Green Line LRT

Updated Segment 2 (16 Avenue N to Elbow River) Alignment, Station Location and Concept Plan

Executive Summary

This document outlines the updated Green Line Segment 2 alignment and station location plan and presents concepts that illustrate how this segment might look like.

Segment 2 extends from 16 Avenue N and Centre Street N south to the Elbow River in the Beltline. The alignment was updated in order to bring the project cost estimates within budget, manage construction risk, and best deliver the vision of the project.

The updated Segment 2 alignment and station location plan includes:

- surface-running LRT on Centre Street N;
- a bridge over the Bow River;
- 2.5 km of tunnel in the Downtown and Beltline; and
- 6 stations (2 at surface, 4 underground).

To develop the updated Segment 2 alignment, station location and concept plan, planning and design objectives were developed from internal and external stakeholder interests and from public feedback from Green Line public engagement sessions, community meetings and stakeholder workshops. These design objectives will be used to inform the development of the functional design for the project.

Segment 2 – Updated alignment and station location plan
Figure identifies sections of Segment 2 alignment that are at-grade (solid lines), tunnel (dashed line) and bridge (solid line with black outline).

Centre Street N

The LRT alignment will run along the surface of Centre Street N in the middle of the road, with a single lane of traffic in each direction and no on-street parking.

16 Avenue N station, a terminus for Stage 1, will be located south of 16 Avenue N, while 9 Avenue N station, considered a community station, will be located between 7 Avenue N and 9 Avenue N.

Bow River Crossing

The Green Line LRT will cross the Bow River with a new LRT bridge. This bridge will also include a multi-use pathway for pedestrians and cyclists.

The bridge alignment will follow an s-curve in order to connect Centre Street N with 2 Street SW. The exact alignment and curve of the bridge will be finalized through the next stage of planning.

Centre Street bridge will be repurposed so that the two middle lanes are converted to dedicated BRT lanes to support improved travel time reliability for north central BRT to north Calgary. The outer lanes will remain useable for general purpose vehicle traffic.

Downtown (Eau Claire, Chinatown & Downton Core)

The alignment continues from the new LRT bridge across the Bow River, over the Bow River Pathway, and travels south until it transitions underground, through a portal that is located west of 2 Street SW and around Waterfront Mews SW.

The 2 Avenue SW station will be underground, and planning is underway to integrate the portal and station infrastructure into the future redevelopment of Eau Claire Market.

South of the 2 Avenue SW station, the tunnel will extend under 2 Street SW towards an underground station at 7 Avenue SW. Plans for the 7 Avenue SW station entrance have not yet been developed. The City will be exploring opportunities to collaborate with adjacent landowners to integrate station entrances into existing or future developments. If integration opportunities are not possible, station entrances would be constructed within sections of the 2 Street SW road right-of-way.

South of 7 Avenue SW station, the tunnel continues south under the LRT Red and Blue Lines and the Canadian Pacific Rail corridor and into the Beltline.

Beltline

Within the Beltline, the tunnel transitions from 2 Street SW to 11 Avenue S along a curve. The exact alignment and curve will be finalized through the next stage of planning.

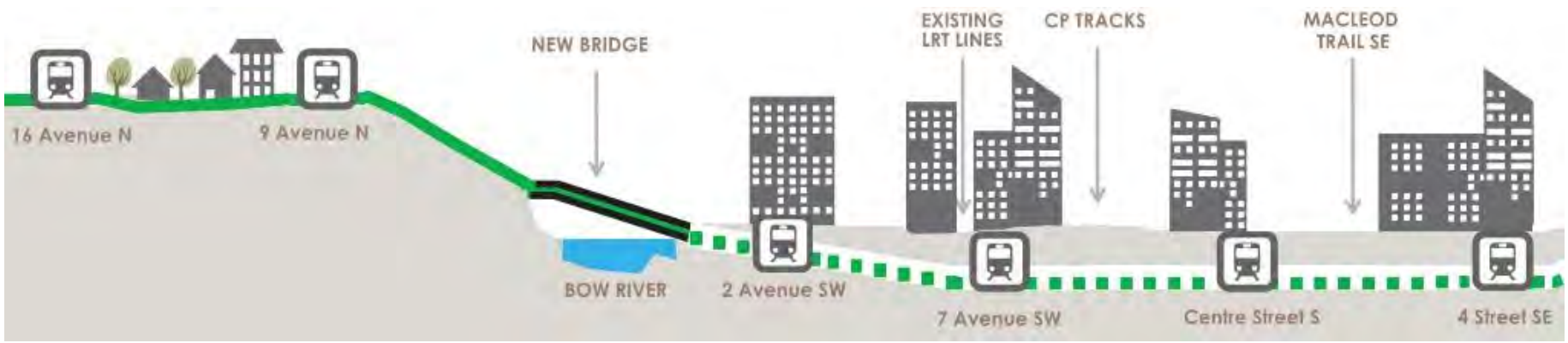
There will be two underground stations: Centre Street S and 4 Street SE. The Centre Street S underground station will be situated in the vicinity of 11 Avenue SE and 1 Street SE. The 4 Street SE underground station will be situated east of 4 Street SE (Olympic Way SE).

The tunnel will extend eastward from the 4 Street SE station, along 11 Avenue SE, until it wraps around the north edge of the Calgary Transit Victoria Park Transit Facility. At this point, the tunnel will transition to the surface just west of the Elbow River bridge.

Moving forward

In order to advance the planning for Segment 2, a work program has been identified that includes the following key activities:

- Segment 2 functional plan;
- underground and integrated station design;
- Bow River bridge planning;
- mobility studies and plans;
- streetscape planning;
- access management planning; and
- reference concept design and technical design requirements.



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2017 Council Approved Stage 1 Alignment

The long-term vision for the Green Line LRT will be a 46 km route from 160 Avenue N (North Calgary) to Seton (Southeast Calgary) with 28 stations.

The 2017 Council approved Stage 1 alignment *(right)* and station plan consisted of 20 km of LRT and 14 stations between approximately 16 Avenue N (Trans-Canada Highway) and 126 Avenue SE (Shepard station).

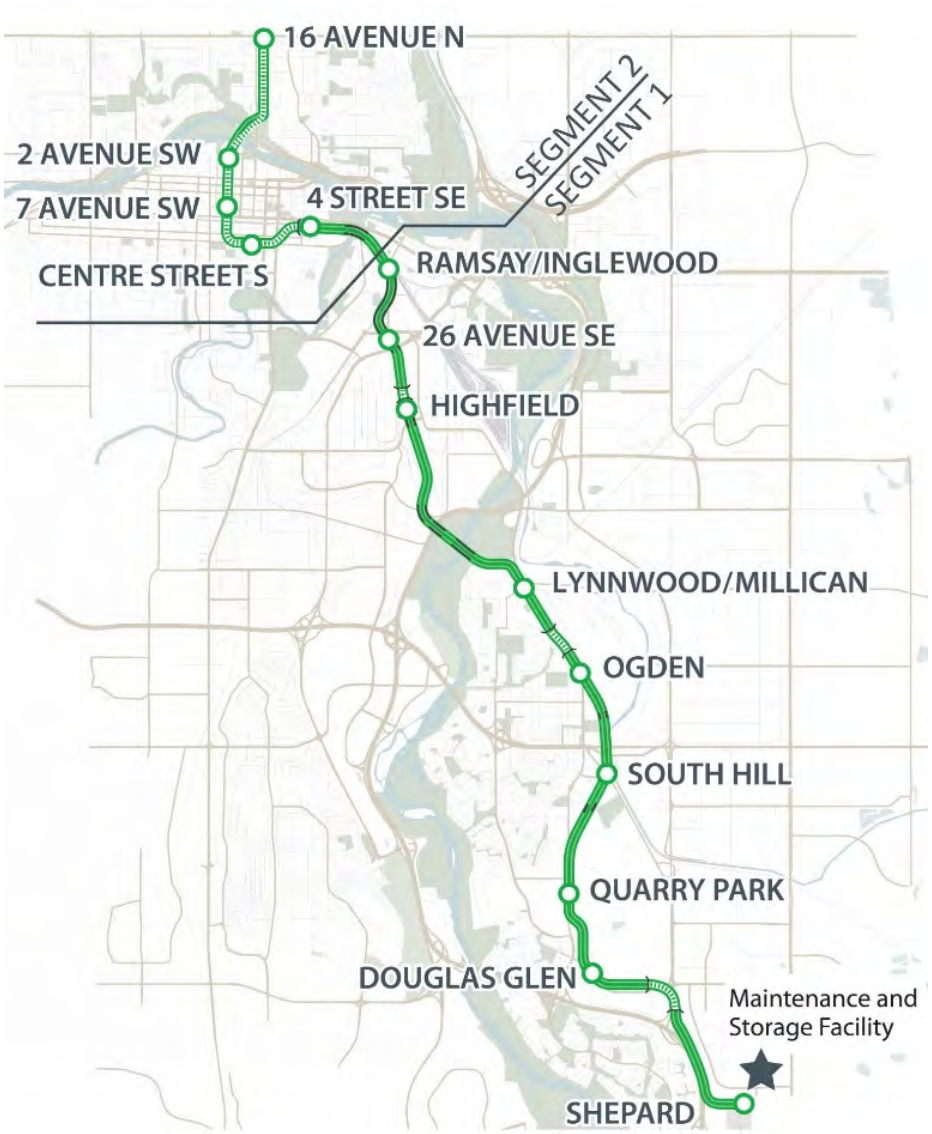
In July 2019, Council split Stage 1 into two segments:

- Segment 1 - Elbow River south to Shepard station;
- Segment 2 - Elbow River north to 16 Avenue N station.

The 2017 approved alignment for Segment 2 included a tunnel which ran from approximately 16 Avenue N and Centre Street N, under the Bow River, under 2 Street SW and under 12 Avenue S, surfacing in East Victoria Park west of Olympic Way and 10 Avenue S. The alignment continued on surface from Olympic Way SE east towards Elbow River.

At a glance, the 2017 Council approved alignment and station location plan included:

- 4 underground stations and 1 surface station;
- 4.2 km tunnel; and
- 0.7 km surface running LRT.



2017 Council Approved Stage 1
Alignment & Station Plan, by Segment.

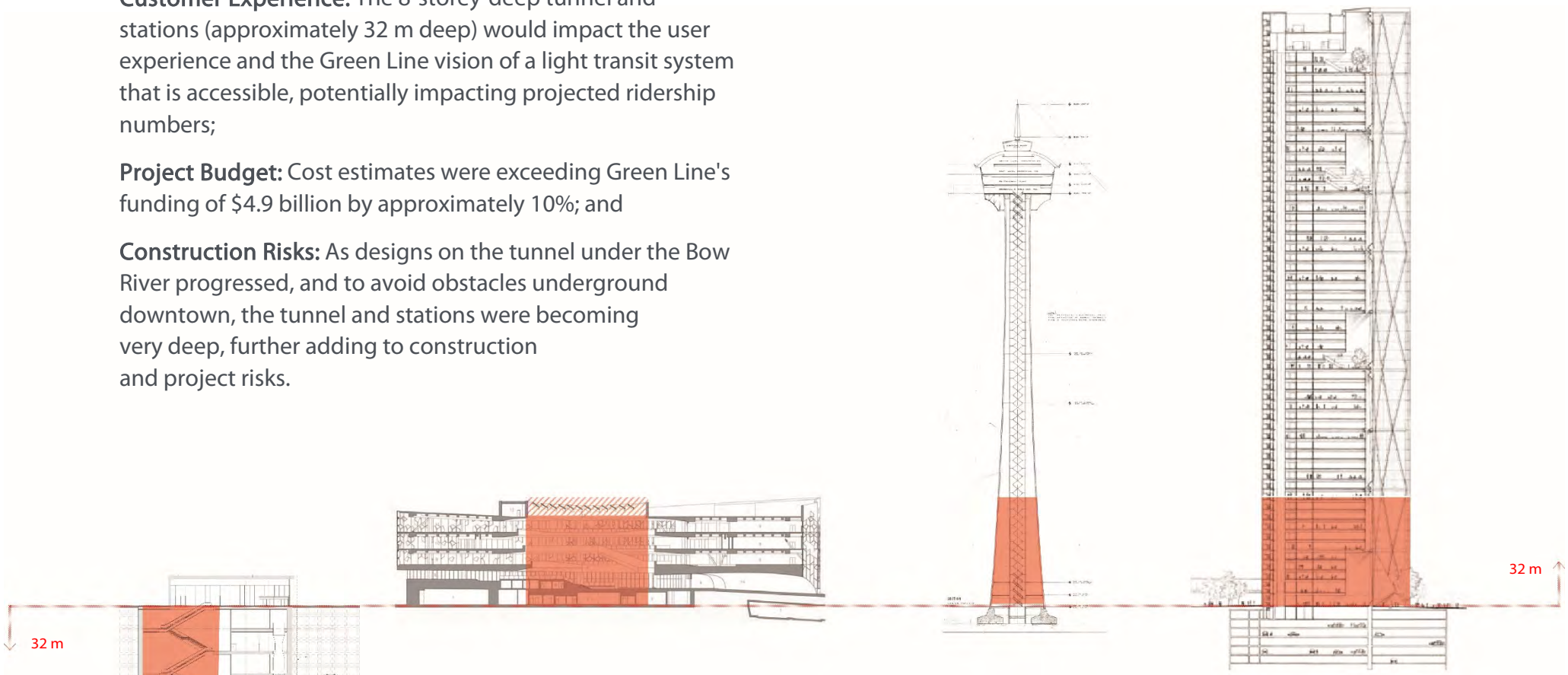
Re-Evaluating Segment 2

In summer 2019, the Green Line project team advised City Council of the need to re-evaluate the Segment 2 alignment for the following reasons:

Customer Experience: The 8-storey-deep tunnel and stations (approximately 32 m deep) would impact the user experience and the Green Line vision of a light transit system that is accessible, potentially impacting projected ridership numbers;

Project Budget: Cost estimates were exceeding Green Line's funding of $4.9 billion by approximately 10%; and

Construction Risks: As designs on the tunnel under the Bow River progressed, and to avoid obstacles underground downtown, the tunnel and stations were becoming very deep, further adding to construction and project risks.



Graphic showing depth of deep underground station relative to the Calgary Central Library, Calgary Tower, and Bow building.

Alignment Options Evaluated

The Green Line project team evaluated multiple alignment options in Segment 2 in order to bring the project cost estimates within budget, manage construction risk, and best deliver the vision of the project. Alignment options evaluated included:

- shortening the length of tunnel;
- reducing the number and depth of underground stations;
- running the LRT on surface on Centre Street N, and along 10, 11 or 12 Avenues S;
- shifting the underground alignment from 2 Street SW to 1 Street SW;
- elevating the LRT track throughout the Centre City;
- truncating the length of Segment 2; and
- a bridge over the Bow River instead of a tunnel.

The different alignment options were evaluated against a series of evaluation themes that included cost and value, connectivity, risk and constructability, development opportunities, mobility, and environmental.

Cost and value

Connects people to places

Risk and constructability

Urban and regional development

Improves mobility

Environmental

Updated Segment 2 Alignment & Station Location Plan

An updated Segment 2 alignment and station location plan was identified through the re-evaluation process, which includes:

- surface-running LRT on Centre Street N;
- a bridge over the Bow River;
- 2.5 km of tunnel; and
- 6 stations (2 at surface, 4 underground).

The updated Segment 2 plan brings the project cost estimates within budget and manages project risk by:

- reducing the length of tunnel by 1.7 km;
- replacing sections of tunnel with surface-running LRT on Centre Street N and a bridge over the river;
- shallowing the depth of all underground stations; and
- reducing land acquisition costs by shifting the alignment to City right-of-way along 11 Avenue S.

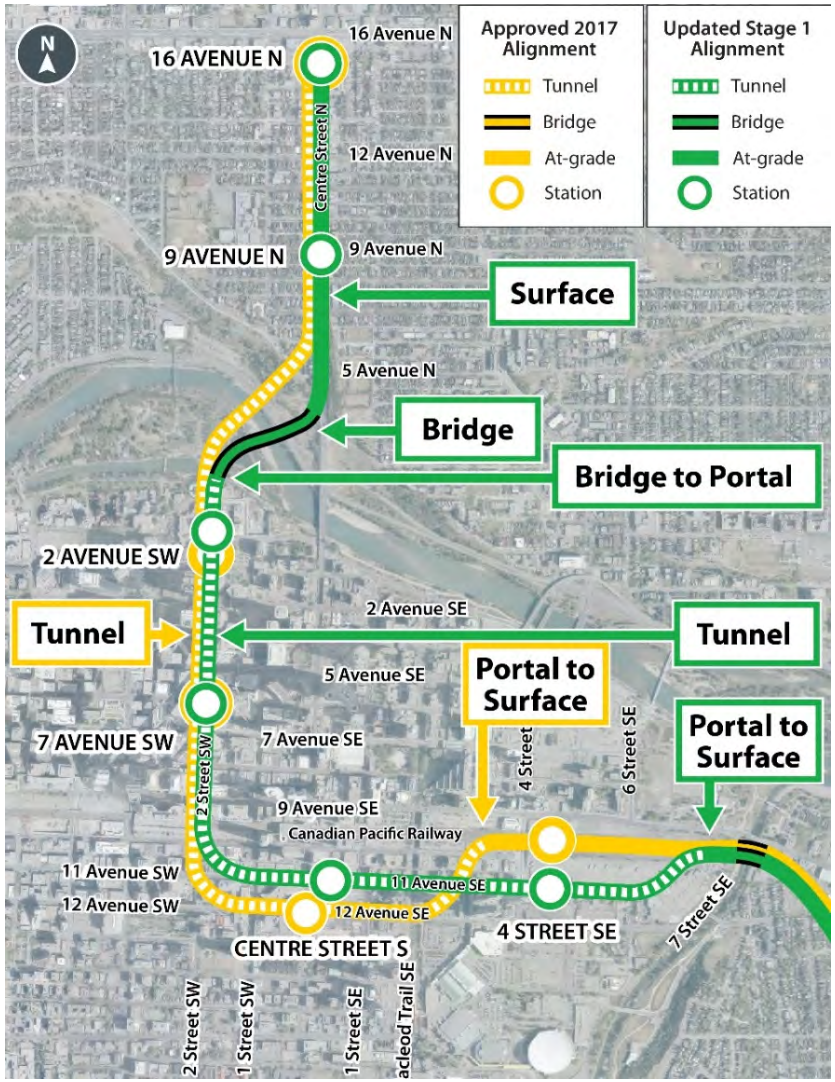
The updated plan improves customer experience by making underground stations shallower and more convenient to access, and through the introduction of surface stations along Centre Street N, including a new station at 9 Avenue N.

Updated Segment 2 - Alignment and Stations

Figure identifies sections of Segment 2 alignment that are at-grade (solid lines), tunnel (dashed line) and bridge (solid line with black outline).

A comparision of the 2017 Council approved and the recommended updated Segment 2 alignment and station location plans is summarized in the following table and graphic.

	2017 COUNCIL APPROVED	UPDATED SEGMENT 2
CENTRE STREET N	• LRT in tunnel • 16 Avenue N underground station	• LRT at-grade • 16 Avenue N surface station • 9 Avenue N surface station
BOW RIVER CROSSING	• LRT in tunnel • No multi-use pathway	• LRT on bridge • Includes multi-use pathway over river
DOWNTOWN	• LRT in tunnel • 2 Avenue SW underground station • 7 Avenue SW underground station	• LRT in tunnel • 2 Avenue SW underground station • 7 Avenue SW underground station
BELTLINE	• LRT in tunnel and at-grade • Centre Street S underground station (on 12 Avenue S) • 4 Street SE surface station (on 10 Avenue S)	• LRT in tunnel • Centre Street S underground station (11 Avenue S) • 4 Street SE underground station (on 11 Avenue S)



Comparison of 2017 and Updated Segment 2 Alignment and Stations

2017 Council approved (yellow) and Updated 2020 Alignment (green).

Updated Segment 2 Concept Plan

This report presents the concept plan for Segment 2 to help illustrate what the updated Segment 2 alignment and stations might look like.

For each of the four areas (Centre Street N, Bow River Crossing, Downtown and Beltline) the following details and concepts are presented:

Planning & design objectives. Informed through common internal and external stakeholder interests, these have been and will continue to be used as guiding principles in the development of the plans for each area.

Alignment summary. An overview on the alignment and any next steps required to finalize. In areas with surface-running LRT, this will also include a description of the overall mobility network.

Station descriptions. A description of the stations and next steps required to finalize any details. In areas with surface-running LRT, this will also include a description of the overall mobility network.

What it might look like. A presentation on what each area might look like through the use of renderings, cross-sections, sketches and precedent photographs.

Centre Street N

Planning and design objectives

Centre Street N planning and design objectives were developed from input received through public engagement, community meetings, and stakeholder workshops. These have been used to guide the alignment and station location planning to date and will continue to be used as the planning and design for Centre Street N advances.

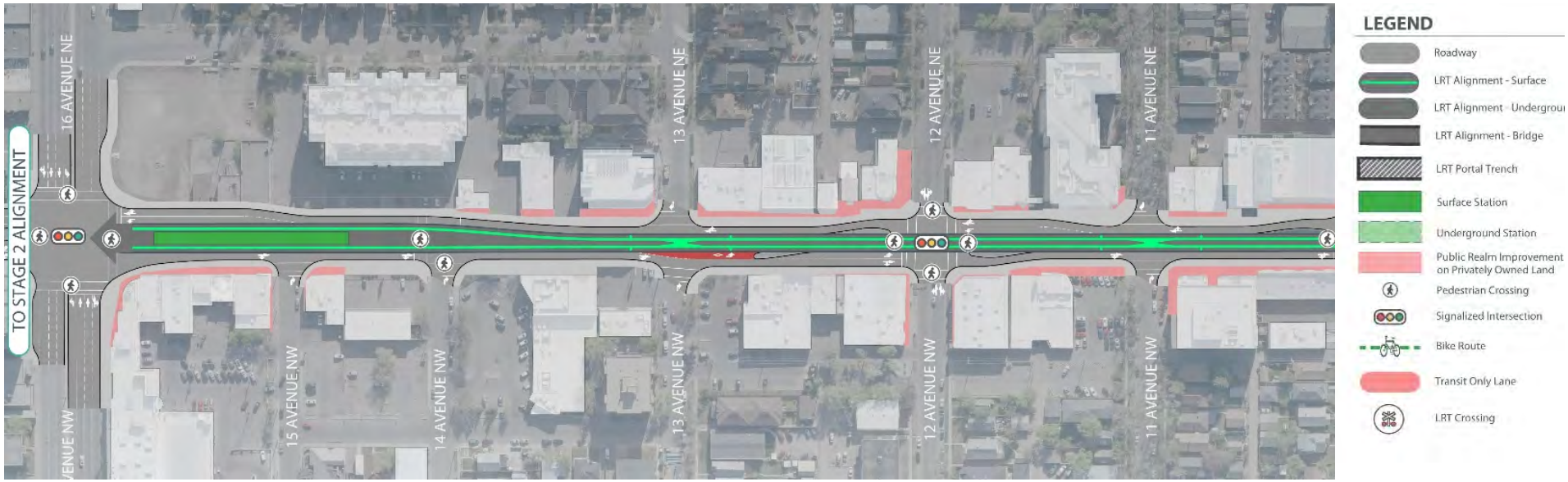
Common stakeholder interests:

- improve public realm and streetscape;
- reduce vehicular traffic along Centre Street N;
- minimize vehicular impact through community;
- consider adding 9 Avenue N Station;
- minimize impacts to existing businesses: access, parking, property values;
- minimize construction impacts to businesses; and
- support Centre Street N redevelopment opportunities.

Centre Street N guiding planning and design objectives

- urban realm that prioritizes pedestrian experience along the corridor;
- pedestrian connectivity across the corridor;
- facilitate reliable, efficient and safe LRT, BRT, local bus operations;
- manage vehicle access for local residents and businesses;
- minimize impacts to existing properties and businesses; and
- maximize future development opportunities, prioritizing transit-oriented development.

Alignment summary

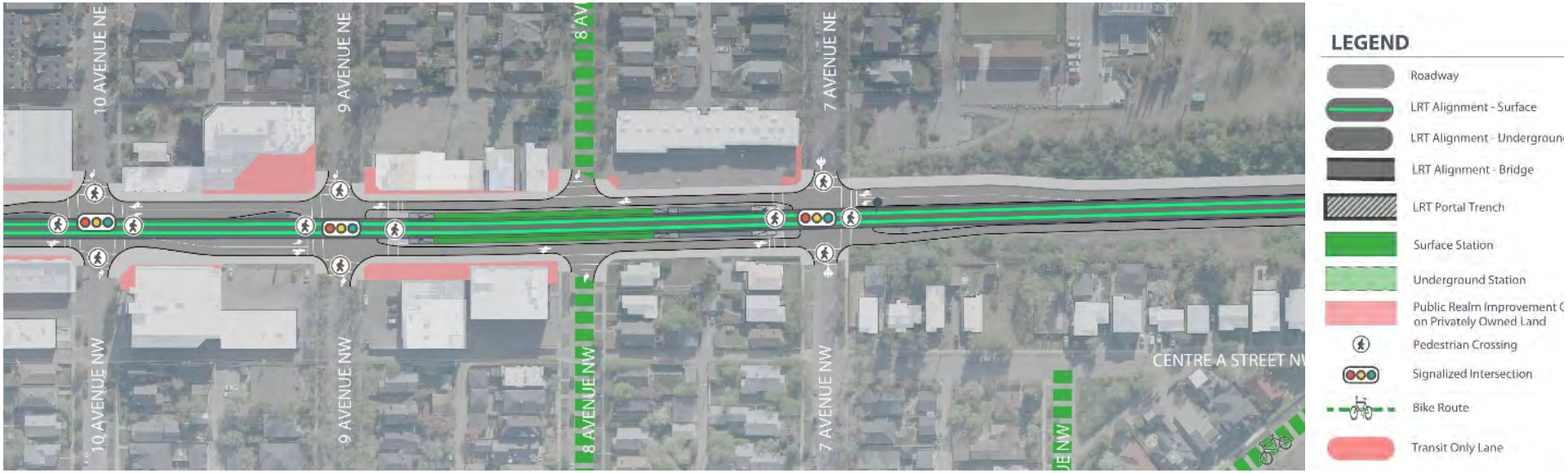


The LRT alignment will run along the surface of Centre Street N in the middle of the road, with a single lane of traffic in each direction and no on-street parking.

A middle-running LRT configuration is being recommended, as it best balances:

- opportunities for pedestrian realm improvements, such as comfortable sidewalks and planting of street trees;
- safe movement of pedestrians, vehicles and LRT;
- access and circulation to businesses and into the community; and
- efficient LRT operations, with trains operating up to the speed of traffic.

LRT trains will operate in a guideway that is separated from vehicle traffic by a curb, and private vehicles will not be permitted in the guideway.



Motor vehicles, bicycles and pedestrians will be permitted to cross the LRT right-of-way at designated locations.

Safe pedestrian movement across the Centre Street N and the LRT right-of-way will be provided at every second block. Each pedestrian crossing will be managed through traffic signals.

Motorists can access businesses and the community through right turns, which will be permitted at every intersection, and through left turns, which will be permitted at signalized left turn bays at 7 Avenue N,
9 Avenue N, 10 and 12 Avenue N.

How the Green Line will extend north in the future is still being examined.

LRT guideway will be designed to allow BRT and Express buses to operate within the LRT guideway south of 13 Avenue N to the north end of Bow River bridge. Permitting BRT and express buses in the guideway will help improve transit travel time reliability along this stretch of Centre Street N, which is currently prone to congestion and delays bus movement.

From the LRT Bow River Bridge intersection to the south end of Centre Street Bridge, the two middle lanes of Centre Street N will re-purposed to provide dedicated transit lanes, which will extend the transit priority along the Centre Street into Chinatown.

Station descriptions

16 Avenue N Station

16 Avenue N station will be the northern terminus station for Stage 1. This station will be located south of 16 Avenue N and north of 14 Avenue N.

The station is being planned as a centre-loading platform with heated shelters. Pedestrians will be able to access the station from signalized pedestrian crossings at 16 Avenue N and 14 Avenue N.

This will be an urban station, whereby the scale of the station infrastructure will fit within the urban context.

Rendering showing what the 16 Avenue N station and adjacent streetscape might look like in winter.

9 Avenue N Station

9 Avenue N station will be located between 7 Avenue N and 9 Avenue N.

The station is being planned with two side-loading platforms. Pedestrians will be able to access the platforms from signalized pedestrian crossings at 7 Avenue N and 9 Avenue N.

This station is considered a community station, which will serve less riders than the busier terminus station at 16 Avenue N. As such, the size and scale of this station will be smaller than 16 Avenue N, which will allow the station to take up a smaller footprint and be more integrated into the surrounding community.

Rendering showing what 9 Avenue N station might look like.

Given the smaller footprint of this station, customer amenities at this station will be simplified.

This station was not included in the original 2017 alignment as the station was very deep underground and cost prohibitive. In response to requests from the Crescent Heights community, the Green Line project team evaluated the feasibility of including this surface station in the updated Segment alignment and station plan.

It is recommended that this station be included since it:

- Better connects the Crescent Heights community and area businesses with Green Line and the broader rapid transit network;
- Enables more opportunities for transit-oriented development in Crescent Heights; and
- Its smaller scale fits into the content of the neighbourhood within the project budget.

What it might look like

Centre Street N Streetscape Master Plan

As part of the Green Line project, a streetscape master plan will be developed for Centre Street N and will be implemented as part of the project delivery.

The Crescent Heights resident and business communities will be engaged in the planning for the streetscape master plan, which will help set the character for the street.

Streetscape improvements that will be delivered as part of Green Line include:

New sidewalks. Sidewalks will be constructed from building face to building face, pending agreements with private landowners. The new sidewalks will provide a consistent, comfortable and accessible walking surface along the entire Centre Street N corridor.

Tree planting. Street trees will be planted in areas with wider sidewalks. The tree planting plan will be developed as part of the streetscape master plan.

New furniture. New furniture will be provided, including benches, bike racks and waste & recycling bins. The look and feel of the furniture will be determined through the streetscape master plan planning process.

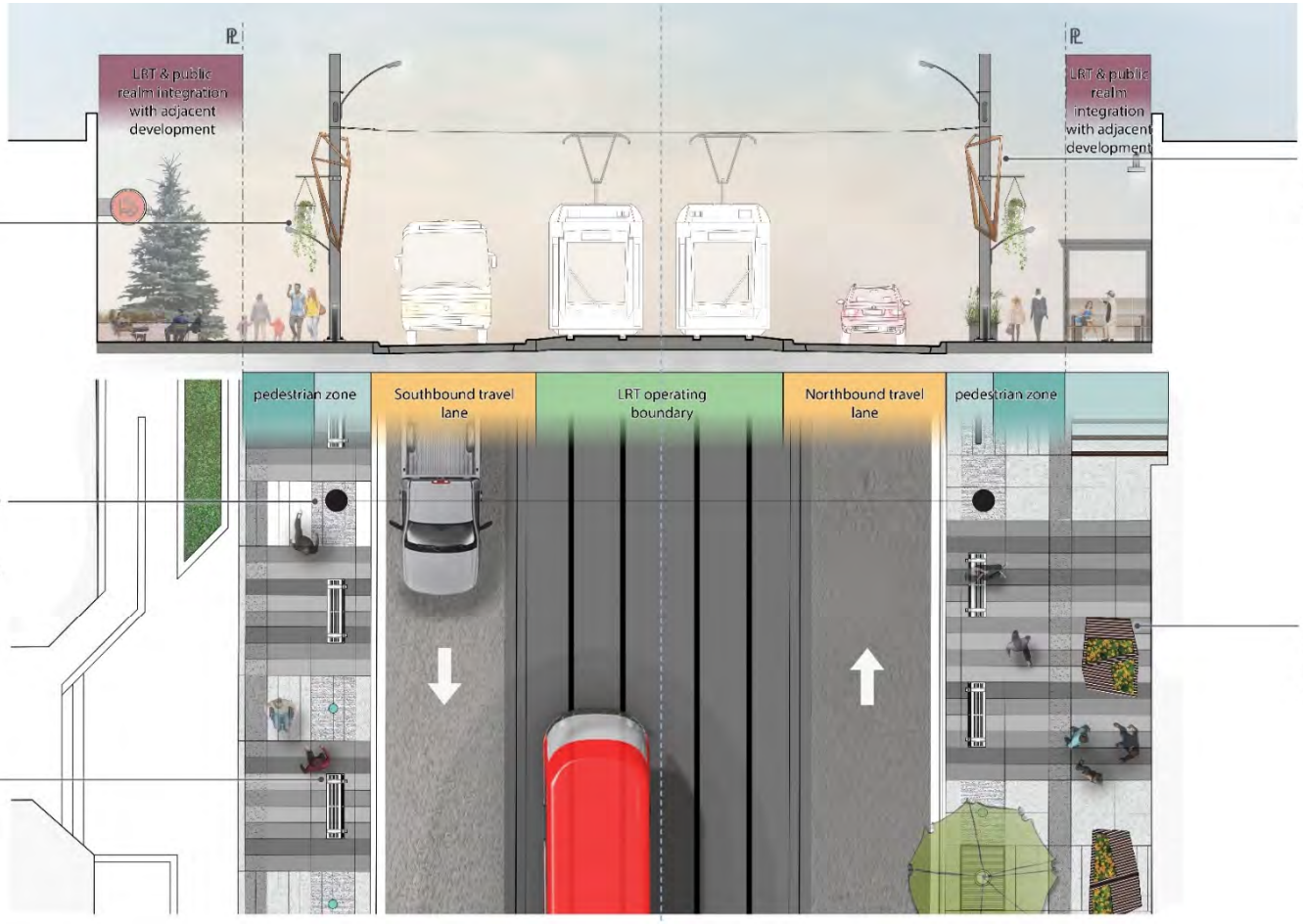
New streetlight poles. Pedestrian-oriented street lighting will be provided to improve illumination levels across the corridor. The new streetlight poles will be designed so they contribute to the character of the corridor. In addition, the poles may be designed to include provision for banner or flower baskets to be hung, which the business improvement area could program to animate and brand the street. The look and feel of streetlight poles will be determined as part of the streetscape master plan.

Pedestrian crosswalks. Green Line will deliver safe, signalized, well-marked pedestrian crossings at least every two blocks along Centre Street N. Thoughtful treatments can enhance the pedestrian experience with consideration to safety and legibility.

Rendering showing new sidewalk, streetlight poles and furniture could look like in narrow sidewalk areas.

Public realm with narrow sidewalks

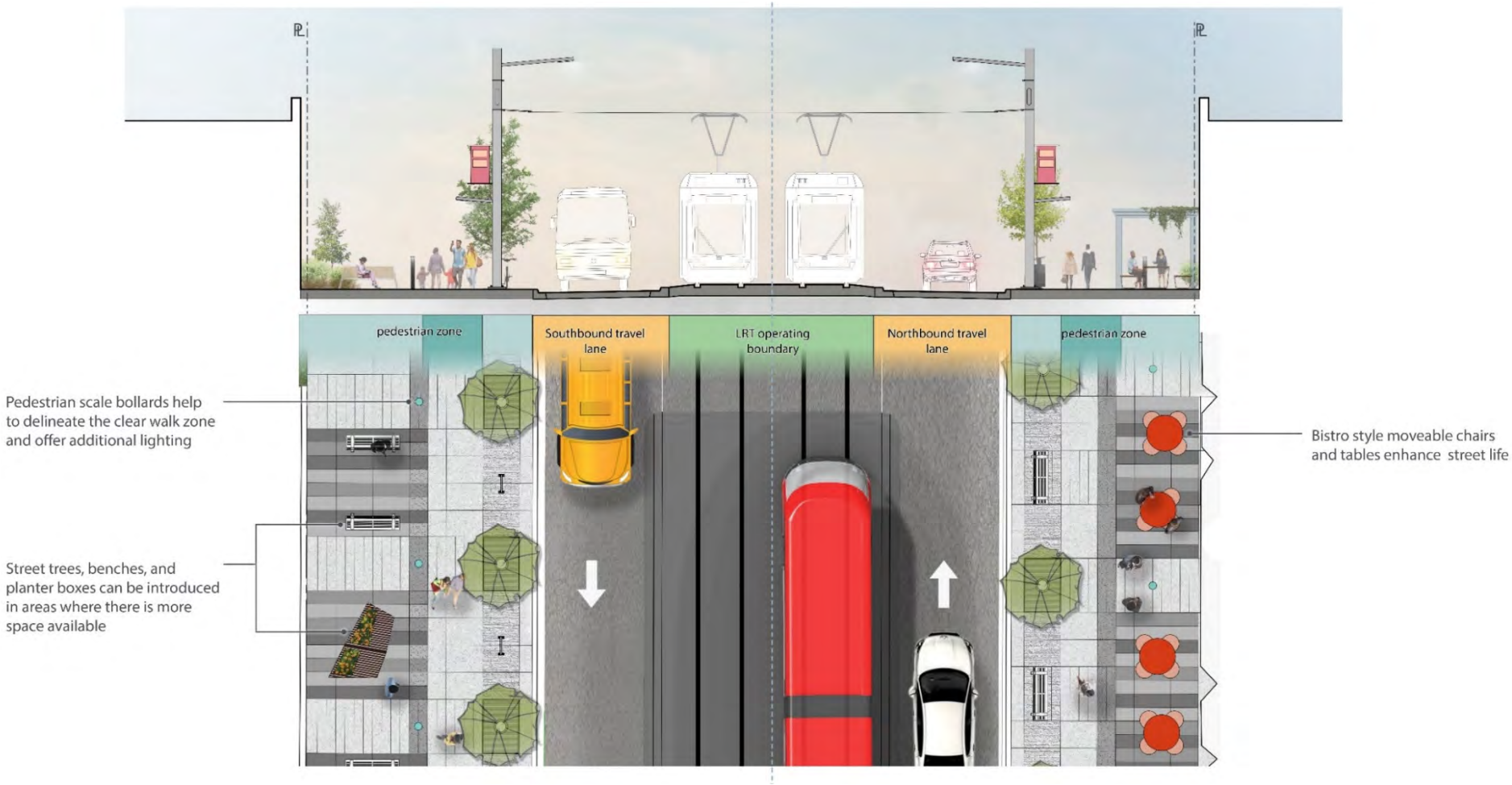
The following cross-section illustrates what the public realm might look like in areas with narrow sidewalks. Urban design features would be provided, including new sidewalks, Pedestrian-oriented streetlight poles with opportunities for banners or flower baskets, and street furniture such as bike racks, benches and waste & recycling bins.



Public realm with wider sidewalks

The following cross-section illustrates what the public realm might look like in areas with wider sidewalks.

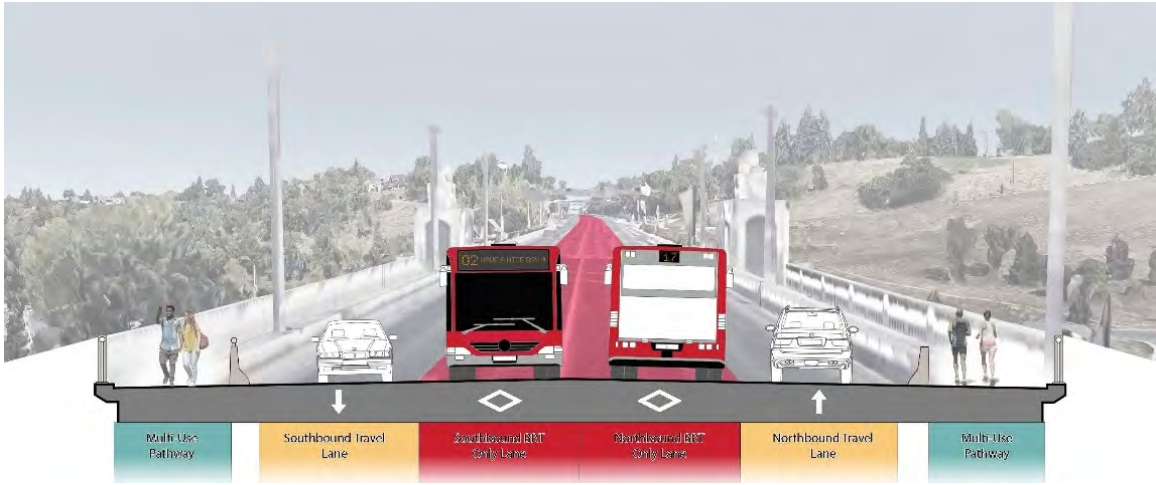
In this situation, there would be opportunities to plant street trees in addition to all other public realm improvements.



Centre Street Bridge – Transit Priority

To support improved travel time reliability for BRT users to North Central Calgary, the two middle motor vehicle lanes on the Centre Street bridge will be repurposed as permanent dedicated BRT lanes. The outer lanes will remain useable for general purpose motor vehicle traffic.

The transition from the BRT dedicated lanes on Centre Street bridge into Chinatown will be determined through the next stage of planning.



Centre Street N Bridge - Proposed BRT. Green Line will allow for the repurposed use of the existing Centre Street Bridge travel lanes.

Bow River Crossing

Planning and design objectives

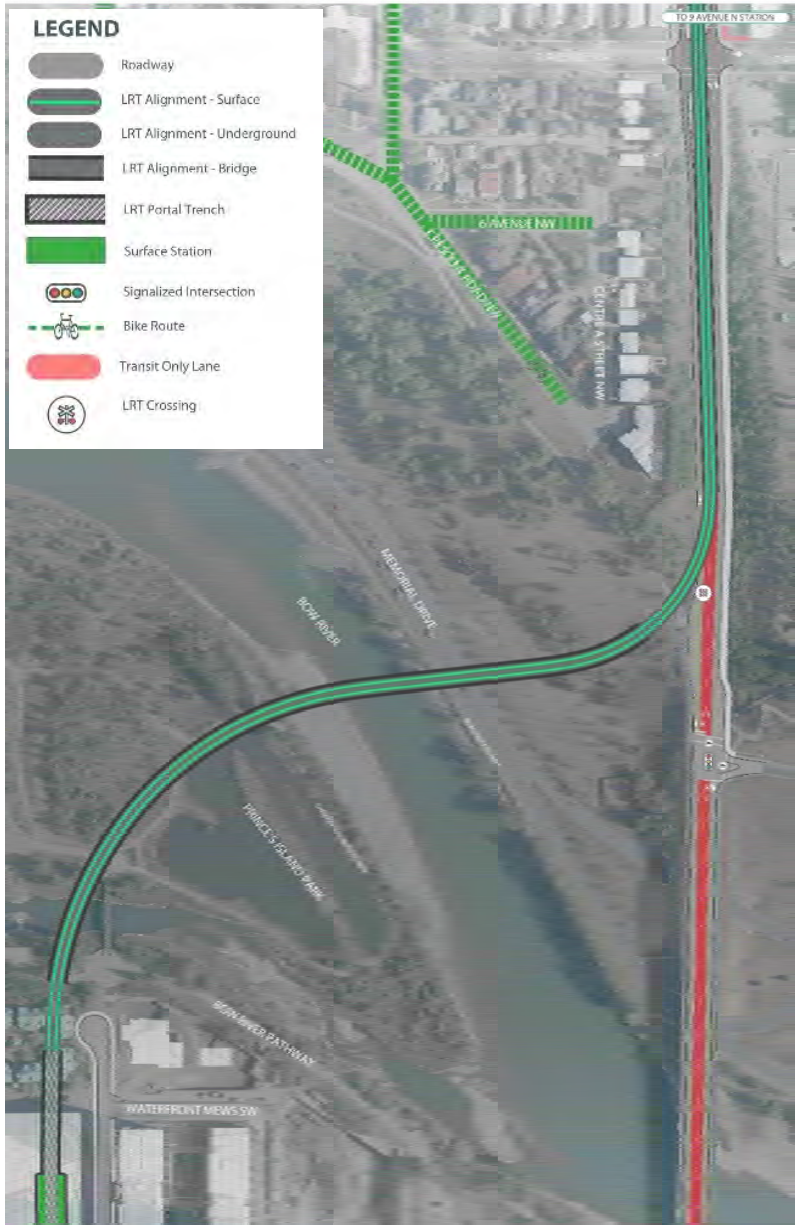
Planning and design objectives for the Bow River Crossing were developed from input received through public engagement, community meetings, and stakeholder workshops. These have been used to guide planning to date and will continue to be used as the planning and design for the bridge advances.

Common stakeholder interests:

- preserve river pathway connectivity and enjoyment;
- minimize impacts to views;
- minimize impacts to adjacent residents;
- minimize environmental impacts;
- explore opportunity for multi-use pathway on bridge; and
- minimize disruption to Prince's Island Park (events, festivals, and community gatherings).

Bow River Crossing guiding planning and design objectives

- provide continued functionality and experience of the river pathway and Prince's Island Park;
- minimize impacts to views;
- incorporate flexibility for thoughtful bridge architecture options;
- minimize environmental impacts;
- mitigate construction impact to users of Prince's Island Park and surrounding area; and
- consider strengthened connectivity for people who walk and bike.



Alignment summary

The Green Line LRT will cross the Bow River with a new bridge. This bridge will also include a multi-use pathway for pedestrians and cyclists.

The bridge alignment will follow an s-curve in order to connect Centre Street N with 2 Avenue SW. The exact alignment and curve of the bridge will be finalized through the next stage of planning.

The bridge will travel over top of Sunnyside Bank Park, Memorial Drive, the Bow River, Prince's Island, the south Bow River Channel lagoon and the Eau Claire Promenade, before connecting into the portal at the 2 Avenue SW Station.

As part of the Bow River Crossing recommendation, the Centre Street bridge will be repurposed so that the two middle lanes are converted to dedicated BRT lanes to support improved travel time reliability for north central BRT to north Calgary. The outer lanes will remain useable for general purpose vehicle traffic.

What might it look like

Bridge alignment variations

The bridge alignment follows an s-curve in order to connect Centre Street N with 2 Avenue SW. The shape (radii) of these curves are constrained by the operating requirements of the LRT and will vary depending on the final design of the 2 Avenue SW station and portal, architectural bridge selected and location of bridge piers. The site plan on the right illustrates some example bridge alignment variations currently being explored.

The final bridge alignment and configuration, including shape of the curve, will be determined through the next stage of planning.

Bridge architectural types

There is currently no design for the Green Line LRT bridge. Instead, the Green Line project team has been reviewing different bridge types to determine which are compatible with LRT and could be considered for the crossing of the Bow River.

These bridge types differ based on their visual prominence, interface with the Prince's Island and the Bow River, span width and overall structural size. Some bridge types would have more prominent architectural features and others would have simpler structures that may blend into the surrounding environment.

Bridge types being explored include constant depth viaduct, trestle structure viaduct, tied arched truss, and cable stayed bridge.

Shape of possible bridge curve variations over the Bow River.

Constant depth viaduct rendering. *A constant depth viaduct is a simple bride structure with evenly spaced piers and a constant depth structure between the piers. This type of structure allows for smaller piers, but as a result, requires that the piers touch down more frequently than other bridge types.*

Tied arch bridge rendering. *A tied arch bridge utilizes a moderate vertical upstand spine in the centre of the bridge to provide vertical support for a main span over the Bow River. A constant depth viaduct would be used on either side of the main span crossing Prince's Island Park and Sunnyside Bank Park.*

Cable stayed bridge rendering. *A cable stayed bridge utilizes a large singular vertical pylon in the centre of the Bow River to support two cable stayed spans on either side. On the north side, the span extends over the Memorial Drive, and on the south side, it extends over Prince's Island Park. This type of structure has a larger visual impact.*

Trestle bridge rendering. *A trestle pier viaduct is a simple bridge structure with evenly spaced v-shaped piers. The v-shaped piers reduce the clear span between piers which allows for a shallower bridge deck. The unique shape of the piers would require additional constructability considerations.*

Pathway connections & Eau Claire Promenade interface

The new LRT bridge will include a multi-use pathway for pedestrians and cyclists. The details of how this pathway will be incorporated into the structure, such as on a top, side or bottom deck, will be determined through the next stage of bridge planning.

Connectivity along the Bow River Pathway will be maintained through the LRT bridge design. Within the Eau Claire area, it is not yet known where the bridge will land. The Green Line team is working closely with The City's Eau Claire Promenade and Flood Mitigation Project team to understand the potential impacts of the LRT bridge crossing on the Eau Claire Promenade and to explore potential measures to mitigate impacts to function, experience, and aesthetics of the pathway.

The intent is to minimize the impact to the promenade, and to complement the existing Eau Claire promenade and flood mitigation objectives. Should the bridge design impact the existing pathway, The City will mitigate by replacing or rerouting affected sections.

Although a preferred bridge architectural variant has not yet been determined, several preliminary bridge variants were placed in different view perspectives to help understand how existing views would change.

Rendering showing multi-use pathway on new LRT bridge.

Rendering of LRT bridge (constant viaduct structure), as viewed from McHugh Bluffs on north side of Bow River.

Rendering of LRT bridge (constant viaduct structure), as viewed from Waterfront Condominium on south side of Bow River.

Rendering of LRT bridge (constant viaduct structure), as viewed from Chevron Learning Pathway on Prince's Island Park.

Rendering of LRT bridge (constant viaduct structure), as viewed from west side of proposed bridge on Prince's Island Park.

Downtown

Planning and design objectives

Planning and design objectives for the Downtown were developed from input received through public engagement, community meetings and stakeholder workshops. These have been used to guide planning to date and will continue to be used as the planning and design for the Downtown advances.

Common stakeholder interests:

- provide great public realm;
- preserve river pathway connectivity;
- do not impact connectivity of east-west avenues and overall mobility network;
- preserve redevelopment opportunities;
- minimize impacts to existing developments; and
- do not negatively impact property values and leasing appeal.

Downtown guiding planning and design objectives

- integrate LRT infrastructure with adjacent development and public realm;
- provide continued functionality, aesthetic and experience of the Eau Claire Promenade;
- support continued vibrancy of cultural, social and commercial activities;
- minimize impacts to existing residential and commercial properties;
- enable adjacent future development potential; and
- minimize impacts to the mobility network.

Alignment summary

The LRT alignment continues from the new LRT bridge across the Bow River, over the Bow River Pathway, and travels south until it transitions underground, through a portal that is located west of 2 Street SW and around Waterfront Mews SW.

The portal will be integrated with the 2 Avenue SW station, and planning is underway to integrate both the portal and 2 Avenue SW station into the future Eau Claire redevelopment.

South of 2 Avenue SW station, the tunnel will extend under 2 Street SW towards an underground station at 7 Avenue SW.

After 7 Avenue SW station, the tunnel continues south under the existing Red and Blue Line LRT, and the CP Rail corridor, into the Beltline.

As the roadway will not be used for the portal or station, it will maintain the flexibility to be rebuilt with a new streetscape.

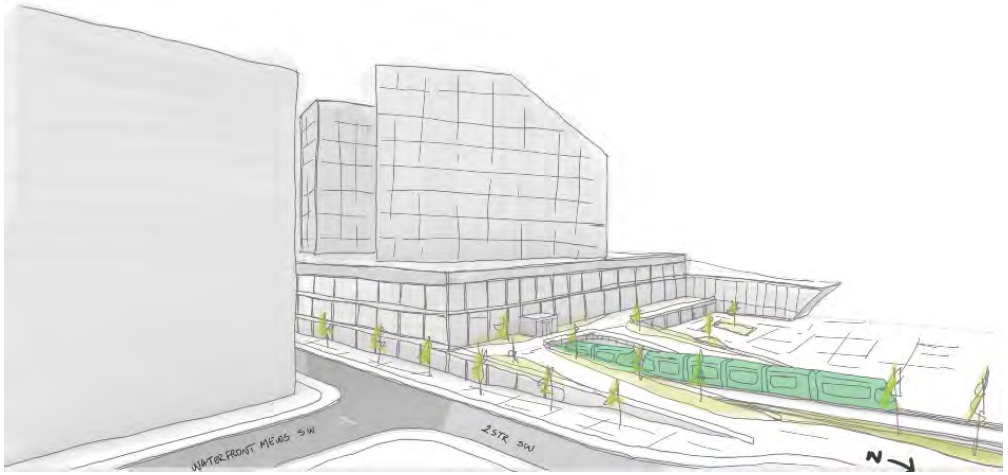
Station description

2 Avenue SW Station

2 Avenue SW station is planned to be fully-integrated directly into the future redevelopment of the Eau Claire Market site. Inspiration for this station design is being drawn from the new Central Library, which encapsulated Calgary Transit's Red Line portal.

By integrating this station into the redevelopment site, the LRT alignment will remain underground until the train exits through a portal at the north end of the property, in the vicinity of Waterfront Mews SW, and connects with the new LRT bridge.

This station layout means that Green Line will not impact the public road network in Eau Claire and Chinatown. The integration plans will also preserve the opportunity for the developer of the Eau Claire Market site to extend Riverfront Avenue SW to west into the development site, as envisioned in their development plans.



Architectural sketch commissioned by The City shows what the portal from underground to the new Bow River bridge might look like once integrated into the future redevelopment of the Eau Claire Market site.

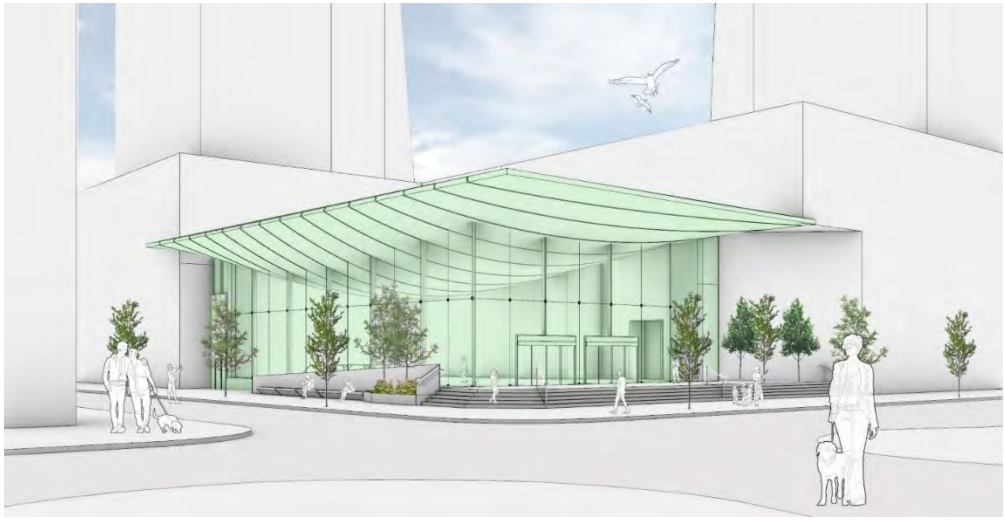
Architectural sketch commissioned by The City that depicts what a station entrance at 2 Street SW and Riverfront Avenue SW might look like once integrated into the future redevelopment of the Eau Claire Market site.

7 Avenue SW Station

7 Avenue SW station is planned to be located north of 7 Avenue SW. This will be the busiest station on the entire Green Line alignment and will serve as a key transfer hub between the Red and Blue LRT lines, as well as provide connections to key destinations Downtown.

Plans for the 7 Avenue SW station entrance have not yet been developed. The City will be exploring opportunities to collaborate with adjacent landowners to integrate station entrances into existing or future developments.

If both station entrances are integrated into adjacent developments, there will be no disruption to the existing mobility network. If integration opportunities are not possible, station entrances would be constructed within sections of the 2 Street SW road right-of-way. This would reduce the road to a single lane between 7 Avenue SW and 5 Avenue SW, while still maintaining access to existing parkades on 2 Street SW. Whether integrated or not on opening day, options for providing underground connections into 7 Avenue SW station in the future will be provided by providing pre-planned knock-out-panels. This will enable adjacent landowners to connect into the stations in the future, if it's not feasible to do so in the timeframe of Green Line construction.



Rendering showing what a station entrance may look like integrated into a future development.

What it might look like

2 Street SW Streetscape Master Plan

As part of the Green Line project, a streetscape master plan will be developed for 2 Street SW and will be implemented as part of the project delivery. This will enhance the pedestrian environment from the Bow River south into the downtown core.

Investing in streetscape upgrades and amenities will contribute to a downtown that is desirable to current and future businesses, residents and visitors. Thoughtful public realm design will seamlessly integrate public and private spaces.

Downtown residential and business communities will be engaged in the planning for the streetscape master plan, which will help set the character for the street. Streetscape improvements that will be delivered as part of Green Line include:

New sidewalks. Sidewalk will be constructed from building face to building face, pending agreements with private landowners. The new sidewalks will provide a consistent, comfortable and a walking surface along 2 Street SW.

New streetlight poles. Pedestrian-oriented street lighting will be provided to improve illumination levels across the corridor. The new streetlight poles will be designed so they contribute to the character of the corridor. In addition, the poles may be designed to include provision for banner or flower baskets to be hung, which the business improvement area could program to animate and brand the street. The look and feel of streetlight poles will be determined through the streetscape master plan planning process.

New furniture. New furniture will be provided, including benches, bike racks and waste & recycling bins. The look and feel of the furniture will be determined in the streetscape master plan.

Tree planting. Street trees will be planted in areas with wider sidewalks. The tree planting plan will be developed as part of the streetscape master plan.

Cycle Tracks. As part of the 2 Street SW master plan, The City will evaluate the possibility of including 2 Street SW into the overall Centre City cycle track network.

Integrated Stations

The Green Line project team will be exploring opportunities to integrate underground stations into adjacent developments. The project team will be meeting with developers and landowners in station areas to explore potential opportunities to collaborate on the integration of Green Line underground station entrances into existing or future private developments, or pre-planning potential future knock-out panel type connections. These collaborations may influence the final location of stations and their entrances.

Integrated stations can benefit The City, developments and transit users. For The City, integrating stations into existing or future developments can help lower the cost of land acquisition and construction costs. For developments, integrating stations into a building may help attract or retain tenants, and may attract new customers to support retail tenants. For transit users, integrated stations can help improve the transit rider experience, providing seamless connection from the LRT into an individual development and the broader +15 network.

Example of what an underground station entrance might look like before its integrated into a development, showing Broadway Station in Vancouver.

Example of what an underground station entrance might look like fully integrated into a development, showing Bayview Station in Toronto.

Example of what a stand-alone station entrance might look like, showing Canada Line in Vancouver.

Beltline

Planning and design objectives

Planning and design objectives for the Beltline were developed from input received through public engagement, community meetings and stakeholder workshops. These have been used to guide planning to date and will continue to be used as the planning and design for the Beltline advances.

Common stakeholder interests:

- minimize impact to mobility network;
- minimize impacts to future development densities;
- avoid impacts to existing developments: access, egress, servicing;
- support Rivers District and Stampede Master Plans and Events Centre planning;
- locate transit infrastructure to service existing Beltline communities; and
- integrate station entrances with development.

Beltline guiding planning and design objectives

- minimize impacts to mobility network;
- locate stations to support the vision of the River's District master plan;
- minimize impacts to Victoria Park Transit Centre operations;
- minimize impacts to Stampede Park and existing residential and commercial properties;
- explore opportunities for station integration; and
- enable future development opportunities and unlock density potential.

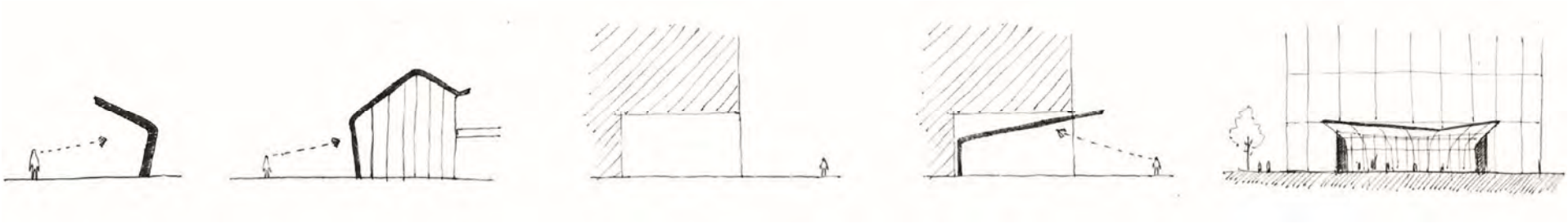
Alignment summary

Within the Beltline, the tunnel transitions from 2 Street SW to 11 Avenue S along a curve. Various curve radii are currently under evaluation and being examined in terms of technical feasibility, train operations, constructability, risk, and capital costs. The final curve will be confirmed through the next phase of planning.

The tunnel will extend along 11 Avenue S in City-owned road right-of-way. It will cross beneath the existing Red Line tunnel and continue east towards the Calgary Transit Victoria Park Transit Facility.

The alignment travels along the north edge of the Victoria Park Transit Facility site, with a portal that brings the LRT to grade just west of the Elbow River, where it limits disruption to current operations of the bus facility.

The roadway configuration in the Beltline will not change from what exists today, as there is no above ground infrastructure that might trigger changes to the road right-of-way.



Station description

Plans for Beltline underground station entrances have not yet been developed. Exact station locations and entrances have not been finalized and are currently under evaluation.

The City will be exploring opportunities to collaborate with adjacent landowners to integrate station entrances into existing or future developments, or purchase land for stand-alone station entrances.

Centre Street S Station

Centre Street S station is an underground station, located at approximately 11 Avenue S and 1 Street SE. The station will have a centre loading platform with a concourse level above.

The station entrances can be integrated directly into adjacent development or can have stand-alone entrances.

4 Street SE Station

4 Street SE station is an underground station that will be located on 11 Avenue S, between 4 Street SE (Olympic Way SE) and 6 Street SE. Similar to the Centre Street S station, it can be integrated into adjacent development or can have stand-alone entrances.

What it might look like

Integrated Stations

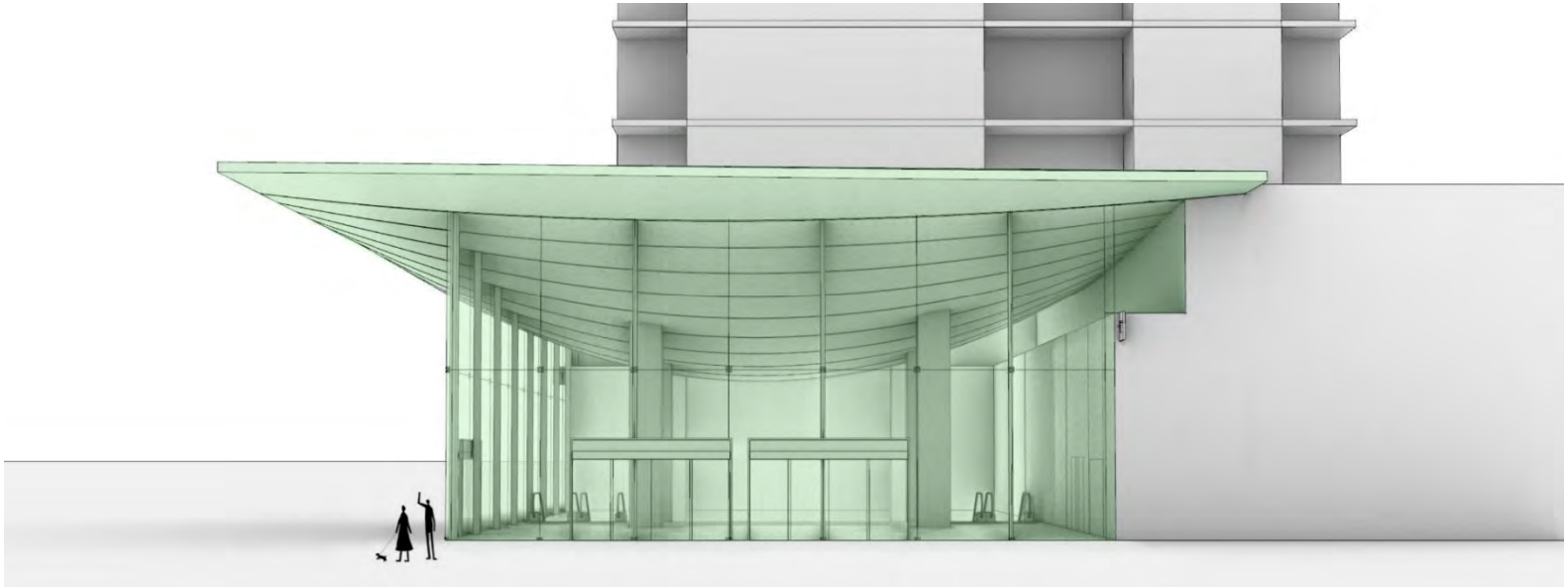
Similar to Downtown, the Green Line project team will be exploring opportunities to integrate underground stations into adjacent developments in the Beltline.

Refer to the Downtown Integrated Stations section for photos and renderings and that depict what integrated stations in the Beltline might look like.

Streetscape Improvements

The public realm and streetscape will be reinstated in areas where LRT construction is anticipated to create disturbances to both the roadway and existing streetscape.

Within the Beltline, this will include areas around the Centre Street S and 4 Street SE stations, and potentially in areas where construction will occur above grade. Public realm improvements within the Rivers District will incorporate the vision of the Rivers District Master Plan and will be coordinated with Calgary Municipal Land Corporation.



Rendering showing what a station entrance (shown in green) may look like integrated into a future development.

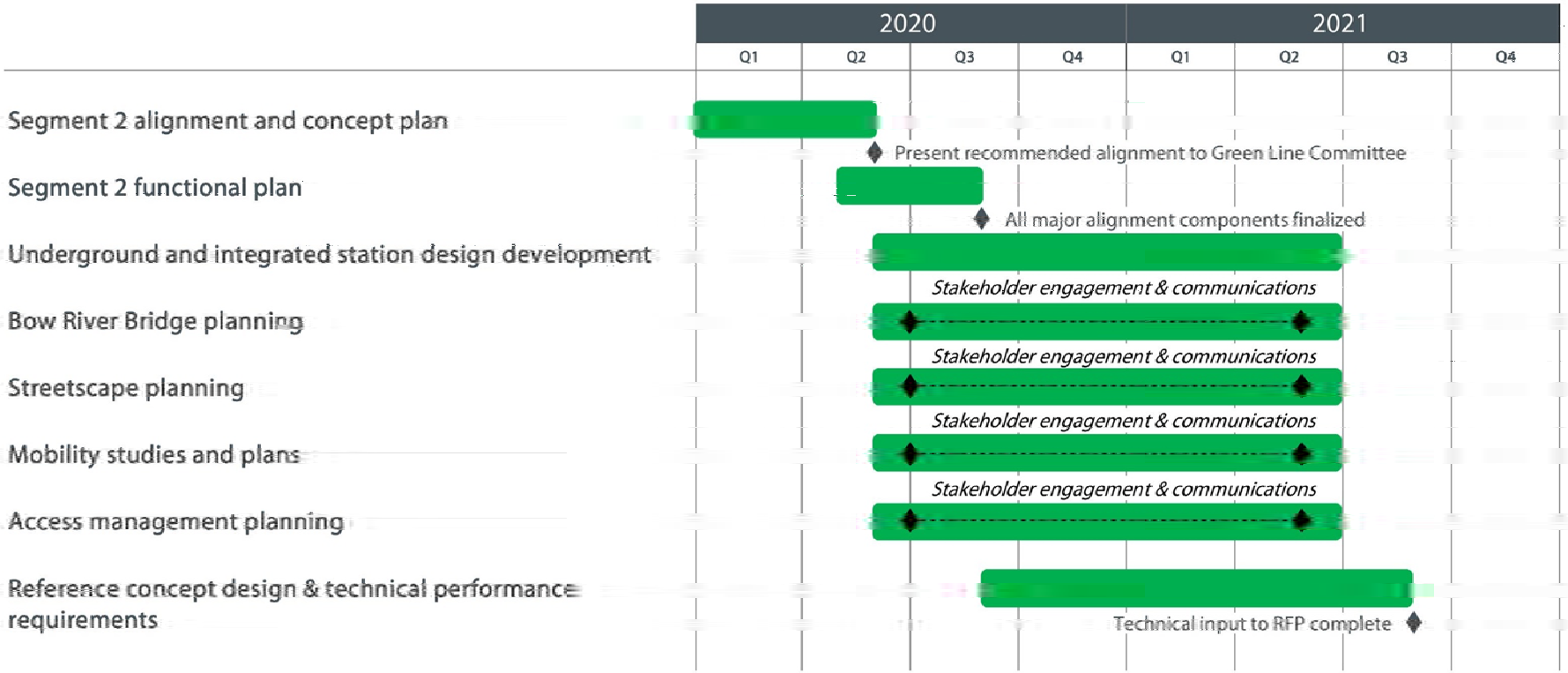
Portal

The portal will be located at the northern edge of the Victoria Park Transit Centre and directly south of the Canadian Pacific rail line. It will be designed in a way to allow for encapsulation within a future development, similar to the approach taken with the new Central Library.

Perspective rendering of LRT emerging from the tunnel portal before crossing the Elbow River.

Next Steps

A work program has been developed in order to advance the planning for Segment 2. The chart below outlines the key planning activities and identifies opportunities for stakeholder engagement and communications, where applicable, and descriptions of each planning activity are outlined in the following sections.



Segment 2 functional plan

The functional planning phase will:

- finalize the LRT horizonal and vertical alignment;
- confirm station box location, platform configurations and station entrance locations;
- develop roadway design for affected roads along the corridor;
- identify utility conflicts;
- identify preliminary property requirements; and
- update capital cost estimates and risk assessments.

Underground and integrated station design development

This design phase includes:

- developing design for station box and station entrances;
- working with Harvard Development Inc. on the integrated portal and station at 2 Avenue SW;
- exploring opportunities with landowners adjacent to 7 Avenue SW, Centre Street S and 4 Street SE stations to integrate underground station entrances in existing or future developments; and
- developing architectural concepts for stations and station areas.

Bow River Bridge planning

Through the next stage of planning detailed technical investigations and studies will include:

- developing a preferred bridge architectural concept, including urban design features;
- confirming bridge pier locations, in conjunction with construction procurement and environmental approvals;
- refining the bridge alignment and configuration, including the shape of the bridge curve;
- determining if the pathway is situated on the top deck, bottom deck, or on the side of the bridge;
- geotechnical, hydrotechnical, archaeological and survey investigations;
- environmental studies to ensure that the bridge design and construction plans minimize environmental impacts and meet municipal, provincial and federal regulatory requirements relating to fish habitat, wildlife and other environmental considerations;
- public engagement process to gather more specific input on bridge architecture objectives;
- identifying potential impacts to natural areas during construction and develop mitigation plans to limit temporary disturbance to vegetation and wildlife habitat; and
- development of plans to restore any impacts to the surrounding natural area.

Mobility studies and plans

Mobility studies and plans will include:

- Community Traffic Review and Plan to address changes to the mobility network and which may include additions and modifications to existing community traffic-calming measures; and
- Network Traffic Review to examine existing traffic patterns, determine which alternate routes will receive more traffic, and develop strategies to manage impacts.

Streetscape planning

Broad streetscape planning will be focused on Centre Street N and 2 Street SW corridors and include:

- analysis of existing conditions, use patterns, circulation, critical connections, constraints and opportunities;
- coordination with other current and planned streetscape and urban realm initiatives to ensure alignment and identify potential collaboration opportunities;
- engagement with stakeholders on general character, aesthetic and theme of streetscape designs, as well to explore potential opportunities on placemaking and city shaping initiatives;
- development of streetscape master plans, which outline the design vision for new sidewalks (building face to building face, pending agreements with private landowners), roadway and pedestrian oriented streetlighting, tree planting locations, new furnishings (benches, bike racks and waste & recycling bins), and pedestrian crossings; and
- development of materials palette, cross-sections, and configuration of streetscape elements to inform the next phase of reference concept and technical design.

Access management

This work program will focus on planning for opening day conditions for area businesses. A key focus of this work will be the development of a Business Access, Loading and Parking Plan that will explore potential solutions to manage access and parking changes resulting from changes to Centre Street N, including changes to on-street parking on adjacent avenues and new opportunities for off-street short-term parking.

Reference concept design and technical design requirements

- structural design of bridges and underground structures, such as stations, portals, and running tunnels;
- utility relocation and protection plans;
- noise and vibration studies to identify where mitigation measures might be required, such as installation of special track systems and other noise and vibration abatement measures;
- update capital cost estimates and risk assessments;
- finalize property acquisition requirements; and,
- draft technical specification requirements to include as part of the contract document for construction of Segment 2.