Lethbridge Transit Master Plan

City of Lethbridge

Stantec

July 2017

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July 7, 2017

Attention: Conrad Westerson
Acting Transit Manager
City of Lethbridge
619 - 4 Ave North
Lethbridge, Alberta
T1H 0K4

Dear Conrad,

Reference: Lethbridge Transit Master Plan – Final Report

We are pleased to present for consideration the Lethbridge Transit Master Plan - Final Report.

The planning process examined the current state of the transit system, created a new transit vision, and developed a simpler, more sustainable and streamlined system that can respond more easily and effectively to future growth within the City of Lethbridge.

This Plan is based upon and reflects the public and stakeholder input gathered through a comprehensive community engagement process, with the intent of creating a more user-friendly transit system that encourages ridership.

A three-phased implementation strategy is proposed, reflecting the reality that this is an ambitious plan that will take considerable time to implement. Similar to the Boulder, Colorado transit mode share success, we anticipate that a long-term commitment and support to change, will yield positive results.

The primary goal of the implementation plan is to firstly establish structural changes to the system and then improve the frequencies as funding becomes available.

Thank you for the opportunity to work on such an interesting and far-reaching project. We acknowledge the contribution of the Lethbridge Transit team and City of Lethbridge Project Steering Committee in the development of the Plan.

Sincerely

Graeme Masterton, M.A.
Transit Planning Leader

Mark Bellamy, P. Eng., FEC, FGC (Hon.)
Senior Principal

1 Introduction

1.1 The Intent of this Master Plan

The intent of this Transit Master Plan is to clearly identify how transit can drive the transformation of Lethbridge into the community envisioned in the Integrated Community Sustainability Plan / Municipal Development Plan.

A robust, well-designed transit system is uniquely situated to affect change because it positively influences nearly every aspect of society and the urban form, including:

- Land development: Transit enables intensification of land use on key corridors and supports new development in identified growth nodes.
- Social equity: Transit promotes access and mobility for all residents by eliminating the need to own or have access to a car.
- Health: Every transit trip begins and/ends as a walking or biking trip. Transit riders typically have greater levels of physical activity integrated into their daily life.
- Community aesthetic: Development along transit corridors is designed for the pedestrian instead of the car. The sidewalk becomes a positive, vibrant place to be and fosters social interaction.
- Financial: Increased use of transit can prolong or eliminate the need for increases in network capacity, saving tax dollars.
- Environmental: Moving 20-50 people in one vehicle compared to individual cars reduces GHG and criteria air contaminants.

Historically, Lethbridge Transit has provided access to the city with routes that are complex and circuitous. As the city grows, the ability of the system to meet the new travel needs is problematic due to the existing system configuration. In public engagement sessions at the outset of the process to build this master plan, the planning direction that was heard was clear – make appropriate and big changes to the system so that it responds favourably to travel demand and supports urban growth and development.

Today, transit is a marginal player in the daily trip making in Lethbridge because of its limited attractiveness and its perceived lack of competitiveness which is partly due to a lack of resources. The limited range of destinations served by transit, the lengthy travel time to reach a destination by transit and the lack of competitiveness compared to the private vehicle are testimonials that explain why only 1.4% of daily commuters choose transit.

A successful transit system creates travel opportunities for everyone, regardless of their origin and destination within Lethbridge. Future Lethbridge Transit provides a network that serves students, commuters, seniors, and others in such a way as to evoke a positive response to the question: Can I travel around the city without my car? This Master Plan presents a vision for the transit system, both as a statement and a transit network, and the implementation steps necessary to transform the system of today towards that of tomorrow.

1.2 Service Options

Service options have been developed that reflect a desired state for the future transit network. These include frequency guidelines for the peak periods (AM Peak is 6AM to 9AM, the PM Peak is 3 PM to 6 PM, Midday is 9AM to 3PM, and Evening is after 6PM) that may not be met initially due to budgetary constraints.

1.3 Fiscal Realities

The plan has been designed in phases to reflect the fiscal constraints on the operating budget until the next four-year budgeting cycle. As such, the Short Term plan is shown as a reflection of the desired routes but with the acknowledgment that there is a fiscal ceiling until after 2018. This means that the short term options are presented as a set of options:

A – Meeting the existing service hour levels with frequencies dictated by the fiscal cap

B – Cost of implementing higher levels of service in Midday during the weekdays for Frequent and Local routes

C - Cost of implementing higher levels of service in the Peak periods on Saturday for Frequent and Local routes

D – Cost of implementing higher levels of service on Sunday

E – Cost of only Implementing the Frequent Transit Network routes in the short term

1.4 The Planning Process

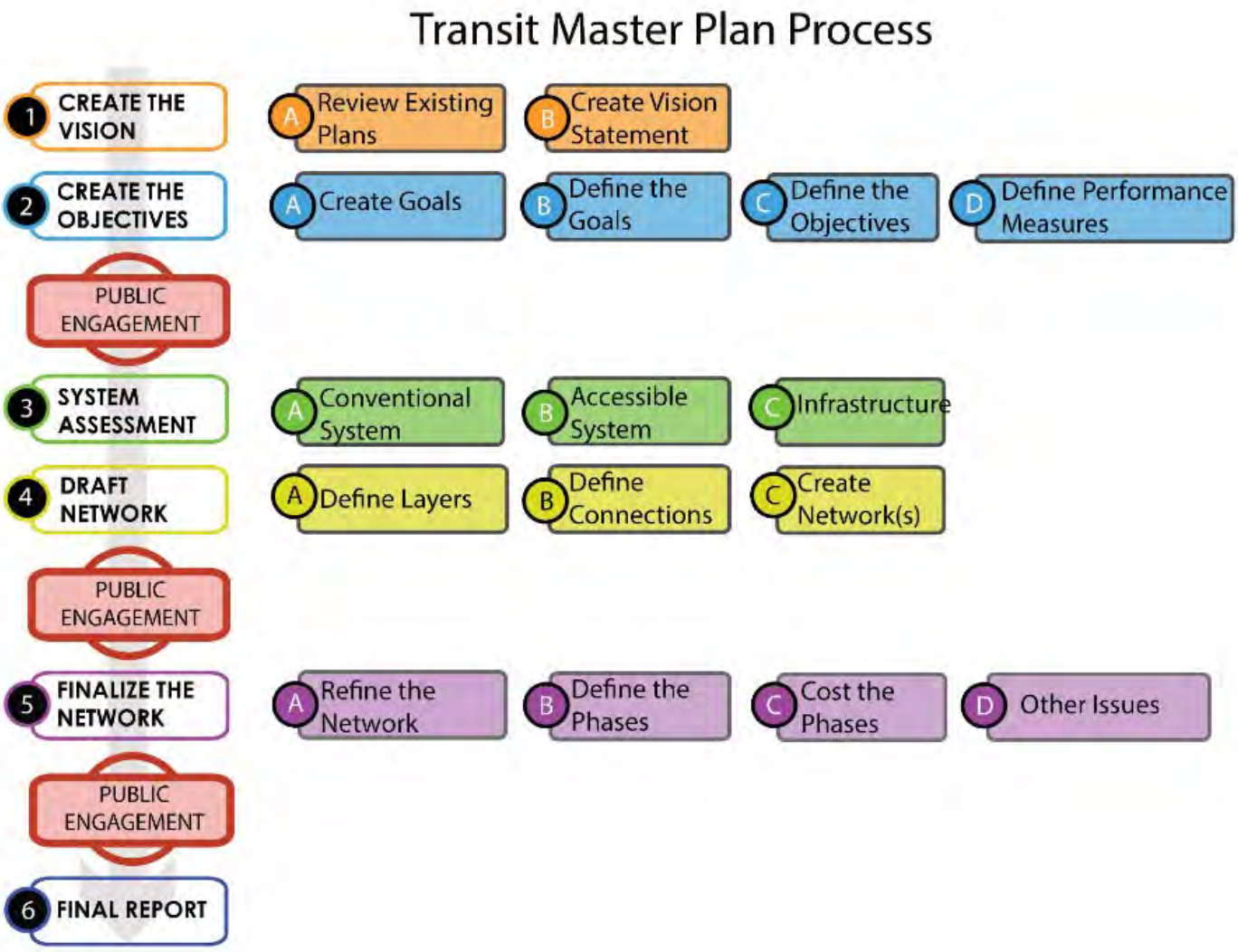
Transit has grown in an organic fashion - routes are adjusted to match the ebb and flow of demand and development over time. The master plan process presents the opportunity to take a step back from the day-to-day realities of operating a transit system and to understand the current and future travel needs of Lethbridge. Like most transit systems, the Lethbridge transit system has grown incrementally and independently, and will require adjustment and refinement to be consistent with the vision, goals, and future plans of the City.

The planning process responds to the following transit related questions:

- What do we have? - System Review.
- What do we want? – Vision.
- What do we need in future? – Develop Plan.
- How are we going to get there? Implementation Strategy.

Figure 1 describes the process followed to develop this Transit Master Plan.

Figure 1:Lethbridge Transit Master Plan Process Overview



1.4.1 PROJECT INITIATION

The first step in the planning process is verifying the intent of the plan and establishing the overall parameters for the project. This ensures all subsequent work contributes to the final outcome and brings focus to technical side discussions that may not advance the project.

There are a number of considerations that contribute to successfully developing an improved and expanded Lethbridge transit network. They include:

- Supporting and accommodating the growth and expansion of the population and urban environments in Lethbridge
- Addressing the travel needs of residents and improve passenger satisfaction
- Improving service efficiency and increase ridership, revenue, and cost recovery
- Aligning and integrating transit with land use and development policies and other plans such as the Transportation and Cycling Master Plans

1.4.2 Step 1: Create the Vision

The vision of the transit system identifies the intent and the unconstrained future of transit. This vision is a clear and concise statement that describes what transit is to the City of Lethbridge. This statement provides the overall guidance to the transit system in terms of its development, expansion, and evolution from its current state.

1.4.3 Step 2: Create the Goals and Objectives

The goals are the key ways in which the vision of the transit system will be achieved to make the required impact on the community. These goals guide the design of the transit system and are typically high level statements with a detailed description of the intent of the goal. Objectives are the intent described and from them we can derive service performance targets that help measure, evaluate and monitor progress towards achieving the goals in pursuit of the vision over time. Stakeholder and public engagement helps refine the vision, goals, and objectives.

1.4.4 Step 3: Existing System Assessment

The existing system assessment is a detailed review of the transit system and other transportation services based on the identified project parameters. The assessment provides an indication of how the services are performing and utilized by customers. Transit use was analyzed in context of the overall transportation network to identify opportunities and gaps in transit service provision relative to market demand.

1.4.5 Step 4: Draft Network

The draft future transit network translates the vision, goals, and objectives from prose to a map containing transit services and associated infrastructure. This iterative and collaborative process begins by brainstorming ideal, unconstrained future networks. The options are refined to either a set of preferred alternatives or to a single option. Stakeholder and public engagement is key to examining the reaction to the proposals, and aides in the refinement of the preferred future transit network.

1.4.6 Step 5: Final Network

Once the final future transit network is approved, the phased implementation plan describes how the network of today will transform over time. It identifies when routes should change, when frequency is required, which changes compliment each other and may be implemented as a package and when infrastructure improvements are required. In some instances, infrastructure provision may precede a set of route changes. Estimates of probable cost and performance measure goals are developed for each phase of the implementation plan.

1.4.7 Step 6: Final Report

The final report is a compilation of the methodology and planning process, public and stakeholder consultation, data analysis, transit vision and goals, implementation phasing, and impacts (costs and ridership).

2 Public Engagement

A comprehensive engagement process was followed in the development of this transit plan to ensure a realistic outcome reflecting the views and needs of stakeholders and the community in general.

The Transit Master Plan embarked on a multi-faceted engagement strategy that provided over 20 different avenues for the public to be engaged and contribute input. At several consultation opportunities, efforts were made to gain input where users congregated such as at the College, University, and Senior organizations. A diversity of tools was employed to encourage participation from home, work or attendance at events. They included surveys, online conversations, sounding boards, message boards, table and board discussions, open houses, hands-on transit opportunities and interactive workshops.

Transit staff participated on the Project Steering Committee and Transit drivers did provide feedback on future network routing.

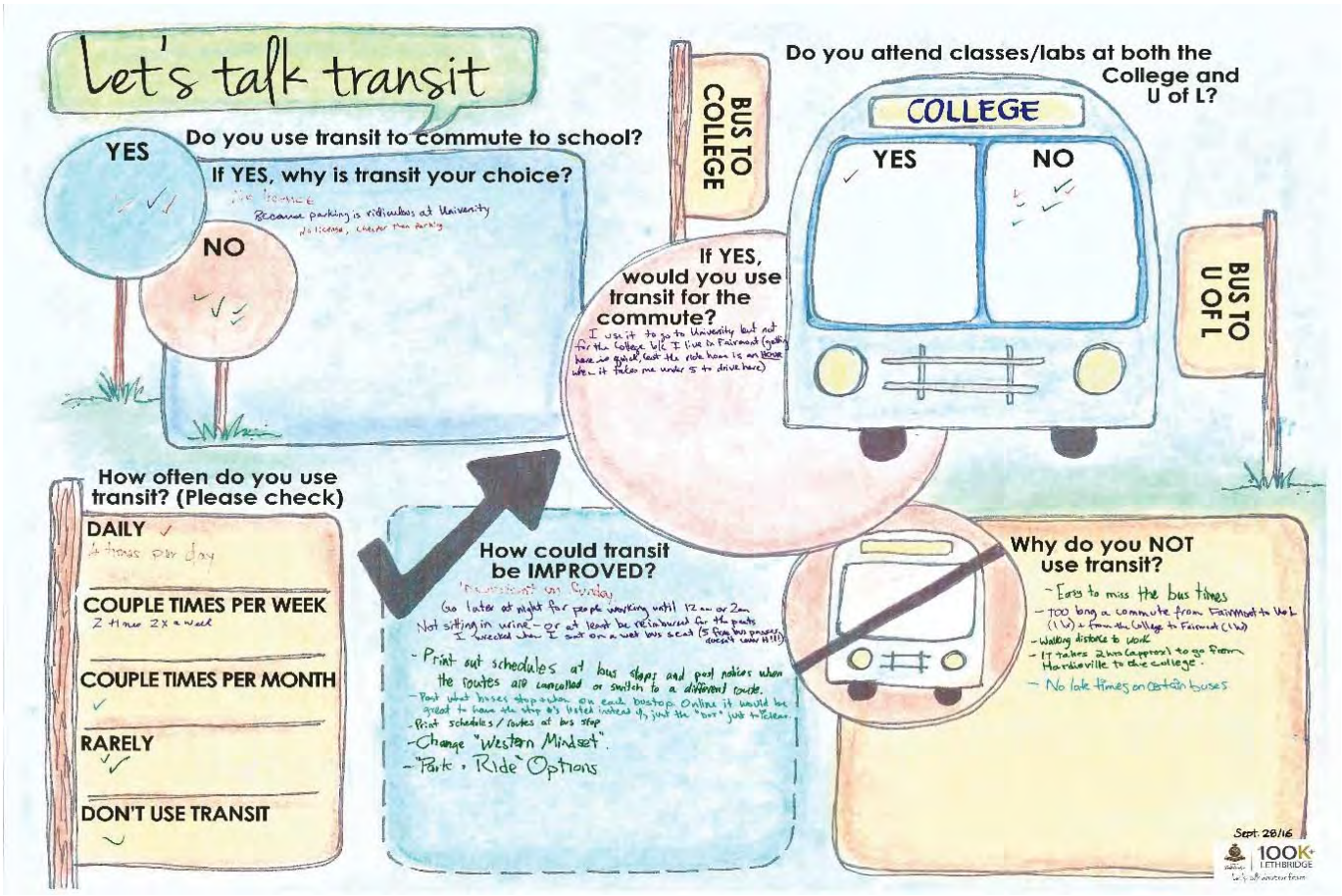


Figure 2: Transit Master Plan Engagement Plan

Key observations throughout the entire process centered on improvements that were needed to increase transit ridership in the City. These included shorter trip times, more frequent stops, fewer transfers, extended evening and weekend hours and more efficient transportation options.

A summary of the public engagement opportunities follows:

Date	Engagement Tool	Audience	Objective	Visits
Jun 16/16	Community Engagement	Public	Share and encouraged feedback on the vision, goals and objectives for the plan and purpose of Access-A-Ride. Explore coverage vs. ridership model.	53
WHAT WE HEARD				
Vision:	Needs more specifics for environmental benefits, a clearer link to land use planning, user friendly, try new ideas			
Goals:	Top goals that resonated were: Convenient, Understandable, Coverage, Competitive			
Access-A-Ride	Purposes: independence, door to door service, social opportunities, access community for physical disabilities. Challenges include last minute booking, cost			

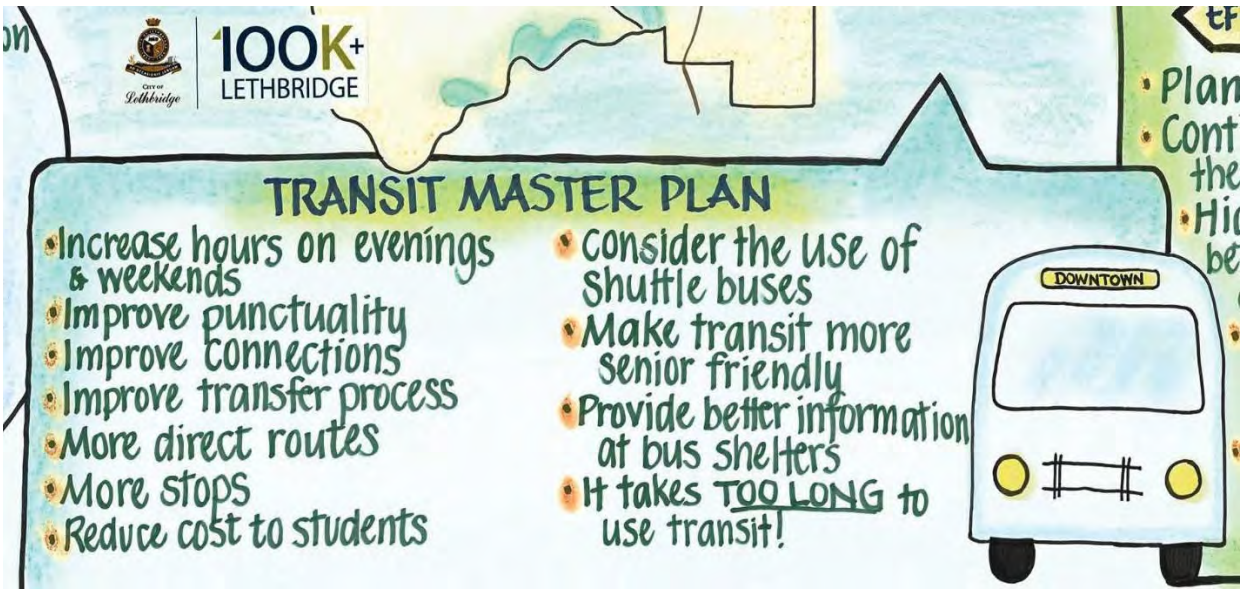
Date	Engagement Tool	Audience	Objective	Visits
Jul /16	Online Survey	Public	To gain insight of transit use, challenges and understanding by the public	58
WHAT WE HEARD				
Frequency	38% use transit 1-5 times or more weekly; 26% were not transit users			
Use	71% use conventional transit, 5% use conventional transit with a wheelchair, 19% use bicycle racks, 17% use large carry-on items, i.e. strollers, walkers, 2% use AAR, 22% not users			
Trip time	29% indicate 15-30 minutes, 31% indicated 30-60 minutes; 55% felt 15-30 minutes should be most appropriate time spent on the bus per trip			
Benefits	Environmentally friendly, reduce traffic congestion and parking issues, cost effective			
Challenges	Takes too long, route frequency, doesn't go to preferred destination, cost too much, require better evening and weekend hours			
Improvements	Increase frequency, provide more direct routes, reduce cost, extended hours			

Date	Engagement Tool	Audience	Objective	Visits
Jul/16-May/17	MindMixer online forum	Public	Questions posed to encourage online conversations and participation in surveys regarding goals, trip destinations, increasing ridership, purpose and improvements to AAR, engagement tools and west side hub locations	144
WHAT WE HEARD				
Participation	144 participants generated 524 interactions, 61 comments, and 180 ideas regarding the 10 topics posed on the site			
Engagement tools	Most frequent engagement tools were City website, MindMixer, Surveys			
Goals	Most important goals included convenient, affordable, competitive, and coverage			

Date	Engagement Tool	Audience	Objective	Visits
Sep 27/16	Pop-Up Engagement	U of L Students	Determine student perspectives on transit use, suggested improvements, and barriers to ridership	N/A
WHAT WE HEARD				
General	Majority of respondents don't use transit to school; those who do, don't have a car/license			
Improvements	Reduce cost to students, have transit fees included in tuition, improve Sunday hours, 15-minute frequency for west side, improve north side service			
Barriers	Infrequency, cost is too high, inconvenient, no access to airport			

Date	Engagement Tool	Audience	Objective	Visits
Sep 28/16	Pop-Up Engagement	College Students	Determine student perspectives on transit use, suggested improvements, and barriers to ridership	N/A
WHAT WE HEARD				
General	Students using transit do so because it is cheaper than parking fees or they don't have a car/license			
Improvements	Extended night hours, transit schedules at bus stops, park & ride options			
Barriers	Too long a commute; not late enough at night			

Date	Engagement Tool	Audience	Objective	Visits
Oct 12/16	100K Day Open House	Public	Provide the public with the process to date including vision, goals, and what we heard from engagements thus far. Presented the draft future transit network for discussion.	318
WHAT WE HEARD				



Date	Engagement Tool	Audience	Objective	Visits
Oct 12/16	100K Day Survey	Public	Gain a public perspective on transit use, how to increase ridership, purpose of AAR	201
WHAT WE HEARD				
Use	21% of respondents are transit users and over half of them own a car and use transit by choice with transit for personal uses far outweighing transit for work or school.			
Increase ridership	Increased frequency of routes/stop and reduction of travel time; improved information at bus shelters; reduce cost to students; make transit more senior friendly, use shuttle buses			
Purpose of AAR	78% Indicated transportation for people with disabilities that cannot use conventional service; 22% indicated transportation for seniors/others affiliated with agencies; 26% indicated both purposes			

Date	Engagement Tool	Audience	Objective	Visits
Mar 22-25/17	Home & Gardens Trade Show	Public	Create awareness of TMP and gain feedback on future transit network	N/A
WHAT WE HEARD				
Transfers	Too many transfers that take too long; extend weekend and evening hours; park & ride on west side; direct route from U of L to College			

Date	Engagement Tool	Audience	Objective	Visits
Mar 28/17	Pop-Up Engagement	U of L Students	Gain feedback on the future transit network	N/A
WHAT WE HEARD				
Frequency	Need express route between U of L and College, extend evening and weekend hours; lower cost; more frequent buses at peak time			

Date	Engagement Tool	Audience	Objective	Visits
Mar 29/17	Pop-Up Engagement	College Students	Gain feedback on the future transit network	N/A
WHAT WE HEARD				
Routes	Routes from Legacy are far too long before reaching connections; bus to airport; keep terminal at College			

Date	Engagement Tool	Audience	Objective	Visits
Apr 10/17	Pop-Up Engagement	LSCO Seniors	Determine what types and frequency of transit used, suggested AAR improvements	10
WHAT WE HEARD				
General	Majority don't use any transit at all; main reason is transit is infrequent and takes too long;			
AAR	AAR can be improved with more availability during weekday peak times; AAR is affordable but subject to abuse; drivers are courteous, friendly, helpful, efficient			

Date	Engagement Tool	Audience	Objective	Visits
Apr. 11/17	Pop-Up Engagement	NORD-BRIDGE Seniors	Determine what types and frequency of transit used, suggested AAR improvements	12
WHAT WE HEARD				
General	Majority don't use any transit at all as there is no need at this time; AAR can be improved by being able to book trips closer to travel time or use smaller van-style vehicles; more benches as stops; good service			

Date	Engagement Tool	Audience	Objective	Visits
May 3/17	100K Day Open House	Public	Presented Transit Vision and Goals and short and long term future transit networks. Also, provided AAR mission, facts, costs, and recommendations to inform the public.	114

Date	Engagement Tool	Audience	Objective	Visits
May 3/17	100K Day Survey	Public	Allow the public to give input regarding AAR eligibility, continued support of the transit vision and where they go for transit route information.	64
WHAT WE HEARD				
AAR	65% or respondents felt AAR eligibility criteria should be reviewed. Criteria suggested included less frequent qualification reviews for long-term disabilities, flexibility and inclusive of all transit users, allow for mental illness, consider all disabilities, documentation.			
Transit Info	My Ride website is frequented by 54% of users followed by 19% who use the transit schedule brochure. 43% indicated they were not transit users.			
Vision	86% of respondents agreed with the Transit value statement			

The Transit Master Plan Engagement Strategy included opportunities to meet and discuss project milestones with key stakeholders. Meetings were held with the Internal Steering Committee, Transit Advisory Committee, Community Design Committee, Community Issues Committee, Senior Management Team and City Council culminating in an engagement tool to update and involve the public in key initiatives; providing an additional layer of transparency to the process.

The schedule of **internal engagements** is summarised below:

	Date	Engagement Tool	Internal Audience	Objective
1	Jan 9/16	Workshop Visioning Session	Internal Steering Committee	Assist in the development of vision, goals, and objectives for presentation to stakeholders and public
2	Feb 4/16	Workshop	Senior Management Team	Present draft vision, goals, objectives. Review initial system operations, growth limitations.
3	Mar 9/16	Meeting	Community Design Committee	Present draft vision, goals, objectives. Review "coverage" vs. "ridership" models.
4	Apr 25/16	Meeting	Community Issues Committee	Presented draft vision, goals, objectives. Discuss need for fundamental change in approach to system expansion and servicing (coverage vs. ridership). Gain feedback from City Council perspective.
5	May 27/16	Meeting	Internal Steering Committee	Update on the process and need for a transformational change
6	Jun 16/16	Community Engagement	Internal Steering Committee and Transit Advisory Committee	Involve internal stakeholders with opportunities that the public would also weigh-in: i.e. Confirmed vision, goals, how to increase ridership, challenges, purpose of AAR.
7	Aug 16/16	Design Workshop	Internal Steering Committee	Present initial routing scenarios (short and long term) and gain feedback.
8	Dec 13/16	Meeting	Internal Steering Committee	Update of short and long term Future Transit Networks
9	Feb 27/17	Workshop	City Council	Provide project update and gain direction for future transit plan development milestones
10	Apr 12/17	Meeting	Internal Steering Committee	Review final long and short term Future Transit Networks.

2.1 Summary of Engagement Issues

Several issues relating to the existing system were highlighted by Lethbridge Transit staff and the public. These issues were considered during the development of the Transit Master Plan:

- **Long trips**: One of the biggest challenges is that the circuitous existing route structure necessitates long trip times to move around the city.
- **Transfers and transit inefficiencies**: The routing structure, with complicated routes attempts to allow timed transfers at key points such as downtown, the University of Lethbridge, and the northern exchange. This means that additional (non-revenue) time is required to ensure that the buses have sufficient time to wait for late buses on other routes, creating losses in efficiency.
- **Expansion opportunities**: The organic growth in the system, the complicated nature of the routing, and maintaining timed transfers means that there is now very little ability to extend existing services into new areas of the city.
- **Attractiveness**: Trip frequency is low. This makes transit less attractive and means that travel requires accurate preplanning. The length of time to make a trip compared to the car is exceedingly long, further diminishing the attractiveness of transit as an alternative travel option.

A New Vision for Transit

3 A New Vision for Transit

The transit vision statement is intended to describe the end state of the system (the ideal outcome) – in the future when all the objectives have been achieved. By its nature, it is inspirational and idealistic. It is important to note that the emphasis of the vision statement is on **what the end will be like**, and less on what the City and/or Lethbridge Transit need to do to get there. Statements on **how** this is achieved are secondary and are stated as objectives and measures.

Despite a true vision statement being high level, it can be a powerful message that drives the motivation and engagement of employees, and that stakeholders such as council and customers can embrace and support through investment and use.

Vision statements are inspirational, clear, memorable, and concise. Some interesting examples are:

Oxfam: A just world without poverty

Habitat for Humanity: A world where everyone has a decent place to live

San Diego Zoo: To become a world leader at connecting people to wildlife and conservation

TED Talks: Spreading Ideas

The Humane Society: Celebrating Animals, Confronting Cruelty

Smithsonian: The increase and diffusion of knowledge

Monterey Bay Aquarium: To inspire conservation of the oceans

The goal is to create a similarly clear vision for transit within Lethbridge that lays the foundation for all subsequent decisions.

3.1 Themes

It is useful to review other plans of the City of Lethbridge in terms of their individual vision, value, and goals as it pertains to transit. Essentially, transit is an integral component of all these plans, helping the City to support the desired outcomes to achieve its overall vision.

A well designed and operated transit system can be a strong contributor to achieving the local goals that are articulated in various plans. Simplicity in design and functionality usually means establishing a **simple and attractive transit** system that everyone can understand and use.

Understanding why people may react to transit in different ways, based on their personal needs and circumstances, helps to create a transit network that is acceptable and that reduces the barrier to use - potentially offering a new way of travel for many.

The expectation of the transit system is captured and incorporated in its overall vision and the transit master plan **articulates this overall vision** by describing what that might look like in terms of service and infrastructure, and then **outlines a potential plan** to evolve from the current condition towards that vision.

The creation of a transit-specific vision is necessary to inform other plans and create a sense of unity amongst them.

Figure 3: Coordinated Planning

A well designed and operated transit system can be a strong contributor to achieving the local goals that are articulated in various plans. One of the challenges in creating a vision for transit is that it is influenced by existing municipal and regional plans that are often created in isolation of each other. The new vision aims to align with 18 of the 33 public service strategies/goals, policies, or principles.

Lethbridge has five major plans that guide development – each with its unique consideration of strategies, goals, policies, and principles relating to planning objectives that refer to density, liveability, urban form, accessibility, as well as the role of transit and transit services in achieving these:

- Strategic Plan 2014-17
- Municipal Development Plan/Integrated Community Sustainability Plan
- Transportation Master Plan
- South Saskatchewan Regional Plan
- Inter-Municipal Development Plan

A further challenge is that existing plans may have unintended operational impacts. For example, a plan might create a requirement for transit stops to be located within 400 metres of the majority of residents to achieve access and improved mobility goals. While this may seem a reasonable goal from the perspective of inclusion, it does commit transit resources. When a new development occurs, there is an obligation to maintain access even at the expense of existing service levels elsewhere (particularly in the early stages when the demand for transit is very low and the transit system does not have additional resources to increase service or extend routes).

In the various plans that have been developed, the role of transit has already been identified as part of value statement themes:

- **City building** – draws on themes relating to transit-oriented development and growth, and making Lethbridge a place of choice for employment and living.
- **Prosperous –** addresses economic development and the role transit plays as an efficient means for urban transportation alternative.
- **Inclusive** – refers to accessibility of transit for all ages and abilities. This addresses services, vehicles, infrastructure, and fares.
- **Healthy** – references the role of transit to support both personal health (active modes) and the health of the environment (reducing traffic volumes).
- **Vibrant** – relates to developing transit-oriented communities and revitalization initiatives in the city centre.
- **Livable community** – touches on themes of place-making, urban design, multi-modal choices, life satisfaction, and more.

3.2 Vision Statement

Transit is the "glue" that binds the city together in a meaningful way and supports the future expansion and development of the city. Transit supports the city moving forward in its sustainable endeavours by offering a realistic alternative to the car, supporting areas with increased density and enhancing the economic vitality of the downtown core through improved accessibility from all parts of the city with frequent and direct transit services. The City of Lethbridge is rapidly growing and transit needs to support development with a system that is easily expandable into new areas without compromising the existing services or forcing constant changes.

The final vision statement that reflects the value statements of recent planning initiatives is:

Transit Master Plan Vision Statement
Lethbridge Transit: Helping move Lethbridge into the future.

3.3 Value Statement

The value statement of the Lethbridge transit system describes the way in which the transit system intends to operate to achieve its vision. This forms the foundation of the operational side of the service.

This value statement describes the service where stakeholders are recognized – i.e. service delivery is focused on maximizing the customer experience in providing service in response to travel demand in an efficient way while augmenting the community's sustainable footprint. The identified value statement is:

Transit Value Statement
Transit operates a safe, efficient, inclusive and customer-focused service that helps create a vibrant and environmentally sustainable Lethbridge.

3.4 Goals and Objectives

To support the Lethbridge transit vision, four goals have been identified that provide guidance in achieving the vision. For each goal, supporting objectives have been identified to reach these goals:

Goal 1: Transit helps transform Lethbridge

- Transit helps transform Lethbridge to establish a more compact urban form focused on development nodes and frequent transit corridors, that support walking and cycling, and connect these activity centres.

Goal 2: Transit values the customer's time

- Transit services are designed and operated to be customer-focused, with simple and efficient routes that allow for reasonably shorter travel times.

- Transit plans and operates services that offer consistent travel times and appropriate frequencies in combination with infrastructure and priority measures to minimize travel delays.

Goal 3: Transit helps achieve a community that is prosperous, competitive and provides choice

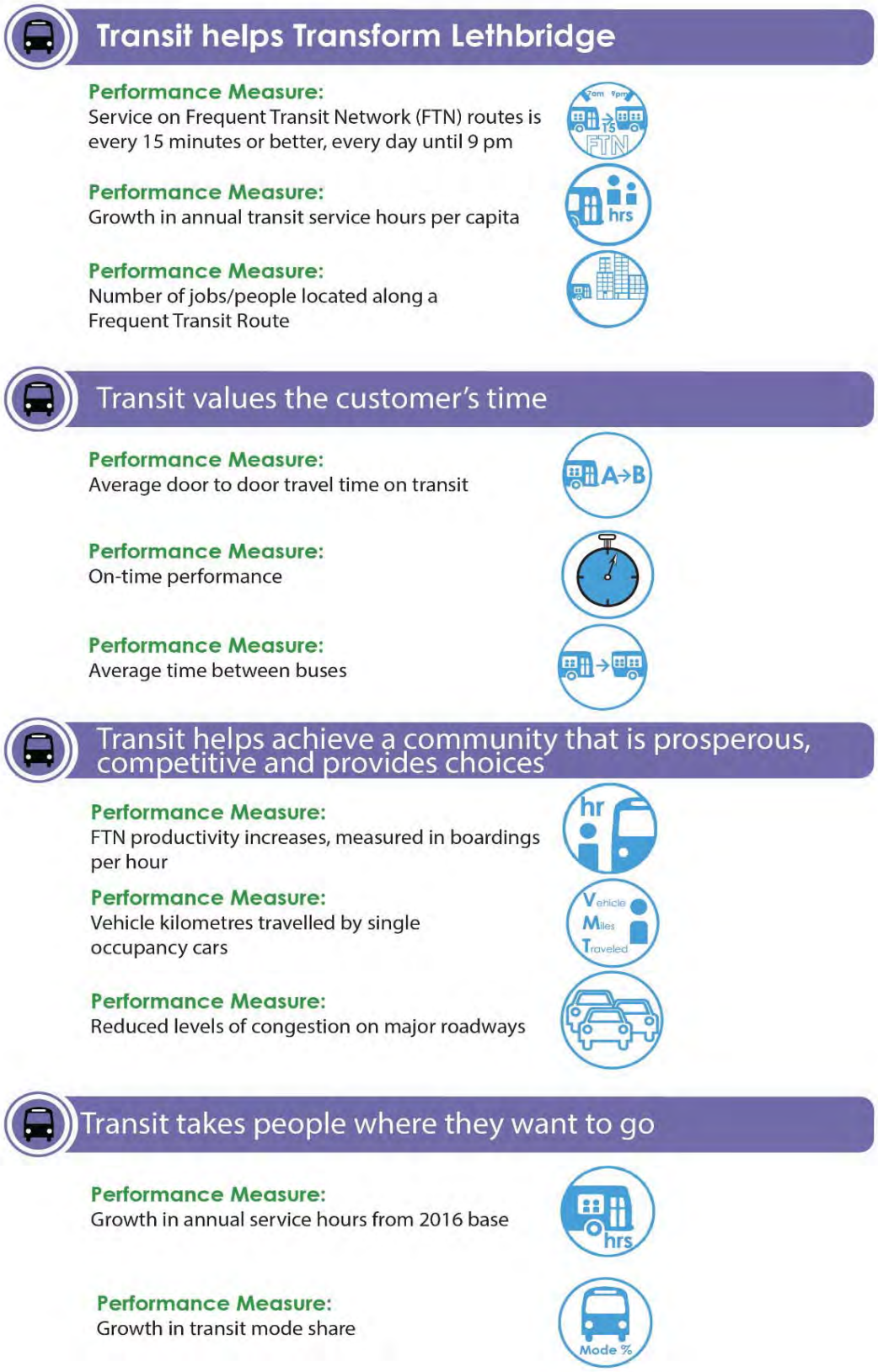
- Transit serves major destinations and provides connections to other transit services via the **Frequent Transit Network** (defined later in the document). It provides the community with a realistic, cost-efficient transportation alternative that is direct, consistent, and easy to understand.

Goal 4: Transit takes people where they want to go - connecting people to jobs, education, and services

- Transit offers direct trips with a single transfer to key destinations along the primary corridors in Lethbridge.

Goals and objectives are summarized in the following figure:

Figure 4: Transit Goals, Objectives, and Performance Measure



The Existing System

4 Service Review

4.1 Description of Service

The existing Lethbridge Transit network is a radial network (see Figure 5) with multi-purpose routes except for Route 12 which connects the University of Lethbridge to Downtown while school is in session. This means that every transit trip within Lethbridge is treated similarly whether it is a trip to school, to work or to the grocery store.

The existing system is structured as a focal point transfer system with timed transfers at three key locations, namely:

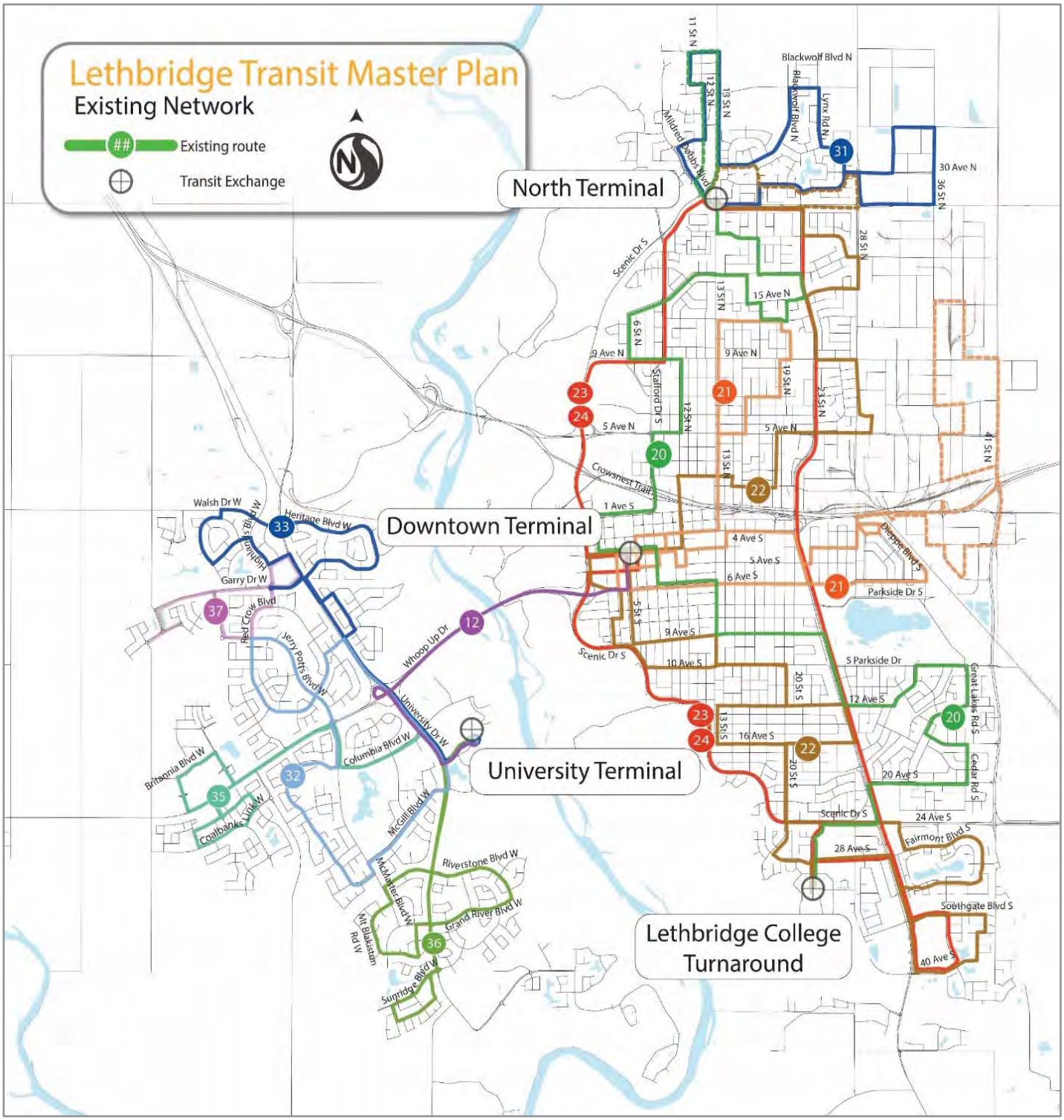
- Downtown
- University of Lethbridge
- Northern Exchange (North Lethbridge)

Most routes radiate out of the existing on-street downtown terminus on 4th Avenue South.

From the two main terminals (Downtown and University of Lethbridge) a total of 11 routes radiate outward serving the city. Route 12 provides a connection between these two terminals. Transit operations at the two terminals is based on a pulse system – whereby routes converge at exchanges at the same time to facilitate timed transfers.

Other than Route 12 that connects East Lethbridge to West Lethbridge with a 15-minute frequency, all other routes have a frequency of 30 minutes and a cycle time (round trip time) of 50 or 100 minutes. The routes are complex with respect to their design, making it a challenge for new users to understand the system. The desire to try and serve many destinations without transfers has resulted in routes with multiple loops and long travel times.

Figure 5: Existing Network



The following table provides an overview of all routes including the frequency of service (minutes) for service periods and average rides per hour and trips per day:

Table 1: Existing Route Characteristics

Route	Service Frequency (minutes)	Service Span			Average Rides per Hour	Trips per day
	Peak/ Off Peak/ Evening	Weekday 6am-12am	Saturday 7am-12am	Sunday 8am-7pm		Weekday
12	15/30/30	✓	✓	✓	29	88
20	30/30/30	✓	✓	✓	48	70
21	30/30/30	✓	✓	✓	21	68
22	30/30/30	✓	✓	✓	40	70
23	30/30/30	✓			14	27
24	30/30/30	✓			15	27
31	30/30/30	✓	✓		6	26
32	30/30/30	✓	✓	✓	18	45
33	30/30/30	✓	✓	✓	13	36
35	30/30/30	✓	✓	✓	12	36
36	30/30/30	✓	✓	✓	8	36
37	30/30/30	✓	✓	✓	3	36

Peak periods refer to commuter/school time frames of 6 – 9am and 3 – 6pm, Midday is 9am – 3pm, and Evening is after 6pm. The majority of transit customers comprise students (40%) and workers (24%). Both these transit markets are known for using transit on a regular basis, generally as frequently as 5 days a week.

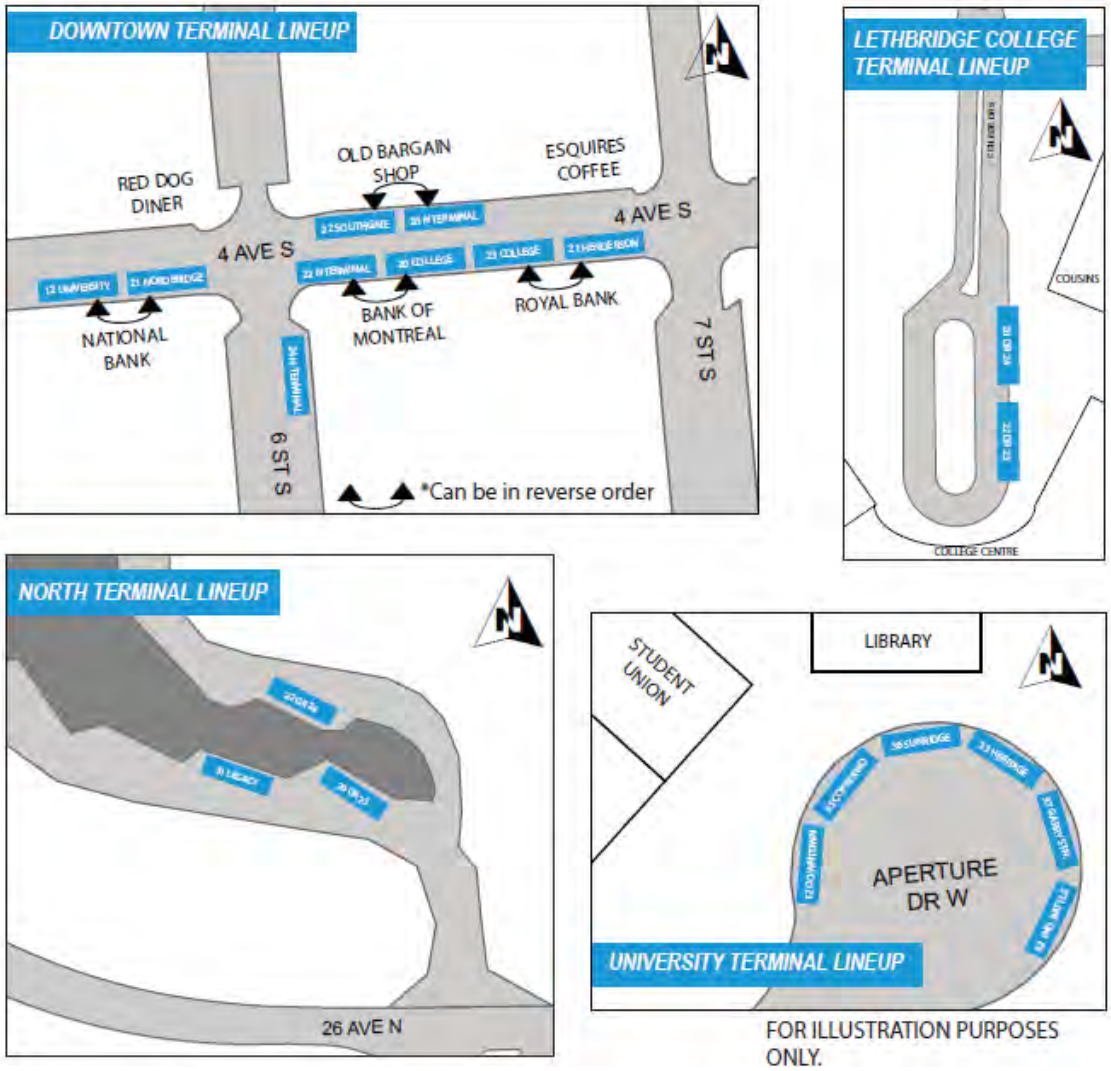
4.2 Facilities

In addition to the two major terminals, two other terminals are in use in Lethbridge - an off-street terminal in the north of the city (26 Ave N/13 St N), and an on-street terminal in the south utilizing the Lethbridge College parking and turnaround loop facilities.

Table 2: Existing Infrastructure

Location	Number of Bays	Boardings per Day	Transfers (%)
Downtown	9	1,857	61
North	6 (3 currently in use)	110	39
University of Lethbridge	6	1,145	43
Lethbridge College	2	86	9

Figure 6: Existing Infrastructure Lineup



4.3 Peer Comparison

Comparing the performance of Lethbridge to similar sized transit systems provides a sense of the status of its performance from a relative perspective. It also can provide targets to reach in the future. The Canadian Urban Transit Association (CUTA) publishes statistics for Canadian urban municipalities on an annual basis.

The following table compares Lethbridge to number of peer systems in Canada:

Table 3: Comparative Service Performance

Comparative Performance of Peer Systems (2014/15)				
City	Province	Annual Revenue Hours	Annual Rides	Rides/Hour
Lethbridge	**AB**	**86,000**	**1,230,618**	**14**
Red Deer	AB	158,600	3,850,000	24
Medicine Hat	AB	90,000	1,250,000	14
St. Albert	AB	91,540	1,648,200	18
Sault Ste Marie	ON	84,200	2,011,800	24
Thunder Bay	ON	144,400	4,196,300	29
Kelowna	BC	151,200	4,849,000	32
Nanaimo	BC	113,200	2,712,300	23
Central Fraser Valley (Abbotsford-Mission)	BC	109,000	2,347,900	21
Kamloops	BC	98,000	3,354,200	34
Prince George	BC	63,500	1,966,700	30
Average		**110,400**	**2,818,600**	**25**

From this table, the current average performance of 14 rides per hour is significantly low in comparison to systems in cities of similar size. The complexity of the existing service, the low frequency and the duration of trips take, all contribute to the impact the ridership. The transit vision should consider higher performance targets for the system along with the restructuring of the routes.

4.4 Three Year Performance Review

A review of the three-year performance using standardized metrics provides a dashboard showing if there are trends that might provide concern or show the strength of the system (see Table 4). Based on this review between 2013 and 2015, it is apparent that the system is in a state of stasis with little change in hours or ridership. One concerning observation is the fluctuation in revenue levels, and 2016 and 2017 data would need to be scrutinized to determine whether this is an anomaly or a trend of sorts. Effectively, the system will not grow or change in terms of ridership without a significant change in philosophy, approach, and structure.

Table 4: Performance Review: 2013-2015

	2013	2014	2015
Annual Ridership	1,193,105	1,215,147 ↑	1,230,618 ↑
Total Revenue Hours	103,519	103,038 ↓	103,714 ↑
Annual Fare Revenue	3,110,113	2,871,039 ↑	3,230,005 ↑
Annual Operating Cost	9,626,734	11,120,887 ↑	11,200,409 ↑

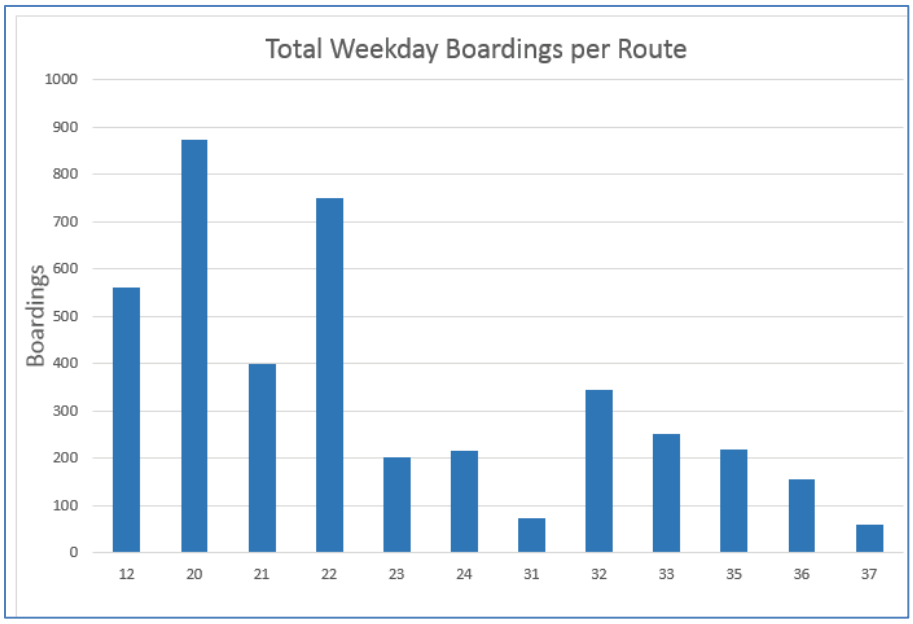
4.5 Ridership by Route

Below is a more detailed examination of each route and its performance with respect to ridership and performance. Data is based on farebox use of non-cash fares for boarding's only.

Figure 7: Total Daily Boarding's (Weekdays)

The average daily boarding's by route clearly shows that Route 12, 20 and 22 are the three dominant routes in the system in terms of passenger volumes.

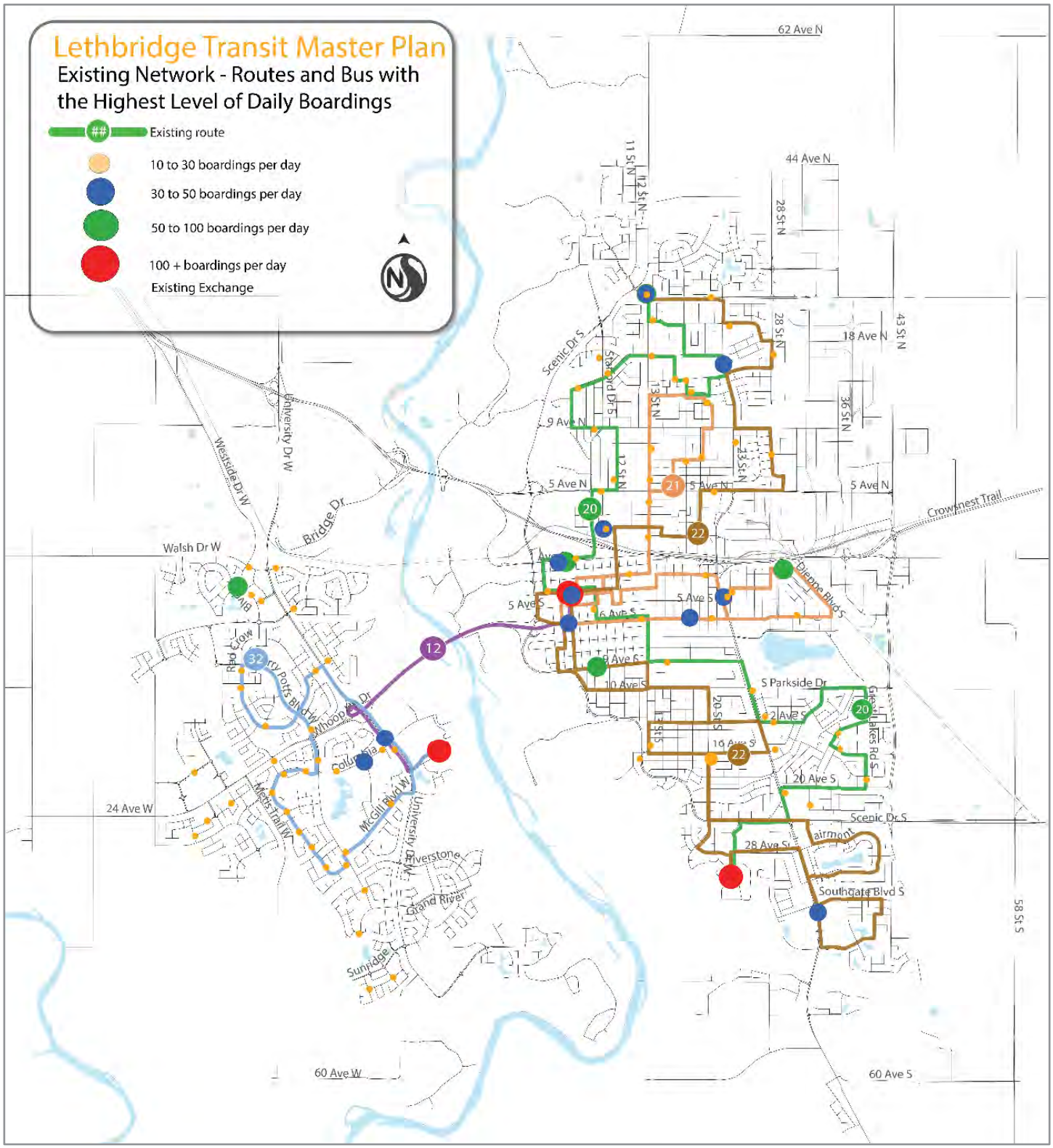
Together, these three routes carry a little more than half of the total weekday passengers that use the system, transporting 2,200 of the 4,100 average daily boarding's.



Routes 20 and 22, which carry forty percent of all riders, have a very similar design - running semi-parallel serving North and South Lethbridge, they connect or intersect eight times, both serve Downtown and the Hospital, and cover the majority of these areas. In addition to serving multiple destinations, they also provide clockface service (consistent regular and easy to memorize) every half-hour, on the hour. These features are key components to attract ridership and these principles will be followed in the development of future service proposals.

The next two most popular routes are Route 21 which connects both North Lethbridge and the Nord-Bridge Seniors Centre to downtown, and Route 32 which connects the University with the shopping centre in West Lethbridge.

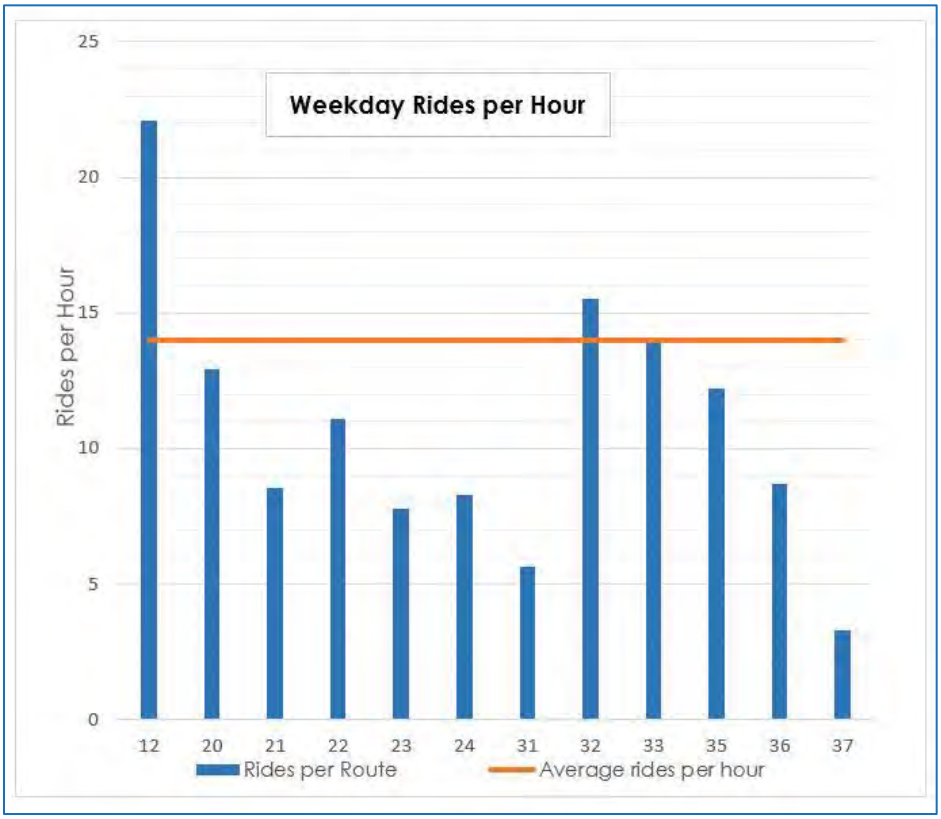
Figure 8: Routes and Bus Stops with the Highest Boarding's per Day



4.6 Rides per Hour

Rides per hour is a standard productivity index for transit services. As a comparative, this will show which routes are most productive relative to the amount of service provided. The direct link between downtown and University of Lethbridge ranks as the highest performer at over 22 rides per hour.

Figure 9: Rides per Hour

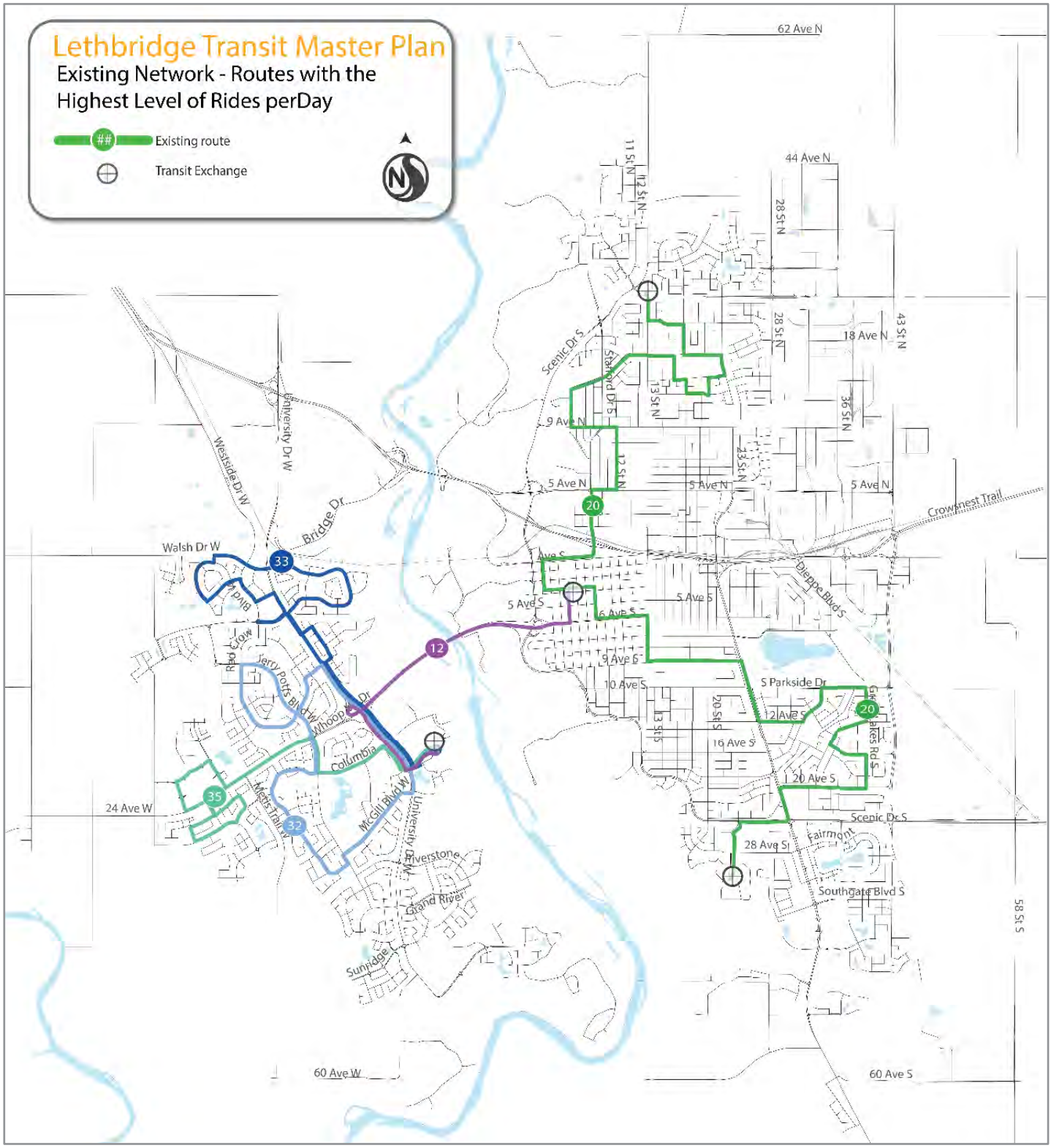


The average rides per hour for all routes is 14. Only five routes exceed the average, namely 12, 20, 32, 33, and 35. Those routes are considered as the most efficient, transporting the highest level of customers per vehicle hour.

Most the routes shown in Figure 9 depicting boardings per weekday do not stand out as high performing routes based on the number of rides per hour. Routes such as the 22, 23 & 24 are long routes versus the more productive 30's level routes which are shorter routes in West Lethbridge.

Compared to the system averages of the peer routes, only Route 12 could be considered a solid performing route.

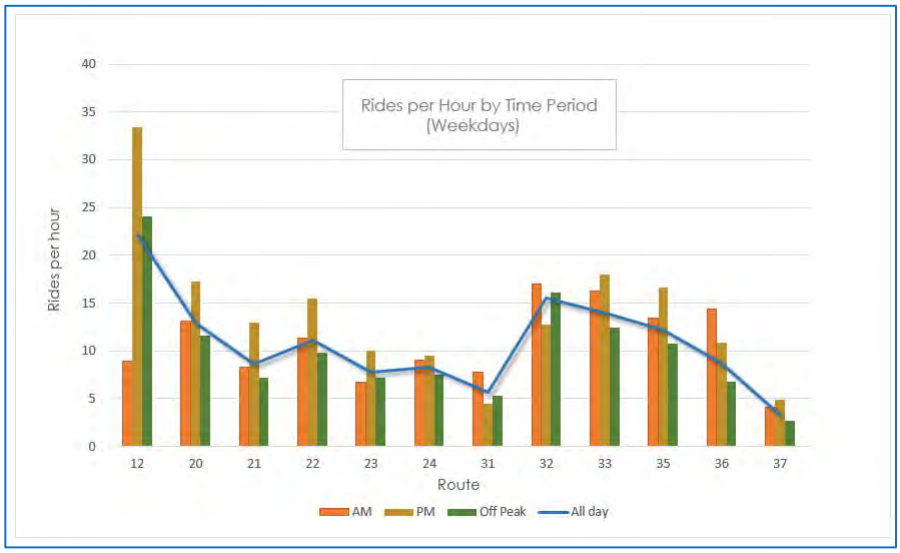
Figure 10: Routes with the Highest Rides per Day



4.7 Rides per Hour by Time Period

When examining the level of rides per hour by time period to determine the highest productive period of the day, the PM peak is most productive in North and South Lethbridge whereas the AM Peak is more predominant on the routes in West Lethbridge. The PM peak in North and South Lethbridge is the combination of a strong midday return trip occurring at the same time as the return trip from the AM Peak. This is less evident in West Lethbridge.

Figure 11: Rides per Hour by Service Period

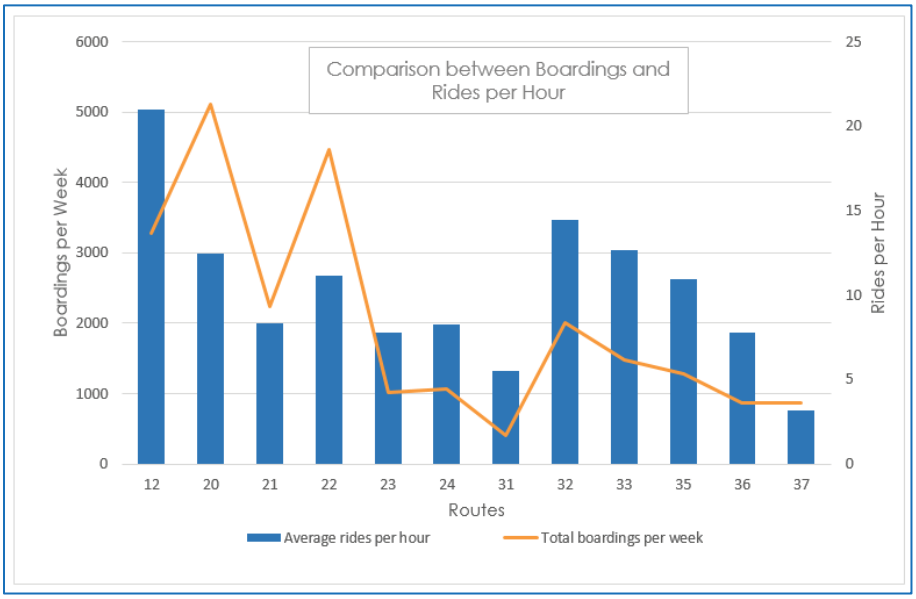


4.8 Total Boardings Versus Route Efficiency

Rides per hour provides an indication of the efficiency of a route, while boardings gives a sense of how many people use the route.

The graph shows that routes with the highest level of rides per hour are not necessarily associated with the route with the highest level of boardings.

Figure 12: Boardings and Rides per Hour Comparison



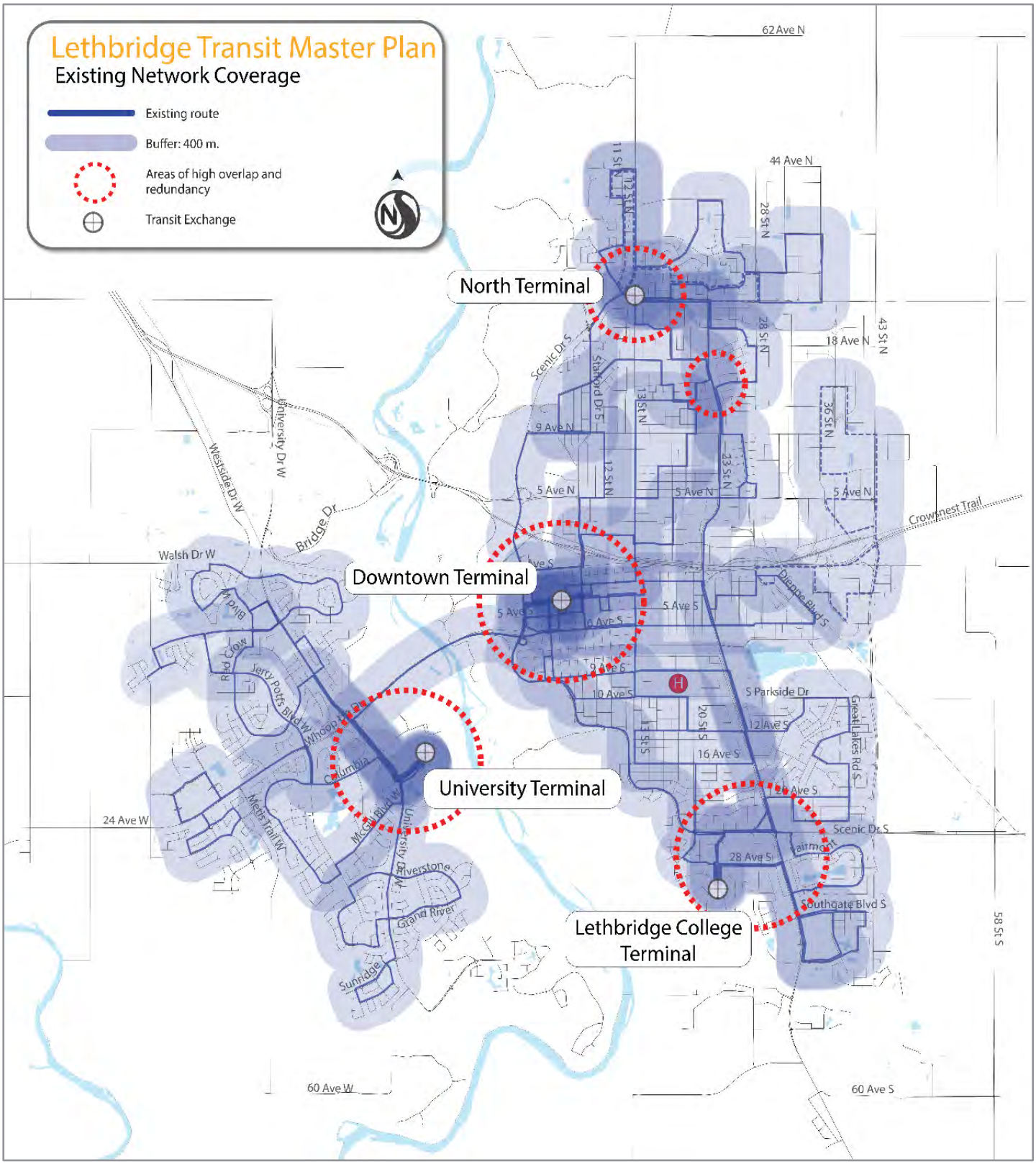
For example, Routes 20 and 22 are the two routes with the highest number of daily boardings. As these routes are long in comparison to others, more vehicles are required to deliver the service and the amount of service provided is therefore not as economical as some shorter routes. This is obvious on the West Lethbridge routes which have low ridership but have limited levels of service with shorter routes, and therefore are relatively more productive. Overall, Route 12 can be considered a very efficient route due to high rides per hour together with an appropriate route length.

4.9 Existing Route Coverage and Barriers

The emphasis on coverage of the existing service is evident when examining walk distance to the routes. In the figure below, a five-minute walk distance for each route is shown and the darker the colour, the greater the extent of overlap of coverage between routes. Most residential areas are within the walk distance guideline parameters except for some areas in West Lethbridge. The transit system shows considerable overlap in most areas of the city with several areas of high duplication (downtown, University of Lethbridge and North Lethbridge).

The extent of overlap or duplication is an indication of the level of inefficiency in the transit system. As such, the opportunity certainly exists to reduce duplicated services and reassign this service elsewhere is the system to improve routes, route frequencies and/or transit service span.

Figure 13: Route Redundancy

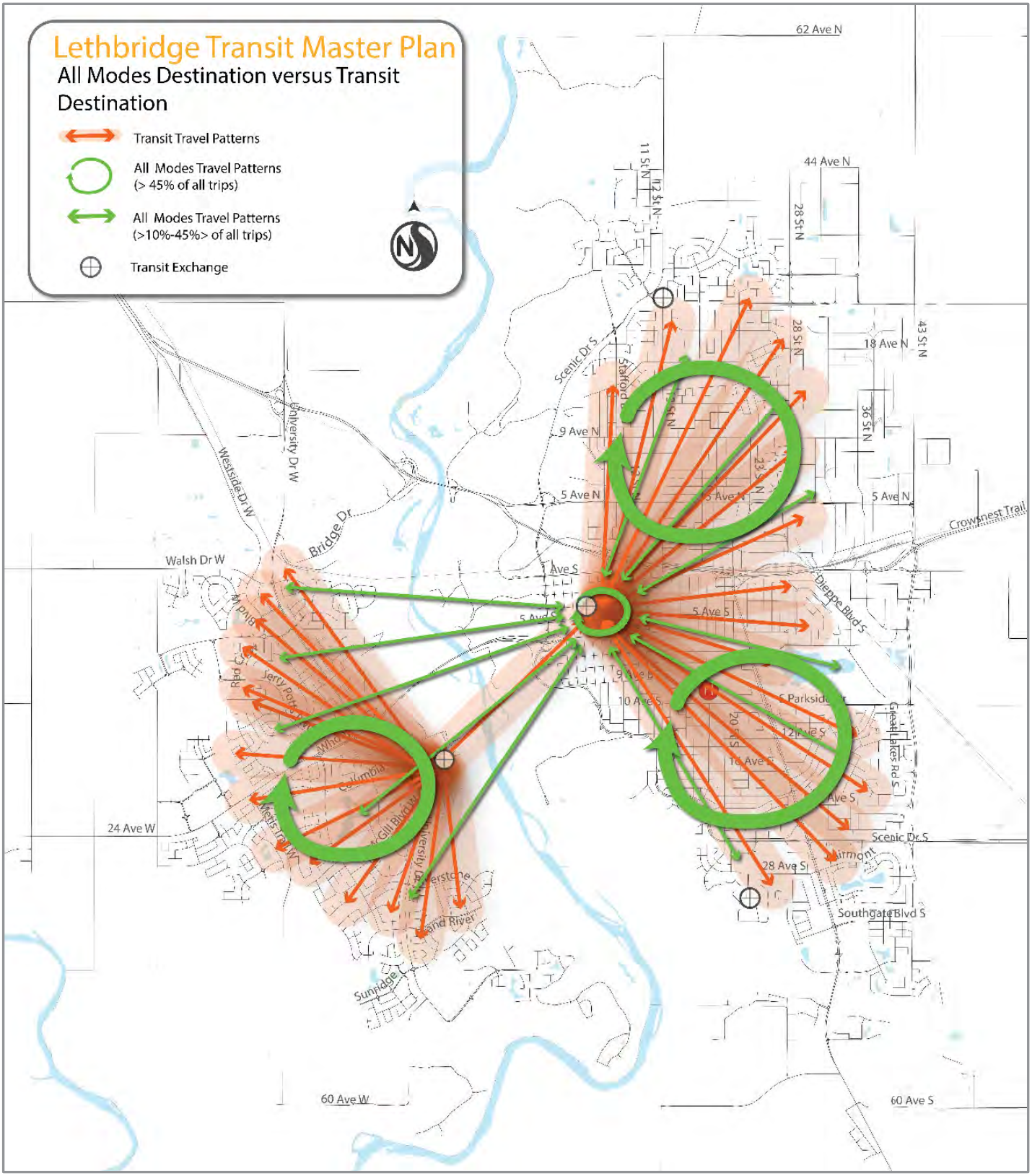


4.10 Origin and Destination Patterns - All Modes

The topography and physical layout of Lethbridge results in several barriers (both natural and man-made) to travel, such as the Lethbridge coulees, the Crowsnest Highway, and Canadian Pacific Railway network. This creates some distinct zones that can be analyzed, namely North Lethbridge, Downtown, South Lethbridge, and West Lethbridge

Based on an origin-destination (OD) survey undertaken in 2010 and documented in the City's Transportation Master Plan, nearly half of all trips taken daily, regardless of the mode, remain within the 3 residential zones (North, South and West Lethbridge) rather than travelling between zones. The second most predominant movement is from the residential zones to Downtown, most likely due to the need to transfer. This has implications for the transit service because it indicates a need to have different types of service to meet the different travel needs. This includes, accommodating customers that travel locally within zones, those travelling to the Downtown, and those moving between zones.

Figure 14: Comparison of Trip Destinations : All Modes versus Transit



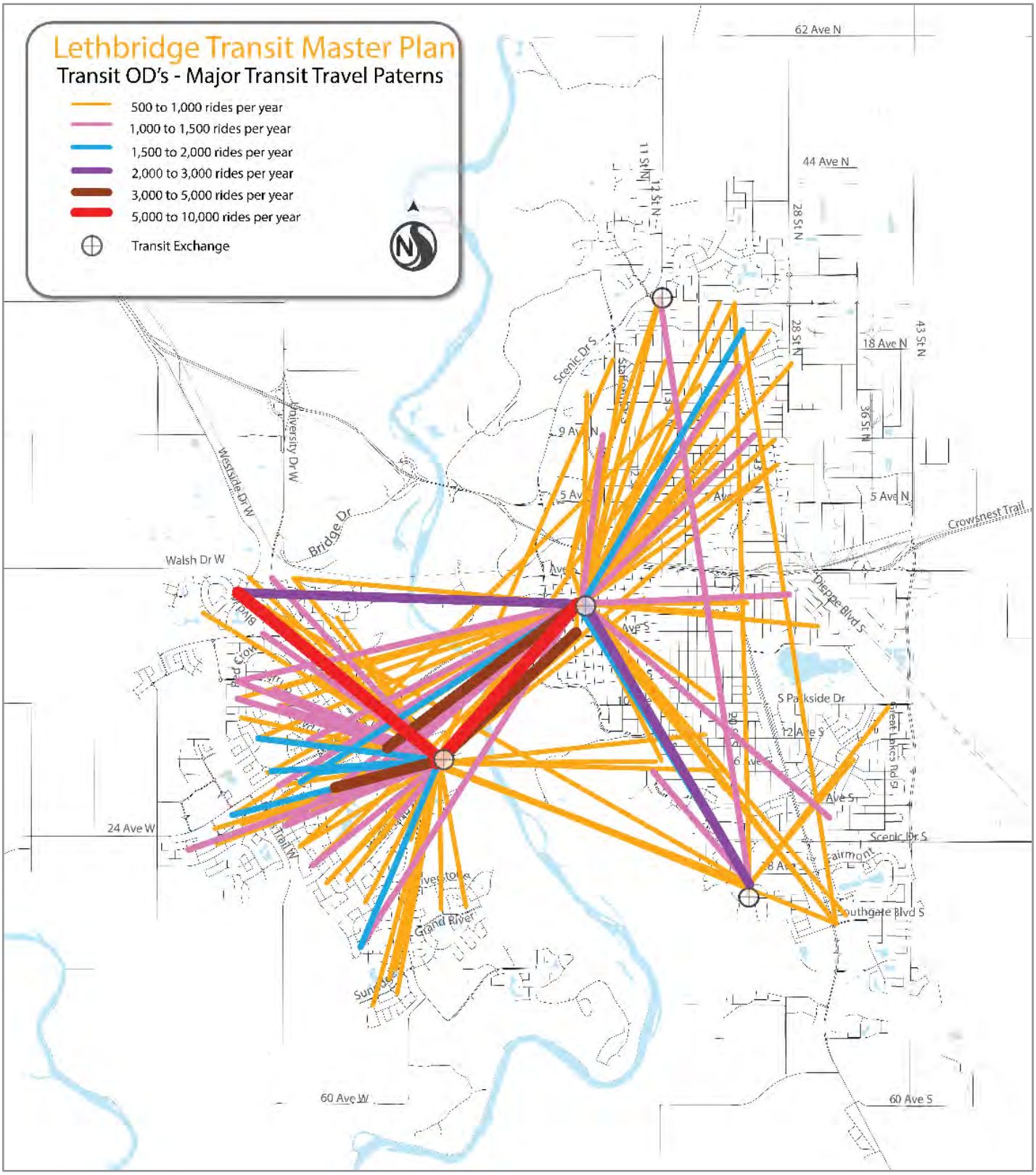
4.11 Origin and Destination Patterns – Transit

Transit represents 1.4% of daily trips (1.9% in AM peak and 1.5% in PM peak). Transit travel patterns are more difficult to interpret because of the requirement to travel to a major transfer hub to transfer to a different route to travel to a destination. Compared to all modes, most transit trips appear to have the University of Lethbridge and Downtown as their destination. With 40% of transit users being students, and the importance of Downtown as a destination from all zones, transit travel patterns could be interpreted simply, however, without more data, it is difficult to accurately quantify and identify the actual end destinations of transit customers.

As shown in the following figure, the major OD patterns can be identified:

- Between West Highlands and University of Lethbridge (U of L)
- Between Downtown (DT) and University of Lethbridge
- Between Whoop-Up Drive, Downtown and University of Lethbridge
- Between West Highlands and Downtown
- Between Lethbridge College and Downtown

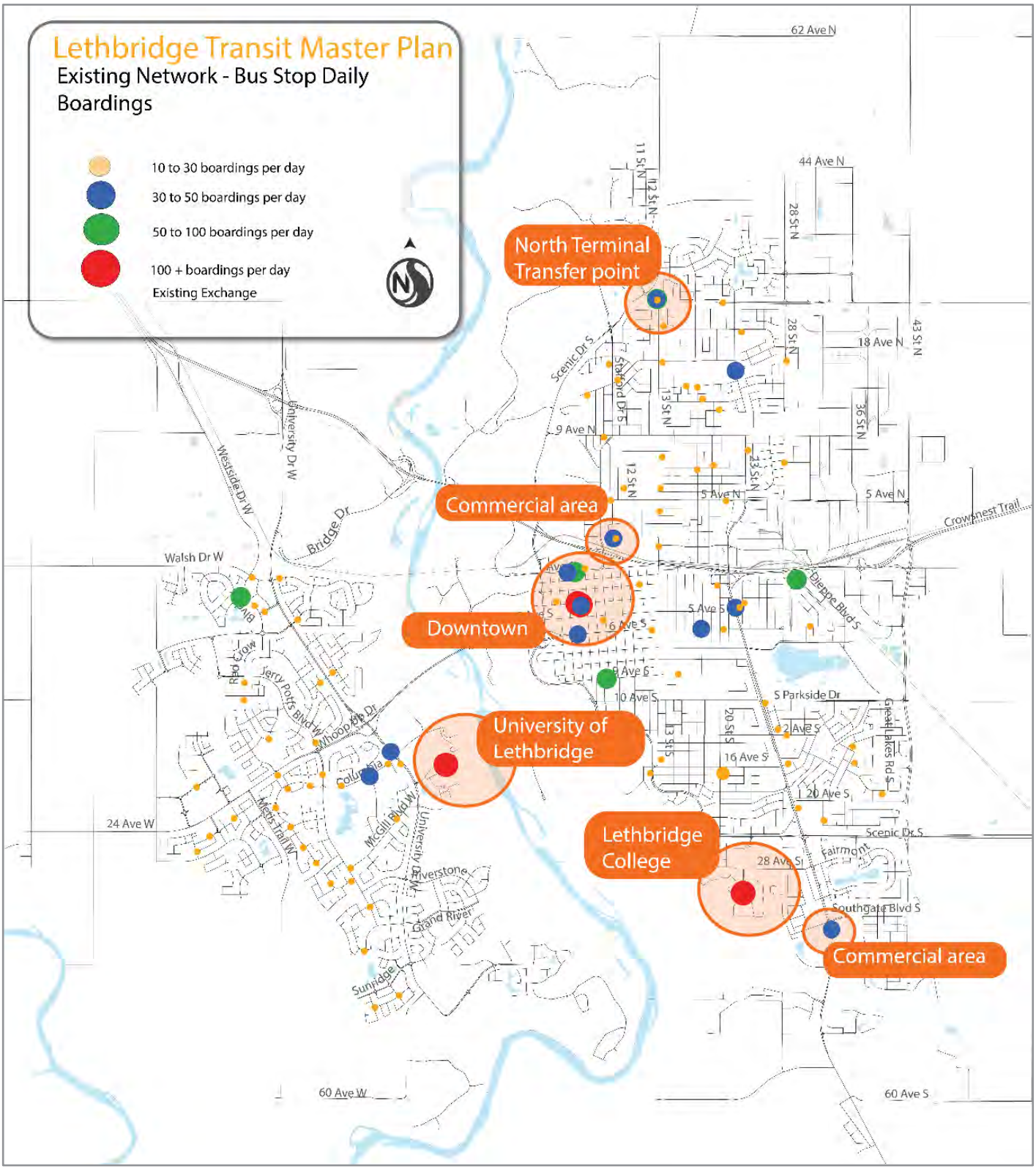
Figure 15: Transit Origin Destinations – Major Transit Travel Patterns



4.12 Bus Stop Utilization

System-wide bus stop utilization is examined to identify the major destinations and significant transfer points between routes. As shown in Figure 16, there are several transit stops that are well utilized. Based on available data, it is however difficult to ascertain whether these stops represent end destinations or function as transfer points. This is particularly true of the Downtown and University of Lethbridge turnaround – both probably functioning as a main destination as well as a transfer point between routes specially to travel crosstown between West Lethbridge and Lethbridge.

Figure 16: Existing Network – Average Boardings per Day by Bus Stop



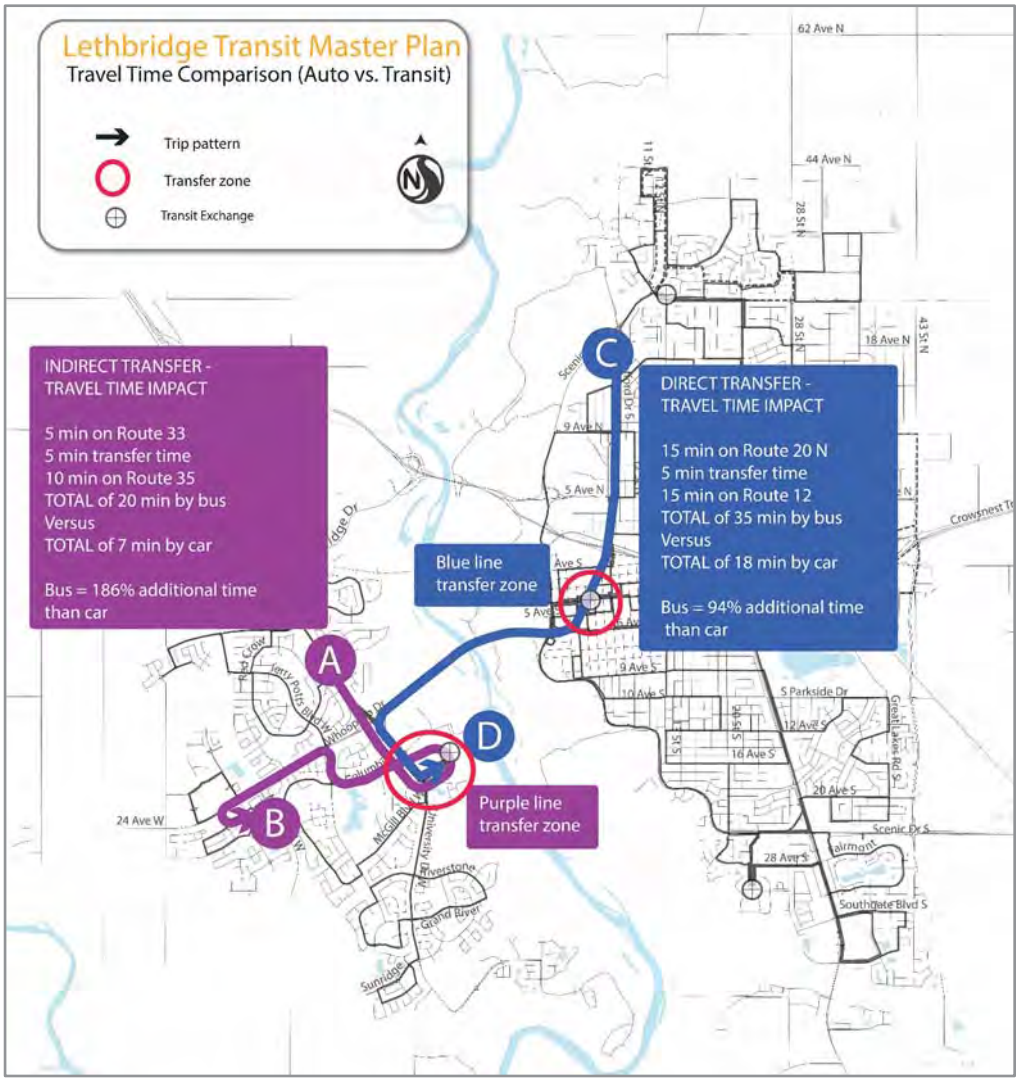
4.13 Transfer Locations

From the ridership statistics of individual routes and the major origin destination patterns it becomes clear that movements between zones is far more intuitive if the transfer occurs in the general direction of travel.

For example, travelling from North Lethbridge to the University of Lethbridge and making a transfer in Downtown is quite natural as it is in the general direction of travel. However, when travelling from a northern location in West Lethbridge to The Crossings neighbourhood via the University of Lethbridge to make a transfer to reach the destination, is not only counter intuitive but also results in an indirect and an unacceptably long trip (see Figure 17).

With the focus of the system on exchanges at terminal points it therefore appears that there may be a lack of appropriate transit options to travel within zones given the high proportion of internal origin-destination patterns. Transit trip patterns are closely linked to the transit network which does not necessarily cater to overall origin-destination demands.

Figure 17: Travel Time Comparison



4.14 Stakeholder Assessment of the Existing System

Multiple stakeholder engagements were hosted during developing the Master Plan. From the various events, it became evident that stakeholders were in general agreement that significant changes to the transit system are warranted and made sense, and would be beneficial in the medium and longer term.

A summary of the main comments that were received are listed below:

- Provide more efficient, direct, and rapid routes to destinations
- Improve service frequencies as well as have longer service days to include late nights as well as weekends
- Improve the "waiting experience", i.e. transfer time and customer amenities (infrastructure)
- Travel duration: transit travel times can be twice as long in comparison to other modes
- For certain trips, there are too many transfers and long transfer times contribute to unacceptable trip times
- Transit services could be improved through improved frequencies and more direct routes
- Transit should accommodate the rapid development around the city through expansion
- Improve the customer's transit experience through improved customer service and smaller buses that reduce noise
- Fares should be more competitive and related to parking fees and the cost of using a private vehicle
- Establishing an annual student U-Pass should also be considered in addition to existing student discount fares. In this regard, the creation of a U-Pass is being examined for the third time based on renewed interest from the University of Lethbridge Student Society.

4.15 System Assessment Summary

System assessment and performance of the conventional transit service was evaluated using data from Canadian Urban Transit Association (CUTA) for similar-sized Canadian cities, data and information provided by Lethbridge Transit, feedback from the Community Engagement process and observation of transit system and operations, is summarised as follows:

Satisfactory coverage of the urban area

The transit assessment shows that the current network offers a satisfactory coverage of Lethbridge. Most developments are covered by at least one route and sometimes more - offering more travel options. However, as all routes are focused on a few specific destinations in a radial fashion, there is a lack in route diversity that serves more destinations and provides more service options to customers.

Service equity relating to frequency and service span

With a frequency of 30 minutes on most routes and uniform service span (length of the service day) on all routes, the community has the same level of service throughout regardless of the demand (except for Route 12 when school is in session).

Annual ridership volumes are not growing and system is under-utilized.

Average of 14 rides per hour per route are well below CUTA peer comparison for similar sized Canadian cities.

Good access to Downtown and the University of Lethbridge

As a radial system that is focused on serving both the downtown and the University of Lethbridge, these two destinations are well served and accessible without a transfer from almost every neighbourhood in Lethbridge.

Discrepancy between transit versus overall travel needs

Current transit service does not cater to the overall travel needs of the community. The overall travel patterns are for direct routes between areas into the downtown, and direct travel between Lethbridge College and University of Lethbridge, whereas transit takes a much more circular route to arrive at the destination. Also, in certain cases you must travel downtown and back to your area to access local amenities because there are few local to local transit routes.

Long travel times

Based on the route structure and travel demands, travel time appears to be unacceptably long for many customers. In addition, existing loop routes can add significant travel time to trips depending on the direction of travel.

Competition with the private vehicle

Due to moderate traffic volumes in Lethbridge, delays in private vehicle trips are low. Along with the availability of affordable parking, this provides a significant advantage to private vehicle use over public transit.

Complex routes

The route structure makes understanding the system a challenge for the casual user and can act as a disincentive to use the service. This also plays into the challenge of long travel times.

Local routing is desired

In some areas of the City trips must travel downtown to transfer and travel back complete a local trip. Allowing for transfers elsewhere in the system with less reliance on downtown transfers to support local service options would improve the system.

From Vision to Reality:

What guides the planning?

5 Translating the Vision

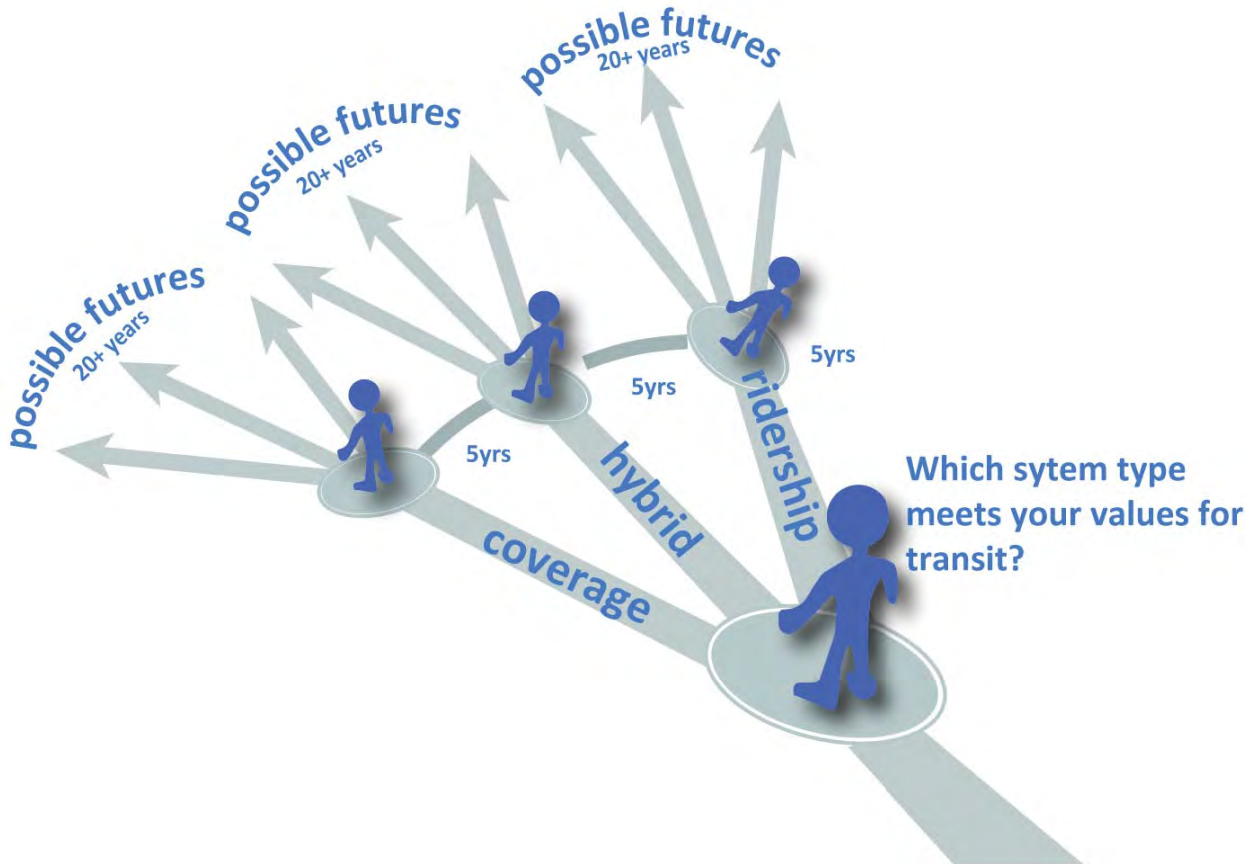
This section describes some of the key decisions and influencing factors that enable the vision and goals to be translated into a future transit network that is ten or more years into the future.

5.1 Service Principles

The service principles are designed to steer the development of the transit network by ensuring it contributes to the goals and objectives of the transit vision. One of the major initiatives in this plan is to simplify the network to improve trip directness, reduce travel time and improve comprehension of the routes by:

- Accommodating the travel demands of all modes and serve main destinations such as the Hospital, University of Lethbridge, Lethbridge College and Downtown, etc.
- Accommodating primary travel demands as well as secondary demands such as connecting neighbourhoods to local commercial nodes
- Integrating the different areas of Lethbridge that are separated by barriers (coulees, highway, and rail corridors)
- Improving service and maximize customer experience:
    - respond to customer questions, comments and concerns
    - improve transit facilities
    - ensuring efficient, seamless, and appropriate connections between all Lethbridge areas
    - establishing an easy to understand, consistent and layered network of routes with different functions depending on trip purpose and demand for transit
- Adapting to the future:
    - create a network that grows with the city without requiring continual restructuring to support economic growth
- Being more efficient and more competitive:
    - avoid route duplication while serving the needs of all customers
    - create a network that is efficient and easy to operate (e.g., 30 min cycle times to support the interlining of routes)
    - provide a realistic transportation alternative that increases ridership, transit mode share, revenue, and overall cost recovery
    - reduce the use of private vehicles thereby reducing congestion and improving sustainability

5.2 Moving Towards a Ridership-Based Service



A **coverage**-based system maximizes access to transit services regardless of the quality or frequency of service. Coverage-based models ensure that residents can access transit within a prescribed walking distance, but the service they have access to may be limited. Typical characteristics include:

- Circuitous and indirect routing
- Lower frequency
- Providing basic access to the transit network
- One-seat rides to everywhere to avoid a transfer
- Timed transfers between buses due to low service levels
- Serving lower-density areas where private vehicles are prevalent
- Limited destinations along the route creating a lack of focus for the service
- Customer travel time is lower priority

Figure 18: Example of Coverage Service

A **ridership**-based system maximizes ridership and productivity. It connects key destinations with services to encourage use of the system. Once routes operate at least every fifteen minutes, they tend to generate new ridership because they remove the need to know the schedule and are very convenient. Typical characteristics include:

- Simple, direct routing
- High frequency (15 minutes or less all day, every day)
- Prioritizing service to areas of strong demand
- Passenger transfers are a key component of travel to reach destinations
- Routes have key destinations along the route and at each end that act as anchors
- The service is designed to move people quickly and efficiently

Figure 19: Example of Ridership Service

Figure 20: Progression from a Coverage to a Ridership-Based System – Existing Service

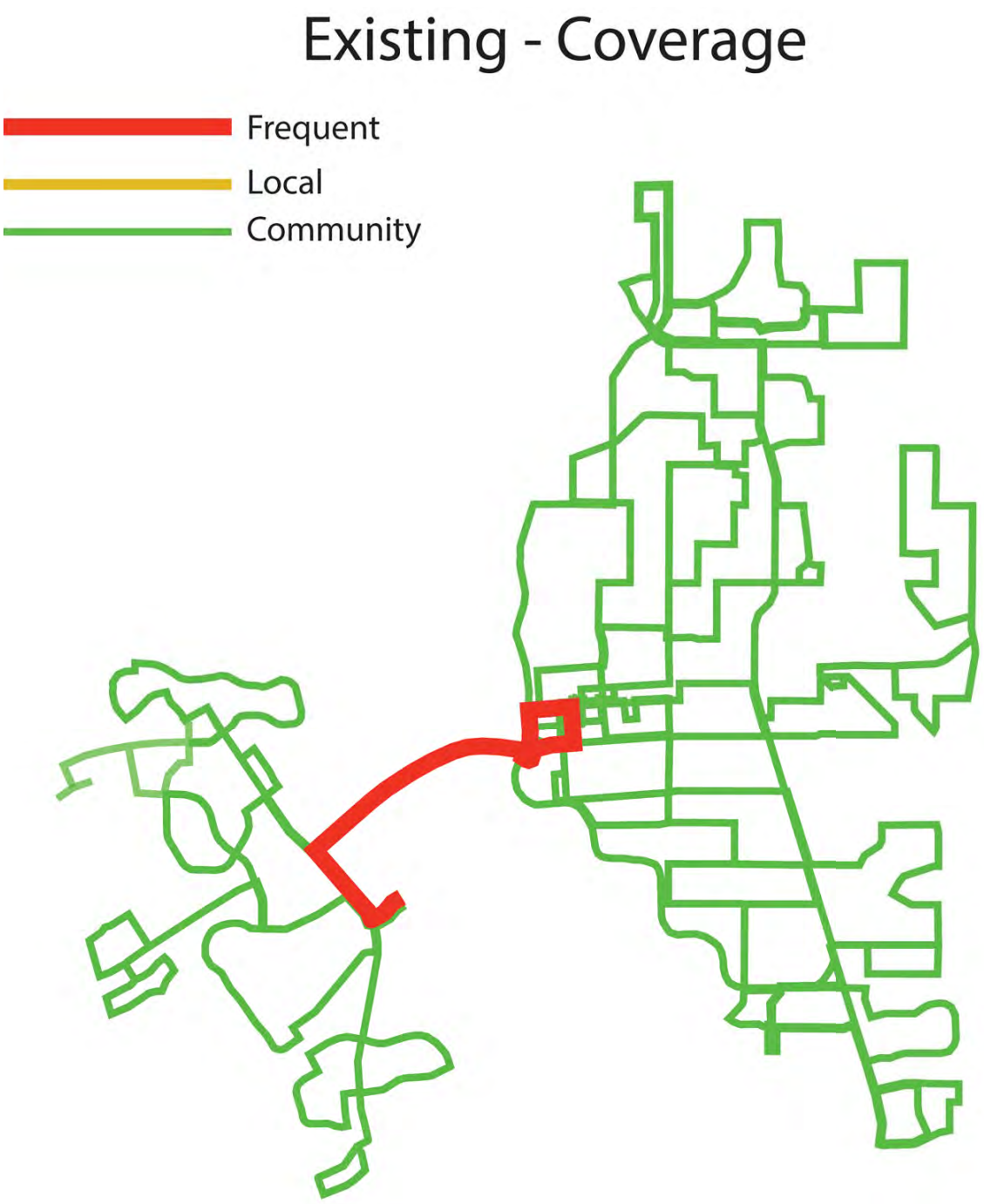


Figure 21: Progression from a Coverage to a Ridership-Based System – Short Term

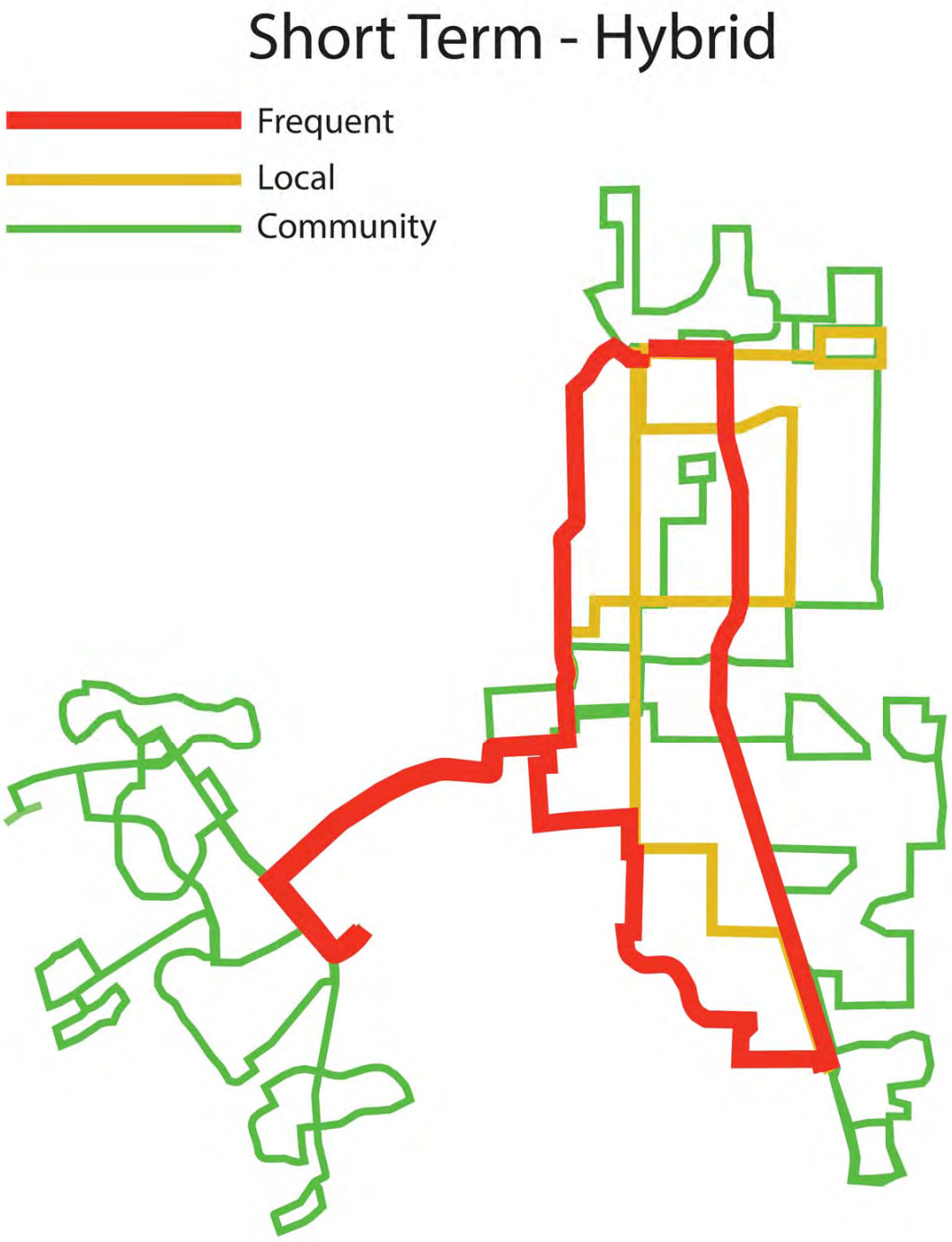
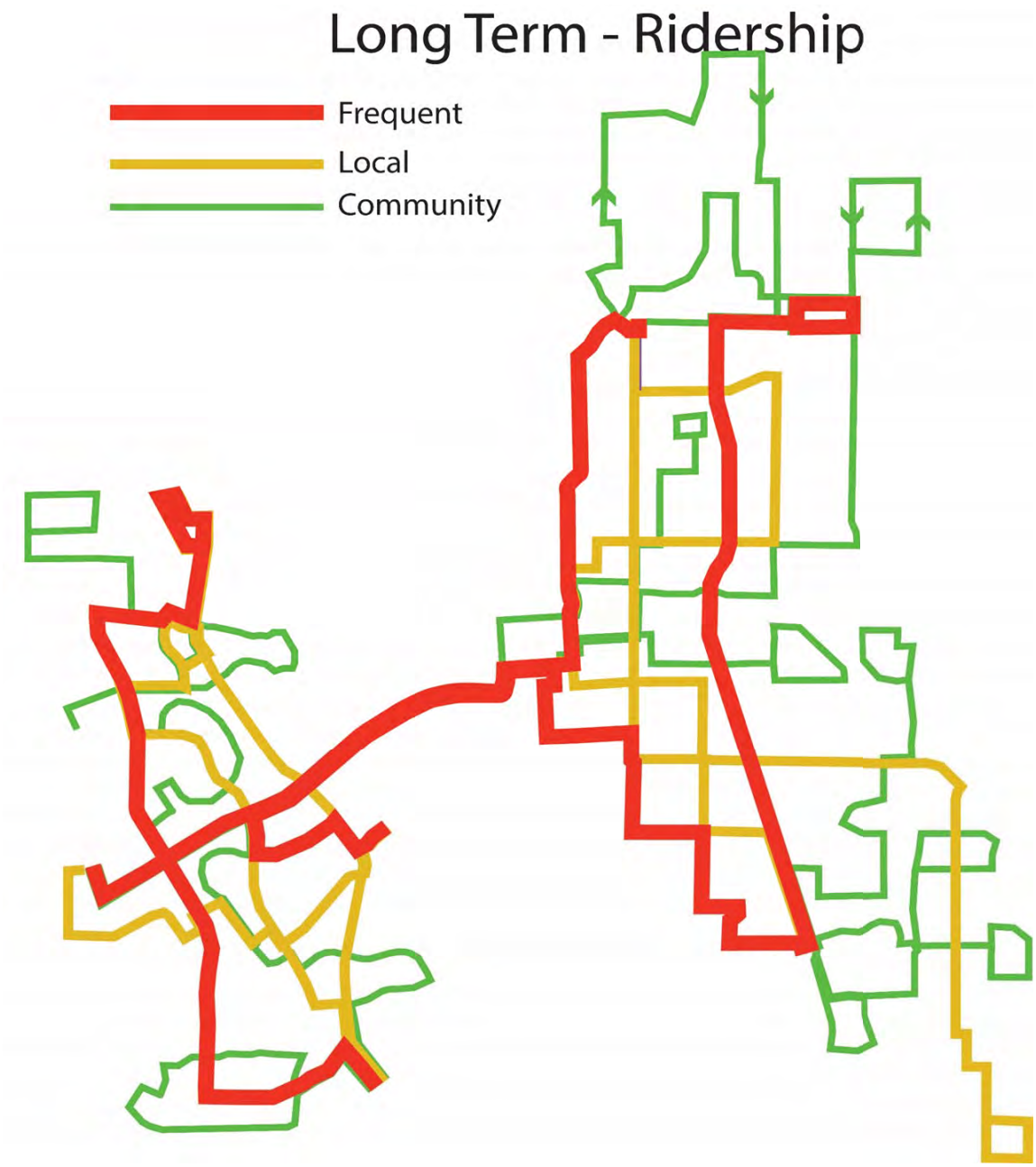


Figure 22: Progression from a Coverage to a Ridership-Based System – Long Term



The current system is designed to provide coverage to the entire city, and has one route that meets the definition of a ridership-focused service. Evolving the system over time towards a ridership-based service requires changes in the systems route structure, how routes interact with each other, and the level of service required. As the focus on ridership grows, there is a natural reduction in the amount of service that is purely coverage-based.

5.3 Route Simplicity

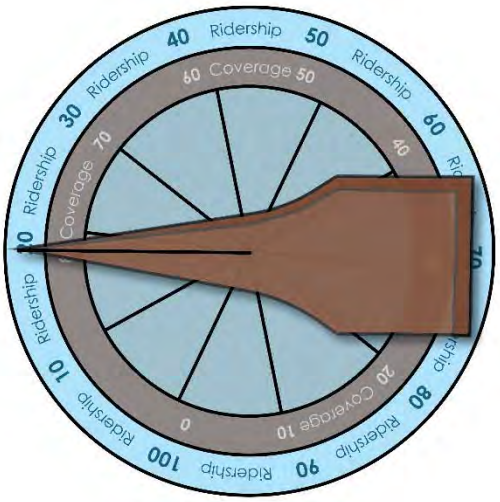
One of the major initiatives in this plan is to simplify the network to improve trip directness, reduce travel time and improve comprehension of the routes.

Simple routes provide bi-directional service along the majority of the route. They are as straight or direct as possible given the road network and may feature a loop at either end of the route. Complicated routes are somewhat circuitous or may feature one-way loops. Complex routes resemble a wet spaghetti noodle dropped on a plate. They feature crossing patterns, loops, and may follow a different path in different directions at different times of day. Looking at a complex route map will not provide a clear indication of the path the bus follows.

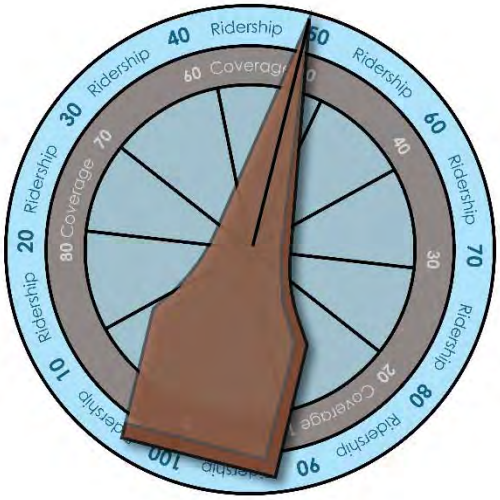
Moving the transit system towards a ridership-based service requires several phases of service improvements which have been defined as short, medium and long. This phasing is based on funding availability.

Figure 23: Changing the Balance

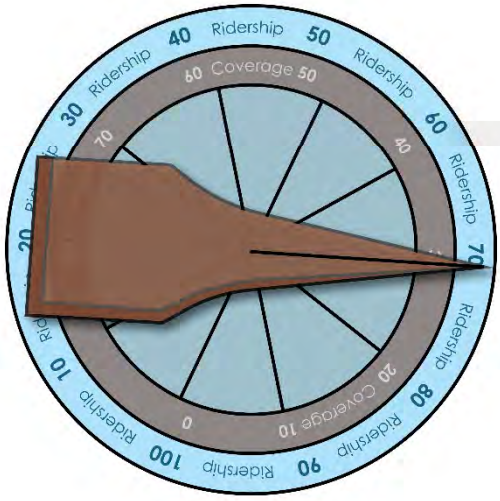
Existing System



Short Term System



Long Term System

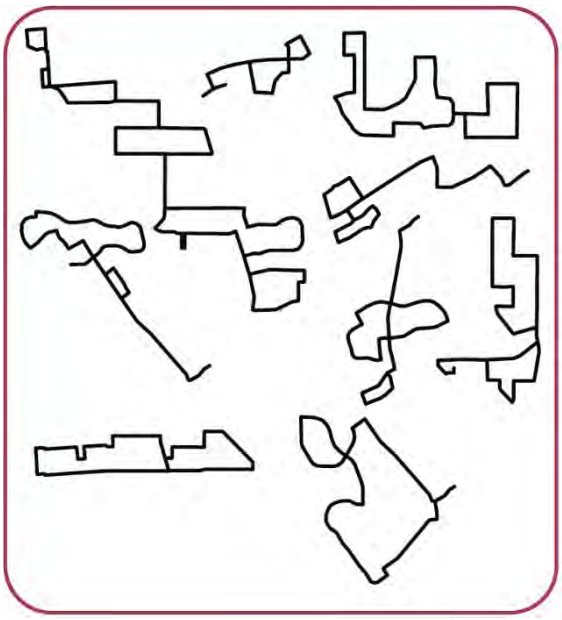


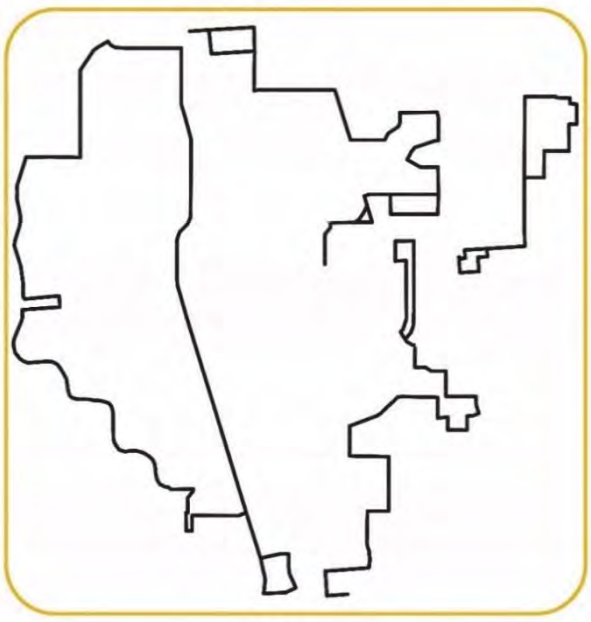
5.3.1 EXISTING ROUTE SHAPES

The current transit system has very complex routes because they attempt to serve multiple audiences and meet the requirement of being within 400m of all residents.

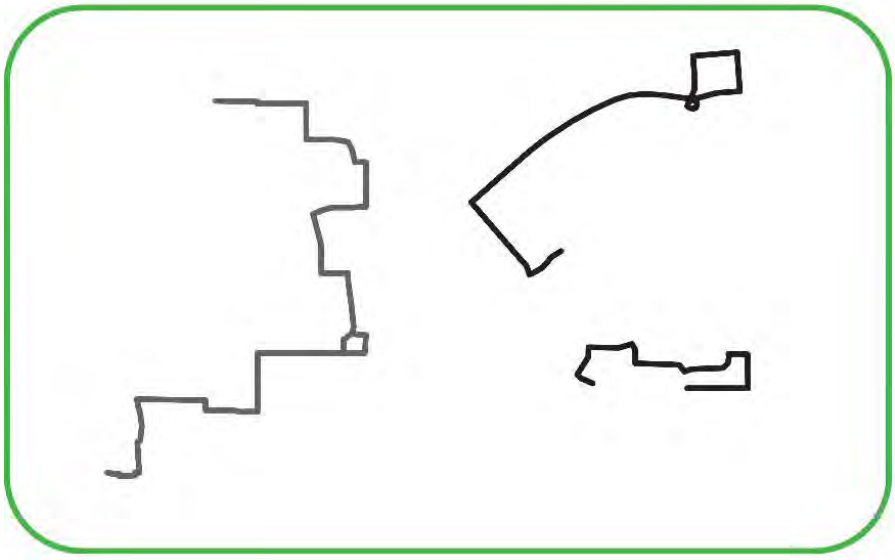
The existing 16 routes can be classified as follows:

Complex	Designs with multiple loops and crossing patterns	56%	**Complicated**	With loops, changes in direction or multiple turns	25%





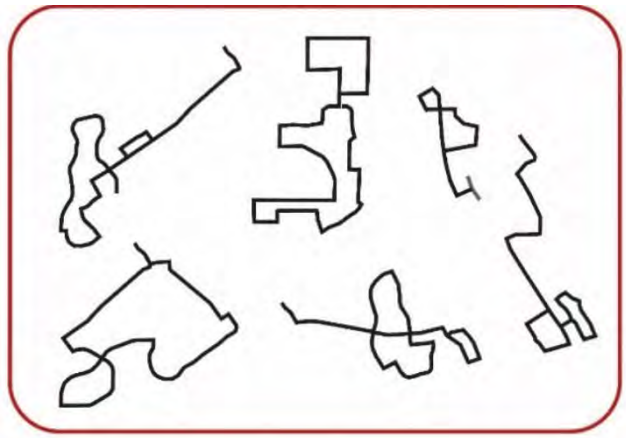
Simple	Straight and simple in design	19%



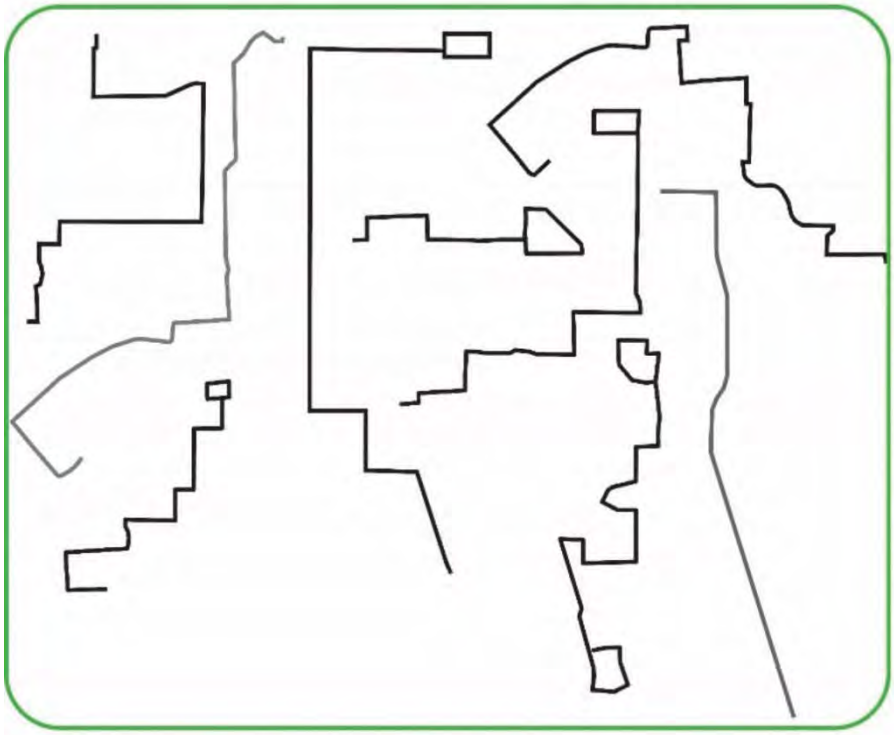
5.3.2 Short Term Route Shapes

The intent of the Short Term changes is to implement some service improvements between North and South Lethbridge within the existing annual service hours to focus on improving ridership. Integral to these initiatives is simplifying the design of many routes; shifting most of the routes into the "simple" route classification, and reducing "complicated" routes and "complex" routes. Due to the constraint of not exceeding the existing revenue hour budget, in the short term, most complex routes in West Lethbridge remain unchanged.

Complex	Designs with multiple loops and crossing patterns	38%	**Complicated**	With loops, changes in direction or multiple turns	6%



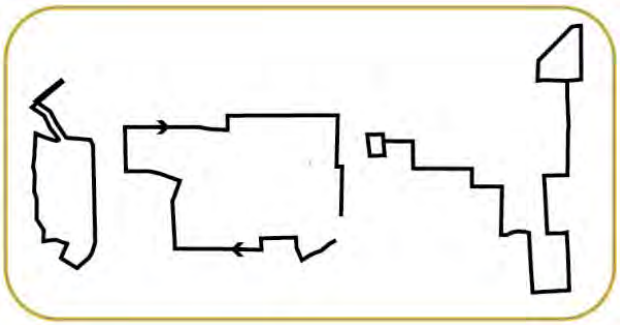
Simple	Straight and simple in design	56%



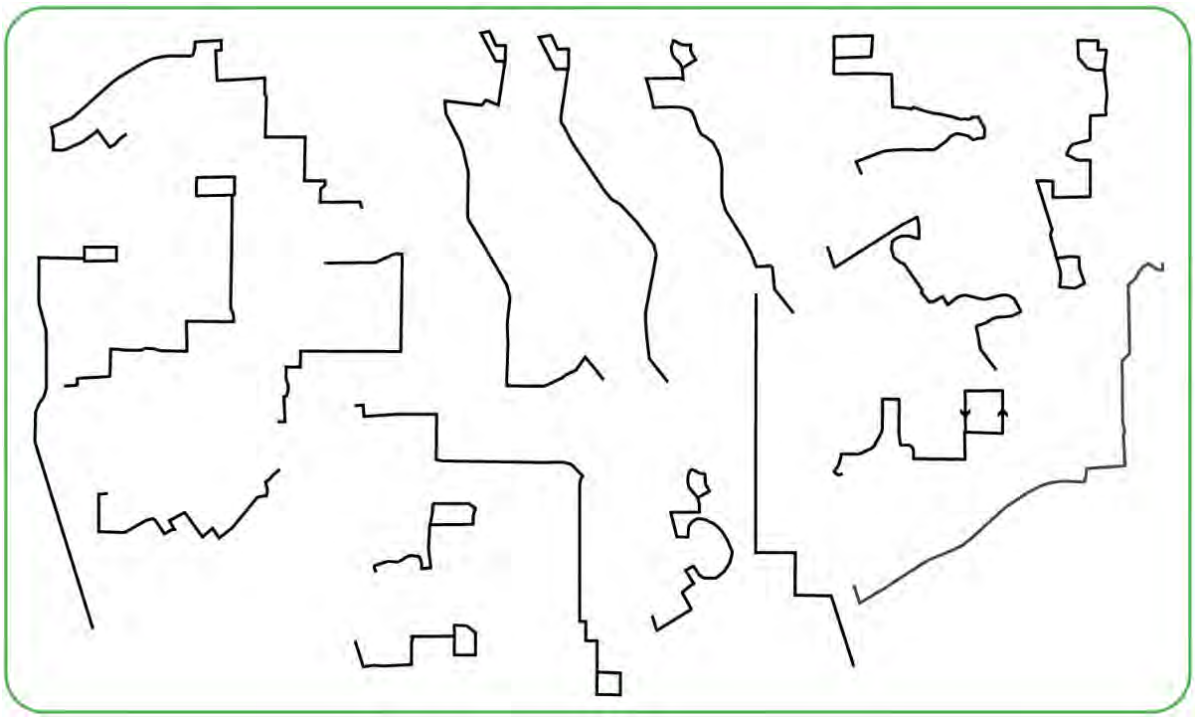
5.3.3 Long Term Route Shapes

In the long term, the network will be overwhelmingly composed of "simple" routes (86%) and the remainder of the routes will be classified as "complicated" due to retention of loops. "Complex" routes will be eliminated entirely in the final future transit network.

Complex	Designs with multiple loops and crossing patterns	0%	**Complicated**	With loops, changes in direction or multiple turns	14%



Simple	Straight and simple in design	86%

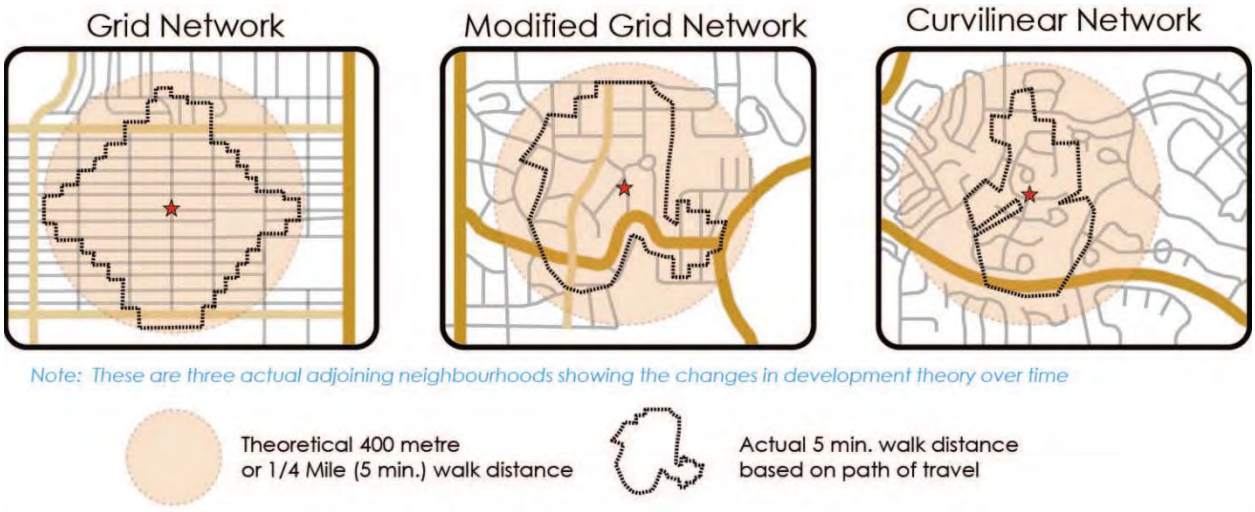


5.4 Road Network Configuration

The closer a city's street network is to a grid system, the easier it is to establish a ridership-based system. One of the primary challenges of providing simple, efficient, ridership-based services is the geographical constraints which create natural barriers. The river valley that separates east and west Lethbridge in combination with the rail lines creates a unique road network in different parts of Lethbridge. Geographically, South Lethbridge has a grid system with an offset to reflect the angle of the valley. This means that there are few key roads traversing from north to south because of the difficulty posed by the valley. Therefore north-south routes require a stepped alignment moving from the downtown towards the major shopping areas in the southeast on Mayor Magrath Drive. On the other hand, West Lethbridge has a curvilinear design which makes the job of transit much more difficult due to increased walking distances.

Figure 24 shows the impact of the transportation network design on transit accessibility. As the street network moves from the grid system towards a curvilinear design, the number of residences within a true five-minute walking distance diminishes. This becomes even more severe when main arterials are fenced reducing the connection of transit to main road access only. Such is often the case in West Lethbridge.

Figure24: Impact of the Road Network Design on Walking Distance



5.5 Service Layers

A well-designed and successful transit system features a mix of layered transit services designed to meet the diverse needs of Lethbridge residents. Transit service layers are distinguished by the level of service (headway or time between buses), the distance between bus stops and the main purpose of the service.

This section identifies the recommended layers of the transit system. The vision for each layer of the transit system is based upon the goals and objectives of the Transit Master Plan. Each layer compliments the other layers to create a comprehensive and integrated system for all residents.

To support the transit vision, the Lethbridge Transit Future Network includes three distinct conventional transit service layers (Frequent, Local, and Community) that when combined with Access-A-Ride, create a complete transit network.

These service layers help focus the style and type of transit that is provided to address the transit needs. The layers of service also embrace the notion of connectivity and the need to establish a comprehensive transportation network that offers choice.

Figure 25: Service Typology

Frequent

Frequent transit service aims to move towards an ultimate service frequency of 15 minutes during the day and 20 minutes during evenings. This service operates along corridors where there is the highest travel demand and greatest diversity and density of land uses, featuring clockface headways (regular, easy to remember schedule times that are prime factors of 60 minutes). The peak periods are typically between 6am – 9am and 3pm – 6pm, Midday or Off-peak runs from 9am to 3pm and Evening is after 6pm.

Local

Local transit operates along corridors where there is a high level of usage but the density (both jobs and people) is not sufficient to warrant a frequent level of service. The goal of this service is to offer a 15-minute peak, 30 minute off-peak and 60-minute evening frequency of service. The goal of all local routes is to operate on a clockface headway, but there may be some variation depending on the length of routes and the cost of maintaining the discipline of such a schedule.

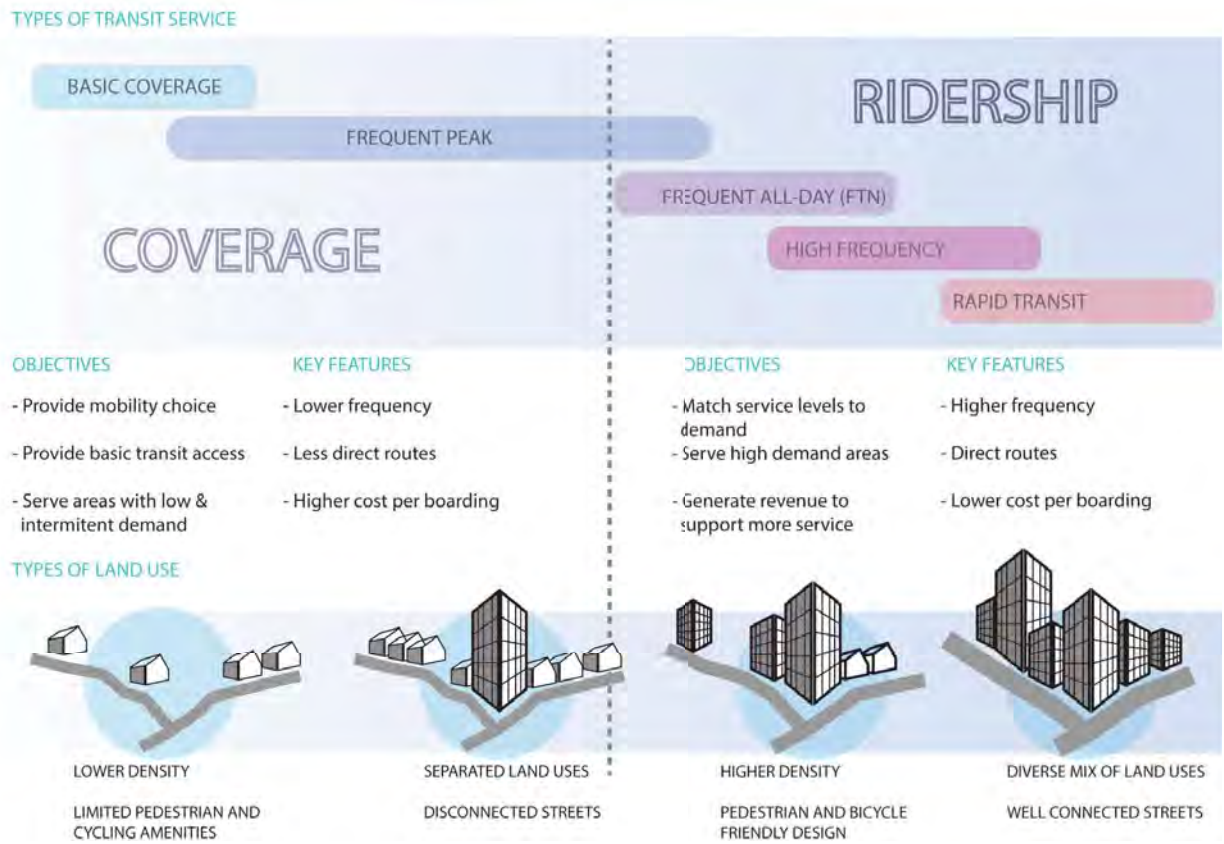
Community

Community service is primarily designed to provide access within residential areas where housing density is low but there is a desire to have alternative transportation options to access shopping or other services. This service connects to the local and frequent transit networks to provide access to transit services to the entire community. The goal of this service is to operate every 30 minutes during the day, and every 60 minutes during the evenings.

Figure 26: Transit Service Layers Create a Network

Together, these service layers combine to create an easy to understand and user friendly network that is right-sized to the diverse urban fabric of Lethbridge. As noted in Figure 27 below, there is a direct correlation between the density of an area (jobs and population) and the amount of transit service that can be supported. The lower the density, the lower the ridership potential which means a reduction in the supply of transit to the area.

Figure 27: Relationship of Land Use Density to Transit Service Type



5.6 Service and Performance Guidelines

5.6.1 Service Standards

Table 5 shows service frequency and ridership standards that have been adopted and used as a basis to develop service hours, and ridership estimates. These standards are reflective of:

- Route function
- Phase of implementation
- Service frequency improvements over time
- Introduction of a high and low season

Table 5: Ridership and Service Standards

Proposed Service Standards	Short Term (0-4 years)	Medium Term (4-8 years)	Long Term (9+ years)
Frequent Routes (FTN)			
Service Frequency (minutes)*	15/30/30*	15/30/30	15/15/20
Average Rides per Hour	15-25	20-25	25-30
Maximum Walking Distance to Stops (m)	800		800
Bus Stop Spacing (m)	600	600	600-800
Local Routes			
Service Frequency (minutes)*	30/60/60	20/30/60	15/30/60
Average Rides per Hour	10-15	15-20	22
Maximum Walking Distance to Stops (m)	400	400	400
Bus Stop Spacing (m)	400	400	250-400
Community Routes			
Service Frequency (minutes)*	60/60/60	30/60/60	30/30/60
Average Rides per Hour	10	15	18
Maximum Walking Distance to Stops (m)	400	400	400
Bus Stop Spacing (m)	150-300	150-300	150-300

* AM/PMPeak/Midday/Evening

It should be noted that a realistic and somewhat conservative approach has been adopted in forecasting the performance of individual routes in the system. The service proposals and improvements are geared towards establishing a solid transit network and offering a realistic transportation alternative.

5.6.2 Cost

The cost of service is a key performance indicator that speaks to service efficiency as well as affordability. In this regard, the operating cost as opposed to fixed costs of all services has been used for this purpose. The average operating cost per revenue hour of $128 for existing fixed route services provided by Lethbridge Transit, includes:

- Operating expenses
- Fuel
- Fleet maintenance
- Facility maintenance
- General administration expenses

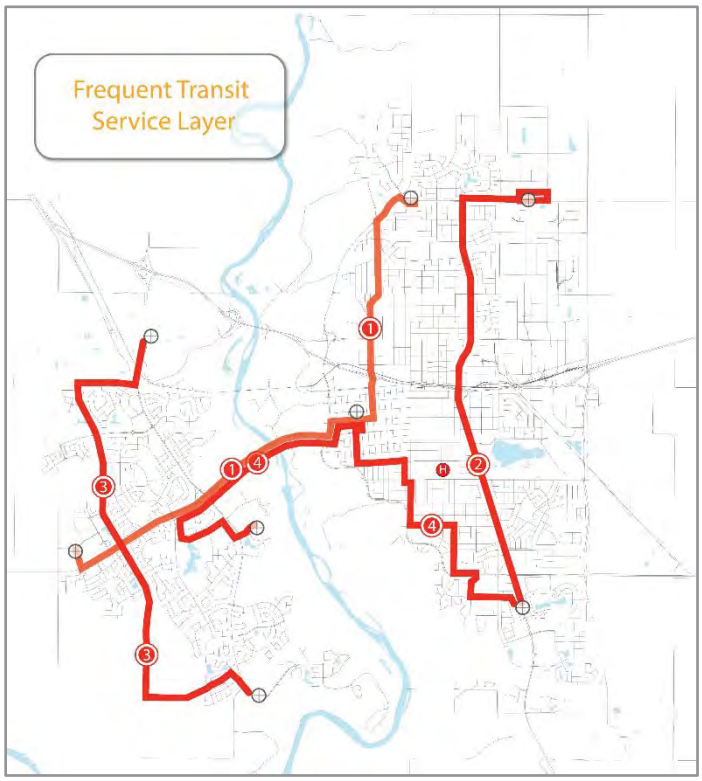
However, this plan reflects the total 2017 Operating Cost unit cost of as provided by Lethbridge Transit of $147 that reflects revenue costs as well as non-revenue time which includes deadhead (non-revenue service) as well as layover time (bus/driver positioning and waiting to deliver the next trip in the shift as opposed to recovery time that is incorporated into the schedule to maintain service reliability).

The cost implication of service improvements in this plan are expressed in 2017 dollars.

It should be noted that this plan does not reflect any capital costs related to vehicles, facilities, or infrastructure.

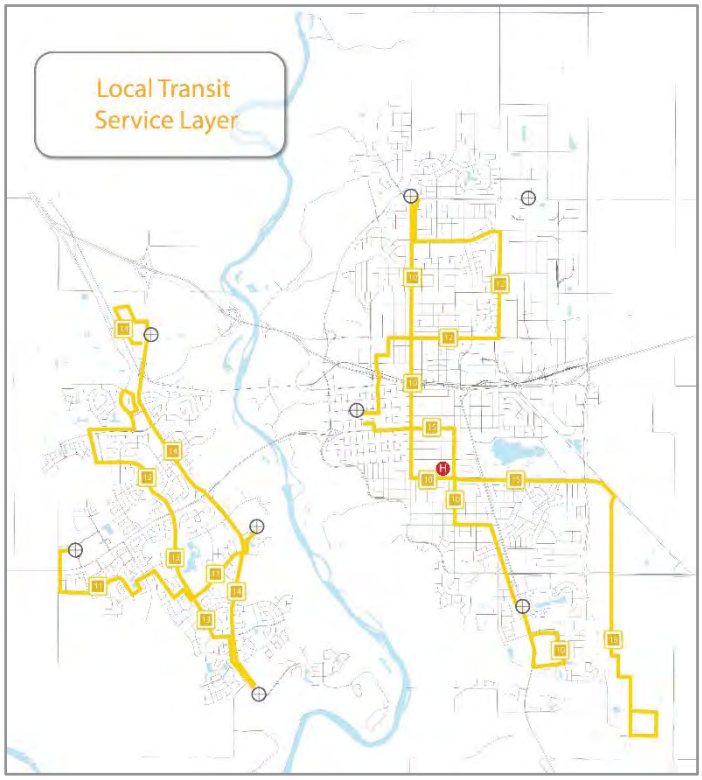
The New Vision For Lethbridge Transit

6 Future Network

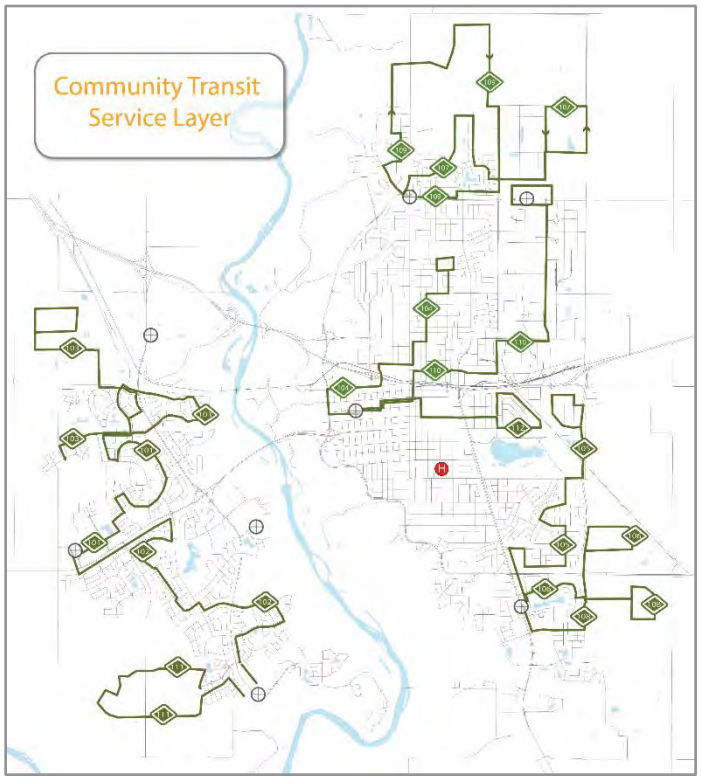


As described earlier, the future transit network is comprised of the three distinct layers (with Access-A-Ride as a parallel layer).

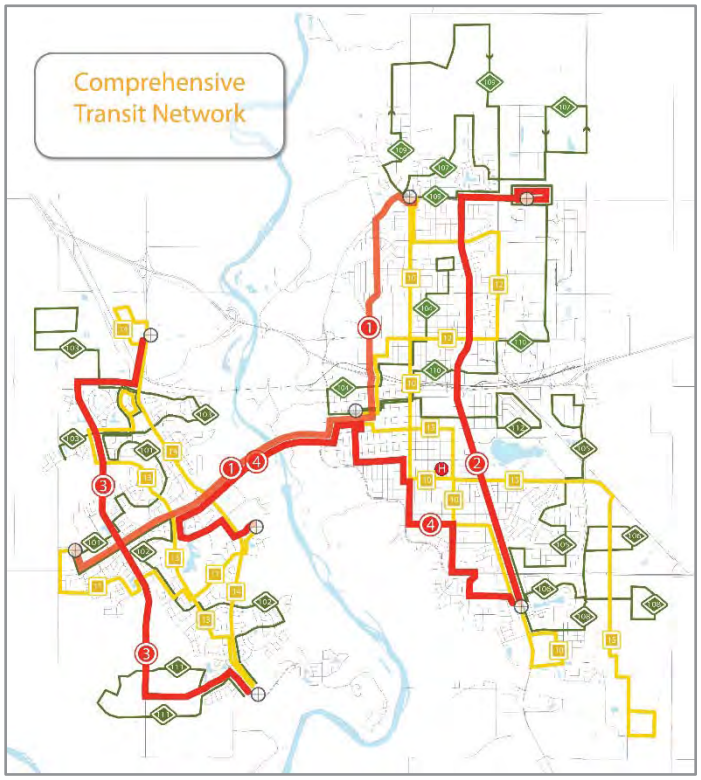
The Frequent Transit Network connects the main corridors and services together. This network is accessible to the majority of residents within an 800m (ten minute) walking distance.



The Local Transit layer fills in the gaps between the Frequent services to reduce the walk distance to 400 metres (five minute) and to create more transfer opportunities.



The Community transit layer serves the harder to reach areas, low density areas, local services and are aimed at moving people within the community. These routes link to the Local and Frequent services



Together, the three layers create a comprehensive conventional transit network, each layer playing a different role in helping move people around Lethbridge. These layers are described in more detail within this section.

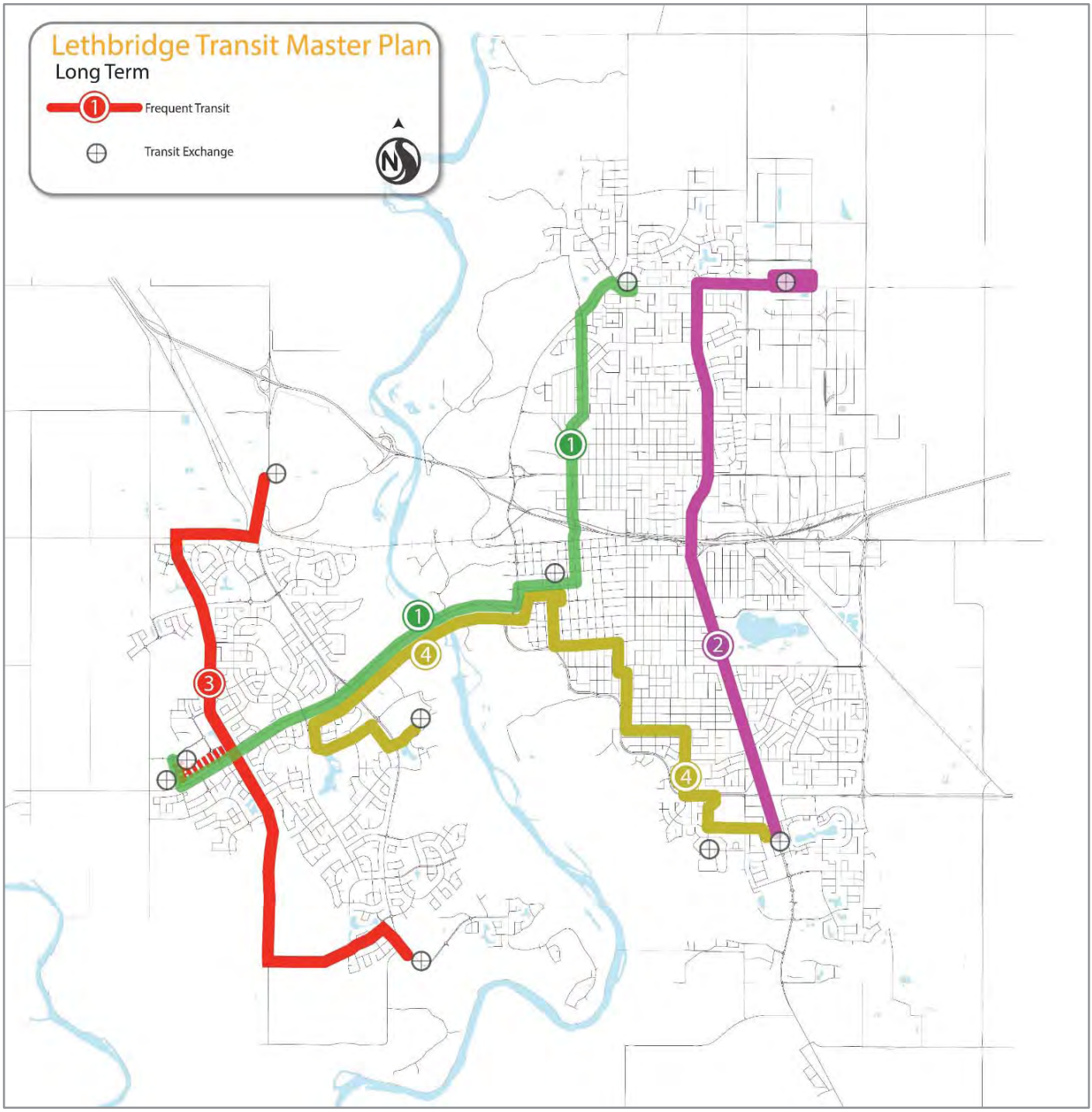
6.1 Frequent Transit Network (FTN)

The FTN focuses on connecting multiple areas of Lethbridge along major corridors that provide access to the primary destinations in the city such as the downtown core, hospital, University of Lethbridge, and Lethbridge College as well as other significant commercial areas. The following four routes have been identified (see Figure 28).

Table 6: Frequent Transit Network Routes

Route	Area Served	Description	Connection to Frequent Transit Network
1	North and West Lethbridge	Serves residential areas in North Lethbridge to The Crossing via downtown Connects to South Lethbridge/University of	Route 4 at Downtown to The Crossing, Lethbridge College, University of Lethbridge Route 3 at Whoop-Up Drive to University of Lethbridge
2	North and South Lethbridge	Links the northern and southern residential areas, while serving commercial and residential area along Mayor Magrath Dr and 23 St N. Routes along Mayor Macgrath connecting major service areas	Route 4 in South Lethbridge to connect to dowtown and West Lethbridge
3	West Lethbridge	Offers a quick connection across West Lethbridge once Metis Trail is built. It will connect the West Highlands commercial area to the Crossings and the South of West Lethbridge. Connects to downtown/University of Lethbridge	Route 11 at The Crossing, Route 1 at The Crossing
4	West Lethbridge and South Lethbridge	Connects the South, Lethbridge College, Downtown and the University of Lethbridge. This route connects residential areas with commercial and institutional destinations. Links to The Crossing, North Lethbridge and Mayor Magrath Drive	

Figure 28: Frequent Transit Network



6.2 Local Transit Network

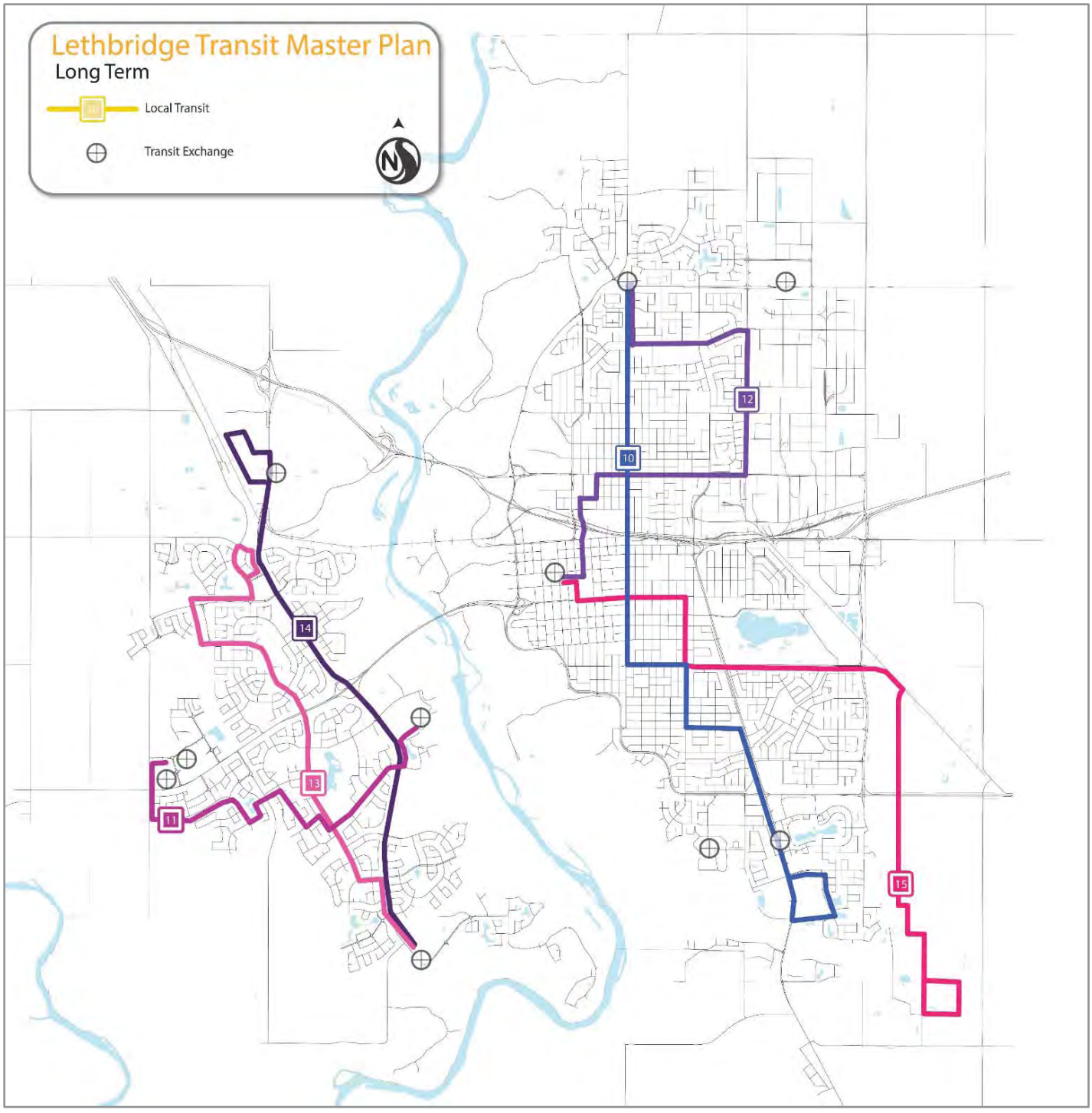
Each local route has the potential to develop into a frequent service if the density and diversity of land uses intensifies and increases travel demand. These routes connect residential neighbourhoods to the FTN and to some primary destinations (see Figure 29).

The following table provides a summary of the proposed local routes:

Table 7: Local Routes

Route	Areas	Description	Connection to Frequent Transit Network
10	North and South Lethbridge	Serves residential areas in North and South Lethbridge with a direct service to the Hospital	Route 1 at the North Terminal Route 2 at the South Terminal Route 4 on 13 Street S
12	North Lethbridge	Links residential areas in North Lethbridge to the downtown and connects with 3 frequents routes	Route 1 at the North and Downtown terminals Route 2 when crossing 23 St S Route 4 at the Downtown terminal
15	South Lethbridge	Links residential areas in South Lethbridge to the downtown.	Route 2 when crossing Mayor Magrath Dr. Route 4 at the Downtown terminal
11	East and West of West Lethbridge	Links residential areas to The Crossings and U of Lethbridge	Route 1 at The Crossings Route 3 when crossing Metis Trail Route 4 at the University of Lethbridge
13	North and South of West Lethbridge	Link residential areas in North and South of West Lethbridge	Route 1 when crossing Whoop Up Dr. Route 3 at 3 locations
14	North and South of West Lethbridge	Link residential areas in North and South of West Lethbridge, and the University of Lethbridge	Route 1 when crossing Whoop Up Dr. Route 3 at 3 locations Route 4 at the University of Lethbridge

Figure 29: Local Routes



6.3 Community Transit Network

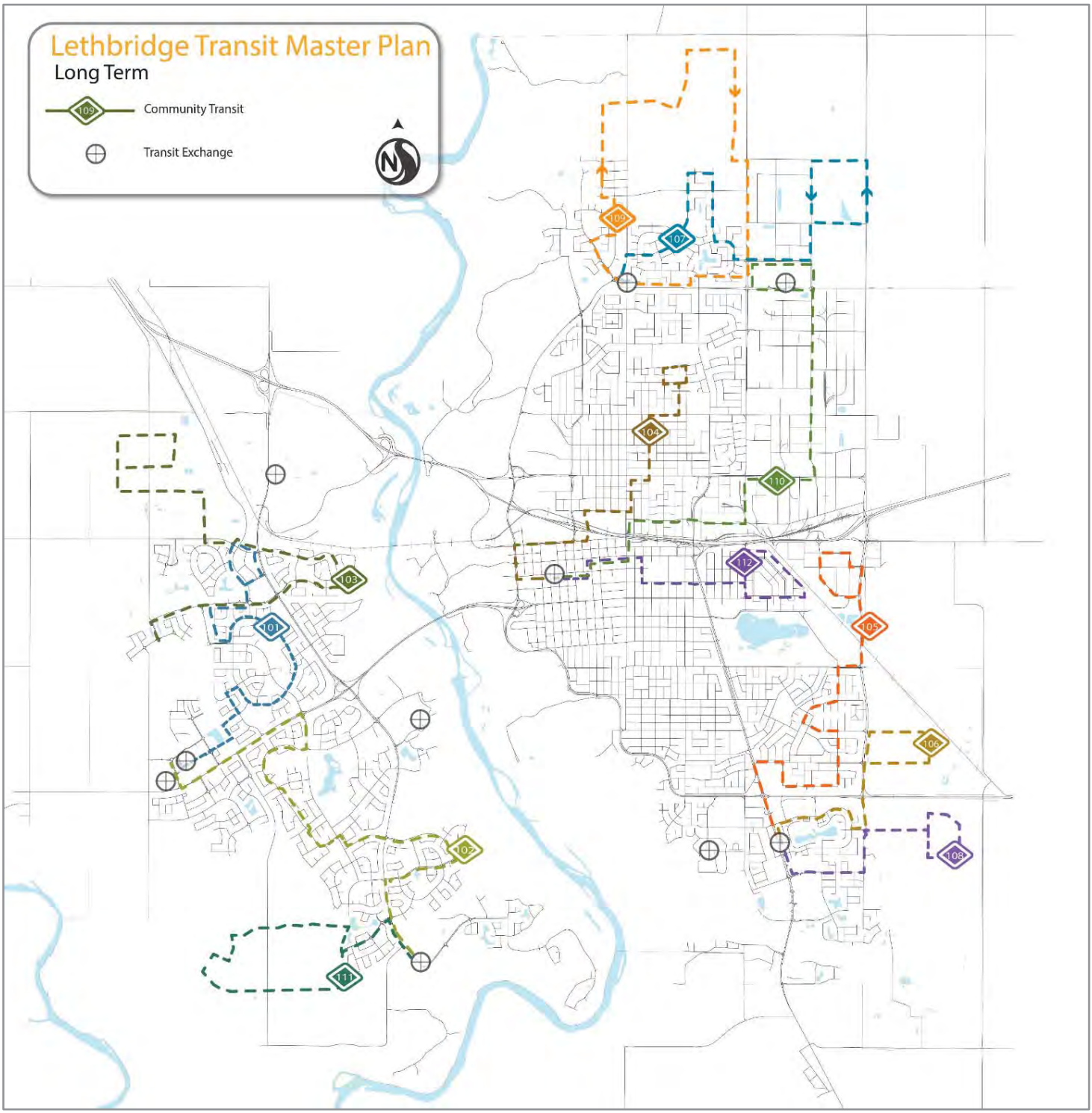
The Community Transit Network has a long-term goal of providing service every 30 minutes during peak periods and every 60 minutes during the off-peak periods. Community routes provide access to lower density or fringe neighbourhoods. They provide connections to local or frequent transit routes and they connect directly to select destinations (see Figure 30).

The following table summarizes the proposed community routes:

Table 8: Community Routes

Route	Area Served	Description	Connections to Frequent and Local Routes
104 110	North Lethbridge	Serves residential areas and Industrial Park, and connects them to Downtown	Connect with frequent routes 1 and 2
			Connect with local routes 10 and 12
107 109	Northern areas of Lethbridge	Serves residential areas and future Cavendish Farm, connects them to North Terminals	Connect with frequent routes 1 and 2
			Connect with local routes 10 and 12
105 106 108	South Lethbridge	Serves residential areas and connects them to the South Terminal	Connect with frequent routes 2 and 4
			Connect with local routes 10 and 15
101	West Lethbridge	Serves north residential areas and connect them with The Crossings	Connect with frequent routes 1 and 3
			Connect with local routes 11, 13 and 14
102	West Lethbridge	Serves south residential areas and connect them with The Crossings	Connect with frequent routes 1, 3, and 4
			Connect with local routes 11, 13 and 14
103	West Lethbridge	Serves north residential areas	Connect with frequent route 3
			Connect with local routes 13 and 14
111	West Lethbridge	Serves south residential areas	Connect with frequent route 3
			Connect with local routes 13 and 14

Figure 30: Community Routes

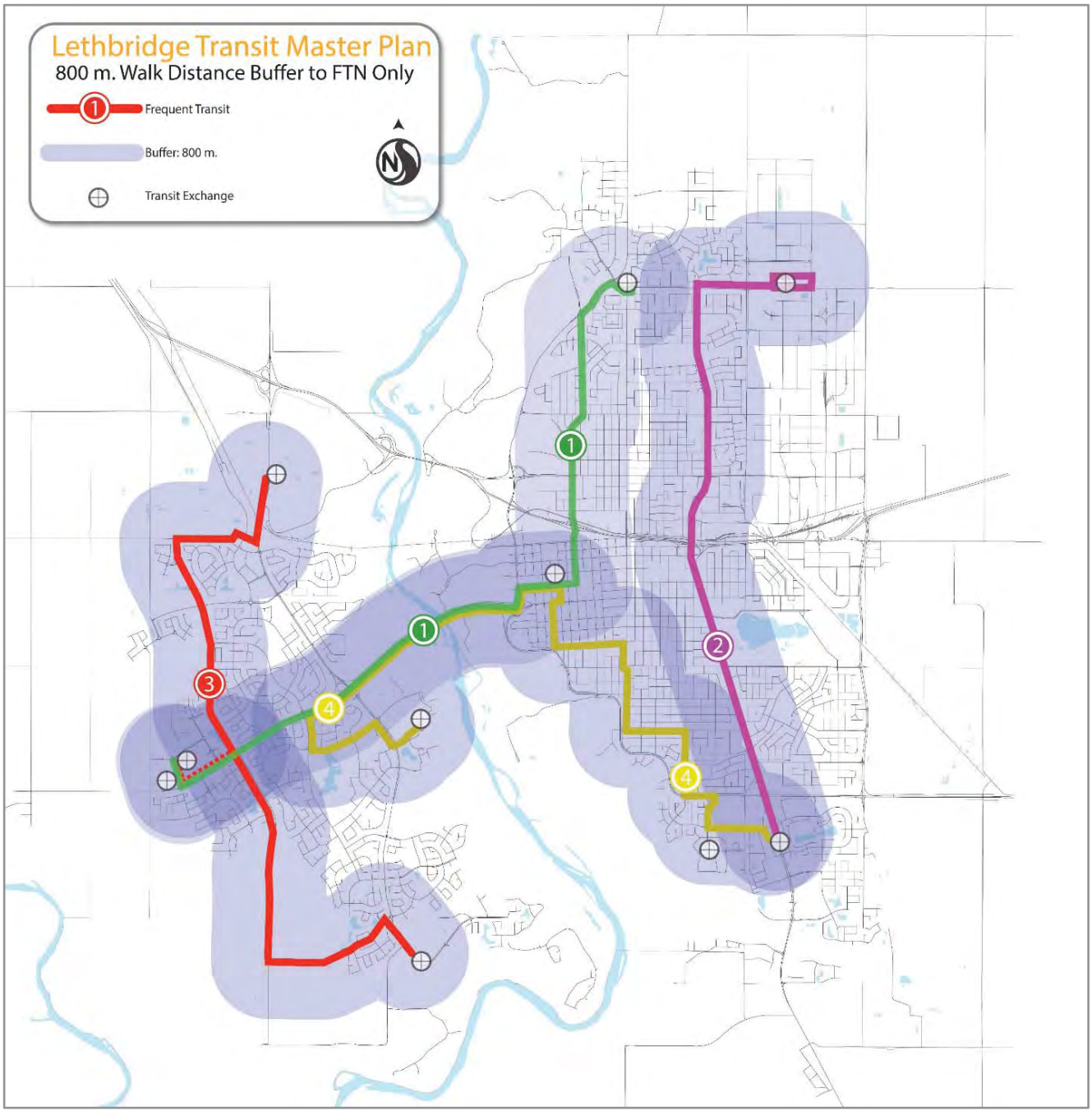


6.4 Future Network Features

The Long Term Lethbridge transit network accommodates the following features:

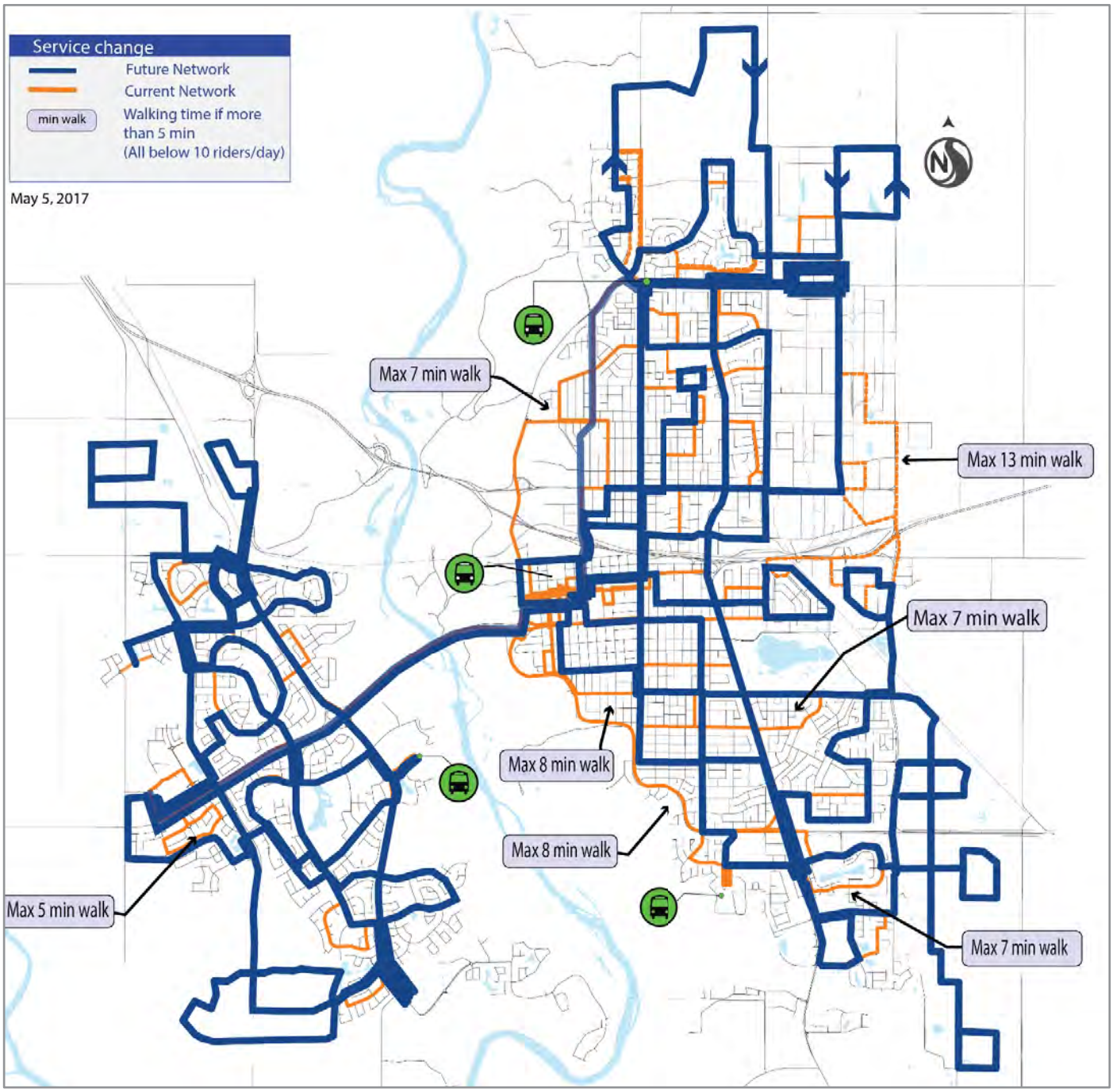
Transit access: The future Lethbridge Transit network will provide access to high quality transit service (Frequent Transit Network) for the majority of residents within 800m walking distance (see Figure 31). These frequent services will connect the major areas together with simple, direct, and fast routes.

Figure 31: Frequent Transit Network: Walking Distance Catchment Area



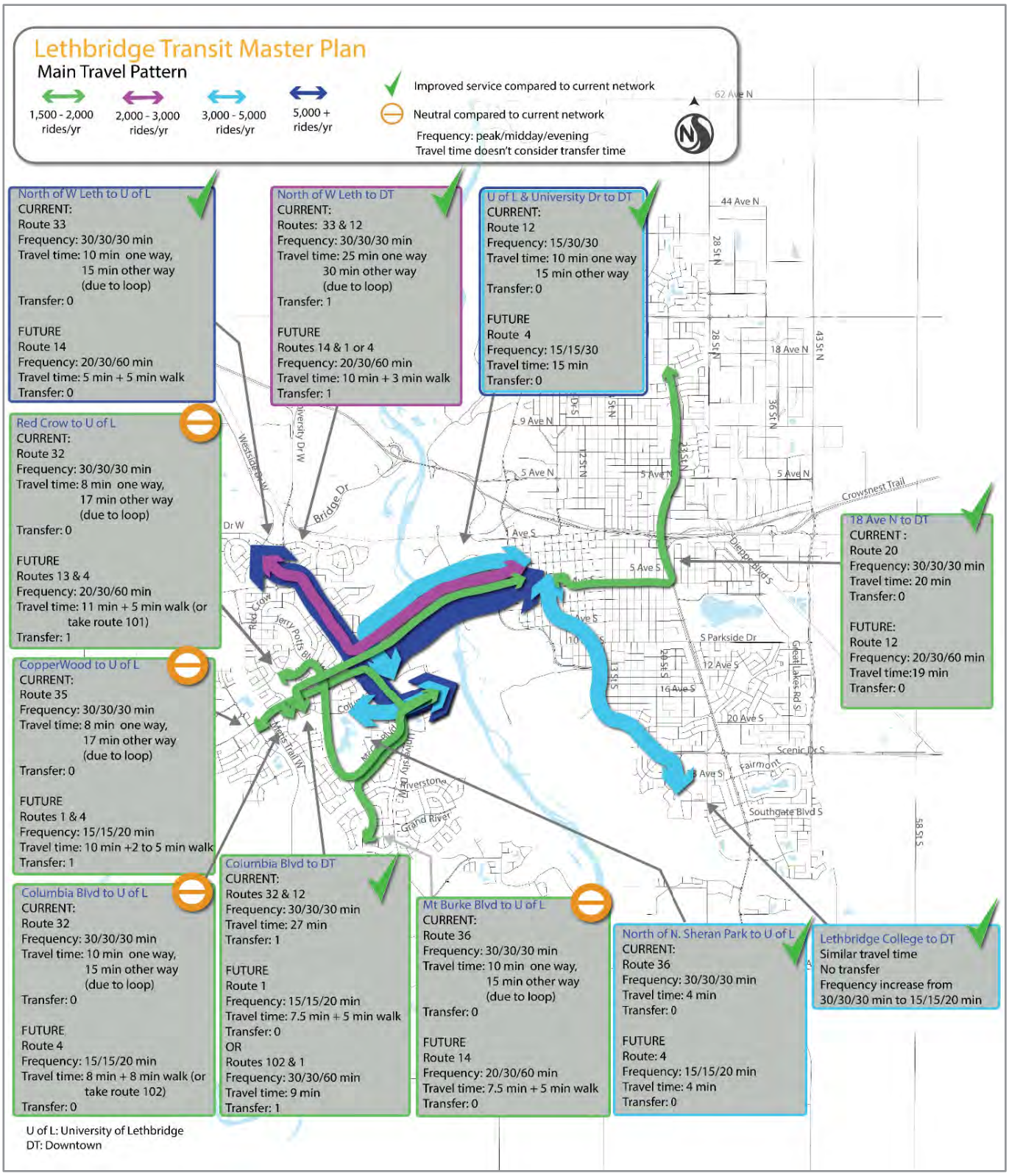
Offer more options to reach the same destination. The local transit services will provide service to residential areas to allow multiple transfer opportunities between different routes and areas. Depending on schedule and walking ability, customers will be able to make the best choice for themselves without having to wait for a single option.

Figure 32: Walking Distances



Reduce travel time to major destinations by honouring the customers time through more direct and more focused services.

Figure 33: Travel Patterns

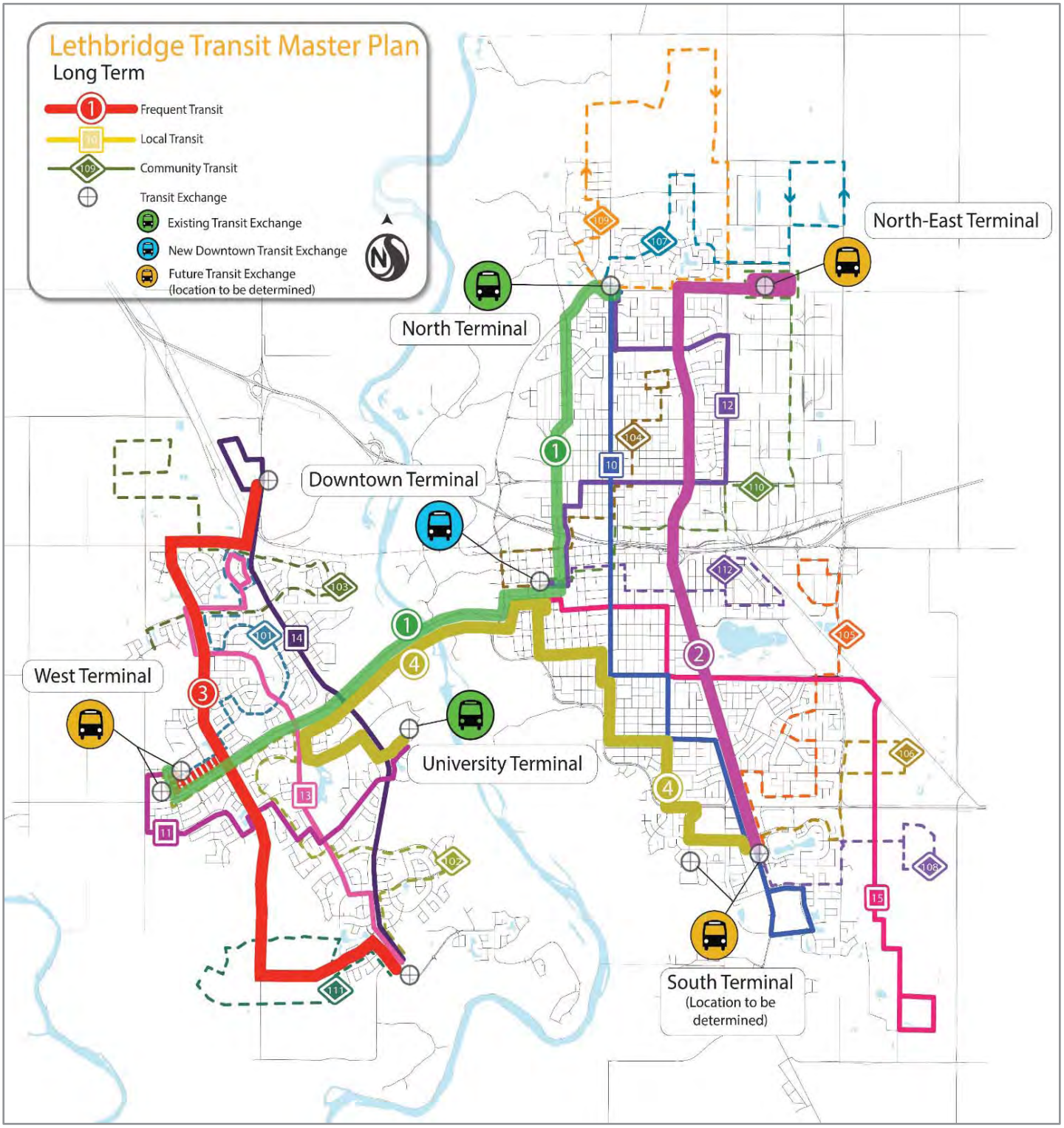


Enable residents to travel to nearby commercial centres with the creation of community based transit services that are designed for that purpose.

Make transit easy to use by creating simple routes which operate on easy to remember schedules (clockface headways).

Easily grow with the city with minimal disruption to the new transit network. With terminals implemented at the extremity of the network a new route can be linked to other routes either by connecting with frequent routes or by reaching one of the terminals. Interlining of routes (a single bus serving multiple routes) becomes a possibility, which means that a transfer may not always be necessary between two routes.

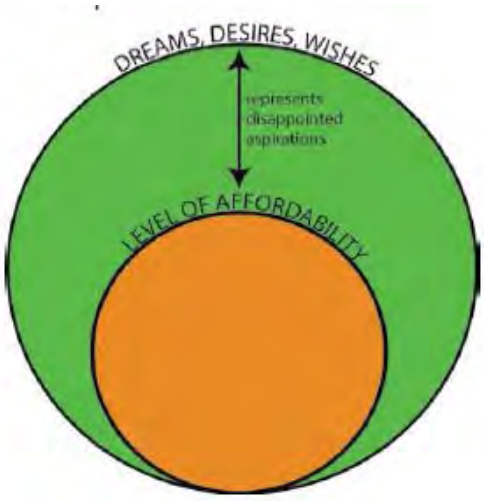
Figure 34: Lethbridge Transit Future Network



7 Implementation Plan

7.1 Phased Approach

The purpose in developing a phased implementation approach is to manage the realities of affordability and competing demands. The financial implications of each phase are estimated to minimize the gap between the planned improvement plan and the reality of financial constraints.



Three service improvement phases have been identified to reflect strategic layering of the service and address funding availability. The intent is to create a base level of improvement in the first phase and then expand and strengthening the network in the subsequent phases. Each phase represents a different stage in the development of the full transit network serving Lethbridge:

- **Phase 1 Short Term:** This phase is focused on transforming the system in a cost neutral fashion
- **Phase 2 Medium Term:** The medium term pursues the ongoing transformation of the system, by expanding the network to serve more neighbourhoods and new developments, and strengthening the system with improved frequencies on those routes that were implemented in the short term
- **Phase 3 Long Term:** The long-term focus is on entrenching the layered route hierarchy and the strengthening of the system with increased frequencies

7.2 Short Term: Transforming the Network

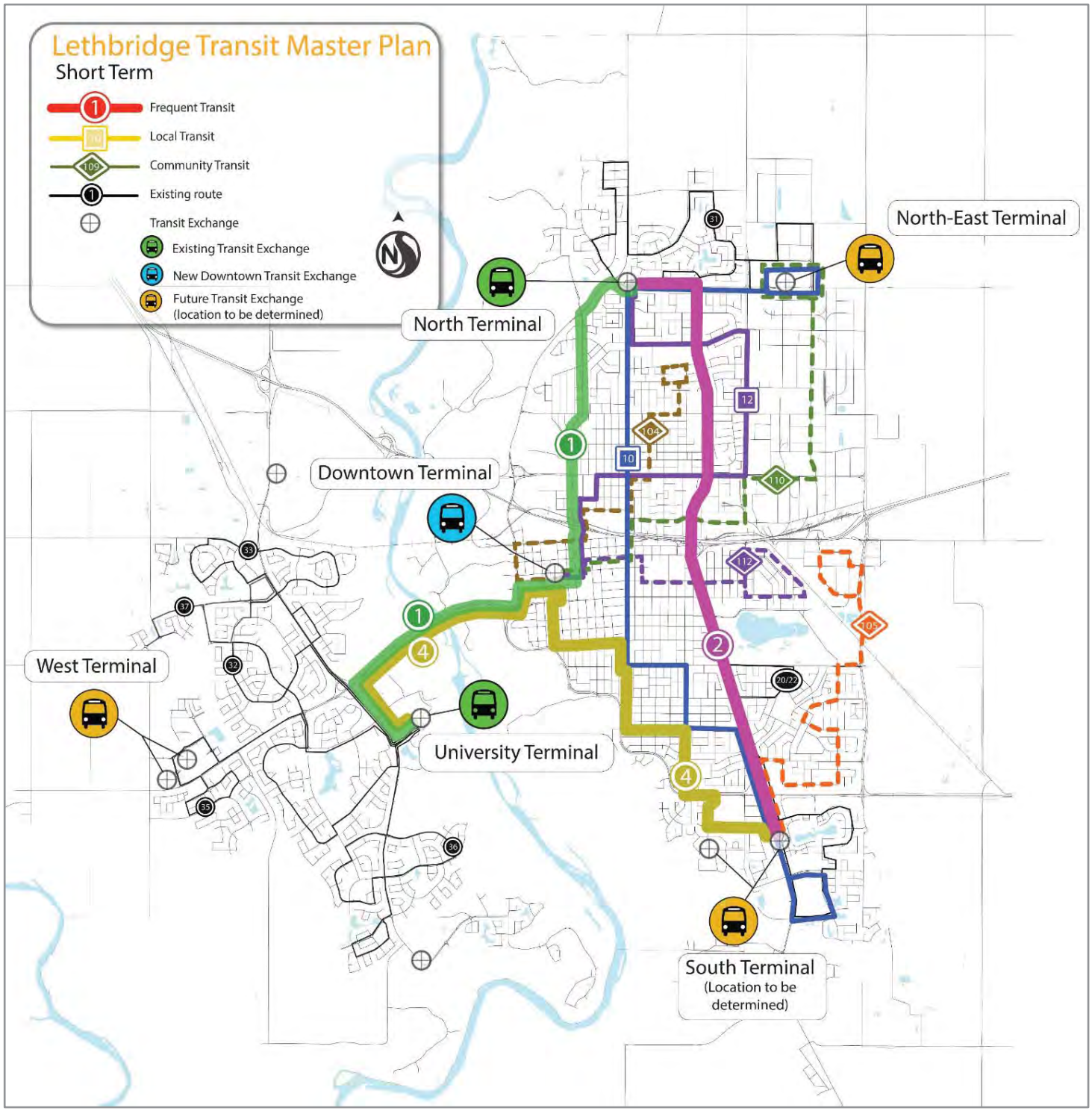
The focus of the Short Term plan is to begin the process of change. The majority of changes occur within North and South Lethbridge due to the limited financial flexibility and focus upon establishing the frequent transit services. The review of the changes is divided into new routes and existing routes. The goal of the short term is to:

- Establish service improvements by increasing the efficiency of the system that keeps the system cost neutral
- Improve ridership levels and at the same time annual fare revenue that increases cost recovery, by better responding to the travel needs of customers

Within this time frame, West Lethbridge routes are not altered due to the nature of the network and the level of complexity that requires more vehicles and hours to create a new structure. In total, two of the existing routes are combined and changed while four existing routes in North and South Lethbridge are removed from service. These four routes are replaced with nine new routes. The focus on the structural changes to the system come at a cost – the midday weekday and weekend peak services cannot be operated at the same level as the existing four routes. The goal to remain within the fiscal limitation of the existing services means that to maintain the same full level of service with nine routes as is currently in place with four is not possible. There are options developed to improve service frequencies on the different layers of services should there be a capability in the short term to increase the service hours available.

Figure 35 shows the network that would be established in the Short Term phase.

Figure 35: Short Term Transit Network



7.2.1 Summary of New Routes

Frequent Transit Routes

There is a focus on creating the new network with the implementation of three of the four new services:

- **Route 1**, between University of Lethbridge Terminal and North Terminal on Whoop-Up Drive and Stafford Dr.
- **Route 2**, between North Terminal and South Terminal, on Mayor Magrath Dr.
- **Route 4**, between University of Lethbridge Terminal and South Terminal, on 5 Street S, 9 Ave S, 13 Ave S and Scenic Dr., and serving the Downtown terminal

Local Routes

Implementation of two Local routes:

- **Route 10**, between existing North Terminal and South Terminal, on 13th St, 10 Ave S, 20 St S, 16 Ave S and Mayor Magrath Dr.
- **Route 12**, between North Terminal and Downtown Terminal, on 5 Ave N, 28 St N and 18 Ave N.

Community Routes

Implementation of four Community routes:

- **Route 104**, between Park Meadows, Westminster and Senator Buchanan neighbourhoods in North Lethbridge and the Downtown Terminal.
- **Route 105**, between WT Hill Business Park neighbourhood and South Terminal, crossing Redwood and Lakeview neighbourhoods
- **Route 110**, between Downtown terminal, the Industrial Park and the North-East Terminal consisting of 6 trips per day, during peak hours (based on Industrial Park shift times)
- **Route 112**, between Downtown terminal and Glendale neighbourhood

7.2.2 Existing Routes

The following changes occur to the existing services:

- All routes are retained in West Lethbridge
- Modification and combination of **Routes 20 and 22**
- Replacement of **Routes 12, 21, 23** and **24**

7.2.3 FACILITIES

In this phase three new terminals are established:

- North-East Terminal (Walmart)
- South Terminal
- West Terminal

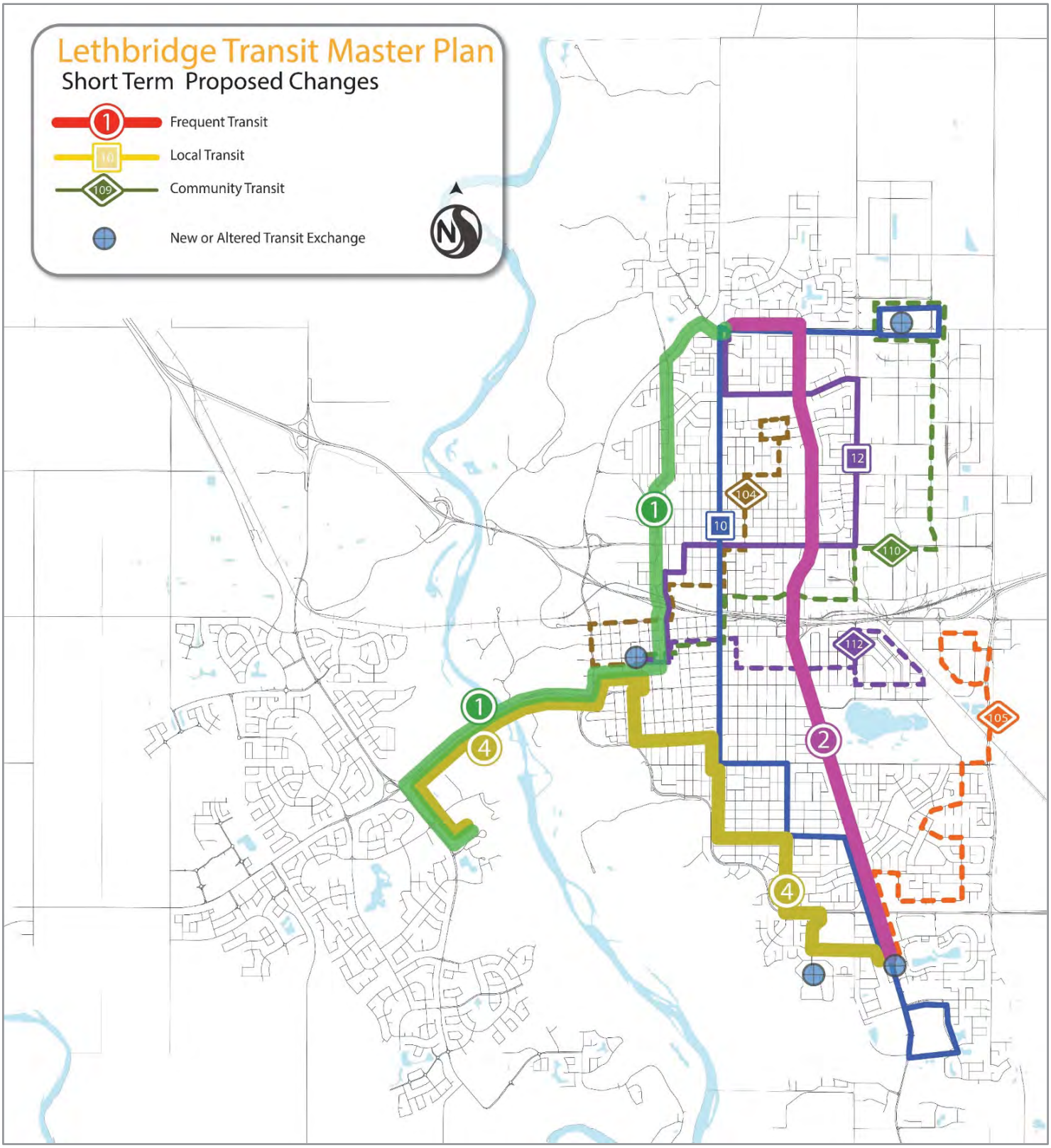
The location of a new south terminal is still subject to further investigation. Initial concepts were developed in the vicinity of Mayor Magrath Dr. and 28th Street, however land acquisition in that area is challenging. Land may be available at the Lethbridge College for a larger terminal facility but these discussions have only recently begun.

7.2.4 SUMMARY OF CHANGES

The Short Term phase of this Master Plan, reflects the first steps in transforming the existing system by making some modifications to the network reflecting 103,700 annual revenue hours. As this is significantly more than the current annual revenue hours, implementation packages have been identified to provide the City with options to initiate the master plan implementation.

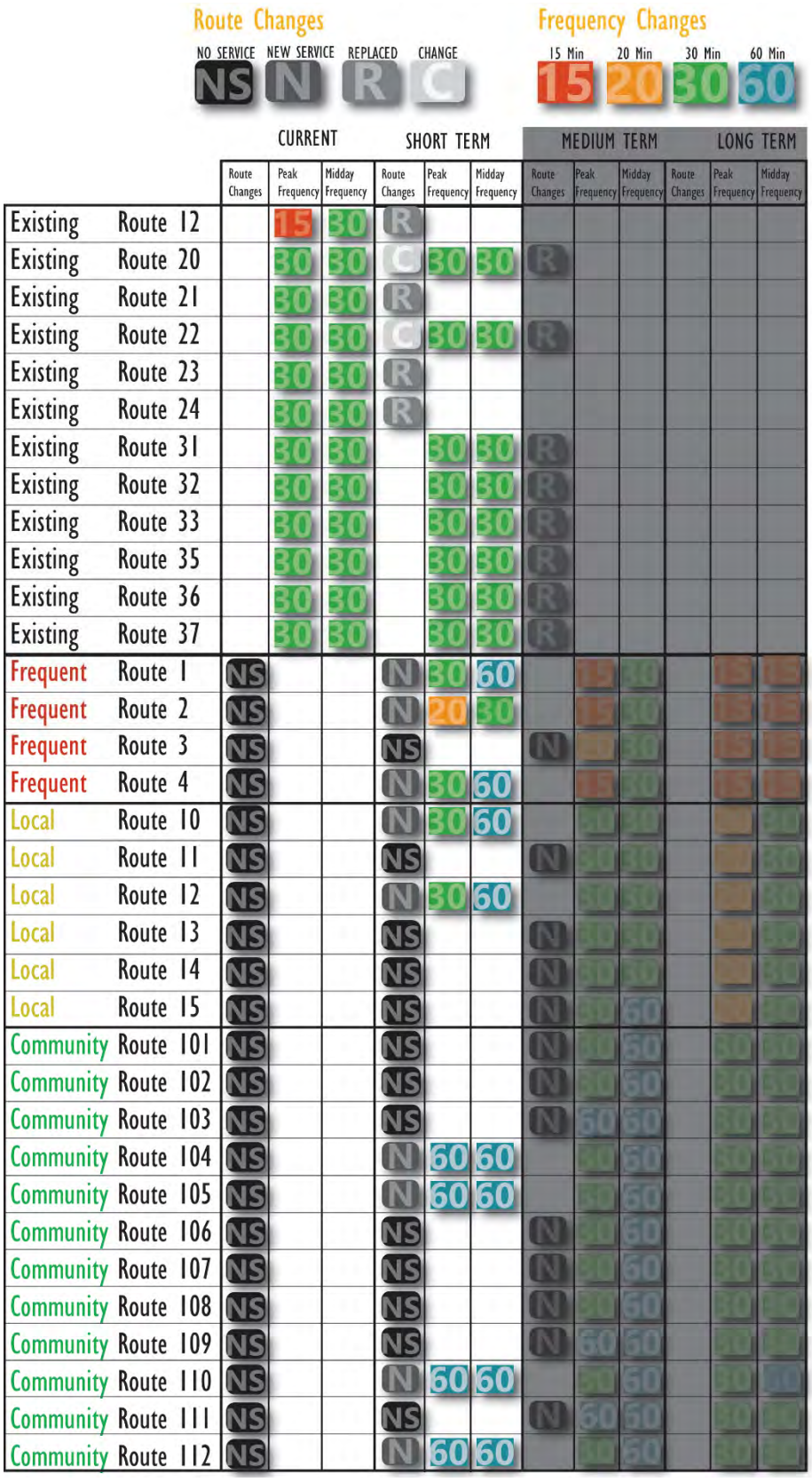
Short Term route changes are shown next:

Figure 36: Short Term Service Changes



Changes in service frequencies are summarised below:

Table 9: Short Term Route and Frequency Improvements



7.2.5 System Performance

In the table below the projected performance for routes of each phase of improvement is summarized in terms of:

- Rides
- Revenue hours
- Revenue
- Vehicle requirements

The details for each route by implementation phase is incorporated in Appendix D.

Table 10: Short Term Transit Performance Summary

EXISTING NETWORK SUMMARY

ROUTE			Rides/h	Annual Rides	Annual Revenue Hours	Annual Total Operating Cost ($)	Annual Revenue ($)	Vehicle Requirements		
Class	Route	Description						In Service	Spare (40%)	Total
	All Routes		11.9	1,230,618	86,000	12,670,800	2,719,200	25	17	42

SHORT TERM SUMMARY

ROUTE			Rides/h	Annual Rides	Annual Revenue Hours	Annual Total Operating Cost ($)	Annual Revenue ($)	Vehicle Requirements		
Service Layer	Route	Description						In Service	Spare	Total
Frequent	1	North Terminal - Univ. of Lethbridge	29.7	255,700	8,600	$ 1,268,200	$ 562,600	3	1	4
Frequent	2	WalMart - South Terminal	21.4	194,300	9,100	$ 1,335,700	$ 427,400	3	1	4
Frequent	4	Univ. of Lethbridge - Mayor Magrath Dr	26.0	253,600	9,800	$ 1,436,800	$ 557,900	3	1	4
Local	10	North Terminal - South Terminal	12.7	142,900	11,300	$ 1,658,400	$ 314,400	3	1	4
Local	12	North Terminal - Downtown Terminal	10.5	83,600	7,900	$ 1,170,600	$ 183,900	2	1	3
Community	104	9 Ave N - WalMart	9.8	43,200	4,400	$ 646,800	$ 95,000	1	1	2
Community	105	South Terminal - Wt Hill Blvd S	7.3	43,700	6,000	$ 885,600	$ 96,000	1	1	2
Community	110	Downtown Terminal - Industrial Park	18.8	28,500	1,500	$ 223,700	$ 62,600	2	1	3
Community	112	Downtown Terminal - Dieppe Blvd	11.1	43,200	3,900	$ 574,900	$ 95,000	1	1	2
Existing Routes										
W Lethbridge	32	Existing Routing	14.5	85,500	5,900	$ 866,700	$ 188,100	1	1	2
W Lethbridge	33	Existing Routing	13.0	76,500	5,900	$ 866,700	$ 168,400	1	1	2
W Lethbridge	35	Existing Routing	11.2	66,100	5,900	$ 866,700	$ 145,500	1	1	2
W Lethbridge	36	Existing Routing	8.0	46,900	5,900	$ 864,200	$ 103,100	1	1	2
W Lethbridge	37	Existing Routing	3.2	19,200	6,000	$ 878,000	$ 42,200	1	1	2
Lethbridge	31	Existing Routing	5.5	20,600	3,800	$ 553,600	$ 45,300	1	1	2
Lethbridge	20 S-22 S	Modified Routing	11.9	95,100	8,000	$ 1,175,000	$ 209,100	2	1	3
TOTAL				1,498,600	103,900	$ 15,271,600	$ 3,296,500	27	7	34

Vehicle Spare Ratio = 19%

Table 10 below compares system performance of the Short Term improvements to that of the current system:

Table 11: Short Term Service Statistics

Service Statistics by Phase

Phase	Annual Rides	%	Annual Revenue Hours	%	Annual Fare Revenue ($)	%	Annual Total Operating Cost ($)	%	Peak Buses	Total Staff Requirement	%
Existing System	1,230,600		86,000		$2,719,200		$12,670,800		25	47	
Short Term	1,498,600	22%	103,900	21%	$3,296,500	21%	$15,271,600	21%	27	49	4%

The following improvements in performance are forecast:

- 22% increase in forecast rides, revenue and operating cost resulting in a marginal improvement in operating cost recovery from 21% to 22%
- The peak vehicle requirement increases from 25 to 27 buses - indicating more concentrated service in the peak periods

Key Performance Indicator improvements:

- Rides per hour remain stable at 14
- Cost per ride decreases marginally to $10.10

Key Performance Indicators

Phase	Average Rides per Hour	Average Cost per Ride	Operating Cost Recovery
Existing System	14	$10.30	21%
Short Term	14	$10.19	22%

7.2.6 Short Term Optional Service Improvement Packages

The Short Term service levels, as noted, do purposely not reflect the service frequency standards that have been identified for Frequent or Local transit services and have lower levels of service than existing routes during the Midday period on weekdays and Peak periods on weekends. This is the implication of the direction given by the City to reflect funding limitations by ensuring that Short Term improvements remain cost neutral. The implication of improving these service frequencies on Frequent and Local Routes are summarized below.

Table 12: Frequency Improvement Packages

Improvement Package	Additional Resources Required (Annual)	
	Hours	Operating Cost ($millions)
Weekday Off Peak Improvements	7,600	1.1
Weekday Evening Improvements	6,100	0.9
Saturday Peak Improvements	2,500	0.4
Sunday Peak Improvements	3,200	0.5
Frequent Network Implementation*	2,000	0.8

* This improvement replaces Routes 12, 23 and 24. Frequencies and service duration can be adjusted to be cost neutral.

7.2.7 Short Term Implementation Timeline

To initiate the implementation of the service improvements in the short term there are several internal processes that must take place in a highly-sequenced order to ensure that the changes are established without hiccups or issues. Changing stop ID information, schedules, public information, operator scheduling etc. from one system to another, requires structure and management of the process. These steps start with Council approval of the new services and culminate with the service implementation. The steps involve both internal and external milestones to ensure that the system is ready.

7.2.7.1 Wayfinding

Wayfinding is the activity of creating information on the service changes for the various users of the system. Update information is used in Driver's handbooks, the creation of turn lists for operators, schedules for operations and dispatch, customer information, rider guides, stop labels, bus destination blinds, smart phone apps, etc.

7.2.7.2 Operations

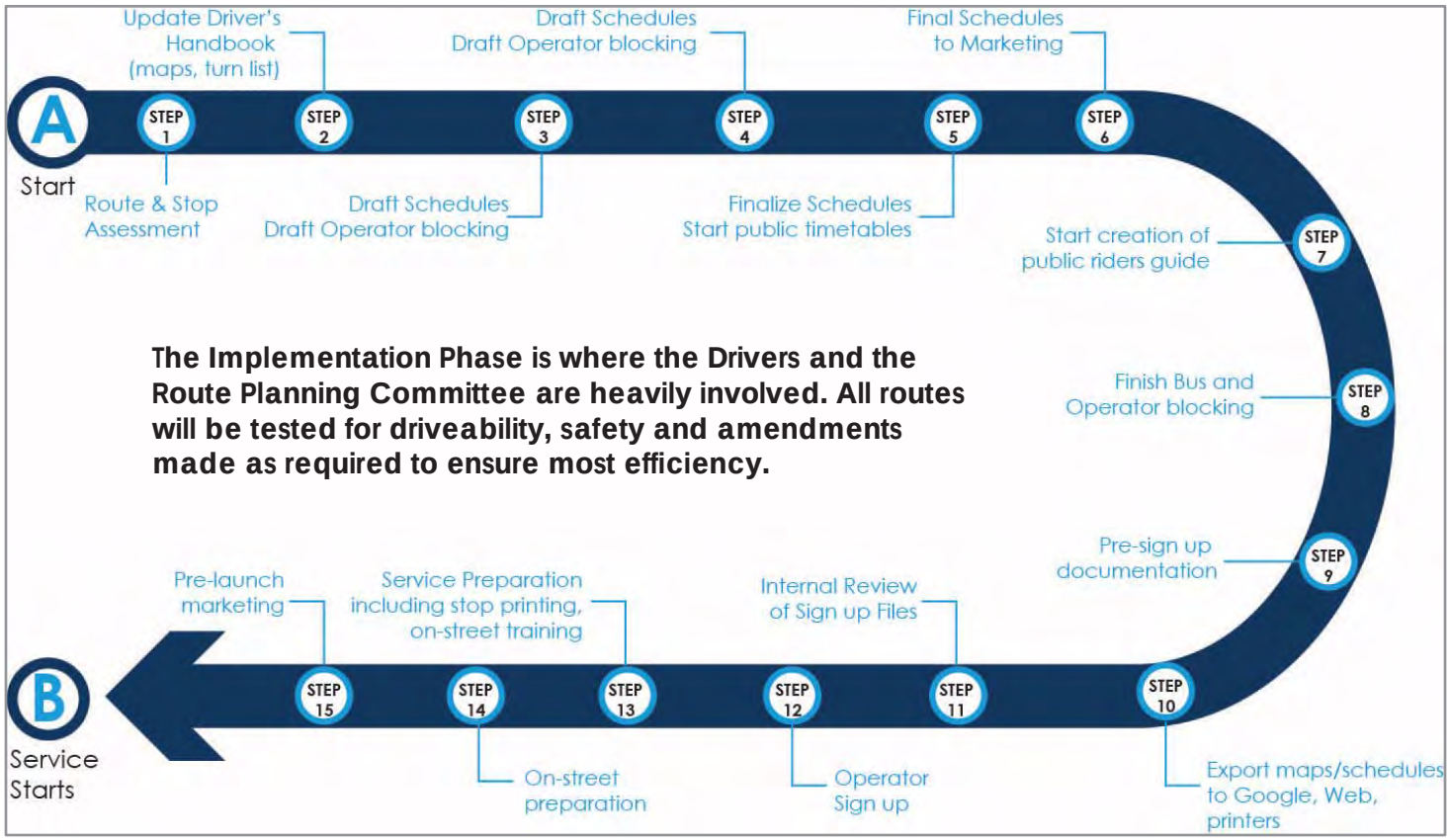
Creating vehicle blocking and operator blocking to prepare dispatch for day-of operations and to allow the preparation and execution of the operator and maintenance sign-ups. This usually requires several iterations. In addition, new routes require the training of operators so that when the service starts, they are familiar with the new route alignments and don't accidently drive discontinued routes.

7.2.7.3 Marketing

Providing customer education and awareness of the changes is critical to ensure that when the change occurs, customers know how to get to use the system.

A summary of the key activities in this process are depicted in Figure 37 and a detailed step-by-step Gantt chart is provided in Appendix I.

Figure37: Tactical Implementation Plan



7.3 Medium Term: Strengthening the System

In the medium term, the transformation and strengthening of the system is pursued by expanding and establishing the final network structure to serve more neighbourhoods and new developments. Frequencies are also increased on routes that were implemented in the short term. There are thirteen new routes put in place to finalize the new network structure and set the stage for frequency improvements in the Long Term.

7.3.1 New Routes

Frequent Transit Routes

- Frequency increased on **Routes 1, 2, and 4**
- Implementation of **Route 3**, between North-West Lethbridge Terminal and South-West Lethbridge Terminal

Local Routes

- Frequency increased on **Routes 10, and 12**
- Route Implementation:

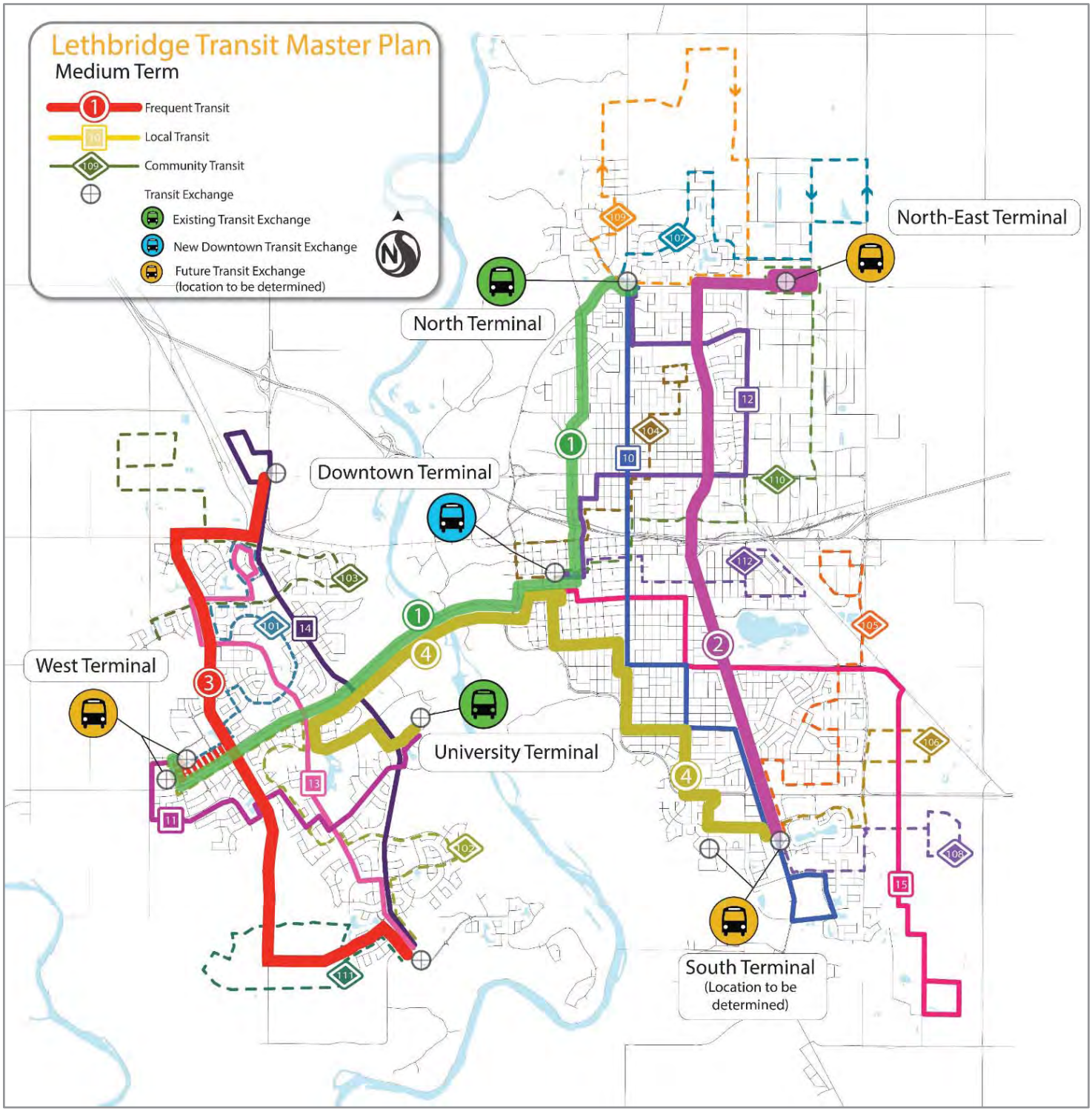
  - **Route 11**, between University of Lethbridge and West Terminal
  - **Route 13**, between North-West terminal and Metis Trail terminal along Jerry Potts Blvd and McMaster Blvd.
  - **Route14**, between North-West terminal and Metis Trail terminal along University Dr.
  - **Route 15**, between the Downtown terminal and SEASP Development

Community Routes

- Frequency increased on **Routes 104, 105, 110, 112**
- Route implementation:

  - **Route 101**, serving West Terminal, Indian Battle Heights, and West Highlands neighbourhoods
  - **Route 102**, between Metis Trail terminal and West terminal, serving RiverStone and Varsity Village neighbourhoods
  - **Route 103**, serving Garry Station, Heritage Heights, and West Lethbridge Employment Center – Industrial neighbourhoods
  - **Route 106**, serving South terminal and South East Employment Center neighbourhood
  - **Route 107**, serving North terminal and Uplands, BlackWolf and Sherring Industrial Park neighbourhoods
  - **Route 108**, serving South terminal and Clearview neighbourhood
  - **Route 109**, serving North terminal and Royal View Development
  - **Route 111**, serving Metis trail terminal and Watermark Development

Figure 38: Medium Term Transit Network



7.3.2 EXISTING ROUTES

- **All routes** in West Lethbridge are replaced
- **Route 31** in north Lethbridge is replaced
- Combined **Routes 20/22** in south Lethbridge are replaced

7.3.3 FACILITIES

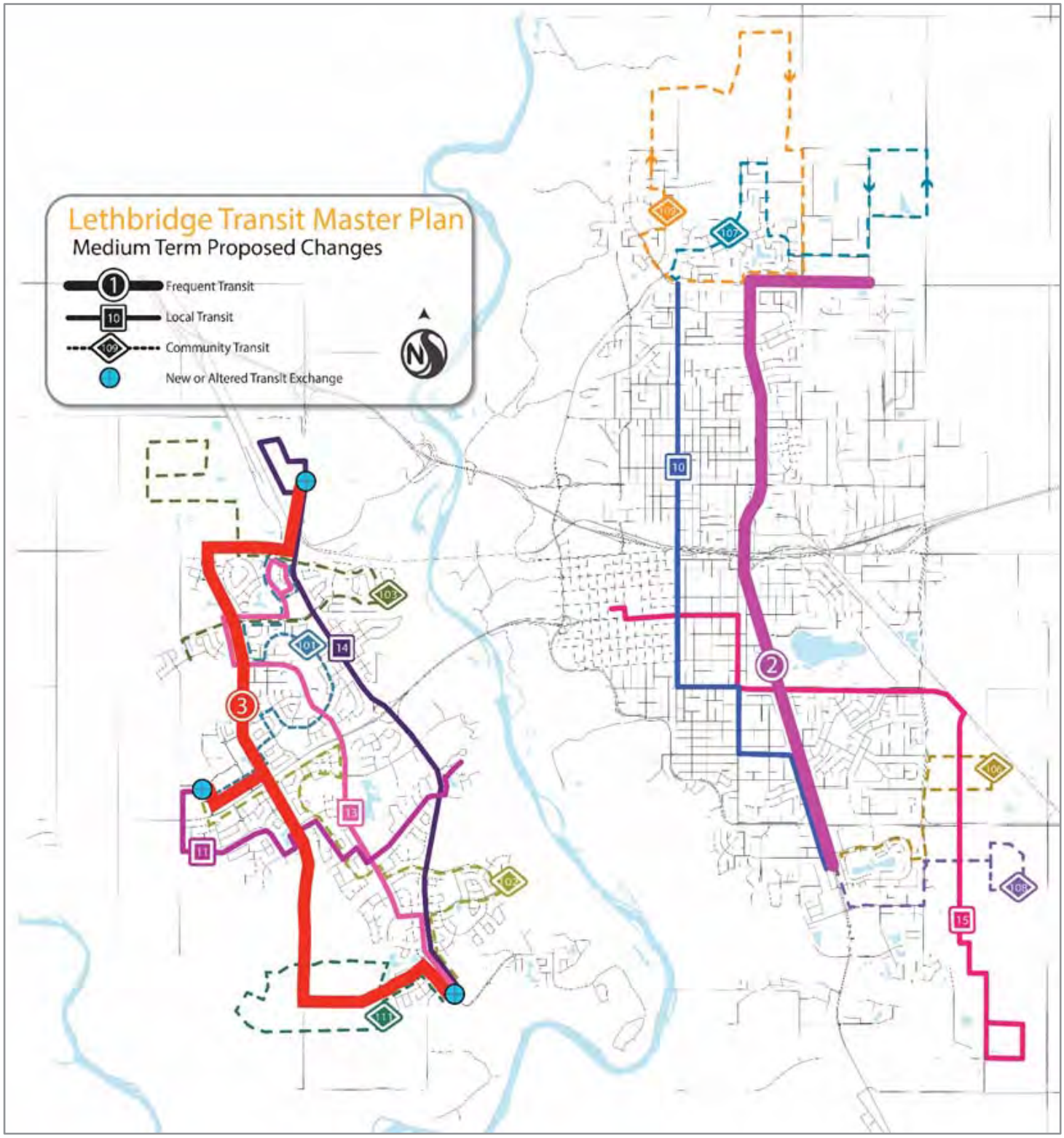
In the Medium Term, two new terminals are established:

- A terminal in the north end of West Lethbridge to allow for connections in West Lethbridge, terminal facilities for operators and an ability to turn buses around efficiently. The exact location is subject to require review based on developments in the northern parts of West Lethbridge
- Metis Trail Terminal at the south end of West Lethbridge to allow for the new routes to connect, buses to turn around and the provision of operator facilities. This will also be established near a key crossroad location s in West Lethbridge

7.3.4 Summary of Changes

Route changes in the Medium Term are shown below:

Figure 39: Medium Term Service Improvements



Route and service frequencies in the Medium Term are summarized below:

Table 13: Medium Term Route and Frequency Improvements

7.3.5 System Performance

The Medium Term sees the implementation of the balance of the new routes as well as frequency improvements which increases both revenue hours and peak vehicle requirements.

The table below summarizes the projected performance by route in the medium term. The details for each route by implementation phase is incorporated in Appendix D.

Table 14: Medium Term Transit Performance Summary

MEDIUM TERM SUMMARY

ROUTE			Rides/h	Annual Rides	Annual Revenue Hours	Annual Total Operating Cost ($)	Annual Revenue ($)	Vehicle Requirements		
Service Layer	Route	Description						In Service	Spare	Total
Frequent	1	North Terminal - Univ. of Lethbridge	27.1	362,500	13,400	$ 1,969,000	$ 797,500	5	1	6
Frequent	2	WalMart - South Terminal	27.1	362,500	13,400	$ 1,969,000	$ 797,500	5	1	6
Frequent	3	North Terminal - South West Lethbridge Terminal	27.5	336,400	12,200	$ 1,802,300	$ 740,100	4	1	5
Frequent	4	North Terminal - Univ. of Lethbridge	22.8	398,100	17,500	$ 2,574,800	$ 875,800	6	1	7
Local	10	North Terminal - South Terminal	20.4	213,100	10,400	$ 1,535,600	$ 468,800	3	1	4
Local	11	West Terminal - Univ. of Lethbridge	12.5	130,400	7,400	$ 1,096,800	$ 286,900	2	1	3
Local	12	North Terminal - Downtown Terminal	14.7	129,700	8,800	$ 1,303,300	$ 285,300	2	1	3
Local	13	North Terminal - South West Lethbridge Terminal	14.7	129,700	8,100	$ 1,194,600	$ 285,300	2	1	3
Local	14	North - South West Lethbridge Terminal	14.7	129,700	8,100	$ 1,194,600	$ 285,300	2	1	3
Local	15	Downtown - SEASP Development	25.5	191,900	10,000	$ 1,479,100	$ 422,100	3	1	4
Community	101	West Highlands - South Terminal (W Leth)	10.6	75,600	7,100	$ 1,052,400	$ 166,200	2	1	3
Community	102	West Lethbrige South T - West Terminal	17.5	135,500	7,700	$ 1,140,100	$ 298,000	3	1	4
Community	103	North of West Lethbridge	16.8	119,800	7,100	$ 1,048,400	$ 263,500	2	1	3
Community	104	9 Ave N - WalMart	14.2	75,000	5,300	$ 779,600	$ 165,000	2	1	3
Community	105	South Terminal - Wt Hill Blvd S	10.6	75,000	7,100	$ 1,039,500	$ 165,000	2	1	3
Community	106	South Terminal - North of SEASP Development	15.9	75,600	4,800	$ 701,600	$ 166,200	2	1	3
Community	107	North Terminal - Cavendish Farm	12.7	75,600	6,000	$ 877,000	$ 166,200	2	1	3
Community	108	South Terminal - SEASP Development	15.9	75,600	4,800	$ 701,600	$ 166,200	2	1	3
Community	109	North Terminal - Royal View Development	13.1	59,900	4,600	$ 674,000	$ 131,800	1	1	2
Community	110	Downtown Terminal - Industrial Park	20.3	111,600	5,500	$ 811,700	$ 245,600	3	1	4
Community	111	South Terminal (West Leth) - Waterbridge Development	16.8	59,900	4,100	$ 599,100	$ 131,800	1	1	2
Community	112	Downtown Terminal - Dieppe Blvd	15.9	75,600	4,800	$ 701,600	$ 166,200	2	1	3
TOTAL				**3,398,700**	**178,200**	**$ 26,245,700**	**$ 7,476,300**	**58**	**14**	**72**

Vehicle Spare Ratio = 19%

Forecasted service statistics compared to short term performance is summarized below:

Table 15: Medium Term Service Statistics

Service Statistics by Phase												
Phase	Annual Rides	%	Annual Revenue Hours	%	Annual Fare Revenue ($)	%	Annual Total Operating Cost ($)	%	Peak Buses	Total Staff Requirement	%
Existing System	1,230,600		86,000		$2,719,200		$12,670,800		25	47	
Short Term	1,498,600		103,900		$3,296,500		$15,271,600		27	49	
Medium Term	3,398,700	127%	178,200	72%	$7,476,300	127%	$26,245,700	72%	58	74	51%

- Significant investment in service – 72% increase in revenue hours and operating cost
- Annual ridership more than doubles to 3.4 million from 1.5 million indicating a compelling increase in service efficiency
- The peak vehicle requirement doubles from 27 to 58 buses. It should be noted that the current system has a high spare vehicle ratio (40%) in comparison to industry standard of 15% for a peak fleet of this size (15%). The opportunity may exist that the increased peak vehicle requirement could be supplemented with existing spare vehicles.

Key Performance Indicator improvements:

- Rides per hour increase to 19
- Cost per ride continues to decrease to $7.72
- Cost recovery continues to increase to 28%

Key Performance Indicators			
Phase	Average Rides per Hour	Average Cost per Ride	Operating Cost Recovery
Existing System	14	$10.30	21%
Short Term	14	$10.19	22%
Medium Term	19	$7.72	28%

7.4 Long Term: Consolidating, Improving and Expanding the System

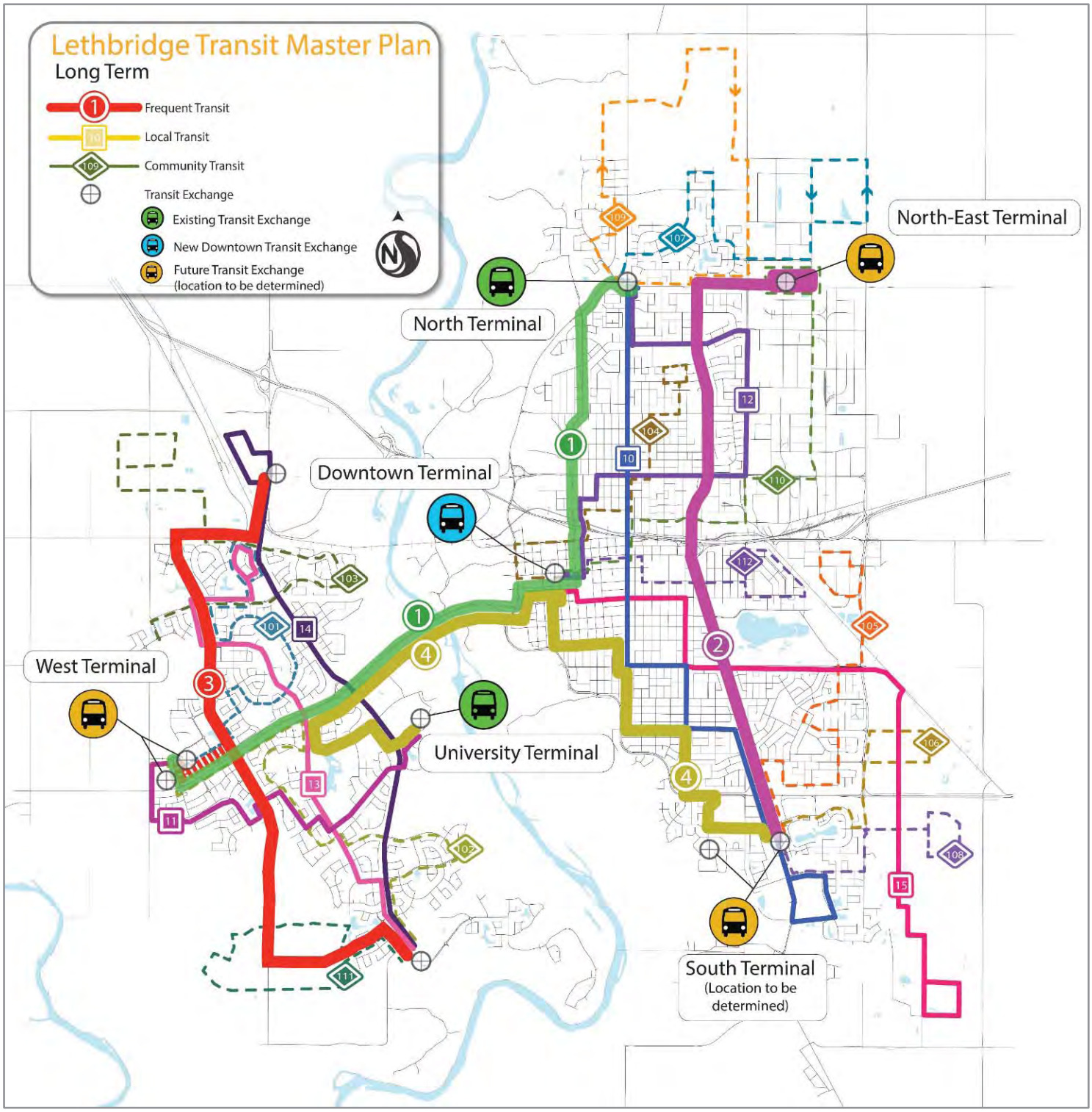
In the Long Term, the focus is on entrenching the layered route hierarchy and strengthening the system with increased frequencies. No route changes are proposed due to the unpredictability of the precise transit needs of Lethbridge over a ten-year period. However, it is assumed that adjustment of existing routes and implementation of new routes will be required as demand warrants.

The long term is based on pursuing frequency improvements on routes implemented in the previous phases.

Table 16 Long Term Frequency Improvements

		CURRENT			SHORT TERM			MEDIUM TERM			LONG TERM		
		Route Changes	Peak Frequency	Midday Frequency	Route Changes	Peak Frequency	Midday Frequency	Route Changes	Peak Frequency	Midday Frequency	Route Changes	Peak Frequency	Midday Frequency
Existing	Route 12				R								
Existing	Route 20				C			R					
Existing	Route 21				R								
Existing	Route 22				C			R					
Existing	Route 23				R								
Existing	Route 24				R								
Existing	Route 31							R					
Existing	Route 32							R					
Existing	Route 33							R					
Existing	Route 35							R					
Existing	Route 36							R					
Existing	Route 37							R					
Frequent	Route 1	NS			N		60		15	30		15	15
Frequent	Route 2	NS			N				15	30		15	15
Frequent	Route 3	NS			NS			N	20	30		15	15
Frequent	Route 4	NS			N		60		15	30		15	15
Local	Route 10	NS			N		60		30	30		20	30
Local	Route 11	NS			NS			N	30	30		20	30
Local	Route 12	NS			N		60		30	30		20	30
Local	Route 13	NS			NS			N	30	30		20	30
Local	Route 14	NS			NS			N	30	30		20	30
Local	Route 15	NS			NS			N	30	60		20	30
Community	Route 101	NS			NS			N	30	60		30	30
Community	Route 102	NS			NS			N	30	60		30	30
Community	Route 103	NS			NS			N	60	60		30	30
Community	Route 104	NS			N	60	60		30	60		30	30
Community	Route 105	NS			N	60	60		30	60		30	30
Community	Route 106	NS			NS			N	30	60		30	30
Community	Route 107	NS			NS			N	30	60		30	30
Community	Route 108	NS			NS			N	30	60		30	30
Community	Route 109	NS			NS			N	60	60		30	30
Community	Route 110	NS			N	60	60		30	60		30	60
Community	Route 111	NS			NS			N	60	60		30	30
Community	Route 112	NS			N	60	60		30	60		30	30

Figure 40: Long Term Transit Network



7.4.1 System Performance

Table 17: Long Term Transit Performance Summary

LONG TERM SUMMARY

ROUTE			Rides/h	Annual Rides	Annual Revenue Hours	Annual Total Operating Cost ($)	Annual Revenue ($)	Vehicle Requirements		
Service Layer	Route	Description						In Service	Spare	Total
Frequent	1	North Terminal - Univ. of Lethbridge	29.5	593,400	20,100	$ 2,960,700	$ 1,305,500	5	1	6
Frequent	2	North Terminal - South Terminal	29.5	593,400	20,100	$ 2,960,700	$ 1,305,500	5	1	6
Frequent	3	North Terminal - South West Lethbridge Terminal	29.5	593,400	20,100	$ 2,960,700	$ 1,305,500	5	1	6
Frequent	4	North Terminal - Univ. of Lethbridge	26.6	699,200	26,300	$ 3,871,700	$ 1,538,300	6	1	7
Local	10	North Terminal - South West Lethbridge Terminal	25.1	305,400	12,200	$ 1,796,600	$ 671,900	4	1	5
Local	11	West Terminal - Univ. of Lethbridge	16.2	197,100	8,700	$ 1,283,300	$ 433,700	3	1	4
Local	12	North - South West Lethbridge Terminal	18.9	196,100	10,400	$ 1,526,900	$ 431,500	3	1	4
Local	13	North Terminal - South West Lethbridge Terminal	18.9	196,100	9,500	$ 1,399,700	$ 431,500	3	1	4
Local	14	North - South West Lethbridge Terminal	18.9	196,100	9,500	$ 1,399,700	$ 431,500	3	1	4
Local	15	Downtown - SEASP Development	29.3	303,400	13,800	$ 2,035,900	$ 667,600	4	1	5
Community	101	West Highlands - South Terminal (W Leth)	14.1	115,000	8,200	$ 1,206,300	$ 253,100	2	1	3
Community	102	West Lethbrige South T - West Terminal	22.1	195,600	8,900	$ 1,306,800	$ 430,400	3	1	4
Community	103	North of West Lethbridge	20.5	195,600	9,600	$ 1,407,300	$ 430,400	3	1	4
Community	104	9 Ave N - WalMart	18.8	114,300	6,100	$ 895,000	$ 251,500	2	1	3
Community	105	South Terminal - Wt Hill Blvd S	14.1	114,300	8,100	$ 1,193,300	$ 251,500	2	1	3
Community	106	South Terminal - North of SEASP Development	21.1	115,000	5,500	$ 804,200	$ 253,100	2	1	3
Community	107	North Terminal - Cavendish Farm	16.9	115,000	6,800	$ 1,005,200	$ 253,100	2	1	3
Community	108	South Terminal - SEASP Development	21.1	115,000	5,500	$ 804,200	$ 253,100	2	1	3
Community	109	North Terminal - Royal View Development	18.7	115,000	6,100	$ 904,700	$ 253,100	2	1	3
Community	110	West Lethbrige South T - West Terminal	25.8	169,000	6,500	$ 964,900	$ 371,800	3	1	4
Community	111	South Terminal (West Leth) - Waterbridge Development	24.1	115,000	5,500	$ 804,200	$ 253,100	2	1	3
Community	112	North of West Lethbridge	21.2	114,300	5,400	$ 795,500	$ 251,500	2	1	3
TOTAL				**5,466,700**	**232,900**	**$ 34,287,500**	**$ 12,028,200**	**68**	**16**	**84**

Vehicle Spare Ratio = 19%

In comparison to the medium term, the long term forecast of performance improvements shows:

Table 18: Long Term Service Statistics

Service Statistics by Phase												
Phase	Annual Rides	% Change	Annual Revenue Hours	% Change	Annual Fare Revenue ($)	% Change	Annual Total Operating Cost ($)	% Change	Peak Buses	Total Staff Requirement	% Change
Existing System	1,230,600		86,000		$2,719,200		$12,670,800		25	47	
Short Term	1,498,600		103,900		$3,296,500		$15,271,600		27	49	
Medium Term	3,398,700		178,200		$7,476,300		$26,245,700		58	74	
Long Term	5,466,700	61%	232,900	31%	$12,028,200	61%	$34,287,500	31%	68	80	8%

- Continued increase in investment – 60% more service hours
- The peak vehicle requirement increases by only ten buses to 68 demonstrating the improvement in the efficiency of service delivery
- Annual ridership is expected to exceed 5 million – a 30% increase over the medium term

Key Performance Indicator improvements:

- Rides per hour increase to 23
- Cost per ride decreases to $6.30
- Cost recovery increases to 35%

It is recommended that further fare increases should be considered which will contribute to the continued increase in cost recovery.

Key Performance Indicators			
Phase	Average Rides per Hour	Average Cost per Ride	Operating Cost Recovery
Existing System	14	$10.30	21%
Short Term	14	$10.19	22%
Medium Term	19	$7.72	28%
Long Term	23	$6.27	35%

In comparing the Long Term forecast of this plan to the system performance of the current system, the following is achieved:

- More than a threefold increase in ridership from 1.2m to 5.4 million. Average rides per hour increase, nearly doubling from 14 to 23.4.
- Annual revenue hours more than double, increasing from 86,000 to 233,700.
- Total Operating Cost increases proportionally from $12.6 to $34.2 million.
- When comparing ridership and revenue hour increases it clearly indicates transitioning into a more efficient system.
- Due to the higher growth in ridership as opposed to revenue hours, Operating Cost recovery through the farebox increases 21% to 35%.
- A significant increase in the peak vehicle (in-service) requirement is forecast - increasing from 25 to 68.

8 Summary of Changes by Implementation Phase

A summary of the proposed routes and their associated improvements over time are presented in this section. These improvements were used as a basis to estimate annual revenue hours, costs, vehicle requirements and forecast ridership. Cost estimates reflect operating cost per revenue hour while ridership is based on recommended guidelines relating to rides per hour for the various classes of routes and phases of implementation.

The first phase of service improvement (Short Term) involves making route changes in North and South Lethbridge and maintaining the service in West Lethbridge. There is some improvement in the simplicity of the system in the short term but a decrease in off peak services to maintain cost neutrality.

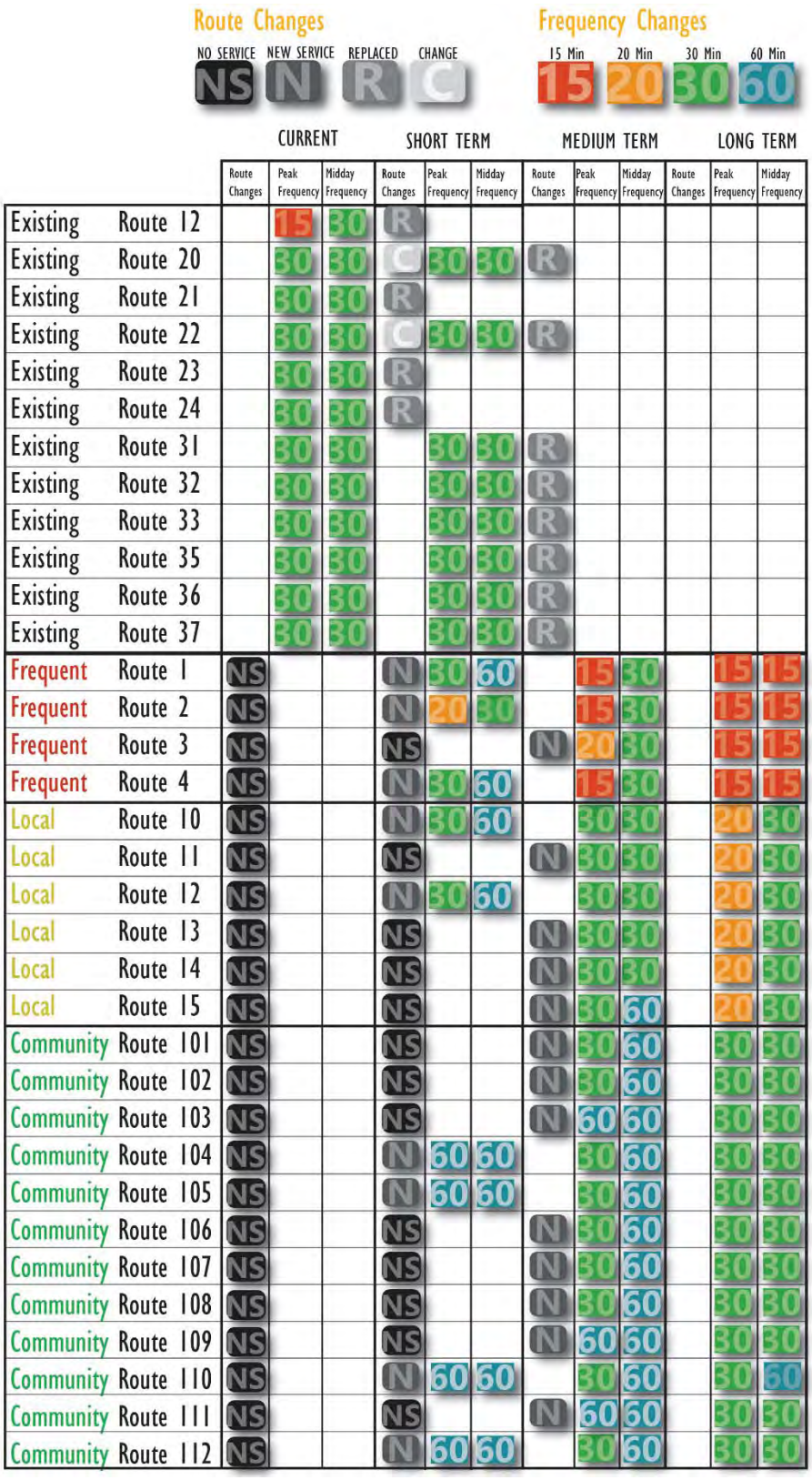
There are options to improve off peak frequencies but they require additional funding which is not likely prior to 2019. The implementation of the new downtown terminal and parking structure harnesses the available additional transit funds during the Short Term period.

The second phase of service improvement (Medium Term) focuses on the installation of the remainder of new routes plus improvements in frequency to those routes implemented in the Short Term. This phase sees the elimination of balance of all remaining original routes.

The long term focuses on reaching the desired frequencies for each route type as outlined in the vision.

A summary of route changes and frequency improvements is summarized in the Table below:

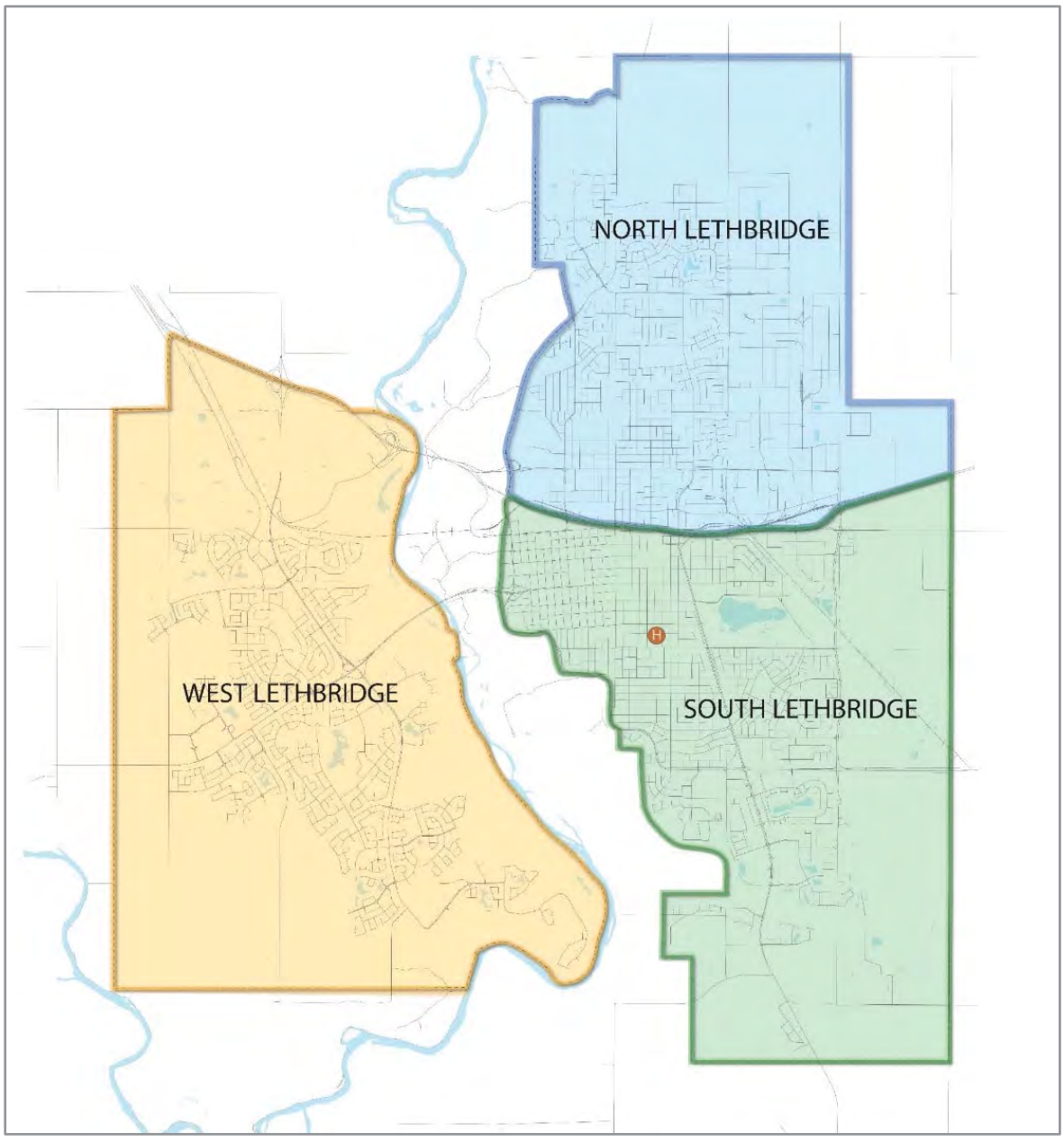
Table 19: Summary of Route and Frequency Changes



9 Summary of Changes by Area

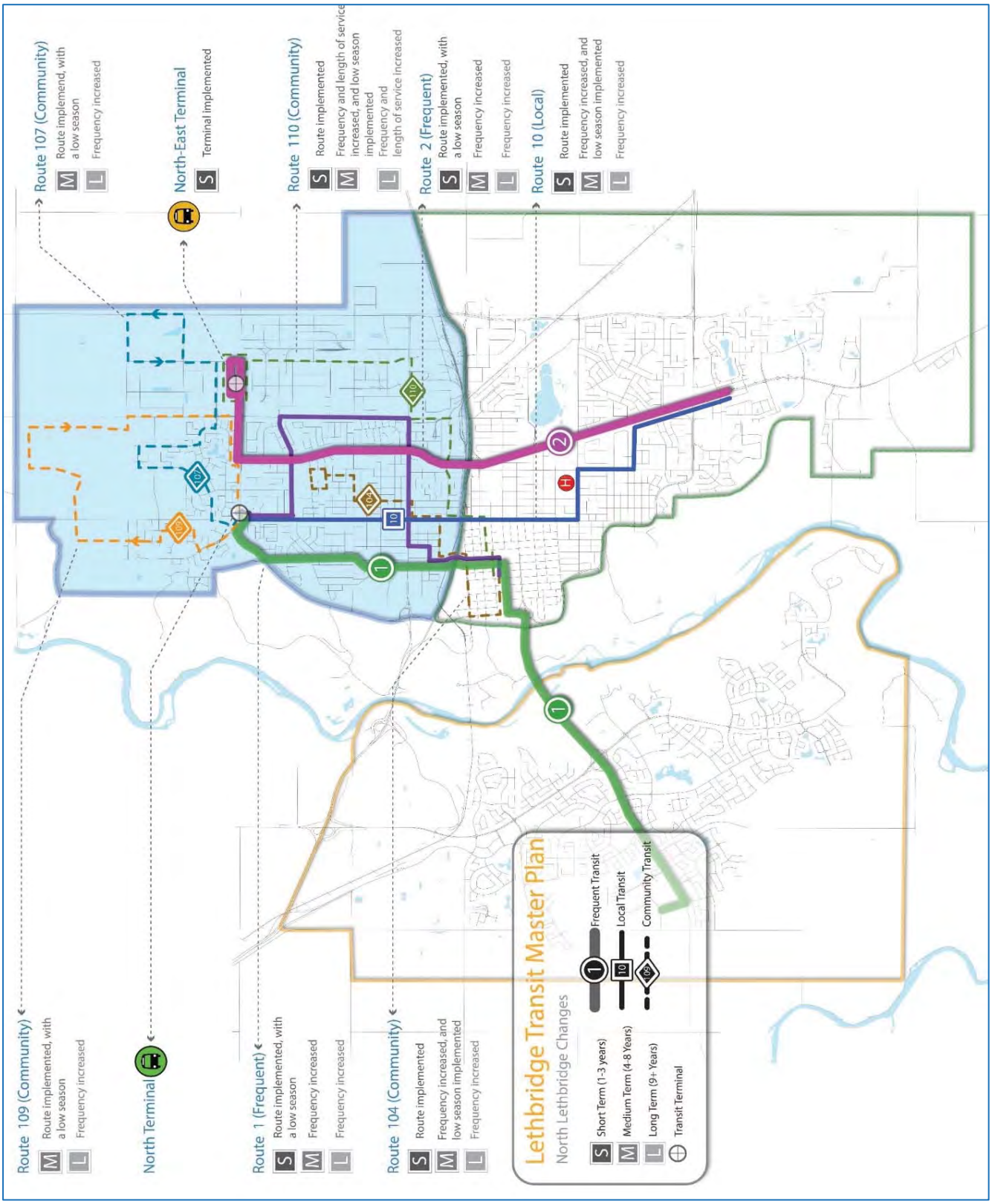
To better understand the proposed service improvements over time, it is useful to review them in the context of the three of the distinct service areas of Lethbridge. These areas are shown in Figure 41 and referred to throughout this section.

Figure 41: Lethbridge Service Areas



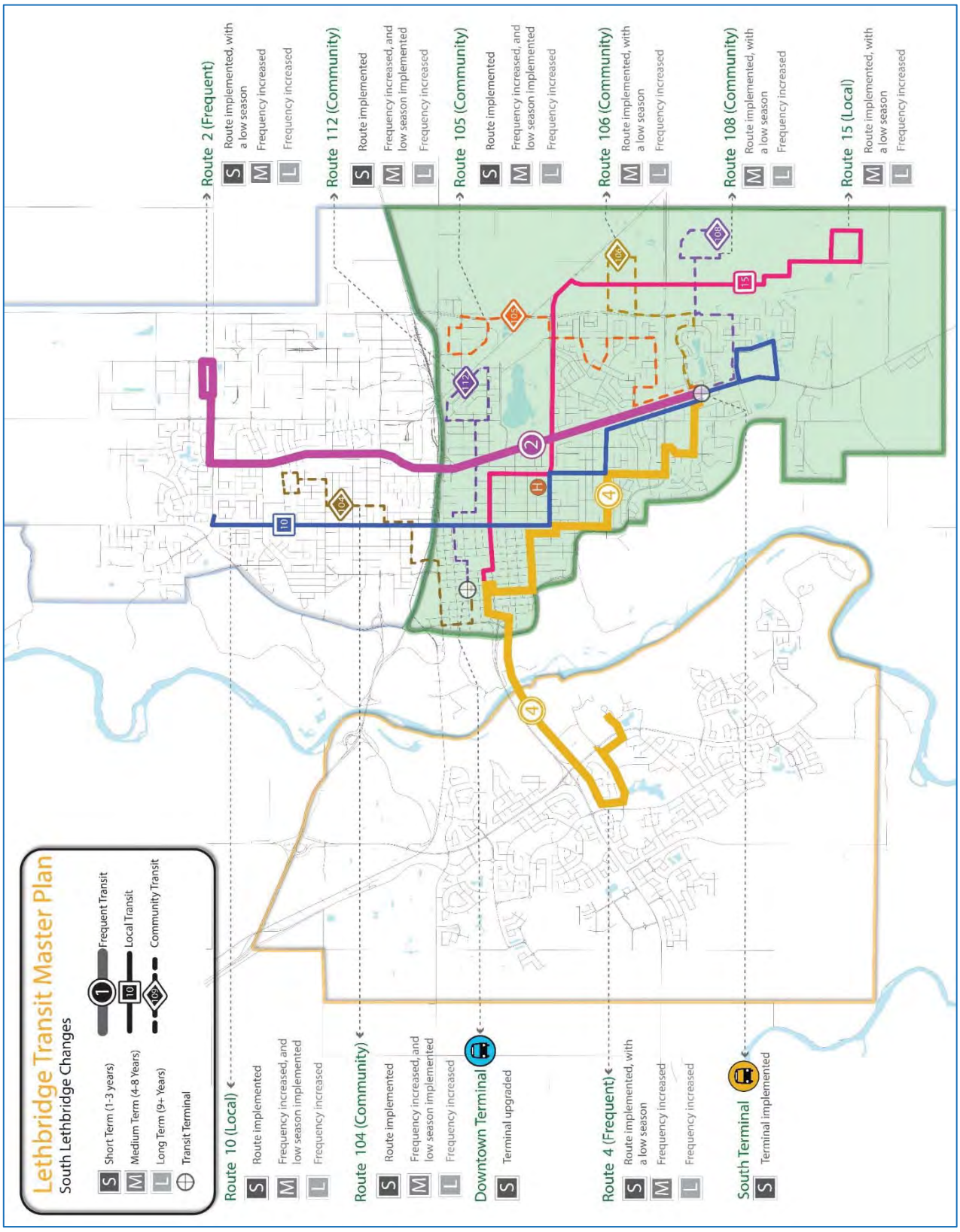
9.1 North Lethbridge

Figure 42: North Lethbridge Service Changes over Time



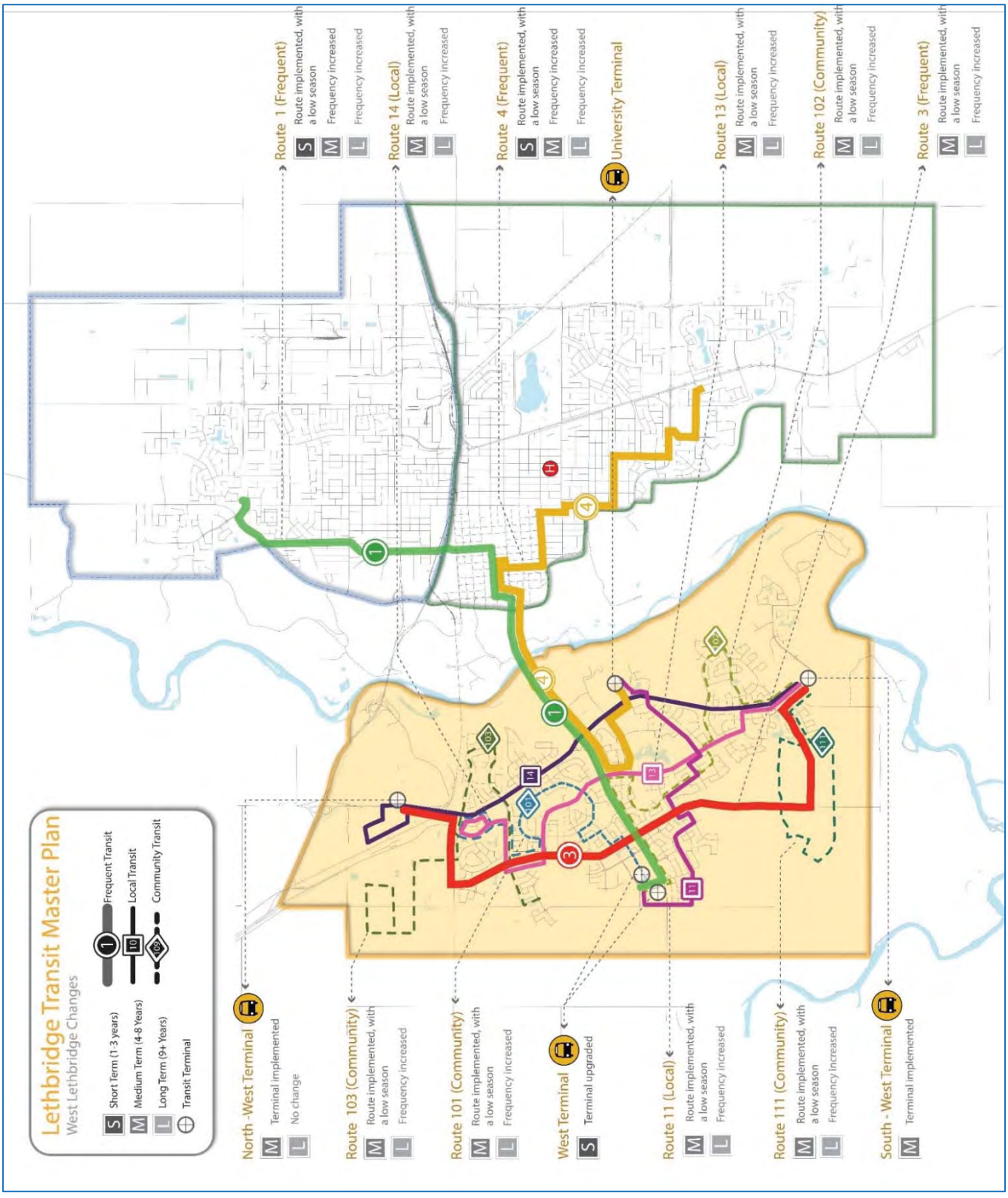
9.2 South Lethbridge

Figure 43: South Lethbridge Service Changes over Time



9.3 West Lethbridge

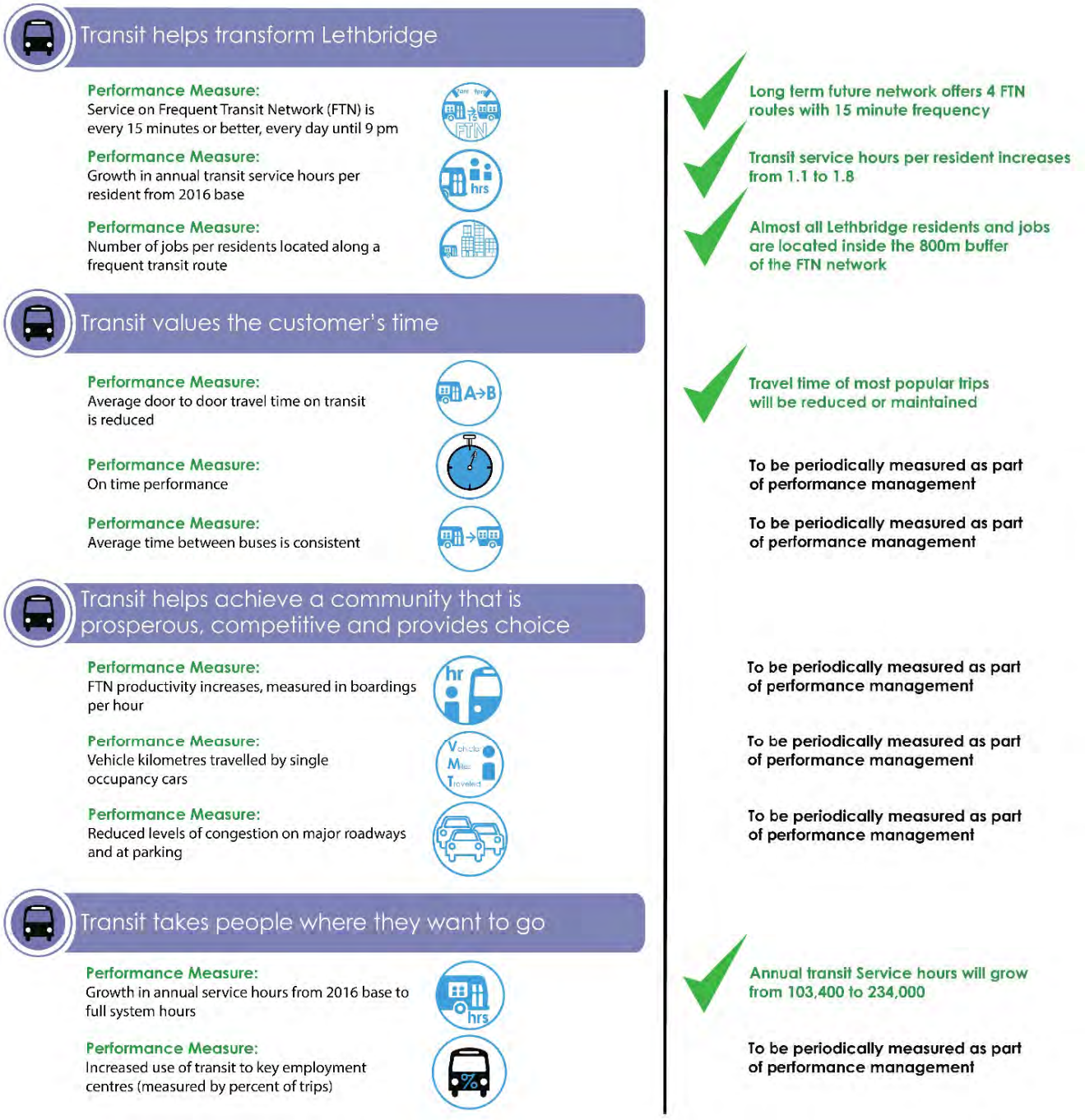
Figure 44: West Lethbridge Service Changes over Time



10 Meeting the Goals and Objectives

The figure below summarizes the response of the proposed future network to the transit Goals and Objectives established at the beginning of this planning process:

Figure 45: Meeting Goals and Objectives



11 Supporting Infrastructure

The expanded future network requires twice the amount of transit terminals and an expanded or new Operations and Maintenance (O&M) centre to accommodate the increase in fleet.

11.1 Future Transit Terminals

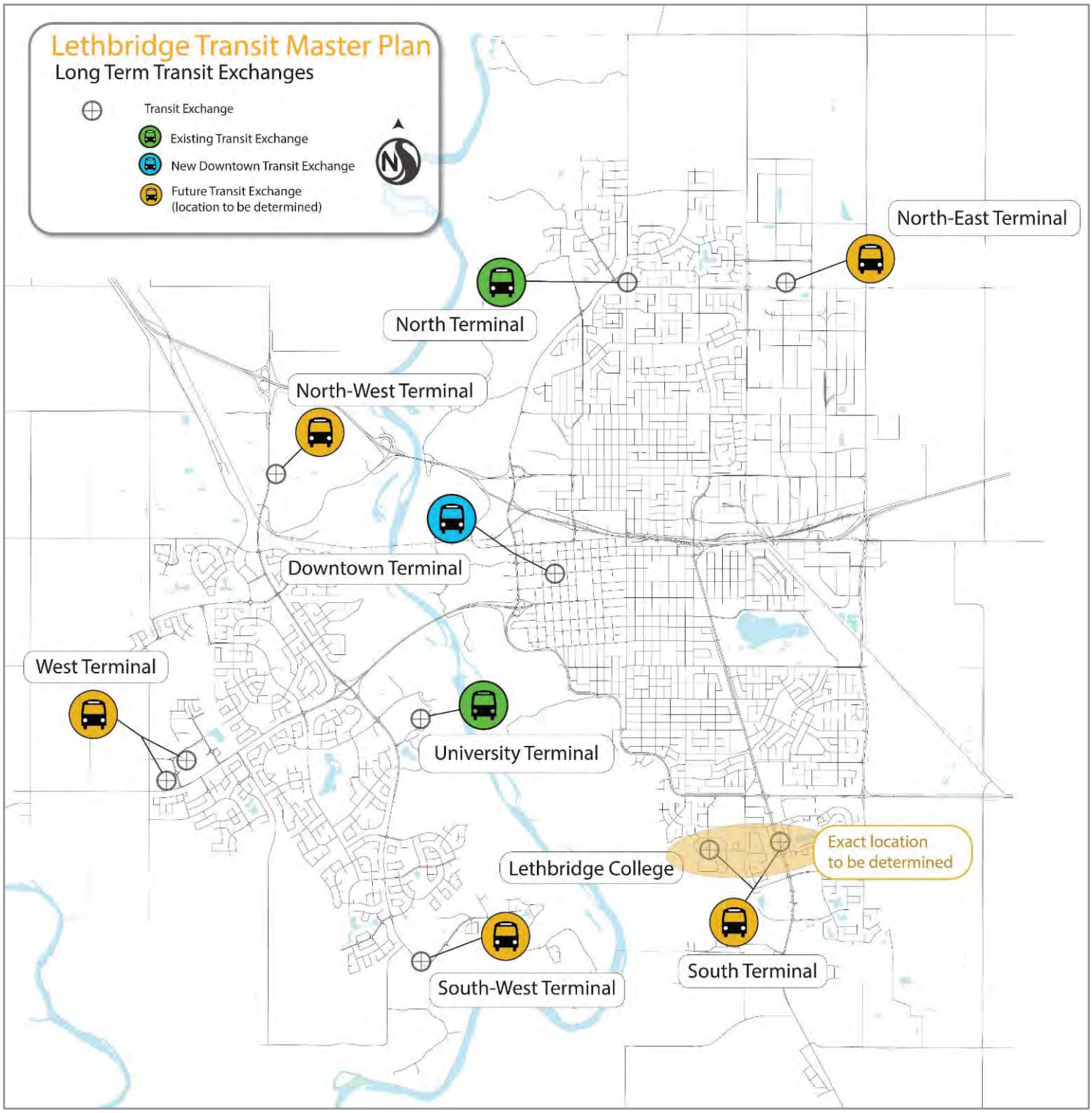
The future transit network will be supported by eight terminals of varying size and type. The terminals will be located on the perimeter of urban development, which allows the transit system to easily expand to support urban development in Lethbridge without restructuring existing services. Future routes can connect new neighbourhoods by beginning and ending at one of these peripheral terminals. This design also ensures that operational requirements do not conflict with customer service objectives. In other words, the buses and operators can pause for recovery time and take breaks in between trips, instead of in the middle of trips which would be required if the terminal is located mid route.

The Downtown Terminal is unique in that it is the only one located in the heart of Lethbridge and it is already scheduled for construction. The Downtown Terminal will be expanded to include ten bays, half of which will be located off-street and the balance located on 5th Ave S. Upgrades will also improve customer and driver facilities.

The location of a new south terminal is still subject to further investigation. Initial concepts were developed in the vicinity of Mayor Magrath Dr. and 28th Street, however land acquisition in that area is challenging. Land may be available at the Lethbridge College for a larger terminal facility but these discussions have only recently begun.

The following map shows the approximate location of these terminals. Depending on the availability of land, some terminals may be established off-street while others are located on-street.

Figure 46: Transit Terminals



11.2 Transit Operations and Maintenance Centres

Lethbridge Transit operations is located on 4 Avenue North where conventional transit vehicles, Access-A-Ride (AAR), and School buses are maintained and stored. This facility is approaching capacity in terms of accommodating existing transit services in terms of storage but not sufficiently large enough for the proposed future extent of the system.

Figure 47: Lethbridge Transit Centre

Source: Google Maps

However, the existing maintenance centre is at capacity from a vehicle maintenance perspective.

11.2.1 Storage

- 9 school bus lanes (6 vehicles per lane stored outside)
- 4 indoor lanes for AAR (nearing capacity - 6 vehicles per lane)
- 5 indoor transit lanes (limited capacity – 9 vehicles per lane)
- 3 lanes for maintenance holds

11.2.2 MAINTENANCE

The existing facility has the following maintenance infrastructure:

- 11 maintenance bays
- 1 wash line and 1 dry clean line

Considerations for the future with the expansion of the fleet must be contemplated. There is the option of building a new facility to replace the existing one at a larger scale, a secondary facility could be created for conventional transit buses, or some existing functions could be moved to a new facility. One option is to create a new facility for medium duty maintenance of vans and community shuttles which would move AAR off-site and open additional capacity for conventional Transit. In this option, it may be possible to increase storage capacity by:

- Moving school buses to another location and extend the existing building to add 9 new interior lanes. This would free up 81 spaces for standard buses. This option incurs the cost of extending the building and finding a new location for school buses.
- Moving AAR vehicles (including the entire AAR operation) to another location to free 4 lanes for standard buses creating 36 spaces for standard buses. Costs involved include purchasing or renting a property for AAR vehicles, maintenance, and office space.

Maintenance capacity could be increased by:

- Introducing a second maintenance shift to increase capacity of the existing bays. This would allow an increase in the number of vehicles (42 vehicles x 2 = 84) and would be sufficient to accommodate the Long Term requirements of 79 vehicles in total. This would require a significant increase in staff to cover this second shift.
- Moving AAR vehicles and operations to a new facility to free up space for conventional vehicles at the existing facility.

12 Future Fleet

The future transit layered approach offers the opportunity to right size the transit fleet to the demand and style of service. Through the established fleet replacement program, Lethbridge can begin to strategically diversify the fleet to optimize the network.

Using current and projected ridership estimates, Lethbridge Transit can establish an ideal fleet type for each layer of service. For example, the frequent transit network has the greatest utilization and sees the highest peaks in ridership. The most appropriate bus may be the 40' conventional or a 30' conventional in different time periods. The community routes may never exceed twenty riders at any given time and can therefore be operated by smaller buses/vans.

Right sizing the systems reduces capital cost because smaller vehicles tend to be less expensive than 40' conventional buses though life cycle costing of the two vehicle types shows that there is little difference. This is because a smaller vehicle may cost 2-2.5 times less that a 40' bus but the lifespan is 2-3 times shorter. Unless operators' wages vary based on vehicle class (some agencies have a distinction based on the need for air brake endorsement on the license), operating costs may remain constant or only vary slightly. The greatest benefit in right sizing the system is in scaling the buses to reflect the diversity of land uses. Community shuttle vans or buses are generally welcomed in residential neighbourhoods that protest the use of 40' conventional buses.

Diversifying the fleet to include smaller vehicles may provide these additional benefits:

- Smaller vehicles can more easily navigate constrained neighbourhoods, and can provide service to areas where conventional vehicles cannot access.
- Smaller vehicles improve the perception that transit is a needed and warranted service by increasing how full each bus is. A standard bus with 10 customers will look empty. A smaller vehicle with the same number of customers will look full and will provide a different perception of the utilization of transit. Lethbridge Transit will have several 30' conventional buses to use in 2017 which may be the best of both worlds in terms of both functionality and perception.
- Vehicle size could change during the day depending on the demands. For example, the ridership of a route during the day might require standard buses but in the evenings the demand may be such that a smaller vehicle makes more sense. This is dependent on variable scheduling for both operators and fleet which may be a goal for the future.

The vehicle increases are based on the premise that the spare ratio (number of buses required to offset daily maintenance and long term rehabilitation) declines over time. The current spare ratio of 40% is far above any industry standards which vary from 15% in smaller systems to 20-25% in larger systems (depending on the speciality nature of the vehicles). This is most probably due to the lack of maintenance staff or hours which means that vehicles are being used as a substitute for personnel.

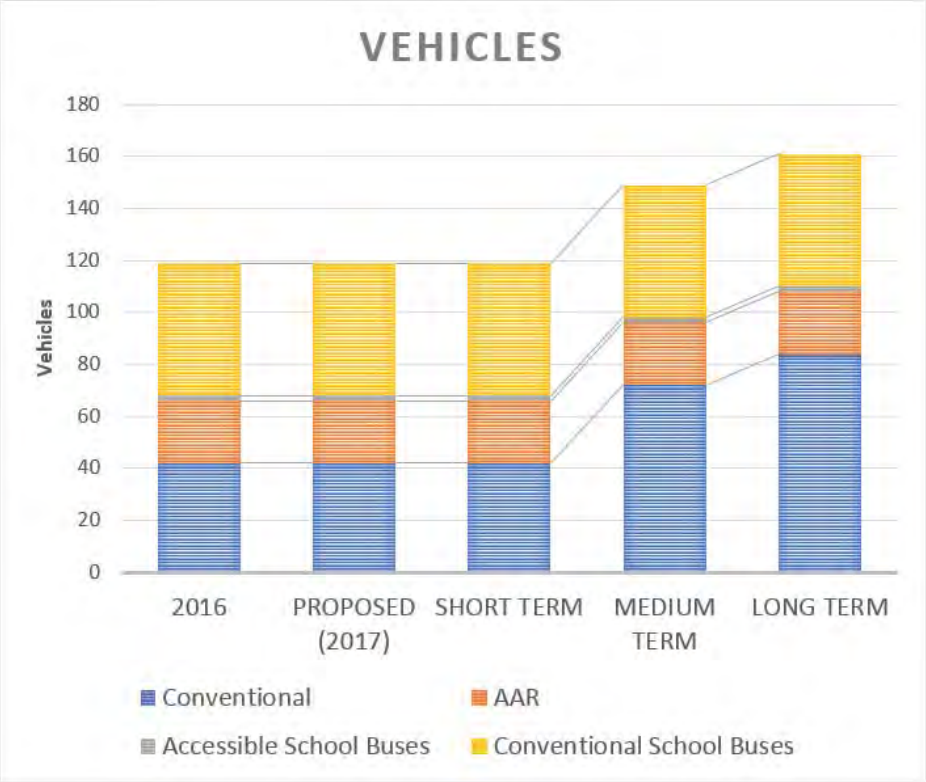
Table 20: Proposed Fleet Changes by Phase

	2016	PROPOSED (2017)	SHORT TERM	MEDIUM TERM	LONG TERM
Total Conventional Vehicles	42	42	42	72	84
Peak Vehicle Requirement	25	25	27	58	68
Total AAR Vehicles	24	24	24	24	24
Total AAR Hours	44,930	44930	44,930	44,930	44,930
Accessible School Buses	2	2	2	2	2
Conventional School Buses	51	51	51	51	51
Total Vehicles	119	119	119	149	161
Conventional Transit Revenue Hours	103,400	103400	103,900	178,200	232,900

In the Medium and Long Term, the spare ratio declines to industry norms at around 19% but is offset by an increase in maintenance staffing as noted in the following section.

Figure 48: Vehicle Changes by Phase

	2016	PROPOSED (2017)	SHORT TERM PHASE	MEDIUM TERM PHASE	LONG TERM PHASE
Total Conventional Vehicles	42	42	42	72	84
Spare Vehicles	17	17	15	14	16
In service Transit	25	25	27	58	68
Spare Ratio	***40.48%***	***40.48%***	***35.71%***	***19.44%***	***19.05%***



13 Organizational Resilience

As the system matures and moves from a small agency towards a medium size sophisticated transit agency, there are changes required in both internal processes and the personnel required to make the transition and move forward.

An internal review in 2015 noted that the current compliment of Transit managers were overloaded, which affects their ability to perform all the tasks required daily. Implementing a new network will further add pressure on staff. Managers currently spend a lot of their time on clerical tasks, typical in a small agency where there are gaps in personnel that must be filled by existing staff. As noted in briefs to senior executive and council, it is proposed that the staff compliment increase by four overall:

- An additional Manager to spread the work load
- Increasing one financial part-time position to full-time
- With the increase in the number and complexity of electronics in buses, an electrical repair technician is required in the short term which some agencies upgrade to an electrical engineer in the longer term
- An additional full-time clerical assistant

When assessing the need for additional human resources, the increase in the number of vehicle and revenue hour per phase is used as a reference. The Short Term sees the start of staffing increases in accordance service increases. With expansion of the system, both in terms of service hours (service delivery) and vehicles (maintenance), additional staff will be required.

Figure 49: Staffing Changes by Phase

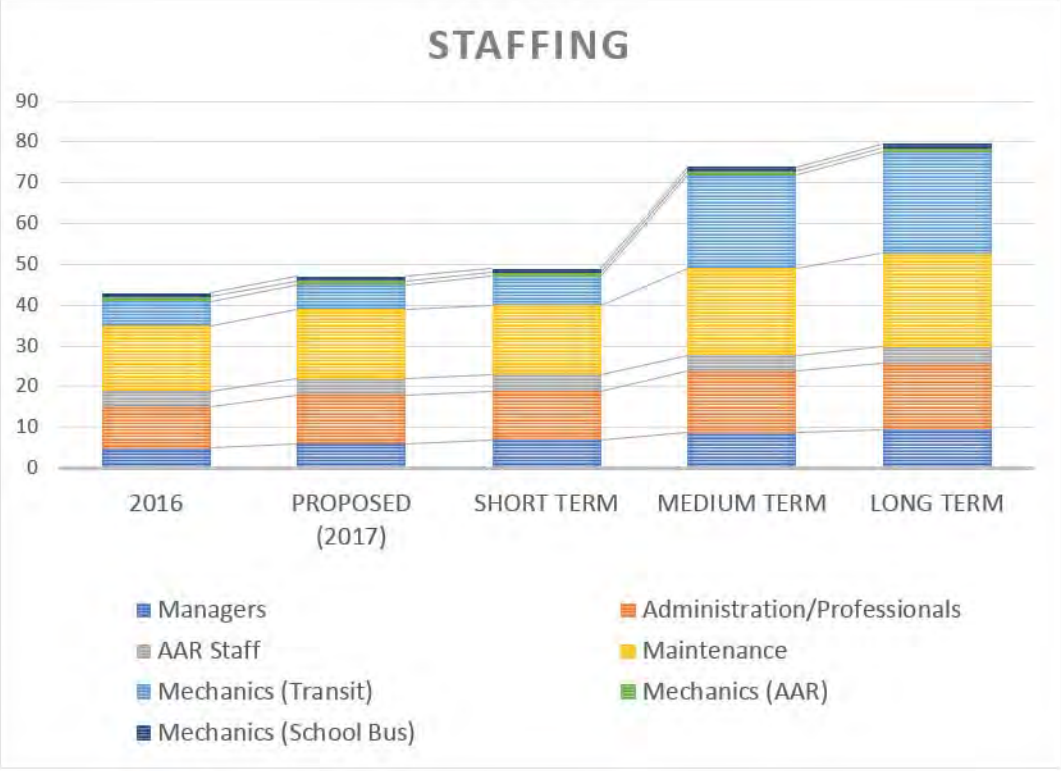


Table 21 shows the current and Short Term phase staffing. The Proposed 2017 Column reflects the increase in personnel by 4 staff. Using standard calculations in terms of persons per bus in the system based on 2017, the three phases have new personnel totals calculated. With the increase in vehicles and service hours, staffing increases to 49 in the Short Term, 74 in the Medium Term and 80 in the Long Term

The current bus/mechanics ratio is 14:1, which is extremely high when compared to comparable peers and industry standards that range between 5:1 and 7:1. For the purposes of this study a ratio of 6:1 was used starting in the Medium Term with the potential to start the transition to more maintenance staff in the Short Term. Although the chart shows a single mechanic devoted to AAR and School Bus services, the reality is that as work load increases, the mechanics are assigned work regardless of the type of bus.

Table 21: Staffing Changes by Phase

Lethbridge Transit Staffing	2016	PROPOSED (2017)	SHORT TERM	MEDIUM TERM	LONG TERM
Managers**	5	6	7	9	9
Administration/Professionals***	10	12	12	15	16
AAR Staff	4	4	4	4	4
Maintenance Staff*	16	17	17	21	23
Heavy Duty Mechanics (Transit)	6	6	7	23	25
Heavy Duty Mechanics (AAR)	1	1	1	1	1
Heavy Duty Mechanics (School Bus)	1	1	1	1	1
Total	**43**	**47**	**49**	**74**	**80**

** 2017: additional Electrical Repair Technician due to increased use of electronics on buses*

*** 2017: additional Manager to address overloading of existing personnel*

**** 2017: convert part time adminstative postion to full time and add an additional financial staff member*

14 Fare Review

The broad objective of the fare strategy is to consider the role of fares in achieving the transit system's objectives and Lethbridge's objectives overall. This includes guidance to balance the potentially competing objectives of increasing revenue and increasing ridership.

Transit exists as a public good, meaning that its role is broad and typically includes an obligation to serve social and economic objectives and to support affordability and equity in the community, yet there is a cost to provide service, and fares typically are intended to cover a portion of these. Transit also exists with business objectives and must operate efficiently, achieving set targets, yet with subsidized fares, it is difficult to make all decisions without some distortions.

14.1 Existing Fare System

The existing fare system segments the transit market by age groupings, as presented in the following table. Cash, tickets, and passes are all stored on the Breeze Card, the Lethbridge Transit smart card (Cash doesn't necessarily have to be stored in the Breeze Card).

Table 22: Existing Fare Structure

Classification	Adult	Youth	Post Secondary	Senior
Eligibility	Age 18-64, non-student	Age 6 - 17	Registered Student*	Age 65+
Cash Fare	$3.00	$3.00	$3.00	$3.00
Day Pass	$7.50	$7.50	$7.50	$7.50
10 Rides	$22.50	$21.00	$22.50	$21.00
Monthly Pass	$77.00	$62.00	$77.00	$28.00
School Year (Youth) / Semester Pass (Post Secondary)	-	-	$289.00	-
Yearly Pass (January to December 2015)	-	-	-	$280.00
Breeze Card Fee (new & replacement)	$5.00	$5.00	$5.00	$5.00

* University of Lethbridge/Lethbridge College

Using a smart card as the Breeze Card provides advantages for Lethbridge. It provides the potential to plan smarter due to the availability of ridership data, and to implement smarter pricing based on enhanced usage data. Reductions in the cost of handling cash also represent a benefit of a prepaid fare systems including a smart card system.

However, there are several barriers that are currently limiting the usage rate for Breeze Cards. These include:

- There is a $5.00 charge for the card
- No discounts for single trip fares paid by Breeze Card
- There is currently no web-based tool to reload the card[1]

[1] A web-based tool is in development.

- Customers cannot set up an automatic or subscription service to repurchase passes each month or automatically refresh multi-ride passes
- Breeze Cards must be renewed periodically requiring a trip to either City Hall or the Lethbridge Transit Office

When comparing with cash fares, passes have a "breakeven" number of trips where the pass becomes a better value than the equivalent cash fares. For example, for adults and post secondary students the 30-Day pass requires 26 trips to be a better value than paying cash, or 13 days each with two one-way trips. Assuming a typical full-time, five-day per week commute to work or school with 10 one-way trips and no other trips each week, each trip would cost $1.80 representing a 20% discount from 10-Ride Passes.

Transit systems typically used prepaid and pass discounts to encourage loyalty and to reduce operating costs. They may also be used to achieve social policy objectives where there is funding and a mandate. Currently the system's prepaid discounts are uneven and may not be achieving specific objectives.

14.2 Peer Review

To develop an understanding of how Lethbridge Transit fares compare with fares in other Canadian cities, a peer review collected data from the Canadian Urban Transit Association's *2015 Canadian Transit Fact Book*. For comparison, the peer group analysis compares performance with the cities in CUTA's Group 4, with population of 50,000 - 150,000. The analysis also includes Saskatoon and Regina - two larger cities that Lethbridge is often compared to.

14.2.1 Cash Fares

- Overall cash fares in Lethbridge are higher than most peer cities in all age ranges.
- Children's cash fares are also in the most expensive quarter among peers while almost half of the peer cities offer a discount for children's cash fares Lethbridge's does not cash fare discount for children.
- Student and senior fares show similar patterns and it is notable that about 1/4 of systems offer a discount for student cash fares and about 1/3 offer discounts for senior cash fares.

14.2.2 Prepaid Fares

Most cities offer discounts to encourage loyalty through purchase of multiple trips. In Lethbridge, the adult rate is $2.25, a 25% discount from the cash fare. In most cities, the incentive to use multiple trip tickets is less than 20%.

14.2.3 Passes

The most significant discounts are generally provided at the highest levels of loyalty. All the peer systems offer a monthly or 30-day pass with discounts, and these discounts are typically greater than the discounts for tickets. Lethbridge provides lower discounts for students than most cities (none for 30-day passes and 6% for the semester pass), and deeper discounts than most for seniors in both the 30-day and annual pass programs.

14.2.4 Other Products

Several cities have other passes such as summer passes, social subsidy passes or commuter passes for access to other transit systems in cities close to major metropolitan regions. Those products do not exist in Lethbridge.

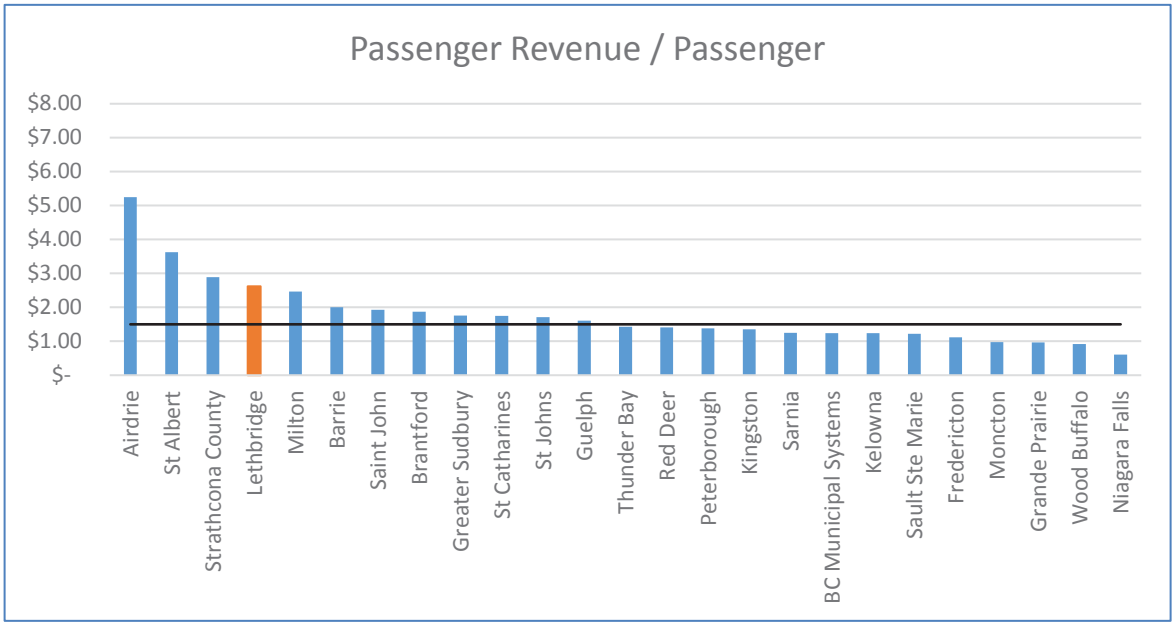
14.2.5 Farebox Recovery

One measure that is often reported for transit systems is the farebox recovery rate. This is not a measure of productivity but is a more nuanced measure that reports how much revenue passengers return to the system on average. Because transit is funded as a public good, cities in North America, and in most other places, employ beneficiary-pay models in which customers (riders) and the public share in the cost of transit.

Communities typically expect to pay a greater share of transit when it is providing a social service function, such as coverage based transit and custom transit (Access-A-Ride). For services that provide a ridership service and are a viable alternative to driving, communities may expect riders to pay a greater share of the cost. It is not unusual, though, to see even these fares subsidized significantly to encourage changes in behaviour.

Lethbridge recovers approximately $2.62 per passenger trip, among the highest in the peer group.

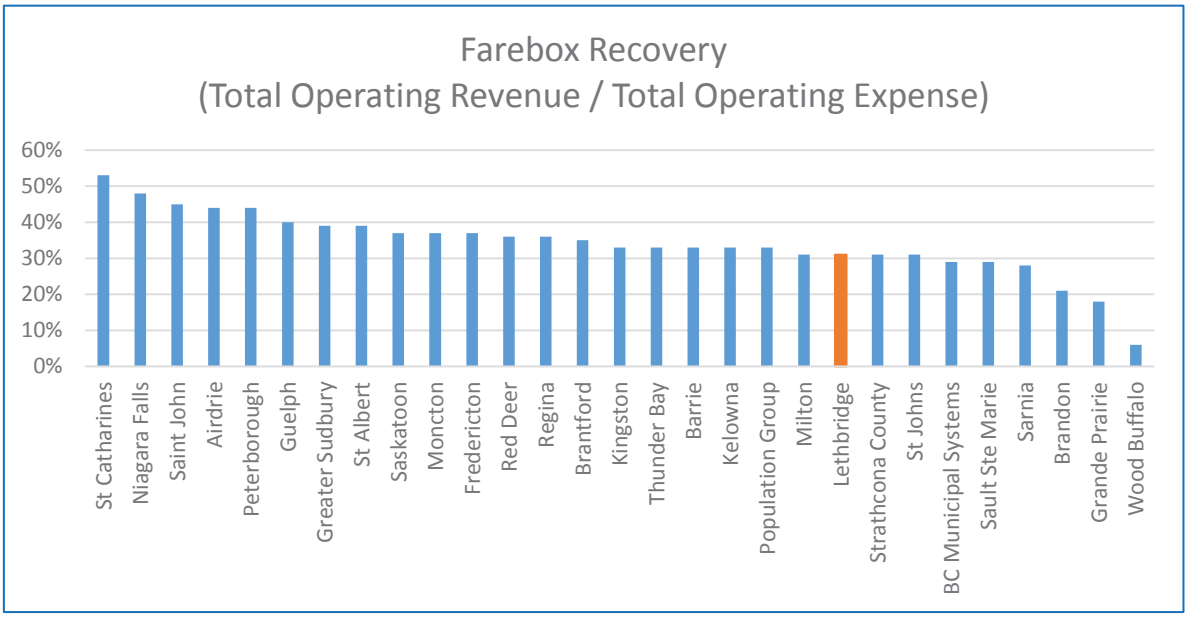
Figure 50: Average Fare



The calculation of overall farebox cost recovery is the measure of total operating revenue (fares) divided by total operating cost.

Among the peer group, cost recovery typically ranges between 30% - 40% of cost. At 31%, Lethbridge is at the lower end of this despite having higher fares and higher per-passenger revenue than many other cities. It could be possible that the relatively high fares play a role in suppressing both transit demand and revenue.

Figure 51: Farebox Recovery



14.3 Fare Considerations

There are several criteria for setting fares used widely by many transit systems. The Transit Cooperative Research Program (TCRP) has identified three main objectives when setting fare policy and pricing[2].

- To increase transit ridership in, or shift ridership to, the periods of the day or days of the week when service is underutilized.
- For improved revenue handling efficiency and control.
- To improve fare equity among users.

Cities typically must decide between revenue objectives and ridership objectives since they may be competing objectives. To increase ridership in support of broader community objectives, many cities choose to have higher subsidies of transit; these may continue for long periods while land use objectives and other factors are developed.

14.4 Principles

Fare policy guidelines are established Lethbridge transit that are aligned with the objectives of the transit system as stated in the Goals and Objectives. The Goals seek a more compact urban form focused on nodes and Frequent Transit Corridors with the Frequent Transit Network serving the places where people travel most, giving residents a realistic, cost-effective transit choice for mobility, and connecting people to jobs, education, and services.

[2] http://www.trb.org/Publications/Blurbs/152419.aspx

From these Goals, the following principles are recommended for transit fares.

- Attractive - Set fares that are attractive to customers and encourage ridership.
- Clear – Design the fares to be clear and easy to understand.
- Strategic – Set fares to encourage use by market segments that have the most potential to increase their use of transit and to optimize revenue while achieving ridership objectives.
- Efficient – Promote fares that make use of technology investments such as Breeze.

14.5 Establishing Fares

As identified above, the existing fares are, among some of the highest peer fares in Canada, and yet farebox recovery is among the lowest. Transit demand is sensitive to price changes so increases should be considered carefully since they can have the unintended consequence of lowering demand, or even reducing revenue. Part of the success in achieving the improvements would also come from having strong, clear marketing to promote loyalty fares such as passes.

Based on the existing fare system, the analysis examined the potential to implement several recommendations as shown below. Further details pertaining to the recommendation are documented in Appendix G.

14.6 New Fare Approaches

Given the desire to increase the share of trips made by transit in Lethbridge and the redesign of the system to promote more direct, frequent, and legible bus routes, the fare system can also contribute to increased ridership by focussing more on attracting use. There are two areas where this can be promoted, though neither one has been analysed in this project:

- Among market segments that have more potential to increase their use of transit, especially post-secondary students
- During times and in places where there is excess capacity, so additional demand can be carried at little or no additional cost

15 Bus Stops

Today, Lethbridge has 590 bus stops, some of them offering bench and/or shelter to improve customers experience. As benches and shelters are managed by the advertising company Pattison, the location is based on advertising potential instead of customer's needs or comfort. Once the contract with Pattison expires, Lethbridge Transit intends to manage and own the bus stop benches and shelters, giving Lethbridge complete control.

The implementation of a new network likely means that some bus stops might need to be relocated, others removed and new ones installed. There are several factors that should be taken into consideration when determining the provision of amenities at bus stops. The primary consideration is the type of route that will serve each bus stop. Based on best practices, the following guideline should be followed:

- Community route: ~ every 150 metres
- Local route: ~ every 400 metres
- Frequent route: ~ every 800 metres

Urban typology, space availability, and major trip generators can influence the location of bus stop; sometimes necessitating smaller bus stop spacing, for example in commercial areas, and other times a larger spacing to allow connections and transfers with other routes. Pedestrian facilities around a bus stop should also be considered: an accessible stop should have a direct link to a sidewalk and adequate space to allow exiting for a bus using a ramp.

Due to budget considerations, it is nor feasible to provide a shelter at every bus stop. Decisions to implement additional facilities (such as shelter, bench or customer information) at bus stops should be guided by:

- Ridership levels
- Environment conditions such as windy locations
- Potential longer customer waiting times, for example at transfer points
- Space availability
- Customer profiles such as seniors and children
- Desired impact (for example custom shelters in high visibility areas such as Downtown to project a positive transit image)

Lethbridge currently has standard bus shelters. With the severe weather conditions of the City, heated shelters could be an interesting option to pursue for implementation at major bus stops. Although some cities opt to develop their own individualized heated shelters to create a unique image, simple heated shelters can be acquired at lower cost from a variety of vendors. The Regional District of Wood Buffalo has recently installed heated shelters to address winter conditions making transit more attractive and pleasant to use. The challenge is always to prevent these shelters from becoming temporary homes for displaced persons.

The decision to implement heated shelters as well as selecting the appropriate type, should be carefully analyzed due to the cost of implementing and ongoing annual heating cost. Bus stop utilization (boarding passengers) is probably the best parameter to evaluate alternative locations and type of shelter (individualized vs industry standard).

16 Technology Review

16.1 Overview

The use of technology is evolving rapidly in public transportation. Technology has made public transportation more effective and efficient and is enabling riders to personalize their riding experience.

Wireless technology has been especially influential in this change. Riders now can locate the nearest transit service to their location, to know when the next vehicle will arrive and to pay their fare. Technology has also introduced choice into the travel decision. Ride hailing and car sharing services are now real options to the use of transit service because of their use of technologies.

Lethbridge Transit understands the influence of technology on its core services as well as the influence that technology has on the ways in which its riders use its transit services. **The agency has already adopted many of what are considered industry best practice technologies including real-time customer information and the Breeze Card electronic fare management system.**

What is required for the next generation of Lethbridge Transit technology is to develop innovative technological solutions that continually enhance the rider experience while providing data and data analytics to help make Lethbridge Transit services sustainable, both financially and environmentally.

16.2 Emerging Technologies

There is a plethora of emerging transportation technologies which are already impacting provision of transit service around the world. This section outlines some of the major ongoing developments in ITS technology from agencies around the world and those technologies that will certainly be part of Lethbridge Transit's future.

16.2.1 Mobile and Open Payments and Account Management Systems

The number of transit payment options has increased with mobile payments, open payments and more. Agencies can now choose between operating branded fare cards (such as Breeze Card); contactless open payment systems (which allow the use of non-affiliated credit and debit cards); mobile phones; wearables or other smart tokens (easily portable devices which can display and transit balances, connect to other devices via near-field communication or Bluetooth, etc.), such as the Barclaycard in London, UK; digital ticketing systems with video-based assistance, such as the NextAgent system in Essen, Germany; smart stations (which provide integrated ticketing platforms enabling connections to other transportation modes such as commuter rail or taxis); or region-wide fare cards which can be used across transportation modes and platforms, such as those used in Sweden and Scotland.

The other payment system often overlooked is account management systems which are proving to be very effective for the delivery of certain types of services and for certain types of riders. Account management systems are perfect payment solutions for riders of accessible services who are seniors and the disabled that may have challenges using traditional fare products. Mobile and open payment systems can communicate with a back office or central management system to validate the rider's eligibility to ride the service and to deduct the value of the ride the rider is taking from a prepaid account. In addition to accessible service programs, account management payment systems work well with commuter rail and bus programs where riders received some form of subsidy from an employer.

16.2.2 Loyalty Programs and Time-of-Day Pricing

The introduction of smart and mobile fare payment has enabled transit agencies to introduce more complex fare schemes without unduly confusing passengers or significantly impacting the time required for passengers to pay fares. Loyalty programs, such as those introduced in Minneapolis, Connecticut, and Montreal, encourage passengers to increase transit use and/or promote monthly pass purchases by providing financial incentives in the form of discounted transit rides or discounts at local businesses. Of note is a Loyalty Program for the Open Payment Program of the Southeastern Pennsylvania Transportation Authority in Philadelphia. This loyalty plan rewards riders, by tying their use of transit service to several retail loyalty programs of Philadelphia area merchants.

Similarly, smart payment systems greatly simplify introduction of time-of-day pricing, which can be used to incentivize passengers to travel during off-peak hours. Cities across the United States and around the world have introduced a variety of time-of-day pricing schemes, including surcharges for peak travel, discounts for off-peak travel, surcharges based on the direction of travel, and others. Where implemented, time-of-day pricing has met with varying degrees of success.

16.2.3 Radio Frequency Identification Devices (RFID)

RFID devices have numerous applications in transportation operations. They can be used to assist with AVL systems or real-time information in key locations (for example, where GPS reception is poor); management of bus refueling and data related to engine performance, vehicle kilometres traveled (VKT), etc.; automatic reporting of maintenance requirements or equipment failures to maintenance staff; and guidance or provision of traveler information for visually impaired passengers. Finally, smart (i.e., fare) cards equipped with RFID devices can also be used to facilitate gateless fare payments on rapid transit corridors.

16.2.4 Electric Buses

Electric vehicle technology is in the midst of a series of quick development cycles, with battery-electric technology (as opposed to hybrid-electric technology) undergoing significant improvements. Transit agencies across Canada and around the world are starting to take advantage of these improvements. US transit in agencies in California have purchased more than 500 pure electric buses, Winnipeg purchased a handful of battery-electric buses in 2014, and Windsor (ON) and Quebec City are currently considering purchases of battery-electric bus fleets. Further, transit agencies in Seoul (South Korea) and Milton Keynes (UK) are testing in-

pavement wireless charging technology to enable buses to travel continuously, with no downtime required for charging.

16.2.5 Automated Vehicles

There is considerable hype surrounding the rollout of automated vehicles (AVs), with time-of-arrival estimates ranging from 2017 to 2035 or beyond. Vehicles with increasing levels of automation, such as automatic emergency braking and lane-keeping, are already available for purchase, and might be replaced with fully driverless systems within the next decade. This will affect transit agencies in multiple capacities.

First, driverless cars could be used to address first-mile / last-mile challenges associated with conventional transit (this is discussed in greater detail in the "Partnerships with Transportation Network Companies" section). Second, driverless buses could be used to cut operating costs associated with conventional transit bus routes. Third, transit agencies could employ a greater variety of vehicle sizes to better tailor service to meet local conditions: for example, neighbourhoods with low-density housing could be served by smaller vehicles which run at frequencies exceeding what is currently affordable for the transit agency Accessible On Demand Service

Accessible, on demand services can be employed in areas of low demand where it is too costly or not operationally feasible to offer conventional fixed route transit services with adequate frequencies. For example, York Region Transit offers a dial-a-ride service along existing conventional transit routes during off-peak times (evenings and weekends), as well as in locations where no fixed conventional service is currently provided. Users pay standard YRT fares, and must call at least 30 minutes in advance of desired pickup at an existing bus stop. Looking forward, establishing a dial-a-ride system, would position Lethbridge Transit well for taking advantage of driverless vehicles once they become part of Lethbridge Transit's fleet.

16.2.6 Transit as Part of Transportation Services Package

Cities are beginning to offer transit services to residents as part of a larger package of transportation services, often termed "Mobility [or Transportation] as a Service". For example, in Gothenburg, Sweden, UbiGo tested a platform to enable households to access public transit, car rentals, car-sharing, taxis, and bike-sharing services as part of a single integrated app and payment plan. Throughout the pilot study, none of the 70 households involved stopped using the service, and the majority wished to continue using the service beyond the pilot. MaaS Finland is set to launch a similar service in 2016 or 2017. Such services have the potential to attract riders to transit by making it easy for occasional riders to take advantage of pricing incentives, and to combine transportation services to address first-mile / last-mile challenges associated with conventional transit.

Transportation or mobility as a utility is gaining more traction among policy makers who consider the offering of multiple options to residents as a solution to regional congestion and accessibility challenges.

16.2.7 Partnerships with Transportation Network Companies (TNCs)

Transit agencies could partner with local Transportation Network Companies (TNCs) or other service providers to address a host of challenges. Cincinnati, Ohio and Memphis, Tennessee are in the process of launching partnerships with Uber to serve areas outside normal service areas and outside service hours, as well as providing first-mile/last-mile connections. Partnerships with TNCs could also be used to provide more affordable service to areas with minimal transit demand, or to complement, expand, or reduce costs associated with provision of paratransit services (e.g., Boston's paratransit user-subsidy pilot program).

16.3 Data Management and Analysis

16.3.1 Potential Data Analytics Initiatives

AVL, APC, AFC, Vehicle Health Monitoring (VHM) and other automated data collection (ADC) systems offer an unparalleled opportunity for transit agencies to generate, at negligible marginal cost, huge volumes of granular passenger trip data and transit operations data. Generation of such data has been commonplace for decades. Resources and skills to clean and organize the data to produce actionable intelligence, however, remain elusive, with few transit agencies to date making the most of their available data. Three challenges impede transit agencies' ability to take full advantage of ADC data:

1. Data is inaccurate, incomplete, poorly organized, or lacking documentation. This is primarily a result of data collection being treated as an afterthought, rather than a critical function, by the ADC manufacturer and database designer.

2. Lack of industry standardization in terms of data types, units, cleaning algorithms, etc. As a result, understanding and cleaning data must be completed on a case-by-case basis, with no guarantee of data quality or usefulness. Moreover, vendors are typically disinclined to design or install ADC systems compatible with systems produced by competing vendors.

3. Lack of resources at transit agencies (personnel, computing power, software). Cleaning and preparing data to facilitate meaningful analysis requires extensive effort and expertise, in large part due to challenges 1 and 2 above. Further, though the cost of computing power and data storage has decreased hugely in recent years, procuring, operating, and upgrading computer systems, including software packages, remains an expensive process.

Despite the challenges, the benefits of thorough ADC data analysis and effective presentation using Business Intelligence tools, for example, are considerable:

- Descriptive data analytics can be built in the form of customizable dashboards to enable an agency to quickly and easily explore its historical and ongoing performance using Key Performance Indicators (e.g. schedule adherence, percent seated capacity, overload events, adequacy of trip times and schedules, operator performance, etc.). Descriptive analytics can also be created to perform origin-destination (O-D) analyses.

- Diagnostic data analytics can be created to help an agency identify underperforming schedules, routes, stops, vehicles, operators, etc., as well as to identify peak travel periods, overcrowded stop locations, etc.

- Predictive and prescriptive data analytics can be used to model "what-if" scenarios, and to model what changes would be required to make "x" happen (e.g., what changes would be required to reduce cycle time from 33 to 30 minutes).

- Data mining software can be used to uncover trends and relationships, drawing correlations and associations within the data. External data sets (such as outdoor air temperature or precipitation) can be used as explanatory data to improve results. For example, analyses could be done comparing vehicle ages vs. breakdowns and maintenance costs, or an analysis of bus collisions vs. weather, operator, and time-of-day data, with results indicating which factors appear to have best correlation or explanatory power.

All of the above analytic techniques can be constructed to facilitate filtering of data for particular days, times, routes, vehicles, operators, etc.

The information which can be gleaned from in-depth analysis of operational data has the potential to drastically reduce operating costs, improve service, increase customer satisfaction, and generate greater public awareness and interest in a transit agency. For example, the MBTA in Boston, Massachusetts, maintains a publicly available website[3] displaying several dashboards related to system performance, including ridership, reliability, financial performance, and customer satisfaction. Providing such dashboards not only obliges the MBTA to track each of the above metrics, but it also lends the agency a degree of transparency and accountability.

Given that Lethbridge Transit's data is already being used to inform GTFS real-time data feeds, it is likely that much of the preparatory data cleaning is already being completed. This provides an excellent platform for building additional analytics tools, such as those described above.

[3] http://mbtabackontrack.com/performance/index.html#/home

17 Access-A-Ride Review

17.1 Service Overview

The mission of the Access-A-Ride (AAR) service is to serve the mobility needs of those individuals who, because of their disability, are unable to use conventional transit services. The current fleet of AAR vehicles consists of 22 cutaway in-service buses (plus seven spares). Most these vehicles are low-floor with the remainder being equipped with lifts.

AAR services are offered Monday to Saturday, between 7am and Midnight, and on Sunday between 8am and 10 pm. Currently over 70% of the trips are taken by agency-affiliated subscription customers.

17.2 System Performance

The following table summarizes the performance measure of the AAR service (2015).

Table 23: AAR Performance Measures

Performance Measure	
Total Trips*	108,300
Total Operating Cost	$2,205,500
Operating cost per revenue hour	$49.09
Trips per hour (trips/hour)	2.4
Cost per hour/trip	$20.37

*Excludes Personal Care Attendants and companions

The following table provides a comparison of system performance of peer custom systems:

Table 24: AAR Peer Comparison

City	Population	Annual Trips*	Cost Per Trip	Trips per hour	One-Way Fares
Guelph, ON	121,668	49,792	$33.15	3.38	$3.00
Thunder Bay, ON	109,000	74,602	$25.28	2.5	$2.75
Milton, ON	100,000	15,496	$15.19	-	$3.50
Brantford, ON	94,586	61,855	$29.26	2.53	$3.00
Strathcona County, AB	92,490	18,234	$32.42	-	$5.00
Lethbridge, AB	**95,000**	**116,119***	**$19.00***	**2.41**	**$2.90**
Rocky View County, AB	87,701	20,211	$40.67	-	Variable
Sarnia, ON	71,420	32,556	$24.65	1.7	N/A
St. Albert, AB	61,970	10,739	$44.91	6	$3.25
Average	**92,093**	**44,400**	**$29.85**	**3.42**	

*Includes Personal Care Attendants and companions for purposes of comparison

System strengths:

- Reasonable cost per trip compared to peers
- Fleet allocation matches well with ridership throughout most hours of the day, (excepting AM & PM peaks)
- Salary parity for operators is a positive practice to reduce operator turnover
- Improved program oversight since joining the Lethbridge transit fleet
- Steady improvement in using scheduling software
- Recent addition of same day service availability is a positive step.

System weaknesses:

- Current eligibility screening process rudimentary, not meeting industry practice
- Results in high proportion of residents using the service as compared to cities of similar size
- Very likely a portion of riders could use conventional transit for some trips
- Current “unmet trip/denial” rate does not accurately reflect capacity constraints.
- 70% subscription rate during weekdays means capacity often not available for same day or occasional trips particularly during AM and PM peaks
- Times of day when non-agency/non-subscription riders know not to expect service
- Lower fares a disincentive to use conventional transit

- Lack of clear service and eligibility parameters creates confusion for customers/staff
- Novus scheduling system needs to be re-evaluated
- Productivity on low to medium end of range, given high proportion of subscription service (direct correlation with design of the conventional)

17.3 Recommendations

17.3.1 Short Term

- A decision is required on the exact purpose of Access-A-Ride services, i.e.:
    - transportation for seniors/others affiliated with agencies, OR
    - transportation for people with disabilities who cannot use conventional service
- Significant overhaul of the eligibility policy and protocols is required
- Eligibility criteria need to be more clearly defined, and client tracking procedures need to be developed
- Performance indicators need to be defined, e.g. trip denials; negotiation windows
- Develop and enforce an effective no-show policy
- Ensure conventional service is customer friendly for people with disabilities (driver training, maintenance of accessibility features, calling out stops etc.)
- Major revision of the User Guide is required
- Recruit travel trainees and undertake travel training of AAR applicants
- Review impacts of Conventional and Access-A-Ride fare structure
- Ensure community involvement in the revision of policies and eligibility criteria

17.3.2 Long Term

- Optimize vehicle type and size for flexibility and efficiency to guide future fleet purchases
- Explore cost sharing options with agencies who utilize Access-A-Ride for their clients on a subscription basis. Currently Lethbridge Transit is paying the full cost of providing these services
- Explore private taxi options for low demand and non-productive hours

Full details of the analysis and recommendations for the AAR service is incorporated in Appendix F.

18 Potential Revised AAR Registration Process

18.1 Introduction

A revised client registration process has been developed and successfully implemented in various transit systems across north America to:

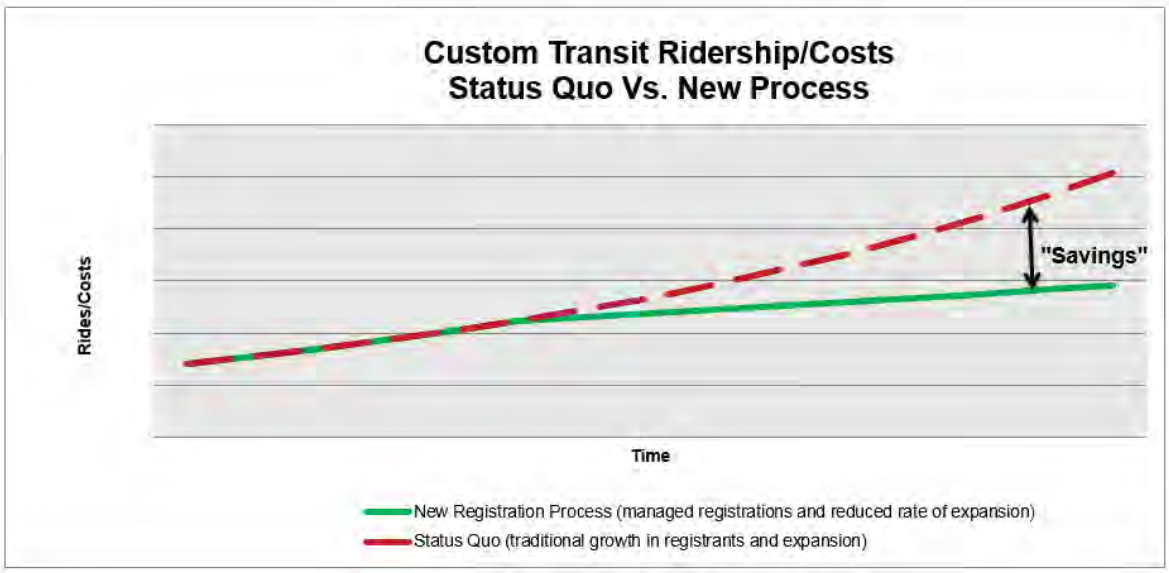
- manage the rate of investment in custom service provision (vehicles, revenue hours, subsidies)
- reduce the volume of unmet trip requests
- best manage the supply (availability) of accessible services to the demand for the service

The response to registration process has been positive in the majority of communities that have implemented it thus far - some seeing a reduction in registrations and most ridership bases remaining stable (rather than increasing). This has led to the decrease in the number of unmet trips.

18.2 Scope

The overarching objective of this revised custom transit eligibility process, now an industry best practice across North America, serves to ensure that those people who are prevented from using conventional transit services due to a disability, can access the appropriate service, to get to and from wherever they need to go in the community. It is intended to ensure that the service is available for those who really need it, due to a permanent or temporary disability, and do possibly not have alternative travel options.

It is recognized that as the population of seniors continues to rise, the demand for these services will continue to rise.



Ongoing estimated savings = rides not delivered/deferred service expansions

18.2.1 Challenges

- As more people gain access to Access-a-Ride services, it gets harder for many to book and get trips they really need
- Unmet trips are increasing
- Difficult to get trips at peak times
- As registrations and thus service area expands, fewer trips can be delivered

18.2.2 The Transit Response

To address the realities, a toolbox of measures has been deployed:

- Establishing a 100% low-floor accessible fixed-route, conventional transit fleet
- Reviewing custom service area boundaries
- Implementing a no-show policy
- Improving scheduling efficiencies
- Upgrading scheduling software
- Improving the client registration process
- Providing travel training to those customers that are able to use accessible, conventional transit services

18.2.3 Potential Process

- Applicant submits application to Access- A-Ride office (as normal)
- Office reviews application for completeness and forwards to an Occupational Therapist (OT) that is approved to conduct mobility assessments
- Applicant attends an in-person mobility assessment that includes:
  - providing an overview of Access-A-Ride rules and regulations
  - general education about the fixed route transit system specifically as it pertains to accessibility and safety (around mobility aids)
- The OT assesses the person's physical and cognitive abilities to use public transit to make one of four eligibility recommendations:
  - *Unconditionally eligible*: the person is fully eligible for custom transit service for a three-year period. Thereafter they are re-evaluated to confirm whether their condition and needs have changed
  - *Conditionally eligible*: the person is eligible for custom transit under some conditions (e.g. eligible in winter months only)
  - *Temporary eligibility*: the person is temporarily eligible for a period of time (usually for recovery purposes)
  - *Ineligible*: the person is ineligible for custom transit service and, is deemed to be fit to use conventional transit services. The outcome is communicated to the applicant and those not being "unconditionally eligible" have the option to appeal the decision.

18.2.4 OBSERVATIONS

From several registration projects implemented in British Columbia by BC Transit, if has been found that:

- Approximately 65-70% of applicants are unconditionally eligible, 10-15% are conditionally eligible, 10-15% are temporarily eligible, and 2-5% are ineligible
- Only 2 to 3% of applicants appeal their eligibility
- An "application abandonment" rate of 10 to 15% has been observed. Anecdotally it has been identified that large numbers of these applications are based on the convenience factor of door-to-door service and the risk of a face to face assessment exposing their true abilities