



2022 From Cars to Corridors : Land Use Strategies for Transit-Supportive Corridors

Final Report

Prepared for City of Kelowna
by SCARP Studio Team
University of British Columbia

Acknowledgement

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“The best
transportation
plan is

a
great
land-use
plan.”

- Brent Toderian,
former chief planner at the City of Vancouver

Figure 1 Downtown Kelowna

Executive Summary

As the fastest-growing municipality in Canada, Kelowna has adopted recent measures to increase housing and livability in the city. Transit Supportive Corridors (TSC) are one approach to support this growing population. TSC are existing transit networks that have been modified to facilitate dense land uses, creating engaging streetscapes and increasing ridership.

This report outlines a classification system for the TSC that may emerge in the City of Kelowna. The system identifies the current state of the corridors, along with interventions to move the corridor along the developmental continuum. Corridor development is a malleable process that can adapt to Kelowna’s needs over time. Our classification system contextualizes Kelowna’s corridors in their current state, focusing on strengths, opportunities for growth, and adaptability for future use.

A policy analysis, literature review, contextual inventory, case studies, and site visit form the basis of our recommendations. We use a critical lens to analyze initiatives across Canada and the United States, including Arlington, VA and Vancouver, BC, and propose policy to strengthen corridor development in Kelowna. Lastly, we classify the Pandosy corridor and recommend small-scale improvements before transitioning into broader interventions for the City.

There are 5 broad takeaways to strengthen corridors in Kelowna:

1. Strengthen retail shops and services
2. Encourage private development
3. Maximize pedestrian accessibility
4. Minimize automobile-oriented commercial development in pedestrian-oriented areas
5. Improve the pedestrian experience

Introduction

About the Project

Kelowna’s growing population and economic development present exciting opportunities to reshape the urban fabric of its metropolitan area. The 2040 Official Community Plan takes dramatic steps to forge ahead with this approach. It aims to manage growth through in-creased density in existing neighbourhoods. TSC are one approach in supporting increased density through improved livability.

TSC connect residential neighbourhoods to urban centres and village centres. These thoroughfares are designed to provide the transit services, destinations, and options necessary to improve livability across a metropolitan area. However, advancing corridors toward a fully-realized state requires continual fine-tuning, a process which Kelowna has commenced.

To support this process, our report presents a framework for the development of TSC in the future. This framework serves as a reference to guide the City’s development within, along, and around corridors. The framework is mal-leable, such that applications to similar corri-dors may be altered to fit another context. It is meant to be a tool as the City creates a vision for the future, with aims at policy refinement, urban realm enhancement, and densification that resonate with the City’s identity.

This report converges the cumulative efforts of components developed over seven months. It provides a contextual background of Kelowna, a policy review, and a literature review on foundational information, critical lenses, and recent findings in the academic area. The “Livable Corridor Transit Typology” frames and supports recommendations meant to transi-tion corridors to a more advanced state of development (Allen 2016). More specifically, the critical lens used here serves as a way of organizing the case studies we examined to find promising practices, and these practices along with additional policies drawn from other areas of planning practice inform possible interventions. Lastly, an example study of the Pandosy corridor is examined in detail, with recommendations provided for its growth along the typology used here.



Figure 1: Kelowna’s Waterfront



Figure 2: Downtown Kelowna

What are Transit Supportive Corridors?

TSC can be imagined as arteries that act as transportation conduits between relatively dense urban and village centres. When properly developed, TSC disperse residents along the corridor to facilitate growth. Some types of growth are increases in residential den-sity and commercial viability. In the latter case, a higher concentration of residents may support new and existing businesses.

TSC and dense urban centres are vital for the future of Kelowna, as these thoroughfares and spaces are buffers between major roads and densifying neighbourhoods. They simultaneously create liveable communities and sustainable communities that reduce vehicle use, increase commercial capacity, and add amenities. However, a one-size-fits-all approach cannot be applied to all corridors. Each corridor has its own identity, includ-ing physical characteristics, transit services, demographics, and more. It is imperative to understand local context when determining a framework for the future. Kelowna aims for densities of 50-100 people per hectare within 200 metres of each corridor. There is ample opportunity to create highly supportive spaces for transit and community. The extent of the benefits reaches as far as creating a healthier Kelowna. Increased access to public transportation and usage is associated with upwards of one fifth of the 150 minutes of exercise recommended by the World Health Organization (Xiao et al., 2019).

If TSC are indeed the arteries of a denser city, it is vital that everyone can navigate them. Taking on an equity perspective on movement, as well as housing selection, ensures that all residents, newcomers, and visitors are included in City initiatives. Renters and home-owners should be able to access destinations freely and select housing that meets their needs. Access to public transit and active transportation infrastructure is often a second thought in the housing market. Yet, it is imperative to residents who need or want to get around without a car.

The rest of the report explores a corridor classification system, small and large-scale recommendations, and the future of corridor development in Kelowna.

Kelowna Context

Kelowna, British Columbia is a medium-sized city on the eastern bank of Okanagan Lake. The municipality comprises 214 km2 of land and 48 km2 of water at the centre of the Okanagan Valley (City of Kelowna, n.d.). With a population of over 140,000 residents, Kelowna is the largest city and economic hub of the region. The Kelowna census metropolitan area (CMA) encompasses Kelowna and West Kelowna. It is the fastest-growing metropolitan area in Canada. Since 2016, the population of the city has grown by 13.5%, while that of the CMA has increased by 14% (Statistics Canada, 2022).

Kelowna has a diverse economy. Agriculture, centred on fruit farming and winemaking, is the region’s historic economic engine and continues to play a significant role. Retail is expected to continue growing in both local and regional markets. Tourism, light industry, and manufacturing are becoming increasingly important to the economy. Other expanding sectors include the logistics industry around Kelowna International Airport, post-secondary education at UBC Okanagan and Okanagan College, and the technology industry.

BC Transit operates the Kelowna Regional Transit Network, which serves Central Okanagan. Currently, a network of 31 bus routes provides service to Kelowna, West Kelowna, Lake Country, and Peachland. While most routes are categorized as local routes with infrequent service and numerous stops, a few frequent bus routes run within the city proper and a single rapid bus route connects the region. The network is the second largest in BC, serving nearly 5 million passengers annually (Waters, 2017).

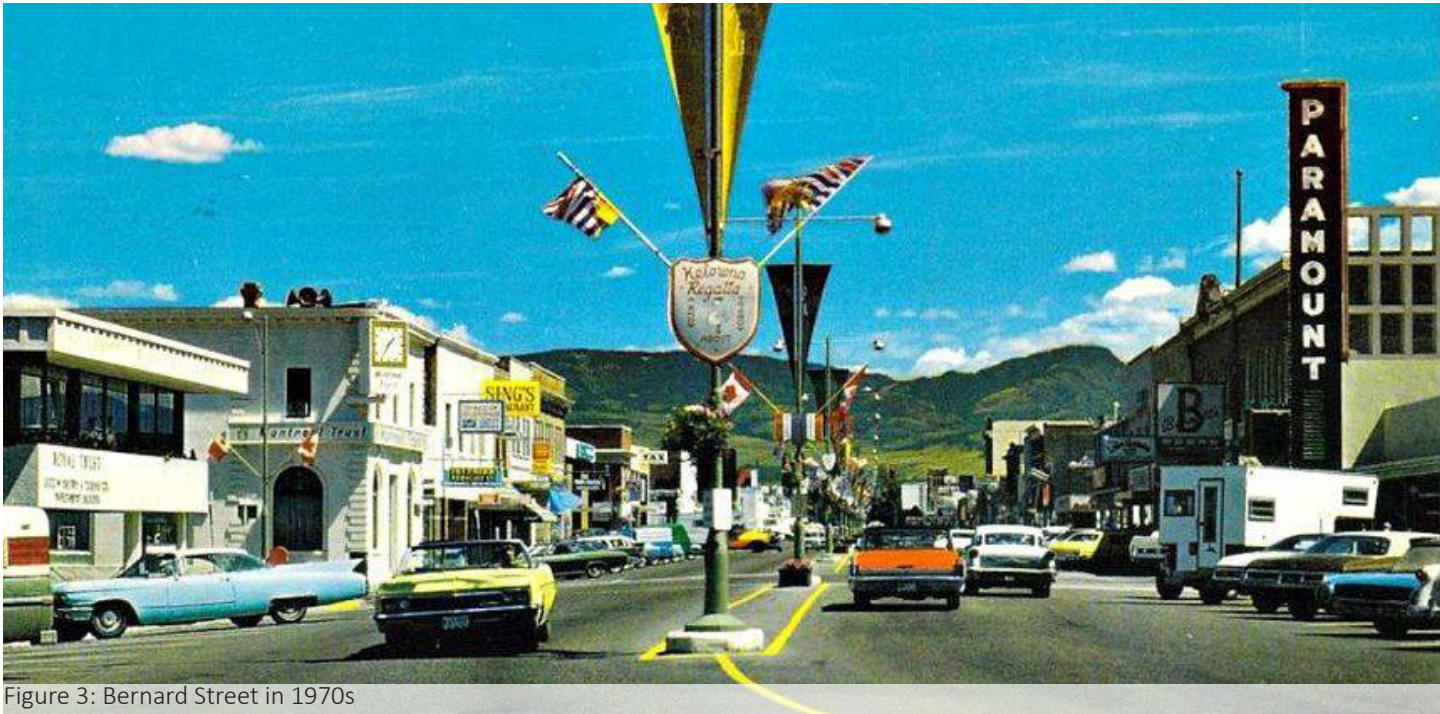


Figure 3: Bernard Street in 1970s

A Brief History

The Okanagan Valley was inhabited by Syilx peoples since time before memory. These First Nations communities hunted, fished, gathered, and traded with one another for generations. They managed their resources using traditional practices and had a varied diet. Although they moved around their territory frequently, they stayed in pit houses during the winters. Europeans began arriving in the Okanagan Valley in the 1800s. The Hudson’s Bay Company and competitors set up trade routes and forts in the region and started trading furs and other goods.

In 1859, Father Pandosy founded the Okanagan Mission, the first permanent European settlement in the valley. He introduced apple and grape cultivation to the region, which remain important crops today. Steamboats brought passengers and goods across the lake and linked together the region. The completion of the Canadian Pacific Railway and Kettle Valley Railroad improved connectivity and facilitated the growth of a successful farming community. In 1905, Kelowna was officially incorporated. Despite its small population of 600 residents, Kelowna quickly developed into an economic hub with sawmills, fruit packing plants, and canneries.

Kelowna grew rapidly in the 1920s. Orchards, ranches, and farms expanded throughout the valley, exporting agricultural produce to coastal cities using the newly built railroads. The fast-growing town also acquired numerous new amenities including banks, churches, schools, and stores. In the 1940s, returning Second World War veterans moving to Kelowna led to a wave of economic development. This postwar growth was centred on the automobile, with the development of car-oriented suburbs and infrastructure. In 1977, the Kelowna Regional Transit System started operations, replacing a small private bus company (Waters, 2017).

Between the 1970s and 1980s, the City of Kelowna’s boundaries kept expanding via amalgamations with surrounding cities. To link Kelowna with the rest of the province, the floating Okanagan Lake Bridge and the Coquihalla Highway were completed in the latter half of the 20th century. William R. Bennett Bridge was built in 2008 to replace the floating bridge. Despite slower economic growth in the 1980s, Kelowna’s population reached 100,000 by 2000. Kelowna is now home to a diverse community, with visible minorities accounting for 9.5% of the population (Marsh, 2022). The Westbank First Nation, whose reserve is located on the western shore of Okanagan Lake, is the geographically closest Indigenous community. They retain the right to self-government over their reserve lands.



Figure 4: Statue of Syilx Chief Charlie Swkncut



Figure 5: Lake Okanagan and vineyards

Developing frequent transit corridors integrated with higher residential density and transit supportive land uses is a priority for both the City of Kelowna and the Central Okanagan. Plans and policies, encompassing different policy areas, are in place to study, identify, and support the development of TSC’s. The following table summarizes key directions from and evaluates the impact of relevant plans and policy documents that influence the development of TSCs. In particular, it identifies if existing context supports, impedes, or is neutral to TSCs.

Scope: Municipal Government - Kelowna		
Document	Key Directions Relevant to Transit Supportive Corridors	Evaluation
Kelowna 2040 Official Community Plan	Prioritize retail and restaurant uses in Village Centres along TSCs to improve pedestrian environment. (Objective 5.1: Policy 5.1.3)	Supports
	Increase residential density along TSCs through the development of low-rise apartments and stacked townhouses, and encourage small-scale commercial uses integrated into neighbourhoods. (Objective 5.2: Policy 5.2.1, 5.2.2, 5.2.4)	Supports
	Discourage larger infill projects, row housing, and apartment housing in Heritage Conservation Areas, even along TSCs. (Objective 5.3; Policy 5.3.7)	Impedes
	Apply transit-oriented design to commercial areas adjacent to TSCs. (Objective 5.6; Policy 5.6.2)	Supports
	Establish a frequent transit network along key corridors, including TSCs, to link together Urban Centres, Core Area Neighbourhoods, and Village Centres. (Objective 5.14: Policy 5.14.5)	Supports
	Establish walkable, mixed use, and multi-modal streets with pedestrian-friendly streetscapes, transit priority measures, and quality transit infrastructure. (Objective 5.15: Policy 5.15.2, 5.15.5, 5.15.6)	Supports
Zoning Bylaw No. 12375	Increase maximum floor area ratios (FARs), maximum heights, and maximum bonus density for residential and commercial developments in specific zones adjacent to TSCs	Supports
	Limits higher density and mixed use zoning along TSCs, due to prevalence of zoning for single detached housing and duplex housing	Impedes
	Requires a large number of off-street parking spaces in residential developments, with provisions for lower parking space minimums limited to lots directly adjacent to TSCs	Impedes

Scope: Municipal Government - Kelowna		
Document	Key Directions Relevant to Transit Supportive Corridors	Evaluation
2040 Transportation Master Plan	Support growth along TSCs by increasing transit service, adding transit priority signal measures, as well as providing clean, safe, and accessible bus shelters and amenities (Policy 3.2-3.6)	Supports
	Specific increases to transit service by 55-120% combined with improvements to transit infrastructure along TSCs including Rutland, Glenmore, Gordon, Pandosy, Richter corridors (Projects 27.2, 27.5, 27.6, 27.7, 30, 31, 43.2, 45, 47, 85)	Supports
Our Kelowna as We Take Action: Kelowna’s Community Climate Action Plan 2018	Improve public transit service by working with BC Transit (Action T3)	Supports
	Coordinate land use and transportation to encourage more sustainable travel modes (Action LU4)	Supports

Scope: Regional Government - Central Okanagan		
Document	Key Directions to Transit Supportive Corridors	Evaluation
Central Okanagan Transit Future Plan 2012	Increase frequency and efficiency of transit service on key corridors, helping support medium- to high- density land uses	Supports
	Develop north-south frequent transit network corridors along Springfield, Pandosy, and Gordon	Supports
Central Okanagan Regional District Regional Growth Strategy 2014	Concentrate new housing development in existing neighbourhoods to reduce infrastructure costs and support public transit (Policy 3.2.6.1, 3.2.6.3)	Supports
	Support the development of mixed use, compact communities and the transformation of existing neighbourhoods to encourage residents to travel by transit and active transportation (Policy 3.2.7.7)	Supports
	Focus transportation funding on improving transit and active transportation, supporting transit oriented development and active transportation amenities (Policy, 3.2.9.5, 3.2.9.8)	Supports
Sustainable Transportation Partnership of the Central Okanagan: Regional Transportation Plan 2020	Focus regional growth along transit corridors located in Urban Centres, reducing the length of commutes by allowing people to live closer to work (5.1.1)	Supports
	Limit expansion of roadways and highways by improving travel demand management, active transportation, and transit (5.2.2)	Neutral
	Coordinate rezoning and collection of development cost charges with neighbouring municipalities to improve transportation along key corridors	Neutral

Corridor Based Transit-Oriented Development

Introduction

This literature review contextualizes TSCs in relation to relevant corridor development frameworks that have been studied in the academic literature. The principal frameworks are corridor transit-oriented development (C-TOD) and bus transit-oriented development (B-TOD), which are relatively new areas of study. Previously, the broader concept of transit-oriented development was mostly approached in isolation from other theories. In action, C-TOD and B-TOD facilitate real-world systems, from bus rapid transit to frequent transit networks.

What is C-TOD?

Corridor transit-oriented development (C-TOD) is distinguishable from other TOD models in its focus on connections rather than nodes or corridors alone. Calthorpe (1993) initially described TOD as a “mixed-use community within an average 2,000-foot walking distance of a transit stop and a core commercial area” (p. 56). In C-TOD, the TOD is extended to multiple transit stops and commercial areas along a line.

C-TOD frameworks

Three frameworks commonly represent C-TOD on the ground. Although the publication dates are contiguous, each framework reflects a unique line of thought that was novel for its time. These findings are useful in distinguishing corridors and quantifying features of the built environment. In ongoing projects, such categories tell us where we are now and where we can go in the future, thus serving as powerful implementation tools founded on years of research.

C-TOD studies generally focus on the elements of the built environment that make corridors function well. To outline these elements, the 5D variables of the built environment — design, density, diversity, distance, and destination accessibility— were expanded from the 3D variables of the built environment proposed earlier (Cervero & Ewing 2010). The earlier study identified design, density, and diversity as pivotal factors in calculating livability and walkability (Cervero & Kockelman 2001). Later, the formula was revised to include distance and destination accessibility. The quantification of livability spurred many studies on the most influential variables in the formula (Berawi et al., 2020).

Going further in this direction, the “Livable Transit Corridor Typology” (Allen et al. 2016) categorizes streets as emerging, transitioning, and integrated corridors. Emerging corridors possess the least investment and activity, while integrated corridors contain the most investment and activity. Transitioning corridors cannot become integrated corridors if commutes between centres are prioritized over activity within the corridor itself (p. 100).

In 2010, the Center for Transit-Oriented Development denoted three types of corridors: destination connectors, commuter corridors, and district circulators (Liu et al. 2020, p. 4). Destination connectors link residential neighbourhoods to employment and recreation op-

portunities. Commuter corridors facilitate movement to the city centre, guiding inbound traffic flow in the morning and outbound traffic flow in the evening. District circulators accelerate movement through business districts. Here, the emphasis on transportation planning contrasts Allen’s focus on land use and the 5D variables (2016).

Common failures

As written by American city planner Jeff Speck, every commute begins with a walk (Speck 2012). There is no “silver bullet” for success in corridor development, but accessibility and mobility are key concerns (Allen et al. 2016, p. 314). Without thorough consideration of all users and abilities, transit-oriented development is doomed to become transit-adjacent development (Suzuki et al. 2015). Pedestrian infrastructure may be a good place to start.

Transit-oriented development often evolves into transit-adjacent development during implementation. This form of development does not necessarily involve public transportation and refers to parcels near major arterials. The difference can make or break ridership. The prioritization of safe walking environments is a core factor in successful C-TOD. Namely, the appearance of active transportation infrastructure in one place does not facilitate the same impact as the appearance of such infrastructure in multiple locations.

In a 2000’s TOD site, Orenco Station, 64% of survey respondents in the Hillsboro, Oregon neighbourhood used single-occupancy vehicles for work commutes in 2007 (Podobnik 2011, p. 117). There were no statistically significant behavioural changes in transit use. This example provides a wealth of knowledge on oversights in TOD, chiefly in the planning process. The balance between unattainable TOD and uninspired transit-adjacent development requires intentional collaboration that stretches beyond land use planning and complements traffic engineering, transportation planning, and policymaking.



Figure 6: Orenco Station Town Centre

Bus Transit-Oriented Development

What is B-TOD?

The B-TOD lens is similar to C-TOD in that it emphasizes connections between neighbourhoods. It is an implementation tool, rather than a framework. As such, research on B-TOD examines the budgets and socioeconomic impact of broadening transit networks. In the United States, an estimated 7.8% of TODs are bus transit-based, and this statistic is only growing (Cervero 2004). Bus services mimic the qualities of urban rail systems without burdensome financial demands, offering a cost-effective alternative in smaller cities.

What are bus rapid transit and frequent transit networks?

Bus rapid transit (BRT) is a system of facilities, services, and amenities that improve the speed, reliability, and identity of bus transit (Levinson et al. 2002). It is sometimes considered a “rubber-tired light rail transit” with greater flexibility and lower operating costs (p. 2). Regardless, real and perceived weaknesses damage its reputation. Buses compete with personal vehicles and, in North America, uphold a reputation as a low-quality mode of transit (Hidalgo 2014; Baker et al. 2018).

Frequent transit networks are a relatively new approach in transportation planning and engineering. This strategy refers to bus systems over other modes of transit. It is implemented in response to user concerns with unpredictable schedules. Stops are placed farther apart with quicker headway, with 15 minutes or less between each arrival. The assumption is that users will walk longer distances for reliable service.

Strengths and weaknesses of B-TOD

To achieve an impact, B-TOD must be executed with a detailed plan. Although it is widely recognized that ridership is dependent on density and land use, recent studies show there is more to the story. Population density, multifamily residential land use, distance from a central business district (CBD), distance from downtown, service quality, pedestrian accessibility, and parking supply play roles in ridership (Johnson 2003, p. 23).

B-TOD can be studied in relation to rail transit-oriented development (R-TOD). Key similarities are benefits like expanded labour markets, lower travel costs, and higher quality of life, especially when car use is discouraged. Differences include the impermanence of bus systems, potential for low usage, and resulting low-density, small-scale development along corridors. B-TOD almost always suggests lower density (Calthorpe 1993; Cervero 2004; Currie 2006).

Planned, implemented, and executed well, the impermanence of bus systems can make way for timely changes that facilitate densification via malleability of development. For example, Cervero and Dai (2014) observe the potential for bus transit-oriented development to fail without ample private development along transit networks (p. 137). The encouragement of private development could include changes to zoning, assistance with land assembly, and improvements to streetscapes.

Another oversight is a lack of pedestrian access. High-quality walking environments, such as footbridges and green walkways, increase real estate prices, particularly when they connect bus stops and high-density land uses. Such connectors issue enjoyable paths that appeal to various users and pose minimal risk to pedestrians.

Conclusion

Oversights in C-TOD and B-TOD are similar in some ways. Pedestrian accessibility is a consideration in each area of study, and the availability of sidewalks, walkways, and bike-ways affects success. In line with the 5D variables, distance to business districts impacts corridors and bus services alike. The most significant difference is that C-TOD can exist without bus services. Similarly, the presence of corridors does not necessarily improve ridership. The corridor must be planned around a particular transit system to strengthen ridership

As such, a dominant mode of transit should be selected in this project. This is likely bus rapid transit. While a light rail system is under consideration, BRT is the most accessible choice in the near future. Therefore, we will centre bus transit-oriented development, bus rapid transit, frequent transit networks, and their relationships to land use patterns.

Our final deliverable uses established categories in the “Livable Transit Corridor Typology” framework. When it comes to Kelowna’s corridors, such as Pandosy Street, criteria facilitate a better understanding of current properties and future objectives. Allen’s framework demonstrates a classification system that outlines current properties in a manner that easily supports and facilitates future objectives.

Livable Transit Corridor Typology (Allen 2016)

Allen’s “Livable Transit Corridor Typology” framework (2016) divides corridors into three types: emerging corridors, transitioning corridors, and integrated corridors. These types are organized in order of effectiveness, with integrated corridors in the most advanced position. Both emerging and transitioning corridors indicate limited investment and infrastructure; however, a transitioning corridor possesses major destinations, such as activity centres.

Major destinations are the keystone of the framework. A transitioning corridor cannot become an integrated corridor without adequate transit service coverage within the corridor. In other words, service to destinations within a corridor is better than service to destinations outside the corridor. Ideally, major destinations support diverse uses, like retail and cultural opportunities, in moderate to high densities.

Smaller subsections reflect context and unique considerations. Emerging subsections include commercial and industrial corridors, suburban commuter corridors, and local bus corridors. Transitioning subsections include major destination corridors and revitalizing corridors. Integrated subsections include continuous transit-oriented corridors and transit-oriented nodes corridors.

To further support corridor development and transit usage, destinations along routes should be situated within 400m of bus stops or corridors. 400m is a comfortable distance, roughly a 5 minute walk, for most ages and abilities, with many able bodied individuals walking longer for trips (Yang & Diez-Roux, 2012). Within this 5 minute walk, captured by a walk shed and not euclidean distance, people are much more likely to walk than drive. This in turn can support viability of corridors as it supports pedestrian movement and transit usage.

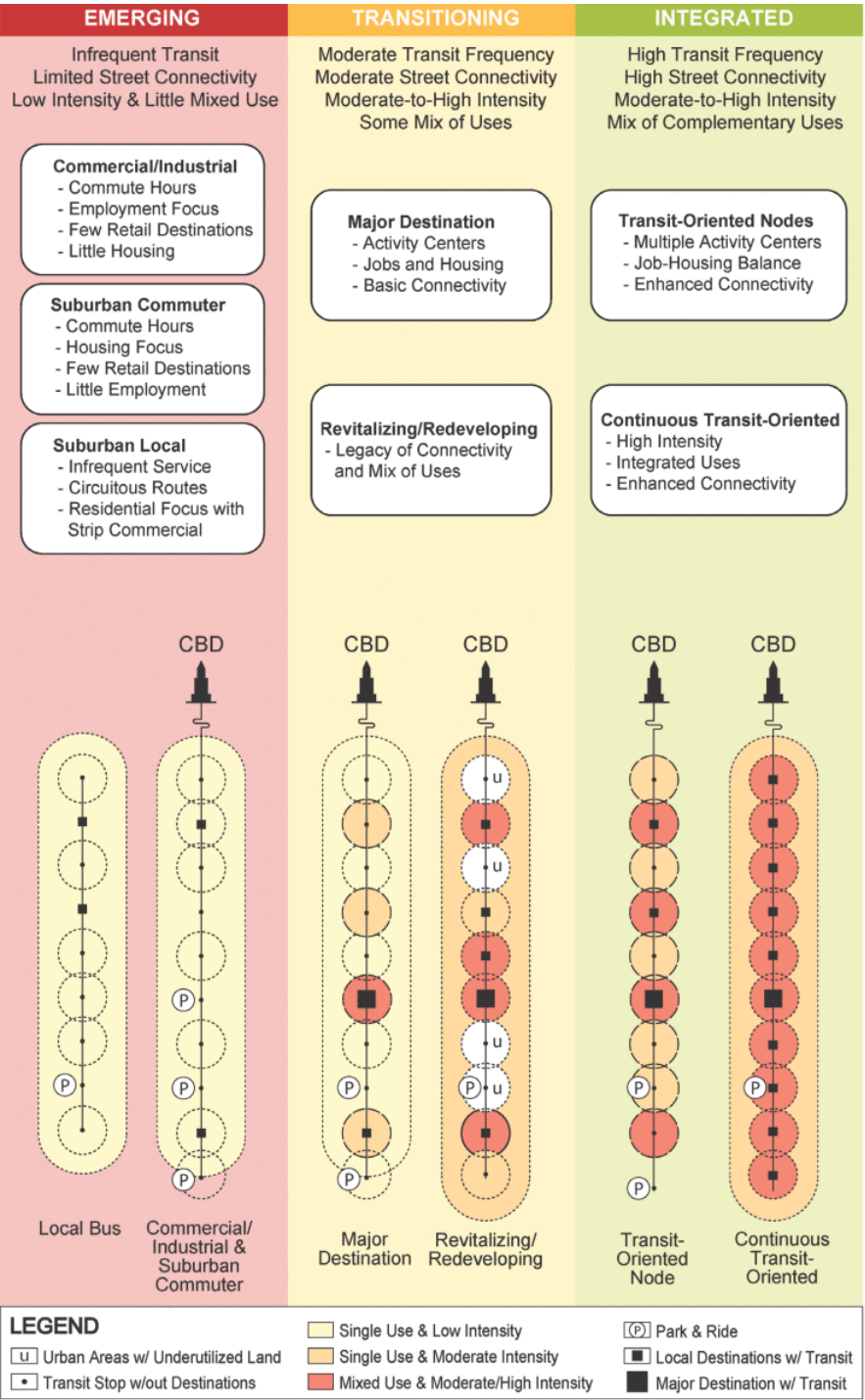


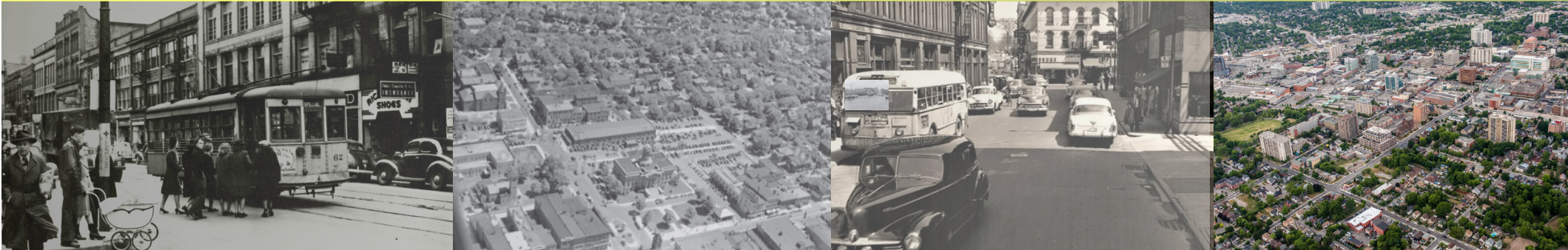
Figure 7: Corridor uncharacteristic and Performance (Allen, 2016)

FROM CARS TO CORRIDORS

Case Study: Overview

Case studies are valuable tool for urban planning by providing real-world examples of successful (and unsuccessful) urban planning projects. By utilizing the Livable Transit Corridor framework as a critical lens, various cities across North America including Waterloo region in Ontario, Vancouver in British Columbia, and Arlington in Virginia, were analyzed and identified as emerging corridor typologies. Despite similarities in their categorization, each city’s unique path and pace of corridor development can offer Kelowna valuable insights and lessons.

Emerging



Transitioning

Waterloo, ON



Figure 8-13

Emerging

Transitioning

Arlington, VA

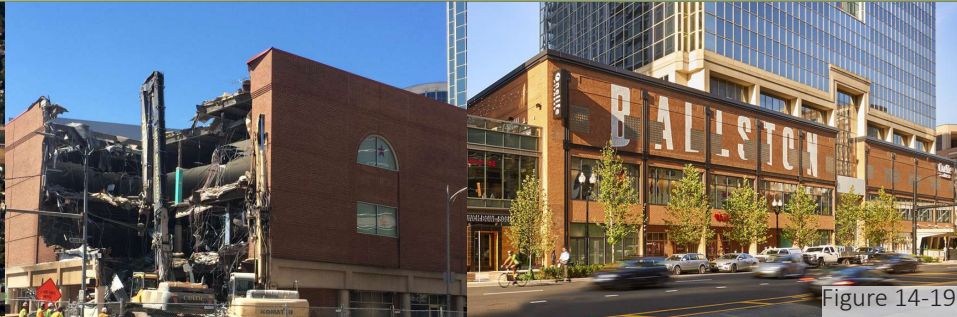


Figure 14-19

Emerging

Transitioning

Vancouver, BC



Figure 20-25

1900s

CURRENT (2020s)

Waterloo Region: Central Transit Corridor



Figure 26: ION LRT in Waterloo-Kitchener

The Waterloo Region consists of three cities- Cambridge, Kitchener, and Waterloo (tri-cities), as well as four rural townships. With a population of approximately 630,000, it is the tenth largest CMA in Canada. Like Kelowna, the Waterloo Region is experiencing rapid growth and expects to accommodate 750,000 residents by 2031. Similarly, the region has a strong agricultural heritage, rural and urban character, and major post-secondary institutions.

However, the Waterloo Region is notably the least populous urban area in North America to build a new light rail transit (LRT) system. While LRT is a recent development, it is the culmination of decades of regional and local planning focused on creating a Central Transit Corridor (CTC) to support intensification and reduce suburban sprawl.

Corridor Development History

After its beginning as an agricultural community, the Waterloo Region transformed into an industrial hub during the postwar period. In 1973, the Tri-Cities and townships in the area came together to form the Regional Municipality of Waterloo to coordinate planning efforts. CTCs as an approach in connecting growing cities and supporting regional development were conceived in the first Regional Official Policies Plan in 1976. However, due to the economic downturn that followed, the implementation of CTCs was delayed until the early 2000s.

Emerging Corridor

The 2003 Regional Growth Strategy aimed to curb sprawl by concentrating development within the CTC and revitalizing historic downtowns. Putting this plan into motion, the region implemented a rapid bus line along the CTC. Branded “iXpress”, the rapid bus followed a 37-kilometre route linking major destinations in the Tri-Cities including commercial districts, shopping centres, and universities.

In between these destinations, however, the rapid bus route traversed low-density, car-oriented neighbourhoods. The iXpress was faster, more frequent, and more punctual than local buses. It ran on 15-minute headways during peak periods, and stations were set far apart. Transit signal priority at intersections and improvements to the pedestrian infrastructure were also implemented. As a result, a degree of modal shift was achieved and ridership climbed to 20,000 trips daily by 2018. iXpress’ success paved the way for LRT.

Transitioning Corridor

The first phase of the “ION” light rail system opened in 2019, linking Waterloo and Kitchener. The second phase, connecting Kitchener with Cambridge, was slated for 2028. Since the development of the Regional Growth Strategy, LRT was seen as the key tool in focusing residential and employment growth in the CTC. The ION followed a route along the centre of the corridor, similar to the route pioneered by the iXpress.

The impact of the ION on development was immediate and more pronounced than that of the iXpress. ION’s approval in 2011 was followed by a wave of redevelopment and in-fill worth over \$3.8 billion within the corridor (Young 2021; Young & Doucet, 2021). From 2011 to 2020, the CTC witnessed rapid population growth twice as fast as other areas in the region. (RMOW, 2020).

Municipal and regional plans were developed to guide intensification in the CTC. The CTC Community Building Strategy, a high-level document guiding investment, planning, and infrastructure, calls for increasing multi-family residential buildings throughout the corridor along with more office spaces near stations (RMOW, 2013). The regional transportation plan provides guidelines for transit-supportive land uses, including recommendations to minimize parking, integrate active transportation, and create pedestrian-friendly



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Case Study 1: Waterloo

zones around stations. The plan aims to facilitate higher density, as well as walkable developments near stations and adjoining areas of the corridor (RMOW, 2010).

Future Directions

While the CTC has developed rapidly in recent years, catalyzed by the ION light rail project, the corridor does not qualify as an integrated corridor. High capacity transit and concentrated employment centres are present. Yet, the corridor lacks key characteristics, such as high street connectivity and significant mixed-use developments outside of historic core areas. Although the municipalities have updated their land use plans to focus growth within the CTC, substantial portions of the corridor consist of low-density residential zoning. To support the CTC’s development into an integrated corridor, the region needs to ensure a balance of housing and employment centres and continue to facilitate mixed-use developments throughout the corridor.

Challenges

Gentrification is an ongoing challenge resulting from CTC development. Recognizing the potential for transit projects to result in gentrification, the Waterloo Region began to monitor housing inclusivity, along with a range of different factors in the corridor. From 2011 to 2020, the proportion of sold housing affordable to the region’s low- and middle-income earners decreased from 62% to 24% (RMOW, 2016; 2020).

While alarming, this measure of absolute housing prices does not factor the decreasing size of units that are constructed and sold. Many of the new housing units in the CTC are single-bedroom, with few two- or three-bedroom units. This suggests that the cost per square foot has increased significantly quicker than the unit prices indicate. In addition to market condominiums, purpose-built rental is being constructed, but affordable units are rare. For example, only 10 of 858 units are affordable in the Barrel Yards purpose-built rental development in Waterloo (Doucet, 2021; Young & Doucet, 2021).

Despite the region’s official report indicating a low rate of tenant displacement, there have been concerns over the transforming social landscape due to perceived increase in evictions. Low- and middle-income residents, particularly families, are relocating from the corridor due to the lack of affordable and suitable housing. The resulting erosion of community connections and support networks, which are especially important for low-income residents, may exacerbate displacement and further gentrification.

Takeaways

The Waterloo Region’s CTC developments show the promise and pitfalls of corridor-based transit-oriented development for medium-sized cities. Like Kelowna, the Waterloo Region redirected development from suburban to urban areas by implementing transit as a growth management tool. The success of iXpress and ION in achieving this purpose demonstrates effective long-range planning and cooperation between regional

FROM CARS TO CORRIDORS

Case Study 1: Waterloo

and local governments. The quick transition from rapid bus to light rail showcases that higher frequency and higher capacity bus service can set the stage for higher order transit. It is notable, however, that substantial investment and development in the CTC occurred only when LRT was approved.

Despite concern about the potential for transit-induced gentrification, Waterloo Region did not effectively mitigate impact. The region developed a monitoring program to analyze 18 indicators on an annual basis. This approach did not capture the full breadth of the situation. For instance, housing affordability was measured using transaction prices, the number of community housing units, and the proportion of households receiving rent assistance. If housing unit size and cost per square foot were considered, the monitoring program would have revealed the lack of affordable and suitable housing for larger, low-income households.

Inadequate monitoring may have been responsible for the lack of action on housing affordability and displacement mitigation. It seems that there are no established procedures to directly transform the outcomes of the annual monitoring reports into actionable policies. The scarcity of reasonably priced rental housing was amplified by a lack of emphasis on constructing affordable, purpose-built rental and social housing. Municipal governments in the Tri-Cities did not have sufficient incentives and requirements to ensure developers created these types of affordable units.

Vancouver: Cambie Corridor



Figure 27: Mid-rise developments along Cambie corridor.

Cambie Street is a major arterial road in the City of Vancouver. The opening of the Canada Line rapid transit system, of which a significant section runs underground, provided the opportunity to transform an emerging corridor into a transitioning corridor. This corridor is currently home to 34,800 residents, and its population is expected to double by 2041, accompanied by significant increases to employment (City of Vancouver, 2021).

Like Kelowna, Vancouver is a British Columbia municipality that possesses a serious housing affordability crisis. The Cambie Corridor planning process offers relevant lessons on land speculation and housing affordability.

Corridor Development History

Emerging Corridor

Cambie Street was created in 1912 and became a major parkway and transit route by the 1930s. Unlike adjacent north-south arterials such as Granville Street or Main Street, Cambie Street did not host a streetcar line (British Columbia Electric Railway Company, 1923). As such, the corridor did not develop like a streetcar suburb. It largely consisted of single-family dwellings. Despite gradual densification throughout the postwar period, the area was predominantly zoned for low-density residential housing with pockets of multi-family residential housing and car-oriented commercial uses in the early 2000s (City of Vancouver, 1960; 1974; 2001). A single trolley bus route provided frequent but slow service on the street, connecting major destinations along the corridor, such as Cambie Village, Queen Elizabeth Park, and Oakridge Centre.

Transitioning Corridor

In 2009, a wave of development followed the opening of the Canada Line. While the high-rise development near Oakridge and Marine Drive stations are the most visible structures, the project propelled substantial mid-rise and infill development along the corridor. By 2015, approximately 6600 new residential units along with over 327,000 sq ft. of commercial space and 272,300 sq ft. of office space were approved. It is estimated that the corridor will contain over 30,000 additional housing units and 50,000 additional residents by 2041 (City of Vancouver, 2020; Sroka 2021).

The three-phase Cambie Corridor Plan was published to guide this development. In 2009, the first phase established planning principles and an interim rezoning policy. In 2011, the second phase identified land use plans for sites in the core area. In 2018, the third phase expanded scope by creating land use plans for neighbourhoods surrounding the stations. It provided direction on instituting amenities to encourage growth, along with a public realm plan to guide the design of public spaces in the corridor. Building upon context in unique sections of the corridor, the plan provides land uses and built forms for each neighbourhood. These are contained in Neighbourhood Area Plans.

Future Directions

The decade since the Canada Line has seen rapid growth, but the Cambie Corridor cannot be considered an integrated corridor yet. Significant portions of the corridor, even areas located near stations, remain primarily single-family residential developments and car-oriented. Future mixed-use hubs such as Oakridge Municipal Town Centre and Marine Gateway are under development but are still years away from completion. Nonetheless, the Cambie Corridor shows promising potential as an integrated corridor in the future due to its well-developed high-capacity and frequent transit system, high degree of street connectivity, with a mix of employment and housing opportunities.



Figure 28: Marine Gateway SkyTrain Station

Challenges

The notable challenges of the Cambie Corridor were land speculation and gentrification. Following the approval of the Canada Line in 2004, land values increased sharply. For instance, single-family residential lots within 500 metres of future stations appreciated in value by 50% in just over eight years. These lots were often assembled and sold based on potential for higher-density, multi-family residential development. It is estimated that Canada Line development resulted in approximately \$8 billion in land lift since the project was approved (Sroka, 2021).

The City of Vancouver did not have appropriate measures to mitigate land speculation. The first phase of the Cambie Corridor Plan was completed approximately six months prior to the opening of the Canada Line, and well into the period of rising land values in the area. Because the city implemented policies within the corridor to maintain the number of rental units and ensure affordable housing was built, the land was valued and purchased largely on the premise of constructing market condominiums (Sroka, 2021).

Housing affordability and gentrification were considered in the plan; however, crucial policy and monitoring were not implemented. Rising land values encouraged developers to build higher priced units to maintain profit margins. As a result, of the units approved by 2015, only 8% were rentals and only 6% were social housing (Sroka, 2021). The first monitoring report, published in 2020, indicates that data on the affordability of market

strata and rental units are still unavailable (City of Vancouver, 2020). The lack of performance monitoring on affordability is likely a significant factor behind the lack of policy on mitigating gentrification.

Takeaways

The Cambie Corridor Plan offers guidance on effective plan-making and transit-oriented design. It serves as a cautionary tale on the importance of early measures to prevent land speculation and gentrification. The structure of the Cambie Corridor Plan, including the phased approach and neighbourhood area plans, were effective in realizing both an overall vision for the area and interventions adapted to local needs.

As the proposed TSC also have varying conditions throughout their length, Kelowna could adopt this approach and create localized plans within the larger corridor plans. The Cambie Corridor’s transit supportive zoning and design principles including: (i) locating high rise, mixed-use developments close to transit stations; (ii) locating mid-rise residential along corridor; (iii) ensuring step-backs to reduce perceived scale, should also be considered.

Kelowna and Vancouver possess similar housing affordability crises. The Cambie Corridor provides key lessons for Kelowna. Planners must ensure that a strategy is in place to mitigate land speculation and set affordable housing targets shortly after a major transit project is approved. Without communication, development conditions, and expectations in place, land values may rise, and market factors may transition to overwhelming condominium development with limited affordable units. Early and effective monitoring is an effective tool for policymakers. With acknowledgement of these areas, the City of Vancouver’s Broadway Plan has a stronger focus on housing affordability. It was adopted far earlier in the transit construction process (City of Vancouver, 2022).

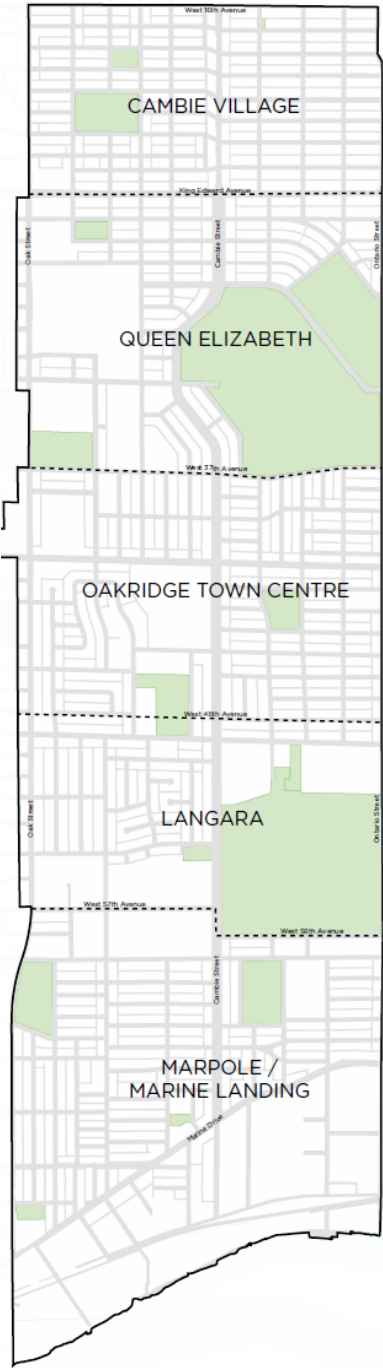


Figure 29: Cambie corridor neighbourhoods

Rosslyn-Ballston Corridor, Arlington, Virginia



Figure 30: Ballston Quarter in Ballston Business Improvement District

The Rosslyn-Ballston corridor in Arlington, Virginia is a successful example of transit-oriented development. The plan, developed in the 1960s, originally centred high-intensity land use around Metro stations and revitalized communities while preserving their character. Highlighting the importance of periodic performance review and updates, the Rosslyn-Ballston corridor could serve as a model to Kelowna. In 2022, Arlington was recognized with a platinum ranking by walking friendly communities, showing its commitment to sustainability and walkability along with San Francisco, Seattle, and New York (Arlington, 2022).

Corridor Development History

Historically Arlington has had a strong tie with public transportation. Long before the arrival of Metro, the city had a streetcar-bus hybrid service connecting neighbouring suburban areas to DC (Greater Greater Washington, 2017). In the Mid 1950’s Arlington was falling behind Washington DC’s rapidly growing metropolitan population. Residential neighbourhoods and retail centres were not suited to the automobile culture that was on the rise across the country. Arlington experienced a population decline during this time, as many newcomers to the metro area chose to live in Arlington’s suburbs.

During this time concerns of transportation connectivity between the thriving suburbs of Arlington to DC where many people worked arose. Unlikely for that time the social benefits and drawbacks were considered between highway and transportation options. To maximize social benefits for Arlington residents 2 subway lines were constructed. Preliminary studies on the corridor land use was conducted in 1972, seven years before the opening of the subway. The vision for Rosslyn-Ballston Corridor was created and centred on the bull’s eye approach, mixed land uses, and high public realm urban design standard.

Similar to cities in North America, Arlington allows both by-right development through zoning compliance, and flexible development through site plan approval.

Emerging to Transitioning Corridor

Rosslyn station opened in 1977, and connected suburban populations who live at relatively low densities to employment centres in Washington D.C and other regional jobs (Greater Greater Washington, 2017). By aligning the route to existing businesses and shops, the subway successfully connected people to services. In earlier stages of Rosslyn-Ballston, the general land use plan only focused on providing limited land uses such as general business, low density, and high density residential uses.

Transitioning corridor

Throughout the 70s and 80s, mixed land uses were introduced and the land use became more diversified. In 1979 the subway line was extended to Ballston, completing the Rosslyn-Ballston corridor. In 1989, the plan marked the 50% completion milestone with a mid-course review. Each station area node was developed into urban villages with unique characteristics. Rosslyn station area became a dense office centre and Ballston became a new downtown (Arlington, 1989).

Current status

Since the beginning of its planning, the Rosslyn-Ballston corridor grew dramatically by adding office and retail spaces, residential units, and jobs. Especially when comparing its office space to other major US downtowns, Arlington has more office space. Despite

FROM CARS TO CORRIDORS

Case Study 3: Arlington

maintaining the highest levels of services, Arlington was able to maintain a low property tax rate. Compared to the rest of Arlington County, the 390 meter radius surrounding the stations maintained the highest diversity of mix use. Balanced ridership throughout the day also contributes to the success of balanced development. The Rosslyn-Ballston Corridor station areas have a high active transportation mode share compared to other suburban metro stations in Virginia.

Future direction

As the Rosslyn-Ballston corridor continues to mature, there are growing needs for expansion and improvement. Planning advocates are calling for an expansion of the station areas in order to increase the number of residents living within a reasonable walking distance of transit stations (Arlington Now, 2020). This can reduce car reliance and make the area more dynamic and livable. They also point out the lack of density transitions between station areas and surrounding single-family neighbourhoods, mainly due to the lack of ground-oriented multifamily housing options, which serves as a barrier to providing more affordable and diverse housing choices.

Looking ahead, recent corridor reviews have identified the need to implement multi-modal transportation strategies that cater to various modes including walking, biking, and rolling. Additionally, they have considered reducing parking requirements to further incentivize the use of alternative modes of transportation and make the area more pedestrian-friendly (Arlington, 2018).

To support the improvement of multimodal transportation strategies, the corridor review emphasizes the importance of strong architectural and urban design guidelines to reinforce cohesive neighbourhood characters and identities while providing a unique sense of place. Enhanced street network and urban realm will help the Rosslyn-Ballston corridor continue to move towards a fully integrated corridor.

Takeaways

The Rosslyn-Ballston corridor serves as a prime example of how long-term planning for transit-supportive corridors can effectively halt urban sprawl and create attractive environments for both work and living. Additionally, the Rosslyn-Ballston offers Kelowna guidance on effective performance monitoring systems and plan updates which were crucial for achieving sustained success in TOD and TSC over time.

Arlington successfully attracts businesses and investments along corridors using various measures. Every year, Arlington reports development progress of each corridor development by measuring GFA completed, under construction and approved building use categories such as office, residential, retail, and hotel (Arlington, n.d.).

This improves transparency and serves as an economic growth indicator informing private investment decisions. Transit accessibility and density modelling and forecasts

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further provide businesses and investors with a higher level of certainty and confidence in their decision making process. Additionally, strategic planning such as retail action plans further aids retention and attraction of businesses.

Furthermore, by tracking progress of corridor development, Arlington has prepared milestone plan reviews, such as mid-course review. These documents provide opportunities to understand emerging development patterns, issues, and opportunities to determine future course of planning.

As the corridors continue to mature, there is a growing recognition of the need to expand beyond the station areas originally envisioned in the 1970s. With the emergence of new mobility technologies and a desire to recognize diverse mobility needs, municipalities should focus on providing and expanding safe and attractive multimodal transit way networks. This can reduce the reliance on private car ownership within station areas and encourage the use of more sustainable modes of transportation.



Figure 31: View of Arlington, Virginia

Winter City Strategy

A winter city strategy can help the City of Kelowna develop stronger corridors for the four distinct seasons that it faces. Kelowna is known for its outstanding summers. However, due to its physical geography, the city experiences harsh, dry winters. With an average temperature of 1.6C° in November, -2.6C° in December, -2.5C° in January, and -0.9 in February, the city does experience cold weather (Government of Canada, 2015).

Kelowna endures a significant amount of snow. It received an average of 83.3cm over four months (Government of Canada, 2015). This is higher than the 73.4cm average that Edmonton, a city understood to be a winter city, faced over the same period (Government of Canada, 2023). By examining the benefits of a winter city strategy, planners can prepare for these conditions.

A winter strategy aims at flipping the narrative that winters are harsh and unpleasant. It depicts a celebratory season by creating activities, improving quality of life, and pursuing a built environment that facilitates positive experiences during the colder months (City of Edmonton, 2015, City of Edmonton, 2016, City of Saskatoon, 2020). For the purpose of this project, the cities of Edmonton and Saskatoon are used as case studies. These cities set a Canadian precedent. With the difficult winters they endure, capacity for benefits can be used to lessen the negative experiences that Kelowna faces in winter.

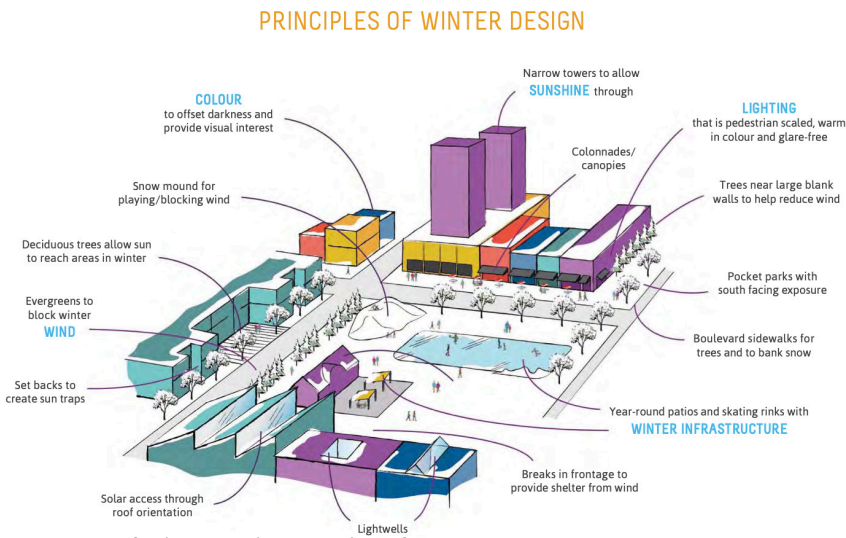


Figure 32: City of Edmonton's Principles of Winter Design

Three winter city goals from the City of Edmonton (CoE) lend strongly to Kelowna in ways to improve the livability and pedestrian experience along the corridors. The first goal is “Design our Communities for Winter Safety and Comfort” where the aim is to design community spaces to increase innovative, climate-oriented urban design within the urban realm. Applicable actions include sections 3.4 and 3.5. 3.4 argues for CoE to ensure new developments consider winter experiences, boost the livability of spaces.3.5 aims towards the development of guidelines that create more livable winter spaces that are inviting year around. Examples include designing for wind mitigation, creation of sun pockets in the winter, creation of covered shelters, and the inclusion of solar, wind, snow, and rain analysis on urban areas for future developments, as seen in figure 32.

Other applicable elements come from “Winter Goal #4 Incorporate Urban Design Elements for Winter Fun, Activity, Beauty and Interest”. Action 4.2 calls for the city and developers to increase the number of buildings with colourful design, as it helps to create a more lively space vs monochromatic spaces that can dominate cities. Action 4.3 calls for designs to be cognizant of light impacts, especially within the context of the winter city

as the periods of night are much longer. Examples of interventions include the creation of public light strategies, playful light installations, and nightscaping with lights along art installations, architecture, and other spaces that people maneuver.

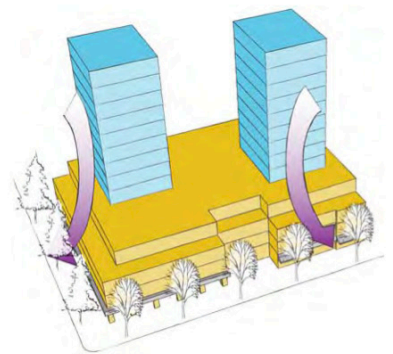
By creating a more aesthetically pleasing space, especially during the cold winter months when things are dark and covered in snow and silt, winter cities can instill better place-making. This arises with the increased positive interactions between the winter space and future corridor developments. The last applicable Winter Goal is #6 to Create a 4-Season Patio Culture. Action 6.1 calls for the removal of barriers to patio installation, such that businesses, restaurants, and other stakeholders can create patio spaces. This could facilitate increased pedestrian traffic to mixed use spaces, create more social connections, and boost business revenue, which promotes more development.

Building upon the strategy, the CoE Winter City Guidelines strongly builds upon the ideas. Taking a similar approach, only strongly applicable components to corridors will be discussed, as to ensure the scope of the analysis fits. However, the rest of the policy may be utilized by Kelowna.

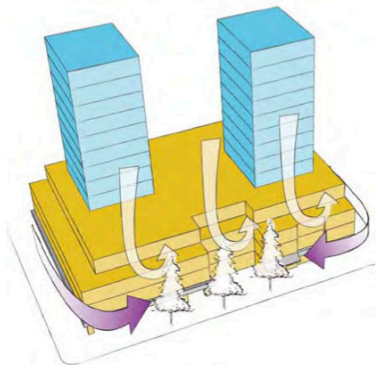
One of the two main themes of the guidelines is the mitigation of climate impacts on the pedestrian experience. This aims to combat negative winter conditions by the implementation of design standards. As seen in figure 33 (City of Edmonton, 2015) examples of interventions that can benefit corridors are sun shade analysis to ensure maximum light in the winter, awnings to protect from precipitation and providing shade in the summer, varying building heights along corridors to minimize wind tunnels, use of trees to limit wind impacts, and glass roofs to increase sunlight permeability, . By increasing the experience of public spaces through design, Kelowna may be able to increase the overall usage of corridors by pedestrians. Due to lack of information comments cannot be made on sun and wind modeling, however it is understood that during the winter months the prevailing winds come from the south at an average of 7.1km/h (weatherspark.com 2023). As a result, built form suggestions shall be reconfigured from CoE's winter guide to ensure successful implementation into the Kelowna context.

The other main theme is the improvement of the public realm to ensure the dynamic experience of the space is extended into the winter months. Through the improvement of corridor livability throughout the winter season, pedestrians can utilize these spaces more, which can lead to a more robust public life, and increased transit usage. Possible interventions include frequent store frontages, parking lots behind buildings, vibrant colours that brighten up the dark winters, a four season patio culture, winter supporting street furniture such as wood benches over metal, and wayfinding. Frequent store frontages and parking in the rear help to facilitate increased pedestrian access from the sidewalks, which can help draw more people to the area. Furthermore, increased colour palettes and building materials can help to add a sense of place and improve community character, both of which are important to walkability (City of Edmonton, 2015).

The last applicable document is Saskatoon's Winter City Strategy, where the overall goals are very similar to Edmonton's. They are; Street activation in the public realm, a variety of activities bringing people outside in the winter, and increased economic activity during the winter months (City of Saskatoon, 2020). A main priority was creating a public space that facilitated social connection, commercial success, joy in the winter,



Wind downwashing effect reduced and redirected by using trees, based on wind-study modelling



Wind corner acceleration effect reduced through the use of trees, based on wind-study modelling

Figure 33: City of Edmonton's Wind analysis and mitigation strategies

and recreation opportunities. Through this approach the city aimed at drawing people towards core areas. Another important feature of the plan was to create a robust active transportation network that supports travel during the winter months. This is achieved by improving snow clearing, and to address the need for end of ride facilities so patrons can change from snow gear. Lastly, the plan aims at ensuring the public spaces are supportive of winter activities, such as all season patios, all season public bathrooms, and a winter light strategy. The plan is less robust than Edmonton’s but the parallels presented may allow for adaptation towards Kelowna’s own corridor development.

Overall, while Kelowna may not face the same level of winter as Edmonton or Saskatoon, the benefits of winter city value implementation may be beneficial to the development of corridors. This becomes applicable to the broader seasons, as the implementation of winter city goals will also help create a more robust area for the other three seasons. For example, more fine grained mixed use may be applicable along Pandosy north of Harvey Ave and in the future along the south portion of Richter street when the mall gets redeveloped.

The creation of four-season patios along all corridors and beyond can help with future pedestrian usage. The deployment of more colourful buildings can help to facialite place-making in all seasons, such as near the hospital to improve feelings of wellbeing, and may help to offset the monotone areas near the gated communities along Gordon Drive. The implementation of lighting strategies along the corridors can help to draw people in while creating a more lively atmosphere for the dark periods of winter. Comprehensively, the winter city strategies are more positioned for place making through the winter lens, such that the positive reframing of a negative experience can become a positive. Thus, efforts to maximize the winter experience will only create positive experiences for the residents of Kelowna. Lastly, due to the mild winters, the financial, logistical, and procedural barriers needed may be less strenuous than other winter cities.

Place-making Strategies

Place-making can be considered to be an important part of corridor development, as the positive experiences that people may endure can facilitate increased usage of corridors (Cleland et al., 2019). Place-making has been identified as an avenue to improve social connections, transit usage, walkability, physical activity, and aging in place (Dupuis-Blanchard et al., 2015; Kerr et al., 2012). Thus a strong place-making lens within corridor development may help Kelowna to facilitate a pedestrian environment that can benefit local residents, out of area Kelownites, and tourists. As a result, the place making strategy of Superior, Colorado, the alley revitalization efforts in Melbourne, Australia, and the framework of transformative place-making will be used as case studies.

Superior, Colorado is located within Boulder county, which is just Northwest of Denver, and was previously a part of the Denver Metropolitan area until Boulder grew enough to absorb it. With a population of 13,297 (United States Census, 2020), it is much smaller than Kelowna. But with similar low density and a Boulder metropolitan area population of 329,543 (United States Census, 2022) it provides an interesting approach to place-making. A major approach to place-making within Superior is creative place-mak-

ing, which can be understood to be a way of valuing aspects of a community’s cultural life as community assets. This may arise from culture, diversity, history, heritage, landscape, and values, as a resource for community development, versus a product approach. Secondly, it uses this approach to rejuvenate dull spaces into lively realms of use.

Three main approaches are utilized in Superior that may prove to be beneficial to corridor development in Kelowna. The first approach is an art path, which is a series of art installations, such as sculptures, functional art installations, murals, and interesting street furniture. These are strategically placed along paths, corridors, schools, or business districts, which help to encourage place-making, but with increased functionality, can improve physical activity and usage of corridors. The second approach is similar and builds upon the current momentum of Kelowna, which is the presence of public art. This helps to build upon place-making and attraction. Approaches that may be beneficial to Kelowna could be interactive public art installations, as they can draw more attention and use to a space. This can also provide a means for social connection, identity, and attract people towards a corridor or destination.

The last Superior approach is called Mobility for All. Within this framework, art is incorporated into design to create a more lively atmosphere, but also improving place-making and safety. These can include painting crosswalks with vibrant colours, as seen in figure 34, creating parklets to increase pedestrian safety and connection, or tactical urbanism in underutilized parking lots. Overall, these three approaches are additions that can be made in corridors and their destinations to improve place-making, social connections, and usage of corridors.

The alleyway revitalization program in Melbourne aimed at transforming underutilized spaces, which in this case was alleys. In 1994 there were roughly only 300m of accessible alleys within the city, but with investments to improve these spaces, they were increased to roughly 3km, generating \$2.1 billion per year to the local economy(Oberklaid-A, 2015), as seen in figure 35. Alleys were targeted as they were underutilized, are built to human scale, and did not have issues surrounding vehicular traffic, creating a pedestrian focused space. The project was spurred originally to bring more business and people to the downtown area, with aims for 8000 people over 15 years. They surpassed this by increasing the population to over 10,000 people, created a 24/7 business and social environment, and broke up city blocks. This was accomplished by policy reform, redevelopment, place making strategies, and mandating active frontages, patios, street side dining, and public art (Oberklaid-B, 2015)

Approaches Kelowna can utilize may be different as many of the corridors do not fully interact with the downtown or urban cores. However, there are corridors that do, which can strongly benefit from the alleyway revitalization approach. Furthermore, the case study signifies the importance of pedestrians through ways on blocks, such that Kelowna can benefit from creating these spaces along corridors to increase pedestrian infiltration. These can arise from alleyway revitalization, greenways, walking trails, bike paths, and many other approaches that increased the porosity of the urban realm. Lastly, this case studies also signifies the value of transforming underutilized spaces into areas of human use. Examples for Keowna can be parklets in parking spaces, transformation of store front parking into patios, and tactical urbanism interventions.



Figure 34: Functional Art Crosswalk

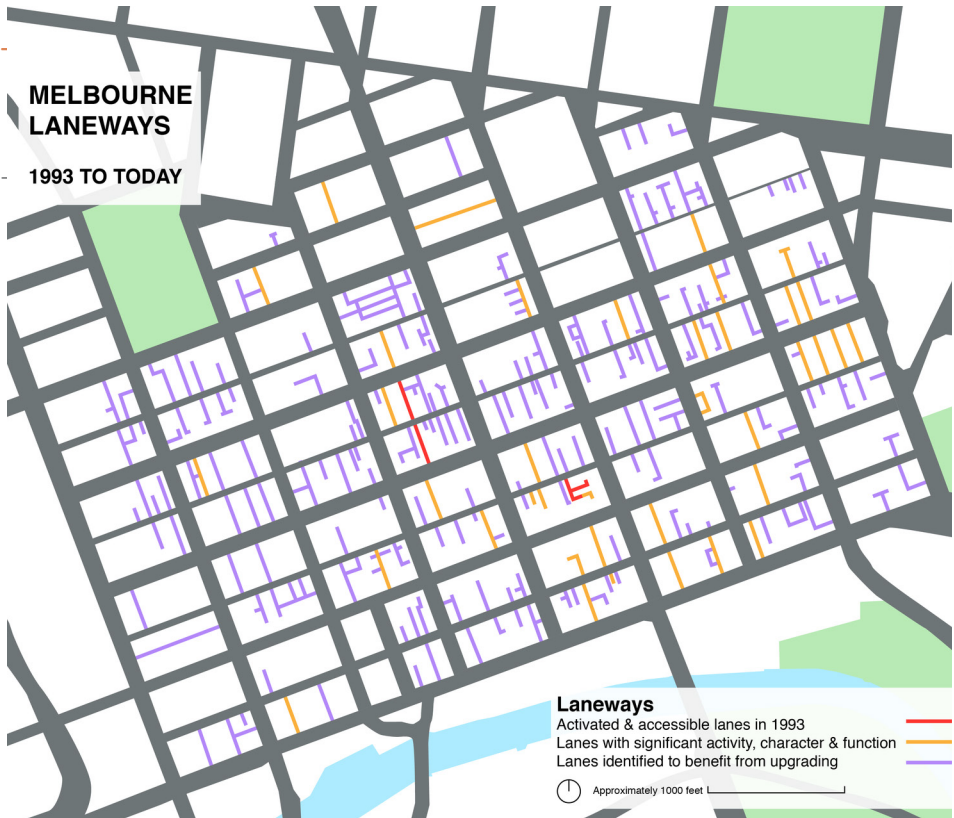


Figure 35: Melbourne Alley Revitalization Map

The last approach to place-making that Kelowna may benefit from may be the concept of transformative place-making. Transformative place-making can be understood to be different from place-making in scale, scope, and integration (Vey & Love, 2019). On scale, it moves from a site or block, to fully encompass a region or area where assets are clustered or connected, which a corridor fits directly into. It is not predefined to a boundary such as a park, but engulfs connected spaces. Regarding scope, it expands on art or installations and aims to create place-making through lifestyle changes such as residences or businesses, with goals integrating economy and lifestyle together for an enriching experience.

Lastly, this approach aims to break silos and integrate land use planners, landscape architects, developers, and other actors in working together to create a space that encompasses all goals. By tying the economic benefits in with the social landscape, built form, and development, corridors may move along the typology. While it is a newer framework, it provides opportunity for Kelowna to adopt within corridor approaches, as corridors may be given their own identities that support use which can support increased use for life, work, and play.

Overall, place-making is a malleable concept in terms of scale, such that it can be directed at singular spaces, such as on a corner of Pandosy street, and to a broader based approach to create a corridor identity. All scales provide strengths to corridor develop-

ment, and can inform practices in which Kelowna best sees fit. The enrichment of the public realm through place-making can improve corridors along the typology, which can increase the livability of these areas, while supporting transit development as more attractions are created.

Healthy Corridor Development

The space in which one works, lives, and plays has impactful consequences on the health and wellbeing of citizens. This occurs subtly and over long periods of time, as lower rates of walkability, lack of greenspace, poor urban design, and other components increase poor health outcomes (Barnett et al., 2017; Brown et al., 2016; McCormack & Shiell, 2011). For this report, the areas of walkability, the pedestrian realm, and safety will be considered, as interventions may be more easily implemented to improve corridor development.

Walkability pertains to the ability in which one is able to walk to destinations within their community (Frank et al., 2010). This becomes important for health as physical activity is associated with lower rates of chronic diseases, such as heart disease and cancer (McCormack & Shiell, 2011; Public Health Agency of Canada, 2018). A common walkability index has been created by Frank et al., (2010), where the components of residential density, mixed land use, pedestrian accessibility, and connectivity of streets are considered. This simple framework allows for the simple understanding of the basic walkability of areas. To improve walkability along and to corridors, block lengths, mid-segment crossings, mixed land use, residential density, and access should be considered.

Other aspects that improve walkability are pedestrian infrastructure and experience. Improved aesthetic spaces, such as visually intriguing frontages, landscaping, art, human scale design, and decorative lights have been associated with increases in walking (Brown et al., 2016; Ding et al., 2011; Farkas et al., 2019). This arises because people have positive experiences with the area, promoting a positive feedback loop to encourage people to use a space, since people desire high quality spaces (Salvo et al., 2018). Other features that can improve corridor development are pedestrian infrastructure. Placement of amenities such as benches, pedestrian scale lighting, planter boxes along buffers, provide a higher sense of safety and provide spaces for people to rest while they walk along a corridor. Tree lined streets provide shade in the summer time to improve walkability, but also are associated with reducing all-cause mortality and morbidity in people (Lu et al., 2018; Salvo et al., 2018). For Kelowna’s corridor development, the implementation of drought resistant trees, benches, water fountains, art, and pedestrian scale lighting may be implemented to improve the pedestrian realm.

The last major component for corridors is pedestrian safety. This is extremely important for healthy corridor development, as perceptions of safety can play a governing role if people partake in walking (Rees-Punia et al., 2018; Smith et al., 2017; Stoker et al., 2015). Pedestrian safety can arise from fear of crime. To combat this some efforts to increase safety are improving street lighting for visibility from others and cars, visually permeable frontages allow for more eyes on the street, and increasing the number of destinations along a corridor (Garvin et al., 2012; McCormack & Shiell, 2011; Stoker et al., 2015).

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Additional Policy

The other major factor is pedestrian safety from vehicles, especially youth and elderly who are at the highest risk of collisions (Stoker et al., 2015). Efforts such as curb extensions to minimize crossing lengths, tight turning radii to keep pedestrians in view of drivers, pedestrian lights, and increased buffers from traffic to sidewalks can reduce vehicular collision risks (Brown et al., 2017; Stoker et al., 2015). Furthermore, traffic calming measures such as speed tables, narrow lanes, perceptual design, and median barriers can be used to slow traffic, increasing pedestrian safety (Brown et al., 2017; Stoker et al., 2015). By creating safer corridors, spaces become more welcoming for pedestrians of all ages.

Overall, by implementing health promoting design in corridors, it can be anticipated that higher rates of usage can be expected. This arises from higher place-making, sense of safety, and increased accessibility to spaces. Aspects can also be integrated together to create compounding impacts, such as trees or pedestrian infrastructure placed in curb extensions. It is important to consider the pedestrian experience in corridor development because it can support increased transit usage within areas (Smith et al., 2017; Xiao et al., 2019). Lastly, it can support business within corridors. Examples include a reduction of store vacancies of 49% through improved walking spaces, increased retail sales by 172% from upgrading an underutilized lot into a park, and increasing sales by 13% by adding public seating in New York City (New York City, 2012).



Figure 36: Kellowna Waterfront

Existing Conditions: Pandosy, Richter & Gordon

The existing conditions of Pandosy, Richter, and Gordon TSCs will provide the ground-work for understanding, as they provide a current snapshot of the locales. This will guide the future urban design, framework, and development suggestions and conditions. The section will cover land use, built form, and transit. As the project is aimed at future corridor development, the analysis will pertain to 2040 OCP conditions unless otherwise stated.

Land Use

Land use between the 3 sites were similar in terms of housing but had important differences in relation to both future development possibilities, but also integration into the broader community fabric. All zoning colour schemes were followed from the 2040 OCP.

Residential

The 3 sites of interest were dominated by Core Area Neighbourhood (C-NHD) designation, with the average total 61.3% of all zoning within a 400m buffer of the TSC. This is in line with the 2040 OCP as C-NHD are aimed at absorbing the majority of Kelowna’s future growth through infill and increased density. Within the current zoning, single- or two-family dwelling zones were the predominant zoning in Pandosy (48.6%) and Gordon (39.1%) of all zoning. Richter was the outlier as this zone only accounted for 31.5% of total zoning within 400m, with 86.2% of that being zoning for duplex housing. This strive for density was compounded by the highest percentage of multi-dwelling zoning with 26.1%. As a result of the previous zoning, the majority of the residential built form follows these breakdowns.



Figure 37: Apartment in Kelowna

Commercial

Commercial zoning in both the current zoning bylaw and the updated 2040 OCP is quite low in the 3 sites of interest. All 3 corridors do not have any Neighbourhood Commercial (NCOM) designations. However, through the 2040 OCP, C-NHD zones located near TSC are allowed to host small scale commercial spaces, such as daycares or corner stores

to support community needs and corridors. Many of the commercial spaces were 1-2 stories tall and located along the corridors with car centric design, such as strip malls or hosting large parking spaces adjacent to sidewalks.

Richter had 22% of Urban Center (UC) designation coverage, with Pandosy at 18.4%, and Gordon at 5.5%. This can help with future commercial development along the corridors and act as nodes for future development that may not be suited to residential areas. Gordon and Richter also were located 400m of Village Centre (VC) zoning, which can help with smaller scale node development.

Block Pattern

Block patterns within the 3 identified corridors had varying ranges, such as blocks over 400 m to as short as 70m long. Many of the residential areas that were aimed at single or dual dwelling and other detached home spaces had shorter block lengths at roughly 85 m long, which were commonly broken up into 42 m segments with intersecting alleys. This provides good pedestrian porosity in navigating the built environment.

However, there were some areas of extended blocks. In areas of multi-dwelling units such as between Lake Avenue and Elliot Avenue on Pandosy Street, there were areas of impermeable blocks that were 335 m long. Furthermore, some block lengths alternate between short and long, such as on Richter where blocks could jump from 82 m to 300 m. Lastly, superblocks exist along Gordon Street where the impermeable blocks create stretches of 410 m that can limit pedestrian movement.

Parking

Due to the car-reliant spaces, parking played a dominant role within the built form. Many areas along the corridors had lots adjacent to roads and sidewalks, creating long setbacks from the pedestrian and transit interactions. Parking was routinely available on one or both sides, with 2-hour limits in some areas. Many homes had multiple cars parked and commercial tenants valued parking lots.

Transportation Network

The streets form the arteries and capillaries within the community where transit, people, vehicles, and cyclist’s traverse. Mobility is constrained by the current road network, as it is costly to upgrade, and helps guide development by deciding where land use can go.

Road Network

The current road network plays a central role in the movement of residents, as the 3 corridors are the major routes connecting between the vital horizontal avenues. It also



Figure 38: Commercial space on Pandosy

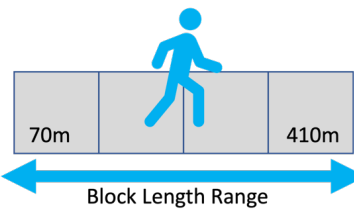


Figure 39: Block pattern of Transit Supportive Corridors



Figure 40: Bus stop in Kelowna



FROM CARS TO CORRIDORS

Existing Conditions

connects to Harvey Ave, which leads to the only bridge across Okanagan Lake. All 3 corridors identified were 4-lane arterials, which carries significant traffic through the city, and connects to major urban center spaces. These corridors were also well connected into collector streets with access to alleys within residential areas.

On average traffic lanes were approximately 3.3 m wide, resulting in a 4-lane road width of approximately 13.5 m. Portions of Pandosy and Richter were limited to 1 lane each direction with at times a center turning lane. Gordon carried a heavier traffic flow, and thus portions had 4 lanes with a median between the 2 directions.

Public Transportation

All 3 sites were identified as TSC, thus was home to many transit stops. Within Kelowna transit is owned and operated by BC Transit, which is a crown corporation by the BC Government (BC Transit, 2022). They provide services to the entire city of Kelowna. Ridership is still recovering as there were 2.6 million riders in 2021-2, which is lower than the 5.7 million riders in 2018-19 (Kelowna Daily Courier, 2022)

Pandosy averaged 1 stop per every 204 m, Gordon at 1 per 253 m, and Richter at 1 per 325 m. This did not include stops near but on abutting streets, while giving insight into stop density, does not illustrate some sections that were adequately serviced by the transit system. Lastly, many bus stops did not have covered shelters or pedestrian scale lighting which can reduce comfort in using the system.

Pedestrian and Cycling Movement

Cycling was strongly supported along all 3 corridors, as each had portions of their roads connected with bike lanes or protected bike lanes to support bikeability. This also improves safety to cyclists and brings cycling to the forefront of drivers. Bike lanes also allowed for exits to collector roads to increase permeability.

Block lengths were quite varied, which can create strengths and limitations for navigating Kelowna. As observed during the site visit, due to the lack of destinations along the corridor there appeared to be limited walking activity by pedestrians. Consequently, related to the big setbacks along many commercial sections of the corridors, the spaces could feel desolate, which was further exasperated when the sun was set. Lastly, the site visit indicated that the pedestrian navigability was hampered by poor crossing signalization where pedestrians were forced to wait for an unnecessary cycle.

Many curbs along the corridors were at 90°, which prevents cars from traversing onto the sidewalk. Most intersections had curb cuts for pedestrians, had streetlights, and had buffers between the high-speed roads and sidewalks. Lastly, many of the roads were wide, creating large crossing distances at some intersections.

FROM CARS TO CORRIDORS

Existing Conditions

Mode of Transportation

Currently, many residents use vehicles as the main form of transportation, with 78% driving to work (Kelowna, 2022) 4% of people bike to work, which is 49% higher than the provincial average (KELOWNA HEALTH PROFILE). Lastly, 6% of people walk to work, which is 16% lower than the provincial average. The city has introduced mode share bikes and scooters within the city to help with micro-mobility of residents.

FROM CARS TO CORRIDORS

Secondary Policy

The built form and related policy were analyzed to further understand the variables that can impact movement and development along the identified corridors.

Urban Sewer

All 3 identified sites were collocated on strong sewer lines that met or surpassed the 200 mm bylaw set out for engineering standards to ensure sufficient sewer capacity for increased densification. This is important because it ensures that pipes do not have to be replaced or upgraded to support increased densification along the transit corridors.

Power Lines

Some portions of Richter had overhead power lines along the corridors. This presents challenges to densification, as the lines are owned by power companies and thus are not under the jurisdiction of the City’s land use bylaws as they serve a utility. As a result, any suggestions of undergrounding current lines will be met with both large scale financial and jurisdictional barriers. Furthermore, utility companies may reject some densification proposals as fire and civilian safety can become jeopardized if built too close to lines.

Tax Incentive Areas

The city has identified areas within the city that are eligible for tax exemptions if they meet conditions. All 3 sites were located within the rental housing tax incentive zone, which supports rental housing development. Richter is additionally located on zones 1 and 2, with zone 1 giving a 100% exemption for any residential or commercial development, and zone 2 encouraging larger scale development by reducing tax from 100-50% if conditions are met. Pandosy is located within 400m of zones 1 and 2 but are not directly on it.

Snow Clearing Priority

Snow clearing for both Pandosy, and Gordon are set at priority 1, which indicates that they will get snow removed first. Richter is located predominantly in level 2. The high priority of these corridors can support mobility within the broader transportation network and help to serve the transportation corridors use in the future.

The following section serves as a useful example and informs future discussions on the development potential for TSCs in Kelowna. Applying the livable transit corridors framework to a selection of the projected Transit Supportive Corridors (TSCs) in Kelowna can provide valuable insights into the unique context of each corridor and their strengths and opportunities. Although the framework and the example do not provide concrete metrics for classifying the corridors, it offers general directions for identifying future land use needs and interventions. By understanding the livability of the TSCs, decision-makers can better assess the development potential of each corridor and prioritize investments that enhance the livability for residents.

Livable Transit Corridor Characteristics and Performance			
	Emerging <<	>> Integrated	
Population Density	Low	Medium	High
Diversity of Land Uses	Low	Medium	High
Pedestrian Accessibility	Low	Medium	High
Employment Density	Low	Medium	High
Economic Development and Investment	Low	Medium	High
Frequency of Transit Services	Infrequent	Frequent	Very frequent
# of activity centres	None	Limited	Numerous
# of transit services (i.e. Bus, shuttle, light rail, subway)	None	Limited	Numerous
# of Recreation amenities	None	Limited	Numerous

Table 2: Livable Transit Corridor Typology (Allen 2016)

Pandosy Street

Pandosy is a significant north-south thoroughfare in Kelowna linking downtown Kelowna to the South Kelowna neighbourhood. The Pandosy stretch is distinguished by its diverse urban forms, including low-density single-family homes, mid-rise multifamily dwellings, and limited high-rise, mixed-use development. Many retail spaces are strip malls. Key destinations, such as Kelowna General Hospital, serve as vital employment hubs.

The 1 and 8 buses operate every 15 minutes during peak hours and every 30 minutes at other times. Wide roads and poor pedestrian infrastructure promote auto-oriented land use and street design. Near Harvey Avenue, the road has five lanes. This leaves limited opportunities and incentives for residents to choose alternative modes of travel. Taking these factors into account, the Pandosy corridor aligns with the Emerging Corridor typology.

The stretch of this thoroughfare in downtown Kelowna exemplifies the environment that the rest of the corridor could become. Pandosy transforms into Water Street north of Harvey Avenue. It is low-density, but harbours various activity centres and destinations. Restaurants, breweries, offices, banks, historic buildings, apartments, and a community theatre line the road.

Richter Street

Richter is a significant arterial road that runs north-south and links Kelowna’s downtown with destinations near Okanagan Kelowna. Compared to Gordon and Pandosy, Richter is attached strongly to the downtown space, providing key accessibility to its CBD, future housing, and industrial spaces to the north. Due to the high potential for development, it presents a key opportunity to create an integrated corridor. Suggestions to improve this corridor can include extending the Richter Street corridor to the commercial centre to the south of K.L.O. road to increase activity, and destination access. Provide transit services that operate N-S, creation of higher mixed use density, higher frequency of pedestrian friendly store fronts, and improve pedestrian accessibility.

Gordon Drive

Gordon is an extensive north-south thoroughfare that begins near the industrial lands near Clement Ave and continues into the Lower Mission and North Mission neighbourhoods. The corridor is predominantly suburban in nature, as reflected in its lack of transit services. The 5 bus maintains headways between 15 to 35 minutes. Unfortunately, the stretches of bare land strata and gated communities along the road fail to provide access points to the corridor. This is a factor in low walkability for residents and low ridership. Interventions to improve the corridor can include the creation of higher density housing near the mall, pedestrian focused infrastructure,

TSC: Pandosy Street

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Opportunities for:

- Grocery store, healthy food options
- Recreation amenities
- Parks or green space
- Childcare desert
- More bus routes: i.e. E-W bus routes to connect to Okanagan College and other neighbourhoods

Large travel destinations:

- Historic downtown
- Changes to Water Street at Harvey Avenue
- Hospital area (Regional hospital)
- Shopping area with mixed use
- South Pandosy neighbourhood

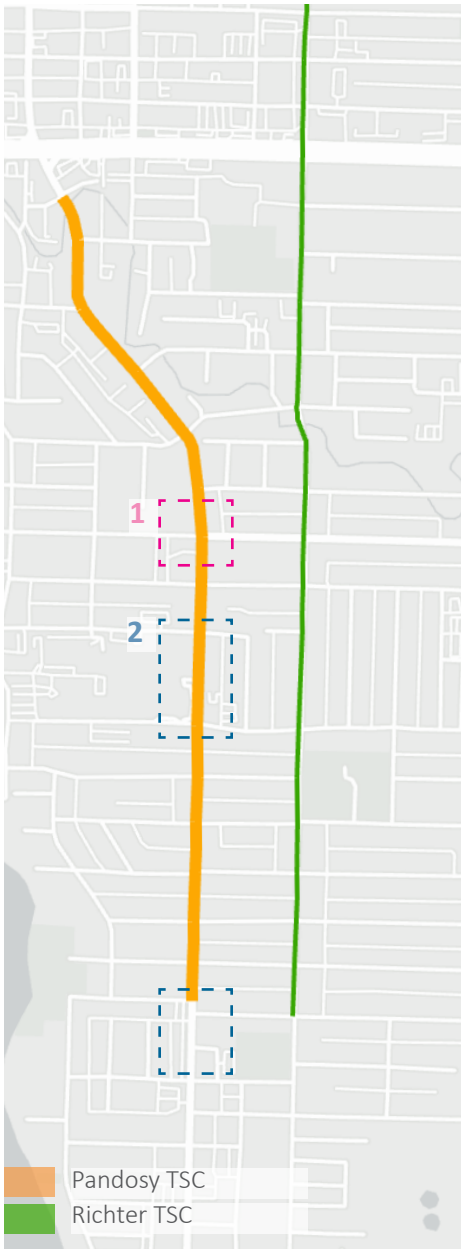


Figure 41: Pandosy and Richter Transit Supportive Corridors

Interventions

1. Densify busy neighbourhood corners!

Main E-W corridor, provides cross pollination of people, encourages people to get off and use other lines. Change 2040 OCP and zoning bylaws to support the densification of critical cross areas.

i.e.. Cadder ave and Pandosy



Figure 42: Illustration showing densification at the corner of Cadder avenue and Pandosy Street

2. Extend TSC south to KLO Road

By extending TSC spaces to major destinations, corridor is supported further, can redevelop

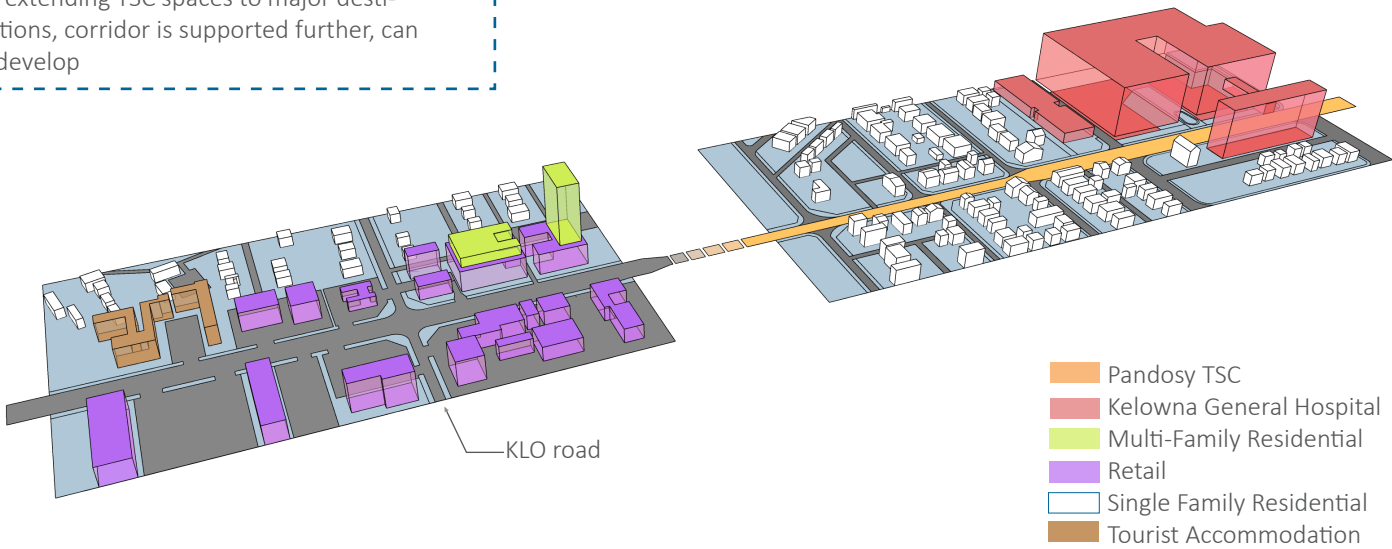


Figure 43: Pandosy Transit Supportive Corridor Extension

Corridor-Wide Interventions

1. Create destinations

- Improve accessibility and frequency of amenities
- Fine grained shop frontages, the higher frequency will increase the amount of the uses
- Parking being placed on the street or behind
- Improve the frequency of amenities and destinations. Ex) Recreation, age friendly amenities, greenspace, etc



Figure 44: Downtown Kelowna

Building retail encourages diversity and destination accessibility by increasing the number of goods and services provided in a neighbourhood. Some theorists identify these variables as the most important factors in a livable and walkable built environment. This is particularly important in a historically low-density area with few business districts. Other important factors for improving corridors is the accessibility, frequency, and variation of destinations. Important examples can include childcare, parks, recreation, food access, restaurants, leisure, cultural, and other amenities that allow people to live, work, and play.

Stores should face the street with visually permeable frontages to promote activity, improve safety with increased eyes on the street, and contribute to an interesting, engaging urban landscape. The higher grained frontages allow for more business per block, which constitutes for more destinations along the corridor. Parking should not be placed on main roads. Parking spaces add to surface area traveled by pedestrians. Additionally, such spaces are typically hostile to all non-motorized users.

2. Increase diversity of dwelling types

- Reduce barriers to development
- Streamline development approval process
- Public education and awareness program on diverse housing needs



Figure 45: Arlington, Virginia

While difficult, eliminating barriers to developers is a proven method in encouraging private development. Because transportation and land use are inherently connected, walkability must be accompanied by density and diverse land uses, and vice versa. Developers avoid transit-oriented projects to minimize risks associated with zoning restrictions and hostile streetscapes. Otherwise, transit-oriented development is quite profitable and attractive.

3. Maximize pedestrian accessibility

- Prioritizing transit-oriented development over transit-adjacent development
- Adding walkways and bikeways
- Making such walks pleasant, comfortable, safe, and secure
- Prioritizing pedestrians and cyclists



Pedestrian accessibility is crucial to corridor usage, as the ease of navigability and accessibility to spaces can play a determining factor if people walk or use a particular space. Hostile walking environments will enforce incentives for people to use single use automobiles, as poor safety and experience will deter use. Options for improvements towards the corridors will be the marking of all crosswalks within the area, curb extensions with landscaping, traffic calming measures such as speed humps or narrow lanes, and further investments in the bikeability of Kelowna. Furthermore, improvements in the pedestrian experience can benefit lively corridors, such as benches, landscaping, wayfinding, lighting, artistic installations, and the breaking up of longer blocks. Lastly, for the corridor to transition, transit-oriented development should be the focus for Kelowna, as transit-adjacent development will hinder efforts made by other interventions, as well as enforcing driving culture.

4. Minimizing automobile-oriented commercial development in pedestrian-oriented areas

- Reduce surface parking
- Reduce number of access points (driveways) onto the main road
- Locate surface parking to the rear of developments, moving retail to the street front



Automobile-oriented commercial developments such as strip malls dedicate a large amount of space for surface parking, making it a relatively low density land use. Often located adjacent to the road, the surface parking also physically separates the commercial space from the pedestrian area making pedestrian access to the stores more difficult and dangerous. Frequent driveways which allow the vehicles to access the road from the surface parking also intersect the sidewalk, intruding into the pedestrian space and acting as an additional obstacle for those with mobility challenges. An option for improvement is to reduce parking maximums to limit the number of allowable parking spots, and encourage locating parking away from the storefronts to the back or underground. Having the parking behind commercial spaces has the added benefit of reducing the number of driveways and access points for vehicles onto the corridor, enhancing the pedestrian space.

FROM CARS TO CORRIDORS

Broad Interventions

5. Improving the pedestrian experience

- Tree lined streets
- Pedestrian infrastructure, such as benches, awnings, lighting
- Alleyway and other underutilized space rejuvenation



Figure 48: St. Andrew’s Playground Park, Toronto

Improvements in the safety and comfort of pedestrians increases movement in corridors by strengthening porosity, navigability, and experience. It enhances economic development and investment by promoting activity, transforming underutilized areas to important destinations. Movement typically occurs in a positive feedback loop with users feeling safer around other people. This also arises through built form interventions that increase safety from traffic along these corridors.

Options include policy reform on alleyway revitalization, business coordination, a 4 season patio culture, investments into pedestrian infrastructure, breaking up blocks to walkable distances, and tree lined streets. Lastly, universal design should be considered in all block, corridor, and land use designs, as it helps people of all ages and abilities comfortably use a space.



Figure 49: Vibrant Kelowna’s Waterfront

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Appendix A: Policy and Planning Background

Municipal Plans and Policies

Imagine Kelowna

Imagine Kelowna was endorsed by Kelowna City Council in July 2018. It is a community vision plan developed through 18 months of public engagement, involving over 4000 contributions from residents. Community members were asked to reflect on their priorities and values as they envision Kelowna in 2040. The four pathways that emerged from this process including a more collaborative, smart, connected, and responsible Kelowna, informed the development of subsequent plans, including the OCP and Transportation Master Plan.

1. **Collaborative:** A community that encourages diverse people to work towards advancing reconciliation, supporting entrepreneurship, and creating community-led solutions to shared challenges.
2. **Smarter:** A resilient and adaptive community that can thrive in changing environmental and economic conditions, while building healthy neighbourhoods that are home to households of all income levels and life stages.
3. **Connected:** An accessible and inclusive community that provides opportunities for people of all backgrounds, ages, and abilities economic, recreational, social and transportation options. This also involves creating more public spaces and supporting the arts and culture scene.
4. **Responsible:** A community that prioritizes social and environmental concerns by concentrating growth in urban centres, limiting urban sprawl, and protecting agricultural land. Furthermore, shared land, water, and air resources including Okanagan Lake are to be preserved.

Kelowna 2040 Official Community Plan

The Kelowna 2040 Official Community Plan (OCP) was adopted in 2022. The plan aims to achieve the community’s vision of becoming a more collaborative, smarter, connected, and responsible city as outlined in Imagine Kelowna. The OCP’s framework is centered on ten pillars which are as follows:

- Focusing investment in Urban Centres to accommodate growth and limit sprawl
- Targeting growth along transit corridors to integrate employment, housing, and transit
- Promoting more housing diversity to support rental housing and healthier neighbourhoods with diverse households
- Incorporating equity into city building to provide opportunities for people of all ages and abilities
- Supporting employment growth and further developing Kelowna’s role as the regional economic hub
- Protecting agriculture by limiting urban growth into agricultural land
- Prioritizing sustainable transportation and shared mobility through investing in public transit, active transportation, and side-walks
- Protecting and restoring our environment by supporting and revitalizing ecosystems
- Taking action on climate change by limiting sprawl and increasing resilience

The general land use strategy outlined in the OCP involves dividing Kelowna into five Growth Strategy Districts with differing policy directions, but all contributing to the ten pillars. Future land use designations, while not a zoning bylaw, are also indicated in the plan to serve as general guidance on future developments.

Transit Supportive Corridors are defined in the OCP as streets in Core Area Neighbourhoods meant to support higher density and mixed uses. They are generally located along Frequent Transit Networks or where transit service will be implemented. The plan calls for densities of approximately 1.8 FAR on TSCs, compared to 1.0 in the general Core Area Neighbourhood. Mixed use commercial and resi-

dential development, along with stacked townhouses and low-rise apartments are the expected building types along these corridors.

In addition to allowing for additional densities, the OCP further supports TSC development by focusing on the pedestrian environment and supporting transit-oriented design in commercial areas adjacent to the corridors. It also contains transit-centered policies such as establishing a Frequent Transit Network across the city, improving transit infrastructure, and implementing transit priority measures. The only policy that appears to impede TSC development is 5.3.7 which limits higher density developments in Heritage Conservation Areas even when located along identified TSCs.

Zoning Bylaw No. 12375

The City of Kelowna Zoning Bylaw No. 12375 is the current zoning bylaw that regulates land use, built form, height, and density of all developments within the City of Kelowna. The zoning bylaw divides the city into various zones to guide urban development and avoid conflicts between incompatible land uses.

As the planned TSCs are extensive, they will be located adjacent to a variety of zoning ranging from single-family residential to mid-rise multi-family residential, as well as mixed-use commercial and residential mid-rises. Nevertheless, a significant portion of TSC-adjacent areas have relatively low density zoning. Large-lot and medium-lot single-family residential zoning is prevalent along sections of Glenmore, Gordon, and Rutland corridors. Duplex residential zoning is common along Gordon, Richter, Rutland, and Pandosy corridors. Increasing the number of residents living along these corridors through denser residential zoning would help ensure frequent transit is economically sustainable.

Mixed-use zoning is limited to specific sections of TSCs located in Urban Centres. Beyond these areas, residential and commercial zoning is separated. As mixed-use areas are key to supporting walkable and pedestrian-oriented streetscapes, additional mixed-use nodes can be considered. Furthermore, commercial zoning is also relatively rare along the TSCs and they are mostly vehicle-oriented commercial. Retail and service areas, particularly those designed for pedestrians, can create destinations that drive demand for transit.

The zoning bylaw requires a significant amount of off-street parking for medium-density residential developments including townhouses, stacked townhouses, and apartment housing. These parking minimums are slightly reduced only for zones fronting a TSC. Requiring significant amounts of off-street parking increases the space dedicated to parking and incentivizes residents to drive rather than take transit. Allowing reduced parking requirements for zones near, but not directly fronting TSCs, could support further transit-oriented development and lead to increased ridership. Please refer to the table below comparing required parking in multi-family residential zones fronting a TSC and other zones within the Core Area:

Table x.x Multi-family residential parking requirements*		
Dwelling Unit	Zones fronting a TSC	All other zones within the Core Area
Bachelor	Min. 0.9 spaces Max. 1.25 spaces	Min. 1.0 spaces Max. 1.25 spaces
1-Bedroom	Min. 1.0 spaces Max. 1.25 spaces	Min. 1.2 spaces Max. 1.6 spaces
2-Bedroom	Min. 1.1 spaces Max. 1.6 spaces	Min. 1.4 spaces Max. 2.0 spaces
3-Bedroom	Min. 1.4 spaces Max. 2.0 spaces	Min. 1.6 spaces Max. 2.5 spaces
*Refers to apartment housing, townhouses, stacked townhouses, residential security operator units Imagine Kelowna		

2040 Transportation Master Plan

The 2040 Transportation Master Plan (TMP), adopted in 2022, is Kelowna’s long-term, comprehensive transportation plan. The plan is aligned with numerous municipal and regional plans, particularly the 2040 Official Community Plan and Regional Transportation Plan. Recognizing the central importance of transportation in guiding the development of Kelowna, the TMP is designed to help the city achieve 12 goals, ranging from improving travel choices and health to supporting sustainable economic development. The plan also sets targets for increasing sustainable transportation usage and decreasing car dependence. These targets consist of doubling transit ridership and quadrupling bicycle trips, while reducing the average distance driven by 20%, within the same period. To work towards the 12 goals and achieve these targets, the plan recommends over 100 actions.

Aligning with the 2040 Official Community Plan, the TMP divides the City into five Growth Strategy Districts. Each district reflects unique transportation needs and projected mode shares. The following table summarizes these findings:

Growth Strategy District	Characteristics	Transportation Challenges	Transportation Opportunities
Urban Centres	<ul style="list-style-type: none">• 5 identified hubs including Downtown, Pandosy, Capri Landmark, Midtown, Rutland• Economic hubs• Centres of employment	<ul style="list-style-type: none">• Insufficient space for driving leading to traffic and parking challenges	<ul style="list-style-type: none">• Majority of trips are short- potential for modal shift to walking/ cycling
Core Area	<ul style="list-style-type: none">• Located near urban centres• Detached housing• Multifamily housing and commercial along corridors	<ul style="list-style-type: none">• Car-centric road network, with many cul-de-sacs increasing walking/cycling distance	<ul style="list-style-type: none">• Potential for modal shift to walking/cycling• Public transit along corridors
Suburban Neighbourhoods	<ul style="list-style-type: none">• Low density residential development• Hilly terrain and further away from city centre	<ul style="list-style-type: none">• Car-centric road network• Steep hillsides	<ul style="list-style-type: none">• Driving will remain the primary mode
The Gateway	<ul style="list-style-type: none">• Area near UBC Okanagan and Kelowna International Airport• Increasing employment opportunities	<ul style="list-style-type: none">• Car-centric industrial areas	<ul style="list-style-type: none">• Increase transit ridership at UBC Okanagan and Kelowna International Airport• Driving will remain primary mode in industrial areas
Rural Lands	<ul style="list-style-type: none">• Agricultural lands with some low-density residential development	<ul style="list-style-type: none">• Limited road network• Long distances	<ul style="list-style-type: none">• Driving will remain primary mode

The TMP recognizes that adding housing and transportation along key corridors would facilitate urban growth and build ridership for the transit network. Policies in the plan support the development of Transit Supportive Corridors at the citywide level by significantly increasing transit service, adding transit priority measures, and improving bus shelters. Moreover, the TMP also signals improvements to transit service frequency and infrastructure along TSCs identified in the OCP including Rutland, Glenmore, Gordon, Pandosy, and Richter corridors. While the region is decades away from a viable light-rail transit (LRT) network, TSCs will lay the groundwork for development of higher order transit systems in the future.

Regional Plans

Central Okanagan Transit Future Plan 2012

The Transit Future Plan was prepared by BC Transit in collaboration with the provincial and local governments in the central Okanagan region. The plan provides a vision for a future regional transportation network that is focused on moving people rather than vehicles. It also sets a target transit mode share of 7% by 2035, which means quadrupling the number of annual transit trips from approximately 4 million to 16 million.

As with Transit Future Plans in other communities across BC, this plan aims to increase investment in transportation, encourage urban forms that support transit, ensure community members are able to access services, create more sustainable transportation options, and build less car-centric communities. The plan is also aligned with the goals of the Provincial Transit Plan which aims to increase transit ridership and reduce emissions from cars.

The plan broadly supports TSC development by significantly increasing transit service throughout the region. BC Transit will triple annual transit operating hours from 177,000 to 600,000 and more than double the size of the transit fleet from 72 to 184 conventional buses. More specifically, the plan also calls for establishing three FTN corridors in Kelowna, along Springfield, Pandosy, and Gordon. The locations of these planned corridors align closely with the City of Kelowa’s planned TSCs as indicated in the OCP and TMP.

Sustainable Transportation Partnership of the Central Okanagan: Regional Transportation Plan 2020

The Regional Transportation Plan (RTP) was developed by the Sustainable Transportation Partnership of the Central Okanagan, a formal partnership that provides unified sustainable transportation policies and programs in the region. The RTP is intended to represent a vision for the future regional transportation network and identify the short- and long-term recommended actions needed to realize this goal.

The RTP’s vision is a transportation network that connects people to destinations and supports the economy, social networks, and natural ecosystems. The RTP is aligned with provincial plans, including Clean BC which aims to reduce greenhouse gas emissions, and the BC Economic Framework which provides recommendations on supporting economic growth and increasing the standard of living. The plan identifies 10 broad goals and 19 recommendations for improvements to specific areas.

The RTP aligns with and informs other regional and municipal plans, particularly the City of Kelowna’s OCP and TMP, in supporting the development of TSCs. Broadly, the plan calls for focusing regional growth along transit corridors located in urban centres. Additionally, it also provides specific recommendations on improving transit service along the Richter and Pandosy corridors. While Harvey Avenue is not a TSC, the plan also supports enhancing the transit infrastructure and increasing nearby densities to support higher order transit in the future. Other policies such as limiting the expansion of roads and highways and coordinating rezoning and development cost charges in neighbouring municipalities may lead to improved transit, but have limited direct impact on TSC development.

Appendix B: Literature Review

Corridor transit-oriented development

Corridor transit-oriented development (C-TOD) is distinguishable from other TOD models in its focus on connections rather than nodes or corridors. This perspective acknowledges that planning for one node impacts other nodes along a transit line. By prioritizing urban fabric over individual centres, C-TOD serves as a valuable framework for City of Kelowna initiatives in corridor development. It is easier to begin initiatives with this foundation than it is to integrate the model later in the process. As an area of study, C-TOD is relatively new and typically addresses lessons from real-world examples. Major points of weakness include applicability and breadth, as simplification and overgeneralization of entire cities and transit networks are inevitable in critiquing urban fabric. Some studies simply add up the sum of TOD sites, which is relevant but distinct from C-TOD research as a response to traditional models.

What is corridor transit-oriented development and why is it studied?

Corridor transit-oriented development is the study of networked TOD at the corridor scale (Liu et al. 2020). To qualify as an example of C-TOD, a project must witness coordination between individual nodes as “connected activity origins” or destinations along a designated space (p. 2).

The Center for Transit Oriented Development estimates more than one in five households will pursue housing in TOD by 2025 (Guthrie & Fan 2016; Dittmar et al. 2004). This widespread appeal has only grown over time. However, TOD varies and assumes unique forms depending on location and characteristics. The success of sites after implementation is rarely predictable. Recent theories have adapted to address this uncertainty; for example, studies on corridor transit-oriented development analyze interactions between features and sites, rather than features alone. It is theorized that a more holistic outlook accounts for human behaviour, consumer demands, and choices in mass transit. A focus on individual stations leaves the potential of network effects untouched and ignores crucial factors in ridership, such as convenience. Users are likely to engage with a system that is smooth, robust, and well-connected. Users are unlikely to engage with a system that is fractured, which happens when land use, density, and transportation planning are disconnected from one another (Hensher et al. 2016; Liu et al. 2020).

Studies and critiques of implementation revealed issues with traditional TOD over time. In Hillsboro, an Oregon municipality roughly 34 kilometres outside Portland, the Orenco Station neighbourhood is a 2000’s relic of Calthorpe’s original model (Calthorpe 1993). The Next American Metropolis specified a “mixed-use community within an average 2,000-foot walking distance of a transit stop and a core commercial area” (p. 56). Calthorpe’s ideas were absorbed into the New Urbanist movement, which set the groundwork for sites like Orenco Station. Ultimately, New Urbanist principles were successful in promoting certain qualities, like social cohesion and community feeling. One study revealed the idyllic nature of the neighbourhood led to exclusionary attitudes among residents, reinforcing negative perspectives of newcomers (Podobnik 2002). Because the neighbourhood was 95% white at the time, this held troubling implications for newcomers of colour.

Another failure was isolation from other TOD sites and transit networks. Although Orenco Station is based around a light rail station, it maintains limited pedestrian and cycling infrastructure beyond a few blocks. The site is confined between stretches of industrial parks and agricultural land. In 2007, 64% of survey respondents in Orenco Station used single-occupancy vehicles for work commutes (Podobnik 2011, p. 117). There were no statistically significant behavioural changes in transit use. This is somewhat attributed to the affluent demographics of the neighbourhood. The surrounding thoroughfares offer more insight.

The busiest roads in the area — Cornell Road, Butler Street, and Century Boulevard — pose impediments to pedestrians and cyclists and fall short of encouraging non-motorized use. Cornell Road has a speed limit of 45 miles per hour, and Century Boulevard has a speed limit of 35 miles per hour. The former has six lanes and two unprotected bike lanes, while the latter has five lanes and one unprotected bike lane. Overall, the appearance of signalized intersections, crosswalks, and bike lanes shows thought for pedestrians and cyclists, but it lacks prioritization of such users. The promotion of active transportation infrastructure does make as much sway as the prioritization of active transportation infrastructure. Similarly, transit needs to be connected to be effective. In 2021, Portland bus operator Don Iler wrote on his route through Orenco Station:

“Of course the Blue Line goes places, but the 47, where does it go? It’s oriented toward transit, but what if that transit goes nowhere? So yes, the 47 goes to Orenco Station, but I had maybe one person get on there, one person get off there per trip if I was lucky. [...] Sta-

tistics say people are more likely in this neighborhood to use transit or bike than other neighborhoods in the region, but it still doesn’t feel like enough and a bus that doesn’t go anywhere doesn’t encourage more people to ride” (Iler 2021).

Orenco Station was built around a light rail system, but the light rail system does not connect Beaverton and Hillsboro residents to predominant industries in the area. Beaverton is renowned for technology, engineering, and manufacturing companies, which led to its title as the “Silicon Forest” of Oregon (Oregon Center for Public Policy 2015). Because Portland’s Metropolitan Area Express (MAX) chiefly moves commuters to downtown Portland and limits stops in outer municipalities like Beaverton, Hillsboro, Milwaukie, Clackamas, and Gresham, it was always unlikely that Beaverton and Hillsboro residents would use the MAX to commute to work. Under this context, buses should have been a priority in the TOD site, and the lack of notable bus services reflects an oversight in approach.

If we shouldn’t focus on sites alone, what else can we do?

New Urbanist principles often fail because planning decision-making is separated from policy decision-making. It is unlikely that the development planners of Orenco Station had a say in transportation planning, zoning regulations, and policy changes. If this is the case for planners at the City of Kelowna, we need to find a way to promote dense, livable communities without waiting for substantial reform in policy decision-making. How can we create tangible change when we don’t have control over the most important aspects of corridor transit-oriented development?

As written by American city planner Jeff Speck, every commute begins with a walk (Speck 2012). In an analysis of bus rapid transit corridors, Allen et al. (2016) conclude that there is no “silver bullet” for success, but accessibility and mobility are key concerns (p. 314). This refers to continuity within bus services, such as transfers. However, continuity strengthens pedestrian access when destinations are contiguous, and these concerns are interrelated. In the Rosslyn-Ballston corridor of Arlington, Virginia, the county worked to implement “special streetscape walkways” with a minimum width of 7.31 metres. Other sidewalks were given a minimum width of 6 metres (Samuelson 2009). Focus groups in Burnaby, British Columbia revealed that walkability, along with an attractive street environment and access to services, were principal themes of approval for SkyTrain users in Maywood and Richmond Park (Jones 2015).

Without thorough consideration of all users and abilities, transit-oriented development is doomed to become transit-adjacent development. Transit-oriented development often evolves into transit-adjacent development during implementation (Suzuki et al. 2015). This form of development does not necessarily involve public transportation and refers to parcels near major arterials. The difference can make or break ridership. This is further explored in the following discussion of bus transit-oriented development. In the context of C-TOD, the consistent prioritization of safe and comfortable walking environments remains a core factor in successful C-TOD. As observed in Orenco Station, the appearance of active transportation infrastructure in one place does not facilitate the same impact as the appearance of such infrastructure in multiple locations.

What does corridor transit-oriented development look like in action?

Allen et al. (2016) divide corridors into three overarching types with seven subsections based on land uses. The broader categories include emerging corridors, transitioning corridors, and integrated corridors. Emerging corridors take place in low-density neighbourhoods with segregated uses and few transit destinations. Transitioning corridors possess investments in transit and economic development, and at least one major activity centre along a corridor. Integrated corridors contain many transit-oriented destinations, along with direct transit routes (p. 96). High-quality walking environments are a factor across the board.

In historically low-density Kelowna, emerging corridors are much of the transportation system. The transformation of emerging corridors into transitioning corridors will involve considerable changes in land use, such as the presence of local businesses and services in residential areas. This should be supported with a transit network that carefully and meticulously debates features such as closed or open systems, corridor types, station types, operation, vehicle technology, intersection type, and control systems (Allen et al. 2016). Examples of major activity centres are malls and business districts, among other possibilities. It is said that a transitioning corridor will not change if it targets commutes between centres rather than activity within the corridor itself (p. 100).

The Center for Transit Oriented Development denotes three types of corridors: the destination connector, the commuter corridor, and the district circulator (Liu et al. 2020, p. 4). Destination connectors link residential neighbourhoods to employment and recreation opportunities. Commuter corridors facilitate movement to the city centre, guiding inbound traffic flow in the morning and outbound traffic flow in the evening. District circulators accelerate movement through districts, such as university campuses and downtowns. The same study suggests “5D” variables in corridor development: density, diversity, design, distance, and destination accessibility. It is shown that altering any one of these variables can impact another variable. For example, diverse land uses shorten the distance residents travel to work.

The 5D variables are known for their broad applicability across municipalities, regions, and even countries. Berawi et al. (2020) labels diversity the most pivotal factor due to its financial implications (p. 15-16). Diversity is directly related to economic development and encourages a wide variety of investors and buyers. More funds pave the path for improvements in other areas. Therefore, it is suggested

ed that diversity is the first step to investing in an emerging corridor. Diversity in land use also contributes to the sentiment shared by focus groups in Burnaby — interesting streetscapes make for attractive streetscapes.

Alternatively, through an equity lens, shortening distance between housing and jobs is a progressive first step. In TOD, it is challenging to avoid displacement, and few municipalities have focused solely on mitigating its impact. Harrison et al. (2019) cite the looming replacement of existing positions with unattainable roles for residents in Johannesburg (p. 461). This insight took place in an analysis of Mayor Mpho Phalatse’s 2013 Corridors of Freedom plan, which reflected a distinctly political stance on socio-spatial transformations. Accompanied with transformations in housing, such changes in the landscape signalled a loss for vulnerable groups. Simultaneously, community engagement has revealed that low-income communities frequently request access to more jobs and services (p. 465). This request echoes a comment by a developer in Minneapolis:

“[I]n my group we say, what’s the best way to build affordable housing? Put it on transit. You don’t even have to touch the unit. You don’t have to subsidize the unit or do anything – just put it on transit. Change the equation about the money going into personal transportation, which is 20% now. Housing is 30%. So, transportation is taking up two-thirds of the budget that your house is. Your car is costing you two-thirds as much as your house! That’s crazy – if you’re on the lower end, especially. So, that’s – you can change the two-by-fours or get government programs all day long, but none of them have the impact of transportation connections.” (Fan & Guthrie 2016, p. 110)

Bus transit-oriented development

An alternative perspective is bus transit-oriented development (B-TOD). The B-TOD lens is similar to C-TOD in its emphasis on connections between neighbourhoods. It is an implementation tool, rather than a framework. As such, research on B-TOD examines the budgets and socioeconomic impact of broadening transit networks. In the United States, an estimated 7.8% of TODs are bus transit-based, and this statistic is only growing (Cervero 2004). B-TOD mimics the qualities of urban rail systems without burdensome financial demands, offering a cost-effective alternative in smaller cities. It is based in systems such as bus rapid transit (BRT) or frequent transit networks (FTN). Some municipalities, like the City of Vancouver, designate both as foundations to transportation plans.

Transit agencies prioritize values in relation to customer needs and demands. According to one source, these values might include safety, cost, time, flexibility, comfort, coverage, and availability of information (Mozayani 2019, p. 13-17). These could be summarized into wider categories: security, reliability, and convenience. Transit users are usually looking for the cheapest and easiest route to move from Point A to Point B, and the most efficient bus systems are rooted in this notion (Johnson 2003). Apart from values, systems take on unique appearances and functions based on vehicles, stations, rights-of-way, schedules, fare collection, and brand identity (Karls-son & Nikitas 2015). Transit might feel a little different in Atlanta, Georgia than it does in Bogotá, Colombia, and the reasoning extends beyond first impressions.

What is bus rapid transit and how does it relate to B-TOD?

Bus rapid transit is a system of facilities, services, and amenities that improve the speed, reliability, and identity of bus transit (Levinson et al. 2002). It is sometimes considered a “rubber-tired light rail transit” with greater flexibility and lower operating costs (p. 2). Despite its potential, particular weaknesses damage its reputation as a sustainable and affordable choice. Buses compete with personal motorized vehicles on the ground and uphold a reputation as a low-quality mode of transit (Hidalgo 2014; Baker et al. 2018). This seems to be more of a problem in North America. The world’s most popular and extensive bus rapid transit networks are found overseas, from Bogotá to Ahmedabad (Hidalgo 2014, p. 10).

The City of Kelowna is in the early stages of a BRT system, and observations on other municipalities relay steps in achieving Transportation Master Plan objectives. Curitiba, Brazil is widely recognized as one of the most successful examples of BRT in the world, and the success is attributed to political leadership, pragmatism, and continuity (Facchini et al. 2010). In the 1970’s, São Paulo, Porto Alegre, and Rio de Janeiro used the same national funding for system performance improvements, while Curitiba pursued corridors to direct growth (p. 17). This decision factored into Curitiba’s overall success in ridership and integration of land use. Additionally, it is noted that the other cities renovated plazas into open bus depots, which detracted from public space and pedestrian accessibility. This demonstrates the importance of land use, placemaking, and active transportation infrastructure not only in bus rapid transit, but bus transit-oriented development.

What are frequent transit networks and how do they relate to B-TOD?

Frequent transit networks are a relatively new approach in transportation planning and engineering. This strategy refers to bus systems over other modes of transit. It is implemented in response to user concerns with unpredictable schedules. Stops are placed farther apart with quicker headway, with 15 minutes or less between each arrival. The assumption is that users will walk longer distances for reliable service. Interestingly, TransLink’s online webpage on frequent transit networks offers a section about benefits for developers. The list includes certainty about the locations of high-quality transit, ease of development near stations, increases in rent, and lower vacancy rates (TransLink 2023).

Literature on frequent transit networks is typically found in traffic and civil engineering publications, including professional reports. These articles are rooted in quantitative studies and analyses. Compared to research on bus rapid transit, research on frequent transit networks centres on transit networks rather than their relation to land use, urban design, density, and equity. The literature review process has revealed that FTN is less common and less researched than BRT as a foundational approach to bus transit-oriented development and corridor transit-oriented development.

How is bus transit-oriented development implemented effectively?

To achieve an ideal impact, B-TOD must be executed with strict objectives and a detailed plan. Although it is widely recognized that ridership is dependent on density and land use, recent studies show there is more to the story. Density and land use are broad categories with many variables, and it is important to identify each variable and its impact. For example, population density, multifamily residential land use, distance from a central business district (CBD), distance from downtown, service quality, pedestrian accessibility, and parking supply play roles in ridership (Johnson 2003, p. 23).

Additionally, findings are contingent on the size of the development observed. Observations within an eighth mile of a transit stop differ from observations within a quarter mile of a stop (Johnson 2003). This is a particularly important consideration given the extensive nature of Kelowna’s growing transportation system. Models that are based on small-scale development may not accurately predict the outcomes of a larger plan. Exceptions include land value, commercial activities, and service activities, which consistently occur in a positive feedback loop. Funds can be used to build more transit-oriented development (Lin et al., 2018). The broadest recommendation is that bus transit-oriented development needs to be executed effectively from the start.

Finally, B-TOD can be studied in relation to rail transit-oriented development (R-TOD). Key similarities are benefits like expanded labour markets, lower travel costs, and higher quality of life, especially when car use is discouraged. Economic growth is both a cause and effect of broadening transit networks. During implementation, policy decisions direct investment to housing, employment, and services around stations or stops. Coordinated regulations, alignment, and a demand for density facilitate all modes of transit.

Differences include the impermanence of bus systems, potential for low usage, and resulting low-density, small-scale development along corridors. B-TOD almost always suggests lower density (Calthorpe 1993; Cervero 2004; Currie 2006). In our case, it is important to focus attention on development that encourages more density over time. Planned, implemented, and executed well, the impermanence of bus systems can make way for timely changes that facilitate densification via malleability of development.

For example, Cervero and Dai (2014) observe the potential for bus transit-oriented development to fail without ample private development along transit networks (p. 137). The encouragement of private development could include changes to zoning, assistance with land assembly, and improvements to streetscapes. Another oversight is a lack of pedestrian access. High-quality walking environments, such as footbridges and green walkways, increase real estate prices, particularly when they connect bus stops and high-density land uses. Such connectors issue enjoyable paths that appeal to various users and pose minimal risk to pedestrians.

Summary

Differing perspectives shine light on unique approaches to TOD. Cervero & Ewing’s 2010 5D variables, as well as Allen’s 2016 Livable Transit Corridor Typology and the Center for Transit-Oriented Development’s 2010 model, are useful in evaluating existing properties of sites slated for TOD. Because the Livable Transit Corridor Typology is land use-based and the C-TOD model is traffic-based, these two models could work together in a new framework. Projects based on Calthorpe’s 1993 model can be examined for important lessons learned.

Calthorpe’s original model of transit-oriented development has been critiqued thoroughly, particularly in relation to New Urbanist principles and projects. Orenco Station’s failure to attract a higher proportion of non-motorized users reflects the planning approaches used to build the site. Although active transportation infrastructure was a consideration, it was not prioritized over vehicular use. Residents were given the convenient opportunity to take the light rail to Portland while choices for nearer municipalities were an after-

thought, despite substantial and prominent commercial activity in the area.

Literature on corridor transit-oriented development emphasizes the short and long-term effects of pedestrian accessibility on sites. The connection between pedestrian accessibility and other factors is reflected in Cervero & Ewing’s 5D variables of the built environment (2010). For example, a resident who can walk to several stores and markets has a reduced need to travel to an adjacent neighbourhood for groceries. This example alone is based in diversity, distance, and destination accessibility variables. Without a holistic perspective, transit-oriented development quickly reshapes to transit-adjacent development. In action, the balance between unattainable TOD and uninspired TAD requires intentional approaches that stretch beyond land use planning and complement transportation planning, traffic engineering, and policymaking.

The classification matrix may include established categories, such as Allen’s emerging corridors, transitioning corridors, and integrated corridors (2016). When it comes to existing thoroughfares, such as Gordon Drive or Richter Street, criterion will facilitate a better understanding of current properties and future objectives. Another method is the Center for Transit Oriented Development’s general categorization of destination connectors, commuter corridors, and district circulators (Liu et al. 2020). This could serve as a broader starting point for our own framework.

On a final note, for the purposes of an introductory framework, a dominant mode of transit should be selected. This is likely bus rapid transit, as it is the most accessible, affordable, and realistic choice to pursue in the near future. While a light rail system is under consideration, existing and future land use planning will demand unique needs and trigger distinct consequences. Therefore, it is more conducive to centre bus transit-oriented development, bus rapid transit, frequent transit networks, and their relationships to land use patterns.

Appendix C:

Transformative Placemaking Framework

Transformative placemaking framework

Transformative placemaking aims to:

Nurture an <i>economic ecosystem</i> that is regionally connected, innovative, and rooted in the assets of its local residents and businesses.	<i>Regionally connected</i>	Connects residents and businesses to regional markets, networks, and economic opportunities.
	<i>Locally empowering</i>	Nurtures and supports the development of local talent, investment, and enterprises.
	<i>Innovative</i>	Fosters creativity, idea exchange, and entrepreneurship.
Support a <i>built environment</i> that is accessible, flexible, and advances community health and resiliency.	<i>Accessible</i>	Provides easy, reliable, and affordable multimodal movement to, from, and within the area.
	<i>Flexible</i>	Offers physical spaces and infrastructure that support a mix of uses while remaining adaptable to growth and change.
	<i>Healthy and sustainable</i>	Encourages development and design that advance the health, safety, and resiliency of people and the environment.
Foster a <i>vibrant, cohesive social environment</i> that is reflective of community history and identity.	<i>Vibrant</i>	Cultivates an engaging public realm animated by a range of activities and programming.
	<i>Cohesive</i>	Promotes social interaction and trust among diverse groups of residents, workers, business owners, and other community members.
	<i>Reflective</i>	Represents the distinct cultural and historical identities of the community and facilitates a shared sense of ownership and attachment.
Encourages <i>civic structures</i> that are locally organized, inclusive, and support network building.	<i>Locally organized</i>	Supports place governance structures that are representative of the community, outcome-oriented, and sustained by funding, expertise, and partnerships.
	<i>Inclusive</i>	Prioritizes the cocreation of initiatives and programming by a wide range of stakeholders, celebrates open and respectful dialogue, and operates with transparency and fairness.
	<i>Networked</i>	Advances the development of formal networks and organizations within the community, while also supporting resident engagement in broader city and regional civic structures.

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