Kelowna Transportation Master Plan

Existing and Future Conditions
Technical Report

August 2019

City of Kelowna

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Executive Summary

a) Purpose of the Report

This report provides an overview of existing conditions along Kelowna's transportation network in 2019 for walking, biking, transit, and driving. It also examines what the future conditions for these modes might look like, out to 2040. In addition, emerging shared mobility options, transportation programs and external air, water and highway connections are discussed.

This Technical Report will inform development of the Transportation Master Plan. It is intended to be used as a reference document that serves as a resource for looking up data related to various aspects of the current and future performance of Kelowna's transportation network.

b) Summary of Future Changes

By 2040, Kelowna is projected to grow by 50,000 residents. In accordance with the Imagine Kelowna Vision and the 2040 Official Community Plan (OCP) endorsed Growth Scenario, 67 per cent of residential and 75 per cent of employment growth will be focused in Kelowna's Core Area and five Urban Centres. These are areas of the City where travel options like transit, walking and biking are increasingly becoming viable alternatives to driving. The remaining growth (33 per cent of residential and 25 per cent of employment) will occur in outlying suburban areas, including hillside neighborhoods that are mostly car-dependent. In addition, changes to transportation technology, demographic shifts, and changing weather patterns mean that transportation in 2040 will likely be very different than it is today.

c) Coordination with Other Plans

Development of the TMP is occurring in coordination with development of the 2040 OCP and the 2040 Servicing Plan and Financing Strategy. These plans are being developed in parallel using Imagine Kelowna as a foundation, and will work together to support our growing City, while minimizing future challenges. While population growth will necessitate substantial future investment to maintain Kelowna's quality of life, the 2040 OCP endorsed Growth Scenario will help mitigate future costs by focusing transportation and infrastructure investments in locations that benefit a high number of people and yield strong returns on investment

d) Central Okanagan Regional Travel Model

To prepare a Transportation Master Plan it is necessary to develop a baseline scenario for the future against which potential investments can be evaluated. To prepare this baseline, staff used the Central Okanagan Regional Travel Model, which is a traditional transportation planning tool that uses assumptions about population growth, land use and the transportation network to estimate future vehicle traffic volumes. In addition, the transportation model also considers human factors, including resident travel behaviors and travel mode choices when generating projections, making it more complex and less flexible than other infrastructure/utility forecasting tools.

In regions where most trips are made by cars, travel models are less accurate at projecting future pedestrian, biking and transit trips and impacts. This is because traditional travel models do not account well for potential changes in traffic flow or travel behavior that may result from significant improvements in transportation technology or improvements to the bicycle, pedestrian, transit or

shared mobility options available. For emerging transportation technologies, projections are even more limited. Travel model results should be interpreted keeping these limitations in mind.

To create the 2040 TMP Baseline Scenario, the 2040 OCP endorsed Growth Scenario was used in combination with the existing transportation network. A limited number of road improvement projects currently within the 10-Year Capital Plan were also included. These have an approximate value of $43 million and include projects that are currently underway and/or are very likely to be constructed by 2040, such as South Perimeter Road. This approach of including some, but not all, of the improvements in the 10-year Capital Plan represents a balance between a no future improvement scenario (which would have resulted in an overly pessimistic projection of the future), and a scenario that included all currently planned projects (which would have left the TMP without much flexibility to address emerging issues). Projects not included in the 2040 TMP Baseline Scenario will be considered as part of the TMP evaluation process.

e) 2040 TMP Baseline Scenario

The 2040 TMP Baseline Scenario reflects a future in which Kelowna grows in accordance with the 2040 OCP Growth Scenario but does so in the absence of a Transportation Master Plan to guide future investment in infrastructure, policies and programs. Travel behaviors are assumed to remain the same as today and are estimated primarily as a function of travel time and cost. Traffic volume estimates are for the weekday afternoon peak, which typically represents the most congested period on Kelowna's transportation network. The purpose of creating this scenario is not to predict the future, but rather to create a baseline for the identification and evaluation of potential investments during Phase 3 of the Transportation Master Plan.

Citywide Results

Under the Baseline Scenario it is projected that 58 per cent of the intersections in this study would be at or over capacity in 2040 (compared to 10 per cent today). Additionally, the total amount of vehicle kilometres travelled (VKT) in the City would grow by approximately 40 per cent, total vehicle hours (time spent driving) would grow by approximately 70 per cent, and average travel speeds would fall by approximately 15 per cent. The greater increase in vehicle hours travelled compared to vehicle kilometres travelled, as well as the reduction in average travel speeds, indicates greater levels of traffic congestion under this future scenario.

To put this in context, Kelowna's population is projected to grow by 39 per cent over the same period. While total VKT is projected to increase in pace with population growth, VKT per capita is projected to fall by 5 per cent. This decrease reflects the endorsed Growth Scenario's focus on targeting future growth in Kelowna's Cora Area and Urban Centres. As travel distances shorten, people living and/or working in the Core Area and Urban Centres will be able to walk, bike or take transit more easily, and when they do drive, they will not have to drive as far as residents living in car-dependent hillside neighbourhoods on the edge of town. While the total amount of VKT and congestion levels are still projected to increase citywide, the increase will be much less than it would have been under a more dispersed growth scenario.

Subarea Results

The 2040 TMP Baseline Scenario shows that future travel demand and traffic patterns will vary in different parts of the City. Some future trips will be inherently car-dependent, while others will be

easier to accommodate using more space-efficient and sustainable travel modes. Overall, traffic is projected to become busier and more complex within the Core Area, where residents commuting in and out of car-dependent hillside neighbourhoods will compete for limited roadway space with Core Area residents who will have options to get around using a variety of travel modes. More focused projections of future travel patterns in different subareas of the City are provided in Chapter 4d – Driving.

f) What is Traffic Congestion?

With traffic levels projected to increase under the 2040 TMP Baseline Scenario, it is important to understand what traffic congestion is and potential options for managing it effectively. In economic terms, traffic congestion happens when the demand for roadway space exceeds the supply. Due to the way society is organized, this typically occurs during the morning and afternoon peaks, when most people need to travel to work and/or school at the same time. This means that increasing congestion levels are often a sign of a growing, vibrant and economically productive city. In fact, traffic levels often become heaviest when the economy is booming and notably recline during a recession[1]. As such, one way to view traffic congestion is as a sign of prosperity and economic success, rather than a wholly negative phenomenon.

However, nobody likes being stuck in traffic. Inching along congested roads in a vehicle capable of going over 100 kilometres an hour is an inherently frustrating experience. Often the response by communities to increasing traffic congestion is to increase roadway capacity by building new roads and widening existing ones. However, as discussed in The Congestion Paradox Facts in Focus discussion paper, this approach can be expensive and ineffective over the long-term, with negative community impacts.

In Kelowna, the construction of new roads is constrained by steep hillsides, Okanagan Lake and protected agricultural lands. In the Core Area, there is little room to widen roads without buying land, tearing down homes or disrupting local businesses. This would be expensive and physically divide existing, established neighbourhoods, making Kelowna a less attractive and healthy place to live. On average, the cost to widen a major road in the Core Area is estimated at $26 million per kilometer (but could be much higher where impacts to adjacent properties are significant). This means that substantial tax increases or new sources of revenue would be needed to try and build our way out of congestion.

Even if the space and funds were available, expanding roadways often reduces congestion to a smaller degree, and for less time, than initially expected. This is because when a new road opens, or an existing road is expanded, people typically respond by shifting routes, traveling at different times, traveling more often, or even relocating where they live or work. These effects are more prominent where new roads significantly reduce travel times between locations. This rebound effect, called "induced demand" by economists, can reduce the long-term congestion mitigation effects of roadway expansion projects[2], often eroding the benefits they originally sought to achieve.

While free-flow automobile travel during the morning or afternoon peaks may not be achievable in a rapidly-growing, economically successful city[3] like Kelowna, there are still a number of strategies that

[1] Downs, A. (2014). Still Stuck in Traffic: Coping with Peak Hour Traffic Congestion
[2] Ewing, R. & Proffitt, D. (2016). Improving Decision Making for Transportation Capacity Expansion: Qualitative Analysis of Best Practices for Regional Planning. Transportation Research Record, 2568, p.1
[3] Downs, A. (2014). Still Stuck in Traffic: Coping with Peak Hour Traffic Congestion

can be implemented to help reduce the rate at which traffic congestion intensifies. Strategies to help manage and minimize the growth of traffic congestion will be explored further as part of the Transportation Master Plan.

g) Keeping Kelowna Moving:

One of the most effective long-term congestion mitigation strategies is to reduce auto-dependency by providing more convenient and realistic alternatives for getting around, especially during the morning and afternoon peaks. This requires a coordinated approach to land use and transportation that shortens trip distances and creates complete, connected and safe bicycle, pedestrian and transit networks between key destinations.

Mode Shift

To help keep Kelowna moving, it will be necessary to shift as many future trips as possible to more sustainable transportation modes that can move more people in the same amount of space. The best opportunities for mode shift will be within the Urban Centres and the Core Area, where the terrain is relatively flat, and some supporting infrastructure for walking, biking and transit is already available. Increased densification will result in shorter trip distances, thus removing the primary barrier to walking and biking for nearby residents. If the City takes consistent and complementary action to ensure the transportation network provides safe, attractive and convenient infrastructure for walking, biking and transit in these densifying areas, the number of trips that are shifted to these modes can be maximized. This will help prioritize road space for trips that must be made by driving, while giving Kelowna residents more choices for getting around.

A Well-Connected, Complete Urban Street Network

Developing a permeable, well-connected, complete urban street network will also be important to keep Kelowna moving. Within the Core Area, where streets will be the busiest, streets with high traffic volumes, long blocks and limited crossings will make it challenging to accommodate growing numbers of people walking, cycling and riding transit. Additionally, streets with high vehicle speeds will require greater space and separation for people to walk and bike safely. To maximize the people-moving capacity in the Core Area and within our Urban Centres, it will be necessary to re-think our existing streets and roadway network. Developing a well-connected grid network of streets that are designed to accommodate growing numbers of people walking, biking, taking transit and driving in the future will be important.

A Progressive Approach to Congestion

As discussed in Appendix A, it will be important to seek out *healthy levels of congestion (*congestion levels that are neither impractically low nor too excessive) to keep Kelowna moving while also achieving the City's vision and goals for transportation. This approach will ensure that the unintended negative consequences of building too much road capacity is minimized, while ensuring that investments in effective infrastructure are maximized.

h) Future Challenges and Opportunities

To keep Kelowna moving, staff have identified 30 future challenges and opportunities around the themes of mode shift, developing a well-connected urban street network, and identifying a progressive approach to congestion management. These have been developed based on the review of existing and future conditions and are intended to work together to guide the development of potential projects,

policies and programs to meet Kelowna's vision and goals for transportation. Each future challenge is also envisioned as an opportunity; that is – they are two different sides of the same coin. The future challenges and opportunities are listed below. Further details can be found in Chapter 4.

Report Chapter		Future Challenge / Opportunity
4a) Walking	1	Design for Walkability in the Urban Centres
	2	Connect the Pedestrian Network in the Core Area
	3	Shift Short Trips to Walking
	4	Ensure People Walking Feel Safe
	5	Create Flexible and Adaptable Pedestrian Spaces
4b) Biking	6	Shift Trips within the Core Area to Biking
	7	Increase Perception of Biking as a Safe Mode of Travel
	8	Make Biking Accessible to More People
	9	Integrate Bicycles with Transit
	10	Build-out a Complete Bicycle Network
4c) Transit	11	Focus Growth near Frequent Transit and Ensure Multimodal Access
	12	Increase Transit Investment where Effective to Serve Growing Demand
	13	Speed Up Transit and Make it More Reliable
	14	Maximize Benefits of Technology Change on Transit
	15	Collect High Quality Data to Support Transit Planning
4d) Driving	16	Growth in Downtown and South Pandosy
	17	Continued Growth in Suburban Hillsides
	18	Increasing Travel Demand through Midtown
	19	Employment Growth Along Highway 97
	20	Reduce the Frequency and Severity of Traffic Collisions
	21	Develop a Well-Connected, Complete Urban Street Network
4e) Shared Mobility	22	Expand and Improve Bikeshare and other Emerging Options
	23	Attract One-way Carshare
	24	Prepare for the Arrival of Ride-Hailing
	25	Prepare for the Arrival of Autonomous Vehicles
4g) Programs	26	Build Community Capacity
	27	Enhance Safe Routes to School
	28	Improve Transit Passes and Payment
	29	Manage the Curb
	30	Move Toward Parking On-Demand

i)   Next Steps

Moving forward, the 30 future challenges and opportunities described in this report will be used along with input from the public to identify potential transportation projects, programs and policies for evaluation. These potential options will be shared with Council and the public for input and evaluated using a strategic decision-making framework. Ultimately, the projects, programs, and policies that are projected to do the best job of helping the City reach its vision and goals for transportation will be

brought forward as recommendations for consideration by Council. Final endorsement of the Transportation Master Plan is anticipated in summer 2020.

1. Introduction

a) Role of the Transportation Master Plan

The Transportation Master Plan (TMP) will be a long-range, system-level transportation plan for the City of Kelowna. Its purpose is to help answer the following key question:

"What are the strategic, prioritized investments (policies, programs, and capital projects) that will be needed over the next 20 years to achieve the community's vision and goals for transportation?"

The TMP will lay out a vision for Kelowna's transportation future. The plan will propose policies, projects and programs to improve transportation for residents, businesses and visitors. Developing a TMP creates a strong business case to allocate constrained resources to priority transportation investments that respond to the growth of our city and the growing complexities of our transportation system.

b) Study Process & Timeline

This current TMP responds to a pressing need, as the previous transportation master plan was completed over 20 years ago, in 1995, and is now outdated. The new TMP is being developed in five phases (see Figure 1b.1).
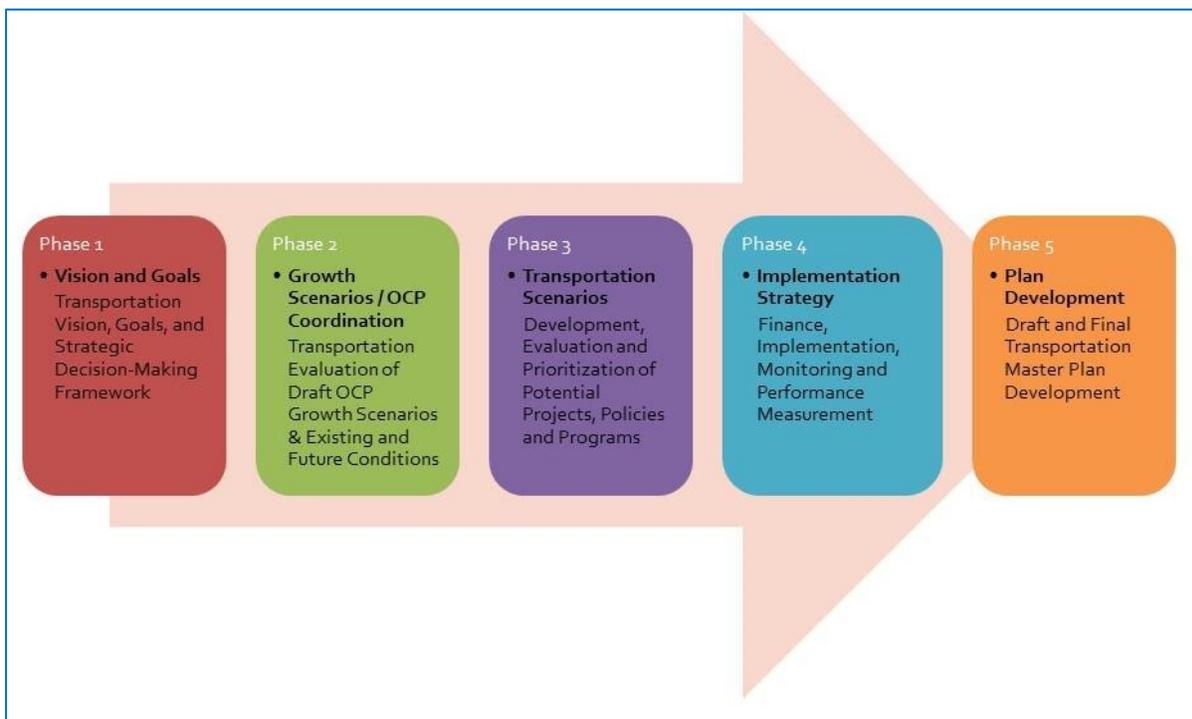

Figure 1b.1: The Transportation Master Plan phases

Phase 1 launched the plan by developing a vision and goals, derived from Imagine Kelowna and presented to the public during spring 2018. The final vision and goals that will guide the TMP are below:

TMP Vision:
"Kelowna will be a city with vibrant urban centres where people and places are conveniently connected by diverse transportation options that help us transition from our car-centric culture."

TMP Goals:

Figure 1b.2: Transportation Master Plan goals

Phase 1 also included the development of four background "Facts in Focus" topic papers for Transportation. The papers were developed to address questions and themes heard during the spring 2018 TMP public engagement. The paper topics are listed below and are available on the TMP project website.

- Transportation and Land Use
- How Transit can keep Kelowna Moving
- The Congestion Paradox
- Transportation, Technology and our Changing Future

Phase 2 of the TMP involved detailed coordination with the 2040 Official Community Plan (OCP). The TMP team provided support during the development and evaluation of the four different growth scenarios presented as part of the Pick Your Path to 2040 engagement. For each scenario, an assessment to understand the broad impacts of land use choices on the transportation system was developed, including the amount of vehicle travel, mode share, and planning-level cost ranges. On March 3rd, 2019 Council endorsed the preferred Growth Scenario, which serves as the foundation for the Transportation Master Plan moving forward.

Phase 2 also includes the development of this Existing and Future Conditions Technical Report for the Transportation Master Plan. This report has two main purposes. The first is to assess the existing multi-modal transportation network in Kelowna, including usage and performance. The second is to forecast the future performance of the network in 2040, using the 2040 OCP endorsed Growth Scenario.

This report aims to answer two questions:
1) Where are we at now?
2) Given the endorsed growth scenario, where will we be in the future?

This report begins by looking at the community context, including demographic trends, relevant plans and policies, and an overview of land use and travel patterns. This is followed by an in-depth discussion of the main travel modes in Kelowna, including walking, biking, transit, and driving. Shared mobility, external connections, and existing transportation programs and incentives are also discussed, along with anticipated challenges and opportunities for each travel mode.

The information in this report will bring the issues and challenges that the Transportation Master Plan needs to address into better focus and help identify the potential projects, policies and programs needed to achieve Kelowna's vision and goals for transportation in 2040.

c) Coordination with Other Plans

Development of the TMP is occurring in coordination with development of the 2040 OCP and the 2040 Servicing Plan and Financing Strategy. These plans are being developed in parallel using Imagine Kelowna as a foundation, and will work together to support our growing City, while minimizing future challenges. While population growth will necessitate substantial future investment to maintain Kelowna's quality of life, the 2040 OCP endorsed Growth Scenario will help mitigate future costs by focusing transportation and infrastructure investments in locations that benefit a high number of people and yield strong returns on investment.

The TMP is also being developed in coordination with the Regional Transportation Plan, Okanagan Gateway Study, Pedestrian and Bicycle Master Plan, Community Climate Action Plan and Transit Future Action Plan, among others.

d) Local and Global Trends

Kelowna is the largest city in the B.C. Interior, with a population of 136,000 people. The city's geography, climate, economy and lifestyle opportunities make it a desirable place to live. Kelowna is one of Canada's fastest growing cities and is quickly transforming from a "big town" to a "small city."

Like many small towns, Kelowna developed around the automobile and as a result, it remains the default way for Kelowna residents to get around, representing 81 per cent of trips (auto driver and auto passenger) made by Kelowna residents (see Figure 2a.1).

Share of Trips by Kelowna Residents

65%	16%	5%	8%	5%	

■ Auto Driver ■ Auto Passenger ■ Transit ■ Walk ■ Bike ■ Other
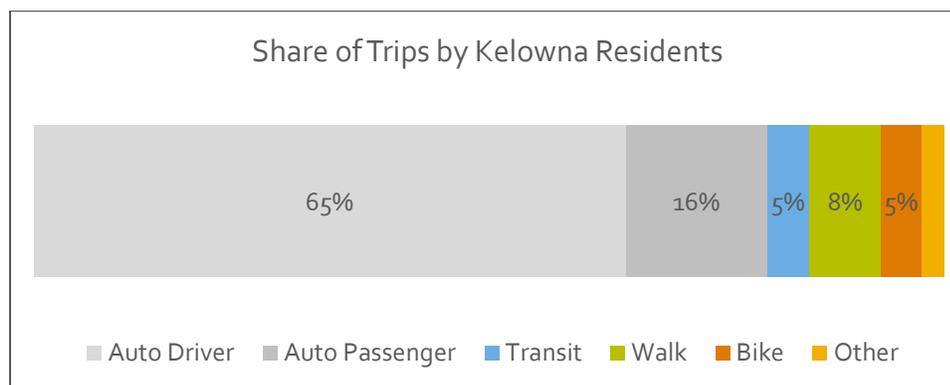
Figure 2a.1 Trips by Kelowna Residents by Travel Mode. Source: 2013 Household Travel Survey, 24hr, Weekday

In most parts of the city and at most times of day, driving is the fastest and most convenient way to travel. Personal vehicles provide door to door service, leave when people want, provide shelter from the elements, and can carry large amounts of passengers and cargo.

However, in many ways driving is the victim of its own success. Cars and trucks take up a large amount of space, are expensive, and emit greenhouse gas emissions. A summary of key local and global trends related to transportation is provided below:

- **A Growing City with Limited Space**: As the population grows and more people drive, parking and roadways quickly fill up and become congested. Options for expanding roadway capacity are constrained by steep hillsides, Okanagan Lake, protected agricultural lands, and limited space in the Core Area. Additionally, expanding roadway capacity is often ineffective at reducing congestion over the long-term. As Kelowna grows, it will be important to invest in transportation modes (e.g. walking, biking, transit and shared mobility options) that can move more people in the limited amount of space available.

- **Infrastructure Deficit:** Transportation is one of the City's largest expenses, consuming approximately 20 per cent of its capital budget. However, despite budgeted spending of approximately $230 million over the next ten years, the City still faces a deficit of over $300 million in unfunded transportation capital projects[4]. Widening roads is expensive. The estimated cost to widen a major road in the Core Area is $26 million per kilometer, and once roads are built, they must also be maintained. Already, approximately two-thirds of the City's current spending on roadways is for operations and maintenance. This spending is expected to increase significantly over the next twenty years, just to maintain existing infrastructure, as streets, bridges, and traffic signals deteriorate over time. A greater reliance on driving to get around would require more expensive infrastructure supported by local taxpayers. Investing in walking, biking, and transit can be more cost-effective solutions to traffic congestion.

- **Housing Affordability:** While housing costs are typically viewed as the main culprit of an expensive city, transportation-related costs typically reflect the next highest share of a households' budget. Growing and investing in a way that enables households to reduce the cost of owning and maintaining a vehicle can dramatically reduce a household's combined housing & transportation financial burden.

- **Aging Population**: Kelowna is projected to have more people in all age categories in 2040, with the greatest increases occurring in the segment of the population over 65 years old. Providing more housing close to services combined with travel options will help Kelowna's older citizens maintain mobility once they can no longer drive.

- **Climate Change and Transportation**: According to the Intergovernmental Panel on Climate Change's (IPCC) special report released October 2018, rapid, far-reaching and unprecedented changes in all aspects of society are needed by 2030 to limit global warming to 1.5 degrees Celsius and avoid catastrophic impacts associated with warming beyond that. To compound matters, Canada's Changing Climate Report released by Environment and Climate Change Canada (April 2019), shows that Canada is experiencing warming at twice the rate of the rest of the world. This

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[4] City of Kelowna 10-Year Capital Plan, 2019 - 2028

will increase the severity of heatwaves and contribute to increased drought and wildfire risks.[5] In Kelowna, transportation accounts for 55 per cent of carbon emissions.[6] While electric vehicles will help reduce tailpipe emissions in the future, they will only be one part of the solution. Working to increase the share of trips made in Kelowna by walking, biking and transit will also be critical to meeting our community's greenhouse gas reduction goals.

Making it Easier for People to Drive Less

Given the challenges of limited land, a growing infrastructure deficit, housing affordability, an aging population and climate change, Kelowna's future depends on giving residents realistic travel options besides driving alone in a vehicle. Investing in space-efficient, cost-effective and low-carbon transportation options such as walking, biking, transit, and shared mobility options can help keep Kelowna moving both now and into the future.

People make travel choices based on many factors including travel time, reliability, cost, safety, and convenience. Convenience can include factors such as the weather, the need to transport goods or people, and the availability of parking. Due to these factors, the versatility of personal vehicles cannot be easily replaced with a single alternative. Walking and biking are only competitive with driving over short distances. Transit is only competitive with driving if the routes and schedules are convenient for a specific trip. If you need to transport lots of cargo, none of these alternatives are very competitive with driving. To make it easier for people to drive less in the future it will be important to invest in a combination of walking, biking, transit and shared mobility options so that a suite of convenient travel options are available to help replace driving trips.

This approach is generally aligned with existing City policy related to transportation and mobility.

e) Policy Context

The TMP builds on existing City plans and policies and is being developed in coordination with ongoing planning initiatives. These related initiatives and their relationship to the TMP are listed below.

Community Vision

The result of the largest public engagement effort in the City's history, *Imagine Kelowna: The Vision to 2040,* is a long-range vision created by the community. The vision serves as the foundation of the TMP, providing strategic direction for both the plan's content and its implementation. One of *Imagine Kelowna's* key goals is to "embrace diverse transportation options to shift away from our car-centric culture." This goal is directly connected to the vision and goals of the TMP.

2040 Official Community Plan Update (in development)

For the first time, Kelowna's OCP and TMP are being developed in co-ordination. There is a strong connection between land use and transportation. As part of the Growth Strategy endorsed by Council in March 2019, two-thirds of new residents over the next twenty years will live in the Core Area. Focusing on the densification of Urban Centres by growing upwards, rather than expanding outwards, will make it easier to establish more convenient alternatives to driving.

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[5] IPCC. (2018). Summary for Policymakers of IPCC Special Report on Global Warming of 1.5°C.
[6] City of Kelowna. (2018). Our Kelowna as We Take Action. p.6 2012 stat

2040 Regional Transportation Plan (in development)

The first Regional Transportation Plan for the Central Okanagan is being developed through the Sustainable Transportation Partnership of the Central Okanagan (STPCO). The STPCO is a partnership between the City of Kelowna, the City of West Kelowna, Westbank First Nation, the District of Peachland, the District of Lake Country, and the Regional District of the Central Okanagan. The Regional Transportation Plan will focus on transportation projects, programs and policies that will help connect regionally significant destinations throughout the Central Okanagan over the next 20 years. The Kelowna Transportation Master Plan will co-ordinate with the recommendations in the Regional Transportation Plan.

Okanagan Gateway Transportation Study (in development)

The Okanagan Gateway Transportation Study will define future projects, programs and policies that will improve connections to Kelowna International Airport, the University of British Columbia Okanagan, and surrounding neighborhoods over the next 20 years. It will support the vision of the area as a growing, vibrant and connected hub that benefits the whole region. The study is being developed through a partnership between the City of Kelowna, Kelowna International Airport, University of British Columbia Okanagan, and B.C.'s Ministry of Transportation and Infrastructure. The Kelowna Transportation Master Plan will co-ordinate with the recommendations in the Okanagan Gateway Transportation Study.

10-Year Capital Plan (2019)

The 10-Year Capital Plan (2019-2028) is guided by the direction set in the 2030 Infrastructure Plan (2016) but is updated annually to be responsive and practical. The total investment allocated for Priority 1 transportation projects in the current 10-Year Capital Plan is approximately $230 million. Of this, approximately $164 million is allocated to roads and associated infrastructure and approximately $66 million is allocated to active transportation and transit.

Capri-Landmark Urban Centre Plan (2019)

The Capri-Landmark Urban Centre Plan provides a vision for the area between Harvey Avenue and Springfield Road and between Gordon Drive and Spall Road. In relation to transportation, the plan aims to improve walkability, invest in sidewalks and break up larger blocks, strengthen cycling connections to key destinations, and improve transportation connectivity and traffic flow. The plan proposes to realign Sutherland Avenue to run through the heart of the Landmark District, and it includes new protected cycling lanes, transit access, and wide sidewalks. The TMP will co-ordinate with the Capri-Landmark Urban Centre Plan.

Transit Future Action Plan (2018)

The 2018 Central Okanagan Transit Future Action Plan provides an update to the 2012 plan and includes transit service and major infrastructure priorities for consideration over the next five years within the Central Okanagan Region. The TMP will be aligned with the Transit Future Action Plan.

Community Climate Action Plan (2018)

Kelowna's Community Climate Action Plan identifies actions needed to reduce greenhouse gas emissions and notes that transportation accounts for the largest component of Kelowna's greenhouse gas footprint (55 per cent as of 2012). The plan includes several actions to mitigate greenhouse gas

emissions from the transportation sector. The TMP will be closely coordinated with the Community Climate Action Plan and incorporate its transportation recommendations.

Pedestrian Bicycle Master Plan (2016)

The Pedestrian and Bicycle Master Plan (PBMP) is a long-term plan that identifies the infrastructure, planning and policies needed to promote and facilitate walking and cycling in Kelowna. Its guiding vision is "to make walking and cycling safer, convenient, and practical modes of travel, to reduce motor vehicle use and resulting greenhouse gas emissions, and to increase opportunities for active living to improve community health and happiness." The PBMP lays out a comprehensive network of bicycle and walking routes which the City has been implementing through projects such as the Ethel Street Active Transportation Corridor, the Sutherland Avenue Protected Bike Lane project, and the Okanagan Rail Trail. The TMP will co-ordinate with the PBMP and result in updates to the PBMP prioritization.

Community for All: Kelowna's All Ages & Abilities Action Plan (2016)

The Community for All Action Plan's vision is of "a city that is healthy, safe, active and inclusive for seniors, children and those with diverse abilities." The action plan's goal is to reduce chronic diseases and social isolation through increasing health, physical activity, social connections, accessibility and equity. In relation to healthy transportation networks, the action plan aims to "prioritize active transportation and encourage mobility for all residents." The TMP goals of improving health and promoting inclusive transportation are aligned with the Healthy City Strategy Community for All Plan.

Healthy Housing Strategy (2018)

The Healthy Housing Strategy highlights the critical alignment of housing and transportation. Addressing housing affordability demands that we look beyond just the price of units and into other key housing-related costs including transportation and energy. Actions within the Healthy Housing Strategy focus on the importance of encouraging housing in the Core Area, near employment and sustainable transportation options, to reduce household transportation costs.

Urban Centres Roadmap (2016)

The Urban Centres Roadmap identifies the core ingredients of a great Urban Centre and provides a framework for guiding future Urban Centre planning in Kelowna. The Roadmap identifies the following key principles related to transportation:

- Principle 1: Mix it Up – Promote vitality through a mix of land uses
- Principle 2: Places for People – Encourage building and street proportions that are inviting for people
- Principle 7: People First Transportation – Prioritize alternative transportation options and connections
- Principle 8: Make it Walkable – Create Streets and blocks that are walkable and comfortable for all pedestrian

The TMP will be aligned with these key principles.

2030 Infrastructure Plan (2016)

The 2030 Infrastructure plan is a 15-year plan (2016-2030) that focuses on taking care of existing infrastructure, along with community health and safety, while meeting legislative requirements and

providing opportunities for growth and economic development. The plan provides a framework for long-term planning and fiscal management.

Central Okanagan Clean Air Strategy (2015)

The Central Okanagan Clean Air Strategy is a collaborative effort between the City of Kelowna, the City of West Kelowna, the District of Lake Country, the District of Peachland, Westbank First Nation, and the Regional District of Central Okanagan. The Strategy includes an updated Clean Air Vision and Goals and outlines a set of strategies and actions to undertake over the next five years.

Parking Management Strategy (2014) and Parking Area Plans

Parking rules, regulations and rates are part of a city-wide Parking Management Strategy, endorsed by Council in January 2014 and in alignment with the City's parking management principles. The strategy makes sure our parking system improves the availability of short-term parking spaces, continues to pay for itself so that general taxation is not impacted, offers customer service options for better customer interaction, and provides a balanced transportation network for residents. Specific parking area plans have been developed for the following subareas:

- South Pandosy Area Plan (2014)
- Hospital Area Plan
- Downtown Area Parking Plan (2019)

Central Okanagan Transit Future Plan (2012)

A collaboration between the City of Kelowna and BC Transit, the Transit Future Plan is a regional plan for transit out to 2030. It introduces the concept of the frequent transit network: key corridors where investments in transit service and growth in population and jobs can create a positive feedback loop that lowers carbon emissions and reduces congestion.

2030 Kelowna Official Community Plan (2011)

The 2030 Official Community Plan (OCP) is a 20-year plan (2010 – 2030) that guides Kelowna's growth and development. A central tenet of the 2030 OCP is sustainable city building. It outlines how sustainability needs to be incorporated into three key planning elements: land use, transportation and infrastructure. Policies in the OCP aim to create a long-term, sustainable community by encouraging efficient land use; providing infrastructure and facilities that will support walking, cycling and transit in a more compact and connected community; and protecting environmentally-sensitive areas while continuing to ensure the city is a desirable place to live. Adopted as a bylaw, the OCP governs Council and staff decisions and has influenced the plans developed since its enactment. A number of objectives and policies relevant to the TMP are housed within the OCP's Infrastructure Chapter including General Transportation Policies, Transport Demand Management Policies, Pedestrian and Cycling Policies, Transit Initiatives, Roadway Initiatives, and Parking Initiatives. The TMP is being developed in co-ordination with the 2030 OCP as well as the OCP update to 2040 that is currently underway.

Transportation Master Plan (1995)

The last Transportation Master Plan was completed over twenty years ago in 1995. Many of the actions contained in this plan have been completed, including the Mission Greenway projects and the Rails with Trails, as well as major road projects like Clement Avenue, Glenmore Road, Gordon Drive and Springfield Road. Due in part to the recommendations in this plan, Kelowna today has the longest

network of bike lanes per capita in Canada. Because so much time has passed, the TMP currently being developed is considered a new plan, rather than an update of the 1995 plan.

2. Community Profile

a) Land Use and Transportation

Transportation and land use are interconnected. Where the places that people live, work, and visit are located influences how they get between them. Kelowna covers a large area with a wide range of land uses, from active agriculture to high rises (see Figure 2b.1). Different areas of the city have different transportation options, challenges, and opportunities. The differences between Kelowna's Urban Centres, Core Area, suburban areas, and rural areas are discussed below.
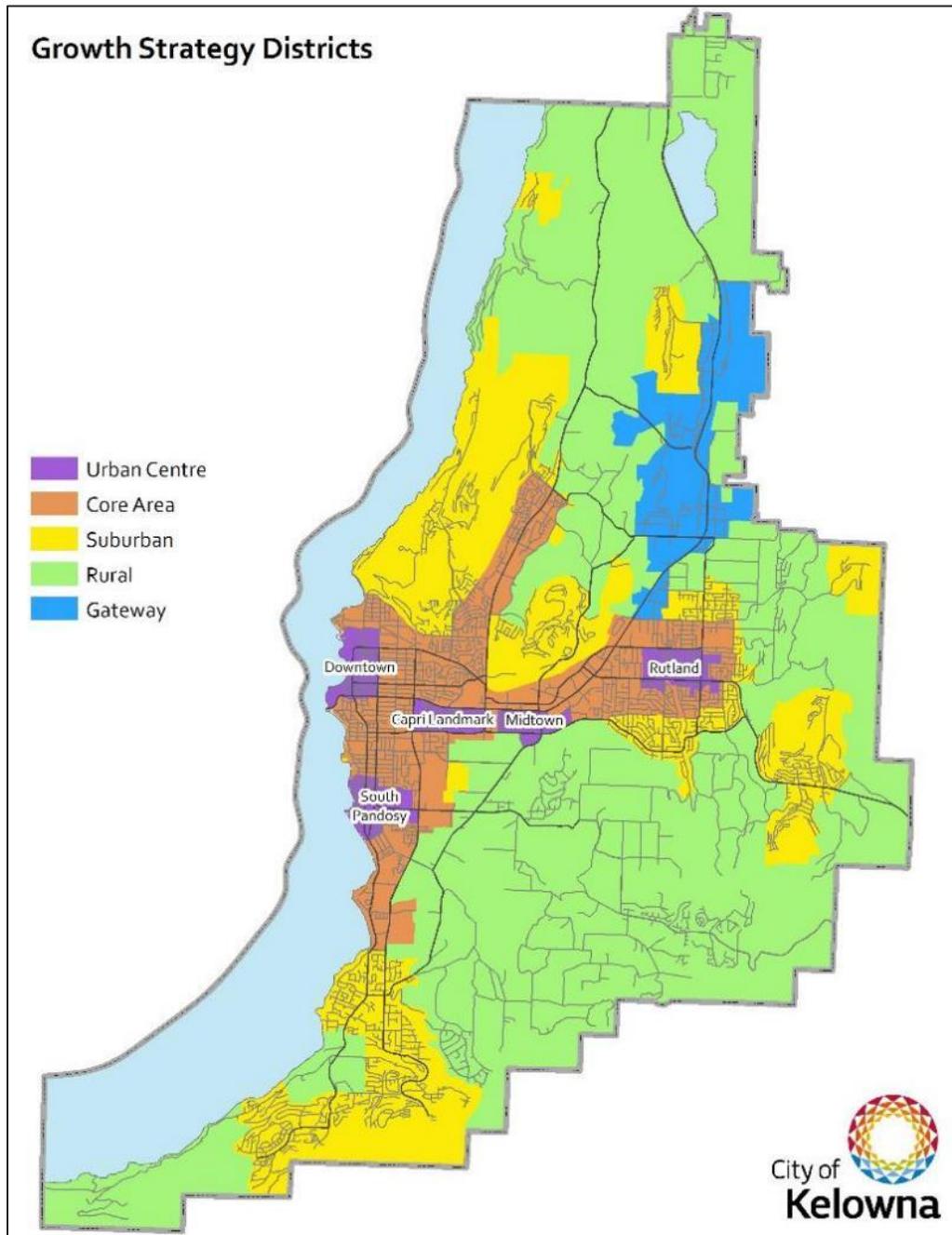

Figure 2b.1: Kelowna Growth Strategy Districts

Urban Centres

Urban Centres are Kelowna's economic hubs. They are the busiest areas of the city, where competition for street space is highest. The concentration of activity in the Urban Centres means there is not enough space for everyone to drive.

The Urban Centres attract trips from all over the Central Okanagan by car, bike, transit, and walking. Approximately 40 per cent of Kelowna's jobs are in the Urban Centres, but only about 15 per cent of its population live in these areas. This imbalance between residents and jobs contributes to traffic and parking challenges as large numbers of workers try to enter and leave at the same time. Since trips *within* the Urban Centres tend to be short, walking can be a convenient way for people to move around.

The OCP identifies five Urban Centres and each of them are at a different stage of development. The Downtown and South Pandosy are more established, while others, like Midtown, Capri-Landmark and Rutland, are still emerging. The 2016 Urban Centres Roadmap lays out a framework for guiding each of these five Urban Centres into maturity.

Core Area

The Core Area generally refers to the flat part of valley and neighbourhoods near the Urban Centres. Most homes in these areas are detached housing, with some multifamily development and commercial land located along major corridors.

Many Core Area neighbourhoods feature cul-de-sacs rather than a grid pattern street network. This can make it much longer to walk or bike if the cul-de-sacs are not connected by cut-through pathways. The lack of a connected network often leads to traffic being concentrated on a few major streets.

Most Core Area neighbourhoods were designed around driving but have the potential to shift to other modes. The relatively flat terrain and shorter distances to destinations means walking and biking can be convenient options. Public transit can also be effective, particularly along corridors between major destinations.

Suburban Areas

Suburban lands are located outside of the Core Area but within the Permanent Growth Boundary. They are characterized primarily by hillside residential neighbourhoods which are home to roughly one-quarter of Kelowna's population, but only five per cent of its jobs. This imbalance leads to a strong outflow of people travelling to work or school in the morning and a strong inflow returning in the afternoon and evening. The steep slopes in hillside areas often lead to a branching street network with many long cul-de-sacs. An entire neighbourhood may have a single point of access, leading to concerns about emergency response.

Driving is often the only option for getting around hillside areas, as they are typically too hilly and far away from major destinations for walking and biking to be convenient. At the same time, population densities are often too low for competitive transit service to be economically viable.

Gateway District

The Gateway District is comprised of UBC Okanagan, Kelowna International Airport, and the surrounding industrial lands. UBC Okanagan is one of the most important destinations in the city and has a much higher share of multifamily development than elsewhere in the Gateway. Because of its

student demographic and its location as a key transit hub, public transit is a much more popular mode of transportation in this area than in other parts of the city.

Rural Areas

These lands are located outside of the City's Permanent Growth Boundary and are mostly composed of agricultural lands or large tracts of resource lands. Small residential neighbourhoods and resort communities such as Gallagher's Canyon and McKinley Beach are also located in these areas, as well as some industrial lands at the northern edge of the city. Overall, the rural areas are home to approximately four per cent of Kelowna's population and 12 per cent of its employment.

The roads in rural areas are often narrow, with tight corners and intersections at irregular angles. Sidewalks and bike lanes are also rare in rural areas. This is not necessarily an issue when roads are quiet, but challenges can arise when higher amounts of traffic begin to use rural roads.

As with suburban neighbourhoods, personal vehicles are the primary way rural residents get around. Low densities in rural areas make them prohibitively expensive to serve with public transit and distances are often too far to walk or bike, though some rural areas are popular for recreational walking and biking.

Travel Modes in Different Areas

As shown in Figure 2b.2, residents of the five Urban Centres make almost 60 per cent of their trips by driving.[7] The share of travel by automobile increases as the distance from the Core Area increases. Walking and biking account for nearly a quarter of trips by Urban Centre residents, but only four per cent of trips by rural residents.

Notably, the share of trips by automobile *passengers* is much lower in the Urban Centres compared to other areas. This suggests that people who are unable to drive (e.g. youth, seniors, etc) can be more independent and less reliant on others for rides in an Urban Centre than in other areas.

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[7] This is an average of all five Urban Centres: in the Downtown, only about half of trips are by driving.
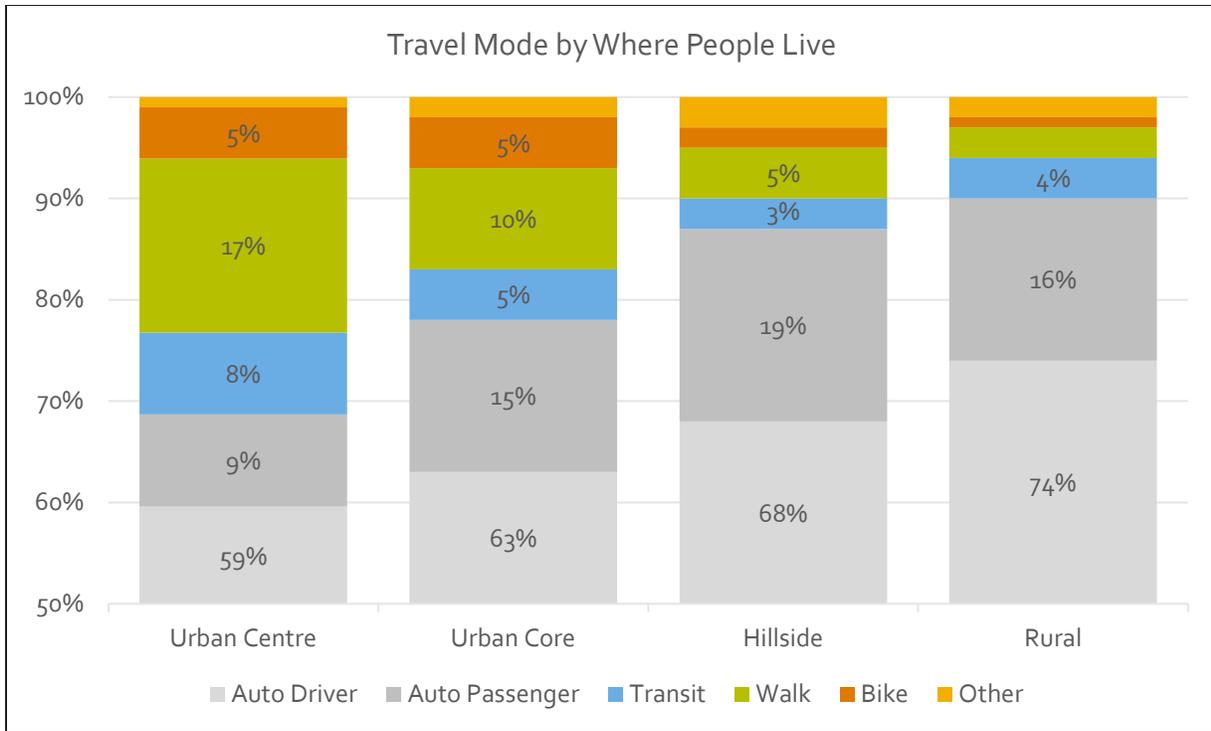
Figure 2b.2: Correlation Between Travel Mode and Where People Live. Source: 2013 Household Travel Survey

Historic and Future Growth

Over the past 20 years, Kelowna has grown by roughly 40,000 people. Based on projections from BC Stats, the City predicts there will be 50,000 new residents in Kelowna (see Figure 2b.3) and 30,000 elsewhere in the Central Okanagan by 2040.
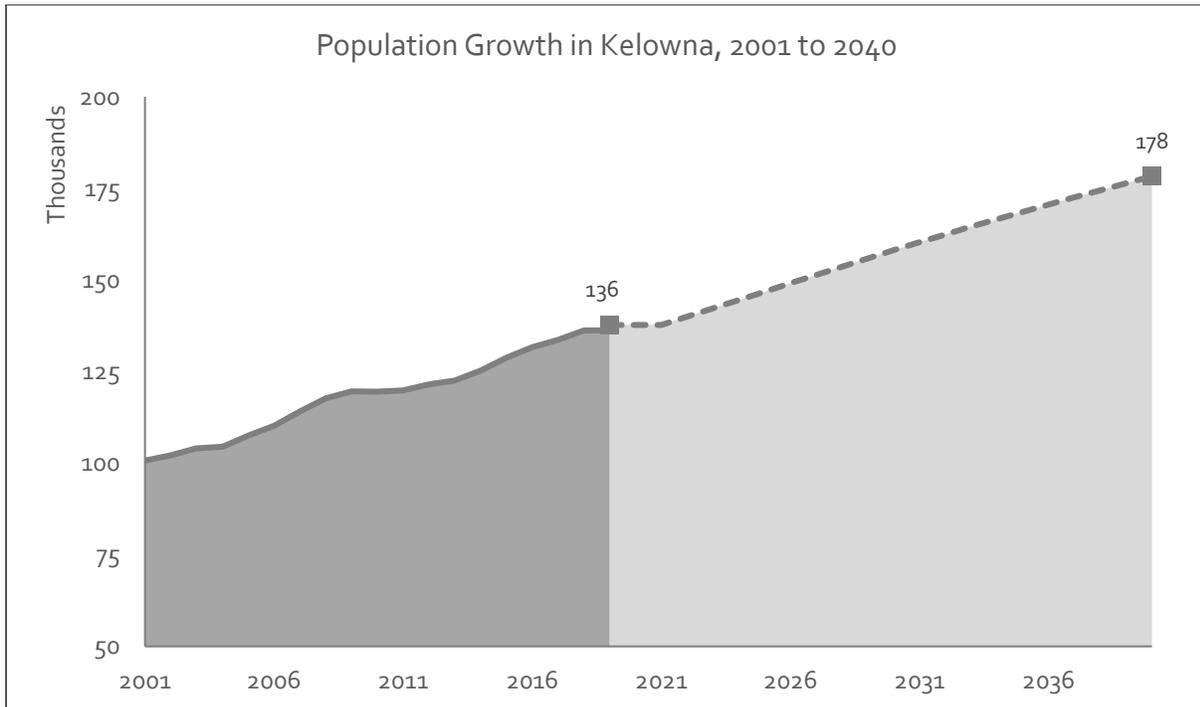
Figure 2b.3: Historical and Projected Population Growth for Kelowna. Source: Census, BC Stats

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Where development occurs has important ramifications for the transportation network, as it determines where people live, work and play and how they get to and from these activities.

Over the past twenty years, hillside areas have accounted for just over one-third of residential growth. The Urban Centres have received about 15 per cent (see Figure 2b.4).
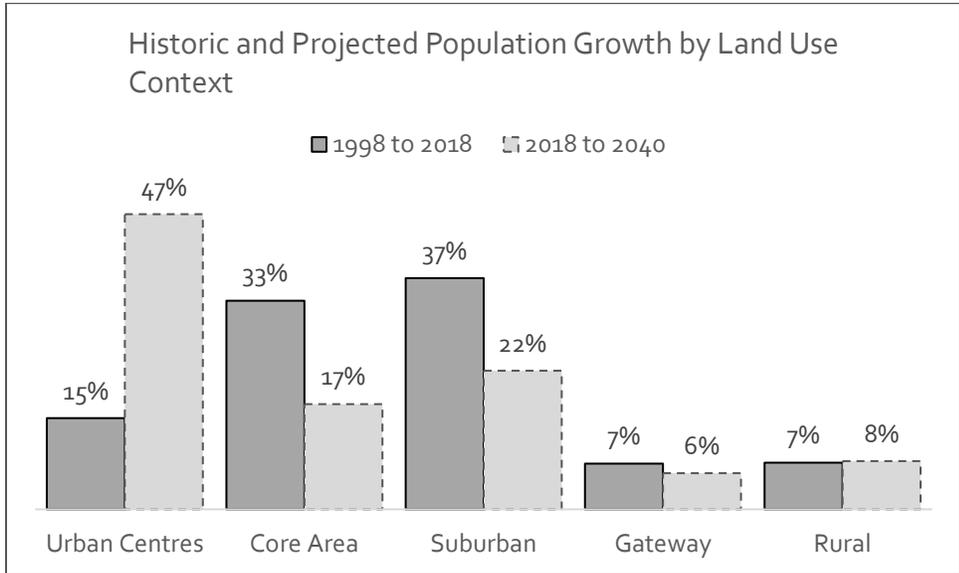
Figure 2b.4: Historic and Projected Residential Growth in Kelowna by Land Use Context. Source: Building Permit Data

As developable land becomes scarcer, most future growth will occur by filling-in existing neighbourhoods.

b) Demographic Trends

Location is not the only factor that influences how residents get around. Demographic factors such as age, family status, employment status, and income also influence travel patterns. As Figure 2c.1 shows, Kelowna is projected to have more residents in all age categories in 2040, with the greatest increases occurring in the population groups from 45 – 64 and over 65 years old.
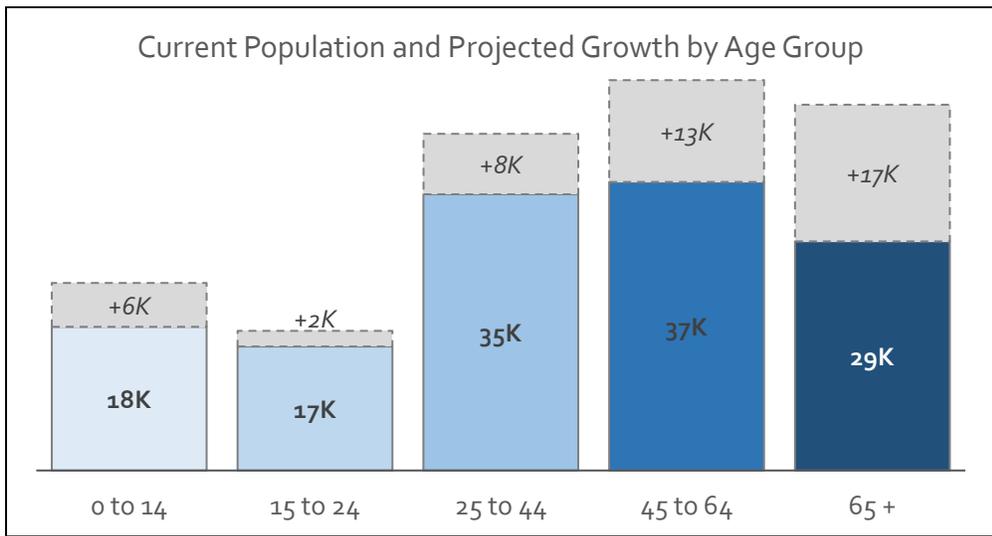
Figure 2c.1: Current Population of Kelowna and Projected Growth to 2040 by Age Group. Source: BC Stats

Different age groups tend to use different travel modes to get around. As shown in Figure 2c.2, children under the age of 14 are passengers for two-thirds of their trips, while public transit is most popular among young adults aged 15 to 24. Driving peaks in middle age, then begins to decline for older adults who tend to work less and do less chauffeuring of children.
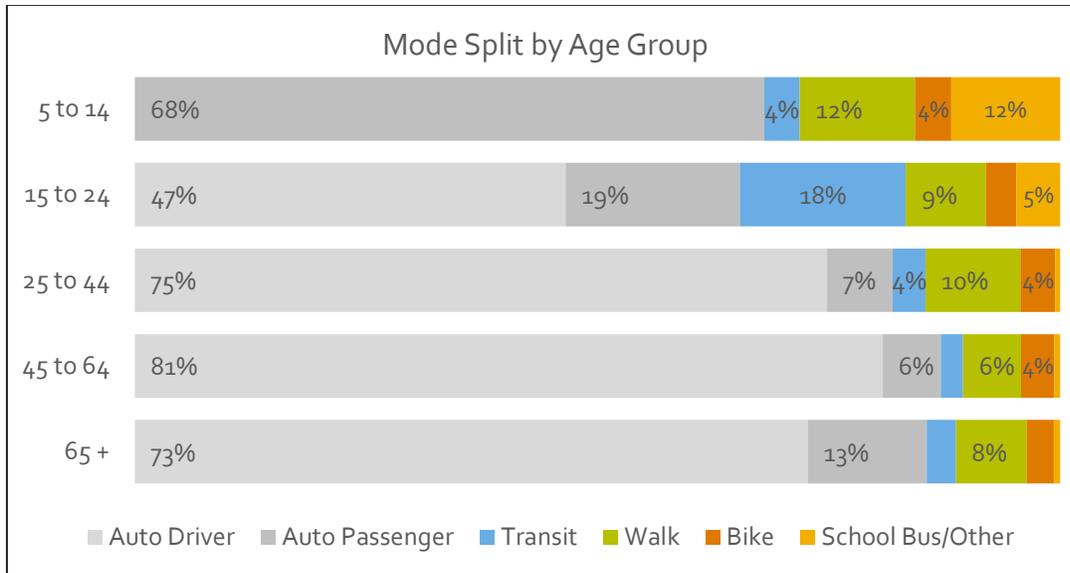
Figure 2c.2: Mode Split by Age Group. Source: 2013 Household Travel Survey

Daily travel patterns are defined by peaks. The morning peak is characterized by a sharp spike that quickly dissipates, while the afternoon peak is characterized by a series of less intense spikes that last longer. At most, only 17 per cent of residents are travelling at any one time. As Figure 2c.3 shows, travel by young people is mostly limited to the morning peak and the early afternoon after school gets out. For middle age adults, the afternoon peak is around 5 p.m., while older adults tend to travel more in the midday. Since the largest population increase is expected in the adults aged 65 and older demographic, this could mean relatively less impact on the morning commute, but with a filling-in of the midday period as seniors drive themselves between appointments and activities. It could also result in increased demands for transit and mobility-related social services.

Percent of Residents Travelling by Age Group

Legend: 0 to 14, 15 to 24, 25 to 44, 45 to 64, 65+
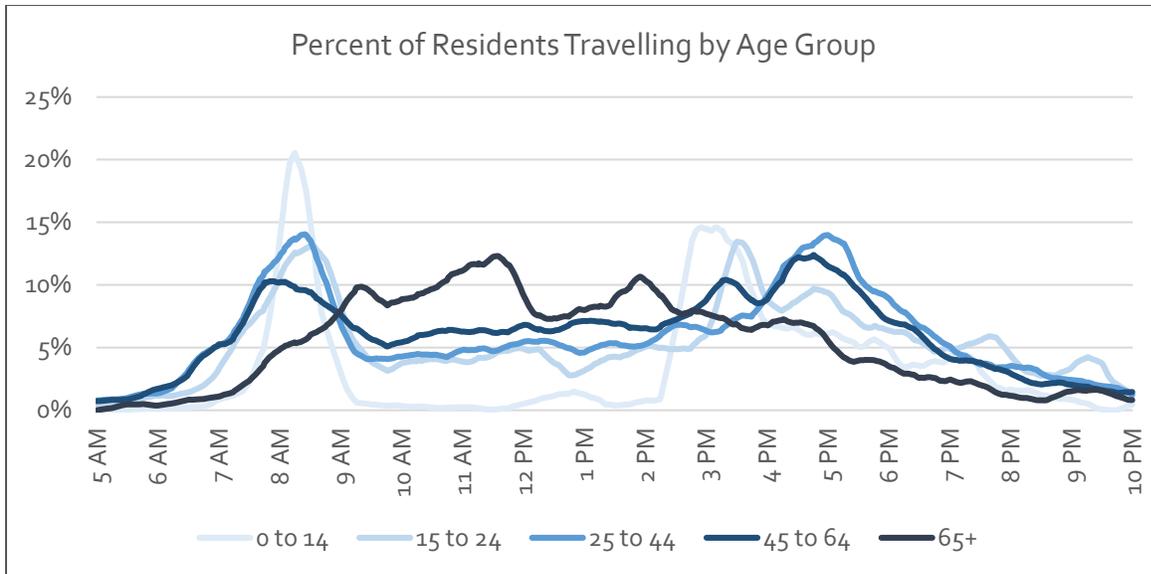
Figure 2c.3: Percent of Residents Travelling by Age Group in Kelowna. Source: 2013 Household Travel Survey

c) Daily Travel Patterns

This section presents a day in the life of Kelowna's street network, describing the city's traffic flows on a typical weekday from the morning through the evening.

Morning Peak (7 a.m. to 9 p.m.)

The morning peak is dominated by residents commuting to work and school. This is typically the longest trip people make each day. Average commute times have increased slightly over the past ten years, from 16.2 minutes in 2007[8] to 18.1 minutes in 2016.[9] As shown in Figure 2d.1, this is comparable to other Canadian cities of a similar size (excluding cities that are part of larger metro areas such as Vancouver or Toronto).

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[8] 2007 Household Travel Survey.
[9] Statistics Canada, 2016 Census of Population.
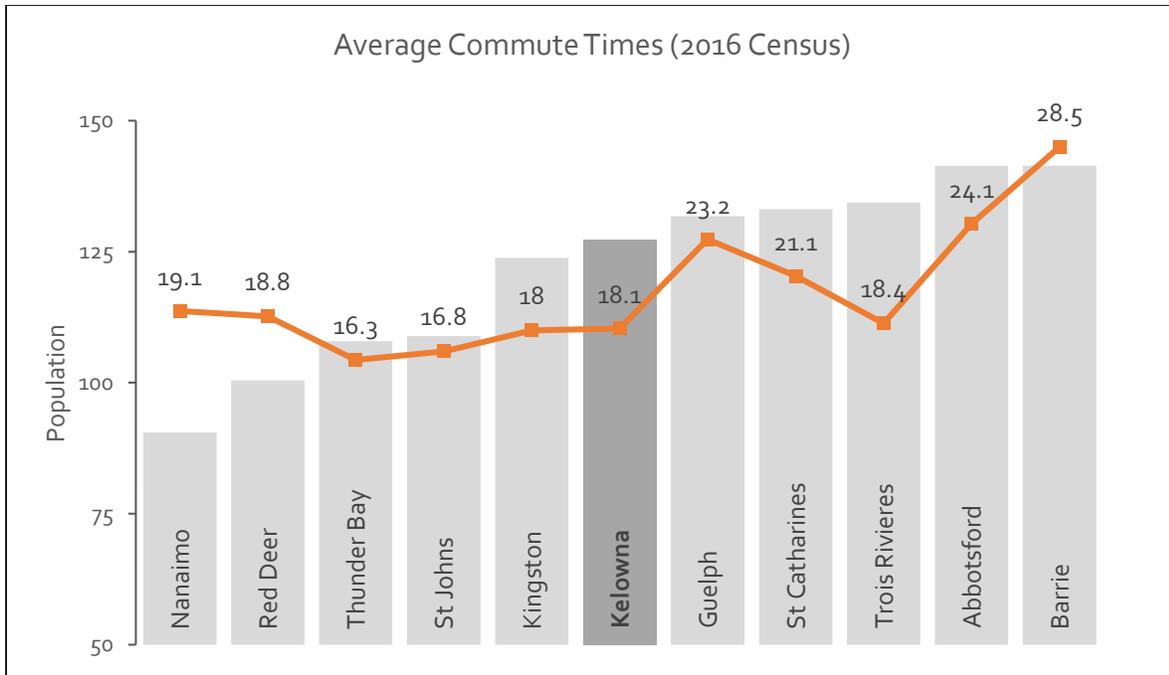
Figure 2d.1: Average Commute Times and Population for Select Canadian Cities. Source: 2016 Census

The vast majority of Kelowna residents also work in the city. However, close to one-quarter of the jobs in Kelowna are filled by workers who commute from other municipalities. Fifteen per cent come from the Westside and the South Okanagan, while 10 per cent come from Lake Country and the North Okanagan.[10]

Figure 2d.2 shows where travelers are headed during the morning peak. Unsurprisingly, destinations are concentrated around employment areas. For example, about 15 per cent of trips during the morning peak are to the Downtown area.

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[10] Statistics Canada. (2017). Community Flow from Geography of Residence to Geography of Work.
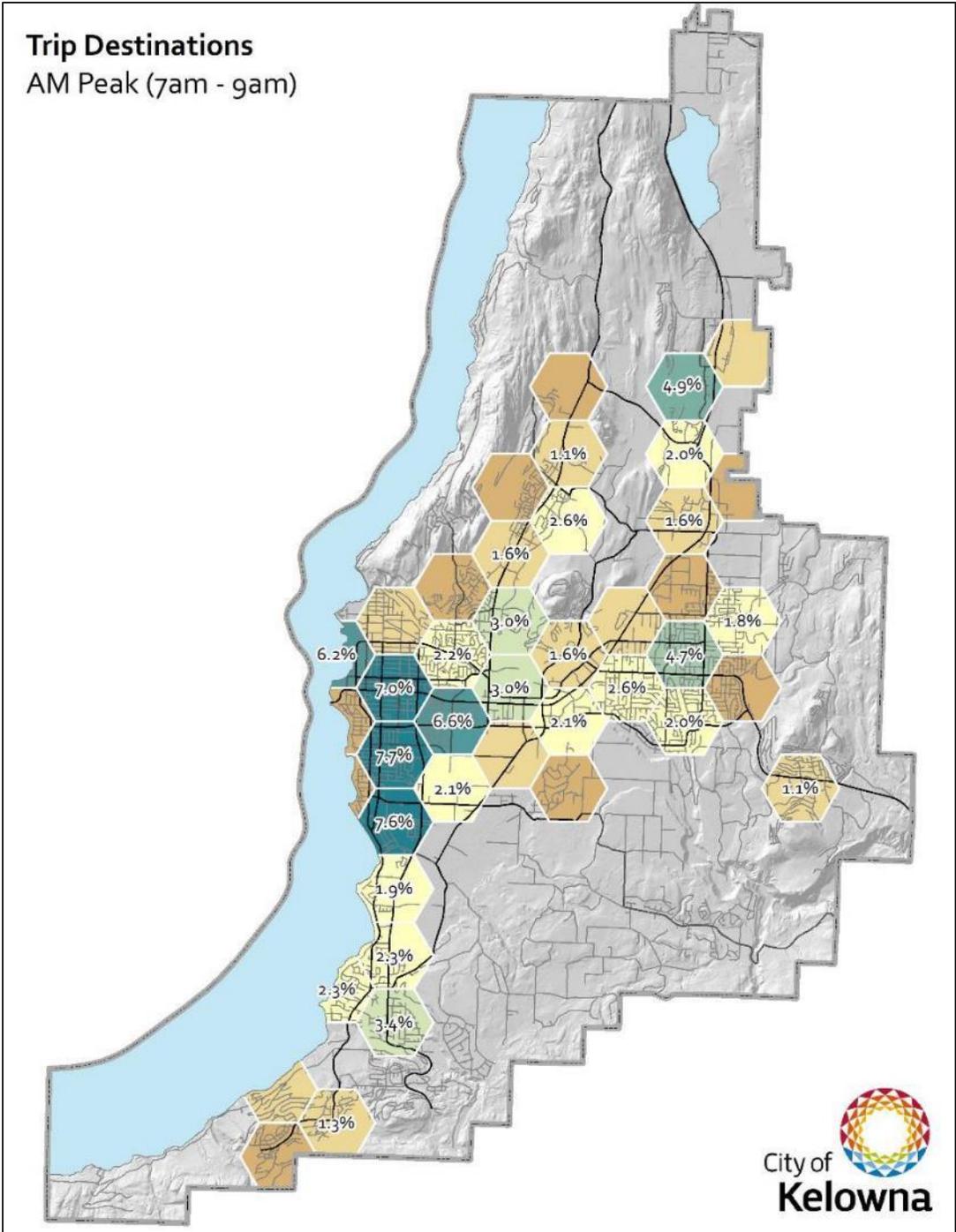
Figure 2d.2: A.M. Peak Trip Destinations Heat Map. Source: 2013 Household Travel Survey

Midday (9 a.m. to 2 p.m.)

By midday, commuting gives way to other kinds of travel. During this time, about 60 per cent of the city's residents are away from home – at work, school, or running errands – and destinations are more dispersed than during the morning peak. Figure 2d.3 shows that the Midtown area contains destinations that are popular in the middle of the day, when more service and shopping trips are being made.

Trip Destinations
Midday (9am - 2pm)

2.5%
1.9%
1.5%
1.3%
1.1%
1.2%
8.4%
3.1%
5.4%
3.7%
8.4%
6.3%
1.4%
1.0%
9.2%
5.4%
1.2%
4.1%
1.2%
1.1%
4.7%
2.6%
1.9%
1.3%
1.1%

City of
Kelowna

Figure 2d.3: Midday Trip Destinations Heat Map. Source: 2013 Household Travel Survey

Residents also have more diverse reasons for travelling during the midday than during the work-focused morning peak. As shown in Figure 2d.4, travel during the midday is almost evenly split between running errands, commuting, and returning home.

Figure 2d.4: Trip Purpose by Time Period. Source: 2013 Household Travel Survey.

Trip purposes also influence people's travel choices (see Figure 2d.5). Commuting trips to work or school have the highest share of walking, biking, and transit use compared to other kinds of trips. Commutes are often the longest trips people make and the most routine. More discretionary or spontaneous trips are often more convenient by driving. Shopping trips are more likely to require carrying cargo, which can be more difficult by transit, walking, or biking.
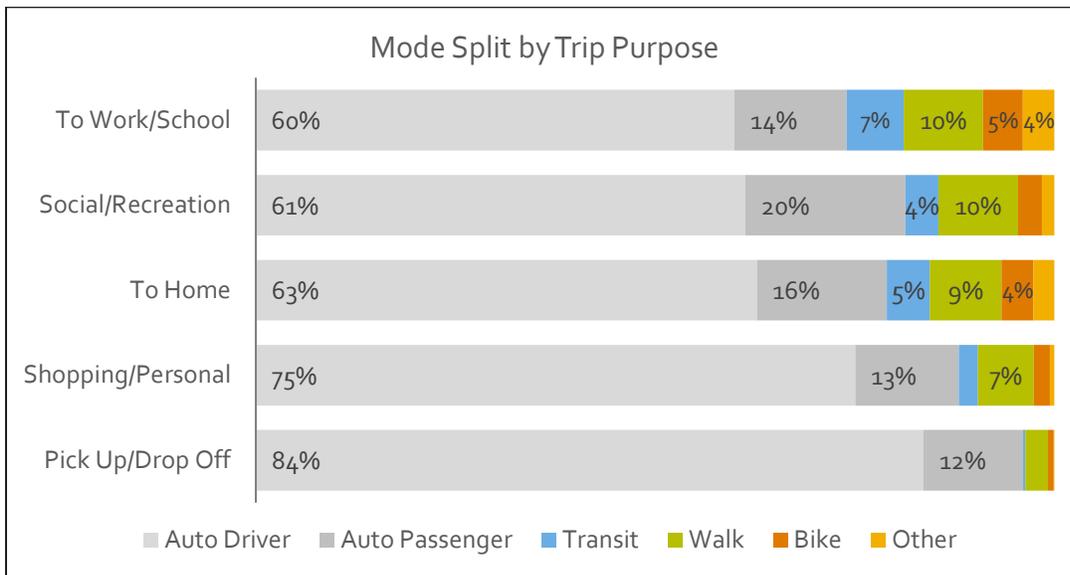
Figure 2d.5: Travel Mode Choice by Trip Purpose. Source: 2013 Household Travel Survey

Afternoon Peak (2 p.m. to 6 p.m.)

The afternoon peak operates differently than the morning peak. Trip purposes are more diverse, and more people are travelling in groups. The afternoon peak is characterized by an early spike in demand when schools get out, and a later wave beginning at 4 p.m. when many people begin leaving work. With

a large percentage of travelers heading for home, trip destinations are the most diverse during the afternoon peak (Figure 2d.6).
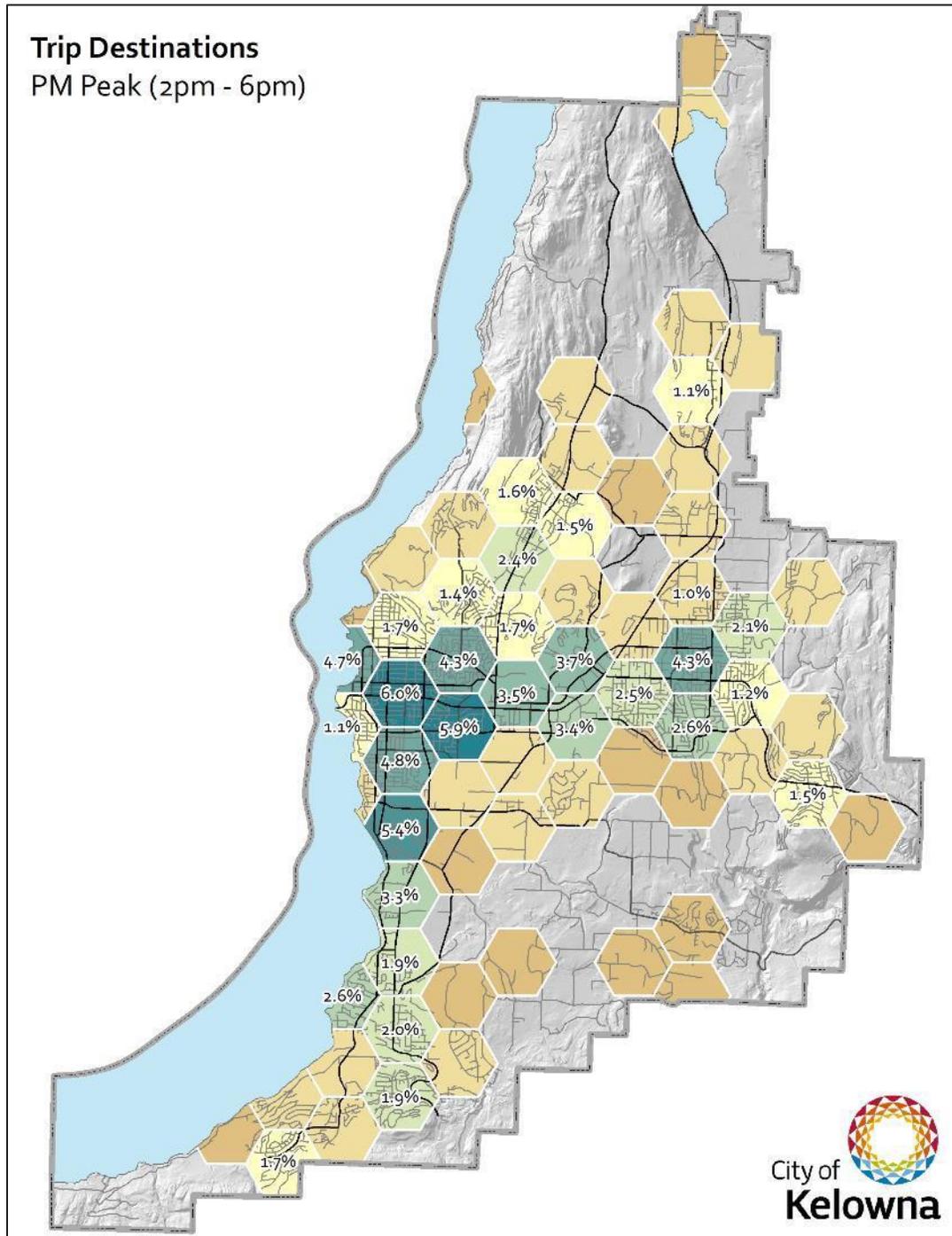
Figure 2d.6: P.M. Peak Trip Destinations Heat Map. Source: 2013 Household Travel Survey

How far people need to travel strongly influences how they choose to get there (Figure 2d.7). Walking is most common for trips under one kilometre, or a 10- to 15-minute walk. Nearly all bike trips are shorter than five kilometres, or a 20-minute ride. Higher speeds are needed to travel long distances in a reasonable amount of time.
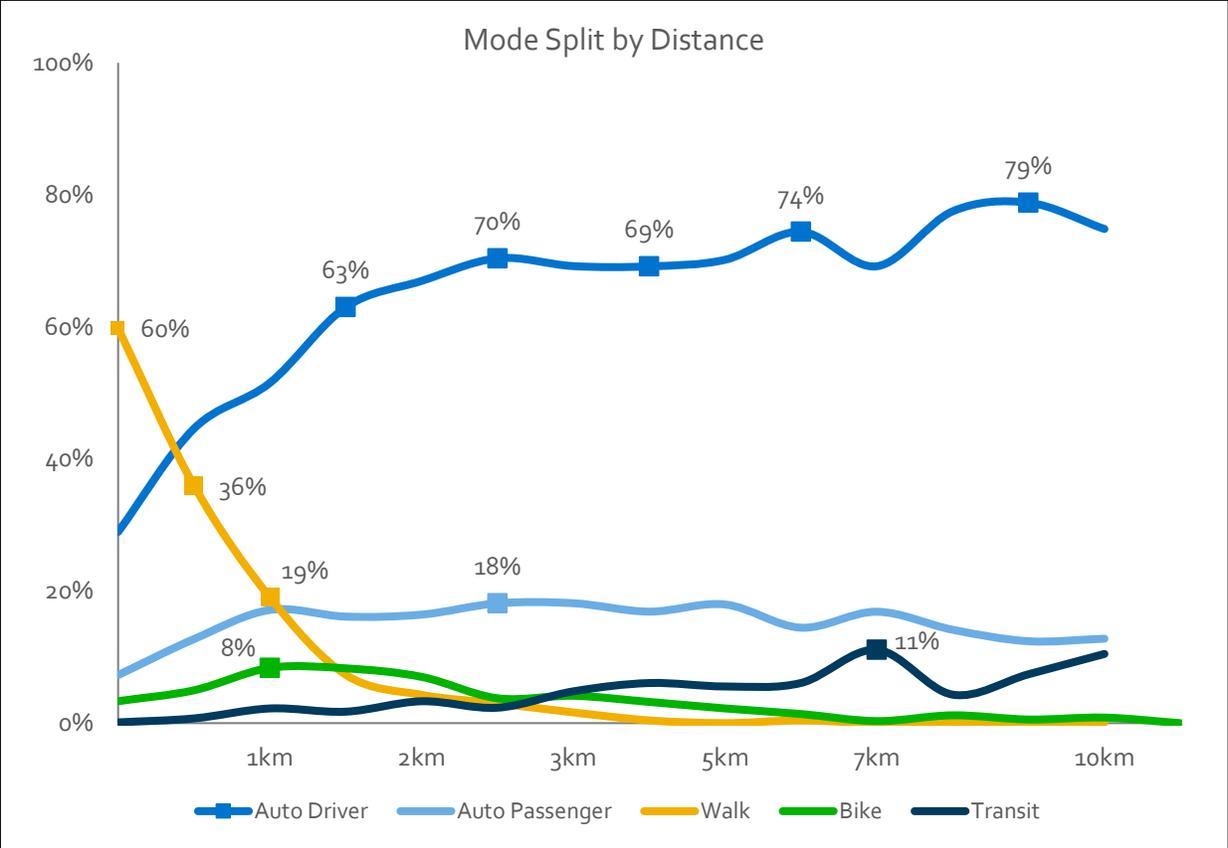
Figure 2d.7: Travel Mode Choices by Trip Distance. Source: 2013 Household Travel Survey.

Most trips in Kelowna are short, with an average length of just over five kilometres. This means that there is a large proportion of trips which can potentially be shifted to walking, biking, and transit if our streets are designed to accommodate these modes (Figure 2d.8).
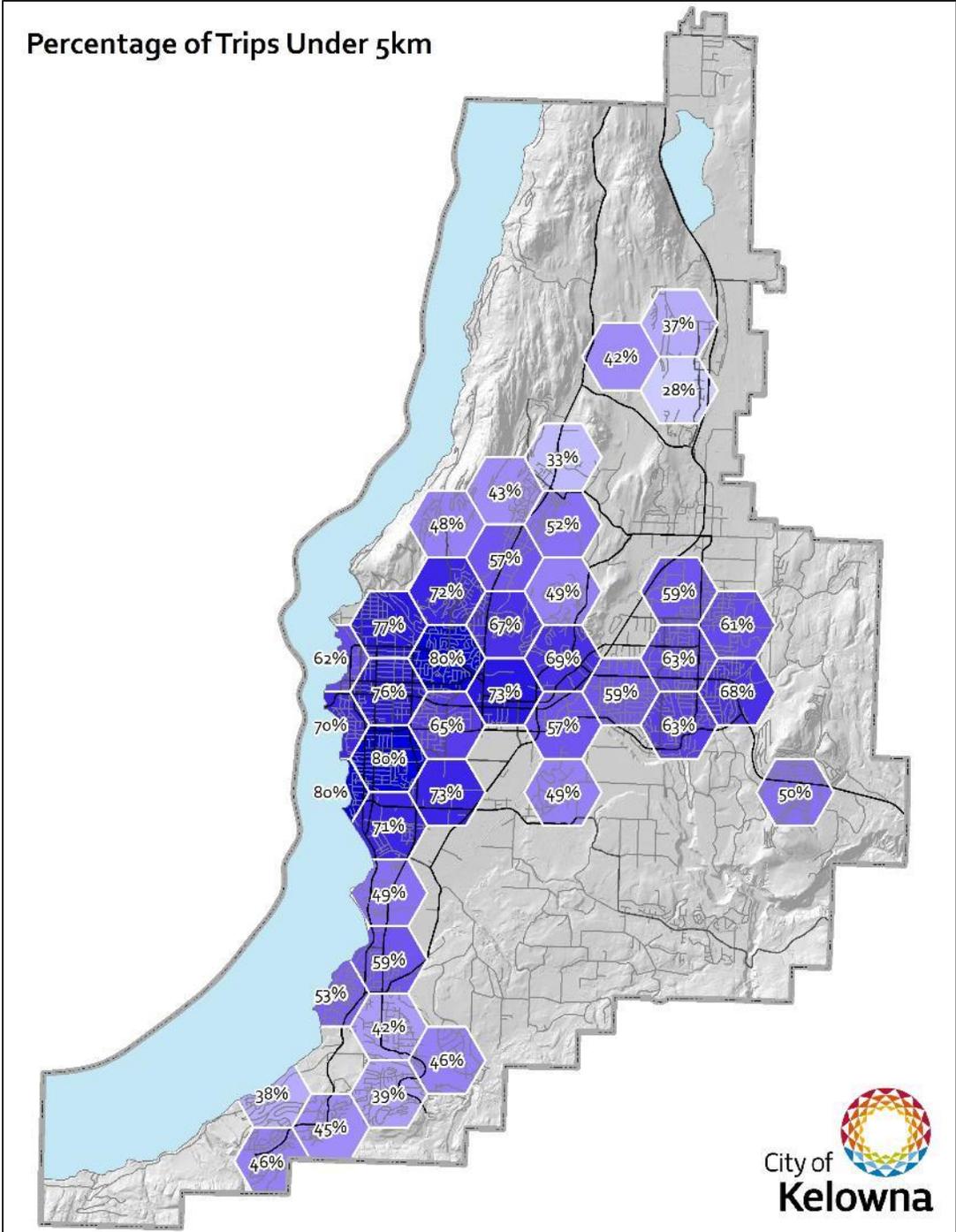
Figure 2d.8: Percentage of Trips under Five Kilometres. Source: 2013 Household Travel Survey

Evening (6 p.m. – Midnight)

Trips home make up the largest share of trip types in the evening, followed by recreational trips. On a typical weekday, Kelowna residents collectively drive 1.2 million kilometres, or two-and-a-half times the distance to the moon. They have also walked, biked, and ridden transit for more than 160,000 kilometres, or approximately four times around the world.

Seasonality

Travel patterns vary across the year as well as throughout the day. Colder and wetter weather makes walking and biking less attractive in the winter. Kelowna's population grows in the summer with visitors and part-time residents. The exact amount of population increase during the summer is difficult to estimate, but about six per cent of dwellings are not occupied year-round.[11] There are approximately 4,500 hotel rooms in Kelowna, which is equivalent to approximately eight per cent of the city's dwellings.

Figure 2d.9 shows the monthly demand for each travel mode as a percentage of the year-round average. Biking has the highest amount of fluctuation throughout the year. It is most attractive in the summer, making it a valuable relief valve when pressure on the road network is highest. Transit ridership is highest in winter, a trend likely influenced by the school calendar.
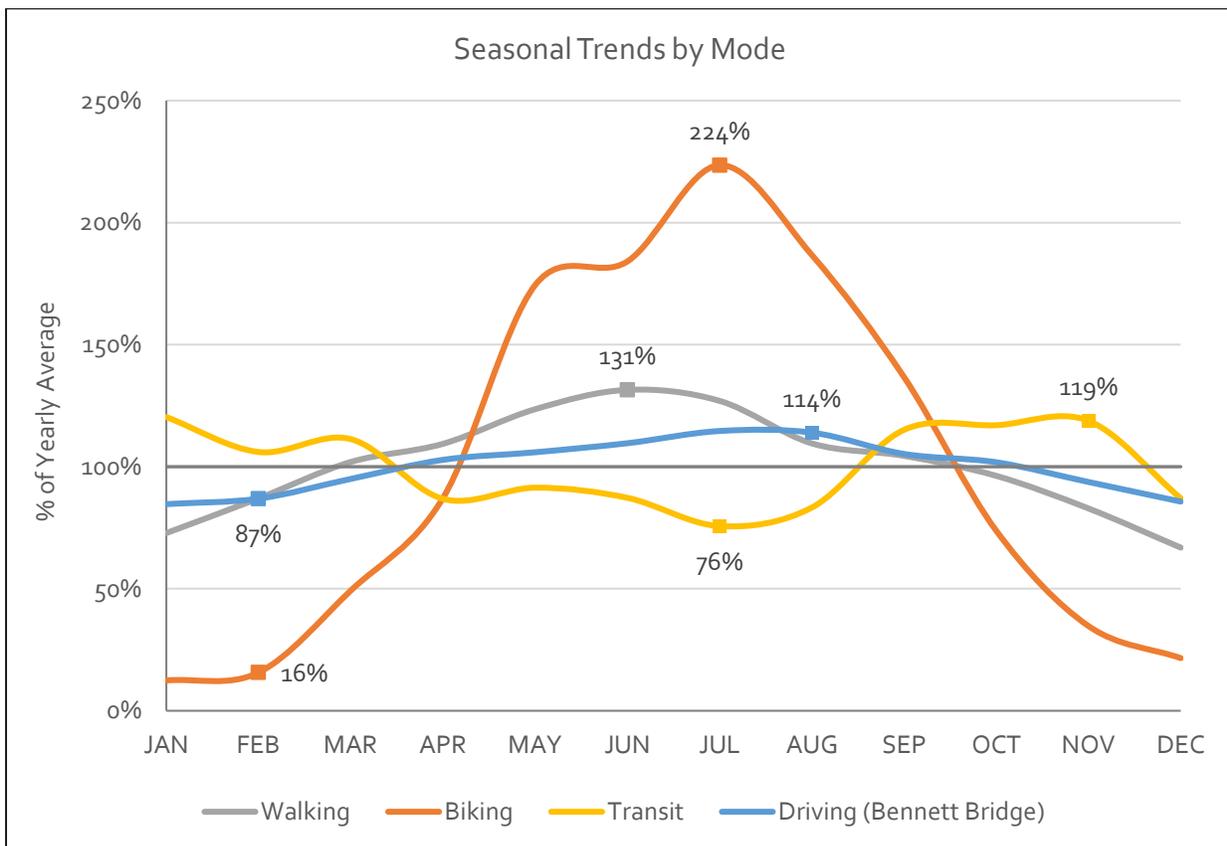
Figure 2d.9: Seasonal Trends by Travel Mode. Source: MOTI Traffic Data, BC Transit, EcoCounter Data

The continuous data needed to take a detailed look at seasonal patterns in vehicle traffic is only available from certain locations. One of these places is the WR Bennett Bridge (see Figure 2d.10). As the backbone of Okanagan Valley's road network, Highway 97 likely experiences the greatest seasonal fluctuations in traffic. Daily traffic volumes on the bridge are 15 per cent below average in the winter and 15 per cent higher than average in the summer, with most of these increases happening during the

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[11] Statistics Canada, 2016 Census of Population.

midday. Traffic volumes during both the morning and the afternoon peaks are consistent year-round, except for winter afternoons.
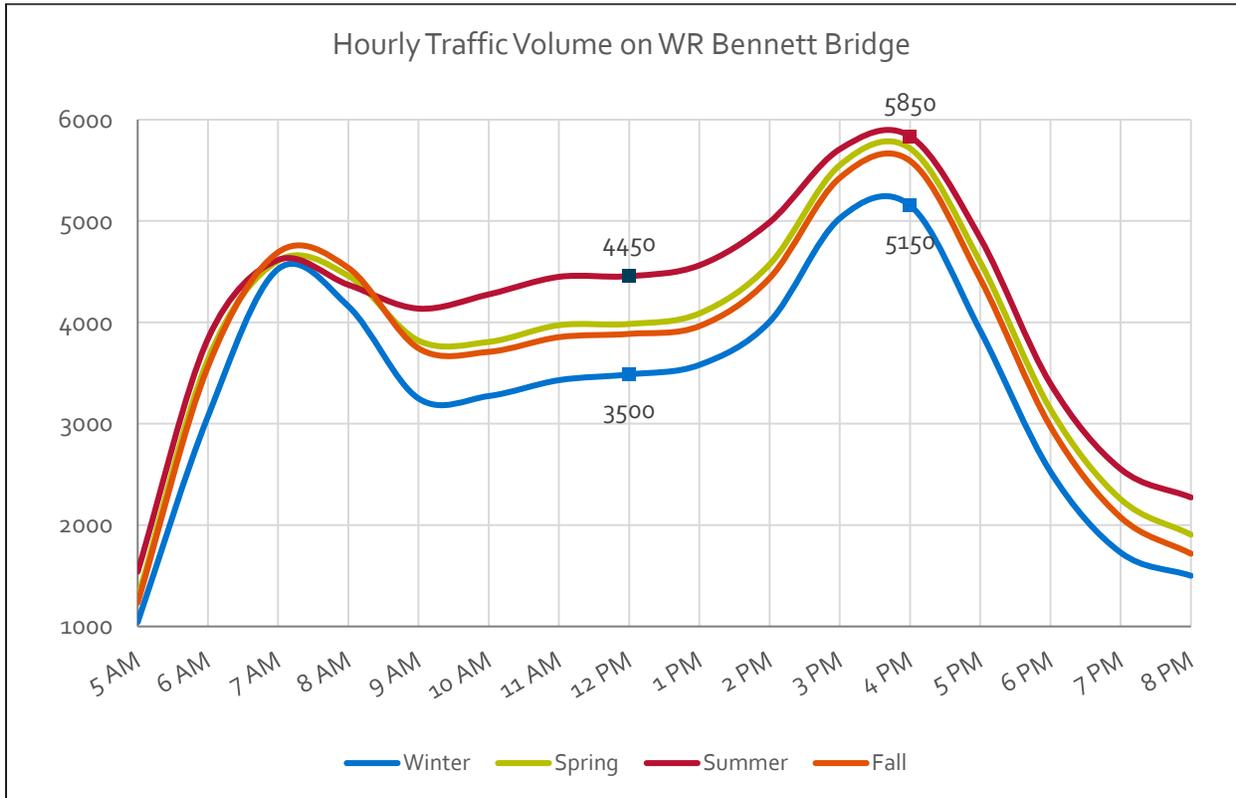
Figure 2d.10: Hourly Traffic Profile on the WR Bennett Bridge Across Seasons. Source: MOTI Traffic Data

3. Summary of Future Changes

a) 2040 OCP Growth Scenario

By 2040, Kelowna is projected to have 50,000 more residents. In accordance with the Imagine Kelowna Vision and the 2040 OCP endorsed Growth Scenario, 67 per cent of residential growth and 75 per cent of employment growth will be focused in the Core Area. Most growth will occur in Kelowna's five Urban Centres (Downtown, South Pandosy, Rutland, Midtown, and Capri-Landmark). However, the endorsed scenario also includes 33 per cent of residential and 25 per cent of employment growth in outlying areas such as Wilden, the Ponds, Black Mountain, Kirschner Mountain, McKinley, and, if approved by Council, Thomson Flats.

Different kinds of development and their locations impact Kelowna's transportation network in different ways. Development in outlying areas increases traffic congestion more than development in the Core Area. This is because residents in outlying areas must often drive to meet their daily travel needs. In hillside neighbourhoods, 90 per cent of residents travel to work by car and drive between two and six times farther compared to residents who live in Core Area neighbourhoods.[12]

Kelowna's existing urban form, combined with future population growth and development patterns, will cause traffic to become busier and more complex. This will be especially true in the Core Area, where residents commuting in and out of car-dependent hillside neighbourhoods will compete for limited roadway space with Core Area residents who will have options to get around using a variety of travel modes. Innovative solutions that provide convenient, space-efficient, and sustainable transportation options will be needed throughout the city to keep Kelowna moving, now and in the future.

b) Transportation Technology

For the first time in nearly a century, transformative technological innovations are coming to transportation. As a result, how people get around in 2040 will likely be very different from how they get around today. Mobile technologies that enable new shared services will combine with driverless electric vehicles to reshape our lives and our communities. New transportation options and services will emerge and link together to create a mobility ecosystem that offers seamless, multi-modal and on-demand travel. This phenomenon is already happening in larger urban areas.

Some of these changes have the potential to increase automobile travel and congestion. However, if we are proactive, these changes can come with benefits such as encouraging active modes, reducing automobile dependency, improving roadway safety and expanding mobility for a wider range of people including youth, the elderly, and people with diverse abilities. Shared mobility options such as carshare, bikeshare, ride-hailing, and rideshare will mean that people will not have to rely as much on owning their own car or bike, as access to shared fleets will become more common. Overall, technology change in transportation can be viewed as both an opportunity and a challenge. If we move quickly to develop and implement new public policies and business models, we can leverage them to achieve Kelowna's vision and goals for transportation.

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[12] 2013 Household Travel Survey

c) Demographics

By 2040, a greater proportion of Kelowna's population is projected to be over 65-years-old. Providing more housing close to services combined with travel options will help Kelowna's older citizens maintain mobility once they can no longer drive. Additionally, Kelowna will have a greater number of young adults and young families. Designing our pedestrian, bike, transit, and shared mobility infrastructure with the needs of Kelowna's future generations in mind will become even more important.

d) Weather Patterns

The Okanagan's weather patterns are changing because of climate change. In the future, we are likely to see increased spring precipitation (which leads to increased flooding risk) as well as hotter and drier summers (which can lead to more risk of droughts and fires).[13] These changes can affect transportation in many ways. For example, existing infrastructure may need more frequent maintenance, impacting available budgets. In addition, people may be less likely to walk and bike on days experiencing extreme heat or poor air quality due to forest fires.

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[13] City of Kelowna. (2018). Our Kelowna as We Take Action: Kelowna's Community Climate Action Plan. p.38.

4. Existing and Future Conditions

a) Walking

For the purposes of this discussion, walking includes travel with the use of mobility aids such as wheelchairs.

Importance of Walking

Walking trips are an important means of day to day transportation. Walking is the simplest and most reliable way to travel and is often used in combination with other modes. Having an accessible, connected and safe pedestrian network provides economic, health, social and environmental benefits for the entire community.

For individuals, walking increases physical activity and social interaction, improving overall health and well-being. It is also the least expensive way to travel. For the broader community, encouraging people to walk can reduce traffic congestion, curb greenhouse gas emissions and other air pollutants, and create more vibrant, livable neighbourhoods. Walking infrastructure is also much less expensive to build and maintain than infrastructure for motorized vehicles.

Key Factors that Influence the Choice to Walk

Shorter Trips

People tend to walk more when their destinations are closer. Shorter trip distances are often found in areas where there is a dense mix of land uses.

Direct Routes

At walking speed, even minor detours can have a big impact on travel times. Walking trips are best accommodated by connected grid networks with short block lengths and frequent, safe crossings that can help shorten walking trips. Some arterials in Kelowna have long blocks, and limited safe crossings with pedestrians forced to cross only at traffic signals which are often separated by large distances, such as along Springfield Road.

Human-Scale Urban Design

People walk more where the built environment is designed for the cognitive and physical capabilities of humans and is easily navigated at walking speed. Interesting building fronts, wide sidewalks, trees, benches, lighting, wayfinding, curb extensions, and traffic calming elements can work together to create lively streetscapes that create opportunities for social interaction and are pleasant to walk.

Pedestrian Safety

Pedestrians are more vulnerable to collisions than motorists or people on bikes. People are less likely to walk in places without sidewalks and safe places to cross busy streets.

Grades

People tend to walk more in flat areas that can be easily walked across. Steep slopes (greater than five per cent) can make walking significantly more challenging, uncomfortable and less attractive, especially for the elderly, people pushing strollers, and people who use mobility aids.

The most important factor for determining whether a trip will be made by walking is trip length. If the trip distance is too far, most people will choose another mode of travel, regardless of other factors. This

means that to support walking in Kelowna, land use strategies that support a variety of land uses in close proximity, will be key.

Land Use and Walking in Kelowna
Urban Centres

Many of the factors that influence people to walk are present in Kelowna's Urban Centres, as well as other parts of the city, such as Lower Mission, North Glenmore, and UBC Okanagan. Kelowna's most developed Urban Centres (Downtown, South Pandosy, and Rutland) have the most potential for walking trips as they have many of the necessary factors that make walking attractive.

Multiple destinations located near each other make Pandosy Village an attractive area to walk (Photo by Gordon Foy.)

The other two Urban Centres, Capri-Landmark and Midtown are ideal locations to support more walking trips. However, they currently lack several of the factors that influence people to walk, including short trip distances, direct routes, and human-scale urban design. Strategies for improving the walkability of Kelowna's Urban Centres are discussed more in the Future Challenges and Opportunities section.

Core Area

Only some of the factors that influence people to walk are present in Kelowna's Core Area. The area is generally flat, with some neighbourhoods in close proximity to key destinations and the Urban Centres.

However, traffic volumes, medium length trip distances and limited pedestrian infrastructure in some locations (e.g. sidewalk gaps, lack of crossings) can be barriers to walking.

Suburban / Hillside Areas

Many of the factors that influence people to walk are not present in Kelowna's suburban and hillside areas. Hillside development typically consists of single-family residential homes that are too far from commercial and employment land uses for walking to be practical. Hillside topography includes steep grades and disconnected pedestrian networks that make trips longer and more challenging. While many hillside neighborhoods have been built with safe and adequate sidewalk facilities, they are often underutilized since few destinations are within walking distance.

While it is likely that most residents in hillside neighborhoods will need to continue driving to meet their daily travel needs, making investments to increase walking, biking, and transit ridership in the Urban Centres will benefit hillside residents by freeing roadway capacity on congested urban streets and making it easier for them to commute by car.

Rural Areas

Rural areas are located where destinations are too far apart for walking to be convenient. Recognizing that this and other key factors are absent, in addition to many of the other factors that influence people to walk, continued investment in pedestrian facilities in rural areas is generally not recommended.

Walk Score

The website Walk Score evaluates the walkability of locations based on distance to amenities and pedestrian friendliness (e.g. block lengths, intersection density, etc). Overall, Kelowna scores 42 out of 100 points and the description notes that most errands require a car.[14]

While this score averages walkability across the entire city, many of Kelowna's Urban Centres receive higher walkability scores (see Figure 4a.1). For example, Downtown Kelowna has a Walk Score of 97 and is described as a "walker's paradise." Pandosy Urban Centre, Capri-Landmark Urban Centre, and Rutland Urban Centre all have Walk Scores in the range described as "very walkable." Midtown Urban Centre (the least mature of Kelowna's five Urban Centres) currently has a Walk Score of 66, which is described as "somewhat walkable."

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[14] Walk Score. Living in Kelowna. https://www.walkscore.com/CA-BC/Kelowna
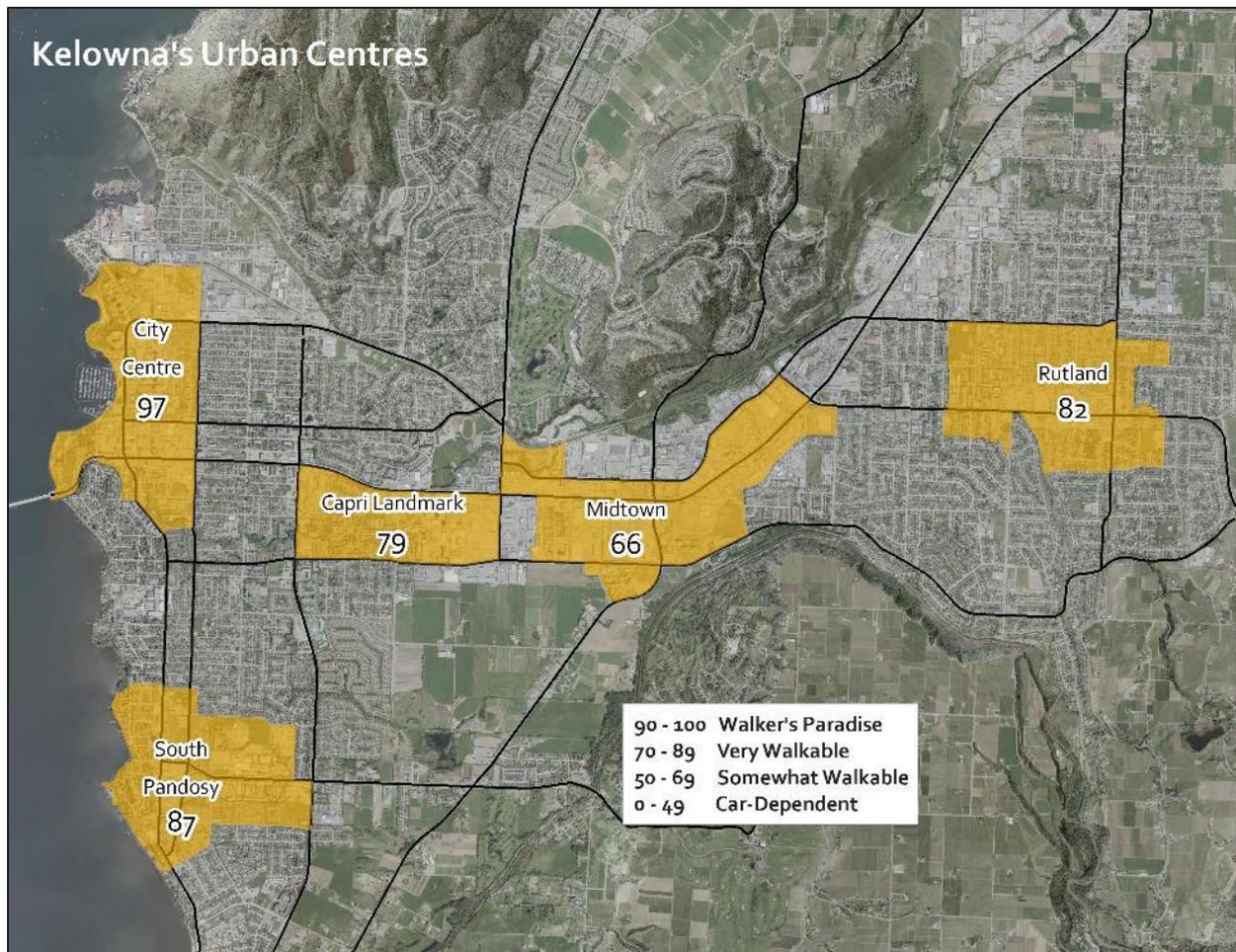
Figure 4a.1: Walk Score for each of Kelowna's Urban Centres. Source: walkscore.com

Walking in Kelowna

Between 2007 and 2013, there was a 44 per cent increase in Kelowna's walking rate. It went from 5.4 per cent of all trips originating in Kelowna in 2007 to 7.8 per cent in 2013.[15]

Walking to Work

Based on Household Travel Survey data, walking is the travel mode used for 8.2 per cent of all trips to work in Kelowna. This is for the city as a whole however, and the percentage varies widely between different areas. Figure 4a.2 shows that walking to work is most frequent in the Downtown and least frequent in outlying areas of the city. Since walking trips tend to be short, where people live greatly influences whether or not they walk to work.

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[15] 2013 Household Travel Survey

Walk Commute Mode Share
By Household Location

North Kelowna 4%

Glenmore 4%

Rutland 5%

City Centre-Pandosy 15%

Midtown 11%

Black Mountain 3%

Southeast Kelowna 2%

The Mission 3%
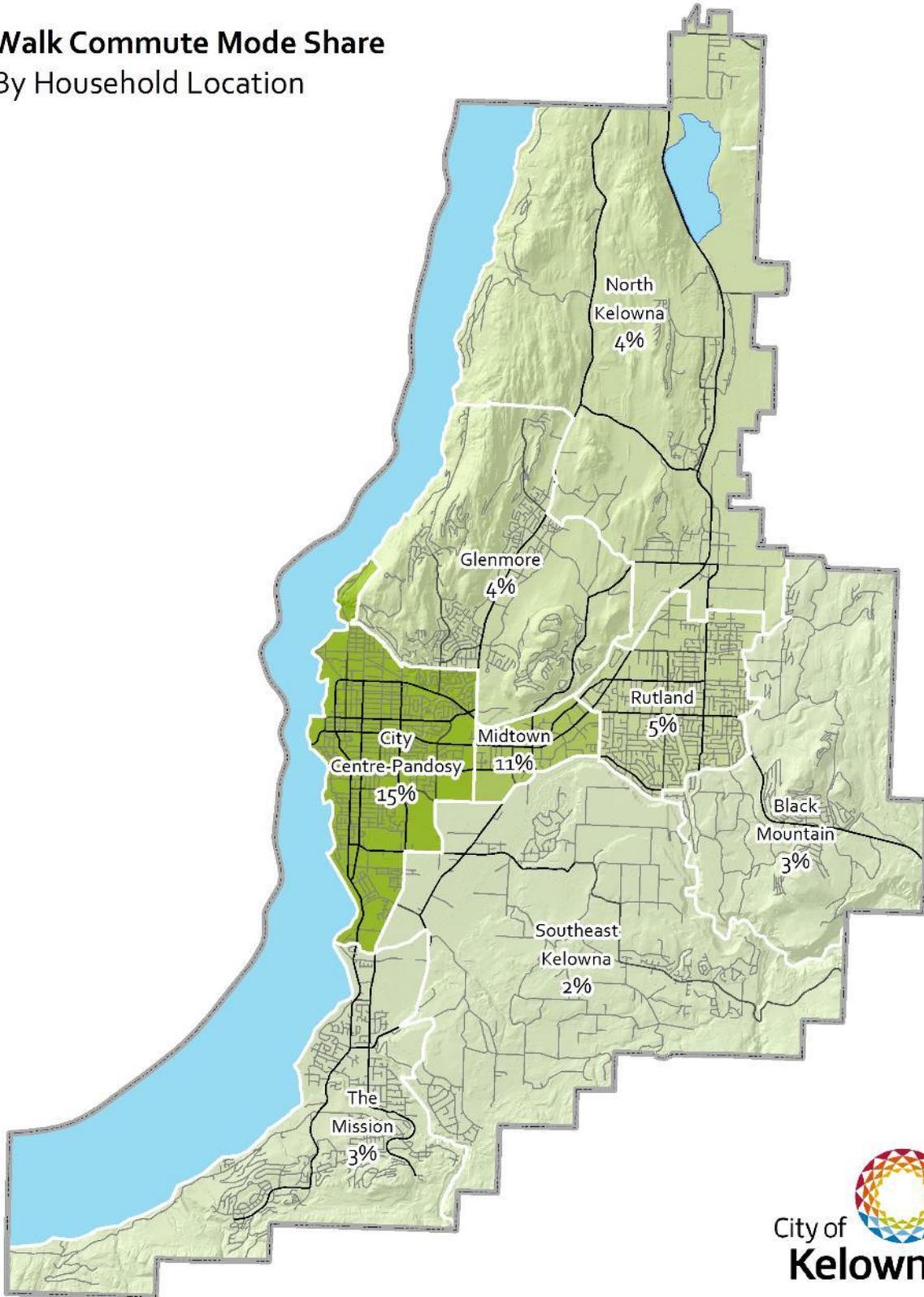
City of Kelowna

Figure 4a.2: Walk Commute Mode Share by Household Location. Source: 2013 Household Travel Survey

Trip Distances

According to Household Travel Survey data, walking trips made within the City of Kelowna tend to be short, with a median of about 630 metres.[16] However, in Kelowna's Core Area, where the built environment encourages walking, the average walking trip is about 900 meters.

Since 24 per cent of trips in Kelowna are two kilometres or less (see Figure 4a.3), there is the potential to increase the number of trips made by walking.[17]
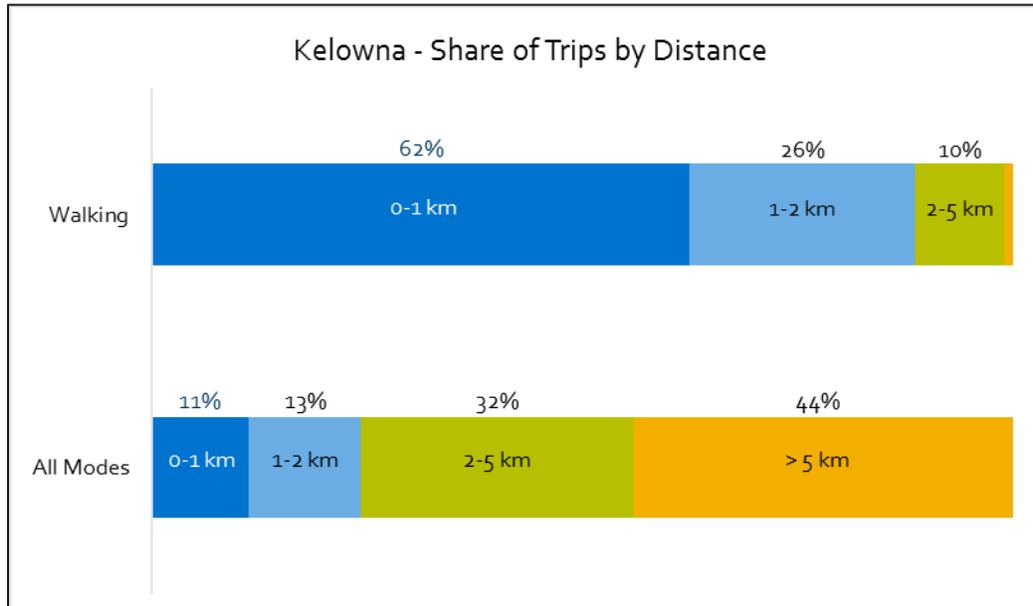
Figure 4a.3: Share of Trips by Distance in Kelowna. Source 2013 Household Travel Survey

Pedestrian Counts

The City has several permanent pedestrian count locations that enable the City to monitor trends. The counter locations and live data can be viewed at the City's Pedestrian & Bicycle Count Data public web page.

The pedestrian counters show that walking trips follow similar travel trends as other modes with more trips made on weekdays than on weekends, with spikes during the morning and afternoon peaks. However, when compared to other modes of travel, walking is relatively more common during the middle of the day and in the evening, and even more so on weekends.

Walking trips also fluctuate by season, with approximately 30 per cent more trips than average in the summer and 30 per cent fewer trips in the winter months (see Figure 2d.10 at the end of Chapter 2). In recent years, walking activity has also decreased during days with poor air quality due to forest fires.

Safety

An average of 46 pedestrian collisions are reported in Kelowna every year.[18] That works out to one pedestrian collision every eight days. Most collisions result in injury and there is an average of three

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[16] 2013 Household Travel Survey
[17] City of Kelowna. (2018). The Congestion Paradox.
[18] 2013-2017 ICBC Data

fatal pedestrian collisions a year. People walking are more vulnerable than other travellers and are more likely to suffer injury or death in a collision compared to motor vehicle occupants. Between 2013 and 2015, people walking were involved in only 1.4 per cent of all collisions but represented 42.9 per cent of all fatalities (see Figure 4a.4 and Figure 4a.5).[19] To put this in context, the City of Kelowna's rate of 32.7 pedestrian collisions per 100,000 people is similar to comparable cities in British Columbia (see Figure 4a.6).
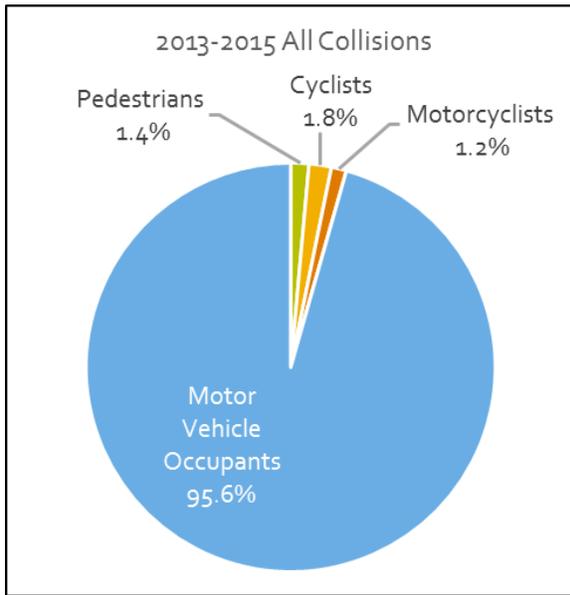
Figure 4a.4: Collisions in Kelowna by Travel Mode. Source: ICBC
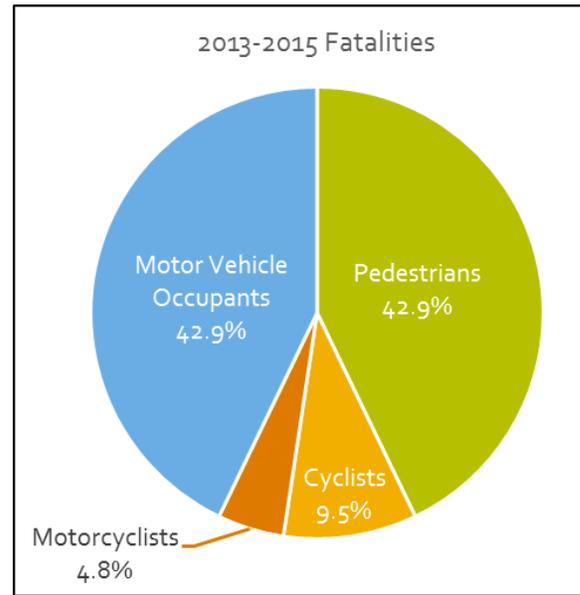
Figure 4a.5: Collision Fatalities in Kelowna by Travel Mode.

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[19] 2013-2015 ICBC Data (from WSP's Network Screening study)

Annual Pedestrian Collisions Per Capita, 2013-2017

City	Value
Vernon	39.9
Abbotsford	36.7
Kelowna	32.7
Chilliwack	32.2
Nanaimo	29.3
Kamloops	28.0
Penticton	23.8
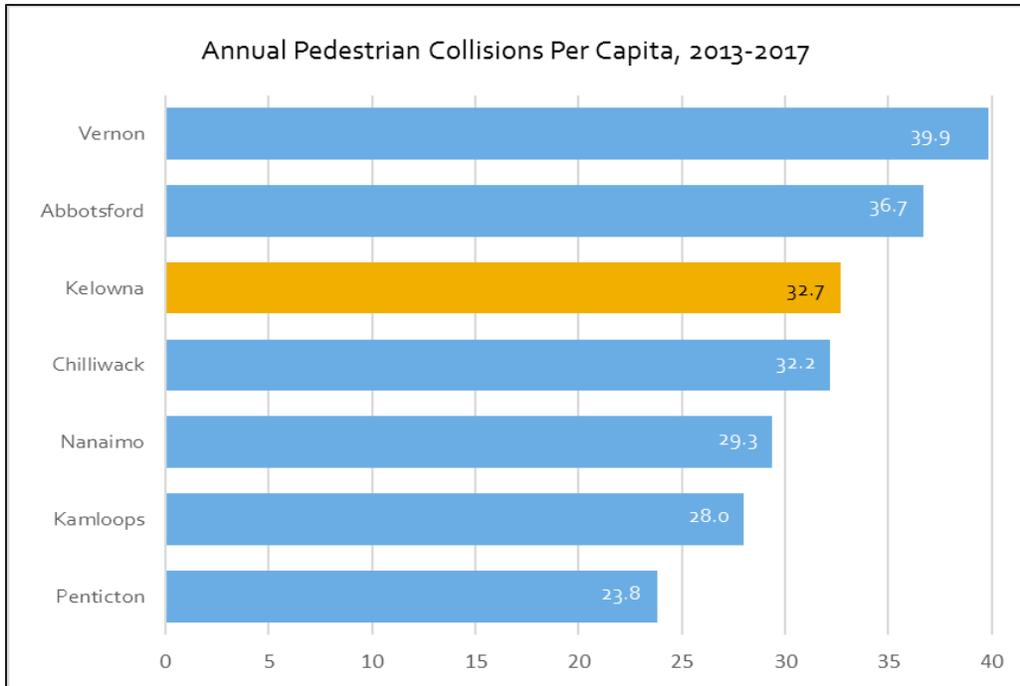
Figure 4a.6: Average Annual Number of Collisions Per 100,000 People, 2013-2017. Adjusted to account for commuters driving in from neighbouring jurisdictions. Source: ICBC, Statistics Canada

Types of Pedestrian Infrastructure

There is a wide range of pedestrian infrastructure that can be installed to help people walk along or across a roadway, conveniently move through neighbourhoods and access natural areas. This infrastructure can help make walking a safe, comfortable and inviting experience. Figure 4a.7 provides examples of the pedestrian facility types used in Kelowna.

A **Sidewalk** is an asphalt or concrete walking facility adjacent to roads exclusively for pedestrians.

Crosswalks are designated road crossing points for pedestrians at intersections and mid-block locations.

Curb Letdowns can help to ease crossings for people in wheelchairs or children in strollers.

A **Pedestrian Laneway** is an alleyway, typically in a commercial area dedicated for pedestrians travel and socializing.

A **Shared-Use Pathway or Trail** is an off-road two-way facility that is shared by pedestrians, bicyclists, and other users built using a range of surface material.

A **Curb Extension** both slows vehicle traffic and decreases the crossing distance for pedestrians.

Pedestrian Countdown timers show the time available to cross the road at a signalized intersection. Audible timers can also help visually impaired pedestrians.

A **Half-signal** shows a flashing green light for motorists that becomes red indicating motorists must stop when activated by a pedestrian.

The **Rectangular Rapid Flashing Beacon (RRFB)** is an amber flashing beacon activated by pedestrians at marked crosswalks.

Walkway: A short segment of walking facility used to connect neighbourhoods to sidewalks usually at the end of cul-de-sac bulbs.

Pedestrian bridges provide a safe crossing where a busy walking route meets a high volume roadway.

Tactile Panels help people with visual impairments.

Figure 4a.7: Types of Pedestrian Infrastructure Installed Around Kelowna.

Accessible to All Ages and Abilities

Accessibility is also an important consideration for young and elderly pedestrians, people who use mobility aides such as wheelchairs, and users of mobility scooters. Curb letdowns, wider sidewalks, and markings for visually impaired users, as shown in Figure 4a.7 above, are design elements that can help to improve accessibility for users of all abilities. Seniors and wheelchair users also tend to move slower than the average pedestrian and therefore measures such as crossing time adjustments can create greater user comfort. In alignment with recommendations from the Healthy City Strategy, the City proactively includes accessibility improvements in sidewalk projects.

Existing Walking Network

In 2018, the City had approximately 429 kilometres of sidewalks and 56 kilometres of paved shared-use paths, as shown in Figure 4a.8.

Existing Walking Network

Shared-Use Pathway
Sidewalk
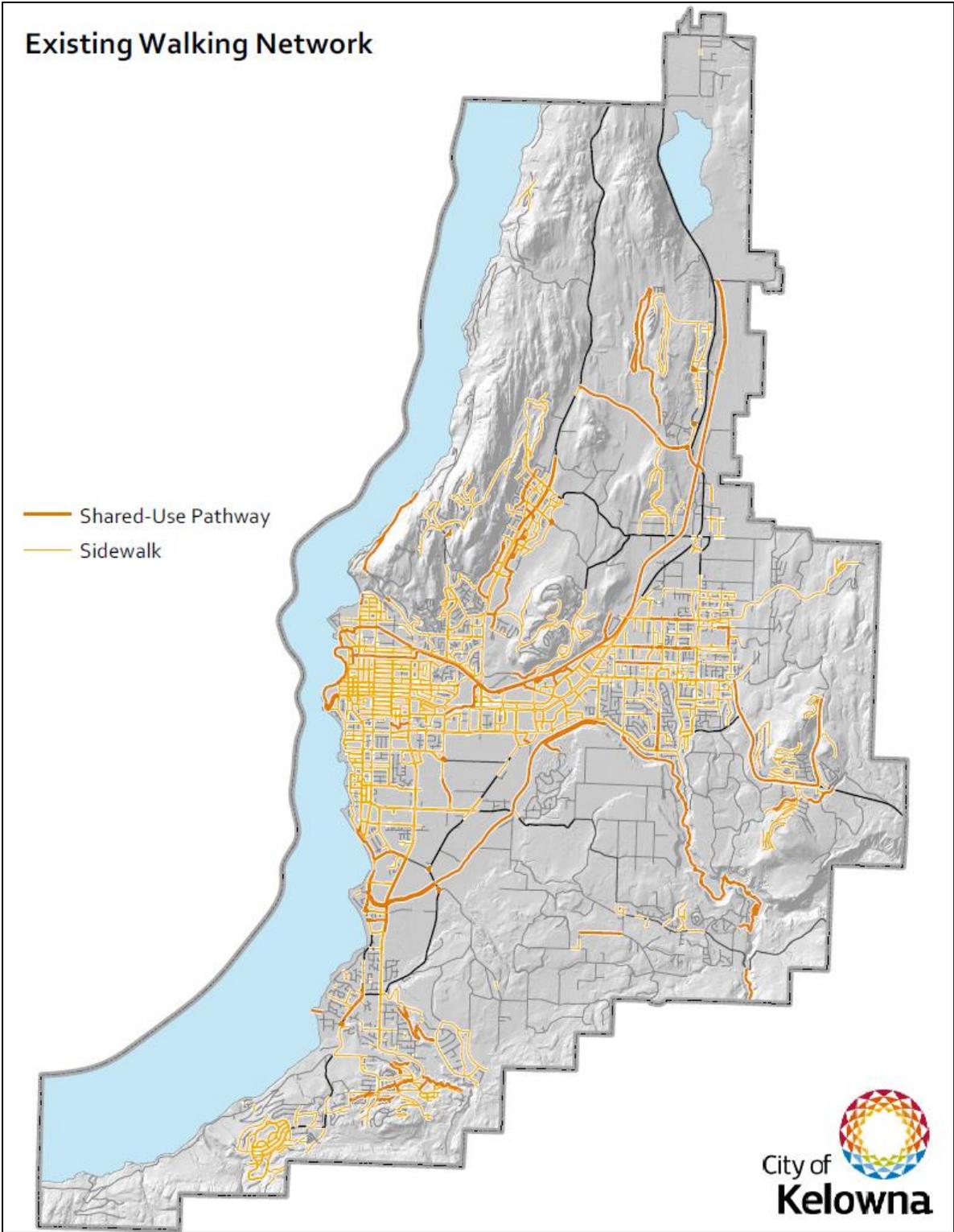
City of
Kelowna

Figure 4a.8: City of Kelowna's Existing Walking Network.

Recent Investment

The City has been working to improve walking conditions throughout Kelowna with projects that provide comfortable and accessible sidewalks, such as the Sidewalk Capital Program. Since the

adoption of the Pedestrian and Bicycle Master Plan in 2016, approximately eight per cent of the plan's proposed sidewalks and 52 per cent of the proposed shared use paths have been built by the City, through partnerships, or by private developers, as shown in Table 4a.1.

Table 4a.1: City of Kelowna Pedestrian Infrastructure Inventory

Infrastructure Type	2016 PBMP		2018		
	Existing (km)	Proposed (km)[2]	Built since PBMP (km)[1]	% of Proposed Built[2]	Proposed Remaining (km)[2]
Sidewalks	400	72	6	8%	66
Shared-Use Pathway	77	38	20	52%	18
1.Twenty-three km of sidewalks have also been built by private developers, in addition to those proposed in the PBMP 2.Proposed includes only infrastructure to be built by the City					

Other recent investments include the Bernard Avenue Revitalization Project (2013), as well as the pedestrian overpass across John Hindle Drive (2018), which connects the UBC Okanagan campus and Academy Way.

In addition to the Sidewalk Capital Program, Kelowna's sidewalk network is expanded through the development process when frontage improvements are completed by private developers. While this infrastructure helps to build out a full and complete pedestrian network, it is only built when and where new development takes place. This is why the City continues to take the lead to ensure that the priority sidewalk network, as identified in the Pedestrian and Bicycle Master Plan, is ultimately completed.

The City plans to continue investing in pedestrian infrastructure. Currently, the 10-Year Capital Plan includes funding out to 2028 for build out of both the sidewalk network and active transportation corridors.

Programs
Education, encouragement, and awareness programs also get people walking and can be cost effective complements to infrastructure investments. The City offers ongoing pedestrian programs through the regional smartTRIPS program.[20] Its aim is to shift single-occupancy vehicle trips to transit, walking, cycling and carpool trips. Other programs that are specific to walking include the Clean Air and Safe Routes 4 Schools Program, International Walk to School Week, and the Walking School Bus Program. In addition, "open street" events such as the Turtle Island Festival, Downtown Kelowna Block Party, and Arts on the Avenue help to promote streets as public spaces and encourage active transportation. These programs are described further in the Programs and Incentives section of this chapter.

Policy Context
Plan and policy documents such as *Imagine Kelowna: The Vision to 2040 (2018), Kelowna Community Climate Action Plan (2018), Kelowna on the Move: Pedestrian and Bicycle Master Plan (2016), Healthy City Strategy Community for All Plan (2016), Urban Centres Roadmap (2016)* and *Kelowna 2030 Official Community Plan (2011)* are all supportive of making walking a safe and convenient mode of transportation. Additionally, public engagement results for the development of the Transportation

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[20] https://www.smarttrips.ca/

Master Plan, held in spring 2018, reinforced the theme of improving diverse modes of transportation and connectivity within the community. This indicates that residents support the City's objective of making walking a convenient and attractive transportation choice.

Kelowna on the Move: Pedestrian and Bicycle Master Plan (2016)

The Pedestrian and Bicycle Master Plan (PBMP) identifies infrastructure, planning, and policy requirements to promote walking and cycling in the community. The plan includes the following principles and goals specifically related to walking:

Principles:

- To increase walking and cycling as practical modes of travel;
- To improve safety and convenience for pedestrians and cyclists.

Goals:

- Increase year-round walking and cycling so that within the next 20 years, 25 per cent of all trips less than five kilometres in length are made by walking or cycling.
- Improve pedestrian and cyclist safety so that the rate of collisions with motor vehicles is reduced by 50 per cent within the next 20 years.

To achieve these goals, the PBMP includes objectives related to network design; planning, monitoring and maintenance; end-of-trip and transit integration; education and promotion; policies and enforcement; and funding.

Kelowna 2030 Official Community Plan (2011)

The Official Community Plan (OCP) is a document that contains a municipality's goals, objectives and policies guiding growth and change. The 2030 OCP includes the following vision, goals, objectives, and policies specifically related to walking:

Vision: Kelowna residents aspire to have:

- Urban communities that are compact and walkable.
- Walking paths and bicycle routes connect to key destinations.

Goals:

- Feature a Balanced Transportation Network.
- Increase the attractiveness, convenience and safety of all modes of transportation by implementing "complete streets" that are designed to serve a broader range of transportation modes, focusing on pedestrians, cyclists and transit service, and function in the context of surrounding land uses.

Objectives:

- Objective 7.6: Place increased emphasis on sustainable modes of transportation (walking, cycling, transit) while maintaining automobile, commercial goods and emergency vehicle mobility.
- Objective 7.8: Provide more active transportation infrastructure to: increase resilience in the face of higher energy prices, improve community health, and reduce greenhouse gas emissions.

Policies:

- Policy.7.6.1: Transportation Infrastructure Priority. Transportation infrastructure will be funded, designed, constructed and maintained to meet the needs of users and according to the following priority:

  i. Active Transportation (Walking and Cycling)
  ii. Transit
  iii. Movement of Goods & Services
  iv. High Occupancy Vehicles (HOVs)
  v. Single Occupant Vehicles (SOVs)

Priority will be assigned to active transportation and transit infrastructure that serves and connects Urban Centres, major employers, health care and education facilities.

Figure 4a.9: OCP Policy 7.6.1 Transportation Infrastructure Priority

- Policy 7.6.2: Complete Streets: Ensure new roads are built as complete streets that incorporate sidewalks and on-street bike lanes on arterial and major collector roads.
- Policy 7.7.2: Ease of Movement: Ensure that pedestrians, bicyclists and transit users can move about pleasantly and conveniently and that they are not unduly impeded in their movements by provisions for enhanced automobile mobility.
- Urban Design Guideline 8.1: Prioritize the safe and convenient movements of pedestrians above all other modes of transportation.

Future Challenges and Opportunities

When planning for the future of Kelowna's pedestrian network, it is important to consider the many ways that 2040 will be different than it is today. The changes in land use patterns, transportation technology, weather patterns, and demographics summarized in Chapter 3 will all influence how much people walk in Kelowna. While many of these changes' present challenges for walking, they often present opportunities as well. In review of the existing and future conditions for walking in Kelowna, five key challenges and opportunities have been identified.

Challenge and Opportunity #1: Design for Walkability in the Urban Centres

With the majority of future growth occurring in Kelowna's Urban Centres, people will want to walk more in these areas. The challenge will be to provide safe, enjoyable pedestrian infrastructure that connects Urban Centre residents to key destinations. The Midtown, Landmark, and Rutland Urban Centres currently lack adequate infrastructure such as sidewalks and public spaces. As growth occurs in these areas, improvements will be needed to ensure walking is comfortable and safe. Pedestrian infrastructure and walking conditions are better in the Downtown and South Pandosy Urban Centres, , but improvements will still be needed to encourage more people to walk in these areas.

Since Kelowna's Urban Centres already contain many of the factors that influence people to walk, this focused future growth provides an opportunity to accommodate and encourage even more walking trips in the future. Ensuring that future development includes human-scale design that provides direct and well-connected pedestrian routes, will make walking even more attractive. Potential strategies for enhancing walkability and increasing walking trips within the Urban Centres include:

- Ensure that future development within the five Urban Centres is aligned with the principles of the Urban Centers Roadmap.
- Ensure that each Urban Centre has an Urban Centre Plan.
- Design sidewalks appropriate to the land use context. For example, Urban Centres with greater commercial activity will have more pedestrian activity and will require more space dedicated from developments for sidewalks.
- Design streetscapes that invite social interaction and strengthen city life. Widening the sidewalks allows space for streetscape amenities and a livelier street front, features that contribute to an improved pedestrian environment.

Challenge and Opportunity #2: Connect the Pedestrian Network in the Core Area

Focused growth within the Core Area will mean more demand for sidewalks. This will be a challenge as many streets within the Core Area lack sidewalks on one or both sides of the street. Since the Core Area already includes some of the factors that influence people to walk, focused growth will help shorten trip distances and make walking even more attractive. Potential strategies for enhancing walkability and increasing walking trips within the Core Area as Kelowna grows include:

More Than Just a Street

Pedestrian space is not just about walking. Improving conditions for pedestrians can also create more inviting public spaces and opportunities for social interaction. Street trees, lighting, benches, wayfinding, bicycle parking, frequent storefronts, patios and landscaping are all examples of streetscape amenities that can not only invite walking, but that can help to create a sense of place and foster community identity. Kelowna's street network represents most of the publicly owned land within Kelowna and as such, presents a substantial opportunity for enhanced place-making, public events and social interaction.

- Focus the Sidewalk Capital Program on implementing the highest priority sidewalk projects within the Urban Centres and Core Area, and update the Pedestrian and Bicycle Master Plan accordingly.
- As Kelowna grows, ensure sidewalk investment priorities are continually re-evaluated to ensure they occur first in areas where they will be most effective. These areas will have many of the factors that influence people to walk such as a dense mix of land uses that lead to shorter trips, a well-connected grid network, and frequent pedestrian crossings.
- Implement mid-block crossings and walkways, where appropriate, to help create more direct routes for people walking.

Challenge and Opportunity #3: Shift Short Trips to Walking

Eleven per cent of trips within Kelowna are less than one kilometer in length. Since a short trip distance is the most important factor for determining whether people will walk, there is an opportunity to shift more of the city's existing trips to walking. This will be a challenge however, given that Kelowna's existing built environment is largely auto-oriented. Potential strategies for shifting existing short trips to walking include:

- Ensure new development uses human-scale, walkable urban design.
- Ensure there is complete and connected pedestrian infrastructure and safe crossings between common destinations less than one kilometre apart, particularly within the Core Area.
- Adopt a more pilot-based approach to pedestrian infrastructure, testing out temporary materials before deciding whether to make them permanent.
- Improve walking connections to transit: 51 per cent of Kelowna residents live within 400 metres of a transit stop (approximately a five-minute walk).
- Improve walking connections and make pedestrian spaces near transit larger and more welcoming.

Challenge and Opportunity #4: Ensure People Walking Feel Safe

While research has proven that the health benefits of walking far outweigh any safety concerns, the challenge is that when a pedestrian is involved in a collision with a motor vehicle, the pedestrian is far more likely to be seriously or fatally injured than the motor vehicle occupants. In addition to the actual collision risk, there is also a popular perception of a lack of safety, which can cause some people to avoid walking. Generally, people feel unsafe when they are walking close to high speed traffic and where they must cross wide roadways. This is particularly true for people with children, people with diverse abilities, and the elderly. However, focusing future growth in the Core Area and Urban Centres presents an opportunity to create pedestrian facilities that feel safe and encourage people to walk. As the Core Area and Urban Centres densify, potential strategies for ensuring that people who walk feel safe include:

- Install crossing treatments such as pedestrian countdown timers, rapid-flashing beacons, and half-signals to help people cross the street safely at appropriate locations.
- Slow traffic speeds and improve pedestrian visibility by installing traffic calming features such as curb extensions, chicanes, speed humps, speed cushions, raised crosswalks, street trees, narrowing wide travel lanes, and other treatments.
- Install buffers, where appropriate, to increase the distance between people walking and driving cars such as wider sidewalks, boulevards with street trees, landscaping, street furnishings and on-street parking, among others.

Challenge and Opportunity #5: Create Flexible and Adaptable Pedestrian Spaces

Over the next 20 years, we know that the way people get around is going to change. The challenge is that we do not know exactly when new technology will come to Kelowna or exactly how it will influence the city's daily travel patterns. However, we do know that shared mobility programs such as bikeshare and ride-hailing will likely become more common and will influence the pedestrian realm. This creates an opportunity to create policy frameworks and design new sidewalks with the future in mind. Potential strategies for planning pedestrian policy and infrastructure that are adaptable to future changes include:

- Reallocate space on streets to accommodate more parking for shared mobility fleets. Where these shared fleets are parked (e.g. in the sidewalk furnishing zone, or in an on-street parking spot) may need to be flexible depending on location. Similarly, as ride-hailing becomes more common in Kelowna, the demand for curb space will increase as customers and drivers seek safe places to pick-up and drop-off passengers. As demand for sidewalk space increases, it will be important to ensure adequate through-space for people walking, as well as for people using mobility aides.
- As shared-mobility options become more common, the legislative framework in British Columbia and associated bylaws in Kelowna will need to be updated.[21] As motors and batteries become more efficient and smaller in size, shared mobility fleets may take on new and different forms (e.g. electric scooters). When they do, the types of shared-fleet mobility options that are permitted to use the City's shared-use paths may need to be clarified.

While Kelowna is currently an auto-oriented city, future changes will bring opportunities to encourage more people to choose walking for some of their daily travel needs. For the most part, these opportunities will be highest within the Urban Centres, where many of the factors that influence people to walk are already present. As the Urban Centres and Core Area densify, more destinations will be close together, shortening trip distances and removing the primary barrier to walking for people in these areas. With consistent and complementary action by the City to help ensure the built-environment provides safe and direct pedestrian routes and a pedestrian realm that is comfortable and attractive, Kelowna will be able to capitalize on these changes to increase the number of daily trips made by walking, improving the health of Kelowna citizens and our community's quality of life.

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[21] The Province is currently reviewing legislation pertaining to shared-mobility

b) Biking

Importance of Biking

Biking is a relatively low-cost travel option and provides mobility to those who cannot afford the high cost of owning, operating and maintaining a personal vehicle. Biking also provides a mobility option for people who are not able to drive, such as children, teenagers, and the elderly. In addition, biking provides both physical and mental health benefits, which have been shown to lead to healthier and longer lifespans.

Biking also has advantages for the entire community. When more people choose biking instead of driving, it results in less air pollution and fewer greenhouse gas emissions, helping to improve air quality and reduce the impacts of climate change. More biking also helps reduce noise levels, while healthier residents are less of a burden on the health care system. In addition, biking is more space efficient than driving. Therefore, increasing the number of people biking can help reduce the need for additional road capacity and save tax dollars. Bicycles are also lightweight and do not impact the roadway as much as motor vehicles, which reduces the need for expensive repaving. Finally, bikes take up less parking space, which means that more people can access high-demand locations, such as Downtown Kelowna and the other Urban Centres, without the need to build more expensive parkades and dedicate high-value land to the temporary storage of personal vehicles.

Shared-use path next to the Parkinson Recreation Area in Kelowna. (City of Kelowna)

Key Factors that Influence the Choice to Bike

Many of the factors that influence people to bike are the same as those that influence people to walk, except that a bike allows people to cover a greater distance in the same amount of time. Key factors include:

Short Trips

While biking has a longer range than walking, biking is still more viable when destinations are close to one another. Shorter trip distances are often found in areas with a dense mix of land uses.

Direct Routes

Circuitous routes can push destinations outside of biking range. Biking trips are best accommodated by a well-connected street grid that includes a well-connected network of bicycle infrastructure. This helps provide direct routes, so people do not need to go out of their way to safely get to their destination.

Low-stress Bicycle Infrastructure

Protecting people riding bikes from motor vehicle traffic can greatly lower the stress of riding a bicycle and can encourage more people to ride. Bicycle infrastructure that separates people riding bicycles from cars and increases bicyclist visibility to motorists, can help improve safety as well as the perception of safety. Examples of low-stress bicycle infrastructure include protected and separated bikeways, buffered bike lanes, the use of green pavement in conflict-zones, safe-crossing treatments for people riding bikes (e.g. elephant feet, green bike boxes, bicycle signals, etc.), and traffic calming on neighborhood streets.

Grades

People tend to bike more in areas that are flat and will seek out routes with minimal elevation gain. Steep hills can make biking significantly more challenging, uncomfortable and less attractive, especially for children and the elderly. However, electric bikes (e-bikes) are gaining in popularity and could help potential riders overcome the deterrent of steeper grades.

The above factors above are supported by recent research. In an independent study of Kelowna residents,[22] the most common factors cited when deciding whether to bike included:

- The presence of a connected network of bicycle routes through the city (60 per cent).
- The presence of separated bicycle lanes along the route (58 per cent).
- Fear of traffic or motor vehicle collisions (56 per cent).

Additional factors that can influence the choice to bike include weather, the need to transport items or passengers, and end-of-trip facilities such as bike parking and workplace showers.

However, by far the most important factor for determining whether a trip will be made by biking is trip length. If the distance is too far, most people will choose another mode of travel, regardless of other factors, like the presence of well-connected, low-stress bicycle infrastructure or flat terrain. Areas with a dense mix of land uses within a comfortable biking distance, such as in Kelowna's Urban Centres, have the best potential for attracting people to biking.

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[22] Cities, Health & Active Transportation Research (CHATR) Lab - Simon Fraser University. (2016). Impacts of Bicycle Infrastructure in Mid-Sized Cities (IBIMS) Study: Survey Findings and Equity Mapping.

Land Use and Biking in Kelowna

Urban Centres

Many of Kelowna's five Urban Centres, such as the Downtown, South Pandosy and Rutland have the key factors that influence people to bike, including a mix of land uses, short trip distances, direct routes and flat terrain. Currently, some Urban Centres have more low-stress bicycle infrastructure than others, and this will need to be an important design consideration as the Urban Centres further develop and mature.

Core Area

Kelowna's Core Area is generally well-suited for biking. With mostly flat terrain and a grid-like street network, there is good east-west and north-south connectivity for people who bike. Areas for improvement include placing new growth close to key destinations, and the installation of low-stress bicycle infrastructure that connects the Urban Centres. By focusing more development in the Core Area and continuing to invest in well-connected, low-stress bicycle infrastructure, biking will become an easier and more convenient transportation option for short trips less than five kilometres.

Suburban Areas

Many of the factors that influence people to bike are not present in Kelowna's hillside areas. These areas typically have steep grades and are located too far from commercial and employment land uses for biking to be convenient for most trips. While many arterial roads in the hillsides have painted bike lanes, the distance and topography issues remain major barriers to biking. Because of this, increased investment in bike infrastructure is not a high priority in hillside areas. However, residents of these areas will still benefit from investments made elsewhere in the city, since they will help to free up roadway capacity on congested urban streets for residents that have little choice but to drive.

Rural Areas

For the most part, the key factors that influence people to bike are not present in Kelowna's rural areas. Most rural areas are far away from destinations and have circuitous roadways with few bike lanes or shoulders. While these conditions are not conducive to using a bike for transportation, rural areas can be popular for recreational biking thanks to their quiet roads and large green spaces.

Biking in Kelowna

Biking to Work

Based on Household Travel Survey data, biking is the travel mode for 5.4 per cent of all trips to work. However, this is for the city as a whole and the percentage varies widely between different areas. Figure 4b.1 shows that biking to work is most frequent in the Downtown and Pandosy Village areas, and less frequent in the outlying parts of the city. Since most bike trips are five kilometres or less, where people live greatly influences whether or not they bike to work.

Bike Commute Mode Share
By Household Location

North Kelowna N/A*

*No bike commute trips were recorded by residents of these areas in the survey

Glenmore 5%

Rutland 5%

City Centre-Pandosy 9%

Midtown 6%

Black Mountain N/A*

Southeast Kelowna 5%

The Mission 2%

City of Kelowna
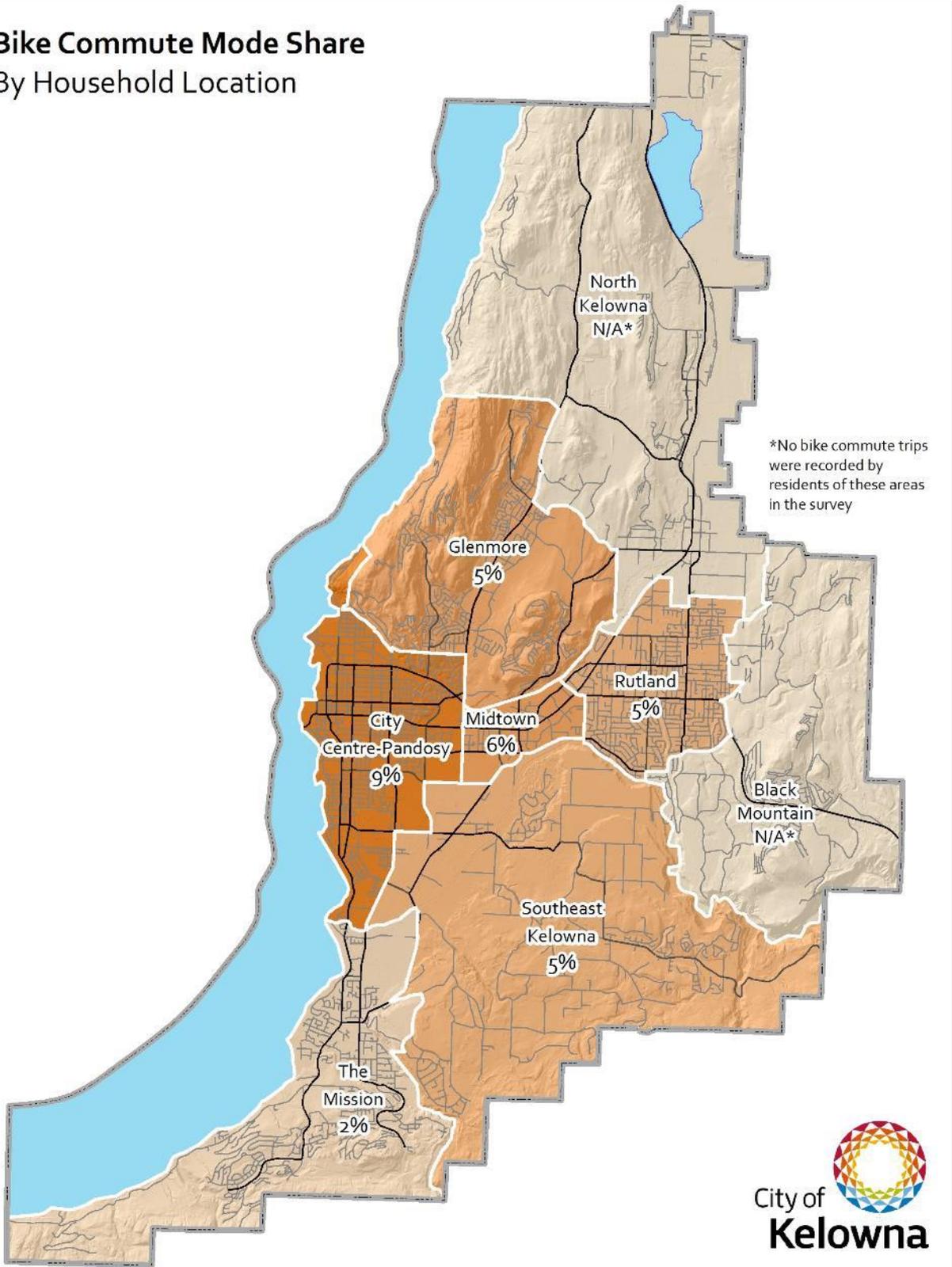
Figure 4b.1: Bike Commute Mode Share by Household Location. Source: 2013 Household Travel Survey

Trip Distance

As previously mentioned, bike trips tend to be ideally suited for short to medium length trips. Figure 4b.2 shows that the average bicycle trip in Kelowna is about 2.8 kilometres, while approximately 88 per cent of all the bike trips are five kilometres or less. In fact, 56 per cent of all the trips made in Kelowna, regardless of mode, are five kilometres or shorter, which indicates there is an opportunity to shift some of those trips to biking.
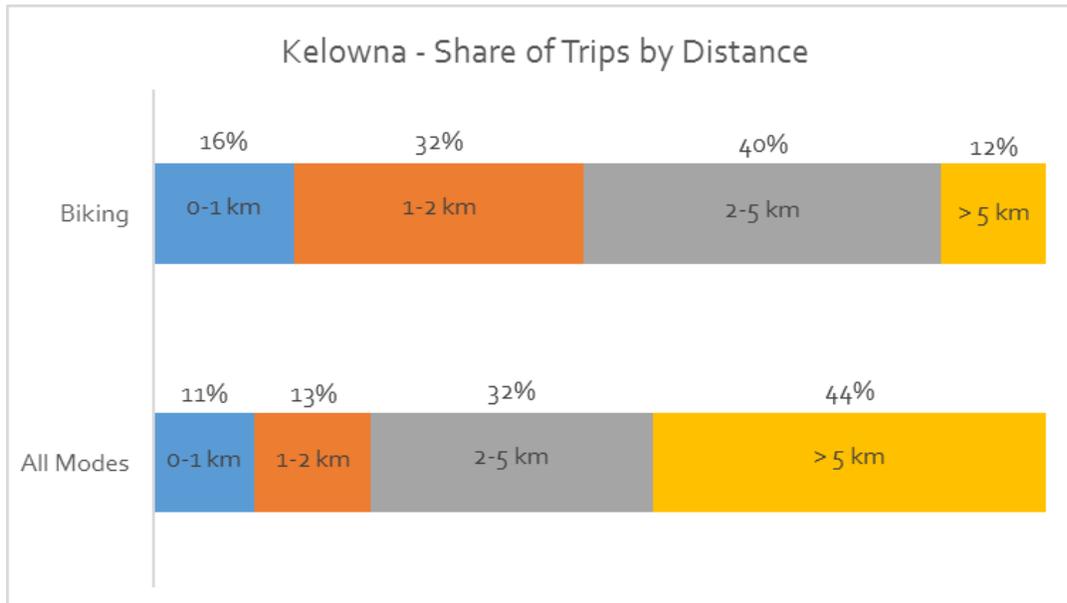

Figure 4b.2: Comparison of Bike Trips and All Trips by Trip Distance. Source: 2013 Household Travel Survey

Bicycle Counts

There are several permanent bicycle counters located throughout Kelowna that help provide a snapshot of biking activity. The counter locations and live data can be viewed at the City's Pedestrian & Bicycle Count Data public web page.

The data show that bike trips follow a similar daily profile to driving during the week, with peak periods during the morning and afternoon commutes. On weekends, biking activity peaks around 2 p.m. The data also show that biking activity fluctuates by season, with cold weather, snow and darkness reducing the amount of bicycle travel. Compared to the yearly average, Kelowna sees approximately 100 per cent more bike trips in the summer and 80 per cent fewer trips in the winter. Additionally, people riding in the evenings and on weekends (i.e. recreational bicyclists) tend to prefer shared-use paths and linear park paths, while people riding during the morning and afternoon peaks (i.e. commuter bicyclists) are using routes that connect to employment, schools and shopping destinations.

Historical Trends

Analysis of the bike count data allows us to see trends over time. For example, the counter along the protected bike lanes on Cawston Avenue (constructed in 2012) shows that the average number of daily bike trips increased 54 per cent between 2014 and 2018 for the months of April to September (See Figure 4b.3 – other months are not included due to lapses in data). Some of this growth may be due to the completion of the Ethel protected bike lanes to the south, as well as population growth in surrounding neighbourhoods.
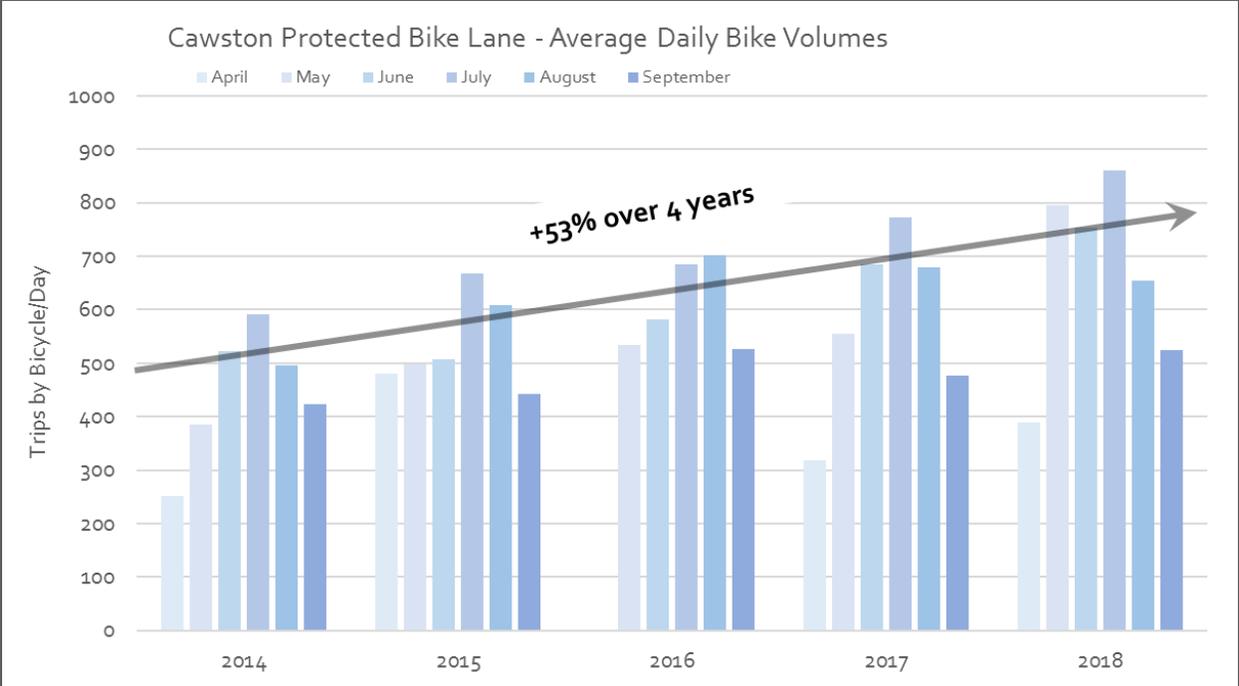
Figure 4b.3: Average Daily Bike Volumes along Cawston Avenue Protected Bike Lane

Another counter is located along the Abbott Street protected bike lanes (constructed in 2005). This location saw a nine per cent increase in the average number of daily bike trips from 2015 to 2018, despite no improvements to infrastructure immediately before or during that time (see Figure 4b.4).
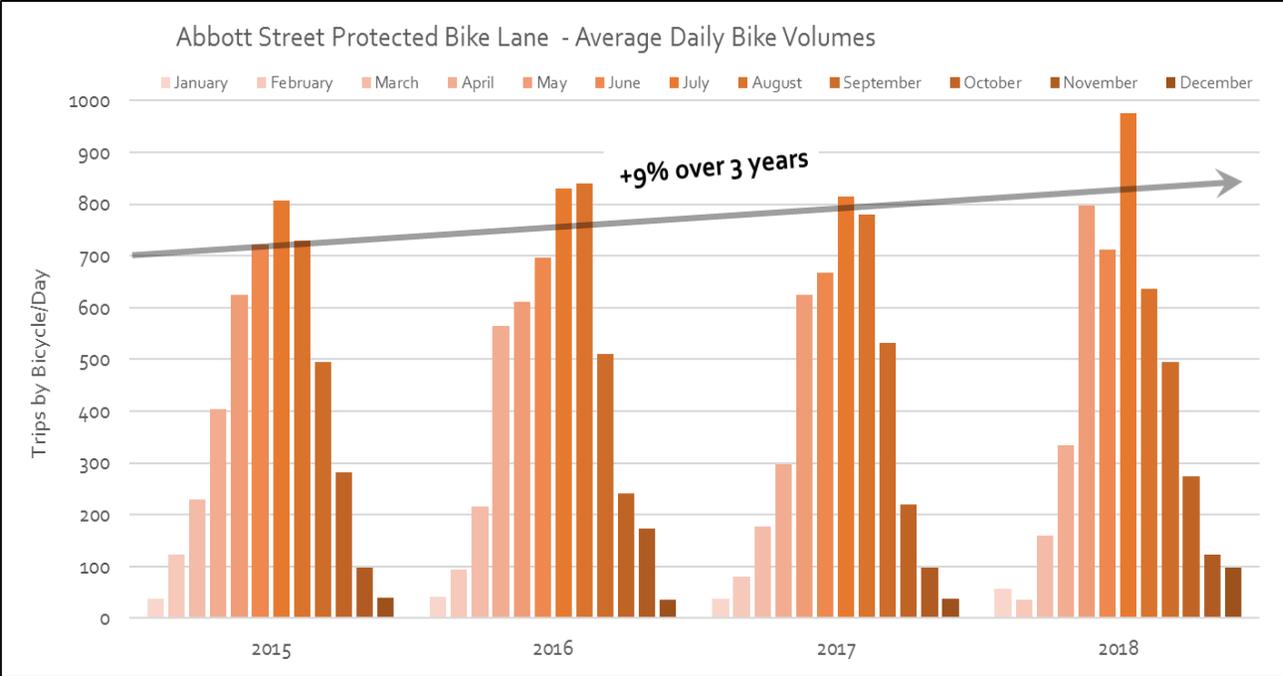

Figure 4b.4: Average Daily Bike Volumes along Abbot Street Protected Bike Lane

On the Rails with Trails path along Clement Avenue, near the Bernard Avenue overpass, the average number of daily bike trips increased 66 per cent from 2017 to 2019 (see Figure 4b.5). This significant increase in use is likely due to the completion of the Okanagan Rail Trail in fall 2018.
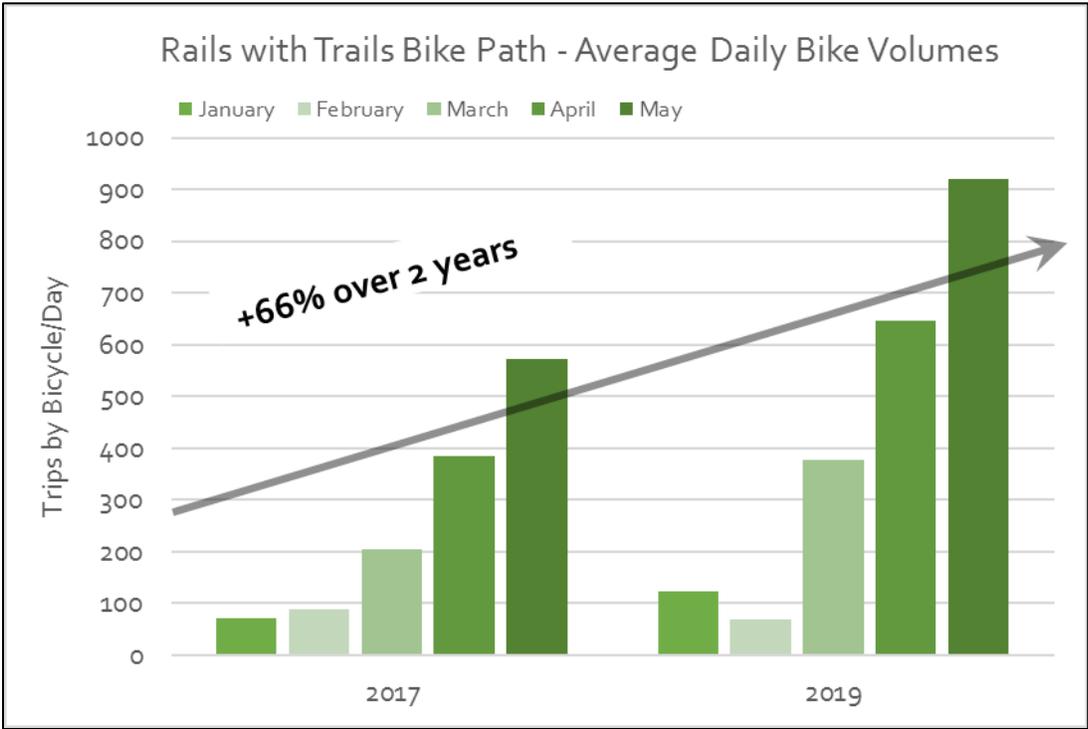
Figure 4b.5: Average Daily Bike Volumes along Rail with Trails Bike Path.

When looking more broadly across the entire city, Household Travel Survey data show that the share of bike trips increased from 2.6 per cent of all trips in 2007 to 3.3 per cent of all trips in 2013.[23]

Safety

An average of 73 bicycle collisions are reported in Kelowna every year.[24] That works out to one bicycle collision every five days. Most collisions result in injury with an average of one fatal collision a year. People biking are more vulnerable than other travellers and are more likely to suffer injury or death in a collision than motor vehicle occupants. As shown in Figures 4b.6 and 4b.7, from 2013 to 2015, people biking were involved in only 1.8 per cent of all collisions but represented 9.5 per cent of all fatalities.[25] To put this in context, Kelowna has an average of 15.6 bicycle collisions per 1,000 bicyclists every year. Compared to similar cities in British Columbia, Kelowna has a below average bike collision rate (see Figure 4b.8).

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[23] 2007 and 2013 Household Travel Surveys
[24] 2013-2017 ICBC Data
[25] 2013-2015 ICBC Data (from WSP's Network Screening study)
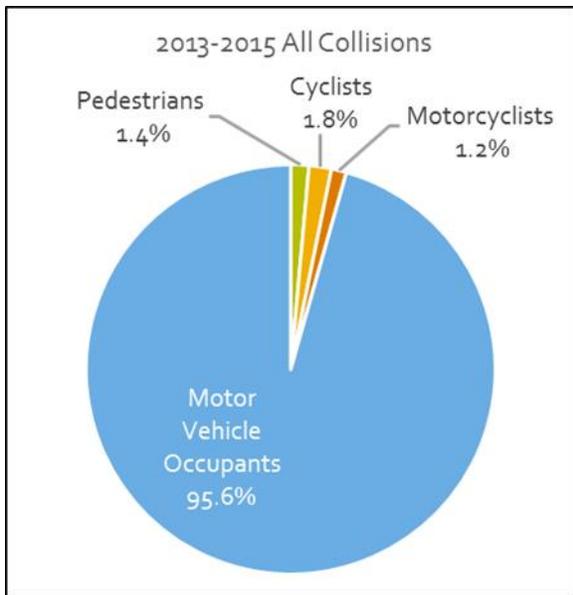
Figure 4b.6: Collisions in Kelowna by Travel Mode. Source: ICBC
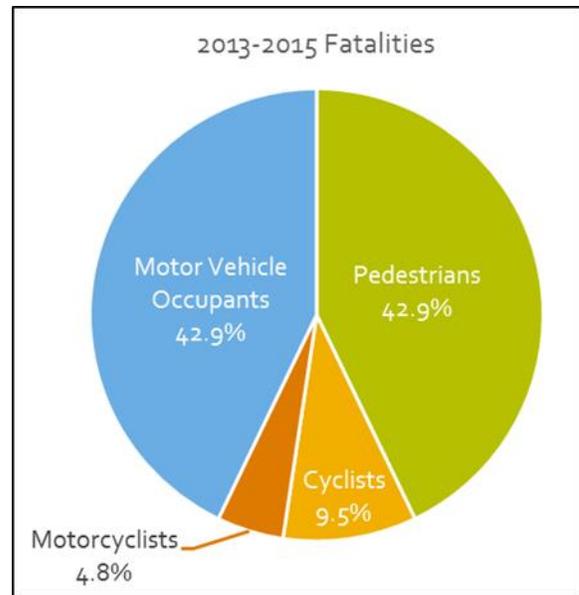
Figure 4b.7: Collision Fatalities by Type of User. Source: ICBC
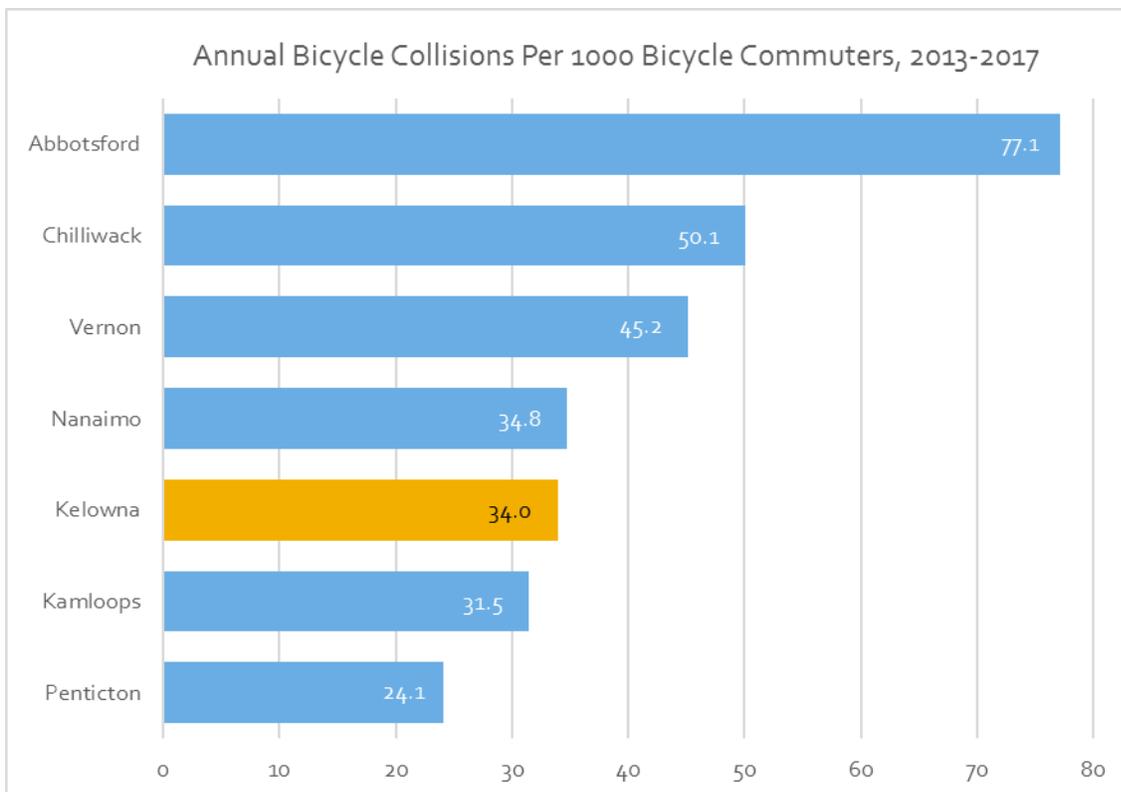
Figure 4b.8: Average Annual Number of Bicycle Collisions Per 1,000 Bicycle Commuters, 2013-2017. Source: ICBC, Statistics Canada

There is some seasonal variation when it comes to collisions. Kelowna's bicycle collision rate is higher in winter than at other times of year (see Figure 4b.9). This could be due to a variety of factors, such as icy and dark roadway conditions and/or fewer people biking on the roads. In general, it is common to see

bicycle collision rates decrease as biking rates increase, as happens in the summer. This phenomenon is known as "safety in numbers" and refers to the tendency of drivers to better anticipate and look for people biking when there are more people biking on the roadways.
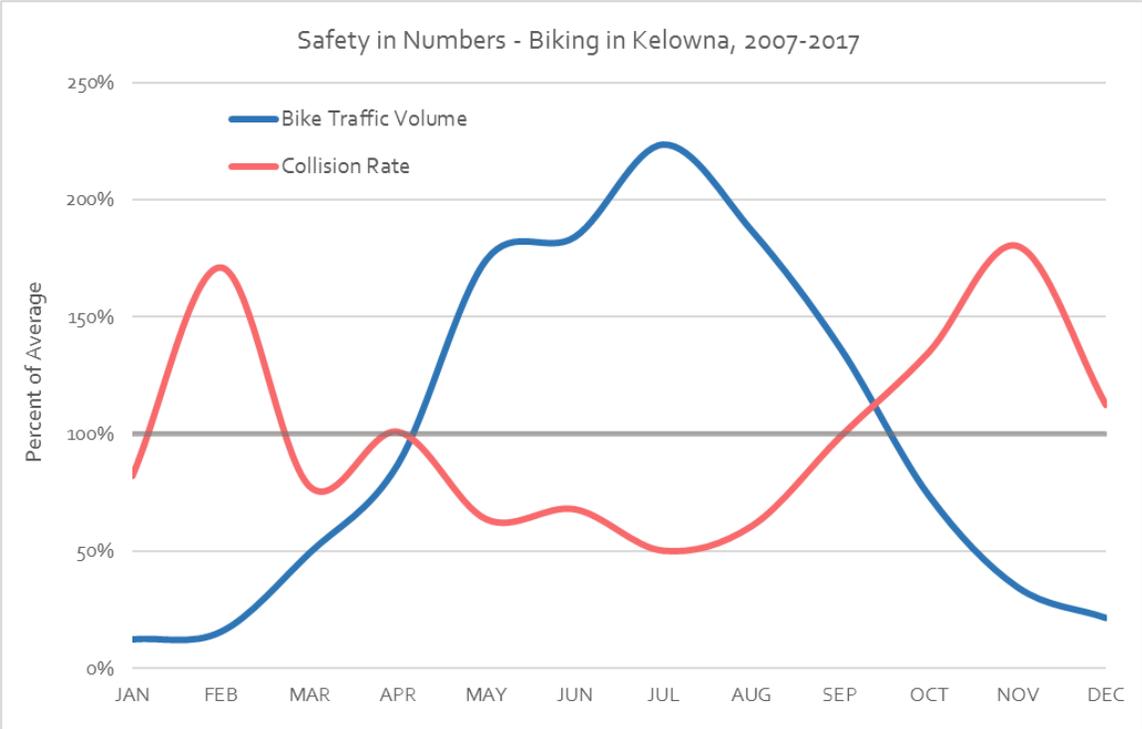
Figure 4b.9: Correlation of Bike Traffic Volumes and Collision Rates. Source: ICBC, Ecocounter

Fear of traffic and motor vehicle collisions is one of the top barriers for people when deciding whether to bike. This is supported by recent research that found that 30 per cent of Kelowna residents think biking is "somewhat dangerous or very dangerous."[26] Safety issues, as well as people's perceptions of safety, can be improved by installing more low-stress bicycle infrastructure that separates and protects people biking from motor vehicle traffic.

Bicycle Facility Types
Figure 4b.10 illustrates the spectrum of bicycle facility types, ranging from least protected to most protected. On the left side of the spectrum (least protected) is the shared-lane marking, sometimes referred to as a "sharrow". These are pavement markings that remind all users to share the lane but that otherwise do not offer bicyclists protection from vehicle traffic. On the right side of the spectrum (most protected) are fully separated and protected bicycle facilities. These are designed for the exclusive use of people biking (as opposed to a multi-use path which is designed to be shared with people walking) and typically include some form of vertical barrier that separates people biking from motor vehicle traffic (e.g. bollards, parked cars, or curbs). An example of a separated, protected bicycle facility in Kelowna is the Ethel Active Transportation Corridor. An example of a multi-use path in Kelowna is the Rail Trail.

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[26] Cities, Health & Active Transportation Research (CHATR) Lab - Simon Fraser University. (2016). Impacts of Bicycle Infrastructure in Mid-Sized Cities (IBIMS) Study: Survey Findings and Equity Mapping.
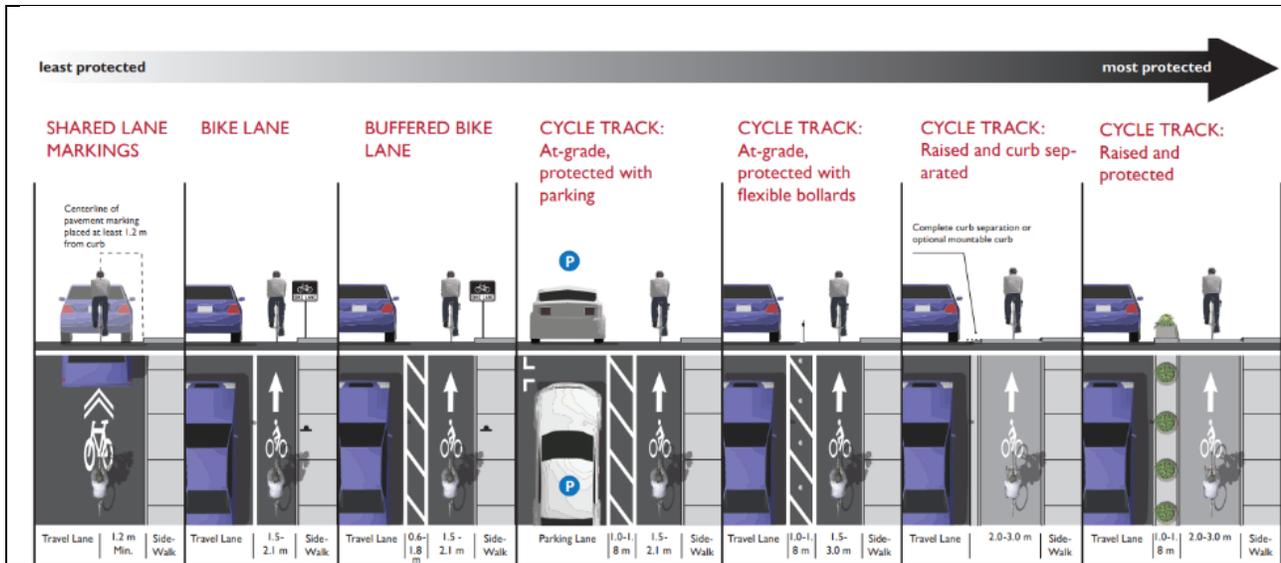
Figure 4b.10: On-road bicycle facility types

Selection of the appropriate type of bicycle facility for a specific corridor depends on engineering standards, traffic analysis, corridor plans, land use context, and stakeholder input. In general, the greater the level of separation provided by a bicycle facility, the greater the level of user comfort and the greater the chances of attracting people of all ages and abilities to ride a bicycle.

Bicycle crossing treatments can help people biking to safely navigate busy intersections. Examples of treatment types are shown in Figure 4b.11.

Figure 4b.11: Examples of bicycle crossing treatments

Existing Bicycle Network

Kelowna has an extensive bicycle network for a city of its size. The network continues to grow and improve with regular additions of new bicycle infrastructure. As of 2018, the City has approximately 312 kilometres of on-street bike lanes and 62 kilometres of off-street protected bike paths (which includes both multi-use paths and separated, protected bikeways) as shown in Figure 4b.12.
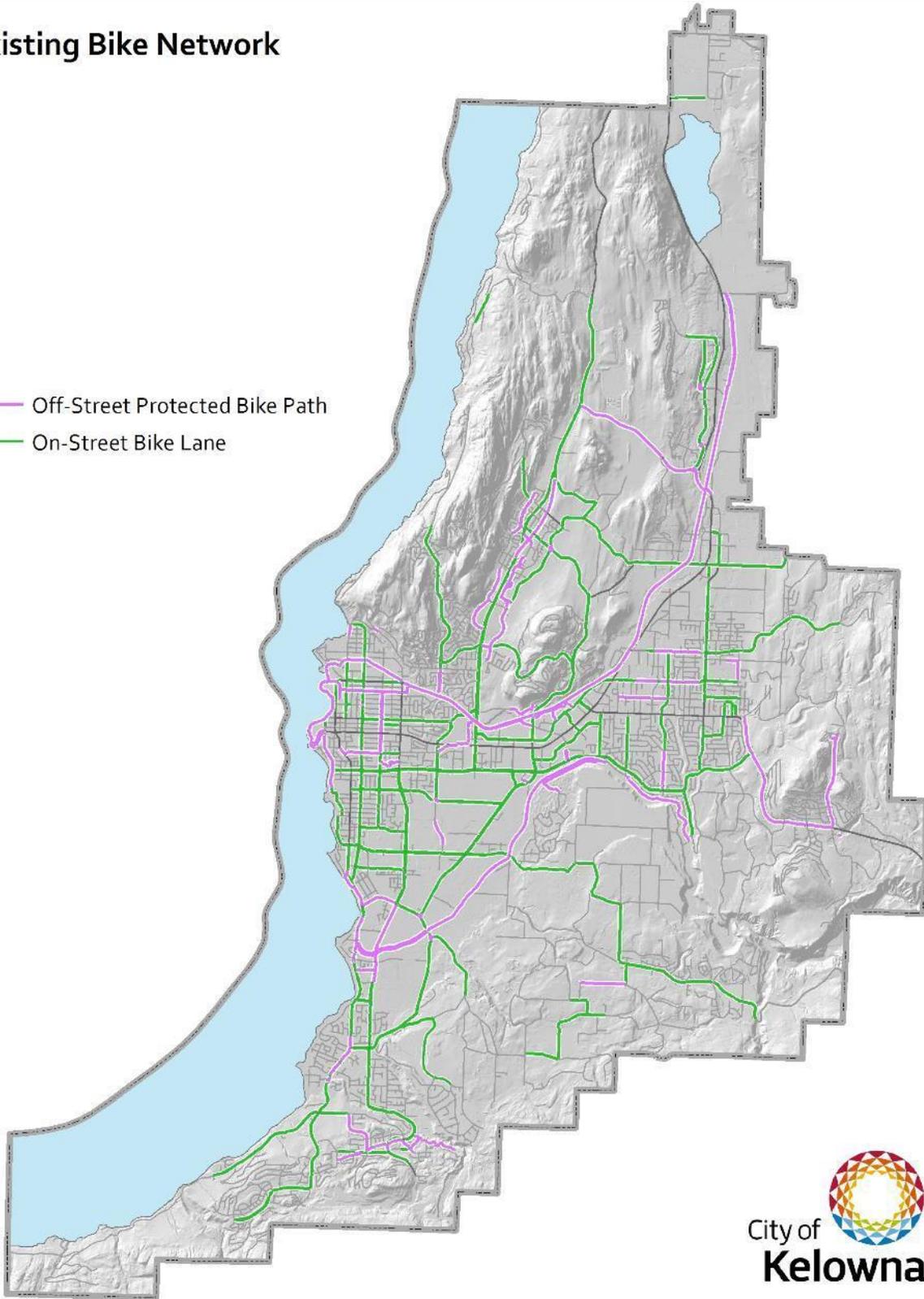
Figure 4b.12: Kelowna's Existing Bike Network

Recent Investment

Since the Kelowna Pedestrian and Bicycle Master Plan (PBMP) was adopted in 2016, the City has accelerated efforts to build and connect an All Ages and Abilities (AAA) Primary Active Transportation Network, which includes developing a supporting network, and filling connectivity gaps.

Overall, about 53 per cent of the proposed shared-use pathways, seven per cent of the proposed protected bikeways, and six per cent of the proposed bike lanes have been built since the PBMP was adopted, as shown in Table 4b.1.

Table 4b.1: Bicycle Infrastructure Inventory

Infrastructure Type	2016 PBMP		2018		
	2016 (km)	Proposed (km)	Built since PBMP (km)	% of Proposed Built	Proposed Remaining (km)
Shared-Use Pathway, Paved	36	38	20	53%	18
Separated, Protected Bikeways	3	42	3	7%	39
Bike Lanes	299	210	13	6%	197

One of the highlights of these accomplishments is the completion of the Okanagan Rail Trail in 2018. Residents and visitors can now connect from downtown to midtown, UBC Okanagan and the airport via a paved, separated multi-use trail. In addition, Phase 3 of the Ethel Active Transportation Corridor was recently completed, which connects Ethel Avenue between Harvey and Sutherland Avenues.

The City plans to continue investing in bicycle infrastructure. Currently, the 10-Year Capital Plan includes funding out to 2028 for both bicycle lanes and active transportation corridors.

Programs

Education, encouragement, and awareness programs help to increase biking and can be cost effective complements to infrastructure investments. The City offers ongoing biking programs through the regional smartTRIPS program.[27] It aims to shift single-occupancy vehicle trips to transit, walking, biking and carpool trips. Programs specific to biking include the Clean Air and Safe Routes 4 Schools Program, Bike to Work and School Week, and the Kelowna Bike Rack Program. In addition, open street events help to promote streets as public spaces and encourage active transportation. These programs are described further in Chapter 4.

Policy Context

Planning and policy documents such as *Imagine Kelowna: The Vision to 2040 (2018)*, *Kelowna Community Climate Action Plan (2018)*, *Kelowna on the Move: Pedestrian and Bicycle Master Plan (2016)*, *Healthy City Strategy Community for All Plan (2016)*, *Urban Centres Roadmap (2016)*, and *Kelowna 2030 Official Community Plan (2011)* all support making biking a safe and convenient mode of transportation. Additionally, public engagement for the development of the Transportation Master Plan, held in spring 2018, reinforced the theme of improving diverse modes of transportation and connectivity within the community. This indicates that residents support the City's objective of making biking a convenient, attractive transportation choice.

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[27] https://www.smarttrips.ca

Kelowna on the Move: Pedestrian and Bicycle Master Plan (2016)

The Pedestrian and Bicycle Master Plan (PBMP) identifies infrastructure, planning, and policy requirements to promote walking and biking in the community. The plan includes the following vision, principles and goals specifically related to biking:

Vision: To make walking and cycling safer, convenient, and practical modes of travel; to reduce motor vehicle use and resulting greenhouse gas emissions; and to increase opportunities for active living to improve community health and happiness.

Principles:

- To increase walking and cycling as practical modes of travel;
- To improve safety and convenience for pedestrians and cyclists.

Goals:

- Increase year-round walking and cycling so that within the next 20 years 25 per cent of all trips less than five kilometres in length are made by walking or cycling.
- Improve pedestrian and cyclist safety so that the rate of collisions with motor vehicles is reduced by 50 per cent within the next 20 years.

To achieve these goals, the PBMP includes objectives related to network design; planning, monitoring and maintenance; end-of-trip and transit integration; education and promotion; policies and enforcement; and funding.

Kelowna 2030 Official Community Plan (2011)

The Official Community Plan (OCP) is a document that contains a municipality's goals, objectives and policies guiding growth and change. The 2030 OCP includes the following vision, goals, and objectives specifically related to biking:

Vision: Kelowna residents aspire to have:

- Walking paths and bicycle routes that connect to key destinations

Goals:

- Feature a Balanced Transportation Network.
- Increase the attractiveness, convenience and safety of all modes of transportation by implementing "complete streets" that are designed to serve a broader range of transportation modes, focusing on pedestrians, cyclists and transit service, and function in the context of surrounding land uses.

Objectives:

- Objective 7.6: Place increase emphasis on sustainable modes of transportation (walking, cycling, transit) while maintaining automobile, commercial goods and emergency vehicle mobility.
- Objective 7.8: Provide more active transportation infrastructure to: increase resilience in the face of higher energy prices; improve community health and reduce greenhouse gas emissions.

The OCP includes many policies related to biking. Key policies include:

- Policy.7.6.1: Transportation Infrastructure Priority. Transportation infrastructure will be funded, designed, constructed and maintained to meet the needs of users and according to the following priority:

    i.   Active Transportation (Walking and Cycling)
    ii.   Transit
    iii. Movement of Goods & Services
    iv.   High Occupancy Vehicles (HOVs)
    v.   Single Occupant Vehicles (SOVs)

  Priority will be assigned to active transportation and transit infrastructure that serves and connects Urban Centres, major employers, health care and education facilities.
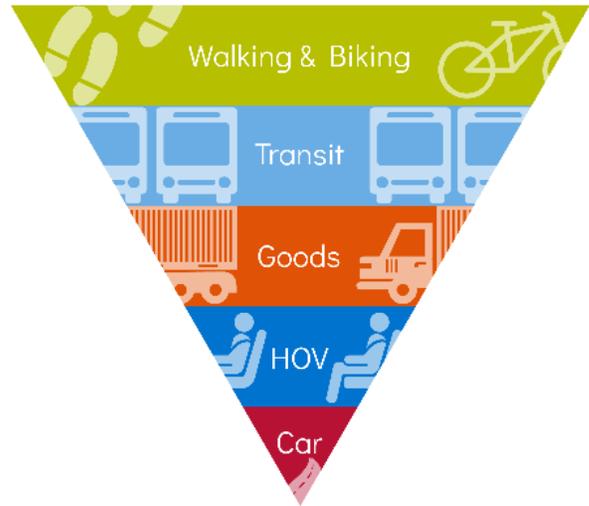
Figure 4b.13: OCP Policy 7.6.1 Transportation Infrastructure Priority

- Policy 7.6.2: Complete Streets: Ensure new roads are built as complete streets that incorporate sidewalks and on-street bike lanes on arterial and major collector roads.
- Policy 7.7.2: Ease of Movement: Ensure that pedestrians, bicyclists and transit users can move about pleasantly and conveniently and that they are not unduly impeded in their movements by provisions for enhanced automobile mobility.
- Urban Design Guideline 8.2: Promote the use of alternative modes of transportation in site design (e.g. prominent bicycle racks for convenience and security, orient building entrances to pedestrian areas).
- Urban Design Guideline 8.3: Provide public access through sites to maintain or enhance the pattern of active transportation within the neighbourhood (e.g. mid-block crossings).

Public Support for Biking

In an independent survey of Kelowna residents conducted in 2016 (see Figure 4b.14), 56 per cent of respondents said they would like to travel by bicycle more than they do. Ninety-four per cent said that building more biking infrastructure is a good idea for Kelowna.[28] Additionally, 67 per cent said they would like to bike but would feel safer doing so with more protected infrastructure. This latter group, identified as the "Interested but Concerned" group, represents the latent demand for biking in Kelowna, and the best opportunity to increase the number of people riding bikes for transportation.

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[28] Cities, Health & Active Transportation Research (CHATR) Lab - Simon Fraser University. (2016). Impacts of Bicycle Infrastructure in Mid-Sized Cities (IBIMS) Study: Survey Findings and Equity Mapping.

Types of Bicyclists

Legend: ■ Strong and Fearless ■ Enthused and Confident ■ Interested but Concerned ■ No Way No How

Victoria: 3% | 7% | 63% | 26%

Kelowna: 2% | 4% | 67% | 27%

Halifax: 2% | 5% | 58% | 35%
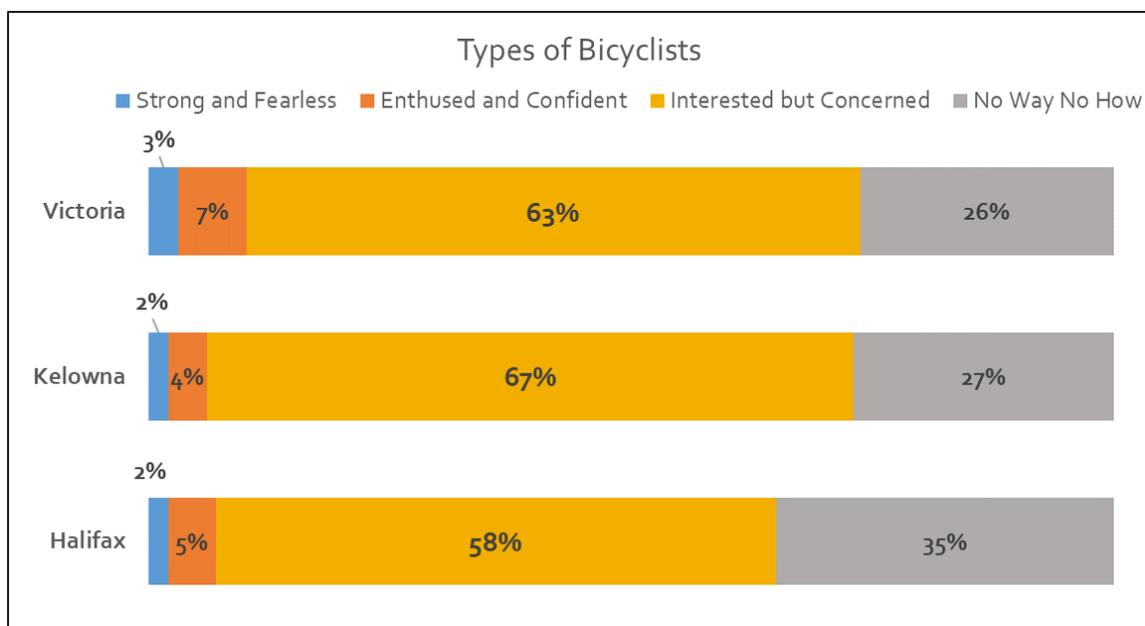
Figure 4b.14: How Residents Feel About Biking.

Source: Impacts of Bicycle Infrastructure in Mid-Sized Cities (IBIMS) Study. www.sfu.ca/ibims. 2016 Survey Findings and Equity Mapping. Cities, Health & Active Transportation Research (CHATR) Lab. Simon Fraser University, Health Sciences.

Part of the challenge in attracting people who are interested in biking but are concerned about safety, is to create a bicycle riding experience that is more enjoyable and has fewer safety concerns. Separating people riding bicycles from motor vehicle traffic helps to achieve this goal and creates a more enjoyable, low-stress biking environment where people of all ages and abilities are more likely to feel safe riding. For example, in the Netherlands where biking is part of the mainstream culture, well-designed, dedicated bicycle infrastructure helps support a more relaxed and casual style of riding that is used by a wide cross-section of the population for everyday trips.

Creating dedicated bikeways that are separate from pedestrian infrastructure and motor vehicle traffic not only benefits people biking, but also benefits people walking and driving as well. This is because separated bikeways result in fewer conflicts between people walking, biking and driving, which increases comfort for all travellers. Additionally, separated bikeways can help to increase the number of people biking, which means that more roadway space is available for people who have no choice but to drive.

Future Challenges and Opportunities

When planning for the future of Kelowna's bicycle network, it is important to consider the many ways that 2040 will be different than it is today. The changes in land use patterns, transportation technology, weather patterns, and demographics summarized in Chapter 3 will all influence how much people bike in Kelowna. These changes create both challenges and opportunities when it comes to building a great city for biking. In review of the existing and future conditions for biking in Kelowna, five key Challenges and Opportunities have been identified.

Challenge and Opportunity #1: Shift Trips within the Core Area to Biking

With most future growth occurring in Kelowna's Core Area and Urban Centres, more people will live within biking distance of a variety of destinations. Since Kelowna's Core Area already contains many of the factors that influence people to bike such as direct routes and flat terrain, this will create an opportunity to shift more trips within the Core Area to biking. However, busy roads such as Harvey Avenue, Springfield Road, and Highway 33 currently act as barriers to biking. Additionally, two of Kelowna's five Urban Centres (Midtown and Capri Landmark) are surrounded by major roads and lack a well-connected grid network of local streets. While work is underway to build out the Future and Supporting Biking Network identified in the PBMP, the challenge will be to build a network that makes travelling by bicycle within and between the Urban Centres easy, convenient, and accessible for all ages and abilities. Potential strategies for shifting trips within the Core Area to biking include:

- Review the Future and Supporting Biking Network in the PBMP and identify projects that will connect the bicycle network within and between the Urban Centres as highest priority for implementation, followed by those that improve general bicycle connectivity within the Core Area.
- Work with the provincial government to establish safe bicycle crossings of Harvey Avenue and Highway 33.
- Develop Urban Centre plans that identify opportunities to break up large blocks and establish more local streets that can be used as bike routes.

Challenge and Opportunity #2: Ensure People Biking Feel Safe

As noted in the safety section, fear of traffic or motor vehicle collisions is one of the top barriers for people when deciding whether to bike. As Kelowna grows and traffic pressures increase on our roadways, it will be increasingly important to separate people on bikes from motor vehicle traffic. This will help to address actual safety hazards as well as people's perceptions of safety, making biking more attractive to the interested but concerned, and the all ages and abilities groups. It will also be important to promote biking as a safe travel mode through educational materials and awareness campaigns. Potential strategies for increasing biking safety include:

- Design and build separated, protected bikeways, where appropriate, to help separate people biking from motor vehicle traffic.
- Install intersection treatments such as bike signals, bike boxes, elephant feet, and colored bike lanes to help make people biking more visible to motorists.
- Install traffic calming features, where appropriate, to slow traffic and improve conditions for biking.
- Develop education and awareness materials that highlight biking as a safe mode of travel for people of all ages and abilities.

Challenge and Opportunity #3: Make Biking Accessible to More People

The increased use of bikeshare and electric bicycles (e-bikes) is making it easier and more convenient for a variety of people to ride a bike. E-bikes allow people to ride with less physical exertion, for longer distances and up steeper slopes. This helps make biking more attractive to the elderly, people carrying children or cargo, and people who live far away or on hillsides. Bikeshare programs meanwhile, allow people to bike for a single trip without the inconvenience of having to own, maintain and park a privately-owned bicycle. This makes biking more accessible and expands the market of potential riders to include those who may not have the funds, space or desire to own a bike. Bikeshare also allows people to choose biking for some of their daily trips while using other modes for trips that cannot be

easily made by bike. For example, a resident who lives in a hillside neighbourhood may need to drive to work in an Urban Centre but can then choose bikeshare for short work-related trips or to run errands during their lunch break.

However, while new technologies are creating opportunities for more people to bike, they can also bring new challenges. For example, new types of bicycles and shared vehicles (e.g. scooters) may conflict with traditional pedal bikes, creating a need to update current regulations and design new educational materials for users. In the long term, small electric vehicles may blur the line between bicycles and cars.

To capitalize on the ability of emerging technology to make biking accessible to more people, it will be necessary to design bicycle infrastructure, regulations and educational materials to accommodate many different types of users beyond the traditional pedal bike rider. Potential strategies for making biking accessible to more people include:

- Design future bicycle infrastructure and bicycle parking (both public and private) with the needs of e-bikes, cargo bikes, and other potential shared and electric vehicles in mind.
- Set the stage for a competitive marketplace of shared vehicles, using incentives and enforcement to ensure that users are obeying the rules of the road and operating companies are respecting the public right-of-way.
- Update outdated regulations that prohibit or restrict the use of e-bikes or other types of shared electric vehicles.
- Design education and awareness campaigns to be responsive to new and emerging technologies.

Challenge and Opportunity #4: Integrate Bicycles with Transit
As Kelowna grows, the demand for transit will increase, including ways to get to and from bus stops. Integrating the bicycle and transit networks can expand the reach of both modes, making it easier and more convenient to get around without a car. The potential market area for transit service is constrained by how many people can reach a transit stop in a reasonable amount of time, typically by walking. As bikes are much faster than walking, making it convenient to bike to a bus stop can effectively double that stop's catchment area. This can be particularly helpful in lower-density areas, where it is impossible to bring transit close to everyone's door. Bikeshare or other shared vehicles can complement transit since they remove the need to take a bike on the bus or worry about leaving one unattended for long periods of time. Potential strategies for integrating bicycles with transit include:

- Prioritize bicycle infrastructure that connects to transit exchanges and major bus stops.
- Provide secure bike parking at transit exchanges and major bus stops.
- Investigate ways to increase the bike-carrying capacity of buses, noting the space constraints, particularly at peak times.
- Encourage the integration of transit and bikeshare by streamlining payment and trip planning applications, as well as providing bikeshare parking near bus stops.

Challenge and Opportunity #5: Build-out a Complete Bicycle Network
The City of Kelowna has improved conditions for biking over the past decade with major projects such as the Abbott, Cawston, and Ethel Active Transportation Corridors. While completely separated, protected bikeways greatly improve the comfort of people biking, these types of projects can be expensive and time-consuming to implement as they often require rebuilding an entire street. As

Kelowna grows, it will be important to balance the need to develop these high-quality, separated, and protected bicycle facilities with the need to build-out a complete bicycle network quickly and efficiently. The City is beginning to explore separated, protected bicycle facility designs that do not require the entire street to be rebuilt. These facilities still provide separation from motor vehicle traffic but tend to be quicker and less expensive to build, which will allow a timelier build-out of a complete bicycle network. Potential strategies for building out a complete bicycle network include:

- Develop designs for protected, separated bikeways that require less extensive retrofits to existing streets.
- Pilot floating off-peak parking on multilane roads as a low-cost, quick way to create more separation for people biking, reduce speeding, and increase parking availability.

While Kelowna is currently an automobile-oriented city, the coming changes present numerous opportunities to encourage more people to bike to meet their daily travel needs. With a favourable climate, a flat Core Area, plans for Urban Centre densification, bicycle infrastructure investment and interest from the community, Kelowna is poised to become a great city for biking. By targeting our investments in cost-effective bikeways that separate people biking from motor vehicle traffic, connect the Urban Centres and Core Area, integrate with transit and accommodate future technologies, Kelowna will be able to capitalize on this opportunity and improve the health and quality of life of both current and future residents.

c) Transit

Importance of Transit

By transporting people en masse, transit produces fewer greenhouse gas emissions and moves more people in the same amount of road space than personal vehicles. As a result, transit has the highest people-moving potential of all travel modes. For example, the bus service on Pandosy Avenue adds one full lane of people-moving capacity to the street. Additionally, transit lessens the need for private vehicle parking at destinations.

Public transit is a lifeline for residents without access to other means of transportation. Walking and biking can be convenient for short trips but are not an option for residents with mobility challenges. For longer trips, transit is often the only option for the 20 per cent of residents who do not have a driver's license to get around independently. It can also provide a less expensive alternative to car ownership for lower income households.

Key Factors that Influence the Choice to Take Transit

When working to achieve Kelowna's community vision of improving transit, there are several key factors that make transit an attractive and competitive transportation option. Without these factors, many people will choose a different travel mode. Some of the key factors that influence whether people choose to take transit include:

Proximity to Transit Stop

People's origin points (e.g. their homes) and destinations (e.g. their places of work) must be close enough to transit stops to make getting to and from transit easy and convenient. Generally, the catchment area of a transit stop is up to 800 metres. This distance can be expanded with mobility options such as bikeshare, carshare, rideshare, or park and ride near transit stops.

Competitive Travel Times

Unlike driving, walking or biking, transit is limited to set routes and schedules. For people to choose transit, the total travel time, including time spent waiting for the bus and any transfers, needs to be competitive with other travel modes. Less frequent service and/or the need to transfer often increases travel times beyond what people are willing to tolerate, especially if they have another option such as driving or riding a bike.

Schedule Frequency

The frequency of transit service often has a greater impact on overall travel times than how fast the buses travel. People are more likely to choose transit if they know that missing one bus is not a big deal, because another bus will be along shortly. Similarly, if missing a transit connection means having to wait for a half-hour or longer before the next bus arrives, people are more likely to choose another travel mode.

Travel Time Reliability

For people to choose transit, they need to feel confident that transit will get them where they are going on time. When a bus is late or fails to show up at all, transit users can end up being late for work or school. A feature such as real-time transit information (e.g. NextRide) provides riders with the trip-planning information they need to minimize disruptions from buses that may be off-schedule.

Perceptions of Safety/Comfort

People are more likely to take transit when they are confident their experience will be safe and enjoyable. Amenities such as roadside shelters, trash cans, clean buses and the presence of transit security can help people feel safe and comfortable when using transit. Additional factors that can influence the choice to take transit include weather, the need to transport bulky or heavy items, or the need to stop at multiple destinations.

However, key factors for determining whether a trip will be made by transit are proximity to a transit stop and competitive travel times. In turn, these factors largely depend on land use. This is because providing frequent transit service everywhere throughout the city is not financially or environmentally responsible if some of the buses are driving around while largely empty. The population and employment densities of where people live, and where they need to go, determines whether a trip can be serviced by high quality transit.

Transit and Land Use

Some of the key factors that influence whether an area can support frequent transit service include:

Density of Population and Jobs

Moving a group of people comfortably and efficiently in a single vehicle requires many people to have origin points and destinations along the same route. Areas with more activity (i.e. with lots of residents and jobs) generate more travel demand for transit to draw from.

Walkability

Most people are willing to walk for five to 10 minutes to get to a transit stop. Areas that are easily walkable, with more direct paths and easier street crossings that connect to transit stops, allow people to walk longer distances in the same amount of time, increasing the catchment area for transit.

Route Directness

Transit works best in straight lines. This means places that are "on the way" between major destinations are easier to serve than those located on circuitous local roadways or at the end of a cul-de-sac. Neighbourhoods without direct roadways through them require buses to meander around, making trips longer for passengers and increasing operating costs. Shorter, more direct routes can be run more frequently with the same number of buses.

Different areas of Kelowna vary in their ability to support frequent transit.

Urban Centres

Kelowna's Urban Centres have the highest concentrations of jobs and population in the city and are among the city's more walkable places, which make them great locations for supporting frequent transit service. Three of the five Urban Centres – Downtown, Capri-Landmark, and Midtown – are located along the #97 RapidBus route, Kelowna's primary transit 'spine'. While short trips entirely within a single Urban Centre are often better suited to walking and biking, trips to, from, and between Urban Centres are ideally suited to transit.

Core Area

Transit is well suited to helping people access destinations within Kelowna's Core Area. All five of Kelowna's Urban Centres are located within the Core Area. As a result, the density, walkability and route directness required to support frequent transit service are all present. Neighborhoods between

the Urban Centres are "on the way" and are easier to serve with frequent transit.[29] As well, many of the Kelowna residents who do not have access to personal vehicles (e.g. people with lower incomes and people living in retirement homes), live within the Core Area.

Suburban Areas

Suburban areas are challenging to provide with frequent service, particularly if they are not located on a corridor between major destinations. The street networks in suburban areas often do not provide direct routes through neighbourhoods or have places for buses to turn around. As a result, bus routes can only be placed along the edges of these neighbourhoods, making the walk to a bus stop longer. In hillside residential areas, the challenges are compounded by topography. Few residents in suburban areas will choose to ride transit if they have access to a vehicle. Transit routes that do extend into suburban neighborhoods are often provided for equity reasons and generally have limited ridership and environmental benefits.

Rural Areas

Like suburban areas, rural areas lack the density, walkability and route directness to support frequent transit service. The few rural areas that do have transit stops are typically those that are "on the way" between two major destinations or are provided to ensure route coverage and social equity.

Taking Transit in Kelowna

Taking Transit to Work

About five per cent of all trips to work in Kelowna are by public transit.[30] However, this is for the city as a whole. The percentage varies widely between different areas, largely depending on land use. As shown in Figure 4c.1, the greatest commute mode shares (percentage of trips to work that are made by transit) are eight per cent for residents in Rutland and nine percent for residents in Midtown, while the lowest transit mode share is two per cent for residents in the Mission area.

The Transit Future Plan sets a target transit mode share of seven per cent for the Central Okanagan by 2035.

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[29] Walker, J. (2011). Human Transit: How Clearer Thinking about Public Transit Can Enrich Our Communities and Our Lives. Washington, DC: Island Press.
[30] 2013 Household Travel Survey

Transit Commute Mode Share
By Household Location

North Kelowna 2%

*No transit commute trips were recorded by residents of these areas in the survey

Glenmore 3%

Rutland 8%

Midtown 9%

City Centre-Pandosy 6%

Black Mountain 4%

Southeast Kelowna N/A*

The Mission 2%

City of **Kelowna**
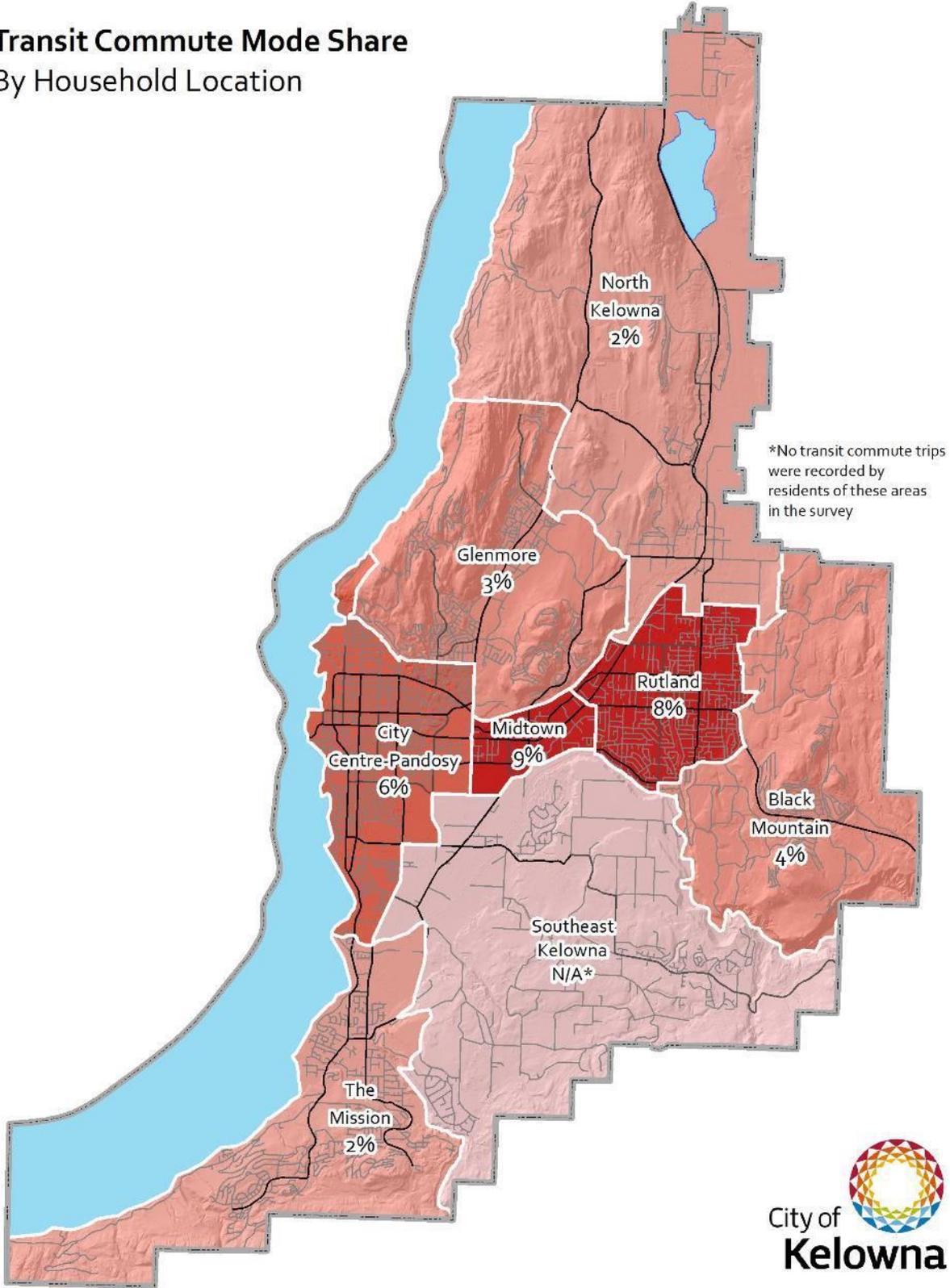
Figure 4c.1: Transit Commute Mode Share by Subarea. Source: 2013 Household Travel Survey

Trip Distance

Transit trips in Kelowna have an average distance of approximately seven kilometres (see Figure 4c.2). Compared to biking or walking, transit is more effective for longer trips and therefore competes more directly with driving trips. Short trips are usually quicker by walking, biking, or driving, unless a bus is coming very soon. This is true even in cities with very high-quality public transit.
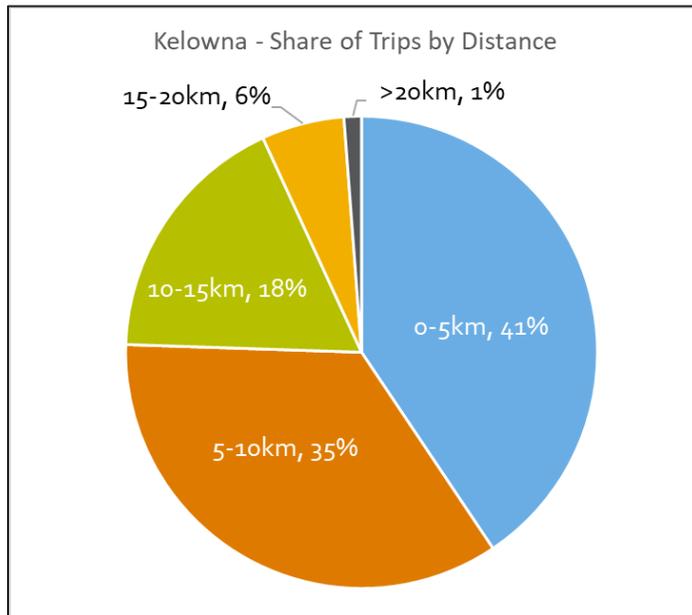
Figure 4c.2: Kelowna Transit Trip Lengths. Source: 2013 Household Travel Survey

Ridership and Performance

Transit service has been operating in Kelowna for over forty years. Figure 4c.3 shows the growth in ridership and annual service hours over the past six years. Service hours have been largely static in recent years while ridership has grown significantly over the past two years, a trend driven largely by increasing post-secondary enrolment and sales of monthly passes to secondary and middle school students. It is estimated that students account for about one-third of the demand for public transit in Kelowna.
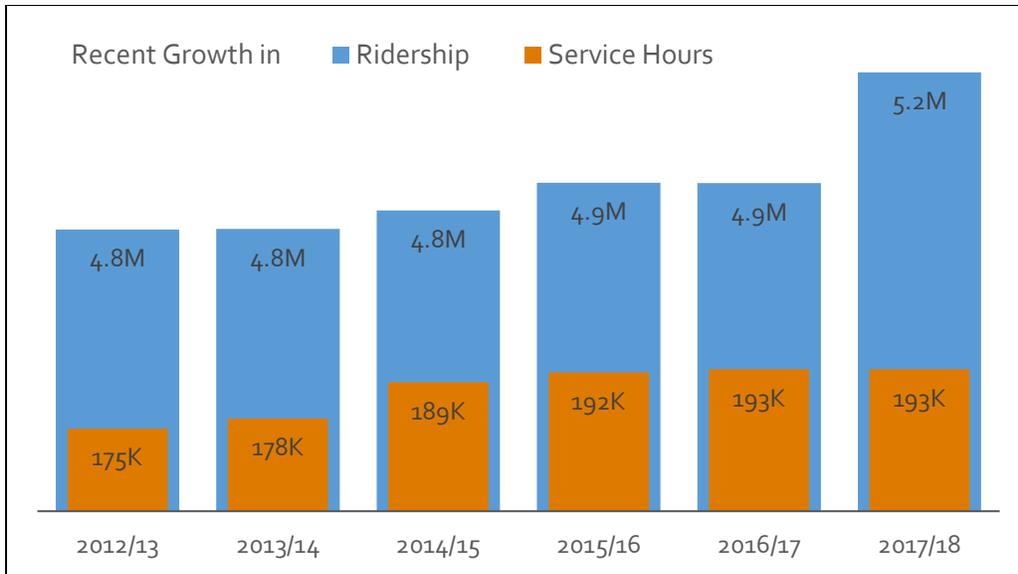
Figure 4c.3: Historical Trends in Ridership and Service Hours. Source: BC Transit

The Kelowna Regional Transit System's ridership is approximately five million passengers a year, as shown in Figure 4c.3. Comparing the transit system to the average for mid-sized cities in Canada, Kelowna has more hours of service, lower operating costs, as well as higher productivity and cost recovery (Figure 4c.4).
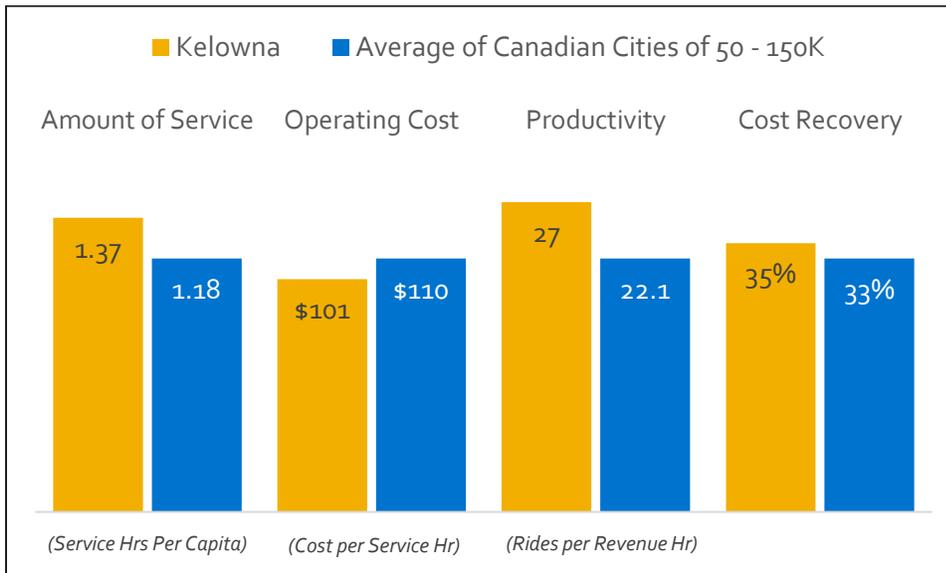
Figure 4c.4: Comparison of Kelowna to the Average of Canadian Cities with populations between 50,000 and 150,000 residents. Source: CUTA 2017 Operating Statistics, p.21 & 53

About one-third of the transit system's operating costs are recovered through fares. This is higher than the portion of the City's spending on roadways that is covered by driver-paid user fees such as fuel taxes, which are about 10 per cent. Popular routes have higher rates of cost recovery, which means that more service can be provided on these routes for each dollar invested.

Figure 4c.5 shows how service levels and ridership vary between routes. The two routes with frequent service to UBC Okanagan, #8 and #97, carry just under half of all passengers. The five busiest routes

account for three-quarters of total ridership, as well as 56 per cent of service hours. The 11 local routes, which primarily service suburban areas, account for about 10 per cent of ridership and service hours.
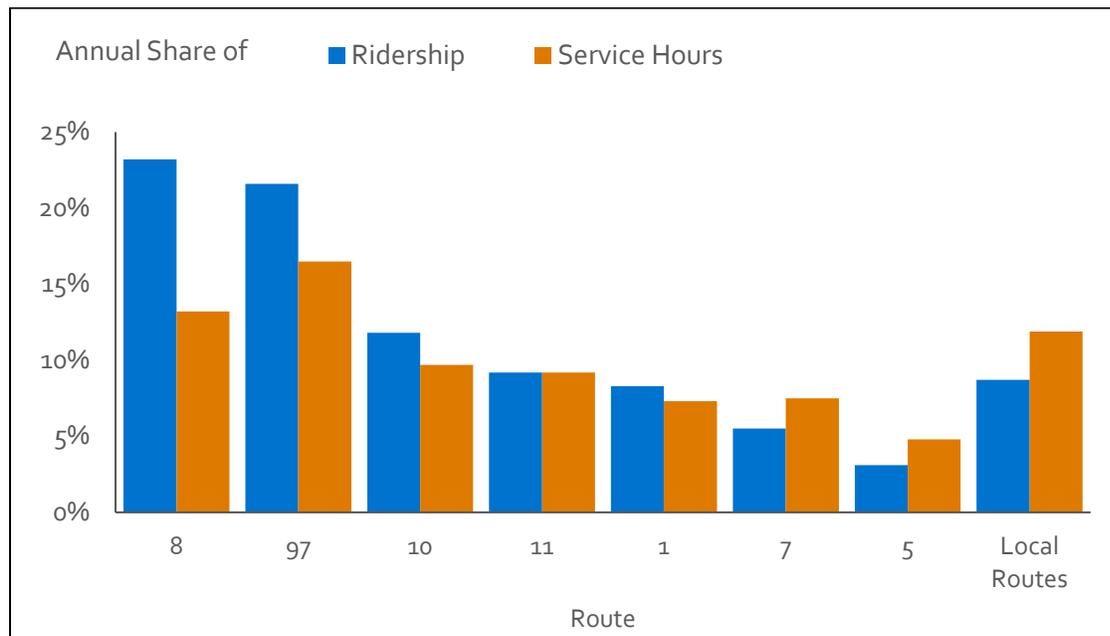
Figure 4c.5: Annual Share of Ridership and Service Hours by Route. Source: BC Transit GFI Data for FY2017/18

Existing Transit Network

Kelowna's public transit system is a partnership between BC Transit, the City of Kelowna, and the other local governments of the Central Okanagan.

BC Transit is responsible for overseeing the private operating company, First Canada, and pays for roughly half of the operating costs. The City provides the other half of funding for service within its boundaries and receives all system revenues. The City is also responsible for transit stops, shelters, amenities, and exchanges, while the Provincial and Federal Governments often provide funding for major projects. Routes and schedules within Kelowna are collaboratively planned by BC Transit and the City.

The Challenge of Balancing Ridership and Coverage

A transit service must balance two objectives: moving people more efficiently; and enabling access for all. Both objectives are important but can sometimes conflict. Trying to maximize efficiency often means concentrating service on key corridors with the highest potential ridership. Providing coverage to as many areas as possible means spreading service thin. Balancing these two goals is important because a full-sized bus carrying fewer than five passengers is less environmentally sustainable than driving alone in a pickup truck. Approximately 80 per cent of transit resources in Kelowna go towards services designed to maximize ridership. The remaining 20 per pays is for coverage services, which are intended to provide access for residents without other means of transportation.

Transit Services

BC Transit operates 18 routes within the city, serving an estimated five million passengers in 2017. Kelowna accounts for roughly 85 per cent of transit service in the Central Okanagan. The City is responsible for 604 bus stops within Kelowna and just over half of these are fully accessible.

The routes operating in Kelowna are divided into four service level layers:

- RapidBus
- Frequent Transit Network (FTN)
- Local Transit Network (LTN)
- Custom Transit

RapidBus and the Frequent Transit Network are primarily designed to maximize ridership. They connect major destinations and Urban Centres with more direct routing and generally fewer stops.[31] The RapidBus along Highway 97 is designed to be the backbone of the transit network and a precursor for the long-term implementation of mass transit (i.e. BRT or LRT).[32] It has limited stops, level-boarding platforms, and limited signal priority at intersections.

The Local Transit Network is generally intended to connect neighbourhoods and provide access for residents without other means of transportation. While many operate in suburban or rural areas, others like Routes #2 and #9 serve lower density areas in the Core Area. Buses on local routes tend to stop more frequently and have less direct routes in order to cover a wider area. However, some local routes share the characteristics of frequent routes, but do not have the same service levels. Others are peak-only express service like Route #4.

Custom Transit refers to door-to-door services for people who cannot use conventional transit. The most common form is the subscription-based handyDART service, but there is also the Taxi Supplement and Taxi Saver programs, which provide discounted taxi fares when handyDART is unavailable. The Custom Transit System provided 134,000 rides in 2017/18.

The following maps provide overviews of the transit system. Figure 4c.6 shows the routes in Kelowna divided into the three service layers: rapid, frequent and local. Figure 4c.7 shows the number of buses per day by road segment, which illustrates how multiple routes combine on major corridors. For example, three routes (#6, #18 and #19) combine to provide a high level of service on Glenmore Road.

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[31] BC Transit. (2012). Central Okanagan Transit Future Plan. p.46
[32] City of Kelowna. (2018). How Transit Can Keep Kelowna Moving.
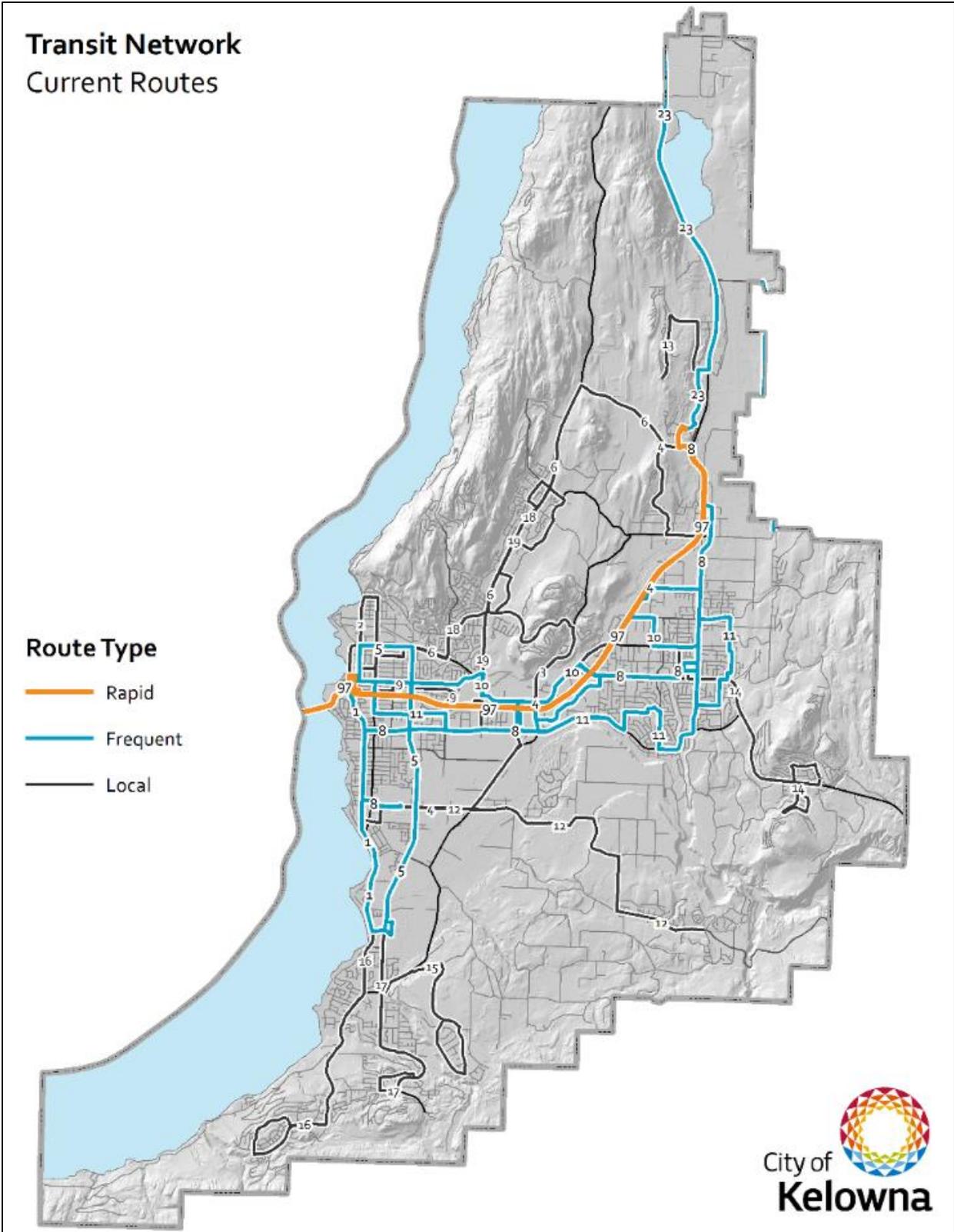
Figure 4c.6: Current Transit Network in Kelowna

Transit Network
Buses Per Day

Buses Per Day

Low

High
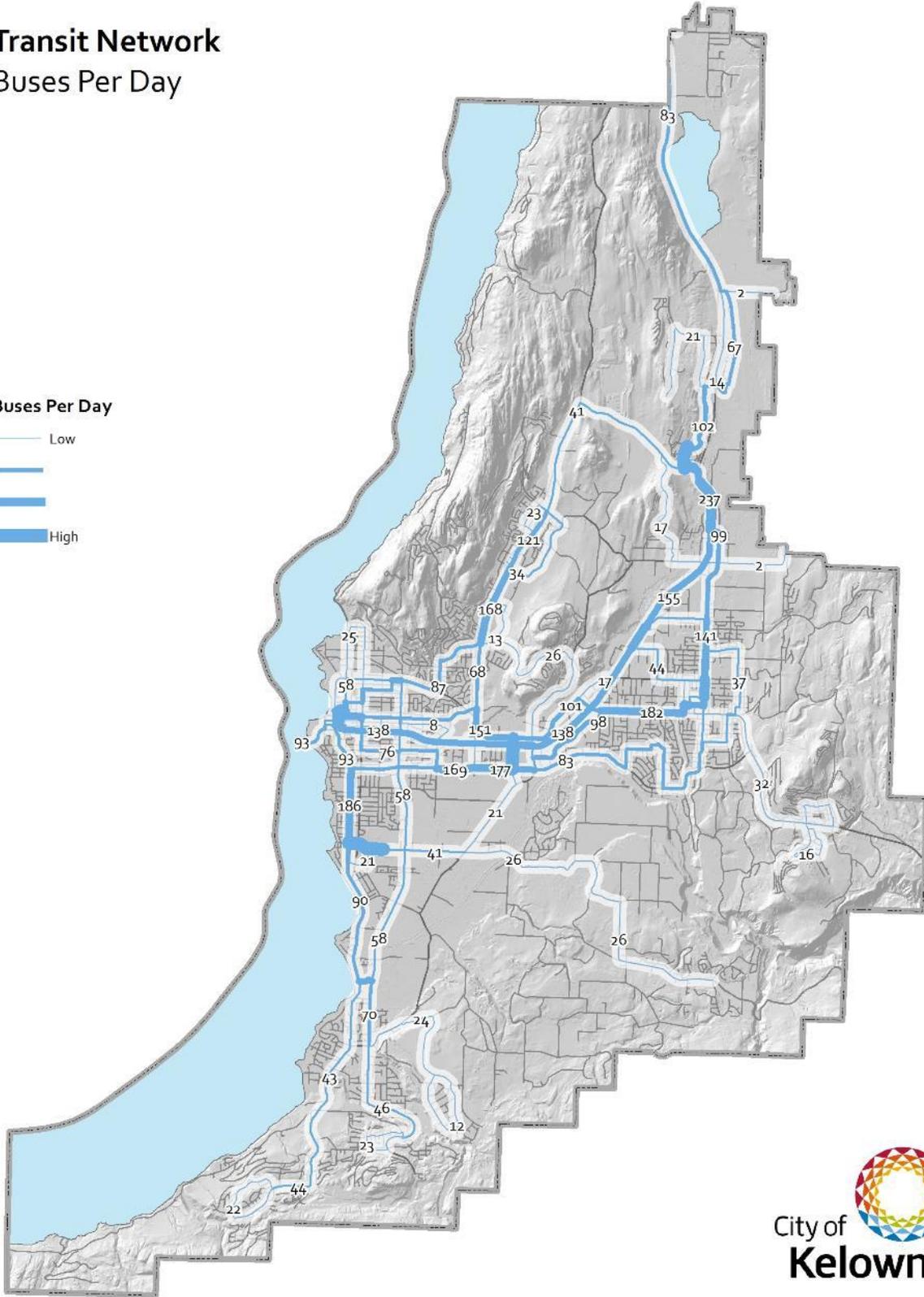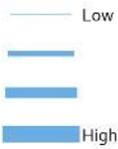
Figure 4c.7: Buses Per Day by Road Segment

Transit Core and Transit Coverage

As part of the Transit Future Action Plan, the Kelowna Region was separated into Transit Core and Transit Coverage areas:

Transit Core Area

This is where transit is most efficient, competitive, and sustainable. A Transit Core area is defined as a contiguous area with a concentration of activity above 30 residents and jobs per hectare, which is high enough to support frequent service throughout the day. The Transit Core is primarily served by the Rapid Transit and Frequent Transit Networks.

Transit Coverage Area

These are the areas outside the Transit Core that are unlikely to generate high ridership levels, but where some level of service is warranted to connect riders to the Core Area or provide access for residents who depend on transit. For planning purposes, potential coverage areas are defined as contiguous areas outside of the Transit Core with concentrations of activity above 10 residents and jobs per hectare, which is BC Transit's minimum threshold to support transit service. The Transit Coverage area is primarily served by the Local Transit Network and Targeted Services.

Figure 4c.8 shows the Transit Core and Transit Coverage areas as defined in the 2018 Transit Future Action Plan for the Central Okanagan Region. Figure 4c.9 shows the estimated cost per boarding by transit route, which reflects the higher cost of providing coverage service compared to core service.
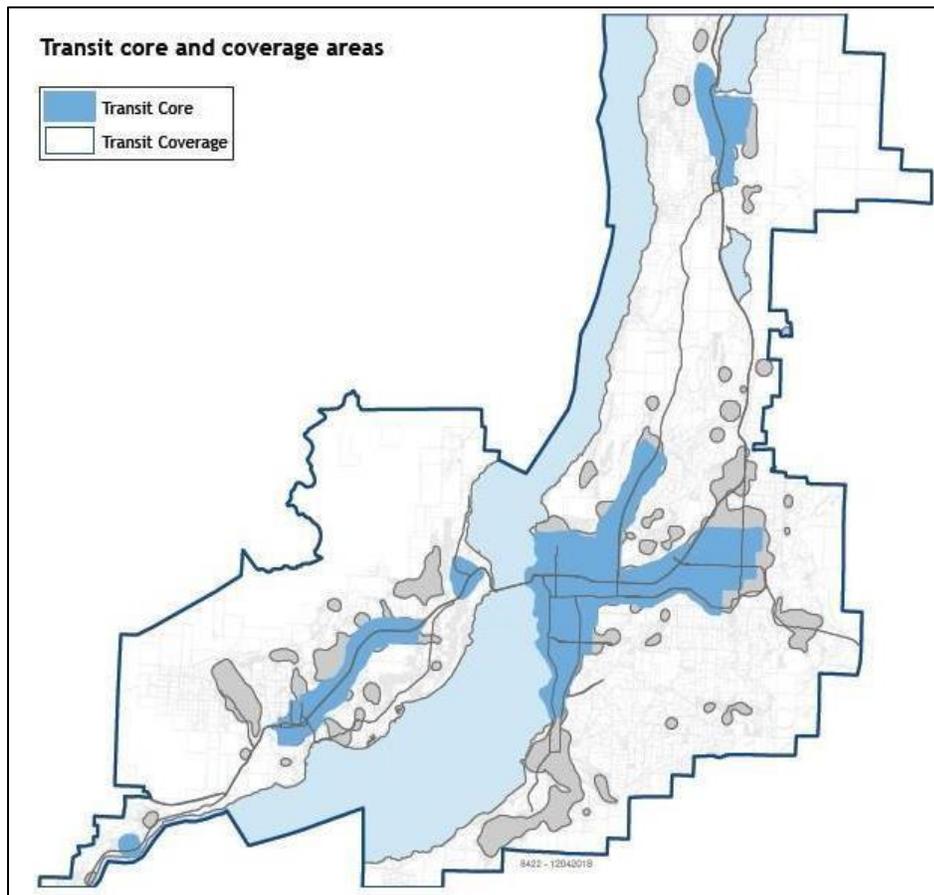
Figure 4c.8: Transit Core and Transit Coverage Areas Within Kelowna. Source: Transit Future Action Plan, BC Transit

Transit Network
Estimated Cost Per Boarding

Cost Per Boarding (FY 2017-18)

Low   High

*Routes 6,7,18 & 19
were restructured in Fall 2018
and do not appear

#23
$8.10

#13
$3.40

#8
$2.50

#4
$5.70

#97
$3.30

#2
$6.80

#3
$6.80

#10
$3.60

#9
$1.70

#9
$1.70

#11
$4.40

#4
$5.70

#14
$5.90

#1
$3.80

#12
$8.60

#5
$6.70

#15
$5.00

#17
$6.80

#16
$7.20

City of
Kelowna
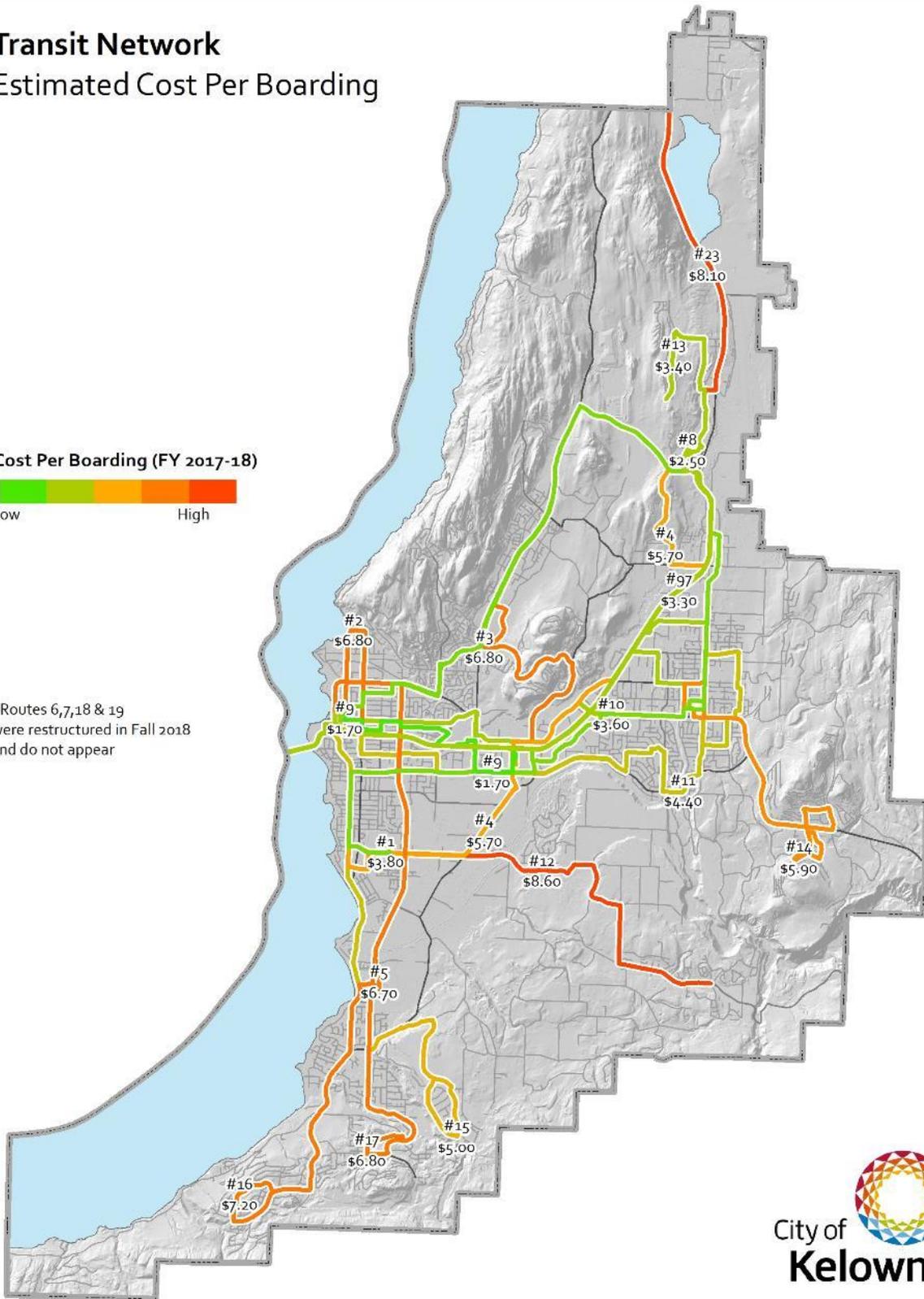
Figure 4c.9: Estimated Cost per Boarding by Route Within Kelowna. Source: BC Transit GFI Data (FY 2017-18)

The City has invested considerably in transit infrastructure in recent years. Since the completion of BC Transit's Central Okanagan Transit Future Plan in 2012, several projects identified in the plan have been delivered:

- #97 Okanagan RapidBus and local service integration.
- New Frequent and Local routes throughout the region (i.e. Route 5, 13, 17, 18, 19).
- Improved service frequencies on Local and Frequent routes (i.e. Route 8, 97).
- Significant infrastructure improvements such as upgrades to Queensway, UBC Okanagan, and Rutland exchanges.
- NextRide – uses Automatic Vehicle Location and Automatic Passenger Counter technology to provide real-time bus location and current capacity information over the Internet. NextRide information is also displayed on information boards installed at bus stops and upcoming stops are announced inside the buses.

Additional transit improvement priorities for consideration over the next five years are identified in BC Transit's 2018 Transit Future Action Plan. These priorities are listed in Table 4c.1.

Table 4c.1: Kelowna Transit Improvement Priorities in BC Transit's 2018 Transit Future Action Plan

#	Project	Estimated Annual Service Hours	# of Additional Buses	Estimated Net Local Annual Cost
	Service Implementation Priorities			
1	Invest in Frequent and Rapid Routes	5,000	2	$206,000
2	John Hindle Drive Connection	2,500	1	$130,000
3	Introduce Service to Academy Way	450	0	$19,000
4	Rutland Exchange Realignment	750	0	$44,000
5	Upper and Lower Mission Service Restructure	1,100 to 1,650	1	$104,000
6	Invest in Local Routes	500	0	$24,000
1	Rutland Network Restructure	5,000	2	$275,000
2	Invest in Frequent and Rapid Bus Routes	2,500	2	$138,000
3	Invest in Existing Local Routes	1,000	0	$47,000
4	Consider Opportunities to Expand Transit to New Coverage Areas	1,500	1	$106,000

#	Project	Estimated Resources
	Infrastructure Implementation Priorities	
1	Midtown Exchange Project	$5.9 – $6.5 million

Priority Level
Short-Term (1-3 Years)

Medium-Term (3-5 Years)

Education, encouragement, and incentive programs also help to increase transit use and can be cost effective complements to transit service and infrastructure enhancements. These types of programs inform the public of the transit service available near them, encourage people to try using transit and support them with educational resources. The City offers ongoing transit programs through the

regional smartTRIPS program.[33] It aims to shift single-occupancy vehicle trips to transit, walking, biking and carpool trips. Programs specific to transit include transit pass programs, such as ProPass and educational resources on combining biking and transit and reading transit schedules. These programs are described further in the Programs and Incentives section of this chapter.

Policy Context

Kelowna residents have repeatedly shown support for creating a more connected and equitable community by improving transit. Planning and policy documents such as *Imagine Kelowna: The Vision to 2040 (2018)*, *the Central Okanagan 5-Year Transit Future Action Plan (2018)*, *the Kelowna Community Climate Action Plan (2018)*, *the Healthy City Strategy Community for All Plan (2016)*, *Urban Centres Roadmap (2016)*, *Transit Future Plan (2012)*, and *the Kelowna 2030 Official Community Plan (2011)* all support making transit a convenient and attractive mode of transportation. Additionally, public engagement for the development of the Transportation Master Plan in spring 2018 reinforced the theme of improving diverse modes of transportation and connectivity. This indicates that residents support the City's objective of positioning transit as a competitive, convenient transportation option.

Transit Future Action Plan (2018)

The Transit Future Action Plan (TFAP) is a five-year plan developed by BC Transit for the Central Okanagan. The plan provides an update to the Transit Future Plan (2012) and builds on the same vision and goals. Action Plans are usually completed every five years following a Transit Future Plan to refine priorities and influence transit system decisions for the following five years.

The 2018 TAP notes that service expansion in recent years has fallen short of the pace set in the 2012 Transit Future Plan. Consequently, the TFAP prescribes a more balanced target for expansion but cautions that growth in demand is beginning to strain resources on major routes at peak times.

Transit Future Plan (2012)

The 2012 Transit Future Plan is BC Transit's long-range strategy for the Central Okanagan. It has a 25-Year horizon and it describes the investments required to double the mode share for transit and quadruple ridership by 2035. The plan includes the following vision and goals:

Vision:

- Transit influences urban form by providing a high-quality, affordable service that puts the customer first.

Goals:

- Attract new riders
- Deliver operational excellence
- Improve transit sustainability
- Improve custom transit utilization

Planning Principles:

- Direct connections between regional and local major destinations
- Transit priority will be in place on Frequent and Rapid Transit corridors to reduce travel time

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[33] https://www.smarttrips.ca/

- Transit service is convenient, comfortable and easy to understand
- Transit service is modern and attractive

Kelowna 2030 Official Community Plan (2011)

The Official Community Plan (OCP) is a document that contains a municipality's goals, objectives and policies guiding growth and change. The 2030 OCP includes the following goals, objectives, and policies specifically related to transit:

Goals:

- Feature a Balanced Transportation Network.
- Increase the attractiveness, convenience and safety of all modes of transportation by implementing "complete streets" that are designed to serve a broader range of transportation modes, focusing on pedestrians, cyclists and transit service, and function in the context of surrounding land uses.

Objectives:

- Objective 5.10: Ensure opportunities are available for greater use of active transportation and transit to: improve community health; reduce greenhouse gas emissions; and increase resilience in the face of higher energy prices.
- Objective 7.6: Place increase emphasis on sustainable modes of transportation (walking, cycling, transit) while maintaining automobile, commercial goods and emergency vehicle mobility.
- Objective 7.9: Ensure efficient and effective transit infrastructure and facilities.

The OCP includes many policies related to transit, some key policies include:

- Policy 5.10.2: Transit Infrastructure. Require that transit service needs to be integrated into community designs and development proposals to optimize access to transit services and incorporate essential infrastructure on transit routes identified in the Transit Plan. Provision of transit infrastructure such as transit stops, bus pull out bays, bus shelters, benches, lighting, accessibility features, bike lockers or other transit amenities, beyond those required by bylaws and regulations, may be considered for a density bonus.
- Policy 5.19.9: Transit Exchanges: Actively encourage both public and private sector development and integration of a full range of compatible uses (residential, employment and commercial activities) at transit exchanges.
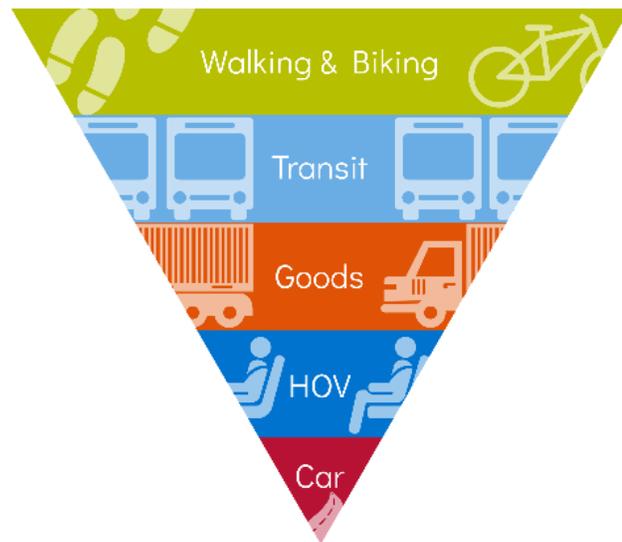
Figure 3.38: OCP Policy 7.6.1 Transportation Infrastructure Priority

- Policy.7.6.1: Transportation Infrastructure Priority. Transportation infrastructure will be funded, designed, constructed and maintained to meet the needs of users and according to the following priority:

    i.   Active Transportation (Walking and Cycling)
    ii.   Transit
    iii.   Movement of Goods & Services
    iv.   High Occupancy Vehicles (HOVs)
    v.   Single Occupant Vehicles (SOVs)

Priority will be assigned to active transportation and transit infrastructure that serves and connects Urban Centres, major employers, health care and education facilities.

- Policy 7.7.2: Ease of Movement. Ensure that pedestrians, bicyclists and transit users can move about pleasantly and conveniently and that they are not unduly impeded in their movements by provisions for enhanced automobile mobility.

Future Challenges and Opportunities

When planning for the future of Kelowna's transit system, it is important to consider the many ways that 2040 will be different than it is today. The changes in land use patterns, transportation technology, weather patterns, and demographics summarized in Chapter 3 will all influence the demand for transit in Kelowna. Specifically, new shared mobility options, such as ride-hailing and bikeshare, could extend the range of transit service. Buses may be powered by electricity in the future, making transit cleaner and quieter. Eventually, autonomous vehicles may revolutionize transit and make it feasible to provide frequent service to more places. These changes create both challenges and opportunities for developing a great transit network. In review of the existing and future conditions for transit in Kelowna, five key Challenges and Opportunities have been identified. Each of these are discussed in more detail below.

Challenge and Opportunity #1: Focus Growth near Frequent Transit and Ensure Multimodal Access
With the majority of future growth occurring in the Core Area, the challenge will be encouraging growth to happen in ways that allow transit to thrive. The most efficient way to build transit ridership is to add more residents and jobs "on the way" between major destinations. It is also important to ensure high quality bicycle, pedestrian and shared mobility access to transit stops to help solve the first/last mile problem. Kelowna's five Urban Centres are already connected by frequent transit. Focusing development along existing transit corridors can start a positive feedback loop, where higher demand supports more frequent service, which in turn makes transit more attractive. Examples of potential strategies include:

- Include a new transportation corridor land use designation in the Official Community Plan which allows for increased densities near transit.
- Ensure frequent transit stops are easily accessible by foot, bike, or using shared mobility options.

Challenge and Opportunity #2: Increase Transit Investments to Serve Growing Demand
While higher ridership lowers the service cost per passenger, the overall investment in transit service will still need to increase to keep up with demand. Chronic overcrowding and pass-ups (when a bus passes a bus stop with waiting passengers because the bus is too crowded to take on additional riders) already occur in some places today and must be addressed for transit to be a reliable choice. The existing operations facility is also at capacity and will need to be replaced in order to add new transit service. Examples of potential strategies include:

- Continue working with BC Transit to establish a new transit operations facility, ensuring that the fleet can expand as demand grows.
- Lay the groundwork for future mass transit (i.e. BRT or LRT) by protecting potential corridors and encouraging new residents and jobs to locate near future stations.
- Increase investment in system service hours, particularly on high performing routes, to meet demand and further grow ridership.

Challenge and Opportunity #3: Speed Up Transit and Make it More Reliable

Transit needs to offer travel times that are competitive with driving in order to attract new customers. Faster buses save people time, and reduce the cost of providing service. Increased traffic congestion poses a significant challenge for funding transit. Regardless of where growth occurs, Kelowna's streets will be busier in 2040. Adding a single minute of traffic-related delay to a route can increase costs by $50,000 over the course of a year. Finding ways to separate transit from congestion can help make transit faster and more reliable. Examples of potential strategies include:

- Expand transit signal priority (this allows buses to extend green lights and shorten reds) from the #97 Okanagan route to other major routes. Adjustments to signal timings should be made with the objective of moving the greatest number of people overall, not just vehicles.
- Periodically review bus stop locations to look for opportunities to combine or streamline stops, where appropriate, giving consideration to nearby destinations such as hospitals or senior housing.
- Review existing and requested detours to ensure that the benefits – in terms of increased ridership and shorter walking distances – outweigh the increased travel time for other customers.
- Explore opportunities to add queue jump lanes for buses at busy intersections and/or bus-only lanes on key corridors.
- Identify the root causes of transit reliability issues and work to resolve them.

Challenge and Opportunity #4: Maximize Benefits of Technology Change on Transit

Public transit may look quite different in twenty years given the pace of technology change and ongoing trends related to vehicle electrification, shared mobility, and autonomous vehicles.

Diesel buses produce significant amounts of air pollution and carbon emissions. In fact, when carrying fewer than five people, a 40-foot diesel bus is less sustainable than driving alone in a pickup truck. Electric buses are being piloted in several Canadian cities, including Vancouver, Winnipeg, Montreal, and Victoria.

Ride-hailing services such as Uber and Lyft cannot compete with the people-moving efficiency of transit but can complement transit in the places and times of day where high-quality service is challenging to provide. Many places in North America are experimenting with partnerships with ride-hailing companies to supplement transit in low density areas. This allows for initiatives like subsidized rides to get residents to the nearest transit exchange. Eventually, autonomous vehicles could transform public transit. The savings from reduced wage costs may allow for more frequent service to be offered in more places.

Another recent trend is the increasing popularity of services which provide short term rentals of bikes and other small vehicles. These services can extend the catchment area for transit beyond typical walking distance. Examples of potential strategies include:

- As battery technology improves, encourage BC Transit to move towards electric buses and support the implementation of charging stations if necessary.
- Work to integrate mobility services with transit through trip planning and payment technologies.
- Adopt policies which promote the use of ride-hailing as a complement to transit service, rather than as a direct competitor.

Challenge and Opportunity #5: Collect High Quality Data to Support Transit Planning
Kelowna's transit system is complex, with 80 vehicles and 16,000 passengers travelling the equivalent of two-and-a-half times around the world each day. Evidence-based decision making is important for public transit, since almost every potential change involves tradeoffs that need to be weighed. Historically however, there has been a lack of data to make effective decisions. For example, customers have consistently ranked reliability as an area for improvement but until recently, the GPS data required to accurately track on-time performance was not available. These kinds of challenges will become more pressing as the system grows and new technologies emerge. Examples of potential strategies include:

- Continue working with BC Transit on the SmartBus initiative, modernizing systems such as passenger counters, vehicle locators and fare collection, which provide valuable insight into how the system is operating while improving customer service.
- Establish service standards that define the minimum levels of transit service required to meet our community's needs. This can include things like the transit system's hours of operations, routes, schedule frequency, walking and biking distance to bus stops, level of accessibility, and service priorities.

d) Driving

Importance of Driving

Kelowna grew up during the golden age of the automobile and for decades, development happened in ways that encouraged people to drive everywhere they went. Therefore, it is not surprising that driving is still often the fastest and most convenient way for people to get around. Personal vehicles provide door to door service, leave when people want, provide shelter from the elements, and can carry large amounts of passengers and cargo. Cars and trucks are also well-suited for longer trips, can easily handle changes in elevation, and are convenient travel options for residents in suburban, hillside and rural areas. Given these features, it's no wonder that the majority of residents often drive to meet their daily travel needs.

However, in many ways driving is the victim of its own success. Cars and trucks take up a large amount of space and emit air pollutants and greenhouse gases. As the population grows and more people drive, roadways quickly fill up and become congested.

What is Traffic Congestion?

In economic terms, traffic congestion happens when the demand for roadway space exceeds the supply. Due to the way society is organized, this typically occurs during the morning and afternoon peaks, when most people need to travel to work and/or school at the same time. This means that increasing congestion levels are often a sign of a growing, vibrant and economically productive city. In fact, traffic levels often become heaviest when the economy is booming and notably recline during a recession[34]. As such, one way to view traffic congestion is as a sign of prosperity and economic success, rather than a wholly negative phenomenon.

However, nobody likes being stuck in traffic. Inching along congested roads in a vehicle capable of going over 100 kilometres an hour is an inherently frustrating experience. Often the response by communities to increasing traffic congestion is to increase roadway capacity by building new roads and widening existing ones. However, as discussed in The Congestion Paradox Facts in Focus discussion paper, this approach can be expensive and ineffective over the long-term, with negative community impacts.

In Kelowna, the construction of new roads is constrained by steep hillsides, Okanagan Lake and protected agricultural lands. In the Core Area, there is little room to widen roads without buying land, tearing down homes or disrupting local businesses. This would be expensive and physically divide existing, established neighbourhoods, making Kelowna a less attractive and healthy place to live. On average, the cost to widen a major road in the Core Area is estimated at $26 million per kilometer (but could be much higher where impacts to adjacent properties are significant). This means that substantial tax increases or new sources of revenue would be needed to try and build our way out of congestion.

Even if the space and funds were available, expanding roadways often reduces congestion to a smaller degree, and for less time, than initially expected. This is because when a new road opens, or an existing road is expanded, people typically respond by shifting routes, traveling at different times, traveling more often, or even relocating where they live or work. These effects are more prominent where new roads significantly reduce travel times between locations. This rebound effect, called "induced

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[34] Downs, A. (2014). Still Stuck in Traffic: Coping with Peak Hour Traffic Congestion

demand" by economists, can reduce the long-term congestion mitigation effects of roadway expansion projects[35], often eroding the benefits they originally sought to achieve.

While free-flow automobile travel during the morning or afternoon peaks may not be achievable in a rapidly-growing, economically successful city[36] like Kelowna, there are still a number of strategies that can be implemented to help reduce the rate at which traffic congestion intensifies. Strategies to help manage and minimize the growth of traffic congestion will be explored further as part of the Transportation Master Plan.

Land Use and Driving in Kelowna

Different kinds of development impact Kelowna's transportation network in different ways. Development in the outlying suburban and rural parts of the city contribute more to traffic congestion compared to development in the Core Area and Urban Centres. This is because in suburban and rural areas, driving is often the only practical option for getting between home and work, school, shopping, and other activities or appointments.

Most suburban and rural neighborhoods are in a situation that planners describe as car-dependent. They lack the necessary population densities to support effective transit service and are too far away from destinations or too hilly to make walking or cycling competitive travel options with driving. While 79 per cent of residents in the city as a whole travel to work by car, over 90 per cent of residents in Kelowna's suburban and rural neighbourhoods do so (see Figure 4d.1). Residents in these neighbourhoods also drive two to six times further than residents in Kelowna's Core Area neighborhoods (see Figure 4d.2). Meanwhile, as the distance between households and the city's centre increases, so too does the average distance driven (see Figure 4d.3).

[35] Ewing, R. & Proffitt, D. (2016). Improving Decision Making for Transportation Capacity Expansion: Qualitative Analysis of Best Practices for Regional Planning. Transportation Research Record, 2568, p.1
[36] Downs, A. (2014). Still Stuck in Traffic: Coping with Peak Hour Traffic Congestion
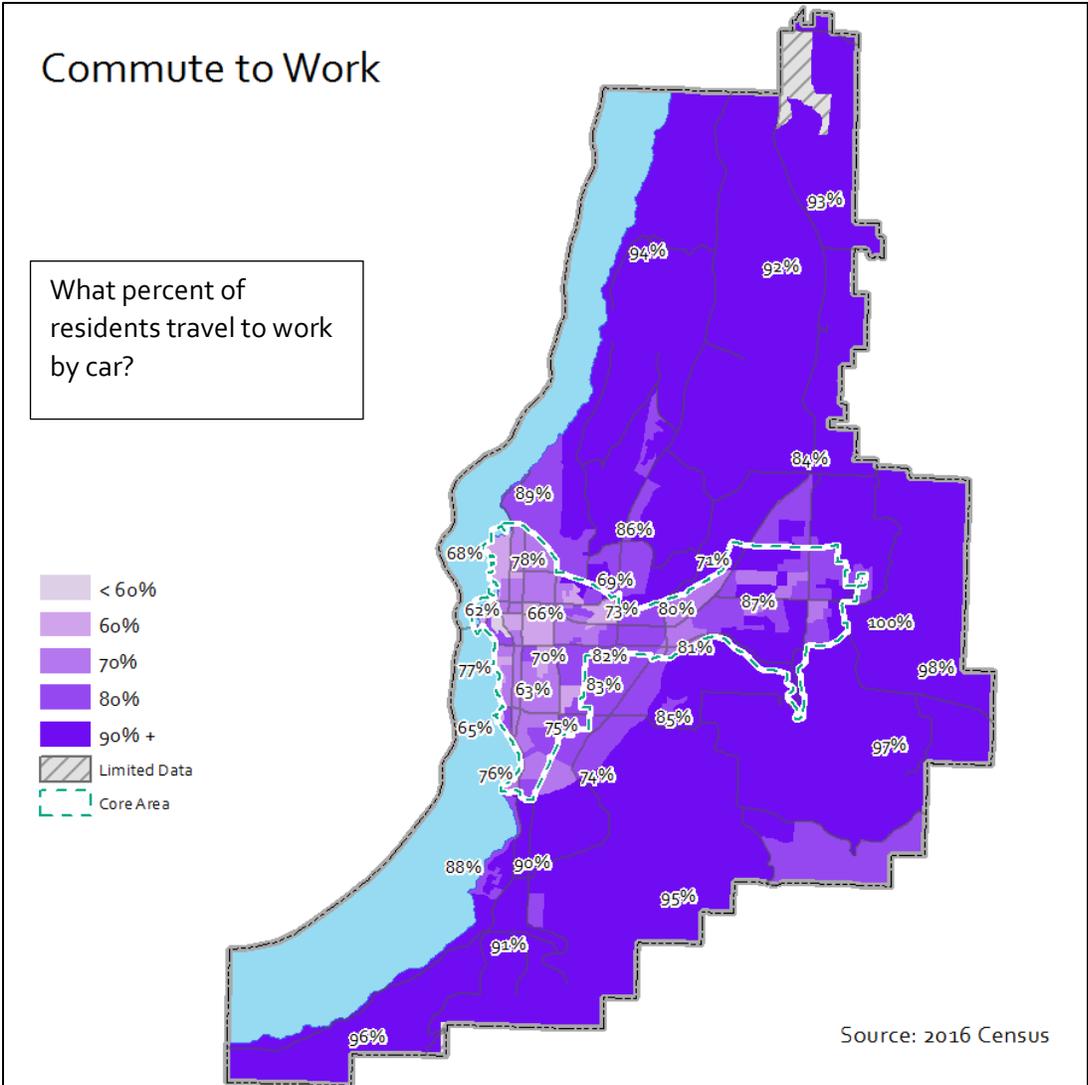
Figure 4d.1: Percentage of Kelowna Residents Who Travel to Work by Car. Source: 2016 Census
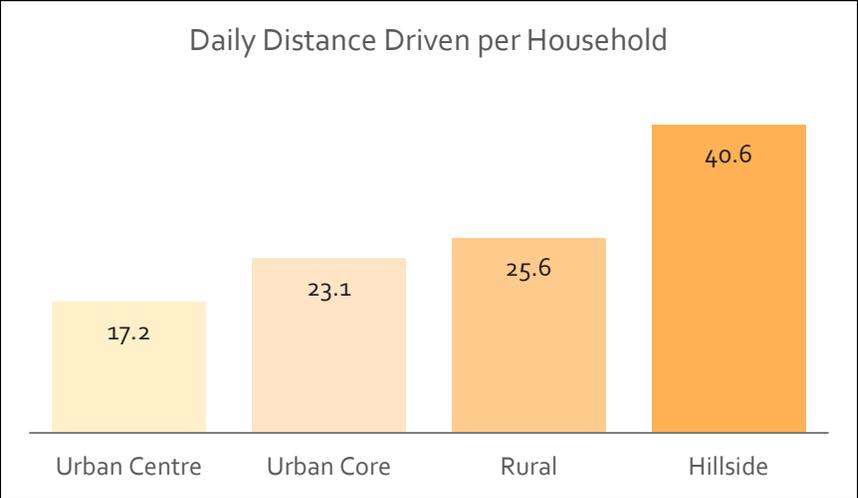
Figure 4d.2: Average Daily Distance Driven per Household. Source: 2013 Household Travel Survey.

Average Daily Distance Driven
Km Per Household
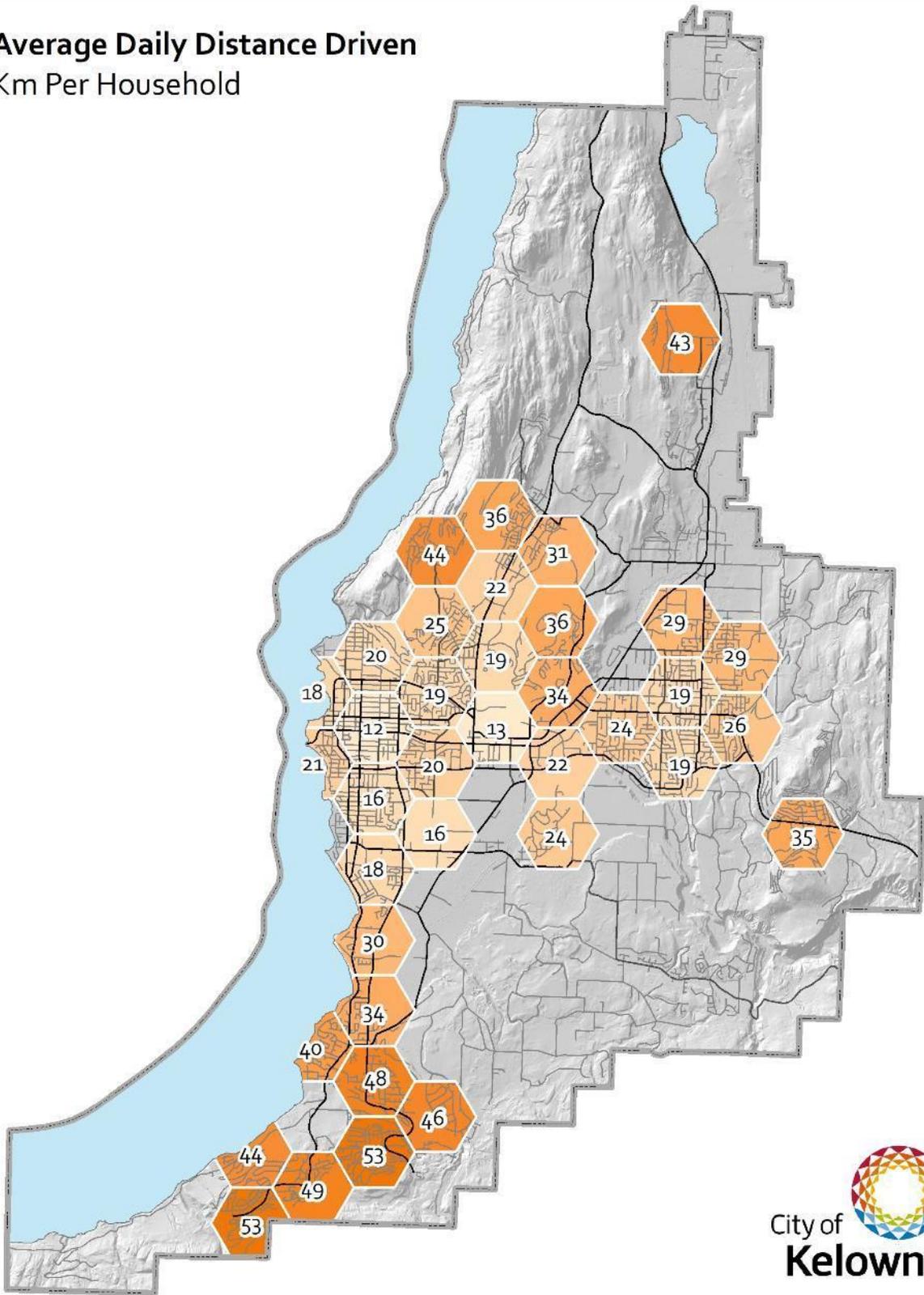
Figure 4d.3: Average Daily Distance Driven per Household. Source: 2013 Household Travel Survey.

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Driving in Kelowna

The average commute time in Kelowna went from 16.2 minutes in 2007[37] to 18.1 minutes in 2016.[38] The 12 per cent increase over ten years is comparable to similar-sized Canadian cities, as shown in Figure 2d.1 in Chapter 2.

Kelowna's average commute time is both below the provincial average of 25.9 minutes and the national average of 26.2 minutes. Although travel times in Kelowna are still shorter than the Canadian average, delays are becoming longer as the city grows.

The highest traffic volumes within the city are concentrated along Highways 97 and 33, the east-west arterials of Springfield Road, Clement Avenue, Bernard Avenue, KLO Road and the north-south arterials of Glenmore Drive, Gordon Drive, Richter Street, Pandosy Street, Lakeshore Road, Rutland Road, and Benvoulin Road (see Figure 4d.5). Most of these routes pass through the Core Area of the city where volumes are the highest.

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[37] 2007 Household Travel Survey
[38] Statistics Canada, 2016 Census of Population.

Average Daily Traffic
Weekdays (Estimated - 2018)

Legend:
- 5,000
- 10,000
- 30,000
- 50,000
- 70,000

19 K · 8 K · 40 K · 6 K · 41 K · 16 K · 21 K · 22 K · 11 K · 17 K · 9 K · 7 K · 46 K · 29 K · 6 K · 45 K · 18 K · 13 K · 48 K · 10 K · 16 K · 8 K · 31 K · 12 K · 15 K · 29 K · 11 K · 9 K · 55 K · 50 K · 18 K · 21 K · 60 K · 68 K · 19 K · 11 K · 7 K · 13 K · 26 K · 35 K · 32 K · 20 K · 14 K · 12 K · 17 K · 6 K · 33 K · 8 K · 41 K · 5 K · 37 K · 30 K · 24 K · 9 K · 20 K · 6 K · 18 K · 17 K · 22 K · 10 K · 7 K · 15 K · 11 K · 16 K · 13 K
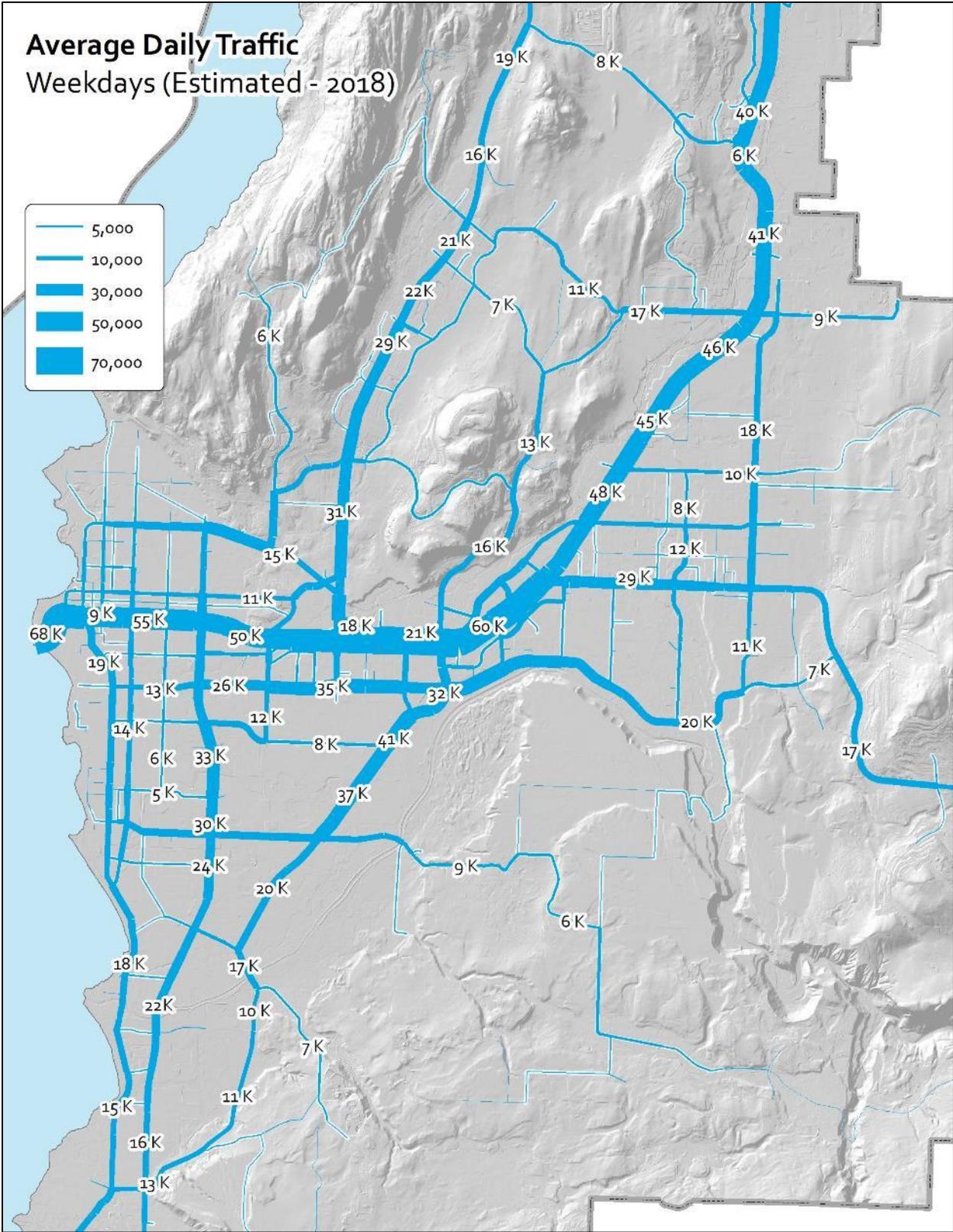
Figure 4d.5: 2018 Average Weekday Traffic Volumes in Kelowna. Source: 2016 – 2018 Traffic Counts.

Peak Travel Periods

On weekdays, traffic volumes and delays vary throughout the day and are typically longest during the morning and afternoon peaks (see Figure 4d.6). The morning peak tends to be more abrupt and dominated by trips to and from work. Trips made during the midday are for a wider range of activities. In the evening, travel is dominated by those returning from work to home, with a smaller peak in the mid-afternoon during school dismissal.

The distribution of traffic across the day varies in different areas of the city. In suburban areas, dominated by residential land uses, traffic volumes typically spike in the morning and to a lesser degree in the afternoon, as residents travel between home, work and school. During the remainder of the day, traffic volumes are often low.

The Core Area experiences similar morning and evening spikes in travel but traffic volumes are higher in the afternoon and midday as residents travel to and from their workplaces, access services and undertake a range of other activities. In recent years, Kelowna has seen the midday get busier, with volumes approaching the morning and afternoon peaks in some areas. Though delays in the Core Area tend to vary less than in outlying areas, they tend to be more persistent, extending over a longer portion of the day.

During weekends, traffic volumes are lower and tend to peak in the middle of the day. Relative to the weekly average, Saturday volumes are typically 85 per cent while Sundays are 70 per cent.
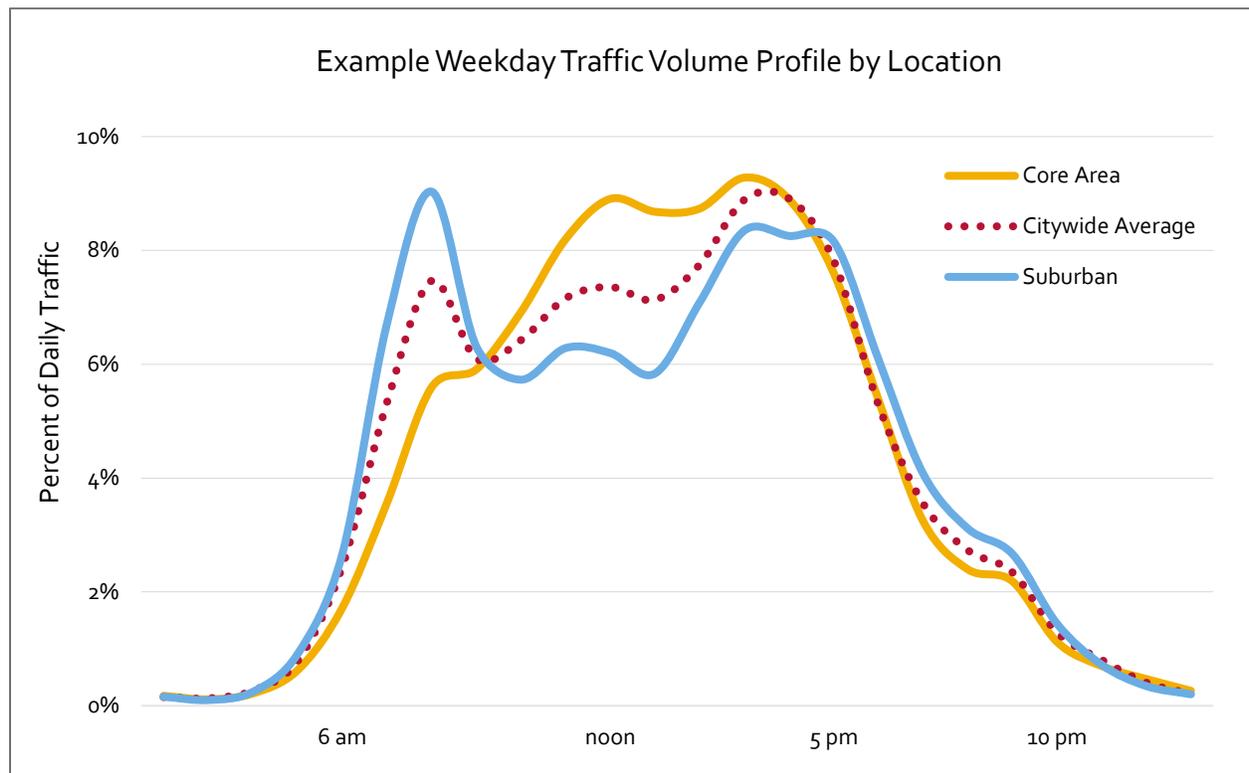
Figure 4d.6: Daily Average Traffic Volumes in Kelowna by Time of Day – February 2018. Source: City of Kelowna Traffic Signal Data

Using a new crowd-sourced approach to data collection, travel times were collected along major Kelowna roadways every 15 minutes continuously between July 2017 and June 2018. A summary of the data is included below and the full report is in Appendix A.

Figure 4d.7 illustrates the data collected for the weekday morning and afternoon peaks during the fall of 2017. A congestion index was calculated for each road segment by taking the ratio of observed travel times to the overnight minimum travel time. Lower values represent higher levels of congestion. These maps show the average congestion for each peak period (7 a.m. – 9 a.m. and 3 p.m. – 6 p.m.) and do not necessarily represent the worst conditions observed.
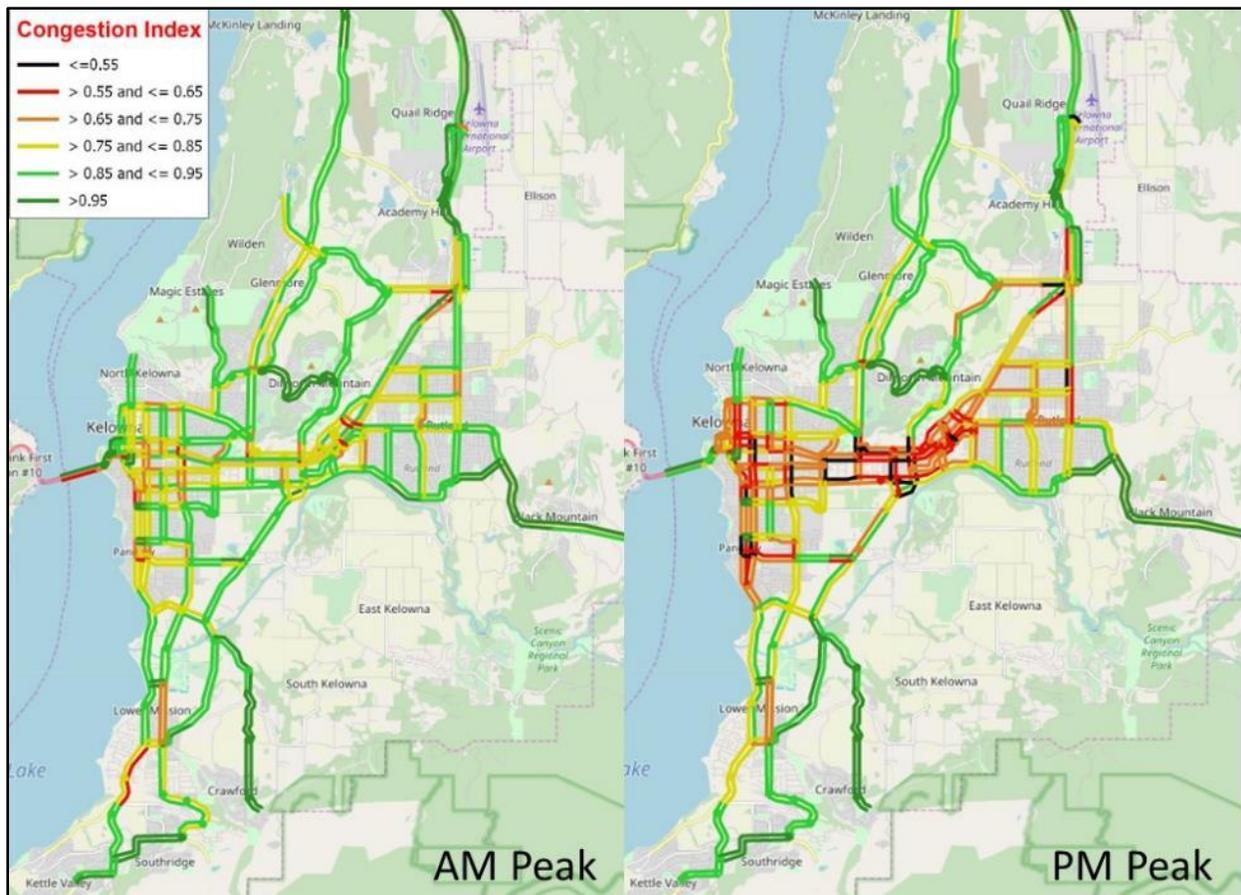
Figure 4d.7: Kelowna Congestion Index – Weekday AM Peak (7 a.m. to 9 a.m.) and Weekday PM Peak (3 p.m. to 6 p.m.), Fall 2017.

There is more congestion during the afternoon peak than during the morning peak. The morning peak primarily consists of commuting and school trips, which tend to be consistent from day to day and only involve a portion of the population. As morning trips tend to be more consistent in time and direction, most of the delays tend to be near residential areas or school sites.

During the afternoon peak, more people are on the move for a wider range of purposes (e.g. commuting, shopping, appointments, and recreation). As a result, traffic volumes increase while travel patterns become more complex.

Travel Time, Delay and Reliability
During busy times, people often account for a potential congestion-related delay in reaching their destination. When the amount of delay is consistent from day to day, people can more reliably predict their travel times. However, when travel times vary considerably from one day to the next, people have to adjust by leaving even earlier and padding their schedule in order to arrive on time. Improving reliability on busy urban streets and reducing the amount of extra time people need to ensure they arrive at their destination on schedule, can provide similar benefits as reducing average travel times.

Broadly speaking, there are four types of travel delays: acute, chronic, event-related, and seasonal. To demonstrate the dynamic nature of travel times across the city, ten routes were sampled connecting major destinations and crossing different parts of the city (see tables 4d.1 and 4d.2).

Acute Traffic Delays
Acute, short-term traffic delays were most often observed for short portions of the morning peak when both students and workers are competing for road space at the same time. The most significant example of acute travel delay was observed on the Kettle Valley to Downtown route during the morning peak. While the average delay was 2.6 minutes, and 80 per cent of the time delay was between 0.7 minutes and 6.7 minutes, the greatest delays occurred on Lakeshore Road, adjacent to Anne McClymont Elementary School, during the 30 to 45 minute period when students are being dropped off. While travel times on Lakeshore Road are highly variable, they vary in a predictable way each school day, and only impact those traveling during those times. Where variability is less predictable over a longer period, the impact of delays is larger.

Chronic Traffic Delays
Chronic, longer-term traffic delays were most commonly observed during the midday and afternoon peaks within the Core Area, where the proximity of employment, services and destinations mixing with pass-through traffic led to delays over a longer period. Of the ten routes observed, the greatest chronic delays occurred between Kelowna General Hospital and the Farmers Market along Springfield Road in both directions, between Rutland and Downtown along Highway 97 and Highway 33 in both directions, and between the Pandosy Urban Centre and Downtown along Pandosy Street in both directions. While chronic delays are generally more predictable than acute delays, they occur over longer periods and impact more people.

Event-Related Traffic Delays
Event-related traffic delays are the result of one-time events, such as construction, landslides, floods, fires or collisions. An example of an event-related delay was construction along the Rutland to UBC Okanagan Route connected to the Highway 97 six-laning project. While impacts from this form of delay can be significant, they are temporary, and end once the event is complete.

Seasonal Traffic Delays
Traffic patterns change throughout the year, resulting in seasonal delays. For example, during the summer when school is out, residents take vacation and many tourists visit popular recreational destinations. During the winter however, school is in session, most residents are working, and adverse weather conditions can change traffic patterns. Averaged across the ten sample routes, travel speeds vary by less than two per cent across the seasons.

Summary

Summer

Relative to other seasons, travel speeds during the morning peak are the fastest (2.5 per cent faster than average). This is likely because school is out, some workers are on vacation and the weather is favourable. During the midday, speeds are slower than in other seasons (2.5 per cent slower than average). This is likely due to the summer tourist season and the associated increase in shopping and recreational trips. The routes that experience the slowest speeds during the midday are routes along Highway 97, Highway 33, Pandosy Street, Lakeshore Road, Glenmore Road, and Clement Avenue. During the afternoon peak, summer travel times are about 2.1 per cent slower than average (faster than in the fall, but slower than in the spring or winter).

Winter

Travel speeds are the slowest (2.3 per cent slower than average) during the morning peak across all ten routes observed. This is likely due to inclement weather conditions and poor visibility (darkness). However, travel speeds are faster during the midday and the afternoon peak (between 1.7 per cent and 3.5 per cent faster than average). This is likely due to snow being cleared by these times, combined with fewer visitors in the city compared to other seasons.

Travel Times between Sample Origin – Destination Pairs

The travel times and delays in the tables below were observed during the morning and afternoon peak. The tables display the average travel times, the variability of travel times (between the 10th and 90th percentiles), and the average and variability of travel time delay experienced on each of the ten routes observed. Delay was calculated as the difference between travel times during the morning or afternoon peak periods and the overnight period. While overnight travel times have been used as a baseline, they are not realistic goals for daytime travel times.

Table 4d.1: Travel Times in Kelowna During the Morning Peak (7 a.m. to 9 a.m.) – Fall 2017

Route	Average Overnight Travel Time (mins)	Average Travel Time (mins)	Travel Time Variability (mins)*	Average Travel Time Delay (mins)Ø	Variability of Travel Time Delay (mins)ϕ
Lake Country to Downtown (along Glenmore & Clement)	23.9	24.6	23.5 - 25.7	0.7	0.5 - 0.9
Lake Country to Downtown (along Hwy 97)	20.6	20.9	19.9 - 21.7	0.3	0.0 - 0.4
Black Mountain to Downtown (along Hwy 33 & Springfield)	20.3	21.2	19.9 - 22.6	0.9	0.4 - 1.7
Kettle Valley to Downtown (along Pandosy & Lakeshore)	18.5	21.1	17.8 – 26.0	2.6	0.7 - 6.7
Glenmore Village to Capri-Landmark (along Glenmore & Bernard)	7.4	8.2	7.5 – 9.0	0.8	0.5 - 1.3
Rutland to Downtown (along Hwy 33 & Hwy 97)	11.7	12.7	11.8 - 13.6	1.0	0.8 - 1.1
Pandosy Urban Centre to Downtown (along Pandosy)	6.7	7.2	6.5 – 8.0	0.5	0.4 - 0.8

UBCO to Rutland (along Hwy 97 & Rutland)	10.7	11.9	8.9 – 16.0	1.2	0.5 - 1.3
Lower Mission to Capri-Landmark (along Gordon & Sutherland)	8.0	8.7	8.0 - 9.6	0.7	0.4 - 1.1
Farmers Market to KGH (along Springfield)	6.3	6.9	6.3 - 7.6	0.6	0.5 – 1.0
	* 10th to 90th percentile, 80% of observations fall between these values. Ø compared to the average overnight travel time ф compared to the 10th and 90th percentile overnight travel times				

During the morning peak, average travel time delays ranged from a low of 0.3 minutes (Lake Country to Downtown along Highway 97) to a high of 2.6 minutes (Kettle Valley to Downtown). The variability of travel times was smallest (1.3 minutes) along the Farmers Market to KGH route. The largest variability (8.2 minutes) was along the Kettle Valley to Downtown route, which experienced its longest delays around 8:30 a.m. During the morning peak, this route had both the worst travel time delays and the worst travel time reliability.

Table 4d.2: Travel Times in Kelowna During the PM Peak (3 p.m. to 5 p.m.) – Fall 2017

Route	Average Overnight Travel Time (mins)	Average Travel Time (mins)	Travel Time Variability (mins)*	Average Travel Time Delay (mins)Ø	Variability of Travel Time Delay (mins)ф
Downtown to Lake Country (along Clement & Glenmore)	23.9	27.8	25.7 - 30.5	3.9	2.7 - 5.7
Downtown to Lake Country (along Hwy 97)	20.4	26.7	23.7 - 31.5	6.3	4.1 - 10.3
Downtown to Black Mountain (along Springfield & Hwy 33)	19.7	22.5	21.8 - 23.3	2.8	2.7 - 2.8
Downtown to Kettle Valley (along Pandosy & Lakeshore)	16.6	18.8	18.2 - 19.5	2.2	1.3 - 3.1
Capri-Landmark to Glenmore Village (along Bernard & Glenmore)	7.3	9.5	8.7 - 10.1	2.2	1.8 - 2.4
Downtown to Rutland (along Hwy 97 & Hwy 33)	11.4	15.7	15.0 - 16.4	4.3	4.1 - 4.5
Downtown to Pandosy Urban Centre (along Pandosy)	5.6	7.1	6.6 - 7.5	1.5	1.4 - 1.7
Rutland to UBCO (along Rutland & Hwy 97)	9.8	12.1	10.3 - 15.7	2.3	1.7 - 3.2
Capri-Landmark to Lower Mission (along Sutherland & Gordon)	7.6	9.2	8.8 - 9.6	1.6	1.5 - 1.6
KGH to Farmers Market (along Springfield)	6.7	10.0	9.0 – 11.0	3.3	2.8 – 4.0
	* 10th to 90th percentile, 80% of observations fall between these values.				

		Ø compared to the average overnight travel time
		φ compared to the 10th and 90th percentile overnight travel times

During the afternoon peak, average travel time delays ranged from a low of 1.5 minutes (Downtown to Pandosy) to a high of 6.3 minutes (Downtown to Lake Country along Highway 97). The variability of travel times was smallest (0.8 minutes) along the Capri-Landmark to Lower Mission route, and largest (7.8 minutes) was along the Downtown to Lake Country along Highway 97 route. This route experienced the worst delays and the worst travel time reliability during the afternoon peak.

Historic Trends

There is historical data collected in 2018 for four of the 10 sample routes.[39] A comparison of travel times between 2008 and 2017/18 is presented in Table 4d.3. While results from the 2008 survey directly measured travel times using GPS, sample sizes were much smaller than for the 2017/18 survey.

Table 4d.3: Travel Times Comparison 2008 and 2017/18 (in minutes)

Route		Morning			Midday			Afternoon		
		2008	2018	Change	2008	2018	Change	2008	2018	Change
Lake Country (via Glenmore)	To DT	21.7	24.8	+3.1 (+14.5%)	23.7	26.2	+2.5 (+10.8%)	23.3	26.3	+3.0 (+12.5%)
	From DT	21.7	24.4	+2.7 (+12.8%)	23.2	26.3	+3.1 (+13.3%)	23.3	28.7	+5.4 (+23.3%)
Lake Country (via Highway 97)	To DT	22.1	21.3	-0.8 (-3.3%)	29.6	25.4	-4.2 (-14.3%)	29.0	25.2	-3.8 (-13.2%)
	From DT	21.0	21.7	+0.7 (+3.4%)	29.4	26.8	-2.6 (-8.9%)	27.9	27.4	-0.5 (-1.5%)
Kettle Valley	To DT	16.4	20.0	+3.6 (+21.4%)	20.0	21.6	+1.6 (+7.6%)	19.9	22.7	+2.8 (+13.9%)
	From DT	16.0	17.2	+1.2 (+7.2%)	18.2	18.9	+0.7 (+3.7%)	18.1	19.1	+1.0 (+5.4%)
Black Mountain	To DT	21.0	21.3	+0.3 (+1.5%)	26.7	23.6	-3.1 (-11.7%)	24.7	24.7	0.0 (+0%)
	From DT	22.3	20.5	- 1.8 (-8.2%)	26.0	26.0	0.0 (+0%)	25.2	26.5	+1.3 (+5.1%)
Peachland	To DT	24.8	27.2	+2.4 (+9.8%)	26.2	27.2	+1.0 (+3.6%)	27.8	28.0	+0.2 (+0.5%)
	From DT	22.4	24.3	+1.9 (+8.4%)	25.2	27.7	+2.5 (+10.3%)	27.1	29.5	+2.4 (+8.8%)

Comparison of the 2008 and 2017/18 travel times include the following observations:

- **Morning Peak:** Travel times increased an average of 1.3 minutes (6.4 per cent)

- **Midday**: Average travel times mostly held steady, increasing by 0.6 per cent

- **Afternoon Peak:** Travel times increased an average of 1.2 minutes (4.7 per cent).

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[39] 2008 Central Okanagan Travel Time Survey

While most routes and time periods saw modest increases in travel times, there were also a few reductions, which may be due to upgrades along Highway 97.

Safety

Traffic collisions can have a significant impact on people's lives including damaged vehicles, injuries, or fatalities. Human suffering, time off work, lost productivity, and vehicle repair costs also have a big impact on our society. We cannot eliminate all collisions, but good street design can help reduce them and their severity. Every weekday, the residents of Kelowna collectively drive 1.2 million kilometres, and this will only increase as the population grows over the next 20 years.[40] The more our streets are used, the greater the potential for conflicts and collisions.

Collision Trends

As shown in Figure 4d.8, the number of collisions per capita is higher in Kelowna than in other similar sized B.C. cities. Cities with a larger number of people commuting in for work each day tend to have higher collision rates.

Annual Collisions Per Capita, 2016

City	Value
Kelowna	30.7
Abbotsford	29.6
Vernon	25.9
Nanaimo	24.0
Chilliwack	22.3
Kamloops	21.7
Penticton	16.8
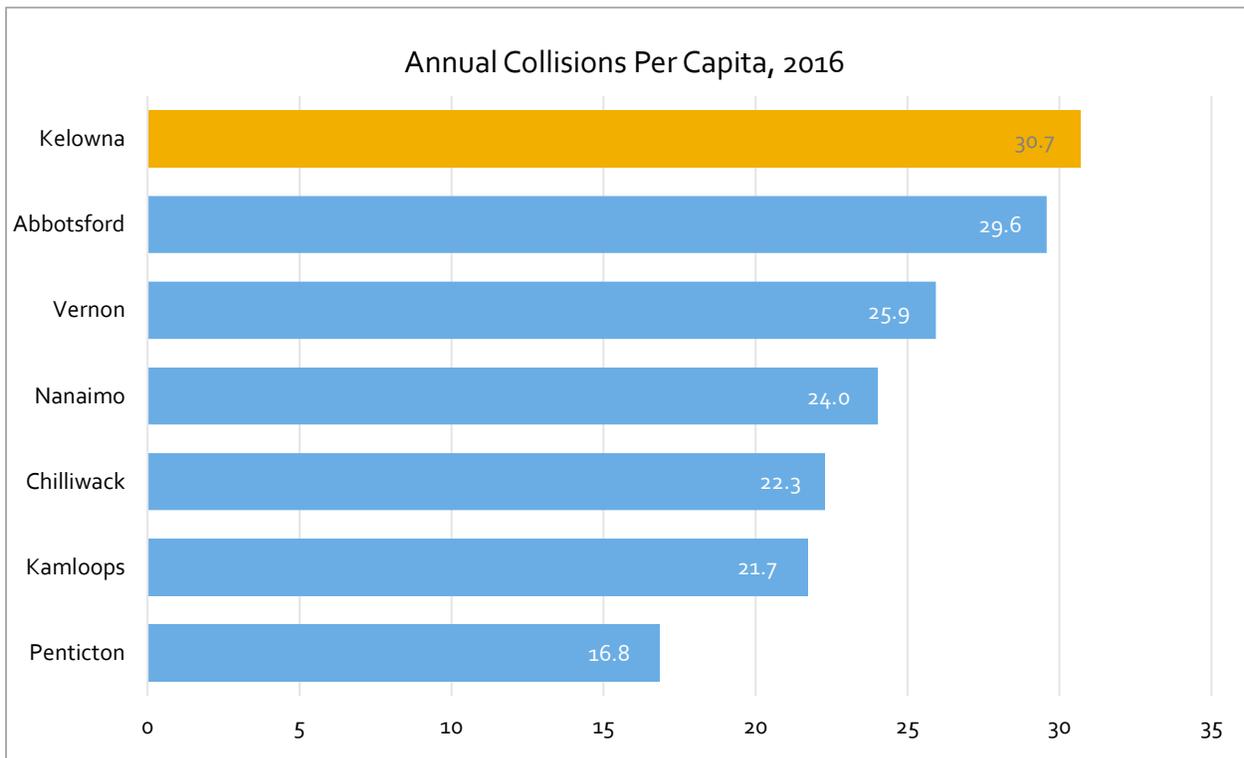
Figure 4d.8: Number of Collisions Per 100,000 Residents, population adjusted for commuters who travel into a city from neighbouring jurisdictions. Source: ICBC, Statistics Canada

Frequency and Severity of Collisions

Over the last decade, approximately two-thirds of collisions in Kelowna resulted in property damage only, approximately one-third resulted in injuries, and less than 0.1 per cent resulted in fatalities

As seen in Figures 4d.9 and 4d.10, while only 35 per cent of traffic collisions caused injury, those collisions cost an estimated $502 million annually, representing 84 per cent of the total estimated cost

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[40] City of Kelowna. (2018). Facts in Focus: The Congestion Paradox.

of all collisions. For comparison, the estimated annual cost of traffic congestion in Kelowna is around $330 million.[41]

| 2007-2017 Collision Severity | 2007-2017 Collisions - Estimated Annual Cost to Society |

Fatality 0.1%
Injury 34.6%
Property Damage 65.3%
Source: ICBC 2007-2017 Data

Property Damage $42M
Fatality $56M
Injury $502M
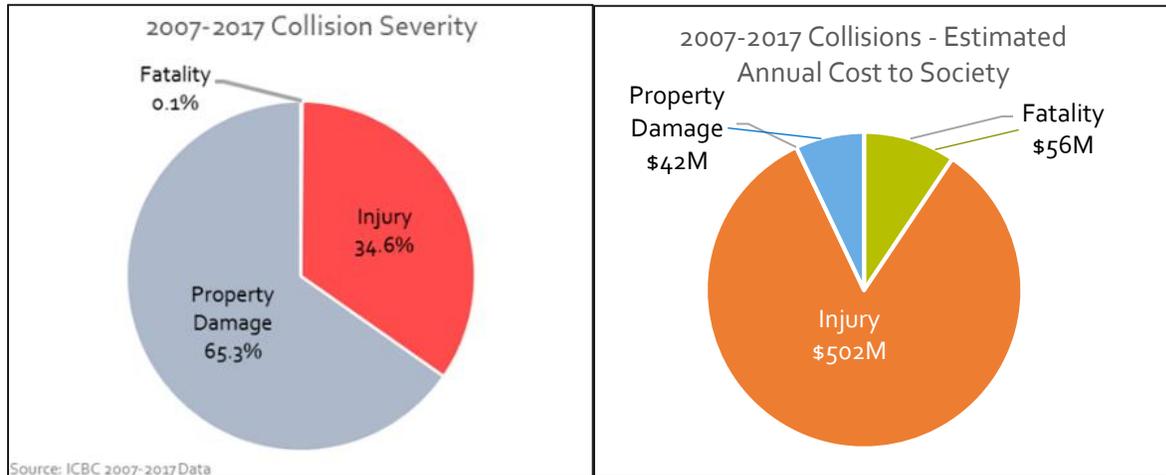
Figure 4d.9: Severity of traffic collisions in Kelowna.   *Figure 4d.10: Estimated annual cost of traffic collisions in Kelowna. Source: ICBC 2007-2017, BC MoTI 2018.*

Figure 4d.11 illustrates the general increase in collisions in Kelowna over the last ten years. Based on similar patterns seen across North America, the decrease between 2008 and 2012 was likely linked to the 2008 economic recession and resulting decrease in economic activity. This was followed by an increase beginning in 2013. Data from ICBC in Figure 4d.12 confirms a similar trend in other B.C. cities. Some of the increase in collisions over the last ten years can be attributed to a growing population, increased economic activity, and increasing traffic volumes in Kelowna.

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[41] HDR. (April 2009). Central Okanagan Traffic Congestion Assessment. Adjusted for inflation and using linear interpolation between 2007 and 2030 congestion forecasts.
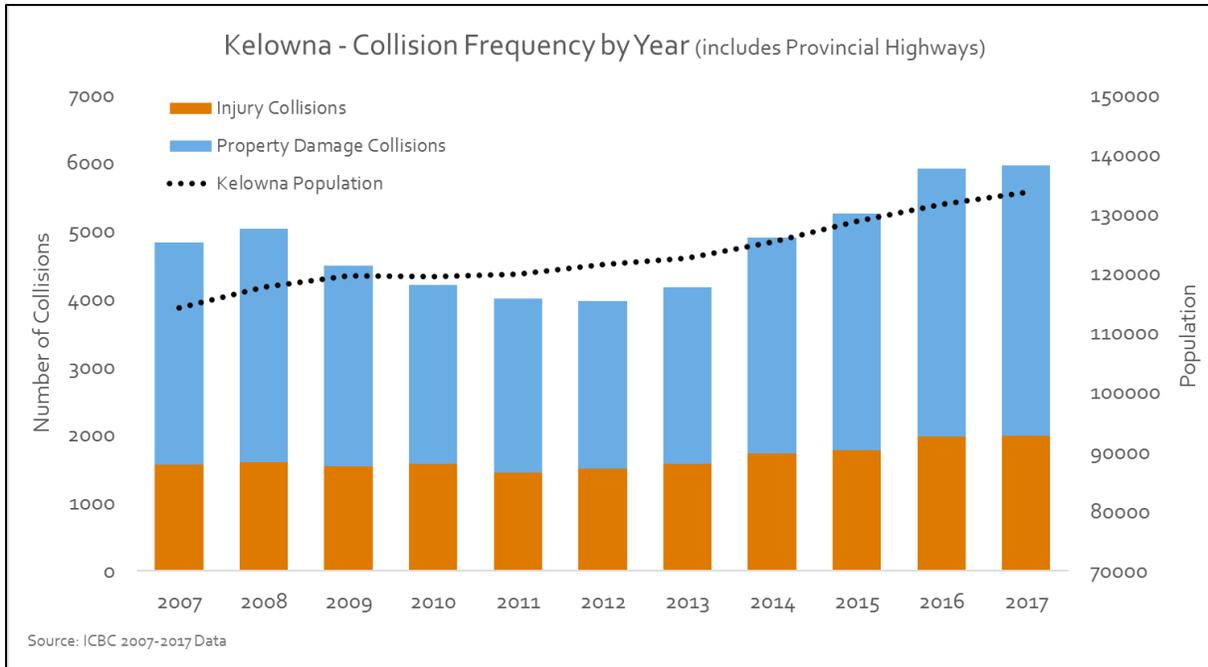
Figure 4d.11: Collision Frequency in Kelowna 2007-2017.
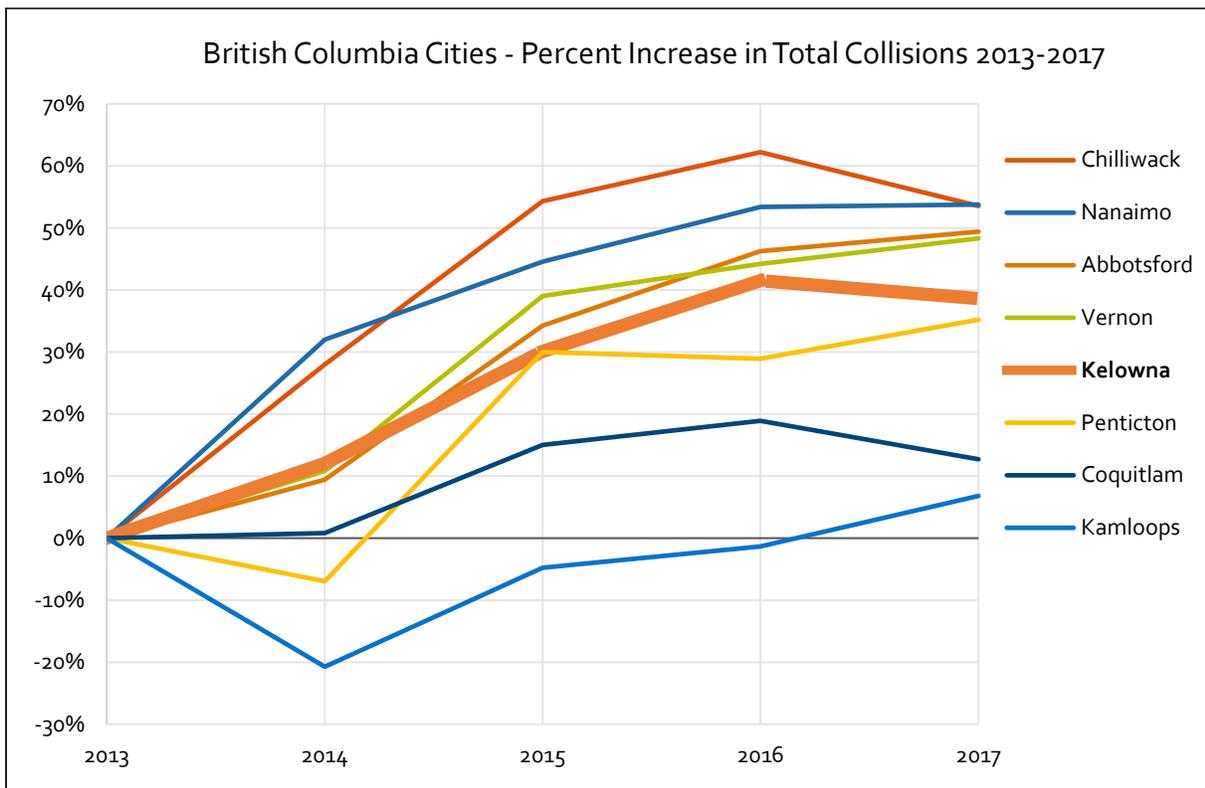
Figure 4d.12: Increase in Collisions for B.C. Cities 2013-2017. Source: ICBC

As shown in Figure 4d.13, there is also some seasonal variability to collisions in Kelowna. Collisions peak in December when peak hour travel takes place after sunset and snowfall is more common. The ratio of fatal and injury collisions remains stable over the year, peaking in the late fall and early winter.
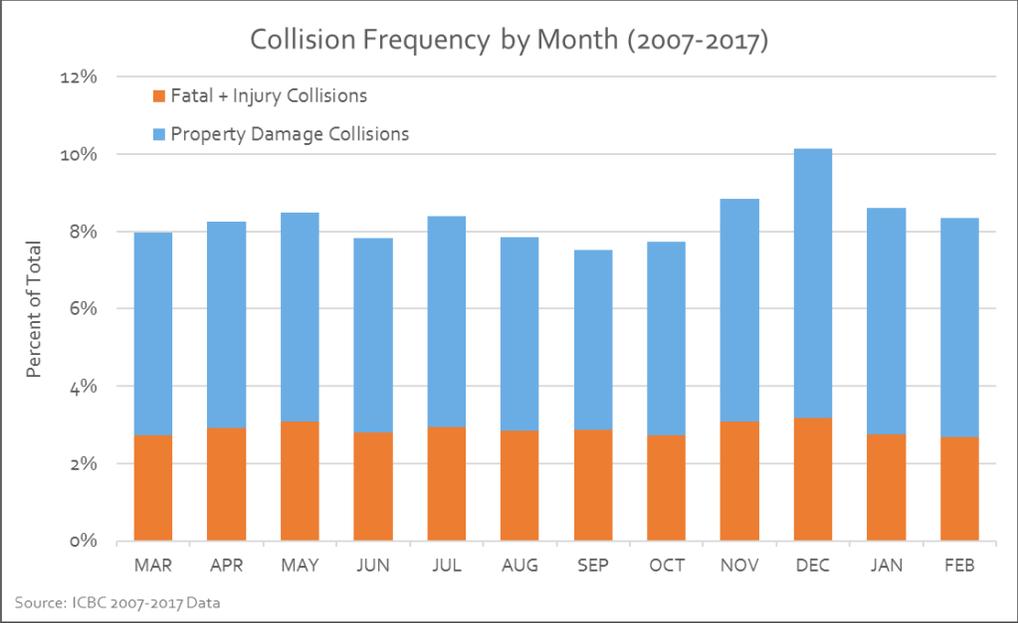
Figure 4d.13: Collision Frequency in Kelowna by Month 2007-2017

Collision frequency also varies by time of day. As shown in Figure 4d.14, collisions generally match the rise and fall of traffic volumes, though there is a disproportionate number of collisions during the afternoon peak.
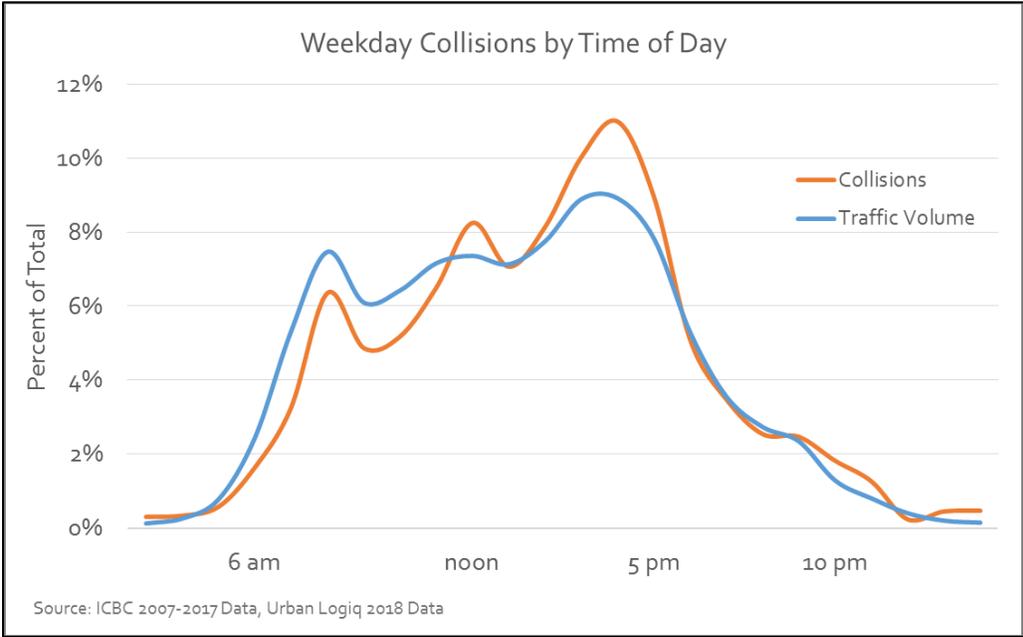
Figure 4d.14: Weekday Collisions in Kelowna by Time of Day 2007-2017.

As discussed in the Walking and Biking sections, people who walk, bike or ride motorcycles are involved in only a small proportion of collisions (less than five per cent), yet they represent a disproportionate number of injuries and fatalities (as shown in Figure 4d.15). While these groups combined are involved in only 4.4 per cent of collisions, they make up 10 per cent of injuries and more than half of fatalities.
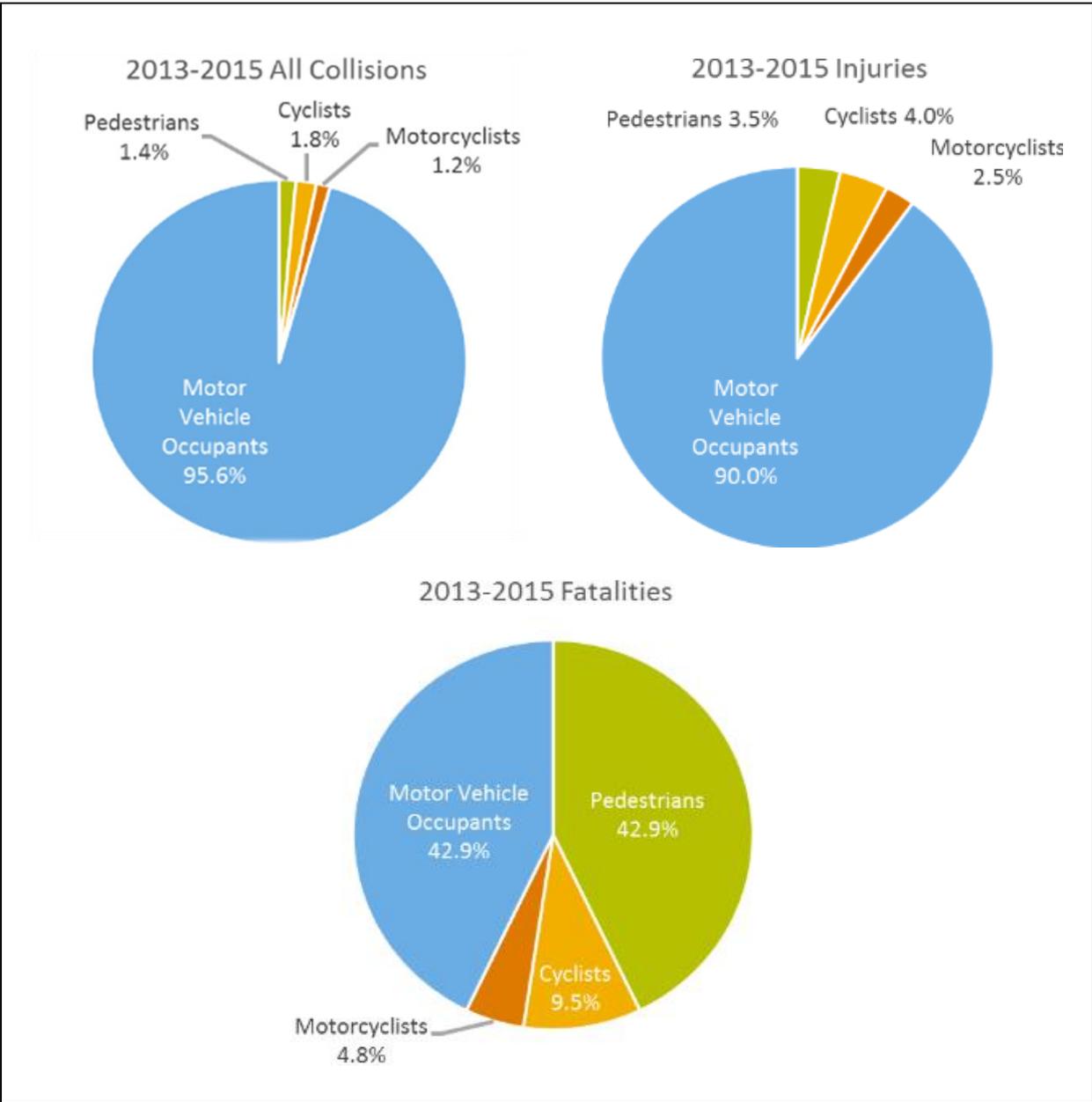
Figure 4d.15: Traffic Collisions, Injuries and Fatalities in Kelowna by Mode 2013-2015. Source: ICBC

As shown in Figure 14d.16, two-thirds of collisions occur at intersections due to the increased potential for conflicts between roadway users at these locations. Collisions at intersections tend to be more severe, representing 84 per cent of injuries and fatalities.
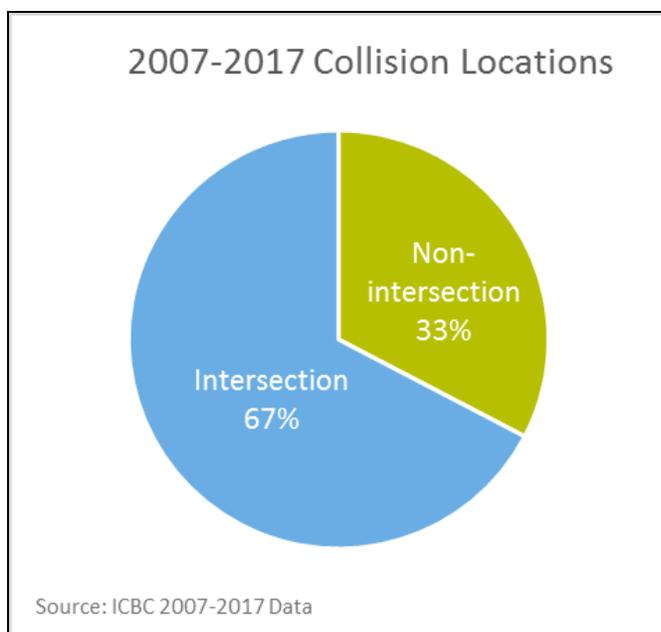
Figure 4d.16: Collision Locations in Kelowna 2007-2017. Source: ICBC

Existing Roadway Network

Roads in the city are classified according to their expected function (see Figures 14d.17 and 14d.18). For example, the primary function of a laneway is to provide access to adjacent properties, while the primary function of a highway is to allow vehicles to move quickly over long distances. This organizational system has six categories: Provincial highways, arterials, major collectors, minor collectors, local roads, and laneways. The primary function of major roads, including highways, arterials, and major collectors, is the movement of vehicles. Major roads make up approximately one-third of Kelowna's road network but carry 90 per cent of vehicle traffic. The primary function of neighbourhood streets including minor collectors, local roads and laneways, is access to adjacent properties.

Provincial Highways

Highways 33 and 97 are under the jurisdiction of the BC Ministry of Transportation and Infrastructure. Highway 97 connects communities within the Central Okanagan, including Lake Country, Kelowna, Westbank First Nation (WFN), and Peachland. Highway 33 connects the Central Okanagan to destinations east of Kelowna such as the Big White Ski Resort.

Arterials and Major Collectors

Arterials and major collectors carry large traffic volumes and typically prioritize mobility for through traffic over access to adjacent destinations. These are also the main corridors for transit and the movement of goods. Examples of arterials include Springfield Road, Clement Avenue, Gordon Drive, and Glenmore Road. Examples of major collectors include Barnaby Road, Lanfranco Road, Gerstmar Road and Valley Road.

Minor Collectors and Local Streets

Minor collectors and local streets typically prioritize access to adjacent destinations over mobility for through traffic. Because properties along these streets often have driveways, the streets generally have lower speed limits than on major roads.

Laneways

Laneways provide access from the street network to adjacent properties. In older parts of the city laneways provide access for vehicles to the back of properties and buildings, including commercial loading in some areas, while pedestrian access is from the street. Laneways are shared spaces for people walking, cycling and driving and as a result operate at lower speeds.
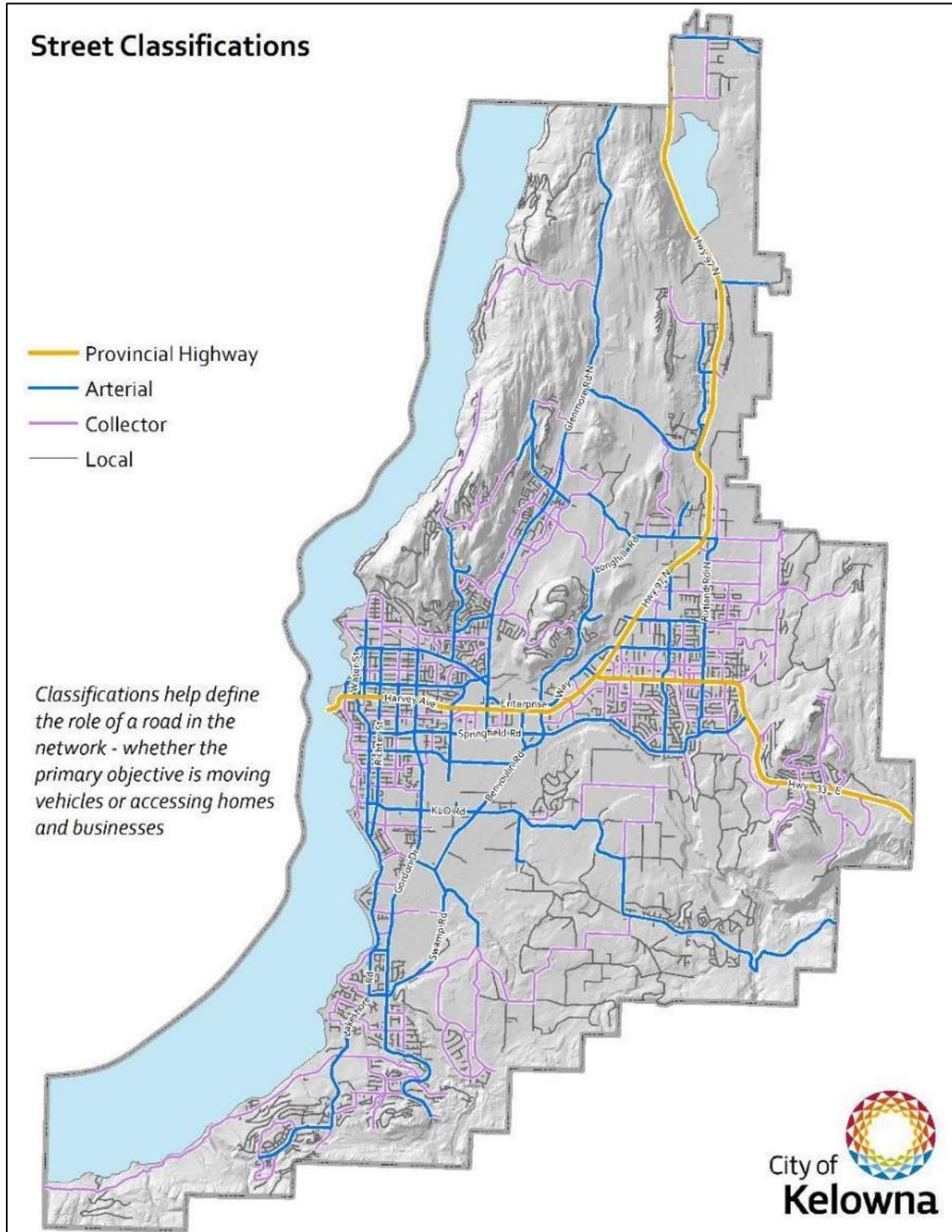
Figure 4d.17: Functional Classification of Kelowna's existing road network.
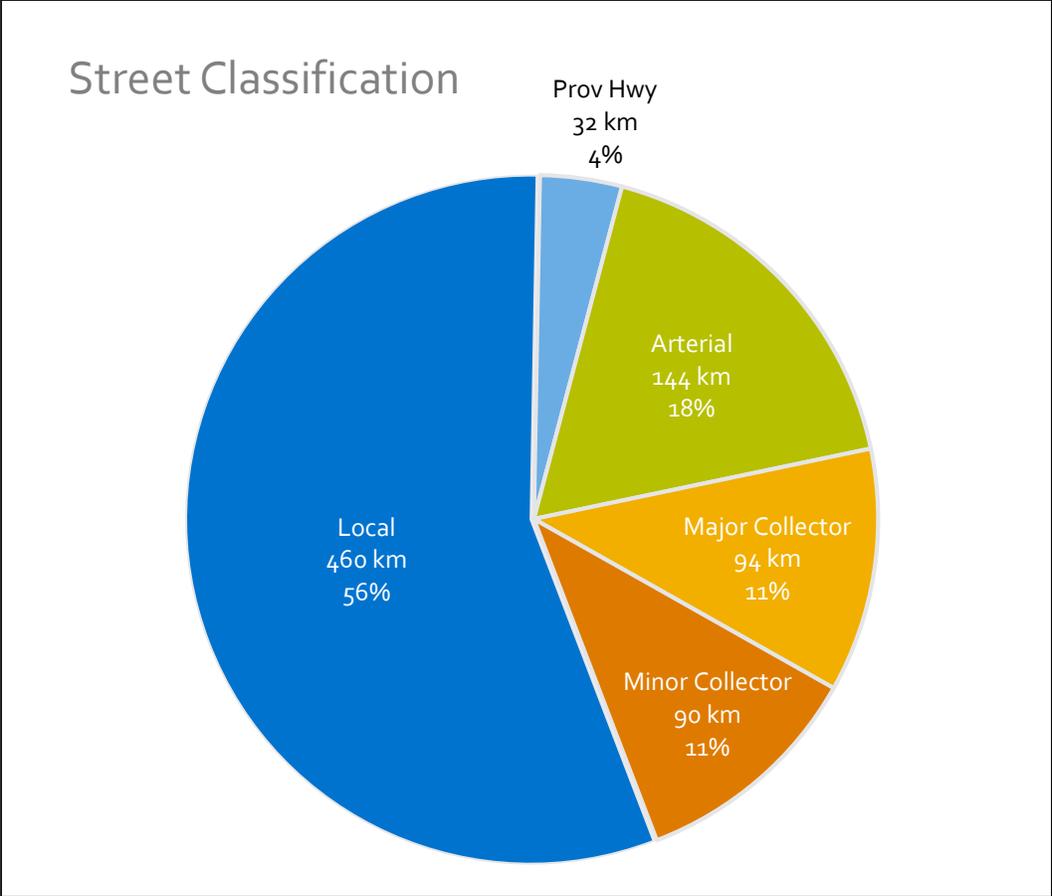
Figure 4d.18: Breakdown of Kelowna's Roadways by Street Classification.

Truck Routes

Truck routes have been established to facilitate the movement of goods to commercial and industrial areas. Trucks travelling within the city use trucks routes for most of their trip, leaving the truck route network to directly access their final destinations.

All highways and most arterials and major collectors are designated truck routes and are designed for use by heavier vehicles. Some truck routes are restricted by time of day, particularly where they pass through residential areas. Figure 14d.19 shows the 121 kilometres of existing truck routes within the City of Kelowna.
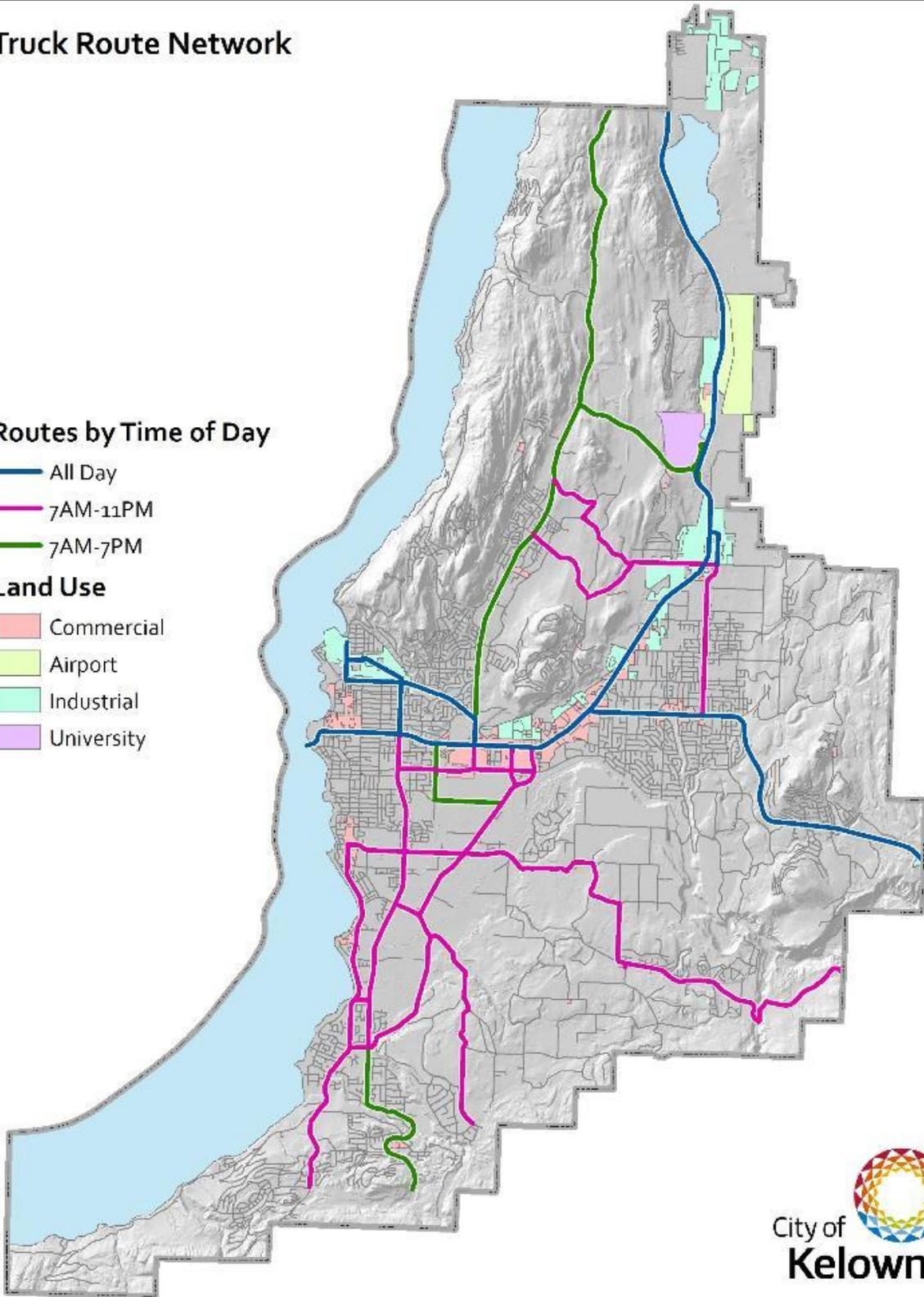
Figure 4d.19: Truck Routes in Kelowna.

Asset Management

The City's transportation assets include sidewalks, bus stops, roads, pathways, bridges, trails, traffic signals, and signage. For example, the City has 35 vehicle bridges and 56 bridges for walking and biking. Once constructed, each transportation asset requires regular maintenance and renewal. The City's transportation system renewal budget is comparable to the budget for new infrastructure.

Arterial and major collector roads, which make up 29 per cent of all roads within Kelowna, require more maintenance due to higher traffic volumes and typically last 20 to 25 years. Many local streets are nearing the end of their service life and will need resurfacing in the next 20 years. Managing the need to maintain Kelowna's current transportation assets will have to be carefully balanced with options for developing new and enhanced infrastructure.

Intersection Traffic Control

Traffic controls, such as traffic signals, stop signs and roundabouts help organize traffic at intersections by assigning right-of-way to road users travelling in different directions. Along urban street networks, road capacity and safety are largely determined by traffic controls at intersections.

There are 119 signalized intersections and 12 roundabouts in Kelowna. The Ministry of Transportation and Infrastructure (MoTI) has over 33 signalized intersections along highways within the city. Figure 14d.20 shows existing traffic controls, including roundabouts and signalized intersections.
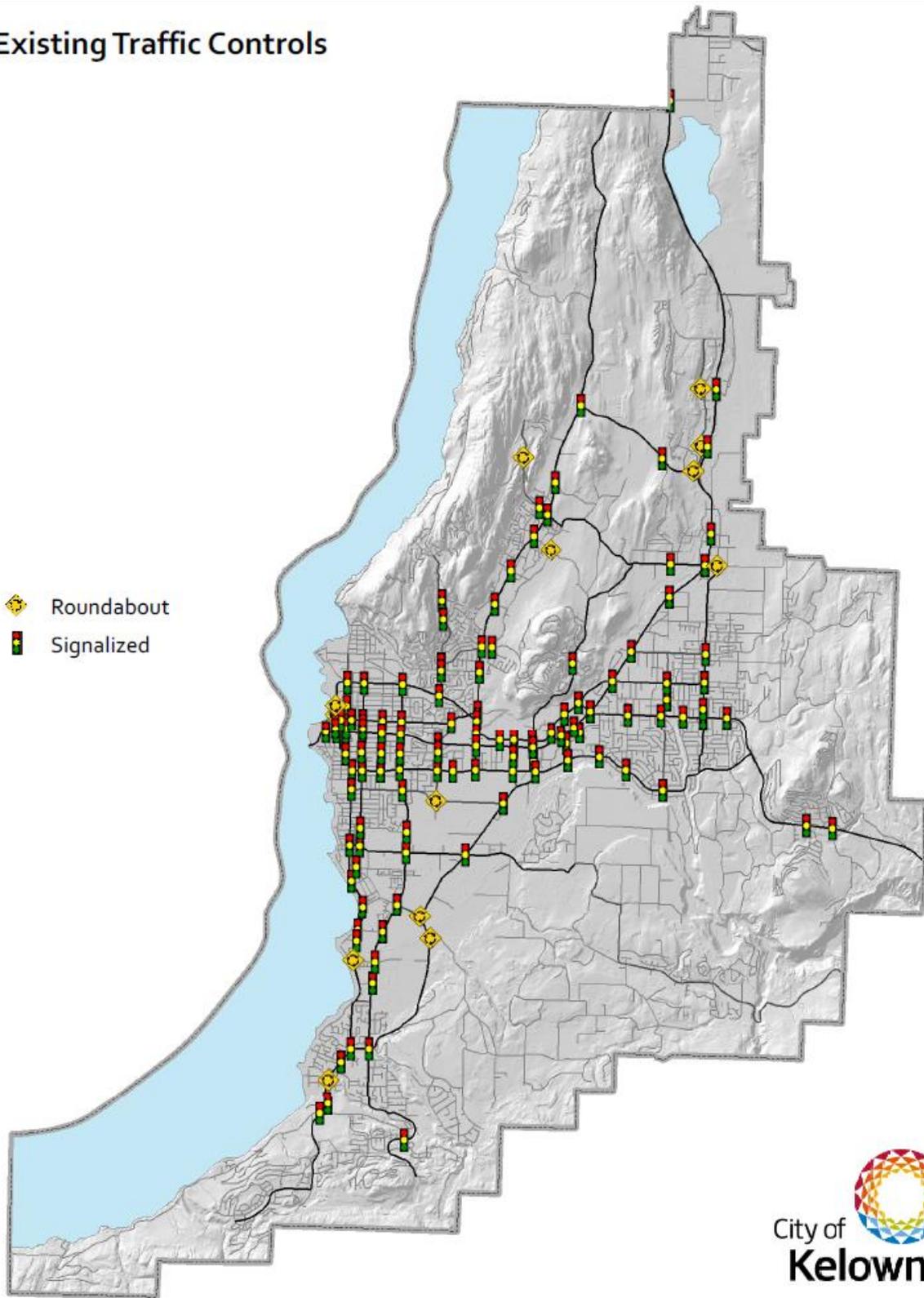
Figure 4d.20: Existing Traffic Controls in Kelowna.

Recent Plans and Projects

As directed by the Official Community Plan, the City is investing in a balanced transportation network, improving all modes of transportation and increasing the transportation choices available to our residents. The construction of transit exchanges and active transportation corridors are part of a strategy to increase travel options. At the same time, the City has invested in street infrastructure to improve the movement of vehicles, including the construction of John Hindle Drive, Shepherd Road and key streets in new subdivisions. John Hindle Drive provides a new route to UBC Okanagan and the Kelowna International Airport, and included a multi-use overpass to give people walking and biking a direct connection to campus.

Table 4d.4: Completed Transportation Projects

Year	Project
2014	Clifton 4-laning
	Roundabout at Queensway & Water
	Royal & Pandosy intersection improvements (half signal)
	Baron & Leckie intersection safety improvements
2015	Ethel ATC (Phase 1) street reconstruction and active transportation corridor (ATC)
	Lakeshore 1 (DeHart to McClure) Road improvements and ATC
	Realignment and traffic signal at Rose & Richter
	Pedestrian flashers installed at RSS & Rutland, Sumac & Rutland, Groves & Pandosy, McCurdy & Hollywood, Sutherland & Capri, and Sutherland & Lindahl.
2016	Ethel ATC (Phase 2) street reconstruction and ATC
	Valley/Longhill/Cross Roundabout
	Bernard Avenue traffic safety improvements at Burtch and Spall intersections
	Clement Avenue widening from St. Paul to Richter
	Pedestrian flashers installed at Robson & Rutland and at Enterprise & Hunter
2017	Ethel ATC (Phase 3) street reconstruction and active transportation corridor
	Roundabout at Lakeshore & Collett
	New signal at Summit and Valley
	Roundabout at Doyle & Water
	Pedestrian flashers installed at the Library & Ellis and at McClure & Gordon
2018	Shepherd Rd extension
	John Hindle Drive completion
	Highway 97 improvements (MoTI/Provincial project)
	Roundabout at Old Vernon & Rutland
	Pedestrian flashers installed at the Rail with Trail & Ellis and at the Rail with Trail & Richter
	Doyle & Richter intersection improvements

The City is continuing to invest in transportation infrastructure with funding outlined in the 10-Year Capital Plan through 2028. Transportation system renewal (maintenance and rehabilitation of road infrastructure) has a comparable annual budget to the construction of new transportation infrastructure. Moving forward, renewal will necessarily become a bigger proportion of our infrastructure budget, which will make it more challenging to fund new roadways.

Programs

In addition to the roadway network and infrastructure improvements, various programs can help to manage travel demand and improve the transportation network. Examples include the City's traffic calming program which helps to manage traffic speeds on neighborhood roadways as well as the City's various parking policies and programs. These programs are described further in the Programs and Incentives section of this chapter.

2040 TMP Baseline Scenario

Central Okanagan Regional Travel Model

To prepare a Transportation Master Plan it is necessary to develop a baseline scenario for the future against which potential investments can be evaluated. To prepare this baseline, staff used the Central Okanagan Regional Travel Model, which is a traditional transportation planning tool that uses assumptions about population growth, land use and the transportation network to estimate future vehicle traffic volumes. In addition, the transportation model also considers human factors, including resident travel behaviors and travel mode choices when generating projections, making it more complex and less flexible than other infrastructure/utility forecasting tools. In regions where most trips are made by cars, travel models are less accurate at projecting future pedestrian, biking and transit trips and impacts. This is because traditional travel models do not account well for potential changes in traffic flow or travel behavior that may result from significant improvements in transportation technology or improvements to the bicycle, pedestrian, transit or shared mobility options available. For emerging transportation technologies, projections are even more limited. Travel model results should be interpreted keeping these limitations in mind.

To create the 2040 TMP Baseline Scenario, the 2040 OCP endorsed Growth Scenario was used in combination with the existing transportation network. A limited number of road improvement projects currently within the 10-Year Capital Plan were also included. These have an approximate value of $43 million and include projects that are currently underway and/or are very likely to be constructed by 2040, such as South Perimeter Road. This approach of including some, but not all, of the improvements in the 10-Year Capital Plan represents a balance between a no future improvement scenario (which would have resulted in an overly pessimistic projection of the future), and a scenario that included all currently planned projects (which would have left the TMP without much flexibility to address emerging issues). Projects not included in the 2040 TMP Baseline Scenario will be considered as part of the TMP evaluation process.

Overall, the 2040 TMP Baseline Scenario reflects a future in which Kelowna grows in accordance with the 2040 OCP Growth Scenario but does so in the absence of a Transportation Master Plan to guide future investment in infrastructure, policies and programs. Travel behaviors are assumed to remain the same as today and are estimated primarily as a function of travel time and cost. Traffic volume estimates are for the weekday afternoon peak, which typically represents the most congested period on Kelowna's transportation network. The purpose of creating this scenario is not to predict the future, but rather to create a baseline for the identification and evaluation of potential investments during Phase 3 of the Transportation Master Plan.

Citywide Results

Under the Baseline Scenario it is projected that the total amount of vehicle kilometres travelled (VKT) in the City would grow by approximately 40 per cent, total vehicle hours (time spent driving) would

grow by approximately 70 per cent, and average travel speeds would fall by approximately 15 per cent. The greater increase in vehicle hours travelled compared to vehicle kilometres travelled, as well as the reduction in average travel speeds, indicates greater levels of traffic congestion under this future scenario.

To put this in context, Kelowna's population is projected to grow by 39 per cent over the same period. While total VKT is projected to increase in pace with population growth, VKT per capita is projected to fall by 5 per cent. This decrease reflects the endorsed Growth Scenario's focus on targeting future growth in Kelowna's Cora Area and Urban Centres. As travel distances shorten, people living and/or working in the Core Area and Urban Centres will be able to walk, bike or take transit more easily, and when they do drive, they will not have to drive as far as residents living in car-dependent hillside neighbourhoods on the edge of town. While the total amount of VKT and congestion levels are still projected to increase citywide, the increase will be much less than it would have been under a more dispersed growth scenario.

Table 4d.5: Transportation Network Metrics

Metric	Existing PM Peak (2018)	Future PM Peak (2040)	Percent Change
Total Vehicle Kilometres Travelled (VKT)	244,000	343,000	+ 40 %
Total Vehicle Hours	5,600	9,500	+ 70 %
Average Travel Speed (km/h)	43	36	- 15 %
Population Growth			+ 39 %
VKT per capita			- 5 %

Intersection Operations

The increases in travel demand described above means that Kelowna's streets would be busier in 2040 under the 2040 TMP Baseline Scenario. The estimated congestion levels and delays would largely by determined by the capacity of the city's intersections.

To forecast future intersection performance under the 2040 TMP Baseline Scenario, Intersection Capacity Utilization (ICU) values were developed. In general, higher ICU values mean that the road's capacity is being used more efficiently (i.e. the intersection is not overbuilt), but queues and delays increase as ICU values approach and exceed 1.0, which represents utilization of 100 per cent of the intersections available capacity (see Table 4d.6).

Table 4d.6: Association Between Intersection Capacity Utilization Values and Congestion

ICU	Congestion description
< 0.5	Typically little to no congestion during peak hour.
0.5-0.7	Higher traffic volumes but delays are minimal during peak hour.
0.7-0.85	Congestion beginning with some delay during portions of the peak hour. Individual turning movements may wait more than one cycle.
0.85-1.0	Congestion during most of the peak hour, with queues forming. Multiple turning movements may wait more than one cycle.
1.0-1.2	Intersection experiences significant congestion and queueing throughout the peak hour. Motorists may shift travel routes and time to avoid congestion.
1.2-1.4	Heavy Congestion with long queues that may extend beyond the peak hour; most turning movements take multiple cycles to get through. Motorists may shift travel routes and times to avoid congestion.
> 1.4	Very Heavy Congestion with long queues that may extend over multiple hours. Motorists will likely shift travel routes and times to avoid congestion where possible.

Current and projected ICU values for major intersections in Kelowna during the most congested hour of the afternoon peak are shown in Figures 4d.21 and 4d.22.The values are averages and individual drivers will experience a range of delays depending on what they need to do (e.g. go straight through an intersection, turn right, or turn left across lanes of opposing traffic).

The figures show that under the 2040 TMP Baseline Scenario, 58 per cent of study intersections would be at or over capacity, compared to 10 per cent today. While this forecasts a very congested future, it is important to remember that the 2040 TMP Baseline Scenario reflects a very unlikely future in which no additional investments are made in the transportation network between now and 2040, other than a limited set of projects which are already underway. The forecast is also somewhat limited in that it is based on the travel model results, which cannot account for future changes in traffic flow due to emerging transportation technologies and assumes no change in how people make travel decisions. Moving forward, staff will use the results of the 2040 TMP Baseline Scenario to help identify the potential transportation investments that will be needed to achieve Kelowna's vision and goals for transportation.

One key takeaway from the ICU analysis is the need to consider the road network as a system, rather than only looking at the performance of individual intersections. For example, along Glenmore Road, increasing delays are primarily projected at the north and south ends of the corridor. This is because traffic is being filtered at the intersection with John Hindle Drive (where southbound traffic from Lake Country first encounters a signal) and the intersection at High Road (where High Road, Glenmore Road and Summit Drive converge). Another example is the intersection of Spall Road and Clement Avenue, which remains below capacity during the afternoon peak because traffic is constrained on the three approaches.

Intersection Performance
2018 PM Peak Hour

Intersection Capacity Utilization (ICU)

- ● < 0.5
- ● 0.5 - 0.7
- ● 0.7 - 0.85
- ● 0.85 - 1.0
- ● 1.0 - 1.2
- ● 1.2 - 1.4
- ● > 1.4

Street Class

── Provincial Highway
── Arterial
── Collector & Local

City of
Kelowna
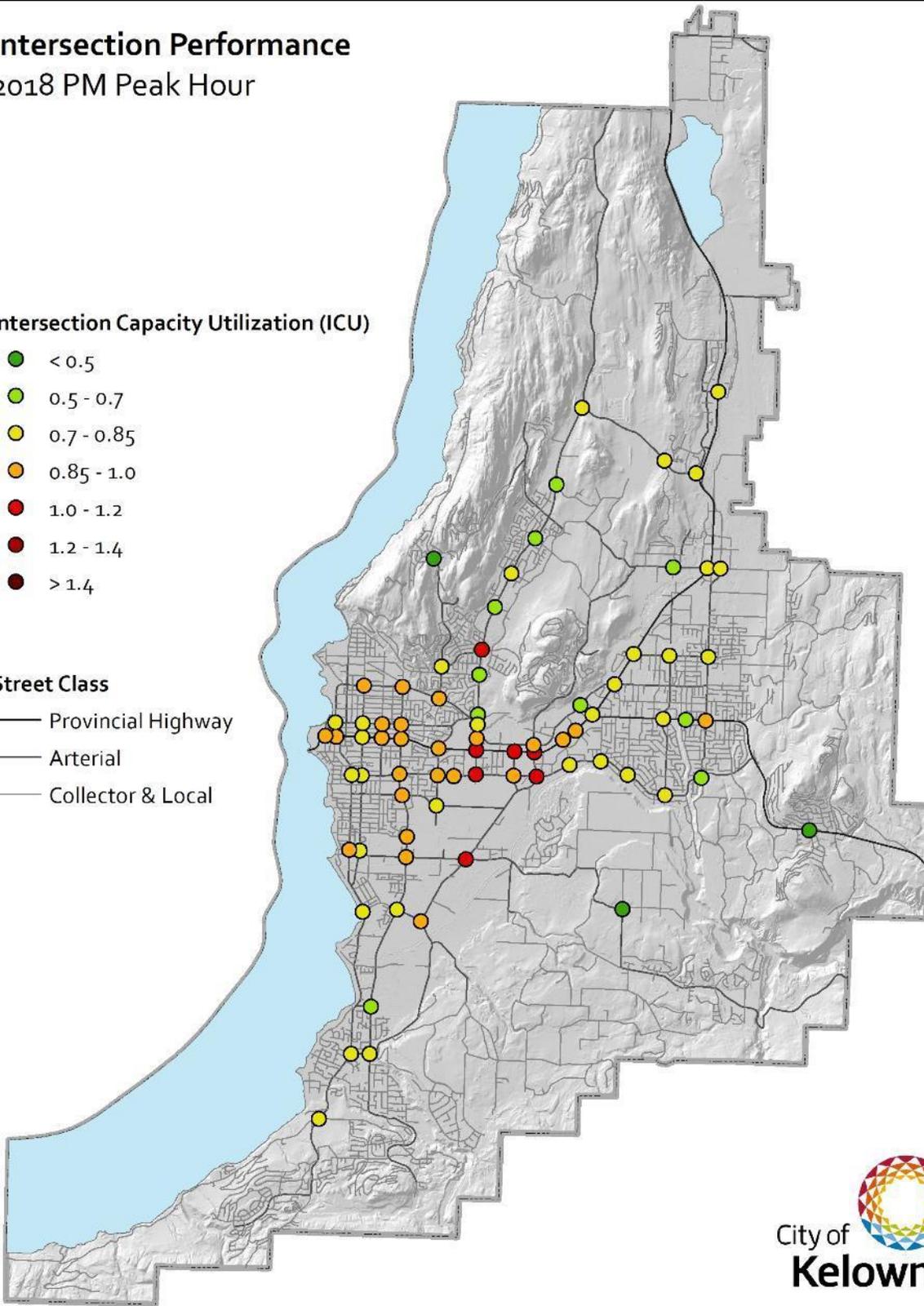
Figure 4d.21: Average Intersection Capacity Utilization Values for major intersections in Kelowna.

Intersection Performance
2040 TMP Baseline Scenario*
PM Peak Hour

Intersection Capacity Utilization (ICU)

- < 0.5
- 0.5 - 0.7
- 0.7 - 0.85
- 0.85 - 1.0
- 1.0 - 1.2
- 1.2 - 1.4
- > 1.4

Street Class

- —— Provincial Highway
- —— Arterial
- —— Collector & Local
- ----- Committed Projects

*Scenario includes a limited number of roadway projects currently in the 10-Year Capital Plan. Travel model predictions are not able to capture the implications of shared mobility and emerging technologies.

City of **Kelowna**
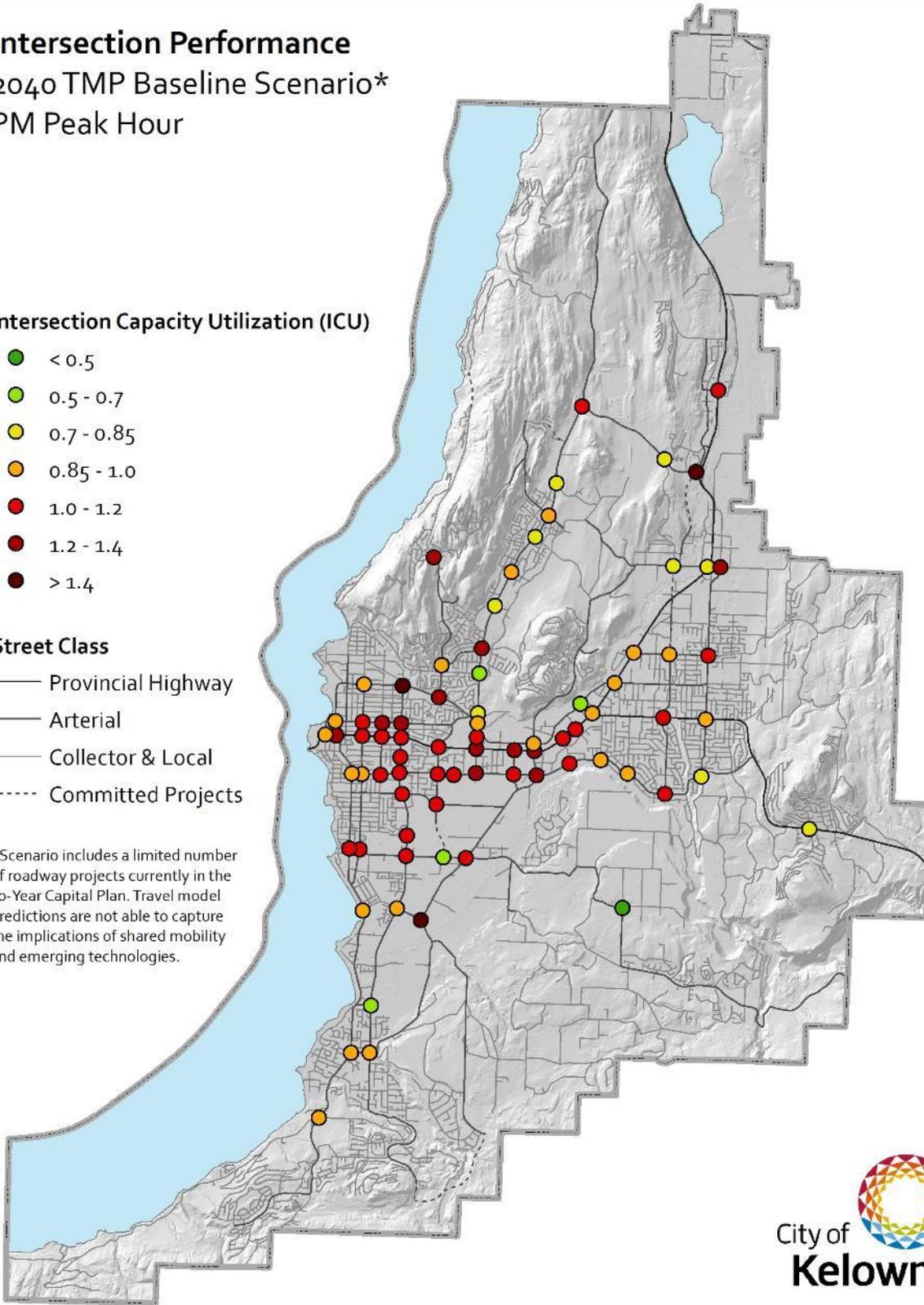
*Figure 4b.22: Projected 2040 average Intersection Capacity Utilization Values for major intersections in Kelowna.*

The 2040 TMP Baseline Scenario shows that future travel demand and traffic patterns will vary in different parts of the City. Some future trips will be inherently car-dependent, while others will be easier to accommodate using more space-efficient and sustainable travel modes. Overall, traffic is projected to become busier and more complex within the Core Area, where residents commuting in and out of car-dependent hillside neighbourhoods will compete for limited roadway space with Core Area residents who will have options to get around using a variety of travel modes. More focused projections of future travel patterns in different subareas of the City are provided in Chapter 4d – Driving.

- **Northern Kelowna and Beyond**

  By 2040, the amount of travel in and out of Kelowna over the city's northern border is projected to increase by 60 per cent, or roughly 1,300 trips during the afternoon peak. This increase is primarily due to projected residential growth in Lake Country, which will likely result in more people commuting into Kelowna for work.

  Currently, about five per cent of people working in Kelowna commute from Lake Country, and one per cent come from the North Okanagan. Vehicle traffic on Highway 97 is projected to grow more slowly than on Glenmore Road, which has more remaining capacity and is located closer to future Lake Country development areas such as Lakestone and McCoubrey.

  At present, most Lake Country residents live in neighbourhoods with few alternatives to driving and it is likely that driving will continue to be the dominant travel mode. Once the Rail Trail is completed, some residents may find it appealing to use a bike for making trips which start and end close to the trail. However, the distance between Lake Country and destinations in northern Kelowna (approximately eight kilometres) is longer than typical biking range. Transit has the potential to be an option for some future trips, especially to UBC Okanagan, depending on how much of the growth in Lake Country happens in areas that can be competitively serviced by transit.

- **Okanagan Gateway**

  By 2040, the amount of travel to and from the Okanagan Gateway area is projected to increase by 65 per cent, or roughly 3,400 trips during the afternoon peak. About two-thirds of those trips will be headed south. This increase is primarily due to significant employment growth. It is expected that one in five new jobs created in Kelowna over the next 20 years will be located in the northern part of Kelowna. Enrolment at UBC Okanagan is also expected to grow by nearly 50 per cent.

  Given the large number of jobs in northern Kelowna relative to the area's residential population, the area is expected to be a net importer of trips in the morning and experience a strong outward flow of trips in the afternoon. As a result, traffic volumes on Highway 97 at Sexsmith Road are projected to increase by 20 per cent.

  There is the potential for some of those future trips to be made by bicycle. Many destinations in northern Kelowna are within 800 metres of the Okanagan Rail Trail, although the connections to and from the trail are poor in some places. Electric bikes may help facilitate longer trips to the area.

  As for transit, it is difficult to provide northern Kelowna's low-density industrial areas with frequent enough service to make transit competitive with driving. However, UBC Okanagan is an exception to the generally low-density nature of the area and has some of the best transit access in the

region. Employment lands close to campus can leverage off frequent transit service and shift some commuting trips away from driving.

- Glenmore

  By 2040, the amount of travel to and from Glenmore, including the nearby hillside neighbourhoods of Wilden and McKinley, is projected to increase by 40 per cent, or roughly 2,300 trips during the afternoon peak. The area is expected to remain primarily residential and will continue to show a strong outbound travel pattern towards employment and services in the morning, followed by a return in the evening.

  As employment in northern Kelowna grows, the number of Glenmore residents returning from the north and south is expected to become more balanced.

  The Glenmore area is also a connection between Lake Country, North Kelowna, and the southern part of the city. Traffic volumes on Glenmore Drive are expected to grow by roughly 25 per cent, which will lead to capacity issues at intersections at the southern part of the corridor like those at High Road or Clement Avenue.

  Shifting trips within the Glenmore area to transit and active transportation could slow down the growth of vehicle traffic on Glenmore Drive, and make room for longer distance trips coming from more car-dependent areas. It is anticipated that residents in McKinley and Wilden will continue to drive for most of their trips and use Clifton Road more often than Glenmore Drive when heading south.

  Because of its central location, Glenmore residents make a large number of medium-length trips (approximately five kilometres) that would typically be thought of as within convenient biking range. However, the gradual slope of Glenmore can make biking in the area less attractive than in other parts of the city. Meanwhile, the steep terrain in hillside neighbourhoods such as Wilden and Magic Estates is a barrier to both walking and biking for almost everyone unless they own an electric bike.

  There is a high potential for increased transit use in the Glenmore area due to its linear nature and location "on the way" between two major destinations (UBC Okanagan and Downtown Kelowna).

- Rutland/Black Mountain

  By 2040, the amount of travel to and from Rutland, including the hillside neighbourhoods of Black Mountain, Kirschner Mountain, and Tower Ranch, is projected to grow by 35 per cent, or roughly 2,600 trips during the afternoon peak hour. This increase is primarily due to residential growth.

  As with other areas which have more population than employment, Rutland will continue to be a net exporter of trips in the morning, with residents returning in the evening. Growth in hillside neighbourhoods will increase the number of trips going south and east through Rutland in the afternoon. For traffic travelling east and west, the limited remaining capacity on Highway 33 will lead to rerouting onto Springfield Road. For traffic travelling north and south, Rutland Road is expected to become busier and more congested, although the connection of Hollywood Road North will reduce some pressure.

It is expected that residents in hillside neighbourhoods will have to continue making nearly all their trips by vehicle. However, there is the potential to shift some trips within Rutland to biking. Trips that start and end in Rutland tend to cover moderate distances over relatively flat terrain, putting them within convenient biking range. Trips to other parts of the city tend to be longer than a typical bike trip.

The higher proportion of longer distance trips (seven to 10 kilometres) made by Rutland residents increases the importance of transit. The Highway 33 and Rutland Road corridors have strong transit ridership today. As a result, the new residents and jobs that move to these corridors will have greater transit access.

- The Mission/Southeast Kelowna
  By 2040, the amount of travel to and from the Mission and Southeast Kelowna is projected to increase by 20 per cent, or roughly 1,500 trips during the afternoon. These trip projections do not consider the impact of the proposed Thompson Flats neighbourhood.

  This area currently experiences some of the worst travel time delays in the city. For example, the route from Kettle Valley to Downtown Kelowna has the lowest performance based on the Congestion Reliability Index.[42]

  Residential growth in the Upper Mission will lead to an increase in the number trips going north in the morning towards employment and services and returning south in the evening. This will increase traffic passing through the South Pandosy Village along Lakeshore Road and Gordon Drive. Meanwhile, the new Canyon Falls middle school and commercial node in the Ponds area will also contribute to slightly more trips that start and end within the Mission.

  Making walking, biking, and transit competitive with driving in the Upper Mission will be challenging. Steep terrain means that only the shortest local trips are viable for walking and biking. Electric bikes may make topography less of barrier, however, long trip distances mean that biking will remain unviable for most people living in the Upper Mission. In the Lower Mission, flatter terrain and somewhat shorter trip lengths make biking more viable.

  As for transit, low population densities and circuitous streets make it uneconomical to provide frequent transit service to the Mission and Southeast Kelowna areas.

- Downtown/South Pandosy/Capri-Landmark
  By 2040, the amount of travel to and from the western half of the Core Area (a roughly triangular area including the Downtown, South Pandosy, and Capri-Landmark Urban Centres) is projected to grow by 40 per cent, or roughly 7,500 trips during the afternoon peak. In addition, the number of trips starting and ending entirely within this area will nearly double.

  This triangle is the hub of activity for the Central Okanagan, with about 40 per cent of regional employment. This is also where approximately half of Kelowna's future growth is expected to occur, bringing 27,000 new residents and 18,000 new jobs to these areas over the next 20 years.

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[42]Acuere Consulting. (2019). Congestion in the City of Kelowna Report.

A large number of driving trips pass through this subarea on the way to other parts of the city and the region. The potential for shifting these pass-through trips to other modes is low. Many of these trips cover long distances, beyond the range of walking or biking, and either start or end in places where competitive transit service is difficult to provide. However, trips that start and end within these Urban Centre areas tend to be short. Approximately three quarters of these trips are less than five kilometres in length, which is about a 20-minute bike ride.

Because the opportunities for expanding road capacity are limited, preventing traffic congestion from worsening will require shifting as many of these shorter trips to other modes as possible. This will make room on the roads for people who must drive. Investments to make biking safe and comfortable for people of all ages and abilities will make it more attractive. Meanwhile, new technologies such as electric bikes and scooters have the potential to become very competitive with driving over short distances. Transit will also play a crucial role in providing connections between the Urban Centres.

- Midtown
  By 2040, the amount of travel to and from Midtown is projected to grow by 25 per cent, or roughly 2,500 trips during the afternoon peak. The volume of trips passing through Midtown is expected to grow at a faster rate.

  Compared to the other Urban Centres, Midtown is expected to grow more slowly, with approximately 2,000 new residents and 5,000 new jobs over the next 20 years. However, traffic congestion in Midtown will also be impacted by growth in other parts of Kelowna because of its central location. The geography of Kelowna means that many trips that start in other parts of the city have to pass through Midtown, creating a bottleneck effect.

  Midtown is Kelowna's largest retail centre and home to roughly one-fifth of the city's employment. There is an imbalance between the large number of jobs located in Midtown and the relatively fewer residents who live there. This means that most trips are either heading into or out of Midtown. Only 10 per cent of trips that originate in Midtown are to other destinations within the area. In comparison, 40 per cent of trips that start in the Downtown also end there.

  Trips to and from Midtown tend to be longer (greater than five kilometres) and outside of typical walking and biking range. Many of these trips also consist of shoppers headed to car-oriented retailers and there is limited potential to shift these trips to other modes. However, as mentioned above, Kelowna's geography means that routes from several directions converge in Midtown. As a result, there is an opportunity to improve transit service in and out of the area and to shift non-shopping trips to transit, such as those to and from work.

  Residents who live in Midtown are often close to many of their daily needs such as employment and shopping. However, the hostile street environment (e.g. large block size, sidewalk gaps that force pedestrians onto the street, lack of protected bike lanes) and difficult road crossings can make walking and biking uncomfortable. By investing in appropriate infrastructure, there is a high potential to shift vehicle trips within Midtown to other modes.

Policy Context

Kelowna 2030 Official Community Plan (2011)

The Official Community Plan (OCP) is a document that contains a municipality's goals, objectives and policies guiding growth and change. The 2030 OCP includes the following goals, objectives and policies related to streets and driving:

Goal:

- Feature a Balanced Transportation Network: Increase the attractiveness, convenience and safety of all modes of transportation by implementing "complete streets" that are designed to serve a broader range of transportation modes, focusing on pedestrians, cyclists and transit service, and function in the context of surrounding land uses.

Objectives:

- Objective 7.6: Place increased emphasis on sustainable modes of transportation (walking, cycling, transit) while maintaining automobile, commercial goods and emergency vehicle mobility.
- Objective 7.7: Reduce peak hour trips and the percentage of trips undertaken by single occupant vehicles, particularly in Urban Centres, in order to reduce or eliminate the expansion of transportation network and capacity.
- Objective 7.10: Ensure roadway planning supports sustainability goals.
- Objective 7.11 Implement parking management programs that promote reduced car ownership, reduced car trips and increased use of active modes of transportation.
- Objective 8.7: Provide a physical infrastructure that connects businesses to their markets.

Policies:

- Policy.7.6.2 Complete Streets. Ensure new roads are built as complete streets that incorporate sidewalks and on street bike lanes on arterial and major collector roads and off-road bike paths as per the Active Transportation Plan and provides for efficient transit service, as well as sufficient space to include landscaping.
- Policy 7.6.3 Road Safety: Ensure that safety audits are conducted as part of major road design processes.
- Policy 7.6.5 Capacity Increases: Where growth creates the need for additional capacity (driving lanes for transit / emergency vehicles / trucks / cars, sidewalks, bike lanes, multi-use paths, intersection improvements, etc.) on any transportation corridor, the City will remove on street parking as a first priority in order to maximize the use of the existing public right-of-way and to reduce the cost to the public. Only where there are no other options will the City acquire additional land.
- Policy 7.7.1 Motorized Trips: Provide infrastructure to the Urban Centres based on the expectation that not more than 45 per cent of total trips in the Downtown and other Town Centres will be by motor vehicle.
- Policy 7.7.3 Congestion: Recognize and accept that a greater level of congestion will result from an increase in suburban growth and a reduced road construction program. The construction of active transportation corridors will be one of the methods of providing alternatives to relieve this congestion.

- Policy 7.10.1 Roadway Modifications: Implement roadway modifications based on Map 7.3 – 20 Year Major Road Network Plan and a process, which primarily considers Transportation Demand Management (TDM) objectives, but also addresses factors such as collision reduction, travel time savings, pavement quality, cost/benefits, minimum level-of-service policy criteria, movement of goods and services on designated truck routes, and environment, land use and development objectives. Except where there are safety issues, refrain from implementing major roadway modifications intended to increase capacity and/or efficiency for automobiles on non-commercial routes (truck routes are considered commercial routes) until the peak hour level-of-service (LOS) is at the threshold of failure, measured at non-tourist season peaks.
- Policy 7.10.2 Traffic Calming: At rezoning, require that all local and minor collector roads be traffic calmed at developer's cost if they are connected to a new development generating more than 10 trips during the peak hour. Priority should be given to traffic calming measures on roads near elderly and child-oriented spaces and facilities.
- Policy 7.11.1 Parking Cost. Work towards a pricing structure where the cost of parking for an hour at a municipal facility (city owned parkade, off street surface lots and on-street parking) exceeds the price of a single transit trip.
- Policy 7.11.2 Cash-in-Lieu Pricing. Work towards cash-in-lieu parking programs that reflect the full costs of providing land/facilities for parking.
- Policy 8.7.1 Highway 97: Recognize the role that Highway 97 plays as a goods and services transportation link between Kelowna and its business markets.
- Policy 8.7.2 Transportation Networks: Ensure transportation networks support continued success and future expansion of key employment nodes (as indicated with commercial, mixed use, and institutional designations in the OCP). Provide effective and efficient levels of transit service and convenient walking and cycling connections between key employment nodes and surrounding residential areas

Future Challenges and Opportunities

When planning for the future of Kelowna's roadway network, it is important to consider the many ways that 2040 will be different than it is today. The changes in land use patterns, transportation technology and demographics summarized in Chapter 3 will all influence how people use the roadway network in Kelowna. While many of these coming changes present challenges, they often present opportunities as well. In review of the existing and future conditions for driving in Kelowna, six key Challenges and Opportunities have been identified.

Challenge and Opportunity #1: Growth in the Downtown and South Pandosy

With fifty thousand new residents expected by 2040, Kelowna's streets will be busier in the future – especially those in the Downtown and South Pandosy, where number of trips is expected to double by 2040. It will not be possible to accommodate all this new travel demand by driving, as land where new roads can be built in these areas and in the Core Area is scarce. The City will need to focus on enhancing the people-moving capacity into and through these areas. The challenge will be to shift the shorter trips in these Urban Centres to more space-efficient and sustainable travel modes (e.g. walking, biking, e-scooter, and transit) to increase the number of people the transportation network can move, while prioritizing roadway space for trips that need to be made by car (e.g. longer trips, commercial vehicles, etc). Potential strategies include:

- Shift as many trips as possible within and between these urban centers to biking, walking and transit, via investments in mass transit, transit signal priority, shared mobility, and active transportation corridors. This will require balancing the allocation of constrained roadway space for multiple modes.
- Work to optimize signal timings to increase people-moving capacity at intersections.

Challenge and Opportunity #2: Continued Growth in Suburban Hillsides

The 2040 Official Community Plan is proposing a shift away from suburban expansion. However, this expansion will not be halted altogether, and it is projected that one in three new homes will still be built in suburban neighbourhoods. Since households in outlying areas must often drive long distances to meet their daily travel needs, hillside development contributes more to traffic congestion and transportation-related greenhouse gas emissions than development in the Core Area where trips are shorter and can more easily be made by biking, walking or transit. While there might be more space to build and widen new roads in the hillside or suburban areas, the travel time benefits of new hillside roads cannot be considered in isolation, as increasing traffic flow from the hillsides will lead to longer delays downstream in the Core Area where expansion is difficult. In the future, the challenge will be to use creative approaches to shift as many peak-hour trips originating in the hillside areas as possible away from single-occupancy vehicle travel, while identifying targeted projects and programs to accommodate the demand for vehicle travel. Potential strategies include:

- Find opportunities to reduce single-occupancy vehicle trips from the hillside areas with services such as electric bikeshare, park and rides, ride-hail pooling, vanpool, telecommuting, and school busing.
- Identify key congested road segments and look for creative solutions (e.g. opportunities to reduce conflicts between commuters and school drop-offs along Lakeshore Road).
- Develop communication strategies to manage expectations of hillside area residents, so that the City is transparent and upfront about the infeasibility of reducing traffic congestion to and from these areas over the long-term.

Challenge and Opportunity #3: Increasing Travel Demand through Midtown

Midtown is located at the geographic centre of Kelowna, at the "neck of the hourglass" where the useable space on the valley bottom narrows. A lack of east-west connectivity and a lack of network redundancy make it difficult to travel through Midtown during peak periods. Large blocks funnel traffic onto just three east-west streets: Enterprise Avenue, Harvey Avenue, and Springfield Road. Midtown is also a major destination, particularly during the afternoon peak. It is home to about one third of Kelowna's retail space, the majority of which is used for large, auto-oriented retailers.[43] The challenge is that due to long block lengths, a hostile walking environment, difficult street crossings, and car-oriented land uses, most travel in Midtown happens by driving, even for short distances. Eighty-five per cent of trips within Midtown occur by driving, compared to 32 per cent within the Downtown. As Kelowna grows however, there is an opportunity to use a creative mix of land use and transportation strategies, to maximize the movement of people and goods through the area. For example, the upcoming Sutherland Avenue multimodal extension/realignment is expected to bring some traffic relief to the area. Potential strategies include:

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[43] GPRA Commercial Demand Study p.8

- Work to develop a street network with smaller block lengths as the area redevelops, which will be necessary to accommodate more residents and jobs within this Urban Centre and take pressure off Harvey Avenue and Springfield Road.
- Evaluate the costs, benefits and trade-offs of extending Clement Avenue from Spall Road to Highway 33 to add east-west connectivity in this area. Look at multiple project design options.

Challenge and Opportunity #4: Employment Growth along Highway 97

The location of new jobs is just as important for future travel patterns as the location of new residents. Growth in Kelowna's Urban Centres will include new space for retail, offices and services in mixed use developments. However, Urban Centres are not suitable locations for every type of business or employer. Much of the remaining land suitable for industrial and large-format commercial development in Kelowna is located along the Highway 97 corridor, in the areas around Sexsmith Road, Airport Way, and Jim Bailey Road. The challenge is that these places are difficult to reach without a vehicle and will likely remain so. They are far outside walking and biking distances for most residents, and it is difficult to provide competitive transit service to low density employment areas. There is an opportunity however, to develop projects and programs to help accommodate the expected growth in travel demand and help workers get to and from their jobs as efficiently and sustainably as possible. Potential strategies include:

- Develop a supporting network of streets adjacent to Highway 97 in order to provide alternate routes for local or shorter-distance traffic.
- Finish the northern section of the Okanagan Rail Trail, which will make it easier for some employees to bike to the area.
- Explore bringing vanpool programs to the city, which would help employees who travel longer distances to save on commuting costs and help reduce congestion.

Challenge and Opportunity #5: Reduce the Frequency and Severity of Traffic Collisions

As population and travel demand increases, the City will likely face the challenge of a corresponding increase in collisions, which represent a large cost to society – estimated at $600 million annually. While coming technology changes may help to improve safety, there is an opportunity to take immediate steps to reduce the toll of property damage, injuries and fatalities on our streets. Reducing the frequency and severity of collisions on a citywide basis will benefit all users of the transportation network, regardless of whether they are in a car, on a bus, riding a bike, or walking. A strategic approach to identify and address the root causes of preventable collisions in Kelowna (e.g. speed management, signage, lighting, geometric improvements, driver education, etc.) will help decrease the frequency and severity of traffic collisions in Kelowna. Potential strategies include:

- Develop a road safety management strategy to identify intersections with correctable safety issues.
- Consider converting some signalized and stop sign controlled intersections to roundabouts while improving safety at right-turn locations.
- Monitor speed limits and enforce speed-related infractions.
- Install traffic calming features, such as curb extensions, chicanes, speed bumps, raised crosswalks, and other treatments that help to slow traffic, improve pedestrian visibility, and enhance safety for all modes.

Challenge and Opportunity #6: Develop a Well-Connected, Complete Urban Street Network
Within the Core Area, where streets are the busiest, accommodating people walking, cycling and riding transit can be challenging because streets with high traffic volumes, long blocks and limited crossings make it difficult for people to walk or bike. This is also true for streets where high vehicle speeds mean greater space and separation is needed for people to walk and bike safely. To maximize people-moving capacity in the Core Area and within our Urban Centres, it will be necessary to re-think our existing streets and roadway network. Developing a well-connected grid network of streets that are designed to accommodate growing numbers of people walking, biking, and taking transit will be important. This may require some trade-offs with space for parking and vehicles when designing streets in urban areas. Potential strategies include:

- As redevelopment occurs in our Urban Centres, recognize that trade-offs will need to be made to reallocate roadway space to slow traffic down, ensure space for safe walking, biking, and transit use, and enhance the public realm.
- Grid networks with relatively short blocks and frequent intersections make it easier to bike, walk and take transit to reach destinations. As our urban centres mature, work to develop a permeable, well-connected grid network of streets that are designed to accommodate multiple travel modes.
- While it will be important to design streets to accommodate multiple modes, the reality is that not every street can be a complete street for all modes. The important factor is to ensure complete and connected multi-modal transportation networks. As the urban centres mature, work to develop complete and well-connected multi-modal transportation networks, recognizing that some corridors may be prioritized for different modes of travel.

e) Shared Mobility

Why Shared Mobility is Important

Shared mobility refers to services that allow users to access transportation options on an as-needed basis. These services are usually accessed through smartphone apps and allow people to get an on-demand ride, car, or bike for individual trips throughout the day. At this point, shared mobility is not necessarily a replacement for vehicle ownership, as most shared mobility users also own a vehicle. However, shared mobility can be an effective alternative to owning a second car. For some trips, it can also be more convenient than using one's private vehicle.

Sharing-economy services (e.g. AirBnB) can sometimes be quite disruptive and can have both positive and negative effects. So far, shared mobility services have not been as disruptive on Kelowna's transportation sector. That could soon change however, given the technological and regulatory changes that appear to be on the horizon.

Shared Mobility in Kelowna

Bikeshare

Bikeshare is a service where bicycles and other small vehicles (e.g. electric scooters) are made available to individuals for short-term use. This service allows users to pick up a bicycle in one location and return it to another location within a defined service area. This allows a bicycle to be used for a one-way trip without a user having to worry about what to do with the bicycle once they arrive at their destination.

Kelowna's bikeshare pilot ran between June and November 2018 and offered only pedal bikes. The uptake was higher than expected. Over the first three months, more 9,000 unique users made more than 33,000 rides on 331 bikes. Approximately one-third of the total trips were made by 600 frequent users, which indicates that a dedicated user-base is emerging for this service. As Figure 4e.1 shows, the uptake of bike sharing in Kelowna is on par with more established systems in North America.
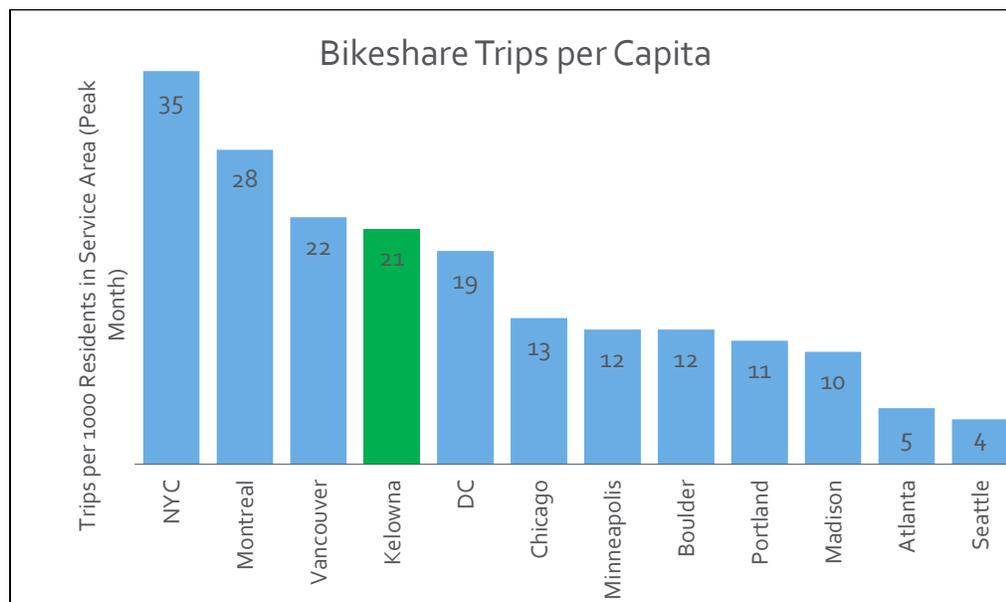

Figure 4e.1: Bikeshare Trips Per Capita for North American Cities

A survey of Kelowna bikeshare users found that they tended to be younger and wealthier than the average Kelowna resident. Interestingly, 73 per cent of Kelowna bikeshare users already had access to a bicycle, and 92 per cent had access to a car. Two conclusions can be drawn from this. The first is that bikeshare is a service that is attractive to people with a wide-variety of income levels. The second is that the City needs to investigate how accessible this kind of service is to lower-income residents.

When surveyed bikeshare users were asked how they would have travelled if bikeshare was not available, 50 per cent said they would have walked, with 28 per cent saying they would have driven. The high replacement rate of walking speaks to the benefits of bikeshare for trips that might be uncomfortably long walks, but that are still too short for public transit. The reduction in car trips is larger than observed in bigger cities. One possible explanation is that since Kelowna has fewer transportation options than many large cities, bikeshare competes more directly with car travel.

Carshare

Carshare is a service which allows people to rent a car or light truck for individual trips. Carshare services typically have multiple pick-up and drop-off stations throughout their service area. By providing a convenient option for trips which cannot be easily completed by bike or bus, carshare programs allow people to save money by owning fewer vehicles. It is estimated that one carshare vehicle results in between nine and 13 privately-owned vehicles being taken off the road.[44]

There are currently two carshare operators in Kelowna, Modo and Zipcar. Between them, they operate more than 20 vehicles. Some apartment and condominium buildings also provide carshare vehicles to their residents. All these services however, require vehicles to be picked-up and dropped-off in the same location, which means they cannot be used for one-way trips.

Ride-Hailing and Taxi Services

The Provincial Government has announced plans to make ride-hailing services such as Uber and Lyft available in September 2019. Multiple taxi companies serve the Central Okanagan with a focus on Kelowna, providing rides on-demand using both phone dispatchers and app-based bookings.

Land Use and Shared Mobility in Kelowna

The kinds of land use that are conducive to bikeshare are the same as those that are conducive to biking in general: areas with a mix of land uses within a comfortable biking distance, such as in Kelowna's Urban Centres (for more, see Chapter 4b.

Generally, carshare, ride-hailing and taxi services are more viable in areas with greater jobs and population densities. They do not need the same density levels as transit however, and therefore can thrive in areas that cannot support mass transit. These services can also provide more convenient and efficient options for trips between Urban Centres or out of the way destinations that are not easily serviced by transit. As well, appropriately-scaled carshare placed in suburban or hillside housing developments can help residents reduce their reliance on personal vehicles.

Policy Context

Currently, the City does not have any policies specific to shared mobility and this is an area that needs attention. Ideally, shared mobility service will be implemented in ways that help achieve the visions,

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[44] Martin, E. & Shaheen, S. (2011). The Impact of Carsharing on Household Vehicle Ownership. *Transportation Research Record*, 2143, p. 150-158

principles and goals laid out in policy and planning documents such as *Imagine Kelowna: The Vision to 2040 (2018)*, *Kelowna Community Climate Action Plan (2018)*, *Kelowna on the Move: Pedestrian and Bicycle Master Plan (2016)*, *Healthy City Strategy Community for All Plan (2016)*, *Urban Centres Roadmap (2016)*, and *Kelowna 2030 Official Community Plan (2011)*.

Future Challenges and Opportunities

When planning for the future of shared mobility options in Kelowna, it is important to consider the many ways that 2040 will be different than it is today. The changes in land use patterns, transportation technology, weather patterns, and demographics summarized in Chapter 3 will all influence how people get around in the future. Changes such as this will create both challenges and opportunities for transportation in Kelowna. In review of the existing and future conditions, four key challenges and opportunities have been identified for shared mobility.

Challenge and Opportunity #1: Expand and Improve Bikeshare and Other Emerging Options

As Kelowna grows, bikeshare will become an important component of ensuring that people have access to multiple, convenient travel options. Other North American cities are also seeing an increase in bikeshare services that have electric bikes (e-bikes) and other small electric powered vehicles (such as e-scooters) in their fleets. E-bikes allow people to ride with less physical exertion, for longer distances and up steeper slopes. This helps make biking more attractive to the elderly, people carrying children or cargo, and people who live far away or on hillsides. However, local regulations severely restrict the use of small electric vehicles on Kelowna's road and pathways. Examples of potential strategies include:

- Design future bicycle infrastructure and bicycle parking with the needs of e-bikes, cargo bikes, and other potential shared and electric vehicle types in mind.
- Set the stage for a competitive marketplace of shared vehicles, using incentives and enforcement to ensure that users obey the rules of the road and operating companies respect the public right-of-way.
- Update outdated regulations that prohibit or restrict the use of electric bikes, scooters and other types of shared electric vehicles.
- Design education and awareness campaigns to be responsive to new and emerging technologies.

Challenge and Opportunity #2: Attract One-way Carshare

The carshare programs available in Kelowna operate on a round-trip basis, which means users must return the vehicle to the same spot upon completion of their trip. This makes carsharing less competitive for commuting, or other trips where people must pay for multiple hours while not actively driving the vehicle. Some carshare operators in other cities provide one-way carshare services that allow users to begin and end their trip in different locations. As Kelowna grows, attracting one-way carshare services would help to provide residents with an additional convenient mobility option that aligns with the City's goals. Examples of potential strategies include:

- Research the needs of one-way carshare companies to identify opportunities to make Kelowna a more attractive market and enable these services by building permissive regulations.
- Investigate the potential to attract vanpool companies that can operate similarly to one-way carshare for commuters that travel long distances.

Challenge and Opportunity #3: The Arrival of Ride-Hailing

As ride-hailing comes to Kelowna for the first time, the City will need to be nimble to ensure the benefits are maximized, while minimizing negative impacts.

On the positive side, ride-hailing might reduce drinking and driving,[45] and allow households to own fewer vehicles. However, there is evidence to suggest that ride-hailing may significantly increase the amount of driving overall, primarily because of the need to circulate for passengers.[46] Ride-hailing has been shown to reduce the need for parking at popular destinations but may create pressure for curbside pick-ups and drop-offs.[47] Examples of potential strategies include:

- Incentivize ride-hailing vehicles to use low-emission vehicles to offset carbon emissions from increases in the amount of driving.
- Consider designating pick-up and drop-off areas in popular locations such as Downtown.
- Research the experience of other communities to identify a set of best practices for regulating and licensing ride-hailing services.
- Change business license requirements to get data from passenger directed fleets, including both ride-hailing and taxi networks.

Challenge and Opportunity #4: The Arrival of Autonomous Vehicles

Once they arrive, autonomous vehicles have the potential to dramatically transform how people and goods move around. At a minimum, the availability of autonomous vehicles will affect people's travel choices, traffic congestion, the use of parking facilities, and the emission of greenhouse gasses and other pollutants. It is also likely that ride-hailing and carshare services will operate much differently once they can use autonomous vehicles. There is an opportunity for these services to become a viable alternative to personal vehicle ownership for many people. However, the challenge is figuring out how to manage the movement of autonomous vehicles on our streets.

For example, what will autonomous vehicles do once they drop off their passengers? Will they be required to park until they are needed again? Or, will these vehicles be permitted to cruise the streets until they are needed? Infrastructure and procedures for fueling and/or charging these vehicles will also be needed. How long until these vehicles arrive on our streets is still unclear. However, there is an opportunity to use this time to conduct research, anticipate the potential effects, and create a regulatory framework that maximizes the benefits of autonomous vehicles while minimizing the negative impacts. Work is already underway in this regard as part of the development of the City of Kelowna's Disruptive Mobility Strategy.

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[45] Penn Medicine News. (2017). Impacts of Ride-Hailing on Crashes Differ From City to City.
[46] Henao, A. & Marshall, W.E. (2018). The Impact of Ride-Hailing on Vehicle Miles Traveled. *Transportation.*
[47] Henao, A. & Marshall, W.E. (2019). The Impact of Ride Hailing on Parking (and vice versa). *The Journal of Transport and Land Use*, 12(1), p. 127-147

f) External Connections

External connections refer to the ways that Kelowna's transportation network is connected to the wider-world to enable the flow of residents and visitors in and out of our city.

External Connections in Kelowna

Provincial Highways

Provincial highways 33 and 97 pass through Kelowna and connect the city to nearby destinations and beyond. Highway 97 to the north provides a connection to the communities of Lake Country and Vernon, while to the south it connects to the Westside communities, South Okanagan, and the Lower Mainland. Highway 33 connects the city to Big White and other destinations to the southeast.

Every day regional traffic enters and exits Kelowna using the provincial highways:

- An average of approximately 68,000 vehicles per day via Highway 97 (across the Bennett Bridge) from the west
- An average of approximately 40,000 vehicles per day via Highway 97 from the north
- An average of approximately 19,000 vehicles per day via Highway 33 from the east

While these amounts of regional traffic are significant, it is Kelowna residents that make up most of the traffic on Highways 97 and 33.[48] Meanwhile, only 13 per cent of traffic on the Bennett Bridge is passing through Kelowna.

Kelowna International Airport

Kelowna International Airport (YLW) has experienced unprecedented growth in recent years, reaching two million annual passengers in 2018, making it the tenth busiest airport in Canada. Efficient transportation options connecting the airport to key destinations within Kelowna and the entire Okanagan Valley is important for the region's economy and quality of life. YLW is owned by the City of Kelowna but is independently funded.

YLW has regular connections to eight destinations year-round: Vancouver, Calgary, Toronto, Edmonton, Victoria, Cranbrook, Prince George, Whitehorse, Seattle (USA) as well as connections to six seasonal destinations: two in the USA, three in Mexico, and one in Cuba. Charter carriers also provide domestic service.[49]

Currently, YLW passengers have the following options for accessing the airport:

- The airport has short-term and long-term lots with pay parking available for motor vehicles, with a total of 2,600 parking spaces.[50] The daily rate for short-term is $21. The long-term lot weekly rate is $70. Other parking options available include accessible parking, valet service, vehicle charging stations and a cell phone waiting area.
- A multi-use path connection to the airport from downtown Kelowna via the Okanagan Rail Trail was completed in fall 2018. Bike racks for parking are available at the south end of the terminal. There are currently no bike lockers or indoor parking available.

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[48] Ministry of Transportation and Infrastructure. (2015). Central Okanagan Planning Study: Current Corridor Conditions, p.460
[49] Kelowna International Airport. (2016). Kelowna International Airport Master Plan 2045. p.32.
[50] https://ylw.kelowna.ca/passengers/parking

- Public transportation from the Core Area to the airport is currently available with a transfer at the UBCO Exchange. BC Transit routes 97 and 6 provide the connection from downtown to UBCO, while the link from UBCO to the airport is via routes 23, 13, or 90. The travel time by bus ranges from approximately 50 minutes to just over an hour.

While the Kelowna TMP will consider access to the airport, air travel is not within the scope of the TMP.

Water Transportation

Historically, ferry service operated across the Okanagan Lake. However, there is currently no public ferry service available in Kelowna and all docks and marinas along Okanagan Lake within the city are privately owned and used primarily for recreational, commercial, and tourism purposes.

If such a service were ever to be reinstituted, bike, pedestrian, and transit access to/from the ferry terminals would need to be carefully considered, along with many other implementation factors.

Policy Context

Most of the policies that govern Kelowna's external conditions are determined by senior levels of government. For example, Highways 33 and 97 are under provincial jurisdiction and any changes must be enacted by the province. Similarly, airport operations are largely governed by federal laws and regulations. This means that changes to Kelowna's external connections must be negotiated with the applicable senior levels of government.

g) Programs and Incentives

There is more to transportation than just infrastructure such as roads, sidewalks, and bike lanes. It includes programs, incentives, and policies to encourage people to make healthier and sustainable travel choices. In an increasingly digitally-connected world, these measures can be just as impactful as physical infrastructure projects.

Role of Partnerships

Some existing transportation programs and incentives are delivered directly by the City of Kelowna. However, this aspect of the transportation system is more reliant on partnerships than others. Transportation projects and incentives are often delivered regionally through the Sustainable Transportation Partnership of the Central Okanagan (STPCO) or the Regional District of Central Okanagan (RDCO).

Programs and Incentives in Kelowna

Wayfinding

Proper signage and wayfinding are important for helping people navigate the city and find comfortable routes for biking and walking. The City and the surrounding region have developed wayfinding standards to achieve regional consistency on pathways which extend beyond Kelowna, such as the Okanagan Rail Trail.

Bike to Work Week

Bike to Work Week encourages residents to create workplace teams and log their biking commutes to win prizes and compete against other local organizations. Each day there are events around the Central Okanagan providing free tune-ups, snacks and prizes to commuters travelling to and from work. Over 2,200 riders registered for Bike to Work Week in 2018.

Walk & Bike to School Week

Occurring at the same time as Bike to Work Week, Bike & Walk to School Week encourages students and their families to walk, scooter, skateboard or ride their bikes to and from school. The goal is to build a passion for active transportation at an early age by encouraging students to try it in a fun and supportive environment. Thirty-one schools participated in Walk in Bike to School Week in 2018.

Bike Rodeos

Bicycle rodeos are an integral part of the lead up to Bike and Walk to School Week. The regional smartTRIPS program teams up with School District 23 and typically hosts 12 bike rodeos at local schools per year. Rodeos are coordinated by the Regional Traffic Safety Officer with the goal of equipping youth with skills and knowledge.

Participants learn basic rules of the road, hand signals, obstacle avoidance and scanning techniques, all on a fun course. Each child is provided with an information sheet to take home to share with their families. Rodeos are intended as an introduction to the skills and knowledge needed to be a confident and safe bike rider.

Clean Air and Safe Routes to School

Clean Air and Safe Routes 4 Schools is a regional program that aims to get more students walking and biking to school, to help improve air quality and reduce traffic congestion near schools. Staff from the STPCO collaborate with multiple stakeholders, including parents, to produce a travel plan which

addresses safety concerns and recommends infrastructure improvements. The program also includes tools to identify areas of poor air quality around the school, promote student understanding of the causes and impacts of air pollution, and provides ideas for engaging staff, students and parents in improving air quality.

Public Transit Programs and Incentives for Students
- The Class Rides Free Program provides free passes to school groups and other organizations which provide out of school programs. The program helps youth get familiar with taking transit and makes better use of transit capacity during the quieter midday period.
- Discounted monthly passes and bundles of tickets are available for high school students and Okanagan College students.
- The UPass program provides UBC Okanagan students with unlimited transit passes as part of their student fees.

For Seniors or People with Disabilities
- The provincial BC Bus Pass Program provides reduced-cost bus passes to low-income seniors and other eligible residents.
- People receiving provincial disability assistance get a monthly $52 transportation supplement that can be used for an annual bus pass or for other transportation needs. Recipients have the option of applying for a BC Bus Pass instead of the supplement.
- Kelowna Regional Transit's Companion Pass program allows designated caretakers or companions of a person with disabilities to ride conventional transit free of charge.

For Employees
- ProPASS is a discounted bus pass purchased by employees through payroll deductions for use on the Kelowna Regional Transit system.

Traffic Calming
The traffic calming program works to reduce speed and short-cutting activity on residential streets. Measures include speed cushions, speed humps, curb extensions, chicanes, and signage. Each year the City receives a high number of requests for traffic calming, and prioritizes the streets based on data, Council Policy 300 and available budgets.

Parking Policies and Programs
The cost and convenience of parking is important factor in determining how people get around. Parking is readily available in most places in Kelowna and only five per cent of vehicle trips end with paying for parking. This does not mean that parking is free however – the cost to build and maintain parking is added on to property taxes, purchases at businesses, and the cost of housing.

As long as personal vehicles are the primary means of travel in Kelowna, parking will be essential for residents and businesses. At the same time, oversupplying large amounts of no-charge parking effectively subsidizes driving, while making walking and biking less safe and less attractive. It also ties up land which might have more productive uses. The amount of space dedicated to parking vehicles in Kelowna is comparable to the combined living space of all the homes in the city (estimated at 10.2 million square metres, or 110 million square feet).

The City's Parking Management Strategy, adopted in 2014, is built on the following guiding principles:

1. Improve the availability of short-term parking spaces, moving away from being the primary provider of long-term parking
2. Ensure that the parking system pays for itself
3. Make parking easier to find and pay for
4. Work with institutions, businesses and developers
5. Support a more balanced transportation system

On-Street Parking

Generally, the role of on-street parking in commercial areas is to provide short term access to businesses. The presence of on-street parking also reduces speeding and makes sidewalks more comfortable for people walking, as the parked cars provide a buffer between pedestrians and traffic. The City tries to make it easier to find convenient parking spots by encouraging parking turnover through pricing and time limits.

For neighbourhood streets, the primary role of on-street parking is longer-term stays for residents. Restrictions which limit the amount of time non-residents can park on the street (e.g. one or two-hour maximum) are in place in six residential zones in Kelowna. These are generally neighbourhood streets near major destinations, such as the Downtown or Kelowna General Hospital.

Off-Street Parking

Off-street parking is typically used for long-term parking (e.g. parking while at work or overnight parking). The City of Kelowna owns 24 off-street parking lots and three parkades. In addition, there are 27 privately-owned lots that offer public parking. These lots typically have higher rates than City-owned lots and parkades.

The City's zoning bylaw also sets the minimum number of spaces to be provided for commercial and residential buildings. In some areas, developers can contribute cash in lieu payments towards building shared parking nearby, rather than paying for it on their own property.

Bike Parking

Cars and trucks are not the only vehicles which require parking. New developments are also required to provide both short-term (Class II) and long-term (Class I) parking for bicycles. The current requirement for long-term bike parking is one space for every two dwellings in apartment buildings and one space for every 10 employees in commercial areas.

For existing commercial buildings, the City's Cost Share Bike Rack Program will pay up to 50 per cent of the cost to add publicly accessible short-term bike parking. The City has also installed secure bike lockers in the Downtown and South Pandosy which are available for monthly rentals.

Future Challenges and Opportunities

When planning for the future of transportation programs in Kelowna, it is important to consider the many ways that 2040 will be different than it is today. The changes in land use patterns, transportation technology, weather patterns, and demographics summarized in Chapter 3 will all influence how people get around in the future. These changes will create both challenges and opportunities for transportation in Kelowna. In review of the existing and future conditions, five key challenges and opportunities for programs have been identified.

Challenge and Opportunity #1: Build Community Capacity

The traditional model of program delivery, where the City develops an idea and hires staff or a contractor to implement it, may not be nimble enough to respond to a changing transportation landscape. Transportation planning and management is becoming increasingly complex and dependent on technology. Because the City is not a technology company, this requires expertise outside of the normal role of municipal government. Examples of potential strategies include:

- Pursue more partnerships with third-party operators to deliver services such as carshare, bikeshare, and carpooling.
- Support other services by providing operators with the open data they need. In this way, the City acts as a facilitator, reducing friction and helping data flow.
- Work at the grassroots level, helping foster resident-driven solutions such as the recent Okanagan Rail Trail fundraising effort.
- The Strong Neighbourhood program can be used to support community led-initiatives such as traffic calming projects. The backlog of these projects can be implemented faster if the City supports neighbourhood groups rather than working on its own.

Challenge and Opportunity #2: Enhance Safe Routes to School

Approximately half of all grade school students are driven to school each day.[51] This reduces the physical activity these children get and contributes to traffic congestion, particularly in areas where schools are located on major roads.

School District 23 typically offers school bus service to elementary school students who live further than four kilometres away from their catchment school, and to middle and secondary school students who live further than 4.8 kilometres away. While the school district provides additional bus service to some neighbourhoods where the topography makes walking infeasible, there is still a pool of students who live too far away from school to conveniently walk or bike, but who do not qualify for busing and are therefore driven to school. In addition, the school district charges an annual fee for bus service and some parents prefer to drive their children to school rather than pay the charge.

Many of the requests to extend public transit service into new neighbourhoods come from parents who would like another option for their children to get to school. However, in some cases providing more school bus service could be more cost effective and convenient than public transit. In cases where schools are located along major routes and are "on the way" between major destinations, public transit could play a bigger role.

In addition to difficulties with bus service, some areas of Kelowna lack the infrastructure necessary to allow students (e.g. sidewalks, protected bike lanes, crosswalks, etc.) to walk or bike safely to school, even when they live nearby. Examples of potential strategies to reduce the number of cars picking and dropping off students at school sites include:

- Continue to prioritize adding sidewalks, protected bike lanes, crosswalks, and traffic calming near schools.
- Expand programs that teach children to safely walk and bike to school.

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[51] 2013 Household Travel Survey

- Work with School District 23 to find ways to increase the number of students taking either school buses or public transit to school.
- Work with School District 23 and BC Transit to identify routes where it makes sense to expand public transit service to accommodate students travelling to and from school.

Challenge and Opportunity #3: Improve Transit Passes and Payment

Many elements of our transit system – from trip planning to payment, are outdated – making it less convenient for customers. For example, paying fares with cash or purchasing passes from select retailers can be a hassle. Many other transit agencies allow customers to pay fares directly with credit cards or mobile payment apps such as Google Pay or Apple Pay. Currently, this is not possible with the equipment on BC Transit's buses.

As more transportation options become available, there will be a need for trip planning apps to help people pick the best modes for their trip. As these apps are developed there is an opportunity is to integrate real-time data from Kelowna's transit system. Transit can also be made more competitive by making discounted passes available to more riders. It is feasible to provide bulk discounts through programs like UPass or ProPASS because of the guaranteed revenue they generate. Examples of potential strategies include:

- Support data sharing for multimodal trip planning and integrated payment.
- Work with Okanagan College and the Okanagan College Students' Union to expand UPass to Okanagan College students.
- Investigate ways to expand the employee ProPASS to more businesses, as well as residential buildings.
- Investigate opportunities for cross-promotion with other mobility services, such as carshare, bikeshare, or ride-hailing companies.

Challenge and Opportunity #4: Manage the Curb

Curb space is a valuable public asset. An increasingly complex transportation system will require thoughtful management of curbside space. On-street parking in Urban Centres is often full in some places and relatively empty in others. New technologies make it easier to adapt pricing to meet demand. Rather than charging a blanket rate, allowing prices to vary between locations and time of day can encourage the use of underused parking areas by making those areas cheaper.

Sometimes, the most valuable use for curb space is for something other than parking cars. As Urban Centres grow, business owners may want to convert on-street parking spaces into patios and seating areas in order to add life to the street. Or, they may want to add parking for bikes or other shared vehicles. Examples of potential strategies include:

- Consider varying parking prices by time, day, season, and location, to achieve target on-street occupancy of 85 per cent (typically one free space per block).
- Continue to expand the Sidewalk Patio Program and refine criteria for allowing the conversion of on-street vehicle parking to other uses (temporarily or permanently) as Urban Centres evolve.

Challenge and Opportunity #5: Move Toward Parking On-Demand

Traditionally, minimum parking requirements have been set on the principle that businesses and residences need to have enough parking stalls to accommodate their busiest times without spilling over

to on-street parking. This leads to an oversupply of parking. Different uses (e.g. office, retail, residential) are busiest at different times or days of the week. In most North American cities, there are three to four parking spaces for every vehicle.[52]

There is an opportunity to better manage these parking spaces. For example, residential and commercial buildings could be permitted to rent out their parking stalls during times when they would otherwise be empty. As a result, off-street parking requirements could be lowered, bringing down the cost of housing and opening more sites for redevelopment. Examples of potential strategies include:

- Consider allowing regulated rental of surplus parking from residential or commercial properties.
- Consider allowing developers to build as much or as little parking as the market demands.

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[52] Shoup, D. (2005). *The High Cost of Free Parking*. American Planning Association: Chicago.

5. Keeping Kelowna Moving

One of the most effective long-term congestion mitigation strategies is to reduce auto-dependency by providing more convenient and realistic alternatives for getting around, especially during the morning and afternoon peaks. This requires a coordinated approach to land use and transportation that shortens trip distances and creates complete, connected and safe bicycle, pedestrian and transit networks between key destinations.

a) Mode Shift

To help keep Kelowna moving, it will be necessary to shift as many future trips as possible to more sustainable transportation modes that can move more people in the same amount of space. The best opportunities for mode shift will be within the Urban Centres and the Core Area, where the terrain is relatively flat, and some supporting infrastructure for walking, biking and transit is already available. Increased densification will result in shorter trip distances, thus removing the primary barrier to walking and biking for nearby residents. If the City takes consistent and complementary action to ensure the transportation network provides safe, attractive and convenient infrastructure for walking, biking and transit in these densifying areas, the number of trips that are shifted to these modes can be maximized. This will help prioritize road space for trips that must be made by driving, while giving Kelowna residents more choices for getting around.

b) A Well-Connected, Complete Urban Street Network

Developing a permeable, well-connected, complete urban street network will also be important to keep Kelowna moving. Within the Core Area, where streets will be the busiest, streets with high traffic volumes, long blocks and limited crossings will make it challenging to accommodate growing numbers of people walking, cycling and riding transit. Additionally, streets with high vehicle speeds will require greater space and separation for people to walk and bike safely. To maximize the people-moving capacity in the Core Area and within our Urban Centres, it will be necessary to re-think our existing streets and roadway network. Developing a well-connected grid network of streets that are designed to accommodate growing numbers of people walking, biking, taking transit and driving in the future will be important.

c) A Progressive Approach to Congestion

As discussed in Appendix A, it will be important to seek out *healthy levels of congestion (*congestion levels that are neither impractically low nor too excessive) to keep Kelowna moving while also achieving the City's vision and goals for transportation. This approach will ensure that the unintended negative consequences of building too much road capacity is minimized, while ensuring that investments in effective infrastructure are maximized.

d) Summary of Future Challenges and Opportunities

To keep Kelowna moving, 30 future challenges and opportunities have been developed around the themes of mode shift, developing a well-connected urban street network, and identifying a progressive approach to congestion management. These have been developed based on the review of existing and future conditions and are intended to work together to guide the development of potential projects, policies and programs to meet Kelowna's vision and goals for transportation. Each future challenge is also envisioned as an opportunity; that is – they are two different sides of the same coin. The future challenges and opportunities are listed below. Further details can be found in Chapter 4.

Report Chapter		Future Challenge / Opportunity
4a) Walking	1	Design for Walkability in the Urban Centres
	2	Connect the Pedestrian Network in the Core Area
	3	Shift Short Trips to Walking
	4	Ensure People Walking Feel Safe
	5	Create Flexible and Adaptable Pedestrian Spaces
4b) Biking	6	Shift Trips within the Core Area to Biking
	7	Increase Perception of Biking as a Safe Mode of Travel
	8	Make Biking Accessible to More People
	9	Integrate Bicycles with Transit
	10	Build-out a Complete Bicycle Network
4c) Transit	11	Focus Growth near Frequent Transit and Ensure Multimodal Access
	12	Increase Transit Investment where Effective to Serve Growing Demand
	13	Speed Up Transit and Make it More Reliable
	14	Maximize Benefits of Technology Change on Transit
	15	Collect High Quality Data to Support Transit Planning
4d) Driving	16	Growth in Downtown and South Pandosy
	17	Continued Growth in Suburban Hillsides
	18	Increasing Travel Demand through Midtown
	19	Employment Growth Along Highway 97
	20	Reduce the Frequency and Severity of Traffic Collisions
	21	Develop a Well-Connected, Complete Urban Street Network
4e) Shared Mobility	22	Expand and Improve Bikeshare and other Emerging Options
	23	Attract One-way Carshare
	24	Prepare for the Arrival of Ride-Hailing
	25	Prepare for the Arrival of Autonomous Vehicles
4g) Programs	26	Build Community Capacity
	27	Enhance Safe Routes to School
	28	Improve Transit Passes and Payment
	29	Manage the Curb
	30	Move Toward Parking On-Demand

6. Next Steps

Moving forward, the 30 future challenges and opportunities described in this report will be used along with input from the public to identify potential transportation projects, programs and policies for evaluation. These potential options will be shared with Council and the public for input and evaluated using a strategic decision-making framework. Ultimately, the projects, programs, and policies that are projected to do the best job of helping the City reach its vision and goals for transportation will be brought forward as recommendations for consideration by Council. Final endorsement of the Transportation Master Plan is anticipated in summer 2020.

Appendix A: Congestion in the City of Kelowna

Congestion in the City of Kelowna

City of Kelowna | Transportation Master Plan

August 2019

Congestion in the City of Kelowna

Baseline Transportation Conditions in Preparation for the Transportation Master Plan

Submitted to

City of Kelowna

Prepared by

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August 2019

Executive Summary

Defining and Measuring Change through Congestion

Congestion is one of the most significant issues for urban regions. Although it is a common and daily experience for many people around the world, congestion is not easily measured or defined. Everyone experiences congestion _subjectively_ on a daily basis in most urban settings. However, a more _objective_ and deeper understanding from a range of viewpoints is required to manage our problems with congestion.

Physically, congestion is a competition for the same space at the same time to a degree that the _demand_ for the use of the space exceeds the _supply_ or _capacity_ of that space. Congestion can be considered as a feedback to society of the overuse and reliance on the automobile—an early warning sign of potentially larger problems to come. Congestion is also a by-product of prosperity, which is a way of looking at the "congestion cup" as "half-full". It is a "necessary cost" arising from economic growth and the increase in wealth. For decades, studies have shown correlations between economic growth and increased traffic congestion in countries around the world. Conversely, when the economy slows down, so do urban activities. With less people employed or shopping, congestion levels also drop proportionally. On the one hand, we want to eliminate congestion altogether because it is a sign of inefficiency. On the other hand, congestion can be an indicator of prosperity and vitality.

Measuring the various dimensions of congestion is a challenge, but through the use of new "big data" methods, the collection of congestion data is now possible at an unprecedented level. From this data, congestion can be defined from a number of metrics to allow for a thorough analysis of the performance of our transport system.

It is also important to note the dual nature of congestion: delay and reliability. This duality presents a way to measure congestion that is more consistent to how people experience congestion compared to merely measuring traffic volumes. The various facets of congestion can be meaningfully measured by incorporating congestion delay and reliability along with traditional metrics such as travel time and speed.

Utilizing a rich dataset of "crowd-sourced" data for a 1-year period, an assessment of congestion in the City of Kelowna was made to understand the performance of main roadways within the city. This entailed the assessment of congestion and travel times along 10 "representative" routes in both directions (Exhibit ES.1).

Exhibit ES.1 – City Routes

ID	Route Name	General Corridor	Origin	Destination
1(i)	Lake Country to Downtown Kelowna	along Glenmore & Clement	Glenmore Rd & Beaverlake Rd	Hwy 97 & Abbott
1(o)	Downtown Kelowna to Lake Country	along Glenmore & Clement	Hwy 97 & Abbott	Glenmore Rd & Beaverlake Rd
2(i)	Lake Country to Downtown Kelowna	along Hwy 97	Hwy 97 & Beaverlake Rd	Hwy 97 & Abbott
2(o)	Downtown Kelowna to Lake Country	along Hwy 97	Hwy 97 & Abbott	Hwy 97 & Beaverlake Rd
3(i)	Black Mountain to Downtown Kelowna	along Hwy 33 & Springfield	Hwy 33 & Goudie	Hwy 97 & Abbott
3(o)	Downtown Kelowna to Black Mountain	along Hwy 33 & Springfield	Hwy 97 & Abbott	Hwy 33 & Goudie
4(i)	Kettle Valley to Downtown Kelowna	along Pandosy & Lakeshore	Chute Lake Rd & Main St	Hwy 97 & Abbott
4(o)	Downtown Kelowna to Kettle Valley	along Pandosy & Lakeshore	Hwy 97 & Abbott	Chute Lake Rd & Main St
5(i)	Glenmore Heights to Capri Urban Centre	along Bernard & Glenmore	Kane & Drysdale	1835 Gordon
5(o)	Capri Urban Centre to Glenmore Heights	along Bernard & Glenmore	1835 Gordon	Kane & Drysdale
6i()	Rutland to Downtown Kelowna	along Hwy 33 & Hwy 97	Rutland Rd & Hwy 33	Queensway & Pandosy (Bernard/Water)
6(o)	Downtown Kelowna to Rutland	along Hwy 33 & Hwy 97	Queensway & Pandosy (Bernard/Water)	Rutland Rd & Hwy 33
7(i)	Pandosy to Downtown Kelowna	along Pandosy	KLO & Pandosy	Queensway & Pandosy (Bernard/Water)
7(o)	Downtown Kelowna to Pandosy	along Pandosy	Queensway & Pandosy (Queensway/Water)	KLO & Pandosy
8(i)	UBCO to Rutland	along Rutland & Hwy 97	University Way & Innovation Drive	Rutland Rd & Hwy 33
8(o)	Rutland to UBCO	along Rutland & Hwy 97	Rutland Rd & Hwy 33	University Way & Innovation Drive
9(i)	Capital News Centre (Lower Mission) to Landmark	along Gordon & Sutherland	4105 Gordon Drive	Sutherland Ave & Burtch Rd
9(o)	Landmark to Capital News Centre (Lower Mission)	along Gordon & Sutherland	Sutherland Ave & Burtch Rd	4105 Gordon Drive
10(i)	Farmers Market to KGH	along Springfield	1992 Dilworth	2268 Pandosy St
10(o)	KGH to Farmers Market	along Springfield	2268 Pandosy St	1992 Dilworth

Data was collected across 4 seasons, 2 weekly periods, and 4 daily time periods:

    Seasons:
- Winter (December, January, February)
- Spring (March, April, May)
- Summer (June, July, August)

- Fall (September, October, November)

Weekly Periods:
- Mid-Week (Tuesdays, Wednesdays, Thursdays)
- Saturdays (mid-day period only)

Time Periods:
- Early Morning (midnight to 7 AM)
- AM Peak (7 AM – 9 AM)
- Mid-Day (9 AM – 3 PM)
- PM Peak (3 PM – 5 PM)

Congestion information can be presented using a number of surrogate metrics, such as **travel time** and **speed**. More direct metrics such as the **Congestion Index (CI)**, which is the ratio between the speed on roads for a particular time period compared to "free-flow" conditions (i.e. overnight), and the **Congestion-Reliability Index (CRI)**, which is the combination of the volatility of congestion levels with the Congestion Index[1]. The variety of congestion metrics allows for the observation and analysis of congestion from different perspectives, allowing for a more well-informed base of evidence from which effective decisions can be made.

Top 10 Congested Route-Times

From **Exhibit ES.2**, it can be seen that the route **4(i)** from **Kettle Valley to Downtown Kelowna** presented the worst congestion levels in the AM peak period, including mid-day Saturdays. Further analysis of this route identified the main source of congestion was on the segment of the route that passes by Anne McClymont Elementary, with a spike in congestion evident between 8:30 to 9:00 AM on all weekdays school was in session. This suggests possibly high traffic flows to and from the school may be creating excessive delays before the morning bell.

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[1] Specifically, the CRI is the CI divided or "normalized" by the coefficient of variation for a given roadway and time period.

Exhibit ES.2: Route Performance Ranked by the Congestion Reliability Index: Top 10 (Most Congested) and Bottom 10 (Least Congested)

Rank	Route ID & Name	DOW	Period	Mean Speed	Mean CI	CV%	CV%90	CRI	CRI-90%
1	4(i) - Kettle Valley to Downtown Kelowna	Tue-Thu	AM	33.21	0.83	15.4%	11.3%	5.41	7.83
2	7(i) - Pandosy to Downtown Kelowna	Tue-Thu	PM	17.28	0.62	10.5%	7.7%	6.16	8.40
3	6(o) - Downtown Kelowna to Rutland	Sat	MD	34.87	0.71	9.8%	8.1%	7.33	8.88
4	10(i) - Farmers Market to KGH	Tue-Thu	MD	31.60	0.70	9.4%	6.4%	7.58	11.13
5	7(o) - Downtown Kelowna to Pandosy	Sat	MD	34.56	0.73	7.6%	6.5%	9.57	11.15
6	10(o) - KGH to Farmers Market	Tue-Thu	PM	26.87	0.64	7.4%	5.7%	8.76	11.24
7	8(i) - UBCO to Rutland	Tue-Thu	PM	34.78	0.75	15.1%	8.4%	7.38	11.36
8	4(i) - Kettle Valley to Downtown Kelowna	Sat	MD	36.07	0.75	7.5%	6.4%	10.30	11.78
9	6(o) - Downtown Kelowna to Rutland	Tue-Thu	MD	34.49	0.71	7.6%	6.2%	9.70	12.06
10	2(o) - Downtown Kelowna to Lake Country (via Hwy 97)	Sat	MD	22.94	0.76	7.1%	5.7%	10.97	13.54

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Rank	Route ID & Name	DOW	Period	Mean Speed	Mean CI	CV%	CV%90	CRI	CRI-90%
71	2i() - Lake Country to Downtown Kelowna (via Hwy 97)	Sat	MD	58.48	0.86	4.6%	3.1%	24.07	31.95
72	4(o) - Downtown Kelowna to Kettle Valley	Tue-Thu	PM	36.92	0.78	3.1%	2.4%	25.43	32.69
73	5(i) - Glenmore Heights to Capri Urban Centre	Tue-Thu	PM	42.81	0.84	3.3%	2.6%	25.61	32.72
74	1(o) - Downtown Kelowna to Lake Country (via Glenmore/Clement)	Sat	MD	50.06	0.90	3.6%	2.7%	25.26	34.07
75	3(o) - Downtown Kelowna to Black Mountain	Tue-Thu	MD	49.89	0.86	3.5%	2.3%	25.35	37.15
76	8(o) - Rutland to UBCO	Tue-Thu	AM	52.97	0.89	20.2%	2.4%	21.23	37.81
77	1(o) - Downtown Kelowna to Lake Country (via Glenmore/Clement)	Tue-Thu	MD	47.81	0.88	3.4%	2.3%	26.20	38.08
78	3(o) - Downtown Kelowna to Black Mountain	Tue-Thu	PM	52.17	0.88	3.1%	2.2%	29.40	39.74
79	1(i) - Lake Country to Downtown Kelowna (via Glenmore/Clement)	Tue-Thu	MD	47.58	0.88	3.0%	2.2%	29.92	39.88
80	1(i) - Lake Country to Downtown Kelowna (via Glenmore/Clement)	Tue-Thu	PM	46.77	0.87	2.9%	1.9%	30.92	46.62

The second most congested route was found to be **Pandosy to Downtown Kelowna 7(i)** during the weekday PM peak period. Although this route did not have the lowest CRI value, it did have the lowest CI value of 62 (annual average), which suggests this location experiences the most delay along its fairly short length. The excessive delays are evident on the road segment adjacent to Kelowna General Hospital.

The third most congested route from **Downtown Kelowna to Rutland 6(o)** was included twice on the top 10 most congested list (number 3 and 9 spots). Unlike the top two congested routes which experience their worst delays during peak periods, this route was the busiest during the mid-day on Saturdays and weekdays, suggesting the delays may primarily be shopping-related.

Exhibits ES.3 - ES.5 illustrate the congestion along these three routes.

Exhibit ES.3: Route 4(i) Kettle Valley to Downtown Kelowna | Fall | Mid-Week | AM
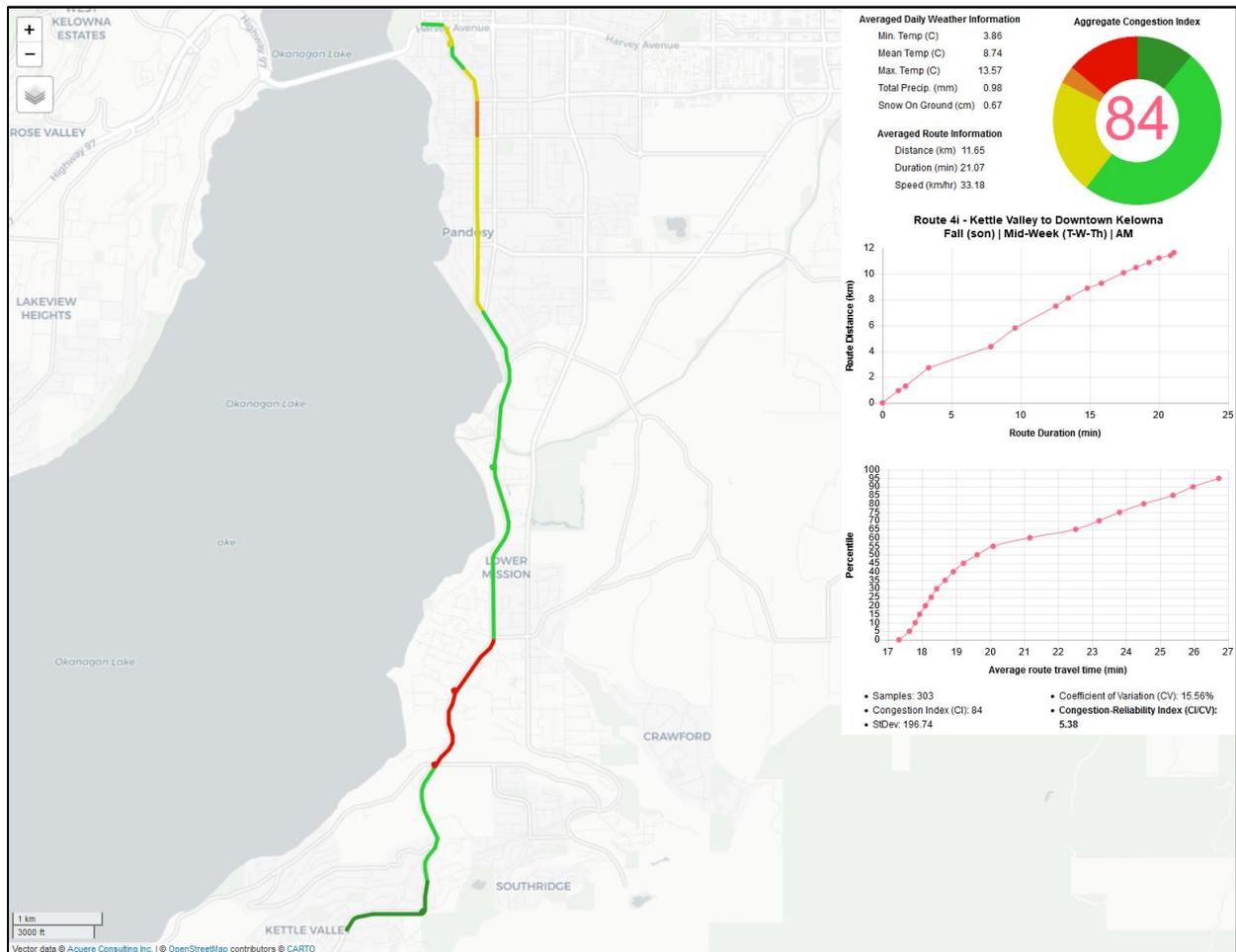
Observations: highest delays occur northbound on Lakeshore Rd. between Barnaby Rd. and DeHart Rd.   Further investigations into the data suggest congestion occurs during morning school drop-off times, possibly at Anne McClymont Elementary.

Exhibit ES.4: Route 6(o) Downtown Kelowna to Rutland | Fall | Saturdays | Mid-Day
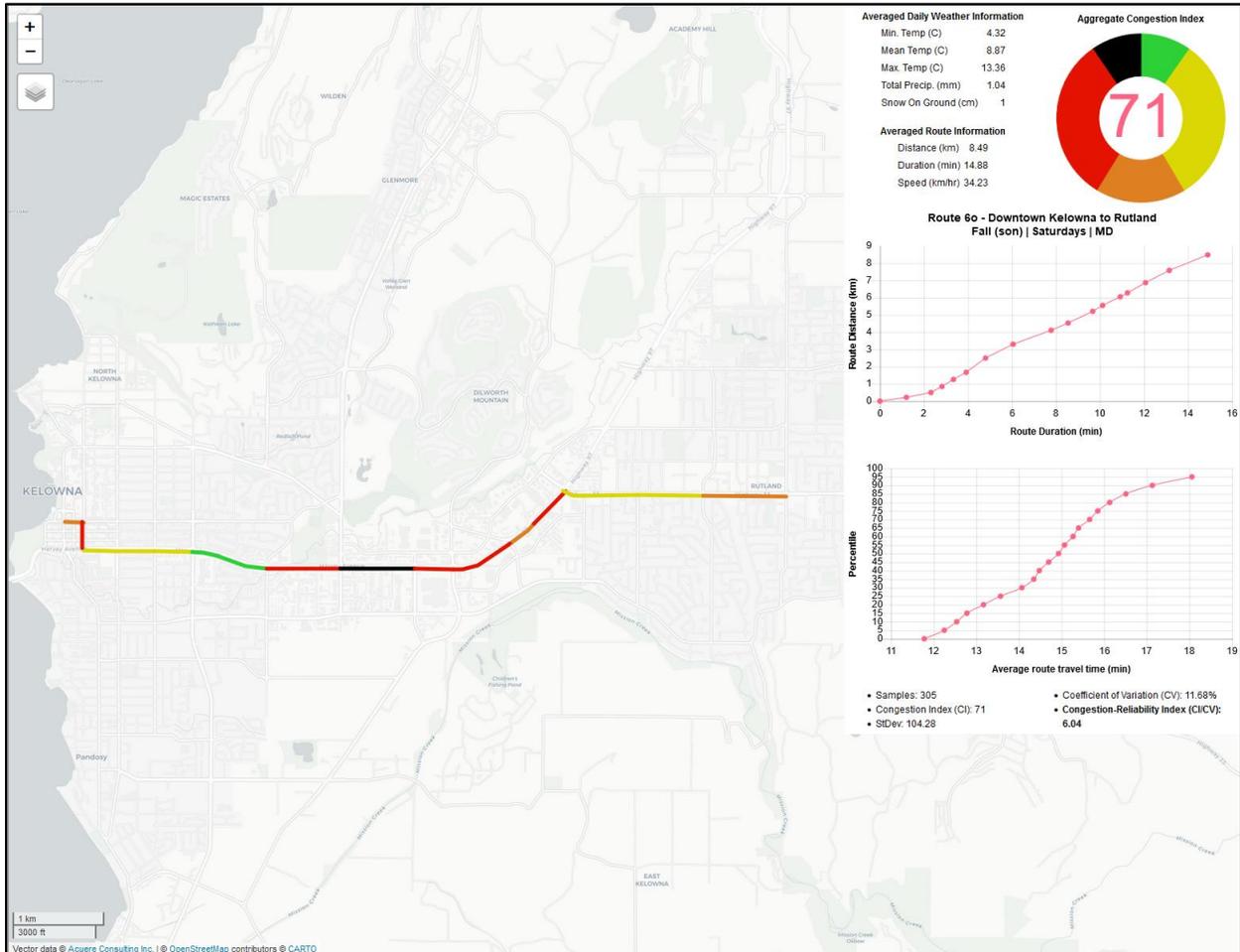
Observations: highest delays occur eastbound on Hwy 97 just before Orchard Park Shopping Centre on Saturdays during the mid-day.

Exhibit ES.5: Route 7(i) Pandosy to Downtown Kelowna | Fall | Mid-Week | PM
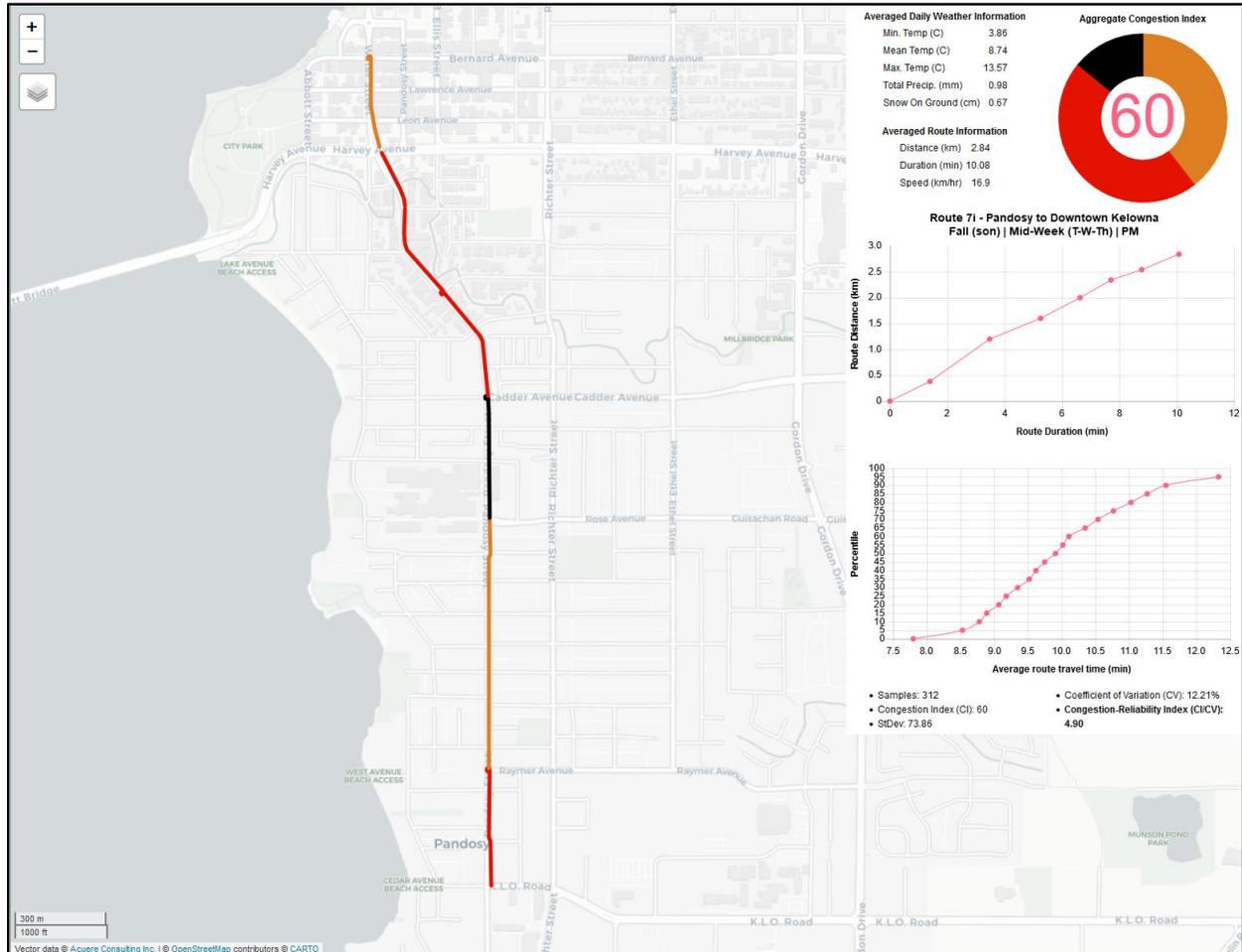
Observations: highest delays occur northbound on Pandosy adjacent to KGH during the PM peak period on weekdays.

Change in Congestion: 2008-2017

A comparison to survey data from a 2008 travel time survey[2] in the Central Okanagan was also made to provide an estimation of changes in congestion between 2008 and 2017. Comparing the recently collected data to the regional travel survey conducted in 2008, it was found that travel times/congestion along surveyed routes:

- increased by 6.4% during the morning peak period,
- held steady during the mid-day peak (0.6% increase), and
- increased 4.7% in the afternoon peak period.

This is the first known measurement of the change in congestion over a long-term period for any region in B.C.

Conclusion: Applications for Transportation Planning

The use of "big data" provides the "eyes" to see details in traffic at an unprecedented level. Having access to this rich data set allows for information-based decision making that will provide a strong foundation for transportation policy making and the development of the Transportation Master Plan. While this report provides a high-level summary of findings, the data can continue to support investigations such as:

- How many incidents of extreme congestion were detected last year, and of those how many are recurring vs. random (e.g. collisions)?

- How congested do roads adjacent to schools get during school days?

- How do changes in speeds correlate to collisions?

- What is a "healthy" level of congestion for a given time and location?

Moving forward, the rich set of congestion data collected will be used to help inform the development of potential projects, policies and programs for evaluation as part of the Transportation Master Plan. Specific attention will focus on problem areas identified in this report.

Further work will help to define reasonable and "healthy" levels of congestion that can be used to better evaluate the performance of the City of Kelowna's road network in alignment with Imagine Kelowna and the community's long-term vision and goals for transportation in the City of Kelowna.

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[2] *2008 Central Okanagan Travel Time Survey*, October 28, 2008, Acuere Consulting for the City for Kelowna

Congestion in the City of Kelowna

1. Urban Congestion

1.1 Congestion and the Health of a Region

What is congestion, and why do we feel there is so much of it in our region? Why does it appear like clockwork every day on the bridge, yet sometimes appears out of nowhere in remote locations? Why can't we get rid of congestion?

Congestion is a common phenomenon that occurs on roads around the world. Anywhere there is a large gathering of people, congestion seems to follow. It is considered a negative aspect to living in urban environments, because it comes down to congestion causing delays to one's travel and seemingly stealing from us the thing that we value: our time. And as we lose both our personal and productive time, we increasingly feel stressed, use excessive fuel, emit more air pollution, and increase wear and tear on our vehicles from all the stop-and-go traffic. In fact, traffic congestion is usually one of the top three issues in most urban regions.

While everyone experiences congestion <u>subjectively</u> on a daily basis in most urban settings, a more <u>objective</u> and deeper understanding from a range of viewpoints is required to manage our problems with congestion. Physically, congestion is a competition for the same space at the same time to a degree that the *demand* for the use of the space exceeds the *supply* or *capacity* of that space. However, congestion can also be viewed as a positive aspect of society. Congestion is a feedback to society of the overuse and reliance on the automobile—an early warning sign of potentially larger problems to come. Congestion is also a by-product of prosperity, which is a way of looking at the "congestion cup" as "half-full". It is a "necessary cost" arising from economic growth and the increase in wealth. For decades, studies have shown correlations between economic growth and increased traffic congestion in countries around the world. Conversely, when the economy slows down, so do urban activities. With less people employed or shopping, congestion levels also drop proportionally.

On one hand, we want to eliminate congestion altogether because it can be a sign of inefficiency. On the other hand, congestion can be an indicator of prosperity and vitality. The irony of humans is that we tend to flock to—and add more congestion to—

places that are already congested. One needs to go no further than to their local street of restaurants and see a bar with lineups extending out the door, while the restaurant adjacent is empty. Which one would you rather go to? Ultimately, congestion is a sign of desirability, and it seems people are willing to put-up with the added delay because their demand for something exceeds the cost of waiting.

But ignoring excess congestion can cause problems as well. For example, people may move away due to long commutes, and businesses may relocate to other cities with less congestion in order to save on transport costs. The question then may be more appropriately: what is an *acceptable* level of congestion? Furthermore, the question could be refined as: what is a *healthy* level of congestion? Like a healthy person, who has a heart-rate appropriate for a given level of activity, a healthy level of congestion can change throughout the day. Exercising requires a higher heartrate and blood pressure, and so during the busy times of the day, we expect higher levels of congestion. During times of rest, our bodies reduce our heartrate and blood pressure, and similarly congestion levels should be lower.

It is the defining of *healthy levels of congestion*—levels that are not too excessive, but also not too low—which should be the aim of cities and regions in order to support their overall goals of sustainability, livability, and vitality. But to perform this balancing act, congestion first needs to be defined and monitored to better understand congestion throughout the course of each day, week, month, and year. Then, from this data set, a values-based approach can be applied to judge what levels of congestion are appropriate for a given time of day and season. This is the modern approach to setting congestion policies to ensure the unintended consequence of building too much road capacity is minimized, while investments in effective infrastructure is maximized.

Through monitoring, the dual issues of congestion can be managed: the frequent occurrence of excessive congestion on a particular roadway facility can be identified and action taken to remedy the situation, while excessive roadway building (which can induce more traffic), can be curbed at locations that do not really need the additional capacity but have the *subjective perception* of the need for expansion.

1.2 The Two Sides of the "Congestion Coin": Delay and Reliability

Like a coin, there are two faces or sides of congestion. Congestion is commonly referred to as excessive delay or the time to travel along a section of roadway. This definition considers the amount of travel time delay as the measure of congestion. While there are predictable changes in congestion levels that occur throughout the

day (what traffic engineers term "recurring congestion") often at places such as approaches to bridges, or at major intersections, there are also random instances of congestion. Random, or "non-recurring", congestion is usually due to traffic incidents such as breakdowns or collisions. They can also occur from temporary road closures, natural disasters, major events, or construction.

Road users tend to react differently to these two types of congestion. Recurring congestion is experienced by people consistently on a daily basis. While no one enjoys the experience of recurring delays, it is predictable and expected, so people tend to grudgingly accept the phenomenon. However, when road users experience random instances of congestion, especially ones that cause high levels of delay, the lack of predictability means that the congestion has a greater chance of negatively impacting people's day and is generally not well-tolerated.

At the heart of the matter is the issue of **congestion *reliability***. Congestion that is predictable and reliable is acceptable to most people as this type of congestion can be planned for and anticipated. However, once congestion becomes unusually volatile, or less reliable, people are negatively impacted and frustration-levels increase.

> **Case in point:** The 2003 Greater Vancouver Travel Time Survey[1] was the first region-wide travel time survey conducted in Canada utilizing GPS technology. The study documented levels of congestion throughout the Greater Vancouver region. A key finding was that congestion was not merely about delays, but also included the variations of delays experienced by people who commuted the same routes on a daily basis. Essentially, it was not only excessive delays, but atypical episodes of excessive delays, that were identified as a factor in the negative perception of congestion.

To conclude, congestion has a dual nature of both travel time ***delay and reliability***— the two sides of the "congestion coin." In order to meaningfully measure congestion, both "sides" of the congestion coin should be considered.

2. Kelowna Congestion Analysis

2.1 Modernizing the Measurement of Congestion

In June 2017, the City of Kelowna and the STPCO initiated a project to measure and assess levels of congestion across major roads within the Central Okanagan. A region-wide congestion analysis network (CAN) was developed, consisting of 700 road segments representing highways, arterials, and collector roads. Utilizing a new "crowd-sourced" approach to obtaining travel time data along roadways, this congestion measurement system was employed to "harvest" travel time data along each segment at a frequency of 15 minutes continuously over a 1-year period. The data collected spanned from July 2017 to June 2018 and comprised over 24 million records to allow for the measurement of congestion at unprecedented spatial and temporal levels.

Utilizing the rich dataset, an assessment of congestion in the City of Kelowna was made to understand the performance of main roadways within the city. This entailed the assessment of congestion and travel times along 10 "representative" routes in both directions (**Exhibit 1**) across 4 seasons, 2 weekly periods, and 4 daily time periods:

Seasons:
- Winter (December, January, February)
- Spring (March, April, May)
- Summer (June, July, August)
- Fall (September, October, November)

Weekly Periods:
- Mid-Week (Tuesdays, Wednesdays, Thursdays)
- Saturdays (mid-day period only)

Time Periods:
- Early Morning (midnight to 7 AM)
- AM Peak (7 AM – 9 AM)
- Mid-Day (9 AM – 3 PM)
- PM Peak (3 PM – 5 PM)

While the congestion performance across these 20 individual routes provides the performance of representative trips, a more macro assessment of congestion was made across the entire city using Kelowna's subset of the overall regional congestion analysis network. This regional purview provides a more holistic assessment of congestion on major roads within the city, resulting in an "executive summary" of congestion over a 1-year period.

Exhibit 2.1 – City Routes

ID	Route Name	General Corridor	Origin	Destination
1(i)	Lake Country to Downtown Kelowna	along Glenmore & Clement	Glenmore Rd & Beaverlake Rd	Hwy 97 & Abbott
1(o)	Downtown Kelowna to Lake Country	along Glenmore & Clement	Hwy 97 & Abbott	Glenmore Rd & Beaverlake Rd
2(i)	Lake Country to Downtown Kelowna	along Hwy 97	Hwy 97 & Beaverlake Rd	Hwy 97 & Abbott
2(o)	Downtown Kelowna to Lake Country	along Hwy 97	Hwy 97 & Abbott	Hwy 97 & Beaverlake Rd
3(i)	Black Mountain to Downtown Kelowna	along Hwy 33 & Springfield	Hwy 33 & Goudie	Hwy 97 & Abbott
3(o)	Downtown Kelowna to Black Mountain	along Hwy 33 & Springfield	Hwy 97 & Abbott	Hwy 33 & Goudie
4(i)	Kettle Valley to Downtown Kelowna	along Pandosy & Lakeshore	Chute Lake Rd & Main St	Hwy 97 & Abbott
4(o)	Downtown Kelowna to Kettle Valley	along Pandosy & Lakeshore	Hwy 97 & Abbott	Chute Lake Rd & Main St
5(i)	Glenmore Heights to Capri Urban Centre	along Bernard & Glenmore	Kane & Drysdale	1835 Gordon
5(o)	Capri Urban Centre to Glenmore Heights	along Bernard & Glenmore	1835 Gordon	Kane & Drysdale
6i()	Rutland to Downtown Kelowna	along Hwy 33 & Hwy 97	Rutland Rd & Hwy 33	Queensway & Pandosy (Bernard/Water)
6(o)	Downtown Kelowna to Rutland	along Hwy 33 & Hwy 97	Queensway & Pandosy (Bernard/Water)	Rutland Rd & Hwy 33
7(i)	Pandosy to Downtown Kelowna	along Pandosy	KLO & Pandosy	Queensway & Pandosy (Bernard/Water)
7(o)	Downtown Kelowna to Pandosy	along Pandosy	Queensway & Pandosy (Queensway/Water)	KLO & Pandosy
8(i)	UBCO to Rutland	along Rutland & Hwy 97	University Way & Innovation Drive	Rutland Rd & Hwy 33
8(o)	Rutland to UBCO	along Rutland & Hwy 97	Rutland Rd & Hwy 33	University Way & Innovation Drive
9(i)	Capital News Centre (Lower Mission) to Landmark	along Gordon & Sutherland	4105 Gordon Drive	Sutherland Ave & Burtch Rd
9(o)	Landmark to Capital News Centre (Lower Mission)	along Gordon & Sutherland	Sutherland Ave & Burtch Rd	4105 Gordon Drive
10(i)	Farmers Market to KGH	along Springfield	1992 Dilworth	2268 Pandosy St
10(o)	KGH to Farmers Market	along Springfield	2268 Pandosy St	1992 Dilworth

A comparison to survey data from a 2008 travel time survey in the Central Okanagan (utilizing GPS technology) was also made to provide an estimation of changes in congestion between 2008 and 2017.

Congestion information can be presented using a number of surrogate metrics, such as **travel time** and **speed**. More direct metrics such as the **Congestion Index (CI)**, which is

the ratio between the speed on roads for a particular time period compared to "free-flow" conditions (i.e. overnight), and the **Congestion-Reliability Index (CRI)** [3], which is the combination of the volatility of congestion levels with the Congestion Index. The variety of congestion metrics allows for the observation and analysis of congestion from different perspectives, allowing for a more well-informed base of evidence from which effective decisions can be made.

Overall, the ability to measure congestion at such a rich level for the first time in the region's history, allows for the monitoring of the performance of transportation services and infrastructure, as well as the performance of policies and plans. Eventually, the transition of modern cities to **smart cities** will be founded on a bedrock of "big data", of which transportation data will be an essential part.

2.2 Congestion Analysis Along City Routes

To understand the variations of congestion from a relatable perspective, typical routes that residents travel on a daily basis were identified. A set of 10 representative routes were defined and congestion levels captured in both directions along these routes. Data was collected on a continuous basis and covered all months of the year, days of the week, and time periods of the day. This resulted in a very large database from which tens of thousands of analyses can be made at a regional or local level.

2.2.1 Examples of Low and High Congestion Routes

The following table (**Exhibit 2.2.1**) provides examples of typical congestion levels along these routes for various time periods and weekdays across a 1-year period (July 2017-June 2018). The list is ranked from "worst" (#1) to "best" (#96) in terms of the CRI-90%[4] index.

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[3] Specifically, the CRI is the CI divided or "normalized" by the coefficient of variation for a given roadway and time period.
[4] The 90%ile version of this index is used to ignore "outliers" which are extreme congestion events due to unusual/rare conditions such as road closures.

**Exhibit 2.2.1: Route Performance Ranked by CRI (90%ile Sample):
Top 10 (Most Congested) and Bottom 10 (Least Congested)**

Rank	Route ID & Name	DOW	Period	Mean Speed	Mean CI	CV%	CV%90	CRI	CRI-90%
1	4(i) - Kettle Valley to Downtown Kelowna	Tue-Thu	AM	33.21	0.83	15.4%	11.3%	5.41	7.83
2	7(i)- Pandosy to Downtown Kelowna	Tue-Thu	PM	17.28	0.62	10.5%	7.7%	6.16	8.40
3	6(o) - Downtown Kelowna to Rutland	Sat	MD	34.87	0.71	9.8%	8.1%	7.33	8.88
4	10(i) - Farmers Market to KGH	Tue-Thu	MD	31.60	0.70	9.4%	6.4%	7.58	11.13
5	7(o) - Downtown Kelowna to Pandosy	Sat	MD	34.56	0.73	7.6%	6.5%	9.57	11.15
6	10(o) - KGH to Farmers Market	Tue-Thu	PM	26.87	0.64	7.4%	5.7%	8.76	11.24
7	8(i) - UBCO to Rutland	Tue-Thu	PM	34.78	0.75	15.1%	8.4%	7.38	11.36
8	4(i) - Kettle Valley to Downtown Kelowna	Sat	MD	36.07	0.75	7.5%	6.4%	10.30	11.78
9	6(o) - Downtown Kelowna to Rutland	Tue-Thu	MD	34.49	0.71	7.6%	6.2%	9.70	12.06
10	2(o) - Downtown Kelowna to Lake Country (via Hwy 97)	Sat	MD	22.94	0.76	7.1%	5.7%	10.97	13.54

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| Rank	Route ID & Name	DOW	Period	Mean Speed	Mean CI	CV%	CV%90	CRI	CRI-90%
71	2(i) - Lake Country to Downtown Kelowna (via Hwy 97)	Sat	MD	58.48	0.86	4.6%	3.1%	24.07	31.95
72	4(o) - Downtown Kelowna to Kettle Valley	Tue-Thu	PM	36.92	0.78	3.1%	2.4%	25.43	32.69
73	5(i) - Glenmore Heights to Capri Urban Centre	Tue-Thu	PM	42.81	0.84	3.3%	2.6%	25.61	32.72
74	1(o) - Downtown Kelowna to Lake Country (via Glenmore/Clement)	Sat	MD	50.06	0.90	3.6%	2.7%	25.26	34.07
75	3(o) - Downtown Kelowna to Black Mountain	Tue-Thu	MD	49.89	0.86	3.5%	2.3%	25.35	37.15
76	8(o) - Rutland to UBCO	Tue-Thu	AM	52.97	0.89	20.2%	2.4%	21.23	37.81
77	1(o) - Downtown Kelowna to Lake Country (via Glenmore/Clement)	Tue-Thu	MD	47.81	0.88	3.4%	2.3%	26.20	38.08
78	3(o) - Downtown Kelowna to Black Mountain	Tue-Thu	PM	52.17	0.88	3.1%	2.2%	29.40	39.74
79	1(i) - Lake Country to Downtown Kelowna (via Glenmore/Clement)	Tue-Thu	MD	47.58	0.88	3.0%	2.2%	29.92	39.88
80	1(i) - Lake Country to Downtown Kelowna (via Glenmore/Clement)	Tue-Thu	PM	46.77	0.87	2.9%	1.9%	30.92	46.62

Top 10 Most Congested Routes

From **Exhibit 2.2.1**, it can be seen that the route **4(i)** from **Kettle Valley to Downtown Kelowna** presented the worst congestion levels in the AM peak period, including mid-day Saturdays. Further analysis of this route identified the main source of congestion was on the segment of the route that passes by Anne McClymont Elementary, with a spike in congestion evident between 8:30 to 9:00 AM on all weekdays school was in session. This suggests possibly high traffic flows to and from the school may be creating excessive delays before the morning bell.

The second most congested route was found to be **Pandosy to Downtown Kelowna 7(i)** during the weekday PM peak period. Although this route did not have the lowest CRI value, it did have the lowest CI value of 62 (annual average), which suggests this location experiences the most delay along its fairly short length. The excessive delays are evident on the road segment adjacent to Kelowna General Hospital.

The third most congested route from **Downtown Kelowna to Rutland 6(o)** was included twice on the top 10 most congested list (number 3 and 9 spots). Unlike the top two congested routes which experience their worst delays during peak periods, this route was the busiest during the mid-day on Saturdays and weekdays, suggesting the delays may primarily be shopping-related.

**Exhibits 2.2.2** - **2.2.4** illustrate the congestion along these three routes.

Exhibit 2.2.2: Route 4(i) Kettle Valley to Downtown Kelowna | Fall | Mid-Week | AM
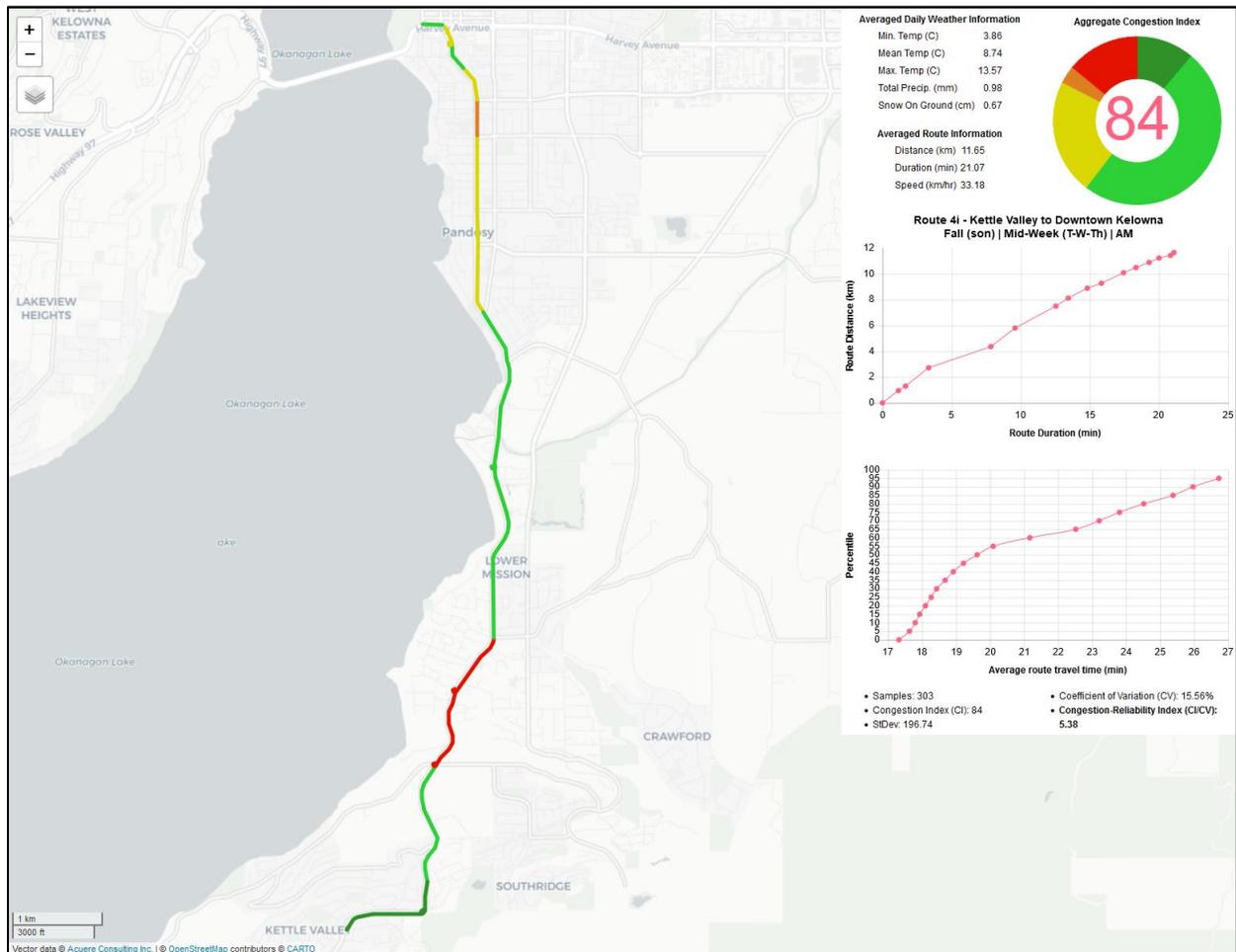
Observations: highest delays occur northbound on Lakeshore Rd. between Barnaby Rd. and DeHart Rd. Further investigations into the data suggest congestion occurs during morning school drop-off times, possibly at Anne McClymont Elementary.

Exhibit 2.2.3: Route 6(o) Downtown Kelowna to Rutland | Fall | Saturdays | Mid-Day
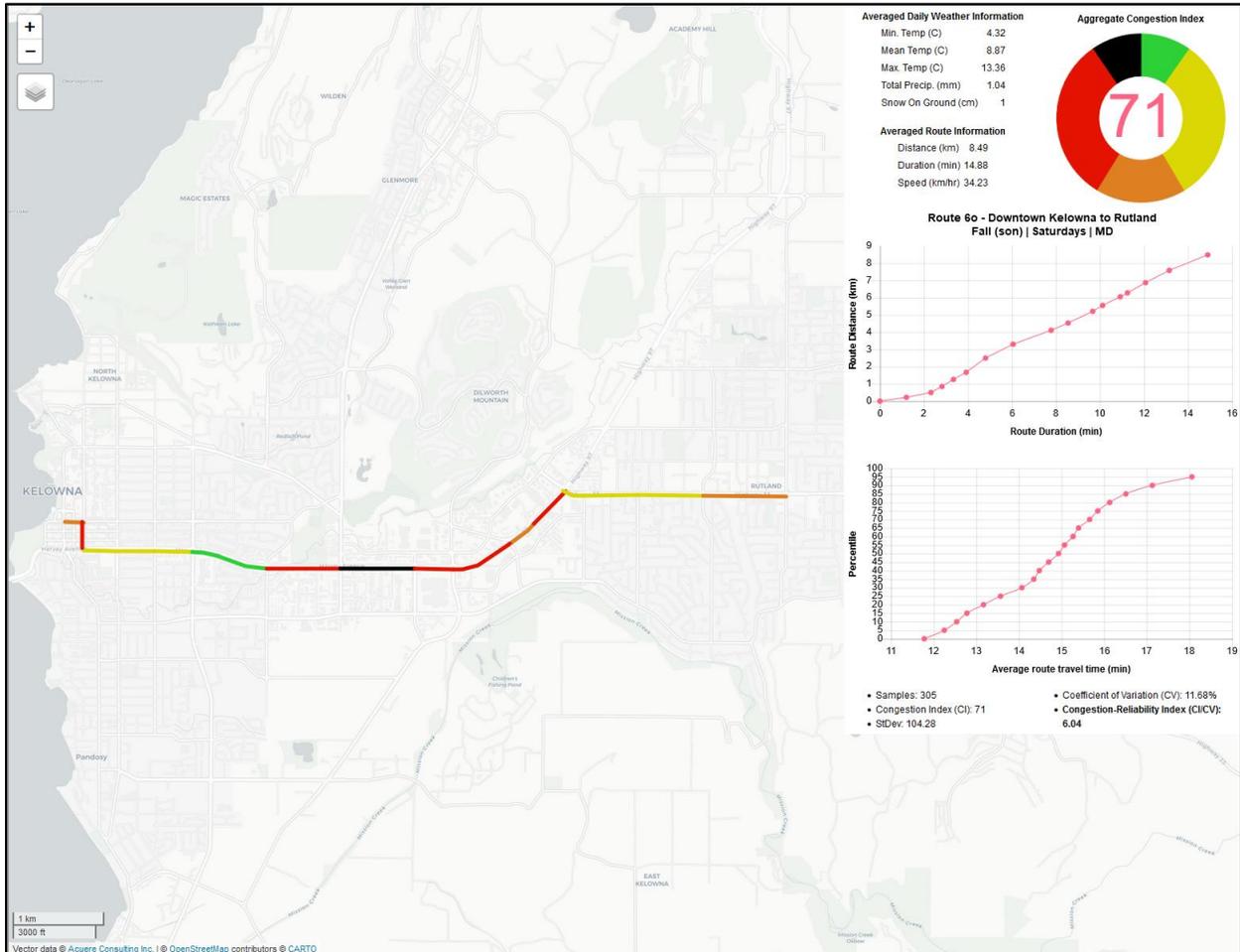
Observations: highest delays occur eastbound on Hwy 97 just before Orchard Park Shopping Centre on Saturdays during the mid-day.

Exhibit 2.2.4: Route 7(i) Pandosy to Downtown Kelowna | Fall | Mid-Week | PM
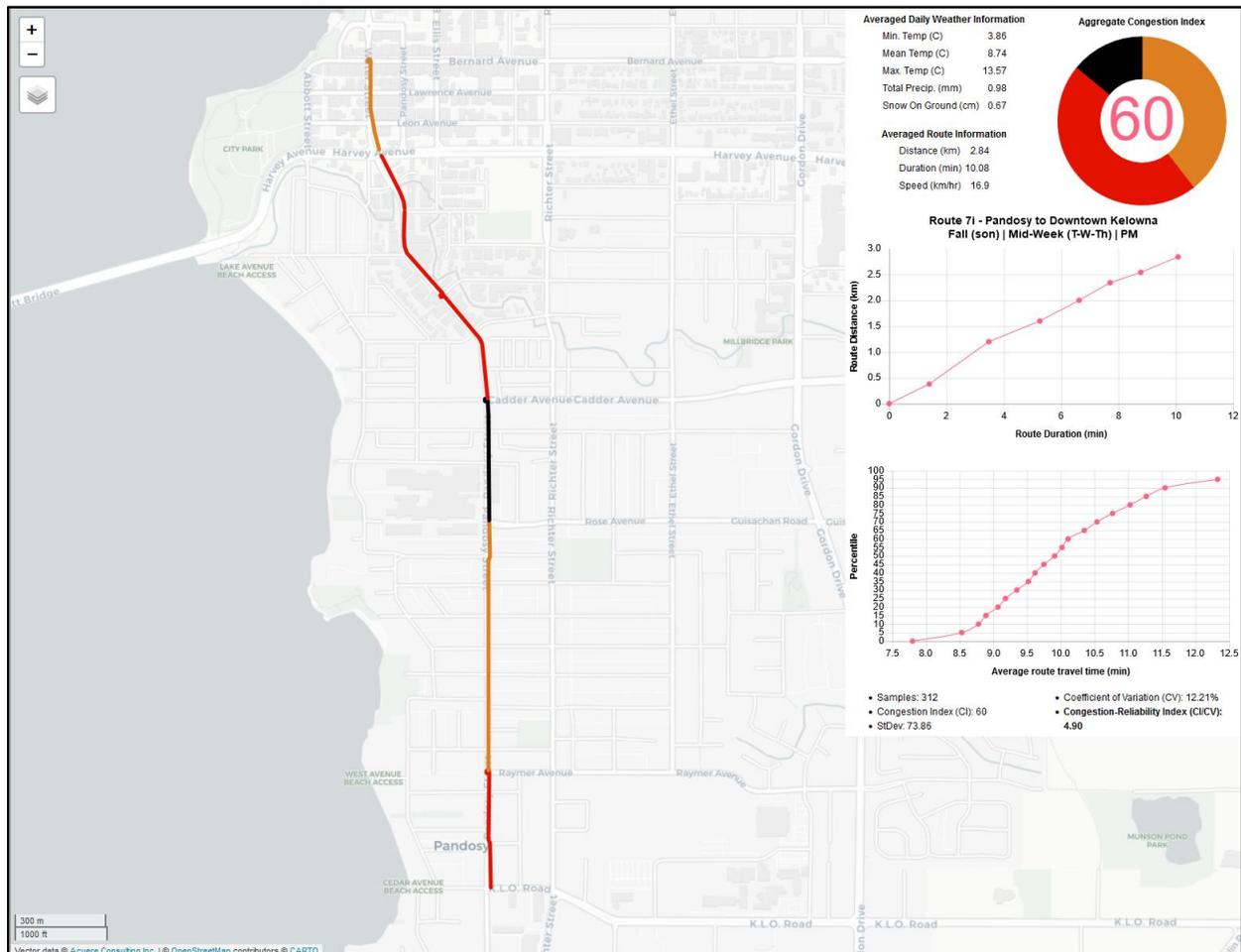
Observations: highest delays occur northbound on Pandosy adjacent to KGH during the PM peak period on weekdays.

Top 10 Least Congested Routes

The routes where the least amount of congestion was observed were mostly on routes that connected to the outer areas of the city. **Route 1(i), Lake Country to Downtown Kelowna (via Glenmore/Clement)**, was the least congested route for mid-day and PM peak time periods during weekdays. While there are a few locations of high congestion, namely where Glenmore meets Clement, most of the remaining route is uncongested for these time periods. The reverse route **1(o), Downtown Kelowna to Lake Country (via Glenmore/Clement)** is also within the top 10 list of least congested routes during weekday mid-day and AM peak periods.

The route from **Downtown Kelowna to Black Mountain 3(o)** is also present twice on this list, during the mid-day and PM peak periods of weekdays. Overall this indicates that traffic flow along Hwy #33 is fairly smooth. However, over a weekend in August 2017,

wildfires in the area required road closures east-bound. Although this particular route is the least congested throughout the year, from the observation of all the data collected, it was calculated as the 2nd most volatile[5] route because of the wildfires.

Overall, these results help to paint a picture of when and where in the city commutes are smooth, and where there are potential issues.

2.2.2 Route Performance During Fall Peak Periods

As an example of the variability and performance of the city-wide routes, a look at the data during the morning and afternoon peak periods in the Fall season provides a representative view of the city's congestion levels.

Exhibit 2.2.5 – 2.2.6 provide the AM and PM Peak Period travel times by route for the Fall season. Comparing travel times to the early morning period (i.e. free-flow conditions), a sense of relative delay can be computed to show the ranges and changes in performance by route.

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[5] Based on the calculated coefficient of variation utilizing 100% of the samples such that outliers are included to help identify periods of extreme congestion.

Exhibit 2.2.5: Average Travel Times and Delays by Route, Fall, AM Peak Period

| O-D Pair (Inbound Direction of Travel) | AM Peak (Fall) | | | | |
	Average Travel Time (Mins)	Range of Travel Times Observed (Mins) (10th% - 90th%)	Average Travel Time Delay (Mins)	Range of Travel Time Delays Observed (Mins)	Average % Delay
1(i) Lake Country to Downtown Kelowna - along Glenmore & Clement	24.6	23.5 - 25.7	0.7	0.5 - 0.9	3%
2(i) Lake Country to Downtown Kelowna - along Hwy 97	20.9	19.9 - 21.7	0.3	0 - 0.4	1%
3(i) Black Mountain to Downtown Kelowna - along Hwy 33 & Springfield	21.2	19.9 - 22.6	0.9	0.4 - 1.7	4%
4(i) Kettle Valley to Downtown Kelowna - along Pandosy & Lakeshore	21.1	17.8 - 26	2.6	0.7 - 6.7	12%
5(i) Glenmore Heights to Capri Urban Centre - along Bernard & Glenmore	8.2	7.5 - 9	0.8	0.5 - 1.3	10%
6(i) Rutland to Downtown Kelowna - along Hwy 33 & Hwy 97	12.7	11.8 - 13.6	1.0	0.8 - 1.1	8%
7(i) Pandosy to Downtown Kelowna - along Pandosy	7.2	6.5 - 8	0.5	0.4 - 0.8	7%
8(i) UBCO to Rutland - along Rutland & Hwy 97	11.9	8.9 - 16	1.2	0.5 - 1.3	10%
9(i) Capital News Centre (Lower Mission) to Landmark - along Gordon & Sutherland	8.7	8 - 9.6	0.7	0.4 - 1.1	8%
10(i) Farmers Market to KGH - along Springfield	6.9	6.3 - 7.6	0.6	0.5 - 1	9%

From the AM table of **Exhibit 2.2.5**, it can be seen that the highest delays, averaging 12% higher than the early morning travel times, occur on the **4(i) Kettle Valley to Downtown Kelowna** route, followed by 8(i) UBCO to Rutland and 5(i) Glenmore Heights to Capri Urban Centre, both with average delays of 10% above free-flow conditions. Overall, average delays along all of the routes during the AM peak period were 7% higher than early morning conditions.

Exhibit 2.2.6: Average Travel Times and Delays by Route, Fall, PM Peak Period

O-D Pair (Outbound Direction of Travel)	Average Travel Time (Mins)	Range of Travel Times Observed (Mins) (10th% - 90th%)	Average Travel Time Delay (Mins)	Range of Travel Time Delays Observed (Mins)	Average % Delay
PM Peak (Fall)					
1(o). Downtown Kelowna to Lake Country - along Glenmore & Clement	27.8	25.7 - 30.5	3.9	2.7 - 5.7	14%
2(o). Downtown Kelowna to Lake Country - along Hwy 97	26.7	23.7 - 31.5	6.3	4.1 - 10.3	24%
3(o). Downtown Kelowna to Black Mountain - along Hwy 33 & Springfield	22.5	21.8 - 23.3	2.8	2.7 - 2.8	12%
4(o). Downtown Kelowna to Kettle Valley - along Pandosy & Lakeshore	18.8	18.2 - 19.5	2.2	1.3 - 3.1	11%
5(o). Capri Urban Centre to Glenmore Heights - along Bernard & Glenmore	9.5	8.7 - 10.1	2.2	1.8 - 2.4	23%
6(o). Downtown Kelowna to Rutland - along Hwy 33 & Hwy 97	15.7	15 - 16.4	4.3	4.1 - 4.5	28%
7(o). Downtown Kelowna to Pandosy - along Pandosy	7.1	6.6 - 7.5	1.5	1.4 - 1.7	21%
8(o). Rutland to UBCO - along Rutland & Hwy 97	12.1	10.3 - 15.7	2.3	1.7 - 3.2	19%
9(o). Landmark to Capital News Centre (Lower Mission) - along Gordon & Sutherland	9.2	8.8 - 9.6	1.6	1.5 - 1.6	17%
10(o). KGH to Farmers Market - along Springfield	10.0	9 - 11	3.3	2.8 - 4	34%

* compared to early morning average travel times

From the PM table of Exhibit 2.2.6 it can be seen that the highest delay was observed along route **10(o) KGH to Farmers Market**, with average PM delays 34% higher than early morning conditions, followed by **6(o) Downtown Kelowna to Rutland**, with average delays 28% higher. Overall, the afternoon peak average delays across all routes were 20% higher relative to early morning conditions. This is almost three times more delay compared to morning peak period conditions.

2.2.3 Daily Congestion Levels

Exhibit 2.2.7 summarizes the average speed and congestion metrics by time period for weekdays (Tuesdays to Thursdays) and Saturdays. The summary shows that city-wide travel times and congestion levels vary over the course of the day.

Overall, average speeds along the arterials and highways monitored in the city are just over 40 km/hr throughout the day. The fastest travel times (when there is little or no traffic) are seen overnight (midnight to 6 AM). As residents and businesses start their day, traffic volumes grow and travel times lengthen, during the morning rush period, with average travel speeds decreasing by about 7.6% compared to overnight conditions, and then by 13.2% in the mid-day. However, while the mid-day experiences lower average speeds, the AM period is the most congested from a delay-reliability perspective with the AM showing a 19.5% CRI-90% rating—the lowest for any time period.

Towards the end of the day, as students and workers return home or travel to other activities, travel speeds are the lowest; over 19% slower than overnight periods. On Saturdays, mid-day travel times are slightly faster than weekday mid-day periods, however slightly more congested from a delay-reliability perspective (CRI-90% of 21.5 on Saturdays vs a CRI-90% of 24.4 on Weekdays).

Exhibit 2.2.7: Average Speed and Congestion Metrics by Time Period, Kelowna 2017-2018

	Average Speed	Average CI	Average CV%90	Average CRI-90%	Comparison vs. Overnight Speeds
Weekdays					
Overnight	46.2	91.2	3.7	28.8	
AM Peak	42.7	85.1	5.1	19.5	-7.6%
Mid-Day	40.1	80.4	4.0	24.4	-13.2%
PM Peak	37.3	76.1	4.2	21.9	-19.4%
Saturdays					
Mid-Day	42.0	81.8	4.5	21.5	-9.0%

All Time Periods	**41.7**	**82.9**	**4.3**	**23.2**
Exclud. Overnight	**40.5**	**80.8**	**4.5**	**21.8**

Notes: higher speeds indicate less congestion delay

higher CI indicates less congestion delay

lower CV%90 indicates less congestion volatility

higher CRI-90% indicates less congestion delay and volatility

2.2.4 Seasonality of Congestion

It is understood that traffic conditions vary by season. To understand the variations, average speed and congestion metrics were summarized by season. **Exhibit 2.2.8** shows the slowest/most congested season is Fall (Sep.-Nov.), followed by Summer (Jun.-Aug.). Interestingly, the least congested season is during the Winter (Dec.-Feb.). This may be due to a few possible factors, such as less volumes of people commuting to work and school during the winter break, as well as people leaving town to warmer climates. Also, as these metrics represent the whole day (excluding overnight periods), during the winter months, there may be less activities (and therefore travel), throughout the day. Contrasting this to the Summer season, in which there is a significant additional tourist population that arrives into the city, congestion is the highest with this temporary increase in population.

Exhibit 2.2.8: Average Speed and Congestion Metrics by Season, Kelowna 2017-2018

	Average Speed	Average CI	Average CV%90	Average CRI-90%	Comparison vs. Winter Speeds
Winter	40.8	81.3	4.1	23.3	
Spring	40.8	80.8	4.2	22.3	-0.1%
Summer	40.4	80.5	4.4	21.1	-1.0%
Fall	40.1	80.7	5.2	20.6	-1.6%
Grand Total	**40.5**	**80.8**	**4.5**	**21.8**	

Notes: data excludes overnight period

higher speeds indicate less congestion delay

higher CI indicates less congestion delay

lower CV%90 indicates less congestion volatility

higher CRI-90% indicates less congestion delay and volatility

2.3 Network-Wide Congestion Analysis

The congestion data collected across the city can be plotted to produce congestion maps for different times of the year. Using the CRI metric, network-wide average congestion values were shown to be somewhat similar in range across the year, with the lowest CRI values (i.e. most congested in terms of high delays and low reliability) observed in the Summer season during AM and PM peak periods:

- Winter AM Period Network CRI: 17

- Winter PM Period Network CRI: 17

- Spring AM Period Network CRI: 19

- Spring PM Period Network CRI: 19

- Summer AM Period Network CRI: 18

- Summer PM Period Network CRI: 16

- Fall AM Period Network CRI: 19

- Fall PM Period Network CRI: 17

  Note: higher values indicate a combination of less congestion and increased reliability.

While there are congestion differences across the network along specific roadway segments, overall, the congestion levels are similar in the Spring and Fall seasons with AM and PM period CRI values between 17 and 19. While the Spring and Fall seasons represent the least congested periods of the year (based on CRI), conversely, the most congested periods are during the Winter and Summer seasons, with AM CRI values between 17-18 and PM CRI values between 16-17. The most congested season and time period is during the Summer afternoon peak, with a CRI value of 16.

As the CI values are similar across the year during peak periods, the differences in measuring congestion with the CRI metric suggests the Winter and Summer seasons are more volatile/less reliable from a congestion perspective.

Exhibits 2.3.1 to 2.3.2 provide network-wide congestion maps based on the CRI metric for the Summer season during the AM and PM peak periods (Tues/Wed/Thu).

Exhibit 2.3.1: Network CRI for Summer – AM Peak Period, Tues-Thurs
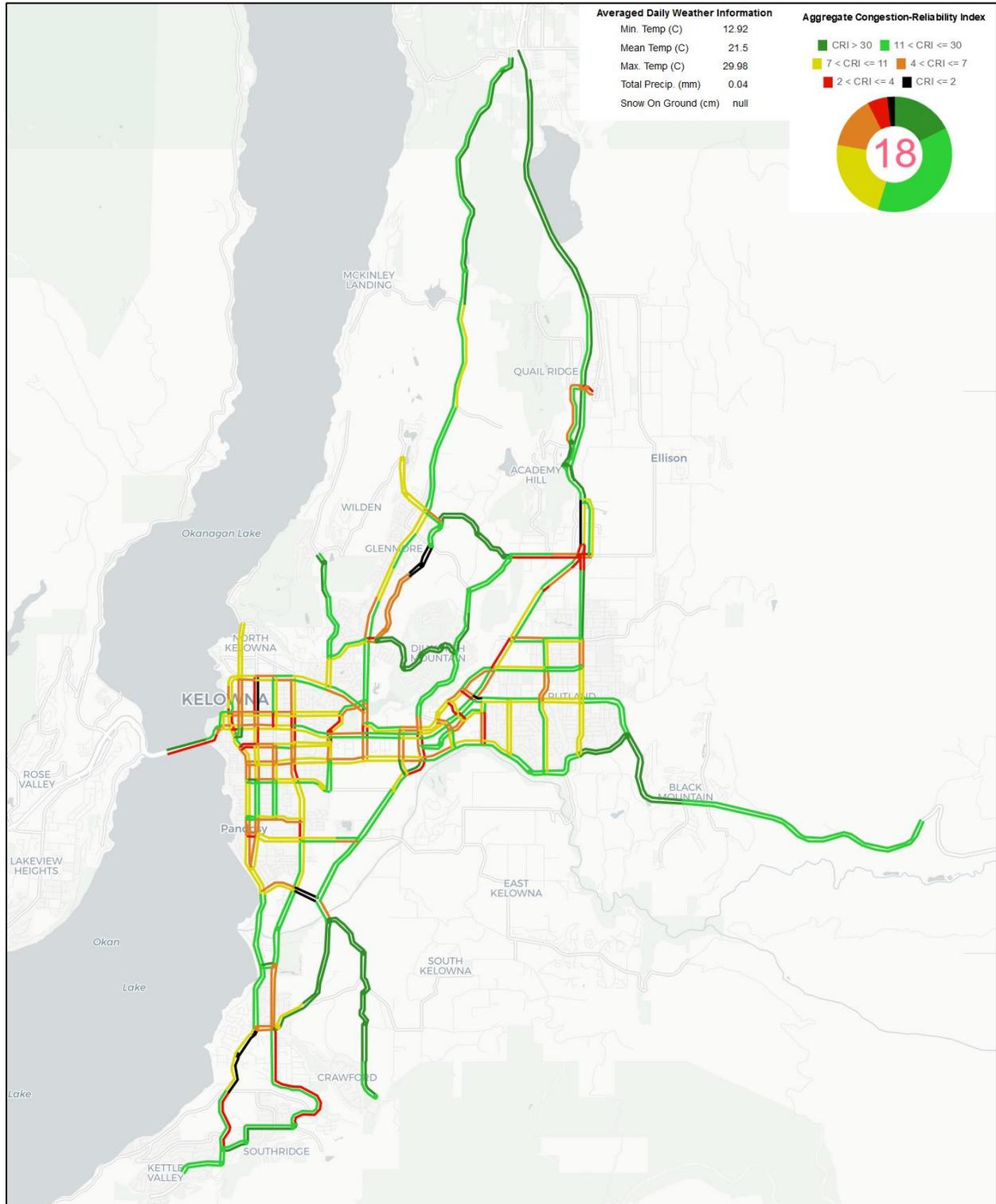
Exhibit 2.3.2: Network CRI for Summer – PM Peak Period, Tues-Thurs
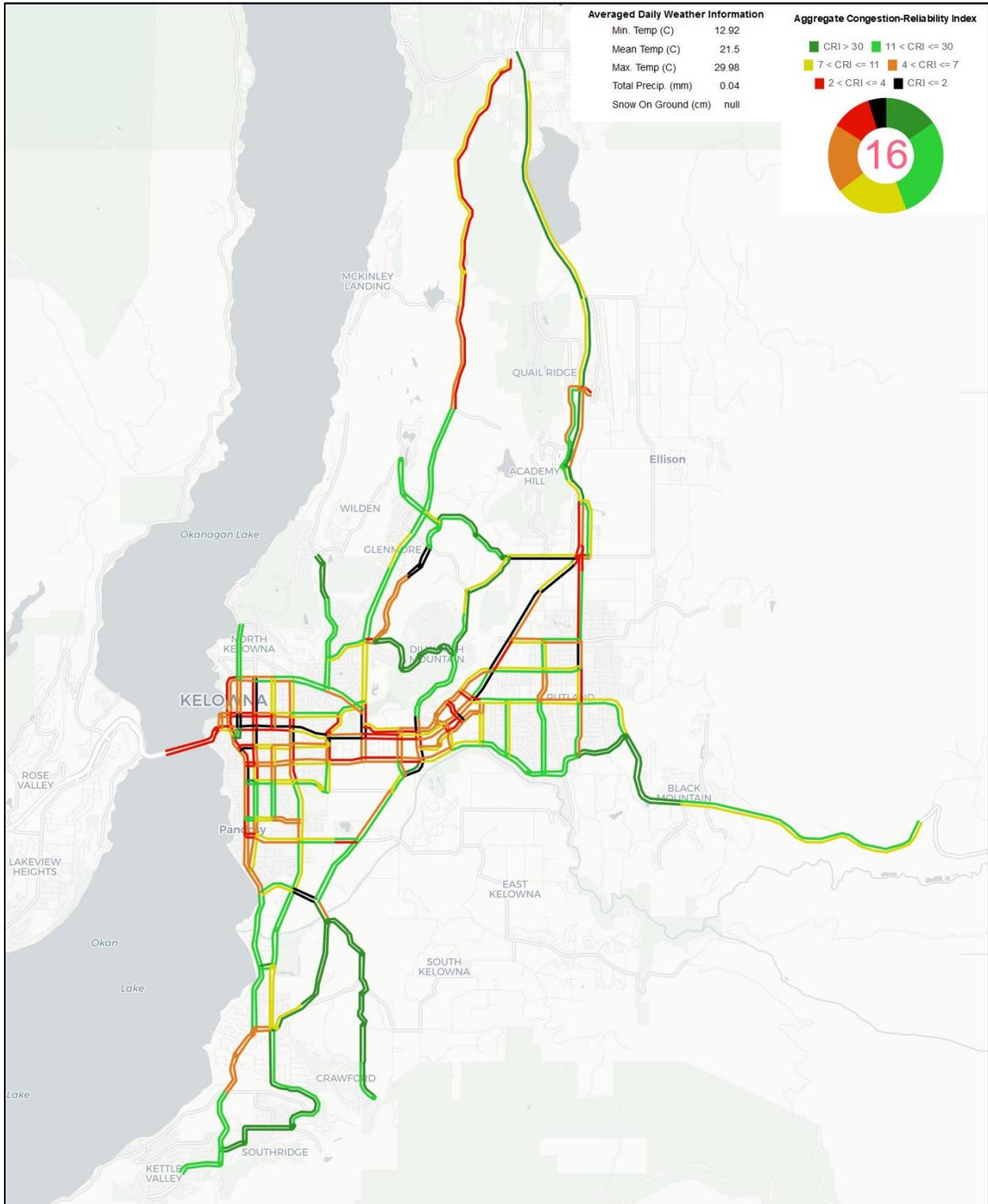
2.4 Change in Congestion: 2008-2017

A useful and important application of congestion data collected over time is the ability to monitor changes to routes and roadway segments. With the benefit of the **2008 Central Okanagan Travel Time Survey**[6] conducted almost a decade ago, a comparison between 2008 and 2017 data allows for the analysis of changes to congestion levels along comparable routes.

Exhibit 3.1 provides the summary of this historic comparison. Overall the following conclusions can be deduced between the 9-year period for the routes surveyed:

- **AM Period**: travel times increased at an average rate of **6.4%** between 2008 and 2017 during the AM Peak period (7:30AM-9AM)
- **Mid-Day**: travel times held steady, if not slightly increased by **0.6%** between 2008 and 2017 during the mid-day period (12PM-2PM)
- **PM Period**: travel times increased at an average rate of **4.7%** between 2008 and 2017 during the PM Peak period (3PM-5PM)

Exhibit 2.4: 2008 vs. 2017 Travel Time Comparison by Route

Route		Morning			Midday			Afternoon		
		2008	2018	Change	2008	2018	Change	2008	2018	Change
Lake Country (via Glenmore)	To DT	21.7	24.8	+3.1 (+14.5%)	23.7	26.2	+2.5 (+10.8%)	23.3	26.3	+3.0 (+12.5%)
	From DT	21.7	24.4	+2.7 (+12.8%)	23.2	26.3	+3.1 (+13.3%)	23.3	28.7	+5.4 (+23.3%)
Lake Country (via Highway 97)	To DT	22.1	21.3	-0.8 (-3.3%)	29.6	25.4	-4.2 (-14.3%)	29.0	25.2	-3.8 (-13.2%)
	From DT	21.0	21.7	+0.7 (+3.4%)	29.4	26.8	-2.6 (-8.9%)	27.9	27.4	-0.5 (-1.5%)
Kettle Valley	To DT	16.4	20.0	+3.6 (+21.4%)	20.0	21.6	+1.6 (+7.6%)	19.9	22.7	+2.8 (+13.9%)
	From DT	16.0	17.2	+1.2 (+7.2%)	18.2	18.9	+0.7 (+3.7%)	18.1	19.1	+1.0 (+5.4%)
Black Mountain	To DT	21.0	21.3	+0.3 (+1.5%)	26.7	23.6	-3.1 (-11.7%)	24.7	24.7	0.0 (+0%)
	From DT	22.3	20.5	- 1.8 (-8.2%)	26.0	26.0	0.0 (+0%)	25.2	26.5	+1.3 (+5.1%)
Peachland	To DT	24.8	27.2	+2.4 (+9.8%)	26.2	27.2	+1.0 (+3.6%)	27.8	28.0	+0.2 (+0.5%)
	From DT	22.4	24.3	+1.9 (+8.4%)	25.2	27.7	+2.5 (+10.3%)	27.1	29.5	+2.4 (+8.8%)

*2008 Survey average times recomputed by recapturing 2008 Survey GPS data

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[6] *2008 Central Okanagan Travel Time Survey*, October 28, 2008, Acuere Consulting for the City for Kelowna

While most of the corridor/time periods saw increases in travel times, there were reductions in travel times on a few corridor/time periods which may have been due to upgrades along Hwy 97. If so, this would suggest the highway upgrades that occurred improved overall performance and congestion levels immediately after completion for routes utilizing Hwy 97.

Overall, the routes with the largest increases in travel times were:

- Routes 2 and 7 between Glenmore/Beaver Lake and Hwy 97/Abbott (both directions): increase of up to 5.4 minutes (23.3%) for the outbound/north direction in the PM commute.
- Routes 5 and 10 between Chute Lake/Main and Hwy97/Abbott (both directions): increase of up to 3.6 minutes (21.4%) for the inbound/north direction in the AM commute.

Further investigations, including a comparison of the route travel times in context to the changes to the transportation system between these survey years, could provide further clarity and understanding of the results.

2.5 Conclusion: Applications for Transportation Planning

The use of "big data" in this report provides the "eyes" to see details in traffic at an unprecedented level. Having access to this rich data set allows for information-based decision making that will provide a strong foundation for transportation policy making and the development of the Transportation Master Plan. While this report provides a high-level summary of findings, the data can continue to support investigations such as:

- How many incidents of extreme congestion were detected last year, and of those how many are recurring vs. random (e.g. collisions)?
- How congested do roads adjacent to schools get during school days?
- How do changes in speeds correlate to collisions?
- What is a "healthy" level of congestion for a given time and location?

Moving forward, the rich set of congestion data collected will be used to help inform the development of potential projects, policies and programs for evaluation as part of the Transportation Master Plan. Specific attention will focus on problem areas identified in this report.

Further work will help to define reasonable and "healthy" levels of congestion that can be used to better evaluate the performance of the City of Kelowna's road network in

alignment with Imagine Kelowna and the community's long-term vision and goals for transportation in the City of Kelowna.