

Northwest Light Rail Transit

Transportation Committee (TC) Concept Planning

Report

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Executive Summary

Overview

On July 7, 2010, the Edmonton City Council approved the corridor for the Northwest Light Rail Transit (LRT) and added this corridor to the Transportation System Bylaw. City policy and past planning have determined the Northwest LRT line will be an urban style, surface running (street level) extension of the North LRT line that is currently under construction. The Northwest LRT will extend from the Northern Alberta Institute of Technology (NAIT) to serve the communities of northwest Edmonton, with an end of line park and ride at Campbell Road. The corridor serves the City Centre Redevelopment (Blatchford neighbourhood); crosses the Yellowhead Trail and Canadian National Rail (CN) Walker Yard; follows 113A Street to 153 Avenue; and terminates in the Transportation and Utility Corridor (TUC) at the City of Edmonton limits.

With the Northwest LRT approved corridor as a basis, the City of Edmonton initiated the concept design in December, 2011. The City of St. Albert served as a key partner in this project. The initiation of this planning study represented another major milestone in the ambitious expansion of LRT throughout the region.

One of the key objectives is to serve developed, redeveloping, and new neighbourhoods in the North and Northwest sections of the City. The Northwest LRT also affords the opportunity to provide an LRT connection at the Edmonton city limits, servicing the City of St. Albert. The design has been set to allow a potential future extension into the City of St. Albert, should the region wish to pursue this.

The proposed extension of Northwest LRT will directly connect key activity centres along the corridor and has applied urban style LRT design elements to effectively integrate the high floor LRT technology into established and developing neighbourhoods. Urban style design of LRT seeks to minimize infrastructure, mitigate potential impacts, and therefore provide a lower cost, integrated solution. The City of Edmonton initially identified the following key objectives for the project:

- Identify and justify a LRT alignment that maximizes the use of existing transportation corridors.
- Increase transportation choice, support growth management, and support environmental sustainability initiatives.
- Develop route alignment that integrates land use planning.
- Identify and justify location of LRT stations, park and ride, pick-up-drop-off, pedestrian/cyclist connection and other necessary facilities.
- Develop concept plans and cost estimates for the recommended route.

The Northwest LRT is a high-floor LRT system and will interline directly with the existing LRT system. The concept plan was developed through a multi-phased process,

engaging with the public and stakeholders at each major milestone. Various options for station locations and alignments (location of LRT tracks) were considered and vetted through the consultation process. Analyses of impacts and benefits were conducted to refine the concept design. Public comments informed the concept design development, along with City policies, and good engineering practices to ensure a workable solution that reflected the City's goals and the local community's desires.

LRT trains along 113A Street/Castle Downs Road, and through the Blatchford neighborhoods would not include gates and warning bells. Trains would not exceed the posted speed limit for the street. LRT trains would have priority at the normal traffic intersection signalled crossings, slowing down to cross each intersection. Omitting the use of gates, and bells in this segment avoids additional property acquisition and noise impacts to the surrounding neighbourhood.

To allow greater flexibility for the City to develop and deliver the system design and operation, from the Castle Downs Station to the end of the line at Campbell Road, the design includes greater segregation and protective gates, barriers, and warning bells at each roadway crossing. The benefits of this design are that LRT could operate at a higher speed on this portion of the corridor. To operate the LRT at speeds higher than the posted speed limit of the roadway, the 153 Avenue segment of the alignment includes concrete barriers separating the tracks from the adjacent lanes of traffic or sidewalks. Additionally, gates and warning bells would be included at intersections (along the 153 Avenue segment only) for trains to pass through traffic intersections at higher speeds. The use of barriers, gates, and warning bells along 153 Avenue will continue to be examined in later phases of design to make a final determination.

In general, those commenting at the public meetings and online expressed a high level of satisfaction with the concept plan, station locations and track alignment. However, concerns were expressed about impacts such as traffic congestion, property values, property acquisition, noise impacts, aesthetics, and other specific design elements. Specific to the 153 Avenue alignment, concerns were expressed regarding noise due to the use of warning bells at intersections.

Much support was expressed for pedestrian/bike paths along the corridor with several comments noting approval for the idea of a pedestrian and bike path in conjunction with the LRT bridge across CN's Walker Yard and Yellowhead Trail. Additionally, comments noted that the station locations would provide easy access for pedestrians, provide easy access for LRT users to reach their destinations, and were located to best avoid property impacts. The process resulted in a recommended concept design that meets the goals for the project. The recommended concept design includes 9 stations to serve the local communities and is approximately 11 kilometres long. Three new transit centres are integrated with LRT stations at the 137 Avenue station, Castle Downs station, and Campbell Road Transit Centre by City of St. Albert. At the terminus station (Campbell Road), a park and ride is proposed with the LRT station. All stations include provisions for pedestrian, cycle, and bus transit access.

The recommended concept design is being presented for consideration by City Council as the ultimate decision makers.

1 Introduction

Purpose

- 1.1 In June 2009, the Edmonton City Council adopted a long term Light Rail Transit (LRT) Network Plan that defines the future size, scale and operation of the city's LRT system. Eventually, the LRT network will extend to the northwest, northeast, east, southeast, south and west, making downtown Edmonton the focal point of the LRT system.
- 1.2 The City of Edmonton (the City) has continued to develop the plans for the LRT network, undertaking a number of corridor studies to identify the routing for future lines. This included the corridor study for the extension of the LRT network to serve the northwest of the City of Edmonton.
- 1.3 The recommended corridor for the Northwest LRT was approved by Edmonton City Council and added to the Transportation System Bylaw on July 7, 2010. The Northwest LRT line will be an urban style, surface running (street level) extension of the North LRT line to the Northern Alberta Institute of Technology (NAIT) that is currently under construction. The Northwest LRT will extend from NAIT to serve the communities of northwest Edmonton, with an end of line park and ride at Campbell Road.
- 1.4 Since the inception of the Northwest LRT (during the earlier corridor selection process) the extension has been envisioned as an urban LRT system, integrating into the local community, utilizing less infrastructure, and controlling cost. City Council policy has directed that all new extensions of the existing LRT and any future Edmonton LRT network additions will be designed in the urban style. Urban LRT attempts to provide easy walk on access by pedestrian, cyclists, and other transit users. This is accomplished by placing LRT stations in highly urbanized areas (or future urbanizing areas) and providing significant connectivity between the stations and the local neighbourhoods. As an extension of the existing LRT system, the Northwest LRT will use the existing high-floor LRT vehicles; however, various design techniques are included to better integrate the high-floor trains into the area neighbourhoods. The recommended Northwest LRT concept design has been developed in partnership with stakeholders and public engagement, resulting in a design that reflects the City and local community's vision for urban LRT. Consideration has also been given to differing operations of the LRT and how that affects the design. For the LRT to travel at higher speeds (higher than posted speed limit of the adjacent roadway) requires additional barriers be included in the design to separate the LRT from adjacent roadway lanes or sidewalks. Additionally, gates and warning bells can be used at roadway intersections to allow trains to travel through the intersections at a higher speeds.
- 1.5 This report details the decision-making process conducted by the City of Edmonton to finalize the concept design for the Northwest LRT. This report explains the project structure, the analysis and decision making for alternative alignments and stations;

and a summary of the technical analysis key points that resulted in the recommended Northwest LRT concept design for consideration by Edmonton City Council.

- 1.6 The recommended concept design detailed in this report is for consideration and action by Edmonton City Council at the Transportation Committee (TC) meeting on May 1, 2013. Staff is requesting approval of the concept design, based on the extensive analysis, design, and consultation conducted. This concept design reflects the policies of Edmonton City Council, input from the local communities, support of the City of St. Albert staff, a focus on urban style LRT, and a balance between benefits and impacts. The sections below provide additional details and justification for the recommended concept plan.

Background

- 1.7 In December 2011, the City of Edmonton commissioned Steer Davies Gleave, to undertake the concept design for the extension of Northwest LRT. The City of St. Albert is a key partner in this project. St. Albert provided consistent staff input and contributed funds to complete the study in partnership with the City of Edmonton. The initiation of this planning study represented another major milestone in the ambitious expansion of LRT throughout the region.
- 1.8 One of the key objectives is to serve developed, redeveloping, and new neighbourhoods in the North and Northwest sections of the City. The Northwest LRT also affords the opportunity to provide an LRT connection at Edmonton city limits, servicing the City of St. Albert. The design has been set to allow a potential future extension into the City of St. Albert, should the region wish to pursue this.
- 1.9 The proposed extension of Northwest LRT will directly connect key activity centres along the corridor and has applied urban style LRT design elements to effectively integrate the high floor LRT technology into established and developing neighbourhoods.
- 1.10 The City of Edmonton initially identified the following key objectives for the project:
- Identify and justify a LRT alignment that maximizes the use of existing transportation corridors.
 - Increase transportation choice, support growth management, and support environmental sustainability initiatives.
 - Develop route alignment that integrates land use planning.
 - Identify and justify location of LRT stations, Park and Ride, Pick-up-drop-off, pedestrian/cyclist connection and other necessary facilities.
 - Develop concept plans and cost estimates for the recommended route.

Urban Style - City Scale LRT

- 1.11 In June 2009, City Council approved a long-term LRT network plan and style of system that differs from the current LRT line. The approved long-term LRT network plan specifies the focus of future LRT expansion will be to provide an urban style - city

scale system. This approach will provide closer stop spacing and improved links to communities, supporting the City's vision for a more compact, sustainable and liveable city. The urban style system detailed in the LRT Network Plan is further supported by the goals in the City of Edmonton's Strategic Plan as well as its Transportation Master Plan and Municipal Development Plan. Example of elements of an urban style system include:

- Utilizing less infrastructure by building smaller scale stations that are spaced closer together than you see on the existing LRT system. This can also result in a lower cost solution.
- Integrating the LRT with the surrounding area by providing better links to a greater number of destinations, and providing more direct transit, pedestrian and cyclist connections.
- Integrating visual elements that minimize intrusion and maximize openness of space to create a safe environment.
- Investing in aesthetics to fit within an urban environment. This includes features such as landscaping, streetscaping, and architectural features like street furniture.
- Utilizing track forms such as embedded track and direct fixation track instead of traditional rock ballast and railway ties to improve visual appeal (where appropriate).

- 1.12 The Northwest LRT is a high-floor LRT system and will interline directly with the existing LRT system. Taking from experiences of many high-floor LRT systems in North America and Europe, the Northwest LRT team has incorporated the urban style LRT principals into this concept design (where possible).

Study Boundary

- 1.13 The development of the Northwest LRT concept plan has been built off of the initial planning and design work completed during the previous corridor study phase, as approved by Edmonton City Council.
- 1.14 The Northwest LRT runs from a connection to the North LRT line at NAIT. The North LRT and a temporary station at the NAIT campus are currently under construction. With the implementation of the Northwest LRT, the temporary NAIT station (adjacent to Princess Elizabeth Avenue) will be replaced with a new (permanent) NAIT station in the planned Blatchford neighbourhood. This station forms the beginning of the Northwest LRT and connects this line to the existing LRT system.
- 1.15 From the permanent NAIT station, the Northwest LRT extends north serving the planned Blatchford neighbourhood. The LRT line then begins to rise on a bridge structure to cross over the Yellowhead Trail, the Canadian National Rail (CN) Walker Yard, and 127 Avenue, before touching down on the western edge of Grand Trunk Park. The LRT then continues north along 113A Street/Castle Downs Road. The line turns west at 153 Avenue. At the CN Rail crossing near 153 Avenue and 142 Street, the LRT enters an underpass under the freight rail line. The LRT resurfaces and continues

west, crossing Campbell Road and entering the end of line, park and ride facility in the Transportation and Utility Corridor (TUC).

1.16 Other than the bridge and tunnel noted above, the Northwest LRT is surface (street level) running LRT. No other grade separations are proposed. Integration between the LRT stations and three new transit centres is proposed at 137 Avenue Station (Griesbach), Castle Downs Station, and the end of line station west of Campbell Road. The end of line station is also the only station where park and ride facilities are proposed as part of St. Albert's transit facility. All other stations are integrated into the local neighbourhoods and focused on pedestrian, cycle, and bus transit access.

1.17 Figure 1.1 provides an illustration of the Northwest LRT and all of the proposed stations.

FIGURE 1.1 NORTHWEST LRT



2 Concept Plan Process Overview

Option Development & Evaluation Process

- 2.1 The process of concept design for the Northwest LRT was based on the 113A Street and 153 Avenue corridor previously approved by City Council. The Northwest LRT team developed an inclusive process to obtain direction and build support for a concept design that:
- Defines specific location of tracks & stations within the approved corridor.
 - Defines the layout of stations.
 - Defines property requirements.
 - Defines auto access requirements for adjacent properties.
 - Considers ease of access & interchange for cyclists, pedestrians & bus users.
 - Provides necessary information to begin preliminary engineering.
- 2.2 To define the concept plan, the team put forth a clear approach to develop and test various options with an internal (City staff) working group, as well as through broader public consultation. The process was incremental and allowed feedback at key milestones. Input was discussed, debated, analyzed, and incorporated at each milestone to continue to advance the concept design. The process is directly aligned with City policies encouraging sustainable development with a multi-modal transportation network. Transit, specifically LRT transit, is a significant element in the implementation of these City policies.
- 2.3 The Northwest LRT concept planning study was led by the City of Edmonton Facility and Capital Planning (Transportation Services) to develop the recommended design for City Council endorsement. Transportation Services developed a cohesive technical working group. The working group included internal decision makers (typically Directors) from the wide range of City departments, as well as a senior representative from the City of St. Albert. City working group members were selected to represent the positions of each of their departments and the broader policies of the City. Given the diverse perspectives of the working group members, the objective was for their input to guide the concept plan. The team included representatives from the following sections/departments/branches/organizations:
- Transportation Planning.
 - Transportation Operations.
 - Edmonton Transit System.
 - LRT Design & Construction.
 - Community Services.
 - Public Engagement.
 - Corporate Properties.
 - Sustainable Development.

- Blatchford Redevelopment Team.
- City of St. Albert.

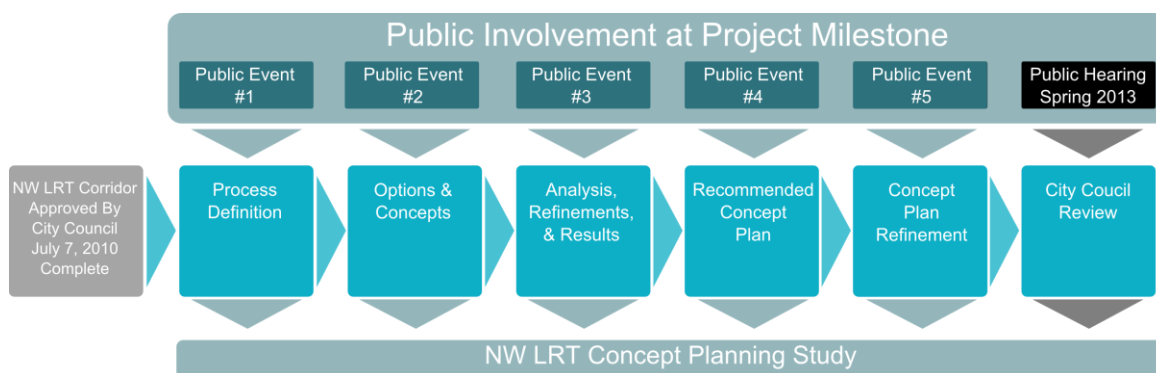
2.4 The Northwest LRT team considered multiple areas of input that would ultimately guide the development of the concept plan. These influences include:

- Technical studies: The work by the internal City working group. Working group representatives were responsible for conveying this work to their respective organizations and obtaining input from their departments at each decision milestone.
- Public input: Information obtained from the public consultation process. This process was conducted in parallel with the technical studies to understand the position of local stakeholders and the public at large.
- LRT Network Plan: The plan that defines the type of LRT system in Edmonton, the number of lines, and their ultimate destination and the system design and technology. The Northwest LRT is one component of this larger system.

Methodology

2.5 The Northwest LRT team, in conjunction with stakeholders, used a multi-phase process to review, develop, assess and identify the recommended concept plan for Edmonton City Council endorsement. In general, the process incrementally developed options, analysed options, and vetted the outputs through the internal working group and public stakeholders, prior to advancing the designs further. Milestone’s 1 and 2 included the development of multiple station site options for the ten station locations. Additionally, these milestones examined both centre and side running track placement along the entire corridor. Milestones 3, 4, and 5 included refinements and incorporation of the stakeholder input for the single option advancing forward. Figure 2.1 displays the milestones undertaken through the concept planning process.

FIGURE 2.1 CONCEPT PLAN PROCESS



Criteria

2.6 Prior to beginning the development of potential alignment (track location) and station location options, the Northwest LRT team developed criteria to compare and contrast each option against. The creation of criteria was informed by input from the internal

working group, as well as the first series of public consultation meetings. The criteria were applied to all options at milestone 3 (analysis, refinements, and results) to advance only the most promising options. Table 2.1 below sets out the final evaluation criteria and the more detailed measurements associated with each criterion used to evaluate the LRT station and alignment options.

2.7 Each criterion was applied based on a qualitative assessment scale using a Consumer Reports style graphic ‘circle’ ratings, illustrating the likely positive and negative impacts respectively (with a full circle being very good and/or least impactful, an empty circle being very poor and/or most impactful, and with a half circle being the same as neutral). If there were no impacts, the rating was neutral. It should also be noted that options were compared against one another.

TABLE 2.1 ASSESSMENT CRITERIA

| Assessment Criteria | Measurement |
|--|---|
| Maintain consistency with Edmonton City policies related to LRT | <ul style="list-style-type: none"> ■ Aligned with City of Edmonton policies |
| Fully integrated LRT into the community and the region | <ul style="list-style-type: none"> ■ Connections to future extension ■ ROW within street ■ Road network impacts ■ Impact on riparian habitat ■ Opportunities for improved streetscape, boundary treatment, landscaping, planting, trees, lighting, fencing, and provision of sidewalk ■ Impacts on parks/open space ■ Property and land impacts ■ Heritage building impacts ■ Cultural/heritage sites adjacent to route including impacts on First Nations and urban street amenities ■ Could neighbourhood impacts be avoided, minimized |
| Fully integrate LRT with other modes (i.e. bus, transit centres, cycle, pedestrians, auto) | <ul style="list-style-type: none"> ■ Integration with transit ■ Integration with cycles ■ Integration with pedestrians ■ Transportation network impacts |
| Consider challenges for LRT operation (i.e. winter city, noise control, etc.) | <ul style="list-style-type: none"> ■ Noise and vibration impacts ■ Segregation |
| Utilize exclusive right of way (ROW) for LRT | <ul style="list-style-type: none"> ■ Segregation |

| Assessment Criteria | Measurement |
|--|--|
| Transportation and land use must support one another | <ul style="list-style-type: none"> ■ Population catchment within 400m ■ Employment catchment within 400m ■ Opportunity for Transit Oriented Development (TOD) |
| Focus on affordable design, construction, & operations/maintenance of LRT by applying design criteria as basis | <ul style="list-style-type: none"> ■ Capital cost ■ Area disturbed during construction |
| Minimize infrastructure | <ul style="list-style-type: none"> ■ ROW within street |
| Design a safe environment for all users | <ul style="list-style-type: none"> ■ Creation of physical barriers or severance |
| Consider the entire LRT system broadly | <ul style="list-style-type: none"> ■ LRT system integration and network-wide benefits for all users |
| Focus on passengers by providing an attractive, easy, safe, convenient, and efficient LRT system | <ul style="list-style-type: none"> ■ Number of activity centres (employment, theatres, colleges, residences, shopping, etc.) |

Unique Considerations

- 2.8 Two areas of the Northwest LRT required unique analysis and consideration. Service to Blatchford and the crossing options for the Yellowhead Trail/CN Walker Yard both required unique consideration, outside of the overall evaluation process.
- 2.9 The Blatchford property is currently being master planned and the Northwest LRT is a critical transportation element in the planning process. Given the aggressive time frames for development of the Blatchford master plan and review by City Council, this segment of the Northwest LRT was advanced separately. Working directly with the Blatchford team, the Northwest LRT team facilitated a process to identify the appropriate track configurations and station locations within the Blatchford neighbourhood. Additionally, the team consulted directly with Blatchford leadership on the crossing of the Yellowhead Trail/CN Walker Yard on the north end of the Blatchford property. The two teams met and shared multiple iterations and ideas of alignments and stations to best support the redevelopment and surrounding uses (such as NAIT). The results of these consultations are reflected in the recommended concept design. The Blatchford team has also reflected the agreed upon design within their overall master plan.
- 2.10 The evaluation for the crossing of the Yellowhead Trail/CN Walker Yard was also undertaken separately from the stations and alignment. The CN Walker Yard is private property owned by CN. Any crossing (over or under) required acceptance by CN. The Northwest LRT team directly engaged with CN, as well as working with CN through key

City Council members and the Mayor. Various designs (both over and under) were considered by the Northwest LRT team.

Options Development

- 2.11 Following the initial internal working group meeting and the first round of stakeholder consultation meetings, the team set out to identify a number of potential station locations, track form types, and track locations for consideration. The project corridor was divided into reasonable segments based on neighbourhoods, the road network, land use, and geography.
- 2.12 The internal working group undertook a discussion and agreement on the general cross section options for each segment, considering the appropriate configuration based on the existing and future land uses. These discussions resulted in advancing designs that were highly integrated and open in the urbanized/urbanizing areas and designs with additional segregation in less urban/industrial areas. Safety was a paramount consideration in all designs advanced forward.
- 2.13 All options proposed are surface (street) level and integrated into the communities they serve. The only grade separations (track going over or under other transportation infrastructure) are proposed at the Yellowhead Trail/CN Walker Yard/127 Avenue and the CN Rail crossing near 142 Street. Based on the analysis, these are the only locations where physical grade separations are required. Additional details are provided in the discussion of traffic in section 5.
- 2.14 The internal working group also reviewed and advanced various track forms in each segment. The type of track proposed, reflected the land use and the urban style LRT as appropriate for the various segments along the corridor. The track forms considered are noted below. All three track forms will potentially be used along the corridor depending on the context of the area.
- Embedded track: Track is embedded and flush with a concrete or paver surface. This type of track is typical of urban style LRT environments.
 - Direct fixation track: Track is directly attached to a concrete base, but is not embedded. This track is also used in urbanized areas where the track should not be crossed.
 - Tie and ballast track: Track and railroad ties are placed on a surface of gravel/rock. This is similar to track on the existing Edmonton system and is typically used in suburban environments.
- 2.15 The Northwest LRT team used the original LRT corridor and nine station sites approved by Edmonton City Council as the starting point for options. Multiple station and track location options were developed, considering stakeholder inputs, the overall goals of the project, and the City's policies related to the development of LRT extensions.
- 2.16 The platforms for each stop will be approximately 980 millimetres high and 125 metres long (to accommodate 5 car trains). Access for passengers is via ramps from the intersections/pedestrian crossings at each end of the platforms. The final set of

stations recommended would provide a station spacing of approximately 1.2 kilometres along the 11 kilometre route.

Alignments & Stations Evaluation

Initial Evaluation

- 2.17 The initial set of station and alignment options developed in milestone 2 were analyzed based on the criteria (presented previously). Some areas include only a single option based on engineering constraints and the goal to minimize impacts to the local communities.
- 2.18 The analysis of alignment locations generally worked to balance the impacts to the neighbourhoods, pedestrian, cycle, and auto traffic; as well as property acquisition. In examining the location of track in alignments, it is important that the track does not shift too often from side to centre, etc. A generally straight alignment (that deviates only at key points, where necessary) is optimum to minimize noise, reach planned speeds, control costs, and minimize traffic impacts. The location of the track was also driven by the desire to integrate stations and transit centres into the local communities.
- 2.19 The analysis of stations first examined the overall station catchment, stop spacing and transit integration. These factors are highly important to delivering an integrated transit focused solution. The detailed criteria were applied to each alignment option and station option, to compare and contrast each option against one another. A summary of the screening analysis is provided in Table 2.2.

Catchment/Station Spacing

- 2.20 The team worked to create a 400 (5 minute) and 800 metre (10 minute) station catchment for the proposed station locations. The average station spacing on the Northwest LRT is approximately 1.2 kilometres. The proposed station locations provide connectivity along the length of the corridor with the built environment within an 800 metre line catchment. The more immediate 5 minute catchment provides good coverage with minimal overlap, offering good connectivity to the local catchment, destinations and transit integration as appropriate.

Transit Integration

- 2.21 Transit integration was considered as a key success factor for stations. The team engaged directly with ETS Service Development to identify the potential complimentary bus network (existing and future), potential transit centres, and how to best integrate these elements. Based on the work with ETS, Northwest LRT stations and integrated transit centres are proposed at 137 Avenue station, Castle Downs station, and the Campbell Road station.

Initial Evaluation Consultation

- 2.22 The options and analysis were reviewed with the internal working group and public stakeholders for input. The presentation of the various options and analysis highlighted the issues and opportunities with the differing options to facilitate

stakeholder involvement and feedback. The goal was to clearly demonstrate the trade-offs of benefits and impacts associated with each option, so stakeholders could provide informed feedback.

Single Recommended Option Refinement

- 2.23 The most promising options resulting from the initial evaluation and stakeholder input were advanced as a single concept design. Milestones 3, 4, and 5 saw the design of stations and alignments further refined, considering the input from the internal working group and public stakeholders. Additional analyses related to ridership, traffic, noise, and overall impacts were completed to determine how the single option would perform. The key discriminators, impacts, and benefits that surfaced during the analysis are summarized below and in Table 2.2.

Property Acquisition

- 2.24 An overarching goal for the project was to avoid negative impacts to the local neighbourhoods served by the LRT. This included minimizing private property acquisition (where possible). One segment of the alignment posed a significant design challenge, due to the limited road right of way width.
- 2.25 The LRT route north of the CN Walker Yard will descend from the bridge crossing to the east of 113A Street within the edge of Grand Trunk Park. The alignment will then run through the most constrained section of the corridor between 129 Avenue and 130 Avenue.
- 2.26 Due to the existing right of way constraints, the proposed bridge design will impact the west side of the Grand Trunk Park with 2 LRT tracks and 2 sidewalk/cycle lanes (4 lanes approximately 16 metres wide in total) running along the edge of the park from 127 Avenue to 129 Avenue. This will be mitigated in part by the inclusion of a fenced perimeter with appropriate landscaping and plantings. Two concept design options were developed for the segment from 129 Avenue to 132 Avenue as follows:
- Close 113A Street between 129 Avenue and 130 Avenue for LRT: 113A Street would be closed to traffic between 129 Avenue and 130 Avenue, but this would result in no property impacts. The limited frontage access could be provided through the alleyway.
 - Locate LRT in the private properties on the east side of 113A Street: all traffic lanes would be retained, but requires purchase of the private properties on the east side of 113A Street between 129 Avenue and 130 Avenue.
- 2.27 Both options were reviewed with the internal working group and public stakeholders throughout the consultation process. In addition to the evaluation feedback from the public at the open house events in June, September, and December 2012, the recommended concept design focuses on the importance of maintaining the traffic lanes and access through the local area. Property owners from the west side of 113A Street expressed concerns regarding frontage access. Owners on the east side of 113A Street were generally more concerned that planning for the LRT would impact the sale of the impacted properties.

- 2.28 Members of the public living south of 137 Avenue also raised concerns that traffic would be rerouted through the neighbourhood road network if 113A Street were to be closed, but also raised existing concerns about traffic using 113A Street, south of 137 Avenue to access 97 and 127 Streets in order to cross the CN Walker Yard.
- 2.29 Based upon the evaluation and public input, it is proposed that the LRT project will purchase the properties on the east side of 113A Street between 129 and 130 Avenue. This arrangement will retain the traffic lanes with a segregated LRT alignment and multi-use trail provided on the east side of 113A Street. This approach will retain local traffic movements and local frontage access to properties. Additionally, to mitigate the potential impacts of traffic on the neighbourhoods, it is proposed as part of the LRT project to focus the east/west turn movement towards 127 and 97 Streets respectively at 137 Avenue, with the 113A Street traffic lanes reduced to provide space for the LRT and continued local neighbourhood road access.

Bridge Structure

- 2.30 The development of the Northwest LRT necessitates the crossing of both the Yellowhead Trail and the CN Walker Yard. Both tunnel and bridge options were considered and advanced forward to CN Rail. The evaluation took into account the issues and opportunities identified by the project stakeholders through the consultation process.
- 2.31 While both options provided the required crossing, the bridge structure allowed for an integrated multi-modal solution with space for LRT, cycles, and pedestrians. This would be a new connection across the Yellowhead Trail and rail yard, effectively creating multi-modal connectivity between Blatchford and neighbourhoods to the north. The bridge structure was also a more cost effective solution.
- 2.32 The CN Walker Yard is private property owned by CN. Any crossing (over or under) required acceptance by CN. The Northwest LRT team directly engaged with CN, as well as working with CN through key City Council members and the Mayor. Ultimately, a working agreement was reached that a bridge structure over the CN Walker Yard would be acceptable. However, the final details and design of the type of bridge structure and mitigations of the impacts to CN would be determined as the Northwest LRT design advances. Therefore, dialogue will be ongoing with CN as the project advances to preliminary engineering.

Altalink Power Lines

- 2.33 The Northwest LRT is proposed to run parallel to the Altalink power utility right of way, south of 153 Avenue. The right of way includes a 240Kv transmission line. During the previous corridor study, the team examined the viability of placing LRT adjacent to these power lines. At that time, it was determined that there would be no impact to or from the LRT and power lines with appropriate grounding protections (that are standard for LRT).
- 2.34 The team has consulted directly with Altalink to understand their preferences for construction adjacent to the utility corridor. Initially, the LRT design was encroaching

on the Altalink right of way. However, the design has been modified to avoid the need to acquire property from Altalink. A smaller transmission line within Altalink right of way would be relocated to provide appropriate separation between the line, roadway, and LRT. Similar to CN Rail, consultations with Altalink will continue to ensure coordination on the design.

Single Recommended Option Refinement Consultation

- 2.35 Similar to the initial evaluation, the refined recommended concept design was reviewed with the internal working group and public stakeholders through milestones 4 and 5. The presentation displayed the changes incorporated to the design, based on stakeholder input and further analysis. The Northwest LRT team worked to detail the trade-offs related to the positive and negative attributes of the design. Following a series of stakeholder open houses in December 2012 and April 2013, the recommended concept design and the compilation of stakeholder comments was referred to the City of Edmonton's TC for review by City Council.

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TABLE 2.2 INITIAL EVALUATION & SINGLE RECOMMENDED OPTION REFINEMENT - ALIGNMENT & STATION ANALYSIS SUMMARY

| Segment | Option Type | Initial Evaluation | Single Recommended Option Refinement | Summary |
|---------------------------------|-----------------------------|---|---|--|
| Blatchford | Station & alignment options | Option 1: Angled station at NAIT side running, transition to centre running w/station at Blatchford north | Option 1: NAIT Station (relocated to the west of temporary NAIT Station) with centre LRT alignment on the north/south roadway; and a second station at Blatchford north b/w 121/122 Ave | The alignment and station recommendations for Blatchford were developed and evaluated in conjunction with the Blatchford team, Blatchford consultants and stakeholders. The track and station configurations support the sustainable, walkable, urban community envisioned for the new Blatchford neighbourhood. |
| Yellowhead Trail/CN Walker Yard | Crossing options | Bridge | Bridge | The project team engaged directly with CN Rail to discuss options for crossing the CN Walker Yard. The two teams met multiple times and reviewed the designs. The result of these consultations was an agreement in principle for a bridge structure crossing the Yellowhead Trail and CN Walker Yard. The details will be determined in later phases of design. The bridge structure was selected because it provides the best, multi-modal, cost effective solution. |
| | | Tunnel | - | |
| 129 Ave to 132 Ave alignment | Alignment options | Option 1: 113A St closure between 129 and 130 Ave | - | Based upon the evaluation and public input, it is proposed the project will purchase the properties on the east side of 113A Street b/w 129 and 130 Avenue. This arrangement will retain the traffic lanes with a segregated LRT alignment and multi-use trail provided on the east side of 113A Street, this will retain local frontage access to properties. Option 2 is recommended. |
| | | Option 2: East side of 113A St | - Option 2: East side of 113A St | |
| 132 Ave | Station & alignment options | Option 1: Station north of 129 Ave - side running | - | The 129 Avenue Station option does not contribute to an even corridor catchment. This option is distant from the adjacent activity centre, increasing the walk links. The 132 Avenue south option provides even corridor catchment and good connectivity to the local amenities. The 132 Avenue north option is similar to the previous option but extends the walk distance to the communities to the north. Based upon the evaluation and public and stakeholder input, Option 2, is recommended. |
| | | Option 2: Station south of 132 Ave - side running | Option 2: Station south of 132 Ave - side running | |
| | | Option 3: Station north of 132 Ave - side running | - | |
| 137 Ave | Station & alignment options | Option 1: Station south of 137 Ave - side running | - | Options 1 to 3 were eliminated due to the lack of transit integration. Both options 4 and 5 provide connectivity to the adjacent transit centre. The centre station option would potentially require a segregated elevated walkway, significantly increasing the scale of infrastructure required, and hence the larger impact on the adjacent communities. An elevated walkway would also increase the walk distance for passengers. Based upon an initial evaluation of traffic and the traffic movements affected at the 113A Street/137 Avenue intersection, both options are similarly impactful. Option 4 provides improved connectivity between the two facilities. This option significantly reduces the scale of infrastructure and therefore the impact to the surrounding community. Option 4 is recommended. |
| | | Option 2: Station south of 137 Ave - centre running | - | |
| | | Option 3: Station north of 137 Ave - side running | - | |
| | | Option 4: Station north of 137 Ave - side running with transit centre | Option 4: Station north of 137 Ave - side running with transit centre | |
| | | Option 5: Station North of 137 Ave - centre running w/transit centre | - | |

| | | | | |
|--------------|-----------------------------|---|--|---|
| 145 Ave | Station & alignment options | Option 1: Station North of 145 Ave - Side Running | - | The side running LRT and station arrangement is impactful to property accesses on the east side of 113A Street. It also increases the walk distance from the existing communities. The centre running track is beneficial at Castle Downs to help mitigate traffic impacts at the intersection (113A Street and 153 Avenue). Option 2, the centre station arrangement at 145 Avenue is recommended. It provides improved corridor catchment, connectivity, and helps mitigate impacts of the LRT north of the station location. |
| | | Option 2: Station North of 145 Ave - Centre Running | Option 2: Station North of 145 Ave - Centre Running | |
| Castle Downs | Station & alignment options | Option 1: Station north of 153 Ave - with transit centre integration | Option 1: Station north of 153 Ave - with transit centre integration | The centre station option would potentially require a segregated elevated walkway, significantly increasing the scale of infrastructure required, and hence the impact on the adjacent communities. An elevated walkway would also increase the walk distance for passengers. Option 1 provides improved connectivity between the two facilities. This option significantly reduces the scale of infrastructure and therefore the impact to the surrounding community. Option 1 is recommended. |
| | | Option 2: Station centre of 153 Ave - with transit centre integration | - | |
| | | Option 3: Station east of 113A St -side running no transit centre | - | |
| 121 St | Station & alignment option | Option 1: Station west of 121 St - centre running alignment | Station removed from consideration | The geometric constraints of the 153 Avenue corridor required this station be located too close to the 127 Street station. The public overwhelmingly noted the 121 Street and 127 Street stations were too close. Mitigation and relocation of the station would be impactful to the local communities. This this option was removed from consideration. |
| 127 St | Station & alignment option | Option 1: Station east of 127 St - centre running alignment | Option 1: Station east of 127 St - centre running alignment | The 127 Street station location is focused on the communities of Cumberland, Oxford, Dunluce and Caernarvon, providing local accessibility to the LRT and improving the LRT corridor catchment. Removing this station would significantly increase walk distances and deter local direct connectivity of passengers with the LRT. |
| 137 St | Station & alignment option | Option 1: Station west of 137 St - side running alignment | Option 1: Station west of 137 St - side running alignment | The 137 Avenue Station location is focused on the communities of Cumberland, Carlton and Oxford, providing local accessibility to the LRT and improving the LRT corridor catchment. Removing this station would significantly increase walk distances and deter local direct connectivity of passengers with the LRT. |
| Campbell Rd | Station option | Option 1: Station integrated with transit centre and park & ride | Option 1: Station integrated with transit centre and park & ride | The Campbell Road station is proposed as the terminus of the line, providing integration with the proposed transit centre and park and ride facility. The concept for this station was designed in conjunction with the City of St Albert and the developers of the Rampart industrial area. |

3 Public/Stakeholder Involvement

- 3.1 With a goal to implement a transparent public involvement process for the Northwest LRT Concept Planning Study, the project followed the City's Involving Edmonton initiative. The public involvement process included:
- Gathering input from key internal and external stakeholders, including immediately impacted residents, businesses and the communities in which they reside to assist with the concept planning phase of the project.
 - Continuing to build awareness, knowledge and understanding of the project and the processes used to develop a concept engineering plan, amongst all citizens (Edmonton and St. Albert), particularly stakeholders and residents within the study area.
- 3.2 At the outset of the project, the Northwest LRT design team developed a public involvement plan, which details the process and activities aimed at successfully engaging with area stakeholders and the broader public. While City Council members are the ultimate decision makers, their choices must be informed by the constituents they represent. The public involvement methods were aimed at obtaining stakeholder feedback, to inform design and support the decision making of City Council. The sections below provide details on the consultation activities, what the team heard and how it influenced the recommended concept plan.

Outreach & Education Efforts

- 3.3 Various methods were used to achieve the goals of the public involvement plan. These included:
- Profiling interviews: Individual interviews were conducted with key stakeholders (individuals or small groups) to introduce the project and its purpose, and familiarize the study team first-hand with the issues. Groups interviewed included the local business association, NAIT, school boards, businesses that abut the alignment, a major shopping centre and major employers.
 - Public meetings/hearing: A series of five public meetings were conducted to directly engage with the public and obtain input. A final public hearing is planned with City Council in mid-2013. The public meetings were conducted at the major project milestones to ensure stakeholders could influence the design development as it was occurring.
 - Public Meeting #1: Kickoff/Process Definition - Included scoping of issues, opportunities and the project process.
 - Public Meetings #2: Options - Provided opportunity for input on draft alignment options.
 - Public Meetings #3: Analysis/Results - Obtained input on the analysis of options.

- Public Meetings #4: Final Recommended Concept Plan - Shared information and obtained input on the analysis and recommended concept plan.
 - Public Meetings #5: Revised Final Recommended Concept Plan - Shared information and obtained input on adjustments to the concept plan along 153 Avenue.
 - Public Hearing: Final Public Review - The TC will serve as the statutory hearing with City Council.
- █ Comment forms: Formal comment forms were provided at each public event and online to allow participants to provide direct input to the project and process. The comment forms also allowed the team to survey stakeholders about issues.
 - █ Individual stakeholder meetings: Separate meetings were conducted on unique issues including with CN Rail (CN Walker Yard crossing), the Blatchford team, and with Altalink (153 Avenue utility right of way).
 - █ Online consultation and communications: A project website was developed and continuously updated with the latest outreach and project information materials. The website also allowed direct contact with the project team.

Public Meetings

3.4 Overall, the project received strong participation from local stakeholders. Attendance recorded at the public meetings:

- █ Public Meeting #1 (April 10, 2012): 330
- █ Public Meetings #2 (June 19 and 20, 2012): 304
- █ Public Meetings #3 (September 26 and 27, 2012): 249
- █ Public Meetings #4 (December 5 and 6, 2012): 132
- █ Public Meeting #5 (April 3, 2013): 122

3.5 Each public meeting featured significant details about the current phase of the project. Multiple opportunities were provided for input from stakeholders. Comment forms were provided and participants also could provide comments on sticky notes and place them directly on display boards or large roll plots with details of the current concept design in the geographic location where the comment was relevant.

Incorporation of Public Input

3.6 In general, those commenting at the public meetings and online expressed a high level of satisfaction with the concept plan, station locations and track alignment. However, concerns were expressed about impacts such as traffic congestion (particularly along 113A Street and at the Castle Downs Road/153 Avenue intersection) and congestion on roads where traffic may be diverted (137 Avenue, 97 Street, and 127 Street). Concerns surfaced regarding the potential for noise impacts along 153 Avenue, if warning bells were implemented at each intersection and that this was inconsistent with the urban style. Other key themes in comments received were loss of property value, noise impacts (specifically crossing bells), aesthetics, impact to available parking at the YMCA, general safety and crime, pedestrian safety related to crossings, the location of

the kiss and ride at the YMCA, general concerns with the location of the Campbell Road station, concerns regarding the removal of right/left turns and the relocation of the Castle Downs Transit Centre (presently located near a seniors' complex).

- 3.7 Much support was expressed for pedestrian/bike paths along the corridor with several comments noting approval for the idea of a pedestrian and bike path in conjunction with the LRT bridge across CN's Walker Yard and Yellowhead Trail. Comments received noted the desire to avoid bells at crossings, due to noise. Additionally, comments noted that the station locations would provide easy access for pedestrians, provide easy access for LRT users to reach their destinations and were located to best avoid property impacts.
- 3.8 Comments received from the public and stakeholders provided throughout the consultation process informed the overall design process. Below are examples of specific adjustments made to the recommended concept plan. These adjustments were informed by the public input received.
- Refined westbound left turn from 137 Avenue onto Castle Downs Road.
 - Provided left turn into Castle Downs Mall from Castle Downs Road.
 - Improved continuity of shared use path at 137 Avenue.
 - Refined arrangement of 137 Avenue Transit Centre.
 - Provided kiss and ride at 137 Avenue station.
 - Moved equipment room location for 145 Avenue station to west side of Castle Downs Road.
 - Provided kiss and ride at 145 Avenue Station.
 - Increased length of left turn lanes at 145 Avenue and 153 Avenue.
 - Provided intersection access to YMCA from Castle Downs Road signaled and pedestrian crossings.
 - Provided kiss and ride at Castle Downs station.
 - Refined arrangement of Castle Downs Transit Centre.
 - Provided turn lane westbound on 153 Avenue to provide access to the Castle Downs spray park and playground.
 - Consulted directly with businesses along 113A Street and 153 Avenue to adjust traffic access points.
 - Reconfigured access and proposed a new signaled intersection to better serve the retail and residential areas near 153 Avenue and 127 Street.
 - Reconfigured parking area at the YMCA to provide maximum parking possible for YMCA users.
- 3.9 A final summary report of the public and stakeholder consultations, including input from the final public open houses on December 5th and 6th (2012), and April 3, 2013 is included as an Appendix to the City of Edmonton Transportation Committee Report.

4 Recommended Concept Plan

Plan Description

4.1 Based on the significant design and analysis completed by the Northwest LRT project team, internal working group, and project stakeholders, a recommended concept plan has been developed for review by City Council. This section details the recommended concept design. Text descriptions of the design are provided below and graphics of each segment are included as an Appendix to the City of Edmonton Transportation Committee Report. Highlights of the Northwest LRT include:

- Length: 11 km (NAIT to northwest City limits).
- Number of Stations: 9.
- LRT Vehicles: Existing high-floor style.
- No funding is currently in place to build the Northwest LRT line.

NAIT

4.2 The Northwest LRT will be an extension of the North LRT line which is scheduled to open in 2014. A temporary station for the North LRT, suitable for three-car trains, is currently under construction adjacent to the NAIT campus and Princess Elizabeth Avenue.

4.3 This station will be the North LRT's final station and the point of extension for the Northwest LRT. When the Northwest LRT is constructed, the NAIT Station will be shifted to the west to allow for five-car trains and to better serve NAIT, the town centre planned for Blatchford, as well as the communities of northwest Edmonton.

From the permanent NAIT station, the alignment turns north, with two tracks of LRT (one in each direction) in the centre of a future north/south roadway to serve the redevelopment. LRT trains through the Blatchford neighborhoods and along 113A Street/Castle Downs Road would not include gates and warning bells. Trains would not exceed the posted speed limit for the street. LRT trains would have priority at the normal traffic intersection signalled crossings, slowing down to cross each intersection. Omitting the use of gates, and bells in these segments avoids additional property acquisition and noise impacts to the surrounding neighbourhood.

Features

- Provides future five-car LRT train capability at the permanent NAIT station.
- Serves the expanding NAIT campus.
- Connects with Kingsway Mall.
- Serves the town centre area of Blatchford.
- Provides access to a future park within the Blatchford neighbourhood.

Blatchford - North

- 4.4 The two tracks of LRT continue north in the centre of the street. A station is proposed to serve the development towards the north end of the site and the existing communities to the east. The station location will be focused around higher density development and facilities in the community.
- 4.5 The route then crosses Yellowhead Trail and CN's Walker Yard on a proposed bridge that includes pedestrian and cycle paths, connecting communities north of the Yellowhead Trail with Blatchford.
- 4.6 The LRT descends from the bridge on the east side of 113A Street along the edge of Grand Trunk off leash dog park. The LRT will be fenced and landscaped adjacent to the park.

Features

- Serves high residential densities.
- Connects communities to the east.
- Provides access to the future Blatchford neighbourhood park.
- Connects pedestrians and cyclists from the north to the development.

132 Avenue Station

- 4.7 The LRT continues north along the east side of 113A Street. The properties on the east side of 113A Street between 129 and 130 Avenues will be required to accommodate the LRT track while allowing 113A Street to remain open to two-way traffic. At 130 Avenue the east arm of the intersection will be closed to through traffic and a cul-de-sac will be created.
- 4.8 A station is proposed to be located on the east side of 113A Street between 130 and 132 Avenues. Pedestrian crosswalks are provided at both ends of the platform, providing connectivity to the surrounding communities, retail and facilities including places of worship and schools (Rosslyn School and the Canadian Islamic Centre).
- 4.9 A shared-use path for both pedestrians and cyclists is provided along the full length of the LRT route on the east side of 113A Street.

Features

- Retains tree line street between 129 and 130 Avenues.
- Retains through traffic on 113A Street.
- Between 132 and 134 Avenue on 113A Street, road is reduced to a single lane in each direction.
- South of 137 Avenue, the traffic lanes on 113A Street are reduced to provide space for the LRT and decrease traffic travelling through the community.
- Retains frontage parking for homes along 113A Street.
- Provides shared-use path along the east side of 113A Street.

137 Avenue Station

- 4.10 The LRT continues across 137 Avenue along the east side of 113A Street. North of 137 Avenue, 113A Street becomes Castle Downs Road. A station is proposed to be located on the north side of 137 Avenue, adjacent to a new transit centre to provide bus connections. The LRT and transit centre will provide an opportunity for future development (potentially retail and housing).
- 4.11 The LRT continues north and transitions from the east to the centre of Castle Downs Road. The existing two traffic lanes in each direction are retained north of 137 Avenue.
- 4.12 Southbound traffic is focused to turn either east or west at 137 Avenue to connect with 97 Street or 127 Street. South of 137 Avenue, the road is reduced to one lane in each direction to accommodate the LRT and provide a more locally focused road network. Improved turn bays are provided for traffic traveling along 137 Avenue, turning north on to Castle Downs Road.

Features

- Serves communities around 137 Avenue.
- Provides bus interchange at the proposed transit centre.
- Retains traffic capacity north of 137 Avenue on Castle Downs Road.
- Provides a community focused road network south of 137 Avenue.
- Provides a shared-use path along the east side of 113A Street/Castle Downs Road.

145 Avenue Station

- 4.13 The LRT continues north in the centre of Castle Downs Road. A station is proposed north of the 145 Avenue intersection to serve the existing community on the west and the growing Griesbach development to the east. Signalled pedestrian crosswalks will be located at both ends of the station, providing strong pedestrian connections into the community.
- 4.14 The LRT continues north in the centre of Castle Downs Road through to the 153 Avenue intersection.

Features

- Serves communities, primarily passengers walking to station.
- Provides a shared-use path along the east side of 113A Street.

Castle Downs Station

- 4.15 The LRT turns west on 153 Avenue at the intersection of Castle Downs Road. A station is proposed to integrate with a new transit centre adjacent to the YMCA facility. This transit centre will replace the transit centre currently located on the east side of Castle Downs Road just north of 153 Avenue, providing strong connections to the surrounding community, retail and public facilities. The transit centre requires reconfiguring parking facilities and access that currently serve the YMCA users. The

design has been refined to retain the maximum number of parking spaces possible for the YMCA.

- 4.16 To improve the pedestrian environment, channelized right turns have been removed at the Castle Downs intersection. Channelized right turns refer to the right turn lanes that allow vehicles to move even when the signal is red, for traffic continuing through the intersection. The channelized right turns cause conflicts between turning vehicles and pedestrians. Signalled pedestrian crosswalks will also be provided at the entrance to both the YMCA and Castle Downs Spray Park.

Once the LRT turns west on 153 Avenue, the design of the corridor changes to allow greater flexibility for the City to develop and deliver the system design and operation. From the Castle Downs Station to the end of the line at Campbell Road, the design includes greater segregation and protective gates, barriers, and warning bells at each roadway crossing. The benefits of this design are that LRT could operate at a higher speed on this portion of the corridor. To operate the LRT at speeds higher than the posted speed limit of the roadway, the 153 Avenue segment of the alignment includes concrete barriers separating the tracks from the adjacent lanes of traffic or sidewalks. Additionally, gates and warning bells would be included at intersections (along the 153 Avenue segment only) for trains to pass through traffic intersections at higher speeds. The use of barriers, gates, and warning bells along 153 Avenue will continue to be examined in later phases of design to make a final determination.

- 4.17 As it continues west, the LRT transitions from the north side of 153 Avenue to the centre of the road. A shared-use path is provided on the south side of 153 Avenue.

Features

- Serves communities around Castle Downs.
- Provides direct connections for LRT and bus at the new transit centre.
- Provides a shared-use path on the south side of 153 Avenue.
- Creates strong connectivity to local amenities.
- Provides greater segregation with barriers, gates, and warning bells at each roadway intersection.
- Improves pedestrian environment and connections.

127 Street Station

- 4.18 The LRT continues west down the centre of 153 Avenue. The pedestrian crossing east of 121 Street is retained and a new full signal is added to access Castle Downs Spray Park. A new shared-use path is provided on the south side.
- 4.19 The LRT continues west to a centre station just east of the 127 Street intersection. A station at 127 Street provides connectivity to the surrounding communities and local amenities. Signalled pedestrian crosswalks will be provided at each end of the station platform.
- 4.20 At the 127 Street intersection, the channelized right turns have been removed to improve the walkability to the station and surrounding area. Channelized right turns

refer to the right turn lanes that allow vehicles to continually move even when the signal is red for traffic continuing through the intersection. The channelized right turns cause conflicts between turning vehicles and pedestrians. At 127 Street, the shared-use path turns south to connect with the existing multi-use trail running within the utility corridor.

Features

- Creates connectivity with surrounding communities and businesses.
- Provides strong connections to bus services on 127 Street.
- Connects to local amenities.
- Provides a shared-use path.
- Provides greater segregation with barriers, gates, and warning bells at each roadway intersection.
- Improves the pedestrian environment.

137 Street Station

- 4.21 The LRT route continues along 153 Avenue, crosses 134 Street and transitions from the centre to the south side of 153 Avenue. The LRT continues west to a proposed station between 137 and 139 Streets, providing strong connectivity with the surrounding communities.
- 4.22 The station is adjacent and connected to the multi-use trail/dog park running within the parallel utility corridor.
- 4.23 The route continues west descending under the CN rail line and returning to surface at 142 Street.

Features

- Provides a community-focused station.
- Provides greater segregation with barriers, gates, and warning bells at each roadway intersection.
- Creates strong pedestrian and bicycle connectivity.

Campbell Road Station

- 4.24 The route continues west. The proposed LRT returns to the surface after crossing the CN Rail line underground, crossing 142 Street at street level.
- 4.25 The LRT continues along the south side of 153 Avenue, crossing Campbell Road.
- 4.26 The Campbell Road Park and Ride, transit centre, and the final Northwest LRT station are located on the west side of Campbell Road.

Features

- Creates strong connectivity with the proposed Campbell Road Park and Ride.
- Provides greater segregation with barriers, gates, and warning bells at each roadway intersection.

- Integrates the St. Albert and Edmonton bus services.

5 Recommended Concept Plan Details

- 5.1 The section below summarizes the analysis conducted for the recommended concept design on each of the unique resources noted.

LRT Operations

- 5.2 The Northwest LRT will operate seven days per week and will provide service approximately 20 hours per day. Weekday service will begin at approximately 5:00 AM and end at approximately 1:00 AM. Saturday service will span the same hours. Sunday and holiday service will begin at approximately 5:00 AM and end at midnight. Final service schedule times will be developed at a later date, closer to the start of service. Weekday peak commuting periods for the existing system are 7:00 am to 9:00 am and 3:30 pm to 6:00 pm. The extension will operate on 5 minute frequencies (one train every 5 minutes) in the morning and evening peak periods. Off peak periods will have a 10 minute frequency for trains. These frequencies generally result in a travel time of 19.0 minutes from the existing NAIT station through to the Campbell Road terminus.

Transportation Network

Traffic Analysis

- 5.3 From the beginning of the project, it was noted with stakeholders that focusing this corridor on transit would move more people, more efficiently through the area. However, the introduction of LRT would result in increased traffic congestion. To analyze the potential changes, a detailed VISSIM traffic model was developed. The analysis used the City's 2044 transportation model traffic assumptions to demonstrate the potential future congestion (as a worst case situation). The analysis demonstrated traffic is accommodated. At its worst, traffic would experience a Level of Service D at specific intersections. It was noted the 137 Avenue and 153 Avenue intersections can become particularly busy at times; however, the build of queues does not continue over the course of the peak hours. It was observed in the model that these queues tend to build up over the first half hour of the peak hour and then tend to 'die down' by the end of the peak hours. In general, the analysis demonstrated that with the introduction of LRT congestion is increased, but is managed to an acceptable level of service. The recommended concept design has taken this analysis into account and adjusted turn lanes and queue lengths where possible to minimize overall impacts.
- 5.4 Each intersection was also analyzed to determine the appropriate level of crossing protection and signals. The LRT signalling system is assumed to be integrated with the traffic signals. The signal timing is designed to provide priority to the LRT, but also to provide sufficient cycles for pedestrians and traffic movements. The planned LRT speeds in most urbanized segments of this Northwest LRT (between the Blatchford and Castle Downs stations) allow the intersection crossing to be controlled in conjunction with the traffic lights. From the Castle Downs station to Campbell Road the trains travel at higher speeds and auto gates/barriers/bells are planned. For planning

purposes, it has been assumed the Northwest LRT will operate with a signaling system similar to the existing LRT network. However, final signal control requirements will be determined during the preliminary engineering.

Cycle & Pedestrian Integration

- 5.5 The Northwest LRT has been designed to generally operate as an urban LRT system, integrating into the local community. Urban LRT designs for all new extensions of the existing and future Edmonton LRT network have been mandated by City Council policy. Key to the success of urban LRT is physical access to stations by pedestrians, cyclists, and transit users. Ensuring direct, simple, and safe access for these modes directly impacts ridership and integration in the surrounding communities. The Northwest LRT has been designed with simple, surface level stations that are highly visible to pedestrians, providing a visual cue for their point of entry to the LRT system.
- 5.6 To ensure the optimized operations for all modes (pedestrian, cycle, transit, auto, and LRT), each roadway intersection was analyzed to provide appropriate signalized crossings, while providing appropriate controls for both traffic and the LRT system. Additionally, full pedestrian sidewalks and a shared-use path is provided along the length of the LRT. Pedestrian gates (when crossing LRT) are planned near 132 Avenue station (Rosslyn school) and from the Castle Downs station to Campbell Road.
- 5.7 The new bridge structure crossing over the Yellowhead Trail/CN Walker Yard will include both cycle and pedestrian paths. This will create a new multi-modal connection between the communities on the north and south of these historic pedestrian barriers (highway and rail yard).

Transit Integration

- 5.8 The development of the concept plan for the Northwest LRT includes the provision of transit centres at 137 Avenue station, Castle Downs station and Campbell Road station. The latter, Campbell Road, would provide integration with both ETS and St. Albert Transit bus services. The development of the facilities at Campbell Road are being led by St. Albert Transit as this park and ride/transit centre will be built in advance of the LRT line. The transit facilities at Castle Downs and 137 Avenue are being developed as an element of the concept planning for the Northwest LRT in conjunction with ETS and their planning for future bus service integration with the LRT line.

Access & Loading

- 5.9 Through development of the concept plan for the Northwest LRT route, access and egress arrangements along the corridor have been reviewed. The arrangement of the LRT, within each of the identified roads, does not fully eliminate any building access points. Certain access points along the Northwest LRT would be adjusted to right in, right out only (primarily along 153 Avenue); however, in all cases the team has ensured multiple points of access and egress are available.

Emergency Services - Access & Egress

- 5.10 The recommended LRT concept plan would not impact emergency services. The LRT is linked to the emergency system and the trains can be stopped, if alerted by the system that emergency services require priority (similar to emergency services and traffic). In the denser, urban areas of the corridor, the track design could allow for emergency services vehicle access, if needed.

Utilities

- 5.11 The development of any LRT line within the City will necessitate the relocation of utilities along the proposed corridor from under the proposed route. Subsequent design will advance an optimal construction process for utility adjustments and relocations. The Northwest LRT design team has collected existing and future utility information for this design. Mitigation measures are proposed to appropriately locate other existing electrical lines parallel the Altalink line. As noted previously, consultations with Altalink will be ongoing to ensure coordination of the design with parallel electrical lines along the LRT corridor.

Drainage

- 5.12 The Northwest LRT team undertook an analysis of the existing and future drainage considerations for the recommended concept plan. This analysis informed the overall design. The team examined storm drainage; changes in impervious surfaces; water quality; and future drainage projects planned. In general, the design accommodates storm drainage and ties into the existing infrastructure appropriately. No significant impacts are anticipated. The LRT corridor is primarily urbanized and no significant changes in impervious surfaces are anticipated. The parking facilities at the Campbell Road station may be an exception. The drainage of the Campbell Road station will be examined as part of the early construction of the bus park and ride facility. Water quality may be positively impacted based on construction of appropriate facilities to treat storm water runoff. Finally, the team examined a sanitary sewer pumping station on the Castle Downs station site that will require relocation. This pumping station is part of a larger sanitary network that has plans for expansion. It is likely that the pumping station will require relocation (based on expansion) prior to the construction of the LRT. Therefore, there is likely no impact. The future design must continue to coordinate with the future sanitary sewer expansion project.

Geotechnical

- 5.13 There are no major concerns related to the geotechnical analysis along the proposed Northwest LRT that cannot be addressed through appropriate design measures. 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.

Environmental

- 5.14 No major environmental impacts were identified. The majority of the proposed Northwest LRT route is on developed urban land, while the northwest portion of the

proposed route contains patches of natural vegetation and wetlands. While the design worked to avoid impacts, in the urban portion of the proposed route, boulevard and meridian trees are expected to be impacted. Removal or alteration of these trees will likely require reclamation (replanting) or compensation. In the more natural portion of the proposed route, native plant communities and wetlands were observed during site visits. Should future construction activities affect these features, compensation or mitigation may be required. Detailed wetland and vegetation assessments are recommended prior to construction. Other wildlife surveys and mitigations (prior to construction) may be necessary to protect nesting birds, amphibians, raptors, etc.

Noise Analysis

- 5.15 The Northwest LRT team conducted an initial noise analysis to determine potential changes in noise level due to the introduction of LRT. The analysis began with obtaining current noise levels to determine the background noise levels. Following the City of Edmonton's Urban Traffic Noise Policy, these levels were used as the basis of analysis when compared to the future conditions including LRT and future traffic congestions. Roadway noise dominates the noise climate along the corridor. The team modelled the potential future noise generated by both higher traffic volumes and LRT. Future background noise will increase due to higher traffic levels and the LRT. Noise impacts that will require noise attenuation mitigation (such as sound walls) include:
- Properties on south west corner of 139 Street and Castle Downs Road.
 - Properties on south east corner of 131 Street and 153 Avenue.
 - Properties on the north side of 153 Avenue between 127 Street and 131 Street.
 - Property on northwest corner of 137 Street -lot 20 137A Street.
 - Property on north side of 153 Avenue - lot 79 138A Street (east side corner of street).
 - Property on north side of 153 Avenue - lot 109 138B Street (west corner of street).
- 5.16 Noise mitigations (fence/walls) were tested in the model and appear to be successful at reducing noise (below impact threshold) at these locations. Final noise mitigations will be developed in the next level of design. Once constructed, the mitigations will be evaluated to determine their final effectiveness.

Historical Resources

- 5.17 No cultural resources or heritage structures will be directly impacted by the construction of the Northwest LRT. However, if cultural resources are encountered during construction and appropriate protocols will be followed to document the resources in cooperation with Alberta Culture.

Property Acquisition

- 5.18 As noted previously, the recommended concept plan proposes to purchase the properties on the east side of 113A Street between 129 and 130 Avenue. This arrangement will retain the traffic lanes with a segregated LRT alignment and multi-use trail provided on the east side of 113A Street, this approach will retain local

traffic movements and local frontage access to properties. Additionally, to mitigate the potential impacts of traffic on the neighbourhoods, it is proposed as part of the LRT project to focus the east/west turn movement towards 127 and 97 Streets respectively at 137 Avenue, with the 113A Street traffic lanes reduced to provide space for the LRT and continued local neighbourhood road access.

Land Use

- 5.19 The Northwest LRT will serve primarily developed, urbanized portions of Northwest Edmonton. The recommended concept plan for LRT has been integrated directly into the Blatchford plans and will be a significant element in supporting this new sustainable, walkable, and transit friendly community. Along 113A Street, the LRT encounters well established neighbourhoods and serves this area with multiple stations. The impact of property acquisition between 129 and 130 Avenues is not anticipated to change land use in this area. Infill opportunities near the station, within these existing neighbourhoods, may be beneficial. The 137 Avenue station and integrated transit centre is located within the Griesbach neighbourhoods, fitting with the walkable, neotraditional style of this development. Moving north and west, the corridor widens and includes more auto oriented style of development. The land uses in these areas are primarily residential, with commercial the major roadway corridor. The Northwest LRT team has considered designs that maximize pedestrian and cycle access between the stations and neighbourhoods. It is recommended the City consider examining future land use plans to take advantage of the introduction of LRT.

Constructability & Operations/Maintenance Facility

- 5.20 The recommended concept plan includes the complete length of the identified corridor from NAIT through to the proposed terminus at Campbell Road at the City of Edmonton boundary. Ideally, funding will be obtained to design and construct the length of the extension. However, based on availability of funding and demand, the LRT could be successful if constructed in phases. The Northwest LRT team also evaluated reasonable segments for construction, based on ridership demand, operations, geography, and likely funding options. The proposed phasing options include:

- NAIT to Blatchford North: Possibly phased with the development of the Blatchford neighbourhood.
- Extend to 137 Avenue: Requires construction of the bridge over the Yellowhead Trail/CN Walker Yard. This station provides a logical terminus with the combined transit centre.
- Extend to Castle Downs: This station provides another logical terminus, integrated with the transit centre and a major activity centre.
- Extend to 137 Street: This station would create a link to a larger activity centre and not extend so far as to require the tunnel under the CN Rail near 153 Avenue and 145 Street.
- The final extension to Campbell Road would complete the line.

5.21 The Northwest LRT team also examined multiple potential sites that could serve as an operations and maintenance facility (OMF). As the Edmonton LRT system continues to grow, additional space for LRT vehicle maintenance, storage, and maintenance of way will be required. The examination of the OMF was completed considering the needs for the entire system, as it grows. The location and development of additional OMF/storage facilities will be dependent on the timing of each of the proposed extensions to the system: South (Heritage Valley), Northeast (Gorman), or Northwest (Campbell Road). Based on the analysis, the City determined an OMF close to the ends of each of the future high floor lines as the preferred scenario. For the Northwest LRT, the potential site is located in the Rampart industrial development. The team has coordinated directly with the City of Edmonton Corporate Properties related to the potential site. It must be noted that development of the Northwest LRT line would be impeded without the availability of either an alternative OMF or a temporary facility unless the complete line along with a proposed OMF at Rampart were developed.

Cost Estimates

5.22 Table 5.1 below details the provisional cost estimates for the corridor.

TABLE 5.1 PROVISIONAL COST ESTIMATE

| Item | Provisional Cost |
|-----------------------------------|------------------|
| Construction | \$953m |
| Site Preparation & Utilities | \$47m |
| Roadway & Trackwork | \$286m |
| Signals & Systems | \$115m |
| Stations | \$231m |
| Bridges & Crossings | \$128m |
| Maintenance Facilities | \$146m |
| Vehicles | \$351m |
| Land | \$28m |
| Engineering & Construction Admin. | \$257m |
| TOTAL | \$1.589b |

6 Next Steps

- 6.1 The recommended Northwest LRT concept plan is presented for consideration by City Council. Should City Council see fit to approve the concept plan, design of the project would be advanced. In order to advance the project and seek out potential funding opportunities, future levels of design (preliminary engineering) would be required. This concept plan sets a strong basis for the future design.
- 6.2 It is possible this LRT extension could be funded and constructed in phases. Additional work will be required to optimise the design, to mitigate issues, and to maximise the Northwest LRT's benefits both in terms of the transportation network and land use integration. Future work will likely include:
- Finalization of noise analysis and additional mitigations (if required) will be completed in Spring 2013.
 - Continued evaluation of the operational benefits for including additional segregation (barriers, gates, and warning bells) along 153 Avenue.
 - Continued development and integration with the land use plans for the corridor, including the Blatchford project.
 - Coordination with construction of the North LRT (and other LRT corridors that may impact operations, etc.).
 - Integration of station locations.
 - Station area land use plans (where appropriate).
 - Urban realm design for further integration into the local neighbourhoods.
 - Further consideration of pedestrian, cycle, and transit connections.
 - Alignment development
 - Building access and egress arrangements.
 - Continued assessment of local and network traffic impacts.
 - Final plans for intersection priority and traffic arrangements.
 - Urban realm design details.
 - Coordination with the City of St. Albert regarding the Campbell Road park and ride, as well as any future planning to extend LRT into St. Albert.
 - Coordination with ongoing development and land use planning efforts in the corridor neighbourhoods. These efforts may present an opportunity to better link the stations to the surrounding development.

