

Yellowhead and Calder Bus Bridge

Recommendation

That the March 13, 2018, Integrated Infrastructure Services report CR_5002, be received for information.

Previous Council/Committee Action

At the March 13, 2018, Urban Planning Committee meeting, the following motion was passed:

That the March 13, 2018, Integrated Infrastructure Services report CR_5002, be postponed to the April 3, 2018, Urban Planning Committee meeting.

At the June 27/28 2017, City Council meeting, the following motion was passed:

That Administration:

1. amend the scope of the NW LRT design study to include exploring a scenario, with pros and cons, where a precursor express bus service could run north from Blatchford on a bridge over the Yellowhead and CN Calder Rail Yard, with the bridge future-proofed for upgrade to rail for LRT,
2. take this scenario into account as part of the continuing Transit Strategy and report back on the opportunity to align the Strategy to this precursor express bus scenario,
3. include this precursor scenario in the continuing public engagement on NW LRT planning,

and report back to Committee in March 2018.

Executive Summary

A feasibility study was undertaken assessing the potential of an express bus precursor to the Metro Northwest LRT corridor (Blatchford to Campbell Road), including assessment of the future Yellowhead and CN Walker railyard bridge. Express bus (also known as Bus Rapid Transit) alternatives were shortlisted to three service level options; regular, enhanced and premium. This report presents the

advantages and disadvantages of each option, along with each option's viability for:

- potential future conversion to LRT
- alignment with the City's Transit Strategy, and
- public support (based on the results of public engagement)

This interim express bus service would improve transit options (compared to existing) for northwest Edmonton residents travelling downtown, but would not have sufficient capacity to meet ultimate ridership projections. Constructing an interim express bus service, and then retrofitting this service to LRT in the future, could result in substantial throwaway costs and present operational challenges (transit service disruption) during the retrofit process.

Report

Project Overview

The Metro Line is a 19 kilometre LRT line that will operate between Health Sciences and Campbell Road, with a 2047 projected ridership of 110,000 boardings per day. Related Council approval and implementation history is as follows:

- The LRT Network Plan was approved in 2009 and identified a LRT corridor to service northwest Edmonton.
- In 2010, the Metro Line Northwest (NAIT to Campbell Road) corridor was approved.
- In 2014, the concept plan for the Metro Line Northwest (NAIT to Campbell Road) was approved.
- In 2015, a 3.3 kilometre extension from Churchill Station to the temporary NAIT station went into operation.

City Council designated the segment of Metro Line running from NAIT to Blatchford as LRT construction priority 1B, along with the Valley Line West (priority 1A), for LRT delivery funding through deliberation on Integrated Infrastructure Services report CR_3314 (*Long Term Funding Plan for the LRT - Strategic Options, Extension Planning and Proposed Stages of Construction*) on May 3, 2016.

In September 2016 the City of Edmonton received funding to complete preliminary design for the Metro Line segment running from Blatchford to Campbell Road through the Government of Canada's Public Transit Infrastructure Fund. This segment of the Metro Line has not been prioritized for construction by City Council.

Yellowhead Trail / CN Walker Rail Yard Bridge

A new bridge will be constructed over Yellowhead Trail and the CN Walker Rail Yard as part of the Metro Line when it is extended north of Blatchford. Administration

reviewed the advantages and disadvantages of advancing construction of this bridge to enable the express bus options explored in this report.

The bridge would provide a key link from the Blatchford community, south of the Yellowhead Trail, to the Lauderdale and Calder communities to the north and would be dedicated for transit operations (bus or LRT) and active modes only, with no vehicular traffic.

The value of this dedicated transit bridge is demonstrated in the long-term (2047) transit ridership models, which project the segment of the line between Blatchford Station and the 132 Avenue Station (which includes the bridge) as having the highest ridership of any segment along the northwest extension from Blatchford to Campbell Road. This includes 7,450 southbound passengers per hour in the morning peak and 5,500 northbound passengers per hour in the evening peak.

Measures can be taken during the initial bridge construction to “future-proof” for LRT, such as installation of duct banks, conduits and foundations for overhead catenary supports, while other elements would be deferred until LRT conversion, such as trackwork, overhead catenary lines and train control systems.

Express Bus Service Level Scenarios

There are multiple methods of providing Express Bus Service (or Bus Rapid Transit), an overview of which is provided in [Attachment 1](#). In response to the Council motion, a number of express bus service alternatives for the Metro Northwest corridor were shortlisted to three options: regular, enhanced, and premium.

| | Regular Service | Enhanced Service | Premium Service |
|-------------------------------|--|-------------------------|---|
| Characteristics | Transit queue jumps with mixed traffic | Blend of options | Dedicated busway Transit signal priority |
| Travel Time | Slowest | Medium | Fastest |
| Reliability of Service | Lowest - traffic dependent | Medium | Highest - mostly independent of traffic |
| Capacity | Low | Low | Medium |
| Cost | Lowest | Medium | Highest |
| Time to Implement | Fastest | Medium | Slowest |

Travel Time and Reliability of Service

For residents of northwest Edmonton wishing to travel from Castle Downs Transit Centre to downtown, all express bus options considered would offer considerable time savings over the existing bus service.

| Option | Est. Present Day Travel Time (Castle Downs to Churchill Station) | Est. Present Day Travel Time (Campbell Rd to Churchill Station) |
|----------------------------|---|--|
| Current Bus Service | 40 minutes (+/- 20%) | N/A <i>no current comparator</i> |
| Regular | 29 minutes (+/- 20%) | 40 minutes (+/- 20%) |
| Enhanced | 28 minutes (+/- 20%) | 38 minutes (+/- 20%) |
| Premium | 26 minutes (+/- 20%) | 33 minutes (+/- 20%) |
| LRT | 20 minutes (+/- 20%) | 27 minutes (+/- 20%) |

Bus travel times for these scenarios are high level estimates based on current traffic conditions and bus operating parameters, and are not based on short and long term traffic modeling projections. Travel times for the express bus options are expected to increase as traffic volumes increase over time. Based on the dedicated corridor for the high quality option it would experience the least amount of impact from traffic volume increases. These travel times assume a five-minute transfer from bus service to LRT based on a 10-minute LRT service frequency.

Capacity

Express bus options were evaluated with the assumption that articulated buses would be used, which can each accommodate 70-85 people. The Metro Line LRT will operate with 5-car trains during peak hours, which can accommodate 700-800 people. Therefore it has been assumed that 10 articulated buses are required to match the capacity of a single 5-car high-floor LRT train.

None of the express bus options reviewed are capable of meeting the 2047 ridership projections. An express service operated at a frequency of three minutes would meet approximately 20 percent of the long term ridership requirements for the southbound AM peak demands. Although these options will not meet long term demands, they would provide a capacity increase over current transit services in northwest Edmonton.

Should a bus express service be advanced for further consideration, the potential use of double articulated bus, which has capacity for 140-170 passengers, would be explored.

Capital Cost

The cost of the express bus service will vary substantially depending on the level of service provided and the amount of LRT future-proofing work undertaken at the time of initial construction. The estimates for express bus options considered in this report range from 20-80 percent of the capital construction cost of the Metro Line. The current conceptual estimate for constructing the Metro Line (Blatchford to Campbell Road) is \$1.75 billion inflated to 2027 dollars.

| | <u>Regular Service</u> | <u>Enhanced Service</u> | <u>Premium Service</u> |
|-------------------------------|---|--|--|
| Capital Cost (% of LRT Cost) | 20-40 | 30-70 | 50-80 |
| Required Items | <ul style="list-style-type: none"> ● Bridge ● Bus Maintenance Facility ● Intersection upgrades ● Stations ● Partial land acquisition ● Blatchford bus exchange ● Dedicated bus fleet | <ul style="list-style-type: none"> ● Bridge ● Bus Maintenance Facility ● Partial right of way ● Stations ● Partial land acquisition ● Blatchford bus exchange ● Dedicated bus fleet | <ul style="list-style-type: none"> ● Bridge ● Bus Maintenance Facility ● Right of way ● Signaling ● Stations ● Full land acquisition ● Blatchford bus exchange ● Dedicated bus fleet |
| Future proofing opportunities | <ul style="list-style-type: none"> ● Full land acquisition | <ul style="list-style-type: none"> ● Full land acquisition ● Utility relocates | <ul style="list-style-type: none"> ● Grade separations ● Utility relocates ● Landscaping |
| Throwaway costs | <ul style="list-style-type: none"> ● Bridge running surface ● Stations ● Blatchford bus exchange | <ul style="list-style-type: none"> ● Bridge running surface ● Stations ● Some right of way surface ● Blatchford bus exchange | <ul style="list-style-type: none"> ● Bridge running surface ● Stations ● Right of way surface ● Blatchford bus exchange |

For all options considered, throwaway capital costs at the time of conversion to LRT are estimated at 30-50 percent. For major structures, such as the Yellowhead Trail and CN Walker Yard bridge, throwaway costs would be lower (approximately 10 percent).

Life Cycle Cost

Although the initial capital costs of an express bus service are less than LRT, the long term life cycle investment needed to support an express bus service are greater.

Matching the passenger capacity of a five-car LRT train requires 10 articulated buses. The typical lifespan of an articulated bus is 12 years, whereas a light rail vehicle has a life expectancy of 35 years. Therefore, to move the same number of riders by bus over the life expectancy of a single 5-car high floor train, a total of approximately 30 buses is required. This also results in a corresponding increase in staff time to operate and maintain the fleet of buses compared to LRT.

Generally, LRT vehicles are less expensive to operate on a per rider basis compared to buses, as the cost to maintain, operate and power a 5-car LRT train is less than that for 10 articulated buses.

As a result of these factors, the total life cycle cost of an express bus system over a 35-year period could be 20-30 percent more than that of an LRT system.

Bus Fleet Maintenance Facility

There is currently no capacity within ETS maintenance garages for an additional fleet of articulated buses. An additional facility would be required, and there is no location currently identified for such a fleet. The proposed Light Rail Vehicle maintenance facility in Rampart is not large enough for the equivalent fleet of buses. It would not be cost effective to retrofit a bus maintenance facility to an LRT facility so a stand alone bus maintenance facility would be an option that could later be repurposed to accommodate growth needs.

BRT to LRT Conversion Considerations

An additional consideration is the operational challenges experienced during the conversion process, which would take approximately two to four years to complete. During this transition phase, express bus operations for all service levels assessed would be substantially impacted because the Yellowhead Trail and CN Walker Yard bridge would not be available for transit use during this time. Bus service would detour to either 97 Street or 127 Street.

For the premium service option, north of the bridge the bus service could be shifted to operate with mixed traffic during the conversion, significantly decreasing the service reliability. For the regular service option, buses could continue to operate in mixed traffic, but at a reduced level of reliability due to traffic management requirements and lane reductions during construction.

Other options include:

- cease express bus services at the time the conversion starts
- shift to an alternate alignment
- convert private vehicle lanes to bus only service

Compromises to the level of service are expected to negatively impact ridership levels, which may take some time to recover after LRT service begins.

Potential Project Timelines

The timeline to design and construct an express bus corridor, to procure buses and to implement express bus service is anticipated to take five years from the time of funding approval and would require extensive coordination with the Yellowhead Trail Freeway Conversion project, which is still in the planning phase.

Transit Oriented Development and Mode Shift

Research cited in Attachment 2 shows that the key to generating redevelopment is the pedestrian-oriented design of the rapid transit stations and integration with the surrounding community. The rapid transit mode may be less important than the quality of station design.

The perception of permanence and prestige associated with LRT often draws more dense development and more riders compared to BRT. The more that BRT can approach features of rail in its design, such as attractive stations and fixed, permanent-seeming infrastructure, the more it will succeed in providing an attractive development climate.

Positive land value impacts near transit are more likely to be seen in commercial property than residential, and in condos more than in single family homes.

Redevelopment is not guaranteed by rapid transit investment. The market and good economic conditions must be in place. Traffic congestion must also exist to increase land value near transit stations.

This research is supported by the Canadian Transit Oriented Development Institute, the Canadian Urban Transit Association and infill developers in Edmonton, who are progressing development plans along LRT corridors. Those developers have advised that their development plans would have progressed with less density in the absence of LRT, and that express bus service would not have enticed the same level of private investment. While express bus service is an effective means of mass transit, the

permanency of LRT is a catalyst to achieving the City's objective of compact urban form.

Transit Strategy Integration

Edmonton's Transit Strategy was approved by Council in July 2017. Upon approving the Strategy, Council directed Administration to initiate a bus network redesign in order to align the bus network with the guiding principles of the Strategy. The conceptual Primary Transit Network presented in the Strategy included a faster, more direct connection from the northwest to the central area, utilizing existing roadways. Work is currently underway to refine the conceptual transit network and prepare for public engagement on the draft network in 2018. The new network plan proposes a peak-only rapid bus route running between NAIT and the northwest, travelling south along 127 Street and down 118 Avenue to the NAIT LRT station. The terminus of this route could be adjusted with the extension of the Metro Line from NAIT to Blatchford station.

The new bus network will be implemented in 2020 and is intended to be revisited on a 10-year cycle. As work advances in parallel on the bus network redesign and Metro LRT design, and timing of major capital projects is reassessed, opportunities to integrate and align the outcomes of these projects will be continuously explored.

Next Steps

This report only provides a high level feasibility assessment. Additional research, scenario development, planning and consultation is required before advancing bus express service to any part of the City. As part of planned updates to the City's Transportation Master Plan and Municipal Development Plan, Administration will assess if and how bus express service should be advanced. Options may include:

- bus express service as a precursor to LRT
- complimentary bus express service running in corridors between LRT lines

Public Engagement

Public engagement has been an essential part of the development of the Metro Line. Public Engagement programs were undertaken for the Metro Northwest corridor selection (2009), the Metro Northwest concept design (2013), and for the construction of the Metro Line (Churchill to NAIT) segment. Additionally, public engagement to inform the current preliminary design assignment began in 2017 and will continue through 2018.

In January 2018, Administration spoke with more than 400 Edmontonians at three public engagement sessions. Feedback was gathered from the public on advancing

express bus service in advance of LRT along the Metro Line Northwest corridor. Some of the key results were:

- Of the survey respondents, approximately two-thirds indicated they would use an express bus service in advance of LRT service
 - Timing is important - citizens do not want to wait 20 years for better transit options, although they still prefer LRT over BRT
- The majority of survey respondents did not favour any one BRT option and the support for each option was relatively close:
 - Approximately one-third favoured the high quality option
 - Approximately one-quarter favoured the minimal option
 - Approximately one-fifth favoured waiting for LRT
 - The remaining one-sixth favoured the mid-service option
- Uncertainty was expressed by a number of survey respondents as to whether or not bus service would encourage new ridership. However, these same survey respondents felt it would be an improvement for existing transit users.
- Many survey respondents felt an interim express bus service would particularly benefit seniors and students.

While there is support for express bus service, respondents generally do not want express bus service in place of the Metro Northwest LRT in the long term, and would prefer to have the LRT service extended into northwest Edmonton as soon as possible.

Corporate Outcomes and Performance Management

| Corporate Outcome(s): Edmontonians use public transit and active modes of transportation | | | |
|---|----------------------|--------------------------|-------------------------|
| Outcome(s) | Measure(s) | Result(s) | Target(s) |
| Edmontonians use public transit and active modes of transportation | Transit ridership | 96.9 rides/capita (2016) | 105 rides/capita (2018) |
| | Journey to work mode | 24.7% (2016) | 25.9% (2018) |

| Corporate Outcome(s): Edmonton is attractive and compact | | | |
|---|--|------------------|--------------------------------------|
| Outcome(s) | Measure(s) | Result(s) | Target(s) |
| Edmonton is attractive and compact | Edmontonians' assessment: Well-designed, attractive city | 53% (2016) | 55% (2018) positive survey responses |

| Corporate Outcome(s): The City of Edmonton has sustainable and accessible infrastructure | | | |
|---|---|------------------|--------------------------------------|
| Outcome(s) | Measure(s) | Result(s) | Target(s) |
| The City of Edmonton has sustainable and accessible infrastructure | Edmontonians' assessment: Access to amenities and services that improve quality of life | 67% (2016) | 70% (2018) positive survey responses |

Attachments

1. Bus Rapid Transit Information Sheet
2. Relevant Publications

Others Reviewing this Report

- C. Campbell, Deputy City Manager, Communications and Engagement
- D. Jones, Deputy City Manager, City Operations
- L. McCarthy, Deputy City Manager, Urban Form and Corporate Strategic Development
- T. Burge, Chief Financial Officer and Deputy City Manager, Financial and Corporate Services