

LRT Concept Planning Questions

Recommendation:

That the March 22, 2011, Transportation Department report 2011TD4049 be received for information.

Report Summary

This report provides a summary of responses to specific questions related to the West and Southeast LRT concept plans.

Previous Council/Committee Action

At the December 8, 2010, Transportation and Public Works Committee meeting, the following motion was passed:

1. That Administration provide a report to Transportation and Public Works Committee with details on:
 - a. how vibration impacts are assessed and mitigated
 - b. solutions to “failed intersections” (such as 87 Avenue - 178 Street, 156 Street, 149 Street, 142 Street on Stony Plain Road, Bonnie Doon Traffic Circle and Whyte Avenue and 83 Street) including tunnelling or related structures
 - c. mode shifts ridership and long range forecasts re congestion of LRT
 - d. West end Park-and-ride options
 - e. best options to deal with neighbourhood access around LRT lines

Report

- a. How vibration impacts are assessed and mitigated.

- To measure if there are any impacts associated with the proposed LRT infrastructure, 24-hour vibration monitoring is conducted in proximity of the proposed line to create a baseline. Measurements are taken with a seismic sensitive accelerometer and an audio recorder is also set up to quantify if there are any abnormalities on the site during the baseline measurement.
- Vibration measurements are also taken adjacent to existing LRT infrastructure to create vibration information for a potential LRT line. This information is used to create a model of the projected vibration levels within the study area. Measurements are taken at various offsets from the track to quantify the disbursement of the vibration levels.
- Vibration levels are measured in both the horizontal and vertical axes in millimetre of movement per second (mm/s). These measurements are consolidated into a single measurement quantity referred to as peak particle velocity (PPV). A continuous level with a PPV of 70 mm/s is considered safe for residential buildings while the City typically uses PPV of 50.8 mm/s for residential and 101.6 mm/s for commercial buildings as threshold for potential damage. For recent vibration studies, the City uses a factor of safety that results in a PPV of 10 mm/s as the measurement to examine potential vibration mitigation.
- For human response the PPV levels are lower and vibrations can be detected at levels as low as 0.5 mm/s. Vibration levels becoming disturbing at approximately three - five mm/s. Typically, the City uses a

PPV of 1.0 mm/s as the threshold for human perception and consideration of mitigation associated with the LRT.

- Through computer modeling the study area is undertaken with existing and future conditions (roads, buildings, residential, proposed LRT). The modeling is conservative as it does not take into account any potential vibration absorption through the soil.
- b. Solutions to “failed intersections.”
 - Level of service for intersections is a performance measurement that denotes an operating condition that occurs on a roadway when it is accommodating specific traffic volumes. It is a qualitative measure that characterizes operational conditions within a traffic stream and their perception by motorists. The calculation of level of service is based on a ratio of the volume utilizing the transportation facility in comparison to the available capacity within the facility (volume to capacity ratio). Level of service can be determined for all movements in the intersection or the intersection as a whole. For signalized intersections, level of service is typically presented in a range from B to F with B representing very low delay, E operating at or near capacity, and F where the intersection or movements are at capacity. For example, a volume to capacity ratio of 0.75 means that the intersection is operating at 75 percent of its capacity which represents a level of service of D.
 - Level of service is analyzed for the a.m. and p.m. peak hours. The duration of Edmonton’s peak averages 15 to 30 minutes in each of the morning and afternoon peak hours. This is significantly less than many urban areas in North America. Major centres such as Toronto, Vancouver, Montreal, and most U.S. centres are experiencing “peaks” of many hours in duration.
- Major intersections along the LRT routes are approaching a level of service of F today and for certain portions of the peak-hour are likely experience a level of service F. As the city grows, the duration for these intersections experience a level of service F will increase. As urban centres grow, increased transportation demand can be met in a number of ways. One of the most cost effective ways is through more effective use of transportation corridors and rights of way through investment in public transit. Travelers may have other choices such as altering their travel route, traveling outside the peak-hour, carpooling, or possibly working from home. The *Way We Move* encourages increased use of these strategies for moving people in Edmonton. Increases in vehicle capacity would be limited to major goods movement corridors such as the inner ring loop and major roadway connections between Anthony Henday Drive and the inner ring road.
- Some of the specific design adjustments/measures to address capacity issues include:
 - In consideration of the reduction in travel lanes along Stony Plain Road improvements on 107 Avenue have been identified at 142 Street and 149 Street to enhance intersection capacity.

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- The LRT alignment at 142 Street aligns to the north to remove the train vehicle conflict from the strong am and pm commuter movement between 142 Street and 102 Avenue.
- At the 83 Street/Whyte Avenue intersection there is consideration for a third eastbound through lane from 85 Street to east of 83 Street to provide additional capacity.
- In consideration of the impacts at the Whyte Avenue/83 Street intersection, the concept plan was considered for “off route” improvement at 85 Street with the addition of southbound double lefts.
- The concept design proposed that the Bonnie Doon traffic circle be replaced with a traditional four legged major signalized intersection splitting the east/west travel patterns between 90 Avenue and 82 Avenue. This combined with the elimination of some movements at south leg of 85 Street reduces the complexity of the intersection.
- To allow the intersections to operate as they are today, the intersections such as 87 Avenue - 178 Street, 156 Street, 149 Street, 142 Street on Stony Plain Road, Bonnie Doon Traffic Circle and Whyte Avenue and 83 Street, can have the LRT grade separated from the road. The implications for providing grade separations at these locations result in an increase of construction costs and property acquisition. In certain locations the additional portal entrance/exit creates a significant barrier for the communities that the LRT is traveling through.
- If grade separations are required, the following provides the proposed approach and potential impacts:
 - 87 Avenue – 178 Street – LRT bridge over 178 Street - Increases construction costs by approximately \$40 million and will extend the length of the LRT bridge in the Aldergrove and Belmead communities.
 - 156 Street to 142 Street on Stony Plain Road – LRT tunnel under 156 Street to 142 Street – Increases construction costs by approximately \$300 million. This would require significant property acquisition for construction and ultimate configuration. Moves the 156 Street station south of 100 Avenue and results in the need for an underground station at 149 Street. This creates less direct accessibility to the LRT in comparison to the current plan.
 - 149 Street to 142 Street on Stony Plain Road – LRT tunnel under 149 Street to 142 Street – Increases construction costs by approximately \$150 million. Similar to 156 to 142 Street tunnel, this requires significant property acquisition and based on feedback from the community would create as significant barrier for the community. This would also result in the station having to move approximately 100 metres further east of 142 Street which is not an ideal location in terms of transit accessibility.
 - Bonnie Doon Traffic Circle – LRT tunnel under the Circle – Increases construction costs by

- approximately \$30 million. This requires considerable property acquisition north of the traffic circle on 85 Street. Based on the performance of the intersection today, the traffic circle would likely be reconstructed independent of LRT to improve operations.
- Whyte Avenue at 83 Street – Grade separation is not supported at this location due to the future complications of providing the ultimate Downtown loop connection onto the south east LRT line.
- c. Mode shifts ridership and long range forecast re congestion of LRT.
- Using the long range forecasts of the projected vehicle and LRT usage a comparison was created for a system with the current LRT system (North and South lines) and the ultimate network proposed for the year 2040.
 - Based on this analysis, the full LRT network results in the reduction of 400,000 daily vehicle kilometre travels for single occupancy vehicles.
 - Comparison of the existing system to the full network shows an increase in LRT ridership projections by approximately 250,000 riders per day. Using a conservative occupancy average of 1.5 people per single occupancy vehicles. this reduces the number of cars on city streets by just under 170,000 vehicles per day.
- d. West-end Park-and-ride options.
- The concept plan identifies a park and ride at the existing Lewis Estates Transit Centre. To accommodate the West LRT the current park and ride will be impacted and the current capacity will be reduced. Available lands for expanding the park and ride in this location are limited due to environmental constraints, proximity to the Transportation Utility Corridor, and developing lands.
- Additional engineering is planned in 2011 to develop strategies to address the reduction in parking stalls at the current site. Conceptually, expansion areas have been identified as outlined in Attachment 1.
 - Another option that is available if space is contained is to provide additional parking by constructing a parkade structure at the current location when the demand is warranted.
 - The lands on the southeast corner of the 170 Street and 87 Avenue intersections at one time were identified as a potential park and ride location for the West LRT. Through the West LRT planning, this area has been identified with a strong potential for transit oriented redevelopment. The park and ride facility at Lewis Estates provides a cost effective park and ride option along the west line and allows for optimal regional connectivity to the surrounding communities such as Stony Plain and Spruce Grove.
- e. Best options to deal with neighbourhood access around LRT lines.
- Throughout the LRT concept planning process, the following are “general” design options that are utilized to help manage access:

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- Where feasible, adjusting intersection layouts to allow for high demand auto left turns to operate concurrently with train movements, particularly where intersections require double lefts. This allows for the most flexibility in mixing and matching the combinations of left-turn phases to minimize impacts of train/vehicle conflict.
- Eliminating certain movements that are either low volume or can be accommodated in another manner provides opportunities to better accommodate the train movements.
- Examining the larger transportation network and incorporating a series of “off route” intersection improvements to enhance capacity for routes paralleling the LRT corridor or provide better neighbourhood access/egress from/to the arterial road network.
- Examine alternatives to consolidate accesses at signalized intersections to minimize the number of roads/lanes intersecting with the LRT route along with consolidation of formal pedestrian crossings.
- Adopting a more “urban” LRT design philosophy; whereby, the LRT and auto traffic signals are more fully integrated in an effort to reduce the traffic impacts when the LRT passes through intersections. This includes minimizing the use of railway crossing signals and gates where possible.
- Elimination of on-street parking in some areas increases through traffic capacity by eliminating or reducing parking/through traffic conflicts. In other cases, parking can be eliminated at intersection approaches to allow for an additional storage capacity.
- Some of the specific design adjustments/measures to address neighbourhood access issues include:
 - Provision of a new, signalized/rationalized access for the hospital, opposite 169 Street.
 - The concept design has developed a provision of formalized/signal-controlled U-turn opportunities at either end of Groat Estates to accommodate east/west movements.

Policy

LRT planning and construction is consistent with policies identified in the Transportation Master Plan.

Attachments

1. Lewis Estates Park and Ride Options

Others Reviewing this Report

- M. Koziol, General Manager, Capital Construction Department and Acting General Manager, Asset Management and Public Works Department