

NORTH LRT EXTENSION

DOWNTOWN TO NAIT

CONCEPT PLANNING REPORT



EXECUTIVE SUMMARY

City of Edmonton
Transit Projects Office

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EXECUTIVE SUMMARY

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1.0 Study Purpose

The purpose of this study is to plan a 3 km extension to the City of Edmonton's LRT system to connect downtown Edmonton to the Northern Alberta Institute of Technology (NAIT). This new LRT leg will connect the major post secondary education facilities of NAIT and Grant MacEwan College with the University of Alberta, and will also connect the Royal Alexandra Hospital with the Health Sciences Centre at the University of Alberta. This extension to NAIT can also be considered as the first stage of a future LRT extension to north Edmonton/St Albert.



2.0 Introduction

2.1 TRANSPORTATION MASTER PLAN

The City of Edmonton's Transportation Master Plan provides policy and direction on how the City will address future transportation issues. To meet the challenges associated with rapid growth, the current Transportation Master Plan proposes a more balanced transportation system, defining an important role for public transit. Specifically, the Transportation Master Plan recommends that studies be undertaken to define proposed technologies, alignments, approximate costs and required right-of-way for High Speed Transit routes to serve the West, North and Southeast sectors of the city.

2.2 STRATEGIC HIGH SPEED TRANSIT PLANNING STUDY

In response to the Transportation Master Plan's recommendation, the City of Edmonton Transportation Department initiated a Strategic High Speed Transit Planning Study in 2003. This Study recommends LRT for the North and West sectors and Bus Rapid Transit for the Northwest and Southeast sectors of the city. The Strategic High Speed Transit Planning Study was approved by City Council in 2004 with the recommendation to commence additional planning studies to evaluate routes and develop staging plans and costs for Bus Rapid Transit on the Downtown to NAIT corridor.

2.3 NORTH HIGH SPEED TRANSIT (DOWNTOWN TO NAIT) CONCEPT PLANNING STUDY

The primary deliverable from the North High Speed Transit (Downtown to NAIT) Concept Planning Study is a recommended Bus Rapid Transit and LRT route between the Downtown core and NAIT. The recommended LRT route originated below grade at Churchill Station, swung to the west, and transitioned to the surface on 105 Avenue, west of 101 Street. The route then turned north on 105 Street to 107 Avenue and swung to the east on 104 Street to Kingsway. The LRT then continued north on 106 Street to Princess Elizabeth Avenue. Station locations were identified at 105 Street/105 Avenue, Kingsway and either 106 Street north of Princess Elizabeth Avenue or Princess Elizabeth Avenue east of 106 Street.

3.0 North LRT Extension Downtown to NAIT Concept Planning Study

In June 2007, a multi-disciplinary consultant team led by UMA Engineering Ltd. was selected by the City of Edmonton to undertake concept planning and preliminary design for an LRT extension from Downtown to NAIT. The schedule for this project was to complete planning in summer 2008 and to complete preliminary engineering design in spring 2009.

3.1 ALIGNMENTS AND STATIONS

On a major transportation planning project such as an LRT extension, numerous brainstorming/value/risk sessions are carried out. Such sessions are not only attended by key project personnel, but also include recognized experts in their particular field of interest. The purpose of these sessions is to ensure that multiple alternatives are considered and that the optimum alignment is selected.

The recommended Downtown to NAIT LRT extension as illustrated in Figure E-1 closely follows the alignment recommended in the North High Speed Transit (Downtown to NAIT) Concept Planning Study with only some slight variations. The line originates underground at Churchill Station and immediately drops in elevation to pass below the proposed EPCOR tower development on the Station Lands Site. This increase in depth moves the location where the LRT comes to grade on 105 Avenue from immediately west of 101 Street to 103 Street. The proposed MacEwan Station is located in the northeast corner of the 105 Avenue and 105 Street intersection. This station is located as close as possible to MacEwan College and will also serve the future high density redevelopment as planned within the Downtown North Edge Planning Study.

The tracks then cross 105 Street at grade and extend to the west side of 105 Street to 107 Avenue. North of 105 Avenue, the 105 Street road right-of-way is only 24.4 m wide. The right-of-way accommodates a four lane arterial roadway (which carries 17,000 veh/day) and sidewalks on both sides of the road. Existing building facades are located on both the east and west property lines of 105 Street. The accommodation of a 9.0 m-wide LRT facility within the 105 Street right-of-way necessitates the loss of roadway capacity. In order to maintain some local roadway capacity and access to the properties along 105 Street, the alignment runs along the west side of the street outside of the road right-of-way.

North of 107 Avenue, the tracks swing back to the east to 104 Street. This section of surface LRT warrants the acquisition of the majority of properties on the west side of 105 Street. The



remnant parcels of land created by the LRT can be redeveloped in accordance with the Downtown North Edge Planning Study.

Vehicular traffic will not be permitted on 104 Street due to the location of the LRT alignment within the road right-of-way. The location and radius of the curve at 108 Avenue necessitates that the tangent line falls on the road right-of-way on 104 Street. Vehicle access to Victoria School will be maintained on 104 Street south of the school, but the remainder of the street will only accommodate surface LRT and a multi-use trail. Access to existing properties adjacent to 104 Street will be accommodated via 108 Avenue and a new intersection at 105 Street and Kingsway Avenue.

The Kingsway Station will be located on existing Kingsway Avenue at 105 Street in close proximity to the Royal Alexandra Hospital. To maintain vehicle traffic on Kingsway, the section of road from east of 104 Street to 111 Avenue will be realigned to the south, allowing the LRT to cross at grade. Relocation of the existing Kingsway Transit Centre from the west side of 106 Street to the south side of 111 Avenue is also recommended.

Immediately north of the Kingsway Station, the tracks turn to the north, cross 111 Avenue at grade, and continue up 106 Street to a temporary NAIT Station located on the east side of 106 Street south of Princess Elizabeth Avenue. The temporary designation for this station is only for the purposes of overall concept plan approval. NAIT has advised the City of Edmonton that they plan to construct a new building immediately north of the existing HP Centre. This new facility would provide the opportunity to fully integrate an underground LRT station with no disturbance to vehicular and pedestrian circulation on 106 Street. At this time NAIT is actively pursuing funding for this new building and when funding is secured the City will initiate negotiations with NAIT regarding the permanent location of the NAIT Station, north of Princess Elizabeth Avenue.

A strategic-level route evaluation was carried out to confirm flexibility for a future LRT extension beyond NAIT. This evaluation confirmed that alignments crossing the CN tracks and Yellowhead Trail would be dependent on the future of the City Centre Airport and on the ultimate destination of the North LRT. Additional planning is required to confirm the optimum location to cross the CN tracks and Yellowhead Trail and the alignment of the tracks to the northern terminus.

3.2 LRT OPERATIONS

The existing LRT in Edmonton operates trains every 5 minutes during peak hours. Ten minute service is provided mid-day during the week and on Saturdays. Fifteen minute service is provided in evenings and on Sundays.



The LRT extension from Downtown to NAIT will provide the same frequency of service between the proposed NAIT Station and the existing south terminus at the Health Sciences Station. This service provides connectivity between the post secondary education facilities of NAIT, MacEwan College and the University of Alberta together with connectivity between the Royal Alexandra Hospital and the Health Sciences Centre at the University of Alberta. In addition, same seat service is provided between north-central Edmonton and the downtown core. This service also means doubling the number of trains in the tunnel section through Downtown. Operating trains at a 2.5 minute headway in the tunnel requires upgrades to the power and signal systems within the tunnel. A new tail track is also required immediately south of the Health Sciences Station to facilitate the turnaround for the NAIT trains.

To operate the proposed service on the Downtown to NAIT extension, 20 new light rail vehicles (LRVs) will be required. These vehicles are recommended to be high floor vehicles similar to the vehicles ordered for the South LRT extension to Century Park. The possibility of switching to low floor vehicles was evaluated and not recommended due to the extremely high cost to retrofit the existing stations and tunnel to accommodate low floor vehicles. The LRVs that are recommended are still universally accessible, in coordination with station platform design.

LRV maintenance is carried out at the D.L. MacDonald facility which is located adjacent to the existing northeast line between Belvedere and Clareview Stations. With the existing fleet and proposed new LRVs for the South LRT extension, the D.L. MacDonald facility will be at capacity. Reconstruction of the Cromdale bus barns is recommended to provide storage and light maintenance for the additional 20 LRVs for the Downtown to NAIT Extension.

3.3 TRAFFIC IMPACTS

The existing roadway network in the study area consists of a typical grid system. Four-lane arterial roadways including 101, 105 and 109 Streets accommodate north/south traffic, predominantly serving the downtown and government centre areas. 109 Street also connects to the High Level Bridge over the North Saskatchewan River. 104, 106, 107 and 111 Avenues are the current east/west arterials. 104 Avenue is a major roadway for west end residents commuting to downtown; 111 Avenue caters to more cross-town traffic. In addition to the grid system of roadways, Kingsway Avenue bisects the study area at approximately 45 degrees, creating many unconventional intersections.

A traffic microsimulation model was used to assess the future impacts of an LRT system on the roadway network. The primary objective of this exercise was to confirm whether the LRT could cross arterial roadways at grade or if grade separations would be required. Using a 2041 traffic projection horizon, the simulation concluded that with the implementation of minor intersection

improvements, all arterial roads can be crossed at grade with only minor increases to delays and congestion. No grade separations are warranted.

The existing transit centre located on the west side of 106 Street north of 111 Avenue is at capacity and is experiencing operational challenges. Locating the Kingsway LRT station south of 111 Avenue would create additional difficulties for transit patrons transferring from bus to LRT due to the distance between the two facilities. Relocating the transit centre to south of 111 Avenue is recommended to provide improved connectivity to the LRT station.

A multi-use trail is also included in the North LRT Concept Plan. A 3.0m wide facility will connect all three stations and terminate at the south end connecting into the proposed 105 Avenue Corridor Study.

3.4 UTILITIES/DRAINAGE

Utility coordination is always a major component of any civil engineering project in an existing developed area. The proximity to Edmonton's downtown and to an existing EPCOR substation compounds the impacts. Sufficient lead time and scheduling will be critical to coordinate utility relocations and mitigation measures to ensure an optimal construction process.

With approximately 25% of the Downtown to NAIT LRT extension located underground, storm water runoff will be another major consideration. To accommodate the design guidelines for both the tunnel and surface over-land flow, drainage facilities will have to be considered in terms of capacity, storage and discharge.

3.5 GEOTECHNICAL/ENVIRONMENTAL/HISTORICAL RESOURCES

An initial geotechnical assessment was undertaken in September, 2007 to identify the subsurface condition along the proposed corridor. This initial assessment was limited to a desktop review of existing published data. The review concluded that subsurface conditions are relatively uniform and comprised of fill, glaciolacustrine clay, glacial till, Saskatchewan sands and gravel, clay shale and sandstone bedrock.

In winter/spring 2008, boreholes were drilled throughout the length of the corridor to confirm geotechnical conditions. Conditions are generally favourable for the construction of the proposed LRT extension.

A Phase I Environmental Site Assessment was also undertaken. Based on a visual inspection and historical review, several locations were identified as having the potential to impact soil and groundwater quality in the vicinity of the proposed North LRT. A Phase II Environmental Site Assessment was conducted specifically on the section adjacent to 105 Avenue from 101 Street

to 105 Street. Soil samples contained benzene and ethylbenzene above acceptable criteria. Soils containing these contaminants will have to be removed and properly disposed.

A Historical Resources Overview was conducted along the proposed LRT alignment and it has been confirmed that a Historic Resources Impact Assessment is not required.

3.6 NOISE/VIBRATION

With any planned improvement or addition to a municipal transportation system, concerns over noise and vibration are always raised by adjacent property owners. To mitigate these concerns on the North LRT extension from Downtown to NAIT, existing noise levels were measured and future noise levels were predicted to the year 2041.

Seven sites were selected throughout the length of the corridor to measure the existing 24 hour noise levels. Four sites were located east of 106 Street in the Spruce Avenue residential community and the remaining three were located south of 111 Avenue.

Three of the four sites in the Spruce Avenue community measured noise levels ranging from 52 – 55 dBA Leq₂₄. The fourth site immediately opposite the existing Kingsway Transit Centre and north of 111 Avenue registered a noise level of 62.7 dBA Leq₂₄. The three sites south of 111 Avenue measured noise levels ranging from 54 – 57 dBA Leq₂₄.

Future noise levels were predicted using a computer model that considered growth in traffic volumes and normal LRT operations. The model estimated that future noise levels adjacent to the LRT would range from 54 – 60 dBA Leq₂₄ throughout the corridor.

Given that the threshold for noise attenuation within the City of Edmonton is 65 dBA Leq₂₄, no noise attenuation is required for this extension.

With the proposed North LRT alignment in close proximity to existing development, vibration has also been identified as a potential concern. Baseline testing will commence in May/June 2008 and results will be incorporated into preliminary design.

3.7 PROPERTY ACQUISITION

Construction of a curvilinear LRT alignment through an existing developed area will require property acquisition as illustrated in Figure E-2. Immediately north of 105 Avenue between 103 Street and 105 Street, a mix of industrial/commercial and vacant or undeveloped properties are required. On the west side of 105 Street between 105 Avenue and 108 Avenue, a mix of industrial/commercial/vacant and apartment properties are required. South of Kingsway Avenue, two large commercial properties are required. A portion of the Royal Alexandra Hospital parking

lot is required immediately south of 111 Avenue to accommodate the transit centre. A commercial property, widening of 111 Avenue from 102 Street to 108 Street, and 13 single family residential properties are required north of 111 Avenue.

Remnant parcels of land on the west side of 105 Street between 105 Avenue and 108 Avenue and on the south side of Kingsway are considered redevelopable.

3.8 STAKEHOLDER CONSULTATION

The stakeholder consultation process was managed directly by the City of Edmonton and facilitated by Gray Scott Consulting. The UMA team provided presentation materials, graphics and plans for all Stakeholder Advisory Group meetings, information sessions and open houses. Team members also participated in all stakeholder meetings.

3.9 COST ESTIMATING/RISK ANALYSIS


Estimation of project costs is another critical component of any major planning activity. In a municipal environment, project costs and annual cash flows are key deliverables in the decision-making process. In addition to the traditional methods of estimating construction tasks, estimates for property acquisition, risks, inflation rates and engineering/administration have all been considered in the development of the overall project cost of \$750M 2008, as illustrated in Figure E-3.

A possible schedule for implementation as illustrated in Figure E-4 identifies land acquisition and utility relocation commencing in 2008, tunnel construction commencing in 2009, and the Downtown to NAIT LRT extension will be operational in 2014.

3.10 MOVING FORWARD

In addition to the normal preliminary design tasks associated with an LRT extension, the following specific tasks have been identified to be resolved through preliminary design:

- Evaluation and comparison of tunneling options, including both sequential excavation and cut and cover technologies
- Hydrovac process to confirm utility locations
- Negotiations with utility companies to confirm cost responsibilities
- Track alignment in vicinity of 108 Avenue and impacts on Prince of Wales Armouries and Edmonton Public School Board site

- 
- Confirmation of property acquisition and budget approval for properties immediately north of 105 Avenue (104 – 105 Streets)
 - Preparation of project brochure and development of stakeholder consultation program
 - Assessment of existing trees along corridor
 - Additional surveys, geotechnical, and environmental evaluations
 - Continue discussions with stakeholders including Emergency Services and the Polish Hall to define impacts to their buildings, as well as how to address these impacts
 - Continue discussions with NAIT regarding temporary and permanent station locations, contingent on future land development on NAIT's site north of Princess Elizabeth Avenue



NORTH LRT EXTENSION DOWN TO NAIT
RECOMMENDED PLAN

UMA | AECOM



ISL Engineering
and Earth Services



LRT
ROADWORKS
MULTI-USE TRAIL

MAY 2008

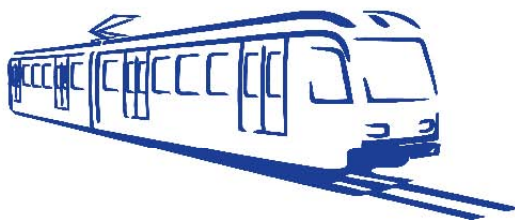
FIGURE E-1





NORTH LRT EXTENSION DOWNTOWN TO NAIT
PROPERTY REQUIREMENTS

UMA | AECOM



PROPERTY REQUIREMENTS

MAY 2008

FIGURE E-2

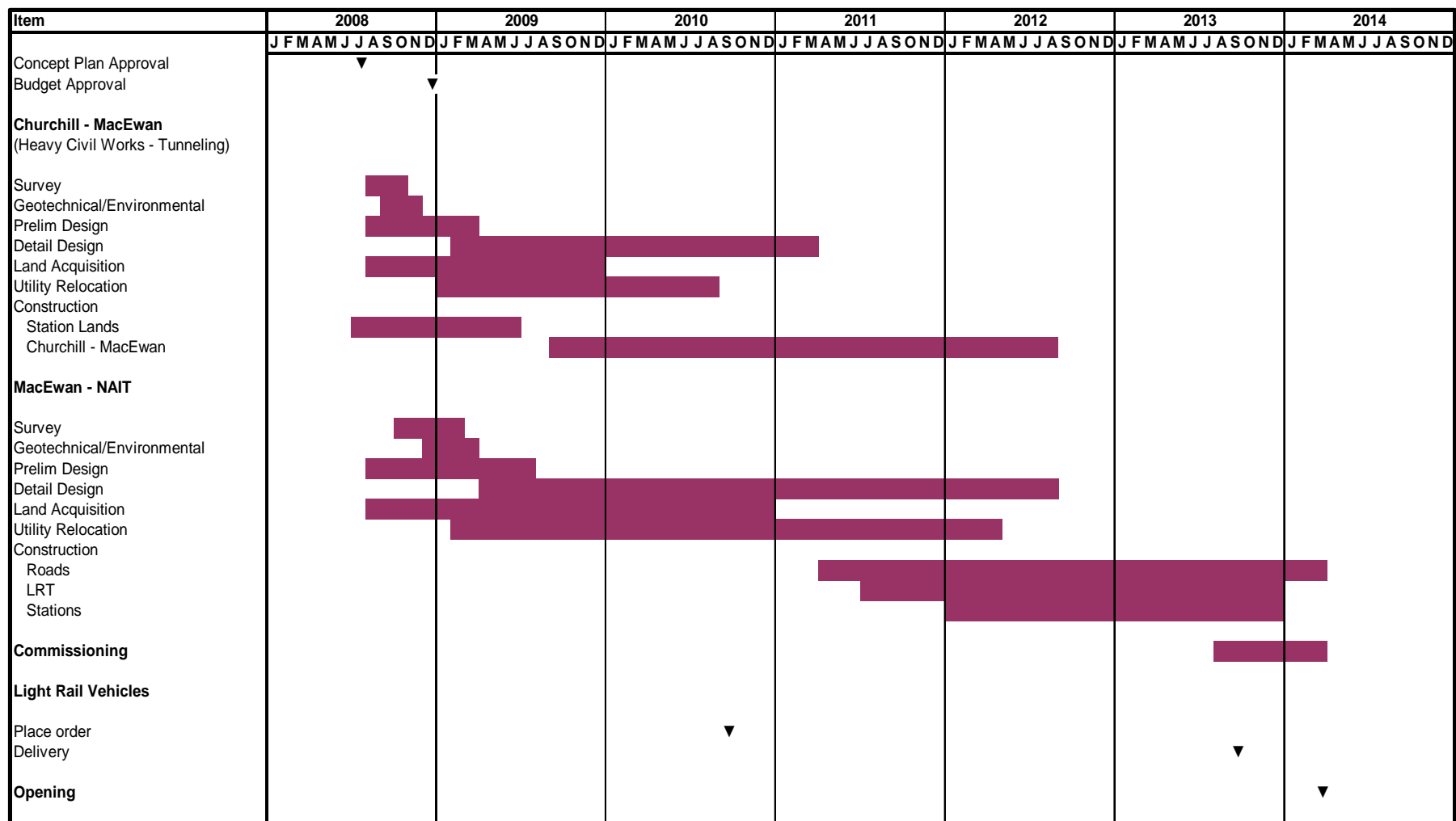


CONCEPT LEVEL COST ESTIMATE - 2008 DOLLARS, NOT INFLATED

CONSTRUCTION	\$450 M
ENGINEERING AND ADMINISTRATION	\$65 M
LIGHT RAIL VEHICLES	\$85 M
LAND	<u>\$150 M</u>
TOTAL	\$750 M

NORTH LRT EXTENSION DOWNTOWN TO NAIT
COST ESTIMATE (2008 DOLLARS)





NORTH LRT EXTENSION DOWNTOWN TO NAIT
DRAFT IMPLEMENTATION SCHEDULE

