



SW EDMONTON MAJOR TRANSPORTATION CORRIDORS ASSESSMENT

Prepared for: City of Edmonton – City Planning Branch

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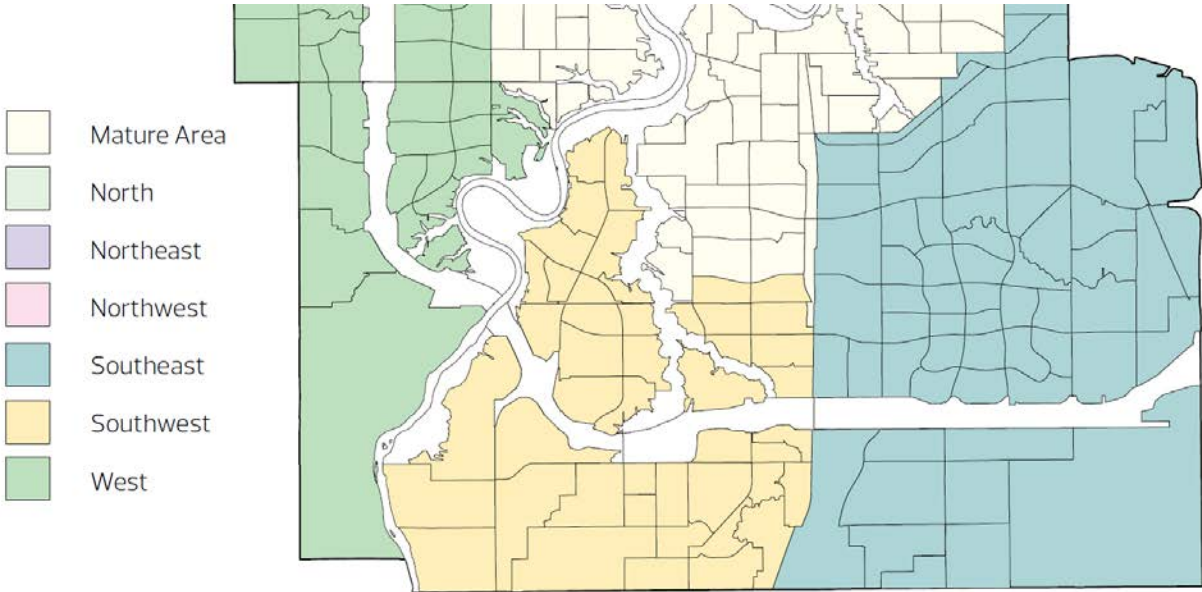
1.0 Introduction

This assessment is technical background for a City Planning Branch report to Executive Committee regarding planning of the Capital Line LRT, and other major transportation corridor facilities, in the context of residential growth and transportation demand in Southwest Edmonton.

1.1 ISSUE DESCRIPTION

The southwest sector of Edmonton (see Figure 1.1) has experienced significant population and employment growth in recent years, and is expected to continue as an area of much land development within the Edmonton Metropolitan Region. Transportation demand and congestion on roads, on LRT, and at Park & Ride facilities are increasing correspondingly.

FIGURE 1.1 - LOCATION OF SOUTHWEST SECTOR (YELLOW SHADED AREA)



Source: 2017 Growth Monitoring Report, City of Edmonton (Map 4.3 - City Subsectors)

The City of Edmonton continues to build-out its LRT system, currently progressing on design and construction of high-priority routes decided by Council in 2016: the Valley Line (connecting the Southeast sector through Downtown to the West sector), and extension of the Metro Line from NAIT to Blatchford. In the Southwest sector, preliminary design of the LRT extension from Century Park to Heritage Valley Park & Ride (at Ellerslie Road - 127 Street) is underway.

Considering the level of peak-hour congestion on roads such as Terwillegar Drive, and the realities of constrained capital funding available for major transportation facilities, this review assesses the relative merits of potential major transportation corridor improvements for Southwest Edmonton. The timeframe focuses on the short-medium term over approximately the next ten years.

1.2 SCOPE

Other than reviewing city-wide residential growth patterns by geographic sector, this assessment focuses on the Southwest sector of Edmonton. It does not address priorities for road or LRT projects in other sectors, notwithstanding that budget decisions are made on a city-wide basis within available resource limitations. Numerous other reports to Council are scheduled in 2018 addressing various aspects of LRT and transportation facility prioritization, including a Network Progress Report.

2.0 Background

2.1 STRATEGIC CONTEXT

2.1.1 COUNCIL GOALS

This assessment recognizes that City Council has adopted specific strategic goals and associated outcomes (see Table 2.1 below) to guide municipal decision-making by Council and Administration. Each strategic outcome is further supported by one or more criteria.

TABLE 2.1 - COUNCIL STRATEGIC GOALS & OUTCOMES

STRATEGIC GOALS	STRATEGIC OUTCOMES
Healthy City	Edmonton is a safe and caring community
	Edmontonians are healthy and fulfilled
Urban Shift	Edmontonians live in complete and uplifting neighbourhoods
	Edmonton has appropriate and accessible infrastructure
Regional Economic Resilience	Edmonton region has an innovative, diverse and entrepreneurial economy
	Edmonton region has an integrated and globally competitive business climate
	The City of Edmonton has a resilient financial position
Energy and Climate	Edmonton has robust infrastructure that ensures the continuity of critical services
	Edmonton is an energy sustainable city

Council has also adopted a fifth strategic goal “Building a Great City” with strategic outcomes and criteria focused more-internally on operational excellence of the municipal corporation.

2.1.2 STRATEGIC PLAN (“THE WAYS”)

The City’s ten-year strategic plan (2009-2018) is entitled The Way Ahead and is supported by several other “Ways” plans including the municipal development plan (The Way We Grow) and the transportation master plan (The Way We Move)¹.

¹ The City is currently initiating an update to these strategic plans.

The Way We Grow contains nine strategic goals that provide direction for growth and development. One of the goals (“Integrating Land Use and Transportation”) is focused on integrating transit and land use to support compact living and encourage transit ridership. The goal is supported by twelve policies designed to render Edmonton's transit system as the primary framework for urban form.

The Way We Move provides more-detailed direction and policies pertaining to all facets of transportation. One of the overarching strategic goals relates to sustainability whereby “...transportation decisions reflect an integrated approach to environmental, financial and social impacts thereby creating sustainability, livable communities that minimize the need for new infrastructure and increase quality of life.”

The transportation master plan also states that adding roadway capacity to serve commuter vehicle mobility will not be a priority (p. 70), while the City's transportation strategy (Strategic Objective 7.3) is to focus major roadway improvements on the efficient movement of goods, service, and transit vehicles. This objective, coupled with the objective to enhance the viability of the public transportation system, is part of the City's overall vision to grow more compactly while increasing capacity for sustainable transportation.

2.1.3 SHIFTING EDMONTON'S TRANSPORTATION MODE

Shifting Edmonton's Transportation Mode is a context report associated with the 2014 Transportation Master Plan. It highlights why Edmonton needs to shift its transportation patterns to a greater share of transit and active modes in order to improve its urban form, accessibility, public health, economic competitiveness, and natural environment.

Importantly, Edmonton recognizes that it cannot build its way out of congestion. While the report does not provide future mode split targets, it does state how the provision of sustainable transportation options—including cycling, transit, and walking—can increase roadway capacity for road users who cannot or choose not to use transit, walk or cycle. Simultaneously, better access to sustainable transportation means more-reasonable choices for those who cannot or choose not to use a car.

2.1.4 TRANSIT STRATEGY

Edmonton's Transit Strategy, adopted in 2017, is a high-level strategy that provides a comprehensive and integrated perspective on the transit system, including LRT, bus and paratransit. The Transit Strategy contains five key outcomes that will result in a modernized public transit system. The most relevant outcome to this assessment is stated as follows: “*Provide service that reflects the different preferences of inner and outer neighbourhoods.*”

This specific outcome is guided by Pillar #3 of the Strategy, which is to “develop a market responsive approach to transit network design.” Part of this pillar recognizes that Edmonton's outer neighbourhoods are still characterized by more-circuitous street patterns and homogenous land uses

where there is greater reliance on automobile use. The network design principles identified for the outer areas are as follows.

- Develop a network of LRT, precursor BRT, Rapid Bus, and Crosstown services in suburban areas for travel to downtown, post-secondary institutions, major employment sites, and major shopping/mixed use areas.
- Develop a network of local routes and explore options with new mobility services (e.g., shared taxi, transportation network companies) for the provision of local services in proximity to seniors' complexes, schools, and local activity centres.
- Integrate City-owned Park and Ride facilities, local bus access, and TOD initiatives at LRT stations and major transfer points in the bus network.

The Transit Strategy identifies a number of actions to support these principles, but in general, the goal is to expand transit service and thereby, improve transportation capacity in outer areas of the city such as the Southwest sector.

2.1.5 OPTIMIZATION OF THE TRANSPORTATION SYSTEM NETWORK

Optimization of the Transportation System Network (OTSN) is City Policy #C569, which established principles for congestion management in Edmonton considering multi-modal travel performance for pedestrians, cyclists, transit users, motor vehicle drivers, and goods movement. The OTSN policy incorporates the principle that physical, financial, and community constraints make it infeasible or undesirable to build or expand roads to alleviate all congestion. Assessment of congestion is to consider all modes of transportation, the modal priority of a corridor, and the land uses and character of the surrounding area.

2.2 EXISTING CONDITIONS

2.2.1 STATUS OF TRANSPORTATION NETWORK

One of the primary drivers for preparation of this assessment is congestion evident on both the road system and LRT system serving Southwest Edmonton. These are described briefly below, and some relevant data and information are contained in Appendix A (Transportation Network Performance Data).

Roads

One of the most prominent “pinch points” in the Southwest Edmonton road network is at Terwillegar Drive - 40 Avenue, where the east intersection (Terwillegar Drive Northbound) operates at >100% capacity and at Level of Service (LOS) “F” in the morning peak hour; the eastbound left turn and westbound right turn movements onto Terwillegar Drive Northbound are the two most-critical movements. In the afternoon peak hour, the peak movements are at the west intersection (Terwillegar Drive Southbound) and although the intersection operates within acceptable range (82% capacity, LOS “C”), vehicles frequently queue as far back as Whitemud Drive.

LRT

Edmonton's Light Rail Transit (LRT) system extends as far south as Century Park, at 23 Avenue - 111 Street, with numerous bus transit connections linking LRT to communities in both Heritage Valley and Windermere. There are also numerous bus transit connections from the Southwest sector to South Campus / Fort Edmonton Park LRT Station.

According to 2016 data, the highest ridership on Edmonton's LRT system is observed between McKernan/Belgravia Station and Health Sciences/Jubilee Station, with daily ridership just over 25,000 passengers/day in each direction.

Particularly in the AM Peak (morning rush hour), when travel patterns are more concentrated than in PM Peak (afternoon rush hour), it is not uncommon for LRT vehicles to arrive to South Campus / Fort Edmonton Park Station at full passenger capacity. This is known to be resulting in "pass ups" whereby trains are unable to accommodate all the passengers waiting to load, and it is necessary to wait for the following train in order to proceed.

Some of this capacity issue between South Campus / Fort Edmonton Park Station and Health Sciences / University Hospital Station is a result of current signaling issues on the Metro LRT Line, which has required every third train to be a three-car train rather than five-cars in length. Resolution of the signaling issues is expected to increase LRT capacity (south of Health Sciences / Jubilee Station) by approximately 15%.

2.3 GROWTH PATTERNS

2.3.1 GROWTH MONITORING REPORT

Edmonton's *Annual Growth Monitoring Report (2017)* provides information regarding residential (and non-residential) development patterns over the five-year period from 2012 to 2016.

As illustrated in Figure 2.1, Southwest Edmonton has experienced significant growth in the reported period, with the highest five-year average lot absorption (just ahead of Southeast Edmonton), and ranking in the top-two busiest sectors in most years reported.

FIGURE 2.1 - FIVE-YEAR LOW-DENSITY LOT ABSORPTION PATTERNS

City Sector	2012	2013	2014	2015	2016	Average
North	1,180	1,068	559	337	73	643.5
Northeast	330	422	609	744	147	450.4
Northwest	415	80	163	178	49	177.0
Southeast	883	1,235	1,347	1,542	638	1,129.0
Southwest	1,197	807	1,330	2,103	655	1,218.4
West	727	818	1,044	857	328	754.8
Total Lots	4,732	4,430	5,052	5,761	1,890	4,373.0

Source: 2017 Growth Monitoring Report, City of Edmonton (Figure 4.4)

As further illustrated in Figure 2.2, Southwest Edmonton was the location of five out of twelve of the neighborhoods (#1, and #7 to #10) with over 1,000 residential units developed in the five-year reporting period. In comparison, the Southeast sector contained three of the twelve neighborhoods, and the North and West sectors each contained two.

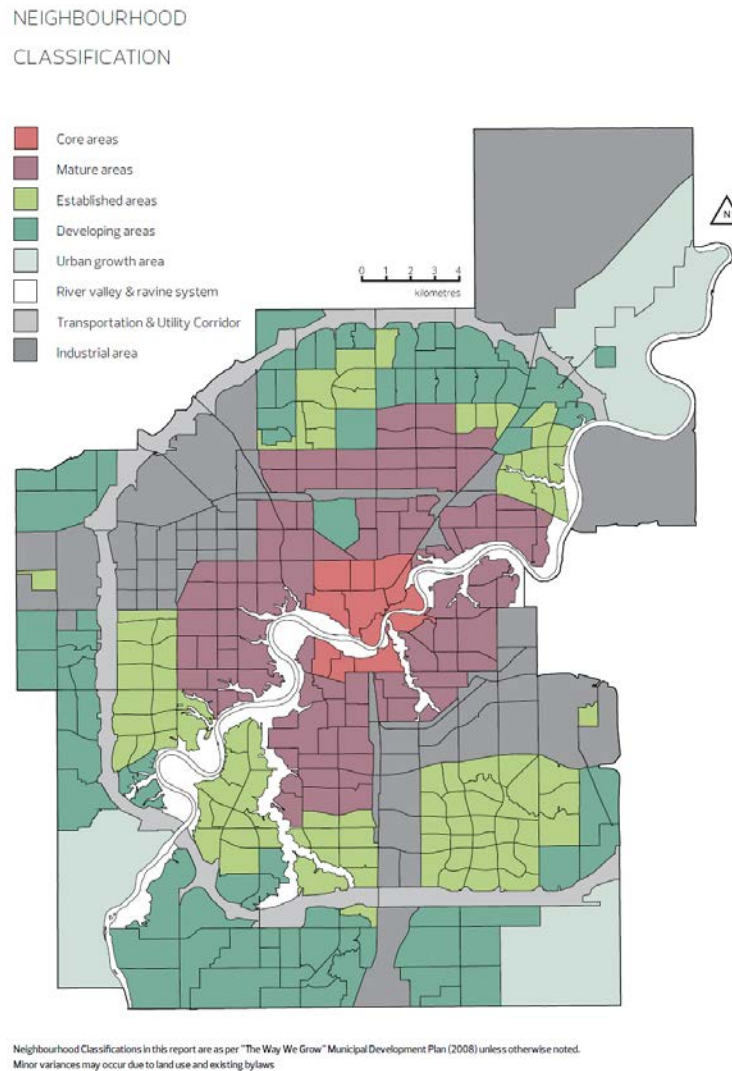
FIGURE 2.2 - DEVELOPING NEIGHBORHOODS WITH >1,000-UNIT GROWTH OVER FIVE YEARS

Windermere	2,772
Walker	2,504
Laurel	2,231
Chamberly	2,090
McConachie	2,038
Summerside	1,983
Allard	1,661
Chappelle Area	1,379
Callaghan	1,273
Ambleside	1,202
Secord	1,095
Rosenthal	1,025

Source: 2017 Growth Monitoring Report, City of Edmonton (Figure 5.15)

The Growth Monitoring Report also has a forward-looking component in that it describes the status and patterns represented by planned growth areas of Edmonton. For example, Figure 2.3 below replicates a map from the Growth Monitoring Report that shows the areas of Edmonton that are either “developing” or “urban growth” areas.

FIGURE 2.3 - RELATIVE SIZE OF DEVELOPING AREAS BY SECTOR



Source: 2017 Growth Monitoring Report, City of Edmonton (Map 1.1)

The urban growth areas are three large development areas that are in relatively-early phases of development planning, such that major contributions to Edmonton’s residential growth are likely to occur closer to, and beyond, a ten-year future time horizon.

A relatively-greater component of growth in the ten-year horizon will come from the developing areas, where neighborhood-level planning is complete and subdivision development is ongoing and poised

to continue. The build-out completion of such developing areas will result in concentrations of transportation demand over the next decade.

Relevant to the current assessment, it can be observed in the figure above that Southwest Edmonton comprises the largest of these darker-green “developing areas” and thus can be expected to continue representing a significant share of Edmonton’s growth.

2.3.2 FUTURE SW HOSPITAL

In May, 2017, the Government of Alberta announced² its intention to construct a new hospital (350-500 beds) in Southwest Edmonton, on a site within provincially-owned lands west of 127 Street and south of Ellerslie Road. The hospital facility is currently undergoing functional programming to determine its size and characteristics in greater detail.

The City of Edmonton is working with the Province to determine appropriate linkages between the hospital design and planning of a future Capital Line LRT station. Such coordination and planning will be beneficial to both the hospital and the municipal transportation network, and traffic loads from the provincial lands have been anticipated throughout the planning of Heritage Valley area. Traffic volumes generated by the hospital will have greatest impact on the road network within Heritage Valley, and will be only a small proportion of future traffic growth between Heritage Valley and the rest of Edmonton.

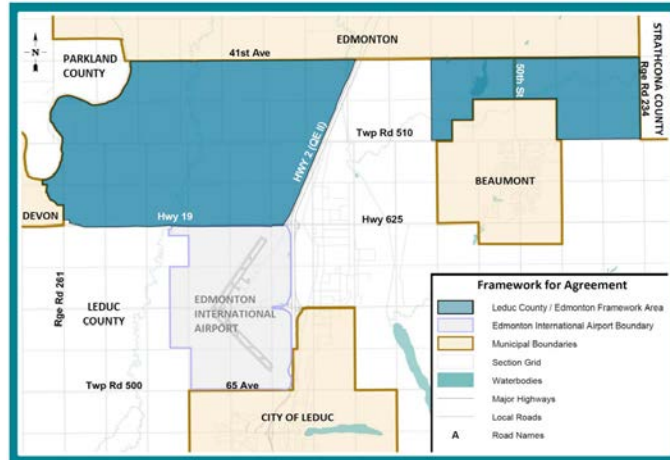
2.3.3 SOUTH ANNEXATION AREA

Over the past five years, the City of Edmonton has been working toward annexation of a large area of future urban development directly south of the Southwest sector of the city. As of 2017, a Framework For Agreement was reached with Leduc County³, setting the stage for likely annexation of 6,625 hectares of land west of the Queen Elizabeth II Highway and south of 41 Avenue SW. Figure 2.4 illustrates the area and its relationship to the Southwest sector of Edmonton.

² <https://www.alberta.ca/release.cfm?xID=4701183C3D0E5-03DA-681B-4A55BD270A593CF1>

³ https://www.edmonton.ca/documents/PDF/NewsReleaseAgreement_June2017.pdf

FIGURE 2.4 - FRAMEWORK FOR AGREEMENT FOR SOUTH ANNEXATION



Source: Growing Together - Annexation Newsletter, City of Edmonton, March, 2017

The eventual transportation demands and traffic patterns from urban development in the future annexation area will undoubtedly be very significant. However, they are reasonably anticipated to be beyond the ten-year timeframe considered in this assessment.

2.4 TRANSPORTATION INFRASTRUCTURE BY OTHERS

2.4.1 ALBERTA TRANSPORTATION

The largest road facility in Southwest Edmonton is Anthony Henday Drive, which is the responsibility of Alberta Transportation. In late 2017, the Minister of Transportation confirmed⁴ that his department is conducting design work for widening of the southwest quadrant of Anthony Henday Drive, although construction timing and funding is currently undetermined.

Tangibly, the Province has issued a Request for Proposal for design of Anthony Henday Drive widening from 4-lanes to 6-lanes, from east of 111 Street to Whitemud Drive. Funding has been committed for design, with construction anticipated to occur in 3 phases from 2018-2021, subject to further funding approvals.

127 Street / 135 Street

The Alberta Transportation project scope noted above includes closing the connection at 127 Street north into Twin Brooks. The City of Edmonton is planning for on/off ramps and arterial road construction to create a southerly connection from Anthony Henday Drive to Ellerslie Road, situated at 135 Street.

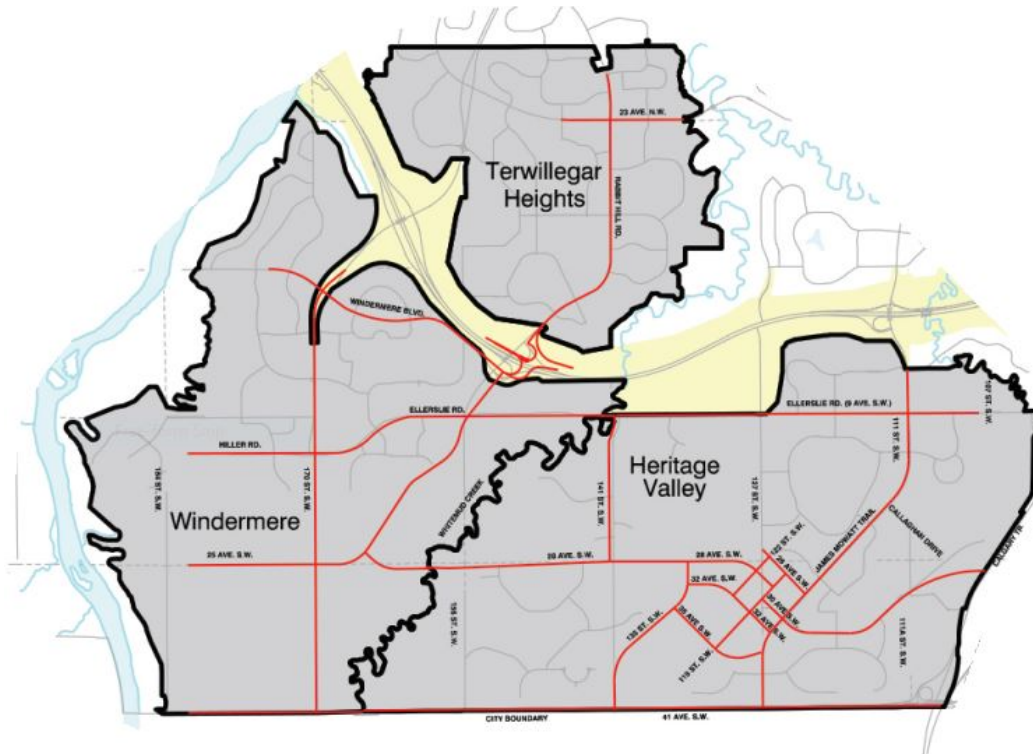
⁴ <http://edmontonjournal.com/news/politics/alberta-slowing-down-its-infrastructure-spending>

2.4.2 LAND DEVELOPMENT PROCESS

As part of the land development process in Edmonton, and based on transportation impact assessments, negotiations with the City of Edmonton (at the time area/neighborhood plans are established) define specific transportation infrastructure which is funded and/or constructed by land developers as neighborhoods are built-out. Administered through Bylaw #14380 (Arterial Roads for Development Bylaw), arterial roadway assessments (ARA) are collected as a condition of a subdivision or development permit, and establish how developers will share the costs of transportation infrastructure (primarily arterial roadways, but also including land for transit centres and contributions toward interchanges on Anthony Henday Drive or the QE II Highway).

Figure 2.5 below illustrates the arterial roads covered by the ARA bylaw in Southwest Edmonton. More-detailed excerpts from the bylaw for Heritage Valley, Terwillegar Heights, and Windermere, are contained in Appendix B.

FIGURE 2.5 - ARA-FUNDED ARTERIAL ROADS IN SOUTHWEST EDMONTON



Source: ARA Overall Plot based on Bylaw #14380, City of Edmonton, February, 2017

Generally, the ARA process results in the first two or four lanes of arterial roads being constructed as neighborhood construction is staged; on arterial roads, it includes a shared-use path on one side and a sidewalk on the other side. In addition to this arterial road infrastructure, developers are responsible for all collector and local roads within neighborhoods, including pedestrian, bicycle, and local transit infrastructure.

The City of Edmonton remains responsible for arterial road expansions, when and where warranted, beyond the basic provision of two or four arterial lanes under the ARA process. In Southwest Edmonton, these City outstanding projects include:

- Rabbit Hill Road (from two to four lanes) from Anthony Henday Drive to Magrath Boulevard
- 23 Avenue (upgrading the eastbound lanes) from Terwillegar Drive to Rabbit Hill Road
- 170 Street (from two to four lanes) from Windermere Boulevard to Ellerslie Road,
- James Mowat Trail (from two to four lanes) from Rutherford Road to 30 Avenue,
- Ellerslie Road (from two to four lanes) from 119 Street to 135 Street (with the portion between 127 Street and 135 Street being undertaken as part of the 135 Street - Anthony Henday Drive connection project).
- Urbanization of two lanes of arterial roadways in conjunction with ongoing subdivision development in the areas of 41 Avenue SW, 170 Street SW, 25 Avenue SW.

3.0 Major SW Transportation Corridor Assessment

This section describes potential scenarios for expanding transportation facilities over the next ten years, within major north-south corridors between Southwest Edmonton and Central Edmonton (e.g., University of Alberta, Downtown). An evaluation of the scenarios is presented, based on qualitative factors (e.g., Council's strategic goals) and quantitative factors (e.g., transportation modeling).

3.1 SCENARIOS

Refer to Figure 3.1 for a mapped illustration of the locations of Scenarios 1 - 3 below.

3.1.1 BASE SCENARIO - 2027 TIME HORIZON - COMMON CHANGES

For purposes of transportation modeling, the following common changes are included in all scenarios.

- Updated population and employment forecasts for Heritage Valley, Windermere, and other growth areas in Southwest Edmonton.
- Construction of arterial roads by developers (as described in Section 2.4.2 - Land Development Process), corresponding to the build-out of neighborhoods in SW Edmonton and elsewhere.
- Municipal Park & Ride at Heritage Valley (Ellerslie Road - 127 Street) with 1,200 stalls and bus shuttle service⁵ to Century Park LRT Station.
- Municipal Park & Ride at Century Park with 1,000 stalls.
- Valley Line LRT (Downtown to Mill Woods).
- Two additional traffic lanes on Whitemud Drive across Rainbow Valley Bridge.

3.1.2 SCENARIO 1 - TERWILLEGAR DRIVE INTERCHANGES

This scenario consists of the Base Scenario plus the following.

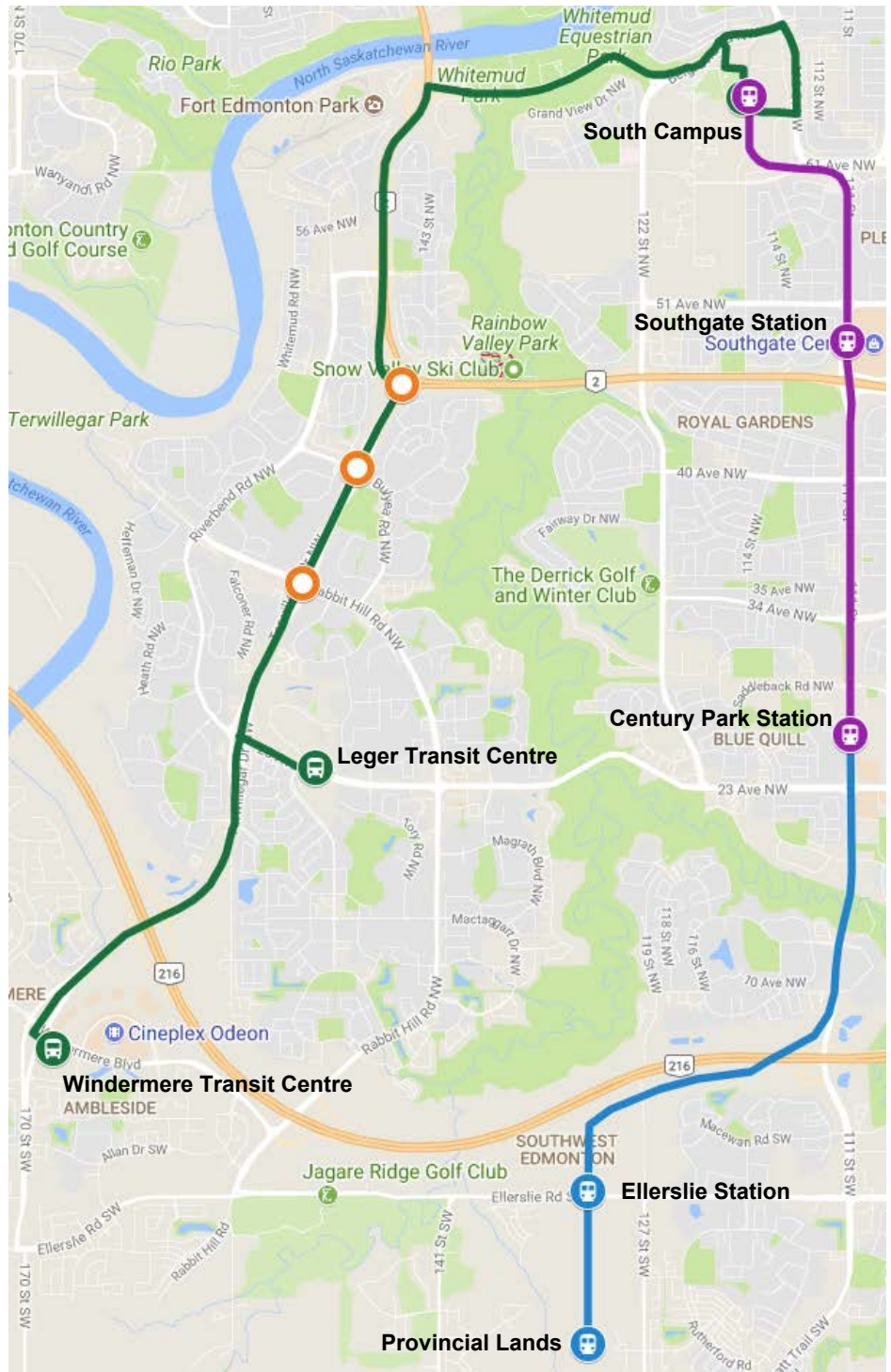
- An interchange at 40 Avenue / Bulyea Road.
- An interchange at Rabbit Hill Road.
- At the Whitemud Drive - Terwillegar Drive interchange, expansion of the ramp connecting Whitemud Drive Westbound to Terwillegar Drive Southbound (from one lane to two lanes).

This scenario essentially represents a free-flow Terwillegar Drive from north of 23 Avenue / Riverbend Road to Whitemud Drive. The conceptual-level cost of this scenario, over that of the Base Scenario, would be in the order of \$100M, based on approximately \$40M for each of two interchanges (including the free-flow mainline road connections between them) plus approximately \$20M for the ramp expansion.

⁵ The bus shuttle service logically is not part of scenarios that include LRT extension to Heritage Valley.

Figure 3.1 Scenarios

-  Scenario 1 - Terwillegar Drive Interchanges
-  Scenario 2 - Extend Capital Line LRT to 20 Avenue SW Station and Build-Out Heritage Valley Park & Ride
-  Scenario 3 - Terwillegar Drive & Fox Drive BRT (Ambleside to South Campus)
-  Existing Capital Line LRT



3.1.3 SCENARIO 2 - EXTEND CAPITAL LINE LRT TO 20 AVENUE SW STATION AND BUILD-OUT HERITAGE VALLEY PARK & RIDE

This scenario consists of the Base Scenario plus the following.

- Extension of the Capital Line LRT from Century Park to the next station south of Heritage Valley Park & Ride at approximately 20 Avenue SW, corresponding to the location of the planned Southwest Edmonton Hospital.
- Municipal Park & Ride at Heritage Valley (Ellerslie Road - 127 Street) with its size increased to 1,900 stalls.
- Municipal Park & Ride at Ambleside (Windermere Boulevard - 170 Street) with 600 stalls and direct bus connections to Heritage Valley Park & Ride / LRT Station. Correspondingly, expansion of Ellerslie Road (170 Street to 127 Street) to six lanes, providing appropriate capacity for the bus connections between Park & Ride stations.

The conceptual-level cost of this scenario, over that of the Base Scenario, would be in the order of \$625M for the LRT extension, plus the Park & Ride and Ellerslie Road expansions. Taking into consideration an assumed 40% federal cost-share and 33.3% provincial cost-share for the LRT extension (yielding a net cost for LRT of \$167M), the conceptual-level cost of this scenario could be in the order of \$200M (i.e., allowing \$33M for the Park & Ride and Ellerslie Road expansions).

3.1.4 SCENARIO 3 - TERWILLEGAR DRIVE & FOX DRIVE BRT (AMBLESIDE TO SOUTH CAMPUS)

This scenario consists of the Base Scenario plus the following.

- Bus Rapid Transit (BRT) service from Ambleside Park & Ride to South Campus / Fort Edmonton Park LRT Station, via Terwillegar Drive (with a stop at Leger Transit Centre), Whitemud Drive, and Fox Drive.
- Municipal Park & Ride at Ambleside (Windermere Boulevard - 170 Street) with 600 stalls and bus connections to Century Park LRT Station.

The scenario is based on utilizing existing carriageway where feasible (such as bus-on-shoulder, or operating in mixed traffic on sections where traffic flows freely), combined with roadway widening through sections of congestion (typically approaching and through signal-controlled intersections). The service was modeled as a 17-minute trip from Ambleside to South Campus, which is similar to the off-peak travel time by automobile, and also similar in duration to the current duration of an LRT trip from Century Park Station to South Campus / Fort Edmonton Park Station; the modeling represents a scenario with sufficient separation from general traffic to be roughly equivalent to LRT in terms of travel time reliability.

In order to obtain a conceptual-level cost for this scenario, additional work is required to examine conceptual design elements necessary to achieve the BRT service and travel times described herein. It should be noted that the current conceptual planning of Terwillegar Drive does not include considerations of BRT in ultimate or staged scenarios for that project.

3.2 EVALUATION

3.2.1 COUNCIL GOALS

Table 3.1 depicts a broad evaluation of scenarios for Southwest Edmonton facilities for private vehicles or public transit, based on Council's strategic goals.

Some of the key differentiating criteria are:

- Transit scenarios are generally more affordable for Edmonton travelers as compared to mobility via private vehicle ownership.
- Riding transit is statistically safer than riding in a motor vehicle.
- LRT has no localized emissions and therefore is advantageous with regard to air quality.
- LRT/BRT scenarios are inherently more supportive of the Urban Shift objective regarding a multi-modal transportation system encouraging transit and active transportation modes.
- Transit scenarios generate revenue from fares and advertising, while road scenarios do not generate revenue (in the absence of tolls).
- Both transit and road scenarios benefit from the “greening” of the electrical grid in Alberta, along with increasing levels of bus and private vehicle electrification, while LRT scenarios are fully electrified.
- Transit is more energy-efficient per passenger than travel by lower-occupancy motor vehicles.

Overall, the evaluation according to Council's strategic goals favours scenarios based on public transit over those based on private vehicles.

3.2.2 TECHNICAL EVALUATION

The City of Edmonton maintains a comprehensive travel demand forecasting model for Edmonton and the Metropolitan Region, known as the Regional Travel Model (RTM). As part of ongoing development and maintenance of the RTM, a ten-year horizon model update was completed in 2017.

For this analysis, customized RTM model runs were executed to represent the base scenario and potential future transportation scenarios as described in Section 3.1 - Scenarios. To assist in the review of evaluation results below, the scenarios are labelled as follows:

- S1 = Terwillegar Drive Interchanges
- S2 = Capital Line Extension + Complete Heritage Valley Park & Ride
- S3 = BRT from Ambleside to South Campus

Vehicle Hours / Vehicle Kilometres / Emissions

Two broad measures of transportation system efficiency are vehicle-hours travelled (VHT) and vehicle-km travelled (VKT), both of which are correlated with production of emissions. Decreases in

Table 3.1 - Broad Evaluation of Road and Transit Scenarios

STRATEGIC GOALS	STRATEGIC OUTCOMES	CRITERIA	Applied To Evaluation of SW Edmonton Transportation Scenarios	Scenarios Providing More Based On Private Vehicles	Scenarios Providing More Based On Public Transit
Healthy City	Edmonton is a safe and caring community	<i>Edmontonians have increased access to affordable and safe housing and transportation options.</i>	All scenarios increase access to housing and transportation. Transit as a mode generally is more affordable than private vehicle ownership, therefore LRT and BRT scenarios provide better affordability options. Riding transit is also safer statistically than riding in a motor vehicle.	○	++
		<i>Edmontonians have access to physical and mental health support for all stages of their lives</i>	All scenarios broadly equivalent. (Could argue that driving in congestion can be stressful, but congested transit vehicles can also be stressful.)	○	○
	Edmontonians are healthy and fulfilled	<i>The City of Edmonton strategies, services, facilities and spaces improve connectivity for all identities.</i>	With regard to these scenarios, this criterion is considered same as "access" above.	n/a	n/a
		<i>Edmonton's public spaces, festivals and events increase its vibrancy</i>	Although transit (especially LRT) generally supports TOD / town centre / public space objectives better, the material benefits are more dependent on other actions and decisions, and are generally achievable under all scenarios.	○	○
		<i>Edmonton maintains air and water quality that sustains healthy people and healthy ecosystem</i>	LRT has no localized emissions and therefore is advantageous with regard to air quality.	○	+
	Urban Shift	Edmontonians live in complete and uplifting neighbourhoods	<i>Edmontonians have access to holistic, integrated neighbourhood level amenities for all seasons</i>	With regard to these scenarios, this criterion is considered the same as "public spaces, festivals, and events" above.	n/a
<i>The City of Edmonton's has a more efficient, connected and integrated multi-modal transportation system that encourages utilization of transit and active transportation modes</i>			The LRT/BRT scenarios are inherently more encouraging of transit.	○	+
Edmonton has appropriate and accessible infrastructure		<i>Edmonton's neighbourhoods are built to be safer and more dense with diverse housing options</i>	The scenarios do not address this type of criterion materially. Density is a prerequisite for effective transit, but transit is not a direct "cause" of density.	n/a	n/a
		<i>The City of Edmonton maintains and provides adaptable, accessible and appropriate infrastructure for the city</i>	With regard to these scenarios, this criterion is generalized and doesn't distinguish between the scenarios in a clear manner.	n/a	n/a

Table 3.1 - Broad Evaluation of Road and Transit Scenarios

STRATEGIC GOALS	STRATEGIC OUTCOMES	CRITERIA	Applied To Evaluation of SW Edmonton Transportation Scenarios	Scenarios Providing More Based On Private Vehicles	Scenarios Providing More Based On Public Transit
Regional Economic Resilience	Edmonton region has an innovative, diverse and entrepreneurial economy	<i>Edmonton increases innovation and entrepreneurial capacity in the region</i>	The scenarios do not address this type of criterion materially.	n/a	n/a
		<i>The City of Edmonton partners to increase the reach and effectiveness of support for entrepreneurship and business innovation</i>	The scenarios all potentially contribute to general support of priorities for entrepreneurship and business innovation.	○	○
	Edmonton region has an integrated and globally competitive business climate	<i>The City of Edmonton has reduced barriers to business growth and better meets the needs of business and industry</i>	The scenarios all potentially contribute to general support of priorities for business and industry.	○	○
		<i>The City of Edmonton has more balanced and sustainable revenue streams</i>	The transit scenarios generate revenue such as fares and advertising; the road scenarios do not generate revenue (in the absence of tolls).	○	+
The City of Edmonton has a resilient financial position	<i>The City of Edmonton has a more equitable share of the financial responsibility for infrastructure and services that benefit the region and Alberta</i>	The LRT scenarios generally incorporate substantial provincial / federal cost-sharing and thus improve (reduce) the City's share of financial responsibility (in the current inter-governmental framework); in other funding frameworks, expressways such as Yellowhead Trail or Whitemud Drive have been significantly cost-shared by provincial / federal funds, and potentially could be again over the next decade based on, say, better connectivity to an international airport; thus propose to deem this criterion as 0-0 between the scenarios.	○	○	
Energy and Climate	Edmonton has robust infrastructure that ensures the continuity of critical services	<i>Edmonton's neighbourhoods and infrastructure are better prepared and more resilient to disaster, crisis and severe weather impacts</i>	LRT is (generally) less affected by severe weather. Disaster and crisis performance of transit versus private automobile scenarios is dependent on the type of disaster or crisis.	○	○
	Edmonton is an energy sustainable city	<i>Edmonton sources energy more sustainably and Edmontonians are engaged in using energy more efficiently</i>	LRT is fully electrified, electric buses are on-order, and private vehicle electrification is also increasing; the electric grid in Alberta serves most electric vehicles and is transitioning toward renewables; thus the scenarios all support this criterion. Transit scenarios are more energy-efficient per passenger.	+	++
		<i>The City of Edmonton manages operations to generate fewer greenhouse gas emissions as we grow</i>	This criterion relates to the City's internal operations, thus the scenarios capitalizing on electrification of the transit fleet are most-supportive of this criterion. However, this aspect is captured largely in the other Energy & Climate criterion.	n/a	n/a

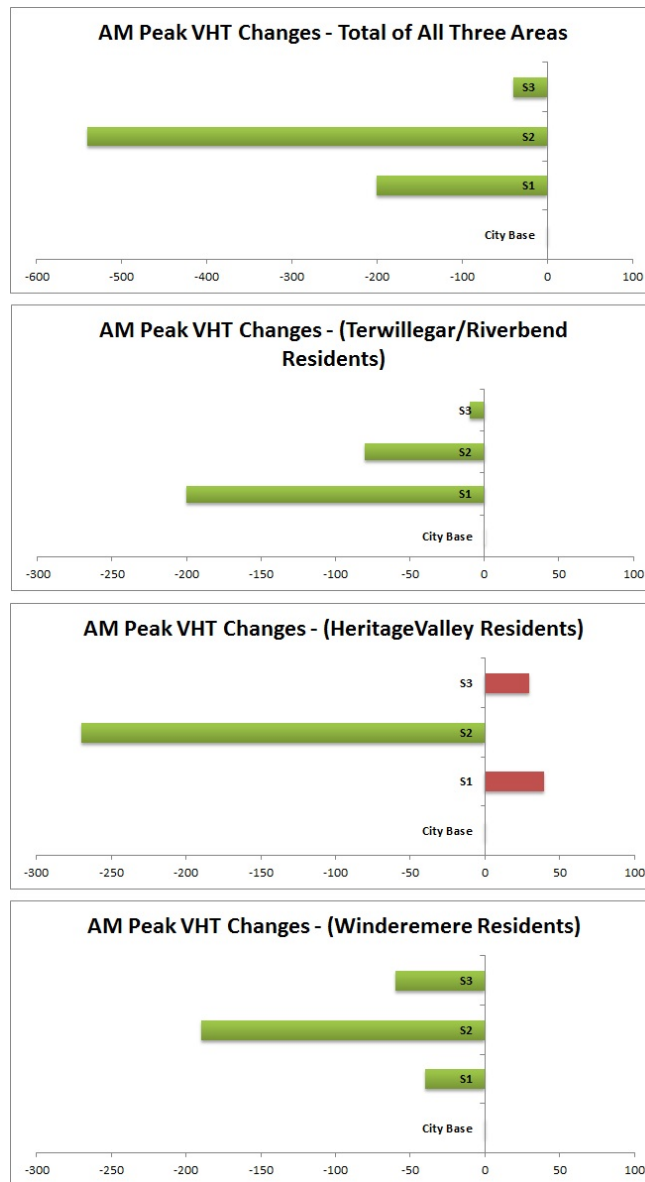
Note:
Council has also adopted a fifth strategic goal "Building a Great City" with strategic outcomes and criteria focused more-internally on operational excellence of the municipal corporation.

Legend:
○ indicates that the scenario is relatively neutral for the corresponding criterion.
+ indicates that the scenario is relatively better for the corresponding criterion, in at least one substantive aspect
++ indicates that the scenario is relatively better for the corresponding criterion, in at least two substantive aspects

VHT and/or VKT are generally preferable in terms of greater efficiency at the overall network and individual traveler levels (as well as decreases in emissions).

Figure 3.2 illustrates model estimates of the increase or decrease in total vehicle-hours travelled (VHT) in the AM Peak (morning rush hours), as compared to the Base Scenario, for the three sub-areas of interest within the Southwest sector of Edmonton, individually and in total. Decreases in VHT represent less time expended by people making their trips to/from destinations in the AM Peak, with lower VHT being more efficient in terms of time as well as generally lower emissions.

FIGURE 3.2 - CHANGES IN VEHICLE HOURS TRAVELED (VHT)

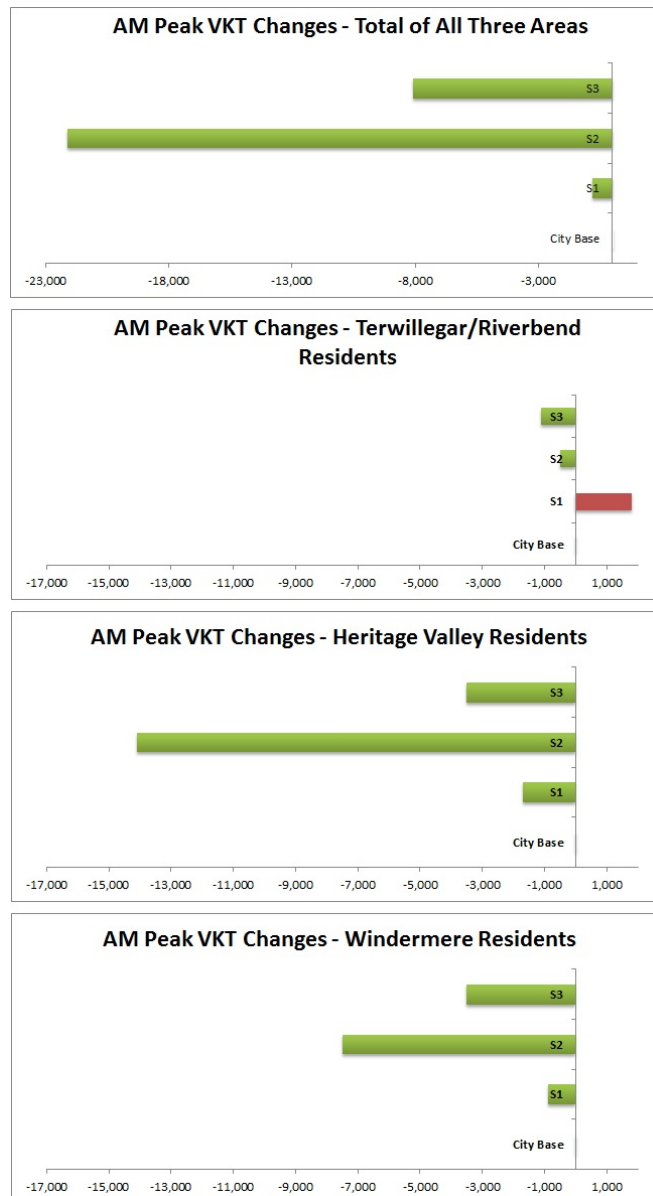


Source: City of Edmonton, Urban Analysis | Systems Analytics Group, February, 2018.

This figure shows that the greatest reduction in VHT is associated with Scenario 2 (LRT extension), on an overall basis and for both of the sub-areas (Heritage Valley and Windermere) south of Anthony Henday Drive (where the LRT extension would directly improve transit access, and decrease time spent driving to Park & Ride and/or ultimate destinations). For the Terwillegar/Riverbend sub-area, the greatest reduction in VHT is associated with Scenario 1 (Terwillegar Drive interchanges).

Figure 3.3 illustrates model estimates of the increase or decrease in total vehicle-km travelled (VKT) in the AM Peak (morning rush hours), as compared to the Base Scenario, for the three sub-areas of interest within the Southwest sector of Edmonton, individually and in total. Decreases in VKT represent less distance being travelled by people making their trips to/from destinations in the AM Peak, with lower VKT being more efficient in terms of vehicle / infrastructure wear-and-tear, as well as generally lower emissions.

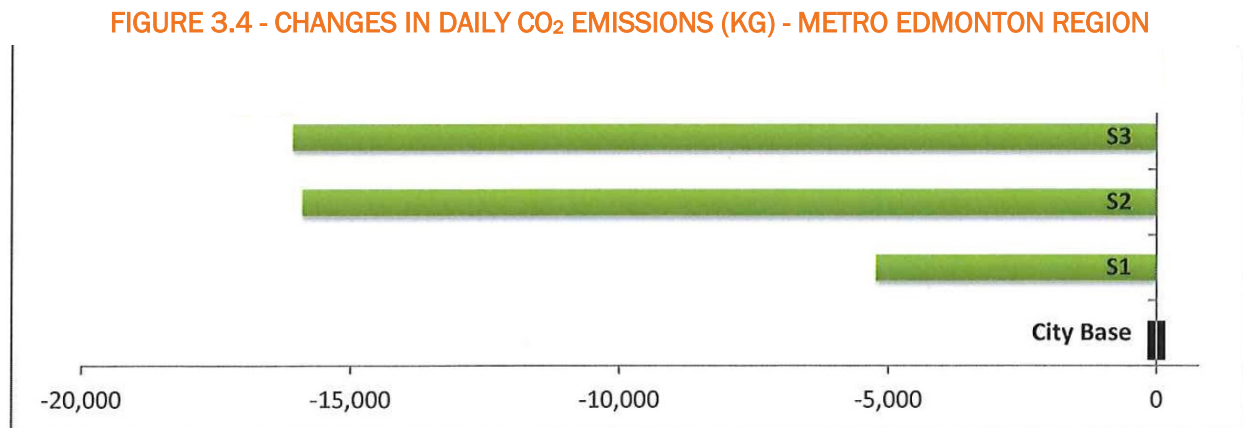
FIGURE 3.3 - CHANGES IN VEHICLE KILOMETRES TRAVELED (VKT)



Source: City of Edmonton, Urban Analysis | Systems Analytics Group, February, 2018.

Similar to the previous figure, this figure shows that the greatest reduction in VKT is associated with Scenario 2 (LRT extension), on an overall basis and for both of the sub-areas (Heritage Valley and Windermere) south of Anthony Henday Drive (where the LRT extension would directly improve transit access, and decrease distances driven to Park & Ride and/or ultimate destinations). For the Terwillegar/Riverbend sub-area, the changes are less pronounced but the larger reduction in VKT is associated with Scenario 3 (BRT from Ambleside to South Campus), likely because it offers an improved transit-based alternative to private motor vehicle users which would attract travelers to transit (also opening up road capacity that is back-filled by other motor vehicles).

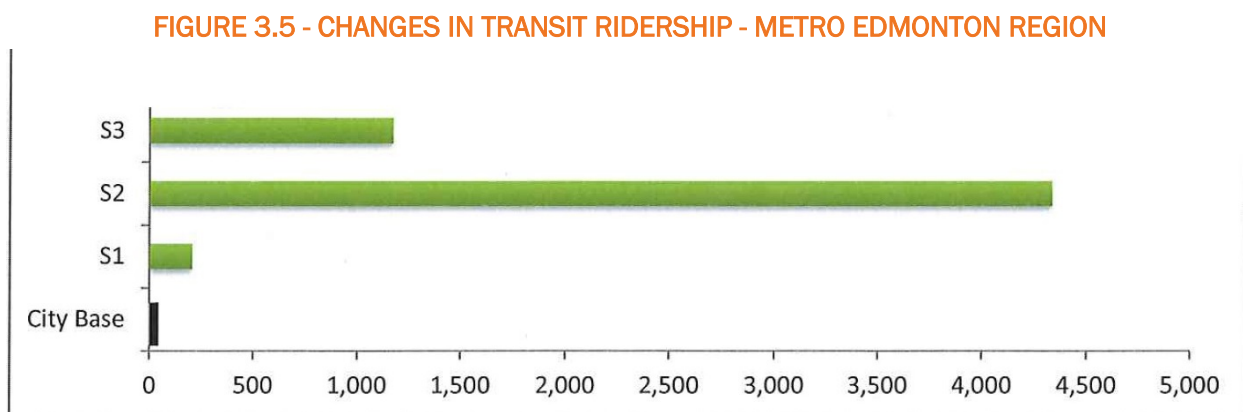
Figure 3.4 displays the changes in city-wide daily CO₂ emissions modeled for the three scenarios, as compared to the Base Case, and indicates that Scenario 3 (BRT from Ambleside to South Campus) and Scenario 2 (LRT extension) would both result in greater decreases in emissions than Scenario 1 (Terwillegar Drive interchanges).



Source: City of Edmonton, Urban Analysis | Systems Analytics Group, February, 2018.

Transit Ridership

Figure 3.5 provides an overview of the impact of each of the scenarios in terms of attracting additional transit ridership, as compared to the Base Case. The figure indicates that Scenario 2 (LRT extension) would attract the greatest amount of additional transit ridership, followed by Scenario 3 (BRT from Ambleside to South Campus).



Source: City of Edmonton, Urban Analysis | Systems Analytics Group, February, 2018.

Roadway Congestion

As shown herein, all three scenarios impart network benefits on the overall Southwest Edmonton transportation network and/or city-wide network. However, the model results do not indicate that any of the scenarios eliminate or significantly reduce roadway congestion except in localized areas (while

other areas upstream or downstream then become the 'critical locations' for observable roadway congestion).

Combination Scenarios

It is recognized that various combinations of the scenarios or scenario elements discussed in this assessment may be appropriate, and further modeling and analysis would be necessary to reflect the specific combinations of interest.

4.0 Conclusions

Based on the assessment undertaken, the following conclusions can be reached.

1. Southwest Edmonton has experienced significant population and employment growth in recent years, and this growth is expected to continue.
2. The growth in Southwest Edmonton has increased travel demand and resulted in peak-hour congestion on key transportation facilities (road and transit) that is tangible to motorists and transit users.
3. In addition to transportation infrastructure in-progress or upcoming by others (such as area developers and Alberta Transportation), the City of Edmonton has plans in place for major corridor facilities including upgrades to Terwillegar Drive and extension of Capital Line LRT across Anthony Henday Drive.
4. This assessment addresses the two noted corridor options plus a third option based on BRT along Terwillegar Drive connecting Windermere to South Campus Station. This option should be subject to concept-design treatment if it is to be pursued further as part of capacity improvements for Southwest Edmonton.
5. Based on broad evaluation using Council Strategic Goals, the scenarios based on public transit (i.e., Scenario 2 - Capital Line LRT Extension, and Scenario 3 - Terwillegar Drive BRT) are more favourable than the scenario based on private motor vehicles (i.e., Scenario 1 - Terwillegar Drive Interchanges).
6. Based on technical evaluation using regional travel modeling, Scenario 2 (Capital Line LRT Extension) provides the greatest reductions in vehicle-hours traveled (VHT), vehicle-kilometres traveled (VKT), and emissions. Similarly, Scenario 2 attracts the greatest amount of additional transit ridership.
7. The technical evaluation indicates that Park & Ride has an important role in supporting any LRT or BRT scenario. Thus Scenario 2 (Capital Line LRT Extension) and Scenario 3 (Terwillegar Drive BRT) include expanded Park & Ride at Heritage Valley and/or Ambleside, which should be incorporated into either scenario. This will allow more private vehicle drivers the option of driving to a closer Park & Ride location rather than all the way to their destinations, for those willing or able to choose this option.
8. The technical evaluation also indicates that, based on travel demand patterns in Southwest Edmonton (and similar to the situation in other sectors of Edmonton), significant road network congestion is expected to remain a characteristic of any of the three scenarios evaluated.

APPENDIX A:
SELECTED TRANSPORTATION
NETWORK PERFORMANCE DATA

INTERSECTION LEVEL OF SERVICE - TERWILLEGAR/RIVERBEND

TERWILLEGAR DRIVE (TWD)

Signalized Intersections	AM		PM		OFF	
	LOS	V/C	LOS	V/C	LOS	V/C
Haddow Drive - TWD	B	0.56	A	0.51	A	0.32
23 Avenue - TWD NB	C	0.6	C	0.52	C	0.43
23 Avenue - TWD SB	B	0.32	C	0.52	C	0.32
RHR - TWD NB	D	0.68	C	0.49	C	0.44
RHR - TWD SB	B	0.33	B	0.54	B	0.43
40 Avenue - TWD NB	F	1.04	C	0.46	C	0.43
40 Avenue - TWD SB	B	0.33	C	0.82	B	0.58

RIVERBEND ROAD (RBR)

Signalized Intersections	AM		PM		OFF	
	LOS	V/C	LOS	V/C	LOS	V/C
Haddow Drive - RBR	B	0.22	B	0.23	B	0.19
Riverbend Road - RHR	B	0.46	B	0.33	B	0.26
56 Avenue - RBR	A	0.18	A	0.18	A	0.17
53 Avenue - *WMD NB	B	0.35	B	0.26	A	0.19
53 Avenue - *WMD SB	B	0.43	B	0.41	A	0.2

RABBIT HILL ROAD (RHR)

Signalized Intersections	AM		PM		OFF	
	LOS	V/C	LOS	V/C	LOS	V/C
Mullen Road -RHR	C	0.81	B	0.62	A	0.49
Mullen way -RHR	A	0.56	A	0.51	A	0.49
Mactaggart Drive - RHR	B	0.68	B	0.62	A	0.54
RHR - Carter crest Rd	A	0.34	A	0.27	A	0.24

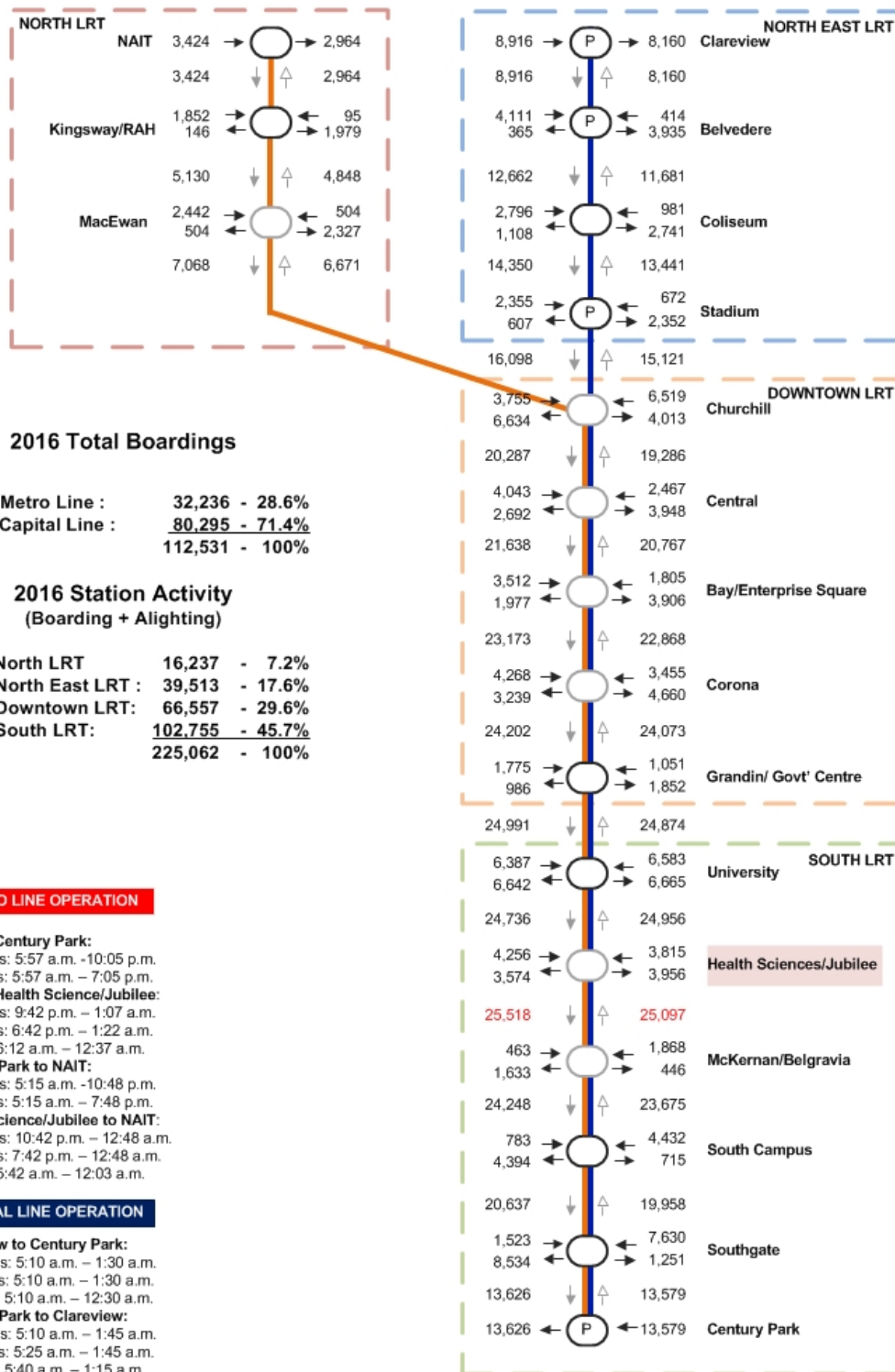
23 AVENUE

Signalized Intersections	AM		PM		OFF	
	LOS	V/C	LOS	V/C	LOS	V/C
23 Avenue - Hodgson way	B	0.51	B	0.67	A	0.33
23 Avenue - RHR	C	0.55	D	0.63	D	0.55
23 Avenue - Leger Gate	A	0.31	B	0.32	A	0.22
23 Avenue - Town Centre	C	0.59	B	0.52	B	0.33

*WMD : Whitemud Drive

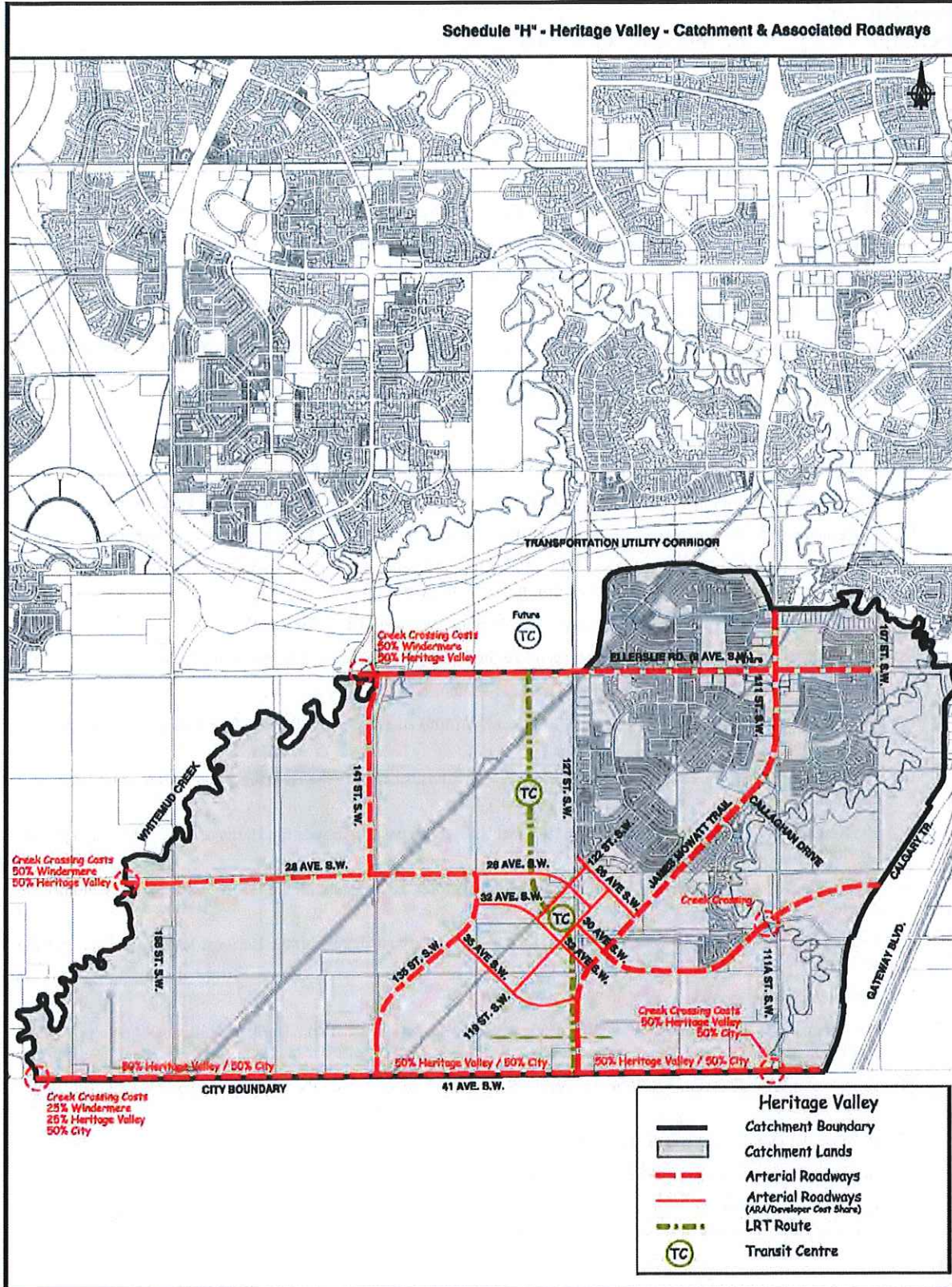
METRO AND CAPITAL LINES AVERAGE DAILY PASSENGER FLOW MAP

2016 - Typical Fall Weekday



APPENDIX B:
ARTERIAL ROAD ASSESSMENT (ARA)
MAPS FOR SW EDMONTON

Schedule "H" - Heritage Valley - Catchment & Associated Roadways

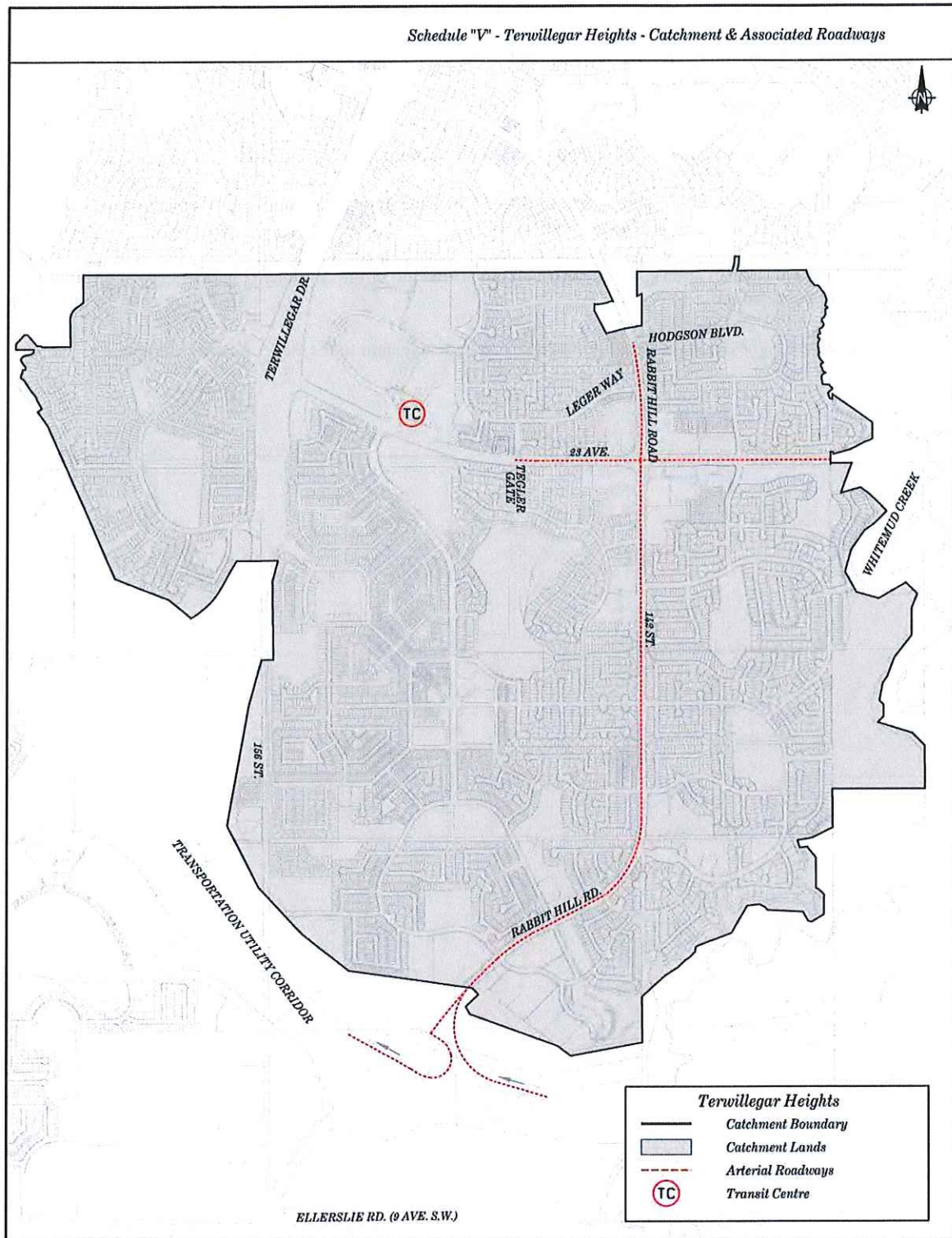


Schedule “H”
Heritage Valley – Catchment & Associated Roadways

The following Arterial Road Improvements are included in the Heritage Valley Catchment:

1. Ellerslie Road (two lanes) – 107 Street S.W. to 127 Street S.W.
2. Ellerslie Road (four lanes) – 127 Street S.W. to Whitemud Creek
3. 41 Avenue S.W. (four lanes) – Calgary Trail to Whitemud Creek (50%/50% cost share with the City of Edmonton)
4. 111 Street S.W. (two lanes) – Transportation Utility Corridor to Ellerslie Road
5. 111 Street S.W. (four lanes) – Ellerslie Road to 25 Avenue S.W.
6. 111 Street S.W. (two lanes) – 25 Avenue S.W. to 41 Avenue S.W.
7. 127 Street S.W. (two lanes) – Ellerslie Road to 20 Avenue S.W. (roadway construction is complete – subsequent over expenditure is cost recoverable)
8. 141 Street S.W. (four lanes) – Ellerslie Road to 25 Avenue S.W.
9. Blackmud Creek crossing at 30 Avenue S.W.
10. Blackmud Creek crossing at 41 Avenue S.W. (50%/50% cost share with the City of Edmonton)
11. Whitemud Creek crossing at Ellerslie Road (50%/50% cost share with the Windermere ARA Catchment)
12. Whitemud Creek crossing at 25 Avenue S.W. (50%/50% cost share with the Windermere ARA Catchment)
13. Whitemud Creek crossing at 41 Avenue S.W. (25%/25%/50% between the Heritage Valley ARA Catchment, the Windermere ARA Catchment and the City of Edmonton, respectively)
14. Transit centre right-of-way dedication north of 28 Avenue SW, west of 127 Street SW
15. Transit centre right-of-way dedication between 119 Street SW and 122 Street SW, north of 32 Avenue SW
16. 135 Street S.W. (four lanes) – 28 Avenue S.W. to 41 Avenue S.W.
17. 26 Avenue S.W. – James Mowatt Trail to 127 Street SW (50% cost share with the Heritage Valley ARA and private development)
18. 28 Avenue SW – 119 Street S.W. to 135 Street S.W. (50% cost share with the Heritage Valley ARA and private development)
19. 30 Avenue S.W. – James Mowatt Trail to 119 Street S.W. (50% cost share with the Heritage Valley ARA and private development)
20. 32 Avenue S.W. – James Mowatt Trail to 135 Street S.W. (50% cost share with the Heritage Valley ARA and private development)
21. 35 Avenue S.W. – James Mowatt Trail to 135 Street S.W. (50% cost share with the Heritage Valley ARA and private development)
22. 119 Street S.W. – 35 Avenue S.W. to 32 Avenue S.W.
23. 119 Street S.W. – 32 Avenue S.W. to 26 Avenue S.W. (50% cost share with the Heritage Valley ARA and private development)
24. 122 Street S.W. – 32 Avenue S.W. to 26 Avenue S.W. (50% cost share with the Heritage Valley ARA and private development)
25. 30 Ave S.W. (four lanes) – Calgary Trail to James Mowatt Trail
26. 28 Ave S.W. (four lanes) – 135 Street S.W. to Whitemud Creek
27. Ten million dollars for 41 Avenue S.W. Interchange or 127 Street S.W. Interchange at the QE II highway (as per the Heritage Valley Memorandum of Understanding)

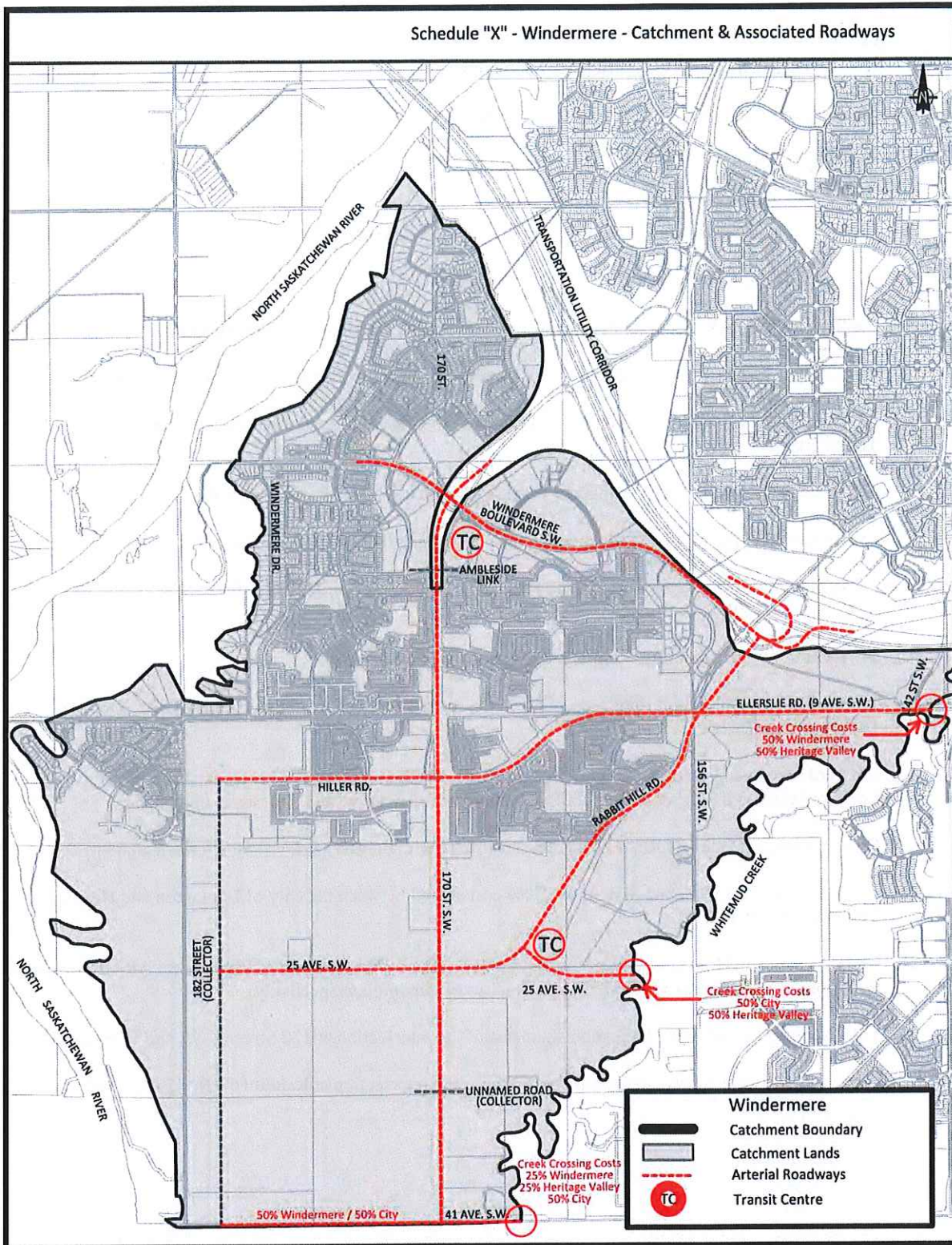
Schedule "V" - Terwillegar Heights - Catchment & Associated Roadways



Schedule “V”
Terwillegar Heights – Catchment & Associated Roadways

The following Arterial Road Improvements are included in the Terwillegar Heights ARA Catchment:

1. 23 Avenue (two lanes) – Whitemud Creek to Tegler Gate
2. Rabbit Hill Road (two lanes) – 23 Avenue to the Transportation Utility Corridor
3. Rabbit Hill Road – transition lanes north of the 23rd Avenue intersection and improvements required for access onto Leger Way and Hodgson Boulevard
4. The permanent right-in and right-out ramps on the north side of the Anthony Henday Drive and Rabbit Hill Road interchange
5. Transit centre right-of-way dedication along 23 Avenue adjacent to the Leger District Campus



Schedule “X”
Windermere – Catchment & Associated Roadways

The following Arterial Road Improvements are included in the Windermere ARA Catchment:

1. Windermere Boulevard S.W. (four lanes) – 156 Street S.W. to approximately 350 metres west of 170 Street
2. Ellerslie Road (four lanes) – Whitemud Creek to 170 Street S.W.
3. Hiller Road (four lanes) – 170 Street S.W. to 182 Street S.W.
4. Rabbit Hill Road S.W. (four lanes) – Transportation Utility Corridor to 25 Avenue S.W.
5. 170 Street N.W. & S.W. (two lanes) – Transportation Utility Corridor to Ambleside Link S.W.
6. 170 Street S.W. (four lanes) – Ambleside Link S.W. to Unnamed Road (Collector) North of 41 Avenue S.W.
7. 170 Street S.W. (two lanes) – Unnamed Road (Collector) North of 41 Avenue S.W. to 41 Avenue S.W.
8. 25 Avenue S.W. (two lanes) Whitemud Creek to Unnamed Road (Collector) east of Rabbit Hill Road S.W.
9. 25 Avenue S.W. (four lanes) – Unnamed Road (Collector) east of Rabbit Hill Road S.W. to 182 Street S.W.
10. 41 Avenue S.W. (two lanes) –Whitemud Creek to 182 Street S.W.
11. The permanent right-in and right-out ramps on the south side of the Anthony Henday Drive and 156 Street interchange
12. The earth works and grading for the 170 Street S.W. re-alignment within the Transportation Utility Corridor lands, at the location south of the Anthony Henday Drive and 170 Street interchange
13. Creek crossing at Ellerslie Road (50%/50% cost share with the Heritage Valley ARA Catchment)
14. Creek crossing at 25 Avenue S.W. (50%/50% cost shared between the City of Edmonton and Heritage Valley ARA Catchment)
15. Creek crossing at 41 Avenue S.W. (cost shared 25%/25%/50% between the Windermere ARA Catchment, the Heritage Valley ARA Catchment and the City of Edmonton, respectively)
16. Transit centre right-of-way dedication southeast of the intersection at 170 Street N.W. and 9 Avenue N.W.
17. Transit Centre right-of-way dedication northeast of the intersection at Rabbit Hill Road S.W. and 25 Avenue S.W.