Bremner Area Project

Transportation Plan – Final Draft

Prepared for:
Strathcona County

Prepared by:
Stantec Consulting Ltd.

March 27, 2019

Table of Contents

Draft Transportation Plan

1 INTRODUCTION – VISION & PRINCIPLES

The Vision for the future of the Bremner Area Concept Plan (ACP) is ambitious: a green, connected, and diverse community, where people have choices and opportunities in how they live, work, and get around. Transportation infrastructure is key in implementing this Vision. Conscientious planning to deliver a transportation network that is truly multimodal requires coordination between land use planners, economic development, transit agencies, and community groups.

This Transportation Master Plan covers the areas of both Bremner and the Local Employment Area (LEA). The Bremner Area is part of the larger Edmonton Metropolitan Region and is situated at the crossing of two major highways. A successful Transportation Plan for Bremner must be both inward and outward looking. Bremner needs a street network that is safe, functional, multimodal, and sustainable over the lifespan of the community. Supporting that local network is an external transportation network that provides vital links to destinations in Strathcona County and the Region.

The Bremner Transportation Plan, in combination with the Bremner ACP and Bremner Design and Construction Standards (DCS), form a package that defines the ambitions for Bremner's transportation network and the tools necessary to implement that ambition. The Transportation Vision and Network Principles form the basis of this plan.

Transportation Goal

Bremner has an accessible, connected, and integrated multimodal transportation system that provides mobility, access for goods and services, safety for all users, and links to local and regional destinations.

Transportation Network Objectives

Demographics – The transportation network supports users of all ages, abilities, and incomes.

Access, Mobility, and Connectivity – The transportation network provides access in all seasons to residents and businesses by all modes of transportation within Bremner, Strathcona County, and the Edmonton Metropolitan Region.

Safety & Health – The transportation network is designed to help achieve a vision of no one being seriously or fatally injured while using it, regardless of mode. The network provides active transportation and recreation opportunities that promote healthy lifestyles.

Integration – The transportation network is context sensitive, supported by complementary land uses and quality multimodal infrastructure that provides proximity to services and integrated mobility options for travel between origins and destinations.

Winter Design – The transportation network is useable and accessible to users of all modes in all seasons.

Green Infrastructure – The transportation network is integrated with open spaces, including storm water systems, public infrastructure, and natural habitats.

Smart City –The transportation network is adaptable to community needs and the changing future.

1.1 OUTLINE

The Transportation Plan outlines a high-level plan for Bremner from opening day to full build out. To support that growth, the Transportation Plan begins with a review of the regional and local context. The Transportation Plan is integrated with the land use plan developed in the ACP, transportation plans from surrounding urban growth areas and other jurisdictions, and the direction from the Edmonton Metropolitan Region Board (EMRB). The Transportation Plan describes the general network and targeted outcomes. The Transportation Plan is supplemented by the Bremner DCS.

The Bremner Transportation Plan is organized as follows:

Section 1: Introduction – Vision & Principles

This section outlines the intent of the Transportation Plan, the Transportation Vision, and the Transportation Network Principles.

Section 2: Context and Framework

This section provides the policy framework for the Bremner Transportation Plan and identifies supporting documents. Key regional infrastructure is identified as it relates to Bremner and impacts it may have. This section also summarizes the land use direction from the Bremner ACP.

Section 3: Transportation Philosophy

This section introduces the concept of Complete Streets and key supporting design philosophy that will direct transportation infrastructure in Bremner including Universal Design, Winter City Design, the concept of Link and Place, Safe Systems and Vision Zero, Design Users, and Street Principles.

Section 4: Bremner Area Transportation Plan

This section presents the Bremner Area Transportation Plan in the context of the Transportation Vision and Network Principles. The section includes transportation networks and policies for all modes of transportation.

Section 5: Implementation

This section identifies a high-level implementation strategy for the Bremner Transportation Plan.

2 CONTEXT AND FRAMEWORK

The Bremner Transportation Plan supports the implementation of the Bremner ACP and Bremner Utilities Plan. The Transportation Plan will be implemented, in part, through the application of the Bremner DCS. This section presents the policy framework that supports and influences Bremner and has directed the Transportation Plan.

2.1 POLICY FRAMEWORK

A brief description of Strathcona County policy documents that impact the Transportation Plan are summarized below.

Strathcona County Municipal Development Plan (MDP) – Bylaw 20-2017: *Forwarding Our Future. Together*. 2017
The recent update to the Strathcona County MDP includes specific consideration for Bremner. The MDP includes objectives related to complete communities, compact form, and transit-oriented development.

The MDP highlights a requirement for multimodal transportation and transit corridors. Active transportation infrastructure is to be connected throughout Bremner, and vehicular level of service guidelines are to be based on the transportation goals of Bremner.

Strathcona County Integrated Transportation Master Plan (ITMP), 2012
The ITMP was approved prior to selecting Bremner as the official urban growth node for Strathcona County. However, the ITMP did include Future Urban Growth Areas, with ambitious goals for transportation mode shift away from single-occupant vehicles for urban growth areas. The guiding principles for the ITMP include Sustainable Transportation, Regional Transportation Integration, Land Use Integration, Transit, Active Transportation, Travel Choices and Demand Management, Transportation System Management, and Multimodal Transportation Network.

The Bremner Transportation Plan will supplement the ITMP with specific focus on the goals and objectives of Bremner.

2.2 REGIONAL CONTEXT

Bremner will play an important role in the future of the Edmonton Metropolitan Region and will depend on coordination of regional infrastructure for success. High-quality regional transit services are needed to provide travel options for regional employment. Bremner is located with

access to two major Provincial and National highways (Highways 16 and 21), which constrains the number of vehicular access points into the community due to standards for interchange spacing. Bremner residents will be impacted by regional population growth, highway expansions, intersection locations, river crossings, regional active transportation networks, and LRT expansion. Key regional policies and infrastructure that are considered for the Bremner Transportation Plan are summarized below.

2.2.1 Edmonton Metropolitan Region Board Growth Plan and Transportation Plan

The 2016 Edmonton Metropolitan Region Board Growth Plan has identified Bremner as part of the Metropolitan Area containing an Urban Centre. an Urban Centre, is defined as "central urban areas in the metropolitan area that provide a sub-regional level of service. Urban centres are intended to accommodate mixed use development at higher intensities and include downtowns and central areas of urban communities." The Growth Plan directs urban densities to coordinate development in a sustainable manner across the Edmonton Metropolitan Region. As part of a larger region, Bremner will ultimately be impacted by regional growth and transportation decisions like investment in higher order transit and road infrastructure.

2.2.2 Alberta Transportation

Alberta Transportation is the managing authority of Highway 16 and Highway 21, and is undertaking a number of projects and studies to identify access needs to Bremner including the:

- Highway 16 Functional Planning Study from Clover Bar Road to Highway 21; and
- Bremner Highway Access Review.

The Highway 16 Functional Planning Study from Clover Bar Road to Highway 21 remained ongoing at the time of completion of this document. The results of the Bremner Highway Access Review are identified in the Street Plan for Bremner and the LEA and are discussed in more detail in the attached Bremner Model Update Memo (Appendix A).

2.2.3 Sherwood Park

Sherwood Park is the existing major Urban Area within Strathcona County. Particularly in the short term, Sherwood Park will be an important connection for regional services and potential employment for many residents of Bremner.

2.3 BREMNER ACP

2.3.1 ACP Description

The Bremner ACP encompasses a total area of 2108.52 ha, and an additional 969.62 ha in the LEA. The overall study area is bounded by Highway 21 to the west, Point-Aux-Pins Creek to the north, Range Road 222 to the east, and the CN Rail Line to the south. The purpose of the ACP is to establish a framework for future land use planning and the provision of municipal infrastructure, services, and amenities in conformance with established planning policies, objectives, and requirements of Strathcona County based on the characteristics and opportunities contained within the site.

The Transportation Plan is a non-regulatory document that supports the implementation of the Vision of the ACP through identifying important transportation considerations for Bremner. The transportation and land use plan work together to impact how residents will get to work, school, and recreation. Affordability, safety, and health are intertwined between housing and transportation choices.

2.3.1.1 ACP Vision and Principles

The ACP is established with a central Vision and eight Principles to shape the plan. The Vision and Objectives for the transportation plan were established with consideration for these overarching principles.

Vision – The vision for the Bremner ACP informs the Transportation Plan through establishing the core values of Bremner. The Vision was adopted from the Bremner Growth Management Strategy (2014), a document that was endorsed by Strathcona County Council in 2016. The Vision was created in consultation with the public, landowners, and community stakeholders. The Vision is also included in the County's Municipal Development Plan (MDP) and is summarized below.

Table 1: Bremner Vision

Green	Connected	Diverse
• Natural features • Agricultural opportunities • Environmental sustainability • Healthy and active neighbourhood	• Walkable destinations • Transit connections to the region • Diverse housing opportunities	• Educational and employment opportunities • Distinct urban destinations • Connections for all modes • Mixed use places with diverse activities

The Principals for the Bremner ACP have also been adopted from the Bremner Growth Management Strategy and were created in consultation with the public, landowners, and community stakeholders:

1. ***Protect and Enhance the Natural Environment;***
2. ***Maintain and Support Agriculture;***
3. ***Reinforce and Diversify the Economy;***
4. ***Accommodate a Diversity of Housing;***
5. ***Provide Transportation Options for Everyday Travel;***
6. ***Create Strong, Distinctive and Safe Neighbourhoods;***
7. ***Establish a Hierarchy of Mixed-use Places; and***
8. ***Provide a Full Range of Recreational and Cultural Amenities.***

The Transportation Plan's Philosophy is established in **Section 3** of this document. Associated Goals and policies are outlined in **Section 4**.

2.3.2 Land Use Development Concept

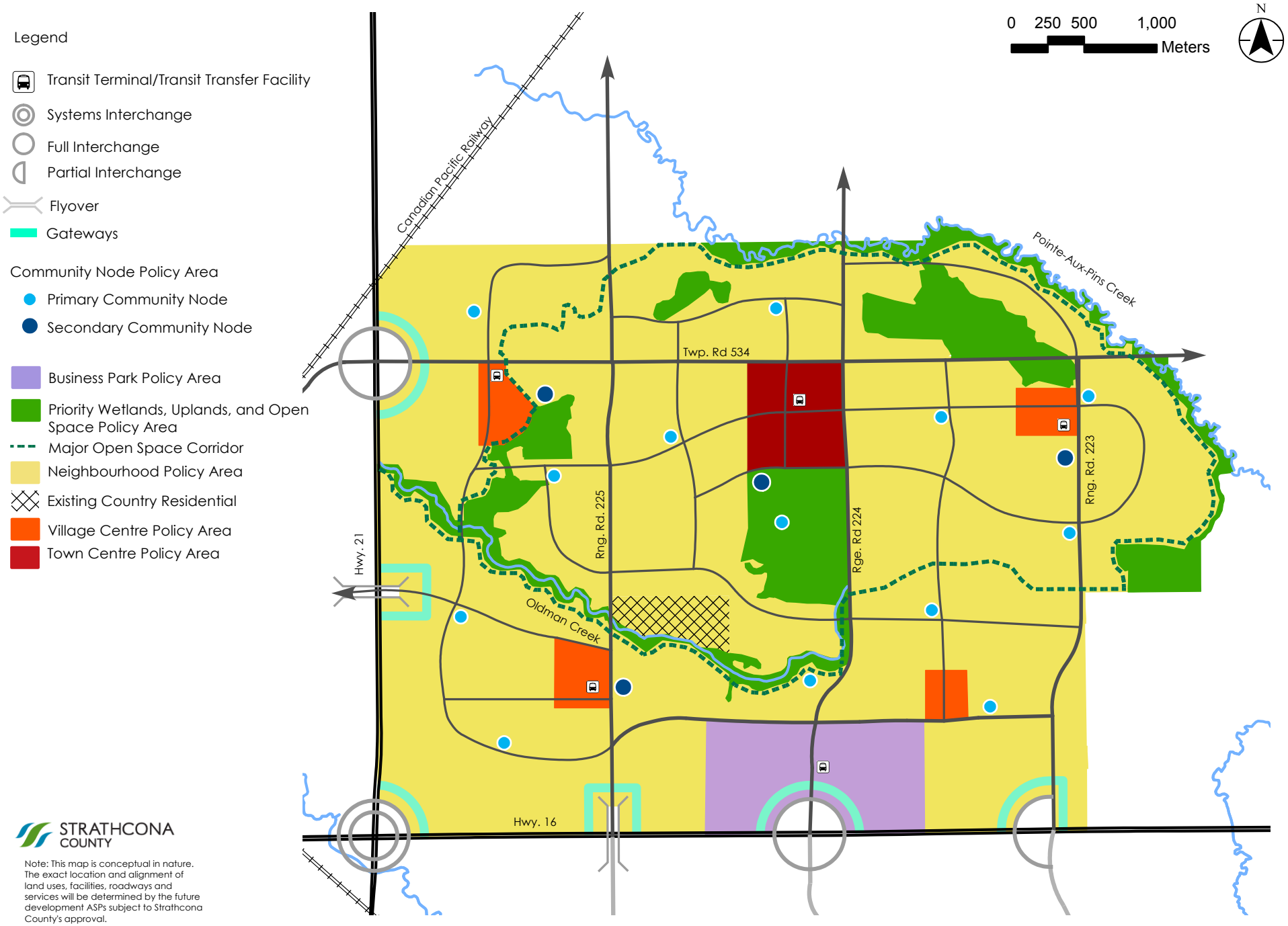
The land use concept was established to meet a number of overlapping goals and objectives. From a transportation perspective, residents will need to have access within, around, and through Bremner. The number of planned residents is based on minimum greenfield residential density identified by the Edmonton Metropolitan Region Growth Plan. The transportation network must respond to the resulting transportation demand. The stresses on the overall regional transportation network will be impacted by travel mode choices, which are further impacted by the land uses. The land use plan and supporting transportation network were created together and the policies and framework outlined in this document support the implementation of the ACP.

There are two areas within this Transportation Plan: Bremner and the LEA. The LEA is south of Highway 16 and is anticipated to be lower density industrial and employment land uses. North of Highway 16 is the Bremner portion of the study area and is arranged with higher density residential, mixed-use community nodes, Town and Village Centres and employment lands.

The Bremner Development Concept is illustrated in Map 1a and 1b.

MAP 1A

BREMNER DEVELOPMENT CONCEPT



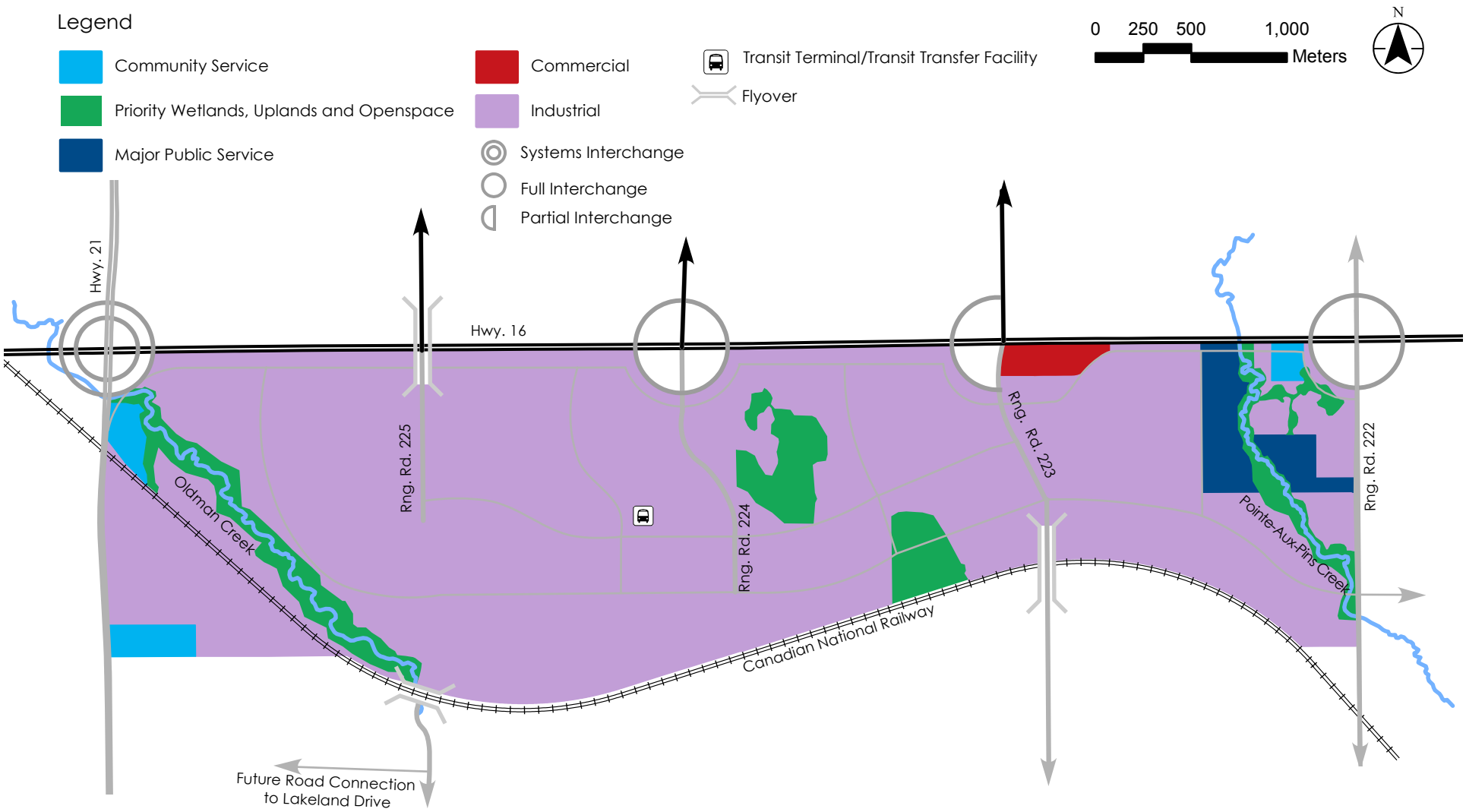
STRATHCONA COUNTY

Note: This map is conceptual in nature. The exact location and alignment of land uses, facilities, roadways and services will be determined by the future development ASPs subject to Strathcona County's approval.

BREMNER AREA CONCEPT PLAN

MAP 1B

LOCAL EMPLOYMENT AREA DEVELOPMENT CONCEPT



STRATHCONA COUNTY

Note: This map is conceptual in nature. The exact location and alignment of land uses, facilities, roadways and services will be determined by the future development ASPs subject to Strathcona County's approval.

The **Town Centre** is a central urban area that provides a sub-regional level of service. With a diverse mix of uses, the Town Centre will include commercial, cultural, and educational uses that service the entire community as well as high density residential. A transit station will connect the Town Centre to residents of Bremner and Strathcona County, as well as providing connections out of the Town Centre to regional destinations for the high-density residents.

Village Centres are service areas within a community that contains a Main Street and a mix of complementary land uses and activities in a compact form wherein the needs of daily life can be met within a convenient walking distance. They are characterized by a mix of uses including higher density residential housing, commercial and local community services. Village Centres focus on the provision of public transit opportunities and an active public realm.

The **Neighbourhood Policy Area** encompasses the majority of residential development within Bremner. Along with residential housing, this area will also include open space as well as local businesses and services to support active neighbourhoods and communities with a mix of uses. Residential areas will contain a variety of built forms to provide a diverse supply of housing that meets the broad range of needs and desires of future residents. Open space, such as community and neighbourhood parks with multi-use trails, will provide recreational opportunities and access for residents throughout their neighbourhood. Opportunities for local business and services will support the local economy while providing services in close proximity to where people live.

The **Existing Country Residential Areas** within Bremner will remain. This area consists of the existing subdivisions of Tidan Heights, Queensdale North, and Queensdale South. These existing country residential subdivisions will be incorporated into future sub-area structure plans with consideration for adjacent uses and impacts of development on existing homes.

The **Business Park Policy Area** consists primarily of light and medium industrial uses with limited convenience commercial services that can support the industrial businesses and employees. This area does not include residential development but provides opportunities for employment for surrounding residents. Included within the Business Park is a transit-controlled location to ensure that employment can be accessed by various modes of transportation.

The **Open Space Concept** identified a major open space corridor which connects Point-Aux-Pins creek to the Oldman Creek as well as other priority wetlands, uplands, and open space areas to create a continuous open space corridor that loops through Bremner. Additional open space connections to centres and community nodes will be used to provide access for residents to environmental reserve and open space areas.

Community Nodes will be essential places for recreation, education, and culture. They build community and support healthy lifestyles. Integrated complementary uses including major community services, open space, commercial, residential, and schools will provide walkable nodes that function as activity hubs within smaller neighbourhood units.

The **Local Employment Area** is bound by Highway 16 to the north, Range Road 222 to the east, the CP Rail Line to the south, and Highway 21 to the west. The CN Rail Line creates a distinct edge due to its low permeability and curvilinear path. The intended use of the Local

Employment Area is industrial and business employment, with direct connections to Bremner as well as connections to the rest of Strathcona County.

2.3.2.1 Population & Employment Estimates

Bremner is targeted to a higher density than Sherwood Park. This provides increased potential for transit and density around commercial, employment, and schooling. The typical densities and people per unit are summarized below.

Table 2: Bremner Housing Types

Type	% of Total Units	People/Unit
Single/Semi	49.3%	2.8
Row-house/Townhouse	44.0%	2.8
Mid-rise Apartment	4.8%	1.8
Mixed Use Residential	0.7%	1.5
High-Rise	1.2%	1.5

Low and medium density housing, located mostly in the Neighbourhood Policy Area, will house a mixture of demographic types, but will primarily consist of families, with or without children. Single people and young couples are more likely to be located in higher density and mixed-use areas. The mixed use and high density also provide opportunities for older adults looking to downsize and remain in their neighbourhoods within walking distance of amenities.

The estimated population demographics are summarized below. This estimate is based on previous population demographics developed for the Strathcona County travel demand model. The estimated population for Bremner is 79,000 people.

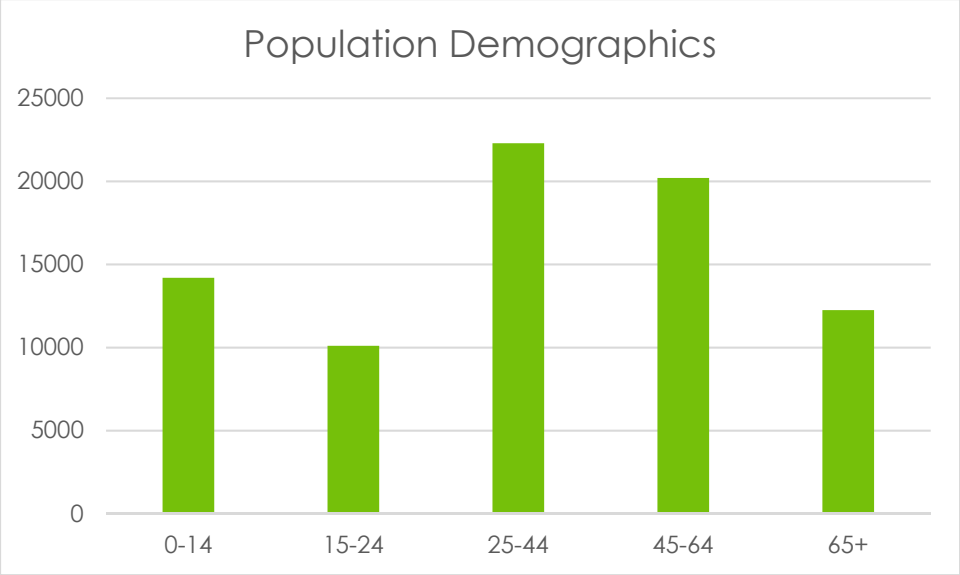


Figure 1: Bremner Population by Age

2.3.2.2 Employment

The employment areas in Bremner are concentrated primarily in the Business Park Policy Area and Town and Village Centres, as well as scattered throughout the Neighbourhood Policy Area and Community Nodes. There is also significant employment located south of Highway 16 in the Local Employment Area. Bremner is estimated to employ 17,301 people. There will be an additional 1,952 jobs within the LEA.

3 TRANSPORTATION PHILOSOPHY

This section presents the foundational philosophies for the Bremner Transportation Plan to fulfill the Transportation Vision and Network Principles. The foundational philosophies include:

- Vision Zero & Safe Systems
- Complete Streets
- Universal Design & Design Users
- Link & Place
- Winter City Design
- Street Principles

3.1 VISION ZERO & SAFE SYSTEMS

Vision Zero, a name originating from a Swedish campaign to eliminate traffic deaths and serious injury, is a transportation philosophy based on the principle that we, as street users and designers, cannot continue to accept serious injuries and fatalities as an outcome of transportation design. Vision Zero campaigns include many facets and can be branded in many ways, with the key objective of making streets safer.

The guiding principles for Vision Zero are enshrined in the United Nations "Decade of Action for Road Safety" with a goal for all countries and organizations to work toward reducing traffic casualties to zero. This idea is one of Bremner's Transportation Network Principles and is also part of Strathcona County's Traffic Safety Strategic Plan 2020.

Starting at the planning level for Bremner, all design decisions that impact users, must incorporate the Safe Systems Approach and consider the needs of all street users, regardless of age, ability, and income.

The Safe Systems Approach acknowledges that even responsible people make mistakes, and the users and designers of the transportation network share the responsibility in minimizing the impacts of those mistakes. Employing ideas from the Alberta and Federal guides that discuss the Safe Systems Approach, Bremner's Transportation Plan is based on Safe Systems principles to achieve Vision Zero.

Safe Systems includes four key principles:

- **People make mistakes.** Research internationally has found that even if a driver follows all the "rules of the road" perfectly, there would be a reduction in fatalities of only 50%[1]. Clearly, there are other factors that need to be addressed to eliminate deaths and serious injuries that could be caused by human error.
- **People are vulnerable.** The human body can only handle so much impact. Safe Systems aim to manage the magnitude of crash forces, increasing the chance of survival and reducing the chance of serious injury or death.

[1] Safer Journeys New Zealand. 2014. *The Safe System approach – how to get the message into your communications. http://www.saferjourneys.govt.nz/assets/Safer-journeys-files/Communicating-the-Safe-System-approach-May-2014-FINAL.pdf*

- **Everyone shares responsibility.** Planners, engineers, policy makers, educators, enforcement officers, vehicle manufacturers, utility providers, and insurers all have key roles to play in achieving a Vision Zero outcome.
- **The system needs redundancies.** Redundancies means there are levels of backup in case one system fails. This can include vehicle technology, users that know the rules and keep their skills current, vehicles that are well-maintained, and a street that is self-explaining and designed to encourage safe behavior and forgive human error.

Safe Systems and Vision Zero is actioned through the Bremner Transportation Plan, and associated Bremner DCS, by applying the following planning and design approaches.

3.1.1 Design Domain

The design dimension for each element of a street should be selected based on the context and intended use of the street. To do so, each street element can take a range of values defined as the Design Domain. For example, in some instances lane widths or sidewalks may be wider or narrower based on the land uses adjacent to the street, the classification of the street (e.g., Arterial Street), and where the buildings are located, in relationship to the street. A well-designed street will review the Design Domain of all the elements within the public right of way to provide an acceptable balance between level of service, cost, quality of life, and environmental impact, resulting in the best level of safety to all its users. In a Safe System, that level of safety should be the priority ahead of all other elements.

For Bremner:

- Design Domain is provided for each street element based on the 2017 Transportation Association of Canada's Geometric Design Guide for Canadian Roads; and
- Different street types are defined to identify transportation modal priority.

3.1.2 Speed

The speed drivers travel is one of the most important features in reducing the incidence of collisions and mitigating the impact of those that do occur.

The figure below illustrates the impact of speed on crash survival. Users without any protection, like people walking or cycling, have rates of survival that are significantly lower as speeds increase above 30 km/h.

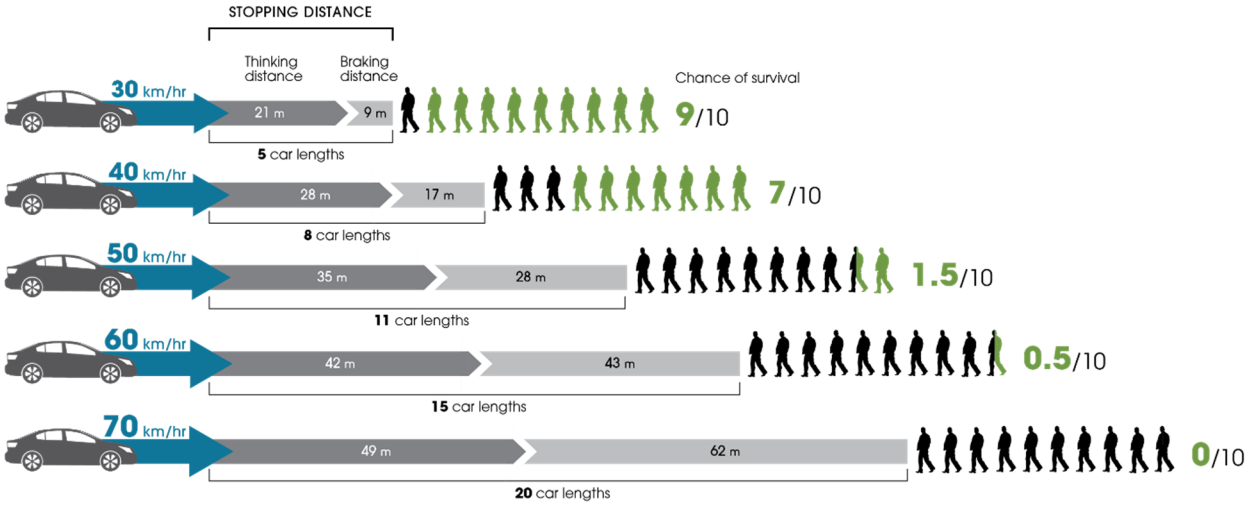


Figure 2: Impact of Speed on Collision Survivability
(Based on: http://www.rsa.ie/en/RSA/Road-Safety/Campaigns/Archived-Campaigns/Mess--Crash/The-statistics/)

Design speed is typically 10 km/h higher than posted speed. A study completed for the City of Edmonton identified that 85th percentile running speeds on most streets proved to be closer to the design speed than the posted speed. If the design is intended to have users drive a certain speed, the street design needs to create a "Self-Explaining Road" (SER) environment. The SER concept is centered on making streets safer by making them more user friendly and understandable for all users.

For Bremner:

- Design speed to equal posted speed to equal targeted operating speed.
- Streets that have a high probability of interactions between people walking and cycling with people driving have a lower design speed such as local streets, main streets, and turning vehicles at intersections.
- Street design and selection of Design Domain dimensions for street elements are used to influence street operating speeds and reinforce design speeds such as lane width and horizontal offsets to trees.
- At intersections and mid-block crossings, low curb radius, raised crossings, and other visual cues are used to reinforce low operating speeds.

3.1.3 Sightlines

Adequate sight distance is necessary to allow users to adjust their behavior to help prevent conflicts, particularly at intersections, driveways, and mid-block crossings. Clear space prior to these conflict points will allow street users time to recognize a potential conflict, time to make decisions, and time to yield/stop.

For Bremner:

- Street elements that can restrict sightlines such as bus stops, signs, trees, landscaping, poles, traffic cabinets, and on-street parking at and near intersections and driveways are located to allow necessary sightlines and clear space, reducing visual obstruction, based on the target operating speed.
- Curb extensions and compact intersection design are used where possible to place more possible conflicting activity within the clear sight triangle and sightlines of all street users.

3.1.4 Separating Conflicts

Most crashes in urban areas occur where people using various modes must cross paths, including intersections and driveways. The best way to improve safety at conflict zones is to maintain or improve the separation between users of different modes in these locations, either though physical barriers or implied barriers, like separated signal phases. Ways to improve this outcome include: shortening crossing distances, providing two stage queuing areas for people cycling, providing median refuges for people walking and cycling, and using signals to provide separate signal phases for each user at signalized intersections.

For Bremner:

- Physically separated facilities are provided for people walking, cycling, and driving, unless volumes and speeds are very low to meet the needs of the Design Users and reduce conflicts between users from occurring at incompatible speeds.
- Bus stops are designed to separate movements of transit vehicles, people walking and boarding buses, and people riding bicycles.
- Traffic signal phasing is used to separate conflicting movements and prioritize safety such as split signal phasing, protected turns, and leading intervals.

3.2 UNIVERSAL DESIGN & DESIGN USERS

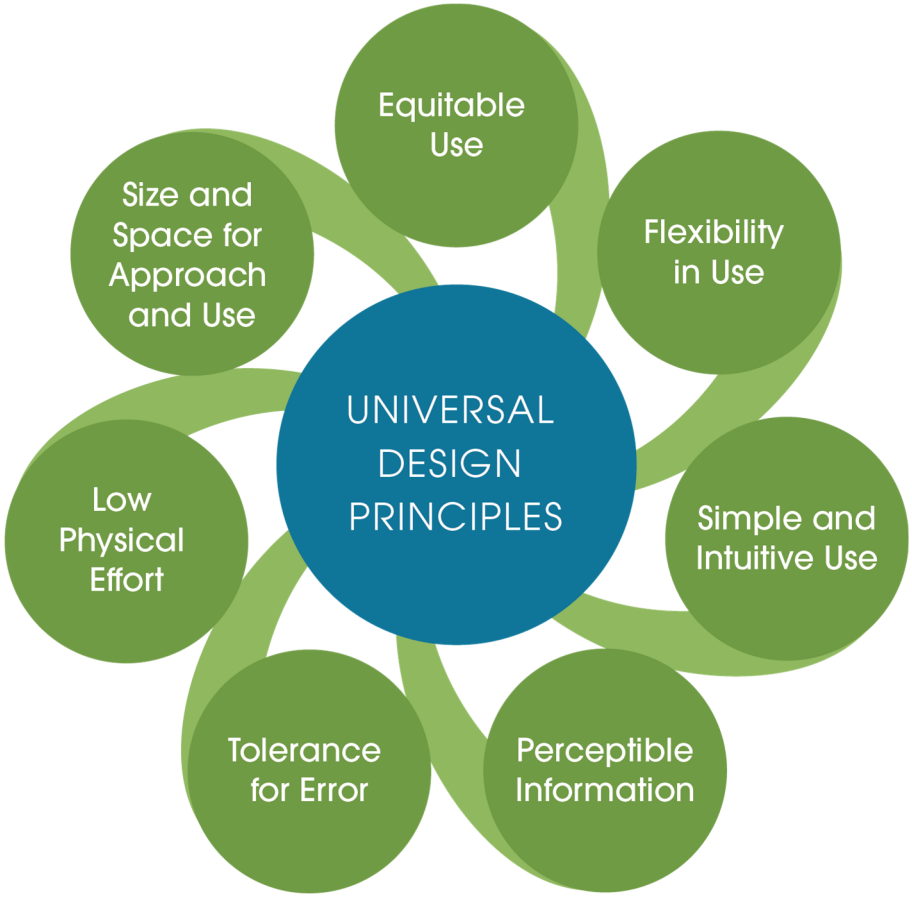


Figure 3: Designing for All Users[2]

Universal Design is an approach to design that increases the potential for developing a better quality of life for a wider range of individuals. The design process creates an environment that is usable to as many people as possible regardless of age, ability, or situation. The goal underscoring Universal Design is social inclusion, which addresses the barriers faced by people with disabilities, older people, children, and other populations that have been overlooked in the design process. In so doing, streets will be designed for the movement of all people at various stages of life and regardless of ability.

Streets are people places (see Link & Place, Section 3.3). How those streets come together as a network, impacts who can use them, and how they are used. Streets are also a public space with limited width, and how that width is allocated impacts their use (see Complete Streets, Section 3.4). Ultimately the users of streets are people – people in cars, people on their feet, people riding their bikes, people using wheelchairs, people waiting for transit, people in buses, people driving, and people moving goods and services to, from, and around Bremner.

The following Design Users are used as the basis for the Bremner Transportation Plan and the associated Bremner DSC:

[2] Adapted from City of Edmonton. *Checklist for Accessibility and Universal Design in Architecture*.

- People Walking – Person using a mobility aid and walking speed of older adults and young children as Design User;
- People Cycling – Person that is uncomfortable sharing streets that have high volumes of motor vehicles or high operating speed as Design User;
- People Riding Transit – Access to transit by people walking; city bus as Design Vehicle along streets with transit service, at transit centres, and at intersections;
- People Driving – Passenger car as Design Vehicle;
- Delivering Goods – WB-21 tractor trailer as Design Vehicle for Arterial Streets and streets in industrial areas; medium single unit truck for deliveries on Main Streets, Primary Collector Streets, and Collector Streets; and
- Emergency Services – Fire truck as Control Vehicle for all streets.

3.3 LINK & PLACE

Traditionally, streets have been primarily thought of as a link where the main function is to connect destinations. Streets, however, also function as a social space and can be a destination and designed to support the uses (e.g., businesses) along the street.

Streets are a valuable public amenity that take up a significant proportion of a community's land. When their use is limited to only supporting driving, other users are excluded from this amenity. Considering the network as a combination of both links and places, with streets that serve as both, is a way to make the public space more valuable to everyone. Bremner's streets are based on the consideration of link and place which impacts the Design Users, the selection of necessary infrastructure (i.e., street elements), and the Design Domain dimensions for the necessary street elements.

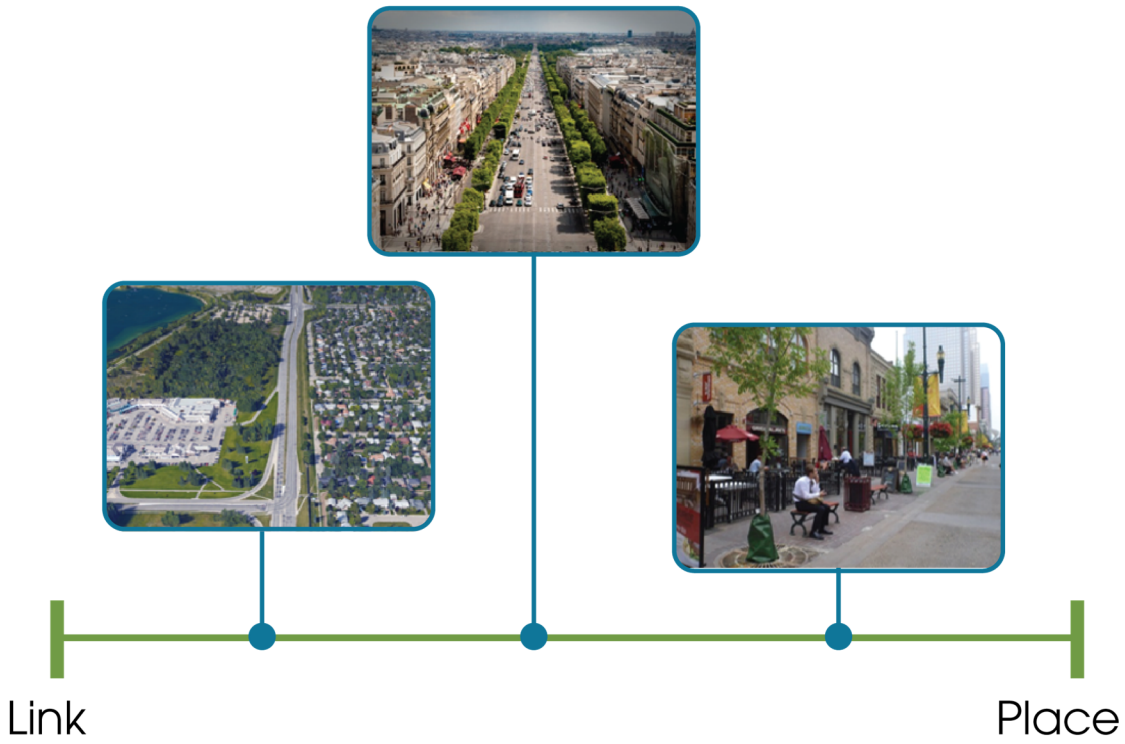


Figure 4: Link and Place Concept

3.4 COMPLETE STREETS

A core philosophy for Bremner is developing a network of streets, trails, and public transit routes/connections that are safe and accessible for everyone in Bremner, regardless of age, ability, income, or mode choice.

For the past 60 years in North America, streets have been primarily designed for people driving. These design practices made it difficult, even unsafe, for people to walk or ride a bike in the public right of way. Transit users were often relegated to infrequent service with poor access to stops. Complete Streets level this playing field. While not every street needs to serve every user equally, a Complete Street network allows users to make real choices about the mode they want to use to get around.

> *"Everyone, regardless of age, ability, income, race, or ethnicity, ought to have safe, comfortable, and convenient access to community destinations and public places – whether walking, driving, bicycling, or taking public transportation."* – National Complete Streets Coalition

There are several challenges that arise when designing a street:

- How can the often-competing demands of people walking, riding bikes, taking transit, delivering goods, and driving be accommodated?
- How can the design reflect the varying land uses along a corridor today and in the future?
- How can cost-effective innovations, such as sustainable practices and improved urban design, be incorporated?
- How can the essential infrastructure be accommodated, such as hydrants and street lights?
- How are placemaking elements like public art, special branding, and amenities provided and how might they vary to reflect unique community needs along a corridor?

The Transportation Plan and the supporting Design and Construction Standards (DCS) provide direction for a network of streets that connect people to work, school, and social opportunities across and outside of Bremner. While the Bremner DCS provide more detailed design direction for streets, including cross sections, intersection treatments, design users and traffic impact assessment guidelines, the network is a key element of Complete Streets and is developed through the Transportation Plan.

Complete Streets design is an iterative, engaged process that requires network consideration and testing of design alternatives. The intent of the process is to ultimately achieve a recommended design that aligns with public and stakeholder feedback, visions, goals, and principles, while considering land use context and modal priorities to finalize design recommendations.

Specific guidance on implementation for Complete Street design in Bremner can be found in the DCS.

3.5 WINTER COMMUNITY DESIGN

Designing for a winter community means considering the impact of transportation design on use in all seasons. This consideration needs to happen at the outset. Five principles that apply to designing for winter are:

- Design and provide infrastructure that supports desired winter life and maintenance and improves comfort in cold weather;
- Create visual interest with light;
- Incorporate design strategies to block wind;
- Maximize exposure to sunshine; and
- Use colour to enliven the winterscape.[3]

Figure 5: Winter City Streetscape[4]

3.6 STREET PRINCIPLES

There has been a conscious choice in the Transportation Plan to use the term "street" instead of "road." Streets are places for people, a part of the public realm where users interact with one another that consider both Link and Place in their design. There will be no roads within Bremner; each street will provide for users of various ages, modes, and abilities, specific to the context and purpose of the given street. Streets are the tools by which the transportation network is implemented. The supporting Bremner DSC contain specific design requirements in how to allocate the street right of way and design streets, intersections, and other street elements for users of all abilities and modes. The Street Principles listed here (with more details provided in the Bremner DCS) impact how to create streets that support the Transportation Vision and Network Principles and incorporate Safe Systems/Vision Zero, Universal Design, Winter City Design, and Complete Streets.

The Street Principles are:

[3] City of Edmonton. 2016. *Winter Design Guidelines*
[4] City of Edmonton. 2016. *Winter Design Guidelines*

Streets are for Everyone

- Streets are equitable and inclusive.
- Streets are comfortable and safe for children and older adults.

Streets are Multimodal

- Streets are designed to prioritize active transportation and transit.
- Streets provide a network for goods and commuter movements that connect to local and regional destinations.

Streets are Safe

- Streets are safe and comfortable for all users in all seasons.
- Streets are designed to prioritize the safety of active transportation users, recognizing their vulnerability.
- Streets are appropriately lit and landscaped and provide a high level of personal security.

Streets are Healthy

- Streets support healthy environments and lifestyle choices.
- Streets support active transportation.
- Streets support positive mental health. (Streets are safe, green, and quiet).

Streets are Public Spaces

- Streets are places, not just links.
- Streets are designed for recreation, cultural expression, social interaction, and celebration.

Streets Create Value

- Streets encourage activity and provide multimodal access, generating value for residents and businesses.
- Streets incorporate public utilities to support development and growth.

Streets are Flexible

- Streets can transition over time and as land use context changes along a corridor.

Streets are Ecosystems

- Streets incorporate green infrastructure and low impact design to improve biodiversity and quality of the environment in all seasons.
- Streets design is informed by natural resources and the local climate.

4 BREMNER TRANSPORTATION PLAN

Achieving an accessible, connected, and integrated multimodal transportation network in Bremner as outlined by the Transportation Vision will require the combination of thoughtful land use planning policies with intentional transportation infrastructure and service provision. The Transportation Plan is organized based on the Transportation Network Principles and defines the key components of the Bremner transportation network and the associated policies to achieve the community Vision.

4.1 DEMOGRAPHICS AND TRAVEL OPTIONS

The transportation network supports users of all ages, abilities, and incomes.

The average Bremner resident will likely be 25-44 years old, may work in an industrial area or in Edmonton, and commute by car. However, commuter trips are not the only trips that Bremner is designed for. As the modelling results showed, half of all trips generated in Bremner in the PM Peak Hour, stay within Bremner. A community designed for the typical commuter alone is not enough to be the makings of a great place. The transportation network has to be equally accessible for a person in a wheelchair, a child learning to ride a bike, a student who cannot afford a car, and a senior who crosses the street a little slower than the average resident.

> *"We believe that if everything we do in our public spaces is great for an 8-year-old and an 80-year-old, then it will be great for all people" – 8-80 Cities*

Regardless of trip purpose, age, ability, or income, transportation choices are provided in Bremner to support transportation for all people.

4.1.1 Travel Patterns

Bremner will be home for almost 80,000 people, and a place of work for 20,000 (if the LEA is included). Bremner will be an urban hub that serves residents within its boundaries, but also attracts people from outside Bremner to use its services and shops, work at its jobs, and attend its schools. Bremner's location with access to a Provincial and National Highway network provides those in Bremner with access to work, shopping, and school in Sherwood Park, Edmonton, the Industrial Heartland, and the greater Edmonton Metropolitan Region. But gone are the days where proximity to highways alone, provide sufficient access. The growing metropolitan region is transitioning into a more urban centre, with improving access to rapid transit and high-quality cycling infrastructure being equally important to the transportation system. Investment in multimodal transportation infrastructure will support Bremner as a modern, innovate community and a thriving part of the Region.

Bremner and the LEA are estimated to generate or attract as many as 400,000 trips by all modes on an average weekday. Multimodal transportation infrastructure and services are required throughout Bremner to support these trips by residents, businesses, and visitors. Providing service

for users of all ages and modes was identified as a key outcome for the transportation network in Bremner. The ACP, multimodal travel modelling, and transportation goals and objectives were used to identify how and where to prioritize various modes. Understanding that providing access is important for economic success, and that Strathcona County values transit, cycling, and walking as equitable, safe, and environmentally sustainable transportation options, a multimodal modelling assessment was used to identify corridors and facility types to best accommodate trips within, to, and from Bremner.

People within Bremner should be able to choose the mode that is right for their journey. Most trips within Bremner are easily achievable on foot, by bike, or using local transit. Transit service can provide access to destinations outside Bremner, like Sherwood Park, downtown Edmonton, and post-secondary institutions. Access to regional highways and neighbouring communities are also provided for those driving or as passengers in private vehicles.

Proximity to services and access to those services will be large determinants in how many people are able to select a mode other than driving to get around. Bremner's compact form promotes walkability and cyclability. A cyclist could reasonably travel between Village Centres and the Town Centre in less than 30 minutes. Most residents will live within 1 km of a school, and about that close to one of the Town or Village Centres.

4.1.1.1 Destinations

The 2015 Edmonton Household Travel Survey identified that around half of daily trips generated in Sherwood Park are destined for Sherwood Park. This pattern once again emerges in Bremner. The modelling results indicate that of the more than half of all trips generated in Bremner or the LEA are destined for Bremner and the LEA, with about 60% of those trips being completely internal to Bremner. Trip origins and destinations are summarized in Figure 6.

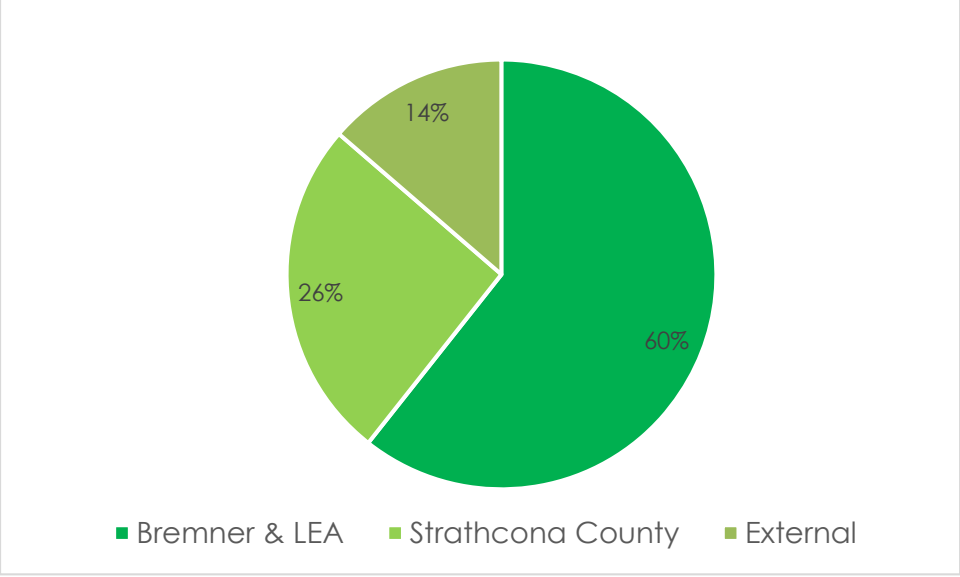


Figure 6: Trip Origins and Destinations in Bremner and the LEA

This pattern indicates a strong potential for people within Bremner to make a choice to get around on foot or by bicycle, as many of the trips within the Bremner area are short enough for most users to comfortably cycle.

4.1.2 Transportation Mode Choice

The design of Bremner's integrated transportation and land use system is intended to develop a community where more travel options are available for all journeys. The shift away from exclusively auto-oriented transportation infrastructure supports the goals of a Green, Connected, and Diverse Bremner.

There are two available sources to review the existing mode share in Sherwood Park: the 2015 Regional Household Travel Survey and the 2016 Government of Canada Census. Typical mode shares for Sherwood Park based on these data are summarized in below. Note that Household Travel Survey Data is not specific to Sherwood Park, but includes regional traffic.

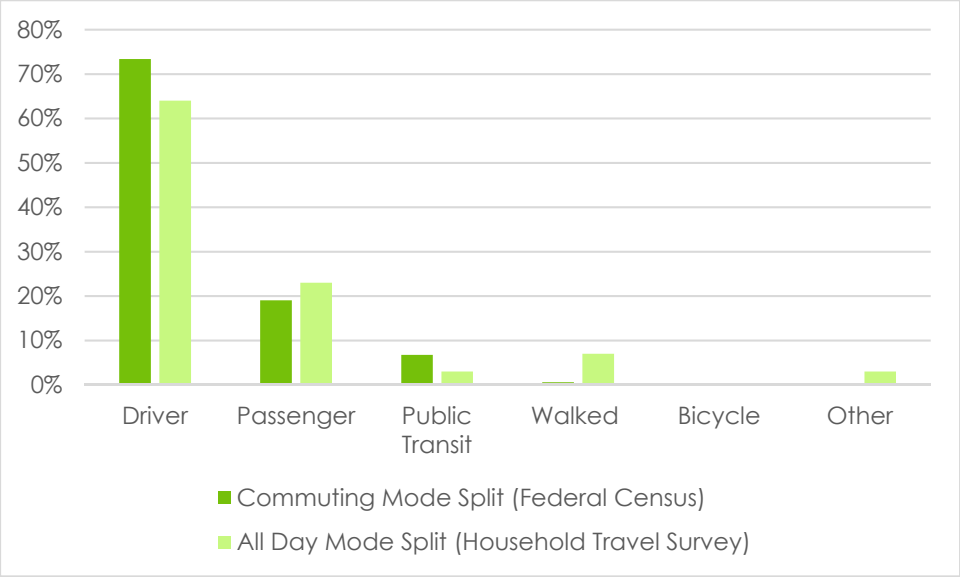


Figure 7: Sherwood Park Existing Mode Share[5]

The transportation and land use plan for Bremner have been designed to accommodate multimodal trip choice. Modelling results based on the goals and objectives of Bremner show a potential shift in mode away from the personal vehicle towards transit, cycling, and walking, especially for shorter trips within Bremner.

4.1.2.1 Transit

Transit ridership in Bremner and the LEA is estimated to potentially only account for less than 1% of total trips. However, modelling indicated that increasing frequency and coverage could improve those outcomes. Long term transit planning within Bremner will require frequent review,

[5] Canada Census for Sherwood Park. 2016, *Journey to Work*, City of Edmonton/Alberta Transportation. 2015 *Household Travel Survey, Person-km Travelled by Mode (Daily) for the Region*

as build out of the area and changes in technology impact transit mode choice. To maximize transit opportunities within Bremner, local routes should have high frequency and regional routes should align with key destinations in Downtown Edmonton, regional employment hubs, and educational institutions within the region.

4.1.2.2 Cycling and Walking

Multimodal modelling tested two general scenarios: a scenario which assumed that regional travel patterns seen today remain constant over the course of Bremner and LEA build out, and a scenario which assumes that travel patterns shift towards more urban behavior. The multimodal modelling is described in more detail in Appendix A (Model Memo).

These scenarios are described below in Table 3.

Table 3: Multimodal Modelling Scenarios

Name	Description	Network speeds (ped/cyc)	Targeted mode shares (ped/cyc)
1	Scenarios with regional travel patterns		
1a	No investment in walking and cycling along main streets and collectors (walking and bicycling allowed on streets)	4.3 km/h 9 km/h	6.4 % 0.8 %
1b	Investments on separate cycling/walking infrastructure along main streets and collectors (+ring trail)	4.3 km/h 18 km/h	n/a
2	Scenarios with travel patterns altered towards more urban behavior		
2a	No investment in walking and cycling along main streets and collectors (walking and bicycling allowed on streets)	4.3 km/h 9 km/h	10.8 % 1.7 %
2b	Investments on cycling/walking infrastructure along main streets and collectors (+ring trail)	4.3 km/h 18 km/h	n/a

The results of this modelling for the PM Peak Hour originating and destined within Bremner are summarized in the following table.

Table 4: Multimodal Modelling Results

Scenario	Scenario 1a	Scenario 1b	Scenario 2a	Scenario 2b
Mode Share Pedestrians	6.7%	11.7%	11.9%	19.8%
Mode Share Cycling	1.5%	2.0%	3.2%	4.3%
Mode Share Driving/Transit	91.8%	86.2%	84.9%	75.9%
Average Length Pedestrian Trip (km)	1.1	1.5	1.1	1.6
Average Length Cycling Trip (km)	1.8	2.7	1.9	2.5
Average Length Driving/Transit (km)	3.1	3.1	3.2	3.3

Key outcomes that can be observed from this data include:

- Driving will continue to be a dominate mode in Bremner regardless of investment in cycling and walking infrastructure, and drivers will need to continue to be accommodated through parking and driving infrastructure.
- Investment in cycling and walking facilities have a significant impact on walking mode share in particular, but also improve the distance users are willing to cycle.
- Providing high quality cycling and walking infrastructure is advantageous, even if user preference for driving remains consistent in Bremner to current patterns seen in the Edmonton Region.
- The results indicate that the greatest impact for cycling and walking takes place within Bremner, not for trips in the region as these are too long to be significantly altered through infrastructure. The focus of cycling and walking facilities should be within Bremner with connections to the LEA.

4.1.3 Highway Access

This plan was developed in partnership with Alberta Transportation to identify what level of interchange access would be supported within Bremner and the LEA. Access to the provincial highway network is crucial for success of the community. However, that cost must be balanced with regional needs and preserving Highway Capacity and function. Alberta Transportation and Strathcona County will work together to provide three interchanges into the Bremner Area:

- Full access at Highway 21 and Township Road 534,
- Full access at Highway 16 and Range Road 224, and
- Partial access (westbound traffic only) at Highway 16 and Range Road 223.

Alberta Transportation's modelling results are discussed in Appendix A.

4.1.4 Demographic & Travel Option Policies

a. **Require** the transportation network to include transportation mode options for all trips to **ensure** access for users of all ages, abilities, and incomes.
b. **Consider** transit corridors on Arterials when higher order transit to the region is provided within Bremner to **support** access to regional transit connections.
c. **Require** street designs that include separated facilities (cycle tracks or multi-use trails and sidewalks) within the right of way on all arterial and collector classified streets to **ensure** a highly connected active transportation network with access to key destinations and services.
d. **Require** local streets to include sidewalks on both sides of the street and to be designed to safely accommodate vehicles and bicycles sharing the right of way through low speed design to **ensure** a connected active transportation network with connections to all arterial and collector streets.
e. **Require** transit stops to be located within 400 m of all residences to **ensure** transit is a viable transportation option for all of Bremner.
f. **Require** transit stops to be located within 250 m of seniors housing (with stops spaced at 300 m) and community housing, and to be designed to accommodate users with mobility aids and visual impairments to **ensure** access to transit for users of all ages, abilities, and income.

4.2 ACCESS, MOBILITY, AND CONNECTIVITY

The transportation network provides access in all seasons to residents and businesses by all modes of transportation within Bremner, Strathcona County, and the Edmonton Metropolitan Region.

4.2.1 Transportation Network

The transportation network for Bremner includes a range of streets with varying levels of service for people using all modes. The network has been developed to accommodate all trip types and all users. The below table shows how the transportation network has been characterized for the different users depending on the trip type.

Table 5: Trip Type and Infrastructure Summary

Getting To and From Bremner	• **Prioritize:** Goods Movement, People Riding Transit, People Driving • **Accommodate:** People Walking, People Cycling • **Transit:** Edmonton Express Route, Connections to LRT and Sherwood Park, Park and Ride Facility • **Walking and Cycling**: Off-Street Multi-Use Trail • **Street Types**: Arterials, Industrial Arterials • **Typical Destinations**: City of Edmonton, Sherwood Park, Industrial Heartland
Getting Around Bremner	• **Prioritize:** People Cycling, People Riding Transit, People Walking, People Driving • **Accommodate:** Goods Movement • **Transit:** Local Transit Routes, Park and Ride Locations, Transit Centres • **Walking and Cycling:** Multi-Use Trails and Cycle Tracks, Bike Parking • **Street Types:** Off-Street Multi-Use Trails, Collector, Main Street Collectors, Primary Collector, Industrial Collector • **Typical Destinations:** Town Centre, Community Nodes, Schools, Local Employment Area
Getting Around the Neighbourhood	• **Prioritize:** People Walking, People Cycling, People Riding Transit • **Accommodate:** People Driving, Goods Movement • **Transit:** Dynamic Transit • **Walking and Cycling:** Sidewalks, Multi-Use Trails, Cycle Tracks • **Street Types:** Residential Laneway, Commercial Laneway, Reverse Housing Laneway, Local, Shared Street, Industrial Local. • **Typical Destinations:** Village Centres, Schools, Transit Stops, Local Commercial Areas

4.2.1.1 Getting To and From Bremner

Bremner and the LEA are estimated to generate or attract as many as 400,000 trips by all modes on an average weekday. The Bremner & LEA Area Concept Plan, Transportation Plan and accompanying traffic modeling is primarily focused on the street network within Bremner and LEA but recognizes the requirement to get to and from Bremner and LEA. The transportation modelling indicates that about 40% of trips are external to Bremner to destinations such as Sherwood Park, Ardrossan, rural Strathcona County, Edmonton, Fort Saskatchewan and Alberta Industrial Heartland. Transit service can provide access to destinations outside Bremner, like Sherwood Park, downtown Edmonton, and Fort Saskatchewan. Access to regional highways and neighbouring communities are also provided for those driving or as passengers in private vehicles.

Strathcona County's growth into the Bremner and LEA Areas will result in future improvements on the transportation network beyond the boundaries of these areas, including Range Roads 223, 224, and 225 North and South, as well as Township Road 534 East and West. Although outside the scope of the ACP and Transportation Plan Work, it should be noted that further studies and analysis is required to fully understand these impacts from both infrastructure requirements and financial perspective.

4.2.1.2 People Driving

The transportation network includes infrastructure for people driving and carpooling to destinations within Bremner and the Edmonton Metropolitan Region. Streets are organized in a hierarchy of classifications to support the range of trips. Streets are designed to serve all users, from people driving to people walking. The consideration for those driving, carpooling and using car share is summarized below. Details on the design of all street types can be found in the Bremner DCS.

Table 6: Street Purpose for People Driving and Passengers

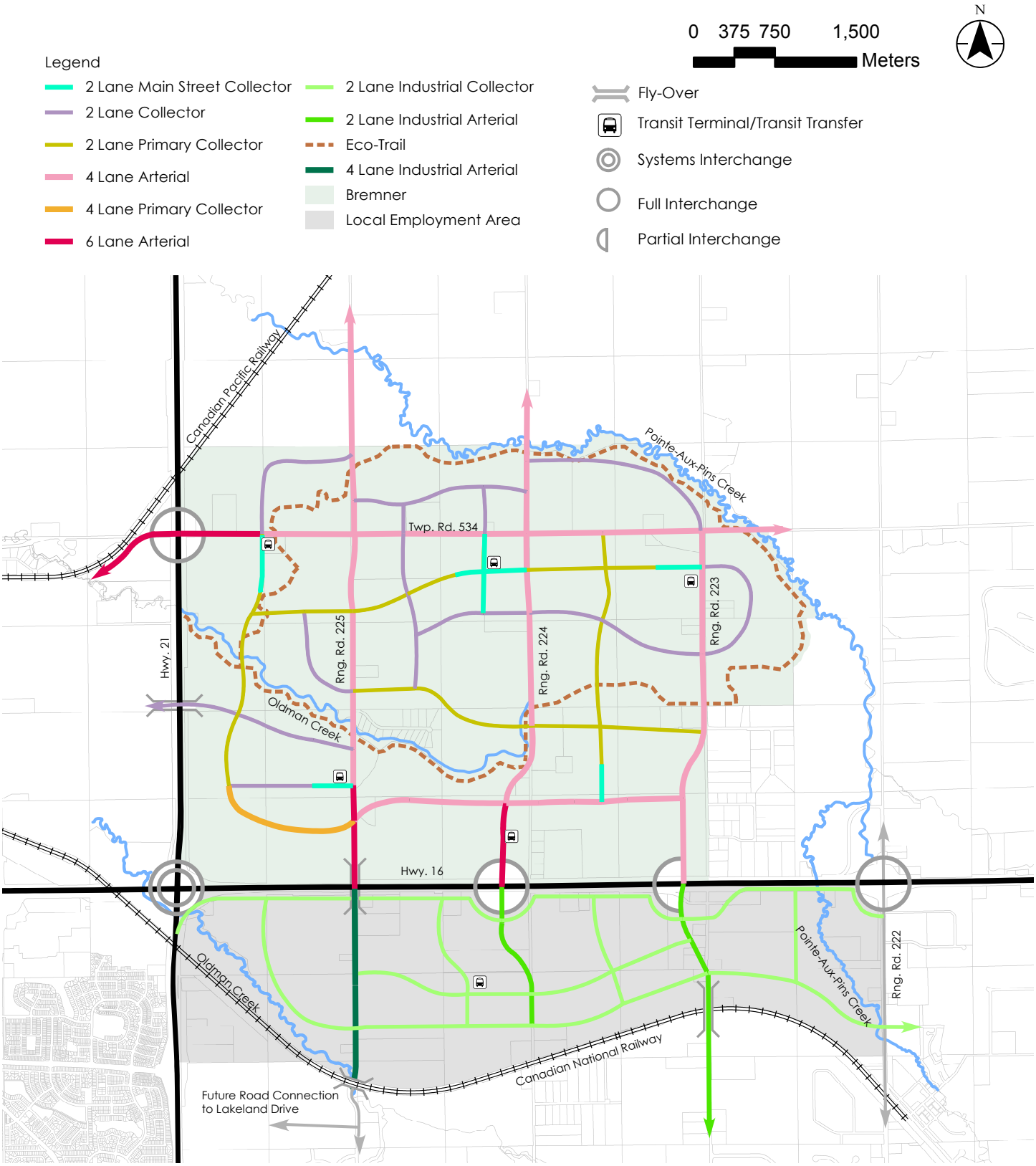
Getting To and From Bremner	• **Street Types:** Arterial Street, Industrial Arterial Street • **Users:** Regional commuters, post-secondary students, commercial and industrial goods movement • **Characteristics:** Higher design and operating speeds (50 – 60 km/h), higher volumes of people driving, facilities for people walking and cycling are located within the right of way, but not in the Travelled Way of the street. Intersections may be larger and include right and/or left turn lanes and signals or roundabouts. These streets provide direct access to Highway 21 and Highway 16.
Getting Around Bremner	• **Street Types:** Collectors, Main Street Collectors, Primary Collectors, Industrial Collectors • **Users:** Local commuters, elementary and secondary school students, people travelling to stores, recreational facilities, and jobs. • **Characteristics:** Design and operating speeds of 30 – 50 km/h, lower volumes of people driving with more people walking and cycling. May include transit routes and cycling facilities could be in the form of cycle tracks within the Travelled Way. These streets primarily provide access between residential areas and employment and retail areas within

	Bremner. Trips are shorter. Intersections may be stop controlled, signalized, or roundabouts.
Getting Around the Neighbourhood	• **Street Type:** Residential Laneway, Commercial Laneway, Reverse Housing Laneway, Local Street, Shared Street, Industrial Locals • **Users:** Local access • **Characteristics:** Low design and operating speeds (30 - 50 km/h or less) and low volume streets. People cycling can safely share the Travelled Way in some cases. May be more midblock crossings and no direct transit service.

The street network is illustrated in Map 2.

MAP 2

ROAD CLASSIFICATION AND NUMBER OF LANES



STRATHCONA COUNTY

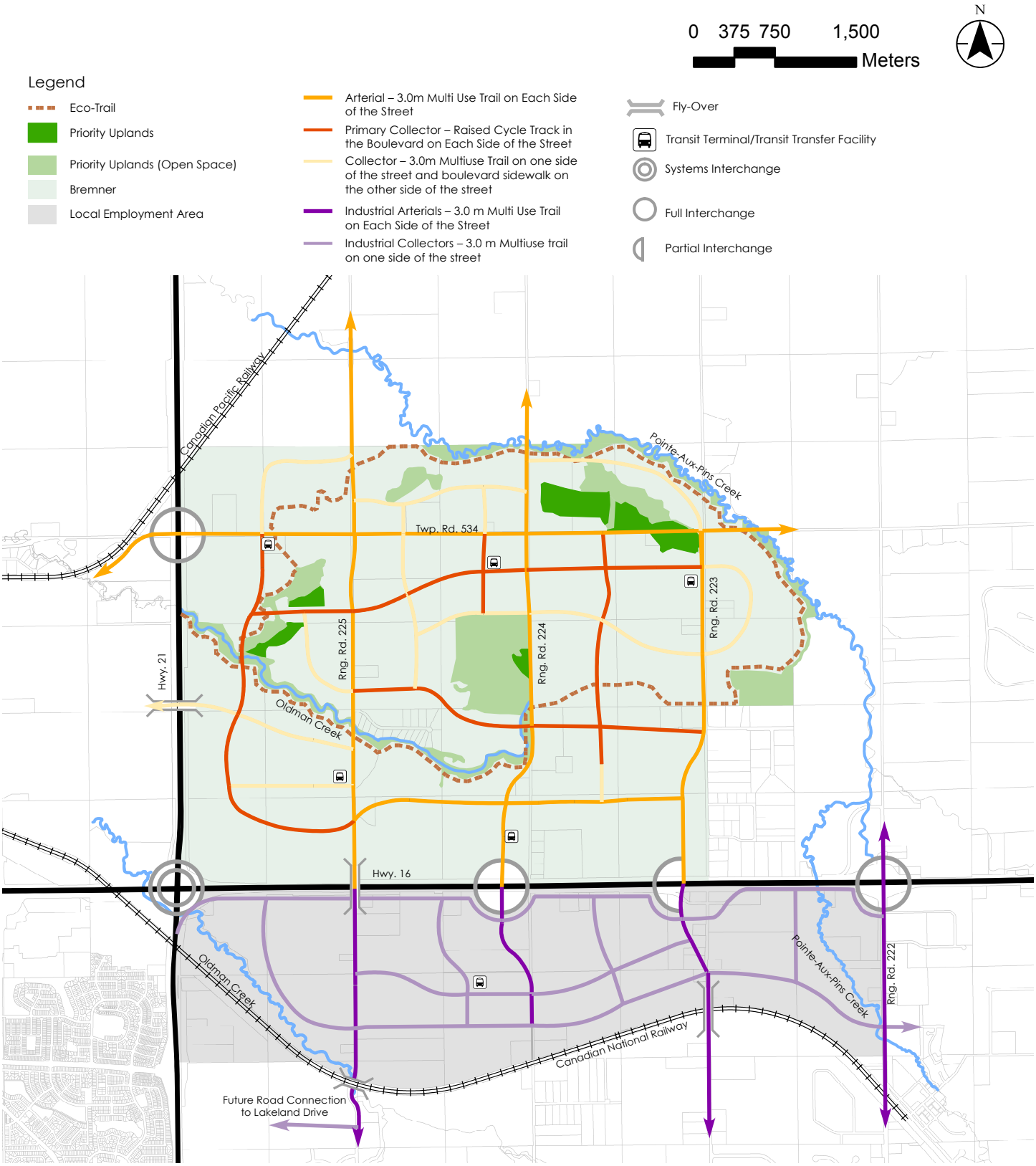
Note: This map is conceptual in nature. The exact location and alignment of land uses, facilities, roadways and services will be determined by the future development ASPs subject to Strathcona County's approval.

4.2.1.3 People Walking and Cycling

The same street network that serves people driving has also been designed to serve those who are walking and cycling. Map 3 shows how active transportation facilities are accommodated on the street network within Bremner. Regional trips are accommodated by the proposed street network (as the streets have facilities for these users on them) and the eco-trail system both within Bremner and connections to the south and west. Details on the all ages and abilities active transportation network are discussed on the following pages.

MAP 3

ACTIVE TRANSPORTATION FACILITIES



STRATHCONA COUNTY

Note: This map is conceptual in nature. The exact location and alignment of land uses, facilities, roadways and services will be determined by the future development ASPs subject to Strathcona County's approval.

Walking

Most trips start and end with walking. Infrastructure built for walking, like sidewalks, street crossings, and multi-use trails, provide a connected network of options for children, teens, seniors, adults, people with visual impairments, and people using mobility aids to navigate their community. Walking is a low cost, highly accessible form of transportation. When a community is designed for walking there are benefits to everyone, such as:

- Improved physical health and reduced risk of diseases;
- Reduced congestion and improved traffic safety;
- Reduced air pollution and use of non-renewable energy sources;
- Increase economic benefit through promoting activity around retail centres;
- Cost savings for residents;
- Improved quality of life through social interactions and tourism; and
- Equal access to the community for lower income residents.[6]

Walking infrastructure in Bremner will include sidewalks, multi-use trails, shared streets, laneways as well as midblock crossings and intersection crossings. A quality walking network will eliminate barriers users may feel to walking, improve and prioritize comfort for those on foot or using mobility aids, and be accessible for all users.

Table 7: Characteristics of a High-Quality Walking Network

Elimination of Barriers	• There should be walking infrastructure on every street. • Infrastructure should be maintained and cleared of snow in the winter. • Intersections should be designed to minimize crossing distance with small curb radii to slow turning vehicles.
Comfort	• The Pedestrian Through Zone (sidewalk or portion of the sidewalk that people walking or using mobility aids can easily traverse) should be designed as identified in the DCS, with sufficient width for two people using mobility aids to pass comfortably. • Sidewalks should be located in visible areas with lighting. • Sidewalks should be buffered from vehicles via boulevards, parked cars, or discomforted mitigated through slow design speeds. • Seating provided.
Accessibility	• Curb ramps should be along the desire line of the Pedestrian Through Zone and raised crossings or intersections can be used. • Wait times at signalized crossings should be minimized. • Wayfinding should be included to major destinations and community nodes.

For Bremner, walking facilities have been identified to promote safe walking, and land use has been identified to promote walkable neighborhoods with destinations located within 1 km of all homes. Multimodal modelling indicated that, even with minimal walking infrastructure investment, the average walking trips in Bremner was 1.1km, so destinations within that boundary are valuable to contribute to a walkable community. Map 4 shows the map of Bremner with the Town and Village Centres encompassed in a 1 km walkshed from those destinations. The map

[6] City of Edmonton. 2009. *Edmonton Walkability Strategy*

also shows the primary and secondary community nodes encompassed by a 1km walkshed (shown in cross-hatching).

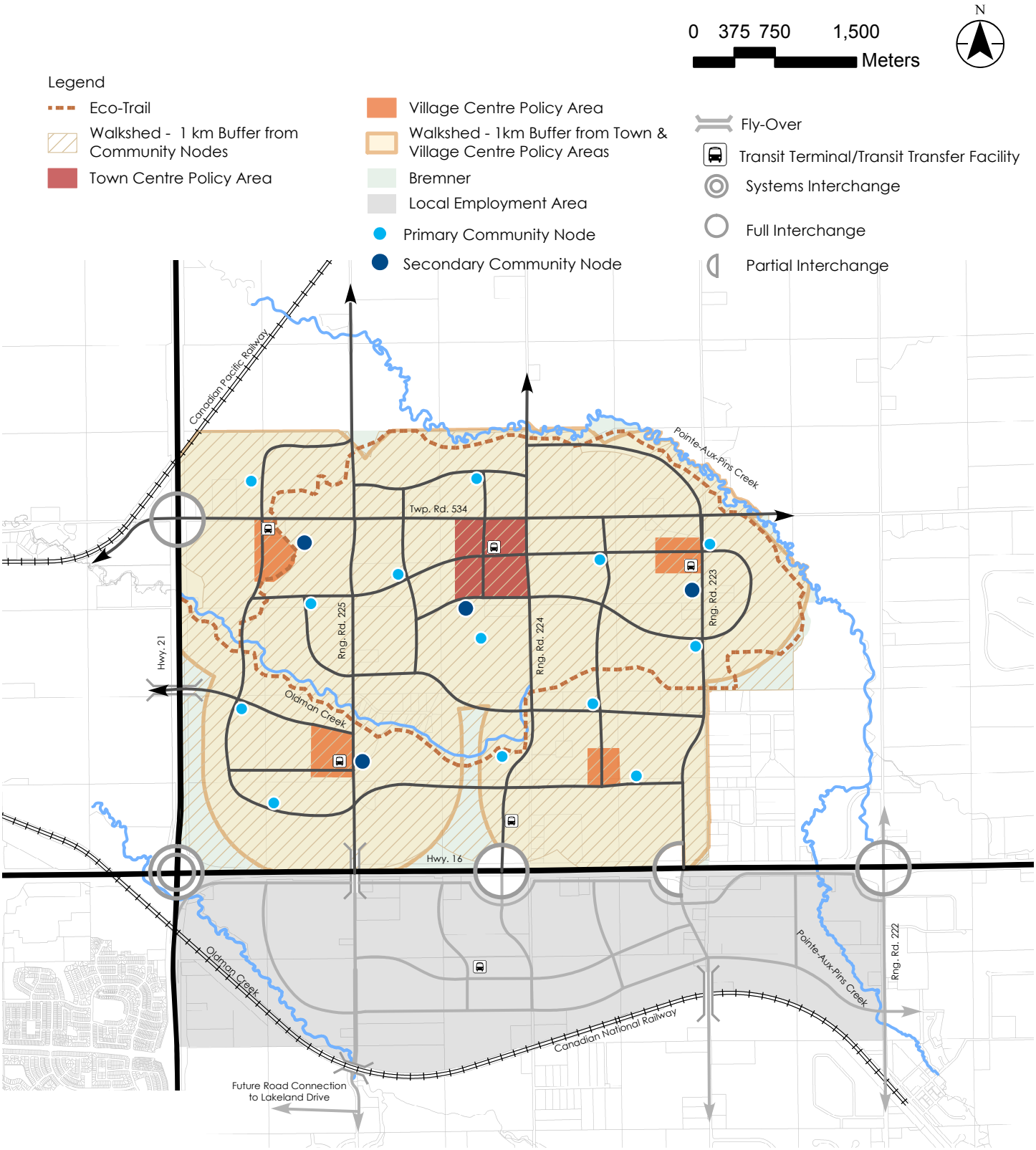
Walking facilities for the Design User are summarized in the following table.

Table 8: Walking Facility Types Summary

Getting To and From Bremner	• **Facility Type:** Multi-Use Trails • **Typical Destination:** Recreational • **Street Type:** Arterial Street, Industrial Arterial Street, Off-Street Multi-Use Trail
Getting Around Bremner	• **Facility Type:** Multi-Use Trails, Eco-Trail, Sidewalks • **Typical Destinations:** School, work, shopping • **Street Type:** Off-Street Multi-Use Trail, Regional Trail, Collector, Main Street Collector Street, Primary Collector, Industrial Collector Street
Getting Around the Neighbourhood	• **Facility Type**: Sidewalk, Multi-Use Trail, Shared Street • **Typical Destinations**: Transit, shopping, schools • **Street Type**: Residential Laneway, Commercial Laneway, Reverse Housing Laneway, Local Street, Shared Street, Industrial Local Street

MAP 4

WALKSHED



STRATHCONA COUNTY

Note: This map is conceptual in nature. The exact location and alignment of land uses, facilities, roadways and services will be determined by the future development ASPs subject to Strathcona County's approval.

Cycling

Cycling, like walking, is an accessible, equitable, and low-cost form of transportation that provides independence for users who may be unable to, or choose not to, drive. People cycling take less space in the right of way and are less environmentally intensive than drivers. There is growing evidence that high-quality bicycle infrastructure increases the number of people cycling, an outcome which aligns with the goals and objectives of the Bremner ACP.

Based on the available research and industry best practice planning and design guidance from the Transportation Association of Canada (TAC, 2017) and the National Association of City Transportation Official (NACTO, 2017), cycling infrastructure should be designed for people of all ages and abilities. This means that facilities should be designed for the users who tend to be less confident and more risk averse. Characteristics of these users and design implications for those users are summarized below.

Table 9: User Characteristics for All Ages and Abilities Cycling Routes[7]

User Characteristics	Geometric Design Implication
Prefers multi-use paths, bicycle boulevards, or bike lanes along low-volume, low-speed streets.	Facility provision should emphasize low-volume and low-speed routes, either through route selection or engineered traffic calming. Where routes are along higher-volume streets, physical separation from traffic is preferred.
May have difficulty gauging traffic and may be unfamiliar with the "rules of the road" as they pertain to riding a bicycle; may walk their bike across intersections.	Intersection treatments that lower exposure to conflicts and minimize merge/weave maneuvers are preferred. Increased delay for people cycling is accepted if a safer, more comfortable maneuver is well accommodated.
May use less direct routes to avoid arterials with high traffic volumes. If no comfortable facility is available, may ride on sidewalks.	On high-volume streets, facility provision should emphasize physical separation from traffic.
May ride at speeds around 12 to 20 km/h. Downhill grades may significantly increase riding speed.	Design for 30 km/h.
Typical trip distance of 1.5 to 8 km.	Out of direction travel becomes more onerous on shorter trip distances. Network and route design should emphasize directness.
Will want to be able to travel with family and friends. This includes side-by-side social riding, and side-by-side riding with children.	Facilities should allow for side-by-side riding while permitting comfortable passing opportunities for other riders.

[7] Transportation Association of Canada. 2017. *Geometric Design Guide for Canadian Roads*

Cycling facility and design standards are included in the Bremner DCS. An overview of cycling facility types based on trip type is summarized below.

Table 10: Cycling Facility Types Summary

Getting To and From Bremner	• **Facility Type:** Off-Street Multi-Use Trails, Eco-Trails, Cycle Tracks • **Typical Destination:** Sherwood Park Edmonton and Local Employment Area • **Street Type:** Off-Street Multi-Use Trail, Arterial Street, Industrial Arterial Street
Getting Around Bremner	• **Facility Type:** Multi-Use Trails, Eco-Trails, Cycle Tracks • **Typical Destination:** Town and Village Centre, Transit Hubs, Schools, Regional Park • **Street Type:** Off-Street Multi-Use Trail, Collector Street, Main Street Collector, Primary Collector Street, Industrial Collector Street
Getting Around the Neighbourhood	• **Facility Type:** Shared Streets, Multi-Use Trails • **Typical Destination:** Neighbourhood commercial, Schools • **Street Type**: Residential Laneway, Commercial Laneway, Reverse Housing Laneway, Local Street, Shared Street, Industrial Local

4.2.1.4 People Taking Transit

The street network has also been designed to accommodate transit facilities and movements by transit vehicles. The overall transit plan is illustrated in Map 5.

Transit services provides numerous benefits to a community. It is an additional transportation option for all users, and particularly for those that may not own a vehicle, such as older adults, teenagers and children, people with mobility challenges, and lower income individuals. Transit also provides access to regional destinations and provides relief for congested streets by making more efficient use of space. A successful transit network, when paired with complementary land uses and walking and cycling infrastructure, can liberate residents from needing to own a vehicle, or limits the number of vehicles a household requires.

People riding transit are prioritized on most streets in Bremner, whether for making trips within around their neighbourhood, within Bremner, or getting to and from Bremner. Details on the transit facilities based on anticipated trip types is described in Table 11 below.

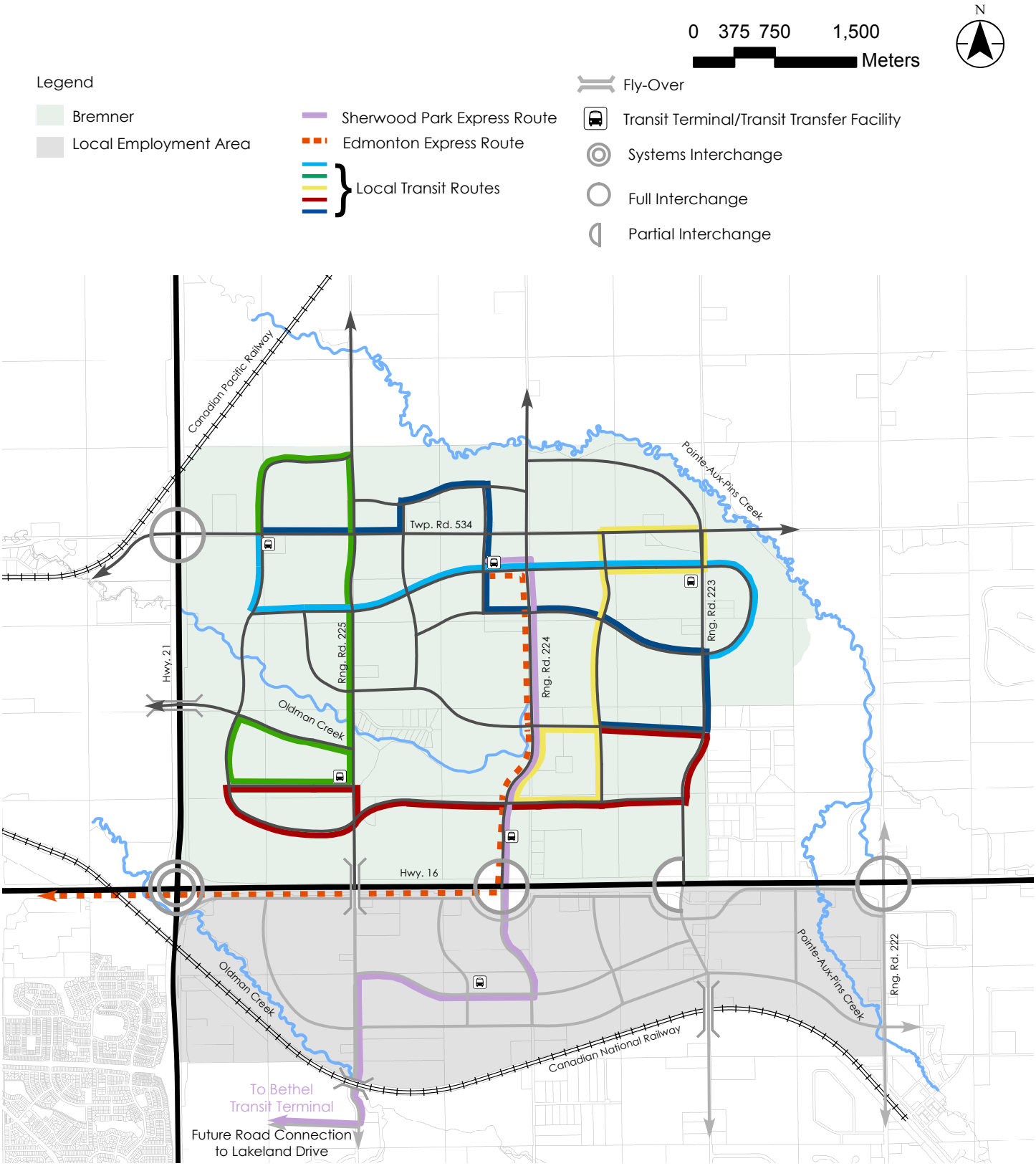
Table 11: Transit Facility Summary

Getting To and From Bremner	• **Transit Type:** Edmonton/University Express Route • **Transit Vehicle:** High Capacity Buses or Eventual BRT • **Service Frequency:** High frequency (10 – 15 minute) peak service, lower frequency (30 minute) all day service. • **Stop Spacing:** Express bus with limited stops. • **Rider Type:** Commuters into Sherwood Park, City of Edmonton and students at post-secondary institutions. • **Streets:** Arterials Streets and Industrial Arterial Streets
Getting Around Bremner	• **Transit Type:** Local Transit Routes • **Transit Vehicle:** Standard Buses • **Service Frequency:** Higher frequency (10 – 15 minutes) during peak hours, lower frequency (>30 minutes) in off peak times. • **Stop Spacing:** 400 – 800 m • **Rider Type:** Users commuting within Bremner, accessing services in Towns and Village Centres, or transferring to commuter routes into the region. • **Streets:** Primary Collector Streets, Industrial Collector Streets, Main Street Collectors, and Collector Streets.
Getting Around the Neighbourhood	• **Transit Type:** Dynamic Transit Routes • **Transit Vehicle:** Dynamic Transit • **Service Frequency:** Lower frequency (30 – 60 min), all day service • **Stop Spacing:** <400 m • **Rider Type:** Users accessing community amenities or Town Centre. May use for local destinations or to transfer to higher frequency routes. • **Streets:** Collector Streets

The transit network provides coverage (based on a 400m walking distance from transit service) for most of Bremner as illustrated in Map 6.

MAP 5

TRANSIT PLAN

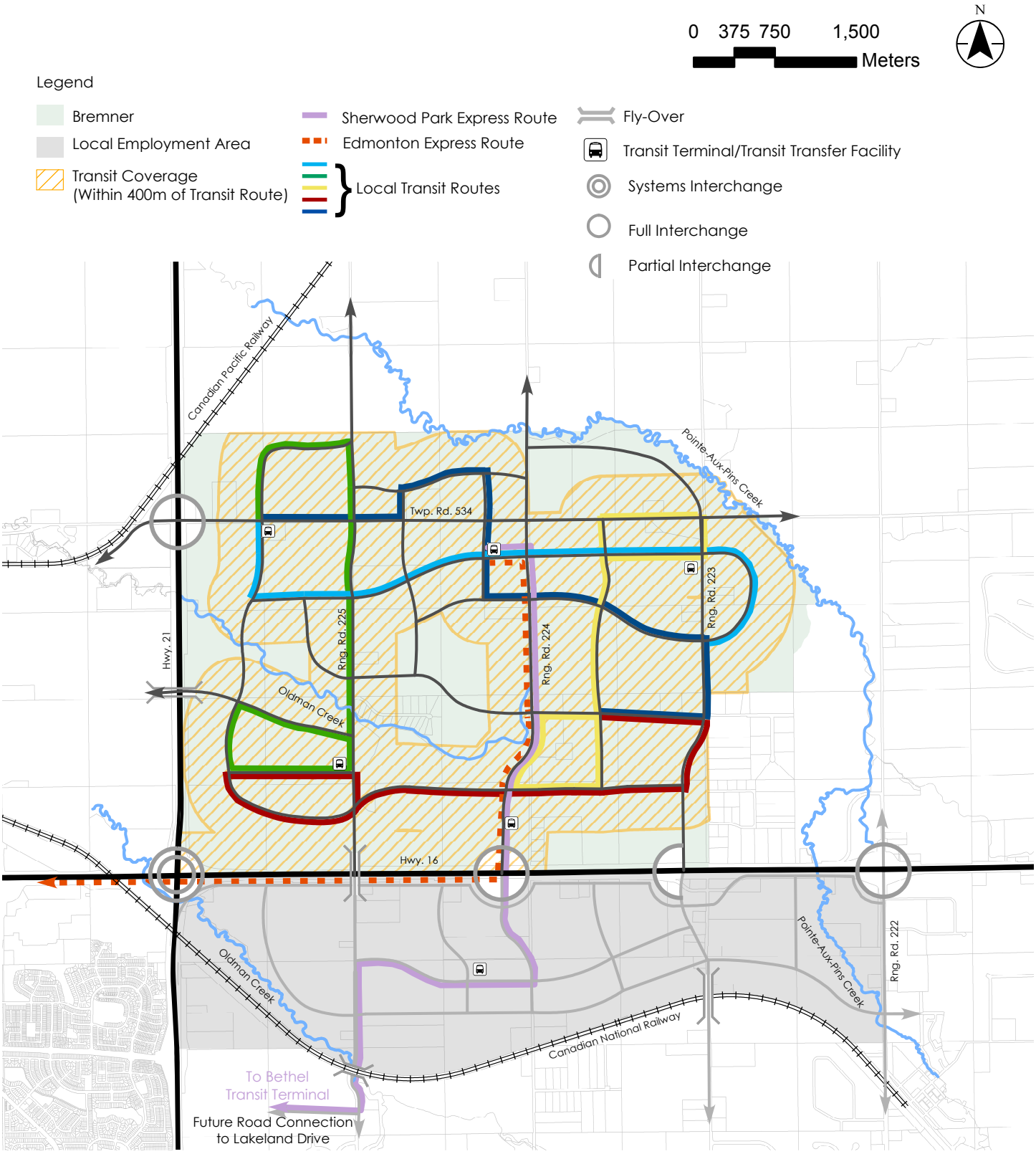


STRATHCONA COUNTY

Note: This map is conceptual in nature. The exact location and alignment of land uses, facilities, roadways and services will be determined by the future development ASPs subject to Strathcona County's approval.

MAP 6

TRANSIT COVERAGE



STRATHCONA COUNTY

Note: This map is conceptual in nature. The exact location and alignment of land uses, facilities, roadways and services will be determined by the future development ASPs subject to Strathcona County's approval.

4.2.1.5 Goods Movement

Industrial and commercial growth in south Bremner and through the Local Employment Area are as important to the long-term viability of the community as the residential homes. The location of Bremner, between two Provincial Highway Systems, provides Bremner with important regional access that will support industrial uses.

The street network in Bremner has been identified to support a hierarchy of uses where there is an appropriate facility for users of all ages and modes across the community. This hierarchy also includes goods movements.

Accommodation of Goods Movement is considered through both the network of streets as well as the design of those streets.

Network

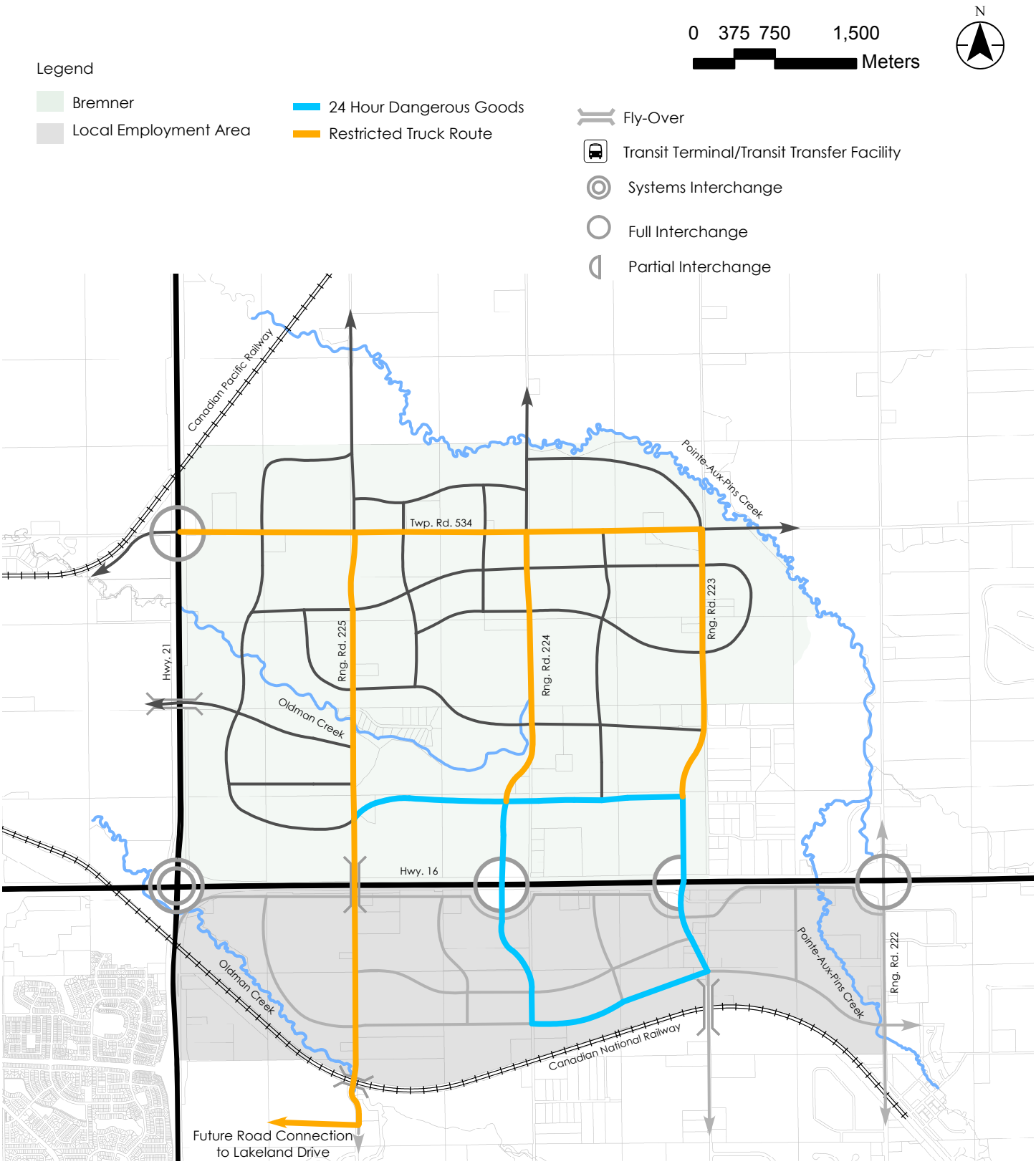
The Goods Movement Network is based on providing a high degree of connectivity between the Local Employment Area and Business Park Area with Highway 16. The majority of heavy truck movements will take place around these areas. As such, the Arterial Streets and Industrial Arterial Streets with access to Highway 16 have been designated as 24-Hour Dangerous Goods Routes.

In addition to the Dangerous Goods Routes, the remaining Arterial Streets have been designated as Restricted Truck Routes. These streets are also designed to accommodate large truck movements, but because of their location through the more residential areas of Bremner and because the anticipated demand for dangerous goods is lower, these routes are intended to provide connections between the highway network, industrial areas, and commercial centres through Bremner. Commercial vehicles will stay on these routes until they divert to take the last leg of their route to their final destination. All industrial street types are included in the Restricted Truck Routes.

The proposed Truck Route Map is included in Map 7.

MAP 7

TRUCK ROUTE PLAN



STRATHCONA COUNTY

Note: This map is conceptual in nature. The exact location and alignment of land uses, facilities, roadways and services will be determined by the future development ASPs subject to Strathcona County's approval.

Deliveries

Several design considerations have been included to consider the needs of commercial and industrial vehicles. In particular, the design of Main Streets through the Town and Village Centre must contain flexibility to accommodate the heavier walking and cycling volumes while still accommodating commercial deliveries. This is accommodated through:

- Furnishing Zones – can be hard surfaced in delivery zones to accommodate the delivery of goods;
- Ancillary Zones – this flexible street allocation allows for delivery zones located in front of commercial sites;
- Lane widths throughout Bremer have been considered to accommodate large turning vehicles where appropriate; and
- All street types can accommodate emergency vehicles.

4.2.2 Access, Mobility, and Connectivity Policies

a. **Require** transit, active transportation, and vehicular connections to large commercial centres and major public community services (such as recreation centres) in existing Sherwood Park to **ensure** accessibility by multiple transportation modes.
b. **Require** the development of a highly-connected street network for all users to **ensure** shorter travel distances for people walking, cycling, and taking transit.
c. **Require** a transportation impact assessment as per the Bremner Transportation Impact Assessment Guidelines as part of a Bremner Sub-Area Structure Plan to **ensure** that new development in Bremner aligns with the transit, active transportation, traffic and goods movement goals and objectives.
d. **Encourage** early implementation of regional transit service to key employment areas within the Edmonton Region to **promote** transit as an option for residents early in the development of Bremner.
e. **Encourage** the introduction of Dynamic Transit Services in accordance with the Strathcona County Transit Master Plan to **promote** transit as a viable option for new residents forming their travel habits.
f. **Require** contiguous phased development to **ensure** transit service implementation early in Bremner buildout.
g. **Require** an active transportation network that includes an internal network of multi-use trails, cycle tracks, and sidewalks within each neighbourhood with connections across neighbourhoods to **ensure** access across Bremner for people walking and cycling.
h. **Require** access for people walking and cycling at all highway crossings to **ensure** inter-regional active transportation.
i. **Require** an interconnected street network in the form of grids and modified grids to **ensure** walkability and transit compatibility.

4.3 SAFETY AND HEALTH

The transportation network is designed to help achieve a vision of no one being seriously or fatally injured while using it, regardless of mode. The network provides active transportation and recreation opportunities that promote healthy lifestyles.

4.3.1 Speeds

Based on the Vision Zero and Safe Systems Approach outlined in Section 3, Design Speeds are intended to support a street network that is safe for users of all modes and context sensitive to the surrounding land uses.

The choice of Posted and Operating Speed of a street significantly impacts the placement and location of furnishings in walkable environments, as well as the comfort and safety of people walking and cycling. Where lower speeds cannot be achieved, the negative impacts should be mitigated through increased sidewalk buffers for people walking, increased physical separation from motor vehicle traffic for people cycling, and safe and convenient crossing opportunities for all vulnerable users.

For all Bremner streets, **DESIGN SPEED EQUALS THE POSTED SPEED**. The Bremner DCS provides the Design Domain for Design Speeds for each street type and for off-street and on-street active transportation facilities.

Design Speed ranges are based on aspects such as land use context, building orientation in relationship to the street, functional classification of the street, types of interactions that can occur between street users, and mobility goals. **While higher speed of travel for people operating vehicles, transit users, and goods movement will result in shorter travel times, the detrimental influence this higher speed can have on other street users, the built environment, and collision severity must be considered.**

4.3.2 Intersections

An intersection is defined as the location where two or more streets join or cross at-grade, including on-street and off-street for all modes of travel. An entrance or exit from an adjacent property (i.e. driveway) is considered an access, and not an intersection.

The technical components of intersection design are covered in the Bremner DCS. Intersection design must balance the competing demands of users to provide acceptable levels of service for people walking and wheeling (including those with disabilities), cycling, driving, operating transit, and delivering goods. Intersections must be safe for all users. Intersections must also be accessible to all users and follow the principles of Universal Design.

The Bremner DCS identify a number of intersection treatments that consider the priority users, functional classification of intersecting streets, types of cycling and walking infrastructure, and adjacent land uses.

When designing an intersection, it is also important to consider the needs and specific limitations of all street users (e.g., people walking, cycling, and driving) and their vehicles, as well as the safety of all street users. Applying this requirement should result in designs that satisfy the following principles:

- A street user's expectations of the design are not violated (i.e., strangers to an area are not surprised by the location of the intersection, or its layout, and there is consistency in design from one location to the next along a corridor).
- The design provides a level of forgiveness for street user errors by:
    - Minimizing exposure to conflicts;
    - Minimizing complexity;
    - Reducing speeds at conflict points;
    - Communicating right of way priority; and
    - Providing adequate sight distance.

Intersection types include: signals, stop or yield controlled, roundabouts, and grade separated.

4.3.3 Multimodal Connections to Transit

The transit plan for Bremner has been identified to take advantage of the multimodal integration potential between trips. Neighbourhood transit routes will provide service to transit centres. Transit centres will, in turn, provide connections to the regional destinations. Almost every transit trip will start or end with a walk or bike component, which is an easy way for residents to add physical activity into their daily commute. Walking infrastructure will connect residents between their homes and dynamic transit or local transit routes. And while walking as a transit trip segment tends to be limited to between 400 m and 800 m, cycling can extend the reach of transit routes even further. Providing a network of high-quality and safe walking and cycling infrastructure is a key piece of the transit network. Ensuring that the connection between that active transportation network and transit, through station and stop infrastructure, crossings, and bus facilities, supports the potential for residents to make choices at every stage of their journey to choose the mode that works best for them and the community.

To support an integrated transit network with opportunities for walking and cycling trips to be part of the journey, the transportation network in Bremner has been identified to be permeated with sidewalks, multi-use trails, and cycle tracks. Bus stops should reflect the transit passenger volumes expected to use the route, with large stops providing more amenities to support rider comfort, and buses should be selected that can allow users to bring bicycles along for the ride.

The principles governing the integrated transit system include:

- Transit trips start the moment the passenger leaves their origin;
- Transit stops are a transfer point that must safely and efficiently manage the transition from the mode the passenger arrived using to the bus or other transit vehicle; and
- The transit trip does not end until the passenger reaches their final destination.

With these principles in mind, design requirements for transit stops and shelter design are included in the Bremner DCS.

4.3.4 Railway Crossings

There are three existing major rail crossings at the south end of the LEA. Range Roads 225, 224 and 223 all cross the CN tracks. Existing crossing facilities include:

- An underpass of the rails at Range Road 225,
- An overpass of the rails at Range Road 224, and
- An at-grade crossing at Range Road 223.

The final road network plan for Bremner and the LEA recommends a closure of the existing crossing at Range Road 224 and an upgrade to the crossings at both Range Road 225 and Range Road 223. Inputs into this recommendation include:

- Range Road 225 is the primary connection between Sherwood Park, Bremner and the LEA due to proposed flyovers at Lakeland Drive and across Highway 16. This location will have the highest demand for traffic volumes, and the ultimate rail/bridge configuration should accommodate an anticipated AADT of 23,500 vpd, which may not be well serviced by the existing capacity of the underpass.
- Range Road 224 is an existing crossing that will reach the end of its service life in 2025. Demand is not significant in this location and to maximize efficiencies of crossings, it is recommended that traffic is spread between Range Road 225 and Range Road 223 crossings.
- Range Road 223 will meet the requirements for a grade separated crossing when daily traffic volumes exceed 5,000 vpd.

4.3.5 Policies

a. **Require** design speeds to equal the posted speed and posted speed limits on streets to be aligned with the goals of Vision Zero to **ensure** safety for all users.
b. **Consider** roundabouts as alternatives to signals at intersections requiring control greater than two-way stops to **support** traffic safety.
c. **Require** roundabout design to prioritize safety for people walking and cycling to **ensure** that Bremner is safe and accessible for users of all ages and all modes.
d. **Encourage** intersection designs that include a separate signal phase (protected phase) for people walking to **promote** the goals of Vision Zero.
e. **Require** safe, efficient, unobstructed, and accessible active transportation infrastructure connections to transit service to **ensure** that walking and cycling to transit is safe and convenient for residents.
f. **Require** the design and location of street crossings to include safety considerations such as small curb radii, pedestrian islands, raised intersections or crossing, protected intersections, and curb extensions to **ensure** short crossing distances and slow motor vehicle speeds.
g. **Require** human-scaled lighting (also known as "pedestrian oriented lighting") along Main Street Collectors, Shared Streets, and other street-oriented contexts with increased spacing and luminaires at lower elevations to **ensure** a safer pedestrian environment during dark hours.
h. **Require** that planning and development applications adjacent to the railway are referred to the railway company for review, and that rail line development guidelines are adhered to, to **ensure** safe development in proximity to rail.
i. **Require** Noise Impact Assessments **in** accordance with Strathcona County standards to **ensure** potential noise impacts can be mitigated.

4.4 INTEGRATION

The transportation network is context sensitive, supported by complementary land uses and quality multimodal infrastructure that provides proximity to services and integrated mobility options for travel between origins and destinations.

4.4.1 Context Sensitive Design

The identified Street Types and Bremner DCS have been developed to present a range of street types that will complement the surrounding land uses. Street should be flexible to change as they transition from one land use to the other and to change over time. The street that best serves the industrial areas will differ greatly from the Main Streets. The Bremner DCS have been developed to consider all streets as a sum of zones, as illustrated below, but with flexibility in the width and details of each zones depending on street context.

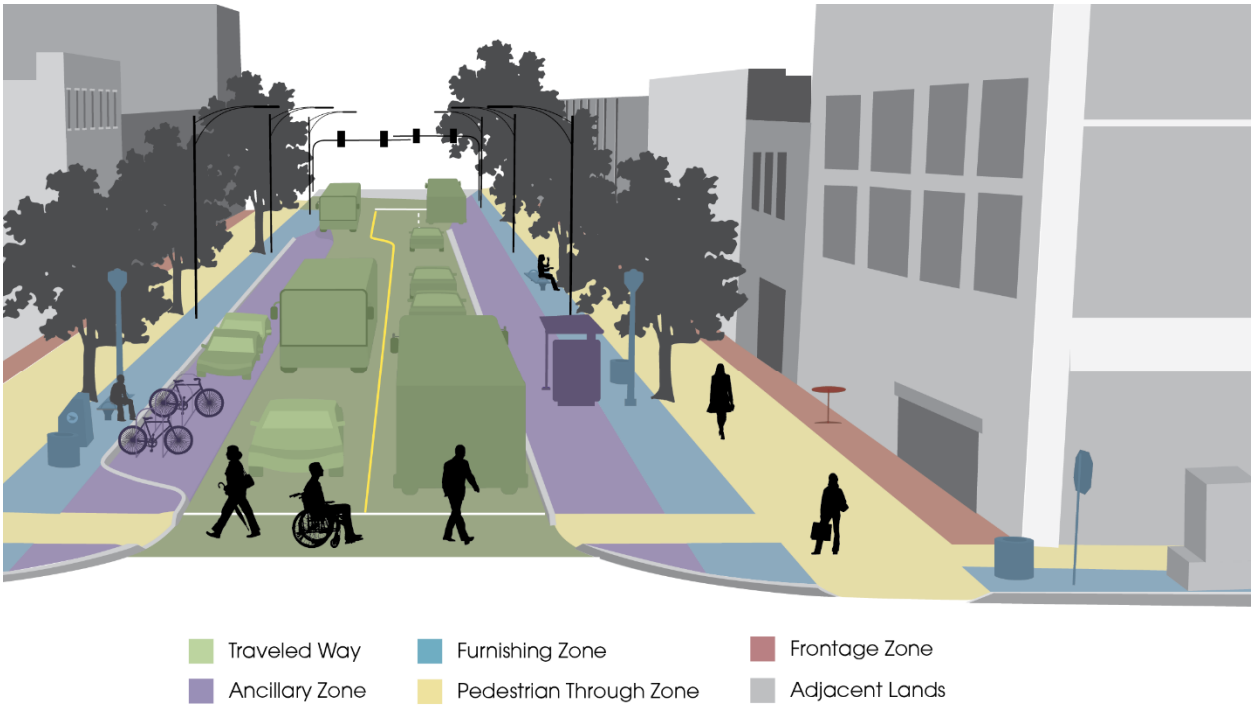


Figure 8: Street Zones

4.4.2 Access

The objective of access management is to provide a consistent approach to how users of the street can expect to have interactions with motor vehicle traffic accessing property from the street. Consideration for how much access to provide impacts people driving, walking, cycling, taking transit, and delivering goods. While restricting access improves operations for people

driving, it has impacts on all other modes and the public realm. Access management must strive to balance the needs of all users while designing for safety.

For Bremner, the Transportation Association of Canada recommends motor vehicle access should be as follows:

- On Arterial Streets, limit access to every 400 m;
- On Collector Streets, limit access to every 200 m; and
- Crossings of accesses for people cycling and walking should be designed to prioritize those modes and maximize visibility for those crossing.

4.4.3 Parking

A typical vehicle spends 23 hours a day parked[8]. This parking infrastructure takes up space and costs money, outcomes that impact everyone regardless of whether they drive or not. Estimating parking demand is challenging, and existing data is often based on studies of suburban areas where parking is provided for free. This can lead to a feedback loop where the supply of parking is never metered, users are never incentivized to use other modes, and parking demand matches or exceeds supply, creating the false sense that the original supply was indeed needed to meet demand.

According to the Victoria Transport Policy Institute[9], there are 10 general principles that help guide planning decisions around parking management:

- Choice – people should have parking and travel options;
- Information – people should be informed about those parking and travel options;
- Sharing – parking facilities shouldn't be restricted to one specific destination, but instead shared between users and destinations;
- Utilization – parking infrastructure should be frequently occupied;
- Flexible – parking infrastructure should be able to change to adjust to changing demand and future uncertainty;
- Prioritization – the most desirable spaces should be managed so they are prioritized for higher priority users;
- Pricing – users should pay directly for the parking facilities they use;
- Peak management – peak demand should be managed using special efforts;
- Quality vs. Quantity – parking facilities should be context specific, aesthetically pleasing, secure and accessible; and
- Comprehensive Analysis – all costs and benefits should be considered.

4.4.3.1 Parking Management Strategy

Parking management will vary throughout Bremner, depending on the land uses. Similarly, a variety of parking management strategies exist to support the Vision and Principles for Bremner.

[8] Victoria Transport Policy Institute (Todd Litman). 12 September 2016. *Parking Management: Strategies, Evaluation and Planning.*
[9] IBID

Centres

Parking demand is expected to be highest in the Town and Village Centres, where employment and retail services will create demand. Providing parking to these areas is important to support access to the area by users of all modes. Parking in the urban areas of the Town and Village Centre should be shared between uses through the use of on-street parking and shared parking facilities.

Shared parking facilities should be designed to be integrated into the urban environment with high quality design. Parking garages should be designed to be future-proofed, where the structure can be repurposed for office or residential space if future parking demand is significantly influenced by disruptive transportation technology (See Section 4.7.1).

On-street parking offers advantages that suit the context of an urban area. On-street parking provided in the Ancillary Zone of Main Streets creates a buffer between motor vehicle traffic along the Travelled Way and people in the Pedestrian Through Zone or cycling in the cycle tracks. The space in the Ancillary Zone is flexible depending on time of day and location along the street. It can be used for car parking, bus stops, bicycle parking, parklets, and curb extensions for midblock and intersection crossings.

On-street parking should be priced to market conditions. According to Donald Shoup in *The Trouble with Minimum Parking Requirements*[10], market price for on-street parking corresponds to a cost that translates to a vacancy rate of 15%. If the price is set too low, people driving will circle the blocks looking for parking, contributing to congestion and wasting time. If the price is too high, stalls will not be occupied, and the space wasted. Finding an appropriate market price is the most equitable way to provide parking, so parking is paid for by those that use it, as opposed to those travelling by transit, bike or on foot.

Pricing curb parking rather than requiring off-street parking improves urban design, reduces congestion, conserves natural spaces, produces revenue, reduces the cost of housing. Providing payment methods that are convenient through electronic payment systems that allow users to pay with credit card or by phone can help minimize the residence to payment.

Town and Village Centres should include bicycle parking in the form of bike racks within the ancillary zones and bike parking within private and public parkades.

Neighbourhoodsl

Neighbourhood areas in Bremner will include a variety of development types ranging from single detached homes to low rise apartment buildings. Residents in higher density developments can have lower parking demands. Proximity to jobs, transit, and active transportation facilities allow residents to choose to not own a car, or in a family situation, to have only 1 car as opposed to multiple. Car sharing services, when available, can reduce the demand for private parking.

On-street parking will be provided in residential areas that can supplement off-street parking. In areas where on-street parking could be in demand by nearby uses (schools, hospitals, and

[10] Shoup, Donald C. 1999. *The trouble with minimum parking requirements*.

employment areas), residential parking permits which restrict on-street parking to local residents can help regulate supply.

In higher density developments (i.e., apartment buildings), one method to reduce parking requirements is to unbundle the cost of parking facilities from the cost of the unit, selling the parking separately. Higher density residential developments should also include covered, secure bicycle parking.

Major Employment

Like in the Centres, parking requirements can be somewhat mitigated in major employment areas by providing shared parking facilities. On-street parking should be considered where employment centres are street oriented; in industrial areas, on-street parking can be incompatible with the demands for larger industrial vehicles and parking should be provided off-street.

In addition to providing bicycle parking, office buildings should provide showers and changing facilities that better support cycling.

Major employment centres, with large number of employees can also decrease parking requirements by providing private shuttles or transit service between higher density areas (e.g.,Town and Village Centres for example) directly to employment areas (e.g. The Industrial Heartland).

4.4.4 Regional Transit

The Edmonton Metropolitan Board Growth Plan currently shows three different regional transit options into the City of Edmonton into Strathcona County.

- Central LRT Extension – The LRT route is currently in the conceptual planning stages for the first phase from Downtown to Bonnie Doon. This line could eventually extend into Sherwood Park into Bethel Transit Terminal;
- BRT/Express Bus from Bonnie Doon down Highway 14; and
- BRT/Express Bus from Beleveder Transit Centre to Bremner down Highway 16.

Further analysis and consultation at future planning stages (ie. Area Structure Plan) will be required with Strathcona County to determine whether or not these routes are viable options for Strathcona County residents.

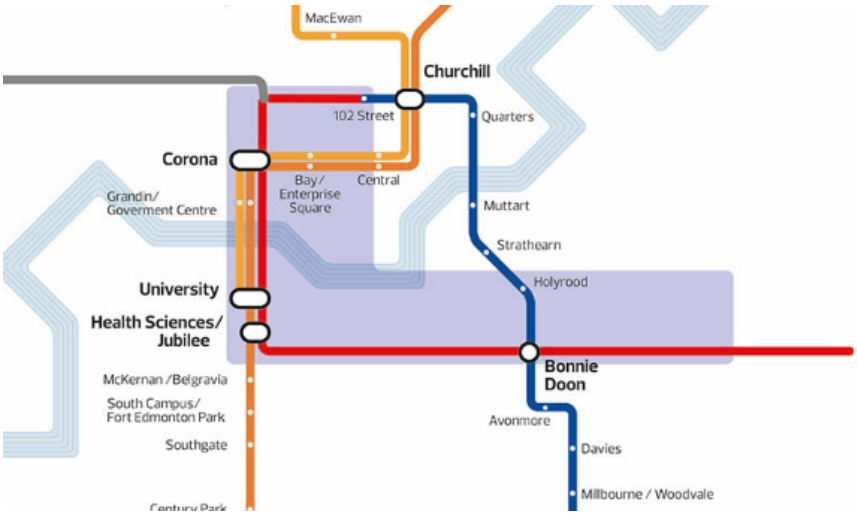


Figure 9: Edmonton Metropolitan Board Growth Plan Long Term Transit Plan

The Bremner transportation plan has identified three regional transit routes; one into Sherwood Park and two into Edmonton (downtown and university). The exact location of these routes should be analyzed in more detail in future study. The main transit centre for regional transit is expected to be located near the interchange of Township Road 534 and Highway 21 in the short term, and eventually extended to include the Town Centre and the business employment area.

Bremner is also expected to generate employment commuter trips to the Industrial Heartland to the northeast of Bremner. Strathcona County should work with employers to identify opportunities for private transit shuttles to access major employment areas.

4.4.4.1 Transit Terminal

Because of its location in the region, Bremner will have a large proportion of commuters travelling to common destinations in the City of Edmonton and Sherwood Park. The transit plan has identified Transit Centres in each of the Town and Village Centres A transit terminal should be provided in the village centre located at the gateway to Township Road 534 and Highway 21.

Use of local transit, walking, and cycling are the preferred travel choices to connect to regional transit terminals. This reduces demands on parking (and associated costs) and the street network within the Town and Village Centres. Park and Ride facilities should only be located when population density being serviced may not support feeder transit, and areas that are not currently compatible with successful transit-oriented development.

Despite these travel options, demand for parking is anticipated to be high and consideration should be given to providing parking facilities such as a park and ride or shared parking with other commercial users. For reference, Bethel Transit Terminal has over 1000 free parking stalls

and 100 reserved paid parking stalls, and during the academic year parking is generally full before 8 am.

Successful park and ride must provide access to reliable transit that is lower cost than driving all the way to the final destination. Park and ride facilities should:

- Be located near a freeway or Arterial Street to provide good vehicle access;
- Located a sufficient distance from the destination to make the transfer worthwhile; and
- Be affordable.[11]

Park and ride facilities should include kiss and ride, taxi stands, parking for people with disabilities, carpool stalls, pedestrian and cycling access, cycle parking, and transit transfer facilities. Those facilities should be located closer to the station than general parking to provide an additional incentive to use alternative modes to access the transit centre.

Free parking at park and ride facilities is a subsidy offered to car owning commuters. Based on demand, charging a market appropriate fee for park and ride reduces operating costs of transit, encourages use of local transit or active modes to access transit centres, and controls demand. Providing subsidies for low income or accessibility challenged passengers can help improve the equity of this arrangement.

4.4.5 Integration Policies

a. **Consider** flexibility in street design elements within the right of way such as lane, boulevard, median, and sidewalk width when designing streets to **support** cross sections that align with context and are flexible to a changing mobility future.
b. **Encourage** on-street parking on Collector Streets, Local Streets, Primary Collector Streets, and Main Streets to **promote** businesses and create a buffer between street traffic and people within the public realm.
c. **Encourage** transit terminals at the arterial gateways of Township Road 534 and Highway 16 to **promote** access to regional transit as well as within the Business Park.
d. **Encourage** transit terminals within Village Centres and Town Centres to prioritize accommodation for people walking and cycling, including safe active transportation connections into transit centres and bicycle parking to **promote** walking and cycling access to regional transit.
e. **Require** development within 400 m of the Town Centre and Village Centres to include street, intersection designs that prioritize people walking, cycling, and taking transit as higher or equal priority to vehicular travel to **ensure** the use of active transportation and transit for trips within Bremner.
f. **Require** transit terminals to have a pedestrian-oriented design where vehicular parking is underground or stacked, shared use, and has a main entrance that is on and faces a public street to **ensure** active frontages to the public realm and improved access to transit terminals by active transportation.
g. **Require** that where vehicular parking is necessary at transit terminals, it is located underground or stacked and has a main entrance on and fronting a public street to **ensure** pedestrian-oriented design, active frontages and improved access to transit terminals by active transportation.

[11] City of Edmonton. 2017. *Park and Ride – Best Practice Review*

h. **Encourage** that where vehicular parking is necessary for transit terminals; shared parking is used to **promote** transportation demand management and utilization of local transit to transit terminals.
i. **Encourage** the County to work with rail companies to establish thresholds and or timelines for crossing upgrades to **promote** rail crossing safety and a connected street network.

4.5 WINTER DESIGN

The transportation network is useable and accessible to users of all modes in all seasons.

4.5.1 Winter Streets

Bremner will be a year-round community, where people can continue to live, work, and play 12 months a year. While there are cold and snowy days, historical temperatures in Sherwood Park are relatively mild with average temperatures ranging between a high of 17.4 degrees Celsius in July and a low of -13.9 in January[12]. These temperatures are highly compatible with walking and cycling, but consideration for how design and snow clearing policies impact that compatibility is also important. High-quality design combined with snow clearing policies that promote equitable access to the network are the foundations of a winter community.

Considerations that impact the livability of a winter community include:

- Snow Clearing Policies;
- Streets as Places and Context Sensitive Design;
- Snow Storage;
- Transit Stop Spacing; and
- Transit Shelter Design.

4.5.2 Snow Clearing

Snow clearing policies need to consider how the streets are available for people walking, cycling, riding transit, driving, and delivering goods in the event of snowfall.

Snow clearing standards can be based on time related to start or end of snowfall or based on accumulation. The following table summarizes the recommended clearing priority.

[12] The Weather Network. Historical Weather Data. https://www.theweathernetwork.com/forecasts/statistics/degreedays/cl3012209/caab0275

Table 12: Bremner Snow Clearing Priority Recommendations

Priority Area	Street Type (Travelled Way Infrastructure)	Street Type (Transit, Cycling and Walking Infrastructure)	Service Level
Priority 1	• Arterial Streets • Industrial Arterial Streets	• Local & Regional Transit Routes • Cycle Tracks (Primary Collectors, Main Streets) • Multi-Use Trails (Arterials) • School Sites (Sidewalks or Multi-use Trails)	• Completed within 12 hours following a 2-5 cm snow accumulation
Priority 2	• Primary Collector • Main Street Collectors • School Drop Off Areas	• Local Transit Routes • Multi-Use Trails (Industrial Arterials) • Multi-Use Trails (Collectors and Industrial Collectors)	• Completed within 12 hours following a 5 – 7 cm snow accumulation and following Priority 1 clearing
Priority 3	• Collector Streets • Industrial Collector Streets	• Eco-Trail	• Completed within 8 days following a 15-21 cm snow accumulation and the completion of the Priority 2 clearing
Priority 4	• Local Streets • Shared Streets • Industrial Local Streets		• Attended to based on deep rutting.

4.5.2.1 Walking and Cycling

As the most vulnerable users of the street, those cycling, and walking require additional thought when considering the impacts of snow clearing policies. A high-quality trail that crosses a windrow of snow to get across the street becomes inaccessible after a snow fall, especially for those with mobility challenges or pushing a stroller. The streets of Bremner must be equally accessible following a snowfall to all users.

- Consider the use of sweepers with brine spray for anti-icing on multi-use trails and cycle tracks. Brine solutions can be effective up to temperatures as low as -30C. Brine solution inhibits ice formation with less salt than traditional street salt equipment and prevents snow bonding to a surface. When combined with street sweepers, especially for more modest snowfalls, this methodology keeps cycling and walking facilities clear of obstructions year-round.
- Consider a more aggressive residential snow clearing policy for residential local streets. Streets should be cleared within 24 hours of a snowfall event to keep access to local transit and services available by walking or for those using mobility aids.

4.5.3 Transit Stops

The first step to higher quality winter transit operations is providing high quality year-round cycling and walking infrastructure. There are additional service improvements specifically when considering transit stops that improve the experience and lend dignity to the winter transit rider. Transit stops, and stations should include:

- Real time information for transit route arrival, particularly at higher volume stops and stations;
- Winter weather protection in the form of wind breaks and heated shelters,
- Pedestrian scale lighting for security;
- Layout of stations that accommodates snow clearing equipment; and
- Secure, covered bike parking at higher volume stations and stops.

4.5.4 Winter Design Policies

a. **Consider** design solutions and practices that make use of (or manage) snow on-site or nearby rather than hauling it to off-site snow storage sites to **support** environmentally friendly snow storage.
b. **Require** design and maintenance of active transportation infrastructure to be safe and accessible year-round to **ensure** there is opportunities for cycling and walking in Bremner in all seasons.
c. **Require** transit terminals and transit transfer facilities incorporate weather protected walking infrastructure and bicycle storage to **ensure** transit is a safe and comfortable year-round option.

4.6 GREEN INFRASTRUCTURE

The transportation network is integrated with open spaces, including storm water systems, public infrastructure, and natural habitats.

4.6.1 Trees/Plantings

Street trees are highly valued urban assets. Studies have found that drivers have a favorable perception of communities with more trees.[13] Street trees can also have a positive impact on crash reduction through decreasing speeds (through visual narrowing of the street) of drivers to more appropriate urban speeds. Streets not only contribute to placemaking, they also create a safer walking environment through creating a more distinct, physically separated walking space[14]. Trees provide shade in the summer and protection from wind in the winter, improve urban air quality, and support noise attenuation. Trees should be located in the boulevard within the Furnishing Zone on all street types except local streets. Tress should be required on private property in local streets.

4.6.2 Off-Street Trails

The Active Transportation Network Plan identifies a primary network of active transportation facilities in the form of multi-use trails, cycle tracks, and sidewalks to support the ease of movement for trips around Bremner. Not shown on this plan at this stage of planning is an anticipated network of trails through environmental reserves, school sites, and parks that will help connect residential areas to the schools, community commercial areas, and the greater active transportation network.

The transportation plan also includes an identified "eco-trail" through the Major Open Space Corridor. This trail is intended primarily for recreational uses. In the winter, this facility could be track set for cross country skiing, adding recreational transportation opportunities that still serve to connect residents across Bremner.

4.6.3 Green Infrastructure Policies

a. **Require** street trees to be integrated into the design of collector and arterial streets , including boulevards and medians to **ensure** pedestrian comfort, shelter and safety; and add value to the adjacent properties.
b. **Encourage** street trees on local streets, which may be provided on private property where right-of-way is not available, to **promote** pedestrian safety and reduced traffic speeds.
c. **Encourage** development of trails between and through environmental reserves for people walking and cycling to **promote** connections to green spaces.
d. **Require** clubroot management plans on affected parcels to **ensure** that clubroot is not spread to other agricultural areas.

[13] University of Washington. Green Cities: Good Health. June 15, 2016. Safe Streets. https://depts.washington.edu/hhwb/Thm_SafeStreets.html
[14] Dan Burden. 2006. *Urban Street Trees – 22 Benefits Specific Applications* http://www.walkable.org/download/22_benefits.pdf

e. **Require** plant species that are not invasive to **ensure** existing agriculture is protected.
f. **Require** the reuse of topsoils within Bremner to **ensure** the majority of higher class soils within the Bremner area are retained.

4.7 SMART CITY

The transportation network is adaptable to community needs and the changing future.

4.7.1 Connected and Autonomous Vehicles

A review of recent research on connected and autonomous vehicles (CV/AV) suggests, with almost certainty, that many Strathcona County residents will experience some impact of driverless technology within their lifetime. Estimates on adoption of fully autonomous vehicles vary, but early forms of automated vehicles are already on the streets. While the benefits of this technology are debated against the impacts, the role of planners is to evaluate what precautions and preparation can take place today to future-proof communities against this uncertain technological future.

CV/AV provides an opportunity to improve the capacity of streets, decrease collisions, increase the range of transit through first mile/last mile shuttles, decrease operations costs, and extend mobility ranges for those who currently cannot drive. However, turning over the urban form and the public realm of the streets to the driverless car should be approached with caution. As communities strive to now plan complete communities, complete streets, and walkable and bikeable urban areas, the priorities for community mobility must be weighed against the perceived benefits of CV/AV technology.

CV/AV technology will also continue to improve on the data available about how and when we travel. Data driven policies around curb pricing, lane allocation, and identifying locations for safety related improvements will improve efficiency, safety, and help cities to make the best decisions about use of public space.

A walkable, bikeable, transit friendly community requires walking and cycling infrastructure, dense urban form, and transit connections to employment areas. The transportation plan has identified these priorities. As development proceeds and technology advances, the following principles should be considered in taking advantage of CV/AV:

- Continue to evaluate the need for new transportation infrastructure against the growing understanding of the impact of CV/AV technology on the capacity of streets;
- Transit will remain the best service to move large groups of people. Plan for rapid mass transit routes that will connect residential areas and employment areas and be flexible in the long-term implementation of technology for those routes;
- Use data from travel patterns/behaviours generated through new mobility to identify parking pricing and vehicle kilometers travelled pricing to manage demand and promote higher capacity shared modes;
- Prioritize on-street parking for parking solutions in commercial and business employment areas, where the potential for decreased parking demand could result in the public realm being repurposed for other uses like parklets, bicycle parking, food trucks, and shops;

- Develop parking garages with the potential to be repurposed into residential or commercial spaces; and
- Develop walking and cycling infrastructure to continue to prioritize active modes regardless of changing technology.

4.7.2 Transit

Changing technology brings opportunities to improve the quality of transit services offered in Bremner. From improved signal control to autonomous shuttles, the impacts of transportation technological advances will likely be first felt in transit regardless of the long-term impacts on general traffic. In addition to technological advancements, transit service can benefit from a number of lower impact interventions that improve the service for transit riders.

4.7.2.1 Transit Priority Measures

Transit priority measures (TPM) describes a range of interventions designed to improve the service and reliability of transit. Examples of TPM include queue-jump lanes, and transit signal priority.

Transit Signal Priority uses technology that communicates with the approaching transit vehicle to change signal timing patterns to provide improved service for a bus. Examples of signal priority measures include:

- Red truncation – as the bus approaches the signal, the phase for stop is shortened decreasing delay for the approaching bus; and
- Green extension – as the bus approaches the signal, the green phase extends long enough to allow the bus to pass through the intersection without stopping.

In Bremner, transit signal priority should be considered on Arterials Streets and Primary Collector Streets, particularly for routes travelling into and out of the City of Edmonton and Sherwood Park.

Queue Jump Lanes are physical widenings of intersections to add an additional shoulder lane for transit only. Buses approaching the intersection will pull into the dedicated transit lane and bypass the queues at the intersection. These can be coordinated with signal priority to give the transit lane a "head start" at the intersection. In Bremner, Queue Jump Lanes should be considered near transit centres and stations.

4.7.2.2 Autonomous Shuttles

Communities around the world are already experimenting with autonomous transit in the form of smaller shuttles and buses that run on fixed routes through communities, supporting tourism, access to regional transit, and major employers. While the Government of Alberta's regulatory environment does not yet support driverless vehicles on public streets, there is an opportunity for Bremner to lead the way with this technology. Because of lower operation costs, neighbourhoods in Bremner could have additional transit service through lower speed autonomous shuttles that connect residential areas to nearby Town and Village Centres. Shuttles like this would offer improved access to transit and increase mobility options, especially for those with mobility challenges.

Figure 10: A driverless shuttle currently operating in Las Vegas[15]

4.7.2.3 Bus Rapid Transit/Light Rail Transit

As discussed in Section 4.4.4, the Edmonton Metropolitan Board long term transit plan includes potential light rail transit (LRT) to Sherwood Park and bus rapid transit (BRT) to Bremner. BRT provides a lower cost alternative to LRT and may be a shorter-term solution to improving regional transit from Bremner to higher employment/education areas like the University of Alberta and Downtown Edmonton. Strathcona County should continue to work with the Edmonton Metropolitan Board to identify timing and preferred routes for higher order transit.

4.7.3 Shared Mobility

Shared mobility is a general term that refers to any transportation scheme where services are shared among users. This term includes public transit, ride-sharing (Uber and taxis), traditional carpooling, as well as newer innovations like car sharing and bike sharing.

Technological advancements like smartphones and GPS have improved the access to car-sharing and bike sharing.

[15] Devin Coldewey, Tech Crunch. November 8, 2017. *Driverless shuttle in Las Vegas gets in fender bender within an hour*
https://techcrunch.com/2017/11/08/driverless-shuttle-in-las-vegas-gets-in-fender-bender-within-an-hour/)

4.7.3.1 Car Sharing

Owning a car is expensive. According to the Canadian Automobile Association, the cost of driving a compact car 20,000 km/year in Alberta is $7,145.30 a year[16]. These costs go up as vehicles get larger and commutes get longer. Even at that cost, many cars sit idle for much of the day. Car sharing schemes can reduce these costs by introducing a fleet of shared vehicles where sunk costs are spread out among a number of users and vehicles sit idle less of the day. Point to point car sharing, where cars can be picked up and dropped off anywhere within a defined boundary, can support transit as "first mile/last mile" trips and help people who use transit or cycling to commute avoid the need to have a vehicle for personal use. A University of California Berkeley study on one-way car sharing identified that systems like car2go or Pogo (the City of Edmonton model) resulted in fewer privately owned vehicles and a reduction in greenhouse gas emissions.[17] This study found that each shared vehicle removed between 7 and 11 vehicles from the transportation network and resulted in a 6% to 16% reduction in vehicle miles travelled. Additionally, the average age of vehicles sold as a result of car2go membership was around 14 years, meaning that older, more polluting vehicles are more likely to be replaced by newer, shared vehicles.

Car sharing within Bremner is another alternative to improving access to Town and Village Centres and regional transit. Car sharing schemes should not come at the expense of cycling and walking infrastructure and should be considered as another tool to improve mobility within Bremner.

4.7.3.2 Bike Sharing

Bike sharing describes a range of service systems that provide a fleet of bicycles that can be rented or borrowed on a short-term basis. Bike share schemes generally include docking stations throughout a defined area where bicycles need to be picked up and returned. Newer bike share systems introduced have also included "dockless" bike share, where bicycles can be left in a variety of pre-approved locations. Bike share systems are already being used in Hamilton, Montreal, Ottawa, Toronto, Calgary, and Vancouver. A pilot program currently underway in Kingston, Ontario of a dockless system is a model for a smaller city.

Bike sharing in Bremner is yet another way to provide improved connections from residential areas to Town and Village Centres and provide alternative mode options to connect residents to jobs, transit, and recreation. Bike shares can improve environmental outcomes, improve public health through encouraging physical activity, and promote equity through introduction of an affordable and convenient transportation option.

[16] Canadian Automobile Association. *Driving Cost Calculator*. http://www.caa.ca/carcosts/
[17] ITS Berkeley. July 18, 2016. *UC Berkeley Study: Fewer Cars, Improved Emissions with Car2Go One-Way Carsharing* http://its.berkeley.edu/node/12871

4.7.4 Smart City Policies

a. **Encourage** the public transportation system to include express transit service outside of Bremner to **promote** transit as a competitive option for commuters to major destinations outside of Bremner.
b. **Encourage** a long-range plan for higher order transit such as LRT and BRT to **promote** connections to higher order transit facilities within the Edmonton Region.
c. **Consider** use of High Occupancy Vehicle lanes as precursor to higher order transit corridors on arterial streets in Bremner to **support** competitive transit travel times.
d. **Encourage** transit priority measures at interchanges near transit terminals with park and ride facilities and at all arterial/collector intersections to **promote** transit as a priority mode.
e. **Consider** the implementation of shared mobility programs (bike and car share) to **support** improved mobility options for residents of Bremner.
f. **Encourage** long-term network planning with regional partners to prepare for connected and autonomous vehicles to **promote** efficient use of infrastructure and the advancement of transit and shared mobility.

5 IMPLEMENTATION

Implementation of the Bremner Transportation Master Plan is primarily supported by the Bremner Design and Construction Standards, which lay out the details of how the proposed street network should be implemented to provide the opportunities desired to achieve a network with multimodal opportunities. As Sub-Area (or Neighborhood) Structure Plans are planned, additional analysis and identified upgrades for the streets immediately adjacent, connected to, and external to the Bremner street network will be required to better understand the increase in traffic demand, need and timing for more capacity, and the potential financial impact of those upgrades. Additional analysis will include, but is not necessarily limited to, supporting Traffic Impact Assessments (TIAs), the requirements of which are included in the Bremner TIA Guidelines.

5.1 PHASING

Phasing of the street network should align with the phasing of the land use build out with the following general recommendations:

- Access to Highway 21 at Township Road 534 is the first priority to open up capacity for the area. Analysis of this intersection is required at the time of the first Neighbourhood Area Structure Plan to identify when upgrades from signals to an interchange may be required.
- Flyover to the LEA is recommended as soon as employment opportunities emerge within the LEA to provide access from Bremner into Sherwood Park.
- Whenever possible four-lane cross sections should initially be implemented as two lane cross sections to provide opportunity to identify if the full capacity is actually needed as long-term development progresses.
- Transit links should be provided early in development especially to key destinations including Sherwood Park Transit Centres, and City of Edmonton and University of Alberta as soon as there is sufficient demand. This will promote early adoption of transit as a mode choice and not require users to change travel patterns later.
- Multimodal facilities should be prioritized including Eco Trails
- Upgrades to rail crossings may be required as early as 2025 to correspond with end of life of the Range Road 224 rail crossing, as discussed in Section 4.3.4
- Review of the range roads north of Bremner will be required as build out commences.
- For additional information regarding Highway 16 access, consult Section 4.1.3 of this report.

APPENDIX A: MODEL REPORT

Stantec

Memo

File: Bremner TMP Date: March 18, 2019

Reference: Appendix A Bremner Travel Model Update Description

OVERVIEW

This memo outlines the overall modelling methodology used to support the transportation planning completed as part of the Bremner Area Concept Plan (ACP). Transportation modelling was used to support the land use and transportation strategy, with the intention of identifying the recommend road network, sizing of facilities including number of lanes, locations and types of cycling facilities, width and location of sidewalks and transit routing. As Sub-Area (or Neighborhood) Structure Plans are planned, additional analysis and identified upgrades for the streets immediately adjacent, connected to, and external to the Bremner street network will be required to better understand the increase in traffic demand, need and timing for more capacity, and the potential financial impact of those upgrades. Additional analysis will include, but is not necessarily limited to, supporting Traffic Impact Assessments (TIAs), the requirements of which are included in the Bremner TIA Guidelines.

METHODOLOGY

The traffic analysis for Bremner was completed using two separate traffic modelling tools: Strathcona County's existing traffic model and a proprietary multimodal modelling tool called BABY BRUTUS, developed and implemented by project team member Strafica Ltd. The traffic modelling exercise also benefited from Alberta Transportation modelling outputs in identifying potential interchange locations and configurations that align with AT requirements and provide sufficient capacity to serve Bremner access requirements while not creating unacceptable stress on the Provincial Highway Network.

The existing Strathcona County VISUM model (which includes Sherwood Park) and data were used to develop a preliminary estimate of potential origin-destination (OD) volumes for trips (total) within Bremner (internal trips) and trips to and from Bremner (external trips). This data was then input into the BRUTUS lite multimodal modelling tool to identify walking and cycling trip potential within Bremner. VISUM was also used to estimate potential transit ridership.

This analysis was used to identify potential driver, walking, cycling, and transit volumes in Bremner which was then used to confirm the required facilities for the internal road network, including number of travel lanes, confirm transit routing, and identify higher and lower priority cycling and walking routes.

STRATHCONA COUNTY VISUM MODEL

The base modelling was completed on a copy of the existing Strathcona County 2044 Travel Model, as received directly from Strathcona County. This is the most "future" scenario currently available. There are a number of discrepancies between this base model and the anticipated full build out of Bremner, which were considered in the analysis:

- Full build out horizon of Bremner is not anticipated until closer to 2080, which is approximately 60 years. The main priority for the internal transportation analysis completed for the Bremner Area Concept Plan is sizing and location of streets within Bremner, as well as confirming

recommended connections to Sherwood Park, Cambrian, and the greater regional network. Additional future background growth in the region is anticipated to have the greatest impact on the Provincial Highway network within the vicinity of Bremner, and not directly on the streets within Bremner. Confirming and identifying anticipated regional infrastructure within the time horizon of the build out of the Bremner Area Concept Plan is beyond the scope of this project. However, Alberta Transportation contributed an analysis of potential interchange locations along Highway 16 for access to Bremner using their long-term model, which extends beyond the buildout of Bremner. Comparing the results from these models allowed the project team to identify where any changes within Bremner may be needed to accommodate longer term growth, as well as identified the recommended interchange locations. Ongoing planning may be required to consider the impacts of timing of regional pieces of infrastructure on Bremner, including higher order transit expansions to Sherwood Park, future additional crossings of the North Saskatchewan River into the City of Edmonton and widening and expansion of Highway 16 and Highway 21.

- The 2044 Strathcona County model assumes LRT construction to Sherwood Park. While this was not modified, express transit routes from Bremner were modeled with direct connections to the City of Edmonton, instead of transferring in Sherwood Park to a potential future LRT.
- The 2044 model includes the previously planned North East River Crossing (NERC). This project was cancelled during development of the Bremner Area Concept Plan. While this may result in changes to how users within Bremner choose to access the provincial highway network, it was beyond the scope of the study to adjust the overall model to account for that change. Alberta Transportation, however, completed their interchange modelling without the NERC, so the results from their model can be reviewed to anticipate where additional pressure may be felt on the network to adjust accordingly if needed.
- The Highway 21 and Highway 16 interchange was being designed at the time of this study. The previously modeled diamond interchange was kept in this analysis for simplicity, however the potential footprint of the future interchange was considered in adjusting the internal road network.

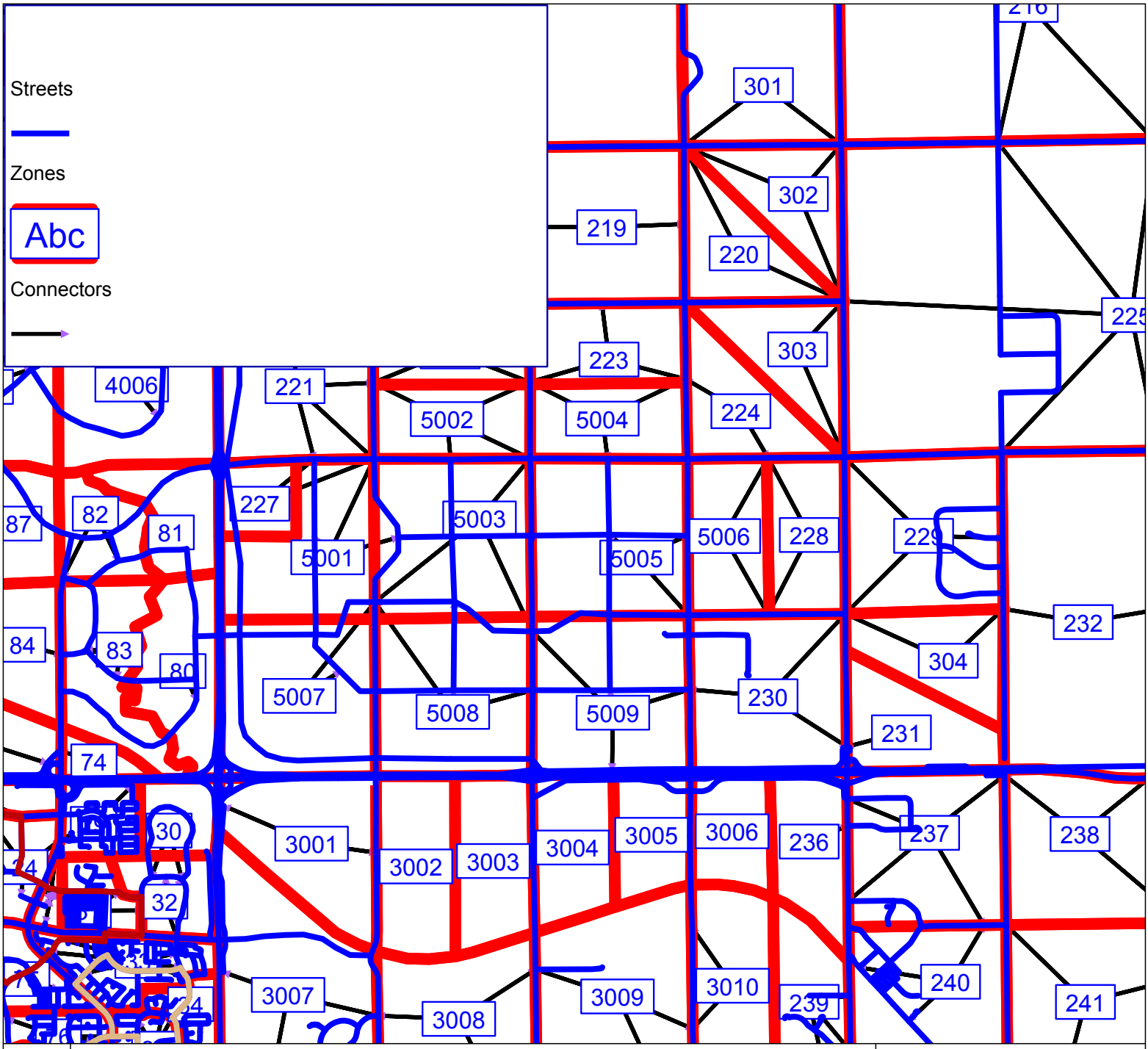
Road network upgrades outside of Bremner that were applied to the model are discussed in the following section.

NETWORK

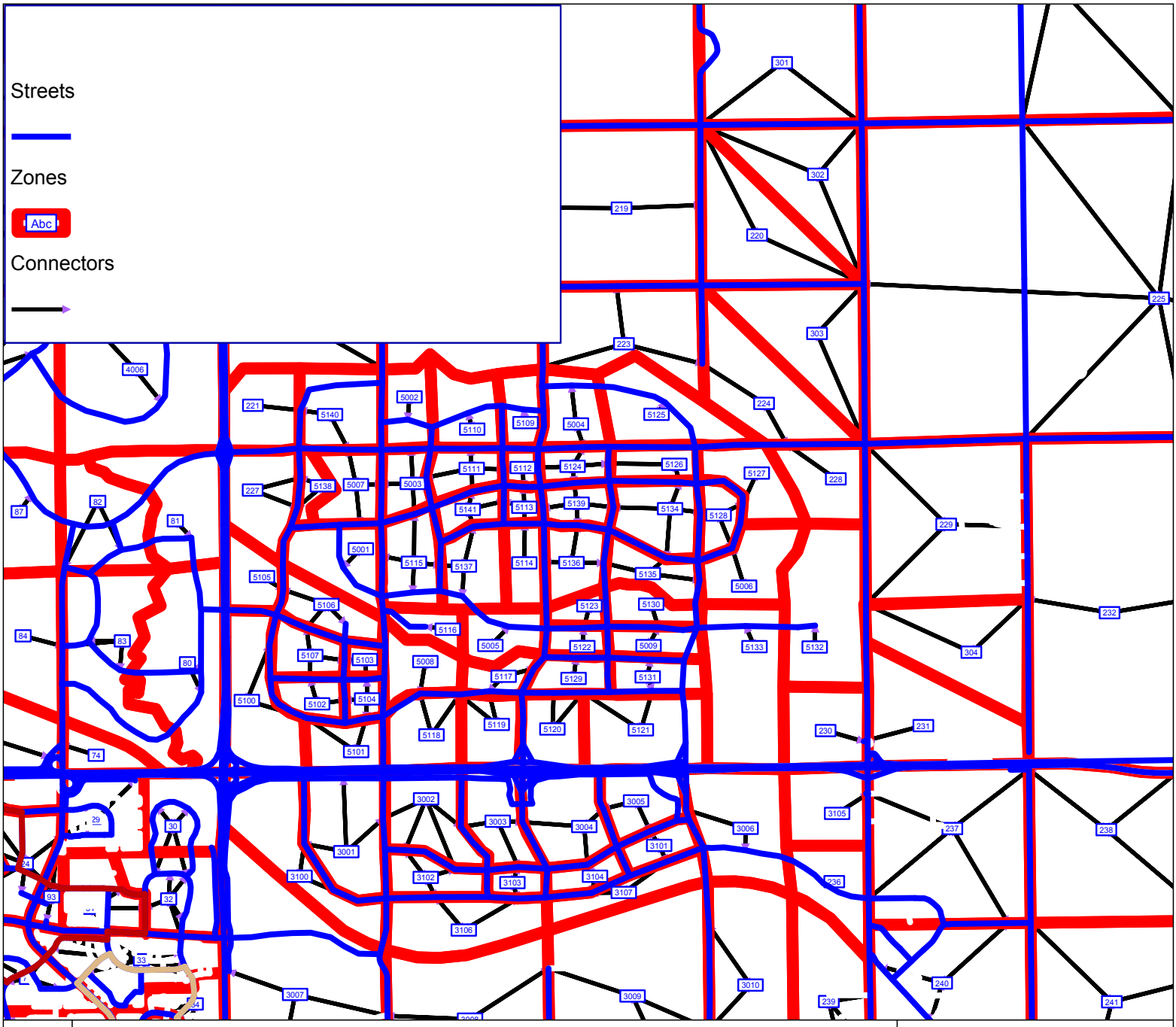
The Strathcona County Model elements are described in detail in the "Strathcona County Integrated Transportation Master Plan Working Paper – Travel Demand Model" prepared in December 2012. Using the provided 2044 Model Scenario as a base, the Bremner Area was updated to reflect the revised proposed street network in an iterative process to ultimately identify the recommended street capacity to serve the Bremner Area.

ZONES

In the original 2044 model, the Bremner network consisted of a smaller number of larger zones, most representing a full section or half section of land. The original Bremner Area from the Strathcona County 2044 Model is illustrated in Figure 1.



		2019-01-03
	Figure 1 - Original Bremner Area Zones	



		2019-01-07
	Figure 2 - Updated Bremner and LEA Zones	

Reference: Appendix A Bremner Travel Model Update Description

ROAD NETWORK

Links

In the original Strathcona County Model, links were assigned attributes based on the County's GIS including road names, road ID, jurisdiction, road function and class, speed limits etc. For the update to the model, the link attributes were focused on the elements that impact the defined capacity of the link. Based on the 2012 Model Report, the capacities used in this model represent environmental capacities, which is a measure of the amount of traffic that is considered acceptable on a link. The classifications from the original 2012 model are summarized in Table 1.

Table 1 Road Classifications 2012 Model

Classification	Capacity Per Lane	Speed	Sample Street
Highway	1200 vphpl	110 km/h	Highway 16
Urban Arterial	1000 vphpl	60 km/h	Sherwood Drive
Urban Collectors	600 vphpl	40 km/h	Oak Street
Highway Ramps	1200 – 1400 vphpl	70 – 80 km/h	Various
Rural Collectors/Arterials	800 vphpl	80 km/h	Range Road 224

Applying these assumptions to the revised street types for the Bremner project, the capacities and speeds of the revised street types are summarized in Table 2. Capacities for ramps and the highway were kept consistent with the previous model.

Reference: Appendix A Bremner Travel Model Update Description

Table 2 Street Classifications Bremner Model

Classification	Capacity Per Lane	Speed	Sample Street
Arterial	1000 vphlpl	50 km/h	Range Road 225
Primary Collector	800 vphpl	40 km/h	NA
Collector	600 vphpl	40 km/h	NA
Local	400 vphpl	30 km/h	NA

Nodes

Node assumptions were kept consistent with the capacity factors identified in Table 2.1 of the Strathcona County Model Report.

Network

The Bremner network is illustrated in Figure 3. Key changes made the external network include:

- Upgrading Highway 16 to 3 lanes in each direction between Highway 21 and Range Road 223.
- Converting Lakeland Drive and Highway 21 to a flyover intersection to reflect future plans.
- Eliminating the rail crossing at Range Road 224.

The figure illustrates the network based on total capacity per 1-way link.

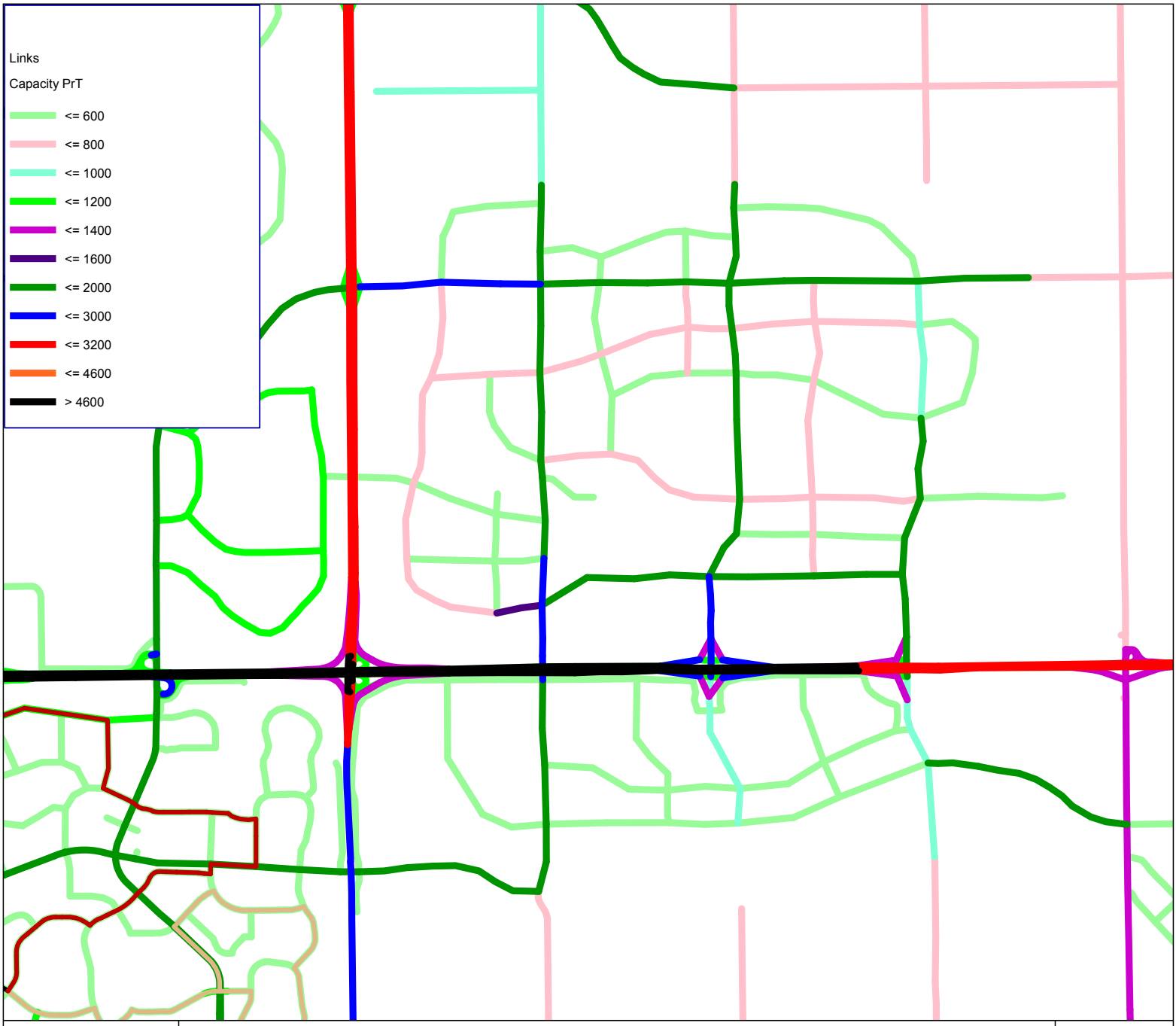


Figure 3 - 1-Way Link Capacity (vphpl)

Transit

Transit routes were sketched based on the proposed transit network, with a park and ride identified in Zone 5119 and Zone 227. Transit routes were scheduled with a 15 minute frequency with start times between 4:30 pm and 5:30 pm. The proposed transit routes within the model are illustrated in Figure 4.

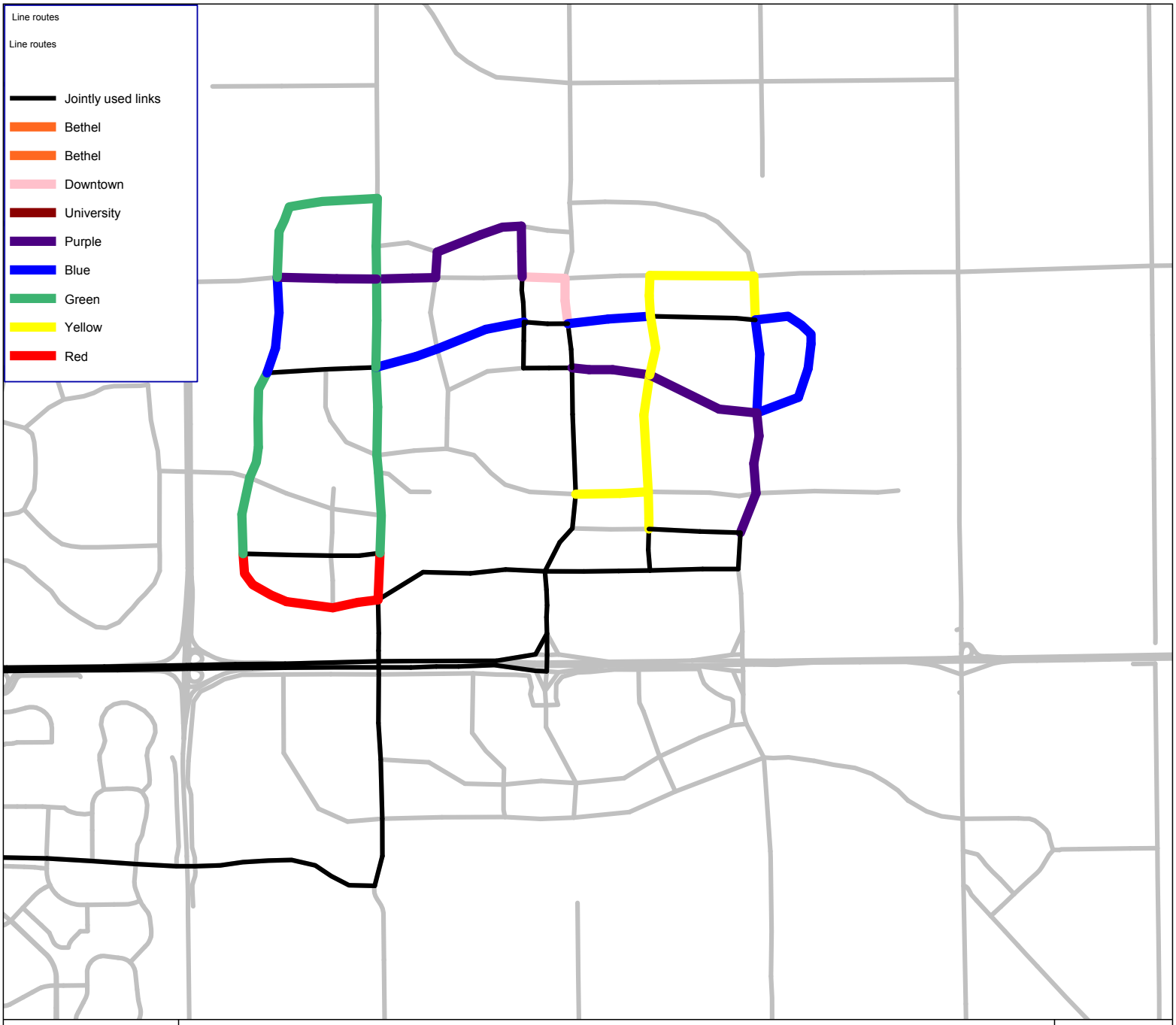


Figure 4 - Links with Transit Service

CN Rail crossing to south

Keeping all CN crossings open on Range Road 225, 224, 223 would ultimately require upgrades at all locations. Reviewing the overall network, the most prioritized crossing was identified as Range Road 225, as this ties into both the flyover into Bremner and the proposed Lakeland Drive connection into Sherwood Park across Highway 21. When the model was run with all crossings opened, the Range Road 225 crossing showed the largest demand. Furthermore, review of existing structures showed that the existing bridge structure at Range Road 224 is both nearing end of life and capacity.

With the previous considerations, this TMP recommends an upgrade to the existing crossing at Range Road 225, closure of the crossing at 224 and long-term grade separation of the crossing at 223 when volumes reach more than 5,000 vehicles per day.

North of Bremner

Range Road 224 may need to be upgraded to the north in conjunction with any infrastructure upgrades planned north of Bremner that attract traffic to the north. The initial modelling for this project includes the assumed and now defunct North East River Crossing (NERC.) This assumption directs traffic towards an assumed upgraded interchange on Highway 21 north of the study area. Future road network planning is now required north of Bremner to be fully certain which range roads will require significant upgrades. Results of the model show potential capacity upgrades required to Range Road 224.

POPULATION AND EMPLOYMENT DATA

The population and employment for Bremner/LEA was input into Bremner/LEA Zones to support trip generation, distribution and assignment identification within the Bremner area.

POPULATION

Bremner ACP identifies a total population of 79,074 mixed between single/semidetached, row-houses/towns houses, mid-rise apartments, mixed use residential and high rises, as summarized in Table 3.

Table 3 Total Bremner Population

Total Residential	Area (ha)	Percentage of Total	Dwelling units/ha	Dwelling units	People /Dwelling unit	Population
Single/Semi	378.00	49.3%	25	9,450	2.8	26,460
Row-house/townhouse	337.34	44.0%	45	15,180	2.8	42,505
Mid-rise Apartment	37.00	4.8%	90	3,330	1.8	5,994
Mixed Use Residential	5.55	0.7%	125	694	1.5	1,041
High-rise	9.11	1.2%	225	2,050	1.5	3,075
TOTAL	767.00	100.0%		30,704		79,074

According to the statistics, this population is divided into four policy areas: The Neighbourhood Policy Areas, the Town Centre Policy Area, the Village Centre Policies Areas, and the Community Nodes. The majority of the population is located in the residential areas. The remainder is distributed as shown in Table 4.

Table 4 Policy Area Population Distribution

Policy Area	Total Population
Neighbourhood	72,202
Village Centre	1,569
Town Centre	4,644
Primary Community Node	504

Secondary Community Node	155

Zone areas were calculated within the model and population distributed within the zones proportionally using an average rate for each policy area. Zone data is included in **Appendix A.1.**

Students

There are 14 Community nodes within Bremner that will eventually host schools with an anticipated total student body population of 15,045 primary students and 4,606 secondary students. To assign students within the model, students were divided equally between each school site. Primary community nodes were assigned 1157 students and Secondary community nodes were assigned 1152 students each.

Employment Areas Within Bremner

Employment can be found throughout Bremner in most Policy Areas including: Town Centre, Village Centre, Community Nodes, and the Neighbourhood Policy Area, and are divided into three employment types: Commercial, Business Employment, and Community/Public Service. We have also assumed additional jobs associated with the schools. School jobs are assumed 1 job for every 10 students, based on a review of existing school sites within the Strathcona County Model. Employment distribution is summarized in Table 5.

Table 5 Employment Distribution

Employment Type	Policy Area (s)	Total Jobs
Commercial	Town Centre, Village Centre, Community Nodes, and Neighbourhood Policy Areas	6437
Business Employment	Business Park	6054
Community/Public Service	Town Centre, Village Centre, Community Nodes	3283
Schools	Community Nodes	1,965

The jobs were assigned to policy areas based on the measured size of each employment area in the various policy areas (ie, jobs were assigned as a proportion of hectares) to identify an overall job number for each policy area. The jobs are summarized in Table 6.

Table 6 Job Distribution

	Town Centre Policy Area	Village Centre Policy Area	Community Nodes	Neighbourhood Policy Area	Business Employment Area
Commercial Jobs	3139	2215	391	692	
Business Employment Jobs					6054
Community Service Jobs	643	667	620		1353
Total Jobs	**3782**	**2882**	**1011**	**692**	**7407**

Job mix based on policy area:

To assign jobs within the model, the jobs must be assigned to either categories of "Other, Retail or Service". The mix for Town Centres, Village Centres, Neighbourhood Areas and Community nodes are based on comparing zones in central Sherwood park (town centre, Sherwood park mall and associated retail areas. The job mix was identified at 38.3% other, 36.6% retail and 25% Service.

For the Business Park Policy area, the mix was based on office employment areas in Sherwood Park and big box centres. The mixture for this area was identified as 22% other, 58% retail and 20% service.

School employment

Three schools in Sherwood Park (Bev Facey, Holy Spirit Elementary and Hawthorn Jr high were reviewed to identify potential employment linked to school sites. Employment numbers varied significantly within these zones, but the lowest estimate identified a total of 1 job per 10 students. Based on the large student populations identified within Bremner, this lowest estimate will be used. To assign within the model, the jobs are divided as 63% 'other', 9% retail and 28% service.

Local Employment Area

There are 3 different employment types identified within the LEA: Commercial, Industrial, and Community/Public Service. Job types for the LEA are summarized in Table 7. These jobs were assigned to the zones within the LEA in the model proportionally. For commercial and Community/Public Service jobs, the employment mix was identified as the same as the Business Park Policy Area. For the Industrial Jobs, the mix was based on existing industrial areas in Sherwood park: 82% other, 5% retail and 13% service.

Table 7 LEA Job Type

Employment Statistics	Jobs
Commercial	35

Industrial	1222
Community/Public Service	695
TOTAL	**1952**

RESULTS

The Bremner network has been identified to support traffic growth over the course of the of the project. A maximum acceptable v/c ratio of 1.0 was identified as the design criteria for supporting capacity. Because the time horizon of the project is so long, and individual neighbourhood ASPs will identify required intersection and street capacity in more detail, these preliminary estimates support identifying anticipated overall cost, required regional network connections, and transit routing. Transit ridership has been separated from private vehicle trips. However, for the results below, multimodal trips (walking and cycling) have not been explicitly removed. Additional details on multimodal modelling can be found in the attached memo described below "Analysis of the Potential of Walking and Cycling in the Bremner Area, Strathcona County."

All analysis reflects a PM Peak Hour of traffic. Figures on the following pages summarize:

- Total PM Peak Hour Volumes (Figure 5)
- Total Transit Ridership (Figure 6)
- V/C Ratio for links (Figure 7)

The total overall volumes are summarized in Table 8 and 9. Trip Tables can be found in **Appendix A.2** (not attached – separate Excel file).

Table 8 Total Driving Trips (PM Peak Hour)

Bremner/LEA Total Trips (Driving)	
External Trips In	9480
External Trips Out	6034
Internal Trips	23515
Total Trips	**39029**

Table 9 Total Transit Trips (PM Peak Hour)

Bremner/LEA Total Trips (Transit)	
External Trips In	989
External Trips Out	139
Internal Trips	2133
Total Trips	**3261**

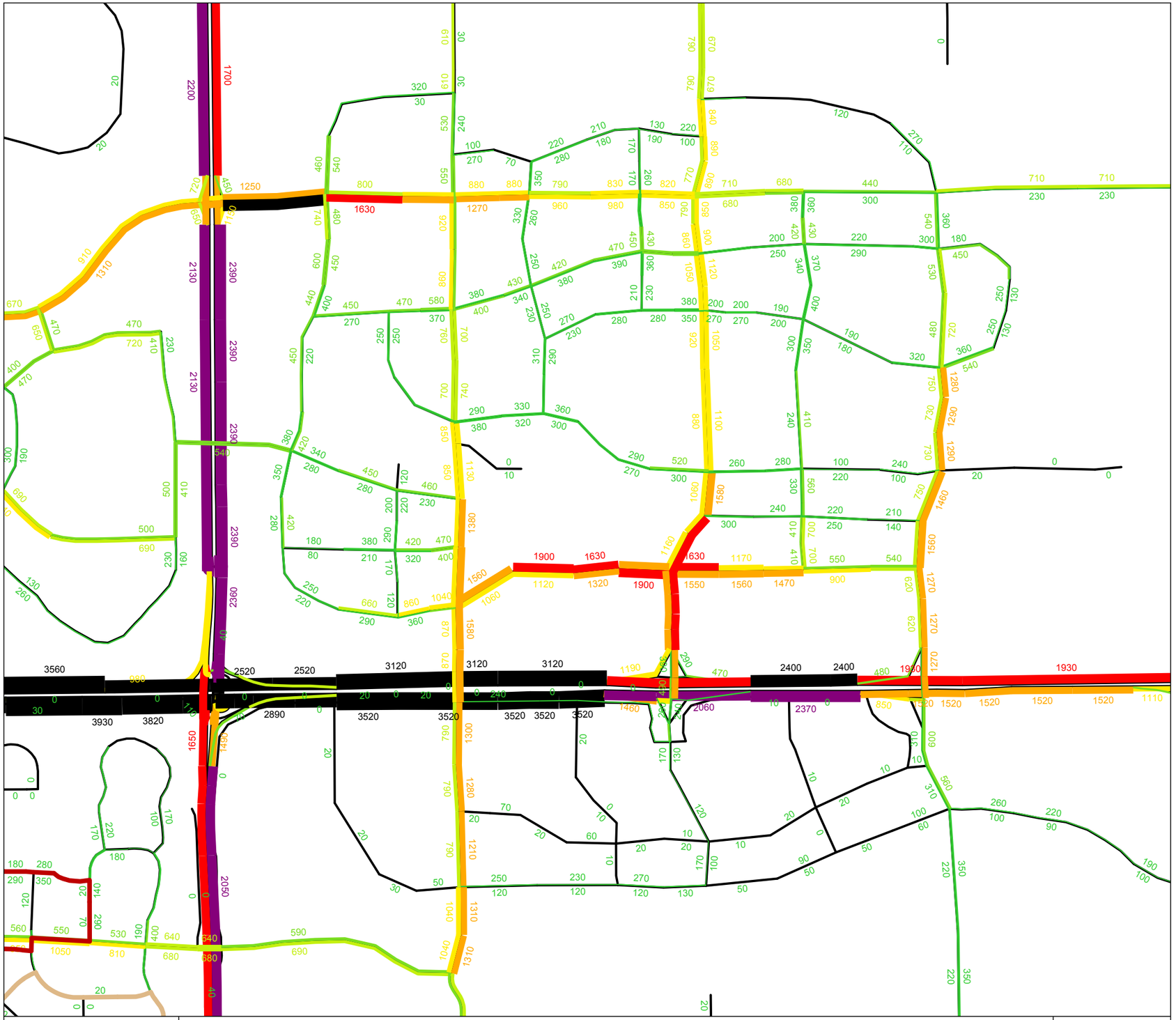


Figure 5 - PM Peak Hour Volumes

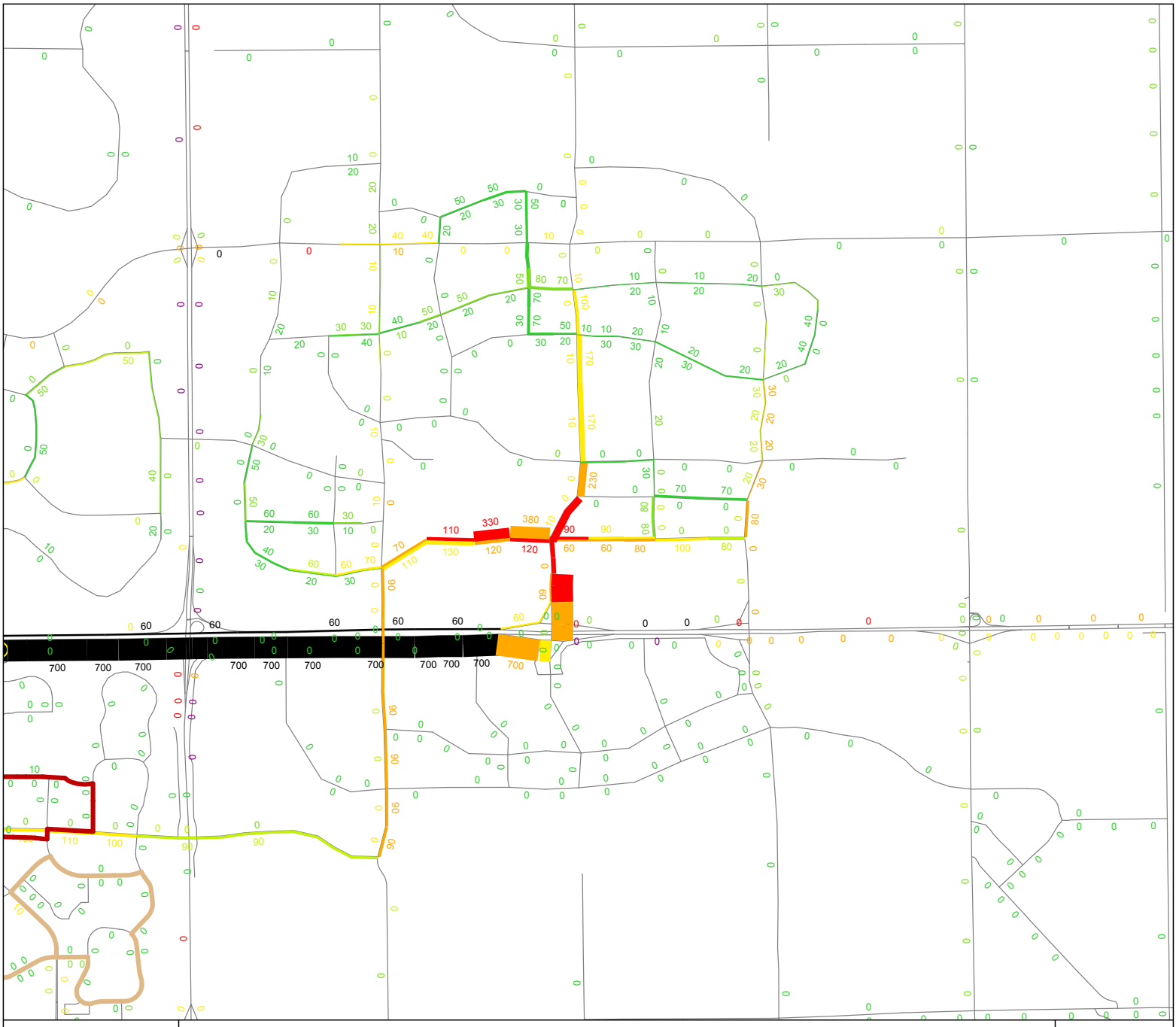


Figure 6 - PM Peak Hour Transit Ridership

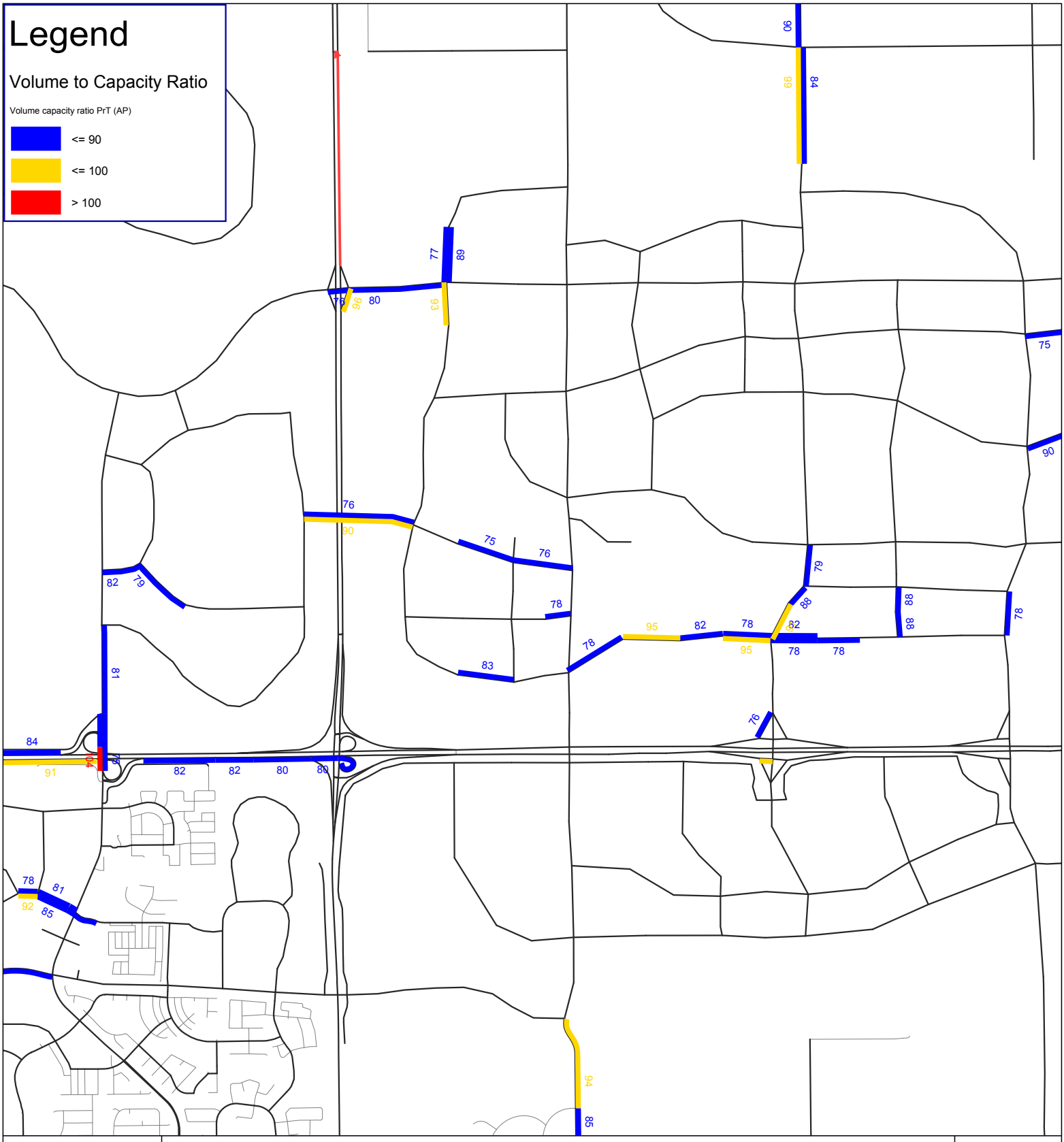


Figure 7 - PM Peak Hour Volume to Capacity Ratio Per Link

BABY BRUTUS (MULTIMODAL MODELLING)

The results of the multimodal modelling and description of the model are included in detail in **Appendix A.3** "Analysis of the Potential of Walking and Cycling in the Bremner Area, Strathcona County. An additional "Star Analysis" conducted by Mobycon was also undertaken to provide recommendations on local and regional bicycle network. These details are in Appendix A.4 and helped inform the TMP Map 3.

ALBERTA TRANSPORTATION

Alberta Transportation used their updated long-term model to identify the recommended interchange configuration for the Bremner Area Concept Plan. This modelling was completed using an early iteration of the Bremner Area Concept Plan population and employment estimates, and included a population of approximately 90,000 residents, 15,000 jobs within Bremner and 15,000 jobs in the LEA.

As part of this analysis, they reviewed 4 different configurations for interchange access on Highway 16:

- Single interchange at Range Road 224 spaced 3.25 km from Highway 21/Highway 16 interchange. This option includes a flyover at Range Road 225 and Range Road 223.
- One partial interchange at 3.0 spacing from Highway 21 followed by a full interchange spaced 2.0 km from the partial interchange. This option includes a flyover midway between the two proposed interchanged.
- Similar to the previous option, with the full and partial interchange swapped.
- Two full interchanges with the first spaced 3.0 km from Highway 21 and the second spaced 1.75 km from the first. This option included a flyover midway between the two interchanges.

The model outputs were completed in the AM and PM Peak and are summarized in **Appendix A.5.**

This modelling confirmed that a single interchange did not provide enough capacity to service Bremner off of Highway 16, but that two full interchanges were not required. Based on this analysis, Strathcona County moved forward with a recommendation of a flyover located at Range Road 225, a full interchange located just west of Range Road 224 and a partial interchange with access to the west only located near Range Road 223.

AT MODEL COMPARISON

AT modelling was based on previous scenario which included 10,000 additional jobs in the LEA, and 10,000 additional population in Bremner. Additionally, the AT modelling is on AT's 100 year model and includes key differences like the elimination of the NERC (included in the AT model but not in Strathcona County's model). A summary of total trips in and out of the Bremner Area is included for both models in Table 10.

Reference: Appendix A Bremner Travel Model Update Description

Table 10 Alberta Transportation Model Comparison (PM Peak Hour)

AT Model	Trips In	Trips Out	Bremner Model	Trips in	Trips out
Total	11396	7116	Total	9650	5620

The Bremner Volumes are approximately 15-20% lower overall. Much of this can be accounted for in the differences in population and employment estimates, and some in potential differences in Transit usage estimates. The Bremner model also includes somewhat higher volumes northbound from Bremner and somewhat lower volumes southbound (using access on Highway 16).

We have preserved space and capacity for the interchanges as identified by Alberta Transportation, so long-term interchange capacity is preserved regardless of ultimate volumes in this location. Arterial capacity is preserved at sufficient levels to support the volumes forecasted in the AT model. It is recommended that phasing of arterial construction be considered, especially to the east side of the study area so as to not overbuild road capacity given the future uncertainty around transportation demand, mode choice and regional development within the time horizon.

Carolyn Sherstone M.PI, P.Eng
Transportation Engineer

Phone: 780-917-8581
Fax:
carolyn.sherstone@stantec.com

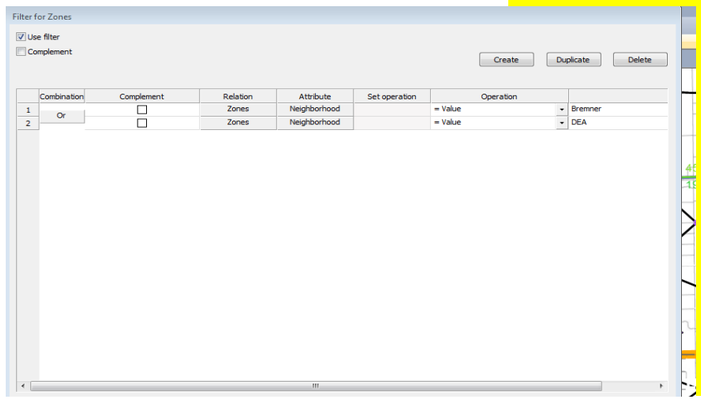
Attachment: Appendix A.1 Zone Data
Appendix A.2 Trip Tables (Submitted as separate Excel File)
Appendix A.3 Analysis of the Potential of Walking and Cycling in the Bremner Area, Strathcona County
Appendix A.4 Star Analysis (Mobycon)
Appendix A.5 Alberta Transportation Modelling

Appendix A.1

No	code	name	nono	aitzone	ait zone na	area_ha	Employment	employment density	employment other	Employment retail	Employ service	f employ 200(	ix	land use ty	municipalit	neighbourl	opbject id	old at zone	old sc zone	park cost	population	population	pop rural 0	pop rural 1	pop rural 2	pop rural 4	pop rural 6	pop urban	pop urban	pop urban	pop urban	pop urban	PR Side	p employn	retail densi	retail propi	sc zone	shape area	source	studen k-1:	student k-1	student un	xi
221			0	3455	3455	60	201		105	42	54	1	0	res	Strathcona	Bremner				0	2704						486	345	763	691	419	0	0			221		Strathcona	1157	0	0	
222			0	3491	3491	40	0		0	0	0	0	0	ag and env	Strathcona	Bremner				0	0						0	0	0	0	0	0	0			222		Strathcona	0	0	0	
227			0	3461	3461	67	27		10	10	7	0	0	res, village	Strathcona	Bremner				0	2814						505	360	794	719	436	0	0			227		Strathcona	0	0	0	
230			0	3468	3468	0	0		0	0	0	2	0	idustrial an	Strathcona	Bremner				0	0						0	0	0	0	0	0	0			230		Strathcona	0	0	0	
236			0		3474	53	183		79	72	32	0	0	ind	Strathcona	DEA	109	0	0	0	0						0	0	0	0	0	0	0			236	1266745	4781.909	Strathcona	0	0	0	
3001			0		3469	91	149		123	7	19	0	0	ind	Strathcona	DEA	209	0	0	0	0						0	0	0	0	0	0	0			3001	2657260	6477.665	Strathcona	0	0	0	
3002			0		3470	70	114		94	6	14	0	0	ind	Strathcona	DEA	210	0	0	0	0						0	0	0	0	0	0	0			3002	1305124	4829.24	Strathcona	0	0	0	
3003			0		3471	51	84		69	4	11	0	0	ind	Strathcona	DEA	211	0	0	0	0						0	0	0	0	0	0	0			3003	1288284	4803.831	Strathcona	0	0	0	
3004			0		3472	70	82		68	4	10	0	0	ind	Strathcona	DEA	212	0	0	0	0						0	0	0	0	0	0	0			3004	1264516	4781.279	Strathcona	0	0	0	
3005			0		3473	46	75		62	4	9	0	0	ind	Strathcona	DEA	213	0	0	0	0						0	0	0	0	0	0	0			3005	1358112	4891.824	Strathcona	0	0	0	
3006			0		3474	100	193		138	28	27	0	0	ind	Strathcona	DEA	214	0	0	0	0						0	0	0	0	0	0	0			3006	1306688	4821.104	Strathcona	0	0	0	
3100			0			94	166		96	44	26	0	0	ind		DEA				0	0						0	0	0	0	0	0	0			3100				0	0	0	
3101			0			27	38		31	2	5	0	0	ind		DEA				0	0						0	0	0	0	0	0	0			3101				0	0	0	
3102			0			39	64		53	3	8	0	0	ind		DEA				0	0						0	0	0	0	0	0	0			3102				0	0	0	
3103			0			18	29		24	1	4	0	0	ind		DEA				0	0						0	0	0	0	0	0	0			3103				0	0	0	
3104			0			24	39		32	2	5	0	0	ind		DEA				0	0						0	0	0	0	0	0	0			3104				0	0	0	
3105			0			61	546		143	296	107	0	0	ind		DEA				0	0						0	0	0	0	0	0	0			3105				0	0	0	
3106						81	134		110	7	17																0	0	0	0	0					3106				0	0	0	
3107						54	57		47	3	7																0	0	0	0	0					3107				0	0	0	
5001			0	3461	3461	67	198		104	41	53	0	0	res	Strathcona	Bremner				0	2432						437	311	686	621	377	0	0			5001		Strathcona	1157	0	0	
5002			0	3456	3456	44	16		6	6	4	0	0	res	Strathcona	Bremner				0	1730						311	221	488	442	268	0	0			5002		Strathcona	0	0	0	
5003			0	3462	3462	34	189		101	37	51	1	0	res	Strathcona	Bremner				0	1529						275	195	431	391	237	0	0			5003		Strathcona	1157	0	0	
5004			0	3457	3457	47	13		5	5	3	0	0	res	Strathcona	Bremner				0	1366						245	175	385	349	212	0	0			5004		Strathcona	0	0	0	
5005			0	3463	3463	46	14		5	5	4	0	0	res	Strathcona	Bremner				0	1470						264	188	414	376	228	0	0			5005		Strathcona	0	0	0	
5006			0	3464	3464	66	19		7	7	5	0	0	res	Strathcona	Bremner				0	2033						365	260	573	520	315	0	0			5006		Strathcona	0	0	0	
5007			0	3465	3465	47	189		101	37	51	0	0	res	Strathcona	Bremner				0	1543						277	197	435	395	239	0	0			5007		Strathcona	1152	0	0	
5008			0	3466	3466	47	194		103	39	52	3	0	res	Strathcona	Bremner				0	2064						371	264	582	527	320	0	0			5008		Strathcona	1152	0	0	
5009			0	3467	3467	31	13		5	5	3	0	0	res	Strathcona	Bremner				0	1432						257	183	404	366	222	0	1			5009		Strathcona	0	0	0	
5100			0			94	41		16	15	10	0	0	res		Bremner				0	4304						773	550	1214	1100	667	0	0			5100			0	0	0	
5101			0			38	16		6	6	4	0	0	res		Bremner				0	1722						309	220	486	440	267	0	0			5101			0	0	0	
5102			0			29	187		100	37	50	0	0	res and village centre		Bremner				0	1338						240	171	378	342	207	0	0			5102			1157	0	0	
5103			0			14	843		323	308	212	0	0	res and village centre		Bremner				0	458						82	59	129	117	71	0	0			5103			0	0	0	
5104			0			17	8		3	3	2	0	0	res and village centre		Bremner				0	767						138	98	216	196	119	0	0			5104			0	0	0	
5105			0			38	16		6	6	4	0	0	res		Bremner				0	1652						297	211	466	422	256	0	0			5105			0	0	0	
5106			0			44	16		6	6	4	0	0	res		Bremner				0	1705						306	218	481	436	264	0	0			5106			0	0	0	
5107			0			38	191		102	38	51	0	0	res, school village cent		Bremner				0	1751						314	224	494	448	271	0	0			5107			1157	0	0	
5108			0			85	0		0	0	0	0	0	res		Bremner				0	0						0	0	0	0	0	0	0			5108			0	0	0	
5109			0			33	14		5	5	4	0	0	res		Bremner				0	1486						267	190	419	380	230	0	0			5109			0	0	0	
5110			0			53	194		103	39	52	0	0	res and school		Bremner				0	2117						380	271	597	541	328	0	0			5110			1157	0	0	
5111			0			34	817		313	299	205	0	0	res and town centre		Bremner				0	2089						375	267	589	534	324	0	0			5111			0	0	0	
5112			0			15	1178		451	431	296	0	0	res and town centre		Bremner				0	1447						260	185	408	370	224	0	0			5112			0	0	0	
5113			0			14	1076		412	394	270	0	0	res and town centre		Bremner				0	1322						237	169	373	338	205	0	0			5113			0	0	0	
5114			0			34	0		0	0	0	0	0	res and district park		Bremner				0	0						0	0	0	0	0	0	0			5114			0	0	0	
5115			0			56	24		9	9	6	0	0	res		Bremner				0	2559						459	327	722	654	397	0	0			5115			0	0	0	
5116			0			26	0		0	0	0	0	0	country residential		Bremner				0	62		11	8	16	15	12	0	0	0	0	0	0	0			5116			0	0	0	
5117			0			22	184		99	35	50	0	0	res and village centre a		Bremner				0	986						177	126	278	252	153	0	0			5117			1157	0	0	
5118			0			49	21		8	8	5	0	0	business employment		Bremner				0	2239						402	286	632	572	347	0	0			5118			0	0	0	
5119			0			48	3564		790	2059	715	0	0	business employment		Bremner				0	0						0	0	0	0	0	0	0			5119			0	0	0	
5120			0			52	3841		851	2219	771	0	0	business employment		Bremner				0	0						0	0	0	0	0	0	0			5120			0	0	0	
5121			0			80	35		13	13	9	0	0	business employment		Bremner				0	3667						659	469	1034	937	568	0	0			5121			0	0	0	
5122			0			19	8		3	3	2	0	0	res and village centre		Bremner				0	872						157	111	246	223	135	0	0			5122			0	0	0	
5123			0			17	122		75	13	34	0	0	res		Bremner				0	627						113	80	177	160	97	0	0			5123			1157	0	0	
5124			0			27	186		100	36	50	0	0	res		Bremner				0	1221						219	156	345	312	189	0	0			5124			1152	0	0	
5125			0			80	18		7	7	4	0	0	res		Bremner				0	1854						333	237	523	474	287	0	0			5125			0	0	0	
5126			0			32	361		138	132	91	0	0	res and school		Bremner				0	1049						188	134	296	268	163	0	0			5126			0	0	0	
5127			0			52	194		103	39	52	0	0	res		Bremner				0	2073						372	265	585	530	321	0	0			5127			1157	0	0	
5128			0			29	13		5	5	3	0	0	res and village centre		Bremner				0	1305						234	167	368	334	202	0	0			5128			0	0	0	
5129			0			31	260		100	95	65	0	0	res		Bremner				0	1340						241	171	378	342	208	0	0			5129			0	0	0	
5130			0			32	13		5	5	3	0	0	res		Bremner				0	1369						246	175	386	350	212	0	0			5130			0	0	0	
5131			0			37	516		226	157	133	0	0	res		Bremner				0	1588						285	203	448	406	246	0	0			5131			1157	0	0	
5132			0			0	0		0	0	0	0	0	res		Bremner				0	0						0	0	0	0	0	0	0			5132			0	0	0	
5133			0			0	0		0	0	0	0	0	country residential		Bremner				0	131		24	17	34	31	25	0	0	0	0	0	0	0			5133			0	0	0	
5134			0			63	478		183	175	120	0	0	res and village centre		Bremner				0	2762						496	353	779	706	428	0	0			5134			0	0	0	
5135			0			43	192		102	38	52	0	0	res and school		Bremner				0	1820						327	233	513	465	282	0	0			5135			1157	0	0	
5136			0			46	19		7	7	5	0	0	res		Bremner				0	1967						353	251	555	503	305	0	0			5136			0	0	0	
5137			0			54	363		196	69	98	0	0	res and school		Bremner				0	1432						257	183	404	366	222	0	0			5137			2309	0	0	
5138			0			18	659		252	241	166	0	0	res and village centre a		Bremner				0	531						95	68	150	136	82	0	0			5138			0	0	0	
5139			0			1	175		96	32	47	0	0	res		Bremner				0	39						7	5	11	10	6	0	0			5139			1157	0	0	
5140			0			70	27		10	10	7	0	0	res		Bremner				0	2825						507	361	797	722	438	0	0			5140			0	0	0	
5141						26	729		279	267	183										1635						294	209	461	418	253					5141			0	0	0	
							19625		7224	7978	4423																																

Bremner
DEA

Highlighted zones can go directly into the model. Filter zones as shown in figure.



STRAFICA

ANALYSIS OF THE POTENTIAL OF WALKING AND CYCLING IN THE BREMNER AREA, STRATHCONA COUNTY

The goal of the project

Good quality planning and implementation of pedestrian and bicycle infrastructure in Bremner can make a difference in people's travel choices especially for trips inside the planning area. The goal for Brutus modeling for the Bremner project was to provide the planners and decision-makers information of the potential usage and role of walking and cycling in the planning area.

Downtown Edmonton and Sherwood Park lie further away from Bremner and are less accessible with the active travel modes. Therefore the focus in the analysis was laid in the Bremner area.

Since not enough accurate travel data was available for estimation of full Brutus demand model, a lighter approach was chosen, which enables development of a solid analytical method using only available data sources from the stakeholders.

The targeted added value from Brutus Light analyses is the more efficient communication of the benefits of the targeted land-use policy and network investments to the decision-makers and financers of the Bremner project.

Method description

<u>Trip generation and destination choice</u>

Brutus light approach uses directly the trip generation of destination choice modeled in the existing regional model (VISUM). The workflow of the Brutus Light is described below.

At first, the land-use data from the Visum model TAZs was split to the Brutus grid of 250m x 250m. A more accurate division of land-use inside certain TAZs was used for the town centre area, provided by Stantec. The land-use inside a TAZ was evenly distributed to the grid, unless more accurate information was provided.

Then, each grid cell's centroid was connected to the network by creation a connector link to the closest point in the network.

The TAZs outside the Bremner area were aggregated to some extent and then connected with feeder links to the Bremner network.

The trip generation and destination choices were taken as they were modeled in the VISUM model. So basically the matrixes of car trips and pedestrian trips were summed up and used as input. The matrixes presented the travel demand on evening rush hour during a weekday. The trips presented in the matrix were directly distributed to the grid using the location of the grid cell centroid as a defining factor. In the distribution of the matrix to the

grid the more accurate TAZ division and the population data was used. A trip table was produced to allow separate handling of each trip.

The total person trip generation was acquired by using the average vehicle load as a multiplier to the vehicle based matrix. Vehicle loads are shown in the table below. Loads from "home-based work" through "non-home-based" were defined by Stantec. Vehicle load for "external" trips is a weighted mean from other vehicle loads, weighted by the number of trips in each category. Transit and walk trip matrix was used as is.

Trip type	Vehicle load (persons per vehicle)
home-based work	1.10
home-based university	1.14
home-based school	1.48
home-based other	1.60
non-home-based	1.5
external	1.356

Networks

The base network used was the car network from the VISUM model received from Stantec. The network inside Bremner area included the main streets and collector streets, but not residential streets. The attributes included, among others, the modeled car demand and link speeds that were used in the mode choice model.

The main street network was complemented with the VISUM model connector links, to represent those residential streets and other paths that provide connections in the Bremner area. This was found to be a feasible solution in the situation where only the main network was planned.

The Brutus grid was connected to either the main street network or Visum connectors, depending which was the closest.

The base network for pedestrians and cyclists was produced from the car network, because the plan is to at least provide the pedestrians and cyclists high-quality routes along these streets. The network "walkability" and "cyclability" values i.e. link speeds differentiated per scenario, as is presented below. In the "investment scenarios" also the ring trail was added to the network.

The trip travel times were calculated for each possible mode by using the above mentioned fixed values to present link speeds. The crossing delay was calculated with Brutus's delay function that used the car volume as a variable.

Mode choice model

A simple logit model was designed to find the potential trips that could shift from cars to walking and cycling. Travel time by bicycle was chosen as an explanatory variable. Several alternatives for model coefficients were generated and tested. As a result, those coefficients that produced best match

with the local mobility study were chosen. The scenario in which the model was "taught" was a scenario with no investment to active modes. No investments means that walking and cycling is allowed on the side of the driveway, but no separate lane or path is built. Such solution is described in the model by setting a 9 km/h cyclability value to the car network. Similar approach is used in many Brutus applications elsewhere.

The model was calibrated so that it produced the same modal split as the regional mobility study from Strathcona County.

In the model mode choice was divided into two phases. In the first phase, a selection was made if a trip in question uses personal car (driver or passenger) or active modes. The probability of choosing car over active modes is

$$P(\text{car}) = \frac{1}{e^{b_0+b_1 t}}$$

in which t is travel time by bicycle and b_0 and b_1 are calibrated model coefficients. Likewise, the probability of choosing active modes over car is

$$P(\text{active modes}) = 1 - P(\text{car}) = \frac{e^{b_0+b_1 t}}{1+e^{b_0+b_1 t}}.$$

In the second phase, another model was used to find the likely mode choice between walking and use of bicycle. Second phase only applies to "active mode" trips from the first phase. This model was also "taught" in the scenario with no investment to infrastructure (to represent the situation where the regional study was made). The probability of choosing bicycle over walking is

$$P(\text{bicycle}) = \frac{1}{e^{c_0+c_1 t}}$$

and the probability of choosing walking over bicycle is

$$P(\text{walking}) = 1 - P(\text{bicycle}) = \frac{e^{c_0+c_1 t}}{1+e^{c_0+c_1 t}}$$

where t is travel time by bike and c_0 and c_1 are calibrated model coefficients.

The only explanatory variable that was used in these models was the bicycling travel time (including crossing penalties), because that was easily available from the network calculation. The same models were used for each trip type for simplicity. No separate modeling was done e.g. for school trips. For simplicity, it was assumed that for every individual all mode choice options are possible.

The above described models were taught in two alternative travel patterns, first one with the mode shares from the region, and one with patterns from inner Edmonton to present more urban travel patterns that are targeted in the planning of Bremner. The model coefficients b_0 and b_1 in these two scenarios can be seen in table below.

	b_0	b_1	c_0	c_1
Region	-0.4	-9.1	3.2	-9.8
Edmonton	0.5	-9.4	3.0	-9.7

It must be noted that no perfect model was found where all travel statistics would match with the regional mobility study. Therefore, the correct mode split was preferred in the choice of the model over other statistics such as average trip length. More data and more elaborated model would be needed to correct the somewhat biased trip lengths.

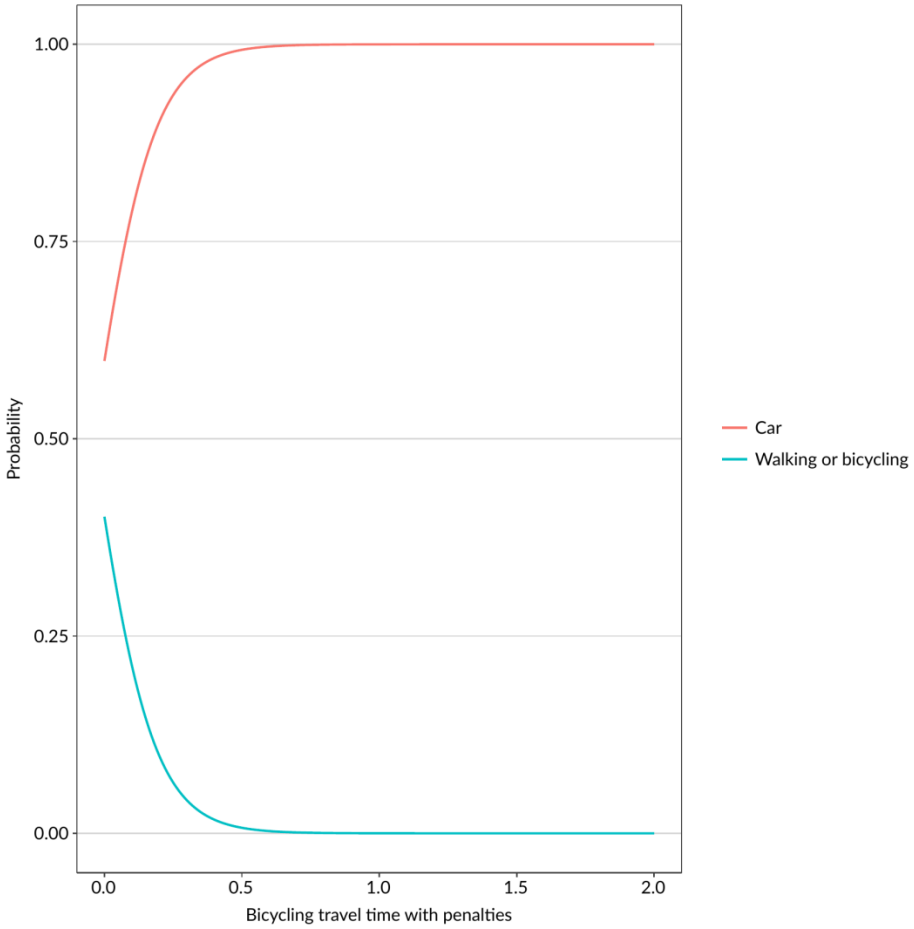


Figure 1 Mode choice model between car and active modes in phase 1

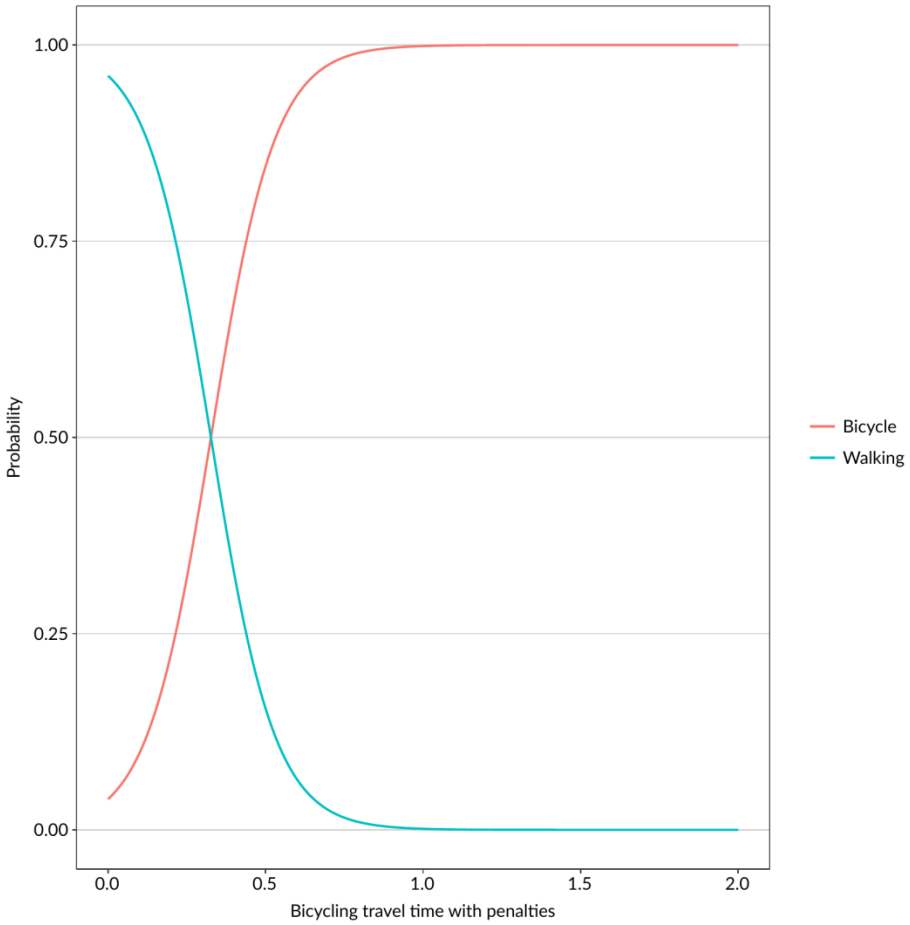


Figure 2 Mode choice model between bicycle and walking in phase 2.

Scenarios

The idea in the scenario design was to enable testing of two policies and their combinations:

- how the investment to better walking and cycling infrastructure affects the mode choices
- what is the effect of using multiple tools and policies to develop an urban travel pattern (in Canadian framework) in the Bremner area

The modeled scenarios are explained in the following table.

Table 1. Modelling scenarios

Name	Description	Network speeds (ped/cyc)	Targeted mode shares (ped/cyc)
1	Scenarios with regional travel patterns		
1a	No investment in walking and cycling along main streets and collectors (walking and bicycling allowed on streets)	4,3 km/h 9 km/h	6,4 % 0,8 %
1b	Investments on separate cycling/walking infrastructure along main streets and collectors (+ring trail)	4,3 km/h 18 km/h	n/a
2	Scenarios with travel patterns altered towards more urban behavior		
2a	No investment in walking and cycling along main streets and collectors (walking and bicycling allowed on streets)	4,3 km/h 9 km/h	10,8 % 1,7 %
2b	Investments on cycling/walking infrastructure along main streets and collectors (+ring trail)	4,3 km/h 18 km/h	n/a

So basically separate models were designed for scenarios 1 and 2. Note that the "walkability" value was fixed to 4.3 km/h in all scenarios. This is a feasible solution because the variable used in the logit model is travel time with bicycle, hence the overall share of bicycling and walking is defined in the first phase of modeling. Therefore the cyclability also affected the mode choice of walking.

The original plan was to design a third scenario with international reference mobility patterns, namely from Lahti, Finland. This was also done. However, the results were not seen as feasible or useful in the planning, since the modal share even in the no investments scenario was 38 % which was seen as unrealistic.

Network assignment

The trips were assigned to the modal networks by using Brutus' stochastic assignment algorithm.

Results and discussion

Results for the whole Region

The model was initially built to present the flows in the whole region. The networks were presented in more detail in Bremner, but the connections to downtown Edmonton were also included. The decision to build the model this way was made because the regional travel data also included longer trips than just trips within one neighborhood.

The main results of the study are presented in the following table. The assignment figures are presented in the Annex.

Let's first analyse the effect of pure infrastructure investment in the use of active modes i.e. walking and cycling. In the base scenario 1a the modal share of active modes is only 7,4 % as was found in the regional study.

Respectively, the modal share of cars is almost 93 %, as the public transit trips are not included in the study.

In scenario 1b the modal share of active modes in total is 9,6 %, showing a raise of 2,2 percentage points. Most of the change happens in car drivers shifting to walking mode. This is the estimated effect of pure infrastructure investment, without any changes in population's preferences towards the use of active modes.

Let's then look what is the additional effect of using multiple policies such as mobility management schemes to change people's tendency to choose active modes over other options. In this study, only a reasonably minor effect was assumed for such policies, as the targeted mobility pattern was taken from a study made in downtown Edmonton. In scenario 2b we can see, that the accumulated effect of both investments and green mobility policies is that the modal share of active modes rises up to almost 17 %, meaning a 10 percentage points rise from the base scenario. Consequently, thanks to the combined investment package and green mobility policies, the mode share of cars falls from 93 % to 83 %.

Table 2. Key figures of the modelled scenarios (evening rush hour)

scenario	scen 1a	scen 1b	scen 2a	scen 2b
population	257 617	257 617	257 617	257 617
workplaces	112 567	112 567	112 567	112 567
ntrips_ped	10 872	14 331	17 886	24 167
ntrips_cyc	1 495	1 675	2 865	3 948
ntrips_car	154 554	150 916	146 170	138 806
ntrips_all	166 921	166 921	166 921	166 921
modshare_ped	6,5 %	8,6 %	10,7 %	14,5 %
modshare_cyc	0,9 %	1,0 %	1,7 %	2,4 %
moshare_active	7,4 %	9,6 %	12,4 %	16,8 %
moshare_car	92,6 %	90,4 %	87,6 %	83,2 %
avlength_ped	0,6	1,0	0,6	1,1
avlength_cyc	1,5	2,5	1,6	2,4
avlength_car	11,4	11,7	12,1	12,6
km_ped	6 178	13 969	10 969	26 207
km_cyc	2 285	4 170	4 697	9 592
km_car	1 767 710	1 759 723	1 762 968	1 742 296

The presented effects may seem small at first, but are actually quite significant as experts all around the world know that a significant change in mobility patterns is extremely hard to achieve.

The effect in the use of bicycle may seem small, but the results indicate that the combined effect of investments and green policies increase the use of bicycle to 2.6 times the amount it is in the base scenario.

The decrease in the number of cars trips is also significant when scaled to day level or year level. It must be noted though that it is the short car trips that are more likely being replaced by active modes according to the model. This phenomenon results in the average car trip length increasing.

What may be striking in the results is that most of the travelers finding an option in active modes choose walking over bicycling. This is due to the design of the mode choice model, which was strongly affected by the

availability of the data. The current model tends to maintain the modal shares of walking and cycling. A more sophisticated mode choice model would possible show different results in this perspective.

In the end of the table 2 also the total km's walked, cycled and driven (during one evening rush hour) are presented. These results are only indicative, since in the design of the mode choice model a compromise was made to stress the correctness of modal shares on the cost of the correctness of average trip lengths. Since the average trip lengths in the base scenarios 1a and 2a are shorter than in the respective mobility studies, it is likely that the total km output may have some amount of error. However the relative changes from scenario to another may be more accurate and useful. The total km's cycled increases to 4 times to that in the base scenario thanks to investments and green policies combined. It should also be noted that the decrease in car mileage is likely to be far less than decrease in car modal share, because it is the short car trips that are more likely being replaced by active modes.

Results inside Bremner area

In this chapter only trips that originate and end inside the Bremner area are discussed. The key figures for all trips inside Bremner are presented in the following table.

Table 3. Key figures of the modelled scenarios (evening rush hour) for trips originating and ending inside Bremner

scenario	scen 1a	scen 1b	scen 2a	scen 2b
ntrips_ped	1649	2877	2916	4852
ntrips_cyc	372	496	795	1051
ntrips_car	22479	21126	20789	18597
ntrips_all	24500	24500	24500	24500
modshare_ped	6,7 %	11,7 %	11,9 %	19,8 %
modshare_cyc	1,5 %	2,0 %	3,2 %	4,3 %
moshare_active	8,2 %	13,8 %	15,1 %	24,1 %
moshare_car	91,8 %	86,2 %	84,9 %	75,9 %
avlength_ped	1,1	1,5	1,1	1,6
avlength_cyc	1,8	2,7	1,9	2,5
avlength_car	3,1	3,1	3,2	3,3
km_ped	1 792	4 441	3 294	7 735
km_cyc	654	1 324	1 543	2 659
km_car	68 713	65 505	66 253	60 690

Comparing the results inside Bremner to the results from the whole model area (Table 2), it is evident that the potential change in modal shares from the network improvement actions and promotion of the use of active modes is greater inside Bremner. Roughly the modal share of active modes in total doubles with the investment to separated infrastructure and triples when in addition the travel patterns are developed to more urban direction with mobility management campaigns etc. In scenario 2b (investments and developed travel patterns) the modal share of cars is below 76 %. Naturally the effects are greater inside Bremner than regionally, because longer trips that are outside the convenient range of the active modes are excluded from the

analysis. There may be more variation between trip types (e.g. the modal share of active modes for school trips is likely to be higher), but these differences are not studied here.

In order to study in more detail the results inside the Bremner area, the Brutus grid was divided into three different land-use categories. The categorisation of the land-uses is based on the earlier categorization in VISUM-model TAZ areas, which was presented to Strafica as input data. This categorization was brought into the Brutus grid, based on in which TAZ area the centre of a grid cell was located in (see Figure 3).

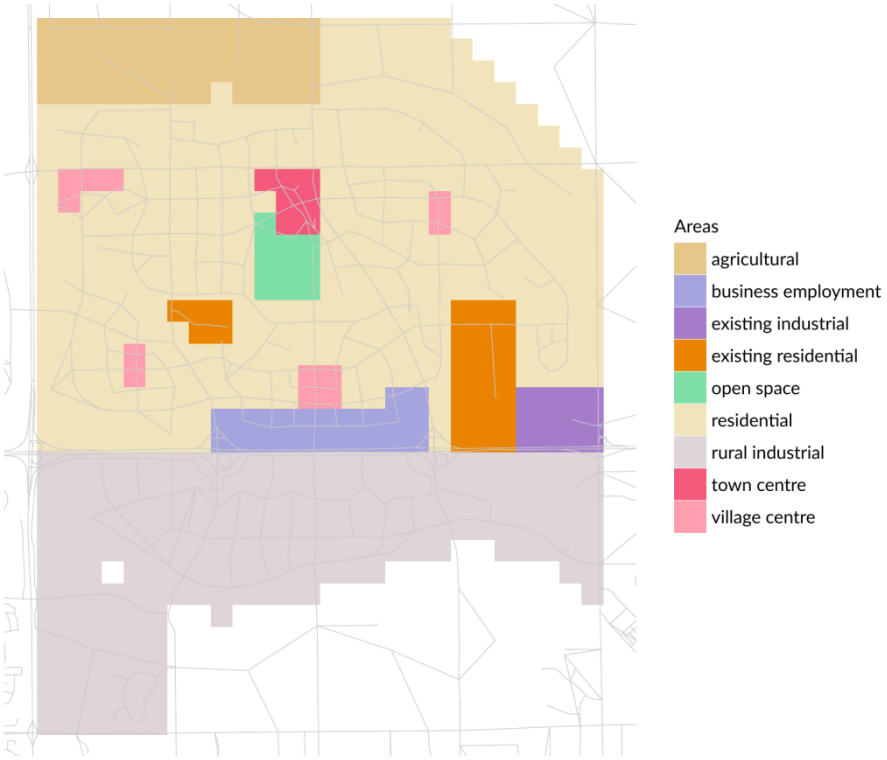


Figure 3 Different land-use categories in the Bremner area model.

These categories were aggregated to three main categories as follows:

a) Residential: residential or existing residential

b) low employment: rural industrial

c) high employment: town centre, village centre or business employment

Finally the key figures were calculated for trips that originate in these land-use types. Only trips inside Bremner were included in this study.

The results are presented in the tables 4-6.

Table 4. Key figures of the modelled scenarios for trips originating and ending inside Bremner - trips from residential areas (evening rush hour)

scenario	scen 1a	scen 1b	scen 2a	scen 2b
ntrips_ped	750	1248	1499	2204
ntrips_cyc	182	189	337	459
ntrips_car	8991	8487	8087	7261
ntrips_all	9924	9924	9924	9924
modshare_ped	7,6 %	12,6 %	15,1 %	22,2 %
modshare_cyc	1,8 %	1,9 %	3,4 %	4,6 %
moshare_active	9,4 %	14,5 %	18,5 %	26,8 %
moshare_car	90,6 %	85,5 %	81,5 %	73,2 %
avlength_ped	1,0	1,5	1,1	1,5
avlength_cyc	1,9	2,6	1,9	2,3
avlength_car	2,7	2,8	2,9	2,9
km_ped	759	1 844	1 688	3 252
km_cyc	345	483	655	1 077
km_car	24 540	23 395	23 282	21 361

Table 5. Key figures of the modelled scenarios for trips originating and ending inside Bremner - trips from low employment areas (evening rush hour)

scenario	scen 1a	scen 1b	scen 2a	scen 2b
ntrips_ped	147	256	213	436
ntrips_cyc	25	91	110	143
ntrips_car	4041	3866	3890	3634
ntrips_all	4213	4213	4213	4213
modshare_ped	3,5 %	6,1 %	5,1 %	10,3 %
modshare_cyc	0,6 %	2,2 %	2,6 %	3,4 %
moshare_active	4,1 %	8,2 %	7,7 %	13,7 %
moshare_car	95,9 %	91,8 %	92,3 %	86,3 %
avlength_ped	1,4	2,2	1,3	2,0
avlength_cyc	1,6	3,7	2,0	3,6
avlength_car	4,6	4,6	4,7	4,7
km_ped	207	555	268	870
km_cyc	40	338	216	508
km_car	18 401	17 692	18 147	17 209

Table 5. Key figures of the modelled scenarios for trips originating and ending inside Bremner - trips from high employment areas (evening rush hour)

scenario	scen 1a	scen 1b	scen 2a	scen 2b
ntrips_ped	751	1373	1195	2207
ntrips_cyc	165	216	344	444
ntrips_car	9408	8735	8785	7674
ntrips_all	10324	10324	10324	10324
modshare_ped	7,3 %	13,3 %	11,6 %	21,4 %
modshare_cyc	1,6 %	2,1 %	3,3 %	4,3 %
moshare_active	8,9 %	15,4 %	14,9 %	25,7 %
moshare_car	91,1 %	84,6 %	85,1 %	74,3 %
avlength_ped	1,1	1,5	1,1	1,6
avlength_cyc	1,6	2,3	1,9	2,4
avlength_car	2,7	2,8	2,8	2,9
km_ped	824	2 040	1 326	3 591
km_cyc	268	502	658	1 064
km_car	25 625	24 273	24 694	22 007

Comparing the modal shares for trips originating from different land-use types it seems that it is the trips from the residential areas and trips from high-employment areas that have the highest potential for the use of active modes. The low employment area in the southern part of Bremner is less potential for the use of active modes.

ANNEX 1. WALKING AND CYCLING FLOWS ON THE NETWORK

Figure 3. Walking flows in the scenario 1a (no investments, local mobility patterns)

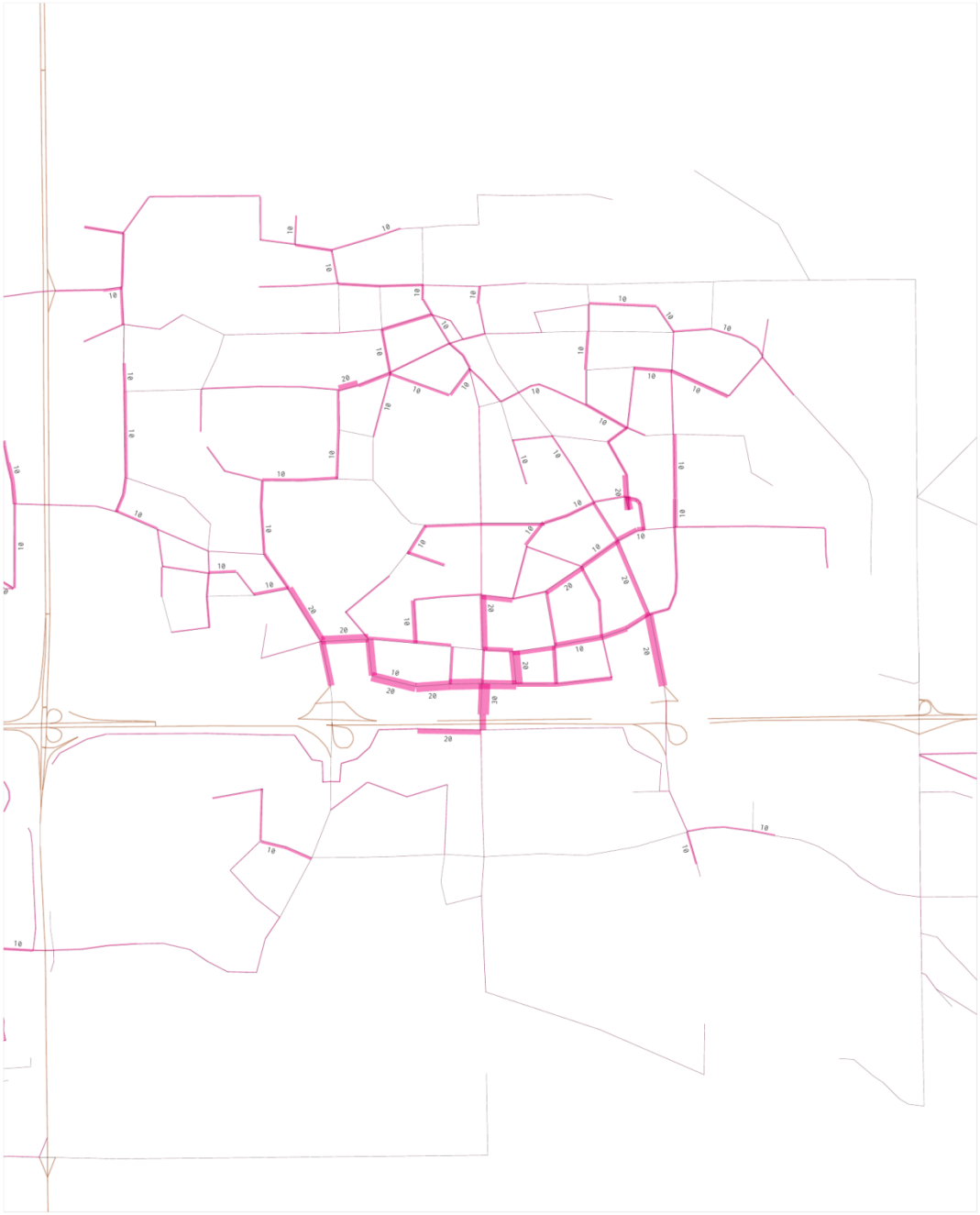


Figure 4. Cycling flows in the scenario 1a (no investments, local mobility patterns)

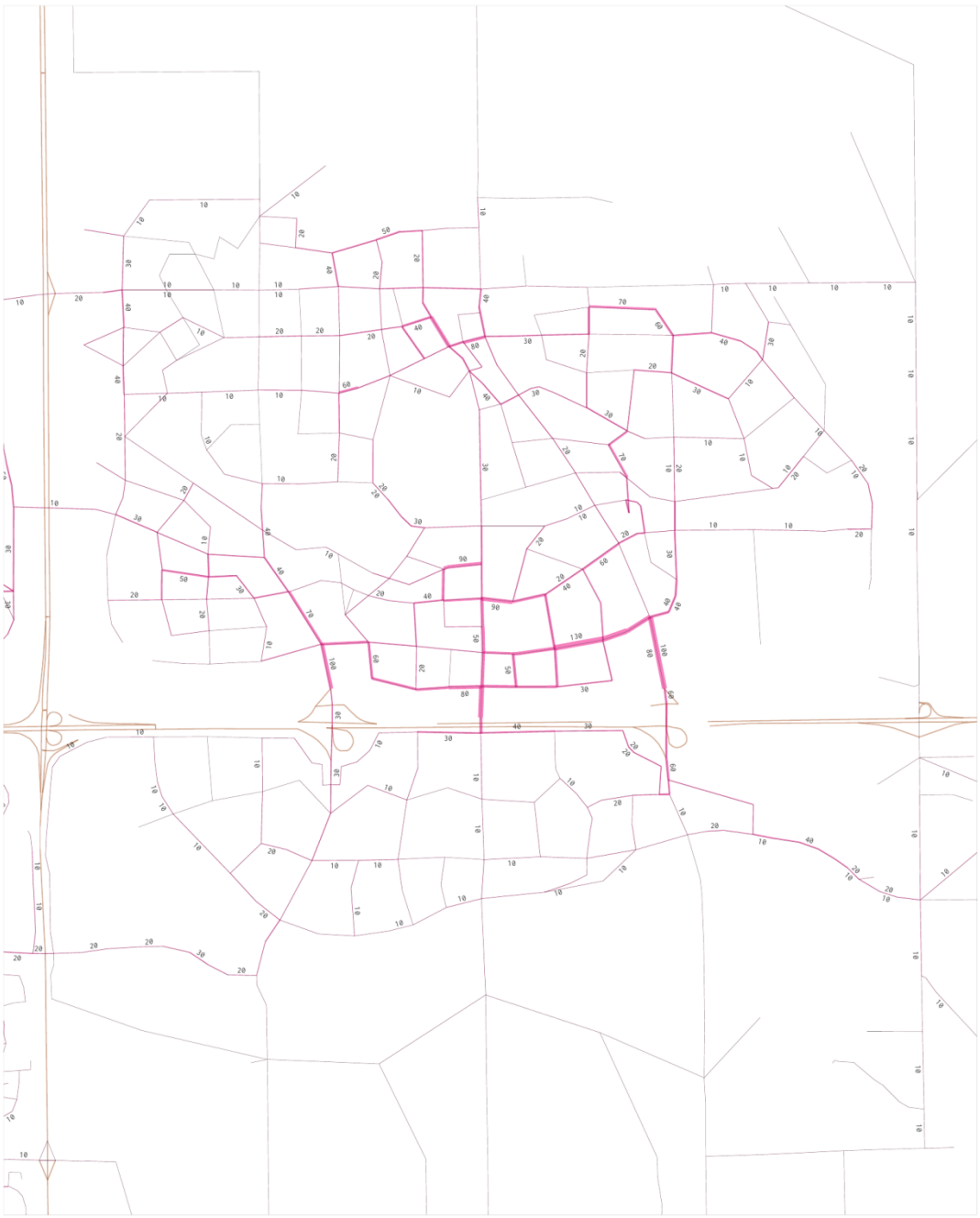


Figure 5. Walking flows in the scenario 1b (investments to network, local mobility patterns)

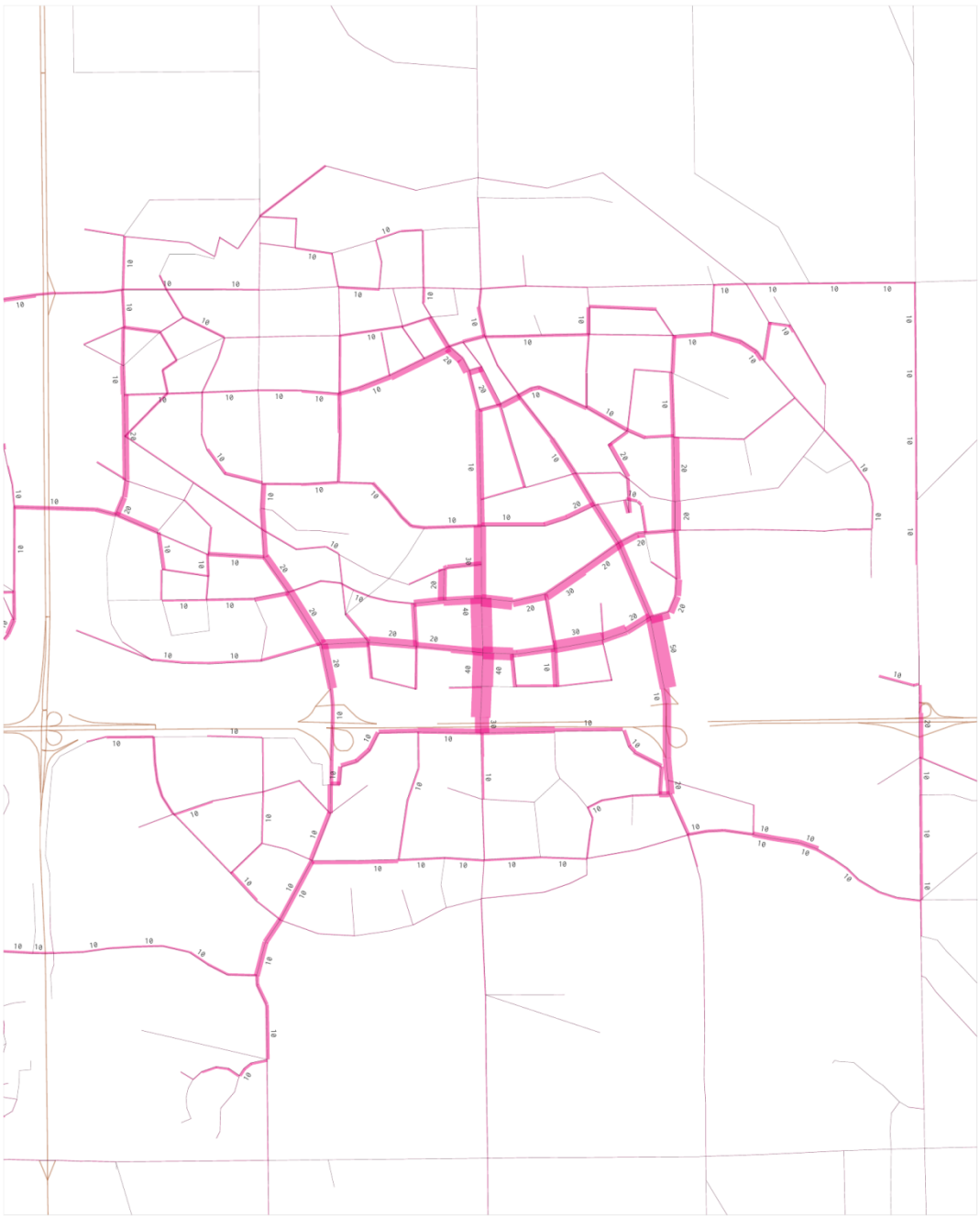


Figure 6. Cycling flows in the scenario 1b (investments to network, local mobility patterns)

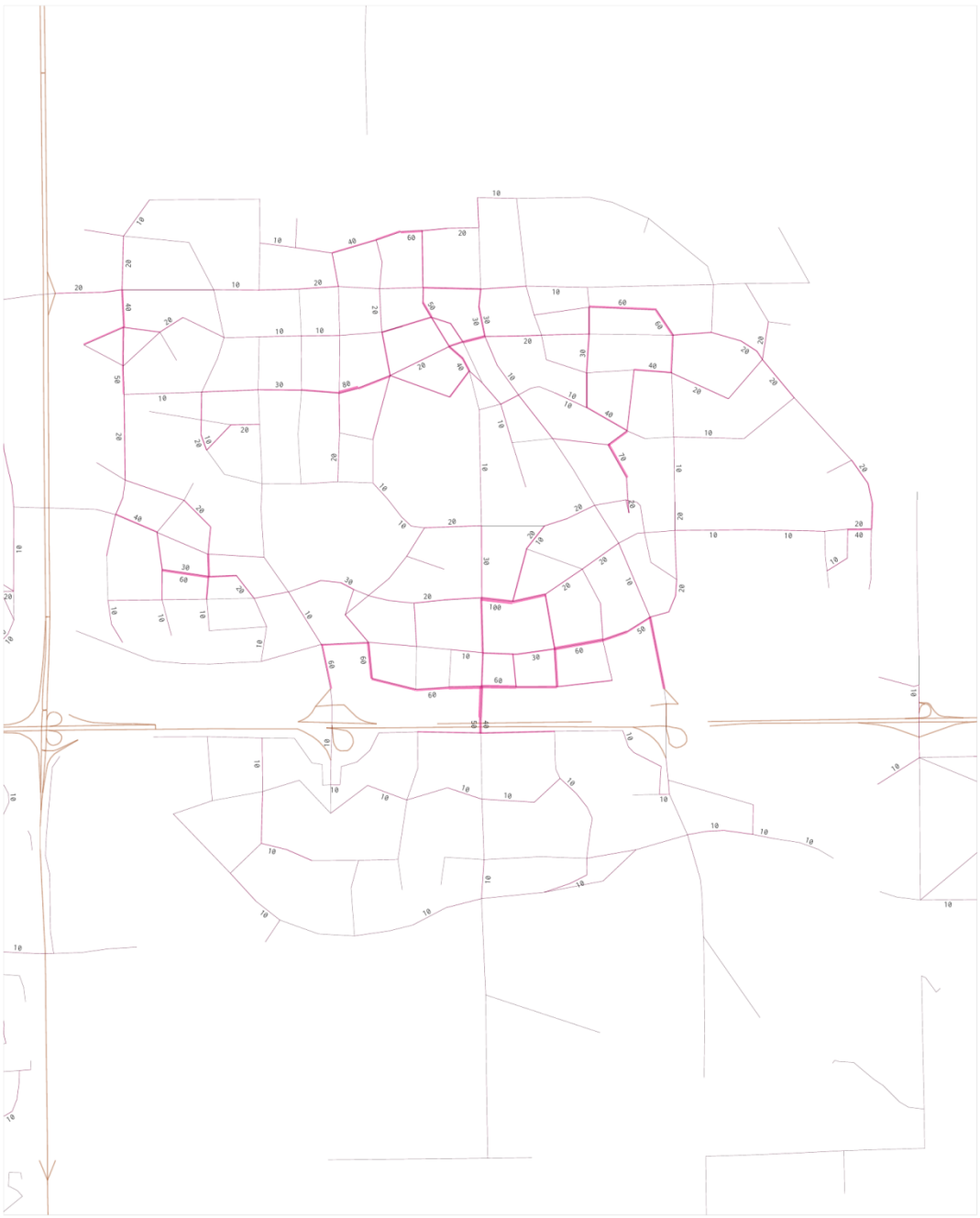


Figure 7. Walking flows in the scenario 2a (no investments, urban mobility patterns)

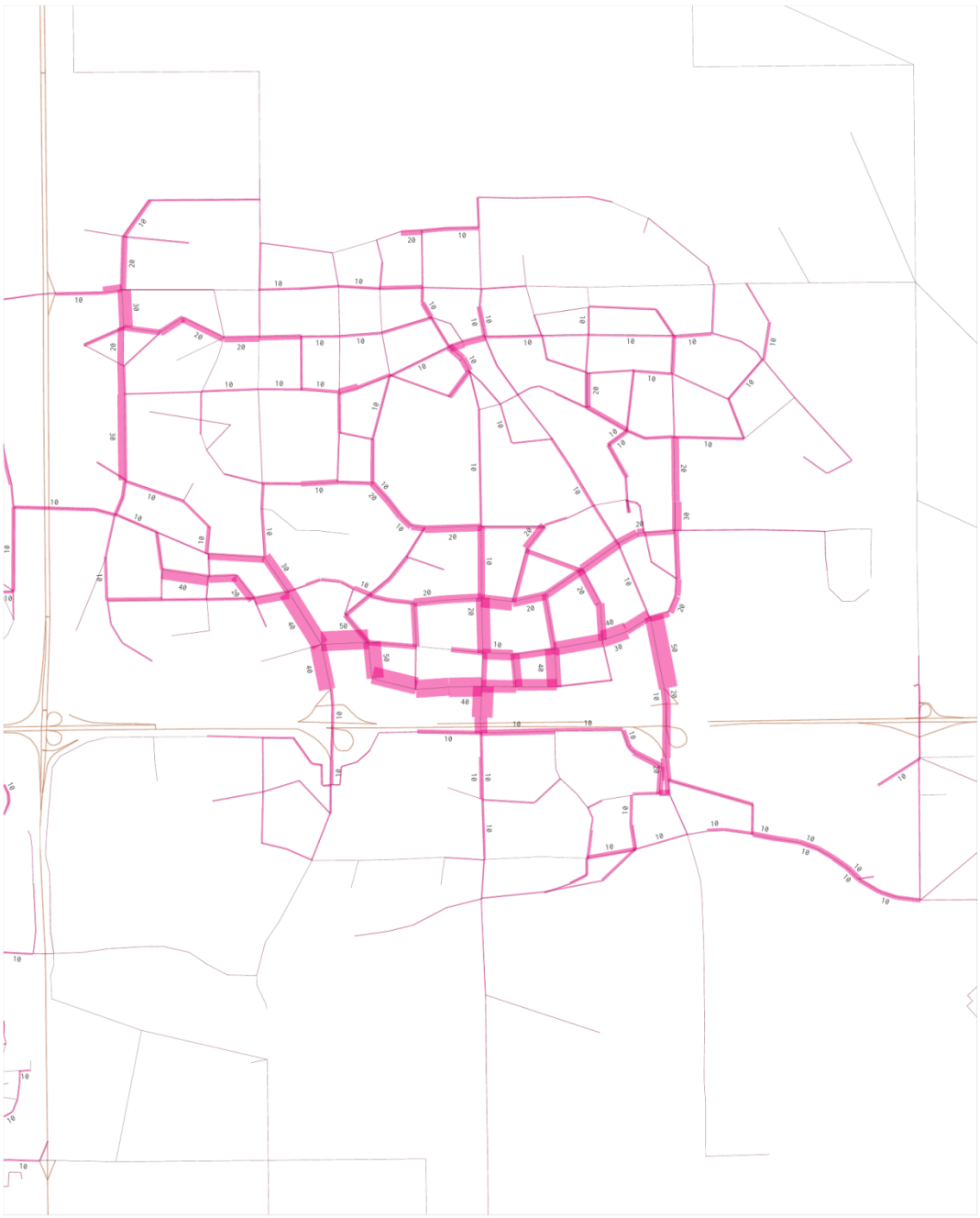


Figure 8. Cycling flows in the scenario 2a (no investments, urban mobility patterns)

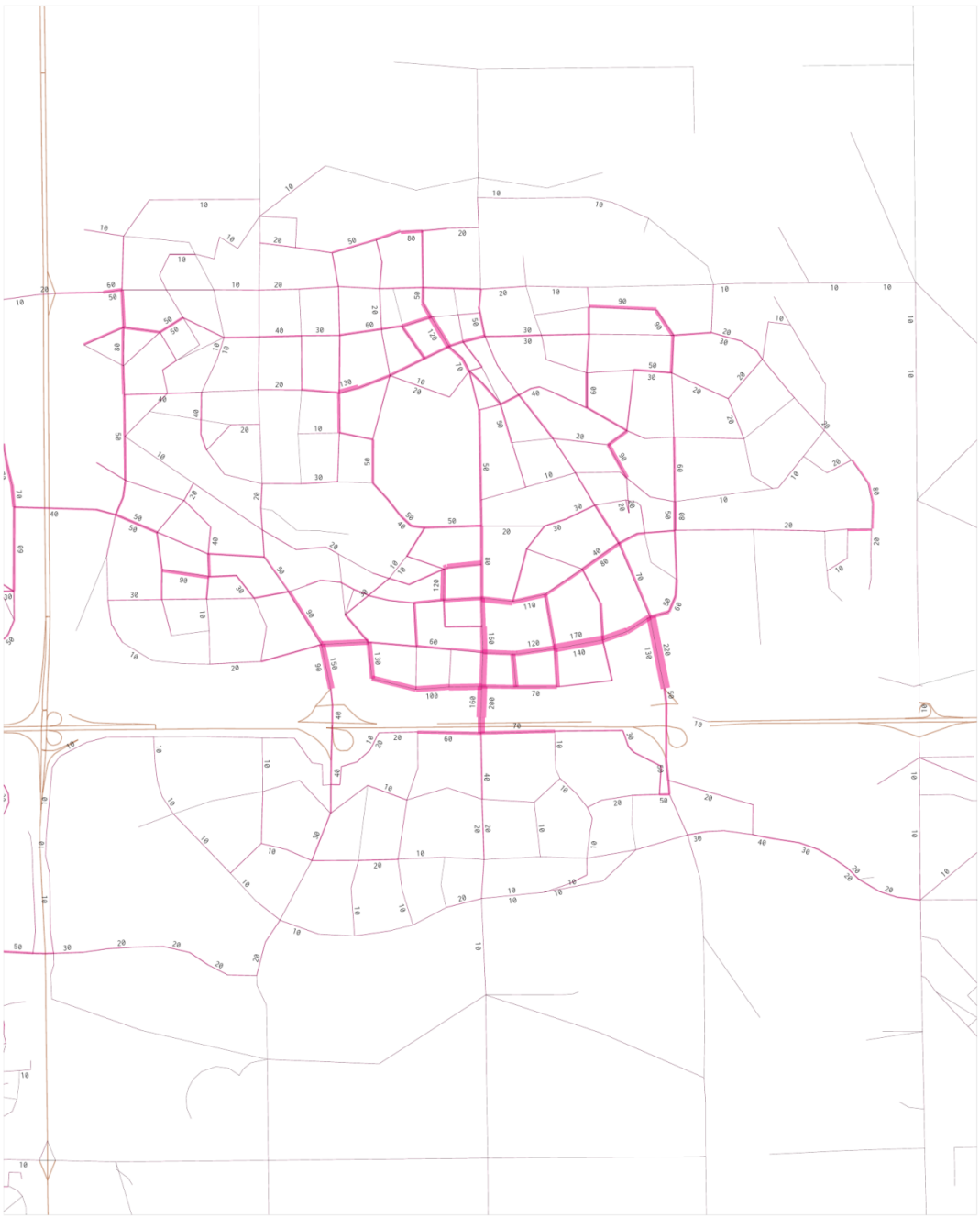


Figure 9. Walking flows in the scenario 2b (investments to network, urban mobility patterns)

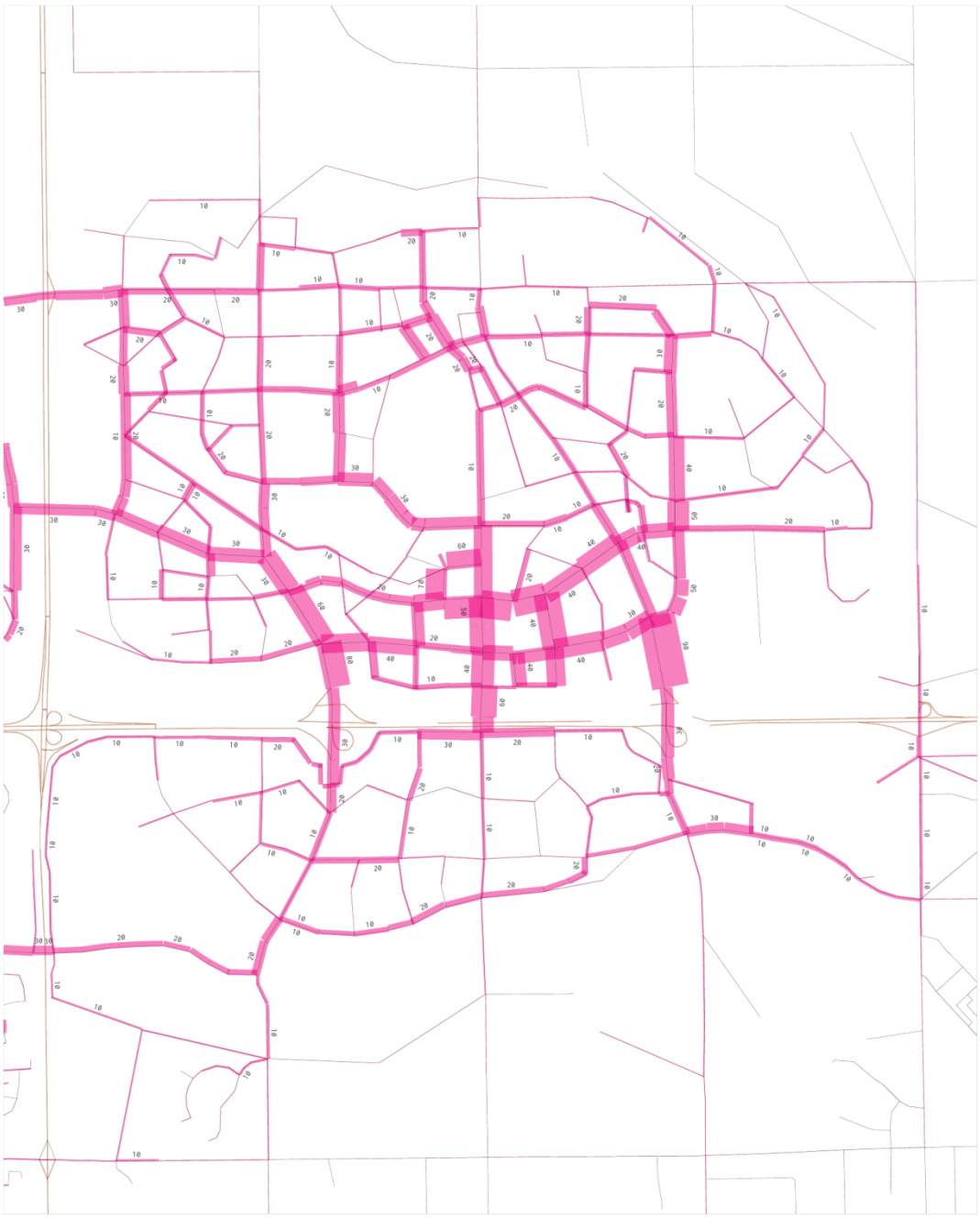


Figure 6. Cycling flows in the scenario 2b (investments to network, urban mobility patterns)

MOBYCON

TRAFFIC • MOBILITY • TRANSPORT

MEMO

Place/date report: 21 January 2019
By: Lennart Nout, Erik Wahle, Mary Elbech

Our reference: 5819, 1161 106200
CC: Joe Olson

Introduction

Mobycon has been subcontracted by Strathcona County and Stantec to investigate the opportunities for walking and cycling in the future Bremner expansion area. As part of these investigations, the cycling model Brutus was used to project potential cycling flows in, to and from Bremner. Two different scenarios were tested to assess the impact of a higher level of investment on the expected cycling mode share. The high investment scenario includes dedicated walking and cycling facilities along all major routes, and slow mixed streets within the residential areas. This would, based on travel data from Edmonton, create a 4.3% modal share for bicycles and up to 21.4% for pedestrians. This creates a total active mode modal share of 25.7%.

Based on these figures, bicycle flows in the evening peak hour through the development are shown in Figure 1. This shows significant bicycle flows mainly clustered on the southern half of the development. The main roads here are expected to carry up to 450 cyclists per day.

To add nuance and additional insight to the multi-modal analysis, another network planning tool was deployed, the Star Analysis.

P.O. Box 2873 • 2601 CW Delft • The Netherlands • +31 (0)15 214 78 99 • info@mobycon.com • www.mobycon.com
KvK 27195561 • BTW nr. NL 8099.42.549.B.01 • IBAN NL44 ABNA 0519 0865 38 • BIC ABNANL2A

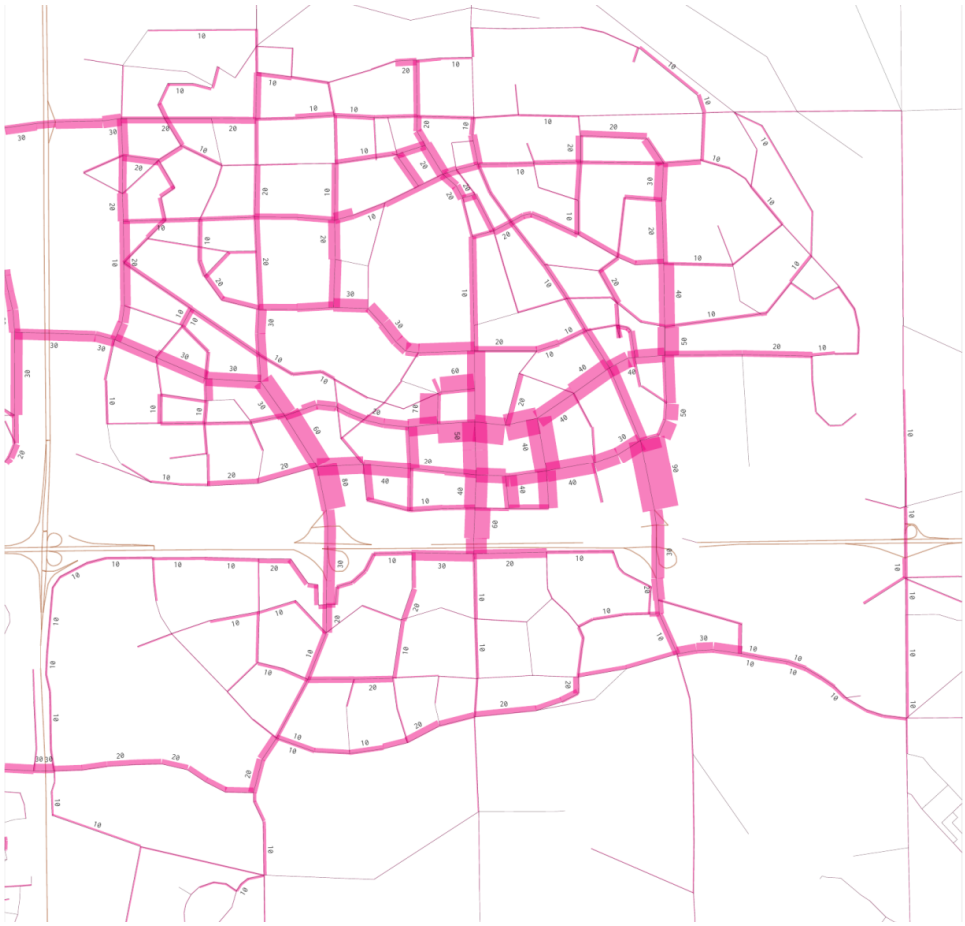


Figure 1: PM peak period (2 hour) bicycle flows in Bremner from previous BRUTUS model

Methodology

The Star Analysis is a visualisation and analysis tool used to plan, prioritize and visualize networks of movement within an existing or planned urban area. Based on the same principles that underpin a traffic model, it highlights large volumes of movements between zones. While a traditional traffic model connects the zones via the road network, a star analysis relies on displaying the direct (relative) relationship between zones. This allows us to visualise which trips will be viable by walking or cycling, even when the road network doesn't allow for these trips yet. This can inform decisions about the planning and prioritization of the bicycle network.

Results

While the initial mapping shows a reasonably scattered distribution of trips, some conclusions can be drawn regarding the relative importance of cycling facilities in various areas of the development.

If we overlay the proposed road network on top of the spider diagram generated through GIS, we get the following result, with the road network in purple. This analysis confirms the higher potential for cycling in the southern section of the Bremner area. The number of potential cycling trips between the various sectors in the Southern half is significantly higher than the Northern side. At the same time, connections to other areas outside the actual Bremner area are also largely focused on the South-Western side.`

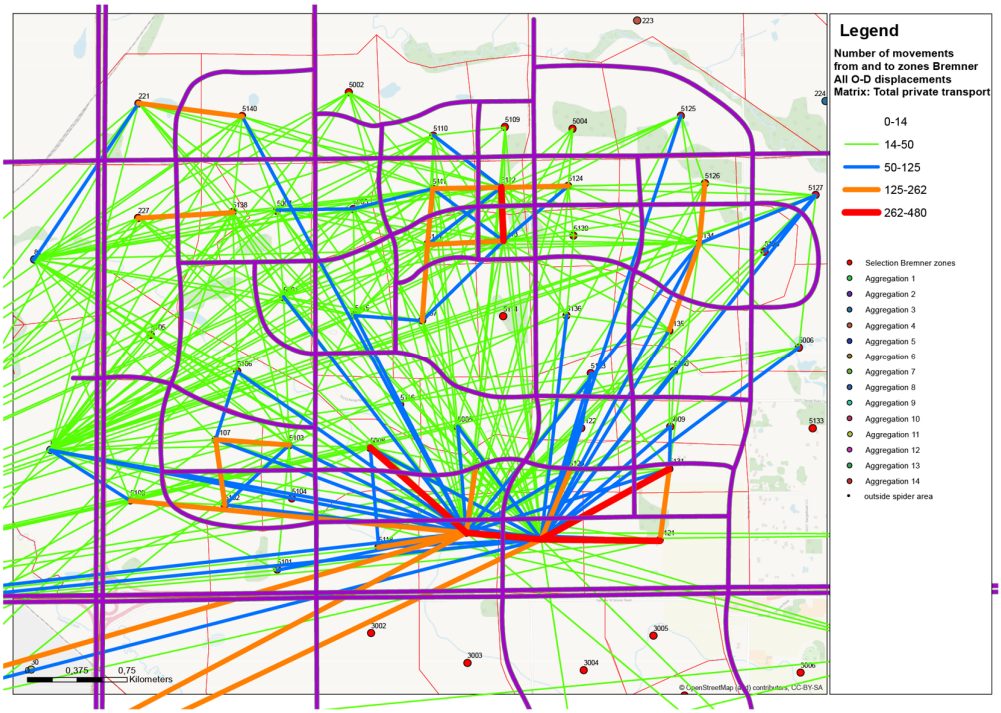


Figure 2: Relative importance of connections between different zones in Bremner

While best practice street design calls for separated cycling facilities on all major roads and traffic calming on all minor streets, this analysis shows the relative importance of a few key corridors, both within the development itself, as well as connecting to destinations outside the Bremner area.

Based on the star analysis, Mobycon recommends the following:

1. Introduce separated bicycle facilities on all major streets

As per the previous work done using the BRUTUS model, providing high quality cycling facilities is the best way to encourage a higher bicycle mode share. Proper levels of investment in walking and cycling facilities could generate up to 26% active mode share, which is high in comparison to other comparable suburban developments. Especially given the large number of internal (short) trips within the Bremner area, and the flat topography there is huge opportunity for walking and cycling. Alternatively, there is an opportunity to create a completely disjointed cycling (trail) network within the development. This would require a re-think of the lot allocation and additional quality criteria with regards to personal safety. However, this model is quite successful in encouraging more active trips.

2. Introduce bicycle facilities parallel to Yellowhead Highway

As can be seen in the map in Figure 2, there is a reasonably strong connection from within the Southern zones in Bremner to the neighboring development (Sherwood Park). The Yellowhead Highway and the interchange with Highway 21 are a considerable barrier to allowing these trips to happen by bicycle. To cater for these trips, there are two basic options. Create a new link across the interchange, connecting the South-Western side of Bremner to Sherwood Park, or create a parallel cycling route along the Yellowhead Highway. Further analysis is necessary to investigate the impact of either option.

3. Create several high quality facilities connection to the West

The spider diagram shows many relatively small (light green) connections between the area within the Bremner development and the area directly adjacent in the West. While each of these links is fairly weak, combined, they will amount to a reasonably large number of people trying to cross Highway 21. To minimize the barrier that is Highway 21, several connections across are recommended. This means approximately every 800 meters, a safe, grade separated crossing is required.

4. Provide a high-quality bicycle connection to Sherwood Park and Edmonton

As mentioned in item 2, there is a desire line towards the Southern side of Edmonton via Sherwood Park. Ideally, this would be catered for by connecting across the Highway 21, Yellowhead Highway interchange. With the relatively high movement from inside Bremner to the southwest, outside of Bremner, this becomes perhaps the most important connection (see '4' on Figure 3). Additionally, a bicycle connection along Yellowhead Highway (on the Southern side) should connect all the way to Downtown Edmonton, to allow also for longer commuter trips.

5. Limit through traffic within neighbourhoods and reduce speed to allow for safe cycling for short trips

As shown in the diagram, there are many short trips within the Bremner area. While some of these will make use of the main roads, the large majority of these will finish and end within one of the residential or commercial areas. For this reason it is important to provide safe cycling throughout the neighborhoods. This means reducing the number of vehicles on the internal roads to a maximum of approximately 3,000 per day, while at the same time reducing their operating speed to a maximum of 30 km/h. This is in line with international best practice.

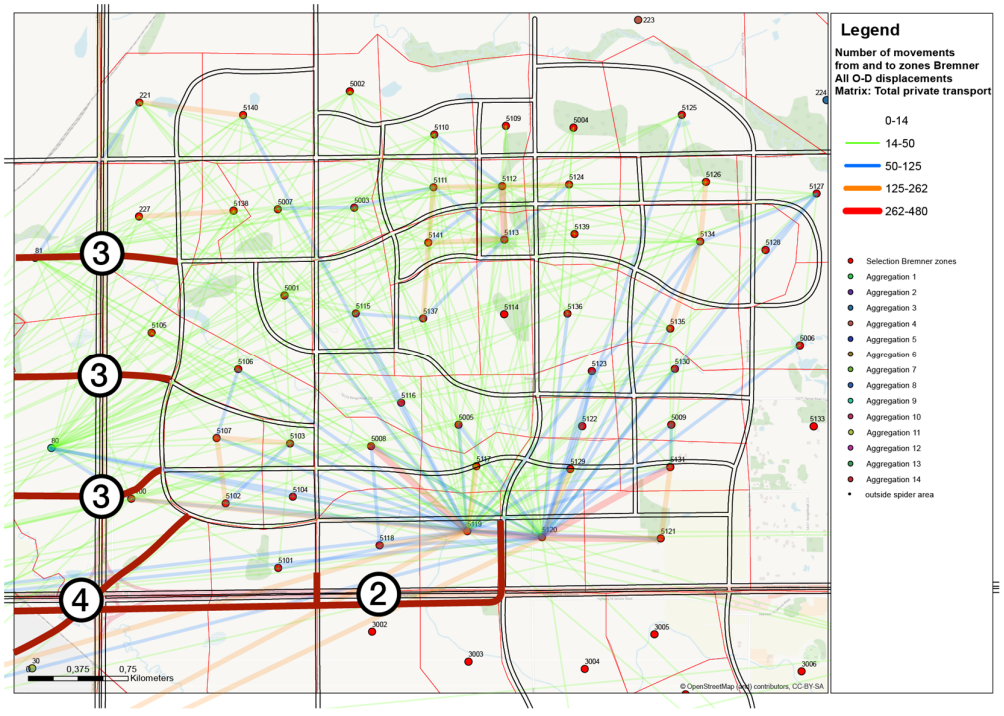


Figure 3: Ideal crossing locations

Alberta Transportation

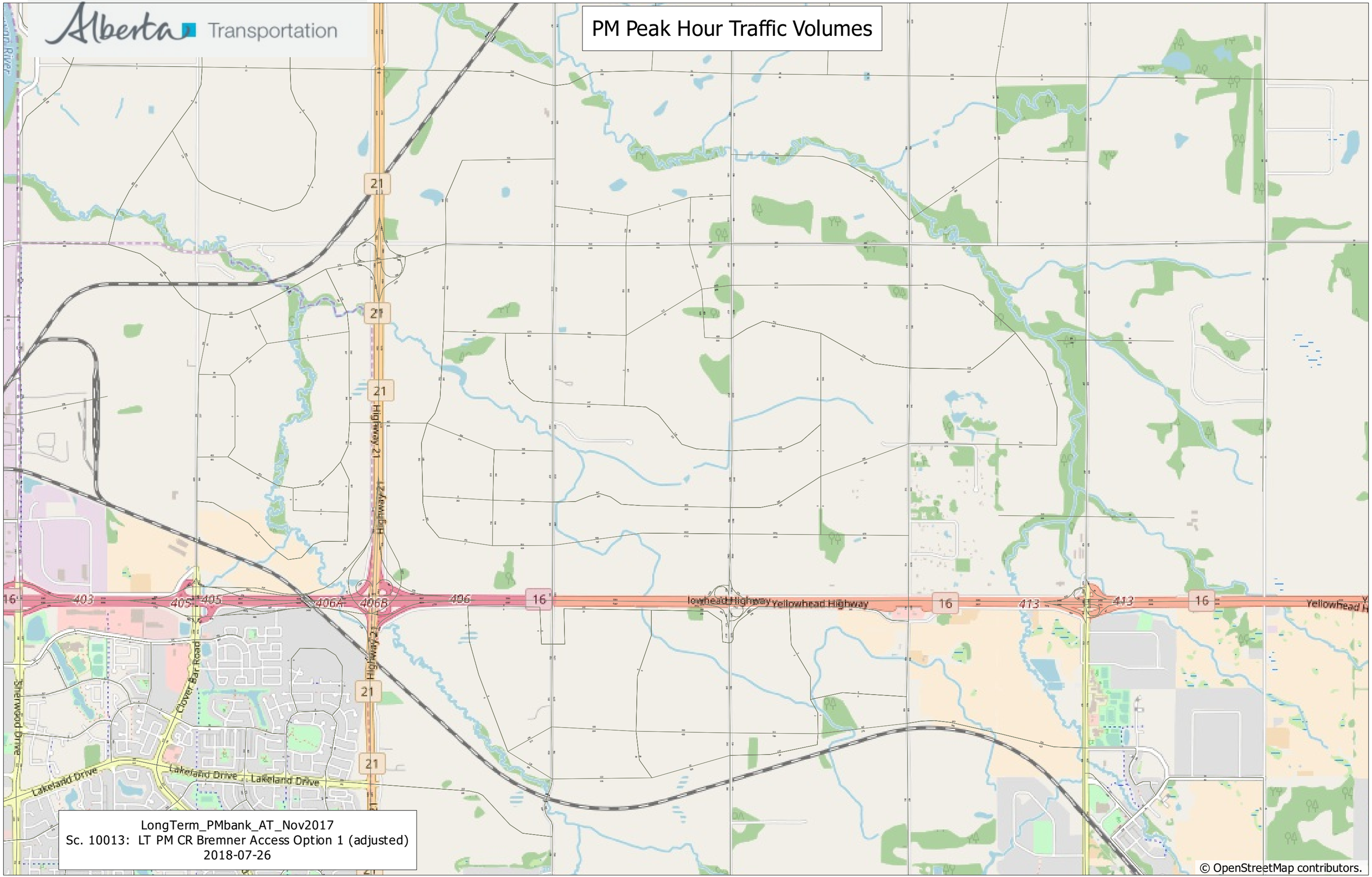
AM Peak Hour Traffic Volumes

Appendix A.4

LongTerm_AMbank_AT_Nov2017
Sc. 10011: LT AM CR Bremner Access Option 1 (adjusted 2018-08-01

Alberta Transportation

PM Peak Hour Traffic Volumes



LongTerm_PMbank_AT_Nov2017
Sc. 10013: LT PM CR Bremner Access Option 1 (adjusted)
2018-07-26

Alberta Transportation

AM Peak Hour Traffic Volumes

LongTerm_AMbank_AT_Nov2017
Sc. 20011: LT AM CR Bremner Access Option 2 (adjusted)
2018-08-01

Alberta Transportation

PM Peak Hour Traffic Volumes

LongTerm_PMbank_AT_Nov2017
Sc. 20013: LT PM CR Bremner Access Option 2 (adjusted)
2018-07-26

Alberta Transportation

AM Peak Hour Traffic Volumes

LongTerm_AMbank_AT_Nov2017
Sc. 30011: LT AM CR Bremner Access Option 3 (adjusted)
2018-08-01

Alberta Transportation

PM Peak Hour Traffic Volumes

LongTerm_PMbank_AT_Nov2017
Sc. 30013: LT PM CR Bremner Access Option 3 (adjusted)
2018-07-26

Alberta Transportation

AM Peak Hour Traffic Volumes

LongTerm_AMbank_AT_Nov2017
Sc. 40011: LT AM CR Bremner Access Option 4 (adjusted)
2018-08-01

Alberta Transportation

PM Peak Hour Traffic Volumes

LongTerm_PMbank_AT_Nov2017
Sc. 40013: LT PM CR Bremner Access Option 4 (adjusted)
2018-07-26