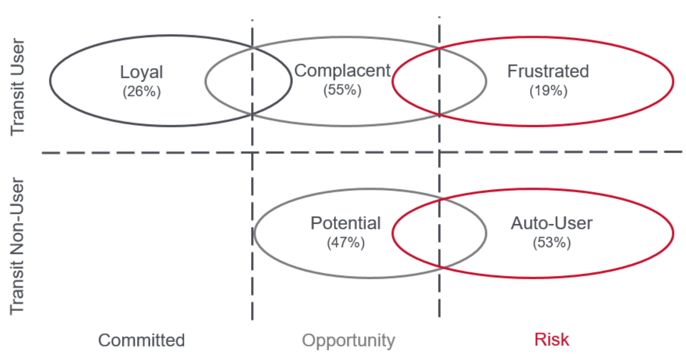


Biennial Usage and Attitudes Survey

The biennial Usage and Attitudes Survey information on behaviour, attitudes, and motivations is used to understand market characteristics, market perceptions and motivations for using transit and other modes of transportation. This was conducted for the first time in 2018 and provides an opportunity to better understand both our customer and non-customers groups, for targeting service improvements, customer experience investments, marketing and communications. The results of the survey identified three main categories of Calgary Transit customers:

- *Loyal Customers* are committed to Calgary Transit. They mostly use transit to commute to and from work, but also for convenience and affordability. Loyal users are very satisfied with the quality of service, ease of travel, and safety. They use transit because it is better for the environment, more relaxing than driving and less expensive than driving.
- *Complacent Customers* are relatively satisfied, but are less committed than loyal users. Transit is attractive to them due to its affordability and because it is better for the environment. They find parking a hassle and like being able to do something else with their commuting time. Complacent users, however, believe driving is faster and more reliable.
- *Frustrated Customers* are regular transit users who are not satisfied. They heavily favour driving in terms of speed, reliability and convenience. They continue to use public transit because they lack vehicle access and are deterred by the costs of driving and parking.

Amongst non-users there are *auto users* and *potential users.* Auto users are very committed to driving and largely uninterested in public transit. Potential users have regular access to a vehicle and favour their cars for the speed and perceived reliability. They use transit to attend social events and represent the greatest opportunity amongst non-users.

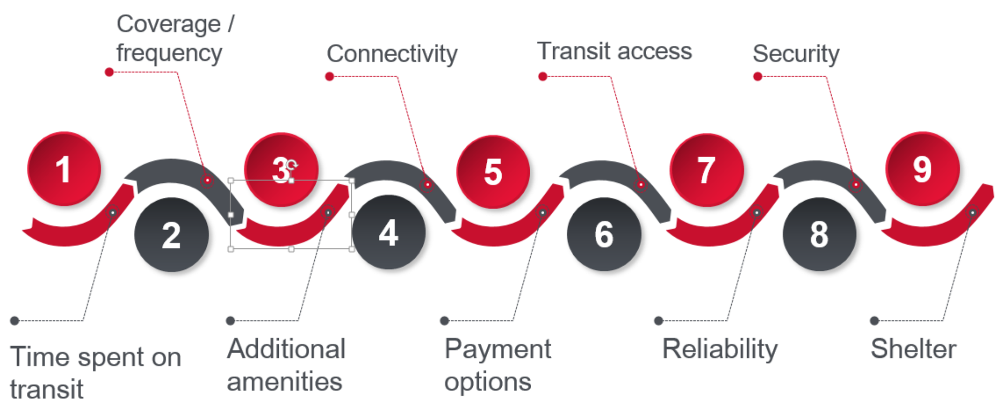


Choice Modelling - Ridership

Choice modelling is the third element of the research program and also the most innovative. Choice modelling helps to determine what value customers place on various components of transit service and enables an understanding of what combination of attributes and trade-offs will provide the largest benefit.

Choice modelling can be performed on any topic once broken down into its smaller components. The first topic that Calgary Transit explored through choice modelling was ridership, evaluating the impacts of various attributes including price, speed, frequency, amenities, fare payment, and reliability improvements.

The results of the choice modelling research indicated that price and travel time on transit were the most significant factors in driving ridership. Other service design elements that also play an influential roles in driving ridership are service coverage and frequency, supplementary amenities (including WiFi, bike racks, luggage space), and connectivity improvements (including bike storage, free and paid parking).



Results of the analysis also indicated that different customer groups primarily value different attributes. Monthly pass holders are mainly attracted to transit service because of core service attributes such as frequency, travel time, and service span. Lapsed users are attracted to transit by free parking, faster service, coverage in new communities and WiFi. Single ticket users are attracted by improved speed and travel time, WiFi and parking availability. Both lapsed users and single ticket users are deterred by slower service, a lack of cash payment and poor sidewalk conditions for transit access.

Analysis of these results are ongoing, and will be used in the business planning process to target investments in service attributes and amenities for highest value and customer gains.

Customer Commitment Performance

The new research program has led to revisions in Calgary Transit's Customer Commitment performance measures. The new and more frequent measures provide a more accurate, timely, and detailed view of our performance. Each new measure (with the exception of reliability) is an index made up of two components:

1. Trip-based perceptions of specific aspects of the experience as they relate to each element of the Commitment
2. General perceptions surveyed biennially through the usage and attitudes survey or polls

Previously, each element of the Customer Commitment was rated through general perceptions only. General perceptions tend to change slowly and are often impacted by a single notable experience or media coverage. Trip-based questions ask about our customers' experiences on their most recent trip and are designed to be a more accurate reflection of the experiences on a day-to-day basis. The table below outlines the new measures, their components, and 2018 performance. This information is also published online at www.calgarytransit.com/customer-commitment.

Customer Commitment Elements and Performance

Element	Components of the new measure	2018
Safety	General perception of safety plus trip-based perceptions of stop/station/vehicle safety.	83%
Reliability – Bus	Percentage of buses that depart from major stops no more than one minute early or five minutes late.	88%
Reliability – Train	Trip-based perception of CTrain reliability	92%
	Monthly average number of major CTrain delays greater than 30 minutes.	4
Helpfulness	General perception of helpfulness plus trip-based perceptions of operators and transit staff encountered.	83%
Information	General perception of information plus trip-based perceptions of the available information and how it was communicated.	78%
Ease-of-Use	General perceptions of ease of use, fares and frequency plus trip-based perceptions of accessibility, park and ride, transfers, length of trip, and information sources.	82%
Cleanliness	General perception of cleanliness plus trip-based perceptions of cleanliness at stops, at stations and inside vehicles.	76%

Overall Satisfaction

Calgary Transit also tracks overall satisfaction as a general perception in the biennial Usage and Attitudes survey and as a measure of the last trip through the monthly survey. In 2016, overall customer satisfaction with Calgary Transit was 81% and the highest it had been since 2000. The general perception of customer satisfaction was 75% in 2018, equivalent to the most recent five-year average. Overall customer satisfaction with recent trips, measured through the monthly performance survey, averaged 88% over 2018 and 87% in Q1 2019.

Moving Forward – 2019 - 2022

Due to recent financial constraints, Calgary Transit has slowed the pace of investments in improvements to the customer experience. Our current approach has been to make modest improvements that maximize value to customers while minimizing the impact to our operating budget. Some of the work planned for 2019 and into 2020 includes:

- Implementation of the southwest MAX line which makes Calgary Transit easier to use through faster, more reliable, and more convenient service.
- Safety, communication and comfort-focused amenities in high traffic MAX locations.
- Implementation of Calgary Transit On Demand, a one-year pilot for on-demand shared transportation service in the actively developing communities of Carrington and Livingston.
- Implementation of Transit Watch, a text message service that allows customers to discreetly report immediate safety concerns and incidents.
- Hiring more Peace Officers to contribute to customers' sense of safety.
- Implementation of My Fare mobile ticketing, which will give customers a more convenient and flexible fare payment option.
- Investments in improvements at priority LRT crossings.
- Completion of refurbishments at six older CTrain stations, consisting of improved lighting, security cameras, electrical and mechanical systems, wayfinding, public address systems, pedestrian flow, accessibility, and general repair of interior and exterior finishes.
- Investments in transit priority measures to improve bus reliability.
- Replacement of our oldest CTrain cars (U2s) to improve LRT reliability.
- Implementing service improvements previously approved in One Calgary in the actively developing communities of Redstone/Cornerstone, Nolan Hill/Sage Hill, Walden/Legacy and Mahogany/Cranston.
- Reviewing opportunities to improve the quality of bus stop cleanliness through revised contracts with external vendors.

With the ongoing learnings from the customer research program as well as other sources of customer information, we plan to continue focusing on the customer experience and the highest return on investment.

RouteAhead Update: Status of Capital Projects

The table below outlines the status of rapid transit projects that have been identified as "10-year" priorities in the RouteAhead plan.

Capital Project	Functional Plan	Pre-Design	Current Status
Green Line	Approved	Design for Stage 1 ongoing	Early works underway in Southeast (utility relocation, environmental remediation, land acquisition, bus route upgrades). Tunnel analysis being finalized. Light Rail Vehicle RFP application being finalized. Project Execution Plan being finalized. Main project RFQ being prepared to be released to market.
17 Avenue SE BRT	Complete	Complete	MAX Purple service launched in 2018 Nov. Final minor completion work, landscaping and Phase 2 intersection road works underway.
Southwest BRT	Complete (updated)	Complete	Roadworks, pedestrian bridge and station construction ongoing. Service launch in late 2019.
South Crosstown BRT	Complete	Complete	MAX Teal service launched in 2018 Nov. Roadworks and station construction for shared portion with Southwest BRT (between Heritage Drive and Glenmore Trail) ongoing.
North Crosstown BRT	Complete	Complete	MAX Orange service launched in 2018 Nov.

NW-HUB (formerly identified as *West Campus Mobility*)	In progress	n/a	Functional planning is in progress, with multiple stakeholders involved (funding partners are University of Calgary and Alberta Health Services). Transit connectivity improvements implemented in study area through MAX Orange, Route 8 North Pointe-Foothills Medical Centre and Route 91 Lions Park-Foothills Medical Centre.

Calgary Transit Efficiency and Effectiveness Improvements

The table below outlines improvements to the efficiency and effectiveness of Calgary Transit service delivery and back-of-house support over 2017- 2019 Q2.

Category	Initiatives

Structural Cost Reduction	• Organizational restructuring
	• Deferred hiring and reprioritization of functions
	• Strategic reductions in positions
	• Significant savings in wages, benefits and materials across divisions
	• Cutting discretionary spending
	• Zero Based Review Recommendations Implementation:
	  o Fleet service lane and reliability improvements
	  o Outsourcing outside maintenance functions
	  o In-housing rail systems communications maintenance functions

Service Optimization	• Improved productivity and optimization of Operator scheduling • Increased adjustments to schedules for lower performing routes and time periods to better match ridership demand and productivity • Increased realignment of service between regular and community shuttle buses based on ridership demand for operating cost savings • Growth service hours eliminated in 2017 and 2018 • Savings of 35,000 service hours in 2017 for Budget Savings Account • Service hour efficiencies and reinvestment through 2018 Transit Service Review to fund 57% of annual operating cost of the MAX network • Savings of 25,700 annual service hours in 2019 • Service efficiencies and reinvestment for improved productivity through the 2019 Transit Service Review
Process Optimization and Continuous Improvement Initiatives	• Operating cost and productivity improvements from changes to cash boxes on buses • Workforce savings and productivity improvements though process reviews and new technology in Operations Control, Recruitment and Training • Fuel and vehicle operating cost savings from installation of fueling stations at Spring Gardens garage • Savings from improved inventory controls, vendor performance monitoring, contract negotiations and cost-effectiveness for Operator and Outside Maintenance supplies

	• Improved effectiveness of Peace Officer deployment through Downtown Outreach Addictions Partnership • Improved productivity of trip booking, scheduling and dispatching through new technology in Calgary Transit Access • Cost savings and mitigation through fuel diversification and replacement of diesel buses with Compressed Natural Gas
Total Approximate Savings Amount	$19 million

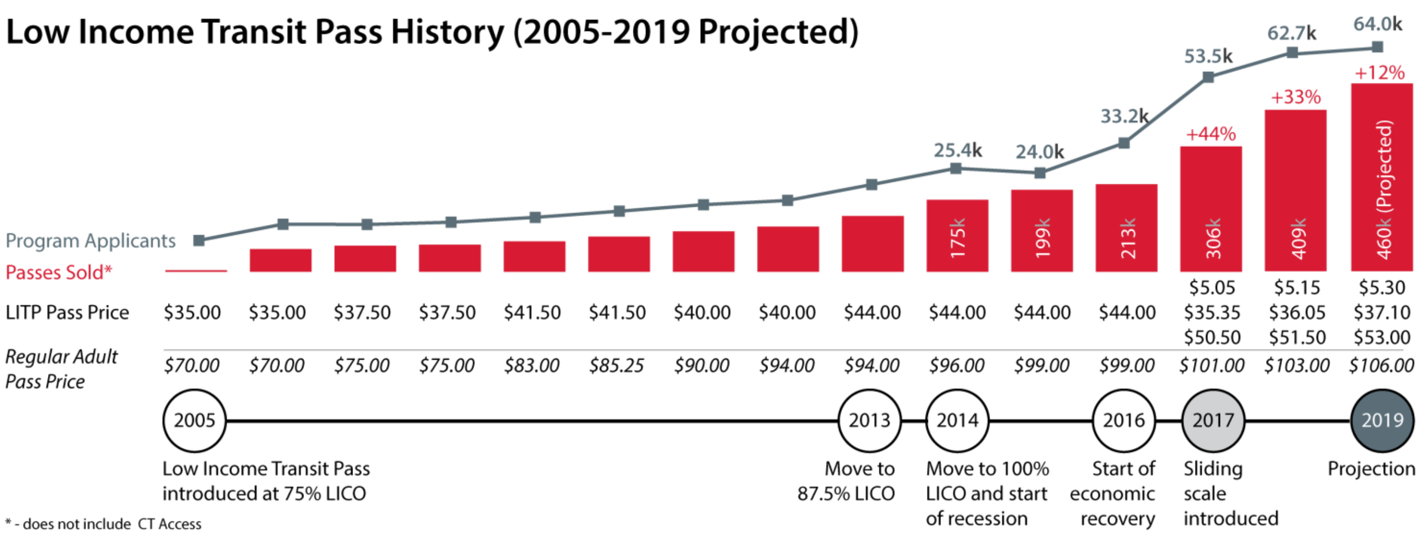
Calgary Transit Low Income Transit Pass Program

Overview

Introduced in 2005, the Low Income Transit Pass (LITP) program has seen several structural changes and significant growth. Changes to the program have included increases to the low income cut-off (LICO) qualification percentages, inclusion of a greater range of proofs of income/poverty to qualify, participation in Fair Entry application process and the implementation of the sliding scale fare structure in 2017 April. Successive changes have significantly improved the affordability and availability of the program and outcomes for those who are in the program. Additionally, significant growth in applicants in the lowest priced band sheds light on the size of the demographic that found it challenging to consistently afford the previous $44 monthly pass.

Since the implementation of the sliding scale fare structure, the program has more than doubled in size and supports 63,000 low income Calgarians with 409,000 passes sold in 2018. Low income Calgarians have been clear that the program has made significant positive impacts in their day-to-day lives. However, the current program structure is only possible because of a three-year $4.5 million annual funding partnership with the Government of Alberta which ends in 2019. The renewal status of this funding beyond 2019 is uncertain at this time. In addition, The City’s subsidy costs have increased by more than $6 million due to the success of the program and its unprecedented growth. Administrative costs are estimated at an additional $250,000 annually.

Advocacy on a multi-year funding extension for the program will continue with the Provincial government. A long-term sustainable funding model for the LITP program will need to be established in advance of the 2020 budget adjustments in order to cover the estimated approximately $11 million funding gap. This will include scenarios for LITP price increases to address some or all of the funding shortfall, based on program growth and the status of Provincial grant funding beyond 2019.



The Council-approved rates for the LITP are set in relation to the adult monthly pass. Both youth and adults pay the same price per the table below. Eligibility is administered through the Fair Entry program, with specific Band eligibility based on household income in relation to the LICO. The median household income in Calgary is $76,000, and average household size is 2.6 individuals (Statistics Canada 2016 Canadian Income Survey).

Band	Pass Price (2019)	LICO Range	Percent Discount off the adult monthly pass	2018 Pass Sales	% of Total YTD Pass Sales
A	$5.30	0-50% LICO	95%	273,000	67%
B	$37.10	50%-85% LICO	65%	116,900	29%
C	$53.00	85-100% LICO	50%	16,600	4%

Household Size	LICO - Band A ($5.30)	LICO - Band B ($37.10)	LICO - Band C ($53.00)
1 person	Less than $12,960	$12,961 - $22,031	$22,033 - $25,921
2 person	Less than $16,135	$16,136 - $27,429	$27,430 - $32,270
3 person	Less than $19,836	$19,837 - $33,721	$33,722 - $39,672
4 person	Less than $24,083	$24,084 - $40,941	$40,942 - $48,167
5 person	Less than $27,315	$27,316 - $46,435	$46,436 - $54,630
6 person	Less than $30,806	$30,807 - $52,371	$52,372 - $61,613
7 person	Less than $34,299	$34,300 - $58,308	$58,309 - $68,598

Current State

The City of Calgary currently has a funding agreement with the Government of Alberta Ministry of Community and Social Services. This agreement provides an annual $4.5 million grant (plus a 5% contingency) for each of 2017, 2018 and 2019.

In the first 12 months of the sliding scale fare structure (April 2017 – March 2018), pass sales grew 70% compared to the same period a year earlier. Between April 2017 and March 2018 over 340,000 passes were sold to almost 53,000 low income Calgarians. Of passes sold, almost two-third are in the lowest price category. In comparison, the previous 12 month period pre-sliding scale (April 2016-March 2017) saw 200,000 passes sold to 32,000 low income Calgarians. The program supported 63,000 low-income Calgarians in 2018, with 409,000 passes sold over the year.

Program Change and Growth

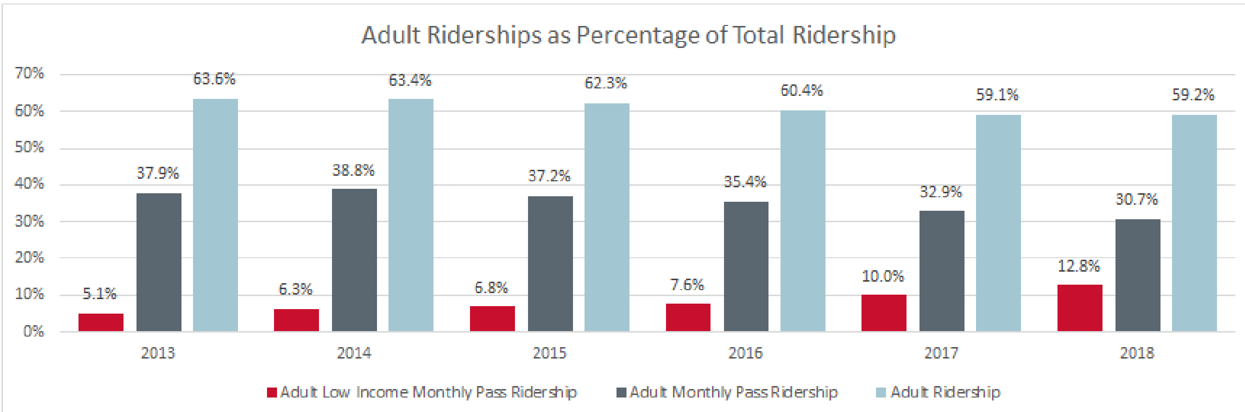
The LITP program realized consistent growth over time since its launch in 2015; however program participation and pass sales have grown rapidly with the introduction of the sliding scale fare structure. From 2006-2016, average annual growth was 14%. Implementation of the sliding scale fare structure in 2017 April has had the single largest impact on program participation, with 43.5% growth in pass sales the first calendar year and 33.7% growth in 2018. Growth in pass sales is projected to normalize moving forward, with approximately 12% projected for 2019 over 2018. While growth has begun to slow and is projected to stabilize in 2021 between 3 and 4% year-over-year, the overall change and impact has been significant in a short period of time. The table below shows actual and projected growth in LITP sales.

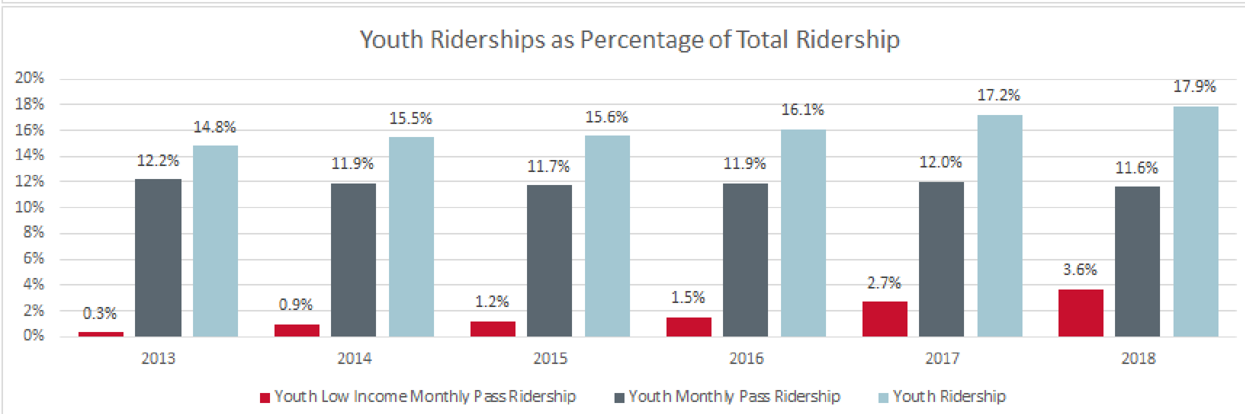
Actual and Projected Growth of LITP Sales

	2016	2017	2018	2019*	2020*	2021*	2022*	2023*	2024*	2025*	2026*
Adult	177,600	244,600	319,000	365,000	400,000	416,000	431,000	446,000	461,000	477,000	494,000
Youth	35,700	61,400	90,000	95,000	110,000	113,000	116,000	120,000	123,000	127,000	131,000
Total	213,300	306,000	409,000	460,000	510,000	529,000	547,000	566,000	584,000	604,000	625,000
Annual Change		43.5%	33.7%	12.5%	10.9%	3.7%	3.4%	3.5%	3.2%	3.4%	3.5%

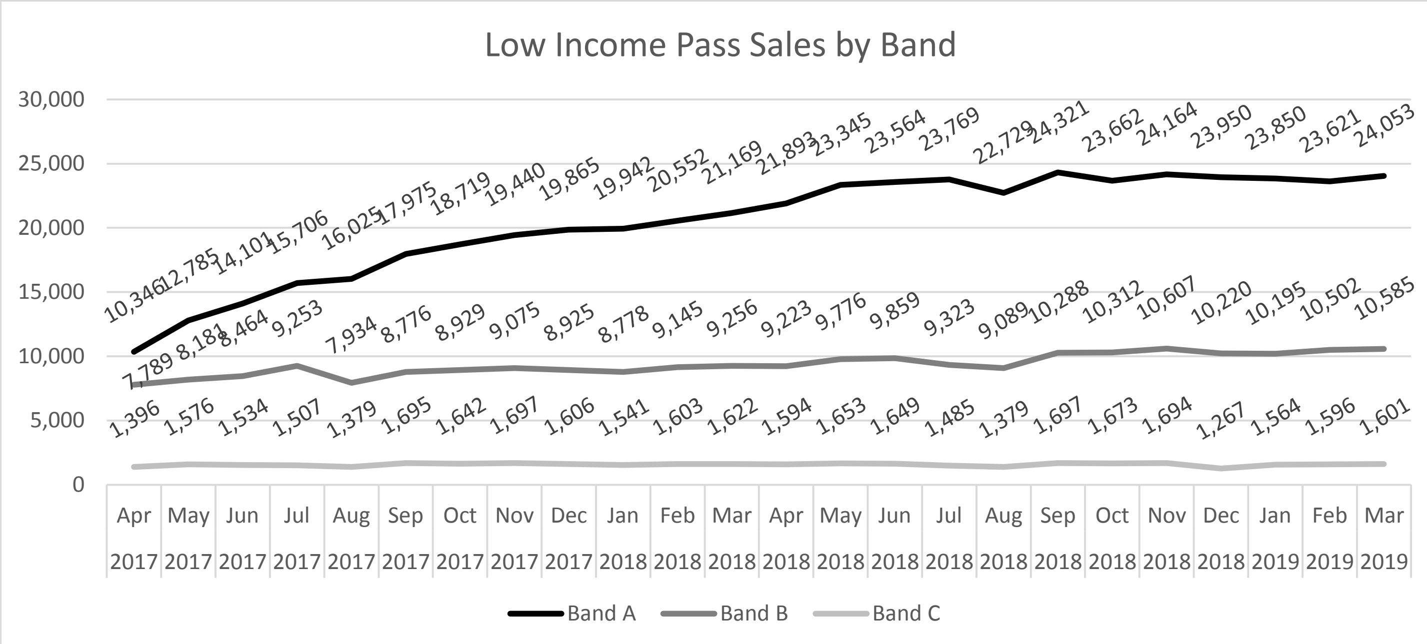
*-Projected

The growth in LITP sales under the sliding scale program comes mainly from two sources. The first is from new ridership i.e. those customers who were not customers of Calgary Transit prior to the sliding scale. The second and representing the majority, is from those customers who converted from regular fares to the LITP program. The relative growth of low income ridership compared to regular adult and youth ridership reinforces that fare conversions are a main source of program growth. The following graphs also illustrate growth in low income ridership while regular pass ridership fell or plateaued.





The strongest growth has occurred in Band A (the lowest priced band) while the other two bands showed more modest growth in sales since the sliding scale program started.



Projections made in 2016 for expected program growth through 2019 forecasted 227,000 total passes to be sold in 2017, 239,000 for 2018 and 249,000 for 2019. The original projections were considerably underestimated, with actual sales being 34% higher in 2017, and sales being 71% higher than projections in 2018 and estimated to be 85% higher in 2019. Unforeseen growth in the lowest-priced fare category, Band A, has driven much of the overall growth. The table below shows the overall proportion of ridership who hold low income passes under the sliding scale compared to the $44 program.

Low Income Participation Rates (Current and Pre-Sliding Scale)

LITP Band	% of Overall Ridership (2018)
A	11.0%
B	4.7%
C	0.8%
Total	**16.4%**
Total Prior to the Sliding Scale (2016 data)	*9.1%*

Customer Changes Post Sliding Scale

As previously stated, there has been significant growth in pass sales and number of persons accessing the LITP. Further analysis of the Subsidy Assistance Management System (SAMS) database was undertaken to identify those areas of greatest change.

The following trends were identified as contributing to overall program growth. The areas of greatest growth included:

- Larger households with 3 or more persons;
    - Larger households are purchasing more passes per household than prior to sliding scale.
- Households in the lowest income categories;
- Persons in receipt of Alberta Works;
- Youth, less than 18 years of age (although Calgary Board of Education policy changes would have accounted for some of the growth in this area);

- Passes purchased per person
    - The number of passes sold to each program participant has risen from 6.6 passes per person per year in 2016 to 7.4 passes per person in 2017 and finally to 7.6 passes per person in 2018.
- Passes purchased per household
    - In the 12 months after implementation of the sliding scale program, each household purchase 2.7 more passes than they did in 12 months before the sliding scale program.

Customer Impact

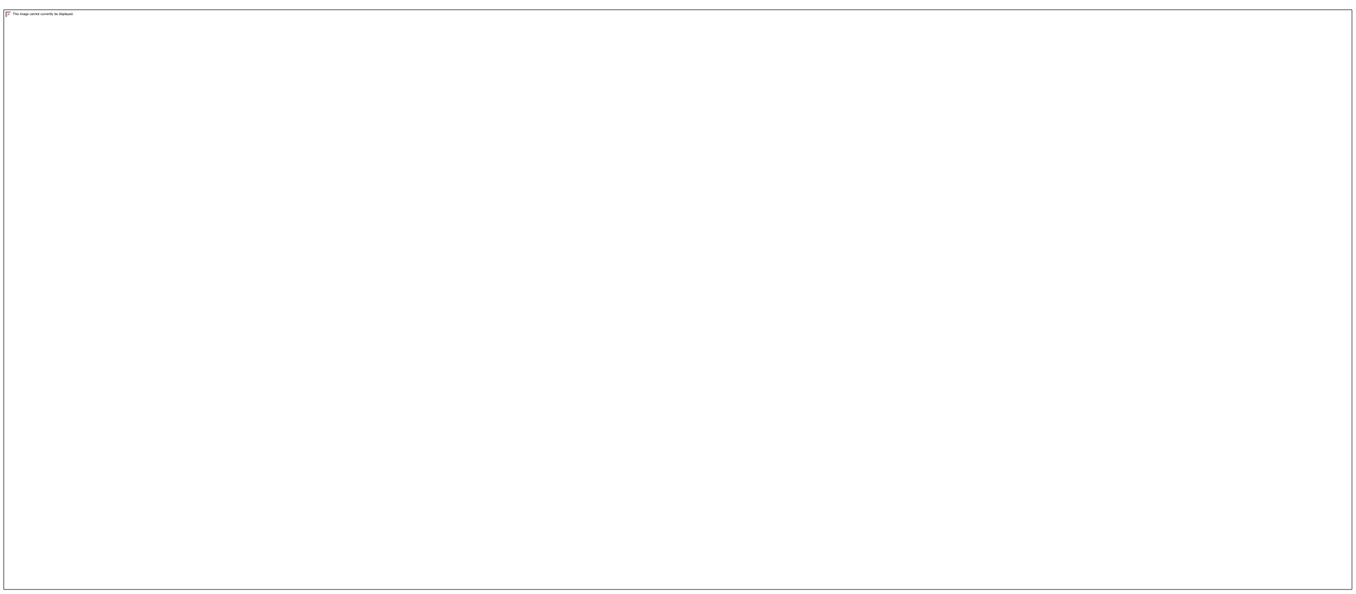
Calgary Neighbourhoods surveyed low-income transit pass customers in fall 2018. The analysis of this data indicated that customers were identifying significant positive impacts of the new sliding scale fare structure. These included:

- 78 percent of respondents said it made it easier to *maintain social supports* through family and friends;
- 84 percent said it was easier to get to *medical and other appointments*;
- 74 percent of respondents agreed the LITP allowed household members *to look for jobs*;
- 91 percent said it *saves their household money*; and
- 87 percent agreed that it *increased their use of Calgary Transit*.

A similar survey was also undertaken in 2017, with 2018 survey responses indicating even greater positive impacts of the program compared to 2017 survey results.

United Way Research – Over the course of the summer and fall of 2018, the Women's Centre partnered with Fair Fares to further engage customers to identify the impact the Low Income Transit Pass program has had in light of the introduction of the sliding scale fare structure. The United Way undertook an analysis of the data collected.

The analysis outlined the proportion of Calgarians who identified a particular benefit within the data collected:



Justice Research - A recent report prepared by Athabasca University and the Elizabeth Fry Society proposed that through increased affordability, the LITP would result in fewer fines issued to low income persons, resulting in fewer instances of non-payment and associated negative consequences. These negative impacts may include issuing of warrants and detention, which in turn provides direct cost savings to the justice system and is evidence of additional benefits of a sliding scale fare structure for the LITP.[1]

[1] Greene, Carolyn & Lucas, Katelyn & Williams, Nicole. (2017). Everything Comes at a Price: An Exploration of the Impact of Bylaw Enforcement Practices in the City of Calgary.

Implications for Funding

The financial change in position for Calgary Transit resulting from the introduction of the sliding scale annually is currently approximately $10.67 million.

Old Program ($44 pass) annual revenue*	$16,200,000
Less New Sliding Scale program annual revenue	$5,530,000
Less Alberta Provincial Subsidy (annual and incl. 5% contingency)	$4,730,000
Net Difference in revenues	$5,940,000

*Includes the revenue from those customers who used regular fares prior to the sliding scale program

Calgary City Council voted to add a one-time funding of $4,000,000 in 2018 and $6,000,000 in 2019. No funding decisions beyond 2019 have been made by the Government of Alberta or City Council.

The overall difference in revenue includes conversions from regular fares, but excludes other cost impacts:

- Additional administration costs of $250,000 annually related mainly to manpower and security costs at Village Square. Pass sales increased at that location by 135% compared to sales before the sliding scale. In addition to more counter staff, security guards were deployed to assist in line management and address customer issues related to prolonged wait times.
- Losses from a change in the Calgary Board of Education's fee waiver program in which the CBE reduced the number of Band C passes they were purchasing monthly from 2,300 to 200. Instead those eligible students were referred to Fair Entry.

As mentioned earlier, the majority of the new participants in the sliding scale program were conversions from other fares; i.e. these customers used Calgary Transit prior to introduction of the sliding scale, but paid with regular fares. Survey data from the summer of 2018 reveals the following usage in the month prior to the survey:

- Monthly Transit Passes
  - Adult regular 29.5%
  - Youth regular 3.9%
- Single Ride Fares
  - Adult tickets 26.6%
  - Youth tickets 16.5%
- Universal Transit Passes 3.6%
- Day Passes
  - Adult 2.0%
  - Youth 1.0%
- Did not pay to ride transit 1.1% (note: includes use of free fare zone and fare evasion)
- Other transit fare 0.8%
- Did not ride transit 25.7% (includes customers who are new to Calgary)

Note: Survey respondents were permitted to select more than one fare type.

As noted above, in the month prior to the survey, 25.7% of respondents had not used transit. Of those, almost half were new to Calgary. From that we conservatively estimate that 17% of new LITP customers were ongoing residents of Calgary and attracted to the program because of the sliding scale.

Based on this, approximately 4,700 people became customers because of the sliding scale and, particularly, Band A. The new ridership combined with increased purchases per household (2.7 more passes per household in the first 12 months of the sliding scale) provide insight into the enabling nature of the program.

Going Forward

Low income Calgarians have been clear that the program has made significant positive impacts in their day-to-day lives, and this program has strong alignment with the City's poverty reduction and economic strategies. However, significant program growth, especially in the lowest price category, has resulted in substantial funding challenges. The current funding model for this program is not sustainable due to the conclusion of the Provincial grant at the end of 2019 and significant increases to the City's subsidy costs from program growth.

Communication and advocacy with the Government of Alberta will need to remain a high priority in light of the expiry of the current funding agreement at the end of 2019.

Most recent communication with other orders of government has included:

Provincially

i. 2018 January – A letter from Mayor Nenshi highlighting the issue as part of the City's provincial budget submission;
ii. 2018 March – Calgary Neighbourhoods (CN) highlighted the funding challenge in its grant annual report submission to Community and Social Services;
iii. 2018 September and October – Meetings with the Minister and Assistant Deputy Minister of Community and Social Services attended by Calgary Transit and CN.
iv. Intergovernmental and Corporate Strategy (ICS) has worked in partnership with Calgary Transit and CN to flag this issue with Municipal Affairs, as part of ongoing charter discussions.
v. LITP funding was included as a priority for election advocacy as part of the YYCMatters campaign.
vi. LITP funding was included as a priority for post-election collaborative opportunities with the Ministries of Transportation and Community and Social Services.

Federally –

i. Q4 2017 and Q2 2018 – ICS and CN had discussions with Social Development Partnership Program raising the issue with program staff.
ii. 2018 September – ICS identified the funding challenge as part of the City's recent Federal pre-budget submission.

Administration continues to have discussions with staff from the Government of Alberta on program evaluation and sustainment, as well as with the City of Edmonton on a coordinated approach to advocacy. Post-election advocacy for an extension of the funding partnership will need to continue with the new Provincial government, in coordination with Intergovernmental & Corporate Strategy.

A long-term sustainable funding model for the LITP program will need to be established in advance of the 2020 budget adjustments in order to cover the estimated approximately $11 million funding gap. This will include scenarios for LITP price increases to address some or all of the funding shortfall, based on program growth and the status of Provincial funding beyond 2019. Administration will continue to evaluate program growth over 2019 and refine the projected short- and medium- term funding gap amounts, and will return in Q3 2019 with recommendations on a sustainable funding model to take forward to the 2020 budget adjustments.

RouteAhead Update: Progress Toward Service Goals

This attachment provides an overview of progress toward service delivery goals identified in RouteAhead, a 30-year strategic plan for public transit in Calgary.

Base Transit Service and Primary Transit Network Service

Base transit service and the Primary Transit Network (PTN) define both the quality and quantity of transit service in terms of the coverage (accessibility), frequency (how often transit vehicles arrive at a stop or station) and the time span of service (when does service start and finish each day).

Base: a combination of services operating at least every 30 minutes, 15 hours a day

PTN: a combination of services operating at least every 10 minutes, 15 hours a day

A key Base service measure is making transit service accessible (i.e. within 400 metres walking distance) to ensure accessibility for the majority of Calgarians where they live and work.

The PTN is intended to provide a network of higher quality services with wider spacing serving high-density development. The PTN will feature vehicles (irrespective of whether the vehicles are standard buses, articulated buses, or Light Rail Transit [LRT]) operating over an extended time span, with transit priority measures and enhanced passenger amenities, and sometimes operating on dedicated rights of way. The PTN offers customers the ability to “show up and go” as a result of 10 minute scheduled headways.

The figures below illustrate:

- The spatial extent of the city where a Base level of transit service (or better) is currently provided, as well as service levels below Base and developing/developed areas without transit service. (Figure 1).
- The percent completion of the PTN (Figure 2).

As shown on Figure 1, in Q1 2019 Base service was provided to 76% of Calgary residences (+3% since 2016) and 77% of employment locations (+1% since 2016).

Some form of transit service (but not necessarily Base service) was provided to 95% of residences and 93% of employment locations.

In Q1 2019, PTN service was provided to 15% of Calgary residences and 31% of employment locations. The PTN now totals nearly 76 kilometers and is nearly 20 percent complete. PTN expansion also contributes towards achieving Base service coverage.

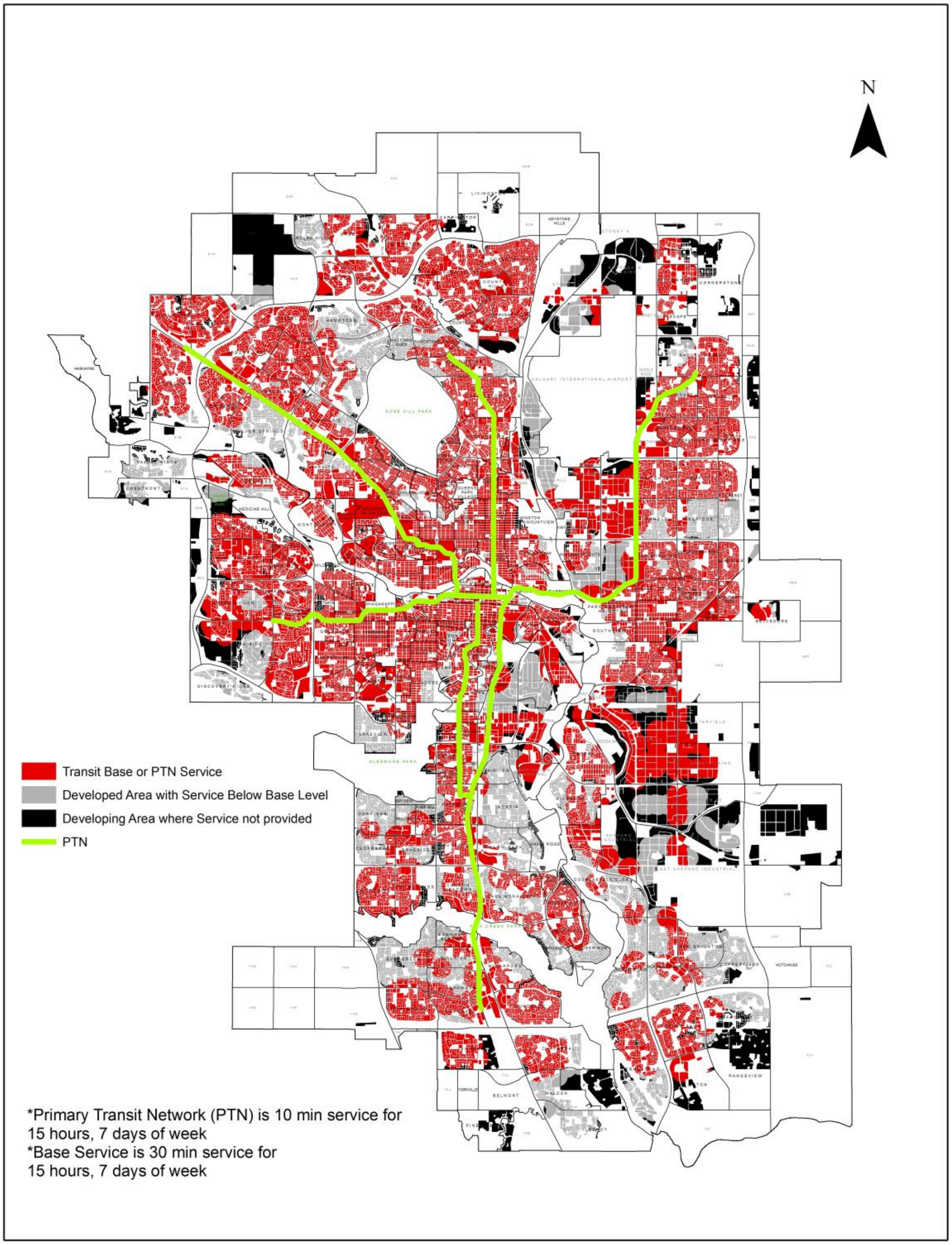


Figure 1 – Q1 2019 Transit Service Map

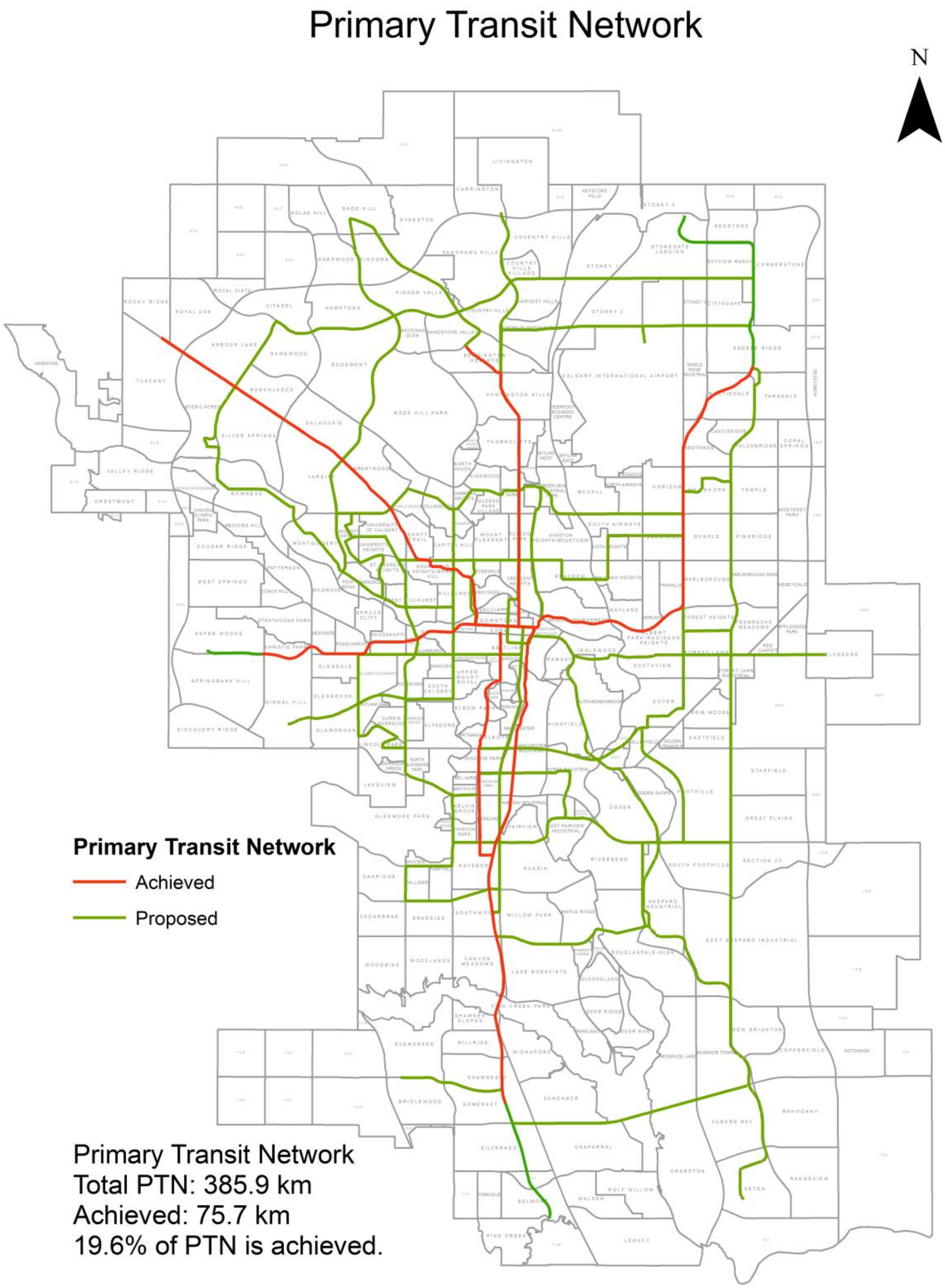


Figure 2 – Q1 2019 Primary Transit Service Map

Table 1 below includes a summary of the percentage of residential areas and employment areas across the city that are reached by Base and PTN service and how that service provision has changed over time.

Table 1

Base and PTN Service Provision to Residential Areas

Year	AM Peak	Midday	PM Peak	Evening	Saturday	Sunday	Total
2014	95.4%	86.3%	95.3%	92.9%	75.8%	56.6%	**60.4%**
2015	95.0%	81.1%	95.0%	91.2%	75.4%	55.3%	**60.4%**
2016	95.1%	92.7%	95.0%	92.8%	85.7%	76.3%	**76.5%**
2017	95.7%	95.7%	92.0%	92.1%	85.5%	76.9%	**76.3%**
2018	96.0%	96.0%	91.6%	91.8%	84.6%	76.6%	**75.9%**
2019 Q1	**95.9%**	**95.9%**	**91.8%**	**91.9%**	**84.4%**	**76.8%**	**75.8%**

Base and PTN Service to Employment Areas

Year	AM Peak	Midday	PM Peak	Evening	Saturday	Sunday	Total
2015	87.8%	89.6%	88.0%	82.1%	71.5%	55.6%	**62.7%**
2016	91.8%	90.4%	91.7%	86.3%	78.8%	76.3%	**76.4%**
2017	93.1%	91.6%	93.0%	87.6%	80.2%	78.2%	**76.4%**
2018	92.9%	91.1%	92.9%	87.3%	79.4%	77.5%	**76.8%**
2019 Q1	**93.1%**	**91.2%**	**93.3%**	**86.8%**	**79.7%**	**78.0%**	**76.7%**

The significant improvement in performance between 2015 and 2016 can be attributed to the addition of midday, off-peak and weekend service frequency as a result of the 2016 Transit Service Review. Significant duplication of routes in northwest and downtown Calgary was addressed, and service hours were reallocated to routes/corridors with gaps in frequency and span of service.

Further improvements to service coverage, frequency and span over the past two years have mainly been achieved through delivering service more efficiently with limited increases to service funding relative to growth in population and development across the city. The 2018 Transit Service Review was the first part of a two-year comprehensive review of Calgary Transit fixed route bus service as a supporting element in implementing the MAX rapid transit network, with the goal of developing a more effective bus network that makes efficient use of MAX infrastructure investments. The review has been informed by technical considerations and public engagement, and based on the following objectives:

1. Implementing a high quality MAX rapid transit route that more customers are able to conveniently connect to;

2. Leverage capital investment in MAX infrastructure (e.g. MAX stations, queue jumps, dedicated lanes) by increasing the routes and customers who can benefit from it;
3. Provide routes that are more direct and easier to understand;
4. Reduce travel time;
5. Operate more frequently with a longer span of service on some routes;
6. Provide better service to key destinations;
7. Reduce duplication of service; and
8. Increase ridership.

Significant improvements have been made to service distribution and local network connectivity; this has mainly been achieved through reallocations that have maintained service coverage with some targeted improvements but while improving connectivity, transferability and ease of travel to key destinations (e.g. employment centres) and among different areas of the city. Building on access to transit service, this has led to improvements in the ability and time required to travel to destinations across the city; both downtown and outside of downtown.

The 2019 Transit Service Review is ongoing in southwest Calgary, with public engagement feedback currently being analyzed to inform potential adjustments to the service proposals. The more efficient and productive local bus network is expected to be implemented with the southwest MAX line introduction in late 2019.

In response to recently approved operating budget reductions in 2019 June, Calgary Transit is currently evaluating service reductions across the network. As part of these reductions, there will be impacts to current service levels and temporal/spatial service coverage, but will be prioritized using a least-harm approach.

Challenges with Service to Actively Developing Communities and Employment Areas

Calgary Transit provides introductory transit service that is intended to evolve as the community grows and ridership matures. Before introductory service may be considered five criteria must first be met:

- Funding must be available to pay for the service
- Labour must be available to operate the service
- Vehicles must be available to provide the service
- The road network must be adequately developed to carry the service
- The population or job intensity must be sufficient to support the service

The viability of new service also depends on the speed at which development is occurring, availability of a continuous road network, the density of the development and the ability to extend service on an existing route versus the need for a new independent route. New service typically begins with weekday peak period service followed over time, as ridership and growth occurs, by off peak services – i.e. mid-day, evenings and weekend – leading up to Base service. An early introduction of transit service, including connections to existing higher-order transit service, is critical to developing transit travel habits of the new residents (which will offset future demand for road infrastructure).

Administration is faced with a challenge that has emerged in new and actively developing communities since the economic downturn, where many new residents are now living and new employment areas are being created. In these newer areas, about 1,040 residents and 500 jobs are currently in actively developing communities that do not receive conventional transit service. The population and jobs in actively developing communities is forecasted to increase significantly by 2022 as outlined in Table 2, with occupancy beginning in some recently approved additional new communities as well. Many newer areas have received peak-period introductory service several years ago, but have continued growing with delayed transitions to mid-day and off-peak bus service. Travel demand exists, and has for some time in many areas, but is not being addressed in a manner consistent with development approvals and the vision of the MDP/CTP and RouteAhead.

Following the elimination of 2017 and 2018 growth investments to manage financial challenges associated with the economic downturn, Administration attempted to address gaps on a first-come first served basis, through negotiated developer-funded service agreements or prioritization of the least costly extensions of existing bus routes. Further service investments to address gaps in a systematic manner were previously approved through One Calgary 2019-2022 for direct incremental operating costs of actively developing communities. Some service improvements have been implemented in 2019 June in the communities of Nolan Hill/Sage Hill, Redstone/Cornerstone, Walden/Legacy, and Mahogany/Cranston. Calgary Transit On Demand, an on-demand shared public transportation pilot is also planned to take place in the communities of Carrington and Livingston, and will help inform how an innovative public transit service can be introduced in low density communities earlier and in a more cost-effective, scalable and demand-responsive manner. Service hour investments over the current budget cycle were planned in order to keep pace with development and occupancy, and meet growing customer demand for Base transit service. These investments will be refined through the annual budget adjustments process based on revised budget targets that are established. As part of this process, reductions in base and growth service budgets will impact current service levels, temporal/spatial coverage and implementation timelines in actively developing communities, but will be prioritized using a least-harm approach.

Transit service to employment areas is also crucial to enable employers to attract and retain staff. The ability of new employment areas to support transit service is typically lower than residential growth and the span of service often needs to be longer to serve multiple shift times, including weekends. However, transit service to these areas is vital to support Calgary's economic growth and diversification (e.g. technology/research, logistics/goods movement), and aligned with Calgary's Economic Strategy to support business growth and development. Bus service to growing industrial employment areas in NE and SE Calgary have been improved over the past two years through limited route introductions/extensions and service reallocation through the 2018 Transit Service Review. Examples include Routes 100 (North Pointe/Airport/McKnight Stn), 119 (Freeport), 147 (Starfield), 148 (Great Plains), 149 (Point Trotter), 150 (114 AV SE), 157 (Saddletowne-Stoney Industrial) and 161 (North Pointe-Stoney Industrial). Calgary Transit will continue to work closely with Real Estate and Development Services and Calgary Economic Development to promote transit options for major employers considering locating in Calgary.

Table 2

Population and Jobs in Developing Areas Currently Without Transit Service

Developing Area Category	Population	Jobs
Actively Developing Communities – 2018	1,040	500
Actively Developing Communities – 2022/2023 forecast	18,800	2,400
New Communities with Approved Plans – 2022/2023 forecast	6,100	1,200

The Calgary Transit Customer Advisory Group Statement on RouteAhead

The Calgary Transit Customer Advisory Group (CTCAG) is pleased with the progress of Calgary Transit as the economy and ridership recover from the recent recession. However, the CTCAG remains concerned about four key customer service priorities also identified by Calgary Transit within RouteAhead, and integration with environmental goals. Service priorities include Real Time accuracy, connectivity of passengers to information, safety and security, the integrity of the Low-Income Transit Pass, and lastly, of fleet maintenance and renewal.

With regard to Real Time and information connectivity, the CTCAG is pleased to see that Calgary Transit has recognized the need to improve Real Time accuracy across the C-Train and bus networks. This includes ensuring that the Real Time information on C-Train platforms and on all mobile applications, (e.g. Google Maps, Transit App, CT app etc) are both accurate and consistent, allowing for minimization of wait times. We wish to emphasize the importance of successfully upgrading Real Time service as it directly relates to the promises of being informative and reliable in the Calgary Transit Customer Commitment. In addition to currently available Real Time information, we would also like to see improved internet and cellular connectivity across the transit network. We note other transit organisations have collaborated with the private sector (e.g. Translink and Rogers for Skytrain cell-service) to install infrastructure upgrades to allow for improved connectivity at little to no cost. Underground connectivity will be particularly important as Calgary moves ahead with Green Line tunnelling.

The CTCAG also pleased to see security maintained to a high standard with additional funding for peace officers in the 2019 budget, the implementation of teletext for security concerns, and improvements to CCTV and station lighting during station renovation. We expect these implementation measures to improve the dispatch of Peace Officers to calls, while also improving the ability of passengers to safely report security concerns on transit. Despite these improvements, there continues to be passenger safety concerns on the LRT during evening and late-night trips, particularly amongst women. Though violent crime remains low on the Calgary Transit system, disorderly conduct remains high and discourages system use. To improve perception of safety, the CTCAG would like to see investment in novel interventions such as roving volunteer teams, or station attendants similar to what exists on other Canadian transit systems such as those in Toronto and Vancouver. The CTCAG would like these interventions to focus on areas identified as high-crime by Public Safety Enforcement, including Westbrook, Victoria Park, Marlborough, and 7thAve. It is critical the LRT be safe to improve evening and late-night ridership on the LRT of all populations, and especially for vulnerable groups. It is a social responsibility of Calgary Transit that the system is perceived as safe by all populations at all times of day.

Aligned with the social responsibilities of Calgary Transit, is commitment to the Low-Income Transit Pass (LITP). The CTCAG applauds council approval of the LITP in 2017. Our members acknowledge that the sliding scale has helped many low-income individuals access jobs, services, medical appointments, family, and friends, allowing them to be a part of the Calgary community. For some, LITP use may be temporary, however for others, chronic situations require ongoing use of the pass program. The CTCAG strongly requests continuous municipal or provincial funding external to Calgary Transit be provided for continuation of the

LITP. Continuous funding eliminates uncertainty created by previous one-time funding, and allows Calgary Transit to operate the program without impacting service hours.

Importantly, the CTCAG wants Calgary Transit to ensure its fleet is in a state of good repair (for reasons of reliability, fuel efficiency, and energy efficiency). We note RouteAhead references a need to replace old vehicles and we are very concerned that 43 LRVs are approaching retirement age, and 23% of 12 metre buses are past retirement age. Though, we are hopeful the announcement by the former provincial government for LRV funding is honoured, as it will allow for the full phasing out of the oldest LRVs we remain concerned about the ability of Calgary Transit to maintain vehicles and infrastructure impacting the customer experience. We believe it is crucial a stable replacement budget be established, and a plan adhered to for orderly vehicle replacement and infrastructure renewal (versus reliance on one-time funding).

Lastly, as fiscal responsibility and climate change become top priorities for governments around the world, the CTCAG would like City Council to recognize the role of Calgary Transit as both an economically and environmentally responsible investment opportunity. In an age when the discussion about environmental or economic gain is often divisive, mass-transportation has the ability to support both efforts with the same dollars. Calgary Transit helps the City and its taxpayers maximize trips per vehicle on existing roadway infrastructure, while minimizing pressure to expand or reinvest in single-occupancy vehicle (SOV) infrastructure. At the same time, an efficient, highly used mass transit provider is a key means to reduce Green House Gas (GHG) emissions by replacing SOV trips with low-emissions, multi-rider transit trips. To ensure the sustainability of Calgary for younger generations - both economically and environmentally, mass transit must continue to be an area of focus for the City of Calgary's investment dollars. The Calgary Transit Customer Advisory Committee sees this unique opportunity to save money and protect the environment as proof these focus areas need not be in opposition to one another. With limited roadway space, we look to Council to mandate a sustainable division.

Despite customer concern within these domains, the CTCAG remains optimistic an improving economy will bring additional riders to the system and will provide ticket revenue necessary to enhance baseline service. However, council is responsible for providing Calgary Transit with appropriate resources and support.

Sincerely,

Matthew Yeung,

Chair, and on behalf of the Calgary Transit Customer Advisory Group

June 10, 2019

Calgary Transit At-Grade LRT Crossing Safety

EXECUTIVE SUMMARY

This report provides a review of the safety guidelines and protection measures of Calgary Transit at-grade Light Rail Transit (LRT) crossings in response to Notice of Motion C2018-1288.

Calgary's LRT system is safe and the design guidelines for at-grade crossings are based on applicable industry standards and best practices for safety. In addition to the design requirements, Calgary Transit follows the 5E's of transportation safety to minimize the risks to pedestrians at at-grade crossings - Engineering, Evaluation, Engagement, Education and Enforcement. Each safety measure is discussed in detail in this report and include:

- Crossing protection devices such as bells, gates, and flashing lights;
- LRT Crossing Committee – A technical review committee that assesses at-grade LRT crossing safety and accessibility which prioritizes improvements based on site specific issues and feedback from operations and users;
- Public education initiatives that raise awareness of at-grade LRT crossing safety;
- Stakeholder engagement to understand user experience; and
- Enforcement tools to enforce and educate safe behaviour at at-grade LRT crossings.

As part of this review, an external consultant examined the at-grade crossing protection measures employed by Calgary Transit, and benchmarked the effectiveness against comparable LRT systems in North America. This analysis found that Calgary Transit has implemented best practices in new designs and for making prioritized improvements to existing crossings. The rate of safety incidents on Calgary's LRT system is consistent with comparable systems in North America.

While these incidents are rare, detailed investigations and multi-disciplinary reviews are conducted to determine if further mitigation measures would be beneficial. Some general improvement opportunities have been recommended to address evolving societal issues such as distracted walking; these recommendations are currently being evaluated and prioritized by the LRT Crossing Committee based on risk and funding availability.

ADMINISTRATION RECOMMENDATION:

That the Standing Policy Committee on Transportation & Transit recommends that Council:

1) Direct Administration to implement an updated public safety education campaign around at-grade LRT crossing safety; and
2) Direct Administration to return to the 2020 budget adjustments with a request for an annual dedicated capital funding stream for at-grade crossing safety improvement opportunities.

3) Direct that Attachment 3 remain confidential pursuant to Section 17 (disclosure harmful to personal privacy) of the *Freedom of Information and Protection of Privacy Act*, and to remain confidential indefinitely.

PREVIOUS COUNCIL DIRECTION / POLICY

At 2018 November 19 Regular Meeting of Council, Notice of Motion C2018-1288 was brought forth by Councillor Colley-Urquhart, Councillor Keating and Councillor Jones, to provide an At-grade LRT Crossing Report by Q2 2019 that includes:

- Inventory of crossings and treatments;
- Inventory of protection measures, what they target, constraints and costs;
- Best practices in design from across the industry;
- History of incidents;
- How The City studies, adapts and audits these crossings; and
- Recommendations for Council on additional programs or initiatives that will address crossing safety.

BACKGROUND

Calgary Transit's light rail transit (LRT) system, known as the CTrain, began operations in 1981. Today, the entire system consists of 60 km of double track and 45 stations. Outside the downtown core, the LRT primarily operates at-grade with signal pre-emption, in a protected right-of-way with vehicle and pedestrian safety measures at crossings occurring at locations where access is required. In the downtown core, the Red Line and Blue Line connect within a downtown transit mall located on 7 Avenue SW between 11 Street SW and 3 Street SE. LRT operations along 7 Avenue SW are based on in-street operations. In-street operations require the LRT to follow traffic signals that also control cross street traffic and bus movements.

Calgary's LRT system has 92 at-grade crossings on its Red and Blue Lines, which includes the downtown crossings. There are inherent risks associated with an at-grade system but these risks are managed by following design guidelines and industry standards, installing appropriate protection measures, enforcement and education. The LRT system also has grade-separated pedestrian crossings at specific locations; these are provided where pedestrian access across the track is restricted by physical site constraints such as station access, road classification or environmental area. Pedestrian volumes, traffic volumes and transit operations are other considerations to grade separate crossings.

An LRT Crossing Committee is in place to ensure appropriate reviews and management of key issues and risks of at-grade LRT crossings, including safety and operational concerns. The group is made up of technical experts from Signals and Rail Systems, Track and Way, Public Safety and Enforcement, LRT Operations, Transit Planning and Communications and Marketing. An advisory group that includes Roads Safety, Calgary Police Services and Liveable Streets are consulted to provide a boarder transportation safety perspective.

History of Incidents

In the 38 years since the LRT system opened in 1981, there have been 88 total fatalities with 42 unintentional fatalities occurring at at-grade crossings. In the past ten years (2009-2018), 19 unintentional fatalities have occurred at at-grade crossings. The locations are listed in the table below.

Approximately one-third of all pedestrian fatalities on the system were intentional fatalities, and the remaining fatalities were attributed to human error factors including intoxication, distracted walking and engaging in risk-taking behaviors.

A review by an external consultant found that Calgary Transit's recent four-year average of 2.5 fatalities per year at crossings is approximately the same as similar transit agencies in North America, with an average of 2.14 fatalities per year.

Locations of At-Grade Crossing Fatalities (2009-2018)

Blue Line – Northeast	**Blue Line – West**	**Red Line – South**	**Red Line – Northwest**
36 St and 8 Av NE		25 Av SE	14 Av and 14 St NW
36 St and 12 Av NE		50 Av SE	
36 St and 20 Av/Rundlehorn Dr NE		Chinook Station	
36 St and 26 Av NE		162 AV S	
36 St and 32 Av NE			
Whitehorn Station			
36 St and 39 Av NE			

INVESTIGATION: ALTERNATIVES AND ANALYSIS

Calgary Transit uses the 5E's of Transportation Safety to ensure safety at at-grade LRT crossings. Attachment 1 reviews each of the safety criteria and how they relate to at-grade crossing safety.

E's of Transportation Safety	**Notice of Motion Requirements**
Engineering	Inventory of crossings and treatments. Inventory of protection measures, what they target, constraints and costs.

Evaluation	Best practices in design from across the industry. How The City studies, adapts and audits these crossings.
Enforcement	Additional programs that support safe crossings.
Education	
Engagement	

Engineering and Evaluation

As part of this review, an external consultant conducted an independent examination of the at-grade crossing safety protection measures employed by Calgary Transit, and benchmarked the effectiveness against guidelines, standards, best practices and incident rates of comparable LRT systems in North America (Attachment 2). The key findings of this at-grade LRT crossing safety evaluation report are:

- Calgary Transit is employing applicable guidelines, standards and best practices in new design and has a process for capturing improvements reflected in these guidelines, standards and best practices into its own guidelines;
- The rate of collisions at at-grade crossings of the Calgary Transit LRT system is comparable to elsewhere in North America;
- The Calgary Transit at-grade crossing warning systems are adequate to provide for the safety of motorists, cyclists and pedestrians;
- Calgary Transit is experiencing the same factors contributing to at-grade crossing safety issues as are found elsewhere in North America; and
- Calgary Transit has implemented best practices in determining the at-grade crossings needing improvements to the warning systems.

As part of this evaluation, the external consultants conducted field assessments of a diverse set of seven at-grade crossings across the LRT network. It was determined that all locations conformed to industry standards, and some recommendations for pedestrian safety enhancements were provided for consideration. The evaluation also recommended additional general improvement opportunities for the LRT Crossing Committee to consider within its engineering toolbox; these include lowering the height of pedestrian warning signals, implementing second train warning signage at more pedestrian crossings, and further evaluating installing automatic gate arms at additional locations based on risk and site considerations. The LRT Crossing Committee is currently evaluating these improvement recommendations and will prioritize them within annual work plans based on risk and budget availability. An annual dedicated capital funding stream will be required to implement these improvement opportunities in a systematic manner and will be requested as part of the 2020 budget adjustments.

Education, Engagement and Enforcement

Public education, engagement and enforcement are guided by a communication and marketing campaign for Safe At-Grade LRT Crossings, as well as reported incidences of risk-taking behaviour and non-compliance with safety devices. This campaign has been ongoing since 2016 but will be updated to reflect growing and evolving societal issues such as distracted walking and mental health issues. A comprehensive approach, beyond engineering measures, is important to improve awareness and promote safe behaviour at LRT crossings.

Stakeholder Engagement, Research and Communication

For this report, the following internal stakeholders and city advisory groups were engaged:

Internal Stakeholder list:

- Calgary Transit
- Green Line
- Transportation Infrastructure
- Transportation Planning
- Roads
- Calgary Police Services
- Calgary Neighbourhoods

City Advisory Groups:

- Calgary Transit Customer Advisory Groups
- Access Design Sub Committee of Advisory Committee on Accessibility

The purpose of the engagement was to learn about the current processes and identify gaps and other improvement opportunities that can be implemented. The LRT Crossing Committee will continue to engage with internal stakeholders and city advisory groups to understand the operational and user safety at at-grade crossings.

The process of engagement can be found in Attachment 1.

Strategic Alignment

This report is aligned with the goals of the following initiatives:

- One Calgary 2019-2022, Council and Citizen Priorities:
    - A city of safe & inspiring neighbourhoods
    - A city that moves
- Calgary Transportation Plan (CTP) Goals and Key Directions:
    - Transportation Goal #2: Promote safety for all transportation system users.
    - Transportation Goal #4: Enable public transit, walking and cycling as the preferred mobility choices for more people.
    - Transportation Goal #7: Ensure transportation infrastructure is well managed.
- RouteAhead, a 30-year Strategic Plan for Public Transit in Calgary and improving the objectives of the Calgary Transit Customer Experience.
- Calgary Transit Customer Commitment:
    - Safe
    - Reliable
    - Easy to use transit service.

- Calgary Safer Mobility Plan – a five-year plan aimed at improving the safety of Calgary's transportation network

Social, Environmental, Economic (External)

Social

At-grade LRT crossings connect people with places they care about by providing a safe, accessible, reliable and easy to understand connection in the transportation network. Safety improvements, public education and internal training about at-grade crossings will improve quality of life for Calgarians.

Environmental

Providing safe at-grade crossings encourages Calgarians to use transit, walk and or cycle. Reducing dependency on the automobile decreases greenhouse gas emissions and energy use.

Economic

Reducing train and pedestrian incidents at at-grade crossings help support a reliable, attractive and convenient LRT system. The LRT helps promote an environment conducive to attracting, retaining and nurturing businesses and creates a city where Calgarians want to live, work and invest because of mobility choices.

Financial Capacity

Current and Future Operating Budget:

There are no operating budget implications associated with the recommendations in this report.

Current and Future Capital Budget:

There is currently no capital budget specifically dedicated to implementing the at-grade LRT crossing safety improvement opportunities highlighted in this report. Immediate safety concerns and high priority improvements are addressed through the lifecycle and asset management budgets in the Calgary Transit. The Council-approved LRT Reliability fund was previously used to address priority improvement opportunities at LRT crossings between 2013-2018. Continuous and consistent implementation of further safety improvement opportunities identified in this report will require an annual dedicated capital funding stream.

Risk Assessment

At-grade LRT systems have inherent safety risks and with changes in social behavior and increased incidents of distracted walking, it is important to continue reviewing and upgrading at-grade crossings using the 5E's of transportation safety.

Calgary Transit's LRT system is growing and changing with new lines, future extensions and crossing conversions. This will result in new and existing transit customers using the system. It is important to apply a consistent approach system wide to address safety measures to improve pedestrian legibility at at-grade crossings.

Without a dedicated annual funding stream, it will be challenging to systematically implement many improvement opportunities to at-grade LRT crossings highlighted in this report.

Improvements will continue to be based on immediate safety concerns and risk, within available existing infrastructure budgets.

REASON(S) FOR RECOMMENDATION(S):

This review addresses the direction from Notice of Motion C2018-1288. The internal and external review identifies that Calgary Transit employs applicable guidelines, standards and best practices in at-grade crossing safety design, and has a robust process for incorporating evolving improvements in the industry.

Further improvement opportunities at at-grade LRT Crossings have been identified and require a dedicated annual funding stream to address in a systematic and consistent manner.

An updated public safety education campaign will be beneficial to address growing and evolving societal issues related to at-grade crossing safety, such as distracted walking and mental health issues.

ATTACHMENT(S)

Attachment 1: At-Grade LRT Crossing Safety Review: 5E's of Transportation Safety

Attachment 2: City of Calgary – LRT Crossing Safety Review

Attachment 3: Confidential – Fatality Data (confidential)

At-Grade LRT Crossing Safety Review: 5E’s of Transportation Safety

Contents

Introduction

Safety is a key element of Calgary Transit's Customer Commitment, and plays a critical role in guiding the planning, design and implementation of transit service. At-grade Light Rail Transit (LRT) crossings are continuously reviewed through the 5E's of Transportation Safety for a comprehensive approach to address pedestrian and vehicle safety. The 5E's are:

- Engineering
- Evaluation
- Enforcement
- Education
- Engagement

Engineering

Engineering treatments are crossing protection devices used to make at-grade LRT crossings safe through physical protection and warning devices. These treatments include bells, swing gates, staggered bedsteads, automatic crossing gates and flashing lights. An inventory of protection measures, device classification, constraints and costs can be found in this section of the report.

Calgary Transit's LRT system has 92 at-grade crossings; Table 1 provides a breakdown of crossing types.

Table 1: Number and Type of At-grade Crossings

At-grade Crossing Type	Number of Crossings
Pedestrian only crossings	32
Road only crossings	12
Mixed crossings (pedestrian and road)	48
Total:	**92**

The design and safety treatments of at-grade LRT crossings follow applicable industry standards and Calgary Transit's LRT Design Guideline Manual (DGM) (Figure 2). In 2009, Calgary Transit updated the guiding principles for planning and design in the DGM for new and reconstruction of LRT crossings (previously from 2001). The updated guiding principles help manage the constraints and design of at-grade crossings. LRT extensions and construction between 2000 and 2009 followed 2001 guiding principles; however, CTrain extensions after the Blue Line West extension followed the updated 2009 guiding principles listed below:

I. Safety is paramount:

- Priority is for a safe and dependable design based on industry best practices.
- Crossing protection must allow for accessibility by all users, including people with disabilities. The Guidelines must account for persons with physical, sensory and developmental disabilities, children, seniors, customers/pedestrians carrying groceries/packages or pushing strollers, cyclists (young, old, proficient, and novice), and the like.

- Facilities must provide clear direction to users.
- The Guidelines must provide for variation from normal practice in special circumstances, with the addition of appropriate mitigating measures.
- Perceived safety issues should be reviewed and addressed where appropriate.

II. Balance rapid transit, customer access and community connectivity:

- Crossing protection (and the number of at-grade crossings) should allow Calgary Transit to operate the LRT at the highest possible speed based on track geometry and station spacing, and to maintain schedule reliability. This must be balanced with the need for customers to access stations efficiently and for community connectivity.
- While the goal of LRT is to provide rapid transit, The Municipal Development Plan/Calgary Transportation Plan has developed goals for intensification, connectivity and increased emphasis on active modes that will influence the design of crossing protection on some potential future rail transit lines in urban corridors (e.g. service with slower speed operation with traditional traffic control devices). Prior to the construction of such lines, the Guidelines should be reviewed to confirm applicability, or the need to develop additional or revised Guidelines to meet requirements specific to that mode of operation.

III. Need for crossing protection:

- Where the LRT is operated at the speed of other adjacent traffic, with an expectation that the train operator will follow standard roadway traffic signal controls (e.g., 7th Avenue or other future at-grade urban corridors), traditional traffic control devices may be used for motor vehicle and pedestrian control (traffic signals, walk/don’t walk signals and audible cues).

IV. Cost-effective approach:

- Calgary’s LRT will continue to be based on an affordable, surface running design integrated into adjacent development, rather than more expensive grade separated concepts. Use of at-grade crossings will continue to be a standard approach, with exceptions only as warranted at major roadways, other railways, major geographic barriers, etc.
- The Guidelines will be applied to new installations. Older installations will be retrofitted to new standards where prioritized based on future safety reviews.

V. Reliability:

- Crossing protection facilities must be proven, robust and capable of operating with a high degree of reliability under all likely conditions with low maintenance requirements.
- Facilities must be fail-safe, and reside in safe mode in the event of failure

LRT operations along 7 Avenue S in downtown are based on in-street operations. In-street operations require the LRT to follow traffic signals that also control cross street traffic and bus movements. Every at-grade crossing outside the 7 Avenue S corridor has engineering protection measures in place. At minimum, all at-grade crossings outside of 7 Avenue are protected by flashing lights and bells. In addition, swing gates or bedsteads are installed at pedestrian crossings and automatic gate arms are installed at road and mixed crossings for vehicular traffic. These additional measures go beyond the current industry standards and have been added to the LRT Crossing Guidelines because they have been found to be effective at reducing near misses and incidents through audits conducted by the LRT Crossing Committee (see Evaluation section).

Calgary's LRT system began operations in 1981, and the LRT Crossing Guidelines have evolved over time with industry standards, best practices and internal experience. A revised edition of the Crossing Guidelines issued in 2017 include significant safety enhancements such as installing automatic pedestrian gate arms for all new lines and extensions. The refreshed guidelines also further extended the minimum requirements to address accessibility issues (such as addition of tactile warning strips) and a minimum required crossing surface width to ensure there is appropriate room for a person using a wheelchair to safely cross the tracks.

The 2017 Crossing Guidelines also provides a decision tree matrix for updating safety measures at existing at-grade crossings in a cost-effective and prioritized manner based on the type of crossing, site conditions and risk. The decision tree can be found in Appendix 1.

Freight railways are federally regulated by Transport Canada Grade Crossing Standards; these specifications are followed where LRT at-grade crossings are in fright railway Right of Way (ROW). Pedestrian crossings that cross LRT tracks along with one or more tracks belonging to a freight railway (i.e. CP Rail) are also protected with flashing lights, bells and crossing arms for vehicles.

A complete inventory of at-grade crossing locations and protection measures can be found in Appendix 2. Table 2 summarizes the type of protection measures that Calgary Transit employs, how the protection measure supports safety, and approximate costs. The costs of each treatment are based on previous Calgary Transit at-grade crossing upgrade projects, and represent the entire costs to implement a measure (e.g. in-house design, labour, signal connections and upgrades, materials, equipment, excavation and thorough testing to ensure the treatments work under normal operating conditions and in safe mode). Costs also vary depending on site conditions (e.g. space, adjacent land uses and vehicle and pedestrian volume). Figure 1 shows some examples of the engineering protection measures used.

The LRT system also has grade-separated pedestrian crossings at specific locations; these are provided where pedestrian access across the track is restricted by physical site constraints such as station access, road classification or environmental area. It is costly and difficult to grade separate an existing crossing however opportunity exists with future extensions or new LRT lines. Pedestrian volumes, traffic volumes and transit operations are considerations when determining grade separated crossings.

Table 2: At-grade LRT Crossing Treatment Inventory

Protection Measure	**Device Classification**	**Industry Guidelines**	**Calgary Transit Guidelines**	**Approximate Costs**

Flashing Lights	Visual warning device	Required	Required	Single track crossing: $15,000-$19,000 Two track crossings: $30,000-$35,000
Bells	Audible warning device	Required	Required	Additional bell: $1,000-$1,500
Swing gates or bedsteads	Physical barriers	Recommended	Required	Swing gate replacement or additional bedstead: $1,000-$4,000 New design and construction: $40,000
Automatic gate arms (pedestrian crossing)	Automatic physical barrier	Recommended under site specific conditions	Existing crossing: Depends on site conditions (see Appendix 1) New crossing: Required	Four gate arms: $400,000-$500,000 +$200,000 for third party coordination (ex. Heavy rail, underground utilities)
Automatic gate arms (road crossing)	Automatic physical barrier	Recommended under site specific conditions	Required	Four gate arms: $400,000-$500,000
Second train light	Visual warning device	Recommended under site specific conditions	Existing crossing: Depends on site conditions (see Appendix 1) New construction: Two tracks and no refuge - Required	One crossing: $13,000

Figure 1: (left) flashing lights, bells and besteads; (middle) automatic pedestrian gate arm, flashing light and bells; (right) automatic vehicle gate arms

7 Avenue S corridor

LRT operations along 7 Avenue S corridor between 11 Street SW and 3 Street SE and 9 St SW function using in-street operations, meaning that trains are required to follow conventional traffic signals. There are no additional protection measures with the following exceptions:

- 11 Street at 7 Avenue SW is the western transition point from in-street operations to signalized territory. Automatic vehicle gate arms exist for NB and SB vehicle traffic and automatic pedestrian gate arms are located on the west pedestrian crossing.
- 3 Street at 7 Avenue SE is the eastern transition point from in-street operations to signalized territory. Swing gates are located in the SE corner at-grade crossing where the Red Line exits and enter the tunnel. As part of this report, this intersection was reviewed to ensure it met best practices for safety (Attachment 2); the review showed that:
    - Pedestrians are disregarding the warning systems due to irregularities with the warning signals due to complex operations of Blue Line and Red Line entering and exiting 7 Av S corridor. The Crossing Committee is reviewing the warning system times at this intersection.
    - The installation of flashing lights, bells and automatic gate arms at the Red Line pedestrian crossing are recommended to address safety and accessibility.

  The recommendations made by the review will be considered by the LRT Crossing Committee and be prioritized within annual work plans by risk and budget availability.
- 9 Street between 4 Avenue and 7 Avenue S
    - 9 Street at 4 Avenue S – flashing lights, bells and bedsteads exist for pedestrians
    - 9 Street at 5 Avenue S – automatic vehicle gate arms exist to maintain vehicle level of service and address operator sight line concerns. For pedestrian safety, flashing lights, bells and bedsteads exist.
    - 9 Street at 6 Avenue S –bedsteads exist for pedestrians

- 9 Street at 7 Avenue S – flashing lights, bells and bedsteads exist for pedestrians

Evaluation

LRT Crossing Committee

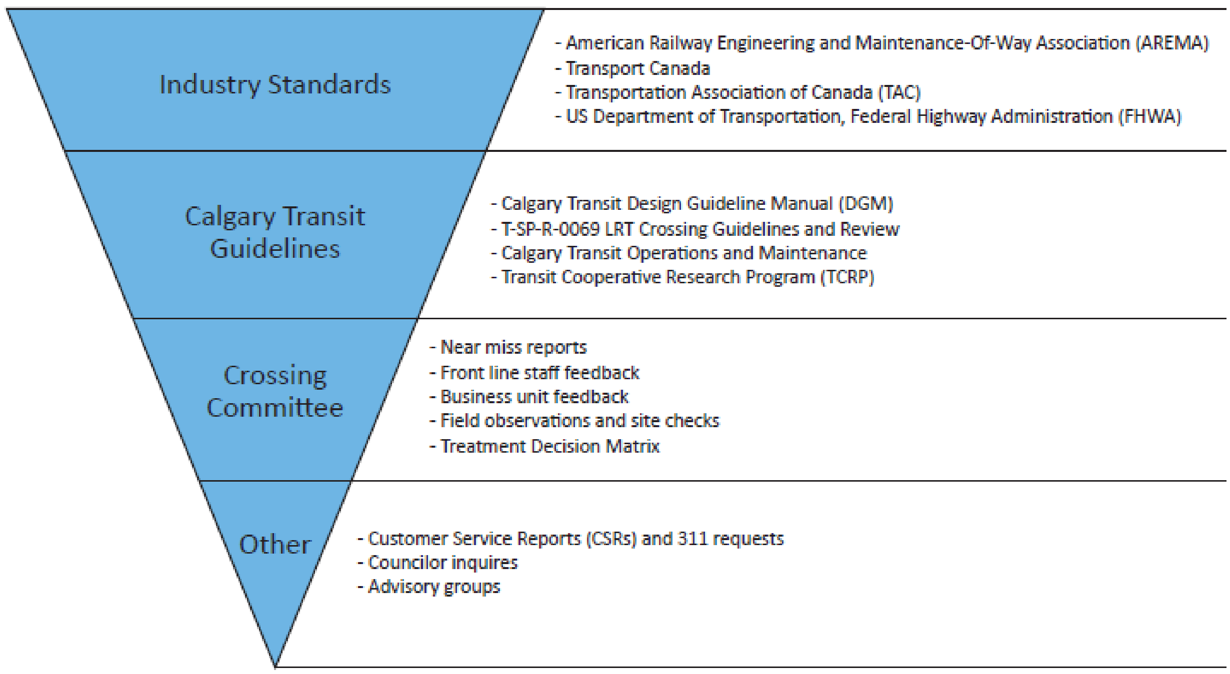
Calgary Transit's LRT Crossing Committee is made up of internal technical experts that are responsible for conducting technical reviews of at-grade crossings to ensure crossing treatments meet the needs of the users, operations and site-specific issues. The group is made up of members from Signals and Rail Systems, Track and Way, Public Safety and Enforcement, LRT Operations, Transit Planning and Communications and Marketing. An advisory group that includes Roads Safety, Calgary Police Services and Liveable Streets are consulted to provide a boarder transportation safety perspective. The LRT Crossing Committee relies on multiple data sources such as near miss reports from LRT operators and public concerns from 311 to prioritize locations for improvement. Other inputs are also included in evaluations such as feedback from Calgary Police Services, Roads and other Calgary Transit divisions such as Operations, Public Safety, and Enforcement and Infrastructure. The LRT Crossing Committee engages internal advisory groups such as the Access Design Sub Committee and Calgary Transit Customer Advisory Group to understand the user experience. Over the past few years, the LRT Crossing Committee has increased the focus of prioritizing their annual work plan based on the number of near misses reported at locations. Table 3 shows the locations with three or more near misses in a year, outside of downtown.

Table 3: Crossing locations, outside of downtown, with three or more near misses per year

2015	2016	2017	2018
Chinook Station	Chinook Station	Chinook Station	Sunnyside Station
Saddletowne Station	36 St and 12 Av NE	Saddletowne Station	Chinook Station
Sunnyside Station	Banff Trail Station	Sunnyside Station	Saddletowne Station
Whitehorn Station	Sunnyside Station	Whitehorn Station	Whitehorn Station
	Saddletowne	Banff Trail Station	58 Av SW
	Whitehorn	Heritage Station	Lions Park Station
	SAIT/ACAD/Jubilee Station	Marlborough Station	Marlborough Station
	36 St and 26 Av NE	McKnight-Westwinds Station	36 St and 20 Av NE
		Shawnessy Station	Brentwood Station
		Sirocco Station	Martindale Station

Immediate safety concerns and high priority improvements are addressed through the lifecycle and asset management budgets in the Calgary Transit Infrastructure division. The Council-approved LRT Reliability fund was previously used to address priority improvement opportunities at LRT crossings between 2013-2018. Having a dedicated source of capital funding will result in continuous and consistent implementation of further improvement opportunities to at-grade crossings prioritized based on risk.

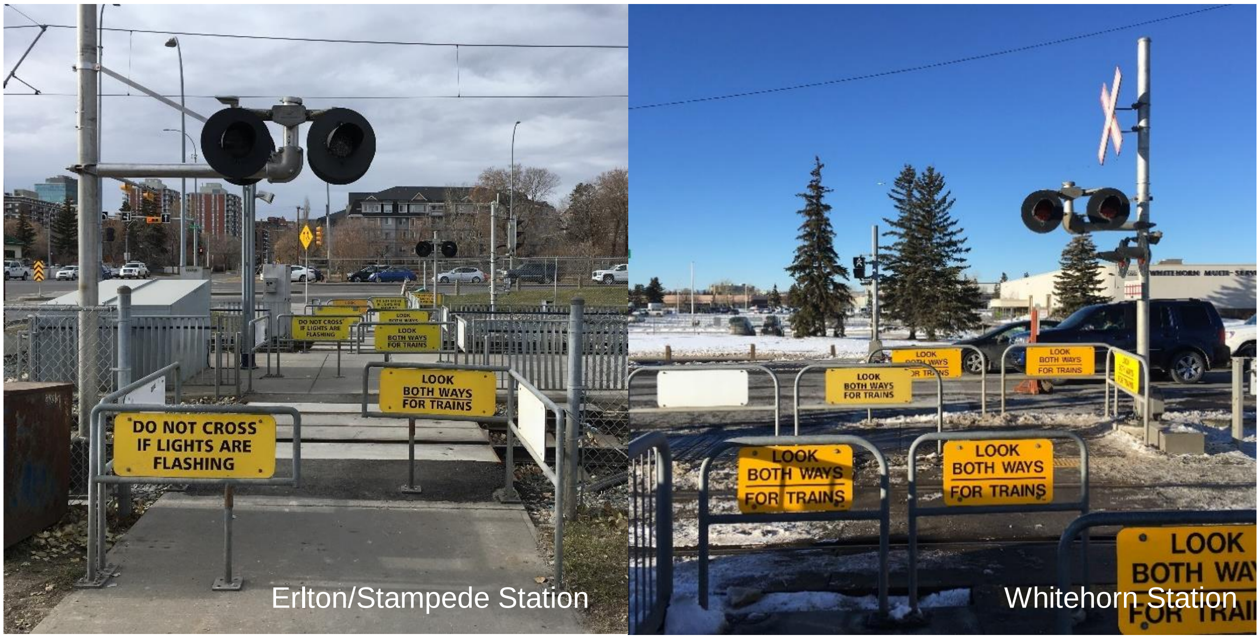
It is important to note that the LRT Crossing Committee and at-grade crossing designs must follow applicable industry standards, Calgary Transit's Design Guidelines and LRT Crossing Guidelines, as indicated in Figure 2. Input from other sources are considered but may not meet the standards and guidelines that are already in place to promote safety. The LRT Crossing Committee manages the feedback outside of the industry standards and LRT's DGM. Figure 2: At-grade LRT Crossing Standards, Guidelines and other Considerations



Calgary Transit's Rail Systems group conducts regular monthly inspections and testing of crossing safety specific infrastructure, such as train approach times, lights, bells (function and sound level), signs and gates. In a situation where crossing protection measures are damaged, malfunction or fails an inspection and cannot be immediately addressed, the crossing is closed or train operations are adjusted until the proper solution can be implemented. Post incident investigations are conducted immediately after an incident occurs, and the findings are shared with the Law department and Calgary Police Services, as requested.

Through the LRT Crossing Committee's review of near misses, site visits and other data sources, continuous upgrades are made to improve pedestrian safety by installing the appropriate safety measures. Figure 3 shows a recent adjustment to the flashing lights at Erlton/Stampede Station and Whitehorn Station. The pedestrian sightlines to the flashing lights were previously not direct but with a slight modification, they have been shifted to be directly facing the pedestrian (cantilevered).

Figure 3: Flashing lights lowered and cantilevered out to directly face pedestrians.



The LRT Crossing Committee is also responsible for evaluating the need for automatic gate arms at existing pedestrian at-grade crossings. Automatic gate arms are not a requirement under industry standards but are recommended under specific conditions through the Transit Cooperative Research Program (TCRP) Report 69- Light Rail Service: Pedestrian and Vehicular Safety (2001). The report uses a decision tree tool for evaluating the type of treatment that should be installed at a pedestrian grade crossing based on site specific conditions such as pedestrian volumes, sight lines and track alignment. Calgary Transit has adopted the TCRP findings and developed a decision matrix applicable to Calgary's LRT system (Appendix 1).

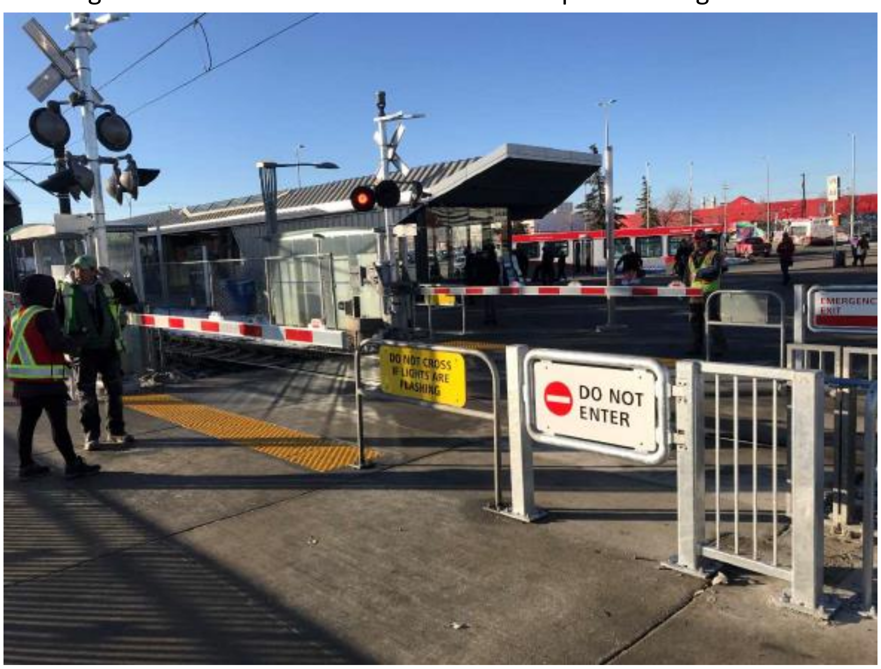
Automatic pedestrian gate arms are highly effective in providing a physical barrier when trains are approaching. However, they are expensive to retrofit into an existing system, requiring design, construction and possible land impacts to ensure sufficient pedestrian refuge areas. Automatic gate arms were recently installed at two existing at-grade locations after an extensive review from the LRT Crossing Committee: Banff Trail Station and Chinook Station. The minimum safety measures were in place at both of those stations; however, it was found that due to context specific features and significant near misses consistently occurring, enhanced safety measures were required (Table 4 and Figure 4).

All pedestrian at-grade LRT crossings on the Blue Line West were implemented with automatic gate arms as recommended by the TCRP Report 69 and lessons learned from the existing system. Green Line Stage 1 is requiring automatic pedestrian gate arms at all at-grade LRT crossings. For all new LRT lines or extensions, Calgary Transit is supportive of treatments that are consistent with the Blue Line West.

Table 4: Considerations and Impacts of Automatic Pedestrian Gate Arms at Chinook Station and Banff Trail Station

Location	Site issues	Safety Measures Before	Safety Measures After	Benefits After
Chinook Station Pedestrian Crossing	• 21 near miss data reports in 2017 • Fatality • High non-compliance of safety measures • High pedestrian realm (Chinook Mall) • Adjacent CP rail corridor • Transit hub of buses and LRT	• Flashing lights • Bells • Bedsteads • Signage	October 2017: • Flashing lights • Bells • Signage • Automatic gate arm • Tactile yellow strip	• Reduced number of near misses to 4 in 2018 • Better compliance of safety measures
Banff Trail Station Pedestrian Crossing	• Fatality • High pedestrian realm (McMahon Stadium) • High non-compliance of safety measures during site visits • High non-compliance of safety measures during enforcement blitz • Sightlines	• Flashing lights • Bells • Swing gates • Signage	2015: • Flashing lights • Bells • Signage • Automatic gate arm	• Better compliance of safety measures

Figure 4: Chinook Station with automatic pedestrian gate arms



Another safety measure that the LRT Crossing Committee has recently implemented is the second train warning light; this light is activated when trains in both directions are approaching the at-grade crossing. The visual display advises pedestrians not to cross when safety measures are activated as a train is approaching in the opposite direction. There are only three locations where the second train light has been implemented: Sunnyside Station south crossing (2018), Sunnyside Station north crossing (2018) and SAIT Campus crossing (1987, updated in 2017) – Figure 5.

Figure 5: Second Train Lights at SAIT Campus Crossing (left) and Sunnyside Station Crossing (right)

Best Practices Review

As part of this report, an external consultant examined the at-grade crossing protection measures employed by Calgary Transit, and benchmarked the effectiveness against comparable LRT systems in North America (Attachment 2). The scope of their review included:

- Applicable guidelines, standards and best practices;
- The rate of collisions at at-grade crossings of the LRT system;
- The adequacy of the at-grade crossing warning systems;
- Factors contributing to at-grade crossing safety issues; and
- Recommendations for improvements to address noted safety issues.

Through this examination, it was determined that Calgary Transit has implemented best practices in new designs and for making prioritized improvements to existing crossings. The effectiveness of the at-grade crossing warning systems in Calgary is similar to that of comparable LRT systems in North America. A copy of the evaluation can be found in Attachment 2; the key findings were:

- Calgary Transit is employing applicable guidelines, standards and best practices in new design and has a process for capturing improvements reflected in these guidelines, standards and best practices into its own guidelines;

- The rate of collisions at at-grade crossings of the Calgary Transit LRT system is comparable to that elsewhere in North America;
- The Calgary Transit at-grade crossing warning systems are adequate to provide for the safety of motorists, cyclists and pedestrians;
- Calgary Transit is experiencing the same factors contributing to at-grade crossing safety issues as are found elsewhere in North America; and
- Calgary Transit has implemented best practices in determining the at-grade crossings needing improvements to the warning systems.

As part of this evaluation, the external consultants conducted field assessments of a diverse set of seven at-grade crossings across the LRT network. It was determined that all locations conformed to industry standards, and some recommendations for pedestrian safety enhancements were provided for consideration. The evaluation also recommended additional general improvement opportunities for the LRT Crossing Committee to consider within its engineering toolbox; these include lowering the height of pedestrian warning signals, implementing second train warning signage at more pedestrian crossings, and further evaluating installing automatic gate arms at additional locations based on risk and site considerations. The LRT Crossing Committee is currently evaluating these improvement recommendations and will prioritize them within annual work plans based on risk and budget availability. An annual dedicated capital funding stream will be required to implement these improvement opportunities in a systematic manner, and will be requested as part of the 2020 budget adjustments.

Enforcement

Calgary Transit Peace Officers educate and enforce the municipal bylaws to ensure safe behavior and compliance at at-grade crossings on the LRT system. Crossing an at-grade LRT crossing when it is not appropriate and safe to do so (i.e. crossing LRT tracks while the control device is activated) is an offence under the following municipal bylaws:

- 26M96 Traffic Bylaw Section 6:
  - (1) A pedestrian shall not cross a street within one block in any direction of a traffic control signal or pedestrian corridor other than in a crosswalk.
  - (3) No pedestrian shall cross an LRT track except on a sidewalk or crosswalk.
  - (4) Where an LRT crossing is controlled by gates, lights, bells, pedestrian lights, or any combination thereof, a person shall not cross the LRT track while the control devices are activated indicating the crossing is not permitted.
- 4M81 Transit Bylaw Section 11:
  - (11.1) No person shall
    - (a) enter inside of the corridor created by fences or barriers located on either side of any light rail transit racks or
    - (b) where there is no corridor created by fences or concrete barriers, sit, stand, play or walking within three (3) meters of any light rail transit tracks.

Between 2015 and 2018, an average total of 890 tickets per year have been issued under the two bylaws listed above.

Enforcement blitzes are a tool used by Calgary Transit Peace Officers to educate, warn and enforce safe at-grade crossings. A combination of police and peace officers are used during a blitz to monitor an at-grade crossing to ensure safe and proper crossings and engage with users. The number of blitzes and location are recommended by the LRT Crossing Committee and based on near miss data. For 2019, approximately ten locations have been identified for an enforcement blitz. A blitz typically occurs over multiple days during high ridership time periods, with warnings and tickets issued for non-compliance. A follow up blitz is scheduled a few weeks later at the same location to examine changes in behavior.

The findings from an enforcement blitz are communicated back to the LRT Crossing Committee for further consideration.

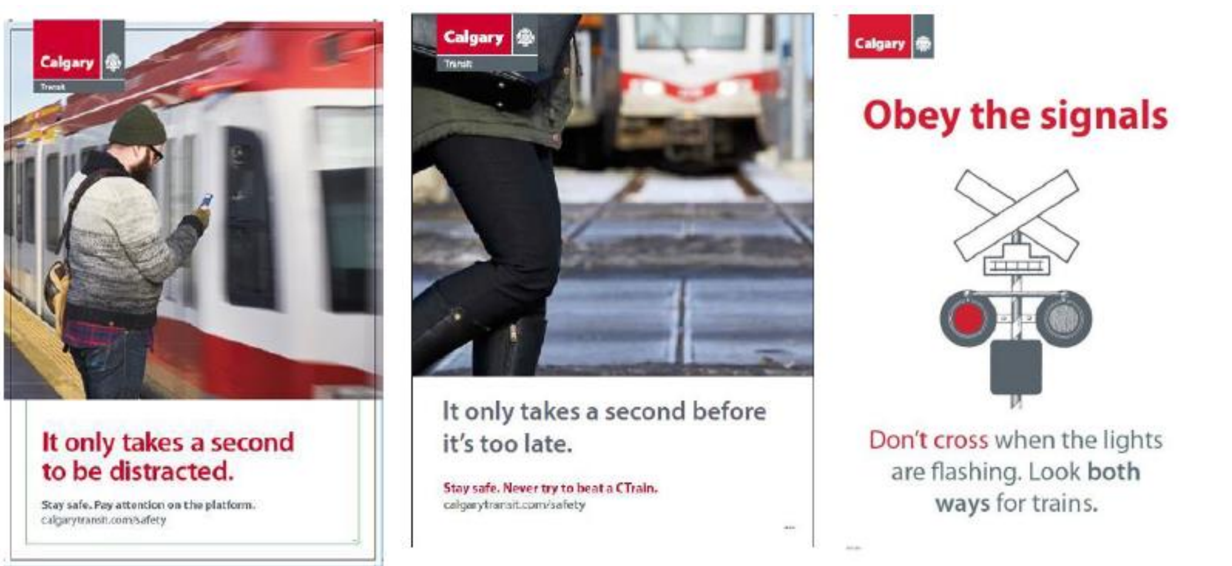
Education

External Programs

Calgary Transit continually implements prevention-oriented safety messages for transit customers to raise awareness and prevent incidents at at-grade crossings.

- Staff monitor LRT platform cameras for hazardous situations and make public safety announcements to address concerns or give general feedback.
- Calgary Transit's website (www.calgarytransit.com/ridersguide) and call centre provide information about LRT and bus safety.
- To raise awareness around distractions and crossings around the CTrain system, Calgary Transit implemented a safety campaign in 2015 called "It Only Takes a Second" and "Obey the Signals (Figure 6)." Locations are targeted based on near miss data collected by the LRT Crossing Working Committee. The campaign is currently ongoing.
- Installing signage at key locations

Figure 6: 2018 At-grade crossing public campaign



Calgary Transit is currently refreshing the public safety campaign to ensure messaging resonates with current evolving issues. The update will be more comprehensive to include distracted walking, mental health and enforcement. It will apply the lessons learned from the previous campaigns and pedestrian behavior data to refresh its key messages, material and deployment strategy.

Calgary Transit has training programs to teach new transit users how to use the transit system including the CTrain system. The programs are designed for Grade 6+ school students, seniors and people with disabilities, although anyone is allowed to participate. The programs teach people how to use Calgary Transit services safety and independently. This includes how to cross at-grade LRT crossings and the measures in place for safety.

Internal Programs

All Calgary Transit staff involved with LRT operations are required to take LRT Rule Book Training and pass annual requalifying tests. The LRT Rulebook is Calgary Transit's guideline for operating rules and procedures for LRT which includes guidelines for operating at-grade crossings. Adherence to the rules and procedures are essential to operator and public safety.

In 2013, Calgary Transit's front-line staff for LRT operations participated in suicide awareness and prevention training. The training was a partnership between Calgary Transit and the Centre for Suicide Prevention, and included LRT Operators, LRT Operations Supervisors, Public Safety and Enforcement Peace Officers, Call Centre, LRT Track and Way, LRT Maintenance, LRT Training and Recruitment and Public Safety Dispatchers. In addition to employee support, Calgary Transit is currently reviewing its Critical Incident Support procedures to ensure resources are available for staff that have been exposed or involved in a serious incident while delivering transit service such as suicides, collisions resulting in death or serious injury or near misses.

Engagement

At-grade crossing safety has limited engagement opportunities due to the technical requirements for how crossing safety treatments are determined and implemented. Crossing safety must follow industry standards and Calgary Transit's LRT DGM. All crossings must also have a similar look and feel to ensure consistent transit customer behavior. Input into the process and the treatment type from other sources and stakeholders are considered through the LRT Crossing Committee but must adhere to industry standards and Calgary Transit's DGM for safety.

For this report, stakeholder engagement was limited to internal city stakeholders and City/CT advisory groups. The LRT Crossing Committee engages with the same stakeholders in their workplans to help implement and prioritize safety improvements.

Internal Stakeholder list

- Calgary Transit
- Green Line
- Transportation Infrastructure

- Transportation Planning
- Roads
- Calgary Police Services
- Calgary Neighbourhoods

City Advisory Groups

- Calgary Transit Customer Advisory Group
- Access Design Sub Committee of Advisory Committee on Accessibility

The various internal stakeholders were identified based on their involvement with at-grade crossings. The department representatives are involved with the planning, implementation, operating, evaluating, enforcement and/or education about at-grade LRT crossings.

The City Advisory Groups were identified based on the groups' representation. Calgary Transit's Customer Advisory Group provides insight and advice to improve the transit customer experience and Calgary Transit's relationship with customers. They will be providing feedback on public safety promotion material, transit rider training programs and the customer experience at at-grade LRT crossings.

The Access Design Sub Committee reviews and makes recommendations on issues that relate to accessibility for people with disabilities throughout the city. At-grade crossings and accessibility are a challenging issue that warrants further review outside of this report. Calgary Transit follows the City of Calgary's 2016 Access Design Standards however, the standards do not address in detail accessibility at at-grade LRT crossings. Some measures do target certain accessibility concerns such as bells for the vision impaired and flashing lights for the hearing impaired but further improvements can still be evaluated. The standards in the Access Design Stations that addresses at-grade crossings are:

- (275) A barrier-free path of travel (1,500mm) wide is required throughout the station site.
- (276) Rail crossings shall be smooth and level across the tracks and provide visual and auditory cues.
- (277) A cane detectable tactile warning strip shall be provided at entrance locations to the LRT pedestrian crossing. The tactile warning strip shall cover the width of the crossing entrance.

Prior to the establishment of the Access Design Standards, Calgary Transit, through the LRT Crossing Committee, have made improvements to address accessibility concerns such as implementing tactile warning strips at track crossings to warn people with a visual impairment that they are about to cross LRT Tracks and creating smooth and level crossings for wheelchair users. The Blue Line West opened in 2012 and has tactile warning strips at all at-grade crossings, and they are being implemented at other existing at-grade crossings during refurbishment programs (Figure 7). Accessibility concerns at at-grade crossings are multi-faceted and need to be fully understood before a solution can be proposed. Comprehensive research, evaluation and testing of evolving standards and practices needs to be conducted before major design changes can be applied to Calgary Transit's LRT system.

The scope of a more detailed accessibility and safety review is being explored by the LRT Crossing Committee as a follow up to this report to ensure that at-grade crossings and future crossings meet evolving accessibility standards, guidelines and best practices.

Figure 7: Tactile warning strip at Chinook Station

Appendix 1: At-Grade Crossing Safety Measures – Decision Matrix (July 2017)

This Chart for use in Semi-exclusive (Type b) LRT Right of Way

CROSSING CATEGORY (Sections 3.3.1 and 4.2.1) →		PEDESTRIAN CROSSING ADJACENT TO A ROAD CROSSING	PEDESTRIAN CROSSING ASSOCIATED WITH STATION ACCESS (AND NOT ADJACENT TO A ROAD)	PEDESTRIAN CROSSING ON ITS OWN
Minimum requirements		• Standard signage • Tactile warning strips • Barriers with "Z" gates or swing gates* • Flashing lights/bell • Access width 1.8m • Crossing surface width 2.8m • 90 degree crossing†	• Standard signage • Tactile warning strips • Barriers with "Z" gates or swing gates* • Flashing lights/bell • Access width 1.8m • Crossing surface width 2.8m • 90 degree crossing†	• Standard signage • Tactile warning strips • Barriers with "Z" gates or swing gates* • Flashing lights/bell • Access width 1.8m • Crossing surface width 2.8m • 90 degree crossing†
Crosses more than one track - sufficient refuge area between tracks		• Add designated refuge area with signage, tactile warning strips, barriers with "Z" gates or swing gates* between tracks	• Add designated refuge area with signage, tactile warning strips, barriers with "Z" gates or swing gates* between tracks	• Add designated refuge area with signage, tactile warning strips, barriers with "Z" gates or swing gates* between tracks
Crosses more than one track – insufficient refuge area between tracks		• Add automatic gates unless roadway gates also cover pedestrian crossing	• Add automatic gates unless station platforms located such that all trains stop before occupying crossing	• Add automatic gates
Crossing includes freight railway track(s)		• Add automatic gates unless roadway gates also cover pedestrian crossing	• Add automatic gates	• Add automatic gates
Crosses road in addition to track(s)	**Limited or normal pedestrian activity#**	• Add median island(s) between road and track with tactile warning strips • Add pavement (crosswalk) markings • Add ped heds • Add permanent barriers to prevent jay-walking	• Add median island(s) between road and track with tactile warning strips • Add pavement (crosswalk) markings • Add ped heds • Add permanent barriers to prevent jay-walking	• Add median island(s) between road and track with tactile warning strips • Add pavement (crosswalk) markings • Add ped heds • Add permanent barriers to prevent jay-walking
	High pedestrian activity	• Increase size of median island(s) • Increase width of pedestrian route	• Increase size of median island(s) • Increase width of pedestrian route	• Increase size of median island(s) • Increase width of pedestrian route
	Pedestrian surges	• Increase size of median island(s) further • Increase width of pedestrian route further	• Increase size of median island(s) further • Increase width of pedestrian route further	• Increase size of median island(s) further • Increase width of pedestrian route further
Does not cross road	**Limited or normal pedestrian activity#**	• N/A	• N/A	• N/A
	High pedestrian activity	• Increase width of pedestrian route	• Increase width of pedestrian route	• Increase width of pedestrian route
	Pedestrian surges	• Increase width of pedestrian route further	• Increase width of pedestrian route further	• Increase width of pedestrian route further
Severe sightline restrictions		• Add automatic gates	• Add automatic gates	• Add automatic gates

Appendix 2: Inventory of at-grade crossing locations and safety measures

#	Line	Location	Crossing Type	Territory	Flashing lights (Wig-wags)	Bells	Second Train Light	Pedestrian			Road Automatic Gate Arms
								Bedsteads	Swing Gates	Automatic Gate Arms	
1	Red Line S	3 St SE	PED-X	LRT ROW	Yes	Yes			Yes		
2	Red Line S	Erlton Stampede Station	PED-X	LRT ROW	Yes	Yes		Yes			
3	Red Line S	25 Av SE	MIXED	LRT ROW	Yes	Yes		Yes			Yes
4	Red Line S	36 Av SE	MIXED	LRT ROW	Yes	Yes		Yes			Yes
5	Red Line S	39 Av SE	MIXED	LRT ROW	Yes	Yes		Yes			Yes
6	Red Line S	50 Av SE	MIXED	CP ROW	Yes	Yes		Yes			Yes
7	Red Line S	58 Av SE	MIXED	CP ROW	Yes	Yes		Yes			Yes
8	Red Line S	61 Av SE	MIXED	CP ROW	Yes	Yes		Yes			Yes
9	Red Line S	Chinook Station	PED-X	LRT ROW	Yes	Yes				Yes	
10	Red Line S	Heritage Dr SE	MIXED	CP ROW	Yes	Yes		Yes			Yes
11	Red Line S	Heritage Station	PED-X	LRT ROW	Yes	Yes		Yes			
12	Red Line S	Southland Station	PED-X	LRT ROW	Yes	Yes		Yes			
13	Red Line S	Anderson Station	PED-X	CP ROW	Yes	Yes				Yes	
14	Red Line S	Anderson Station Wy SE	ROAD	CP ROW	Yes	Yes					Yes
15	Red Line S	Fish Creek Lacombe Station	PED-X	LRT ROW	Yes	Yes		Yes			
16	Red Line S	James McKevitt Rd SW	ROAD	CP ROW	Yes	Yes					Yes
17	Red Line S	Shawnessy Station	PED-X	LRT ROW	Yes	Yes			Yes	Yes	
18	Red Line S	162 Av SW	MIXED	CP ROW	Yes	Yes		Yes			Yes
19	Red Line S	Somerset Station North	PED-X	CP ROW	Yes	Yes				Yes	
20	Red Line S	Somerset Station South - East	PED-X	CP ROW	Yes	Yes				Yes	
21	Red Line S	Somerset Station South - West	PED-X	LRT ROW	Yes	Yes				Yes	
22	Red Line S	Shawville Gate	MIXED	CP ROW	Yes	Yes		Yes			Yes
23	Blue Line NE	7 Av/4 St SE	MIXED	LRT ROW	Yes	Yes		Yes			Yes
24	Blue Line NE	6 Av SE	MIXED	LRT ROW	Yes	Yes		Yes			Yes

25	Blue Line NE	Deerfoot Tr SE	ROAD	LRT ROW	Yes	Yes					Yes
26	Blue Line NE	28 St. SE	MIXED	LRT ROW	Yes	Yes		Yes			Yes
27	Blue Line NE	4 Av NE	ROAD	LRT ROW	Yes	Yes					Yes
28	Blue Line NE	5 Av NE	MIXED	LRT ROW	Yes	Yes		Yes			Yes
29	Blue Line NE	8 Av NE	MIXED	LRT ROW	Yes	Yes		Yes			Yes
30	Blue Line NE	12 Av NE	MIXED	LRT ROW	Yes	Yes		Yes			Yes
31	Blue Line NE	16 Av NE	ROAD	LRT ROW	Yes	Yes					Yes
32	Blue Line NE	16 Av NE	ROAD	LRT ROW	Yes	Yes					Yes
33	Blue Line NE	20 Av NE	MIXED	LRT ROW	Yes	Yes		Yes			Yes
34	Blue Line NE	26 Av NE	MIXED	LRT ROW	Yes	Yes		Yes			Yes
35	Blue Line NE	32 Av NE	MIXED	LRT ROW	Yes	Yes		Yes			Yes
36	Blue Line NE	Whitehorn Station	PED-X	LRT ROW	Yes	Yes		Yes			
37	Blue Line NE	Whitehorn Drive	ROAD	LRT ROW	Yes	Yes					Yes
38	Blue Line NE	39 Av NE	MIXED	LRT ROW	Yes	Yes		Yes			Yes
39	Blue Line NE	44 Av NE	MIXED	LRT ROW	Yes	Yes		Yes			Yes
40	Blue Line NE	McKnight Westwind Station	PED-X	LRT ROW	Yes	Yes			Yes		
41	Blue Line NE	Martindale Bv NE (south leg)	MIXED	LRT ROW	Yes	Yes			Yes		Yes
42	Blue Line NE	Martindale Bv NE (north leg)	MIXED	LRT ROW	Yes	Yes				Yes	Yes
43	Blue Line NE	Saddletowne Circle NE (south leg)	MIXED	LRT ROW	Yes	Yes			Yes		Yes
44	Blue Line NE	Saddletowne Station South	PED-X	LRT ROW	Yes	Yes			Yes		
45	Blue Line NE	Saddletowne Station North	PED-X	LRT ROW	Yes	Yes			Yes		
46	Blue Line NE	Saddletowne Circle NE (north leg)	MIXED	LRT ROW	Yes	Yes		Yes			Yes
47	Red Line NW	9 St at 7 Av SW	PED-X	In-Street Operations	Yes	Yes		Yes			
48	Red Line NW	9 St at 6 Av SW	MIXED	In-Street Operations	No	No		Yes			
49	Red Line NW	9 St at 5 Av SW	MIXED	In-Street Operations	Yes	Yes		Yes			Yes
50	Red Line NW	9 St at 4 Av SW	MIXED	In-Street Operations	Yes	Yes		Yes			
51	Red Line NW	2 Av NW	MIXED	LRT ROW	Yes	Yes		Yes			Yes
52	Red Line NW	Sunnyside Station South	PED-X	LRT ROW	Yes	Yes	Yes		Yes		

53	Red Line NW	Sunnyside Station North	PED-X	LRT ROW	Yes	Yes	Yes		Yes		
54	Red Line NW	4 Av NW	MIXED	LRT ROW	Yes	Yes		Yes			Yes
55	Red Line NW	SAIT Campus	PED-X	LRT ROW	Yes	Yes	Yes	Yes			
56	Red Line NW	SAIT/ACA/Jubilee Station	PED-X	LRT ROW	Yes	Yes			Yes		
57	Red Line NW	Jubilee Cr NW	MIXED	LRT ROW	Yes	Yes		Yes			Yes
58	Red Line NW	14 St NW (east leg)	MIXED	LRT ROW	Yes	Yes		Yes			Yes
59	Red Line NW	14 St NW (west leg)	MIXED	LRT ROW	Yes	Yes		Yes			Yes
60	Red Line NW	Lions Park Station East	PED-X	LRT ROW	Yes	Yes		Yes			
61	Red Line NW	Lions Park Station West	PED-X	LRT ROW	Yes	Yes			Yes		
62	Red Line NW	14 Av NW	MIXED	LRT ROW	Yes	Yes		Yes			Yes
63	Red Line NW	Banff Trail Station	PED-X	LRT ROW	Yes	Yes				Yes	
64	Blue Line W	11 St SW	MIXED	LRT ROW	Yes	Yes				Yes	Yes
65	Blue Line W	26 St SW	ROAD	LRT ROW	Yes	No					Yes
66	Blue Line W	Shaganappi Station	PED-X	LRT ROW	Yes	Yes				Yes	
67	Blue Line W	47 St SW	ROAD	LRT ROW	Yes	No					Yes
68	Blue Line W	45 St SW Station (47 St SW east)	PED-X	LRT ROW	Yes	Yes				Yes	
69	Blue Line W	47 ST SW (west)	PED-X	LRT ROW	Yes	Yes				Yes	
70	Blue Line W	Sarcee Tr SW	ROAD	LRT ROW	Yes	No					Yes
71	Blue Line W	Sarcee Tr Greenway (Pathway)	PED-X	LRT ROW	Yes	Yes				Yes	
72	Blue Line W	Sirocco Station (Costello Bv SW east)	PED-X	LRT ROW	Yes	Yes				Yes	
73	Blue Line W	Costello Bv SW	ROAD	LRT ROW	Yes	No					Yes
74	Blue Line W	Costello Bv SW (west)	PED-X	LRT ROW	Yes	Yes				Yes	
75	Blue Line W	Christie Park Ga SW (east)	PED-X	LRT ROW	Yes	Yes				Yes	
76	Blue Line W	Christie Park Ga SW	ROAD	LRT ROW	Yes	No					Yes
77	Blue Line W	Christie Park Ga SW (west)	PED-X	LRT ROW	Yes	Yes				Yes	
78	7 Avenue S	3 St SE	MIXED	In-Street Operations	Yes	Yes					
79	7 Avenue S	3 St SE	PED-X	In-Street Operations	Yes	Yes			Yes		
80	7 Avenue S	Macleod Tr SE	MIXED	In-Street Operations	No	No					
81	7 Avenue S	1 St SE	MIXED	In-Street Operations	No	No					

82	7 Avenue S	Centre St S	MIXED	In-Street Operations	No	No					
83	7 Avenue S	1 St SW	MIXED	In-Street Operations	No	No					
84	7 Avenue S	2 St SW	MIXED	In-Street Operations	No	No					
85	7 Avenue S	3 St SW	MIXED	In-Street Operations	No	No					
86	7 Avenue S	4 St SW	MIXED	In-Street Operations	No	No					
87	7 Avenue S	5 St SW	MIXED	In-Street Operations	No	No					
88	7 Avenue S	6 St SW	MIXED	In-Street Operations	No	No					
89	7 Avenue S	7 St SW	MIXED	In-Street Operations	No	No					
90	7 Avenue S	8 St SW	MIXED	In-Street Operations	No	No					
91	7 Avenue S	9 St SW	MIXED	In-Street Operations	No	No					
92	7 Avenue S	10 St SW	MIXED	In-Street Operations	No	No					

City of Calgary
LRT Crossing Safety Review

Final Report

2019-05-28	0	Draft	D. Hein	A. Hamel	D. Hein
Date	**Rev.**	**Status**	**Prepared By**	**Checked By**	**Approved By**
HATCH					

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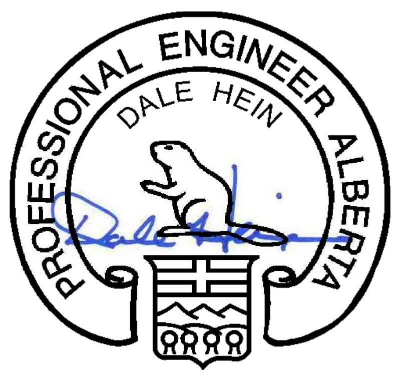

2019-05-29

HATCH
APEGA PERMIT TO PRACTICE
No. P-70881

Executive Summary

An examination of the at-grade crossing warning systems employed by Calgary Transit was performed, addressing:

- Applicable guidelines, standards and best practices;
- The rate of accidents at at-grade crossings of the LRT system;
- The adequacy of the at-grade crossing warning systems;
- Factors contributing to at-grade crossing safety issues; and
- Recommendations for improvements to address noted safety issues.

Through this examination, it was determined that the effectiveness of the at-grade crossing warning systems in Calgary is similar to that of comparable LRT systems in North America.

Calgary Transit and other LRT systems were found to have variation in the types of warning systems employed. For Calgary Transit, this variation reflects the standards employed by Calgary Transit at the time of construction; these standards have evolved over time based on experience and changes to industry best practices.

The review found that:

- Calgary Transit is employing applicable guidelines, standards and best practices in new design and has a process for capturing improvements reflected in these guidelines, standards and best practices into its own guidelines;
- The rate of accidents at at-grade crossings of the Calgary Transit LRT system is comparable to that elsewhere in North America;
- The Calgary Transit at-grade crossing warning systems are adequate to provide for the safety of motorists, cyclists and pedestrians;
- Calgary Transit is experiencing the same factors contributing to at-grade crossing safety issues as are found elsewhere in North America; and
- Calgary Transit has implemented best practices in determining the at-grade crossings needing improvements to the warning systems.

No significant deviations from applicable industry standards and best practices were noted. Opportunities to improve the safety of at-grade crossings were identified and are addressed in the report. The biggest opportunity relates to distracted walking which is an ongoing issue in the industry.

Table of Contents

1. Introduction

The report examines the at-grade crossing warning systems employed by Calgary Transit. This examination will address:

- Applicable guidelines, standards and best practices;
- The rate of accidents at at-grade crossings of the LRT system;
- The adequacy of the at-grade crossing warning systems;
- Factors contributing to at-grade crossing safety issues; and
- Recommendations for improvements to address noted safety issues.

The report is intended to benchmark the effectiveness of the at-grade crossing warning systems in Calgary against comparable LRT systems in North America and will recommend best practices employed elsewhere that could result in improved crossing safety where necessary.

Calgary Transit operates a high floor light rail system of 59.9 km and 45 stations with an annual ridership of approximately 88 million (2017) and daily weekday ridership of 314,400 (Q1 2018). The systems operates primarily in a semi-exclusive alignment (type b.1 and b.2), with a non-exclusive (type c.1) right-of-way segment along 7 Avenue and two exclusive (type a) right-of-way segments on the Blue Line West LRT. There are 92 at-grade crossings of the LRT system.

In the 38 years since Calgary Transit's light rail system opened in 1981, there have been 88 total fatalities, with 42 accidental fatalities occurring at at-grade crossings. Respecting the Freedom of Information and Protection of Privacy guidelines, the yearly and location specific statistics on the number of fatalities is provided in Appendix C: Confidential Data to protect the identity of those impacted.

2. Applicable Regulations, Standards and Guidelines

Calgary Transit is not a federally regulated railway. Furthermore, the Railway (Alberta) Act defines a railway in a manner so that it “does not include an urban rail transit system”.

The documents identified in Table 2-1 are referenced as sources of best practices for the design and construction of roadway crossings of the Calgary Transit LRT system. These documents are the basis for the current Calgary Transit Guidelines shown in Table 2-2.

Table 2-1 Applicable Regulations, Standards, and Guidelines

Number	Title	Applicable Version	Short Name
American Railway Engineering and Maintenance-Of-Way Association (AREMA)			
	Communications & Signals Manual of Recommended Practice	2019	
Transport Canada			
SOR/2014-275	*Grade Crossings Regulations*	November 27, 2014	GCR
-	*Grade Crossings Standards*	January 01, 2019	GCS
G4-A	*Minimum Railway/Road Crossing Sightline Requirements for All Grade Crossings Without Automatic Warning Devices*	December 17, 2009	G4-A
Transportation Association of Canada (TAC)			
-	*Geometric Design Guide for Canadian Roads*	2017	
-	*Manual of Uniform Traffic Control Devices for Canada*	2014	
US Department of Transportation, Federal Highway Administration (FHWA)			
MUTCD	*Manual on Uniform Traffic Control Devices for Streets and Highways*	2009 Edition with Revision 1 and 2 dated May 2012	MUTCD

Table 2-2 Calgary Transit Guidelines

Number	Title	Applicable Version	Short Name
T-SP-R-0069	*LRT Crossings Review* *LRT Crossings Guidelines*	Rev. No. 01, July 2017	
	LRT Design Guidelines	Revision 2, March 2009	DGM

2.1 Transport Canada Grade Crossings Regulations and Grade Crossings Standards

The *Grade Crossing Regulations* and *Grade Crossing Standards* are applicable to at-grade crossings of federally regulated freight railways. As such, they are applicable where there is a common roadway crossing of the Calgary Transit LRT system and CN or CP track. Where the GCS is applied, the required warning time and gate descent delay may be longer than Calgary Transit has historically used elsewhere.

Elsewhere on the Calgary Transit LRT system, these documents would be considered a source of best practices. The GCR and GCS have been incorporated into the Calgary Transit guidelines applicable to at-grade crossings of the LRT System. It should be noted that Calgary Transit Specifications may exceed Transport Canada's; this is particularly true in the case of requirements for pedestrian automatic gates.

2.2 Manual of Uniform Traffic Control Devices

The *Manual of Uniform Traffic Control Devices for Canada* provides information concerning the road signage to be employed in conjunction with a roadway crossing of the Calgary Transit LRT system.

The *Manual on Uniform Traffic Control Devices for Streets and Highways* published by the Federal Highway Administration is a referenced source as Part 8 Traffic Control for Railroad and Light Rail Transit Grade Crossings specifically addresses LRT systems. The document provides guidance on the use of traffic control signals as an alternative at roadway crossings of an LRT system and treatments appropriate to pedestrians and cyclists. The traffic control signals employed in the Calgary Transit in-street alignment are based on this document.

2.3 Calgary Transit Technical Specification T-SP-R-0069

This document, dating to 2011 and officially published in 2017, provides guidance and a general overview of the technical requirements for planning and design in the layout, devices used, and signage associated with Calgary LRT road and pedestrian at-grade crossings. The document sets out guiding principles, functional planning guidelines and design guidelines.

It was noted that the decision chart provided as Appendix B identifies situations where Calgary Transit requires the installation of automatic pedestrian gates. These requirements exceed those contained in the referenced standards and guidelines and are felt to reflect a best practice being employed by Calgary Transit.

2.4 Calgary Transit LRT Design Guidelines

This document provides guidance for the design of the circuits controlling automatic crossing warning systems. The latest version was published in 2009, and was employed during the construction of the Blue Line West LRT and Red Line Tuscany Station extension. The original version was published in 2001.

2.5 Other Information Sources

The Transit Cooperative Research Program has published a number of reports concerning the impact of light rail transit on pedestrian and vehicular safety. These documents have been employed by Calgary Transit as a source of information.

Table 2-3 Other Information Sources

Number	Title	Applicable Version	Short Name
Transportation Research Board of the National Academies, Transit Cooperative Research Program (TCRP)			
TCRP Report 17	*Integration of Light Rail Transit into City Streets*	1996	TCRP Report 17
TCRP Report 69	*Light Rail Service: Pedestrian and Vehicular Safety*	2001	TCRP Report 69
TCRP Report 137	*Improving Pedestrian and Motorist Safety Along Light Rail Alignments*	2009	TCRP Report 137
TCRP Report 175	*Guidebook on Pedestrian Crossings of Public Transit Rail Services*	2015	TCRP Report 175
TCRP Research Results Digest 84	*Audible Signals for Pedestrian Safety in LRT Environments*	May 2007	TCRP Research Results Digest 84

2.6 Application of Calgary Transit Guidelines

The at-grade crossing warning devices on the Calgary Transit system reflect the standards employed by Calgary Transit at the time of construction. With experience and changes to industry best practices, these guidelines have evolved over time. This has resulted in some variation in the at-grade crossing warning devices across the system.

Calgary Transit's efforts to address some past practices are discussed later in this report. All past practices are acceptable but, in some instances, current practices are considered to improve the safety of the crossing.

It is noted that the Calgary Transit Green Line Stage 1, which is a mix of exclusive (type a) and semi-exclusive (type b.1 and b.2) alignments, is to provide flashing lights with gates for all road crossings of the LRT right-of-way and flashing lights with gates and audible devices for all pedestrian crossings.

2.7 Comparison of Regulations, Standards and Guidelines employed

The regulations, standards and guidelines employed by Calgary Transit are similar to those employed by other transit agencies.

This was determined through the review of the standards and guidance documents cited for the Edmonton Valley Line, the Minneapolis Blue Line LRT Extension and the Southern California Regional Rail Authority (Metrolink), The few differences relate to the regulatory frame works that are applicable to the different agencies. The Transport Canada standards adopted by Calgary Transit largely mirror the US Department of Transportation guidance (such as the Federal Highway Administration's *Railroad-Highway Grade Crossing Handbook* and *Guidance on Traffic Control Devices at Highway-Rail Grade Crossings*) applicable to many US transit agencies.

It was noted that Calgary Transit's Technical Specification T-SP-R-0069 and Design Guideline Manual exceed the Transport Canada GCS (and the standards employed by other transit agencies) in the area of requirements for pedestrian automatic gates. This is considered to be an area where Calgary Transit has developed a best practice.

3. Crossing Committee

Calgary Transit has established a Crossing Committee to oversee the design and operation of at-grade crossings of the LRT system. This structure provides a means of examining the effectiveness of the installed warning devices, updating City of Calgary technical specifications and examining emerging best practices. The Crossing Committee consists of three groups: management, working and advisory.

3.1 Crossing Working Committee

Calgary Transit's Crossing Working Committee includes representation from Calgary Transit (including Track and Way, LRT Systems, LRT Training, Operations Control Centre, Public Safety and Enforcement, and Transit Planning), Calgary Roads, Calgary Transportation Planning, Calgary Police Services, and Calgary Access Design Subcommittee. This multi-disciplinary team conducts assessments of the operation of new and existing at-grade crossings, identifying deficiencies and employing their judgement and knowledge to develop a consensus concerning recommended improvements and their relative priority. The "LRT Crossings – Field Inspection Worksheet" is employed to document this procedure.

It was noted that inviting representation from the adjacent freight rail company is desirable; Calgary Transit intents to ensure that this is done for future crossing assessments.

The Crossing Working Committee is responsible for revision of the LRT Crossing Guidelines and their incorporation via the Technical Documents Committee into the permanent Calgary Transit technical body of knowledge. They are also to establish a prioritized work plan to address crossing related issues, including a list of crossing locations of concern and proposed modifications to existing crossings.

The Crossing Working Committee conducts approximately 10 crossing assessments annually as part of identifying and addressing crossing related issues; the 2019 plan includes the conduct of 11 crossing assessments.

Early drafts of the Transport Canada GCS included a requirement that all crossings be accessed periodically, with a maximum interval between assessments of no more than 4 or 8 years. This requirement was not included in the adopted version of the GCS; railroads in Canada are expected to address the need for and frequency of crossing assessments in their Safety Management System. This results in a risk based approach to the frequency of crossing assessments which is similar to that employed in most of the United States.

Calgary Transit's Crossing Committee and the periodic safety assessment of crossings is a best practice. Canadian freight railways conduct crossing assessments in accordance with the requirements of their safety management system; typically this only happens when changes are planned or when a hazardous condition is identified.

4.

Public Safety and Enforcement Crossing Blitz

Calgary Transit's Public Safety and Enforcement (PSE) team conducts period crossing blitz's, the most recent of which took place over 5 days in March 2019 between 0600 and 0800 at Whitehorn, Lions Park, McKnight-Westwinds, Sunnyside and 3 Street SW Stations.

Issues identified during the blitz included:

- Crossing the street against the light when no vehicles were present (jaywalking);
- Complaints that lights did not work properly; and
- Crossing the tracks when the crossing warning signals were active where there were no automatic gates.

The recent addition of Second Train active and passive signage at Sunnyside was found to be effective.

There were a total of 27 warnings and 7 violation tickets issued during the blitz's.

Active enforcement is an important means of addressing at-risk behaviours that negatively impact at-grade crossing and road safety.

5. Customer Advisory Groups

5.1 Customer Advisor Group

The Calgary Transit Customer Advisory Group (CAG) is tasked to provide comments to CT with respect to the customer experience.

The Customer Advisory Group recently examined the issues related to changing behaviour at at-grade crossings. Factors that were identified as causing people to cross when warning devices are active or against traffic signals included:

- Impatience (trying to catch a train that has just pulled into the station or that is approaching the station (visible or as indicated by PID);
- Impatience (trying to make a bus transfer);
- Impatience (excessive pedestrian wait times to cross 36 Street NE);
- Herd mentality (when one person crosses when the warning devices are active or against the light, others follow);
- Inconsistent information (false activations of warning devices, PSE allowing people to cross during stampede when warning devices are active, different information provided by traffic signals and warning devices);
- Inconsistent PSE enforcement;
- Inattention (distracted walking); and
- Complacency.

The Customer Advisory Group will also provide input to the public engagement material on the issue that Calgary Transit is currently developing strategy and content for.

5.2 Access Design Subcommittee

The Access Design Subcommittee within the City of Calgary is tasked with making recommendations on issues that relate to accessibility for people with disabilities. This includes the review of major public and private projects (properties, buildings, walkways, pathways, parks and transit facilities) to ensure the greatest level of accessibility for persons with physical, sensory and cognitive disabilities. The Access Design Subcommittee reports to Council's Advisory Committee on Accessibility.

The Access Design Subcommittee has recommended changes in Calgary Transit crossings, including the use of alternatives to swing gates and the installation of cane detectable treatments before the crossing surface.

Improvement Programs

As a result of issues identified by Calgary Transit's Crossing Working Committee, improvements have been made recently at crossings. These changes have resulted in improved compliance with the at-grade crossing warning systems.

6.

6.1 61 Ave SW (Chinook Station)

Automatic pedestrian gates were installed on the east and west sides of the center load station platform. The automatic gates replaced bedsteads, with the intent of increasing the compliance with the at-grade crossing warning system. Additional barrier channelization was provided, especially on the CP side. This has proven effective.

Figure 6-1 Chinook Station Pedestrian Crossing of Inbound LRT and CPR

6.2 Sunnyside Station

Active second train warning signs and bells were installed between tracks on the north and south end pedestrian crossings at Sunnyside Station, in conjunction with passive signs. The red indicator lights illuminate when two trains are approaching the crossing simultaneously.

While not common, the use of such active signs is not new to Calgary; the signs installed at SAIT Station were indicated as an innovative feature of the Calgary Transit system in TCRP 69. Calgary Transit has not installed active second train warning signs where pedestrian automatic gates are present. This should be considered as a further enhancement.

Figure 6-2 Second Train Warning Signage at Sunnyside Station (Calgary Transit)

6.3 26 Ave NE

The provision of simultaneous preemption of traffic signals adjacent to at-grade crossings was a common practice historically. To ensure that:

- traffic that may potentially has queued through the crossing surface is given an opportunity to clear; and
- to eliminate potential for conflicting information resulting from the operation of the at-grade crossing warning signals before the adjacent traffic signals have entered the dwell phase (red phase for conflicted traffic)

the use of advance traffic signal preemption is now preferred.

As an example of such a change, the 26 Avenue NE crossing was modified to provide 20 second advance preemption calls to the traffic signals. This change was also completed at 8 Ave NE, 12 Ave NE and 20 Ave NE. This has also reduced the number of instances where vehicles strike gates.

Work is planned to add advance pre-emption at the remaining crossing locations along 36 St NE, with all remaining works expected to be completed prior to the end of 2019.

6.4 Whitehorn Dr NE (Whitehorn Station)

The flashing light signals for the pedestrian at Whitehorn drive have been lowered and a cantilevered signal installed so that the warning devices directly face the pedestrians. Similar changes were previously made at 61 Avenue SE (Chinook Station) and at 25 Ave SE (Erlton/Stampede Station) and found to reduce non-compliance. Additional bedsteads were also installed at Whitehorn to create overlap and better channelization. Additional warning time was provided for outbound train movements at Whitehorn.

Figure 6-3 Revised Crossing Signals at Whitehorn Station (Calgary Transit)

Figure 6-4 Revised Crossing Signals at Whitehorn Station (Calgary Transit)

7. Crossing Design Best Practices

7.1 Comparison to Similar LRT Systems

7.1.1 US Agencies

The guidance incorporated within the US MUTCD and predecessor documents, has been the basis for design of at-grade warning systems employed by US transit agencies. The resulting treatments for road traffic are generally consistent with those employed by Calgary Transit, including:

- Flashing light signals with automatic gates; or
- Traffic control signals where LRT speeds are 55 km/h (35 mph) or less;

The US MUTCD recommends flashing light signals with an audible device for pedestrian crossings where it is determined that the sight distance is not sufficient for pedestrians to complete their crossing prior to the arrival of the LRT at the crossing or where LRT speeds exceed 55 km/h (35 mph). The treatments applied at pedestrian crossings vary greatly, with many agencies only installing passive signage only.

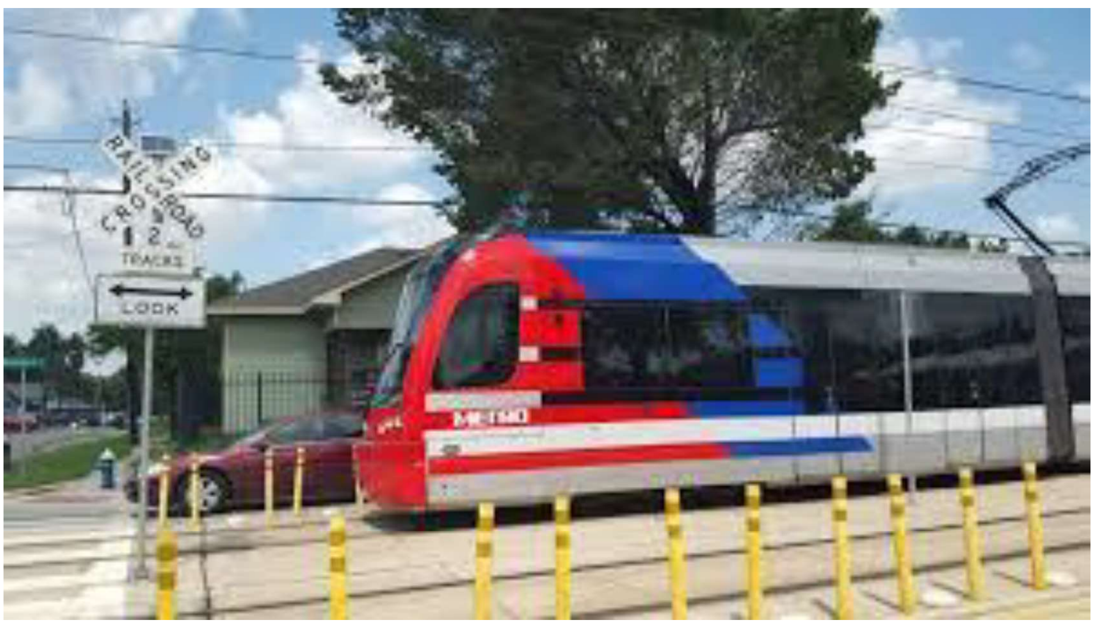

Figure 7-1 Passive Crossing Warning Signals (houstonpublicmedia.org)

The best practice, as identified in TCRP 69, is to apply a decision tree to determine the appropriate treatment for a pedestrian crossing of the LRT right-of-way. On this basis, additional crossing treatments are recommended to address greater levels of risk. The decision tree provided in TCRP 69 would recommend the use of pedestrian automatic gates where:

- The sight distance is not sufficient for pedestrians to complete their crossing prior to the arrival of the LRT;
- The crossing is in a school zone and the LRT speeds exceed 55 km/h (35 mph);
- There are high pedestrian activity levels, the LRT speeds exceed 55 km/h (35 mph), and either pedestrian surges occur or there is high pedestrian inattention.

As indicated in Table 7-2, there is a mix of pedestrian warning treatments in use. While many US transit agencies report the use of pedestrian automatic gates, they also report the use of swing gates and/or bedsteads (pedestrian channelization). Pedestrian automatic gates continue to only be used in special circumstances such as higher speed sections of the right-of-way.

Table 7-2 Pedestrian Control Devices by LRT System (TCRP 69)

Agency	Pedestrian Automatic Gates	Swing Gates	Pedestrian Channelization	Special Pedestrian Signs	Special Audible Devices
Baltimore	Yes		Planned		
Calgary	Yes	Yes	Yes	LRV-actuated "Danger – 2nd Train Approaching"	Yes
Dallas	Yes		Yes		
Denver	Planned		Planned		
Edmonton	Yes				Planned
Los Angeles	Yes	Yes		LRV-actuated "Second Train Approaching"	
Portland	Yes	Yes	Yes	Yes	Yes
Sacramento					Yes
Saint Louis	Yes		Yes		
San Diego			Yes		Yes
San Jose	Yes	Yes		LRV-actuated "Caution Second Train Approaching"	Planned

It is noted that, there is also a wide variety of flashing light signals for pedestrian applications employed by US transit agencies. The US MUTCD does show smaller pedestrian warning signals. The various TCRP reports have identified a variety of alternative pedestrian signals; in all instances they locate the warning signals much lower so that they are in the pedestrian's cone of vision.

Figure 7-3 "Portland Style" Pedestrian Flasher

Figure 7-4 Smaller Scale Pedestrian Flasher in Portland (Fitzpatrick)

Figure 7-5 "Minneapolis Style" Pedestrian Flasher

While consistency of the warning device design is an important factor in the ability of a person to correctly react to the information being presented, it is noted that some US agencies have a variety of warning devices in use, with the figures showing some of the variations employed in Portland as an example.

7.1.2 *Edmonton Transit*

The City of Edmonton's light rail system is slightly older, opening in 1978 but otherwise has many of the same challenges. ETS operates a high floor light rail system of 24.3 km and 18 stations with a daily weekday ridership of 112,805 (2017). The system operates primarily in a semi-exclusive alignment (type b.1 and b.2) including a center running semi-exclusive alignment along 111 Ave. ETS has a exclusive (type a) right-of-way segment in the downtown; Edmonton Transit does not have non-exclusive right-of-way (type c.1, c.2, c.3 or c.4). Edmonton is currently constructing their first urban integrated low floor alignment for Stage 1 (SE) of the Valley Line.

The Edmonton Transit system includes flashing lights with gates for road traffic. Typically, pedestrian traffic is address through a bell, although some crossings are equipped with barrier channelization or pedestrian automatic gates with an emergency exit swing gate. There are instances where there is not a set of warning signal lights provided for each lane of traffic.

The warning devices employed at crossings have varied over time. On the Metro Line, automatic pedestrian gates were installed at many pedestrian crossings; however, the pedestrian crossing at 106 Ave NW does not have automatic pedestrian gates.

For the Valley Line Stage 1, a Low-Floor urban LRT system Decision Tree was created and employed as the basis for RPT-20140227-SEtoW-Intersection Hazard

Analysis Report. Train speeds at most at-grade crossings of the Valley Line Stage 1 are 55 km/h or less and traffic control devices will be employed instead of flashing lights with gates and bells.

Figure 7-6 Warning Devices at 92 St NW LRT Crossing (Google)

A safety improvement program in Edmonton has been used to improve street lighting at at-grade crossings and to install pedestrian gates. Where there is more than one lane for road traffic in each direction, cantilevered warning devices are being provided.

7.2 Metro Transit

Minneapolis Metro Transit operates a high floor light rail system of 35.1 km and 37 stations with a daily weekday ridership of 71,900 (2017). The system has been in operation since 2004.

The Metro Transit system includes a mix of semi-exclusive and non-exclusive right-of-way.

Figure 7-7 Metro Crossing (metrotransit.org)

In semi-exclusive alignments, flashing lights with automatic gates and bells are provided for roadway traffic. Flashing lights are provided for pedestrian traffic where necessary. Pedestrian automatic gates are also employed. This philosophy is to continue on the proposed Blue Line extension which, while providing pedestrian flashing light signals, employs bedsteads and not pedestrian automatic gates.

Traffic signals are employed in non-exclusive alignments.

7.3 Comparison to Calgary Transit Best Practices

Except in the in-street alignment where LRT speed has been restricted to 40 km/h, the Calgary Transit Technical Specification requires:

- Flashing lights and gates for roadway crossings of the LRT system;
- Flashing lights and bells for pedestrian crossings of the LRT system;
- Swing gates or bedstead barriers for pedestrian crossings of the LRT system.

It is noted that, due to accessibility issues, bedstead barriers are preferred over swing gates except where bed steads cannot be configured as offset barriers due to space constraints.

The decision chart provided in Appendix B provides guidance concerning the appropriate treatments for pedestrian crossings of the LRT system in semi-exclusive right-of-way, including identification of situations where pedestrian automatic gates with an emergency exit swing gate are to be employed.

Calgary Transit's Technical Specifications incorporate the best practices observed in use by other agencies. These Technical Specifications require a greater use of pedestrian automatic gates than required elsewhere.

Areas where the current Calgary Technical Specifications could be improved include:

- Pedestrian refuge areas. The US MUTCD recommends that, "Where LRT tracks are immediately adjacent to other tracks or a road, pedestrian signalization should be designed to avoid having pedestrians wait between sets of tracks or between the tracks and the road." When this is not practical, adequate pedestrian refuge and additional warning signals should be provided. The size of the pedestrian refuge area must be adequate for the pedestrian volumes.
- The design of pedestrian warning signals and second train warning signals.

Both of these issues are not unique to Calgary Transit; these topics are addressed poorly by all standards reviewed. Calgary Transit has recognized these issues and is working to ensure that they addressed in new projects.

7.4 Comparison of Crossing Design Best Practices Within Calgary Transit System

The at-grade crossing warning devices on the Calgary Transit system reflect the standards employed by Calgary Transit at the time of construction. These guidelines have evolved over time as industry best practices have changed. This has resulted in the at-grade crossing warning devices across the Calgary Transit system varying.

The ongoing crossing assessment process employed by Calgary Transit provides a means of ensuring that, within the limits of available funding, action is taken to improve the safety of at-grade crossings.

It was noted that there are fewer accidents at at-grade crossings equipped with pedestrian automatic gates, however, the data sample size is small. It is generally accepted that at-grade crossings with flashing lights and automatic gates are safer than crossings with only flashing lights.

8. Crossing Assessments

Calgary Transit identified 7 crossings for assessment as part of the LRT Crossing Safety Review. The crossings are summarized in Table 8-1.

The crossings represent a mix of different crossing types across the Red Line, Blue Line and 7 Avenue. As the crossings were built at different times, as part of the original LRT segment and during subsequent extensions, the crossings have been built to different standards applicable at the time of construction.

Table 8-1 Crossings Assessed

Line Segment	Crossing Location	Crossing Type
NW	Lions Park West End Pedestrian Crossing	Pedestrian
NE	Saddletowne Station South Pedestrian Crossing	Pedestrian
NE	Whitehorn Drive	Mixed
S	162 Ave S	Mixed
S	61 Ave SW (Chinook Station)	Mixed
NE	12 Ave NE at 36 St NE	Mixed
7 Ave	7 Ave S at 3 St SE	Mixed

8.1 Lions Park West End Pedestrian Crossing

The Lions Park west end pedestrian crossing is equipped with flashing lights with bells and swing gates. The crossing allows pedestrian movements between side load platforms. There is heavy pedestrian traffic due to the North Hill shopping center.

8.1.1 This location has a significant number of near miss reports.Adherence to Minimum Industry Standards

This location conforms to the practices appropriate for a pedestrian crossing on a semi-exclusive alignment.

It should be noted that the swing gates are now felt to create accessibility issues for people in wheelchairs. The user must pull the gate towards themselves and maneuver past the gate.

Figure 8-2 Lions Park West End Pedestrian Crossing

8.1.2 Noted Safety Issues

The flashing light signals are mounted at greater than 8 feet above the top of rail. While appropriate from the perspective of reducing vandalism, this location places the warning devices above the normal cone of vision for pedestrians.

Two minor issues were noted with the existing warning devices. The top hinge on the center swing gate on North (East) side is broken. Gate still somewhat operable but does get stuck. The crossing sign for northward direction is present but extremely faded.

8.1.3 Recommended Enhancements

The addition of active second train warning devices should be considered. The replacement of swing gates with pedestrian automatic gates should be considered.

8.2 Saddletowne Station South Pedestrian Crossing

The Saddletowne south end pedestrian crossing is equipped with flashing lights with bells and swing gates. The crossing allows pedestrian movements between a center load platform and the adjacent infrastructure. There is heavy pedestrian traffic due to this being a terminus station.

This location has a significant number of near miss reports.

The warning devices for the inbound and outbound tracks operate independently.

Figure 8-3 Saddletowne South End Pedestrian Crossing

8.2.1 Adherence to Minimum Industry Standards

This location conforms to the practices appropriate for a pedestrian crossing on a semi-exclusive alignment.

It should be noted that the swing gates are now felt to create accessibility issues for people in wheelchairs. The user must pull the gate towards themselves and maneuver past the gate.

8.2.2 Noted Safety Issues

The flashing light signals are mounted at 8 feet or more above the top of rail. While appropriate from the perspective of reducing vandalism, this location places the warning devices above the normal cone of vision for pedestrians.

One minor issue was noted with the existing warning devices. One of the swing gates remained open and would not return to closed position on its own..

8.2.3 Recommended Enhancements

The replacement of swing gates with pedestrian automatic gates should be considered.

8.3 Whitehorn Drive Mixed Crossing

The Whitehorn Drive crossing is equipped with flashing lights with bells and automatic gates for road traffic. Flashing lights with bells and bedsteads are provided for pedestrian traffic movements to the center load platform. There is heavy pedestrian traffic during rush hour.

This location has a significant number of near miss reports. Information concerning pedestrian fatalities is found in Appendix C: Confidential Data.

The pedestrian flashing light signals have been lowered and extra cantilever assemblies have been installed.

Figure 8-4 Whitehorn Drive Crossing

8.3.1 Adherence to Minimum Industry Standards

This location conforms to the practices appropriate for a pedestrian crossing on a semi-exclusive alignment.

8.3.2 Noted Safety Issues

The crossing operation is not split for inbound and outbound train movements; the resulting nuisance operation of the warning system on the non-active track creates the impression that the warning devices are not functioning correctly, leading pedestrians to being accustom to crossing the track while warning devices are operating.

Refuge areas between the traffic on 36 St NE and the LRT alignment are narrow.

8.3.3 Recommended Enhancements

Pedestrian automatic gates would be desirable but additional space would be required.

Pedestrian compliance with traffic and at-grade crossing warning signals would benefit from splitting the operation of the at-grade crossing warning signals so that the inbound and outbound tracks operate independently. PSE has noted that pedestrians are ignoring the warning signals, resulting in an undesirably high number of near miss reports. This operation would be similar to that at 25 Ave SE (Erlton/Stampede Station). Changes are planned as soon as funding is available.

8.4 162 Ave SW Mixed Crossing

The 162 Ave SW crossing is equipped with flashing lights with bells and automatic gates for road traffic. Flashing lights with bells and bedsteads are provided for pedestrian traffic movements; the bedstead in the NW quadrant is located between the LRT alignment and the CP.

This location does not have a significant number of near miss reports. Pedestrian traffic is light. Information concerning pedestrian fatalities is found in Appendix C: Confidential Data.

Figure 8-5 162 Ave SW Crossing

8.4.1 Adherence to Minimum Industry Standards

This location conforms to the practices appropriate for a pedestrian crossing on a semi-exclusive alignment.

8.4.2 Noted Safety Issues

The flashing light signals for pedestrians are mounted at greater than 8 feet above the top of rail. While appropriate from the perspective of reducing vandalism, this location places the warning devices above the normal cone of vision for pedestrians. The sharing of flashing light signals for road traffic and pedestrians further complicates this issue and results in the placement of the warning signal in NE quadrant being 4.5 meters from the center of sidewalk.

On the north sidewalk, bedstead barriers are present but there is evidence that cyclist and pedestrians bypassing them. Additional barriers or fencing are required.

8.4.3 Recommended Enhancements

The addition of active second train warning devices should be considered. The replacement of bedsteads with pedestrian automatic gates should be considered.

8.5 61 Ave SE (Chinook Station) Mixed Crossing

The 61 Ave SE crossing is equipped with flashing lights with bells and automatic gates for road traffic. Flashing lights with bells and bedsteads are provided for pedestrian traffic movements on the north side of the road. Flashing lights with bells and pedestrian automatic gates are provided fore pedestrian traffic movements on the south side of the road, adjacent to the station platform.

This location does not have a significant number of near miss reports. Pedestrian traffic is heavy adjacent to the Chinook station, accessing into the station platform. Information concerning pedestrian fatalities is found in Appendix C: Confidential Data.

The pedestrian warning devices on the south side of 61 Ave for the inbound and outbound tracks operate independently.

Figure 8-6 61 Ave SE Crossing

8.5.1 Adherence to Minimum Industry Standards

This location conforms to the practices appropriate for a pedestrian crossing on a semi-exclusive alignment.

8.5.2 Noted Safety Issues

The flashing light signals for pedestrians are mounted at greater than 8.5 feet above the top of rail. While appropriate from the perspective of reducing vandalism, this location places the warning devices above the normal cone of vision for pedestrians. Aligning lights downward is not affective.

Signal Masts C&D are missing the "2" tracks signs.

8.5.3 Recommended Enhancements

An additional warning signal should be added in NW quadrant for pedestrian traffic.

8.6 12 Ave NE at 36 St NE Mixed Crossing

The 12 Ave at 36 St NE crossing is equipped with flashing lights with bells and automatic gates for road traffic. Flashing lights with bells and bedsteads are provided for pedestrian traffic movements. There is moderate pedestrian due to the Canadian Tire and McDonalds shopping area.

Information concerning pedestrian fatalities is found in Appendix C: Confidential Data.

Pedestrians are routed to a single side of 12 Ave NE.

8.6.1 Adherence to Minimum Industry Standards

This location conforms to the practices appropriate for a pedestrian crossing on a semi-exclusive alignment.

8.6.2 Noted Safety Issues

Westward pedestrians must cross four lanes before getting to track and there is no refuge point until after crossing both tracks. No crossbuck or 2 tracks sign visible for westbound pedestrians while in crosswalk.

Gate for southbound left turn lane to eastbound across track is parallel with track (not perpendicular to the road) and does not substantially block the lane.

8.6.3 Recommended Enhancements

It is recommended that the lane arrangement for 36 St NE be revised to provide a pedestrian refuge area in the SE quadrant. This has been previously estimated as $150,000.

8.7 7 Ave S at 3 St SE Mixed Crossing

The 3 Street SE crossing is located directly east of City hall building and has the New Centre library and Bow Valley College buildings in close proximity. For this reason and the proximity to the revitalized East Village, there is heavy pedestrian traffic year-round. The location consists of;

- Red and Blue Lines entering and existing downtown
- A road crossing (3rd Street East) which crosses both the Red Line and the Blue Line. This crossing is controlled by traffic lights.

- A pedestrian crossing on the west side of 3rd Street which crosses both the Red Line and the Blue Line. This crossing is controlled by traffic lights and walk/don't walk indicators.
- A pedestrian crossing on the east side of 3rd Street which crosses the Blue Line. This crossing is controlled by traffic lights and walk/don't walk indicators.
- A pedestrian crossing slightly east of 3rd Street which crosses the Red Line, near the library. This crossing is protected by a warning system consisting of walk/don't walk indicators, swing gates and a bell.

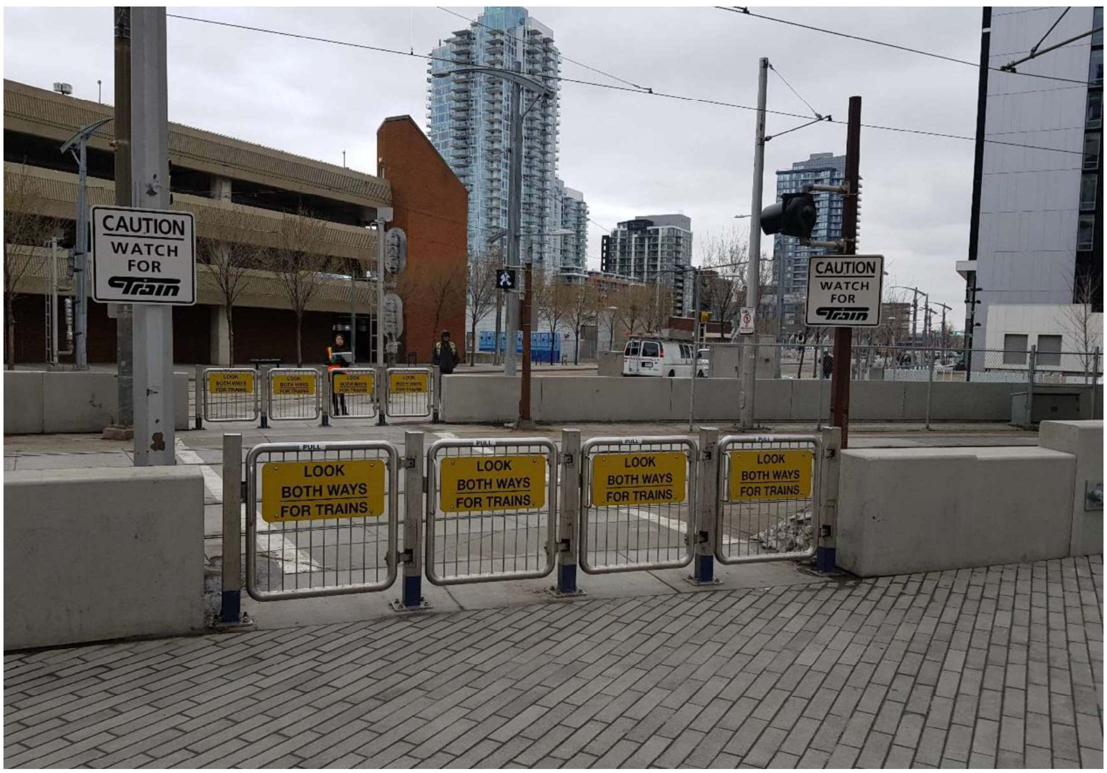

Figure 8-7 7 Ave at 3 St SE Library Pedestrian Crossing

This crossing is located at the eastward extent of the in-street limits.

There are a high number of near miss reports concerning this crossing.

8.7.1 *Adherence to Minimum Industry Standards*

This location conforms to the practices appropriate for a low speed line segment operated on a line-of-sight basis. Additional treatments beyond the normal pedestrian type signals used along 7 Ave, including swing gates and bell, are provided for the pedestrian crossing of the Red Line near the library. Sightlines to approaching Red Line trains are restricted by track geometry and the tunnel portal.

It should be noted that the swing gates are now felt to create accessibility issues for people in wheelchairs. The user must pull the gate towards themselves and maneuver past the gate. This is a concern at this and other locations where swing gates are employed.

8.7.2 *Noted Safety Issues*

It was noted that:

- Many pedestrians were disregarding the warning system installed on the pedestrian crossing on the Red Line near the library. (possibly partially account of the nuisance warning reported below)
- There was significant nuisance warning by the warning system on the pedestrian crossing near the library. Specifically, nuisance warning was observed when;
    - Northbound, Red Line trains approached.
    - Eastbound, Red Line and Blue Line trains approached, when switch was lined for the Red Line.
    - Randomly while trains had left the crossing and were trailing away from the crossing.
    - Randomly, while no trains were in the vicinity.
- Some short warning time events (as short as 7 seconds) were observed on Northbound trains from Red Line on the crossing near the library.
- Irregular warning times observed on crossing near library on Eastbound trains going to Red Line. Warning times varied from 30 to 50 seconds. Likely caused by passengers loading in the station.

No irregularities were observed with the traffic lights on 3 Street SE.

8.7.3 *Recommended Enhancements*

The design of the pedestrian crossing of the Red Line near the library should be reviewed to determine the cause of nuisance operations and short warning time events associated with the bell. The investigation of this problem is ongoing, with further work to determine the root cause planned during the May maintenance shut down.

Once this issue has been addressed, the ongoing issues related to pedestrians disregarding the warning system should be reviewed. Without the nuisance operation, it is anticipated that these issues will be reduced. The use of swing gates and the bell at the pedestrian crossing of the Red Line near the library exceeds what is installed along 7 Ave.

At the other end of 7 Ave, the 11 Street SW crossing also has additional warning devices. The pedestrians on the west side of the street are controlled by flashing lights with bells and automatic gates and all crossings east of that location are controlled by Traffic Signals. While local characteristics associated with the location of the station result in greater complexity at 3 Street SE, the installation of flashing lights, bells &

automatic gates for the pedestrian crossing near library may ultimately be found to be appropriate.

Among the concerns with the installation of additional warning devices is the potential to confuse pedestrians crossing the Blue line on east side of 3 Street SE. Closing this crossing or the addition of flashing lights, bells and automatic gates for the pedestrians on east side of 3 Street SE may be appropriated. Barriers to channel pedestrians towards the crossing point may be appropriate.

In contemplating any of these changes, consideration of pedestrian delay is important as this is a driver of undesirable pedestrian behavior.

8.7.4 Other Issues

While looking at the approaches for the 3 St SE crossing, it was noticed that there is a pedestrian crossing located just west of 4th Street East that only has some channelization; there are no pedestrian signals or crossing warning signals provided. The adjacent road crossing has flashing lights with bell and gates and the pedestrian crossing on the east side of the road has bedsteads. We recommend that this pedestrian crossing be assessed and warning devices added as appropriate.

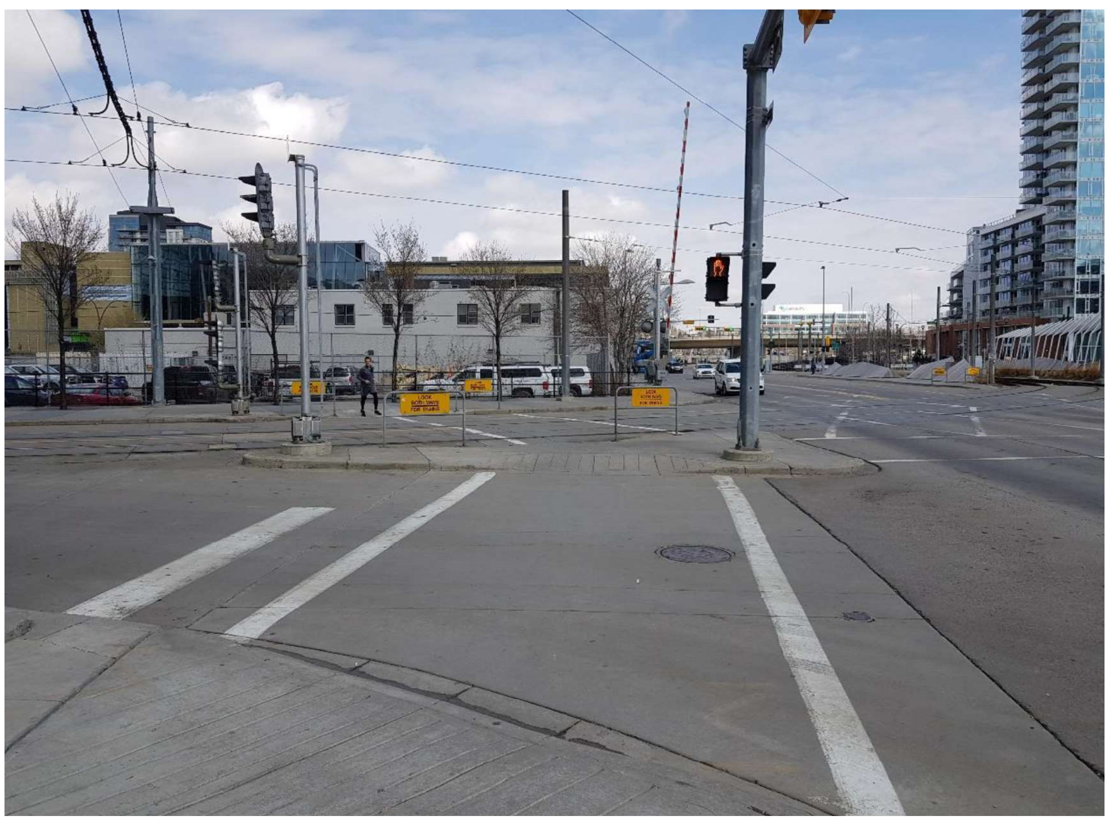

Figure 8-8 7 Ave at 4 St SE Pedestrian Crossing

This issue has also been identified by Calgary Transit and Calgary Roads. The addition of flashing lights with pedestrian automatic gates, bells and second train warning signs is under review. The addition of cantilevered flashing light signals and bedstead barriers is currently being considered as a nearer term improvement.

9. Accident and Incident Rates

9.1 Baseline Accident Data

Statistics Canada *Table 13-10-0156-01 Death by cause, Chapter XX: External causes of morbidity and mortality (V01 to Y89)* summarizes the causes of death in Canada. On the basis of this data, most recently published for the calendar year 2016, it is possible to develop an average annual individual risk of death.

Table 9-1 Annual Individual Risk of Death

Cause	2000 Deaths	2016 Deaths	2000 Average Annual Individual Risk of Death	2016 Average Annual Individual Risk of Death
Transport Accident	3120	2075	101.7	59.0
Railway Accidents	104	40	3.4	1.1
Pedestrian Collision with Train or Railway Vehicle	32	16	1.0	0.5
Assault	453	390	14.8	11.1
Intentional Self Harm	3605	3974	117.5	113.1
Lightening	3	2	0.1	0.06

The data indicates that in 2016 an average of 59 people in a population of 1 million died to a transportation accident, of which only 1.1 people in a population of 1 million died due to a railway accident. The rate of death due to a pedestrian collision with a train or railway vehicle was 0.5 per 1 million population.

The average annual individual risk of death due to assault and intentional self harm were one and two orders of magnitude greater respectively.

Although there has been a statistically significant decrease in transport accidents, all other causes listed would be viewed as unchanged during the period between 2000 and 2016.

9.2 Calgary Transit Accident and Incident Data

In 2017, the analysis of accidents that had occurred to date since 1981 indicated that they were distributed as:

- 6.8% due to collision of LRV with a car;
- 4.1% due to collision of LRV with a cyclist;
- 89% due to collision of LRV with a pedestrian.

The fatal injuries were distributed as:

- Accidental 66.2%
- Intentional self-harm 31.1%

Accidental fatalities at at-grade crossings were attributed to human error factors including intoxication, distracted walking and noncompliance with safety measures.

The 18 fatal accidents involving Calgary Transit between 2015 and 2018 would result in an average annual individual risk of death of 3.62 in 1 million, well below the average annual individual risk of death due to transport accidents. When the incidents of intentional self harm are excluded, the average annual individual risk of death is 2.2 in 1 million.

There were 10 fatal injuries at crossings within the Calgary Transit system, amounting to a average annual individual risk of death of 2.08 in 1 million. While this is above the national rate for pedestrian collision with train or railway vehicle, this is not unexpected given the greater number of potential interactions resulting from the train frequency in a light rail system (200 or more crossing events per day) versus a heavy rail system (typically 25 crossing events per day).

For the period between 2015 and 2018, Calgary Transit had:

- 4.5 fatal injuries per year (all causes)
- 2.75 fatal injuries per year (excluding those due to intentional self-harm);
- 2.5 fatal injuries per year at crossings;
- 0.03 fatal injuries per crossing per year.

All fatal injuries occurred in semi-exclusive right-of-way.

For the period between 2016 and 2018, there were 83 collisions not resulting in fatal injuries, an average of 27.6 per year. 37 of these collisions or an average 12.3 per year, occurred in the downtown.

9.3 Comparison of Accident and Incident Rates Within Calgary Transit System

The number of accidents involving fatalities and collisions are insufficient to draw a conclusion concerning the need for safety improvements at any given location. It was noted that the West LRT portion of the Blue line has had no fatal accidents or collisions during the period for which data was provided. This indicates that the City's current standards are effective.

Calgary Transit tracks near miss events.

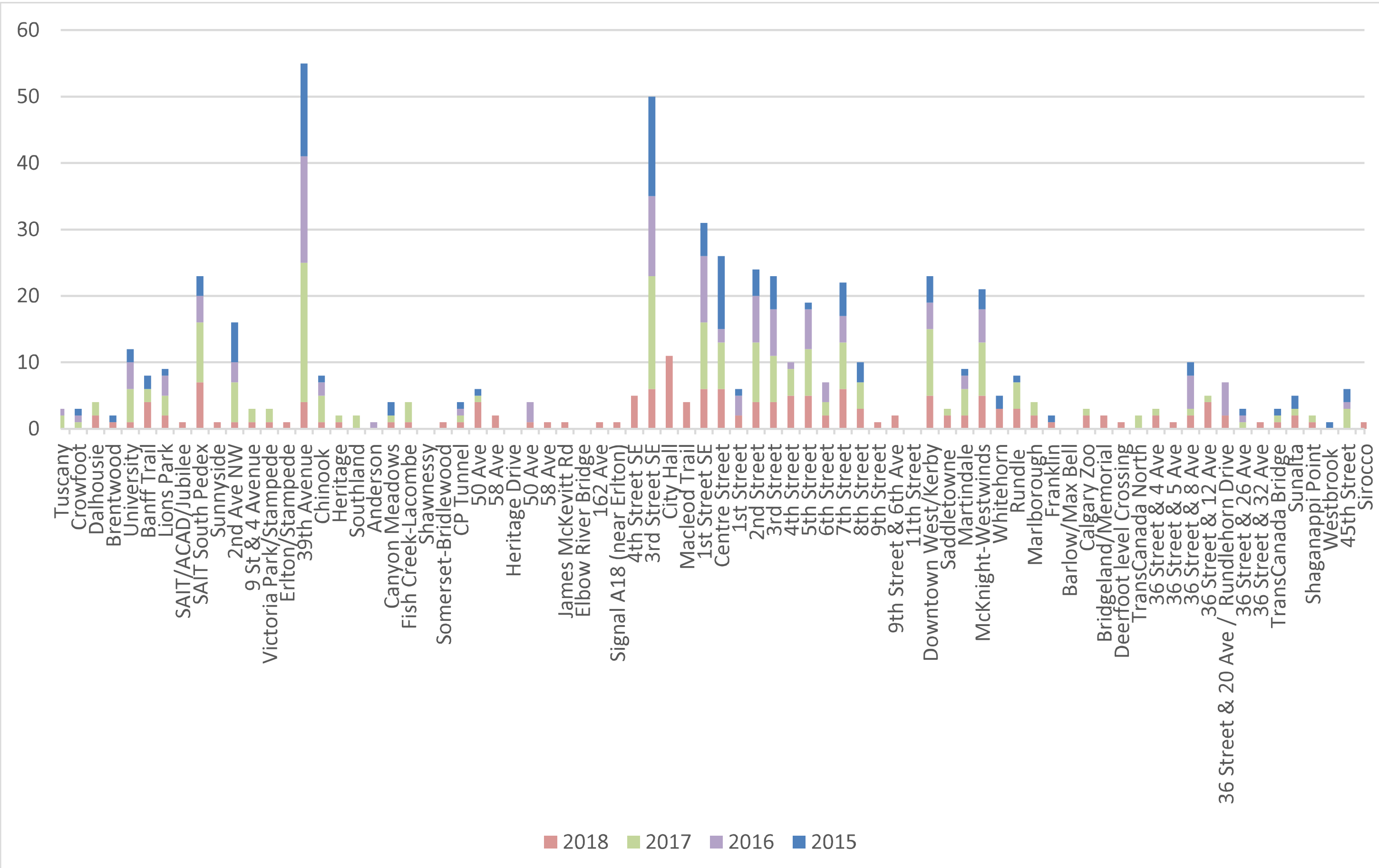

Figure 9-2 LRT Near Miss Events 2015-2018 (Calgary Transit)

This data shows:

- A high occurrence rate of near miss events in the area of non-segregated alignment in the downtown;
- A low rate of occurrence along the West LRT segment of the Blue Line
- A high rate of events at University Station, SAIT/ACAD/Jubilee Station South pedestrian crossing, 2 Avenue NW, 39 Avenue, McKnight-Westwinds Station and 36 Street at 8 Avenue NE;
- 80 percent of reported near miss events involved pedestrians.

9.4 Edmonton Transit Accident and Incident Data

For the years 2016 to 2018, Edmonton reported 25 major incidents (an average of 8.3 per year) and 315 near miss events (an average of 105 per year). There were an average of 2.3 instances annually of individuals being struck by a train.

Given the differences in the data reported, the frequency of individuals being struck by a train is the only common point within the Calgary Transit and Edmonton Transit data. Edmonton Transit's fatal accident rate is approximately half that of Calgary Transit's, however, their system is approximately half the size of Calgary's. As such, the frequency of individuals being struck by trains in both cities is very similar.

The most common near miss cause related to pedestrians and vehicles disregarding warning devices (29%).

9.5 Metro Transit Accident Data

Minneapolis Metro Transit experienced 6 pedestrian collisions, of which 3 were fatal, during the 31 day period between December 4, 2015 to January 3, 2016. Of these collisions, 4 involved pedestrians, one involved a cyclist and one involved a person on a mobility device. The consistent theme that emerged was ignoring active warning devices. During the 12 month period between January 4, 2015 and January 3, 2015, they experienced 14 LRT pedestrian collisions.

The subsequent year, between January 4, 2016 and January 3, 2017, they experienced 7 LRT pedestrian collisions. There was also a reduction of 235 close call reports. The accident reduction was attributed to an outreach program and a variety of engineering initiatives. The engineering initiatives included:

- Installation of alternating flashing train headlamps, with the fleet now 66% equipped;
- Low mounted Train Approaching signals at station entrances that flash when a train is approaching;
- Fencing extensions;
- Maintaining bell operation when the automatic gates are in the down position; and
- Active advance warning signage on a bike path.

Metro Transit, which is significantly smaller than Calgary Transit, has a higher rate of collisions with pedestrians than Calgary Transit.

9.6 Comparison to Other Similar LRT Systems

The TCRP has published 3 reports addressing vehicle and pedestrian safety in Light Rail systems. The earliest report, TCRP 17, was published in 1996 and the most recent, TCRP 137, was published in 2009.

TCRP 69 summarizes data from 11 agencies for the period up to 1996, including Calgary Transit and Edmonton Transit. Calgary transit had an Average Annual Total Accidents of 12.2 compared with an industry average of 20.9.

Calgary Transit had an Average Annual Accidents per LRT Crossing-Year of 0.26 for semi-exclusive alignment types b.1 and b.2, compared to the average of 0.17 for all 11 agencies and 0.21 for Edmonton Transit.

Calgary Transit had an Average Annual Accidents per LRT Crossing-Year of 0.55 for non-exclusive and semi-exclusive alignment types b.3 and b.4, compared to the average of 0.54 for all 11 agencies. While non-exclusive and semi-exclusive right-of-way types b.3 and b.4 account for an average of 23% of the total LRT right-of-way, they account for an average of 87% of the accidents.

Calgary Transit's performance in terms of annual accidents per LRT crossing matched the industry average in areas other than semi-exclusive right-of-way types b.1 and b.2 where CT's performance was found to be worse than the industry average.

Table 9-3 Summary of Accident Experience at LRT Crossings Through 1996 (TCRP 69)

Agency	Average Annual Total Accidents	Semi-Exclusive Right-of-Way, Types b.1 & b.2 (above 55 km/h)			Semi-Exclusive & Non-Exclusive Right-of-Way, Types b.3, b.4, b.5, c.1, c.2, & c.3 (below 55 km/h)		
		Average Annual Accidents	Average Annual LRT Crossing-Years	Average Annual Accidents per LRT Crossing-Year	Average Annual Accidents	Average Annual LRT Crossing-Years	Average Annual Accidents per LRT Crossing-Year
Baltimore	29.8	0.8	18	0.04	29.0	21	1.38
Calgary	12.2	5.1	20	0.26	7.1	13	0.55
Dallas	6.0	2.0	22	0.09	4.0	14	0.29
Denver	34.0	0.5	2	0.25	33.5	29	1.16
Edmonton	1.7	1.7	8	0.21			
Los Angeles	50.7	10.7	28	0.38	40.0	56	0.71
Portland	20.8	0.1	4	0.03	20.7	74	0.28
Sacramento	20.5	2.2	14	0.16	18.3	62	0.30
Saint Louis	0.5	0.5	11	0.05			
San Diego	28.5	5.9	43	0.14	22.6	42	0.54
San Jose	25.2	0.2	3	0.07	25	59	0.42
Average	**20.9**	**2.7**	**16**	**0.17**	**18.2**	**34**	**0.54**

TCRP 137 summarizes data from 23 US agencies for the period of 2002 through 2007. Key takeaways from the report include:

- 44.8% of collisions occurred on non-exclusive right-of-way, 20.1% of collisions occurred on semi-exclusive right-of-way, 11.8% of collisions occurred on exclusive right-of-way, and 24.1% of collisions occurred on unclassified right-of-way;
- An average of 0.073 collisions per crossing occurred.
- An average of 2.32 collisions per million vehicle revenue miles occurred.
- An annual average of 59 fatal injuries occurred (or 2.68 fatalities per agency), with 80% involving pedestrians.
- An annual average of 404 injuries occurred (or 18.36 injuries per agency), with 65% involving motor vehicles and 29% involving pedestrians.

Table 9-4 Ratio of Collisions (TCRP 137)

Agency	Annual Average 2002-2007			Annual Average 2002-2006		
	Collisions	Number of Crossings	Ratio	Collisions	Million Vehicle Revenue Miles	Ratio
Bi-State Development Agency	1	24	0.042	1	4.85	0.2
Dallas Area Rapid Transit	12	98	0.121	14	5.01	2.8
Denver Regional Transportation District	4	39	0.090	3	3.74	0.8
Hillsborough Area Regional Transit Authority	2	21	0.095	2	0.08	24.0
King County Department of Transportation – Metro Transit Division	8	14	0.571	8	0.04	194.7
Los Angeles County Metropolitan Transportation Authority	20	104	0.106	21	7.29	2.9
Maryland Transit Administration	5	52	0.090	5	2.20	2.0
Massachusetts Bay Transportation Authority	4	65	0.059	4	5.72	0.7
Memphis Area Transit Authority	2	62	0.024	2	0.38	4.0
Metro Transit	3	45	0.067	3	1.28	2.3
Metropolitan Transit Authority of Harris County, Texas	23	68	0.331	24	0.71	34.1
New Jersey Transit Corporation	1	88	0.011	1	1.90	0.5
New Orleans Regional Transit Authority	1	238	0.006	2	0.63	2.4
Niagara Frontier Transportation Authority	2	8	0.250	2	0.78	2.6
Port Authority of Allegheny County	4	44	0.083	4	1.67	2.2
Sacramento Regional Transit District	9	104	0.090	10	2.90	3.6
San Diego Trolley, Inc.	5	96	0.052	4	7.24	0.6
San Francisco Municipal Railway	19	351	0.055	19	5.51	3.5
Santa Clara Valley Transportation Authority	2	119	0.017	2	2.30	0.8
The Greater Cleveland Regional Transit Authority	8	22	0.356	9	0.96	9.2
Tri-County Metropolitan Transportation District of Oregon	11	128	0.087	12	6.11	2.0
Utah Transit Authority	6	72	0.081	6	2.63	2.3
Average	**152**	**1862**	**0.073**	**147.5**	**63.51**	**2.32**

Table 9-5 Severity and Type of Collision 2002-2007 (TCRP 137)

Agency	Fatalities				Injuries			
	Total	With Motor Vehicle	With Person	With Cyclist	Total	With Motor Vehicle	With Person	With Cyclist
Bi-State Development Agency					5	1	3	
Dallas Area Rapid Transit	5		5		28	20	8	
Denver Regional Transportation District	1		1		13	9	4	
Hillsborough Area Regional Transit Authority	1		1		1	1		
King County Department of Transportation – Metro Transit Division					2	1	1	
Los Angeles County Metropolitan Transportation Authority	18	1	13	4	63	41	18	4
Maryland Transit Administration	3				11	9	1	
Massachusetts Bay Transportation Authority	1				21	5	12	1
Memphis Area Transit Authority					2	2		
Metro Transit	4	2	2		7	5	2	
Metropolitan Transit Authority of Harris County, Texas					65	54	11	
New Jersey Transit Corporation					1	1		
New Orleans Regional Transit Authority					3	2		
Niagara Frontier Transportation Authority					1		1	
Port Authority of Allegheny County					4	4		
Sacramento Regional Transit District	2		2		21	12	5	4
San Diego Trolley, Inc.	10		10		19	11	7	1
San Francisco Municipal Railway	5				66	33	27	2
Santa Clara Valley Transportation Authority	4	2	1	1	5	3	2	
The Greater Cleveland Regional Transit Authority	4	1	3		10	10		
Tri-County Metropolitan Transportation District of Oregon	1		1		39	26	12	1
Utah Transit Authority	2		1	1	17	11	3	3
Average	**2.68**	**0.27**	**2.14**	**0.27**	**18.36**	**11.86**	**5.32**	**0.73**

The Calgary Transit's 4.5 fatal injuries per year for the period between 2015 and 2018 is better than the industry average of 9.8 accidents per year reported with TCRP 137.

The Calgary Transit average of 2.5 fatal injuries per year at crossings is approximately the same as the industry average of 2.14 pedestrian fatalities per year.

10. Evolving Issues

10.1 Distraction

Distraction has emerged as an issue contributing to accidents and incidents, to such an extent that distracted driving has been addressed legislatively under the Alberta Traffic Safety Act. The number of distracted driving convictions has declined from 27,417 in 2015 to 23,546 in 2018.

The Office of the Chief Coroner for Ontario's *Pedestrian Death Review: A Review of All Accidental Pedestrian Deaths in Ontario from January 1st, 2010 to December 31st 2010* found that, as a causal factor in these deaths, distraction may have been a factor in approximately 20% of occurrences. This includes using a cell phone, MP3 player, a mobile device, pushing a shopping cart, walking a dog, or riding a skateboard. While the report recommended a "complete streets" approach to pedestrian safety, there were no recommendations in the report to directly address pedestrian distraction.

For Calgary Transit, distracted walking has also been an issue. At at-grade crossings of the LRT alignment, distractions can lead to a reduction in the effectiveness of the installed warning equipment. In addition, noise cancelling headphones can negate the benefits of audible warning devices.

Potential solutions need to address providing information within the pedestrian's cone of vision. Vertically, the cone of vision is 10 degrees below the horizontal eye position of a standing individual. Color can be differentiated in the range from +25 to -30 degrees from the horizontal eye position.

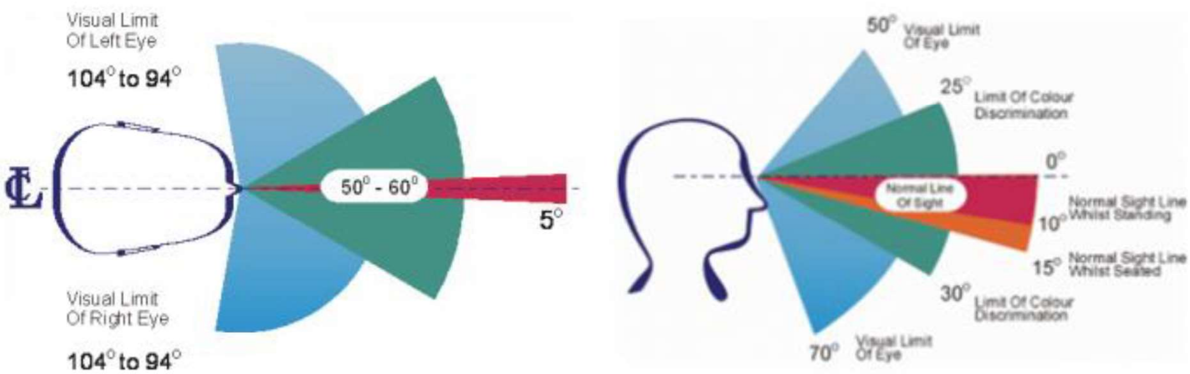

Figure 10-1 Cone of Vision (epd.gov.hk)

Solutions include mounting warning devices lower. Alternative treatments have been employed elsewhere as shown in Figure 10-2 and Figure 10-3. The example treatments place LED lights in barriers or in the pavement. While these solutions would be problematic due to Calgary's climatic conditions, they have the potential to address placement of warning information in the pedestrian's cone of vision.

It would also be possible to install gate lights on top of swing gate posts.

Figure 10-2 Non-traditional Warning Lights – YYC Airport Link (GEC Architecture)

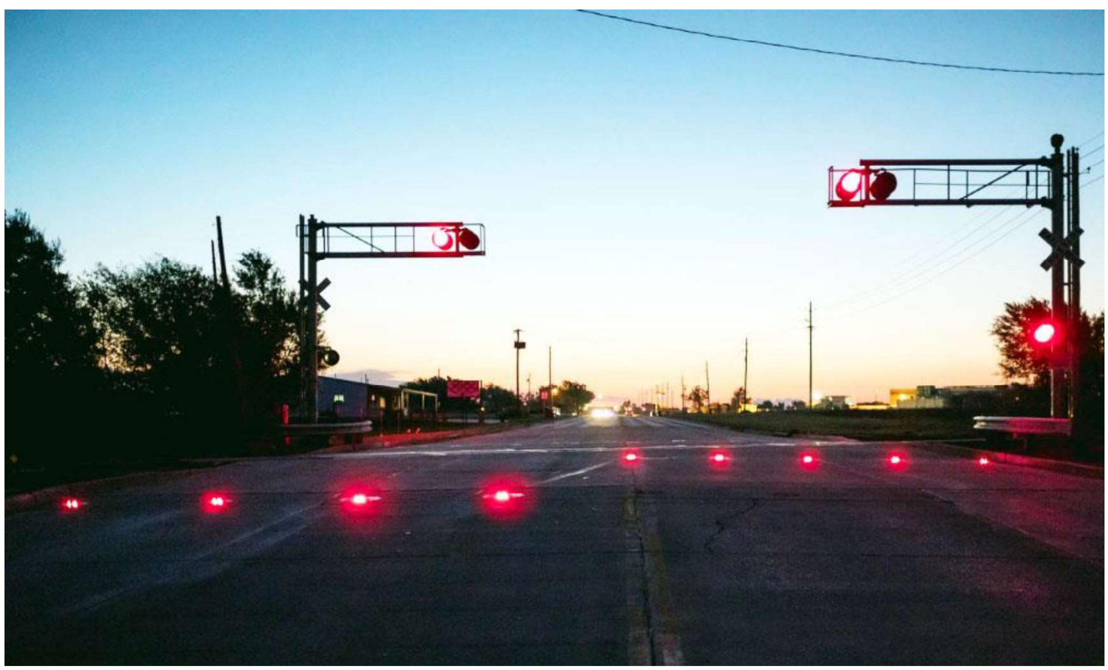

Figure 10-3 Warning Lights Set in Pavement (LightGuard TraxAlert™)

10.2 Accessibility

Accessibility issues center around the following:

- Crossing angle **–** A crossing angle of between 70 and 120 degrees has a lower risk of the wheels of an assistive device being impeded by the flangeway gap than a crossing that is angled beyond these limits;
- Flangeway gap **–** The GCS and the Americans with Disabilities Act Accessibility Guidelines (ADAAG) specify limits that the flangeway gap is to be maintained within;
- ADA tactile strip **–** The ADAAG and the City of Calgary Access Design Standards recommend the use of a cane detectable and high contrast tactile tile before the crossing surface.

There has been an increasing focus on the issues associated with building assessible infrastructure and, especially, transportation infrastructure. The current Calgary Technical Specifications address these issues.

With the exception of emergency exit gates (which you push to open) installed in conjunction with pedestrian automatic gates, the use of swing gates in new crossings is now considered undesirable from an accessibility perspective. Swing gates must be pulled open and cannot cost effectively be powered due to provide accessible access.

10.3 Vehicles Turning onto the LRT Right-of-Way

There have been numerous incidents of vehicles turning onto the LRT right-of-way. This is seen to be an issue of distraction, with drivers sometimes being confused by GPS directions and turning onto the track instead of the adjacent road. In 2017, Long Island Railroad (LIRR) recorded 29 reports of cars on tracks. In Toronto, there have been several incidents of vehicles turning onto the alignment of the new Eglinton Crosstown LRT line.

LIRR has employed extended roadway markings, flexible, four-feet high reflective delineators and additional reflective devices to better alert drivers. that they should not make a turn onto the tracks. LIRR has also partnered with Waze to alert motorists using the app that they are approaching a grade crossing.

Figure 10-4 Crossing Edge Markings on LIRR (Huntington NOW)

Within Calgary, this issue is most evident along 7 Avenue SE and SW and 36 Street NE. Calgary Transit is coordinating improvements to street lighting and is examining the installation of delineators.

In the case of 7 Avenue, each intersection is bounded by clearly marked crosswalks, with overhead signage indicating that turns onto 7 Avenue are not permitted (RB-15 Turns Prohibited Sign). Due to busses and emergency vehicles employing 7 Avenue, it is not possible to square off the corners of the intersection to further discourage turning movements.

Figure 10-5 7 Ave at 7 St LRT Signage (Google)

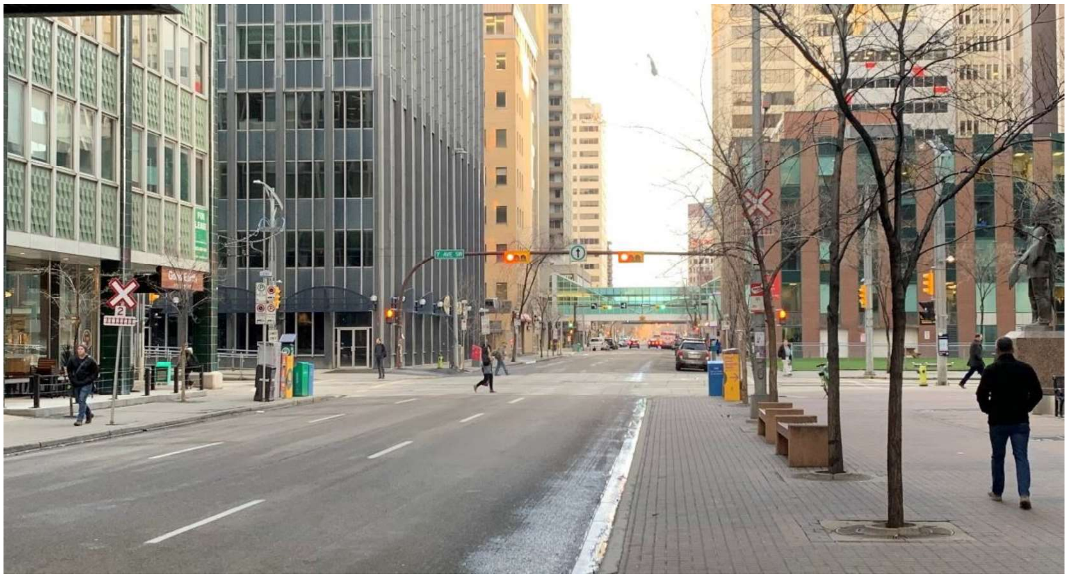

Figure 10-6 7 Ave at 6 St LRT Signage

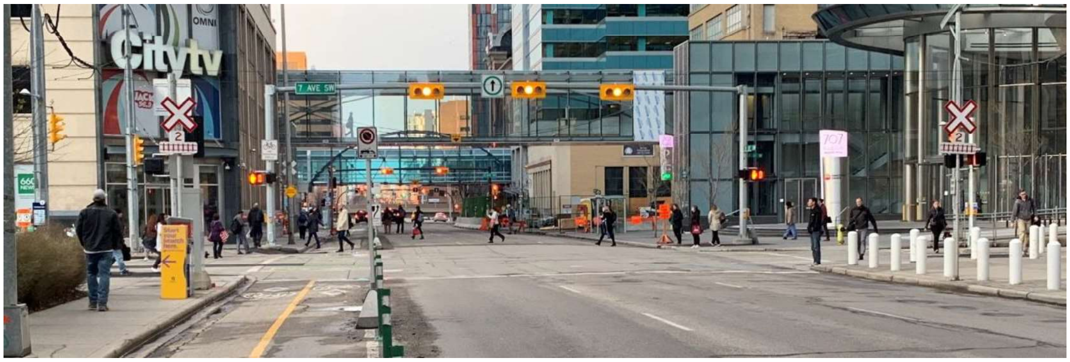

Figure 10-7 7 Ave at 5 St LRT Signage

The LRT crossing signage near 7 Avenue is inconsistent (both in terms of the signs employed and placement) and should be standardized. Signage is missing for the cycle tracks in one direction (opposing direction to road traffic). Calgary Transit and Calgary Roads have conducted a review of signage for the LRT system in downtown and have developed a plan to address this issue.

10.4 Deaths Due to Intentional Self Harm on the ROW

In 2016, there were 3974 instances of death due to intentional self-harm in Canada, amounting to an average annual individual risk of death of 113.1 in 1 million. During the same year, 79 deaths were reported as a result of the individual jumping or lying before a moving object (accounting for an average annual individual risk of death of 2.25 in 1 million); eliminating the deaths that occurred in heavy rail environments (based on Transportation Safety board of Canada data), the remaining 32 deaths likely all occurred in light rail and subway environments (an average annual individual risk of death of 0.91 in 1 million).

The 7 fatal events involving intentional self-harm involving Calgary Transit between 2015 and 2018 would result in an average annual individual risk of death of 1.4 in 1 million, in line with national trends.

To supplement the access prohibited signs, Metrolinx (GO Transit) now posts mental health helpline numbers at points of access to the ROW, including at the end of station platforms. The effectiveness of such signs is currently not known.

Figure 10-8 Mental Health Helpline (Metrolinx)

10.5 Noise

Railroad crossing bells are designed to emit sound on a 180 degree plain. This can negatively impact neighboring homes and businesses. Calgary Transit employs "soft tone" adjustable bells and adjusts the sound output. Other agencies have tried shutting off the bell when gates are in the down position. Metro Transit, which only provides gates for road traffic typically, has recently changed this policy. As bells are a pedestrian warning device and may be the only indication of an approaching train to an individual with a visual impairment, bells should ring when the warning signals for the crossing are active.

Audible devices other than railroad bells are being investigated for use on the Green Line, with the intent of providing a more focused warning, similar to "chirpers" that are employed with traffic signals.

11. Recommendations for Future Improvements

11.1 Ongoing Calgary Transit Improvements

The following improvements are being made by Calgary Transit as budgets permit. These initiatives should be continued on a risk based basis as funding permits.

11.1.1 Split Warning Phases at Center Load Station Platforms

The warning systems at pedestrian crossings at the end of center load station platforms should operate independently so as to provide warning only when required. This eliminates unwanted warning device operation which leads to a perception that the warning devices do not function correctly.

This will be made a requirement for the Green Line Stage 1.

11.1.2 Second Train Warning Signage

Second train warning signage should be provided at crossings where there is the potential for two trains to pass within the limits of the crossing approach.

For the Green Line Stage 1, active blank-out signs, similar to those employed in Portland, are being recommended.

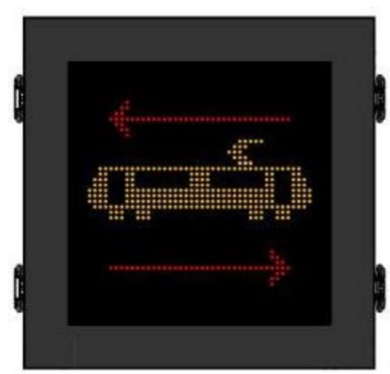

Figure 11-1 Active Blankout Second Train Warning Sign

The use of second train warning signage is intended to supplement the current Calgary Transit practice of training drivers to pass each other while in the crossing surface.

11.1.3 Height of Pedestrian Warning Signals

The installation of pedestrian warning signals should be reviewed to ensure that they are installed in the normal code of vision of pedestrians. This is particularly critical due to the issues surrounding distraction.

For Stage 1 of the Green Line, pedestrian warning signals are required to be installed so that the light is at a 2.3 to 2.6m (7.5 to 8.5’) above the crown of the sidewalk or pathway. This is at the lower end of the range for warning signals (normally 2.3 to 2.9m) and is intended to improve signal conspicuity.

It is understood that this change will increase the potential for vandalism and the need for maintenance activities.

11.1.4 Pedestrian Automatic Gates

As indicated in MUTCD Section 8C.05, situations where the sight distance is not sufficient for pedestrians and bicyclists to complete their crossing prior to the arrival of the LRT traffic at the crossing warrant the installation of active warning devices. The minimum acceptable pedestrian sighting time is 10 seconds per Transport Canada G4-A 'Minimum Railway/Road Crossing Sightline Requirements for All Grade Crossings Without Automatic Warning Devices'. This allows for sufficient time for a pedestrian to cross the tracks between points of safety prior to arrival of the train and is shown in Table 11-2. The variable distance travelled by the train during this time is shown as a function of train speed in Figure 11-3, with a sight distance of greater than 223m required when the train is travelling at 80 km/h.

Table 11-2 Minimum Pedestrian Sight Distance & Minimum Stopping Sight Distance

LRT Speed (km/h)	LRT Speed (m/s)	Minimum Pedestrian Sight Distance (m)	Minimum LRT Stopping Sight Distance (m)
25	6.9	69	46
30	8.3	83	58
35	9.7	97	76
40	11.1	111	87
45	12.5	125	107
50	13.9	139	130
55	15.3	153	154
60	16.7	167	181
65	18.1	181	210
70	19.4	195	240
75	20.8	209	273
80	22.2	223	307

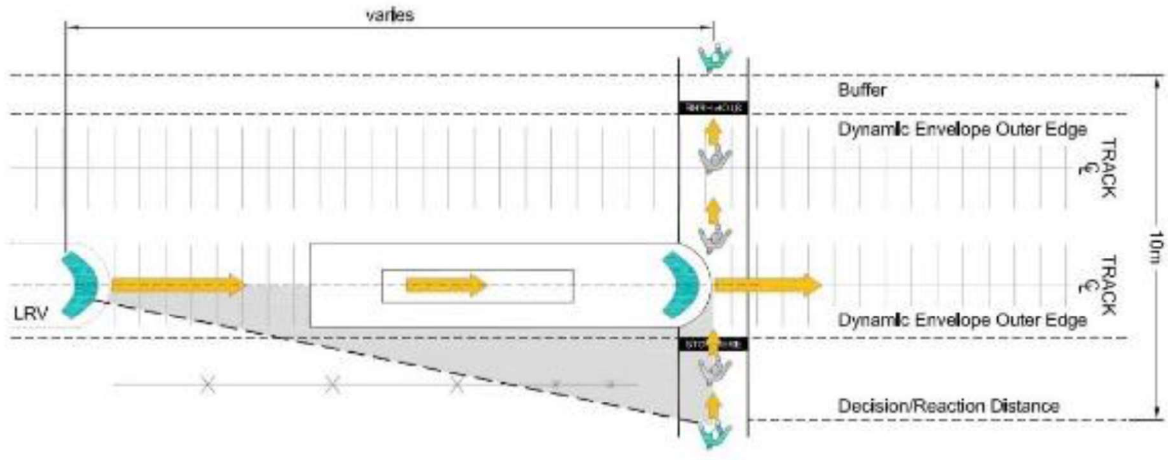

Figure 11-3 Minimum Pedestrian Sight Distance

TCRP Report 17 'Integration of Light Rail Transit into City Streets' recommends automatic gates for pedestrian crossings whenever LRV stopping sight distance is inadequate. As indicated by the Technical Memo 'Calgary LRT Green Line - Light Rail Vehicle (LRV) Service Braking Distances' and summarized in Table 11-2, the LRV stopping sight distance would be 307m for an initial speed of 80 km/h. Once again, the provision of flashing lights with gates is a suitable mitigation when it is not possible to provide the necessary LRT stopping sight distance.

At existing crossing locations, the installation of pedestrian automatic gates in place of bedstead barriers and swing gates has been done at some crossings, including Chinook. The primary challenge to installing pedestrian automatic gates at all crossings is the lack of sufficient pedestrian refuge area, especially in areas where the LRT has a center running alignment in a street median. The addition of pedestrian automatic gates further decreases what may already be an insufficient refuge area.

The provision of pedestrian automatic gates is a requirement for Stage 1 of the Green Line.

11.1.5 Do Not Stop on Track

To provide mitigation against motorists stopping on tracks, the "Keep Clear" zone should be indicated. Historically, this has been done in Calgary as shown in Figure 11-4. Do Not Stop on Tracks Signs (RB-59) should be installed in conjunction with the pavement markings.

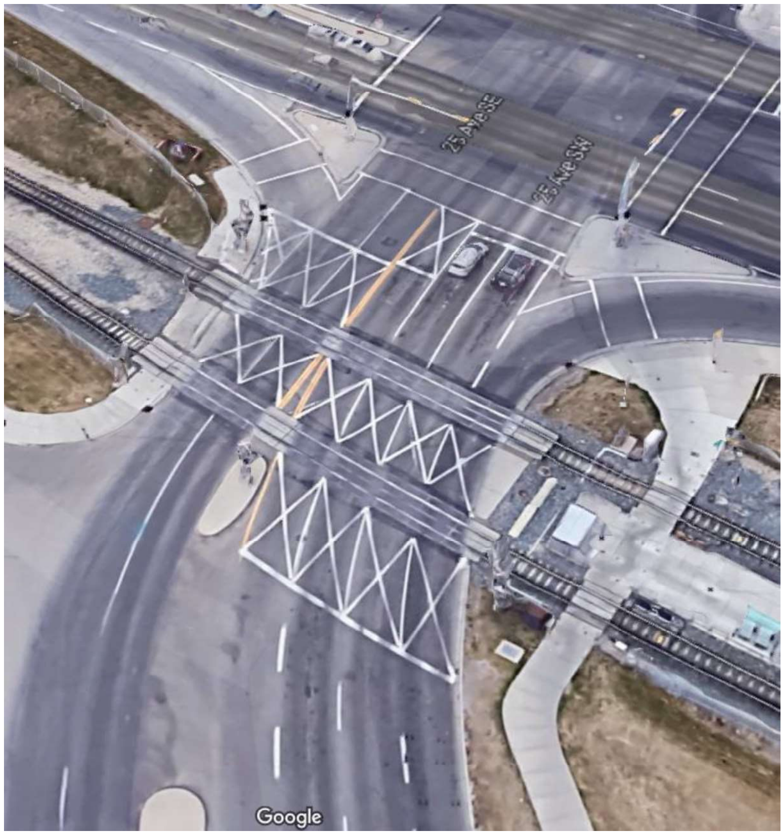

Figure 11-4 Keep Clear Zone Markings

To prevent motorists from driving around gates, medians or median barriers should be provided. These barriers should be appropriate to the Calgary climate and not impede snow clearing.

11.2 Calgary Transit Technical Specification T-SP-R-0069

There are a number of minor issues with the content of Calgary Transit Technical Specification T-SP-R-0069. These include:

- The document should be updated to include in-street operations, especially given the City's intent to develop an unban integrated low floor LRT system for the Green Line.
- References to RTD 10 should be eliminated as this was a draft document has been superseded by the Transport Canada Grade Crossings Standards (GCS) since 2014.
- 4.3.3.1 Flashing Lights. Starting flashing lights at-least 12 seconds prior to arrival of the train for pedestrian crossings does not conform with the Transport Canada GCS, AREMA C&S Manual or US MUTCD. A minimum of 20 seconds warning time should be provided for all crossings.

- 4.3.3.2 Automatic Gate Arms. The gate descent delay indicated does not conform with the Transport Canada GCS. Longer gate descent delays are sometimes necessary to permit a vehicle at the safe stopping distance when the warning devices activate to clear the gate arms. Upper limits for gate descent delays should be established.
- 4.4.5.4 Crossing Angle. The referenced content from RTD 10 was changed substantively in the Transport Canada Grade Crossings Standards (GCR) and Grade Crossings Standards (GCS). The crossing angles referenced should be maintained as a best practice, especially for pedestrian crossings, but they are no longer required by the GCS.
- Table 4.1 Examples of why design guidelines may not be met. The GCR and GCS do not prohibit the construction of an at-grade crossing within 30m of the near side of an adjacent intersection. The GCR and GCS do not prohibit the construction of a crossing with an angle of less that 45 or greater than 135 degrees. Cantilevered crossing warning signals can be provided using traffic signal structures.

It is also recommended that this document be revised to provide guidance concerning:

- Light unit alignment for flashing lights provided for roadway and pedestrian traffic;
- The usage of active second train warning signage; and
- Appropriate signage for non-exclusive alignments such as 7 Avenue.

11.3 Calgary Transit LRT Design Guidelines

There are a number of minor issues with the content of Calgary Transit LRT Design Guidelines. These include:

- References to Transport Canada General Order E-6 should be eliminated as this document has been superseded by the Transport Canada Grade Crossings Standards (GCS) since 2014.
- The design guidelines should be updated to include a minimum standard for pedestrian refuge areas. These areas should be provided before the LRT guideway in all instances.
- The DGM should be updated to include design requirements and operating circuits for second train warning and for interconnections with traffic signals.

11.4 Emergency Notification Signs

Transport Canada requires the installation of an emergency notification sign at all at-grade crossings. These signs provide information to roadway users so that they can notify Calgary Transit about emergencies and malfunctioning traffic control devices. Calls would be routed to the PS100 desk.

Emergency notification signs should conform to Figure 11-5.

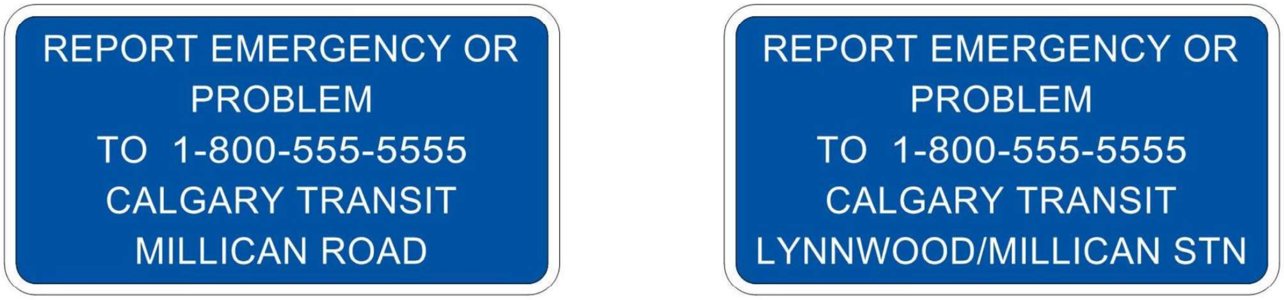

Figure 11-5 Emergency Notification Sign

It should be noted that CP and CN employ a different sign in Canada, pre-dating the US MUTCD recommended sign. These signs are typically placed on the back side of one of the standardized reflectorized crossing sign but can also be placed on the crossing most or the crossing house. All crossings that are shared with CP, such as those along the south end of the Red Line, have a CP emergency notification sign posted.

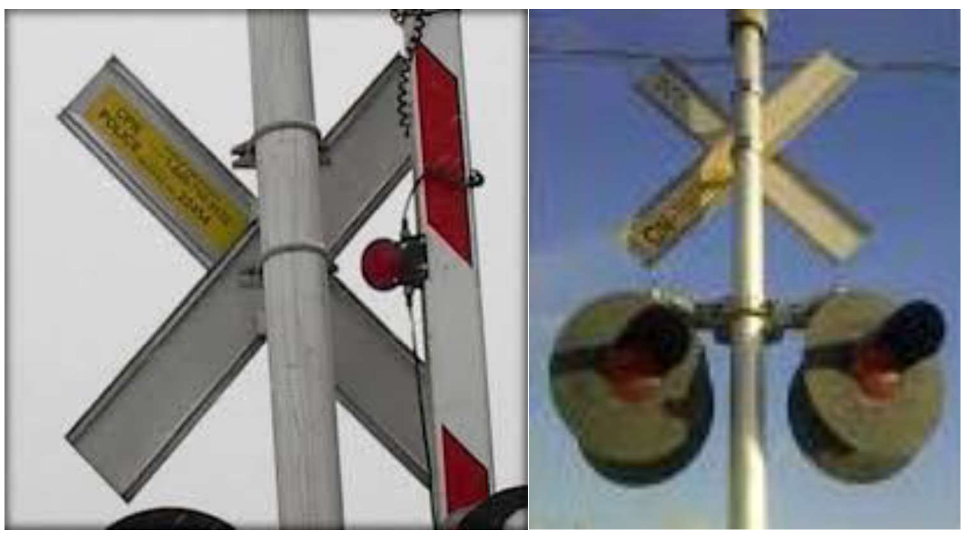

Figure 11-6 CP and CN Emergency Notification Signs (CP, CN)

Transport Canada and the Canadian MUTCD currently do not recommend a sign for this purpose.

The US MUTCD requires that emergency notification signs be positioned so that they do not obstruct any traffic control devices or limit the view of rail traffic approaching the grade crossing. Guidance is provided that signs should be oriented so as to face vehicles stopped at the grade crossing or on the traveled way near the crossing.

There is currently no indication that the lack of emergency notification signs is creating a hazard. This is, however, a low cost item (typically less than $200 per crossing) and provides a means or reporting emergencies and problems that is consistent with other crossings in Calgary on CN and CP.

11.5 Desirable Data

Benchmarking should be done on the basis of:

- average collisions per crossing;
- average fatal injuries per crossing;
- average injuries per crossing;
- average number of near miss events per crossing;
- average collisions per million vehicle revenue miles;
- average injuries per million vehicle revenue miles; and
- average fatal injuries per million vehicle revenue miles.

This provides a means of benchmarking Calgary Transit's performance as the size of the system increases and against other agencies.

It is recommended that a means of reporting this data annually be established.

Appendix A: Crossing Assessments

Note that areas of concern are highlighted in red in the attached reports and are addressed in the report above.

12.

12.1 Lions Park West End Pedestrian Crossing

Calgary Transit
, Calgary, Alberta

Crossing Safety Assessment

Issue and Revision Record					
Rev	**Date**	**Originator**	**Checker**	**Approver**	**Description**
0	2019-05-01	Jenny Xing	Andy Hamel	Dale Hein	Final

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The safety assessment of this grade crossing covers physical features which may affect road and rail user safety and it has sought to identify potential safety hazards. However, the auditors point out that no guarantee is made that every deficiency has been identified. Further, if all the recommendations in this assessment were addressed, this would not confirm that the crossing is 'safe'; rather, adoption of the recommendations should improve the level of safety of the facility.

HATCH

1. Summary

A safety assessment of the grade crossing located at in Calgary, Alberta (Red Line subdivision) was undertaken on May 2nd ,2019. Data on site was acquired by Jenny Xing and the assessment of the information provided was performed by Andy Hamel/Jenny Xing.

For the purposes of this report, crossing is described in a North/South orientation, while the rail line is described in an East/West orientation. The crossing is equipped with an active crossing warning system with flashing lights and bell(s).

2. Purpose

The Fundamental objectives of this assessment are:

1. Identify opportunities to reduce collision risk within the grade crossing environment.
2. Identify opportunities to minimize the frequency and severity of preventable crashes.
3. Consider the safety of all grade crossing users.
4. Verify compliance of the Grade Crossings Standards (GCS, dated July 2014) referred to in the most recent Grade Crossings Regulations (GCR, SOR 2014-275, November 28, 2014).
5. Ensure that all the crash mitigation measures/factors aimed to eliminate or reduce the identified safety problems are fully considered, evaluated and documented for review/action by the appropriate authorities.

3. Site Sketch

A site sketch is included to provide an aerial perspective of the layout for the crossing, which identifies the railway and roadway on appraoch to the grade crossing location. It identifies key components and considerations that impact the safety of the crossing which may include obstructions, signage, crossing infrastructure, and surrounding land use.

4. Assesment Data

The assessment data is provided in pages 4 to 11. Assessment questions are presented to reflect all requirements in the GCS for both passive and active warning systems. Assessment data not within compliance of the GCS is highlighted red for quick reference. Assessment data that is not applicable to the crossing is filled with N/A. Items not within compliance with the GCS are summarized following the assessment data along with suggested actions for remediation.

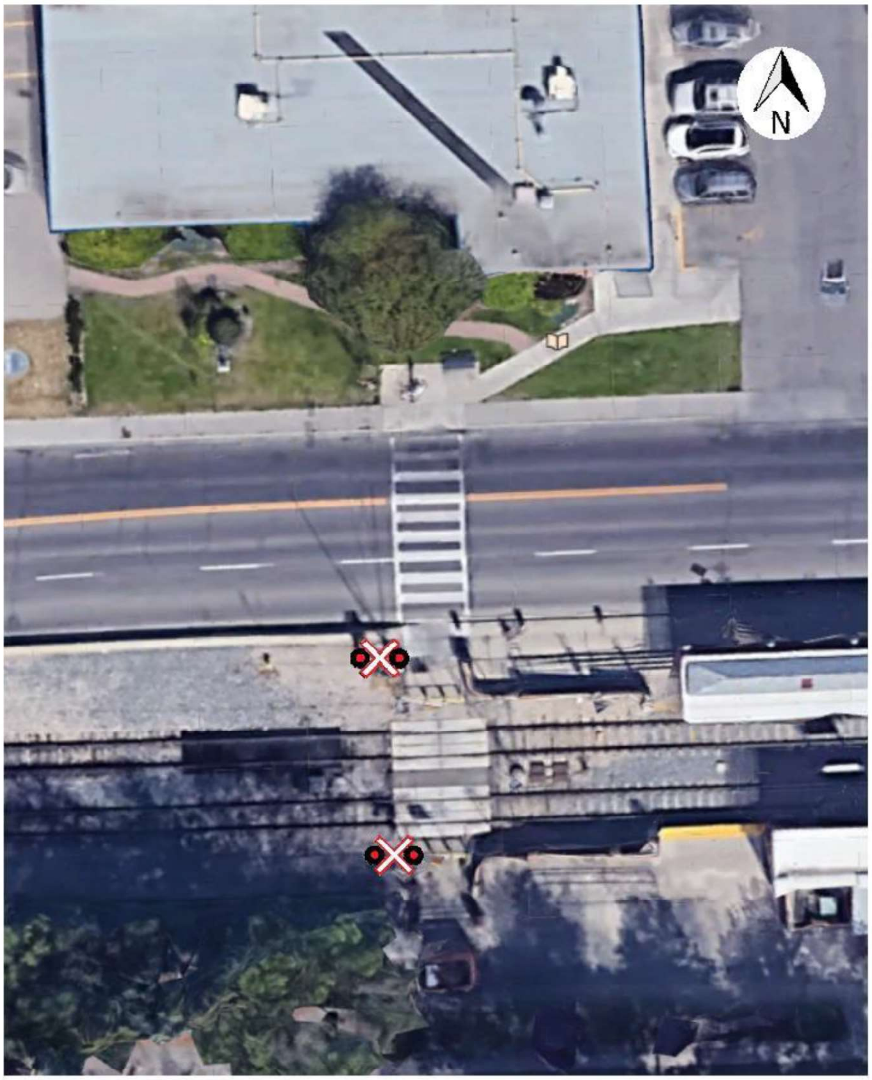
5. Recommendations

Following the report generated from site, items that do not comply with the Transport Canada's Grade Crossing Standards and Regulations are itemized in a summary table with suggested actions for remediation, if required. Responsibilities for remediation are identified in the adjacent column as per the GCR, where applicable.

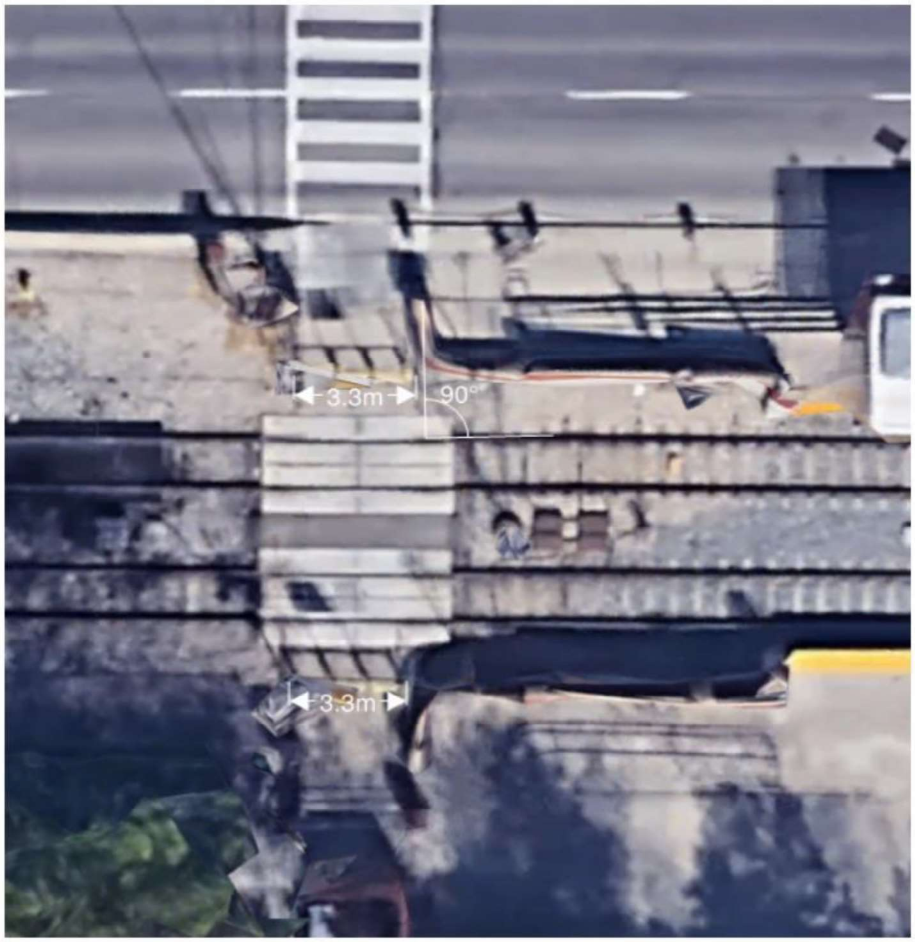
6. Site Photos

In order to highlight conditions on site, photographs are included at the end of the report. The pictures are meant to highlight considerations of the report and may include items such as sightlines, signage, warning system equipment, road markings, road condition, rail condition, and site documentation.

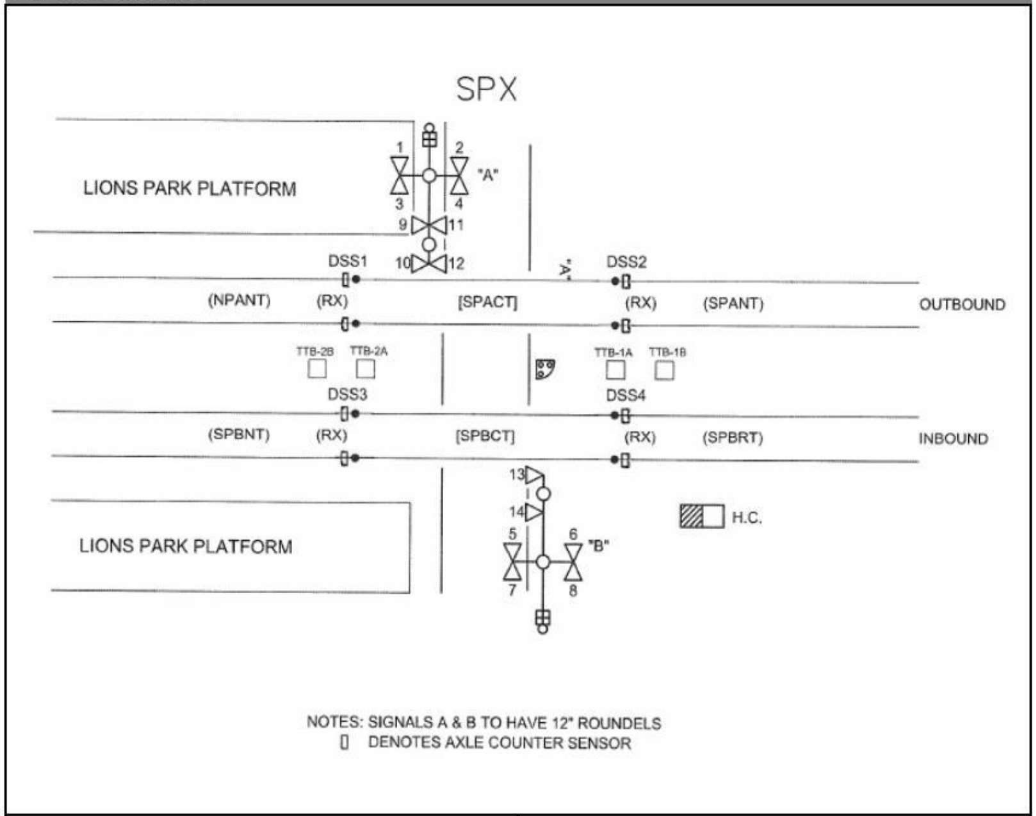
SITE SKETCH

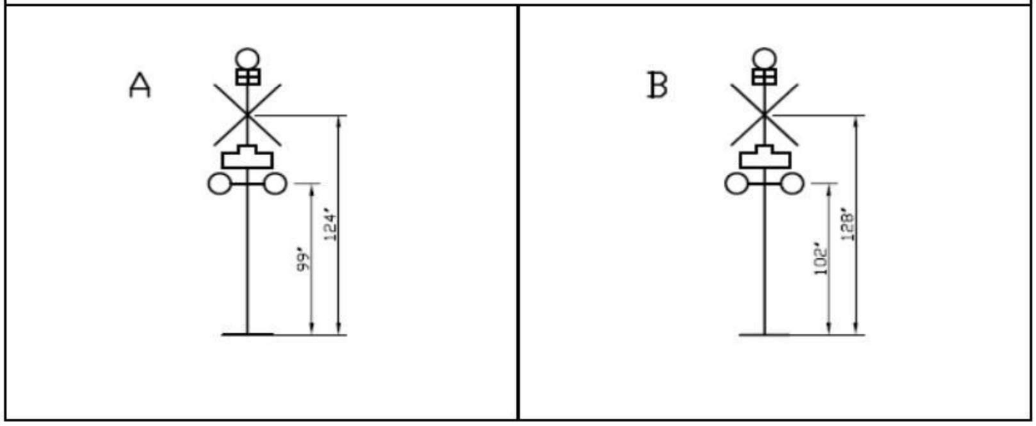


Road Measurement Sketch



FLB&G Sketch


SPX
LIONS PARK PLATFORM
"A"
DSS1
DSS2
(NPANT)
(RX)
[SPACT]
(RX)
(SPANT)
OUTBOUND
TTB-2B
TTB-2A
TTB-1A
TTB-1B
DSS3
DSS4
(SPBNT)
(RX)
[SPBCT]
(RX)
(SPBRT)
INBOUND
H.C.
LIONS PARK PLATFORM
"B"
NOTES: SIGNALS A & B TO HAVE 12" ROUNDELS
DENOTES AXLE COUNTER SENSOR


A
124"
99"
B
128"
102"

HATCH

ASSESSMENT DATA

Assessor Information

Data acquisition by:	Jenny Xing
Crossing assessment by:	Andy Hamel/Jenny Xing
Date of site visit:	May 2nd ,2019
Comments:	

Railway Company Information

Railway company:	Calgary Transit
Location Chainage:	
Subdivision:	Red Line
Rail orientation:	East/West
Number of tracks:	2
Can railway equipment pass each other at the crossing?	Yes
Average annual daily train traffic: (AADT)	200
Freight train design speed: (mph)	
Passenger train design speed: (mph)	
Type of crossing warning system:	Active: FLB
Is whistling used at crossing?	N/A
Class of track:	CLASS 1
Comments:	

Road Authority Information

Road authority:	City of Calgary
Street name:	
Municipality:	Calgary
Province/Territory:	Alberta
Design vehicle:	
Design Vehicle Length: (m)	6
Average annual daily road traffic: (AADT)	
Public or private road?	
Urban or rural?	
Local, collector, arterial, expressway, or freeway?	
Divided or undivided?	
Crossing cross angle: (degrees)	

Crossing Approaches	**North**	**South**
Road crossing design speed: (km/h)		
Number of traffic lanes:		
Traffic lane width: (m)		
Traffic lane width including shoulders: (m)		
Average grade of road approach:		
Stopping sight distance (SSD):		
Vehicle departure time: (calculated)		
Prepare to Stop required activation time:		
Interconnection delay timing:		

Sidewalk	**East**	**West**
Sidewalk present?		
Is sidewalk designated for persons using assistive devices?	Yes	Yes
Comments:		

HATCH

ASSESSMENT DATA

C NEW STANDARDS

5	Crossing Surface			East	West
	Road extensions off of the travelled way: (m)	min 0.5			
	East sidewalk extensions of the travelled way: (m)	min 0.5			
	West sidewalk extensions of the travelled way: (m)	min 0.5			
	Is crossing surface smooth and continuous?			Yes	
	Flangeway			**Min**	**Max**
	Flangeway width: (mm)	min 65	max 75		
	Flangeway depth: (mm)	min 50	max 75		
	Flangeway field side width: (mm)		max 0		
	Flangeway field side depth: (mm)		max 0		
	Top of rail to road crossing surface: (mm)	min -7	max 13		
	Comments:				

Flangeways and crossing surfaces are good.

6	Road Geometry			North	South
	East slope within 5m of the nearest rail at a sidewalk or path: (%)		max 2%		
	West slope within 5m of the nearest rail at a sidewalk or path: (%)		max 2%		
	Slope within 8m of the nearest rail: (%)		max 2%		
	Slope between 8m and 18m of the nearest rail: (%)	max_1 5%	max_2 10%		
	What is allowable percentage grade slope through crossing?				
	What is the grade slope through the crossing?				
	Is grade slope through crossing less than limit?				
	Are horizontal and vertical alignments smooth and continuous on approach?				
	Width of travelled way on each approach: (m)				
	Width of travelled way at crossing: (m)				
	Width through the crossing greater than approach?				
	Does the travelled way have curbs?				
	Grade crossing angle: (degrees)	min 0	max 180		
	Comments:				

Road geometry is good

7	Sightlines	North	South
	SSD calculated: (m)		
	SSD measured: (m)		
	D_{SSD} calculated: (m)		
	D_{SSD} driver's left measured: (m)		
	D_{SSD} driver's right measured: (m)		
	$D_{stopped}$ calculated: (m)		
	$D_{stopped}$ driver's left measured: (m)		
	$D_{stopped}$ driver's right measured: (m)		
	$D_{stopped}$ pedestrian's left measured: (m)		
	$D_{stopped}$ pedestrian's right measured: (m)		
	Are there any obstacles to driver's left that may affect visibility?		
	Are there any obstacles to driver's right that may affect visibility?		
	Is there any vegetation to driver's left that may affect visibility?		
	Is there any vegetation to driver's right that may affect visibility?		
	Is visibility along track impaired due to angle of crossing?		
	Comments:		

ASSESSMENT DATA

Sightlines are good.

HATCH

ASSESSMENT DATA

8 Signs & Pavement Markings

Crossing Sign(s)			**North**	**South**
Railway crossing sign present with reflective 50mm border?				
Number of tracks sign present and reflective?				
Height of cross buck from crown of road: (m)	min 1.5	max 2.5		
Is 100mm retroreflective strip on back of each blade?				
Distance of strip from crown of road: (mm)		max 300		
Distance of strip from top of cross buck: (mm)	min 70	max 70		
Crossing sign distance from shoulder: (m)	min 2	max 4.5		
Distance to nearest rail: (m)	min 3			
50mm strip on front post?				
Is sign post made of material such that if struck by a vehicle it will break?				
Condition of sign:				
Railway Crossing Ahead Sign and Advisory Speed Tab			**North**	**South**
Are vehicles required to slow prior to crossing due to shorter SSD?				
Is sign present upon approach?				
Is sign visible from SSD as defined by road speed?				
Is sign showing correct road orientation?				
Is Advisory Speed tab installed and correct?				
Advisory Speed: (km/h)				
Adjusted SSD: (m)				
Condition of sign:				
Stop Sign Ahead Sign			**North**	**South**
Stop sign ahead sign required?				
Stop sign ahead sign installed?				
Stop Sign visible from SSD at design road speed?				
Condition of sign:				
Stop Sign			**North**	**South**
Is D_{SSD} insufficient to warrant a stop sign?				
Is stop sign installed?				
Size of stop sign?				
Distance from crown of road to bottom of sign: (m)	min 1.8			
Distance from top of sign to centre of crossing sign: (m)	min 0.5	max 0.5		
Condition of sign:				
Emergency Notification Sign				
Is Emergency Notification Sign Present?				
Does Emergency Notification Sign contain all information?				
Can Emergency Notification Sign(s) be seen from both approach?				
Condition of sign:				
Stop Bars			**North**	**South**
Are stop bars able to be painted on approach?				
Are stop bars present?				
Distance from nearest rail (m):	min 5.0			
Distance from nearest signal (m):	min 2.0			
Condition of markings:				
'X' Markings			**North**	**South**
Is 'X' marking able to be painted on approach?				
Is X marking present?				
Condition of markings:				

Comments:

Railway crossing X-buck for northward direction is present but extremely faded. See photos.

HATCH

ASSESSMENT DATA

9 Warning Systems Specification

Traffic volume cross product:
Railway speed: (mph)
Is there a sidewalk present?
Number of tracks:
Is there an intersection within a distance 'D" from the crossing?

Flashing Lights and Bells

Additional condition requires warning system?
Lights and bells required?
Are flashing lights and bells present?

Gates

Additional condition requires gates?
Gates required?
Are gates present?

Sidewalk Flashing Lights	**North**	**South**
Is sidewalk outside island circuit?		
Additional lights required for sidewalk?		
Are flashing lights for the sidewalk present?		

Sidewalk Gates	**North**	**South**
Are gates required for sidewalk?		
Are gates for the sidewalk present?		

Comments:

D DESIGN CALCULATIONS

10 Design Calculations	**North**	**South**
Vehicle clearance Distance (Cd) measured: (m)		
Pedestrian clearance Distance (Cd) measured: (m)		
Vehicle travel distance (S) calculated: (m)		
Departure Time (T_D) calculated: (s)		
Maximum approach grade within "S": (%)		
Grade adjustment factor "G":		
Design vehicle departure time "s" calculated: (s)		
Pedestrian Departure Time (T_P) calculated: (s)		
Departure Time measured: (s)		
Gate arm clearance time calculated: (s)		
Gate arm clearance time measured: (s)		

11 Location of Grade Crossings		**North**	**South**
Are there any intersections along approach to crossing?			
Queuing		**North**	**South**
Distance "D" from stop sign: (m)	min 30		
Distance "D" from traffic signal: (m)	min 60		
Is 'D' insufficient such that road vehicles might queue onto the tracks?			
Can traffic queue from adjacent intersection to within 2.4m of nearest track?			
Can traffic queue from crossing into adjacent intersections?			
Are there any queuing issues that would require traffic preemption?			

Comments:

HATCH

ASSESSMENT DATA

E WARNING SYSTEM DESIGN

12 Warning System Operation - General

Flashing Lights			North	South
Cross buck present with reflective 50mm border?				
Number of tracks sign present and reflective?				
Distance from shoulder to outside of outer signal: (m)	min 1.88			
Distance to nearest rail: (m)	min 3			
Exposed signal foundation from crown of road: (mm)		max 100		
Bottom of lowest signal from crown of road: (m)	min 2.3	max 2.9		
Number of track sign to bottom of lowest signal: (mm)	min 125	max 175		
Cross bucks to top of highest signal: (mm)	min 125	max 175		
Radius of signal backgrounds: (mm)	min 305	max 305		
Distance from centre of signal to centre of mast: (mm)	min 380	max 380		
Condition of signals:				
Gates			**North**	**South**
Gate mechanism protrusion: (mm)		max 650		
Gate up protrusion height at edge of signal: (m)	min 5.2			
Gate down height from crown of road: (m)	min 1.1	max 1.4		
Gate tip to centre of mast: (m)		max 11.6		
Gate tip to edge of travelled lane: (m)	min -1	max 1		
Gate tip to tip of other gate: (m)	min 0	max 1		
First signal solid and other signals alternating?				
Gate tip to first gate signal: (mm)	min 355	max 915		
First gate signal to last gate signal: (m)	min 2.74			
Are gate signals equally spaced?				
Gate arm stripe width: (mm)	min 406	max 406		
Gate arm stripes vertical?				
Condition of gates:				
Sidewalk Gates			**East**	**West**
Sidewalk width: (m)				
Gate mechanism protrusion: (mm)		max 650		
Gate up protrusion height at edge of signal: (m)	min 5.2			
Gate down height from crown of road: (m)	min 1.1	max 1.4		
Gate tip to centre of mast: (m)		max 11.6		
Number of lights required:				
Does gate extend full width of sidewalk?				
Are gate signals equally spaced?				
Are gate signals alternating correctly?				
Gate arm stripe width: (mm)	min 406	max 406		
Gate arm stripes vertical?				
Condition of gates:				
Cantilevers			**North**	**South**
Height of cantilever from crown of road: (m)	min 5.2	max 6		
Radius of signal backgrounds: (mm)	min 305	max 305		
Condition of mast:				
Condition of signals:				
Crossing Case				
Distance of crossing case to edge of rail (m):				
Distance of crossing case to edge of road (m):				

Comments:

Page 11 of 16

HATCH

ASSESSMENT DATA

	Equipment			
	Is data recorder capable of retaining information up to 30 days?			
	Is design failsafe?			
	Is power out indicator installed and visible from the road?			
	Do fouling circuits have at least two discrete conductors?			
	Does track circuit detect a 0.06ohm resistance?			
	Are non insulated joints properly bonded?			
	Do insulated joints provide proper insulation?			
	Does battery back-up give 8 hours continuous or 24 hours normal operation?			
	Comments:			
13	**Number and Location of Light Units**		**North**	**South**
	Can front lights be seen from SSD?			
	Can front lights be seen along entire approach?			
	Can front lights be seen from intersections entering approach?			
	Can back lights be seen by all vehicles stopped at crossing?			
	Are additional lights required?			
	Are additional lights installed?			
	Cantilevers		**North**	**South**
	Distance from centre of signal to edge of travelled lane: (m)	max 7.7		
	Distance from second signal to edge of travelled lane: (m)	max 7.8		
	Can front light be seen by all vehicles on approach?			
	Is roadway classified as an expressway?			
	Is a cantilever required?			
	Is a cantilever installed?			
	Sidewalk		**East**	**West**
	Centre of warning system to centre of sidewalk: (m)	max 3.6		
	Can at least one set of lights be seen by sidewalk from both sides of rail?			
	Is sidewalk outside island circuit?			
	Additional signal required?			
	Are flashing lights for the sidewalk present?			
	Comments:			
14	**Light Units - Alignment**		**North**	**South**
	Are signal alignment requirements available on site?			
	Are all units 200mm or 300mm LEDs?		200mm inc	200mn inc
	Light flash rate: (flashes per minute)	min 45 max 65		
	Are all lights flashing alternatively and uniformly?			
	Are front lights aligned to 1.6m above road at SSD (or when first visible)?			
	Are back lights aligned to 1.6m above road at 15m from front lights?			
	Are additional lights required for approaches?			
	Are additional lights installed and aligned for 1.6m above road surface?			
	Sidewalk		**East**	**West**
	Are all light units 200mm or 300mm LEDs?			
	Light flash rate: (flashes per minute)	min 45 max 65		
	Are all lights flashing alternatively and uniformly?			
	Are front lights aligned to 1.6m above road at 30m (or when first visible)?			
	Comments:			
	200 mm incandescent lights at this crossing.			

HATCH

ASSESSMENT DATA

15 Bells and Gates

Bells			North	South
Is bell installed on mast?			Yes	Yes
Is bell on side with sidewalk?				
Distance from sidewalk to bell mast: (m)		max 30		
Bell gong rate: (rings per minute)	min 100	max 325		
Does bell ring for as long as warning system is active?				
Gates			**North**	**South**
Is gate arm perpendicular to road approach?				
Gate descent delay measured: (s)				
Does gate arm stop if obstructed?				
Gate arm descent time: (s)	min 10	max 15		
Time to train arrival: (s)	min 0			
Gate ascent time: (s)	min 6	max 12		
Does gate arm descend smoothly and without rebound?				
Does gate arm return to proper position after clearance of obstruction?				

Comments:

16 Circuitry

Required warning time: (s)	
Measured or recorded warning time: (s)	
Are crossing warning times consistent?	
Are warning times less than 13s more than required?	
Are cut-out circuits installed, if required?	
Type of crossing equipment:	
Are directional stick circuits installed?	
Does stick have release timer or restrict train speeds through signaling?	
Are all wires properly tagged and clear?	

Comments:

17 Inspection and Testing - Warning Systems

Are plans available at location and up to date?	
Is there proof of testing at periods defined in GCS?	

Comments:

F INTERCONNECTED DEVICES

18 Prepare to Stop at Railway Crossing Sign	North	South
Is SSD restricted such that a prepared to stop at railway sign is required?	N/A	N/A
Is prepare to stop sign installed?		
Can the prepare to stop sign be seen from SSD?		
Do prepare to stop flashers activate with enough preemption?		
Does battery back-up allow Prepare to Stop sign to operate for up to 4 hours?		
19 Interconnection of Traffic Signals	**North**	**South**
Is intersection within 30m of crossing?		
Are there any queuing issues that would require traffic preemption?	N/A	N/A
Is interconnection installed?		
Does interconnection allow vehicles to clear the grade crossing?		
Does interconnection prevent vehicles from entering crossing?		
Does battery back-up allow traffic signals to operate for up to 4 hours?		

HATCH

ASSESSMENT DATA

20 Interconnected Devices - Inspection and Testing

Is there proof of testing of interconnected devices as defined in GCS?

Comments:

APPENDIX D - WHISTLE CESSATION

	North	South
Is SSD adequate?		
Are sightlines along track greater than 400m in both directions?		
Type of crossing warning system:	*Active: FLB*	
Number of tracks:	*2*	
Railway speed: (mph)		
Is crossing warning system adequate for whistle cessation?		
Is whistling required at crossing?		
Is whistling used at crossing?		

Comments:

ADDITIONAL COMMENTS

Comments:

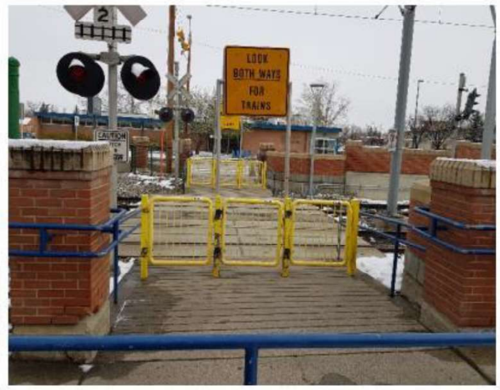
Location equipped with pull gates.

The top hinge on the center pull gate on North (East) side is broken. Gate still somewhat operable but does get stuck.

Consider installing gates at this location or gate style lights mounted on top of posts between the pull gates to put flashing lights in peripheral vision of pedestrians distracted by phone/tablets.

Replace the NB X-bucks as the existing sign is extremely faded.

SITE PHOTOS

Lion's Park Looking North - 1	Lion's Park Looking North - 2
	

Lion's Park Looking North - 3	Lion's Park Looking NE
	

Lion's Park Looking NW	Lion's Park Looking South - 1
	

SITE PHOTOS

Lion's Park Looking South - 2	
	

12.2 Saddletowne Station South Pedestrian Crossing

HATCH

Calgary Transit
Saddletowne South PED-X, Calgary, Alberta

Crossing Safety Assessment

Issue and Revision Record					
Rev	**Date**	**Originator**	**Checker**	**Approver**	**Description**
0	2019-04-10	Jenny Xing	Andy Hamel	Dale Hein	Final

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The safety assessment of this grade crossing covers physical features which may affect road and rail user safety and it has sought to identify potential safety hazards. However, the auditors point out that no guarantee is made that every deficiency has been identified. Further, if all the recommendations in this assessment were addressed, this would not confirm that the crossing is 'safe'; rather, adoption of the recommendations should improve the level of safety of the facility.

1. Summary

A safety assessment of the grade crossing located at Saddletowne South PED-X in Calgary, Alberta (Blue Line subdivision) was undertaken on Apr 11, 2019. Data on site was acquired by Jenny Xing and the assessment of the information provided was performed by Andy Hamel/Jenny Xing.

For the purposes of this report, Saddletowne South PED-X crossing is described in an East/West orientation, while the rail line is described in a North/South orientation. The crossing is equipped with an active crossing warning system with flashing lights and bell(s).

2. Purpose

The Fundamental objectives of this assessment are:

1. Identify opportunities to reduce collision risk within the grade crossing environment.
2. Identify opportunities to minimize the frequency and severity of preventable crashes.
3. Consider the safety of all grade crossing users.
4. Verify compliance of the Grade Crossings Standards (GCS, dated July 2014) referred to in the most recent Grade Crossings Regulations (GCR, SOR 2014-275, November 28, 2014).
5. Ensure that all the crash mitigation measures/factors aimed to eliminate or reduce the identified safety problems are fully considered, evaluated and documented for review/action by the appropriate authorities.

3. Site Sketch

A site sketch is included to provide an aerial perspective of the layout for the crossing, which identifies the railway and roadway on appraoch to the grade crossing location. It identifies key components and considerations that impact the safety of the crossing which may include obstructions, signage, crossing infrastructure, and surrounding land use.

4. Assesment Data

The assessment data is provided in pages 4 to 11. Assessment questions are presented to reflect all requirements in the GCS for both passive and active warning systems. Assessment data not within compliance of the GCS is highlighted red for quick reference. Assessment data that is not applicable to the crossing is filled with N/A. Items not within compliance with the GCS are summarized following the assessment data along with suggested actions for remediation.

5. Recommendations

Following the report generated from site, items that do not comply with the Transport Canada's Grade Crossing Standards and Regulations are itemized in a summary table with suggested actions for remediation, if required. Responsibilities for remediation are identified in the adjacent column as per the GCR, where applicable.

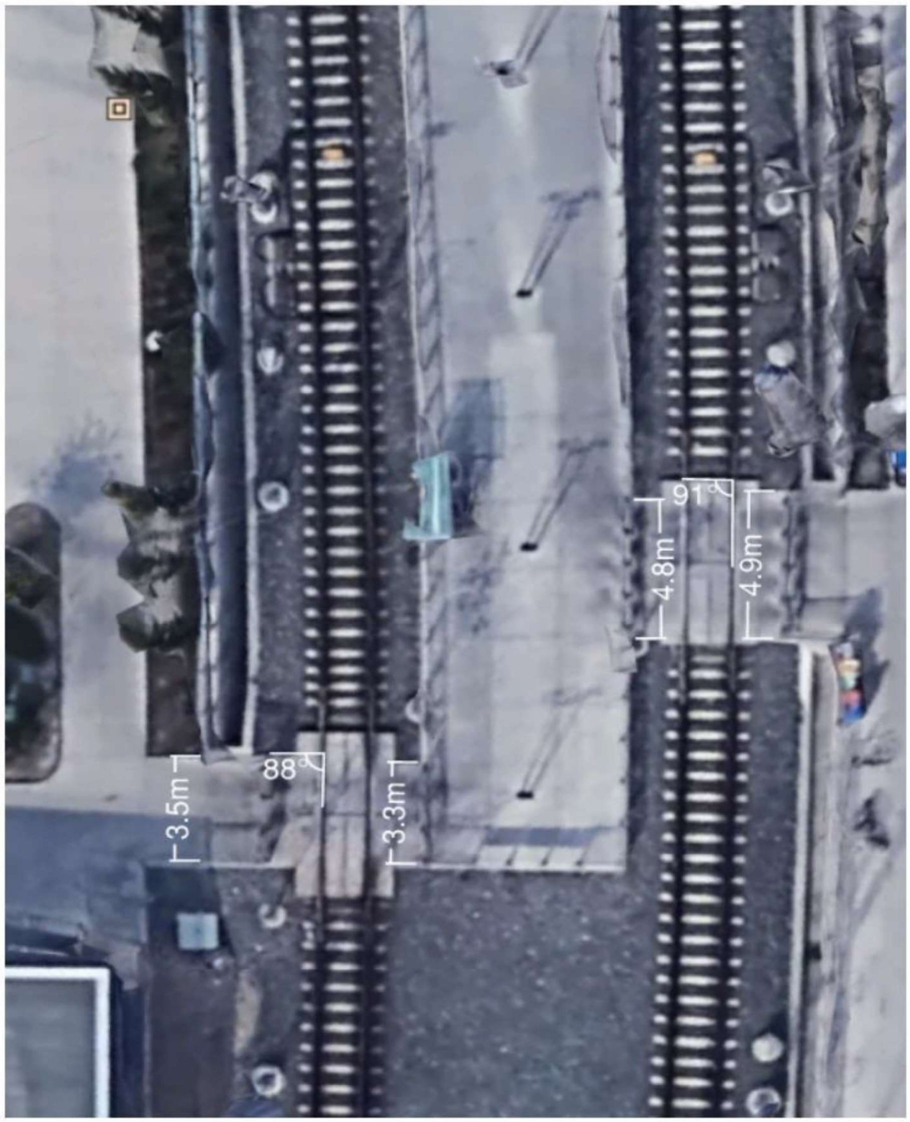
6. Site Photos

In order to highlight conditions on site, photographs are included at the end of the report. The pictures are meant to highlight considerations of the report and may include items such as sightlines, signage, warning system equipment, road markings, road condition, rail condition, and site documentation.

HATCH

SITE SKETCH

SITE SKETCH



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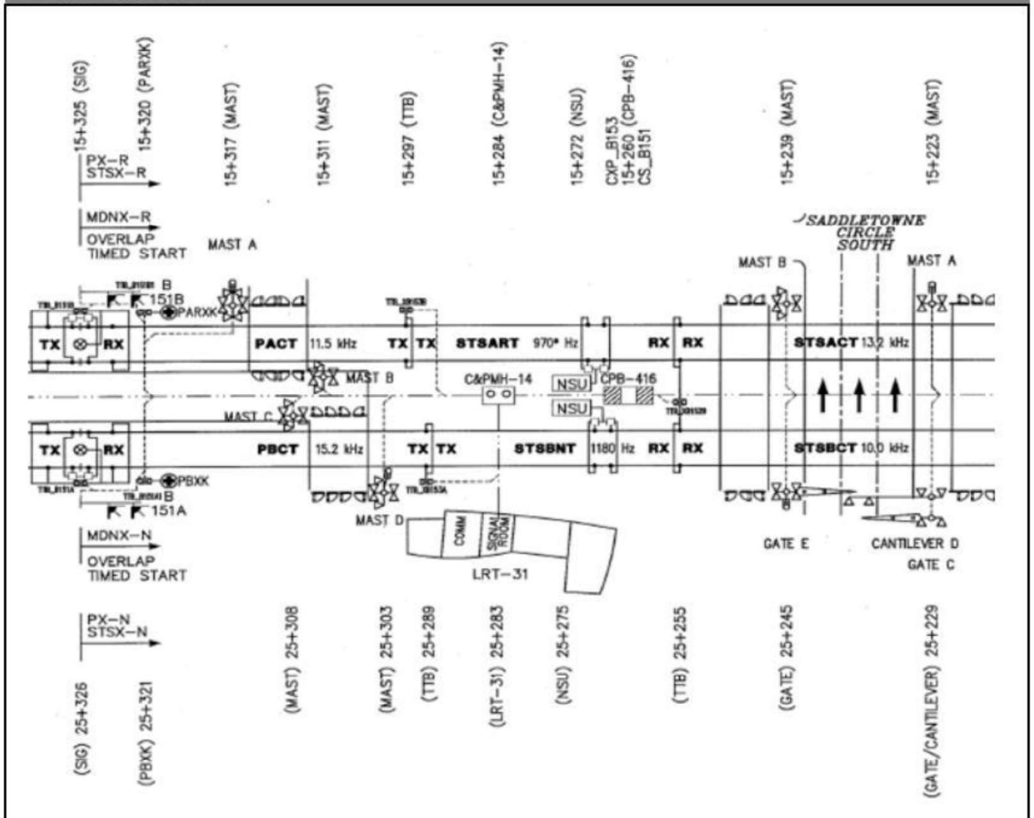
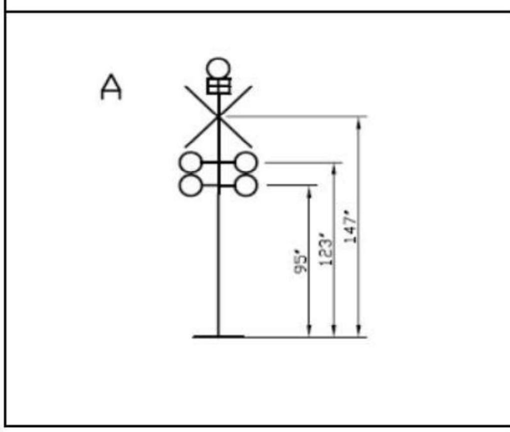
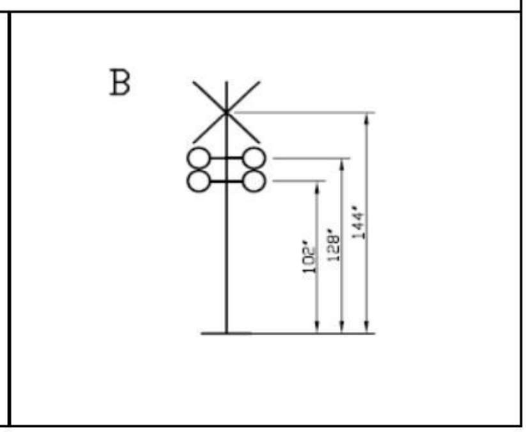
FLB&G Sketch







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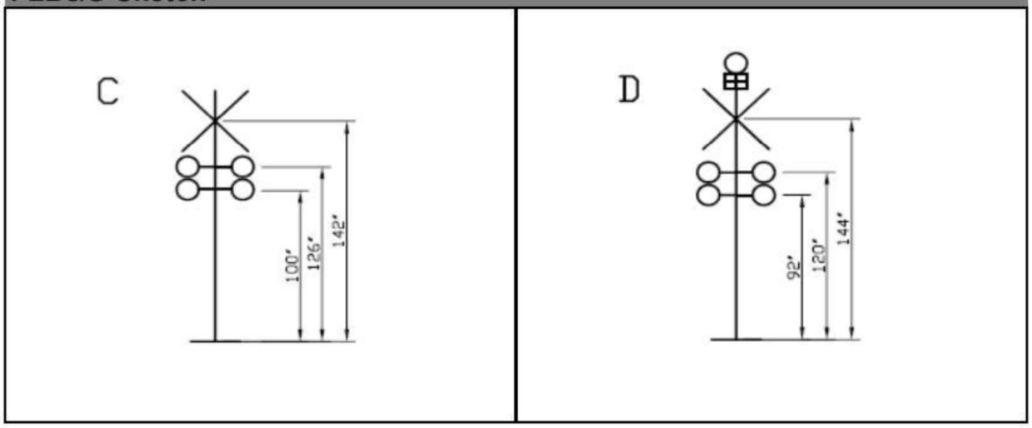
FLB&G Sketch



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ASSESSMENT DATA

Assessor Information

Data acquisition by:	Jenny Xing
Crossing assessment by:	Andy Hamel/Jenny Xing
Date of site visit:	2019-04-11

Comments:

Ped XING

Railway Company Information

Railway company:	Calgary Transit
Location Chainage:	
Subdivision:	Blue Line
Rail orientation:	North/South
Number of tracks:	2
Can railway equipment pass each other at the crossing?	Yes
Average annual daily train traffic: (AADT)	200
Freight train design speed: (mph)	
Passenger train design speed: (mph)	
Type of crossing warning system:	Active: FLB
Is whistling used at crossing?	N/A
Class of track:	*CLASS 1*

Comments:

Road Authority Information

Road authority:	City of Calgary
Street name:	Saddletowne South PED-X
Municipality:	Calgary
Province/Territory:	Alberta
Design vehicle:	N/A
Design Vehicle Length: (m)	*N/A*
Average annual daily road traffic: (AADT)	N/A
Public or private road?	
Urban or rural?	
Local, collector, arterial, expressway, or freeway?	
Divided or undivided?	
Crossing cross angle: (degrees)	

Crossing Approaches	**East**	**West**
Road crossing design speed: (km/h)		
Number of traffic lanes:		
Traffic lane width: (m)		
Traffic lane width including shoulders: (m)		
Average grade of road approach:		
Stopping sight distance (SSD):		
Vehicle departure time: (calculated)		
Prepare to Stop required activation time:		
Interconnection delay timing:		

Sidewalk	**North**	**South**
Sidewalk present?	Yes	Yes
Is sidewalk designated for persons using assistive devices?	Yes	Yes

Comments:

HATCH

ASSESSMENT DATA

C NEW STANDARDS

5	Crossing Surface			North	South
	Road extensions off of the travelled way: (m)	min 0.5			
	North sidewalk extensions of the travelled way: (m)	min 0.5			
	South sidewalk extensions of the travelled way: (m)	min 0.5			
	Is crossing surface smooth and continuous?				
	Flangeway			**Min**	**Max**
	Flangeway width: (mm)	min 65	max 75		
	Flangeway depth: (mm)	min 50	max 75		
	Flangeway field side width: (mm)		max 0		
	Flangeway field side depth: (mm)		max 0		
	Top of rail to road crossing surface: (mm)	min -7	max 13		
	Comments:				

6	Road Geometry			East	West
	North slope within 5m of the nearest rail at a sidewalk or path: (%)		max 2%		
	South slope within 5m of the nearest rail at a sidewalk or path: (%)		max 2%		
	Slope within 8m of the nearest rail: (%)		max 2%		
	Slope between 8m and 18m of the nearest rail: (%)	max_1 5%	max_2 10%		
	What is allowable percentage grade slope through crossing?			0.0%	
	What is the grade slope through the crossing?				
	Is grade slope through crossing less than limit?				
	Are horizontal and vertical alignments smooth and continuous on approach?				
	Width of travelled way on each approach: (m)				
	Width of travelled way at crossing: (m)				
	Width through the crossing greater than approach?				
	Does the travelled way have curbs?				
	Grade crossing angle: (degrees)	min 0	max 180	0	
	Comments:				

7	Sightlines	East	West
	SSD calculated: (m)		
	SSD measured: (m)		
	D_{SSD} calculated: (m)	0	0
	D_{SSD} driver's left measured: (m)		
	D_{SSD} driver's right measured: (m)		
	$D_{stopped}$ calculated: (m)		
	$D_{stopped}$ driver's left measured: (m)		
	$D_{stopped}$ driver's right measured: (m)		
	$D_{stopped}$ pedestrian's left measured: (m)		
	$D_{stopped}$ pedestrian's right measured: (m)		
	Are there any obstacles to driver's left that may affect visibility?		
	Are there any obstacles to driver's right that may affect visibility?		
	Is there any vegetation to driver's left that may affect visibility?		
	Is there any vegetation to driver's right that may affect visibility?		
	Is visibility along track impaired due to angle of crossing?		
	Comments:		

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HATCH

ASSESSMENT DATA

8 Signs & Pavement Markings

Crossing Sign(s)			**East**	**West**
Railway crossing sign present with reflective 50mm border?				
Number of tracks sign present and reflective?			N/A	N/A
Height of cross buck from crown of road: (m)	min 1.5	max 2.5		
Is 100mm retroreflective strip on back of each blade?				
Distance of strip from crown of road: (mm)		max 300		
Distance of strip from top of cross buck: (mm)	min 70	max 70		
Crossing sign distance from shoulder: (m)	min 2	max 4.5		
Distance to nearest rail: (m)	min 3			
50mm strip on front post?				
Is sign post made of material such that if struck by a vehicle it will break?				
Condition of sign:				
Railway Crossing Ahead Sign and Advisory Speed Tab			**East**	**West**
Are vehicles required to slow prior to crossing due to shorter SSD?				
Is sign present upon approach?				
Is sign visible from SSD as defined by road speed?				
Is sign showing correct road orientation?				
Is Advisory Speed tab installed and correct?				
Advisory Speed: (km/h)				
Adjusted SSD: (m)				
Condition of sign:				
Stop Sign Ahead Sign			**East**	**West**
Stop sign ahead sign required?				
Stop sign ahead sign installed?				
Stop Sign visible from SSD at design road speed?				
Condition of sign:				
Stop Sign			**East**	**West**
Is D_{SSD} insufficient to warrant a stop sign?				
Is stop sign installed?				
Size of stop sign?				
Distance from crown of road to bottom of sign: (m)	min 1.8			
Distance from top of sign to centre of crossing sign: (m)	min 0.5	max 0.5		
Condition of sign:				
Emergency Notification Sign				
Is Emergency Notification Sign Present?			No	
Does Emergency Notification Sign contain all information?				
Can Emergency Notification Sign(s) be seen from both approach?				
Condition of sign:				
Stop Bars			**East**	**West**
Are stop bars able to be painted on approach?				
Are stop bars present?				
Distance from nearest rail (m):	min 5.0			
Distance from nearest signal (m):	min 2.0			
Condition of markings:				
'X' Markings			**East**	**West**
Is 'X' marking able to be painted on approach?				
Is X marking present?				
Condition of markings:				

Comments:

HATCH

ASSESSMENT DATA

9	**Warning Systems Specification**		
	Traffic volume cross product:		
	Railway speed: (mph)		
	Is there a sidewalk present?	Yes	
	Number of tracks:	2	
	Is there an intersection within a distance 'D' from the crossing?		
	Flashing Lights and Bells		
	Additional condition requires warning system?		
	Lights and bells required?	Yes	
	Are flashing lights and bells present?		
	Gates		
	Additional condition requires gates?		
	Gates required?		
	Are gates present?		
	Sidewalk Flashing Lights	**East**	**West**
	Is sidewalk outside island circuit?		
	Additional lights required for sidewalk?		
	Are flashing lights for the sidewalk present?		
	Sidewalk Gates	**East**	**West**
	Are gates required for sidewalk?		
	Are gates for the sidewalk present?		
	Comments:		

Pull open (swing) gates are installed. On date of inspection, one of the swing gates remained open. It did not return to closed position on its own.

D DESIGN CALCULATIONS

10	**Design Calculations**	**East**	**West**
	Vehicle clearance Distance (Cd) measured: (m)		
	Pedestrian clearance Distance (Cd) measured: (m)		
	Vehicle travel distance (S) calculated: (m)		
	Departure Time (T_D) calculated: (s)		
	Maximum approach grade within "S": (%)		
	Grade adjustment factor "G":		
	Design vehicle departure time "s" calculated: (s)		
	Pedestrian Departure Time (T_P) calculated: (s)		
	Departure Time measured: (s)		
	Gate arm clearance time calculated: (s)		
	Gate arm clearance time measured: (s)		
11	**Location of Grade Crossings**	**East**	**West**
	Are there any intersections along approach to crossing?		
	Queuing	**East**	**West**
	Distance "D" from stop sign: (m) min 30		
	Distance "D" from traffic signal: (m) min 60		
	Is 'D' insufficient such that road vehicles might queue onto the tracks?		
	Can traffic queue from adjacent intersection to within 2.4m of nearest track?		
	Can traffic queue from crossing into adjacent intersections?		
	Are there any queuing issues that would require traffic preemption?		
	Comments:		

HATCH

ASSESSMENT DATA

E WARNING SYSTEM DESIGN

12 Warning System Operation - General

Flashing Lights			East	West
Cross buck present with reflective 50mm border?				
Number of tracks sign present and reflective?			N/A	N/A
Distance from shoulder to outside of outer signal: (m)	min 1.88			
Distance to nearest rail: (m)	min 3			
Exposed signal foundation from crown of road: (mm)		max 100		
Bottom of lowest signal from crown of road: (m)	min 2.3	max 2.9		
Number of track sign to bottom of lowest signal: (mm)	min 125	max 175		
Cross bucks to top of highest signal: (mm)	min 125	max 175		
Radius of signal backgrounds: (mm)	min 305	max 305		
Distance from centre of signal to centre of mast: (mm)	min 380	max 380		
Condition of signals:				
Gates			**East**	**West**
Gate mechanism protrusion: (mm)		max 650		
Gate up protrusion height at edge of signal: (m)	min 5.2			
Gate down height from crown of road: (m)	min 1.1	max 1.4		
Gate tip to centre of mast: (m)		max 11.6		
Gate tip to edge of travelled lane: (m)	min -1	max 1		
Gate tip to tip of other gate: (m)	min 0	max 1		
First signal solid and other signals alternating?				
Gate tip to first gate signal: (mm)	min 355	max 915		
First gate signal to last gate signal: (m)	min 2.74			
Are gate signals equally spaced?				
Gate arm stripe width: (mm)	min 406	max 406		
Gate arm stripes vertical?				
Condition of gates:				
Sidewalk Gates			**North**	**South**
Sidewalk width: (m)				
Gate mechanism protrusion: (mm)		max 650		
Gate up protrusion height at edge of signal: (m)	min 5.2			
Gate down height from crown of road: (m)	min 1.1	max 1.4		
Gate tip to centre of mast: (m)		max 11.6		
Number of lights required:				
Does gate extend full width of sidewalk?				
Are gate signals equally spaced?				
Are gate signals alternating correctly?				
Gate arm stripe width: (mm)	min 406	max 406		
Gate arm stripes vertical?				
Condition of gates:				
Cantilevers			**East**	**West**
Height of cantilever from crown of road: (m)	min 5.2	max 6		
Radius of signal backgrounds: (mm)	min 305	max 305		
Condition of mast:				
Condition of signals:				
Crossing Case				
Distance of crossing case to edge of rail (m):				
Distance of crossing case to edge of road (m):				
Comments:				

HATCH

ASSESSMENT DATA

Equipment		
Is data recorder capable of retaining information up to 30 days?		
Is design failsafe?		
Is power out indicator installed and visible from the road?		
Do fouling circuits have at least two discrete conductors?		
Does track circuit detect a 0.06ohm resistance?		
Are non insulated joints properly bonded?		
Do insulated joints provide proper insulation?		
Does battery back-up give 8 hours continuous or 24 hours normal operation?		
Comments:		

13 Number and Location of Light Units		East	West
Can front lights be seen from SSD?			
Can front lights be seen along entire approach?			
Can front lights be seen from intersections entering approach?			
Can back lights be seen by all vehicles stopped at crossing?			
Are additional lights required?			
Are additional lights installed?			
Cantilevers		**East**	**West**
Distance from centre of signal to edge of travelled lane: (m)	max 7.7		
Distance from second signal to edge of travelled lane: (m)	max 7.8		
Can front light be seen by all vehicles on approach?			
Is roadway classified as an expressway?			
Is a cantilever required?			
Is a cantilever installed?			
Sidewalk		**North**	**South**
Centre of warning system to centre of sidewalk: (m)	max 3.6		
Can at least one set of lights be seen by sidewalk from both sides of rail?			
Is sidewalk outside island circuit?			
Additional signal required?			
Are flashing lights for the sidewalk present?			
Comments:			

14 Light Units - Alignment			East	West
Are signal alignment requirements available on site?				
Are all units 200mm or 300mm LEDs?			200	200
Light flash rate: (flashes per minute)	min 45	max 65		
Are all lights flashing alternatively and uniformly?				
Are front lights aligned to 1.6m above road at SSD (or when first visible)?				
Are back lights aligned to 1.6m above road at 15m from front lights?				
Are additional lights required for approaches?				
Are additional lights installed and aligned for 1.6m above road surface?				
Sidewalk			**North**	**South**
Are all light units 200mm or 300mm LEDs?				
Light flash rate: (flashes per minute)	min 45	max 65		
Are all lights flashing alternatively and uniformly?				
Are front lights aligned to 1.6m above road at 30m (or when first visible)?				
Comments:				

HATCH

ASSESSMENT DATA

15 Bells and Gates

Bells			East	West
Is bell installed on mast?				
Is bell on side with sidewalk?				
Distance from sidewalk to bell mast: (m)		max 30		
Bell gong rate: (rings per minute)	min 100	max 325		
Does bell ring for as long as warning system is active?				

Gates			East	West
Is gate arm perpendicular to road approach?				
Gate descent delay measured: (s)				
Does gate arm stop if obstructed?				
Gate arm descent time: (s)	min 10	max 15		
Time to train arrival: (s)	min 0			
Gate ascent time: (s)	min 6	max 12		
Does gate arm descend smoothly and without rebound?				
Does gate arm return to proper position after clearance of obstruction?				

Comments:

16 Circuitry

Required warning time: (s)	
Measured or recorded warning time: (s)	25
Are crossing warning times consistent?	
Are warning times less than 13s more than required?	
Are cut-out circuits installed, if required?	
Type of crossing equipment:	
Are directional stick circuits installed?	
Does stick have release timer or restrict train speeds through signaling?	
Are all wires properly tagged and clear?	

Comments:

17 Inspection and Testing - Warning Systems

Are plans available at location and up to date?	
Is there proof of testing at periods defined in GCS?	

Comments:

F INTERCONNECTED DEVICES

18 Prepare to Stop at Railway Crossing Sign	East	West
Is SSD restricted such that a prepared to stop at railway sign is required?		
Is prepare to stop sign installed?		
Can the prepare to stop sign be seen from SSD?		
Do prepare to stop flashers activate with enough preemption?		
Does battery back-up allow Prepare to Stop sign to operate for up to 4 hours?		

19 Interconnection of Traffic Signals	East	West
Is intersection within 30m of crossing?		
Are there any queuing issues that would require traffic preemption?		
Is interconnection installed?		
Does interconnection allow vehicles to clear the grade crossing?		
Does interconnection prevent vehicles from entering crossing?		
Does battery back-up allow traffic signals to operate for up to 4 hours?		

ASSESSMENT DATA

20 Interconnected Devices - Inspection and Testing

Is there proof of testing of interconnected devices as defined in GCS?

Comments:

APPENDIX D - WHISTLE CESSATION

	East	West
Is SSD adequate?		
Are sightlines along track greater than 400m in both directions?		
Type of crossing warning system:	*Active: FLB*	
Number of tracks:	*2*	
Railway speed: (mph)	*0*	
Is crossing warning system adequate for whistle cessation?		
Is whistling required at crossing?		
Is whistling used at crossing?		

Comments:

ADDITIONAL COMMENTS

Comments:

Consider installing powered (standard) Xing gates in place of swing gates.

Consider installing crossing-gate-styled LED light on top of posts of swing gates. Heights at this position would be in peripheral vision of someone distracted by phone or tablet.

SITE PHOTOS

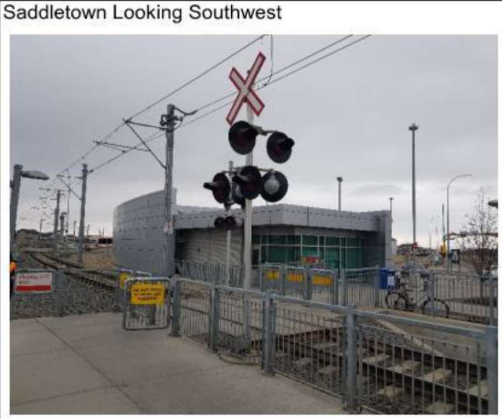
Saddletown Looking East - 1

Saddletown Looking East - 2

Saddletown Looking South

Saddletown Looking Southeast

Saddletown Looking Southwest



Saddletown Looking West - 1

SITE PHOTOS

Saddletown Looking West - 2	Road Xing South of Saddletown Station, Looking West
	

12.3 Whitehorn Drive Mixed Crossing

HATCH

Calgary Transit
Whitehorn Drive, Calgary, Alberta

Crossing Safety Assessment

Issue and Revision Record					
Rev	**Date**	**Originator**	**Checker**	**Approver**	**Description**
0	2019-04-10	Jenny Xing	Andy Hamel	Dale Hein	Final

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To the extent that this report is based on information supplied by other parties, Hatch accepts no liability for any loss or damage suffered by the client, whether through contract or tort, stemming from any conclusions based on data supplied by parties other than Hatch and used by Hatch in preparing this report.

The safety assessment of this grade crossing covers physical features which may affect road and rail user safety and it has sought to identify potential safety hazards. However, the auditors point out that no guarantee is made that every deficiency has been identified. Further, if all the recommendations in this assessment were addressed, this would not confirm that the crossing is 'safe'; rather, adoption of the recommendations should improve the level of safety of the facility.

HATCH

1. Summary

A safety assessment of the grade crossing located at Whitehorn Drive in Calgary, Alberta (Blue Line subdivision) was undertaken on Apr 11, 2019. Data on site was acquired by Jenny Xing and the assessment of the information provided was performed by Andy Hamel/Jenny Xing.

For the purposes of this report, Whitehorn Drive crossing is described in an East/West orientation, while the rail line is described in a North/South orientation. The crossing is equipped with an active crossing warning system with flashing lights, bell(s) and gates.

2. Purpose

The Fundamental objectives of this assessment are:

1. Identify opportunities to reduce collision risk within the grade crossing environment.
2. Identify opportunities to minimize the frequency and severity of preventable crashes.
3. Consider the safety of all grade crossing users.
4. Verify compliance of the Grade Crossings Standards (GCS, dated July 2014) referred to in the most recent Grade Crossings Regulations (GCR, SOR 2014-275, November 28, 2014).
5. Ensure that all the crash mitigation measures/factors aimed to eliminate or reduce the identified safety problems are fully considered, evaluated and documented for review/action by the appropriate authorities.

3. Site Sketch

A site sketch is included to provide an aerial perspective of the layout for the crossing, which identifies the railway and roadway on appraoch to the grade crossing location. It identifies key components and considerations that impact the safety of the crossing which may include obstructions, signage, crossing infrastructure, and surrounding land use.

4. Assesment Data

The assessment data is provided in pages 4 to 11. Assessment questions are presented to reflect all requirements in the GCS for both passive and active warning systems. Assessment data not within compliance of the GCS is highlighted red for quick reference. Assessment data that is not applicable to the crossing is filled with N/A. Items not within compliance with the GCS are summarized following the assessment data along with suggested actions for remediation.

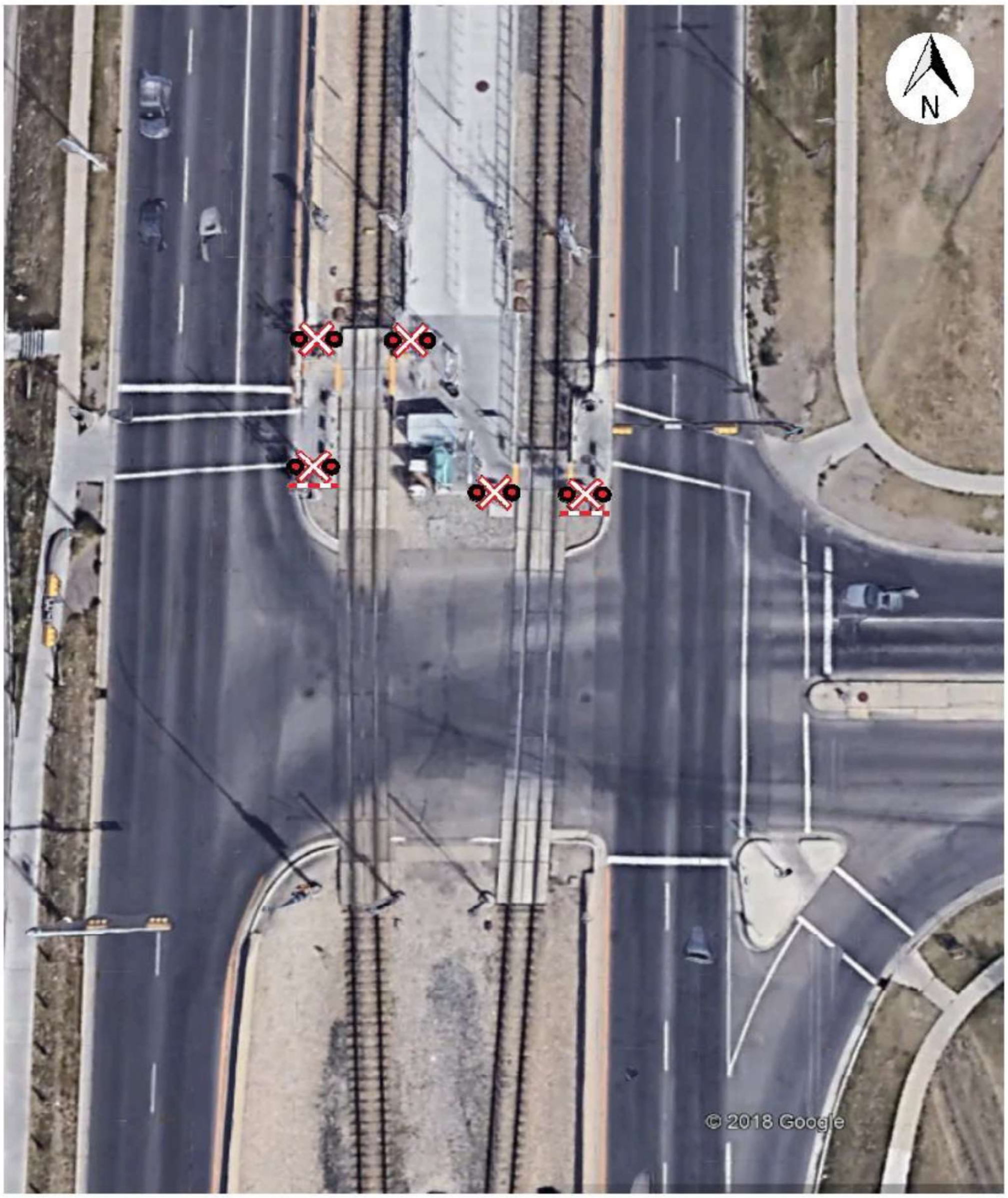
5. Recommendations

Following the report generated from site, items that do not comply with the Transport Canada's Grade Crossing Standards and Regulations are itemized in a summary table with suggested actions for remediation, if required. Responsibilities for remediation are identified in the adjacent column as per the GCR, where applicable.

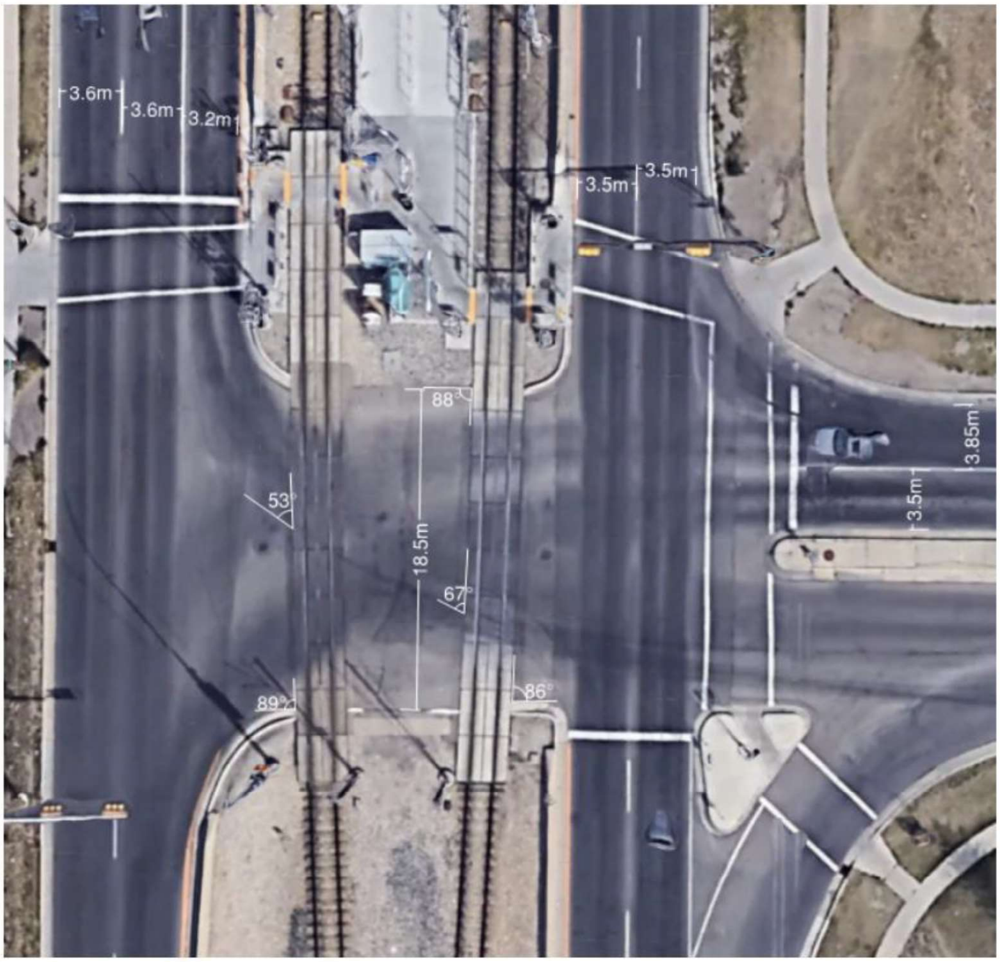
6. Site Photos

In order to highlight conditions on site, photographs are included at the end of the report. The pictures are meant to highlight considerations of the report and may include items such as sightlines, signage, warning system equipment, road markings, road condition, rail condition, and site documentation.

SITE SKETCH



Road Measurement Sketch



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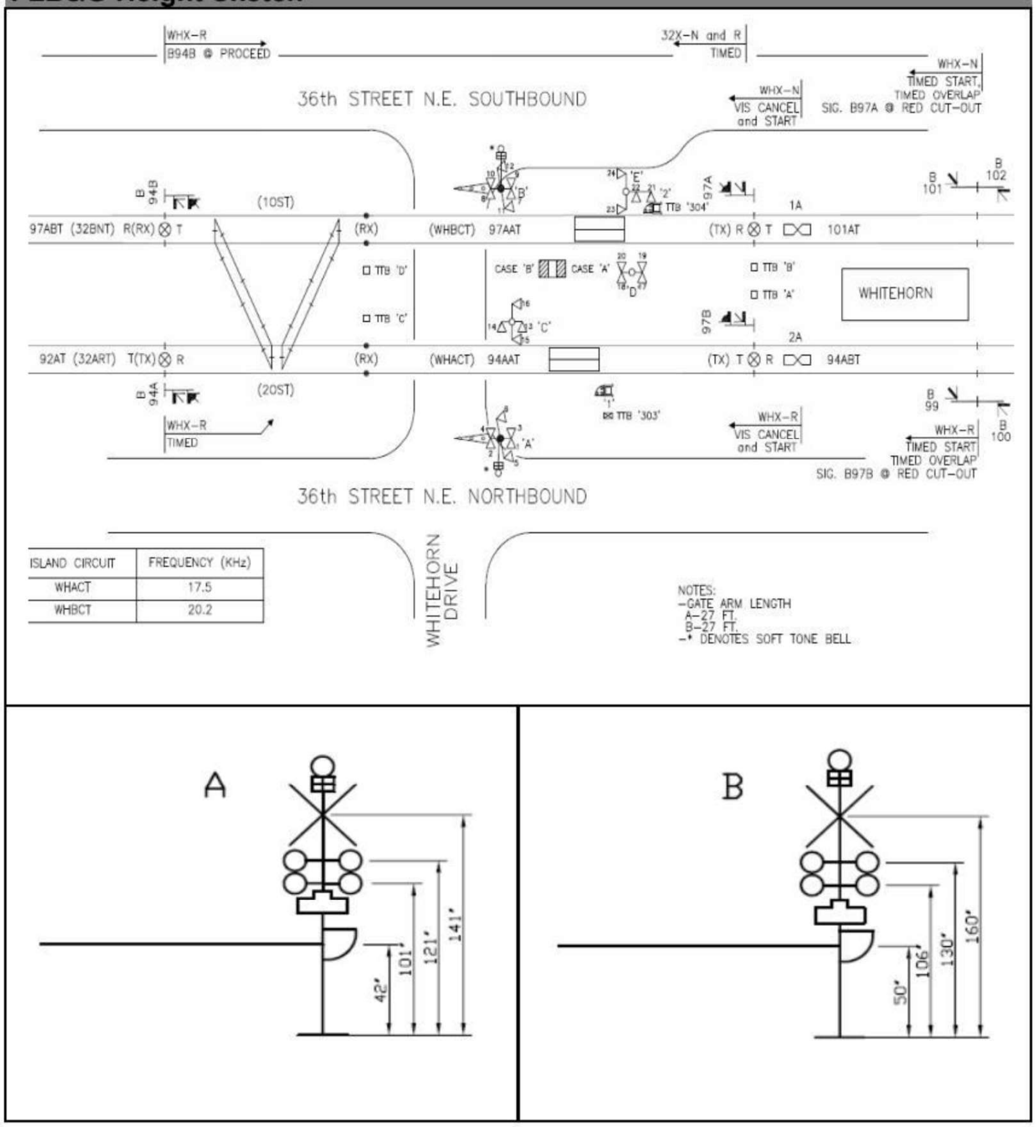
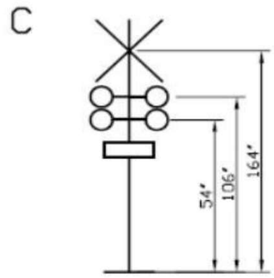
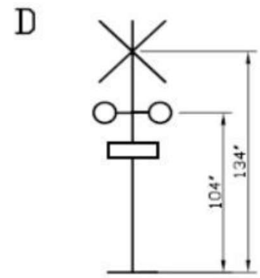
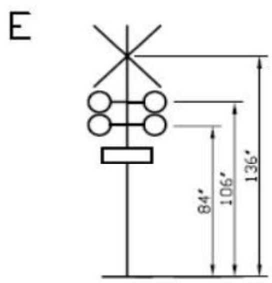
FLB&G Height Sketch



FLB&G Height Sketch







HATCH

ASSESSMENT DATA

Assessor Information		
Data acquisition by:	Jenny Xing	
Crossing assessment by:	Andy Hamel/Jenny Xing	
Date of site visit:	2019-04-11	
Comments:		
Railway Company Information		
Railway company:	Calgary Transit	
Location Chainage:		
Subdivision:	Blue Line	
Rail orientation:	North/South	
Number of tracks:	2	
Can railway equipment pass each other at the crossing?	Yes	
Average annual daily train traffic: (AADT)	200	
Freight train design speed: (mph)		
Passenger train design speed: (mph)		
Type of crossing warning system:	Active: FLB & G	
Is whistling used at crossing?	N/A	
Class of track:	*CLASS 1*	
Comments:		
Road Authority Information		
Road authority:	City of Calgary	
Street name:	Whitehorn Drive	
Municipality:	Calgary	
Province/Territory:	Alberta	
Design vehicle:		
Design Vehicle Length: (m)	*6*	
Average annual daily road traffic: (AADT)		
Public or private road?	Public	
Urban or rural?	Urban	
Local, collector, arterial, expressway, or freeway?	Arterial	
Divided or undivided?	Divided	
Crossing cross angle: (degrees)		
Crossing Approaches	**East**	**West**
Road crossing design speed: (km/h)	50	50
Number of traffic lanes:		
Traffic lane width: (m)		
Traffic lane width including shoulders: (m)		
Average grade of road approach:		
Stopping sight distance (SSD):	*65*	*65*
Vehicle departure time: (calculated)	*6.39*	*6.39*
Prepare to Stop required activation time:		
Interconnection delay timing:		
Sidewalk	**North**	**South**
Sidewalk present?	No	No
Is sidewalk designated for persons using assistive devices?		
Comments:		

HATCH

ASSESSMENT DATA

C NEW STANDARDS

5	Crossing Surface			North	South
	Road extensions off of the travelled way: (m)	min 0.5			
	North sidewalk extensions of the travelled way: (m)	min 0.5			
	South sidewalk extensions of the travelled way: (m)	min 0.5			
	Is crossing surface smooth and continuous?			Yes	
	Flangeway			**Min**	**Max**
	Flangeway width: (mm)	min 65	max 120		
	Flangeway depth: (mm)	min 50	max		
	Flangeway field side width: (mm)		max 0		
	Flangeway field side depth: (mm)		max 0		
	Top of rail to road crossing surface: (mm)	min -25	max 25		
	Comments:				

Minimum flangeway width & depth. Crossing surface in very good condition.

6	Road Geometry			East	West
	North slope within 5m of the nearest rail at a sidewalk or path: (%)		max 2%		
	South slope within 5m of the nearest rail at a sidewalk or path: (%)		max 2%		
	Slope within 8m of the nearest rail: (%)		max 2%		
	Slope between 8m and 18m of the nearest rail: (%)	max_1 5%	max_2 10%		
	What is allowable percentage grade slope through crossing?				
	What is the grade slope through the crossing?				
	Is grade slope through crossing less than limit?				
	Are horizontal and vertical alignments smooth and continuous on approach?				
	Width of travelled way on each approach: (m)				
	Width of travelled way at crossing: (m)				
	Width through the crossing greater than approach?				
	Does the travelled way have curbs?				
	Grade crossing angle: (degrees)	min 0	max 180		
	Comments:				

7	Sightlines	East	West
	SSD calculated: (m)		
	SSD measured: (m)		
	D_{SSD} calculated: (m)		
	D_{SSD} driver's left measured: (m)		
	D_{SSD} driver's right measured: (m)		
	$D_{stopped}$ calculated: (m)		
	$D_{stopped}$ driver's left measured: (m)		
	$D_{stopped}$ driver's right measured: (m)		
	$D_{stopped}$ pedestrian's left measured: (m)		
	$D_{stopped}$ pedestrian's right measured: (m)		
	Are there any obstacles to driver's left that may affect visibility?	No	
	Are there any obstacles to driver's right that may affect visibility?	No	
	Is there any vegetation to driver's left that may affect visibility?	No	
	Is there any vegetation to driver's right that may affect visibility?	No	
	Is visibility along track impaired due to angle of crossing?	No	
	Comments:		

HATCH

ASSESSMENT DATA

8 Signs & Pavement Markings

			East	West
Crossing Sign(s)			**East**	**West**
Railway crossing sign present with reflective 50mm border?			Yes	Yes
Number of tracks sign present and reflective?			Yes	Yes
Height of cross buck from crown of road: (m)	min 1.5	max 2.5		
Is 100mm retroreflective strip on back of each blade?			N/A	
Distance of strip from crown of road: (mm)		max 300	N/A	
Distance of strip from top of cross buck: (mm)	min 70	max 70	N/A	
Crossing sign distance from shoulder: (m)	min 2	max 4.5		
Distance to nearest rail: (m)	min 3			
50mm strip on front post?			N/A	
Is sign post made of material such that if struck by a vehicle it will break?				
Condition of sign:				
Railway Crossing Ahead Sign and Advisory Speed Tab			**East**	**West**
Are vehicles required to slow prior to crossing due to shorter SSD?			No	No
Is sign present upon approach?				
Is sign visible from SSD as defined by road speed?				
Is sign showing correct road orientation?				
Is Advisory Speed tab installed and correct?				
Advisory Speed: (km/h)				
Adjusted SSD: (m)				
Condition of sign:				
Stop Sign Ahead Sign			**East**	**West**
Stop sign ahead sign required?				
Stop sign ahead sign installed?			N/A	N/A
Stop Sign visible from SSD at design road speed?			N/A	N/A
Condition of sign:			N/A	N/A
Stop Sign			**East**	**West**
Is D_{SSD} insufficient to warrant a stop sign?				
Is stop sign installed?				
Size of stop sign?			N/A	N/A
Distance from crown of road to bottom of sign: (m)	min 1.8		N/A	N/A
Distance from top of sign to centre of crossing sign: (m)	min 0.5	max 0.5	N/A	N/A
Condition of sign:			N/A	N/A
Emergency Notification Sign				
Is Emergency Notification Sign Present?			No	
Does Emergency Notification Sign contain all information?				
Can Emergency Notification Sign(s) be seen from both approach?				
Condition of sign:				
Stop Bars			**East**	**West**
Are stop bars able to be painted on approach?			Yes	Yes
Are stop bars present?			Yes	Yes
Distance from nearest rail (m):	min 5.0			
Distance from nearest signal (m):	min 2.0			
Condition of markings:				
'X' Markings			**East**	**West**
Is 'X' marking able to be painted on approach?			No	No
Is X marking present?			No	No
Condition of markings:				

Comments:

Crossing protected by traffic lights intersection.

HATCH

ASSESSMENT DATA

		East	West
9	**Warning Systems Specification**		
	Traffic volume cross product:		
	Railway speed: (mph)		
	Is there a sidewalk present?	No	
	Number of tracks:	2	
	Is there an intersection within a distance 'D" from the crossing?		
	Flashing Lights and Bells		
	Additional condition requires warning system?		
	Lights and bells required?		
	Are flashing lights and bells present?	Yes	
	Gates		
	Additional condition requires gates?		
	Gates required?		
	Are gates present?	Yes	
	Sidewalk Flashing Lights	**East**	**West**
	Is sidewalk outside island circuit?		
	Additional lights required for sidewalk?		
	Are flashing lights for the sidewalk present?		
	Sidewalk Gates	**East**	**West**
	Are gates required for sidewalk?	No	No
	Are gates for the sidewalk present?		
	Comments:		

Recommend splitting crossing control for each track for Ped Xing and adding gates to both tracks of Ped Xings. Separate Ped Xing is in inland circuit.

D DESIGN CALCULATIONS

			East	West
10	**Design Calculations**		**East**	**West**
	Vehicle clearance Distance (Cd) measured: (m)			
	Pedestrian clearance Distance (Cd) measured: (m)			
	Vehicle travel distance (S) calculated: (m)		6	6
	Departure Time (T_D) calculated: (s)		4.4	4.4
	Maximum approach grade within "S": (%)		0.0%	0.0%
	Grade adjustment factor "G":		1	1
	Design vehicle departure time "s" calculated: (s)		6.39	6.39
	Pedestrian Departure Time (T_P) calculated: (s)		N/A	N/A
	Departure Time measured: (s)			
	Gate arm clearance time calculated: (s)		4.00	4.00
	Gate arm clearance time measured: (s)			
11	**Location of Grade Crossings**		**East**	**West**
	Are there any intersections along approach to crossing?		No	No
	Queuing		**East**	**West**
	Distance "D" from stop sign: (m)	min 30		
	Distance "D" from traffic signal: (m)	min 60		
	Is 'D' insufficient such that road vehicles might queue onto the tracks?			
	Can traffic queue from adjacent intersection to within 2.4m of nearest track?			
	Can traffic queue from crossing into adjacent intersections?			
	Are there any queuing issues that would require traffic preemption?			
	Comments:			

There are intersections nearby, but not studied.

HATCH

ASSESSMENT DATA

E WARNING SYSTEM DESIGN

12 Warning System Operation - General

Flashing Lights			**East**	**West**
Cross buck present with reflective 50mm border?				
Number of tracks sign present and reflective?				
Distance from shoulder to outside of outer signal: (m)	min 1.88			
Distance to nearest rail: (m)	min 3			
Exposed signal foundation from crown of road: (mm)		max 100		
Bottom of lowest signal from crown of road: (m)	min 2.3	max 2.9		
Number of track sign to bottom of lowest signal: (mm)	min 125	max 175		
Cross bucks to top of highest signal: (mm)	min 125	max 175		
Radius of signal backgrounds: (mm)	min 305	max 305		
Distance from centre of signal to centre of mast: (mm)	min 380	max 380		
Condition of signals:			Good	Good
Gates			**East**	**West**
Gate mechanism protrusion: (mm)		max 650		
Gate up protrusion height at edge of signal: (m)	min 5.2			
Gate down height from crown of road: (m)	min 1.1	max 1.4		
Gate tip to centre of mast: (m)		max 11.6	*	
Gate tip to edge of travelled lane: (m)	min -1	max 1	N/A	N/A
Gate tip to tip of other gate: (m)	min 0	max 1		
First signal solid and other signals alternating?				
Gate tip to first gate signal: (mm)	min 355	max 915		
First gate signal to last gate signal: (m)	min 2.74			
Are gate signals equally spaced?				
Gate arm stripe width: (mm)	min 406	max 406		
Gate arm stripes vertical?				
Condition of gates:				
Sidewalk Gates			**North**	**South**
Sidewalk width: (m)			N/A	N/A
Gate mechanism protrusion: (mm)		max 650	N/A	N/A
Gate up protrusion height at edge of signal: (m)	min 5.2		N/A	N/A
Gate down height from crown of road: (m)	min 1.1	max 1.4	N/A	N/A
Gate tip to centre of mast: (m)		max 11.6	N/A	N/A
Number of lights required:			N/A	N/A
Does gate extend full width of sidewalk?			N/A	N/A
Are gate signals equally spaced?			N/A	N/A
Are gate signals alternating correctly?			N/A	N/A
Gate arm stripe width: (mm)	min 406	max 406	N/A	N/A
Gate arm stripes vertical?			N/A	N/A
Condition of gates:			N/A	N/A
Cantilevers			**East**	**West**
Height of cantilever from crown of road: (m)	min 5.2	max 6	N/A	N/A
Radius of signal backgrounds: (mm)	min 305	max 305	N/A	N/A
Condition of mast:			N/A	N/A
Condition of signals:			N/A	N/A
Crossing Case				
Distance of crossing case to edge of rail (m):				
Distance of crossing case to edge of road (m):				

Comments:

* Gate is parallel to track and does not substantially block lane.

HATCH

ASSESSMENT DATA

Equipment		
Is data recorder capable of retaining information up to 30 days?		
Is design failsafe?		
Is power out indicator installed and visible from the road?		
Do fouling circuits have at least two discrete conductors?		
Does track circuit detect a 0.06ohm resistance?		
Are non insulated joints properly bonded?		
Do insulated joints provide proper insulation?		
Does battery back-up give 8 hours continuous or 24 hours normal operation?		
Comments:		

13 Number and Location of Light Units	**East**	**West**
Can front lights be seen from SSD?		
Can front lights be seen along entire approach?		
Can front lights be seen from intersections entering approach?		
Can back lights be seen by all vehicles stopped at crossing?		
Are additional lights required?		
Are additional lights installed?		
Cantilevers	**East**	**West**
Distance from centre of signal to edge of travelled lane: (m) max 7.7		
Distance from second signal to edge of travelled lane: (m) max 7.8		
Can front light be seen by all vehicles on approach?		
Is roadway classified as an expressway?		
Is a cantilever required?		
Is a cantilever installed?		
Sidewalk	**North**	**South**
Centre of warning system to centre of sidewalk: (m) max 3.6	N/A	N/A
Can at least one set of lights be seen by sidewalk from both sides of rail?	N/A	N/A
Is sidewalk outside island circuit?		
Additional signal required?		
Are flashing lights for the sidewalk present?		
Comments:		

14 Light Units - Alignment	**East**	**West**
Are signal alignment requirements available on site?		
Are all units 200mm or 300mm LEDs?	300	300
Light flash rate: (flashes per minute) min 45 max 65		
Are all lights flashing alternatively and uniformly?		
Are front lights aligned to 1.6m above road at SSD (or when first visible)?		
Are back lights aligned to 1.6m above road at 15m from front lights?		
Are additional lights required for approaches?		
Are additional lights installed and aligned for 1.6m above road surface?		
Ped Xing	**North**	**South**
Are all light units 200mm or 300mm LEDs?	200	200
Light flash rate: (flashes per minute) min 45 max 65		
Are all lights flashing alternatively and uniformly?		
Are front lights aligned to 1.6m above road at 30m (or when first visible)?		
Comments:		

ASSESSMENT DATA

15 Bells and Gates

Bells			East	West
Is bell installed on mast?				
Is bell on side with sidewalk?				
Distance from sidewalk to bell mast: (m)		max 30		
Bell gong rate: (rings per minute)	min 100	max 325		
Does bell ring for as long as warning system is active?				
Gates			**East**	**West**
Is gate arm perpendicular to road approach?			No	Yes
Gate descent delay measured: (s)			3	3
Does gate arm stop if obstructed?				
Gate arm descent time: (s)	min 10	max 15		
Time to train arrival: (s)	min 0		25	25
Gate ascent time: (s)	min 6	max 12		
Does gate arm descend smoothly and without rebound?				
Does gate arm return to proper position after clearance of obstruction?				

Comments:

Gate for SB left turn to EB is parallel to track and is easily driven around.

16 Circuitry

Required warning time: (s)	20.00
Measured or recorded warning time: (s)	25-30
Are crossing warning times consistent?	Yes
Are warning times less than 13s more than required?	
Are cut-out circuits installed, if required?	
Type of crossing equipment:	
Are directional stick circuits installed?	
Does stick have release timer or restrict train speeds through signaling?	
Are all wires properly tagged and clear?	

Comments:

17 Inspection and Testing - Warning Systems

Are plans available at location and up to date?	
Is there proof of testing at periods defined in GCS?	

Comments:

F INTERCONNECTED DEVICES

18 Prepare to Stop at Railway Crossing Sign	East	West
Is SSD restricted such that a prepared to stop at railway sign is required?		
Is prepare to stop sign installed?		
Can the prepare to stop sign be seen from SSD?		
Do prepare to stop flashers activate with enough preemption?		
Does battery back-up allow Prepare to Stop sign to operate for up to 4 hours?		

19 Interconnection of Traffic Signals	East	West
Is intersection within 30m of crossing?		
Are there any queuing issues that would require traffic preemption?		
Is interconnection installed?		
Does interconnection allow vehicles to clear the grade crossing?		
Does interconnection prevent vehicles from entering crossing?		
Does battery back-up allow traffic signals to operate for up to 4 hours?		

HATCH

ASSESSMENT DATA

20 Interconnected Devices - Inspection and Testing

Is there proof of testing of interconnected devices as defined in GCS?

Comments:

APPENDIX D - WHISTLE CESSATION

	East	West
Is SSD adequate?		
Are sightlines along track greater than 400m in both directions?		
Type of crossing warning system:	*Active: FLB & G*	
Number of tracks:	2	
Railway speed: (mph)		
Is crossing warning system adequate for whistle cessation?		
Is whistling required at crossing?		
Is whistling used at crossing?		

Comments:

ADDITIONAL COMMENTS

Comments:

The control of PED warning devices for each track should be split. As is, there is nuisance ringing on the opposite track each time a train activates the crossing (unless there happens to be a train on both tracks at once). Pedestrians are accustomed to ignoring the warning devices due to nuisance ringing.

Refuge areas between the raod and track on each side are relatively small. Larger refuge areas recommended.

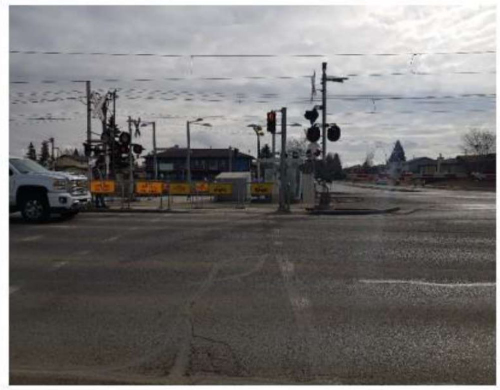
Recommend splitting control of ped warning devices, expand refuge areas and add gates to each ped crossing.

Interconnection with traffic signals not studied. No conflict between crossing warning system and traffic signals were observed while at the crossing.

SITE PHOTOS

Whitehorn Looking East - 1

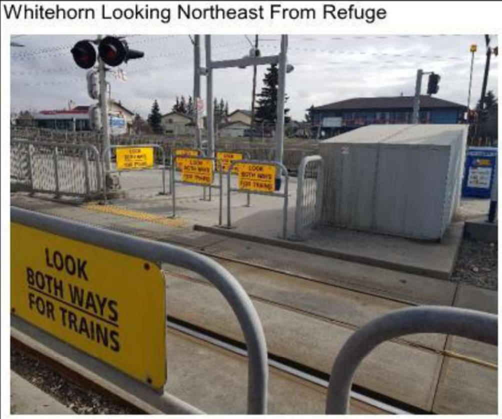
Whitehorn Looking East - 2



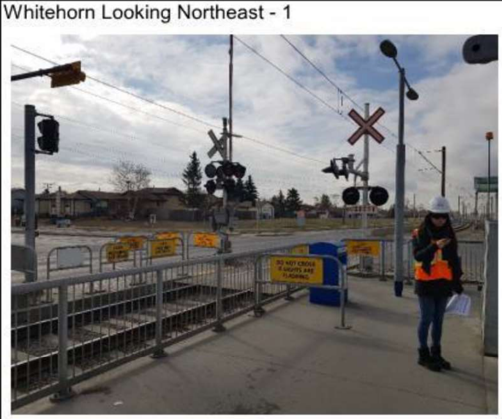
Whitehorn Looking East - 3

Whitehorn Looking East - 4

Whitehorn Looking Northeast From Refuge



Whitehorn Looking Northeast - 1



HATCH

SITE PHOTOS

Whitehorn Looking Northeast - 2

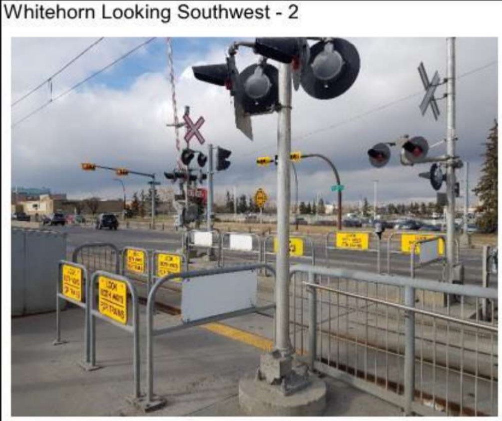
Whitehorn Looking Northwest

Whitehorn Looking South - 1

Whitehorn Looking South - 2

Whitehorn Looking Southwest - 1

Whitehorn Looking Southwest - 2



SITE PHOTOS

Whitehorn Looking West - 1	Whitehorn Looking West - 2
	
Whitehorn Looking West - 3	Whitehorn Looking West - 4
	
Whitehorn Looking West - 5	Whitehorn Looking North
	

12.4 162 Ave SW Mixed Crossing

HATCH

Calgary Transit
162 Ave S, Calgary, Alberta

Crossing Safety Assessment

Issue and Revision Record					
Rev	**Date**	**Originator**	**Checker**	**Approver**	**Description**
0	2019-05-02	Jenny Xing	Andy Hamel	Dale Hein	Final

The safety assessment of this grade crossing covers physical features which may affect road and rail user safety and it has sought to identify potential safety hazards. However, the auditors point out that no guarantee is made that every deficiency has been identified. Further, if all the recommendations in this assessment were addressed, this would not confirm that the crossing is 'safe'; rather, adoption of the recommendations should improve the level of safety of the facility.

1. Summary

A safety assessment of the grade crossing located at 162 Ave S in Calgary, Alberta (Red Line subdivision) was undertaken on May 02, 2019. Data on site was acquired by Jenny Xing and the assessment of the information provided was performed by Andy Hamel.

For the purposes of this report, 162 Ave S crossing is described in an East/West orientation, while the rail line is described in a North/South orientation. The crossing is equipped with an active crossing warning system with flashing lights, bell(s) and gates.

2. Purpose

The Fundamental objectives of this assessment are:

1. Identify opportunities to reduce collision risk within the grade crossing environment.
2. Identify opportunities to minimize the frequency and severity of preventable crashes.
3. Consider the safety of all grade crossing users.
4. Verify compliance of the Grade Crossings Standards (GCS, dated July 2014) referred to in the most recent Grade Crossings Regulations (GCR, SOR 2014-275, November 28, 2014).
5. Ensure that all the crash mitigation measures/factors aimed to eliminate or reduce the identified safety problems are fully considered, evaluated and documented for review/action by the appropriate authorities.

3. Site Sketch

A site sketch is included to provide an aerial perspective of the layout for the crossing, which identifies the railway and roadway on appraoch to the grade crossing location. It identifies key components and considerations that impact the safety of the crossing which may include obstructions, signage, crossing infrastructure, and surrounding land use.

4. Assesment Data

The assessment data is provided in pages 4 to 11. Assessment questions are presented to reflect all requirements in the GCS for both passive and active warning systems. Assessment data not within compliance of the GCS is highlighted red for quick reference. Assessment data that is not applicable to the crossing is filled with N/A. Items not within compliance with the GCS are summarized following the assessment data along with suggested actions for remediation.

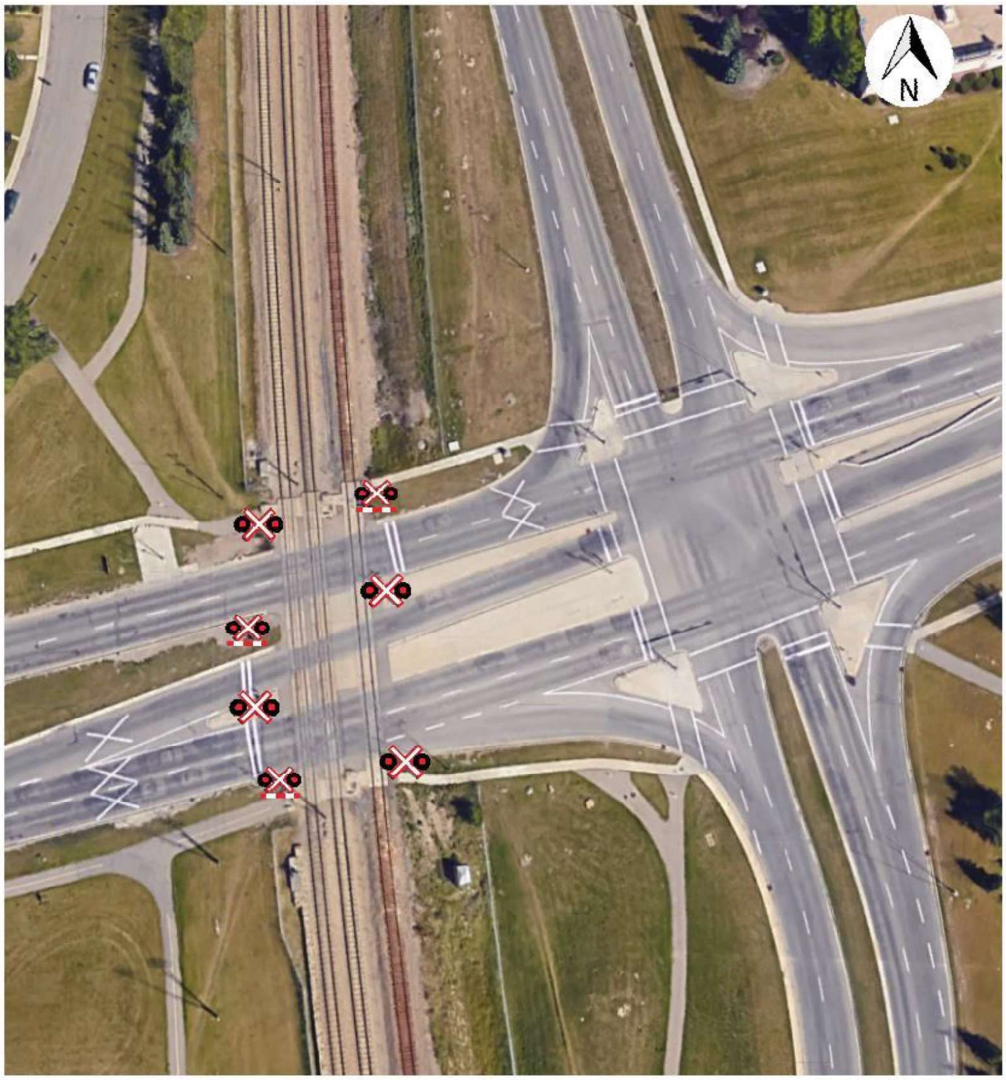
5. Recommendations

Following the report generated from site, items that do not comply with the Transport Canada's Grade Crossing Standards and Regulations are itemized in a summary table with suggested actions for remediation, if required. Responsibilities for remediation are identified in the adjacent column as per the GCR, where applicable.

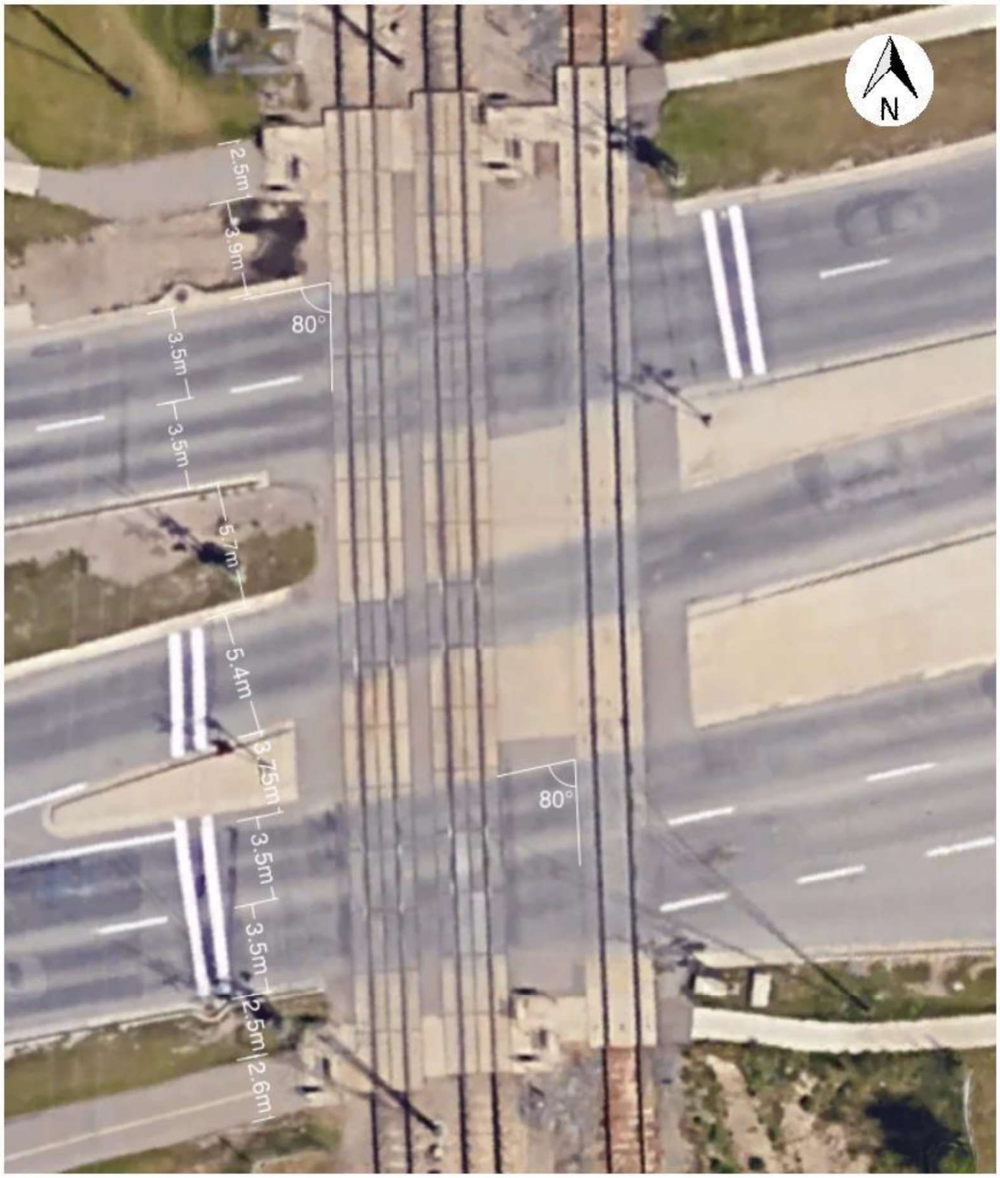
6. Site Photos

In order to highlight conditions on site, photographs are included at the end of the report. The pictures are meant to highlight considerations of the report and may include items such as sightlines, signage, warning system equipment, road markings, road condition, rail condition, and site documentation.

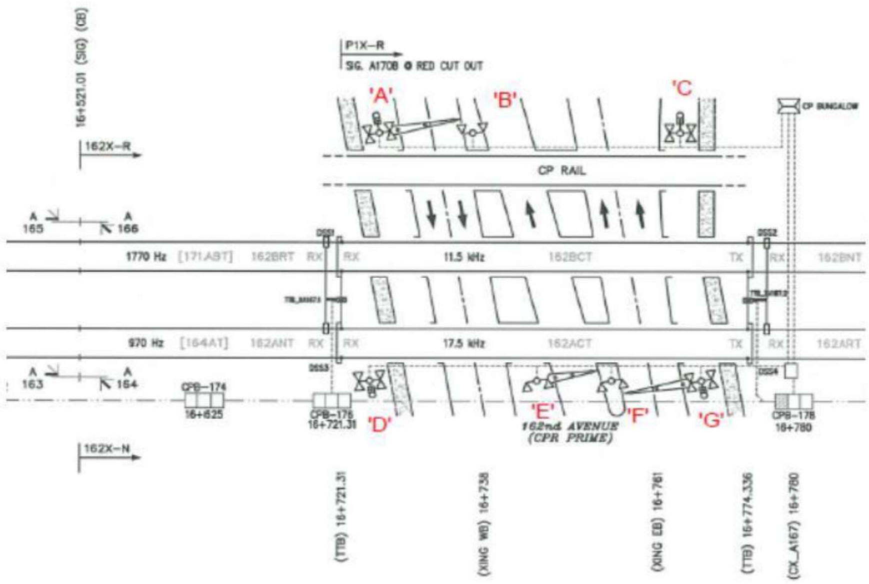
SITE SKETCH

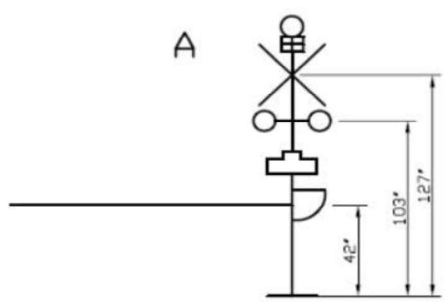


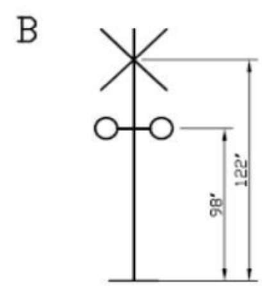
Road Measurement Sketch



FLB&G Sketch

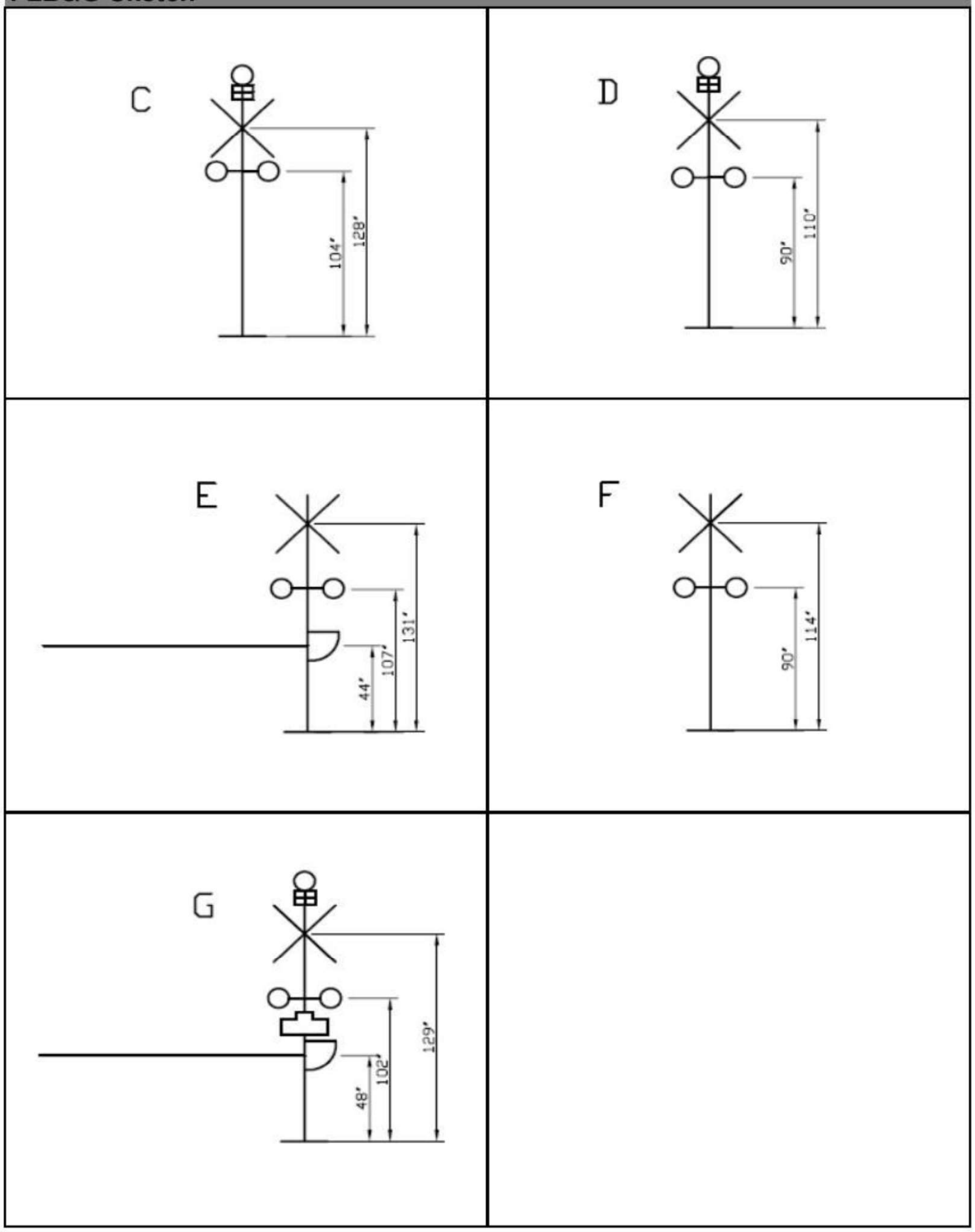

P1X–R
SIG. A170B @ RED CUT OUT
'A'
'B'
'C'
CP BUNGALOW
CP RAIL
162X–R
16+521.01 (SIG) (CB)
1770 Hz
11.5 kHz
970 Hz
17.5 kHz
'D'
'E'
'F'
'G'
162nd AVENUE
(CPR PRIME)
162X–N
(TTB) 16+721.31
(XING WB) 16+738
(XING EB) 16+761
(TTB) 16+774.336
(CX_A167) 16+780


A
127"
103"
42"


B
122"
98"

HATCH

FLB&G Sketch



HATCH

ASSESSMENT DATA

Assessor Information

Data acquisition by:	Jenny Xing
Crossing assessment by:	Andy Hamel
Date of site visit:	2019-05-02
Comments:	

Railway Company Information

Railway company:	Calgary Transit
Location Chainage:	
Subdivision:	Red Line
Rail orientation:	North/South
Number of tracks:	2
Can railway equipment pass each other at the crossing?	Yes
Average annual daily train traffic: (AADT)	200
Freight train design speed: (mph)	
Passenger train design speed: (mph)	
Type of crossing warning system:	Active: FLB & G
Is whistling used at crossing?	Yes
Class of track:	CLASS 1
Comments:	

Railway Company Information

Railway company:	Canadian Pacific Railway
Location ID:	
Subdivision:	Aldersyde
Rail orientation:	North/South
Number of tracks:	1
Can railway equipment pass each other at the crossing?	N/A
Average annual daily train traffic: (AADT)	
Freight train design speed: (mph)	
Passenger train design speed: (mph)	
Type of crossing warning system:	Active: FLB & G
Is whistling used at crossing?	Yes
Class of track:	CLASS 1
Comments:	

Road Authority Information

Road authority:	City of Calgary
Street name:	162 Ave S
Municipality:	Calgary
Province/Territory:	Alberta
Design vehicle:	
Design Vehicle Length: (m)	6
Average annual daily road traffic: (AADT)	19000
Public or private road?	Public
Urban or rural?	Urban
Local, collector, arterial, expressway, or freeway?	Arterial
Divided or undivided?	Divided
Crossing cross angle: (degrees)	

HATCH

ASSESSMENT DATA

Crossing Approaches			East	West
Road crossing design speed: (km/h)			60	60
Number of traffic lanes:			5	5
Traffic lane width: (m)				
Traffic lane width including shoulders: (m)				
Average grade of road approach:				
Stopping sight distance (SSD):				
Vehicle departure time: (calculated)				
Prepare to Stop required activation time:				
Interconnection delay timing:				
Sidewalk			**North**	**South**
Sidewalk present?			Yes	Yes
Is sidewalk designated for persons using assistive devices?			Yes	Yes
Comments:				

C NEW STANDARDS

5 Crossing Surface			North	South
Road extensions off of the travelled way: (m)	min 0.5			
North sidewalk extensions of the travelled way: (m)	min 0.5			
South sidewalk extensions of the travelled way: (m)	min 0.5			
Is crossing surface smooth and continuous?				
Flangeway			**Min**	**Max**
Flangeway width: (mm)	min 65	max 75		
Flangeway depth: (mm)	min 50	max 75		
Flangeway field side width: (mm)		max 0		
Flangeway field side depth: (mm)		max 0		
Top of rail to road crossing surface: (mm)	min -7	max 13		
Comments:				

6 Road Geometry			East	West
North slope within 5m of the nearest rail at a sidewalk or path: (%)		max 2%		
South slope within 5m of the nearest rail at a sidewalk or path: (%)		max 2%		
Slope within 8m of the nearest rail: (%)		max 2%		
Slope between 8m and 18m of the nearest rail: (%)	max_1 5%	max_2 10%		
What is allowable percentage grade slope through crossing?				
What is the grade slope through the crossing?				
Is grade slope through crossing less than limit?				
Are horizontal and vertical alignments smooth and continuous on approach?				
Width of travelled way on each approach: (m)				
Width of travelled way at crossing: (m)				
Width through the crossing greater than approach?				
Does the travelled way have curbs?				
Grade crossing angle: (degrees)	min 0	max 180		
Comments:				

7 Sightlines			East	West
SSD calculated: (m)				
SSD measured: (m)				

HATCH

ASSESSMENT DATA

D_{SSD} calculated: (m)				
D_{SSD} driver's left measured: (m)				
D_{SSD} driver's right measured: (m)				
$D_{stopped}$ calculated: (m)				
$D_{stopped}$ driver's left measured: (m)				
$D_{stopped}$ driver's right measured: (m)				
$D_{stopped}$ pedestrian's left measured: (m)				
$D_{stopped}$ pedestrian's right measured: (m)				
Are there any obstacles to driver's left that may affect visibility?				
Are there any obstacles to driver's right that may affect visibility?				
Is there any vegetation to driver's left that may affect visibility?				
Is there any vegetation to driver's right that may affect visibility?				
Is visibility along track impaired due to angle of crossing?				
Comments:				

8 Signs & Pavement Markings

Crossing Sign(s)			**East**	**West**
Railway crossing sign present with reflective 50mm border?				
Number of tracks sign present and reflective?				
Height of cross buck from crown of road: (m)	min 1.5	max 2.5		
Is 100mm retroreflective strip on back of each blade?				
Distance of strip from crown of road: (mm)		max 300		
Distance of strip from top of cross buck: (mm)	min 70	max 70		
Crossing sign distance from shoulder: (m)	min 2	max 4.5		
Distance to nearest rail: (m)	min 3			
50mm strip on front post?				
Is sign post made of material such that if struck by a vehicle it will break?				
Condition of sign:				
Railway Crossing Ahead Sign and Advisory Speed Tab			**East**	**West**
Are vehicles required to slow prior to crossing due to shorter SSD?				
Is sign present upon approach?				
Is sign visible from SSD as defined by road speed?				
Is sign showing correct road orientation?				
Is Advisory Speed tab installed and correct?				
Advisory Speed: (km/h)				
Adjusted SSD: (m)				
Condition of sign:				
Stop Sign Ahead Sign			**East**	**West**
Stop sign ahead sign required?				
Stop sign ahead sign installed?				
Stop Sign visible from SSD at design road speed?				
Condition of sign:				
Stop Sign			**East**	**West**
Is D_{SSD} insufficient to warrant a stop sign?				
Is stop sign installed?				
Size of stop sign?				
Distance from crown of road to bottom of sign: (m)	min 1.8			
Distance from top of sign to centre of crossing sign: (m)	min 0.5	max 0.5		
Condition of sign:				
Emergency Notification Sign				

ASSESSMENT DATA

		East	West
Is Emergency Notification Sign Present?			
Does Emergency Notification Sign contain all information?			
Can Emergency Notification Sign(s) be seen from both approach?			
Condition of sign:			
Stop Bars		**East**	**West**
Are stop bars able to be painted on approach?			
Are stop bars present?			
Distance from nearest rail (m):	min 5.0		
Distance from nearest signal (m):	min 2.0		
Condition of markings:			
'X' Markings		**East**	**West**
Is 'X' marking able to be painted on approach?			
Is X marking present?			
Condition of markings:			

Comments:

		East	West
9 Warning Systems Specification			
Traffic volume cross product:			
Railway speed: (mph)			
Is there a sidewalk present?			
Number of tracks:			
Is there an intersection within a distance 'D" from the crossing?			
Flashing Lights and Bells			
Additional condition requires warning system?			
Lights and bells required?			
Are flashing lights and bells present?			
Gates			
Additional condition requires gates?			
Gates required?			
Are gates present?			
Sidewalk Flashing Lights		**East**	**West**
Is sidewalk outside island circuit?			
Additional lights required for sidewalk?			
Are flashing lights for the sidewalk present?			
Sidewalk Gates		**East**	**West**
Are gates required for sidewalk?			
Are gates for the sidewalk present?			

Comments:

D DESIGN CALCULATIONS

10 Design Calculations	East	West
Vehicle clearance Distance (Cd) measured: (m)		
Pedestrian clearance Distance (Cd) measured: (m)		
Vehicle travel distance (S) calculated: (m)		
Departure Time (T_D) calculated: (s)		
Maximum approach grade within "S": (%)		
Grade adjustment factor "G":		
Design vehicle departure time "s" calculated: (s)		
Pedestrian Departure Time (T_P) calculated: (s)		
Departure Time measured: (s)		

HATCH

ASSESSMENT DATA

				East	West
	Gate arm clearance time calculated: (s)				
	Gate arm clearance time measured: (s)				
11	**Location of Grade Crossings**			**East**	**West**
	Are there any intersections along approach to crossing?				
	Queuing			**East**	**West**
	Distance "D" from stop sign: (m)	min 30			
	Distance "D" from traffic signal: (m)	min 60			
	Is 'D' insufficient such that road vehicles might queue onto the tracks?				
	Can traffic queue from adjacent intersection to within 2.4m of nearest track?				
	Can traffic queue from crossing into adjacent intersections?				
	Are there any queuing issues that would require traffic preemption?				
	Comments:				

E WARNING SYSTEM DESIGN

12	**Warning System Operation - General**				
	Flashing Lights			**East**	**West**
	Cross buck present with reflective 50mm border?				
	Number of tracks sign present and reflective?				
	Distance from shoulder to outside of outer signal: (m)	min 1.88			
	Distance to nearest rail: (m)	min 3			
	Exposed signal foundation from crown of road: (mm)		max 100		
	Bottom of lowest signal from crown of road: (m)	min 2.3	max 2.9		
	Number of track sign to bottom of lowest signal: (mm)	min 125	max 175		
	Cross bucks to top of highest signal: (mm)	min 125	max 175		
	Radius of signal backgrounds: (mm)	min 305	max 305		
	Distance from centre of signal to centre of mast: (mm)	min 380	max 380		
	Condition of signals:				
	Gates			**East**	**West**
	Gate mechanism protrusion: (mm)		max 650		
	Gate up protrusion height at edge of signal: (m)	min 5.2			
	Gate down height from crown of road: (m)	min 1.1	max 1.4		
	Gate tip to centre of mast: (m)		max 11.6		
	Gate tip to edge of travelled lane: (m)	min -1	max 1		
	Gate tip to tip of other gate: (m)	min 0	max 1		
	First signal solid and other signals alternating?				
	Gate tip to first gate signal: (mm)	min 355	max 915		
	First gate signal to last gate signal: (m)	min 2.74			
	Are gate signals equally spaced?				
	Gate arm stripe width: (mm)	min 406	max 406		
	Gate arm stripes vertical?				
	Condition of gates:				
	Sidewalk Gates			**North**	**South**
	Sidewalk width: (m)				
	Gate mechanism protrusion: (mm)		max 650		
	Gate up protrusion height at edge of signal: (m)	min 5.2			
	Gate down height from crown of road: (m)	min 1.1	max 1.4		
	Gate tip to centre of mast: (m)		max 11.6		
	Number of lights required:				
	Does gate extend full width of sidewalk?				
	Are gate signals equally spaced?				
	Are gate signals alternating correctly?				
	Gate arm stripe width: (mm)	min 406	max 406		

HATCH

ASSESSMENT DATA

Gate arm stripes vertical?				
Condition of gates:				
Cantilevers			**East**	**West**
Height of cantilever from crown of road: (m)	min 5.2	max 6		
Radius of signal backgrounds: (mm)	min 305	max 305		
Condition of mast:				
Condition of signals:				
Crossing Case				
Distance of crossing case to edge of rail (m):				
Distance of crossing case to edge of road (m):				
Comments:				
Equipment				
Is data recorder capable of retaining information up to 30 days?				
Is design failsafe?				
Is power out indicator installed and visible from the road?				
Do fouling circuits have at least two discrete conductors?				
Does track circuit detect a 0.06ohm resistance?				
Are non insulated joints properly bonded?				
Do insulated joints provide proper insulation?				
Does battery back-up give 8 hours continuous or 24 hours normal operation?				
Comments:				
13 Number and Location of Light Units			**East**	**West**
Can front lights be seen from SSD?				
Can front lights be seen along entire approach?				
Can front lights be seen from intersections entering approach?				
Can back lights be seen by all vehicles stopped at crossing?				
Are additional lights required?				
Are additional lights installed?				
Cantilevers			**East**	**West**
Distance from centre of signal to edge of travelled lane: (m)		max 7.7		
Distance from second signal to edge of travelled lane: (m)		max 7.8		
Can front light be seen by all vehicles on approach?				
Is roadway classified as an expressway?				
Is a cantilever required?				
Is a cantilever installed?				
Sidewalk			**North**	**South**
Centre of warning system to centre of sidewalk: (m)		max 3.6		
Can at least one set of lights be seen by sidewalk from both sides of rail?				
Is sidewalk outside island circuit?				
Additional signal required?				
Are flashing lights for the sidewalk present?				
Comments:				
14 Light Units - Alignment			**East**	**West**
Are signal alignment requirements available on site?				
Are all units 200mm or 300mm LEDs?			300mm	300mm
Light flash rate: (flashes per minute)	min 45	max 65		

HATCH

ASSESSMENT DATA

Are all lights flashing alternatively and uniformly?				
Are front lights aligned to 1.6m above road at SSD (or when first visible)?				
Are back lights aligned to 1.6m above road at 15m from front lights?				
Are additional lights required for approaches?				
Are additional lights installed and aligned for 1.6m above road surface?				
Sidewalk			**North**	**South**
Are all light units 200mm or 300mm LEDs?				
Light flash rate: (flashes per minute)	min 45	max 65		
Are all lights flashing alternatively and uniformly?				
Are front lights aligned to 1.6m above road at 30m (or when first visible)?				

Comments:

15 Bells and Gates

Bells			**East**	**West**
Is bell installed on mast?				
Is bell on side with sidewalk?				
Distance from sidewalk to bell mast: (m)		max 30		
Bell gong rate: (rings per minute)	min 100	max 325		
Does bell ring for as long as warning system is active?				
Gates			**East**	**West**
Is gate arm perpendicular to road approach?				
Gate descent delay measured: (s)				
Does gate arm stop if obstructed?				
Gate arm descent time: (s)	min 10	max 15		
Time to train arrival: (s)	min 0			
Gate ascent time: (s)	min 6	max 12		
Does gate arm descend smoothly and without rebound?				
Does gate arm return to proper position after clearance of obstruction?				

Comments:

16 Circuitry

Required warning time: (s)	
Measured or recorded warning time: (s)	
Are crossing warning times consistent?	
Are warning times less than 13s more than required?	
Are cut-out circuits installed, if required?	
Type of crossing equipment:	
Are directional stick circuits installed?	
Does stick have release timer or restrict train speeds through signaling?	
Are all wires properly tagged and clear?	

Comments:

17 Inspection and Testing - Warning Systems

Are plans available at location and up to date?	
Is there proof of testing at periods defined in GCS?	

Comments:

F INTERCONNECTED DEVICES

HATCH

ASSESSMENT DATA

		East	West
18	**Prepare to Stop at Railway Crossing Sign**	**East**	**West**
	Is SSD restricted such that a prepared to stop at railway sign is required?		
	Is prepare to stop sign installed?		
	Can the prepare to stop sign be seen from SSD?		
	Do prepare to stop flashers activate with enough preemption?		
	Does battery back-up allow Prepare to Stop sign to operate for up to 4 hours?		
19	**Interconnection of Traffic Signals**	**East**	**West**
	Is intersection within 30m of crossing?		
	Are there any queuing issues that would require traffic preemption?		
	Is interconnection installed?		
	Does interconnection allow vehicles to clear the grade crossing?		
	Does interconnection prevent vehicles from entering crossing?		
	Does battery back-up allow traffic signals to operate for up to 4 hours?		
20	**Interconnected Devices - Inspection and Testing**		
	Is there proof of testing of interconnected devices as defined in GCS?		

Comments:

APPENDIX D - WHISTLE CESSATION

	East	West
Is SSD adequate?		
Are sightlines along track greater than 400m in both directions?		
Type of crossing warning system:	*Active: FLB & G*	
Number of tracks:	*3*	
Railway speed: (mph)		
Is crossing warning system adequate for whistle cessation?		
Is whistling required at crossing?		
Is whistling used at crossing?		

Comments:

ADDITIONAL COMMENTS

Comments:

In the NE quadrant, center of mast to center of sidewalk is 4.5 meters.

On North sidewalk, Z barriers are present but there is evidence that cyclist and pedestrians bypassing them. Recommend installing fence if not upgraded to FLB&G.

Consider installing FLB&G for sidewalks or alternatively installing gate style lights on top of short posts at z barrier to put lights in peripheral vision of pedestrians distracted by phone or tablet.

ASSESSMENT DATA

Recorded outbound warning time is around 27 seconds. Gate horizontal time for East gate is 15 seconds and 17 seconds for West. Gate delay is 8 seconds. Recorded inbound warning time is 27 seconds for preferred and 32 seconds for unpreferred. Gate horizontal time is 17 seconds and gate delay is 8 seconds.

SITE PHOTOS

162Ave Lookng E

162Ave Lookng E - 2

162Ave Lookng E - 3

162Ave Looking N

162Ave Looking N - 2

162Ave Looking S

SITE PHOTOS

162Ave Looking W

162Ave Lookng W - 2

162Ave N sidewalk Lookng E

162Ave N sidewalk Lookng E - 2

162Ave N sidewalk Lookng E

162Ave S sidewalk Looking W

SITE PHOTOS

162Ave S sidewalk Looking W - 2	162Ave S sidewalk Lookng E
	
162Ave, CP mileage	162Ave, Emergency contact sign
	

12.5 Ave SW (Chinook Station) Mixed Crossing

HATCH

Calgary Transit
61 Ave SW, Calgary, Alberta

Crossing Safety Assessment

Issue and Revision Record					
Rev	Date	Originator	Checker	Approver	Description
0	2019-05-02	Jenny Xing	Andy Hamel	Dale Hein	Final

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The safety assessment of this grade crossing covers physical features which may affect road and rail user safety and it has sought to identify potential safety hazards. However, the auditors point out that no guarantee is made that every deficiency has been identified. Further, if all the recommendations in this assessment were addressed, this would not confirm that the crossing is 'safe'; rather, adoption of the recommendations should improve the level of safety of the facility.

HATCH

1. Summary

A safety assessment of the grade crossing located at 61 Ave SW in Calgary, Alberta (Red Line subdivision) was undertaken on May 02, 2019. Data on site was acquired by Jenny Xing/Andy Hamel and the assessment of the information provided was performed by .

For the purposes of this report, 61 Ave SW crossing is described in an East/West orientation, while the rail line is described in a North/South orientation. The crossing is equipped with an active crossing warning system with flashing lights, bell(s) and gates.

2. Purpose

The Fundamental objectives of this assessment are:

1. Identify opportunities to reduce collision risk within the grade crossing environment.
2. Identify opportunities to minimize the frequency and severity of preventable crashes.
3. Consider the safety of all grade crossing users.
4. Verify compliance of the Grade Crossings Standards (GCS, dated July 2014) referred to in the most recent Grade Crossings Regulations (GCR, SOR 2014-275, November 28, 2014).
5. Ensure that all the crash mitigation measures/factors aimed to eliminate or reduce the identified safety problems are fully considered, evaluated and documented for review/action by the appropriate authorities.

3. Site Sketch

A site sketch is included to provide an aerial perspective of the layout for the crossing, which identifies the railway and roadway on appraoch to the grade crossing location. It identifies key components and considerations that impact the safety of the crossing which may include obstructions, signage, crossing infrastructure, and surrounding land use.

4. Assesment Data

The assessment data is provided in pages 4 to 11. Assessment questions are presented to reflect all requirements in the GCS for both passive and active warning systems. Assessment data not within compliance of the GCS is highlighted red for quick reference. Assessment data that is not applicable to the crossing is filled with N/A. Items not within compliance with the GCS are summarized following the assessment data along with suggested actions for remediation.

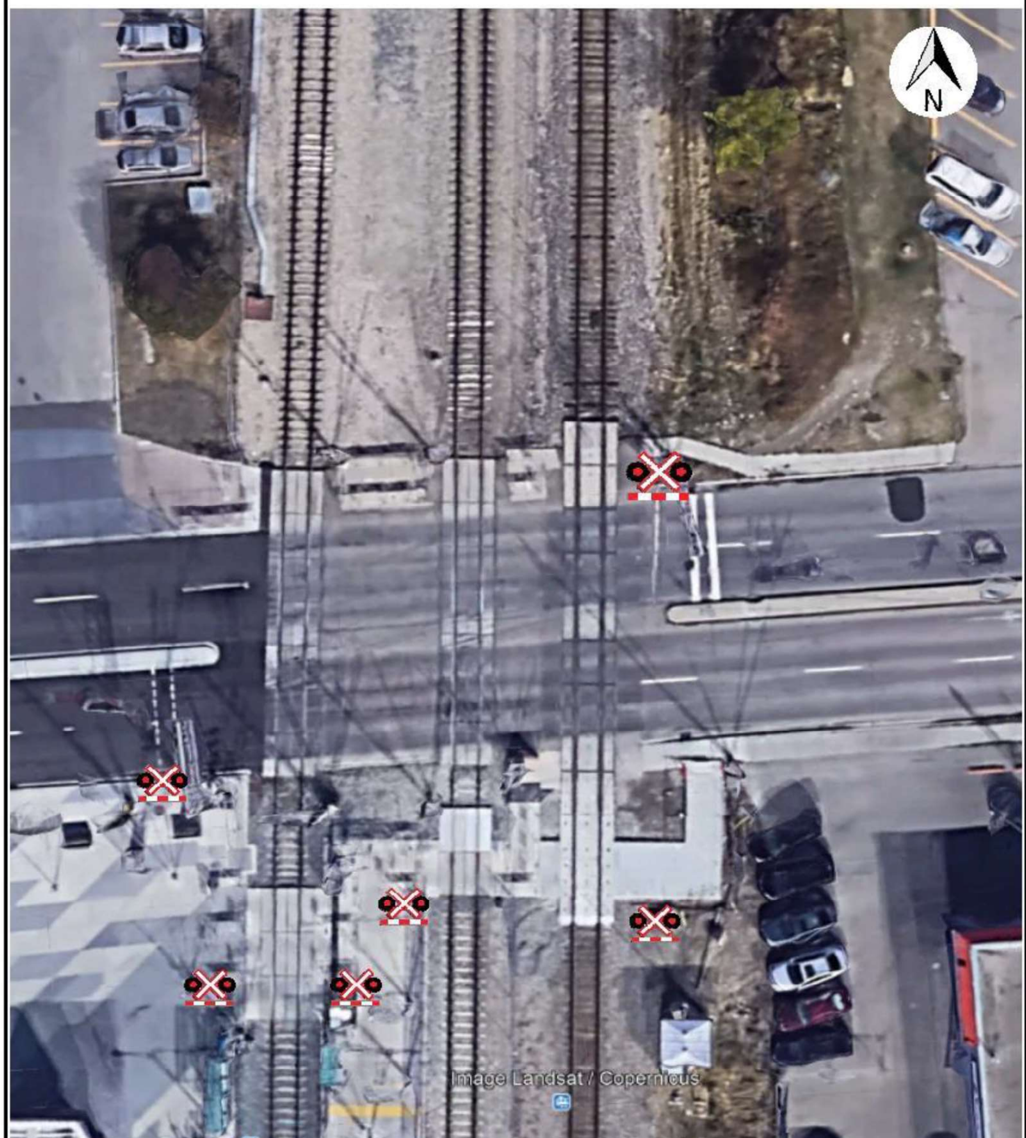
5. Recommendations

Following the report generated from site, items that do not comply with the Transport Canada's Grade Crossing Standards and Regulations are itemized in a summary table with suggested actions for remediation, if required. Responsibilities for remediation are identified in the adjacent column as per the GCR, where applicable.

6. Site Photos

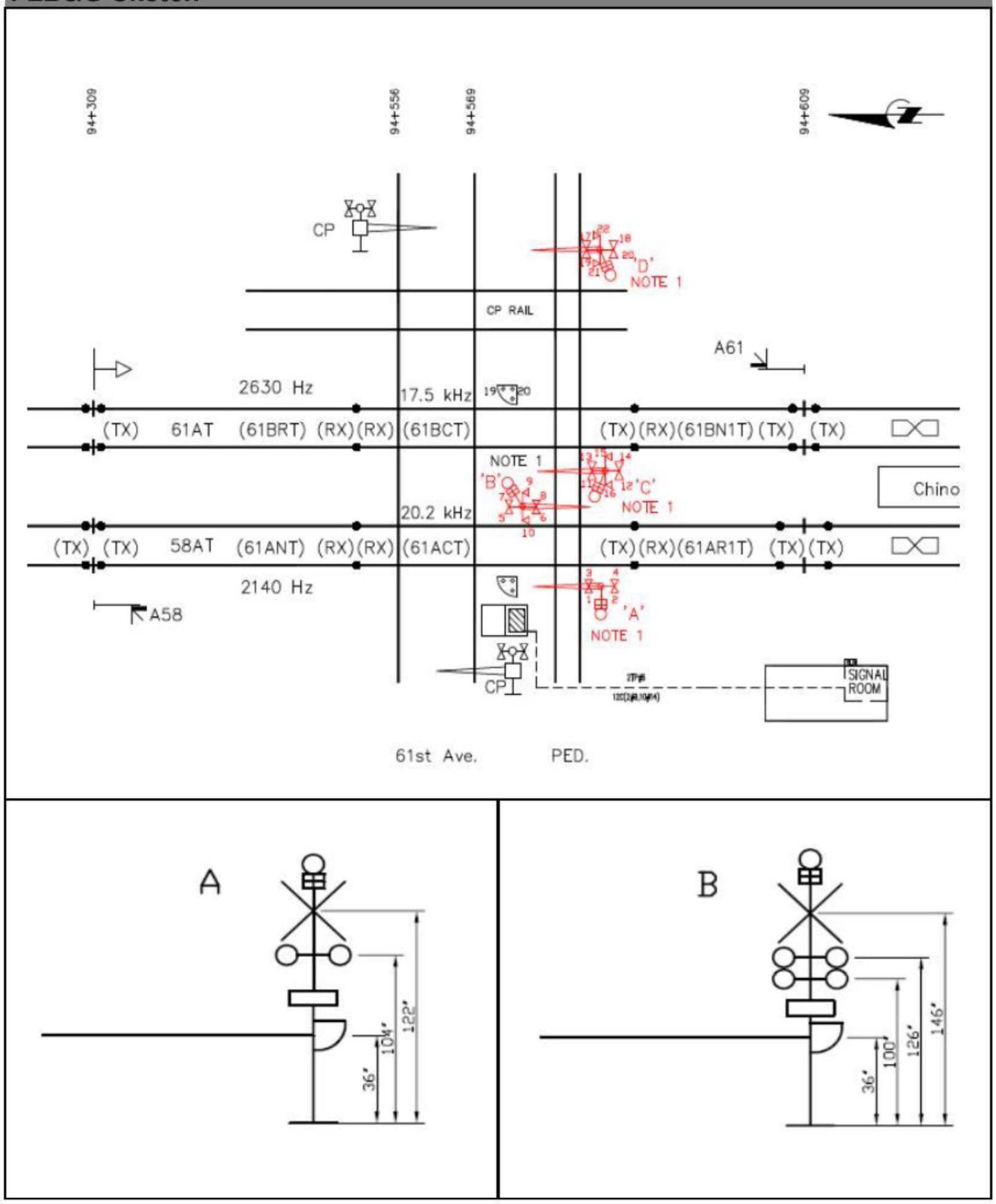
In order to highlight conditions on site, photographs are included at the end of the report. The pictures are meant to highlight considerations of the report and may include items such as sightlines, signage, warning system equipment, road markings, road condition, rail condition, and site documentation.

SITE SKETCH

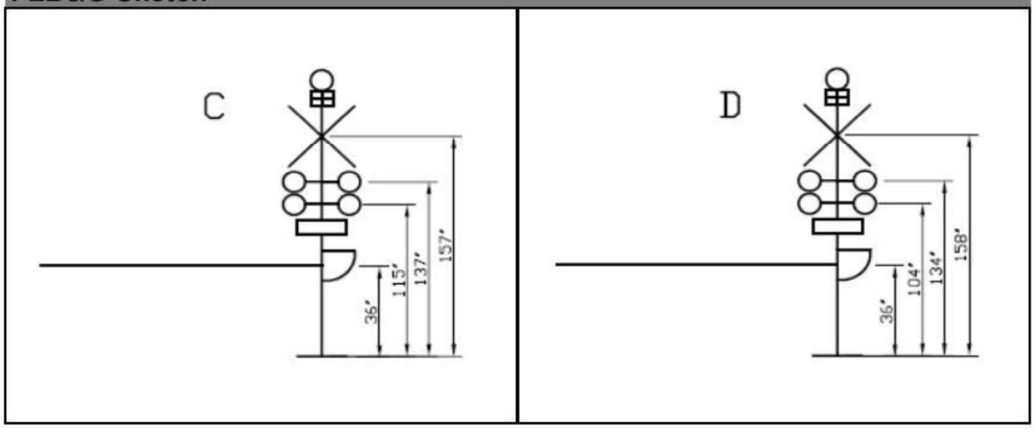


Road Measurement Sketch

FLB&G Sketch


94+309
94+556
94+569
94+609
CP
'D'
NOTE 1
CP RAIL
A61
2630 Hz
17.5 kHz
(TX) 61AT (61BRT) (RX)(RX) (61BCT)
(TX)(RX)(61BN1T) (TX) (TX)
NOTE 1
'B'
'C'
NOTE 1
Chino
20.2 kHz
(TX) (TX) 58AT (61ANT) (RX)(RX) (61ACT)
(TX)(RX)(61AR1T) (TX)(TX)
2140 Hz
A58
'A'
NOTE 1
CP
SIGNAL ROOM
61st Ave.
PED.
A
122"
104"
36"
B
146"
126"
100"
36"

FLB&G Sketch



ASSESSMENT DATA

Assessor Information	
Data acquisition by:	Jenny Xing/Andy Hamel
Crossing assessment by:	
Date of site visit:	2019-05-02
Comments:	
Railway Company Information	
Railway company:	Calgary Transit
Location Chainage:	
Subdivision:	Red Line
Rail orientation:	North/South
Number of tracks:	2
Can railway equipment pass each other at the crossing?	Yes
Average annual daily train traffic: (AADT)	200
Freight train design speed: (mph)	
Passenger train design speed: (mph)	
Type of crossing warning system:	Active: FLB & G
Is whistling used at crossing?	Yes
Class of track:	*CLASS 1*
Comments:	
Railway Company Information	
Railway company:	Canadian Pacific Railway
Location mileage:	
Subdivision:	Aldersyde
Rail orientation:	North/South
Number of tracks:	1
Can railway equipment pass each other at the crossing?	N/A
Average annual daily train traffic: (AADT)	
Freight train design speed: (mph)	
Passenger train design speed: (mph)	
Type of crossing warning system:	Active: FLB & G
Is whistling used at crossing?	Yes
Class of track:	*CLASS 1*
Comments:	
Road Authority Information	
Road authority:	City of Calgary
Street name:	61 Ave SW
Municipality:	Calgary
Province/Territory:	Alberta
Design vehicle:	
Design Vehicle Length: (m)	*6*
Average annual daily road traffic: (AADT)	13000
Public or private road?	Public
Urban or rural?	Urban
Local, collector, arterial, expressway, or freeway?	Arterial
Divided or undivided?	Undivided
Crossing cross angle: (degrees)	
Crossing Approaches	**East** **West**

Page 7 of 18

HATCH

ASSESSMENT DATA

Road crossing design speed: (km/h)	50	50
Number of traffic lanes:	4	4
Traffic lane width: (m)		
Traffic lane width including shoulders: (m)		
Average grade of road approach:		
Stopping sight distance (SSD):	*65*	*65*
Vehicle departure time: (calculated)	*0.00*	*0.00*
Prepare to Stop required activation time:		
Interconnection delay timing:		
Sidewalk	**North**	**South**
Sidewalk present?	Yes	Yes
Is sidewalk designated for persons using assistive devices?	Yes	Yes

Comments:

HATCH

ASSESSMENT DATA

C NEW STANDARDS

5	Crossing Surface			North	South
	Road extensions off of the travelled way: (m)	min 0.5			
	North sidewalk extensions of the travelled way: (m)	min 0.5			
	South sidewalk extensions of the travelled way: (m)	min 0.5			
	Is crossing surface smooth and continuous?				
	Flangeway			**Min**	**Max**
	Flangeway width: (mm)	min 65	max 75		
	Flangeway depth: (mm)	min 50	max 75		
	Flangeway field side width: (mm)		max 0		
	Flangeway field side depth: (mm)		max 0		
	Top of rail to road crossing surface: (mm)	min -7	max 13		
	Comments:				

6	Road Geometry			East	West
	North slope within 5m of the nearest rail at a sidewalk or path: (%)		max 2%		
	South slope within 5m of the nearest rail at a sidewalk or path: (%)		max 2%		
	Slope within 8m of the nearest rail: (%)		max 2%		
	Slope between 8m and 18m of the nearest rail: (%)	max_1 5%	max_2 10%		
	What is allowable percentage grade slope through crossing?				
	What is the grade slope through the crossing?				
	Is grade slope through crossing less than limit?				
	Are horizontal and vertical alignments smooth and continuous on approach?				
	Width of travelled way on each approach: (m)				
	Width of travelled way at crossing: (m)				
	Width through the crossing greater than approach?				
	Does the travelled way have curbs?				
	Grade crossing angle: (degrees)	min 0	max 180		
	Comments:				

7	Sightlines	East	West
	SSD calculated: (m)		
	SSD measured: (m)		
	D_{SSD} calculated: (m)		
	D_{SSD} driver's left measured: (m)		
	D_{SSD} driver's right measured: (m)		
	$D_{stopped}$ calculated: (m)		
	$D_{stopped}$ driver's left measured: (m)		
	$D_{stopped}$ driver's right measured: (m)		
	$D_{stopped}$ pedestrian's left measured: (m)		
	$D_{stopped}$ pedestrian's right measured: (m)		
	Are there any obstacles to driver's left that may affect visibility?		
	Are there any obstacles to driver's right that may affect visibility?		
	Is there any vegetation to driver's left that may affect visibility?		
	Is there any vegetation to driver's right that may affect visibility?		
	Is visibility along track impaired due to angle of crossing?		
	Comments:		

HATCH

ASSESSMENT DATA

8 Signs & Pavement Markings

Crossing Sign(s)			**East**	**West**
Railway crossing sign present with reflective 50mm border?				
Number of tracks sign present and reflective?				
Height of cross buck from crown of road: (m)	min 1.5	max 2.5		
Is 100mm retroreflective strip on back of each blade?				
Distance of strip from crown of road: (mm)		max 300		
Distance of strip from top of cross buck: (mm)	min 70	max 70		
Crossing sign distance from shoulder: (m)	min 2	max 4.5		
Distance to nearest rail: (m)	min 3			
50mm strip on front post?				
Is sign post made of material such that if struck by a vehicle it will break?				
Condition of sign:				
Railway Crossing Ahead Sign and Advisory Speed Tab			**East**	**West**
Are vehicles required to slow prior to crossing due to shorter SSD?				
Is sign present upon approach?				
Is sign visible from SSD as defined by road speed?				
Is sign showing correct road orientation?				
Is Advisory Speed tab installed and correct?				
Advisory Speed: (km/h)				
Adjusted SSD: (m)				
Condition of sign:				
Stop Sign Ahead Sign			**East**	**West**
Stop sign ahead sign required?				
Stop sign ahead sign installed?				
Stop Sign visible from SSD at design road speed?				
Condition of sign:				
Stop Sign			**East**	**West**
Is D_{SSD} insufficient to warrant a stop sign?				
Is stop sign installed?				
Size of stop sign?				
Distance from crown of road to bottom of sign: (m)	min 1.8			
Distance from top of sign to centre of crossing sign: (m)	min 0.5	max 0.5		
Condition of sign:				
Emergency Notification Sign				
Is Emergency Notification Sign Present?				
Does Emergency Notification Sign contain all information?				
Can Emergency Notification Sign(s) be seen from both approach?				
Condition of sign:				
Stop Bars			**East**	**West**
Are stop bars able to be painted on approach?				
Are stop bars present?				
Distance from nearest rail (m):	min 5.0			
Distance from nearest signal (m):	min 2.0			
Condition of markings:				
'X' Markings			**East**	**West**
Is 'X' marking able to be painted on approach?			Yes	Yes
Is X marking present?			No	No
Condition of markings:				

Comments:

Page 10 of 18

HATCH

ASSESSMENT DATA

9 Warning Systems Specification

Traffic volume cross product:
Railway speed: (mph)
Is there a sidewalk present?
Number of tracks:
Is there an intersection within a distance 'D" from the crossing?

Flashing Lights and Bells

Additional condition requires warning system?
Lights and bells required?
Are flashing lights and bells present?

Gates

Additional condition requires gates?
Gates required?
Are gates present?

Sidewalk Flashing Lights	**East**	**West**
Is sidewalk outside island circuit?		
Additional lights required for sidewalk?		
Are flashing lights for the sidewalk present?		

Sidewalk Gates	**East**	**West**
Are gates required for sidewalk?		
Are gates for the sidewalk present?		

Comments:

D DESIGN CALCULATIONS

10 Design Calculations	**East**	**West**
Vehicle clearance Distance (Cd) measured: (m)		
Pedestrian clearance Distance (Cd) measured: (m)		
Vehicle travel distance (S) calculated: (m)		
Departure Time (T_D) calculated: (s)		
Maximum approach grade within "S": (%)		
Grade adjustment factor "G":		
Design vehicle departure time "s" calculated: (s)		
Pedestrian Departure Time (T_P) calculated: (s)		
Departure Time measured: (s)		
Gate arm clearance time calculated: (s)		
Gate arm clearance time measured: (s)		

11 Location of Grade Crossings		**East**	**West**
Are there any intersections along approach to crossing?			
Queuing		**East**	**West**
Distance "D" from stop sign: (m)	min 30		
Distance "D" from traffic signal: (m)	min 60		
Is 'D' insufficient such that road vehicles might queue onto the tracks?			
Can traffic queue from adjacent intersection to within 2.4m of nearest track?			
Can traffic queue from crossing into adjacent intersections?			
Are there any queuing issues that would require traffic preemption?			

Comments:

HATCH

ASSESSMENT DATA

E WARNING SYSTEM DESIGN

12 Warning System Operation - General

Flashing Lights			East	West
Cross buck present with reflective 50mm border?				
Number of tracks sign present and reflective?				
Distance from shoulder to outside of outer signal: (m)	min 1.88			
Distance to nearest rail: (m)	min 3			
Exposed signal foundation from crown of road: (mm)		max 100		
Bottom of lowest signal from crown of road: (m)	min 2.3	max 2.9		
Number of track sign to bottom of lowest signal: (mm)	min 125	max 175		
Cross bucks to top of highest signal: (mm)	min 125	max 175		
Radius of signal backgrounds: (mm)	min 305	max 305		
Distance from centre of signal to centre of mast: (mm)	min 380	max 380		
Condition of signals:				
Gates			**East**	**West**
Gate mechanism protrusion: (mm)		max 650		
Gate up protrusion height at edge of signal: (m)	min 5.2			
Gate down height from crown of road: (m)	min 1.1	max 1.4		
Gate tip to centre of mast: (m)		max 11.6		
Gate tip to edge of travelled lane: (m)	min -1	max 1		
Gate tip to tip of other gate: (m)	min 0	max 1		
First signal solid and other signals alternating?				
Gate tip to first gate signal: (mm)	min 355	max 915		
First gate signal to last gate signal: (m)	min 2.74			
Are gate signals equally spaced?				
Gate arm stripe width: (mm)	min 406	max 406		
Gate arm stripes vertical?				
Condition of gates:				
Sidewalk Gates			**North**	**South**
Sidewalk width: (m)				
Gate mechanism protrusion: (mm)		max 650		
Gate up protrusion height at edge of signal: (m)	min 5.2			
Gate down height from crown of road: (m)	min 1.1	max 1.4		
Gate tip to centre of mast: (m)		max 11.6		
Number of lights required:				
Does gate extend full width of sidewalk?				
Are gate signals equally spaced?				
Are gate signals alternating correctly?				
Gate arm stripe width: (mm)	min 406	max 406		
Gate arm stripes vertical?				
Condition of gates:				
Cantilevers			**East**	**West**
Height of cantilever from crown of road: (m)	min 5.2	max 6		
Radius of signal backgrounds: (mm)	min 305	max 305		
Condition of mast:				
Condition of signals:				
Crossing Case				
Distance of crossing case to edge of rail (m):				
Distance of crossing case to edge of road (m):				
Comments:				

HATCH

ASSESSMENT DATA

Equipment			
Is data recorder capable of retaining information up to 30 days?			
Is design failsafe?			
Is power out indicator installed and visible from the road?			
Do fouling circuits have at least two discrete conductors?			
Does track circuit detect a 0.06ohm resistance?			
Are non insulated joints properly bonded?			
Do insulated joints provide proper insulation?			
Does battery back-up give 8 hours continuous or 24 hours normal operation?			
Comments:			
13 Number and Location of Light Units		**East**	**West**
Can front lights be seen from SSD?			
Can front lights be seen along entire approach?			
Can front lights be seen from intersections entering approach?			
Can back lights be seen by all vehicles stopped at crossing?			
Are additional lights required?			
Are additional lights installed?			
Cantilevers		**East**	**West**
Distance from centre of signal to edge of travelled lane: (m)	max 7.7		
Distance from second signal to edge of travelled lane: (m)	max 7.8		
Can front light be seen by all vehicles on approach?			
Is roadway classified as an expressway?			
Is a cantilever required?			
Is a cantilever installed?			
Sidewalk		**North**	**South**
Centre of warning system to centre of sidewalk: (m)	max 3.6		
Can at least one set of lights be seen by sidewalk from both sides of rail?			
Is sidewalk outside island circuit?			
Additional signal required?			
Are flashing lights for the sidewalk present?			
Comments:			
14 Light Units - Alignment		**East**	**West**
Are signal alignment requirements available on site?			
Are all units 200mm or 300mm LEDs?			
Light flash rate: (flashes per minute)	min 45 max 65		
Are all lights flashing alternatively and uniformly?			
Are front lights aligned to 1.6m above road at SSD (or when first visible)?			
Are back lights aligned to 1.6m above road at 15m from front lights?			
Are additional lights required for approaches?			
Are additional lights installed and aligned for 1.6m above road surface?			
Sidewalk		**North**	**South**
Are all light units 200mm or 300mm LEDs?			
Light flash rate: (flashes per minute)	min 45 max 65		
Are all lights flashing alternatively and uniformly?			
Are front lights aligned to 1.6m above road at 30m (or when first visible)?			
Comments:			

HATCH

ASSESSMENT DATA

15 Bells and Gates

Bells			East	West
Is bell installed on mast?				
Is bell on side with sidewalk?				
Distance from sidewalk to bell mast: (m)		max 30		
Bell gong rate: (rings per minute)	min 100	max 325		
Does bell ring for as long as warning system is active?				

Gates			East	West
Is gate arm perpendicular to road approach?				
Gate descent delay measured: (s)				
Does gate arm stop if obstructed?				
Gate arm descent time: (s)	min 10	max 15		
Time to train arrival: (s)	min 0			
Gate ascent time: (s)	min 6	max 12		
Does gate arm descend smoothly and without rebound?				
Does gate arm return to proper position after clearance of obstruction?				

Comments:

16 Circuitry

Required warning time: (s)	
Measured or recorded warning time: (s)	
Are crossing warning times consistent?	
Are warning times less than 13s more than required?	
Are cut-out circuits installed, if required?	
Type of crossing equipment:	
Are directional stick circuits installed?	
Does stick have release timer or restrict train speeds through signaling?	
Are all wires properly tagged and clear?	

Comments:

17 Inspection and Testing - Warning Systems

Are plans available at location and up to date?	
Is there proof of testing at periods defined in GCS?	

Comments:

F INTERCONNECTED DEVICES

18 Prepare to Stop at Railway Crossing Sign	East	West
Is SSD restricted such that a prepared to stop at railway sign is required?		
Is prepare to stop sign installed?		
Can the prepare to stop sign be seen from SSD?		
Do prepare to stop flashers activate with enough preemption?		
Does battery back-up allow Prepare to Stop sign to operate for up to 4 hours?		

19 Interconnection of Traffic Signals	East	West
Is intersection within 30m of crossing?		
Are there any queuing issues that would require traffic preemption?		
Is interconnection installed?		
Does interconnection allow vehicles to clear the grade crossing?		
Does interconnection prevent vehicles from entering crossing?		
Does battery back-up allow traffic signals to operate for up to 4 hours?		

Page 14 of 18

HATCH

ASSESSMENT DATA

20 Interconnected Devices - Inspection and Testing

Is there proof of testing of interconnected devices as defined in GCS?

Comments:

APPENDIX D - WHISTLE CESSATION

	East	West
Is SSD adequate?		
Are sightlines along track greater than 400m in both directions?		
Type of crossing warning system:	*Active: FLB & G*	
Number of tracks:	*3*	
Railway speed: (mph)		
Is crossing warning system adequate for whistle cessation?		
Is whistling required at crossing?		
Is whistling used at crossing?		

Comments:

ADDITIONAL COMMENTS

Comments:

Signal Masts C&D on the NB PedX are missing the "2" tracks signs.

"B" mast shown in wrong location on track layout drawings. (It is on south side of PedX)

200mm LEDs on masts A & C.
300mm LEDs on masts B & D.
300mm LEDs on CP masts.

On sidewalk on North side of Avenue, no railway X-Buck visible from sidewalk when EB.Z barriers are present. Consider adding FLB&G on sidewalk for pedestrians or adding crossing gate style lights on short posts to put flashing lights in peripheral vision for pedestrians distracted by phone or tablet.

SITE PHOTOS

61st Ave Looking E

61st Ave Looking E - 2

61st Ave Looking NE

61st Ave Looking W

61st Ave Looking W - 2

61st Ave, N sidewalk Looking E

SITE PHOTOS

61st Ave, N sidewalk Looking E - 2

61st Ave, N sidewalk Looking W

NB Ped Looking E

NB Ped Looking SW

NB Ped Lookng W

SB Ped Lookng E

SITE PHOTOS

SB Ped Looking E2	SB Ped Looking E3
	
SB Ped Looking SW	
	
East Gate	West Gate

12.6 12 Ave NE at 36 St NE Mixed Crossing

Calgary Transit
12 Ave NE, Calgary, Alberta

Crossing Safety Assessment

Issue and Revision Record					
Rev	**Date**	**Originator**	**Checker**	**Approver**	**Description**
0	2019-04-10	Jenny Xing	Andy Hamel	Dale Hein	Final

The safety assessment of this grade crossing covers physical features which may affect road and rail user safety and it has sought to identify potential safety hazards. However, the auditors point out that no guarantee is made that every deficiency has been identified. Further, if all the recommendations in this assessment were addressed, this would not confirm that the crossing is 'safe'; rather, adoption of the recommendations should improve the level of safety of the facility.

1. Summary

A safety assessment of the grade crossing located at 12 Ave NE in Calgary, Alberta (Blue Line subdivision) was undertaken on Apr 11, 2019. Data on site was acquired by Jenny Xing and the assessment of the information provided was performed by Andy Hamel/Jenny Xing.

For the purposes of this report, 12 Ave NE crossing is described in an East/West orientation, while the rail line is described in a North/South orientation. The crossing is equipped with an active crossing warning system with flashing lights, bell(s) and gates.

2. Purpose

The Fundamental objectives of this assessment are:

1. Identify opportunities to reduce collision risk within the grade crossing environment.
2. Identify opportunities to minimize the frequency and severity of preventable crashes.
3. Consider the safety of all grade crossing users.
4. Verify compliance of the Grade Crossings Standards (GCS, dated July 2014) referred to in the most recent Grade Crossings Regulations (GCR, SOR 2014-275, November 28, 2014).
5. Ensure that all the crash mitigation measures/factors aimed to eliminate or reduce the identified safety problems are fully considered, evaluated and documented for review/action by the appropriate authorities.

3. Site Sketch

A site sketch is included to provide an aerial perspective of the layout for the crossing, which identifies the railway and roadway on appraoch to the grade crossing location. It identifies key components and considerations that impact the safety of the crossing which may include obstructions, signage, crossing infrastructure, and surrounding land use.

4. Assesment Data

The assessment data is provided in pages 4 to 11. Assessment questions are presented to reflect all requirements in the GCS for both passive and active warning systems. Assessment data not within compliance of the GCS is highlighted red for quick reference. Assessment data that is not applicable to the crossing is filled with N/A. Items not within compliance with the GCS are summarized following the assessment data along with suggested actions for remediation.

5. Recommendations

Following the report generated from site, items that do not comply with the Transport Canada's Grade Crossing Standards and Regulations are itemized in a summary table with suggested actions for remediation, if required. Responsibilities for remediation are identified in the adjacent column as per the GCR, where applicable.

6. Site Photos

In order to highlight conditions on site, photographs are included at the end of the report. The pictures are meant to highlight considerations of the report and may include items such as sightlines, signage, warning system equipment, road markings, road condition, rail condition, and site documentation.

SITE SKETCH

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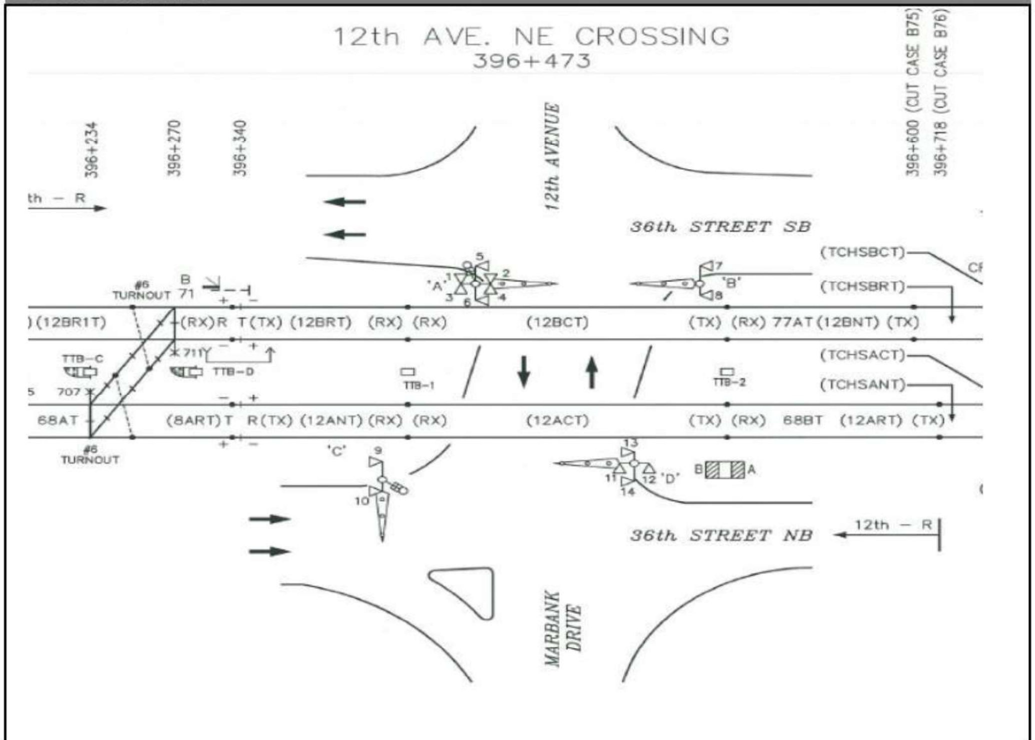
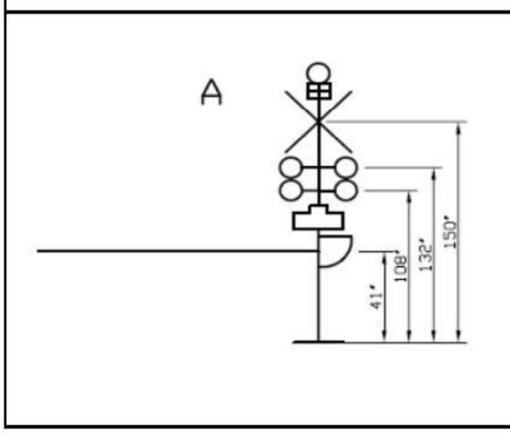
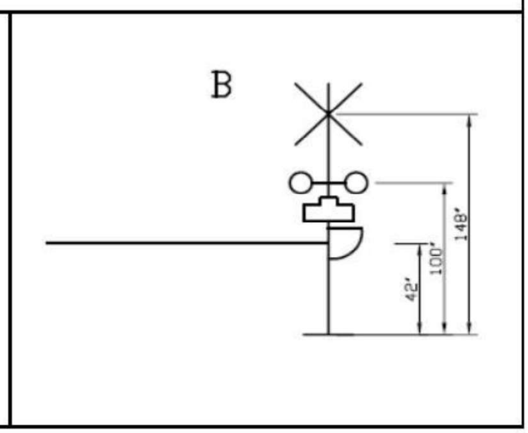
Road Measurement Sketch

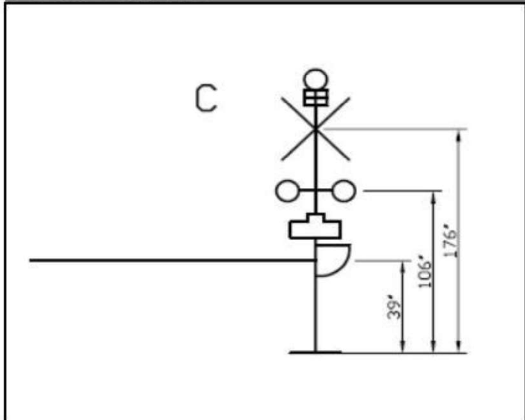
FLB&G Sketch

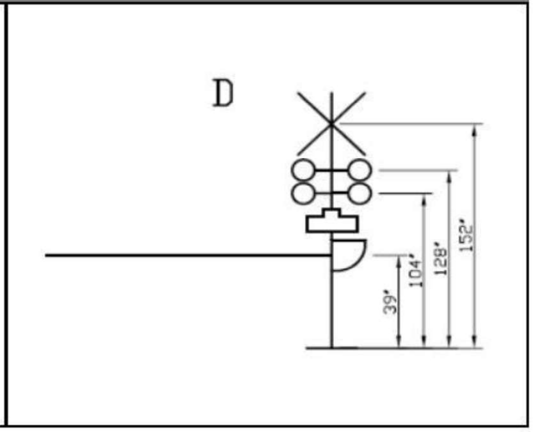

12th AVE. NE CROSSING
396+473
396+234
396+270
396+340
12th AVENUE
396+600 (CUT CASE B75)
396+718 (CUT CASE B76)
36th STREET SB
36th STREET NB
(TCHSBCT)
(TCHSBRT)
(TCHSACT)
(TCHSANT)
(12BCT)
(12ACT)
#6 TURNOUT
TTB-C
TTB-D
TTB-1
TTB-2
MARBANK DRIVE


A
41"
108"
132"
150"


B
42"
100"
148"

FLB&G Sketch





ASSESSMENT DATA

Assessor Information

Data acquisition by:	Jenny Xing
Crossing assessment by:	Andy Hamel/Jenny Xing
Date of site visit:	2019-04-11
Comments:	

Railway Company Information

Railway company:	Calgary Transit
Location Chainage:	
Subdivision:	Blue Line
Rail orientation:	North/South
Number of tracks:	2
Can railway equipment pass each other at the crossing?	Yes
Average annual daily train traffic: (AADT)	200
Freight train design speed: (mph)	
Passenger train design speed: (mph)	
Type of crossing warning system:	Active: FLB & G
Is whistling used at crossing?	N/A
Class of track:	*CLASS 1*
Comments:	

Road Authority Information

Road authority:	City of Calgary
Street name:	12 Ave NE
Municipality:	Calgary
Province/Territory:	Alberta
Design vehicle:	
Design Vehicle Length: (m)	*6*
Average annual daily road traffic: (AADT)	11000
Public or private road?	Public
Urban or rural?	Urban
Local, collector, arterial, expressway, or freeway?	Arterial
Divided or undivided?	Undivided
Crossing cross angle: (degrees)	

Crossing Approaches	**East**	**West**
Road crossing design speed: (km/h)	50	50
Number of traffic lanes:		
Traffic lane width: (m)		
Traffic lane width including shoulders: (m)		
Average grade of road approach:		
Stopping sight distance (SSD):	*65*	*65*
Vehicle departure time: (calculated)	*0.00*	*0.00*
Prepare to Stop required activation time:		
Interconnection delay timing:		

Sidewalk	**North**	**South**
Sidewalk present?	Yes	Yes
Is sidewalk designated for persons using assistive devices?	Yes	Yes

Comments:

HATCH

ASSESSMENT DATA

C NEW STANDARDS

				North	South
5	**Crossing Surface**			**North**	**South**
	Road extensions off of the travelled way: (m)	min 0.5			
	North sidewalk extensions of the travelled way: (m)	min 0.5			
	South sidewalk extensions of the travelled way: (m)	min 0.5			
	Is crossing surface smooth and continuous?				
	Flangeway			**Min**	**Max**
	Flangeway width: (mm)	min 65	max 75		
	Flangeway depth: (mm)	min 50	max 75		
	Flangeway field side width: (mm)		max 0		
	Flangeway field side depth: (mm)		max 0		
	Top of rail to road crossing surface: (mm)	min -7	max 13		
	Comments:				

				East	West
6	**Road Geometry**			**East**	**West**
	North slope within 5m of the nearest rail at a sidewalk or path: (%)		max 2%		
	South slope within 5m of the nearest rail at a sidewalk or path: (%)		max 2%		
	Slope within 8m of the nearest rail: (%)		max 2%		
	Slope between 8m and 18m of the nearest rail: (%)	max_1 5%	max_2 10%		
	What is allowable percentage grade slope through crossing?				
	What is the grade slope through the crossing?				
	Is grade slope through crossing less than limit?				
	Are horizontal and vertical alignments smooth and continuous on approach?				
	Width of travelled way on each approach: (m)				
	Width of travelled way at crossing: (m)				
	Width through the crossing greater than approach?				
	Does the travelled way have curbs?				
	Grade crossing angle: (degrees)	min 0	max 180		0
	Comments:				

		East	West
7	**Sightlines**	**East**	**West**
	SSD calculated: (m)		
	SSD measured: (m)		
	D_{SSD} calculated: (m)		
	D_{SSD} driver's left measured: (m)		
	D_{SSD} driver's right measured: (m)		
	$D_{stopped}$ calculated: (m)		
	$D_{stopped}$ driver's left measured: (m)		
	$D_{stopped}$ driver's right measured: (m)		
	$D_{stopped}$ pedestrian's left measured: (m)		
	$D_{stopped}$ pedestrian's right measured: (m)		
	Are there any obstacles to driver's left that may affect visibility?		
	Are there any obstacles to driver's right that may affect visibility?		
	Is there any vegetation to driver's left that may affect visibility?		
	Is there any vegetation to driver's right that may affect visibility?		
	Is visibility along track impaired due to angle of crossing?		
	Comments:		

HATCH

ASSESSMENT DATA

8 Signs & Pavement Markings

Crossing Sign(s)			East	West
Railway crossing sign present with reflective 50mm border?				
Number of tracks sign present and reflective?				
Height of cross buck from crown of road: (m)	min 1.5	max 2.5		
Is 100mm retroreflective strip on back of each blade?				
Distance of strip from crown of road: (mm)		max 300		
Distance of strip from top of cross buck: (mm)	min 70	max 70		
Crossing sign distance from shoulder: (m)	min 2	max 4.5		
Distance to nearest rail: (m)	min 3			
50mm strip on front post?				
Is sign post made of material such that if struck by a vehicle it will break?				
Condition of sign:				
Railway Crossing Ahead Sign and Advisory Speed Tab			**East**	**West**
Are vehicles required to slow prior to crossing due to shorter SSD?			No	No
Is sign present upon approach?				
Is sign visible from SSD as defined by road speed?				
Is sign showing correct road orientation?				
Is Advisory Speed tab installed and correct?				
Advisory Speed: (km/h)				
Adjusted SSD: (m)			N/A	N/A
Condition of sign:				
Stop Sign Ahead Sign			**East**	**West**
Stop sign ahead sign required?				
Stop sign ahead sign installed?				
Stop Sign visible from SSD at design road speed?				
Condition of sign:				
Stop Sign			**East**	**West**
Is D_{SSD} insufficient to warrant a stop sign?				
Is stop sign installed?				
Size of stop sign?				
Distance from crown of road to bottom of sign: (m)	min 1.8			
Distance from top of sign to centre of crossing sign: (m)	min 0.5	max 0.5		
Condition of sign:				
Emergency Notification Sign				
Is Emergency Notification Sign Present?			No	
Does Emergency Notification Sign contain all information?				
Can Emergency Notification Sign(s) be seen from both approach?				
Condition of sign:				
Stop Bars			**East**	**West**
Are stop bars able to be painted on approach?				
Are stop bars present?				
Distance from nearest rail (m):	min 5.0			
Distance from nearest signal (m):	min 2.0			
Condition of markings:				
'X' Markings			**East**	**West**
Is 'X' marking able to be painted on approach?			Yes	Yes
Is X marking present?			No	No
Condition of markings:				

Comments:

ASSESSMENT DATA

		East	West
9	**Warning Systems Specification**		
	Traffic volume cross product:		
	Railway speed: (mph)		
	Is there a sidewalk present?	Yes	
	Number of tracks:	2	
	Is there an intersection within a distance 'D" from the crossing?	No	
	Flashing Lights and Bells		
	Additional condition requires warning system?		
	Lights and bells required?		
	Are flashing lights and bells present?	Yes	
	Gates		
	Additional condition requires gates?		
	Gates required?		
	Are gates present?	Yes	
	Sidewalk Flashing Lights	**East**	**West**
	Is sidewalk outside island circuit?	No	No
	Additional lights required for sidewalk?	No	No
	Are flashing lights for the sidewalk present?		
	Sidewalk Gates	**East**	**West**
	Are gates required for sidewalk?	No	No
	Are gates for the sidewalk present?	No	No
	Comments:		

D DESIGN CALCULATIONS

			East	West
10	**Design Calculations**			
	Vehicle clearance Distance (Cd) measured: (m)			
	Pedestrian clearance Distance (Cd) measured: (m)			
	Vehicle travel distance (S) calculated: (m)			
	Departure Time (T_D) calculated: (s)			
	Maximum approach grade within "S": (%)			
	Grade adjustment factor "G":			
	Design vehicle departure time "s" calculated: (s)			
	Pedestrian Departure Time (T_P) calculated: (s)			
	Departure Time measured: (s)			
	Gate arm clearance time calculated: (s)			
	Gate arm clearance time measured: (s)			
11	**Location of Grade Crossings**		**East**	**West**
	Are there any intersections along approach to crossing?			
	Queuing		**East**	**West**
	Distance "D" from stop sign: (m)	min 30		
	Distance "D" from traffic signal: (m)	min 60		
	Is 'D' insufficient such that road vehicles might queue onto the tracks?			
	Can traffic queue from adjacent intersection to within 2.4m of nearest track?			
	Can traffic queue from crossing into adjacent intersections?			
	Are there any queuing issues that would require traffic preemption?			
	Comments:			

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ASSESSMENT DATA

E WARNING SYSTEM DESIGN

12 Warning System Operation - General

			East	West
Flashing Lights			**East**	**West**
Cross buck present with reflective 50mm border?				
Number of tracks sign present and reflective?				
Distance from shoulder to outside of outer signal: (m)	min 1.88			
Distance to nearest rail: (m)	min 3			
Exposed signal foundation from crown of road: (mm)		max 100		
Bottom of lowest signal from crown of road: (m)	min 2.3	max 2.9		
Number of track sign to bottom of lowest signal: (mm)	min 125	max 175		
Cross bucks to top of highest signal: (mm)	min 125	max 175		
Radius of signal backgrounds: (mm)	min 305	max 305		
Distance from centre of signal to centre of mast: (mm)	min 380	max 380		
Condition of signals:				
Gates			**East**	**West**
Gate mechanism protrusion: (mm)		max 650		
Gate up protrusion height at edge of signal: (m)	min 5.2			
Gate down height from crown of road: (m)	min 1.1	max 1.4		
Gate tip to centre of mast: (m)		max 11.6		
Gate tip to edge of travelled lane: (m)	min -1	max 1		
Gate tip to tip of other gate: (m)	min 0	max 1		
First signal solid and other signals alternating?				
Gate tip to first gate signal: (mm)	min 355	max 915		
First gate signal to last gate signal: (m)	min 2.74			
Are gate signals equally spaced?				
Gate arm stripe width: (mm)	min 406	max 406		
Gate arm stripes vertical?				
Condition of gates:				
Sidewalk Gates			**North**	**South**
Sidewalk width: (m)			N/A	N/A
Gate mechanism protrusion: (mm)		max 650		
Gate up protrusion height at edge of signal: (m)	min 5.2			
Gate down height from crown of road: (m)	min 1.1	max 1.4		
Gate tip to centre of mast: (m)		max 11.6		
Number of lights required:				
Does gate extend full width of sidewalk?				
Are gate signals equally spaced?				
Are gate signals alternating correctly?				
Gate arm stripe width: (mm)	min 406	max 406		
Gate arm stripes vertical?				
Condition of gates:				
Cantilevers			**East**	**West**
Height of cantilever from crown of road: (m)	min 5.2	max 6		
Radius of signal backgrounds: (mm)	min 305	max 305		
Condition of mast:				
Condition of signals:				
Crossing Case				
Distance of crossing case to edge of rail (m):				
Distance of crossing case to edge of road (m):				

Comments:

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HATCH

ASSESSMENT DATA

Equipment			
Is data recorder capable of retaining information up to 30 days?			
Is design failsafe?			
Is power out indicator installed and visible from the road?			
Do fouling circuits have at least two discrete conductors?			
Does track circuit detect a 0.06ohm resistance?			
Are non insulated joints properly bonded?			
Do insulated joints provide proper insulation?			
Does battery back-up give 8 hours continuous or 24 hours normal operation?			
Comments:			
13 Number and Location of Light Units		**East**	**West**
Can front lights be seen from SSD?			
Can front lights be seen along entire approach?			
Can front lights be seen from intersections entering approach?			
Can back lights be seen by all vehicles stopped at crossing?			
Are additional lights required?			
Are additional lights installed?			
Cantilevers		**East**	**West**
Distance from centre of signal to edge of travelled lane: (m)	max 7.7		
Distance from second signal to edge of travelled lane: (m)	max 7.8		
Can front light be seen by all vehicles on approach?			
Is roadway classified as an expressway?			
Is a cantilever required?			
Is a cantilever installed?			
Sidewalk		**North**	**South**
Centre of warning system to centre of sidewalk: (m)	max 3.6	N/A	
Can at least one set of lights be seen by sidewalk from both sides of rail?		N/A	
Is sidewalk outside island circuit?		*No*	
Additional signal required?			
Are flashing lights for the sidewalk present?			
Comments:			
14 Light Units - Alignment		**East**	**West**
Are signal alignment requirements available on site?			
Are all units 200mm or 300mm LEDs?		300	300
Light flash rate: (flashes per minute)	min 45 max 65		
Are all lights flashing alternatively and uniformly?			
Are front lights aligned to 1.6m above road at SSD (or when first visible)?			
Are back lights aligned to 1.6m above road at 15m from front lights?			
Are additional lights required for approaches?			
Are additional lights installed and aligned for 1.6m above road surface?			
Sidewalk		**North**	**South**
Are all light units 200mm or 300mm LEDs?			200
Light flash rate: (flashes per minute)	min 45 max 65		
Are all lights flashing alternatively and uniformly?			
Are front lights aligned to 1.6m above road at 30m (or when first visible)?			
Comments:			

HATCH

ASSESSMENT DATA

15 Bells and Gates

Bells			**East**	**West**
Is bell installed on mast?				
Is bell on side with sidewalk?				Yes
Distance from sidewalk to bell mast: (m)		max 30		1
Bell gong rate: (rings per minute)	min 100	max 325		
Does bell ring for as long as warning system is active?				
Gates			**East**	**West**
Is gate arm perpendicular to road approach?			*	*
Gate descent delay measured: (s)			3	3
Does gate arm stop if obstructed?				
Gate arm descent time: (s)	min 10	max 15		
Time to train arrival: (s)	min 0			
Gate ascent time: (s)	min 6	max 12		
Does gate arm descend smoothly and without rebound?				
Does gate arm return to proper position after clearance of obstruction?				

Comments:

*Gate for southbound left turn lane to Eastbound across track is parallel with track and does not substantially block the lane. (Not perpendicular to road).

16 Circuitry

Required warning time: (s)	20.00
Measured or recorded warning time: (s)	25 - 30
Are crossing warning times consistent?	Yes
Are warning times less than 13s more than required?	
Are cut-out circuits installed, if required?	
Type of crossing equipment:	
Are directional stick circuits installed?	
Does stick have release timer or restrict train speeds through signaling?	
Are all wires properly tagged and clear?	

Comments:

17 Inspection and Testing - Warning Systems

Are plans available at location and up to date?	
Is there proof of testing at periods defined in GCS?	

Comments:

F INTERCONNECTED DEVICES

18 Prepare to Stop at Railway Crossing Sign	**East**	**West**
Is SSD restricted such that a prepared to stop at railway sign is required?		
Is prepare to stop sign installed?		
Can the prepare to stop sign be seen from SSD?		
Do prepare to stop flashers activate with enough preemption?		
Does battery back-up allow Prepare to Stop sign to operate for up to 4 hours?		
19 Interconnection of Traffic Signals	**East**	**West**
Is intersection within 30m of crossing?		
Are there any queuing issues that would require traffic preemption?		
Is interconnection installed?		
Does interconnection allow vehicles to clear the grade crossing?		
Does interconnection prevent vehicles from entering crossing?		
Does battery back-up allow traffic signals to operate for up to 4 hours?		

ASSESSMENT DATA

20 Interconnected Devices - Inspection and Testing

Is there proof of testing of interconnected devices as defined in GCS?

Comments:

APPENDIX D - WHISTLE CESSATION

	East	West
Is SSD adequate?		
Are sightlines along track greater than 400m in both directions?		
Type of crossing warning system:		*Active: FLB & G*
Number of tracks:		*2*
Railway speed: (mph)		
Is crossing warning system adequate for whistle cessation?		
Is whistling required at crossing?		
Is whistling used at crossing?		

Comments:

ADDITIONAL COMMENTS

Comments:

No crossbuck or 2 tracks sign visible for westbound pedestrians while in crosswalk.

Westward pedestrians must cross four lanes before getting to track and there is no refuge point until after crossing both tracks. Could be issue for small children and people with disabilities.

Interconnection with traffic signals not studied. No conflict between crossing warning system and traffic signals were observed while at the crossing.

SITE PHOTOS

12th Ave Looking East - 1

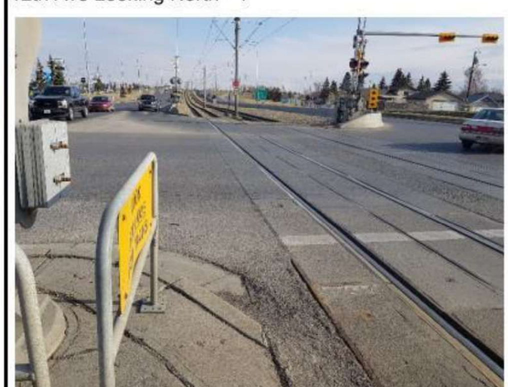
12th Ave Looking East - 2

12th Ave Looking East - 3

12th Ave Looking East - 4

12th Ave Looking NE in Refuge

12th Ave Looking North - 1



SITE PHOTOS

12th Ave Looking North - 2

12th Ave Looking North - 3

12th Ave Looking Northeast

12th Ave Looking Northwest

12th Ave Looking South - 1

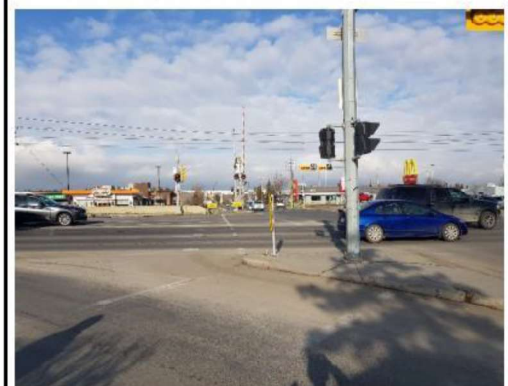
12th Ave Looking South - 2

HATCH

SITE PHOTOS

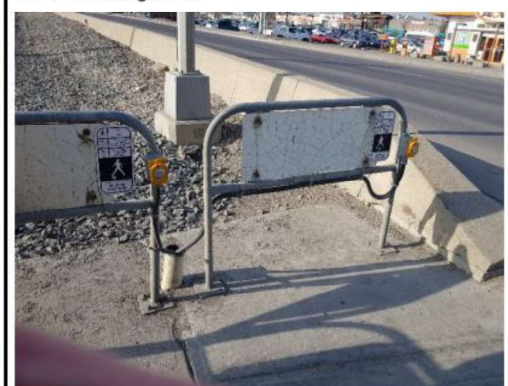
12th Ave Looking South - 3

12th Ave Looking West - 1



12th Ave Looking West - 2

12th Ave Refuge PBs



12.7 7 Ave S at 3 St SE Mixed Crossing

HATCH

Calgary Transit
7Ave 3rd Street SE, Calgary, Alberta

Crossing Safety Assessment

Issue and Revision Record					
Rev	**Date**	**Originator**	**Checker**	**Approver**	**Description**
0	2019-05-02	Jenny Xing	Andy Hamel	Dale Hein	Final

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The safety assessment of this grade crossing covers physical features which may affect road and rail user safety and it has sought to identify potential safety hazards. However, the auditors point out that no guarantee is made that every deficiency has been identified. Further, if all the recommendations in this assessment were addressed, this would not confirm that the crossing is 'safe'; rather, adoption of the recommendations should improve the level of safety of the facility.

1. Summary

A safety assessment of the grade crossing located at 7Ave 3rd Street SE in Calgary, Alberta (Red and Blue Line subdivision) was undertaken on May 02, 2019. Data on site was acquired by Jenny Xing and the assessment of the information provided was performed by Andy Hamel.

For the purposes of this report, 7Ave 3rd Street SE crossing is described in a North/South orientation, while the rail line is described in an East/West orientation. The crossing is equipped with a passive crossing equipped with stop signs.

2. Purpose

The Fundamental objectives of this assessment are:

1. Identify opportunities to reduce collision risk within the grade crossing environment.
2. Identify opportunities to minimize the frequency and severity of preventable crashes.
3. Consider the safety of all grade crossing users.
4. Verify compliance of the Grade Crossings Standards (GCS, dated July 2014) referred to in the most recent Grade Crossings Regulations (GCR, SOR 2014-275, November 28, 2014).
5. Ensure that all the crash mitigation measures/factors aimed to eliminate or reduce the identified safety problems are fully considered, evaluated and documented for review/action by the appropriate authorities.

3. Site Sketch

A site sketch is included to provide an aerial perspective of the layout for the crossing, which identifies the railway and roadway on appraoch to the grade crossing location. It identifies key components and considerations that impact the safety of the crossing which may include obstructions, signage, crossing infrastructure, and surrounding land use.

4. Assesment Data

The assessment data is provided in pages 4 to 11. Assessment questions are presented to reflect all requirements in the GCS for both passive and active warning systems. Assessment data not within compliance of the GCS is highlighted red for quick reference. Assessment data that is not applicable to the crossing is filled with N/A. Items not within compliance with the GCS are summarized following the assessment data along with suggested actions for remediation.

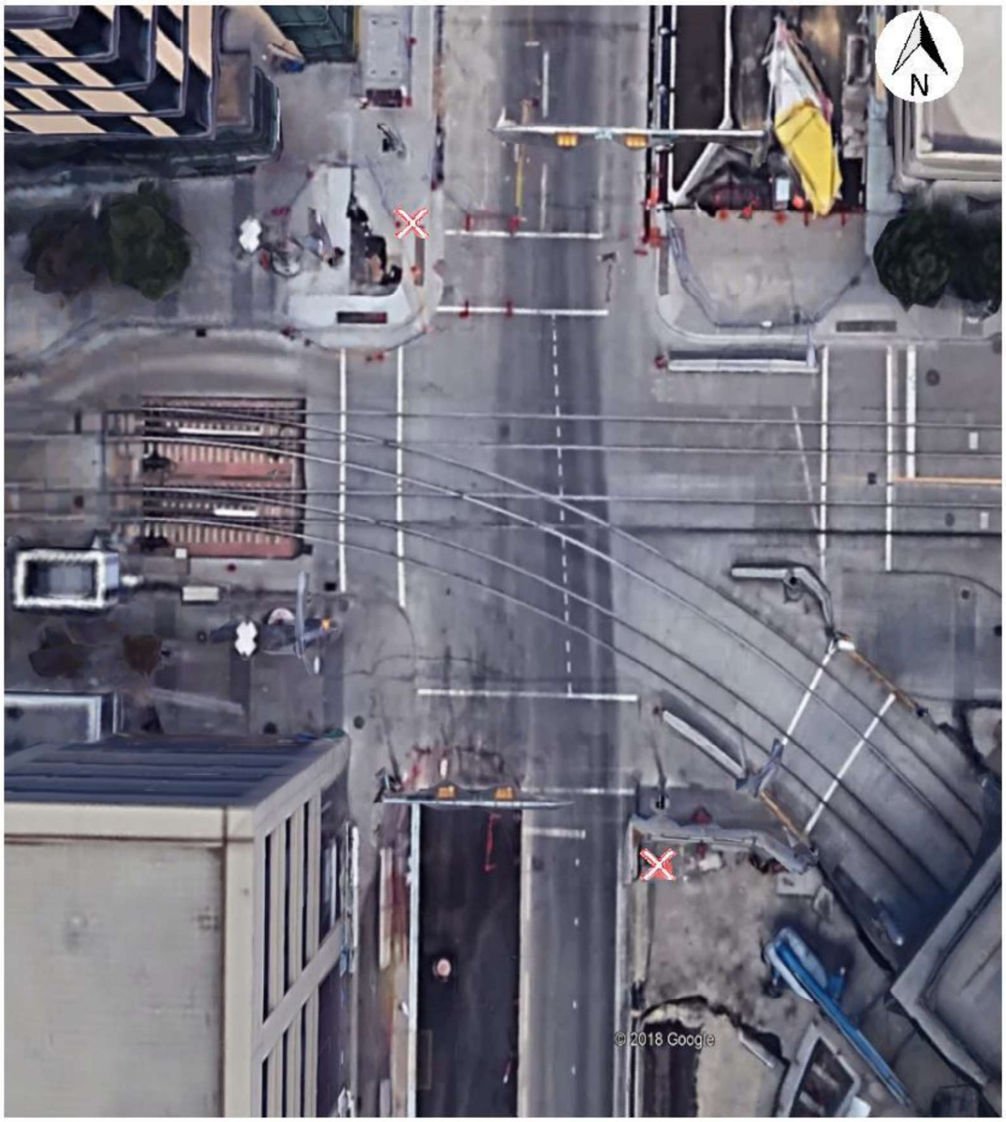
5. Recommendations

Following the report generated from site, items that do not comply with the Transport Canada's Grade Crossing Standards and Regulations are itemized in a summary table with suggested actions for remediation, if required. Responsibilities for remediation are identified in the adjacent column as per the GCR, where applicable.

6. Site Photos

In order to highlight conditions on site, photographs are included at the end of the report. The pictures are meant to highlight considerations of the report and may include items such as sightlines, signage, warning system equipment, road markings, road condition, rail condition, and site documentation.

SITE SKETCH



Road Measurement Sketch

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ASSESSMENT DATA

Assessor Information

Data acquisition by:	Jenny Xing
Crossing assessment by:	Andy Hamel
Date of site visit:	2019-05-02
Comments:	

Railway Company Information

Railway company:	Calgary Transit
Location Chainage:	
Subdivision:	Red and Blue Line
Rail orientation:	East/West
Number of tracks:	2
Can railway equipment pass each other at the crossing?	Yes
Average annual daily train traffic: (AADT)	400
Freight train design speed: (mph)	
Passenger train design speed: (mph)	
Type of crossing warning system:	X Sign & Traffic Signals
Is whistling used at crossing?	N/A
Class of track:	*CLASS 1*
Comments:	

Road Authority Information

Road authority:	City of Calgary
Street name:	7Ave 3rd Street SE
Municipality:	Calgary
Province/Territory:	Alberta
Design vehicle:	
Design Vehicle Length: (m)	*6*
Average annual daily road traffic: (AADT)	NA
Public or private road?	Public
Urban or rural?	Urban
Local, collector, arterial, expressway, or freeway?	Arterial
Divided or undivided?	Undivided
Crossing cross angle: (degrees)	

Crossing Approaches	**North**	**South**
Road crossing design speed: (km/h)	50	50
Number of traffic lanes:	2	2
Traffic lane width: (m)		
Traffic lane width including shoulders: (m)		
Average grade of road approach:		
Stopping sight distance (SSD):	*65*	*65*
Vehicle departure time: (calculated)	*0.00*	*0.00*
Prepare to Stop required activation time:		
Interconnection delay timing:		

Sidewalk	**East**	**West**
Sidewalk present?	Yes	Yes
Is sidewalk designated for persons using assistive devices?	Yes	Yes

Comments:

West lane under construction

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ASSESSMENT DATA

C NEW STANDARDS

5	Crossing Surface			East	West
	Road extensions off of the travelled way: (m)	min 0.5			
	East sidewalk extensions of the travelled way: (m)	min 0.5			
	West sidewalk extensions of the travelled way: (m)	min 0.5			
	Is crossing surface smooth and continuous?				
	Flangeway			**Min**	**Max**
	Flangeway width: (mm)	min 65	max 75		
	Flangeway depth: (mm)	min 50	max 75		
	Flangeway field side width: (mm)		max 0		
	Flangeway field side depth: (mm)		max 0		
	Top of rail to road crossing surface: (mm)	min -7	max 13		
	Comments:				

6	Road Geometry			North	South
	East slope within 5m of the nearest rail at a sidewalk or path: (%)		max 2%		
	West slope within 5m of the nearest rail at a sidewalk or path: (%)		max 2%		
	Slope within 8m of the nearest rail: (%)		max 2%		
	Slope between 8m and 18m of the nearest rail: (%)	max_1 5%	max_2 10%		
	What is allowable percentage grade slope through crossing?				
	What is the grade slope through the crossing?				
	Is grade slope through crossing less than limit?				
	Are horizontal and vertical alignments smooth and continuous on approach?				
	Width of travelled way on each approach: (m)				
	Width of travelled way at crossing: (m)				
	Width through the crossing greater than approach?				
	Does the travelled way have curbs?				
	Grade crossing angle: (degrees)	min 0	max 180		
	Comments:				

7	Sightlines	North	South
	SSD calculated: (m)		
	SSD measured: (m)		
	D_{SSD} calculated: (m)	0	0
	D_{SSD} driver's left measured: (m)		
	D_{SSD} driver's right measured: (m)		
	$D_{stopped}$ calculated: (m)		
	$D_{stopped}$ driver's left measured: (m)		
	$D_{stopped}$ driver's right measured: (m)		
	$D_{stopped}$ pedestrian's left measured: (m)		
	$D_{stopped}$ pedestrian's right measured: (m)		
	Are there any obstacles to driver's left that may affect visibility?		
	Are there any obstacles to driver's right that may affect visibility?		
	Is there any vegetation to driver's left that may affect visibility?		
	Is there any vegetation to driver's right that may affect visibility?		
	Is visibility along track impaired due to angle of crossing?		
	Comments:		

HATCH

ASSESSMENT DATA

8 Signs & Pavement Markings

Crossing Sign(s)			**North**	**South**
Railway crossing sign present with reflective 50mm border?				
Number of tracks sign present and reflective?				
Height of cross buck from crown of road: (m)	min 1.5	max 2.5		
Is 100mm retroreflective strip on back of each blade?				
Distance of strip from crown of road: (mm)		max 300		
Distance of strip from top of cross buck: (mm)	min 70	max 70		
Crossing sign distance from shoulder: (m)	min 2	max 4.5		
Distance to nearest rail: (m)	min 3			
50mm strip on front post?				
Is sign post made of material such that if struck by a vehicle it will break?				
Condition of sign:				
Railway Crossing Ahead Sign and Advisory Speed Tab			**North**	**South**
Are vehicles required to slow prior to crossing due to shorter SSD?				
Is sign present upon approach?				
Is sign visible from SSD as defined by road speed?				
Is sign showing correct road orientation?				
Is Advisory Speed tab installed and correct?				
Advisory Speed: (km/h)				
Adjusted SSD: (m)				
Condition of sign:				
Stop Sign Ahead Sign			**North**	**South**
Stop sign ahead sign required?				
Stop sign ahead sign installed?				
Stop Sign visible from SSD at design road speed?				
Condition of sign:				
Stop Sign			**North**	**South**
Is D_{SSD} insufficient to warrant a stop sign?				
Is stop sign installed?				
Size of stop sign?				
Distance from crown of road to bottom of sign: (m)	min 1.8			
Distance from top of sign to centre of crossing sign: (m)	min 0.5	max 0.5		
Condition of sign:				
Emergency Notification Sign				
Is Emergency Notification Sign Present?				
Does Emergency Notification Sign contain all information?				
Can Emergency Notification Sign(s) be seen from both approach?				
Condition of sign:				
Stop Bars			**North**	**South**
Are stop bars able to be painted on approach?				
Are stop bars present?				
Distance from nearest rail (m):	min 5.0			
Distance from nearest signal (m):	min 2.0			
Condition of markings:				
'X' Markings			**North**	**South**
Is 'X' marking able to be painted on approach?				
Is X marking present?				
Condition of markings:				

Comments:

HATCH

ASSESSMENT DATA

9 Warning Systems Specification

Traffic volume cross product:
Railway speed: (mph)
Is there a sidewalk present?
Number of tracks:
Is there an intersection within a distance 'D" from the crossing?

Flashing Lights and Bells

Additional condition requires warning system?
Lights and bells required?
Are flashing lights and bells present?

Gates

Additional condition requires gates?
Gates required?
Are gates present?

Sidewalk Flashing Lights	North	South
Is sidewalk outside island circuit?		
Additional lights required for sidewalk?		
Are flashing lights for the sidewalk present?		

Sidewalk Gates	North	South
Are gates required for sidewalk?		
Are gates for the sidewalk present?		

Comments:

D DESIGN CALCULATIONS

10 Design Calculations	North	South
Vehicle clearance Distance (Cd) measured: (m)		
Pedestrian clearance Distance (Cd) measured: (m)		
Vehicle travel distance (S) calculated: (m)		
Departure Time (T_D) calculated: (s)		
Maximum approach grade within "S": (%)		
Grade adjustment factor "G":		
Design vehicle departure time "s" calculated: (s)		
Pedestrian Departure Time (T_P) calculated: (s)		
Departure Time measured: (s)		
Gate arm clearance time calculated: (s)		
Gate arm clearance time measured: (s)		

11 Location of Grade Crossings		North	South
Are there any intersections along approach to crossing?			
Queuing		**North**	**South**
Distance "D" from stop sign: (m)	min 30		
Distance "D" from traffic signal: (m)	min 60		
Is 'D' insufficient such that road vehicles might queue onto the tracks?			
Can traffic queue from adjacent intersection to within 2.4m of nearest track?			
Can traffic queue from crossing into adjacent intersections?			
Are there any queuing issues that would require traffic preemption?			

Comments:

HATCH

ASSESSMENT DATA

E WARNING SYSTEM DESIGN

12 Warning System Operation - General

Flashing Lights			North	South
Cross buck present with reflective 50mm border?				
Number of tracks sign present and reflective?				
Distance from shoulder to outside of outer signal: (m)	min 1.88			
Distance to nearest rail: (m)	min 3			
Exposed signal foundation from crown of road: (mm)		max 100		
Bottom of lowest signal from crown of road: (m)	min 2.3	max 2.9		
Number of track sign to bottom of lowest signal: (mm)	min 125	max 175		
Cross bucks to top of highest signal: (mm)	min 125	max 175		
Radius of signal backgrounds: (mm)	min 305	max 305		
Distance from centre of signal to centre of mast: (mm)	min 380	max 380		
Condition of signals:				
Gates			**North**	**South**
Gate mechanism protrusion: (mm)		max 650		
Gate up protrusion height at edge of signal: (m)	min 5.2			
Gate down height from crown of road: (m)	min 1.1	max 1.4		
Gate tip to centre of mast: (m)		max 11.6		
Gate tip to edge of travelled lane: (m)	min -1	max 1		
Gate tip to tip of other gate: (m)	min 0	max 1		
First signal solid and other signals alternating?				
Gate tip to first gate signal: (mm)	min 355	max 915		
First gate signal to last gate signal: (m)	min 2.74			
Are gate signals equally spaced?				
Gate arm stripe width: (mm)	min 406	max 406		
Gate arm stripes vertical?				
Condition of gates:				
Sidewalk Gates			**East**	**West**
Sidewalk width: (m)				
Gate mechanism protrusion: (mm)		max 650		
Gate up protrusion height at edge of signal: (m)	min 5.2			
Gate down height from crown of road: (m)	min 1.1	max 1.4		
Gate tip to centre of mast: (m)		max 11.6		
Number of lights required:				
Does gate extend full width of sidewalk?				
Are gate signals equally spaced?				
Are gate signals alternating correctly?				
Gate arm stripe width: (mm)	min 406	max 406		
Gate arm stripes vertical?				
Condition of gates:				
Cantilevers			**North**	**South**
Height of cantilever from crown of road: (m)	min 5.2	max 6		
Radius of signal backgrounds: (mm)	min 305	max 305		
Condition of mast:				
Condition of signals:				
Crossing Case				
Distance of crossing case to edge of rail (m):				
Distance of crossing case to edge of road (m):				
Comments:				

HATCH

ASSESSMENT DATA

	Equipment			
	Is data recorder capable of retaining information up to 30 days?			
	Is design failsafe?			
	Is power out indicator installed and visible from the road?			
	Do fouling circuits have at least two discrete conductors?			
	Does track circuit detect a 0.06ohm resistance?			
	Are non insulated joints properly bonded?			
	Do insulated joints provide proper insulation?			
	Does battery back-up give 8 hours continuous or 24 hours normal operation?			
	Comments:			
13	**Number and Location of Light Units**		**North**	**South**
	Can front lights be seen from SSD?			
	Can front lights be seen along entire approach?			
	Can front lights be seen from intersections entering approach?			
	Can back lights be seen by all vehicles stopped at crossing?			
	Are additional lights required?			
	Are additional lights installed?			
	Cantilevers		**North**	**South**
	Distance from centre of signal to edge of travelled lane: (m)	max 7.7		
	Distance from second signal to edge of travelled lane: (m)	max 7.8		
	Can front light be seen by all vehicles on approach?			
	Is roadway classified as an expressway?			
	Is a cantilever required?			
	Is a cantilever installed?			
	Sidewalk		**East**	**West**
	Centre of warning system to centre of sidewalk: (m)	max 3.6		
	Can at least one set of lights be seen by sidewalk from both sides of rail?			
	Is sidewalk outside island circuit?			
	Additional signal required?			
	Are flashing lights for the sidewalk present?			
	Comments:			
14	**Light Units - Alignment**		**North**	**South**
	Are signal alignment requirements available on site?			
	Are all units 200mm or 300mm LEDs?			
	Light flash rate: (flashes per minute)	min 45 max 65		
	Are all lights flashing alternatively and uniformly?			
	Are front lights aligned to 1.6m above road at SSD (or when first visible)?			
	Are back lights aligned to 1.6m above road at 15m from front lights?			
	Are additional lights required for approaches?			
	Are additional lights installed and aligned for 1.6m above road surface?			
	Sidewalk		**East**	**West**
	Are all light units 200mm or 300mm LEDs?			
	Light flash rate: (flashes per minute)	min 45 max 65		
	Are all lights flashing alternatively and uniformly?			
	Are front lights aligned to 1.6m above road at 30m (or when first visible)?			
	Comments:			

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ASSESSMENT DATA

15 Bells and Gates

Bells			North	South
Is bell installed on mast?				
Is bell on side with sidewalk?				
Distance from sidewalk to bell mast: (m)		max 30		
Bell gong rate: (rings per minute)	min 100	max 325		
Does bell ring for as long as warning system is active?				

Gates			North	South
Is gate arm perpendicular to road approach?				
Gate descent delay measured: (s)				
Does gate arm stop if obstructed?				
Gate arm descent time: (s)	min 10	max 15		
Time to train arrival: (s)	min 0			
Gate ascent time: (s)	min 6	max 12		
Does gate arm descend smoothly and without rebound?				
Does gate arm return to proper position after clearance of obstruction?				

Comments:

16 Circuitry

Required warning time: (s)	
Measured or recorded warning time: (s)	
Are crossing warning times consistent?	
Are warning times less than 13s more than required?	
Are cut-out circuits installed, if required?	
Type of crossing equipment:	
Are directional stick circuits installed?	
Does stick have release timer or restrict train speeds through signaling?	
Are all wires properly tagged and clear?	

Comments:

17 Inspection and Testing - Warning Systems

Are plans available at location and up to date?	
Is there proof of testing at periods defined in GCS?	

Comments:

F INTERCONNECTED DEVICES

18 Prepare to Stop at Railway Crossing Sign	North	South
Is SSD restricted such that a prepared to stop at railway sign is required?		
Is prepare to stop sign installed?		
Can the prepare to stop sign be seen from SSD?		
Do prepare to stop flashers activate with enough preemption?		
Does battery back-up allow Prepare to Stop sign to operate for up to 4 hours?		

19 Interconnection of Traffic Signals	North	South
Is intersection within 30m of crossing?		
Are there any queuing issues that would require traffic preemption?		
Is interconnection installed?		
Does interconnection allow vehicles to clear the grade crossing?		
Does interconnection prevent vehicles from entering crossing?		
Does battery back-up allow traffic signals to operate for up to 4 hours?		

HATCH

ASSESSMENT DATA

20 Interconnected Devices - Inspection and Testing

Is there proof of testing of interconnected devices as defined in GCS?

Comments:

APPENDIX D - WHISTLE CESSATION

	North	South
Is SSD adequate?		
Are sightlines along track greater than 400m in both directions?		
Type of crossing warning system:	*X Sign & Traffic Signals*	
Number of tracks:	*2*	
Railway speed: (mph)		
Is crossing warning system adequate for whistle cessation?		
Is whistling required at crossing?		
Is whistling used at crossing?		

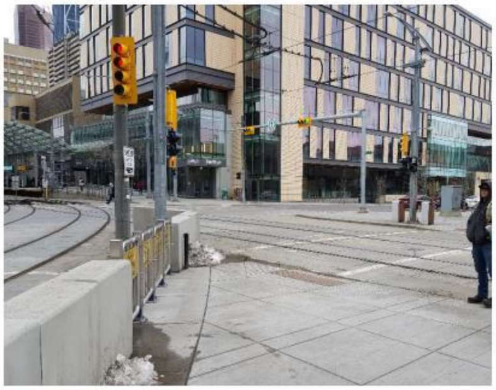
Comments:

ADDITIONAL COMMENTS

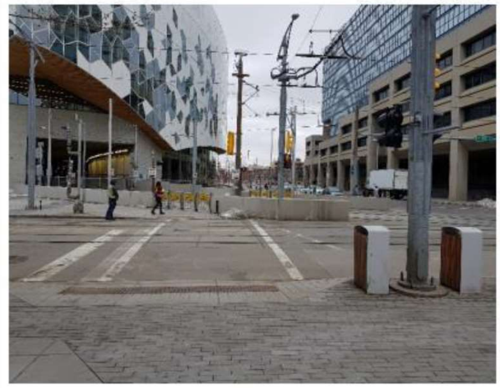
Comments:

SITE PHOTOS

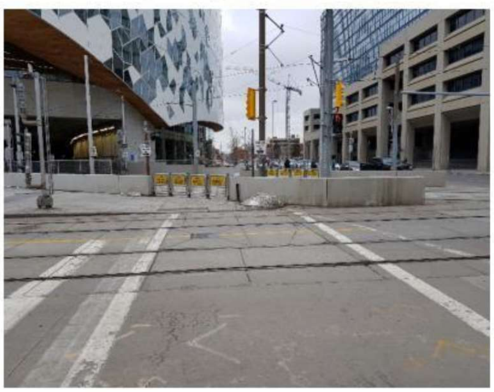
3rd St E Ped xing looking NW



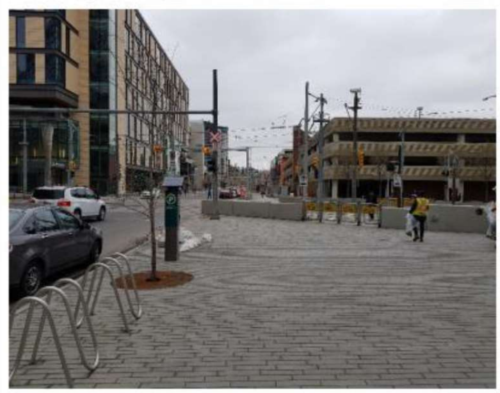
3rd St E Ped xing looking S



3rd St E Ped xing looking S - 2



3rd St E(E) looking N

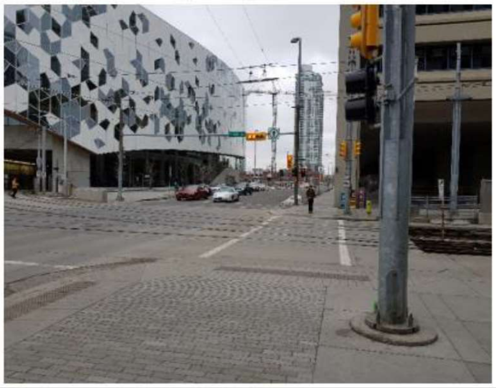


3rd St E(W) Ped xing looking N

3rd St E(W) Ped xing looking S

SITE PHOTOS

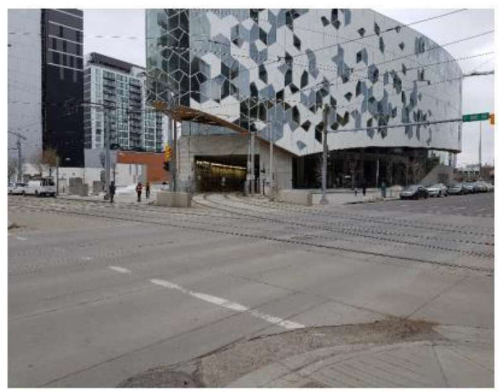
3rd St E(W) Ped xing looking S - 2



3rd St intersection looking NE

3rd St intersection looking NW

3rd St intersection looking SE



3rd St looking N

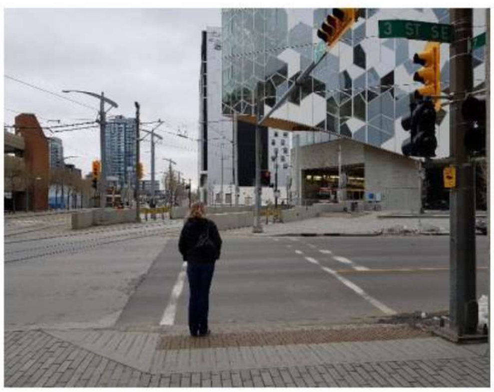
3rd St looking N - 2

SITE PHOTOS

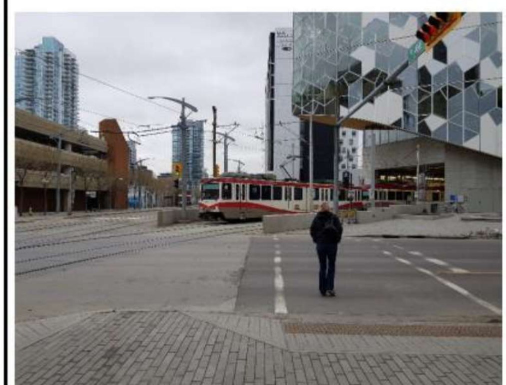
3rd St looking NE

3rd St Xwalk(N) looking W

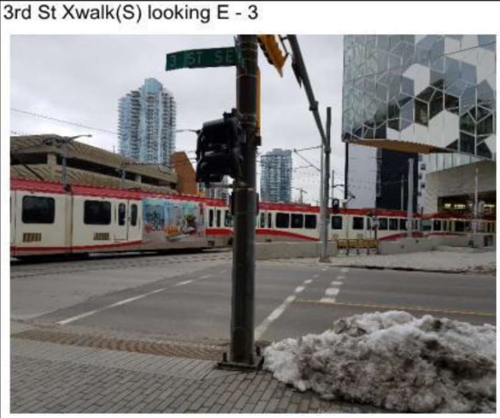
3rd St Xwalk(S) looking E



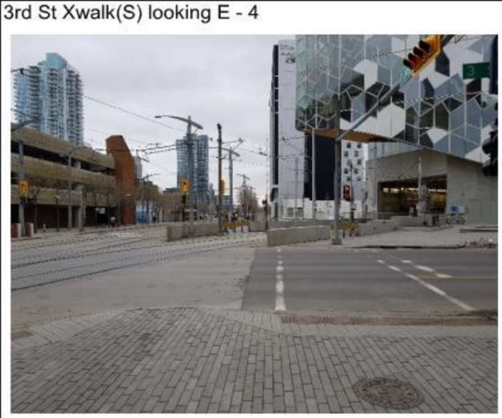
3rd St Xwalk(S) looking E - 2



3rd St Xwalk(S) looking E - 3



3rd St Xwalk(S) looking E - 4

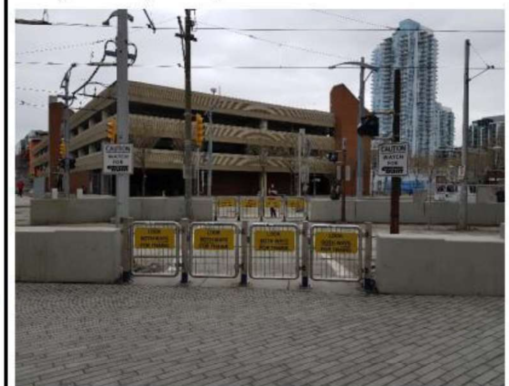


HATCH

SITE PHOTOS

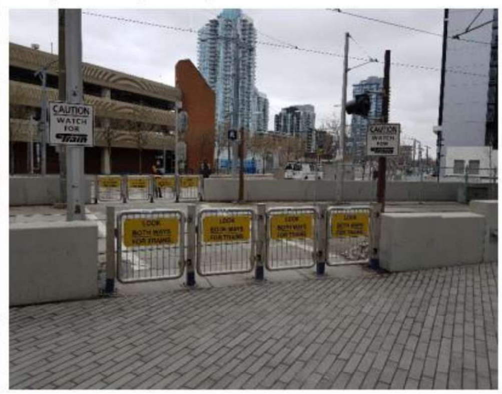
Library Ped xing looking W

Library Ped xing looking N

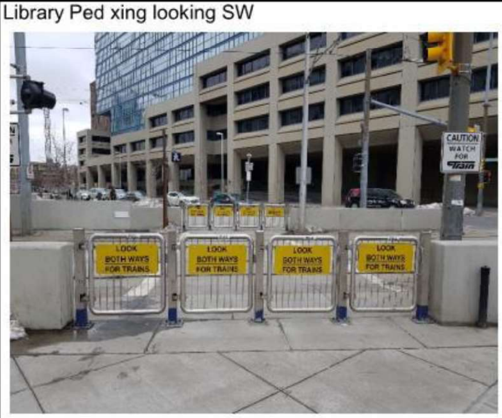


Library Ped xing looking N - 2

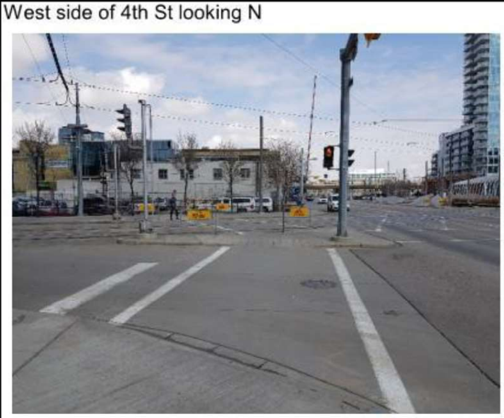
Library Ped xing looking NE



Library Ped xing looking SW



West side of 4th St looking N



Appendix B: Calgary Transit Crossing Inventory

13.

Line	Location	Crossing Type	Territory	Flashing Lights	Bells	Ped-X			Road Automatic Gate Arms	2nd Train Light and Associated Signage
						Bedsteads	Swing Gates	Automatic Gate Arms (incl. Emergency Swing Gate)		
Red Line S	3 St SE	PED-X	LRT ROW	Yes	Yes		Yes			
Red Line S	Erlton Stampede Station	PED-X	LRT ROW	Yes	Yes	Yes				
Red Line S	25 Av SE	MIXED	LRT ROW	Yes	Yes	Yes			Yes	
Red Line S	36 Av SE	MIXED	LRT ROW	Yes	Yes	Yes			Yes	
Red Line S	39 Av SE	MIXED	LRT ROW	Yes	Yes	Yes			Yes	
Red Line S	50 Av SE	MIXED	CP ROW	Yes	Yes	Yes			Yes	
Red Line S	58 Av SE	MIXED	CP ROW	Yes	Yes	Yes			Yes	
Red Line S	61 Av SE	MIXED	CP ROW	Yes	Yes	Yes			Yes	
Red Line S	Chinook Station	PED-X	LRT ROW	Yes	Yes			Yes		
Red Line S	Heritage Dr SE	MIXED	CP ROW	Yes	Yes	Yes			Yes	
Red Line S	Heritage Station	PED-X	LRT ROW	Yes	Yes	Yes				
Red Line S	Southland Station	PED-X	LRT ROW	Yes	Yes	Yes				
Red Line S	Anderson Station	PED-X	CP ROW	Yes	Yes			Yes		
Red Line S	Anderson Station Wy SE	ROAD	CP ROW	Yes	Yes				Yes	
Red Line S	Fish Creek Lacombe Station	PED-X	LRT ROW	Yes	Yes	Yes				
Red Line S	James McKevitt Rd SW	ROAD	CP ROW	Yes	Yes				Yes	
Red Line S	Shawnessy Station	PED-X	LRT ROW	Yes	Yes		Yes	Yes		
Red Line S	162 Av SW	MIXED	CP ROW	Yes	Yes	Yes			Yes	
Red Line S	Somerset Station North	PED-X	CP ROW	Yes	Yes			Yes		
Red Line S	Somerset Station South - East	PED-X	CP ROW	Yes	Yes			Yes		
Red Line S	Somerset Station South - West	PED-X	LRT ROW	Yes	Yes			Yes		

Line	Location	Crossing Type	Territory	Flashing Lights	Bells	Ped-X			Road Automatic Gate Arms	2nd Train Light and Associated Signage
						Bedsteads	Swing Gates	Automatic Gate Arms (incl. Emergency Swing Gate)		
Red Line S	Shawville Gate	MIXED	CP ROW	Yes	Yes	Yes			Yes	
Blue Line NE	7 Av/4 St SE	MIXED	LRT ROW	Yes	Yes	Yes			Yes	
Blue Line NE	6 Av SE	MIXED	LRT ROW	Yes	Yes	Yes			Yes	
Blue Line NE	Deerfoot Tr SE	ROAD	LRT ROW	Yes	Yes				Yes	
Blue Line NE	28 St. SE	MIXED	LRT ROW	Yes	Yes	Yes			Yes	
Blue Line NE	4 Av NE	ROAD	LRT ROW	Yes	Yes				Yes	
Blue Line NE	5 Av NE	MIXED	LRT ROW	Yes	Yes	Yes			Yes	
Blue Line NE	8 Av NE	MIXED	LRT ROW	Yes	Yes	Yes			Yes	
Blue Line NE	12 Av NE	MIXED	LRT ROW	Yes	Yes	Yes			Yes	
Blue Line NE	16 Av NE	ROAD	LRT ROW	Yes	Yes				Yes	
Blue Line NE	16 Av NE	ROAD	LRT ROW	Yes	Yes				Yes	
Blue Line NE	20 Av NE	MIXED	LRT ROW	Yes	Yes	Yes			Yes	
Blue Line NE	26 Av NE	MIXED	LRT ROW	Yes	Yes	Yes			Yes	
Blue Line NE	32 Av NE	MIXED	LRT ROW	Yes	Yes	Yes			Yes	
Blue Line NE	Whitehorn Station	PED-X	LRT ROW	Yes	Yes	Yes				
Blue Line NE	Whitehorn Drive	ROAD	LRT ROW	Yes	Yes				Yes	
Blue Line NE	39 Av NE	MIXED	LRT ROW	Yes	Yes	Yes			Yes	
Blue Line NE	44 Av NE	MIXED	LRT ROW	Yes	Yes	Yes			Yes	
Blue Line NE	McKnight Westwind Station	PED-X	LRT ROW	Yes	Yes		Yes			
Blue Line NE	Martindale Bv NE (south leg)	MIXED	LRT ROW	Yes	Yes		Yes		Yes	
Blue Line NE	Martindale Bv NE (north leg)	MIXED	LRT ROW	Yes	Yes			Yes	Yes	
Blue Line NE	Saddletowne Circle NE (south leg)	MIXED	LRT ROW	Yes	Yes		Yes		Yes	
Blue Line NE	Saddletowne Station South	PED-X	LRT ROW	Yes	Yes		Yes			

Line	Location	Crossing Type	Territory	Flashing Lights	Bells	Ped-X			Road Automatic Gate Arms	2nd Train Light and Associated Signage
						Bedsteads	Swing Gates	Automatic Gate Arms (incl. Emergency Swing Gate)		
Blue Line NE	Saddletowne Station North	PED-X	LRT ROW	Yes	Yes		Yes			
Blue Line NE	Saddletowne Circle NE (north leg)	MIXED	LRT ROW	Yes	Yes	Yes			Yes	
Red Line NW	7 Av SW	PED-X	In-Street Operations	Yes	Yes	Yes				
Red Line NW	6 Av SW	MIXED	In-Street Operations	Yes	No	Yes				
Red Line NW	5 Av SW	MIXED	In-Street Operations	Yes	Yes	Yes			Yes	
Red Line NW	4 Av SW	MIXED	In-Street Operations	Yes	Yes	Yes				
Red Line NW	2 Av NW	MIXED	LRT ROW	Yes	Yes	Yes			Yes	
Red Line NW	Sunnyside Station South	PED-X	LRT ROW	Yes	Yes		Yes			Yes
Red Line NW	Sunnyside Station North	PED-X	LRT ROW	Yes	Yes		Yes			Yes
Red Line NW	4 Av NW	MIXED	LRT ROW	Yes	Yes	Yes			Yes	
Red Line NW	SAIT Campus	PED-X	LRT ROW	Yes	Yes	Yes				Yes
Red Line NW	SAIT/ACA/Jubilee Station	PED-X	LRT ROW	Yes	Yes		Yes			
Red Line NW	Jubilee Cr NW	MIXED	LRT ROW	Yes	Yes	Yes			Yes	
Red Line NW	14 St NW (east leg)	MIXED	LRT ROW	Yes	Yes	Yes			Yes	
Red Line NW	14 St NW (west leg)	MIXED	LRT ROW	Yes	Yes	Yes			Yes	
Red Line NW	Lions Park Station East	PED-X	LRT ROW	Yes	Yes	Yes				

Line	Location	Crossing Type	Territory	Flashing Lights	Bells	Ped-X			Road Automatic Gate Arms	2nd Train Light and Associated Signage
						Bedsteads	Swing Gates	Automatic Gate Arms (incl. Emergency Swing Gate)		
Red Line NW	Lions Park Station West	PED-X	LRT ROW	Yes	Yes		Yes			
Red Line NW	14 Av NW	MIXED	LRT ROW	Yes	Yes	Yes			Yes	
Red Line NW	Banff Trail Station	PED-X	LRT ROW	Yes	Yes			Yes		
Blue Line W	11 St SW	MIXED	LRT ROW	Yes	Yes			Yes	Yes	
Blue Line W	26 St SW	ROAD	LRT ROW	Yes	No				Yes	
Blue Line W	Shagnappi Station	PED-X	LRT ROW	Yes	Yes			Yes		
Blue Line W	47 St SW	ROAD	LRT ROW	Yes	No				Yes	
Blue Line W	45 St SW Station (47 St SW east)	PED-X	LRT ROW	Yes	Yes			Yes		
Blue Line W	47 ST SW (west)	PED-X	LRT ROW	Yes	Yes			Yes		
Blue Line W	Sarcee Tr SW	ROAD	LRT ROW	Yes	No				Yes	
Blue Line W	Sarcee Tr Greenway (Pathway)	PED-X	LRT ROW	Yes	Yes			Yes		
Blue Line W	Sirocco Station (Costello Bv SW east)	PED-X	LRT ROW	Yes	Yes			Yes		
Blue Line W	Costello Bv SW	ROAD	LRT ROW	Yes	No				Yes	
Blue Line W	Costello Bv SW (west)	PED-X	LRT ROW	Yes	Yes			Yes		
Blue Line W	Christie Park Ga SW (east)	PED-X	LRT ROW	Yes	Yes			Yes		
Blue Line W	Christie Park Ga SW	ROAD	LRT ROW	Yes	No				Yes	
Blue Line W	Christie Park Ga SW (west)	PED-X	LRT ROW	Yes	Yes			Yes		
7 Avenue S	3 St SE	MIXED	In-Street Operations	Yes	Yes					
7 Avenue S	3 St SE	PED-X	In-Street Operations	Yes	Yes		Yes			
7 Avenue S	Macleod Tr SE	MIXED	In-Street Operations	No	No					

Line	Location	Crossing Type	Territory	Flashing Lights	Bells	Ped-X			Road Automatic Gate Arms	2nd Train Light and Associated Signage
						Bedsteads	Swing Gates	Automatic Gate Arms (incl. Emergency Swing Gate)		
7 Avenue S	1 St SE	MIXED	In-Street Operations	No	No					
7 Avenue S	Centre St S	MIXED	In-Street Operations	No	No					
7 Avenue S	1 St SW	MIXED	In-Street Operations	No	No					
7 Avenue S	2 St SW	MIXED	In-Street Operations	No	No					
7 Avenue S	3 St SW	MIXED	In-Street Operations	No	No					
7 Avenue S	4 St SW	MIXED	In-Street Operations	No	No					
7 Avenue S	5 St SW	MIXED	In-Street Operations	No	No					
7 Avenue S	6 St SW	MIXED	In-Street Operations	No	No					
7 Avenue S	7 St SW	MIXED	In-Street Operations	No	No					
7 Avenue S	8 St SW	MIXED	In-Street Operations	No	No					
7 Avenue S	9 St SW	MIXED	In-Street Operations	No	No					
7 Avenue S	10 St SW	MIXED	In-Street Operations	No	No					

Transportation Report to
SPC on Transportation and Transit
2019 June 26

ISC: UNRESTRICTED
TT2019-0684

Review of the Calgary Transit Public Safety Citizen Oversight Committee

EXECUTIVE SUMMARY

The Calgary Transit Public Safety Citizen Oversight Committee (PSCOC) was established in 2002 at the request of the Calgary Police Service as a pre-condition for Calgary Transit Special Constables (now Calgary Transit Public Safety and Enforcement Officers) to carry pepper spray and ballistic batons. The Calgary Police Service supported the application contingent upon Calgary Transit having a Citizen Oversight Committee to review completed public complaint use-of-force investigations.

Since 2002, the delivery of policing services in the Province of Alberta has undergone significant transformation, which includes the establishment of the Peace Officer Act and two corresponding regulations (2006) which operationalize the Alberta Government's Law Enforcement Framework. These new policies have established greater accountability for peace officer teams in the province.

While significant changes have occurred in relation to the delivery of law enforcement services, the mandate of the Citizen Oversight Committee has not broadened. With the committee's current mandate limited to reviewing public complaints, it has only reviewed two complaints in 2017 and three in 2018, while Calgary Transit Public Safety and Enforcement section has initiated 121 use-of-force reviews in 2017 and 146 in 2018.

The lack of public investigations is currently not using the full potential of the PSCOC. It is recommended that the committee's membership increase from three to five, with a selection of candidates with qualifications that include experience with law enforcement. In addition to this, look at expanding policy development and education around use-of-force to build resiliency and prepare for future demands of Calgary Transit Public Safety and Enforcement Officers.

ADMINISTRATION RECOMMENDATION:

That the Standing Policy Committee on Transportation & Transit recommends that Council direct Administration to:

1. Increase the number of citizen members on the Calgary Transit Public Safety Citizen Oversight Committee from three to five; and
2. Broaden the mandate of the committee to include:
    a. Oversight of employer initiated use-of-force investigations;
    b. Participation in use-of-force reviews undertaken by Calgary Transit's Officer Safety Incident Review Team; and
    c. Policy formation and educational development related to use-of-force.

PREVIOUS COUNCIL DIRECTION / POLICY

2019 February 25 Notice of Motion, Review of the Protective Services Citizen Oversight Committee Mandate C2019-0220, moved by Councillor Colley-Urquhart, seconded by Councillor Jones

That Council postpone the following to the end of 2019 March 04 Special Meeting of Council:

Review of the Calgary Transit Public Safety Citizen Oversight Committee

- 12.1.1 Review of the Protective Services Citizen Oversight Committee Mandate, C2019-0220…

Motion Carried.

2019 March 04 Special Meeting of Council, Review of the Protective Services Oversight Committee Mandate, C2019-0220. Copies of a document entitled 'Terms of Reference' were distributed with respect to Report C2019-0220.

Moved by Councillor Colley-Urquhart, seconded by Councillor Farrell, that with respect to Councillor Colley-Urquhart's proposed motion C2019-0220, the following by adopted:

NOW THEREFORE BE IT RESOLVED that Council direct Administration to consult with key stakeholders including Members of Council, and to:

a. Examine best practices on public transit governance oversight models;
b. Review the current Terms of Reference – including but not limited to citizen membership (skills and attributes required), citizen appeal mechanisms and reporting to Council.

Report back to Council through the SPC on Transportation and Transit Committee no later than June 2019 so that required changes can be reflected in advertising for Council appointments in October 2019.

BACKGROUND

The creation of a Calgary Transit Public Safety Citizen Oversight Committee (formerly Protective Services Citizen Oversight Committee) stemmed from an application made by Calgary Transit in 2002 to equip Peace Officers with oleoresin capsicum 'pepper' spray and batons. The Calgary Police Service supported the application contingent upon Calgary Transit having a citizen lead oversight committee to review completed public complaint use of force investigations.

Any person may, in accordance with the regulations, make a complaint in writing regarding a peace officer to the peace officer's authorized employer. Complaints against Calgary Transit Public Safety and Enforcement Officers are investigated by the Professional Standards Inspector with the Public Safety and Enforcement Peace Officer division. Once the Professional Standards Inspector concludes their investigation, and appropriate action has been taken, the report and recommendations are provided to the Calgary Transit Public Safety Citizen Oversight Committee (PSCOC).

The purpose of the committee set out in the Terms of Reference (Attachment 1) is to act as an objective body by reviewing all public use-of-force complaints after the investigation concludes to ensure that the investigation was conducted in a proper and professional manner. In addition, to ensure that the investigation aligns with the requirements of the Peace Officer Act, the Peace Officer Regulation and the Peace Officer (Ministerial) Regulation.

The committee consists of three citizen members and one use-of-force instructor (an advisory role, non-voting) and based on workload, is scheduled to meet on a quarterly basis. Upon receipt of the investigative results regarding the complaint, the committee will evaluate the process to determine if further investigation is required, the policy was adhered to, appropriate force was used, the force was justified, and recommended follow-up such as:

- Further investigation by CPS of possible criminal charges;
- Advise the Justice Department that they may have to investigate;
- Advise the Law Department of possible litigation, if they have not already been briefed; and
- Suggest training and policy revisions that may be necessary.

Calgary Transit regards the role as an important means for ensuring transparency, accountability and building public trust. The level of public trust translates into greater user compliance and encourages new ridership based on elevated perceptions of safety.

INVESTIGATION: ALTERNATIVES AND ANALYSIS

Since the inception of the Calgary Transit Public Safety Citizen Oversight Committee (PSCOC), the delivery of policing services in the Province of Alberta has undergone significant transformation, which includes the establishment of the Peace Officer Act in 2006 and two corresponding regulations, which provides the governance for the investigation of complaints.

The establishment of a new model of community policing described as the Law Enforcement Framework of Alberta in 2011 has broadened the scope whereby Peace Officers are reviewed and created a higher accountability that peace officers are now held to.

As Calgary Transit's peace officer program has grown from 32 personnel in 2002 to102 in 2019, there has been a significant increase in the volume of peace officer-citizen contacts. The expansion of authority through the Peace Officer Act and volume of contacts with citizens has resulted in the increased incidences of use-of-force, most of which fall outside the scope of review in the current mandate of the PSCOC. Currently it only reviews public initiated complaints under Section 14 of the Peace Officer Act, while there has been an increase of employer initiated use-of-force investigations, under Section 16. (Attachment 3)

The number of public use-of-force complaints made in relation to Calgary Transit peace officers is very low making it difficult for the PSCOC to develop a working body of knowledge and frame of analysis to exercise the oversight role.

While there are very few public complaints falling within the scope of review of the PSCOC, there is an opportunity for the PSCOC to participate in file reviews conducted by the Officer Safety Incident Review Team (OSIRT), an internal group within the Calgary Transit Public Safety and Enforcement. This team conducts peer reviews related to elevated use-of-force incidents with the goal of reducing use-of-force incidents overall and the associated injuries to both peace officers and citizens. In addition to being a participant in OSIRT, PSCOC members would be involved in monitoring recommendations from Fatality Inquiries or independent reports including the Use of Force Review, that Hon Chief Justice Wittmann, QC conducted for the Calgary Police Service.

While there is no statutory requirement to maintain a citizen oversight committee, having one serves the public's interest in accountability, transparency and legitimacy of the people entrusted with maintaining the safety of the transit system. The following recommendations support these principles:

- Membership of the committee be increased to five members from three. This will facilitate the creation of sub-committees including a review of force committee, an audit committee to monitor use-of-force recommendations made by fatality inquiries and court rulings;
- Selection of candidates to include qualifications such as having a good understanding of governance and oversight, the role of law enforcement in modern society, the challenges faced by law enforcement, and how to oversee a law enforcement body;
- The work of the committees includes participation in the Officer Safety Incident Review Team which reviews over 150 use-of-force incidents per year and meets monthly; and
- Broaden the current file review mandate to include files that have made their way into the public domain, typically through social media, and other means.

Stakeholder Engagement, Research and Communication

The following agencies were consulted in preparation of this report:

- Calgary Community Standards
- Provincial Public Security Peace Officer Program
- Calgary Legal Guidance
- Calgary Police Service
- Calgary Police Commission
- Citizen Oversight Committee
- Alberta Serious Incident Response Team

A survey was sent to all major transit public safety enforcement agencies across Canada to benchmark governance structures in other jurisdictions. Apart from BC Transit Police where there is a statutory requirement for a police board/commission, in the rest of the country, oversight and governance of transit law enforcement authorities is generally through the employer and accountability to the local police agency.

Strategic Alignment

Maintaining and supporting a Public Safety Citizen Oversight Committee (PSCOC) is a critical component of citizen engagement and allows community members input in how to make Calgary Transit safer for customers, peace officers and all transit users, particularly vulnerable users who are often in conflict with the law. Expansion of the role and mandate of the committee corresponds with Calgary Transit’s Customer Commitment for providing safe and informative transit service and also aligns with RouteAhead direction to ensure Calgary Transit continues to be safe and secure.

Exposing the committee to use-of-force incidents reviewed by the Officer Safety Review Team (OSRT) will broaden the PSCOC awareness and understanding of conditions faced by peace officers daily which will enable prescriptive work in areas of peace officer mental health. This aligns with recent developments in provincial Occupational Health and Safety legislation, namely ‘psychological safety’. Finally, a broadened mandate for the PSCOC aligns with citizen requirements for municipal government transparency and accountability.

Transportation Report to
SPC on Transportation and Transit
2019 June 26

ISC: UNRESTRICTED
TT2019-0684

Review of the Calgary Transit Public Safety Citizen Oversight Committee

Social, Environmental, Economic (External)

Expanding the role of the Public Safety Citizen Oversight Committee, there is a social return on investment (SROI) by creating access to a broader range of use-of-force files serves the ongoing needs of Calgarian's for transparency and accountability in government. Broadly, the community consents to having their safety and security needs addressed by peace officers.

Public trust assumes peace officer authority, including critical authorities such as the power of arrest and authority to use force will be exercised judiciously and professionally. When trust and confidence are high, transit user's compliance for laws and policies are generally easier to achieve. In addition, the community of transit riders assumes some ownership for a safe transit system as well.

Financial Capacity

Current and Future Operating Budget:

Broadening the mandate of the committee will require some reorganization of administrative tasks and increased capacity within the Calgary Transit Public Safety and Enforcement division to manage increased demands from the Public Safety Citizen Oversight Committee as well as potential for training opportunities of committee members. Additional costs can be covered by the current operating budget. Current and Future Capital Budget:

No impact to capital budget.

Risk Assessment

Expanding the role of the committee results in increased complexity and a change management strategy will be required to ensure the effort is clearly understood by key partners including Calgary Community Standards, the Calgary Police Service and the Provincial Public Security Peace Officer Program. It is vitally important to build acceptance with these partners which legitimizes the role of the Public Safety Citizen Oversight Committee.

REASON(S) FOR RECOMMENDATION(S): That as the model of public safety and law enforcement evolves, new demands will be placed on Calgary Transit and the role of its peace officers. These recommendations prepare a foundation for ongoing evolution and professionalization of Calgary Transit Peace officers and ultimately a high level of customer focused services.

ATTACHMENT(S)

1. Attachment 1 – C2019-0220 Notice of Motion
2. Attachment 2 – Terms of Reference
3. Attachment 3 – Public and Employer Initiated Investigations

TT2019-0684
ATTACHMENT 1

Report Number: C2019-0220

Meeting: Combined Meeting of Council

Meeting Date: 2019 February 25

NOTICE OF MOTION

RE: REVIEW OF THE PROTECTIVE SERVICES CITIZEN OVERSIGHT COMMITTEE MANDATE

Sponsoring Councillor: COUNCILLOR COLLEY-URQUHART

WHEREAS the Protective Services Citizen Oversight Committee was established in 2002 at the request of the Calgary Police Service as a pre-condition for Calgary Transit Special Constables (now Calgary Transit Public Safety and Enforcement Officers) to carry pepper spray and ballistic baton;

AND WHEREAS the mandate of the Protective Services Oversight Committee is to oversee the disposition of public complaints regarding the use of pepper spray and baton involving Calgary Transit PSE Officers;

AND WHEREAS the Peace Officer Act was proclaimed in 2006, repealing the *Special Constable Regulation* (Alberta) and establishing a new model of community policing described as the Law Enforcement Framework of Alberta and stewarded by the Ministry of Justice and Solicitor General of Alberta;

AND WHEREAS developments in the evolution of community safety have seen the complement of Calgary Transit's Peace Officers grow from 32 Peace Officers in 2002 to 102 in 2019. This has been accompanied by increased legal authorities in critical areas such as powers of arrest and detention, investigations, and community outreach;

AND WHEREAS the Peace Officer Act has established a Provincial oversight framework for Peace Officer Use-of-Force; however, citizen involvement in the review of Peace Officer use-of-force is not a statutory requirement;

AND WHEREAS the current membership of the committee is comprised of three community members and one member of administration who is the ex-officio use-of-force advisor to the committee;

AND WHEREAS the Committee has met six times since 2016 to review public complaints and their dispositions in relation to Peace Officer use-of-force incidents;

AND WHEREAS transparency of peace officer enforcement is only a key component of good governance and a broader range of citizen inputs in the roles, authorities and responsibilities of Calgary Transit Peace Officers is critical for public trust.

NOW THEREFORE BE IT RESOLVED that Council direct Administration to consult with key stakeholders including Members of Council, and to:

a) Examine best practices on public transit governance oversight models;
b) Review the current Terms of Reference – including but not limited to citizen membership (skills and attributes required), citizen appeal mechanisms and reporting to Council.

Report back to Council through the SPC on Transportation and Transit Committee no later than June 2019 so that required changes can be reflected in advertising for Council appointments in October 2019.

CALGARY TRANSIT PUBLIC SAFETY CITIZEN OVERSIGHT COMMITTEE

TERMS OF REFERENCE

BODY	Calgary Transit Public Safety Citizen Oversight Committee
TERMS OF REFERENCE	The purpose of this committee is to perform an evaluation on all use of force complaints, after the conclusion of the investigation. Essentially, the committee operates as an objective body; to ensure that the investigation was conducted in a proper and professional fashion and that it satisfies all requirements of the Police Act, the Special Constable regulations and the Protective Services policy and mandate. The following points form the basis for this committee
COMPOSITION	• The Committee will consist of three volunteer members of the public. • A Use of Force instructor will sit in an advisory role to provide any necessary technical knowledge on use of force issues. • Committee members are screened on the basis of security checks and previous qualifications. Previous knowledge of law enforcement is not considered relevant in the selection process. • Once selected, committee members are required to swear an oath, pursuant to Schedule Two of the Police Act and serve on the committee for up to a three-year period. • Upon conclusion of their three-year term, a committee member can apply to extend their appointment beyond their current term. • Committee members will receive training in use of force issues, such as the use of force continuum and its practical application. Upon receipt of the investigative results regarding the complaint, the committee will evaluate the process to determine: 1. If further investigation is required 2. Policy was adhered to 3. Appropriate force was used 4. The force was justified 5. Recommend follow-up, such as:

CALGARY TRANSIT PUBLIC SAFETY CITIZEN OVERSIGHT COMMITTEE

TERMS OF REFERENCE

- further investigation by CPS of possible criminal charges;
- advise the Justice Department that they may have to investigate;
- advise the Law Department of possible litigation, if they have not already been briefed;
- suggest training and policy revisions that may be necessary.

TERM

- Staggered terms; one appointee for one year, one appointee for two years and one appointee for three years for the initial term, and for three (3) year terms thereafter.
- A public member may serve a maximum of six consecutive years.
- Despite the above, a public member may serve until his or her successor is appointed. The service of a member beyond the appointed term shall not count toward the limit on the length of service set out above if the additional service is half the term or less.
- When an appointment is made to fill a public member vacancy:
  - If the balance of the term to be served is half the term or less, that service shall not count toward the limit on the length of service; and
  - If the balance of the term to be served is more than half the term, that service shall count toward the limit on the length of service.
- A public member may serve more than six consecutive years by a two-thirds vote of Council.

REPORTS TO General Manager, Calgary Transit

Adopted	*2001 June 04*	*CPS2001-30*
Amended	*2017 May 08*	*PFC2017-0312*

Calgary Transit Public Safety Citizen Oversight Committee Complaint Investigations

<u>Public Initiated Investigations (Section 14 of Peace Officer Act (Alberta)</u>

**Under the current mandate of the Public Safety Citizen Oversight Committee*

Table 1 - Disposition of 2017 Public Complaint Investigations (Section 14 Peace Officer Act)

Allegation Type	Founded	Unfounded	Unsubstantiated	Informally Resolved	Ongoing	Total
Conduct	0	0	1	0	0	1
Excessive Force	1	0		0	0	1
Total	1	0	1	0	0	2

Table 2 - Disposition of 2018 Public Complaint Investigations (Section 14 Peace Officer Act)

Allegation Type	Founded	Unfounded	Unsubstantiated	Informally Resolved	Ongoing	Total
Conduct	1	0	0	1	1	3
Excessive Force	0	0	0	0	0	0
Total	1	0	0	1	1	3

Calgary Transit Public Safety Citizen Oversight Committee Complaint Investigations

Employer Initiated Investigations (Section 16 of Peace Officer Act (Alberta)

**Not currently under the current mandate of the Public Safety Citizen Oversight Committee*

Type of Report	2017	2018
Incident Report sent to the Alberta Public Security Peace Officer Program	3- Pepper spray deployments 3- Baton deployments 2- Sensitive incidents (Peace Officer drug exposure and near in-custody death)	7- Pepper spray deployments 1- In-custody death
Use-of-force incidents sent to CPS for criminal investigation	0	3- Including an in-custody death
Files reviewed by the Officer Safety Incident Review Team (OSIRT)	121	146
Section 14 Peace Officer Act (Alberta) files reviewed by the Calgary Police Public Safety Citizen Oversight Committee (PSCOC)	1- Employer-initiated use of force investigation	1
Total	130	158

Transportation Report to
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Green Line Q2 2019 Update

EXECUTIVE SUMMARY

The purpose of this report is to update Council on the status of the Green Line LRT project for the period of 2019 Q2. The key focus areas that will be highlighted in this report include a technical update on the single bore tunnel design development plan and a commercial focus area update on budget, schedule and contract strategy.

Given Calgary's current economic situation and based on market feedback, Administration continues to evaluate the projects readiness for procurement, the acceptable risk tolerance and the need to responsibly manage the projects delivery in order to deliver Stage 1 within budget and on schedule. The Q2 quarterly report addresses how Administration has been responding to the identified project risks with the objective of delivering the highest value for Calgarians that meets the commitment of the projects vision.

New and emerging items have also been reflected in this report, as significant work has begun in the Leadership, Governance, and Commercial focus areas of the project. These have been highlighted in the "notable deliverables" section of the report. These items are not scheduled to be completed until Q3, however are noted at this time as it underscores the culture shift that is occurring within the Green Line as we strengthen our relationship with our Executive Steering Committee, project team, partners, and external advisors. A more fulsome report on these initiatives will be provided in the 2019 Q3 Green Line Update Report.

ADMINISTRATION RECOMMENDATION:

That the Standing Policy Committee on Transportation & Transit Committee recommend that Council:

Direct Administration to return with a status Report no later than Q3 2019.

PREVIOUS COUNCIL DIRECTION / POLICY

At the 2019 April 29 Combined Meeting of Council, Report TT2019-0229 (Green Line Public Gardens Report) was approved on as urgent business and the following was adopted:

That Council:

"Direct Administration to report back to the SPC on Transportation and Transit no later than Q4 2019 with a workplan including scope, cost, resources, funding source, engagement and delivery strategy for the Public Gardens Master Planning work and the development of six Public Garden Projects."

At the 2019 April 08 Combined Meeting of Council, Report TT2019-0245 (Green Line Q1 Update) was received for information.

At the 2019 April 08 Combined Meeting of Council, Report AC2019-0353 (Green Line Project Governance Audit) was received for information.

Green Line Q2 2019 Update

BACKGROUND

At the 2019 March 20 SPC on Transportation and Transit, Administration presented the cadence and flow of the Green Line quarterly reports to include the following:

- **Project Progress Report Card** is a summary on the status of the five key project focus areas: leadership, governance, commercial, stakeholder and technical areas of the project (Attachment 1).
- **Project Risk Assessment** is a high-level project risk registry with highlighted risks and associated mitigation plans (Attachment 2).
- **Project Expenditures** is the financial activity for the project
- **Project Timeline** is a timeline chart presenting our current state and upcoming milestones for 2019 (Attachment 3).
- **Key Project Focus Area Update** is an update and activity report on one or more of the five key focus areas: leadership, governance, commercial, stakeholder and technical

The 2019 quarterly reports scheduled to be presented to the SPC on Transportation and Transit are as follows:

	2019 Q1 March 20	2019 Q2 June 26	2019 Q3 September 18	2019 Q4 December 18
Status Update	• Project Progress Report Card • Risk Registry • Project Timeline	• Project Progress Report Card • Risk Registry • Project Timeline	• Project Progress Report Card • Risk Registry • Project Timeline	• Project Progress Report Card • Risk Registry • Project Timeline
Key Project Focus Area Update	• Technical Focus Area Update: Single Bore Design Development Plan • Future Stages Analysis	• Technical Focus Area Update: Preliminary Outcomes from the Single Bore Design Development Plan • Commercial Focus Area Update: Budget and Schedule and Contract Strategy	• Technical Focus Area Update: VE/CR Outcomes • Stakeholder Focus Area Update: Taking Care of our Communities and Businesses	• Combined 2019 Q4 and Green Line Annual Report

Green Line Q2 2019 Update

INVESTIGATION: ALTERNATIVES AND ANALYSIS

The 2019 Q2 Green Line LRT Quarterly Progress Report Card (Attachment 1) provides an overview of the key deliverables that have been achieved and those upcoming to be presented in the next progress report.

Some of the notable deliverables achieved to date and of upcoming deliverables are identified below:

Notable Q2 deliverables achieved:

- ✓ 2019 Q2 – Recruitment of Green Line Managing Director complete and on boarding commencement;
- ✓ 2019 Q2 – Development of Green Line Project Charter (vision, mission and values) in partnership with the Executive Steering Committee, and external consultants Blakes/Hatch/KPMG/
- ✓ 2019 Q2 – Roll-out of project organization structure with defined roles and responsibilities;
- ✓ 2019 Q2 – Project Governance Terms of Reference for the Executive Steering Committee, Senior Management Team Committee and the Technical and Risk Committee drafted;
- ✓ 2019 Q2 – Completed the design and analysis of the Single Bore Tunnel;
- ✓ 2019 Q2 – Evaluated and established the projects risk tolerance;
- ✓ 2019 Q2 – Evaluated the procurement strategy based on market feedback.

Q3 look ahead - upcoming key deliverables:

- ✓ 2019 Q3 – Engage with stakeholders on findings from scope re-evaluation;
- ✓ 2019 Q3 – Finalize and implement key foundational leadership / governance documentation (e.g. Project Charter, Project Management Plan);
- ✓ 2019 Q3 – Monitor and revise the integrated schedule based on design and procurement development;
- ✓ 2019 Q3 – Perform a skills assessment including finding efficiencies and maximizing existing resources and develop a staffing plan and a recruitment strategy to support the Project’s organizational design;
- ✓ 2019 Q3 – Operationalize the Technical and Risk Committee;
- ✓ 2019 Q3 – Develop the execution plan and management processes / procedures to support stakeholder engagement and communications;

For this 2019 Q2 report, there are two key focus area updates provided:

- Technical Update on the Single Bore Tunnel Design Development Plan
- Commercial Update on Budget, Schedule, and Contract Strategy

Key Project Focus Area Update:

Technical Update on the Single Bore Tunnel Design Development Plan

Administration has completed an update of the single bore tunnel design and has optimized the scope of the twin bore tunnel design to be comparable to the single bore. The purpose was to allow for a reasonable comparison between the single bore and twin bore design solutions. This work provided a consistent scope between the two options to provide an operable, reliable and maintainable light rail system that meets ridership, runtime and reliability objectives.

The tunnel was evaluated through constructability, value engineering, optimization of the design, identification and mitigation of risks to ensure optimum value and long-term operations. The Green Line team will be engaging with stakeholders in Q3 to share the results of the scope and evaluation.

Calgary is in a different economic time and Administration is undertaking a rigorous review of all risks, scope, constructability, and the contracting strategy to ensure we are building a project that meets the needs of Calgarians, this means being prudent financial managers and making sure we get the best value out of every dollar spent. Green Line has entered the execution phase of the project The City is evaluating the project to ensure it still meets the expectations of Calgarians today.

While changes to infrastructure may be required, administration will ensure that the Green Line project vision is maintained.

Green Line is selecting a Technical and Risk Committee comprised external industry project specialists in the areas of procurement, commercial strategies, stakeholder management, design, and tunnel construction, to support project oversight. This committee will provide insights from leading practices and advise on key technical considerations and risks.

Commercial Focus Area Update on Cost Estimates, Schedule and Contract Strategy

Significant work continues on evaluating cost estimates and scheduling in parallel with the various technical design options. Administration maintains its due diligence to ensure prudent financial management ensuring the best value to Calgarians while maintaining the vision.

Evaluation of the contract strategy is ongoing. A current scan of the construction market indicates a lack of capacity in the market for large procurement options. Other mega projects across the country have experienced significant challenges indicating that the sizes of the procurement packages impact the attractiveness for bidding and must be considered.

Stakeholder Engagement, Research and Communication

Over the last quarter engagement has been ongoing with businesses and residences impacted by current and anticipated Enabling Works projects. Communication has comprised of electronic formats, mailed letters, face-to-face meetings and facilitated meetings. Additionally, updates were made to the online Green Line map to enhance usability and an overall review of the website's functionality was initiated.

Engagement included an open house in Ramsay (over 90 participants) that focused on construction impacts in the community this summer. The event was coordinated with our internal partners, the Inglewood/Ramsay coordination team, Inglewood Sanitary Trunk and 9 Avenue S.E. Bridge Replacement and external partners, Enmax and Canadian Pacific Rail. Residents in the area responded well to comprehensive construction zone maps presented.

The Green Line Stakeholder Relations team has been implementing its' mandate to help stakeholders prepare for and manage the potential impact of Green Line LRT construction, with a focus on the current enabling works and utility projects in the communities of Ramsay, Highfield, Ogden, and Beltline. The team has been focused on supporting stakeholders most impacted by construction (e.g. one-on-one small interactions, small group meetings, community public information session), implementing construction access management plans and coordinating construction efforts between the various third-party utility providers who are performing work on behalf of Green Line.

Strategic Alignment

Social, Environmental, Economic (External)

The project aligns with social, environmental and economic priorities of The City and the priorities of the provincial and federal governments. Green Line will improve Calgarians' quality of life by providing people with options on how to move, work, live, and play, and allows more affordable access to essential community services and programs.

The Green Line Project is tasked with achieving/meeting City of Calgary, and federal and provincial funding partner requirements that include: climate resilience reporting; environmental assessments; First Nations consultation; application of the Envision management system; and the provision of technical environmental requirements and guidelines to satisfy the procurement process. To meet funding partner requirements Green Line will be intentionally procuring goods and services to achieve overarching social, environmental, and economic goals while maximizing value in the purchases.

Calgary is in a different economic time and we need to do our due diligence to ensure we are building a project that meets the needs of Calgarians, this means being prudent financial managers and making sure we get the best value out of every dollar spent. Stage 1 of the Green Line will stimulate the local economy creating thousands of jobs during and after construction. The City is committed to working with local industry in a competitive procurement process that provides the highest opportunity to create jobs within our talented local workforce

The Green Line is providing stimulus to the economy by contributing $390 million in spending to date. Construction of Stage 1 of the project will provide 20,000 direct and indirect jobs. Additionally, the land areas around stations in Stage1 of the project are expected to experience property value uplift of $1.92 billion by 2046 as determined by an economic analysis completed in 2016/2017.

Financial Capacity

Current and Future Operating Budget:

There is no impact to the operating budget from this report.

Future operating budget impacts includes the following:

On 2017 May 15, and 2017 November 27, a preliminary estimate was provided to Council on the estimated annual incremental operating and maintenance costs for the Stage 1 project. This $40 million per year estimate, in 2016 dollars, continues to be supported following the completion of the constructability review and further technical reviews.

This estimate is dependent on several factors and will be further refined once the major construction contract has been awarded and the construction schedule is set. The operating and maintenance costs are currently not funded and an ongoing funding source will need to be in place prior to the start of operations. This will be reviewed during the current One Calgary cycle with refinements and updates to be finalized in the next business and budget cycle (2023 to 2026).

Current and Future Capital Budget:

Twenty-five million in funding was originally allocated to the Green Line SetWay in 2014. As the project evolved, $520 million of capital funding was approved for the Stage 1 project as part of the Action Plan business plan and budget cycle. This represented 10 years of City funding at $52 million per year from 2015 to 2025. Extension of this funding for 30 years was approved in principle in December 2015 (NM2015-33).

The Project has also received funding for its enabling works projects that are related to preparing the right-of-way for the Stage 1 major construction. The enabling works budget is $360.6 million and is provided by separate grants from the two orders of government (Federal Public Transit Infrastructure Fund (PTIF) = $111 million, provincial 50% PTIF match = $55.5 million, provincial GreenTRIP = $92.4 million) with the City's matching portion of $101.7 million for each grant contributed from the Action Plan allocation above.

Final Stage 1 funding has been secured through the signing of the Ultimate Recipient Agreement in January 2019.

Risk Assessment

All mega projects experience risk and to assist in mitigating this risk, Green Line is selecting a Technical and Risk Committee comprised of external industry project specialists in the areas of procurement, commercial strategies, stakeholder management, design, and construction, to support project oversight. This committee will provide insights from leading practices and advise on key technical considerations and risks.

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In addition, with the support of KPMG, Administration is currently developing a comprehensive Risk Management Plan that will be the basis to establish risk management standards, procedures and daily practices, as well as a "risk aware" culture for the Green Line project.

As part of developing the Risk Management Plan, the existing Green Line Risk Registry (Attachment 2) is being assessed to ensure that it is appropriately structured, populated, managed and used.

REASON(S) FOR RECOMMENDATION(S):

ATTACHMENT(S)

1. Attachment 1 – 2019 Q2 Green Line LRT Quarterly Progress Report Card
2. Attachment 2 – 2019 Q2 Green Line Risk Registry
3. Attachment 3 – 2019 Q2 Green Line LRT Project Timeline

Calgary

Green Line LRT Quarterly Progress Report Card

Colour Ratings: Controlled | Needs attention | Requires immediate attention

Five Focus Areas	Q4 2018 (Oct–Dec) Key Deliverables	Q1 2019 (Jan–March) Key Deliverables	Q2 2019 (April–June) Key Deliverables	Q3 2019 (July–Sept) Key Deliverables	Q4 2019 (Oct–Dec) Key Deliverables
Leadership • Vision, mission and values • Organizational culture • Capability, capacity and competence • Management of Change • Communications • Soft Controls	☑ Posted position for GL Managing Director ☑ Established the Vision and Mission ☑ Established Project Team ground rules ☑ Completed first series of Change Management sessions	☑ Interviewed candidates for GL Managing Director position ☑ Ongoing Change Management program	☑ Onboarding of new GL Managing Director ☑ Ongoing Change Management program ☐ Finalize Project Management Plan	☐ Finalize and implement the Project Management Plan ☐ Conduct a Project skills assessment ☐ Develop staffing plan and recruitment strategy	
Governance • Oversight • Decision, Authority & Escalation Protocols • Organizational Design (and Roles & Responsibilities) • Reporting/Line of Sight • Performance Management	☑ Developed process to evaluate governance and reporting	☑ Completed review of organizational structure and team skills assessment ☑ Governance review ☑ Developed an escalation and decision-making framework ☑ Developed Project Report Card and overall Project Gap Analysis tool	☑ Organize Project Team ☑ Development of project Quarterly Status Report ☑ Project Governance and Terms of Reference agreed	☐ Finalize and implement Project-level governance controls (e.g. delegation of authority, escalation protocols) ☐ Finalize and implement Project Charter ☐ Operationalize Technical and Risk Committee	
Commercial • Contract Strategy • Contract Development • Supply Chain & Markets • Risk Management • Finance & Funding	☑ Developed the contracting strategy ☑ Developed a Risk Management Plan	☑ Finalized agreements between The City and Canadian Pacific ☑ Ultimate Recipient Agreement signed ☑ RFQ for LRV released ☑ Finalized industry notification of Enmax Power Services Corporation	☑ Finalize supplemental contracts strategy ☑ Project risk strategy defined ☐ Finalization of comprehensive Risk Management Plan ☐ Release main contract RFQ	☐ Finalization of comprehensive Risk Management Plan ☐ Develop functional inputs to Project Agreement – including key commercial terms ☐ Request for Proposals for Utility Contract Manager released, closed and awarded ☐ Identify and onboard Constructability Advisors	
Stakeholder • Government Relations • Indigenous Relations • Community/Public Engagement • Internal Stakeholders	☑ Held meetings with Indigenous groups/ communities ☑ Enabling Works engagement ☑ Developed a Market Research Project	☑ Community Stakeholder engagement and communication ☑ Developed draft internal and external Communications Plan ☑ Design Talks partnership for an International Ideas competition ☑ Presentation to Calgary Construction Association	☐ Development of Global Indigenous Plan	☐ Develop Project stakeholder management plans ☐ Coordinate support from corporate functions	
Technical • Engineering & Construction Management • Properties Management • Budget • Schedule • Project Controls • Technology Systems & Processes • Environmental, Safety, Regulatory, Quality, & Compliance	☑ Developed a Project Execution Plan ☑ Enabling Works: 78 Avenue, CN/Highfield, utility relocations ☑ Approved City Shaping Implementation Strategy ☑ TOD Symposium	☑ Single-Bore Tunnel Analysis Underway ☑ Adoption of the Envision Sustainability Management System ☑ Development of an Integrated Schedule ☑ Railway Gardens Notice of Motion Explorative Informal Steering Committee Meetings ☑ TOD Implementation Strategy development	☑ Finalize the Single Bore Tunnel Design Analysis ☑ Finalization of Project Controls strategy	☐ Finalize scope re-evaluation ☐ Develop an integrated Project schedule ☐ Develop Project Controls plans and processes ☐ Develop Project information and systems strategy ☐ Develop and implement required technical management plans	

2019 Q2 Green Line Risk Registry

Low	Willing to accept and monitor these risks since they have low likelihood of occurrence with minor consequences.
Medium	Recognizes these risks will probably occur and will have moderate consequences. Management will monitor and manage risks by implementing contingency plans to reduce the likelihood and impact of their occurrence.
High	Recognizes these risks are top priorities of critical importance to the organization. Management is spending more effort to manage and monitor these risks by implementing risk mitigation strategies to reduce the likelihood and impact of their occurrence.

Risk Category	#	Potential Risk Identified	Risk Rating 6/19/2019	Mitigation	Risk Rating 3/20/2019
Financial	F2	Final project will be delivered over budget.	**Medium**	Establish cost estimation, procurement, and cost control protocol to ensure budget is controlled. Retain Technical & Risk Committee to support early indicators of risk. Lower risk tolerance to ensure budget available to mitigate risks and to strengthen budget.	**Medium**
Technical	T3	Geotechnical ground conditions must be investigated using specific methodology based on single or twin bore.	**High**	A safety and technical risk assessment will be conducted with contractor and City BU's including experienced GL management.	**High**
	T5	Tunneling under the Bow River and below/through downtown infrastructure has not been performed to this scale ever before in the City of Calgary.	**High**	Collaborative safety and technical risk assessment with contractor and City BU's including experienced GL management, fire department and EMO.	**High**
Construction	C1	Significant disruption to traffic, businesses, and communities during construction.	**High**	Ensure that specifications clearly outline acceptable traffic impacts. Develop Taking Care of Business strategy.	**High**
Legal	L3	Clarity concerning corporate risk tolerance, including bid response methodology and bid thresholds.	**Medium**	Proceed with the following steps: 1) Set risk tolerance (P-score) and budget, and design to it 2) Bring closure to the design exercise and be clear about the findings (estimate at set risk tolerance, define budget ceiling, with the set risk tolerance, at what estimate are we willing to go to market, and let the market decide) 3) Define response thresholds to total bid, either under or over budget ceiling. - Set decision making responsibility at appropriate levels within the organization to account for degree of risk (e.g., GL BU, Executive Steering Committee).	**Medium**
Procurement	P1	Scale of procurement contract minimizes meaningful competition from the construction market.	**Medium**	Market sounding and industry feedback coupled with procurement analysis to validate scale and risk transfer of specific procurement.	**Medium**
	P2	Protracted procurement process that frustrates the market and increases cost.	**Medium**	Maintain consistency with recent procurement timelines and market sensitivities to contract negotiations.	**Medium**
	P3	Selection of Downtown Tunnel Construction Method causes delay in RFQ/RFP.	**Medium**	Design specific evaluation criteria that sufficiently balances operational costs post construction to augment potential capital cost savings to assist in a balanced evaluation of either option if we go to market as non-decided. Design contractual language that minimizes specified tunneling technology integration with the documents.	**Medium**
Access/Real Estate	A5	Negotiations unable to move forward in light of the constructability review and tunnel method decision in the Centre City.	**High**	Seek opportunity to advance with an agnostic approach to meet needs for tunnel bore options and consider alternative construction methods. Working with technical team to finalize design through the city center and confirm property requirements. Developing an acquisition strategy to address the city center and allow transactions to advance as early as possible.	**High**
Environmental/ Permitting	E1	Risk that CEA project description for the MSF triggers determination of federal EA required.	**High**	Early engagement with CEA to understand requirements; Maintain up-to-date information on CEA requirements; Proper planning and execution of permit requirements will help to mitigate schedule delays.	**High**
	E2	Timelines to receive regulatory approvals through DFO, Transport Canada, Public Lands, and Water Act exceed expected timelines (as outlined in PLA matrix).	**Medium**	Pre discussions with regulatory bodies. Discussions to be documented and put into data room. Listing of known regulatory requirements in TPR. Participate in City of Calgary corporate capital project priority process with Alberta Environment and Parks (coordinated effort to not overburden regulatory bodies with requests).	**Medium**
Safety	S1	The magnitude of the project will require a fast pace of construction integrated within several public communities carrying on with their daily routines. This inherently increases public exposure to construction hazards.	**Medium**	GL SMT and supporting resources to collaboratively participate in the development of all aspects of safety in each of the respective areas to address stakeholder interaction with planned construction activities; and, participate in construction safety inspections to ensure public is aware of and following safety mitigative measures.	**Medium**
	S2	Pedestrians accessing stations at locations other than pedestrian crosswalks provided.	**High**	Public awareness with Community Relations group. Prime Contractors fencing and signing sites, as well as, situation awareness for trespassers.	**High**
HR	H1	The majority of City personnel are not experienced in mega project delivery and construction which will present a steep learning curve to deliver successfully.	**Medium**	Ensure Managing Director is experienced in this scale tunnel construction contract management and has supporting resources to effectively manage the delivery and construction for the project.	**Medium**
QA	Q1	Insufficient Quality Control and Assurance Program is in place impacting the design and construction of the project.	**Low**	Develop Quality Control and Assurance Protocol and require all stages of the project to adhere to the Protocol.	**Low**
Communications	M2	Stakeholders have an expectation of receiving updates on the Green Line project due to the high amount of engagement previously undertaken. There is a reputation risk if we do not continue to provide information to the public, as they will begin to lose confidence in our ability to deliver the project and may lose	**Medium**	Ongoing updates to stakeholders is required to instill confidence, maintain trust and excite stakeholders/build advocates for the project.	**Medium**

Note: Specific legal and financial risk are not included in the public register as the procurement process is competitive and confidential in nature.

Green Line LRT: Project timeline

Q1 2019

- ✓ PFC update on funding and financing (**January 22**)
- ✓ Funding agreement signed (**January 30**)
- ✓ Request for Qualifications (RFQ) for LRVs (**February 1**)

Q1 2019

- ✓ Quarterly updated to SPC on T&T (**March 20**)
- ✓ Green Line Governance Audit to Audit Committee (**March 22**)

Q2 2019

- ✓ Memo on supplemental contracts (**April 5**)
- ✓ T&T update on Public Garden Notice of Motion (**April 24**)
- ✓ Request for Qualifications (RFQ) for LRVs closed (**May 16**)
- Technical and Risk Committee RFP closes (**June 26**)
- Quarterly update to SPC on T&T (**June 26**)

WE ARE HERE

Q3 2019

- RFQs for Green Line begin to be released
- RFP for Utility Contract Manager Released
- RFP for Constructability Advisors Released
- Quarterly update to SPC on T&T (**September 28**)

Q4 2019

- Quarterly update to SPC on T&T (**December 18**)
- Transit-Oriented Development (TOD) update to SPC on PUD (**December 4**)

Q1 2020

- RFPs for Green Line begin to be released
- Request for Proposals (RFP) for LRV released