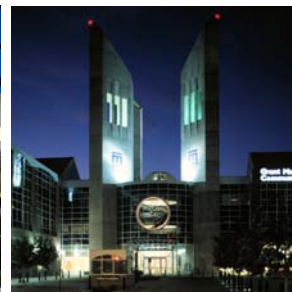
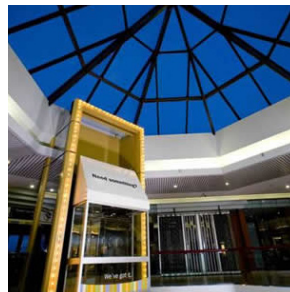


NORTH LRT EXTENSION

DOWNTOWN TO NAIT

CONCEPT PLANNING REPORT



ADDENDUM

City of Edmonton
Transit Projects Office

September 2008



This Addendum Report is intended to be read with and amend parts of the Concept Plan Report dated June 2008. In the event of a conflict, this document will prevail.

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**NORTH LRT EXTENSION
DOWNTOWN TO NAIT
CONCEPT PLANNING REPORT - ADDENDUM**

1.0 Introduction

In June 2007, a multidisciplinary team lead by UMA Engineering Ltd. was commissioned to undertake planning and preliminary design for a proposed extension to the City of Edmonton's LRT system from downtown Edmonton to the Northern Alberta Institute of Technology (NAIT).

The North LRT Extension (Downtown to NAIT) Concept Planning Final Report was submitted to the City of Edmonton's Transit Project Office in June 2008.

At the Special City Council Meeting on July 8, 2008, the City of Edmonton's administration presented the North LRT Extension (Downtown – NAIT) Concept Planning Report to City Council. This report recommended:

"That the Concept Plan for the North LRT Extension (Downtown to NAIT as outlined in the June 24, 2008 Transportation Department Report 2008TD5736 be approved."

Following a public hearing at which numerous presentations were made, City Council approved the following motions:

1. That the North LRT Extension: Downtown to NAIT Concept Plan be referred back to Administration to amend the Downtown to NAIT Concept Plan by planning the LRT alignment on 105 Street from 105 Avenue to 108 Avenue.
2. That a Special City Council meeting be scheduled for September 25, 2008 at 1:30pm to deal with this matter and any other related matters.

This Addendum outlines amendments to the June 2008 North LRT Extension (Downtown to NAIT) Concept Planning Final Report in response to City Council's direction to plan the North LRT extension between 105 and 108 Avenues on 105 Street.

2.0 Alignment

105 Street from 105 Avenue to 107 Avenue is classified as an arterial road and carries approximately 17,000 vehicles/day. North of 107 Avenue, 105 Street is a local road that terminates at 108 Avenue. The cross section of 105 Street between 105 Avenue and 108 Avenue is constant at 24.4 m wide. However, road, sidewalk and boulevard widths vary block by block. Existing cross sections are illustrated in the following Figures:

Figure 1 105 Avenue - 106 Avenue

Figure 2 106 Avenue - 107 Avenue

Figure 3 107 Avenue - 108 Avenue

Three possible scenarios exist for LRT operation on 105 Street. These are illustrated in the following figures:

Figure 4 East side operation

Figure 5 West side operation

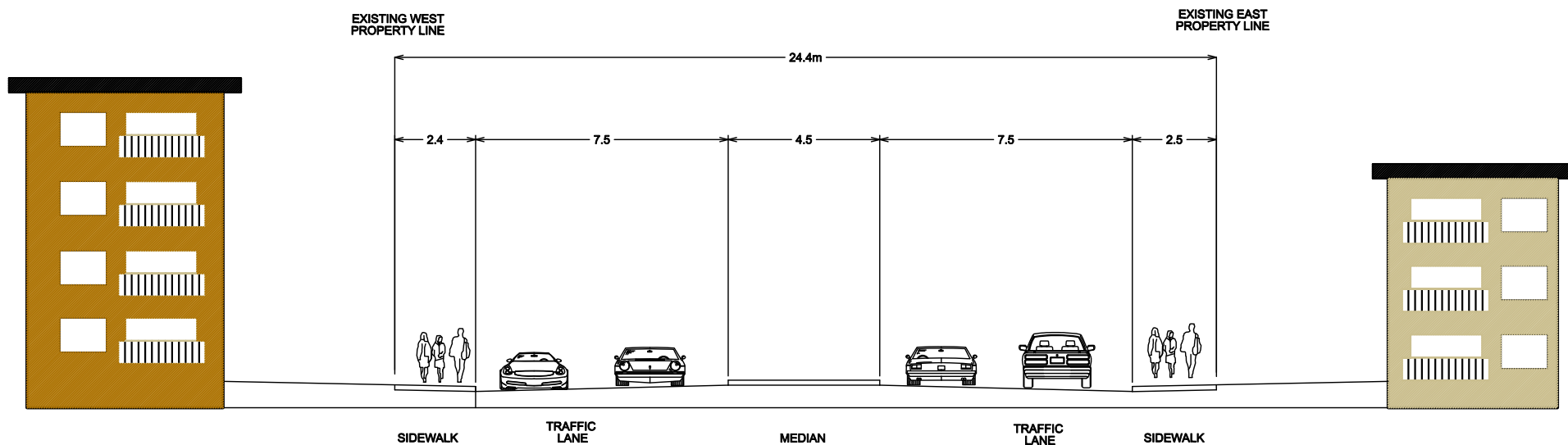
Figure 6 Centre operation

The entire centre operation alignment is illustrated in Figure 7. A matrix evaluating these three options has been prepared and is illustrated in Figures 8a and 8b. Options were evaluated in terms of LRT geometry, traffic impacts, business impacts, community impacts, pedestrian and bicycle circulation, access, landscaping and parking. A total closure of 105 Street between 107 and 108 Avenues is common to all three options.

As any cost difference between the three options is negligible at this stage of planning, the centre operation with one lane of traffic in both northbound and southbound directions is the recommended alternative. This option equally distributes the impacts of LRT on both sides of 105 Street and minimizes impacts on access.

To maximize the radius of the turn from 105 Avenue to the centre of 105 Street, the location and orientation of the Grant MacEwan Station has been adjusted. In the June 2008 Final Report, the two existing accesses to Square 104 on 105 Avenue were maintained. Eliminating the easterly access and realigning the access to the westerly underground parkade allows the Grant MacEwan Station to be located further to the south. It is recommended that both 105 Avenue accesses be replaced by a single all-directional signalized access on 104 Avenue at 104 Street.

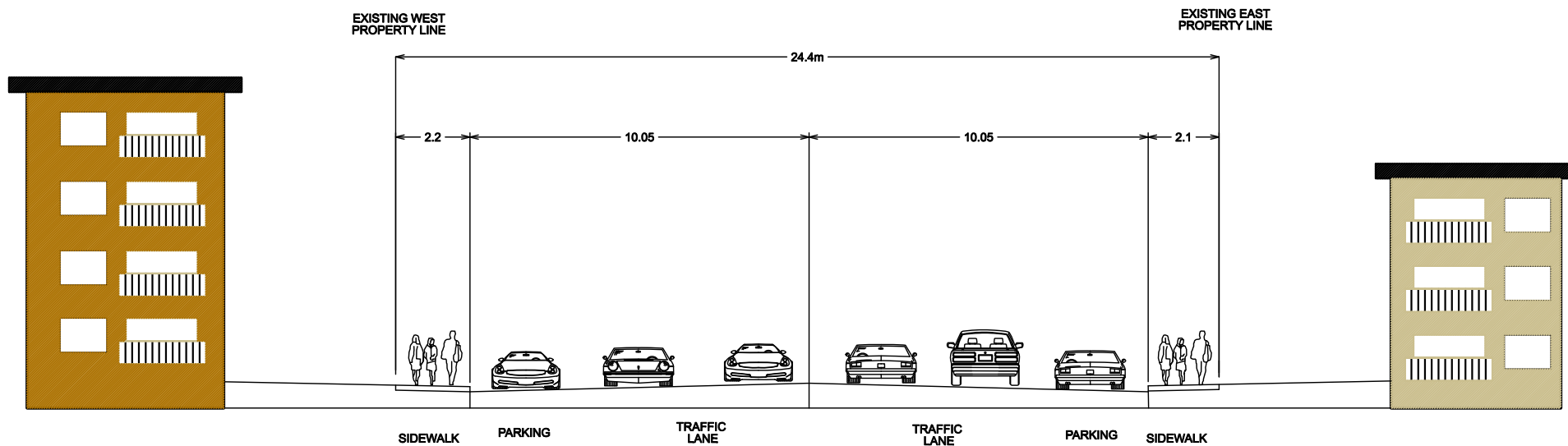
As illustrated in Figure 3, the roadway width of 105 Street north of 107 Avenue is 9.0 m, currently allowing substantially wider boulevards. Mature elm trees exist within these wider boulevards and consideration was given to the impact of the LRT on these trees. A centre median LRT operation as illustrated in Figure 9 will probably warrant removal of trees on both sides of 105 Street. A slight realignment of the LRT to the east was considered to potentially save the trees on the west side. This option will be reviewed during preliminary engineering in conjunction with a more detailed evaluation of the trees.



EXISTING 105 STREET (105 - 106 AVENUE)

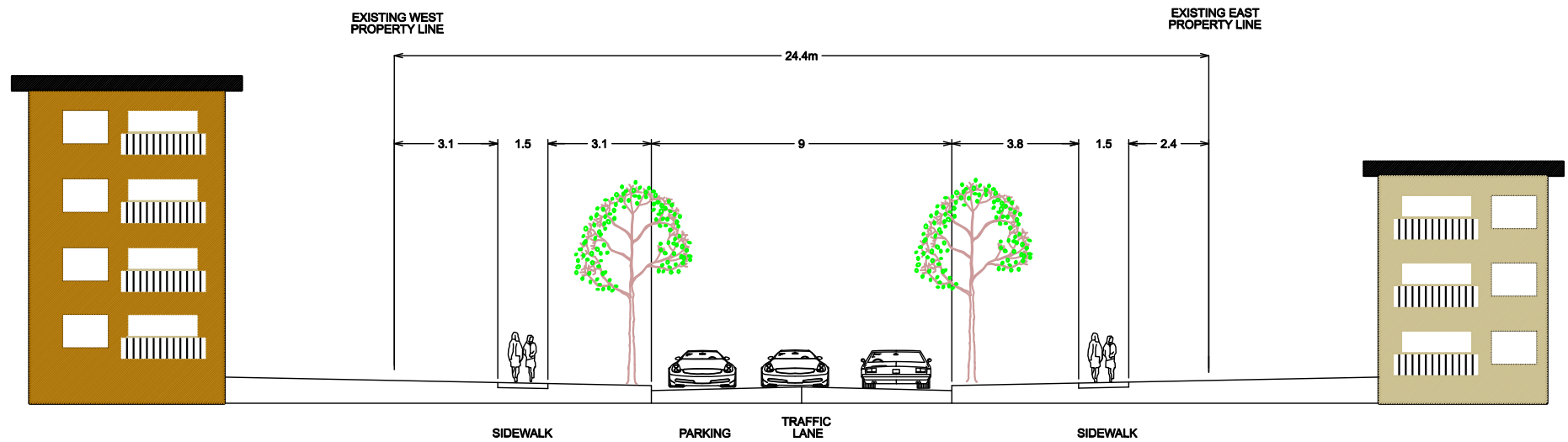
DOWNTOWN - NAIT LRT STUDY





EXISTING 105 STREET (106 - 107 AVENUE)
DOWNTOWN - NAIT LRT STUDY

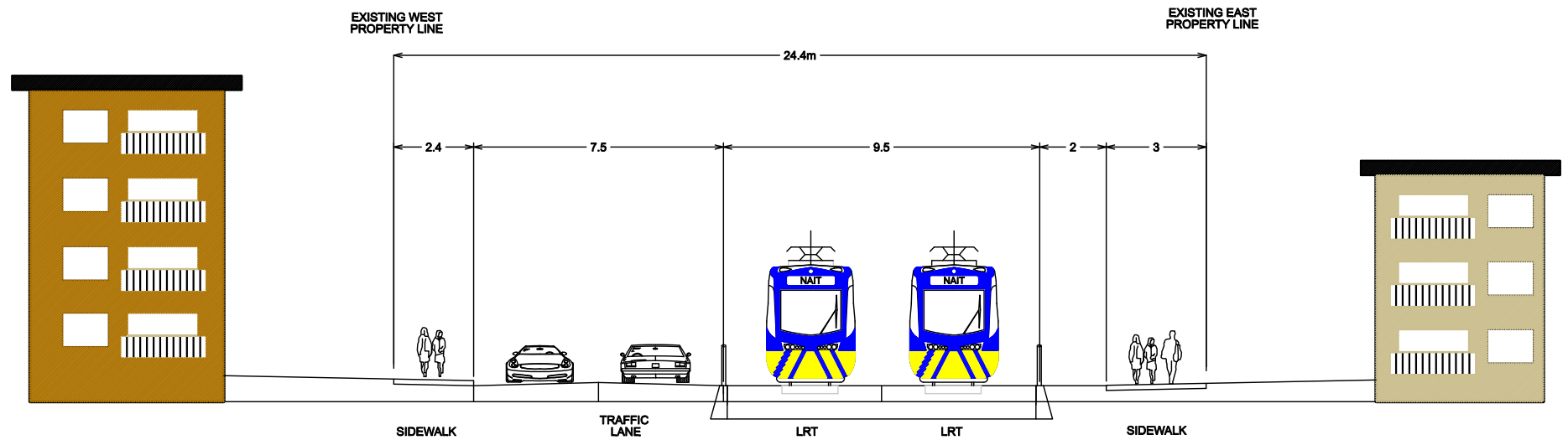




EXISTING 105 STREET (107 - 108 AVENUE)

DOWNTOWN - NAIT LRT STUDY

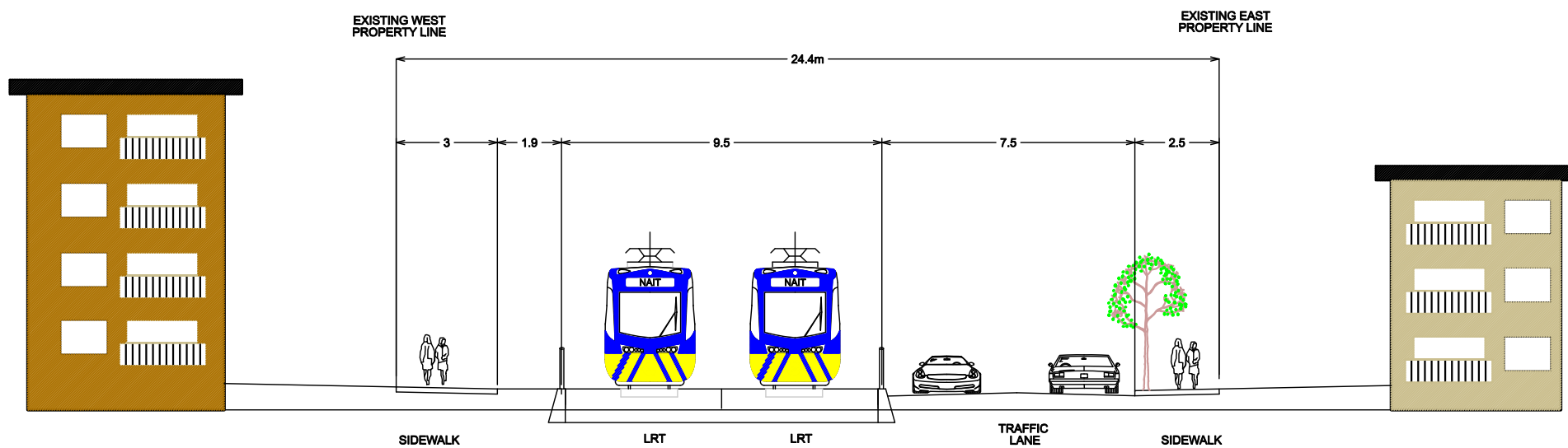




PROPOSED EAST SIDE CROSS SECTION

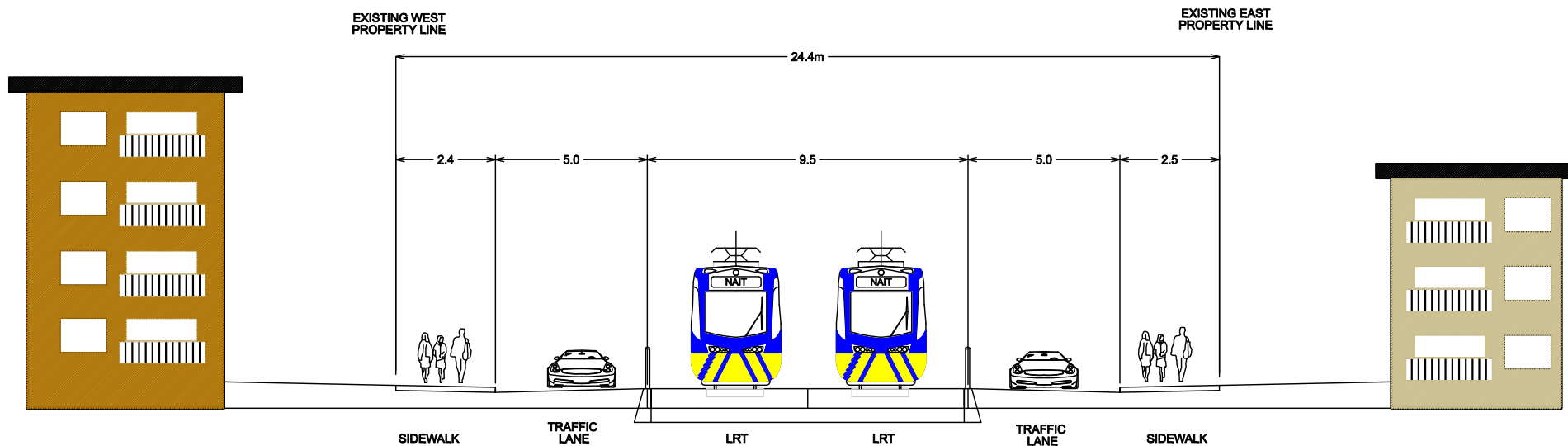
DOWNTOWN - NAIT LRT STUDY





PROPOSED WEST SIDE CROSS - SECTION
DOWNTOWN - NAIT LRT STUDY





MEDIAN CROSS - SECTION 105 - 106 AVENUE

DOWNTOWN - NAIT LRT STUDY





LEGEND:

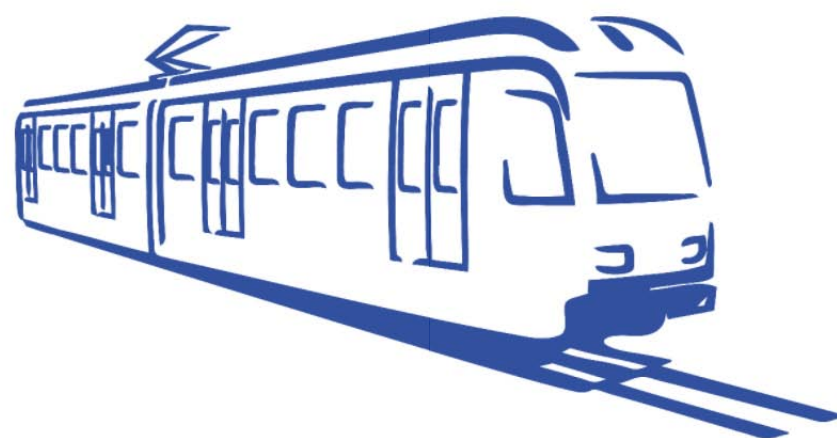
- ACCESS
- ACCESS TO PARKING FROM LANE
- NORTH LRT ROUTE
- PROPERTY TO BE PURCHASED

4/23/2012 12:34 PM North LRT Drafting a project in Alignment Figure 7.dgn

UMA | AECOM



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North LRT Extension - Downtown to NAIT
Concept Planning

CENTRE LRT OPERATION
WITH ONE WAY TRAFFIC EACH SIDE
FIGURE 7

IMPACT COMPARISON AND DECISION MATRIX LRT on 105 Street



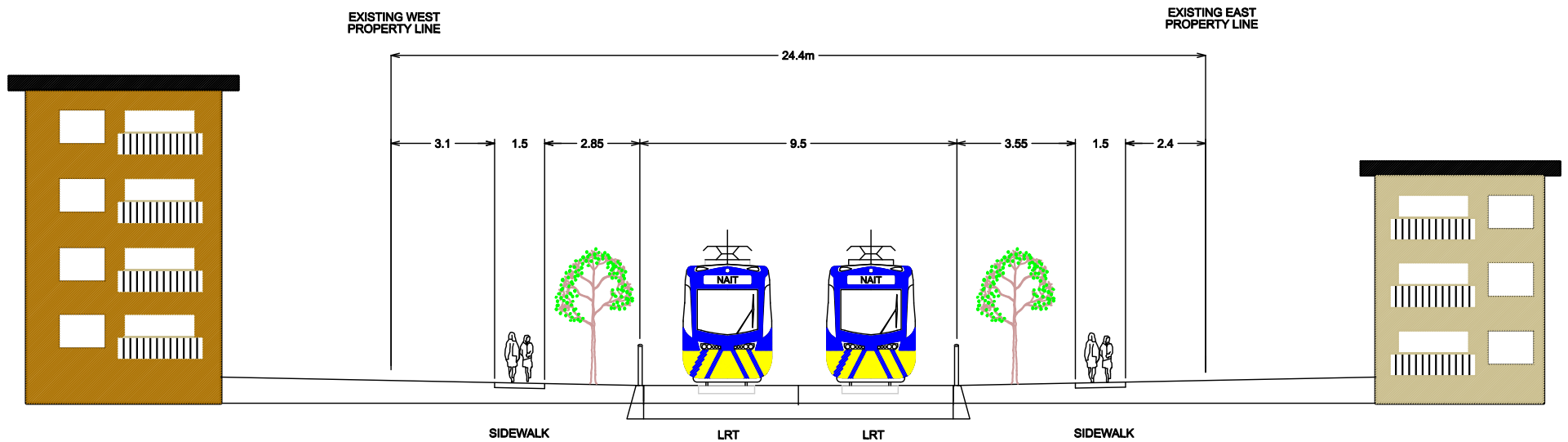
	Option 1	Option 2	Option 3	Option 4	Option 5	
Impacts	Centre of 105 Street LRT Operation - single lane of traffic in each direction	West Side of 105 Street LRT Operation - single lane of traffic in each direction	3 East Side of 105 Street LRT Operation - single lane of traffic in each direction	LRT on East Side of 105 Street w/ Couplet Traffic Oper. on 105 St and 106 St	Contra-flow 105 Street Operation Three lanes Centre Lane SB-AM & NB-PM	Notes
Vehicle access blocked south of 107 Avenue (105 St. closed north of 107 Ave.)	None - existing accesses will be right-in-right-out only. 105 – 107 Avenue no accesses blocked existing median restricts access to right in right out. One access restricted.	2 business access closed	2 business accesses closed	2 business accesses closed	2 Business accesses closed Will need to use ITS close to accesses to provide direction to turn on centre lane for NB or SB depending on time of day. Significant traffic control required	Blocked accesses may cause community concern and business impacts.
Crossing at 105 Avenue and 105 Street.	Northbound traffic impacted.	Northbound and southbound traffic impacted.	Neither northbound nor southbound traffic impacted.	Neither northbound nor southbound impacted	Neither northbound nor southbound impacted	
LRT Track Radii at 105 Avenue (m)	90m	100m	75m	75m	75m	Current Edmonton LRT guidelines have 180m minimum radius; actual minimum on Edmonton LRT system = 157m
106 Avenue Intersection	Left turning traffic 105 Street NB to 106 Ave WB will block through movements on 105 Street. Four turn movements allowed during train crossing. Ban northbound/southbound left turns onto 106 Avenue	Left turning traffic must cross tracks at 106 Ave. No room to allow a left turn lane to be developed. Left turning traffic will block through traffic unless left turns are banned. Three turn movements allowed during train crossing. Ban northbound/southbound left turns	No room to allow a left turn lane to be developed. Left turning traffic will block through traffic unless left turns are banned. Three turn movements allowed during train crossing. Ban northbound and southbound left turns	Minor impacts - Left turn lane can be developed	Minor impacts - Left turn lane can be developed	With single lane traffic operation left turns onto 106 Avenue must be banned.
107 Avenue Intersection	Left turning traffic must cross tracks at 107 Ave. No room to allow a left turn lane to be developed. Left turning traffic will block right turn movements. Two turn movements allowed during train crossing.	Left turning traffic must cross tracks at 107 Ave. No room to allow a left turn lane to be developed. Left turning traffic will block right turn movements. Two turn movements allowed during train crossing.	Northbound left turns from 105 Street do not cross the tracks. Two turn movements allowed during train crossing.	Minor impacts - left turn lane can be developed. Ban through movements	Minor impacts - left turn lane can be developed. Ban through movements	Through movements to 105 Street north of 107 Avenue to be banned. 105 Street between 107 Avenue and 108 Avenue will become a LRT/pedestrian corridor to allow for best operation of 107 Avenue intersection
Emergency Medical Services (EMS) Access	Existing all directional access to be maintained. EMS priority required for crossing, otherwise right-in/right-out northbound one way.	All directional access maintained. EMS vehicles cross tracks north or south of building.	EMS priority required to allow EMS vehicles out of EMS facility, otherwise no access.	EMS priority required to allow EMS vehicles out of EMS facility, otherwise no access.	Will need to use ITS to provide direction to turn for NB or SB depending on time of day	LRT on east side of 105 Street impacts the EMS access the most. LRT on west side of 105 Street will impact north and southbound EMS vehicles as they try to exit area.
Business Impacts on 105 St.	No parking allowed on 105 Street.	Pedestrian access only on west side - deliveries must be made from rear of building. One adjacent business on property line. No parking on 105 Street.	Pedestrian access only on east side - deliveries must be made from rear of building. Four adjacent businesses on property line. No parking on 105 Street.	Reduction to "one-way" traffic. Also there will be pedestrian access only on east side - deliveries must be made from rear of building. No parking on 105 Street.	Some confusion because of two way operation. Will require significant use of ITS technology. No parking on 105 Street.	There will be impacts to businesses on 105 Street
Existing Landscaping / Mature Trees Impacts	Low potential to maintain mature trees on both sides of 105 Street between 107 Avenue and 108 Avenue. Opportunity for new landscaping. Closing 105 Street to vehicles north of 107 Avenue enhances potential to maintain trees.	Mature trees on west side of 105 Street between 107 Avenue must be removed. Potential to maintain trees on east side. Opportunity for new landscaping.	Mature trees on east side of 105 Street between 107 Avenue and 108 Avenue must be removed. Potential to maintain mature trees on west side. Opportunity for new landscaping.	Mature trees on east side of 105 Street between 107 Avenue and 108 Avenue must be removed. Opportunity for new landscaping.	Mature trees on both sides of 105 Street between 107 Avenue and 108 Avenue must be removed. Opportunity for new landscaping.	Trees on either or both sides of 105 Street between 107 Avenue and 108 Avenue will have to be removed. Any trees that are removed must be replaced under City Bylaw.



	Option 1	Option 2	Option 3	Option 4	Option 5	
Impacts	Centre of 105 Street LRT Operation - single lane of traffic in each direction	West Side of 105 Street LRT Operation - single lane of traffic in each direction	3 East Side of 105 Street LRT Operation - single lane of traffic in each direction	LRT on East Side of 105 Street w/ Couplet Traffic Oper. on 105 St and 106 St	Contra-flow 105 Street Operation Three lanes Centre Lane SB-AM & NB-PM	Notes
Pedestrian & Bicycle Impacts	Limited right-of-way available for a multi-use trail. 9.5m for LRT, 2 lanes at 4.5m leaves 5.9m for sidewalks/MUT. Existing sidewalks are 2.1-2.5m wide).	Normal sidewalk on one side; right-of-way available on other side for a multi-use trail. With only one lane in each direction 5.9m available for sidewalks/MUT With one lane in each direction with parking on one side or a three lane section sidewalks reduced to 2m. MUT on 104 Street.	Normal sidewalk on one side; right-of-way available on other side for a multi-use trail.	Normal sidewalk on one side; right-of-way available on other side for a multi-use trail.	With three lanes (2 x 3.5m + 4.0m contra-flow lane only 2.0m+- available on both sides for narrow sidewalks on both sides without offsets Sub-standard lane widths and sidewalks with this option FATAL FLAW	Multi-use trail will continue to be planned down 104 Street. Depending on option selected, space available on 105 Street between 105 Avenue and 107 Avenue will allow for up to 3.0 m sidewalks on each side.
Potential for Shortcutting	Some, especially with only a single left turn lane at 107 Avenue.	Some, especially with only a single left turn lane at 107 Avenue.	Some, especially with only a single left turn lane at 107 Avenue.	106 Street will become a one way arterial. Different operation on 106 Street will require a bylaw amendment to upgrade this residential street to an arterial. FATAL FLAW	Minimizes expectation of shortcutting unless an incident occurs on 105 Street	Most options may result in some shortcutting on 106 Street and 107 Street.
Impact on 107 Avenue traffic	Expect considerable queuing on 107 Avenue for LT traffic onto 105 Street. Queuing on 107 Ave at 105 street will move left turns to 106 and 107 Streets. No left turn bays, which will impact through traffic on 107 Avenue.	Left turning traffic from 107 Avenue to 105 Street does not have to cross tracks.	Expect considerable queuing on 107 Avenue for LT traffic onto 105 Street.	Minimal impact.	Some confusion because of two way operation. Will require use of ITS technology	To assist 107 Avenue operation, through movements to 105 Street north of 107 Avenue to be banned. 105 Street between 107 Avenue and 108 Avenue will become a LRT/pedestrian corridor.
Grant MacEwan Access (vehicle)	Access from 105 Street will be affected, especially if left turns are banned NB-WB Access via 105 Avenue impacted due to green street concept west of LRT Access from east via 107 Avenue impacted by reduced capacity on 105 Street and no left turn bays on 107 Avenue at 106 and 107 Streets.	Access from 105 Street will be affected, especially if left turns are banned NB-WB Access via 105 Avenue impacted due to green street concept Access from east via 107 Avenue impacted by reduced capacity on 105 Street and no left turn bays on 107 Avenue at 106 and 107 Streets.	Access from 105 Street will be affected, especially if left turns are banned NB-WB Access via 105 Avenue impacted due to green street concept Access from east via 107 Avenue impacted by reduced capacity on 105 Street and no left turn bays on 107 Avenue at 106 and 107 Streets.	One-way access to Grant McEwan College only.	105 Avenue access limited by contraflow lane. It may be possible to keep LT lane south of 105 Avenue.	Vehicle access into Grant McEwan northbound to westbound will be affected by closure of lanes and LRT in centre or on west side of 105 Avenue. A left turn lane may be developed south of where LRT crosses 105 Street.
Impacts on Other Arterials (101 St., 109 St.)	More congestion on other arterials into/out of downtown. These arterials exist at close to capacity. Longer delays at intersections.	More congestion on other arterials into/out of downtown. These arterials exist at close to capacity. Longer delays at intersections.	More congestion on other arterials into/out of downtown. These arterials exist at close to capacity. Longer delays at intersections.	More congestion on other arterials into/out of downtown. These arterials exist at close to capacity. Longer delays at intersections.	More congestion on other arterials into/out of downtown. These arterials exist at close to capacity. Longer delays at intersections.	More congestion inevitable.
On Street Parking Impacts	Parking banned on 105 Street	Parking banned on 105 Street	Parking banned on 105 Street	Off-peak parking only allowed on 105 Street	No parking allowed on 105 Street With 3 lanes on 105 Street and narrow sidewalks, we could operate 2 lanes northbound in pm, 2 lanes southbound in am and parking off peak.	Existing on-street parking on 105 Street from 106 Ave to 107 Ave will be affected by LRT.
Notes	Single lane traffic operations will cause delays	Single lane traffic operations will cause delays	Single lane traffic operations will cause delays	This alternative not likely to be acceptable to neighbourhood community. Higher cost to implement. This option was discarded because of 106 St. issue.	Substandard sidewalks; narrow traffic lanes; ITS technologies present safety concerns. Good overall road capacity. This option was discarded because of sub-standard lane widths and offsets.	Issue to be resolved is between small radius of LRT track, poor LRT operation, blocked EMS access and good traffic operation OR larger LRT radius, but poorer traffic operation with LRT on west side. Could be resolved by relocating the ambulance station. Option 1 is the best balance of concerns.

DOWNTOWN - NAIT LRT STUDY

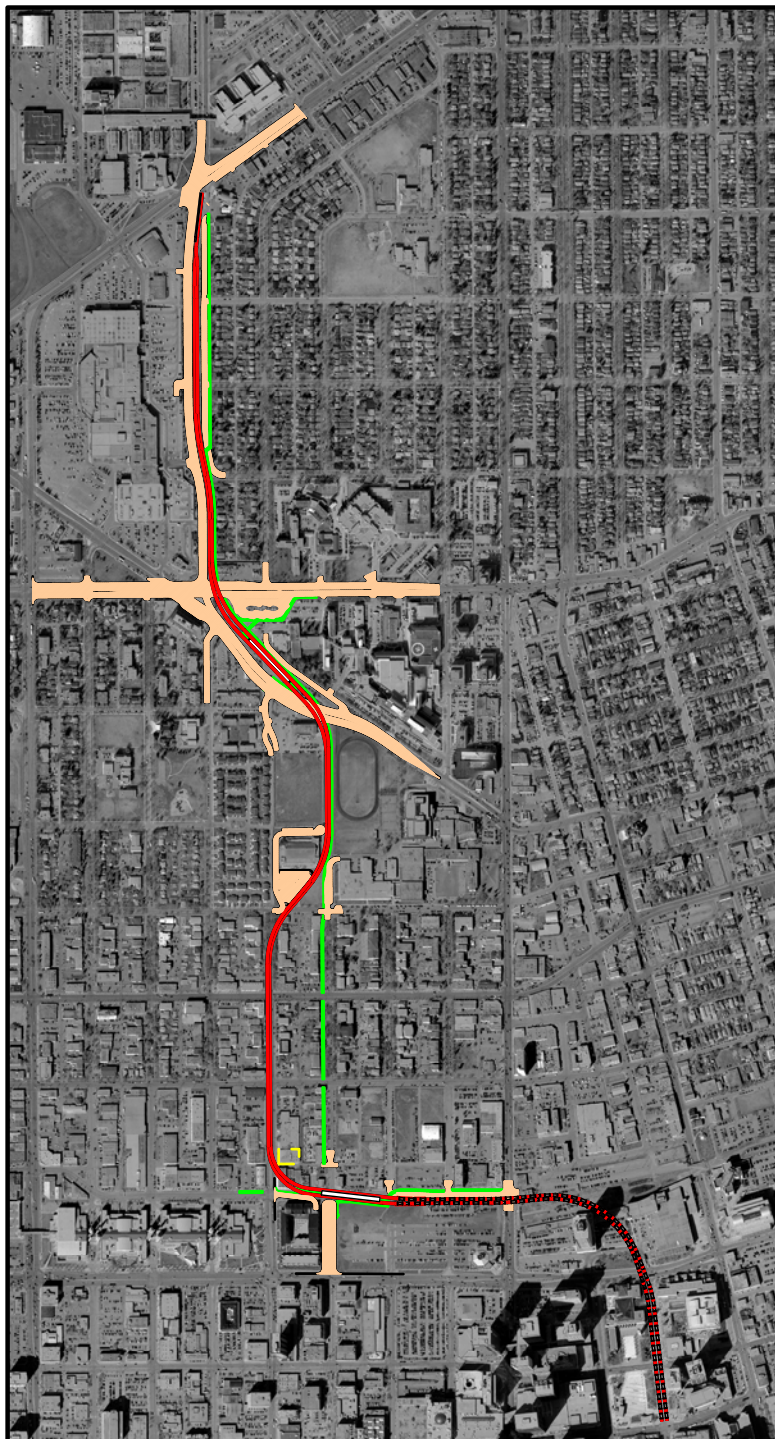
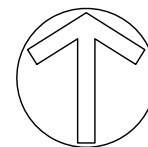




MEDIAN CROSS - SECTION 107 - 108 AVENUE
DOWNTOWN - NAIT LRT STUDY



The recommended North LRT Downtown to NAIT Concept Plan is illustrated in Figure 10. Details of the amended alignment and profile from Churchill Station to 108 Avenue are illustrated in Figures North T01 – North T06.



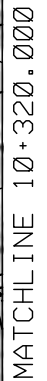
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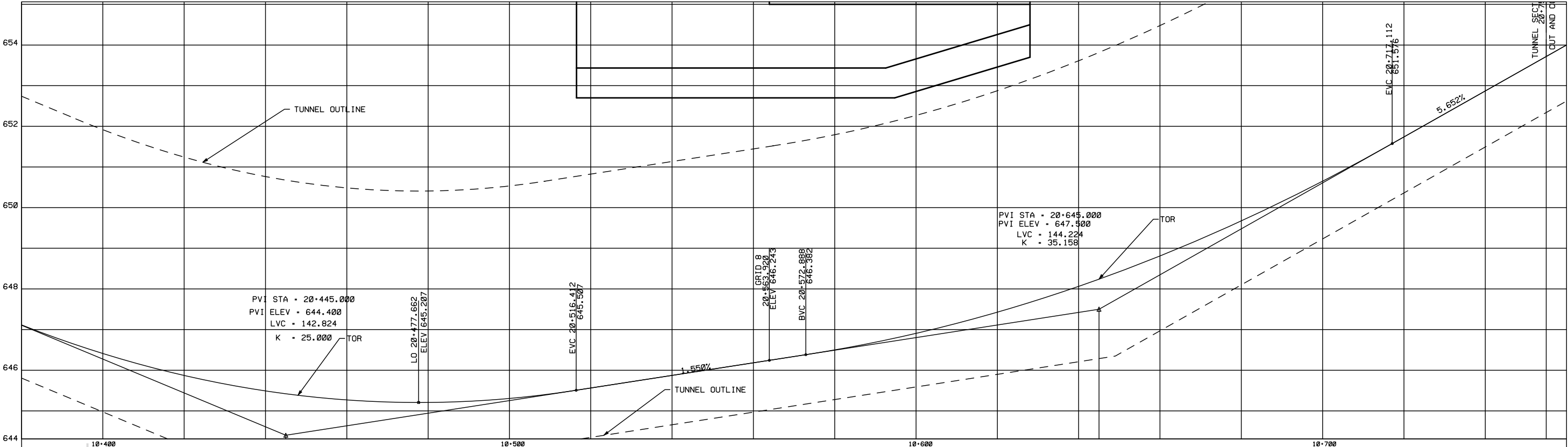
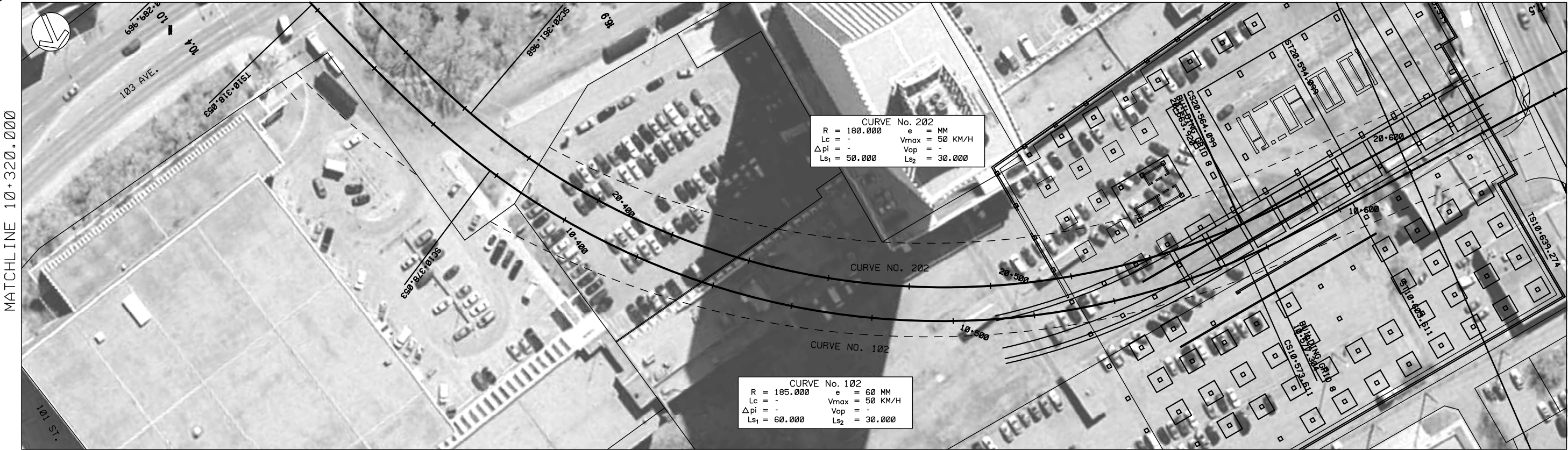


North LRT Extension - Downtown to NAIT
Concept Planning

- LRT
- ROADWORKS
- MULTI-USE TRAIL

RECOMMENDED PLAN
FIGURE 10



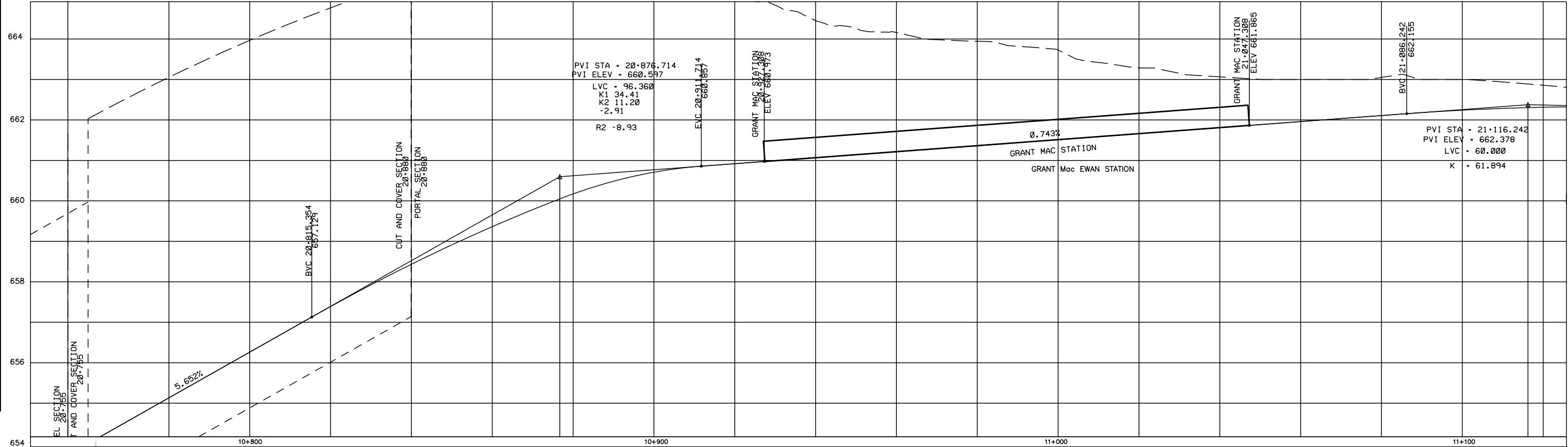
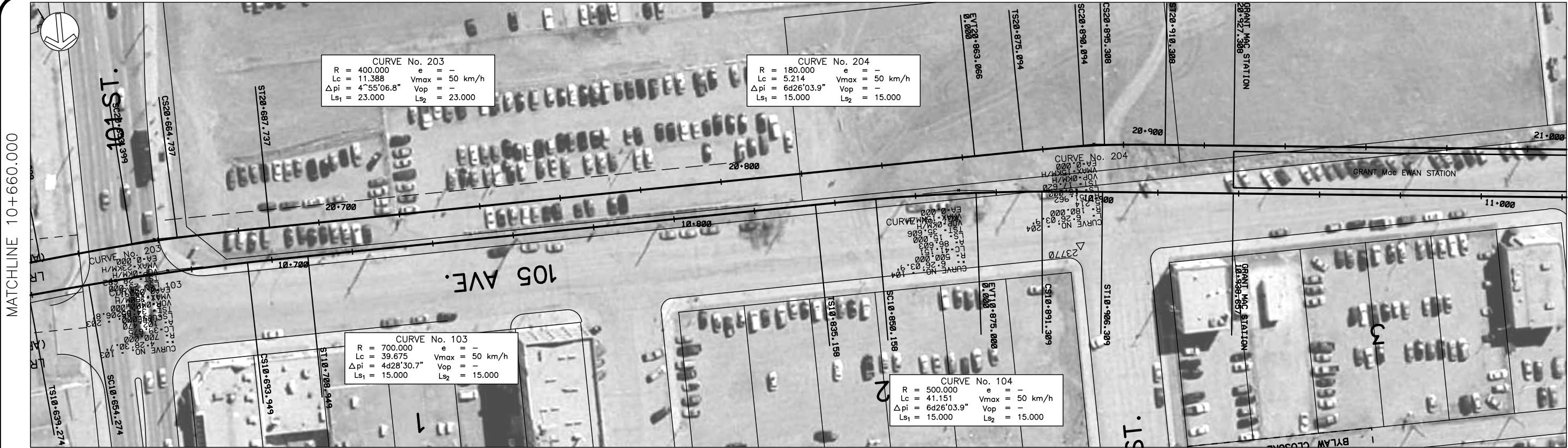


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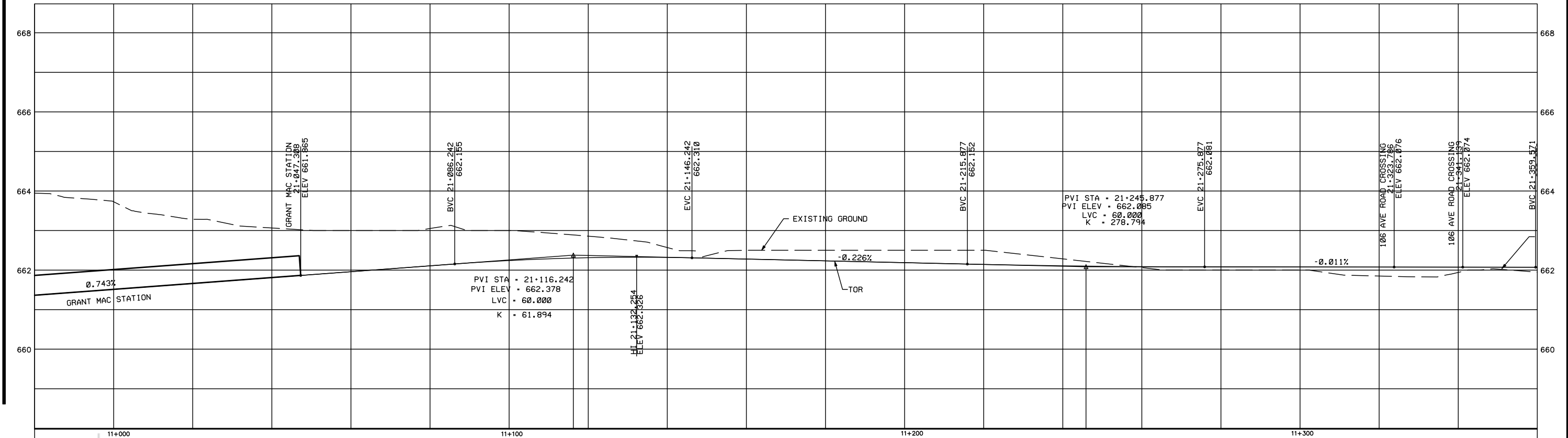
THE CITY OF
Edmonton
North LRT Extension - Downtown to NAIT
Concept Planning
NORTHBOUND TRACK
PLAN AND PROFILE
TRACK INSTALLATION
NORTH -T02

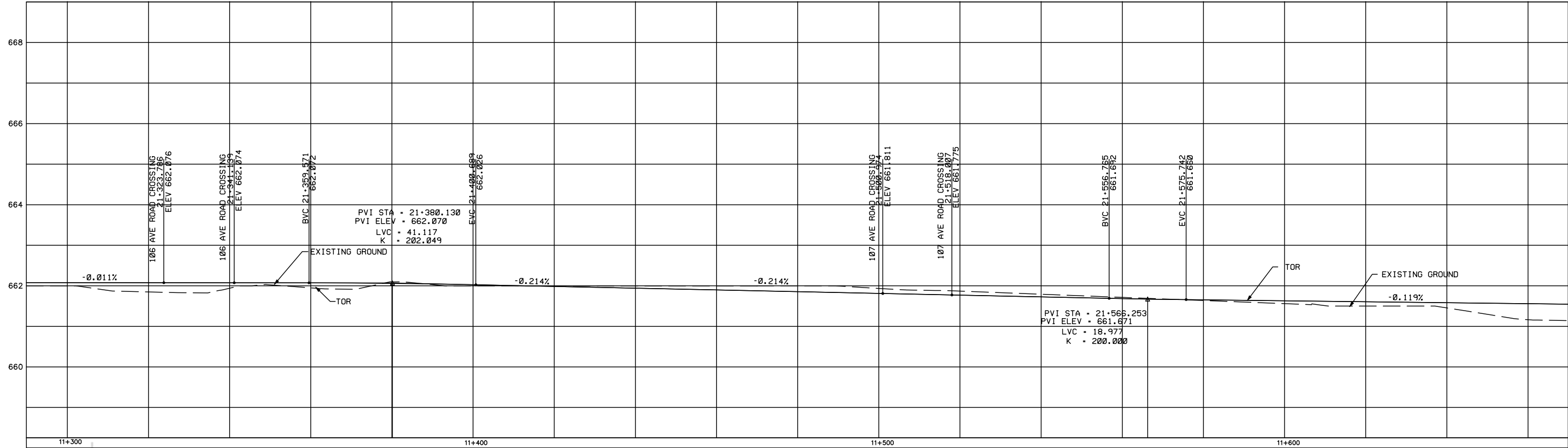


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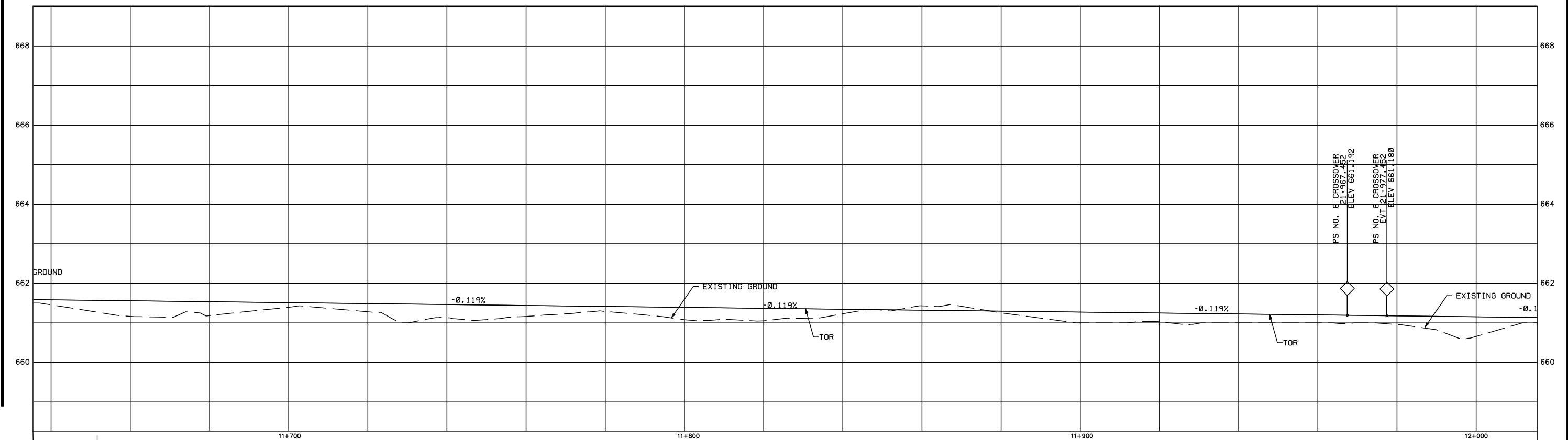
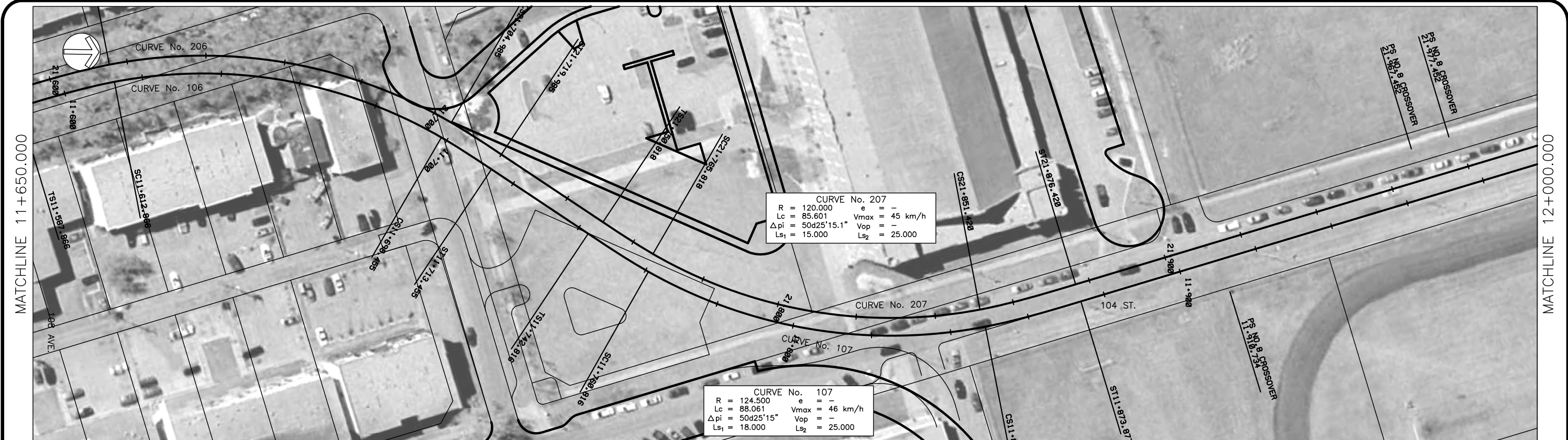
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Stantec | ISL Engineering and Land Services



THE CITY OF
Edmonton
North LRT Extension - Downtown to NAIT
Concept Planning
NORTHBOUND TRACK
PLAN AND PROFILE
TRACK INSTALLATION
NORTH -T05

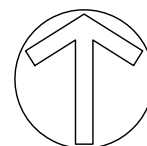


3.0 Operations

The June 2008 Final Report identified an LRT service plan that would operate 2 -3 car trains at a 5-minute headway during peaks hours. This plan required the acquisition of 20 new light rail vehicles (LRVs). Subsequently, the City requested that a 10-minute headway during peak hours be considered with a reduced number of new LRVs. For the amended cost estimates, acquisition of 10 new LRVs was assumed.

To accommodate the turn from 105 Avenue to 105 Street, it is necessary to realign the tracks from west of 105 Street to the middle of 105 Street. This results in a reduction in curvature from 110 m to 90 m. Although this radius is less than the desirable minimum radius outlined in the City of Edmonton LRT Design Guidelines, a 90 m radius is greater than the minimum mainline radius in the cities of San Jose, Portland and Calgary with similar LRT operations.

The June 2008 Final Report identified that accommodating a temporary station on the east side of 106 Street, south of Princess Elizabeth Avenue with twin tracks and side loading platforms required the realignment of the existing service road and sidewalk immediately in front of the Holy Rosary Church. This service road realignment encroached on the Church property. In an attempt to eliminate this encroachment, a revised layout for the temporary NAIT Station has been developed. This concept, in conjunction with a 10-minute headway, proposes the use of single track operation at the station with only one platform. This concept, as illustrated in Figure 11, does not require realignment of the existing service road and therefore does not impact the Holy Rosary Church property.



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North LRT Extension - Downtown to NAIT
Concept Planning
**TEMPORARY NAIT STATION
LOCATION**

FIGURE 11

4.0 Traffic

With LRT located in the centre of 105 Street, the remaining right of way (ROW) can only accommodate existing sidewalks with one lane of traffic northbound and southbound. Currently, the four lanes of traffic on 105 Street south of 107 Avenue cater to 17,000 vehicles/day. A reduction to only two lanes will have a major impact on traffic. The surrounding arterial network of roadways will have to absorb the redistribution of 5000 – 7000 vehicles/day from 105 Street. This will result in increased traffic on 104 Avenue, 101 Street and 109 Street. Signalized intersections on these roads do not accommodate all-directional turns and are currently approaching or are at capacity. The increased traffic from 105 Street will result in longer delays at signalized intersections during peak hours. Other impacts to traffic will include:

- Left turn bans both northbound and southbound on 105 Street at 106 Avenue
- Elimination of on-street parking on 105 Street
- Restricted turns at 105 Street/107 Avenue; i.e.: dual left turns to become single left turns
- New signalized intersection on 104 Avenue at 104 Street
- Vehicle access prohibited on 105 Street from 107 Avenue to 108 Avenue
- Increased use of back lanes for deliveries and to access parking areas

Further evaluation, quantification, and mitigation of traffic impacts will be undertaken throughout the preliminary engineering phase of this project.

5.0 Noise

As outlined in the amended noise report prepared by aci Acoustical Consultants, ambient noise levels on 105 Street within the 105 to 108 Avenues corridor will actually be lower in the proposed conditions due to a significant reduction in vehicle traffic on 105 Street. As there are no areas as designated by the UTNP C506 where noise levels are above 65 dBA Leq₂₄, noise mitigation is not required. Please see Appendix A for an addendum to the noise study.

6.0 Property Acquisition

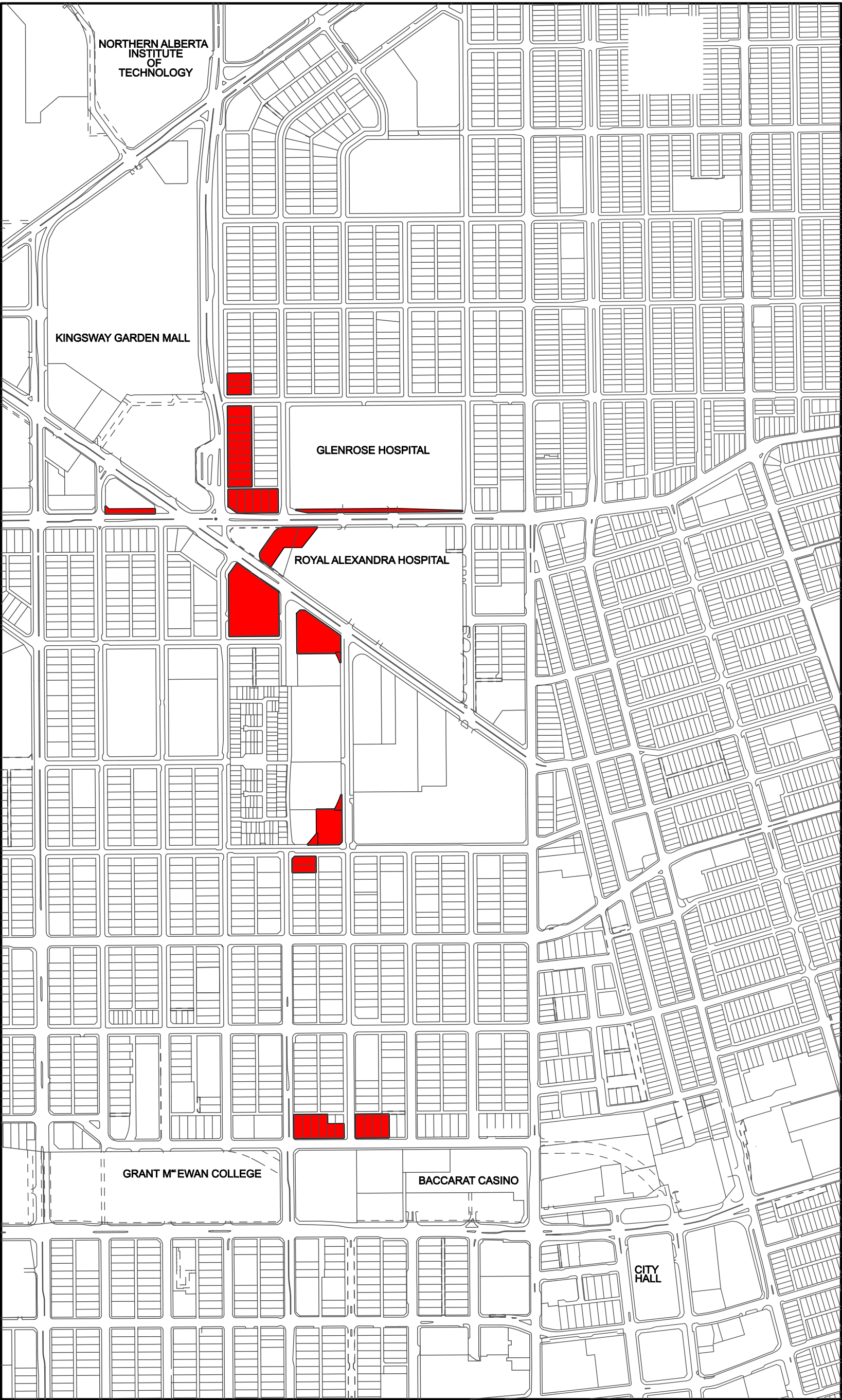
Locating the LRT tracks within the existing 105 Street ROW reduces the number of privately owned parcels of land to be acquired. The properties identified in the June 2008 Final Report on the west side of 105 Street between 105 Avenue and 108 Avenue are no longer needed and therefore existing land uses can remain in operation. The property requirements on the north side of 105 Avenue east of 105 Street have not changed. The two parcels of land on the east side of 105 Street immediately south of 108 Avenue are still required. Land requirements north of 108 Avenue have not changed.

The existing Emergency Medical Services (EMS) building on the east side of 105 Street north of 105 Avenue requires all directional access. With LRT located in the middle of 105 Street, all-directional access is feasible with an LRT crossing. As an alternative, the ambulance station may be relocated. Costs to relocate the ambulance station have been included in total project cost as a contingency. The remaining functions in the 105 Street building can continue to operate with LRT on 105 Street. Discussions with EMS will continue in the preliminary engineering design phase to confirm requirements.

Adjustments to LRT operations at the NAIT temporary station have resulted in the elimination of the minor encroachment onto the Holy Rosary Church property located at the southeast corner of 106 Street and Princess Elizabeth Avenue.

Property requirements for the North LRT extension from Downtown to NAIT are illustrated in Figure 12. These requirements will be reviewed during preliminary design in order to minimize property acquisition.

Possible redevelopment opportunities for remnant parcels as illustrated in the June 2008 Final Report are now no longer applicable.



NORTH LRT EXTENSION DOWNTOWN TO NAIT
PROPERTY REQUIREMENTS

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PROPERTY REQUIREMENTS

MAY 2008

FIGURE 12



7.0 Estimating & Risk

The following two major cost items have changed from the June 2008 Final Report:

1. Land acquisition costs will be reduced in conjunction with the moving of the LRT from west of 105 Street to the middle of 105 Street.
2. The reduction in number of new LRVs will result in a cost savings.

In addition to a reassessment of project costs and cash flows, a review of project risks and risk management was also undertaken. The overall project cost estimate is reduced from \$750M to \$660M in 2008 dollars. A breakdown of this revised estimate is illustrated in Figure 13. Details of the estimating and risk studies are documented in Appendix B.

REVISED NORTH LRT COST ESTIMATE

	2008 DOLLARS	INFLATED 2009-2014
CONSTRUCTION	\$450 M	\$600 M
ENGINEERING AND ADMINISTRATION	\$65 M	\$70 M
LIGHT RAIL VEHICLES	\$45 M	\$50 M
LAND	<u>\$100 M</u>	<u>\$105 M</u>
TOTAL	\$660 M	\$825 M

REVISED NORTH LRT EXTENSION DOWNTOWN TO NAIT
COST ESTIMATE



8.0 Consultation

To gain input from stakeholders regarding the relocation of LRT tracks from the west side of 105 Street to the middle of 105 Street a questionnaire was distributed to property owners and occupants on both sides of 105 Street from 105 Avenue to 108 Avenue.

From a commercial/business point of view the following priorities were ranked highest:

- Accommodating vehicle traffic on 105 Street to downtown
- Providing vehicle access to businesses on 105 Street.

From a residential point of view the following priorities were ranked highest:

- Providing vehicle access to residences on 105 Street
- Accommodating vehicle traffic traveling on 105 Street from 107 Avenue to 108 Avenue.

The feedback received from this survey in conjunction with comments received throughout the year long planning consultation process will be considered along with technical and financial implications in the further development of the plan.

9.0 Moving Forward

In addition to the issues/considerations for preliminary engineering identified in the June 2008 Final Report the following should also be considered:

- Review of potential new sites for EMS building
- Given City Council's direction to locate LRT on 105 Street from 105 Avenue to 108 Avenue, a review of both the LRT and roadway geometrics in the vicinity of Kingsway Station may be warranted
- Possible emergency vehicle crossing of LRT tracks at 108 Avenue
- Review and evaluation of existing trees on 105 Street north of 107 Avenue