Attachment 1

EDMONTON LRT EXPANSION

DOWNTOWN LRT CONNECTOR CONCEPT PLAN

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THE CITY OF Edmonton

Downtown LRT Connector

Concept Planning Report

Report

May 2011 (revised)

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1 Introduction

Study Purpose

1.1 The purpose of this study is to develop plans for a 2.1-km addition to the City of Edmonton's Light Rail Transit (LRT) system to connect the proposed West and Southeast LRT with a street-running alignment in downtown Edmonton.

Document Changes from Previous Version

1.2 This document has been amended (May, 2011) since it was originally presented to the City for consideration in 2010. The document has been updated to provide new details, addressing stakeholder feedback received since the public information sessions in November, 2010. Changes that have been introduced to the Recommended Concept Plan in this document include:

- Campus Stop has been moved to 107 Street (between 104 & 103 Avenue)
- LRT vehicle parking lane provided on 107 Street (between 102 & Jasper Avenue)
- Dedicated two way cycle lane provided on 102 Avenue (between 107 & 99 Street)
- Continuous eastbound traffic lane provided on 102 Avenue (between 107 & 95 Street)
- On street parking provided on 102 Avenue
- Parking loading provided between 96 & 95 Street
- Pedestrian crossing provided west of 95 Street on 102 Avenue

1.3 Details on these changes are provided in the subsequent sections

Background

1.4 In June 2009, the City Council adopted the long-term LRT Network Plan that defined the future size, scale, and operation of the regional LRT system. The Network Plan makes downtown Edmonton the focal point of the system, with the determination that a street-level LRT system would be needed in the downtown core to serve future system expansion separate from the existing LRT system in the downtown tunnel.

1.5 This report builds upon the earlier works undertaken to identify the LRT corridor through the downtown which was approved on 21 June 2010 at a statutory public hearing of the City Council in conjunction with the Capital City Downtown Plan (CCDP). The corridor approved by City Council identified the streets and avenues the LRT would follow through the downtown. This report further refines the approved corridor, identifying the specific concept alignment and station stop details.

1.6 The document describes the process used in the development of the concept design for the Downtown LRT Connector. It outlines the approach taken to develop and assess

the potential options and presents a summary of the technical analysis that resulted in the recommended Downtown LRT Connector.

1.7 The recommended Downtown LRT Connector complements, and links the proposed West and Southeast LRT corridors and is also consistent with the Capital City Downtown Plan (CCDP). In combination, these initiatives provide a major opportunity for the City of Edmonton to introduce a series of major improvements to the downtown. In particular, the introduction of a new (surface level) LRT route can be a significant "city shaper" providing a focus for new development, and changing the way in which people access and use the downtown and it's many facilities.

1.8 The report consists of the following five sections:

- Introduction
- Project context
- Option development and evaluation
- Recommended corridor
- Next steps

Urban Style – City Scale LRT

The City of Edmonton has adopted a new long-term LRT network plan and style of system that differs from the current LRT line. The focus of future LRT expansion will be to provide an Urban Style - City Scale system, an approach that will provide closer stop spacing and improved links to communities, supporting the City's vision for a more compact, sustainable and liveable city. An Urban Style – City Scale system is defined in the LRT Network Plan as:

Urban Style:- *A style of System that offers: reduced scale platforms and stops; modern low floor LRT vehicles; frequent stops; transit priority; serving dense urban corridors.*

City Scale:- *Distinctive design that provides: identity; seamless integration; easily accessible; supportive of land use plans, and walkable communities.*

1.9 Figure 1.1 provides examples of Urban Style - City Scale LRT in Dublin and Amsterdam, showing related transit oriented development (TOD) and the integration of LRT into existing city streetscapes.

FIGURE 1.1 EXAMPLES OF URBAN STYLE – CITY SCALE LRT

LRT/Stop - Dublin, Ireland

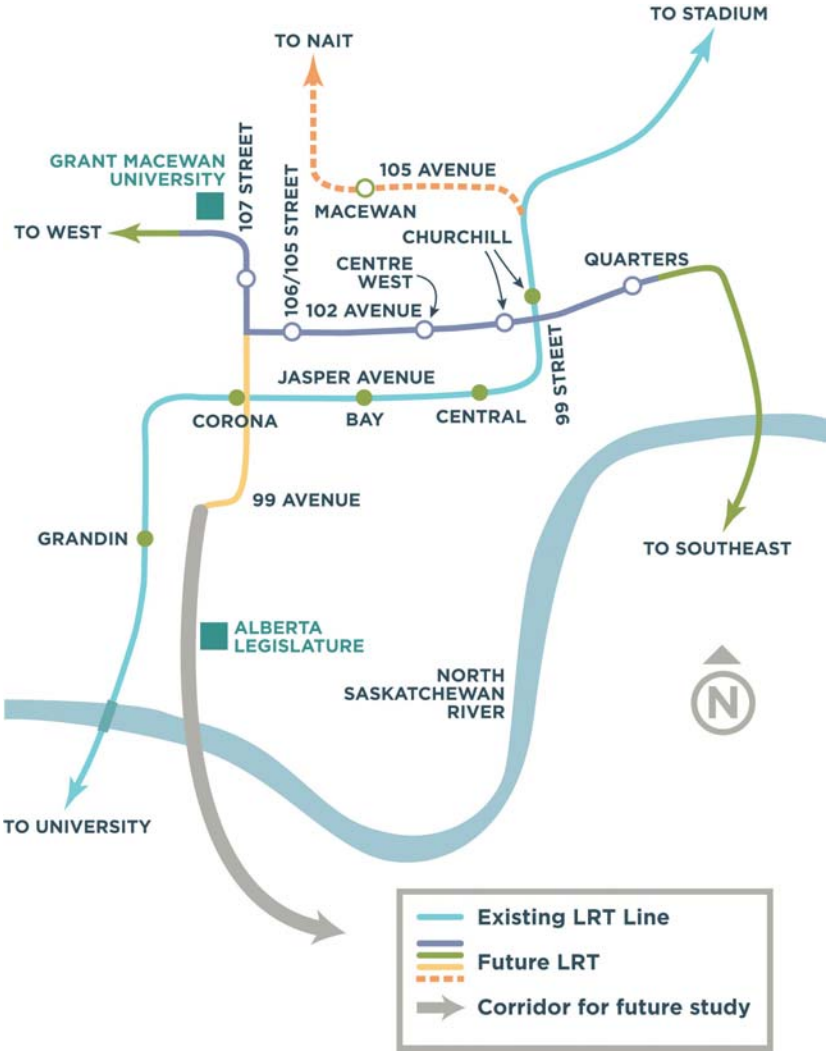
Alignment - Amsterdam, Netherlands

Study Boundary

1.10 The development of the Concept Plan for the Downtown LRT Connector builds upon the earlier work undertaken to identify the LRT corridor through the downtown, as approved by City Council.

1.11 The route runs from a connection to the West LRT line on 104 Avenue, running south on 107 Street before turning east on 102 Avenue through the Warehouse Campus District and through Churchill Square, connecting to the Southeast line in the Quarters. Figure 1.2 provides an illustration of the Downtown LRT Connector.

FIGURE 1.2 DOWNTOWN LRT CONNECTOR CORRIDOR



1.12 The corridor encompasses the Downtown (including the Warehouse Campus, Commercial, and Capital City districts) and the Quarters (a development area close to the eastern boundary of the Downtown).

2 Project Context

City Plans

2.1 The development and assessment of the recommended corridor for LRT through the downtown has been influenced by The City of Edmonton's strategic vision, which aims for a more compact, livable and sustainable city, where people have the opportunity to choose and use alternative transportation modes. In turn, this approach is also set out in the following City plans:

- "The Way Ahead", the Strategic Plan
- "The Way We Grow", the Municipal Development Plan (MDP)
- "The Way We Move", the Transportation Master Plan (TMP)
- The LRT Network Plan
- The "Capital City Downtown Plan" (CCDP)

The Way Ahead

2.2 The City of Edmonton's Strategic Plan provides a framework to establish priorities and make informed decisions for the future. This plan sets a vision for Edmonton 30 years in the future. Created with input from citizens, the vision sets direction for the City by establishing a descriptive target of a vibrant, sustainable city that builds on Edmonton's cherished assets. Recognizing the critical role that public transportation plays in the viability and success of Edmonton, the Plan serves to guide City Council's decision making with strategic goals and progress checkpoints.

The Way We Grow

2.3 The MDP represents the City's strategic growth and development plan. Clear direction on municipal and regional planning is critical given the anticipated population growth of over 1 million residents by 2040. The realization of many goals and objectives of the MDP will shape the city's urban form and direct the development in conjunction with key transit node and corridor locations including LRT. This approach serves to manage growth and ultimately create a sustainable, healthy, and compact City.

The Way We Move

2.4 The TMP re-prioritized the transportation network towards transit and goods movement, providing private automobile trips with a lower priority. At the same time, the City has followed through with its policy direction to coordinate land use and transportation planning by directly linking the TMP to the MDP and vice versa. The new TMP also promotes a more compact urban form, the creation of transit-oriented development and a significant investment in public transportation.

2.5 The TMP establishes a number of strategic goals for the City's transportation network and planning. These cover areas including:

- Transportation and Land Use Integration
- Access and Mobility
- Sustainability
- Health and Safety
- Transportation Mode Shift
- Well-Maintained Infrastructure
- Economic Vitality

2.6 The new TMP sets out how a larger, more integrated LRT network could be used to meet the goals set out within the TMP and help the City deliver it's wider objectives set out in the City's Strategic, Municipal and Capital City Downtown Plans.

The LRT Network Plan

2.7 Expansion of the LRT network has a significant role to play in helping to shape future city development and supporting the City's strategic objectives.

2.8 New LRT stops, developed in conjunction with surrounding land use plans encouraging appropriate density, provide the catalysts for the development of more compact urban communities. The new LRT lines also provide the opportunity to incorporate urban realm improvements, integrating the routes and stop with the communities they serve. The use of surface routes and stops offer improved accessibility, help to promote greater use of transit, and increase mode share. The stops also help to generate increased local vibrancy through the pedestrian movement to and from the stops.

2.9 Recognising the importance of transit's role in helping to meet the City's strategic goals and the role that the existing and future development of LRT can play in this effort, the City has developed an LRT Network Plan to guide the long term expansion of the network.

2.10 The Plan is based on an assessment of long term population and employment growth, capacity requirements, and an evaluation of potential LRT catchments and corridors. The plan proposes a six line LRT system extending from the Downtown to the Northwest, Northeast, East, Southeast, South and West, as illustrated in Figure 2.1.

FIGURE 2.1 EDMONTON'S PROPOSED FUTURE LRT NETWORK

2.11 Key elements of this plan include:

- Serving communities only where future land use and demand warrants it
- Street level operation of new LRT lines
- An Urban Style, City Scale approach to guide any future LRT development
- Low-floor LRT technology for new lines that do not connect to the existing system

Capital City Downtown Plan

2.12 In the development of the Downtown LRT Connector a critical influence has been the CCDP, which sets out the proposals for the ongoing development of the downtown area. Within this plan, the Downtown LRT Connector is identified as one of the nine catalyst projects, as it will provide opportunities to improve access through the

downtown, with the LRT stops providing opportunities to focus development and support new activity centres and existing and new communities.

2.13 The Capital City Downtown Plan was prepared in parallel with the Downtown LRT Connector study, which provided the ideal opportunity to integrate the two studies. In turn, this ensures the LRT network is integrated into the CCDP to maximise the proposals for land use, urban realm and street use (which include pedestrian, cycling, transit and general traffic).

2.14 The CCDP also set four key policies which help guide the development of the downtown LRT alignment, Under these policies, the development of the LRT will help support and facilitate all the objectives under the four policies:

- Sustainable
  - Healthy natural environment
  - Reduced energy and emissions and improved air quality
  - Stewardship of natural and material resources
  - Healthy communities
  - A sense of place
- Vibrant
  - Additional downtown housing
  - Commercial, retail and educational activities
  - Diverse arts, culture and entertainment
- Well-Designed
  - Well designed built and urban forms
  - Defined street framework
  - Additional connected parks and open spaces
  - Historic preservation
- Accessibility
  - Efficient roadway system
  - Enhanced pedestrian circulation
  - Improved cycling
  - Superior transit

3 OPTION DEVELOPMENT & EVALUATION

Concept Plan Process Overview

3.1 The City Transportation Department and the project team, in conjunction with stakeholders, have used a multi-stage process to review, develop, assess and identify the preferred Concept Plan for the Downtown LRT Connector.

3.2 The approved Downtown LRT Corridor formed the starting point for the study team. The development of the preferred alignment of the Downtown LRT Connector was then approached in three stages.

1. Initial Options
2. Draft Concept
3. Recommended Concept

3.3 The first stage included the development of "Initial Options" for alignment features, such as stop location options and the location of track within the alignment. The second stage identified the most promising components of each option to form the "Draft Concept". A design plan was developed at this point to support further stakeholder and public engagement. The third stage used the input and feedback from the stakeholder and public engagement to identify the "Recommended Concept Plan". A detailed plan for this single option was developed to further identify impacts, benefits, and methods of mitigation. Each step is described in detail below.

Initial Options Development

3.4 Using the approved LRT corridor through the downtown, the associated LRT stop locations were reviewed to ensure that they best served the City and fit with the objectives set out by the City. At each of the stop locations a number of objectives were identified to support the development of options that would meet each location's objectives.

3.5 The options were drawn up in conceptual form and used to produce a consultation booklet ("Concept Plan for the Downtown LRT Connector – Design Options"). The booklet was used in meetings with Downtown Stakeholders in September 2010 to highlight the issues and opportunities with the differing options and to help facilitate stakeholder involvement and feedback.

3.6 The feedback from the stakeholder events was used in combination with the City's objectives to evaluate the options against the City's LRT assessment criteria. The top level criteria are:

- LRT alignment
- Catchment
- Land use integration

- Transportation network integration
- Urban design
- Urban form

3.7 This approach resulting in a preferred stop arrangement for each of the identified locations.

Draft Concept

3.8 Based on the information obtained during the "Initial Options" phase, the plan was developed and further refined to identify the "Draft Concept". A public consultation booklet was produced focused on the single concept ("Downtown LRT Connector – Draft Concept Plan"). This document was used for the public open house session and stakeholder meetings conducted in early November 2010 to help facilitate public involvement and feedback. The original draft of this report was also provided to the Transportation and Public Works Committee (TPW) as an information item on December 8, 2010.

3.9 In parallel to the development of the public consultation booklet and materials, the development of the draft concept design continued, examining:

- Pedestrian and cycle integration
- Traffic assessment and identification of complimentary measures
- Utilities and drainage
- Geotechnical issues
- Environmental issues including
  - Landscape
  - Historic resources
  - Noise and vibration
- Cost estimates

3.10 The public consultation and stakeholder involvement was then used in the final stage to refine the Recommended Concept Plan.

Recommended Concept Plan

3.11 The final, recommended option was further refined based upon the stakeholder and public involvement and where possible to mitigate issues raised. An additional public consultation booklet was produced focused on the single concept ("Downtown LRT Connector – Draft Concept Plan April 2011"). This document was used for the public information session and stakeholder meetings conducted in late April 2011 to facilitate public involvement and feedback. The primary changes incorporated into the Recommended Concept Plan based on feedback included:

- Campus Stop has been moved to 107 Street (between 104 & 103 Avenue - now referred to as the 107 Street stop)
- LRT vehicle parking lane provided on 107 Street (between 102 & Jasper Avenue)
- Dedicated two way cycle lane provided on 102 Avenue (between 107 & 99 Street)
- Continuous eastbound traffic lane provided on 102 Avenue (between 107 & 95 Street)
- On street parking provided on 102 Avenue
- Parking loading provided between 96 & 95 Street
- Pedestrian crossing provided west of 95 Street on 102 Avenue

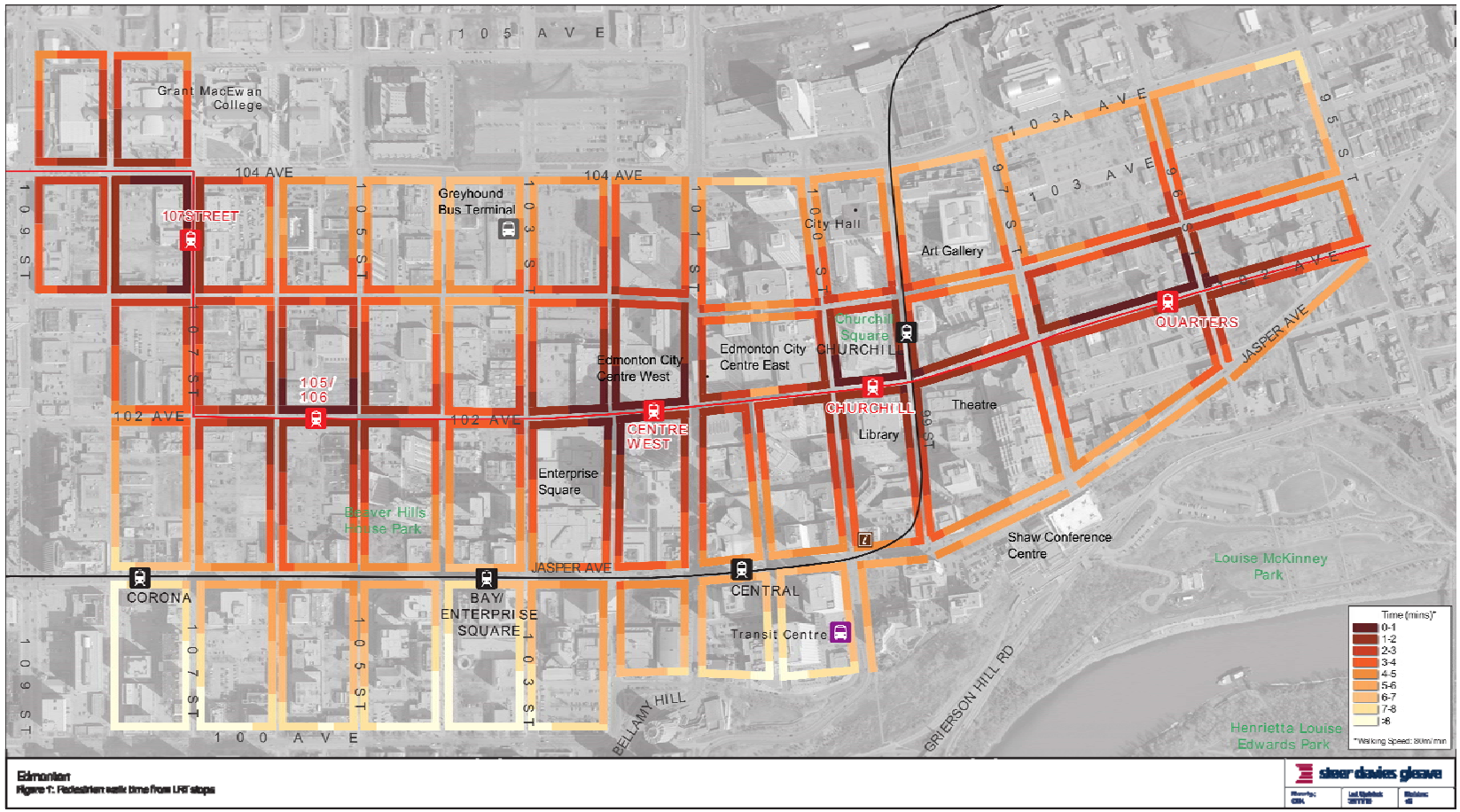
Stop Options Development

3.12 During the development, assessment and recommendations of the corridor, a number of potential stop locations were identified along the proposed corridor, 107 Street, 105/106 Street, Centre West, Churchill Square, and the Quarters. These stop locations were reviewed on commencement of the plan development.

3.13 The platforms for each stop will be approximately 30 to 35 centimetres high and 80 metres long, effectively the length of the block. Access for passengers is via shallow ramps from the intersections at each end of a block.

3.14 The identified stops locations would provide an average stop spacing of approximately 500 metres along the 2.1 kilometre route. The 400 metre catchment of the proposed stop locations is shown in Figure 3.1, the diagram shows that the identified stop locations maximise the close walking accessibility and catchment along the proposed corridor.

FIGURE 3.1 STOP CATCHMENT – WALK TIME



107 Street

3.15 The objective of this stop location in this area is to provide a direct and convenient transit service to Grant MacEwan University, NorQuest College, the Warehouse Campus Neighbourhood identified in the CCDP, and 108 Street. The stop locations that would meet these objectives are potentially more widely spaced than other stop locations being considered along the alignment, as opportunities exist at a greater number of locations on this section of the route.

3.16 A single stop location is proposed to strategically serve both Grant MacEwan and NorQuest. A number of stop locations have been identified and evaluated between 102 Avenue/107 Street and 104 Avenue and 109 Street. The stop location would also serve part of the Warehouse Campus district.

105/106 Street

3.17 The objective for this stop location is to provide a stop as far west as possible on 102 Avenue to provide walking links through to Jasper Avenue and Corona Station prior to the potential future wider downtown LRT circulator. The stop would also provide local walk links within the Warehouse Campus District and walking links to the Provincial Government building to the southwest.

Centre West

3.18 The objective for this stop location is to provide connectivity to the commercial core within the downtown, walking links through to Jasper Avenue, interchange with transit on 101 Street and future connectivity to the potential arena development.

3.19 The stop location is proposed between 101 and 102 Streets on 102 Avenue. The location will provide connectivity and accessibility to the core business district, Downtown shopping and amenities, Pedway and the potential future arena.

Churchill Square

3.20 The objective for this stop location is to provide connectivity to the arts and entertainment district within the downtown, interchange with the existing LRT line, walking links through to Jasper Avenue and the river valley, interchange with transit on 100 Street, and connectivity to the municipal government.

3.21 The stop location is proposed to be between 99 and 100 Street on 102 Avenue. The stop will provide connectivity to both the west and east side of Churchill Square, and provides the opportunity to integrate the stop platform with the existing sidewalks and surfacing. The location will provide the connectivity between the existing LRT system and the new lines. A new dedicated accessible entrance at the southeast corner of Churchill Square would provide a direct connection between the two LRT systems, and a further connection to the existing Pedway.

Quarters

3.22 The objective of this stop location is to serve the Quarters area and provide an eastern most stop in the Downtown before the LRT descends into a short tunnel to turn south to connect to the Southeast LRT line. A number of stop locations in conjunction with the location of the tunnel portal were considered.

Alternative Stop Designs

3.23 The identified stop locations were used as the basis for the development of a number of alternative stop designs. The following options were used as a starting point for evaluation

- 107 Street Options
  - Option 1: stop on the north side of 104 Avenue
  - Option 2: Stop located on a diagonal alignment between 108 to 107 Streets
  - Option 3: Stop on west side of 107 Street between 103 and 104 Avenue
  - Option 4: Stop on the east side of 107 Street between 103 and 102 Avenues
- Following discussions with stakeholders a number of further options were developed and evaluated. "Dialog" options were developed in consultation with NorQuest College and their consultants.
  - Dialog Option 1: stop on the west side of 107 Street between 103 and 102 Avenues (centered between 103 and 102 Avenues)
  - Dialog Option 2: stop on the west side of 107 Street between 103 and 102 Avenues (south end of 107 adjacent to 102 , alignment on north side of 102)
  - Dialog Option 3: stop on the west side of 107 Street between 103 and 102 Avenues (south end of 107 adjacent to 102, alignment on south side of 102)
- 105/106 Street Options
  - Option 1: Stop between 105 and 106 Street retains two traffic lanes
  - Option 2: Stop between 105 and 106 Street retains single eastbound traffic lane with dedicated two way cycle lanes
  - Option 3: Stop between 105 and 106 Street closes a section of 102 Avenue to all traffic, dedicated two way cycle lanes would be provided
- Centre West Options
  - Option 1: Stop between 102 and 101 Street, retains two traffic lanes
  - Option 2: Stop between 102 and 101 Street, closes a section of 102 Avenue to all traffic, dedicated two way cycle lanes would be provided
  - Option 2a: Stop between 102 and 101 Street, single traffic lane, dedicated two way cycle lanes would be provided
  - Option 3: Stop between 103 and 102 Streets, closes a section of 102 Avenue to all traffic, dedicated two way cycle lanes would be provided
  - Option 3a: Stop between 103 and 102 Streets, single traffic lane, dedicated two way cycle lanes would be provided
- Churchill Square Options
  - Option 1: Stop between 100 and 99 Streets, retains two traffic lanes

- Option 2: Stop between 100 and 99 Streets, with single eastbound lane and dedicated cycle lanes
- Option 3: Stop between 100 and 99 Streets, closes a section of 102 Avenue to all traffic, dedicated two way cycle lanes would be provided

I The Quarter Options

- Option 1: Stop between 97 and 96 Street
- Option 2: Stop between 96 and 95 Street
- Option 3: Stop located on 95 Street

3.24 The options were evaluated against the City's LRT assessment criteria taking note that within the downtown, the primary role of the LRT is somewhat different from the radial LRT corridors which feed it. In the downtown, LRT will provide access to major destinations, serve the increasing residential catchment area within the downtown, and provide a link to the existing transit network. The evaluation of the downtown route has taken account of the LRT route being one of the nine catalyst projects included within the CCDP. Development of the Downtown LRT Connector supports the associated policies under the CCDP's four key themes (Sustainable, Vibrant, Well-Designed, and Accessible).

3.25 In addition, the development of the Downtown LRT Connector is based on the design vision and associated design criteria set out in the LRT System Design Report (Steer Davies Gleave, May 2010). That report described the Urban Style – City Scale LRT system being developed in Edmonton, with recommendations and examples related to stop design, alignment design, and operational principles, all aimed at improving user accessibility and convenience.

3.26 The evaluation of the options therefore focused on the following assessment criteria:

I LRT Alignment

I Catchment

I Land Use Integration

I Transportation Network Integration

I Transit Network Impacts

I Urban Design

I Property Impacts

I Urban Form

The Quarters Portal Options

3.27 In the draft Concept design, the LRT descended east of 96th Street along 102 Avenue into an open portal which transitions into a covered tunnel just west of 95 Street. The alignment then turns south under 95th Street to connect with a new crossing of the

North Saskatchewan River. In response to various comments related to adjusting the location of the LRT portal, the multiple configurations previously considered are included for reference. These options included:

- Option 1: Portal between 99 Street and 97 Street
- Option 2: Portal between 97 Street and 96 Street
- Option 3: Portal between 96 Street and 95 Street
- Option 4: Portal on 95 Street

3.28 These portal locations are reviewed below and should be considered in conjunction with the potential stop locations as discussed previously.

3.29 Options 1 and 2 move the portal west of 96 Street. These options result in multiple technical fatal flaws. These portals either conflict with the existing LRT tunnel passing under 99 Street or require closing half of 97 Street to traffic. These options would also be in conflict with the major tenet of the urban-style, low-floor LRT to provide simple stop infrastructure that is integrated into the community and highly visible/accessible to users. These options would require an underground station be developed in the Quarters at approximately ten times the cost of the proposed surface stop. The length of the underground alignment to the North Saskatchewan River crossing would also be increased, as would the associated capital cost.

3.30 Option 3 is the recommended option, allowing a surface stop between 97 Street and 96 Street, consistent with the Quarters redevelopment plans. This option best meets all the constraints and objectives identified. Traffic impacts are minimised with west and eastbound lanes provided; as well as pockets of parking and direct auto drop-off points for seniors facilities in the area. Due to the narrow right-of-way, acquisition of property is necessary on the south side of 102 Avenue, between 96 Street and 95 Street. The City will work directly with property owners to develop appropriate acquisition plans and mitigations. The Chinese Arch would remain in its current location and configuration. This arrangement provides a surface stop at the centre of the Quarters development which is highly accessible to the local neighbourhood. Formal pedestrian crossings are provides at each end of the LRT portal (as well as at all street crossings) to provide a safe mid block pedestrian options. Engagement with the local community during the subsequent design will be necessary to incorporate appropriate local aesthetic/architectural features into the portal and stop designs including aesthetic features, railings, pedestrian access, public art, etc.

3.31 Option 4 would result in the development of a tunnel portal within 95 Street. This option would not allow the LRT alignment to descend to a desirable height to cross the North Saskatchewan River. It would result in a much higher crossing of the river with greater impact. Various engineering constraints dictated the general location of the portal. The width of a portal would be approximately 10 metres by 180 metres long in order to create a reasonable grade (incline) for the LRT trains as they emerge from (or enter) the tunnel to cross the North Saskatchewan River. The underground tunnel was set to exit just east of Louise McKinney Park and creates a smooth transition to touch

down on the south side of the river in the Cloverdale area. Adjustments would result in the river crossing being higher over the river valley and touching down beyond the Muttart Conservatory. This scenario would increase the height and length of aerial structure through the Cloverdale community. This option would also eliminate the development of a reasonable stop at the Muttart Conservatory.

Stakeholder Involvement

3.32 Stakeholder sentiment and feedback served as a critical input to the Initial Options and Draft Concept development; and ultimately the Recommended Concept Plan. Outreach to stakeholders included two primary components. The first component included focused discussions with key stakeholder organizations such as major downtown employers, the Downtown Community League, and major civic attractions. The second component included broad outreach to public stakeholders. To provide clear and concise information on the project, process, and options, a workbook of the concept plan options was produced and used to support the stakeholder consultation sessions held in September 2010 and early 2011. The team consulted with approximately 250 stakeholders, including:

- Building Owners and Managers Association
- Winspear Centre
- Grant Mac Ewan University
- Manulife Place
- Canada Place
- City Centre Mall
- Chinese Benevolent Association
- Downtown Business Association
- Downtown Edmonton Community League
- Citadel Theatre
- Stanley A. Milner Library
- Katz Group
- Downtown YMCA
- Downtown Market
- NorQuest College
- Boyle Street Community League
- Riverdale Community League

4 Recommended Concept Plan

4.1 Based upon the technical evaluation and stakeholder consultation the Recommended Concept Plan was identified as best meeting the assessment / evaluation criteria and the objectives of the City's Plans, particularly the CCDP. Table 4.1 below details the recommended concept alignment option for each stop location and provides key information regarding the selection of each.

TABLE 4.1 RECOMMENDED CONCEPT PLAN

107 Street	105/106 Street	Centre West	Churchill Square	Quarters
Option 3: Stop between 104 to 103 Avenues on 107 Street, with single northbound lane	Option 2: Stop between 105 & 106 street with a single eastbound traffic lane	Option 2a: Stop between 102 and 101 Street, with a single eastbound traffic lane	Option 2 : Stop between 100 and 99 Streets, with single east bound traffic lane	Option 1: Stop between 97 and 96 Streets, with single eastbound lane
Rated highest due to its high pedestrian and access, linkages to nearby activity centers including the two campuses, urban design integration, TOD potential and consistency with the CCDP.	Provides the optimum LRT and cycle arrangement while retaining local traffic access eastbound. The arrangement provides the highest level of local walking and cycle accessibility. The arrangement is supportive of the CCDP policies related to Sustainable, Vibrant, Well Designed, and Accessibility.	Rated higher than the other options due to its proximity to transit connections on 101 Street and its connectivity within the heart of the downtown core (shopping, offices and leisure). The option reduces the traffic impacts on vehicle egress from 102 Street by providing an eastbound traffic lane through to 101 Street and a westbound traffic lane and dedicated right turn lane through to 103 Street. The option would be supportive of the CCDP policies to create a Sustainable, vibrant, Well-Designed and Accessible Downtown.	Provides a quality arrangement for the LRT at what is the heart of the City. The arrangement would provide greater platform space and the highest level of accessibility and integration with Churchill Square and the associated precinct, while retaining a consistent eastbound traffic lane along the length of 102 Avenue. Stop platforms would be integrated with the sidewalks providing an opportunity to reinforce the sense of place, to enhance and complement the square and support all year round street vibrancy. This approach would support the CCDP.	This stop location was developed in conjunction with the Quarters planning team and best represents the ultimate development goals of the Quarters Plan.

4.2 The review, development and assessment of the potential Downtown LRT Connector options, and the consultation undertaken with stakeholders identified the Recommended Concept Plan detailed below. This plan best meets the objectives for the future LRT and would be the most supportive of the CCDP, as well as the wider City objectives.

4.3 In summary the Downtown LRT route's prime functions are:

- To both serve the downtown itself and to connect the proposed West and Southeast LRT routes.
- To make provision for a Central Area Circulator LRT (for future assessment) providing LRT links to the University and Strathcona area.
- To reflect and advance the wider City and downtown objectives, including support for development, reducing auto use and making Edmonton a more liveable city.

Recommended Concept Plan

4.4 The recommended alignment of the Downtown LRT Connector starts at the connection to the West LRT line in the centre of 104 Avenue at its intersection with 109 Street. The alignment continues in the centre of 104 Avenue for two blocks to 107 Street where the alignment turns south to run on the west side of 107Street.

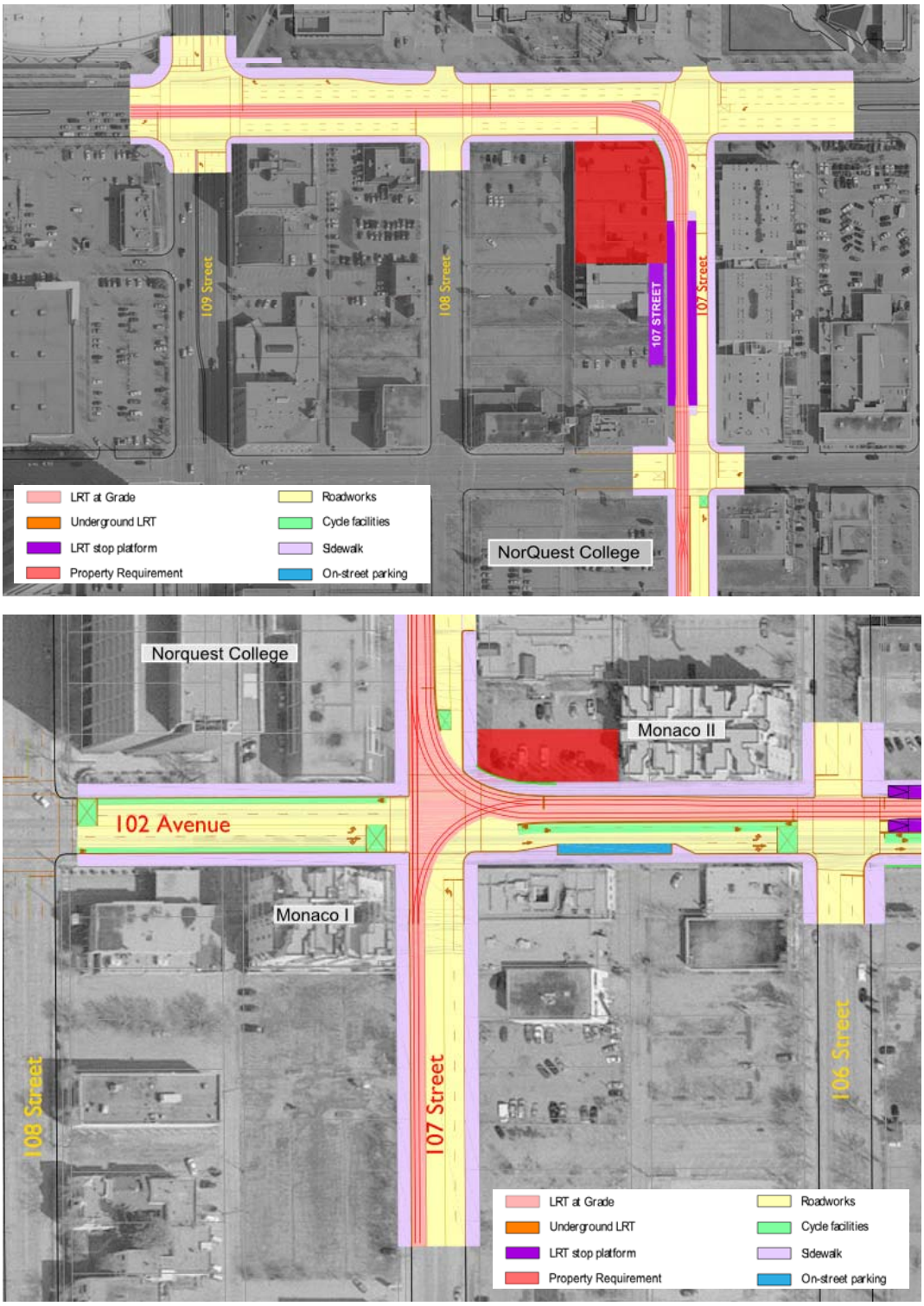
107 Street Stop

4.5 The stop is sited between 104 and 103 Avenues on the western side of 107 Street. A single northbound traffic lane is retained. Cyclists would travel with traffic at this location and cycle priority boxes would be provided at the intersection of 107 Street at 102 Avenue. The main, segregated cycle route is located on 102 Avenue.

4.6 The alignment continues on the west side of 107 Street through to the intersection with 102 Avenue, one traffic lane is maintained in each direction on this section of 107 Street. The LRT alignment turns east running on the north side of 102 Avenue. A single eastbound traffic lane is retained through to 106 Street, with provision for on street parking.

4.7 A single track on 107 Street between 102 Avenue and Jasper Avenue is provided on the west side of the street to park an LRT vehicle to provide operational flexibility, allowing the service frequency through the downtown to be regulated, providing space for trains to be turned back in the event of any disruption and enabling an extra vehicle to be stored close to the heart of the downtown (to provide extra capacity to cater for events within the downtown). This track also does not preclude a future connection to the Central Area Circulator LRT. This connection is subject to further study.

FIGURE 4.1 107 STREET STOP

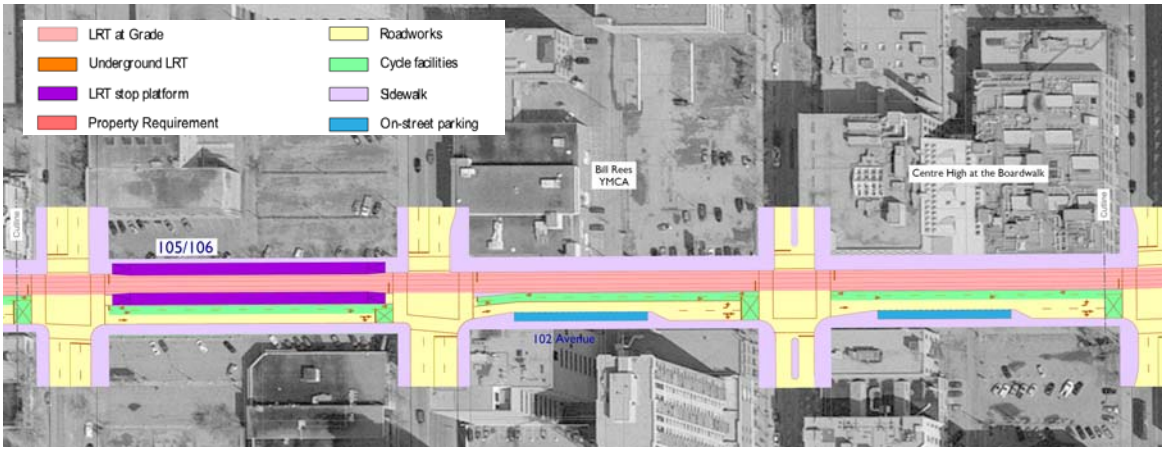


105/106 Street Stop

4.8 The stop is sited on the north side of 102 Avenue between 106 and 105 Street with side platforms and with the westbound platform integrated with the sidewalk. Dedicated cycle lanes are provided in both directions along with an eastbound traffic lane. Improved sidewalks would be provided on 106 and 105 Streets between 103 Avenue and Jasper to offer enhanced pedestrian routes.

4.9 The LRT alignment continues on the north side of 102 Avenue with a single eastbound traffic lane provided between 105 and 103 streets. Provision for pockets of on street parking are also provided. Between 103 and 102 streets a single eastbound traffic lane is retained.

FIGURE 4.2 105/106 STREET STOP

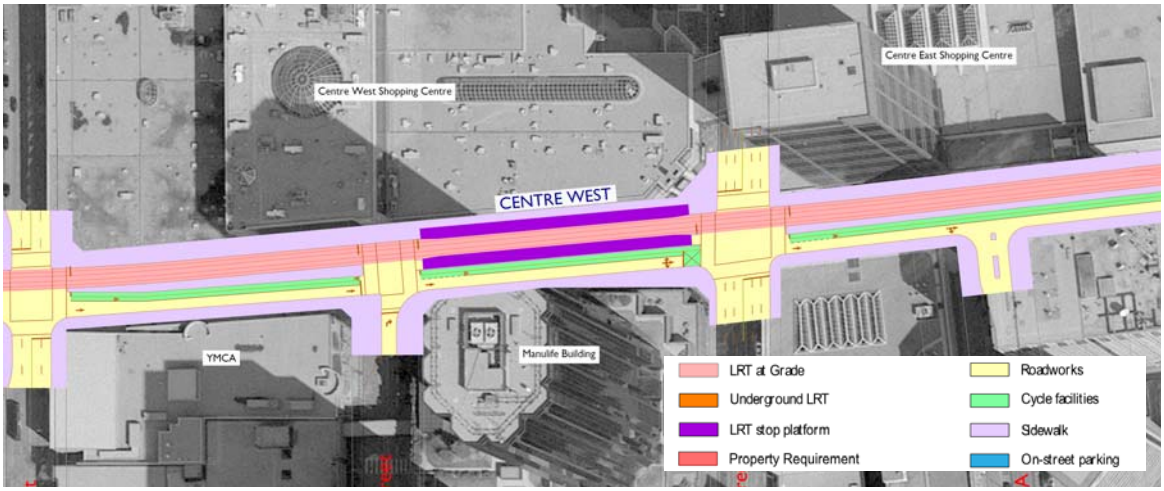


Centre West Stop

4.10 The stop is sited on the north side of 102 Avenue between 102 and 101 Street with side platforms, with the westbound platform integrated with the sidewalk. Dedicated cycle lanes are provided in both directions along with an eastbound traffic lane, to help facilitate vehicle egress from 102 Street. This configuration best integrates with the significant transit corridor along 101 Street.

4.11 The LRT alignment continues on the north side of 102 Avenue with a single traffic lane provided eastbound between 101 and 100 Street.

FIGURE 4.3 CENTRE WEST STOP



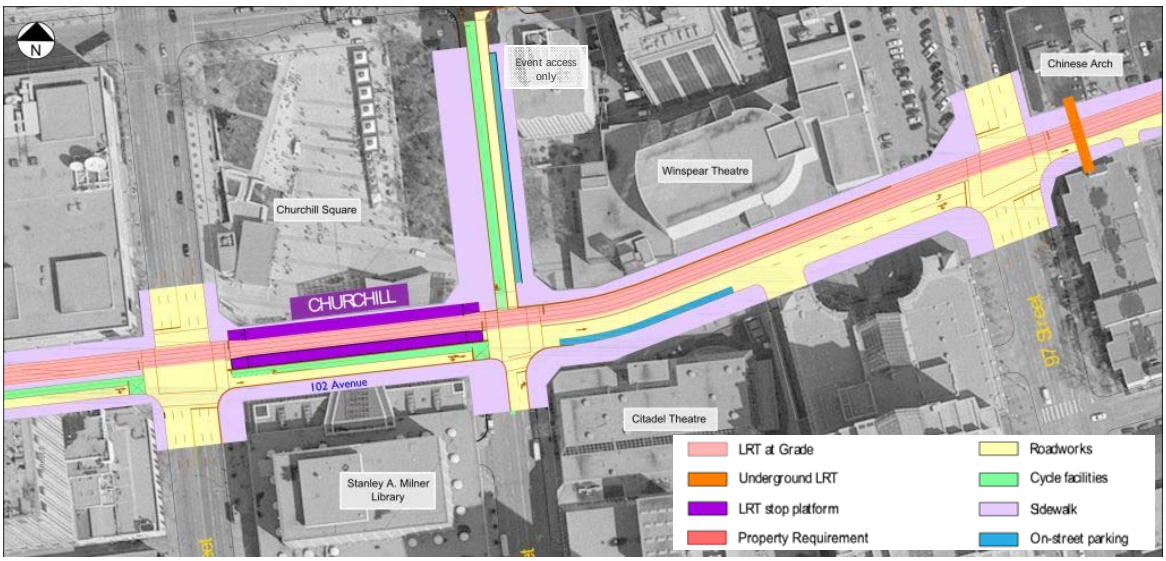
Churchill Square Stop

4.12 The road between 100 and 99 Street would include a single eastbound traffic lane with the stop integrated with Churchill Square. This would help create a more continuous public space from City Hall to the Stanley A. Milner Library. A dedicated cycle lane would be provided in each direction. A new connection to the existing LRT would be provided at the southeast corner of Churchill Square to ensure that there is a high quality connection between the two LRT systems.

4.13 To complement the development of the LRT and the connectivity to Churchill Square, 99 Street between 102A and 102 Avenues would be closed (as previously planned by the City). The dedicated cycle lanes would turn north onto 99 Street to connect with a potential cycle route on 102A Avenue through to Jasper Avenue in the east. Event access and parking would be provided on 99 Street. The LRT alignment then continues on the north side of 102 Avenue with a single eastbound traffic lane provided between 99 and 97 Street.

4.14 The alignment continues across 97 Street through the "Chinese Arch" through to the Quarters stop, and a single eastbound access lane would be provided with on-street parking.

FIGURE 4.4 CHURCHILL SQUARE STOP

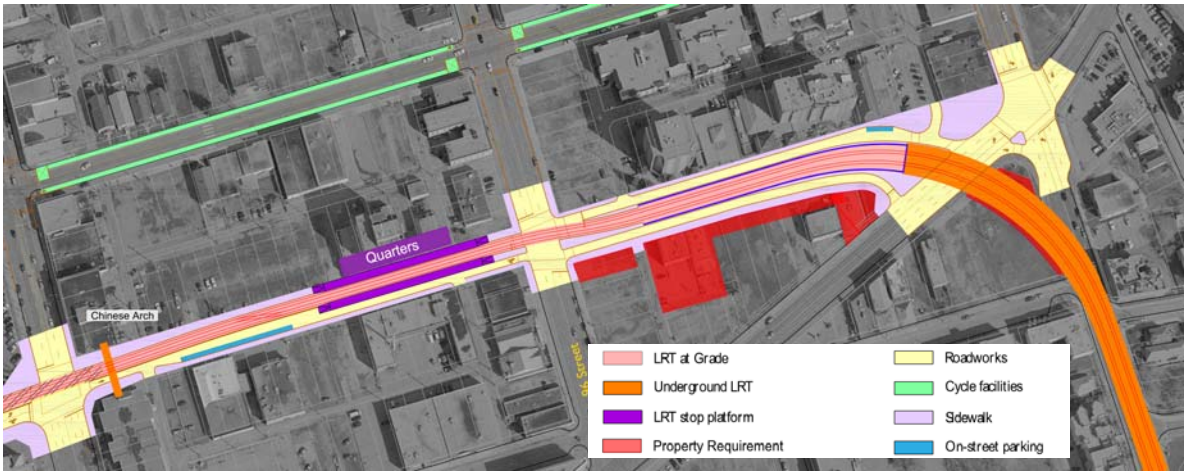


Quarters Stop

4.15 The Quarters stop would be sited close to 96 Street with side platforms, the westbound platform integrated with the sidewalk, with the eastbound traffic lane continuing through to 96 Street.

4.16 The route crosses 96 Street before descending into a tunnel portal to connect to the southeast LRT. To provide access to the properties between 95 and 96 Street on 102 Avenue, a single traffic lane is retained westbound with two loading / drop off bays provided at the east end of the street. Dedicated pedestrian crossings are provided at each end of the tunnel portal. On the south side of 102 Avenue, an eastbound traffic lane would be provided connecting to Jasper Avenue. These design elements were added in direct response to the community comments received regarding the Quarters stop.

FIGURE 4.5 QUARTERS STOP



LRT Operations

4.17 The principle for the operation of the proposed low floor urban style LRT routes are:

- Driver operated
- Maximise the proportion of segregated alignment
- Line-of-sight operation on street, with segregated track
- Use of dedicated LRT signalling aspects at intersections
- Speed restrictions will be imposed in enclosed alignments (tunnels, cuttings) where the horizontal or vertical curvature limits sighting distances, and/or a form of local LRT signalling installed to indicate a clear route
- Bi-directional running over other than a short clearly visible section will be controlled by the use of an LRT signalling system to indicate the route is clear and to detect and visually indicate two vehicles on a single line section
- Vehicle speed within the downtown
  - In the downtown, the LRT vehicle would not exceed the posted speed limit for the street where it is traveling (typically 50kph in the downtown)
  - The average speed would vary, depending on the opportunity for priority over other traffic
  - Each train would typically spend approximately 20 seconds at each stop

Vehicle Operation

4.18 The vehicles (either single or coupled vehicles) will be driver-operated using line-of-sight operation. Similar to a bus driver, the individual LRT operators would control the train, responding to the street conditions including adjacent traffic, pedestrians, weather, etc. Operating rules and training will be developed to ensure the LRT vehicles are driven in a confident but defensive manner, ensuring drivers are aware of pedestrians and other road users, and when approaching a pedestrian crossings or signalled intersections, speed is reduced to ensure the vehicle can stop if it is not given priority over the other movements.

4.19 The operation will be supported by a central control and vehicle timetabling system using automatic vehicle location. The system monitors vehicle positions, typically based upon GPS and the vehicle's odometer, reporting this to the central system via a radio data channel. The system then responds real time to the source LRT vehicle and adjacent services to show if the LRT vehicle is ahead or behind schedule. The schedule status is then used to prioritise each vehicle's priority at road intersections. Vehicle running on time or behind schedule are afforded the highest level of priority and the vehicles running ahead of schedule less priority.

Intersection Priority

4.20 The signalling through each intersection for low floor LRT vehicle would be controlled by the local traffic signal controller, with the light rail system placing a demand for the signalled movement as required. The highest level of priority should be afforded to the LRT wherever this is achievable. The priority is adjusted depending on each vehicle's performance to the timetable, highway conditions and time of day. The intersection signal controller compensates for any movements cut short on subsequent signal cycles.

4.21 When the LRT is given a proceed signal, all the conflicting traffic movements would be set to red.

4.22 A peak service 5 minute headway has been assumed for the LRT system resulting in for both directions approximately 24 LRT movements through each intersection during peak periods.

Transportation Network

GENERAL

4.23 The development of in-street LRT will necessitate the reallocation of road space away from general traffic within the identified corridors to the LRT. However this is not necessarily to the detriment of the network because overall people moving capacity will be increased. An example of this is 102 Avenue, where the use of the street will change to being primarily LRT and local traffic. The capacity of this street will increase significantly over the current peak capacity today of approximately 900 people (600 vehicles with 1.5 people per vehicle). With the LRT the corridors capacity would increase to approximately 5,000 per direction plus local traffic based upon a 5-minute LRT peak period headway, assuming trains are at least 70% full. Traffic within the downtown will likely decrease as more people use the LRT, with the remaining traffic rerouting onto parallel corridors in the existing grid network. The individual user of the downtown road network are considered further below.

PEDESTRIANS

4.24 The inclusion of a surface level LRT within the downtown, especially around stop locations will significantly increase pedestrian activity. The pedestrian links to the stop locations have been assessed to ensure easy pedestrian navigation and wayfinding. Pedestrian crossings of the adjacent roads will be provided and controlled at the adjacent intersections.

CYCLES

4.25 The CCDP identifies 102 Avenue as an east-west cycle route through the downtown. The development of the LRT will either provide or retain this cycle route if already in place, and where possible enhance it with dedicated or additional space for cyclists. With the development of the LRT, 102 Avenue will become a slower traffic street more focused on local access rather than through movements. This will reduce traffic and improve the road environment for both cyclists and pedestrians.

TRANSIT

4.26 The provision of an additional LRT corridor through the downtown will significantly improve capacity and provide improved connectivity within the downtown and the wider city. However LRT on 102 Avenue will necessitate the removal of bus services on the corridor. To provide additional bus routes within the downtown it is recommended that 103 Avenue between 103 Street and 100 Street be converted to two way traffic flow.

4.27 The bus network would be revised to complement the LRT routes, minimise service duplication, maximise the return on the LRT investment and improve network efficiency. This reduction and revision in service will help mitigate the loss of buses on 102 Avenue.

4.28 A complementary bus network plan will need to be developed within the downtown to support and facilitate the introduction of the LRT network. This may need to provide complementary transit priority for other service particularly to provide good transit network integration on 101 and 100 Street with the retained bus services.

TRAFFIC ASSESSMENT

4.29 The road network within the downtown consists of a typical grid network, providing traffic with multiple routes. The main arterial routes running north/south within the downtown include 101,105 and 109 Streets, the later providing connectivity to the High Level Bridge over the North Saskatchewan River. In the east/west direction 104 and Jasper Avenue are the main arterial routes into the downtown.

4.30 Traffic simulations were completed to determine overall adjustments and impacts to traffic movement in the downtown, related to the introduction of the new LRT. The simulations were developed using the City's 2010 Synchro model, updated to reflect the inclusion of the proposed LRT (Downtown, West and Southeast) using data from the City's Emme2 model for 2016.

4.31 The development of the LRT routes and the use of existing road space within the identified corridors, results in reduced traffic volumes within the LRT corridors, with some reassignment of traffic to other routes. The new LRT routes themselves will provide people with improved and new journey opportunities, reducing the use of the private car into the downtown.

4.32 The traffic simulations show the road network (within the downtown) currently provides a high level of service. The inclusion of the future LRT will result in some increase in delay and congestion but within acceptable levels.

4.33 As the development of the LRT continues further work will need to be undertaken to continue to optimise the priority afforded to the LRT system and to ensure the impacts on remaining traffic within the downtown are minimised. Consideration should be given to the conversion of the single direction sections of 103 Avenue to two-way operation, to provide a more complete parallel corridor to that of 102 Avenue.

ACCESS AND LOADING

4.34 In developing the Recommended Concept Plan for the LRT route though the downtown, existing building access and egress arrangement have been reviewed. The arrangement of the LRT within each of the identified downtown roads, does not directly impact upon any existing building accesses directly. A number of lanes are closed on the north side of 102 Avenue, in all cases other point of access and egress are available. As the project moves into Preliminary Engineering, additional consultation with property owners will be required to address concerns regarding access and loading.

EMERGENCY SERVICES (Access and Egress)

4.35 The proposed LRT route runs on 107 Street, the location of Fire Station number 2. The LRT alignment is on the far side of the street from the Fire Station. Full access for emergency vehicles exiting the fire station would be provided (north and south). Consultation with Edmonton Fire and Emergency Services was conducted to obtain input on the plan.

4.36 In addition the LRT tracks within the downtown will be constructed to enable emergency vehicle access along the LRT alignment as required.

Utilities

4.37 The development of any LRT line within the City will necessitate the relocation of utilities along the proposed corridor from under the proposed route of the LRT. This work will need to be coordinated and planned in advance to ensure an optimal construction process is achieved for the LRT.

Drainage

4.38 There are no major concerns relating to the existing drainage system along the proposed LRT alignment. A recent report from Stantec confirmed that the downtown drainage system along the proposed route is in relatively good condition with adequate capacity. The development of the Downtown LRT Connector will not increase the stormwater runoff volume that currently gets into the system, thus it should not impact the current drainage condition or improvements recommended by Stantec. The LRT alignment is within existing road corridors and as such will not add impervious land.

4.39 Where feasible, future levels of project design will examine opportunities to enhance water quality off the road and track areas

Geotechnical

4.40 There are no major concerns related to the geotechnical analysis along the proposed LRT alignment that cannot be addressed through appropriate design measure. An initial geotechnical assessment has been undertaken. The primary areas of concern that could impact the performance of the proposed track system from a geotechnical perspective include subgrade non-uniformity and frost heave potential

4.41 The design of the track construction will need to take account of these issues as the design for the LRT alignment are developed. As part of the Southeast LRT Concept Plan development a similar high-level geotechnical analysis was conducted and indentified no major concerns. Additional geotechnical analysis will be conducted in the future design phases and issues mitigated through the design process.

Environmental

4.42 Because this alignment is located within an urban, fully built environment, limited impacts to the natural environment are anticipated. However, in the downtown, natural elements (such as trees) take on an even more important role to offset the heavily urbanized environment. A detailed inventory of vegetation and trees was completed along the alignment. Guidelines for tree evaluation are derived from the City of Edmonton's Asset Management and Public Works Department, Parks Branch Bylaw 7829 Appendix A "Guidelines for Evaluation of Trees", February 2010.

4.43 The most common species within the Connector corridor are ash species. Oak, elm, spruce, cherry and pine were also located within the corridor. There are also vegetation islands that may be disturbed depending on final design. These were not assigned a monetary value.

4.44 Approximately 181 trees were measured along the alignment. The tree's environmental and monetary value will be considered as design progresses. All efforts will be made to maintain existing mature vegetation (where possible).

Landscape

4.45 The development of the alignment, and in particular the stop locations, will impact upon existing trees within the corridor. The development and construction of the LRT would provide the opportunity to provide infill tree planning along the corridor to provide more consistent tree lines street. The lane ends closed could also be used to provide replacement tree planting. The proposed 106 /105 Street stop is adjacent to land owned by the City and proposed for a future downtown park.

Historic Resources

4.46 The Register of Historic Resources was reviewed to identify any resources currently listed as Designated Municipal Resources (legally protected) or Historic Resources (merit conservation, but not legally protected). One Designated Municipal Resource and five Historic Resources were identified along the project corridor. None of these resources are directly impacted by development of the Downtown LRT Connector. As design progresses, additional examinations will be completed to verify these resources are not adversely affected.

Property Impacts

4.47 The concept planning for the downtown LRT has focused where possible, on limiting the need for property acquisitions.

4.48 A property at the southwest corner of 104 Avenue and 107 Street would be required along with a strip of property at the Northeast corner of 107 Street and 102 Avenue.

4.49 Properties on the south side of 102 Avenue between 96 Street and 95 Street would be required to provide the eastbound traffic lane alongside the proposed LRT portal. It is assumed that the traffic lane would be developed in conjunction with the redevelopment of these properties over time, as proposed within the Quarters plan

Land Use Impacts

4.50 The Downtown LRT is a catalyst project within the CCDP and as such the corridor and the LRT alignment have been developed to support the four policies of the CCDP:

- Sustainable
- Vibrant
- Well-Designed
- Accessibility

4.51 The proposed LRT alignment will help support development along the corridor, such as Grant MacEwan University and Norquest College. The 107 Street and 106/105 Street stops are both centred on areas of the downtown that are currently less well developed, which should increase the desirability of development around these two locations, helping to generate development within the Warehouse/ Campus District.

4.52 The location of the 107 Street and 106 /105 Street stops will provide the City with opportunities to instigate future TOD development in combination with the LRT.

Noise and Vibration

4.53 Currently the background level of noise and vibration within the downtown are high during the day due to the existing levels of traffic operating within the proposed LRT and cross corridors. This will reduce the impact of the LRT during the day as it is likely to be within the current background noise levels. At times of the day where there are currently reduced volumes of traffic the operation of the LRT may be become more pronounced.

4.54 The team has looked at the potential locations that would be noise receptors and potentially be affected by the LRT corridor. These include:

- Residential Buildings
- Norquest College
- YMCA
- Stanley A. Milner Library
- Winspear Theatre
- Citadel Theatre

4.55 The operation of the LRT vehicles on straight track with good design, construction and maintenance should minimise potential noise issues. An identified location where additional measures will need to be considered is alongside the Winspear and Citadel Theatres, at this location consideration should be given to the use of a form of track construction that reduces ground borne vibration (Floating track slab design).

4.56 Operation of LRT vehicles through sharp turns in the track can generate noise. This type of track arrangement is required on the route at 102 Avenue/ 107 Street and 104 Avenue and 107 Street. To alleviate the potential impact the LRT vehicle would operate at slow speeds and can if required be fitted with a wheel dampening system to reduce wheel noise. These measures, in conjunction with good design and maintenance of the alignment should reduce the generation of noise and the associated impacts.

Cost Estimates

4.57 The estimate of the cost of the alignment is a critical component of the planned LRT corridor and the routes connectivity through the downtown for the Southeast and West routes. The cost estimates include property acquisitions are detailed in Table 4.2 below.

TABLE 4.2 COST ESTIMATE

	Cost Estimate (Millions $ - 2010)
LRT Construction	$120
Road and Trackwork	$65
Signals	$35
Stations	$20
Land & property	$20
Engineering and Construction Admin	$15
Total	**$155**

5 Next Steps

5.1 The draft Downtown LRT Connector plan is presented as an update to City Council. Since the previous City Council information session, regarding the Downtown LRT Connector, the project team has conducted further consultation with project stakeholders. Based on the feedback received the Recommended Concept Plan has been refined to mitigate potential impacts.

5.2 The draft Downtown LRT Connector and the associated concept plans provide the basis for further development of the future LRT alignment between Lewis Estates in the West and Millwoods in the Southeast.

5.3 The next phase of this project will include Preliminary Engineering. At the Preliminary Engineering stage, further optimization of the design will be completed to mitigate issues and to maximise the route's benefits both in terms of the transportation network and land use integration.

5.4 The parallel development of the Capital City Downtown Plan and the LRT route through the downtown provides a real opportunity for the City to coordinate transit and land use investment decisions and deliver its stated sustainable City Vision objectives.

5.5 Preliminary Engineering will include:

- Continued development and integration with the draft Capital City Downtown Plan
- Coordination with the LRT corridor studies
- Optimisation of stop locations
  - Stop area plans
  - Urban realm design
  - Pedestrian and cycle connections
  - Transit integration
  - Integration with development
- Alignment development
  - Building access and egress arrangements
  - Detailed assessment of local and network traffic impacts
  - Intersection priority and traffic arrangements
  - Urban realm design
- Coordination with the development of the Central Area Circulator LRT Network
- Coordination with High Speed Rail plans

- Coordination with ongoing land use planning both in the downtown and the LRT corridors
- Downtown road network assessment (all users, pedestrians through to general traffic)

APPENDIX

A

STOP/PORTAL OPTION EVALUATION

(Available upon request)

APPENDIX

B

CONCEPT DRAWINGS

(Available upon request)