



Region of Waterloo

Shared Micromobility Feasibility Study

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Executive Summary

The Region of Waterloo Shared Micromobility Feasibility Study recommends actions for implementing long-term bike share, e-bike share, and e-scooter share solutions throughout the region.

Understanding Shared Micromobility

Micromobility is an umbrella term for personal transportation devices that include human and motorized vehicles. The most common micromobility vehicles are bicycles, electric assist bikes (e-bikes), and e-scooters. Shared systems provide people access to vehicles through a membership, pay-per-use, or time-based fares. Municipalities across Canada and throughout the world are implementing shared micromobility programs to support mobility and active transportation. Shared micromobility programs are used to offset traffic congestion, respond to climate change, and provide more options for people to conveniently get around their community.

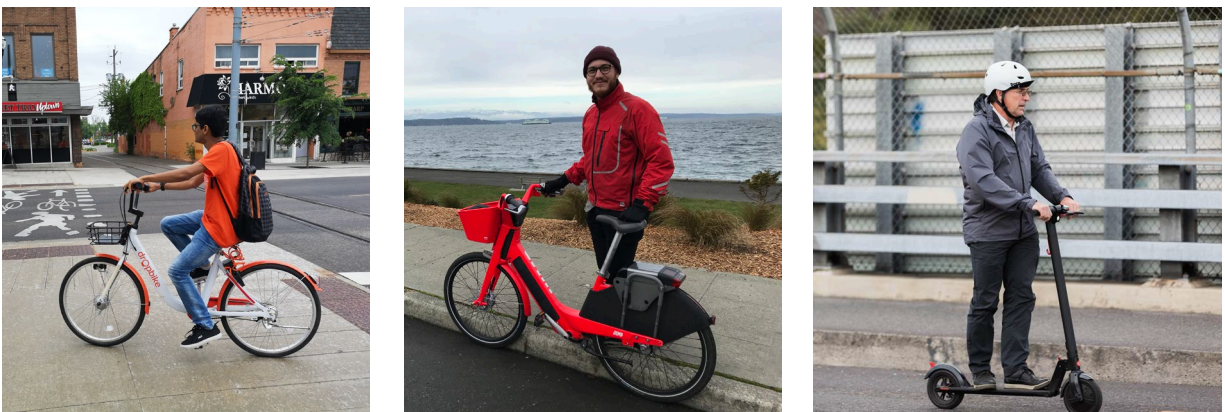


FIGURE 1. FROM LEFT TO RIGHT: CONVENTIONAL PEDAL BIKE, ELECTRIC ASSIST "E-BIKE", AND E-SCOOTER

Understanding This Study

The study reviews the development of shared micromobility systems and considers other jurisdictions' systems and current trends in the shared micromobility industry.

The project steering committee developed a vision to support the decision-making process in establishing a system in Waterloo Region as well as goals and measurable objectives for a shared micromobility program.

Vision Statement: The Waterloo Region will be home to shared micromobility systems that positively contribute to the Region's high quality of life, economic vibrancy, and climate action goals. The system will integrate with transit to provide additional mobility options.

Goals:

- Micromobility is environmentally friendly.
- Micromobility is available throughout the region.
- Micromobility is equitable.
- Micromobility is integrated with transit.
- Micromobility leverages existing and planned transportation infrastructure.
- Micromobility equipment is safe and reliable.
- Micromobility positively contributes to the Region's public realm.
- Micromobility contributes to regional economic development.
- Micromobility positively impacts public health throughout the region.
- Micromobility options evaluate and respond to new technology.
- Micromobility should enable positive user experience and be responsive to user needs.
- Micromobility data are accessible for public sector use.
- Micromobility is sustainable and adaptable for years to come.

Exploring the Dropbike Pilot

The project team analyzed the Dropbike pilot's performance during this study. Results explore potential improvements for future shared micromobility systems in the region. In 2019 during the course of the 7 month pilot, over 4,600 total trips were taken by 1573 unique users. Drop Mobility's Licence Agreement was an important evaluation tool, since this document set the pilot's parameters. Pilot results were also evaluated based on a public survey and the Steering Committee's shared micromobility goals. The Institute of Transportation and Development Policy (ITDP) is an internationally recognized organization focused on transportation and climate change. The project team used the ITDP Bike Share Planning Guide evaluation metrics to compare the pilot with other bike share systems. Overall the pilot was conditionally successful based on evaluation to license adherence, but it is noted that staff and stakeholders had concerns that the pilot did not meet expectations.

Where Could a System Operate?

A market analysis identified concentrations of potential high shared micromobility ridership throughout the three area municipalities. The analysis identifies the relative level of demand based on where people live, work, learn, play, shop, and access transit. The study reviewed areas identified through Public Health Ontario's Material Deprivation analysis to consider priority equity areas within service area planning. Bikeways within the region were mapped to show the overlap between high demand areas with existing low stress active transportation facilities. This process attempted to minimize geographic and infrastructure barriers that could deter people from using shared micromobility.

The team used the market analysis to develop a recommended service area to encompass the three Area Municipalities. The suggested phasing approach would concentrate shared

micromobility vehicles and parking to high demand and high equity areas first such as Uptown Waterloo, Downtown Kitchener, universities, and Downtown Cambridge (Galt). These areas would have a high density of these services. The recommended phasing would eventually expand to encompass all three municipalities. Future expansion beyond these boundaries is also possible. Service area recommendations were developed and iterated based on stakeholder feedback.

Key Recommendations

Key recommendations to foster shared micromobility include:

- **Near-term (2020-2022):** Establish a permit system for single or multiple operators that would deliver a mix of shared micromobility vehicles (e.g., bike share, e-bikes, e-scooters). Invite operators to apply to provide their services in the region.
 - Follow the National Association of City Traffic Officials (NACTO) recommendations for shaping shared micromobility regulations. Categories include: general provisions, scope and operations oversight, public engagement, mobility data and user privacy, and infrastructure.
 - Monitor and evaluate the on-going performance of operators under the shared micromobility permitting system.
- **Short-term Contingency (2023-2024):** One of this study's goals is to anticipate future technology and industry developments. With this in mind, the Region should be prepared to consider a procurement approach, should no operators apply for a permit-based system.
- **Long-term Contingency (2025 and beyond):** If elements of the permit system are not achieving the goals and objectives, consider procurement options. Procuring a system owned by a public agency would require more public agency funding than the short-term options. This study's pro forma documents potential funding and costs.

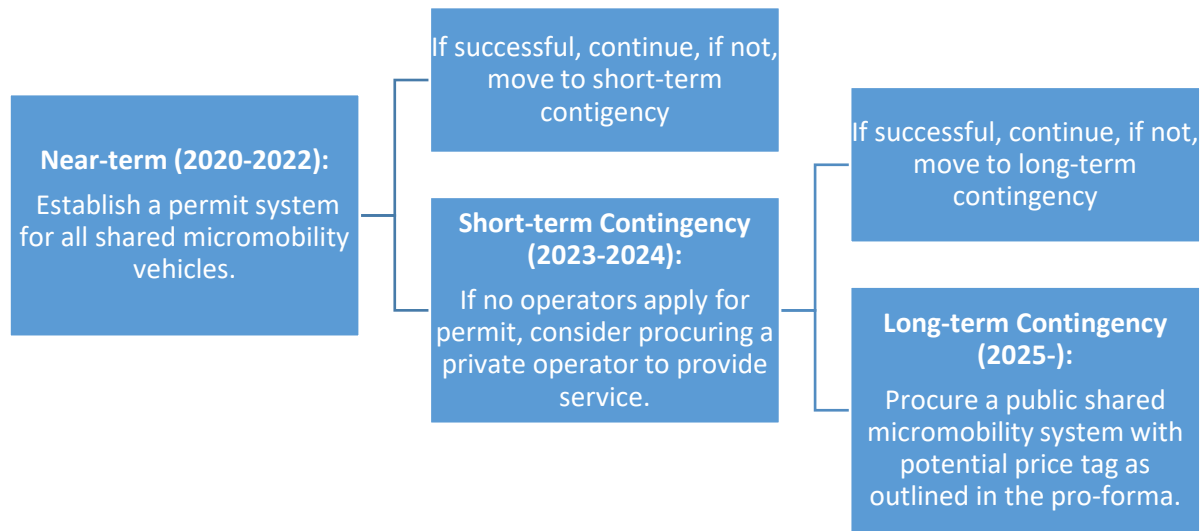


FIGURE 2. ROADMAP OF RECOMMENDATIONS FOR SHARED MICROMOBILITY

Greenhouse Gas Emissions Avoidance

As part of the terms of this study, the impact that shared micromobility has on greenhouse gas (GHG) emissions was evaluated. Based on a review of the literature, shared micromobility systems primarily avoid GHG emissions through trip replacement (shifting of trip modes) from car trips. System ridership uptake scenarios were developed based on guidance, and potential trip replacement percentages were identified based on the Dropbike pilot and other system's experiences. Overall, provision of bikes and e-scooters alone is not enough to encourage the high frequency of use necessary to achieve significant GHG emissions reductions. Shared micromobility systems should be implemented in coordination with transportation demand management (TDM) strategies and marketing to increase the impact of shared micromobility systems on GHG emissions avoidance.

Expected Public Sector Contributions: Proposed Permit-based System

Permit-based shared micromobility systems rely on private vendors to operate systems. However, public sector staff are still needed to help foster the systems' success throughout the region, and public funding may be required for subsidized or incentivized equity programming. The chart below, from the Business Plan section of this study, identifies necessary public sector contributions.

TABLE 1. PUBLIC SECTOR ROLES

Category	Expected Public Sector Contribution
Launch Costs: Establish the system, such as hiring employees, warehouse fees, pre-launch marketing	• Hire 1 to 2 FTE employees within Region of Waterloo to serve as Shared Micromobility Coordinator. • New FTE and other staff time manage permitting process.
Capital Costs: Vehicle and parking	• Leverage funding from existing bike parking funding source for the creation of bike parking open to bike share and personal bikes. • Bike share specific parking would be funded by private operators • Increase funding for installing new bike parking. This document recommends 200 bike share specific parking corrals. • The Region and Area Municipalities should add 200 additional bike parking corrals phased to growth of bike share network expansion, to address public comment/concern of limited bike parking, at least 40 corrals annually. • Total cost: approximately \$500,000 over five years and could create as many as 2,000 bike parking spaces.
Operational Costs: On-going cost of system upkeep and programming	• Public agency staff time is needed to communicate with vendors regarding the Licence Agreement to make sure this stays on track. • Contribute funding for equity programming (e.g., subsidized memberships).
Marketing Costs: promote the system and proper usage	• Distribute marketing materials (funded and/or developed by vendor), invite vendor to relevant public agency-led community events.



FIGURE 3. AN EXAMPLE OF A BIKE USED IN A BIKE SHARE SYSTEM

1. INTRODUCTION

What Is Shared Micromobility?

Micromobility is a term that describes shared forms of personal transportation such as bikes, e-bikes, and e-scooters. They are built for one passenger at a time and are small vehicles that are parked on sidewalks or within dedicated on-street parking areas. Individual people do not own the bikes and scooters. Rather, they pay to access shared vehicles left at convenient locations throughout a community.

As of the end of 2017, 45 of the 50 most populous U.S. cities had a functional bike share system, a 900% increase from 2010, when only five of these cities had bike share systems. Bike share is also growing in Canadian communities. Six cities currently have operating bike share systems: Victoria, Vancouver, Calgary, Hamilton, Toronto, and Montreal.



FIGURE 4. DOCK-BASED BIKE SHARE IN MONTREAL

Bike Share

Bike share systems encourage short, spontaneous, one-way trips. Bikes are checked out, ridden for a short period of time (typically up to 30 or 60 minutes), and returned to any station in the system or parked at the final destination.

Bike share is quickly becoming common in small, mid-size, and large cities in North America. Bike share is operational in six Canadian cities. At least three Canadian universities and one business park offer bike share.

Bike share is cost-effective, environmentally-friendly, and offers convenient trips. It offers a relatively inexpensive and quick extension of a city's public transportation system. A bike share system consists of a fleet of user-friendly, durable bikes that can include conventional pedal-powered bikes as well as electric assist bicycles. They are either docked at bike share specific stations or parked by users at destinations, in the case of dockless bike share. Differences between these approaches are explained in subsequent sections.

Types of Bike Share Systems

Most systems employ a pricing schedule that encourages short, frequent trips and discourages using bikes for long periods of time. Some systems permit unlimited, short trips for casual (24 hour) users or annual/monthly members. This approach is sometimes called a “buffet” style of pricing. Others charge for each trip or a designated usage time, sometimes called “à la carte” pricing. Each pricing model focuses on reaching nearby destinations quickly and conveniently. Public bike share is not intended to compete with bike rental companies, which are intended for renting a bicycle continuously for longer periods of time. Modern bike share systems use one of three types of technology.

Dock-based Bike Share

Dock-based systems are modular and consist of docking plates and kiosks that use solar power and wireless communication. This technology was the first to achieve widespread implementation among public systems.

Dockless Bike Share

Dockless systems allow the shared bicycles to be locked anywhere within a designated service area, either locked to a fixed object or locked to itself. This is a newer technology, which evolved to reduce equipment costs.

Hybrid / “Lock-to” Bike Share

Hybrid systems (“lock-to”) feature smart locks but require locking the bike to a fixed bike rack or designated station. Urban cores typically have designated

stations and less densely populated areas typically allow bikes to be parked to any bike rack. This is a newer technology, which evolved to reduce equipment costs.

Regardless of technology, bike share represents a fleet of shared bikes for use by members or casual users. Increasingly, dockless bike share operators charge for rides on a time or usage basis, rather than through membership passes.

Typically, users access bikes from, and travel within, a designated service area of a city or region. Depending on levels of use and operator regulations, bicycles must be redistributed from one station or part of the city to another to ensure that bikes are available in areas where residents or visitors would typically look for them. Systems require a software back-end that keeps track of ridership information and most can be linked in real time to a website or mobile device application. The software back-end also tracks the number of trips, the distance travelled, and where the bicycle was accessed and parked.



FIGURE 5. DOCK-BASED BIKE SHARE SYSTEM IN TORONTO, ON



FIGURE 6. DOCKLESS BIKES IN OTTAWA, ON



FIGURE 7. "HYBRID" BIKES PARKED AT A STATION IN HAMILTON, ON

In November 2019, the Ministry of Transportation Ontario announced a five-year pilot program allowing municipalities to permit e-scooters to operate on public roadways.



FIGURE 8. A DOCKLESS SCOOTER

Electric Scooter Share (“E-Scooters”)

Electric scooter share generally follows the same principles as bike share. An e-scooter is a power-assisted scooter with a step-through frame. A single rider stands while driving the vehicle, which does not include a seat. E-scooters can be parked in an upright position with the use of a kickstand. A customer interested in using an electric scooter can rent one for short, one-way trips.

E-scooters use dockless parking areas or existing sidewalk space. The first electric scooter share (e-scooters) system in Canada, operated by Lime, was in operation in the City of Waterloo as of October 2018 until August 2019. Other systems have begun operation throughout Canada, including Kelowna, Calgary, Edmonton, and Montreal.ⁱ



FIGURE 9. A PERSON USING AN E-SCOOTER

Study Purpose

This study was initiated to determine the minimum requirements for a sustainable regional bike share system that is integrated with transit. This goal is critical since the regional Community Access Bike Share (CAB) system ceased operations in 2018. The study provides recommendations for regulating and managing shared micromobility operators.

The study's purpose is grounded in the potential greenhouse gas (GHG) emission avoidance of shared micromobility. Shared micromobility has the potential to replace car trips with bike or e-scooter trips.

Implementing the proposed system has the potential to reduce greenhouse gas (GHG) emissions roughly the equivalent of planting 38,000 trees and allowing them to grow and sequester CO₂ for ten years. A detailed analysis of the greenhouse gas emission avoidance potential through the implantation of bike share and e-scooter share systems is included as Appendix A.

reducing greenhouse gas emissions as a key consideration for Regional decision making.

- Shared micromobility can contribute towards the mode split targets outlined in **the 2041 Regional Transportation Master Plan Update (RTMP)** by increasing cycling trips and lowering the number of automobile trips. Relevant goals and strategies include Goal 1: Build a Transportation Network that Supports all Modes of Travel, Goal 2: Promote a Healthy Community, , and Strategy 5: Position the Region for New Mobility.
- The Region's **2014 Active Transportation Master Plan** also includes a recommendation to work with the Area Municipalities and local organizations to support the development of a bike share system in the region.
- Each Area Municipality played a crucial role on the project's advisory committee.

Supporting Plans

Shared micromobility has the potential to help accomplish goals from other planning processes. Examples of related plans and processes include the following.

Regional Plans

- The Region's **2019-2023 Strategic Plan** includes a Sustainable Transportation focus area, with a strategic objective to increase rates of active transportation. The plan also includes a Climate Action strategic imperative that identifies

Area Municipality Plans

- **Complete Streets Kitchener:** This plan sets a vision, goals, and design principles to achieve complete streets. It includes preferred designs based on street typologies. Work to create streets that are safe for all is essential in encouraging shared micromobility ridership.
- **City of Kitchener Strategic Plan:** The current strategic plan includes a goal of promoting “People-friendly Transportation” with a corresponding action to incentivize and subsidize a bikeshare program by 2021.
- **The City of Kitchener Cycling and Trails Master Plan** identifies a bikeshare program within the implementation plan.
- **City of Waterloo Transportation Master Plan:** The City is currently updating the 2011 plan. The previous plan’s guiding principles also apply to shared micromobility: accessibility, choice, sustainability, and fiscal responsibility. The city’s
- **The City of Waterloo Strategic Plan** also includes an objective to facilitate a modal shift toward “safe, sustainable transportation”.
- **City of Cambridge Bike Your City Cycling Master Plan:** This plan was released in February 2020 and sets a long-range vision for cycling. A five year

plan identifies high priority actions to advance year-round cycling. Action 2D.2 within the **Cycling Master Plan** to continue supporting a regional bike share system. The city’s

- **The City of Cambridge Strategic Plan** includes an objective to move people within Cambridge and outside of Cambridge without using a car.

Relation to Pilot Projects

The study occurred separately from shared micromobility pilot projects that occurred in the region during the planning process. The companies involved in the pilots were not principal actors in the development of this study. Nonetheless, the pilots were influential in thinking about long-term options for shared micromobility.

- The City of Waterloo initiated a scooter share pilot with Lime along a section of the Laurel Trail and in the David Johnstone Research and Technology Park from 2018-2019. E-scooters were not allowed on public roads at the time of the pilot.
- The Region of Waterloo and the Cities of Waterloo, Kitchener, and Cambridge initiated a bike share pilot with Dropbike in 2019. The pilot is discussed in depth in Section 3 of this study.

Vision, Goals, and Objectives

Vision Statement

The Waterloo Region will be home to shared micromobility systems that positively contribute to the region's high quality of life, economic vibrancy, and climate action goals. The system will integrate with transit to provide additional mobility options.

Program Goals and Objectives

Table 2 lists program goals and objectives. They were brainstormed by the consultant team and Project Advisory Committee (PAC), comprised of representatives from the Region and Area Municipalities. They were frequently revised throughout the process to reflect upon how shared micromobility should operate within the region. The vision, goals, and objectives were also shared with stakeholders in the region. The list of goals is also summarized below, independent of the table.

- Micromobility is environmentally friendly.
- Micromobility is available throughout the region.
- Micromobility is equitable.
- Micromobility is integrated with transit.
- Micromobility leverages existing and planned transportation infrastructure.
- Micromobility equipment is safe and reliable.
- Micromobility positively contributes to the Region's public realm.
- Micromobility contributes to regional economic development.
- Micromobility positively impacts public health throughout the region.
- Micromobility options evaluate and respond to new technology.
- Micromobility should enable positive user experience and be responsive to user needs.
- Micromobility data are accessible for public sector use.
- Micromobility is sustainable and adaptable for years to come.



FIGURE 10. THE REGION OFFERS OPPORTUNITIES TO EXPLORE WITHOUT USING A CAR

TABLE 2. PROGRAM GOALS AND OBJECTIVES

Goal	Objectives	Bike Share Considerations	E-scooter Considerations
Micromobility is environmentally friendly	- Micromobility should help reduce greenhouse gas emissions (GHG). A <i>Climate Action Plan for Waterloo Region</i> identifies transportation-related actions including supporting bike share and increased cycling. - Micromobility vehicles have lifecycle targets that emphasize reusability.	Bike share systems lower barriers to using bikes to replace trips made by one person driving alone. However, the system's vehicle production and use of motor vehicles to rebalance bikes can lower the overall impact.	E-scooters currently have very low lifecycles. However, research indicates they can also replace car trips. They likely replace more trips per day and replace a higher percentage of trips than bike share. The average trip distance is shorter. E-scooters also require charging, likely from fossil fuels.
Micromobility is available throughout the region	- Micromobility should, at a minimum, serve each of the three cities within the Region of Waterloo. Systems should have the potential for future expansion to the four townships. - Equipment is safe and perceived as safe by residents/visitors.	With thoughtful management, both modes can accomplish this goal.	
Micromobility is equitable	- Micromobility serves people of all ages and abilities. - Micromobility should serve areas that are currently underserved by mobility options. This is supported by programming to lower barriers to using the system (e.g., provide multiple payment options, hire program ambassadors, provide subsidized memberships). - Micromobility should enhance social equity while also serving areas that will result in the highest overall use of the system (e.g., placement by potential "early adopters").	Thoughtful program management can accomplish these goals.	Costs for users are typically more expensive than bike share.

Goal	Objectives	Bike Share Considerations	E-scooter Considerations
Micromobility is integrated with transit	- Micromobility should connect people to ION stations and key bus stops. - The system will pursue options for integration with transit fare cards or other payment options.	Both modes can accomplish this goal.	
Micromobility leverages existing and planned transportation infrastructure	- Micromobility should connect to existing trails and other low-stress cycling infrastructure. - Micromobility should be part of enabling use of investment in a wayfinding system. - Micromobility should connect to transit.	Both modes can accomplish this goal. Low-stress roadway conditions and education are needed to discourage sidewalk riding.	
Micromobility equipment is safe and reliable	- Micromobility regulations and system approach should contribute to orderly equipment parking/docking. - Micromobility vehicles should be durable and reliable through use of quality parts and routine maintenance.	Thoughtful program management can accomplish this goal.	
Micromobility positively contributes to the Region's public realm	- Micromobility should be easily available to residents and visitors while keeping sidewalks and greenways open and clear for pedestrians. - Micromobility should contribute to the liveliness of the public realm. - Micromobility should be distinct and intuitive in the public realm.	Bikes without a "lock-to" mechanism can block walkways, if not appropriately managed.	E-scooters can block walkways, if not appropriately managed.
Micromobility contributes to regional economic development	- Micromobility contributes to vibrant neighbourhoods within Waterloo Region by providing a convenient way to access popular destinations. - Micromobility complements regional development along major public transportation corridors. - Micromobility encourages residents and visitors to visit the region's economic assets and local businesses. - Micromobility attracts talent and businesses by offering more options for commuting.	Thoughtful program management can accomplish this goal.	

Goal	Objectives	Bike Share Considerations	E-scooter Considerations
Micromobility positively impacts public health throughout the region	- Micromobility encourages more people to meet physical activity guidelines. - Micromobility connects people to parks and other places that offer recreation opportunities. - Micromobility contributes to positive mental health and stress reduction.	Biking for trips encourages more people to meet physical activity guidelines. Adaptive options are available for people with disabilities.	E-scooter users typically walk to the vehicles, but are less active during a trip. Accessing the scooter could offer more physical activity than some users typically achieve. Adaptive options are also emerging for people with disabilities.
Micromobility options evaluate and respond to new technology	Micromobility evolves based on technological trends. However, new services, or other developments, are evaluated based on their ability to further the region's mobility goals.	Thoughtful program management can accomplish this goal.	
Micromobility should enable positive user experience and be responsive to user needs	- Micromobility is logical and easy to use. Systems emphasize a positive user experience. - Micromobility user experience adapts to meet users' expectations. - Micromobility providers are responsive to public agency and user communications and requests.	Thoughtful program management can accomplish this goal.	
Micromobility data is accessible for public sector use	- Micromobility providers produce data in a format that is accessible to public agencies (e.g., General Bikeshare Feed Specification). - Micromobility data are anonymized when shared with public agencies to protect user privacy.	Thoughtful program management can accomplish this goal. However, data transparency varies by system.	
Micromobility is sustainable and adaptable for years to come	- Micromobility vendors/operators should demonstrate financial stability. - Micromobility regulations are adaptable, based on lessons learned. - Micromobility pilot projects should be explored to foster a culture of innovation and to enhance user experience.	Micromobility vendor financial stability varies over time.	

2. MARKET ANALYSIS

A market analysis for shared micromobility looks at where jurisdictions can expect to see concentrations of shared micromobility activity. The bike share market analysis uses five major inputs:

- **Live** – where people live.
- **Work** – where people work.
- **Play** – where people recreate.
- **Learn** – where people learn.
- **Ride** – where people use transit and ride bicycles.

Categories for the market analysis were selected based on research pertaining to factors influencing micromobility usage. Areas with higher population density, more workplaces, stores, schools, community facilities, existing cycling facilities, and transit stops have a higher demand for people to access these places, which could correspond with higher shared micromobility ridership relative to other areas.

Existing cycling facilities were included in the analysis to identify overlap between low stress streets and high demand areas. High demand areas with streets that discourage cycling may be future candidates for shared micromobility hubs, if these streets are retrofitted to accommodate cycling infrastructure. The map also shows locations where residents suggested adding Dropbike pilot locations.

Market Analysis Results

Individual heatmaps were developed for each input to determine where demand for shared micromobility may be concentrated. Colour spectrums are set at threshold levels to indicate relative demand. The area used to complete the analysis includes the cities of Cambridge, Kitchener and Waterloo. This study recommends the eventual expansion of bike and scooter share beyond these communities, but the analysis focuses on more densely-developed parts of the Region.

Figure 11 shows a “composite” heat map that indicates the overall demand for shared micromobility within Waterloo Region. Each of the five inputs is weighed equally within the composite map, based on best practice from other communities.

Seasonal variation in ridership levels is more pronounced without low stress cycling facilities that are maintained during winter months. As new infrastructure is built and maintained throughout the region, winter cycling rates would likely increase.

Barriers to Use

There can be many different types of barriers to using shared micromobility. These can include physical elements such as infrastructure and spatial availability of the system, as well as the programmed elements, such as ways to access the system, cost, etc. The barriers are addressed throughout the study in applicable sections.

The demand analysis considers the Region's existing cycling network to reflect areas where a system will be attractive to use. The demand analysis factors in a higher demand preference for lower stress facilities (such as separated bike lanes). The proposed service area and phasing consider significant barriers, such as Highway 85 and Highway 401.

High Demand Clusters

The composite demand map (Figure 11) includes population, employment, retail, transit, parks, trails, cycling facilities, and school data. The composite demand map provides a planning level understanding of where latent demand for bike share exists in Waterloo Region. Here is a list of high demand clusters throughout the Region that would be eligible candidates for bike share locations.

They also have a concentration of suggested bike share points from online public engagement. The survey was launched before the pilot to get station location recommendations. High demand clusters include:

- **Uptown Waterloo:** a top destination for those working and shopping in the City of Waterloo. The area is filled with shops and restaurants and contains three ION stations.
- **Downtown Kitchener:** this area has high employment with the hospital, start-up companies, post-secondary campuses, restaurants, many retail businesses, and six ION stations. The King-Victoria

Transit Hub will be located here in the future.

- **University of Waterloo:** a student population of approximately 36,000 students and employs 2,500 staff. The University of Waterloo ION station and future transit plaza is located within the main campus adjacent to Ring Road.
- **Wilfrid Laurier University:** approximately 18,000 students and is located less than one kilometre from Laurier Waterloo Park ION station.
- **Fairview Park Mall:** a major shopping destination for people from across the Region, as well as a major transit hub for those travelling throughout the tri-city area. Medium demand shopping destinations include Conestoga Mall and Cambridge Centre.
- **Downtown Cambridge (Galt):** the mixed-use nature of Galt gives it a high score in the composite demand map. Other areas in Cambridge such as Hespeler and Preston had lower overall demand by comparison.



FIGURE 11. MARKET ANALYSIS COMPOSITE MAP

3. DROPBIKE PILOT DATA

Dropbike implemented a hybrid “lock-to” style bike share pilot in the region from May to November 2019. Main program components included:

- The Region of Waterloo and the three cities established the pilot through a pilot program agreement.
- Drop Mobility and participating jurisdictions created the pilot’s service area and station locations.
- Dropbike cost \$1 per hour. Memberships were also available for 30, 90, or 365 days. Payment was processed through the mobile app.
- Dropbike was permitted to have up to 500 bikes deployed across the service areas for the pilot’s duration.

Performance Metrics

The Dropbike pilot was evaluated in numerous ways:

- Adherence to the pilot License Agreement.
- Actual ridership and this project’s market analysis.
- Evaluation of public survey.
- Performance compared to program goals.
- Institute for Transportation and Development Policy (ITDP) Bike Share Planning Guide.

These metrics were used to evaluate and reflect upon whether the pilot addressed the Region’s goals for shared micromobility and how the pilot compared to other bike share systems from around the world using the ITDP metrics. While these are useful for evaluation, the pilot Licence Agreement was the only established terms in place at the start of the pilot. As such, the Adherence to the Licence Agreement is the most suitable metric for evaluating the pilot’s success.

The pilot showed public enthusiasm for shared micromobility. The pilot’s execution showed that a long-term approach should be to continue offering bike share (94% of survey respondents said they would use a future system). Considerations for a future approach to bike share include:

- Include more bikes at launch
- Provide a larger service area
- Operators should communicate more to the jurisdictions and residents
- Offer robust customer service
- Anticipate possible mobile app issues

Overview

System usage slowly increased from the pilot's launch in May until early August 2019, when usage peaked. The system started with 100 bikes and grew to 400 by the time the usage peaked near mid-Summer. The busiest week occurred during the first week of August when over 200 people took 380 trips. Ridership then declined until the system was removed at

the end of the pilot in November 2019. The number of bikes stayed the same during this time. Overall, an average of 165 trips were taken per week over the 28 weeks of operation. Over 4,600 total trips were taken by 1573 unique users. The average trip length was just under four hours long, but this is likely the result of data issues, or issues with properly ending trips. On many weeks, the average trip length was between 20 to 60 minutes.

Adherence to Licence Agreement

The licence agreement between the Regional Municipality of Waterloo and Drop Mobility established a framework for the Dropbike pilot. Generally, Drop Mobility followed points outlined in section six of the agreement that states, "In relation to Bicycles, the Licensee shall operate the Pilot according to the following requirements". This section was reviewed because it is most pertinent to the pilot's operation. Table 3 compares the licence to the pilot's results.

TABLE 3. DROP MOBILITY ADHERENCE TO LICENCE AGREEMENT

Licence Text	Conditions Met?
a. "Deploy up to 500 Bicycles total for all operations within the geographic area of The Regional Municipality of Waterloo, inclusive of The Corporation of the City of Waterloo, The Corporation of the City of Kitchener and The Corporation of the City of Cambridge properties..."	Met – at peak service 400 bikes were deployed
b. "Identify and establish "Havens" within the Licensed Areas for the pick up and drop off of Bicycles at locations approved in advance of Bicycle deployment by the Region's Director of Transit Services"	Met – staff note that station identification process was more manual than had been proposed (i.e., limited use of digital location data for candidate sites)
c. "not erect or place racks or other appurtenances on Region property without the prior written consent of the Licensor's Director of Transit Services"	Met
d. "Demarc the location of "Havens" using a painted box, partial box or flag or other material placed in consultation with the Region's Director of Transit Services" or equivalent with area municipalities	Somewhat met – not all Havens areas marked

Licence Text	Conditions Met?
a. “Maintain deployed Bicycles in a safe and functional state of operation and within ten (10) hours of being notified promptly remove any Bicycles not located in Havens, or damaged, unsafe or non-functional Bicycles as requested and at the Licensee’s sole cost”	Somewhat met – response time varied from within 24 hours to several days
b. “Inspect the service area at regular intervals and at a minimum of once per week to rebalance Bicycle locations, remove Bicycles from inappropriate locations, and remove Bicycles in need of repair or replacement;”	Met
c. “Provide clearly visible contact information for Dropbike service and inquiries on all Dropbike Bicycles and on all Dropbike user interface or point of sale applications and promotional materials;”	Somewhat met – missing information at initial launch. Eventually resolved
d. “Respond to inquiries, complaints or requests made by the users, members of the public or the Licensor within ten (10) hours of receiving notice;”	Somewhat met – average response time was 11 hours
e. “Use commercially reasonable efforts to ensure the drop off of Bicycles by customers of the Licensee at Havens instead of public bike racks for Dropbike Bicycles that are not in use by system users. Should Bicycles not be dropped off in proper Havens, s. 5(e) of this Agreement shall apply;”	Not met
f. “Promote the Pilot to the entire community and its visitors;”	Not met
g. “Use commercially reasonable efforts to operate the Dropbike system in a manner that does not restrict access to, through or from any portion of the Licensor’s property including without limitation municipal road allowances, and especially upon sidewalks and especially with respect to access by persons with disabilities. Should Bicycles be left in such a manner that access is restricted contrary to this paragraph, s. 5(e) of this Agreement shall apply;”	Mostly met
h. “Use commercially reasonable efforts to operate the Dropbike system in a manner that does not create any hazard or nuisance to users of the Licensor’s property including without limitation municipal road allowances and the Licensor’s Light Rail Transit System. Should Bicycles be in such a manner that creates a nuisance contrary to this paragraph, s. 5(e) of this Agreement shall apply;”	Mostly met
i. “Create a public Application Programming Interface (API) in a General Bikeshare Feed Specification (GBFS) format for all operations within Waterloo Region including all variables in Schedule B to this Agreement for minimum information that must be publicly available at all times throughout the Pilot. Failure to provide requested data, without satisfactory rationale to the Licensor may result in termination of this Agreement;”	Not met – provided operational data, did not establish a public GBFS feed
j. “Collect and make public system performance information upon request and at the end of the Pilot...”	Met

Licence Text	Conditions Met?
k. “The Licensee will retain a record of maintenance activities, including but not limited to Bicycle identification number and maintenance performed, and make it available to the Licensor;”	Somewhat met – every bike was checked approximately every 10 days; record keeping unknown
l. “Refund any user deposits collected in a timely and fair manner and in accordance with any terms of use agreements that Dropbike may make;”	Somewhat met – unknown if all users received refunds
m. “Remove all deployed Bicycles and any associated appurtenances, including but not limited to bikes racks and paint, from the Licensor’s property at the termination of the Agreement to the satisfaction of the Licensor;”	Not met – Haven markings remain
n. “Remove/modify location of “Haven(s)”, deployed Bicycles, and any associated appurtenances, including but not limited to bike racks, and paint, from Regional property as requested by the Region for reasons that include (but are not limited to): unanticipated conflict with City/Region maintenance/operation procedures, weather events, site construction/closures, etc.;;”	Met
o. “When the use of Haven(s) is terminated, either by deletion of a Licenced Area pursuant to s.1 of this Agreement or the Termination of the Agreement for any reason whatsoever, the Licensee shall remove all materials and markings and return the Licensor’s property to its condition prior to the installation of the Haven at the sole cost of the Licensee within a commercially reasonable time period, but in no circumstances shall that time period exceed one (1) month.”	Somewhat met – Haven markings remain



FIGURE 12. DROPBIKES PARKED AT BIKE RACK AT KITCHENER MARKET

Comparison with Market Analysis

Areas with higher Dropbike ridership generally correlate with the estimated demand map that was created for this feasibility study (Figure 11). Areas of higher ridership also match many of the requested locations for Dropbike hubs that members of the public identified before the start of the pilot. The majority of trips occurred near the universities, from Westmount Road to Weber Street, between Columbia Street and Erb Street, as well as in Uptown Waterloo, and in downtown Kitchener along King Street. In Cambridge, trips were mostly taken in Downtown Galt. Based on the trip start and end point data, it appears that people using the system most often returned the bikes to designated hubs.

Institute for Transportation and Development Policy Bike Share Planning Guide

The pilot's performance did not meet bike share evaluation metrics recommended within the Institute for Transportation and Development Policy (ITDP) Bike Share Planning Guideⁱⁱ. ITDP is an internationally recognized organization focused on transport and climate change. A comparison between ITDP performance goals, selected Canadian system metrics, and Dropbike's performance is provided in Table 4. Overall, the performance of the pilot was poor, with low number of users and ridership.

Public Survey

A survey at the Dropbike pilot's conclusion collected public feedback. Over 200 people responded (206). Nearly half (48%) said they had used the system with most (83%) using the system 1-5 times. **Of survey respondents who used the system, 94% would like a dockless bike share service available again and 60% would like improvements to a future service.**

Who Used Dropbike?

Rates of people who said they would use dockless bike share were similar by gender. On average, people who make less than \$100,000 per year said they would use a future bike share system more frequently than those who make \$100,000 or more. Additional data from the survey is available in Appendix B.

Trip Purpose and Trip Replacement

Respondents mostly used Dropbike for recreation/exercise (42%), work related travel (39%), and running errands (34%). When asked what mode they would have used if Dropbike was not available, most would have walked (65%), while others would have used a personal bike (24%), car (21%), or transit (20%).

Vendor/System Reliability

More than half of people who used the bikes (57%) thought that the majority were well maintained. The survey also asked about customer service. Roughly half of respondents (47%) who contacted Dropbike to report an issue were not able to reach them.

Non-user Opinions

The respondents who did not use the service were generally more critical of its performance and more likely to dislike the service's return. When asked why they did not use the service, 49% responded that they prefer using their own bike, 20% responded that no bikes were available near them.

Station Location

Feedback

Generally, a 5 minute walk is considered an acceptable distance to bike share by respondents.

Barriers

The need to use a smartphone and an app was a barrier for 12% of respondents.



FIGURE 13. INSTRUCTIONS ON BASKET OF DROPBIKE TO USE BIKE

ITDP Targets

Table 4 evaluates the program using metrics from the Institute for Transportation Development and Policy (ITDP) Bike Share Planning Guide (2018 edition). The comparison assumes 400 deployed bikes, which was the average number of bikes deployed. The population was calculated based on residents within the pilot area (~169,000). Recommendations for a long-term system, presented in the following chapter, used ITDP targets to think about the recommended number of bikes per 1,000 residents and their density.

TABLE 4. DROPBIKE PILOT EVALUATION BASED ON ITDP TARGETS

Metric	ITDP Target	Dropbike Performance (2019 Pilot)
Average daily trips per bike	4-8 daily trips per bike.	0.065 daily trips per bike (overall average usage). 0.135 daily trips per bike (highest week of usage).
Bikes per 1,000 residents (in Service Area)	10-30 bikes per 1,000 residents.	2.4 bikes per 1,000 residents.
Average daily trips per 1,000 residents (in Service Area)	Variable, city generated target - Seattle average is 4. - Montreal average is 28.	0.15 average daily trips per 1,000 residents (overall average usage). 0.32 average daily trips per 1,000 residents (highest week of usage).
Bike density (bikes per square kilometre of Service Area)	Variable - Seattle has 37 bikes per km². - Montreal has 28 bikes per km².	Pilot had 5.7 bikes per km ² - KW Service Area = 23 km². - CAM Service Area = 47 km². - Total Service Area= 70 km².

Achievement of Shared Micromobility Goals

Using survey responses, Alta evaluated the Dropbike pilot based on its achievement of goals established during the shared micromobility study process.

TABLE 5. DROPBIKE PILOT EVALUATION BASED ON SHARED MICROMOBILITY GOALS

Goal	Goal Met?	Dropbike Performance (2019 Pilot)
Micromobility is environmentally friendly	Yes	Survey respondents indicated taking Dropbike in cases when otherwise they would have used a car (21%).
Micromobility is accessible throughout the region	Somewhat	Pilot operated service in all three cities. In the post-pilot survey, 57% of respondents thought the bikes were well maintained.
Micromobility is equitable	No	Did not achieve these goals. People who took the post-pilot survey mentioned frustration with lack of payment options besides using a smart phone to unlock bikes. The system also required a credit card and a deposit, which concerned survey respondents.
Micromobility is integrated with transit	Somewhat	Drop Mobility worked with GRT to identify station locations at iXpress stops and ION stations. Did not integrate payment systems, or provide publicly accessible data feed for transit-bike share integration. Post-survey did not specifically ask if people used Dropbike to connect with transit. However, some people commented that it would be too expensive to use both services as part of a trip.
Micromobility leverages existing and planned transportation infrastructure	Yes	Dropbike utilized existing bike parking infrastructure at many locations (e.g., bike racks at transit stops/stations). However, many survey respondents mentioned a need for more bike parking, as the pilot took up many spaces for personal bikes at destinations.
Micromobility equipment is safe and positively contributes to the Region's public realm	Somewhat	No reported collisions. However, some post-pilot survey respondents commented on how the bikes took up bike parking at destinations. Primarily non-users opined that the bikes were "an eyesore". Some people had concerns that the bikes were parked to any kind of sign, post, etc. However, this may demonstrate a gap in bike parking infrastructure in some location.
Micromobility contributes to regional economic development	N/A	Effects are unclear, based on the pilot results.

Goal	Goal Met?	Dropbike Performance (2019 Pilot)
Micromobility positively impacts public health throughout the region	N/A	Unable to evaluate with level of data – would require data on shifting from car-based modes, or enabling them to be outside and active. Post-pilot survey question about what mode people took if a Dropbike wasn't available indicate that 21% used cars, suggesting Dropbike provided an opportunity to increase daily physical activity. There were no known reported injuries from Dropbike users.
Micromobility options evaluate and respond to new technology	Yes	The pilot was a way for residents to try a new form of transportation. There were no e-bikes, or other micromobility vehicles implemented as part of the pilot. The Lime e-scooter pilot was located within the same service area, but was limited to a much smaller geographic area and was a separate vendor.
Micromobility should enable positive user experience and be responsive to user needs	No	In the post-pilot survey, only 39% of people were able to reach Dropbike when there was a problem. Municipal staff indicated they had challenges communicating with Dropbike on occasion.
Micromobility data are accessible for public sector use	No	Did not provide publicly-available access to a GBFS feed.
Micromobility is sustainable and adaptable for years to come	Yes	Pilot is adaptable through permitting terms. Specific financial sustainability of Dropbike's business model is unknown (e.g. required trips per bike).

Summary of Dropbike Pilot Experience

The Dropbike pilot was a low-stakes opportunity to test a “lock-to” style bike share service in the region. The pilot was evaluated using several metrics, as described in this chapter:

- Adherence to the pilot License Agreement.
- Evaluation of public survey.
- Actual ridership and this project’s market analysis.
- Performance compared to program goals.
- Institute for Transportation and Development Policy (ITDP) Bike Share Planning Guide.

Ultimately, the pilot was evaluated based on meeting the requirements within the Licence Agreement. This is because the Licence Agreement provided the parameters for the pilot to operate. The other evaluation considerations were also used as inputs to compare the pilot to other systems and to the Region’s own goals.

Based on this, **the Dropbike pilot was conditionally successful**, in that it achieved eight of the 15 licence agreement terms reviewed as part of this study. There are some aspects of the licence terms where the pilot was not successful and where improvements should be made to future systems.

Although Dropbike was able to meet the majority of licence agreement terms, some project team members, as well as other municipal partners and engaged members of the public were of the

opinion that the system’s user experience, hardware, and technology did not meet expectations and differed from what was initially proposed by Dropbike.

Compared to other bike share systems, the Dropbike pilot had limited success. This stems from many constraints, including the duration of the pilot, number of vehicles, and service area (e.g. effectively operating two service areas under the pilot). The ITDP targets are developed from systems that have been in place for longer-term, and hence have higher use, and are more developed.

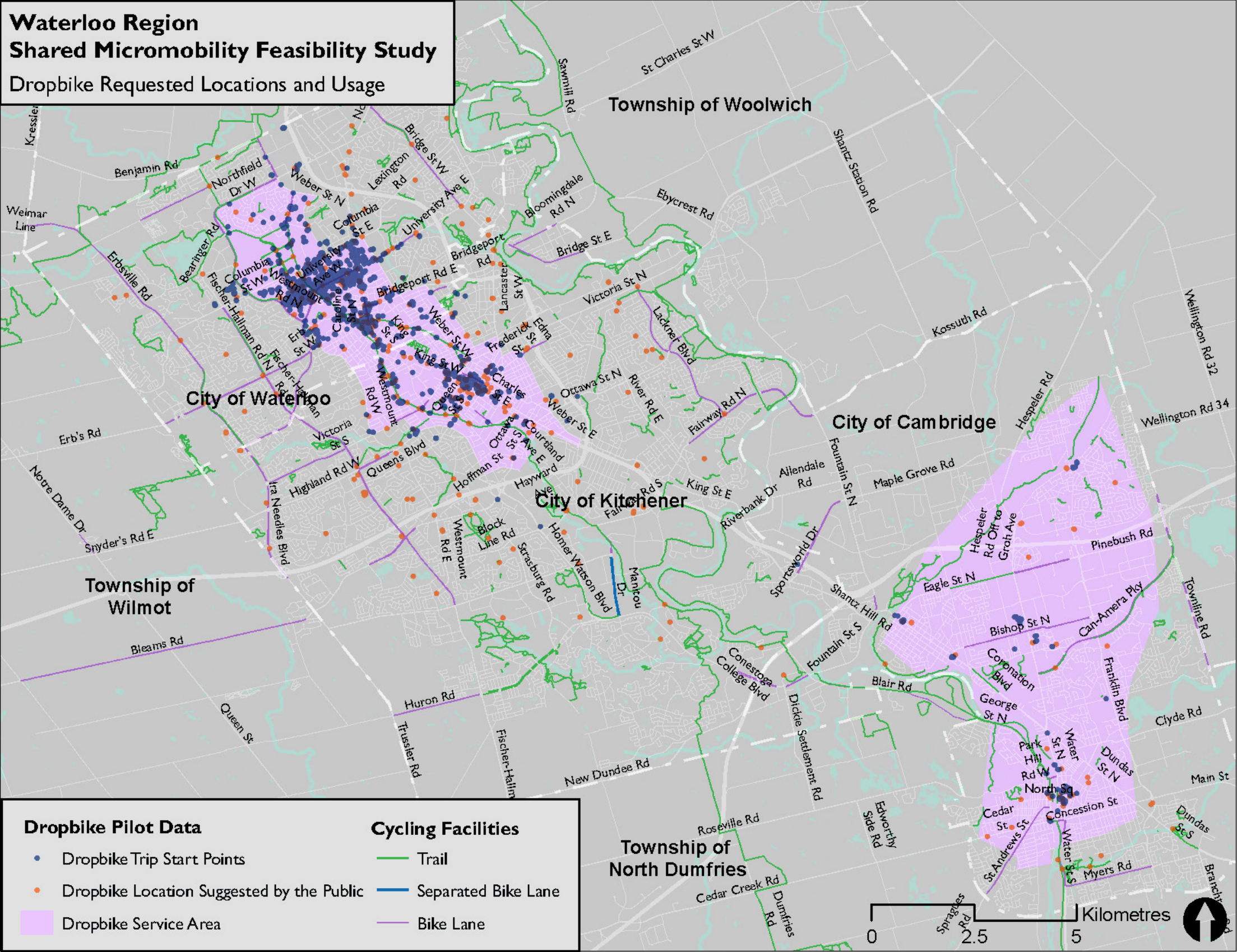


FIGURE 14. MAP ILLUSTRATING THE ACTUAL USAGE OF THE DROPBIKE SYSTEM COMPARED WITH THE REQUESTS FROM THE PUBLIC AND THE RESULTS FROM THE DEMAND ANALYSIS

4. MINIMUM SERVICE STANDARDS

Recommended Bike Share System Type

Overall, a carefully planned and managed “lock-to” (“hybrid”) system is most likely to achieve the program goals and objectives over the long-term. A permit-based system is recommended to bring bike share operators Waterloo Region. Ultimately, with future funding secured, a procurement solution could offer future benefits.

Compared to dockless or station-based systems, a lock-to smart bike system with dedicated parking would offer the following advantages:

- Provide customers with flexible trip beginning and end points throughout the service area.
- Flexible end-of-trip choices, such as system-branded dedicated parking “hubs”, as well as existing bike racks.
- Bike share hubs provide a visual presence of bike share within the region and promote an awareness of the transportation option.
- Hybrid systems are typically faster to deploy than station-based systems.

The Dropbike pilot provided lessons learned to improve service. The recommended number of bikes, parking, service area, and regulatory checklist build upon the pilot and its perceived challenges.

Recommended E-scooter System Type

As of January 1, 2020, the Province is currently allowing a five-year pilot of e-scooters on public roadways.ⁱⁱⁱ Municipalities may choose to permit their use locally, and identify/restrict where they may be used.

In 2019, the City of Waterloo conducted a pilot with the University of Waterloo to trial e-scooters on trails and private roadways, since e-scooters were not allowed on public roadways during the pilot program.

It is recommended that the Region permit e-scooters as a pilot program that would build on the City of Waterloo’s 2019 program.

This section recommends the number of e-scooters to permit within the region. It is recommended that e-scooters and bike share systems use the same service area boundaries detailed in this section.

Recommended Bike Share System Type Decision Matrix

In developing recommendations for a preferred system type, the Steering Committee completed a decision matrix to explore how the system types compare to each other in addressing the goals for shared micromobility in the region. In addition to the decision matrix, a review of existing conditions and trends also contributed to the decision to pursue a hybrid system.

TABLE 6. COST-BENEFIT DECISION MATRIX

Goal	Docked System	Hybrid System	Dockless System
Environmentally friendly	4	3.5	2.5
	Bike share systems that are responsive to the climate crisis should encourage residents and visitors to use those vehicles instead of cars. Product lifecycles should focus on reusability, instead of shared vehicles that are quickly obsolescent.		
Available throughout the region	2	4	3.5
	Bike share that is accessible to customers is visible, distributed geographically, focused on equity, and easily rebalanced.		
Equity	2.5	3	2.5
	Bike share systems should pursue equitable development by having a broad geographic reach and by providing payment options that serve people without bank accounts / credit cards. Outreach will be necessary to counteract “NIMBYism” and to foster community acceptance of the new transportation service. Adaptive bikes such as tricycles and hand bikes should be available, especially as part of system area expansion.		
Integrated with transit	3.5	4	2
	Transit integration should consider frequency, as well as the varying transit stop typologies and the amenities available near each. Financial viability should be considered so that the system can expand to reach transit stations and stops. Bike share service should be reliable so that bikes are available near transit when users need them. Integrated systems require publicly-available system information on multiple platforms. Public bike share feeds allow for users to confidently locate available bikes and plan integrated trips with transit.		
Leverages existing and planned transportation infrastructure	2.5	3	2.5
	The system should have the ability to expand in phases to reach areas that are not currently comfortable for cycling, but will be in the future as new cycling facilities are built. The size of stations/hubs and number of bikes should be flexible. New stations should be easy to deploy		

Goal	Docked System	Hybrid System	Dockless System
Contributes to regional economic development	4	4	3
	Bike share should be reliable, especially near high demand locations. Stations or hubs could be more visible than individual bikes. Bike share operators should actively seek business-to-business partnerships to serve customers and employees, increase financial sustainability, and expand stations/system.		
Equipment is safe and positively contributes to the Region's public realm	4	3.5	2.5
	Bike share equipment should be orderly and should not interfere with the pedestrian access route. Equipment should include standard safety features and should be well-maintained.		
Positively impacts public health throughout the region	2.5	3	2.5
	Bike share usage should positively impact public health. Adaptive bicycles could expand the program's reach to serve a broader cross-section of ages and abilities. Equity should be considered so that the system benefits underserved people/neighbourhoods. Brief orientation/training on rules of the road / safety tips should be provided to new users to reduce injury risk through awareness and skill-building.		
Micromobility options evaluate and respond to new technology	3	3.5	2
	Bike share system operators should communicate changes in hardware or software with the Region. The new system should recognize the latest technology, while ensuring it is user-friendly and does not restrict past/prospective user groups.		
Positive user experience	4	4	4
	Bike share systems should respond to user needs by providing robust customer service and support. System implementation should anticipate aspects of the system that are not intuitive and should rectify these potential issues.		
Data is accessible for public sector use	3	3	2.5
	Data should be provided in real-time and through an easy-to-use dashboard. Data should use the General Bikeshare Feed Specification (GBFS) and should be anonymized.		
Long-term sustainability / adaptability	3	3.5	2
	Bike share technology has evolved since it was originally conceived. A bike share system for the Region should be able to continue evolving. Many start-ups and technology companies are located in Waterloo Region. Therefore, long-term viability should be balanced with a system that is open to new ideas from potential new companies, especially local companies.		
TOTAL SCORE	38	42	31.5

Establishing Shared Micromobility Operations

Understanding how shared micromobility systems are established is integral for their implementation. It is important to identify the organizations responsible for the implementation and operation of the future shared micromobility system. These can include a combination of public, private, and non-profit organizations. There are two common methods for municipalities to provide shared micromobility services: procurement and permit approaches. Each of these approaches are described below. The consultant team used these considerations to recommend a preferred approach to service provision.

Types of Micromobility Owners and Operators

Shared micromobility systems are typically divided into the four categories of system ownership and operation described below. Recently, privately owned companies have become more common as owners and operators of bike share and scooter share systems. This trend is occurring in Canada, other North American cities, and around the world, particularly in large Chinese cities and other countries in Asia.

Type 1: Privately Owned and Operated

Increasing numbers of bike share systems are privately owned and operated. A private company provides equipment and

operates the system, typically with dockless equipment. The private company takes on the system's financial risk. The company retains any profits, although the companies may pay fees to local public agencies for use of the public right-of-way, marketing expenses, and other costs. Previous iterations of private bike share systems were highly dependent on the capacity of private sector fundraising. More recently, venture capital (VC) funds have bolstered private micromobility companies. Lime and Bird shared mobility companies are each valued at more than \$1 billion USD.^{iv} However, confidence in the long-term sustainability of private micromobility companies has been challenged by recent company closures.

Municipalities and regions manage private companies through one of two approaches^v:

- **Licensed Exclusive Service Provider:** A public government agency releases a Request for Proposal (RFP) or similar document to select one service provider to launch mobility services. The provider supplies equipment and operates the system. A contract outlines service quality metrics that the provider must meet for continued work in the community.
- **Multiple Permitted Service Providers:** System providers apply for permits to operate. Each provider supplies equipment and operates their respective system.

Type 2: Publicly Owned and Privately Operated

A public government agency purchases and owns the system. Therefore, financial risk is placed on the public agency. The public agency issues a contract to a private company to manage system operations and takes on liability for the system. However, certain tasks, such as marketing initiatives, may remain under the guidance of the public agency.

Type 3: Non-Profit Organization Owned and Privately Operated

A non-profit organization purchases and owns the system, thereby taking on the financial risk. Operations are contracted to a private company, which takes on liability for the system.

Type 4: Non-Profit Organization Owned and Operated

An existing non-profit organization, or a non-profit organization formed specifically to manage bike share in the area, owns and operates the micromobility system. Therefore, financial risk is placed on the non-profit organization. Public agencies or others may provide funding for system start-up (e.g. Community Access Bikeshare accessed Region/city grant programs). Government agencies may also act as a pass-through entity to administer federal, provincial, or local funding.

Option 1: Procurement Method

Procurement typically involves the municipality purchasing equipment or services for an operator which could be a public, non-profit, or private organization to be responsible for implementation and day-to-day operations. As these services are purchased, there is an agreement in place that secures the system's operation over an agreed upon time period.

Option 2: Permitting Method

For permit approaches, municipalities typically create a permit program which outlines terms and conditions for operators to comply with, and can include penalties for non-compliance.

Private operators can choose to apply for a permit to operate in the municipality to provide their system. The permit terms and conditions as well as the greater shared micromobility market significantly influence which operators decide to apply for a permit to operate.

Operators may choose to remove their system from the municipality at their own discretion in accordance with the permit terms and conditions. Detailed regulation considerations that are frequently used in permit terms of reference are provided in the Regulating and Organizational Framework section in Chapter 5.

Table 7 outlines further considerations about each service provision approach.

TABLE 7. CONSIDERATIONS FOR PROCUREMENT AND PERMITTING OF SHARED BIKES AND SCOOTERS.

Considerations	Procurement	Permitting
Ownership of System	City/Region, non-profit, or private.	Private.
Operation of System	City/Region, non-profit, or private.	Private.
Public Agency Role	Owns the equipment, and/or administers contract with private operator or non-profit.	Responsible for permitting and managing operators, including enforcing permit terms.
Transparency	Large amount of public agency control and involvement.	Operator controls decision-making, re-investment, expansion, and operations in compliance with permit.
Risk	Financial risk taken on by public agency or non-profit organization.	Risk is taken on by the private sector.
Profits	Profits are generally reinvested into the system to fund expansion and improvements.	Retained by private company. Reinvestment subject to business model.
Operating Expertise	Mix of expertise and experience.	Makes use of private sector experience.
Fundraising	Different levels of government and other government directed funding programs, as well as sponsorship opportunities.	Venture capital funded, some sponsorship opportunity.
Expansion Potential	Contractually simple, depends on available funding.	Expansion focused towards profitability, or permitting requirements.
Examples	Toronto Bike Share, Bixi (Montreal), Nice Ride (Minneapolis), SoBi (Hamilton), Mobi (Vancouver).	Calgary (Lime), Kelowna (Zip, Bunny, ROLL, SPIN), Seattle (JUMP), Montreal (Lime, Bird, JUMP).

Recommended Approach to Establishing Shared Micromobility Operations

A permit approach for both bike and scooter share are recommended based on the variables presented in Table 7Table 6

Table 7 outlines further considerations about each service provision approach.

Table 7 and the preceding section. Moreover, **private ownership and operations of shared micromobility assets is recommended at this time.** This would avoid the financial burden, and added complexity of one or more public agencies purchasing shared micromobility equipment and vehicles.

Implementation Process

The following steps generally outline the actions the Region and Area Municipalities would need to take to implement a permit-based system. The Region should implement a single permit program that is vehicle agnostic. This means that the program provides a path to permit operation of any shared vehicle program, not just to bikes, e-bikes, or e-scooters. The steps are outlined below in Figure 15.

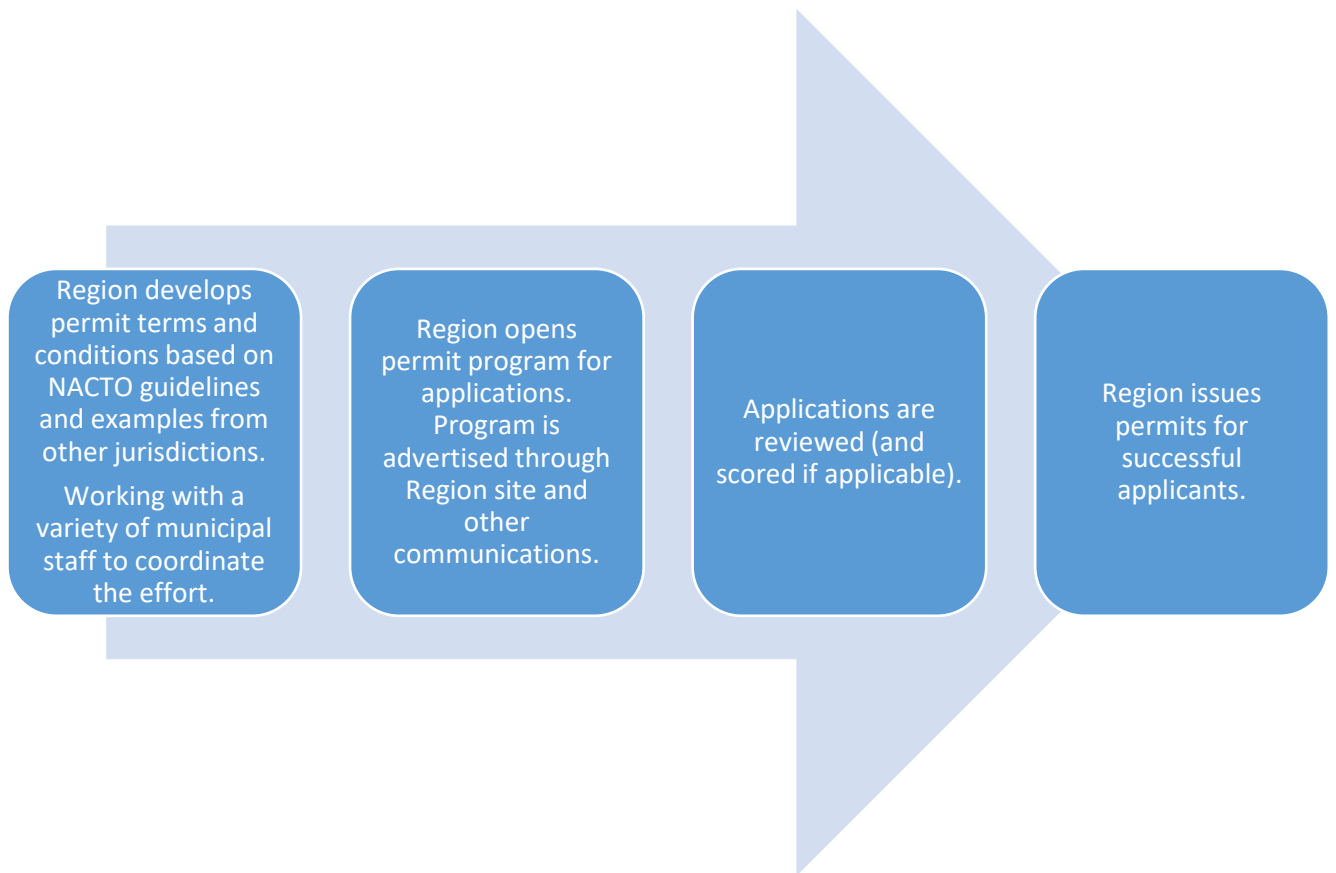


FIGURE 15. PROCESS TO IMPLEMENT A PERMIT PROGRAM (PREFERRED NEAR-TERM APPROACH)

If the program is not successful at attracting an operator to provide bike share service in the region, the Region should consider procuring a private bike share operator to provide service. This approach is highlighted in the following figure.

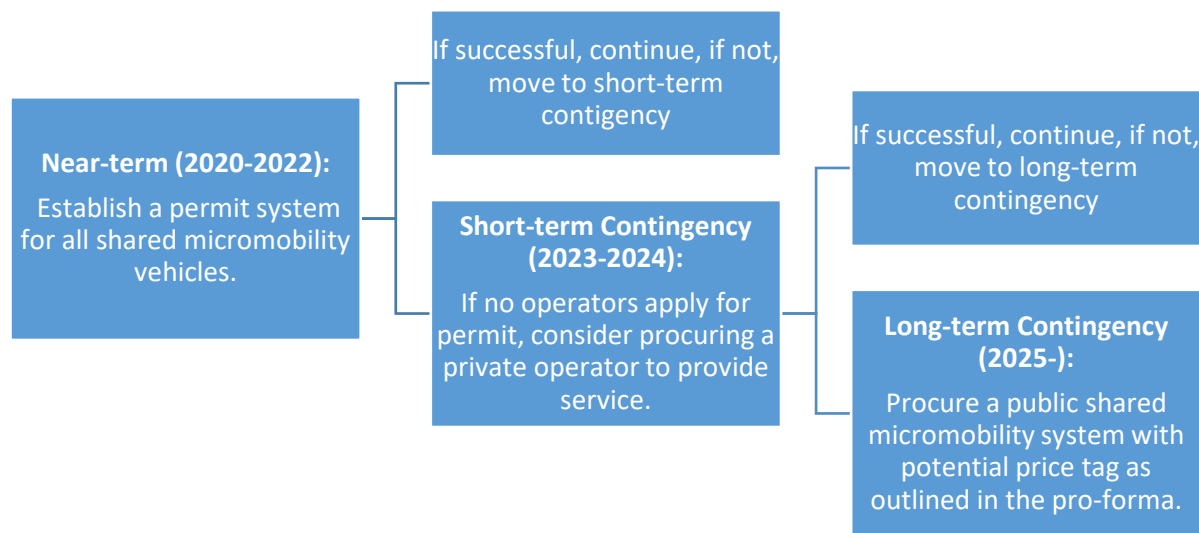


FIGURE 16. ROADMAP FOR IMPLEMENTING BIKE SHARE SYSTEM

Recommended Service Area and Phasing Strategy

This section proposes a phased strategy for designating a service area within the City of Waterloo, City of Kitchener, and City of Cambridge. Recommendations also discuss potential expansion into the surrounding townships. The service area identifies the geographic area where bikes may be unlocked, ridden, and parked. These recommendations were informed by the market analysis, areas of material deprivation as defined by the Province of Ontario (to determine areas of high social

need), and resident requests for Dropbike pilot locations.

Recommended Service Area

The recommended service area is shown in Figure 18. The service area includes parts in all three cities. The service area is considered appropriate for bike share, e-bike share as well as shared e-scooters. High demand areas apply to both forms of micromobility. Serving all three cities better achieves the goal that shared micromobility is accessible throughout the region.

Figure 18 also illustrates the recommended approach to phasing. The initial launch should build from momentum begun by the Dropbike pilot. It should be large enough to provide coverage to high demand areas and areas identified as having a high social need.

The station locations identified on the map are located on local streets or along streets with dedicated cycling facilities. The density of stations correlates with level of demand and areas prioritized based on the Public Health Ontario Marginalization Index.

Phase Two aims to connect Waterloo, Kitchener, and Cambridge. The service area radiates outward from these areas to include mid- and lower-demand areas. Phase Three extends beyond these areas, while Phase Four represents more significant service area across the cities. Ultimately, Phase Five provides service for the complete boundaries of the City of Waterloo, City of Kitchener, and City of Cambridge.

The Townships were not evaluated as part of this study for their potential to be part of the service area. In the future, expansions to the service area to destinations within the Townships could be considered.



FIGURE 17. HYBRID BIKE SHARE HUB AND E-SCOOTER RIDER

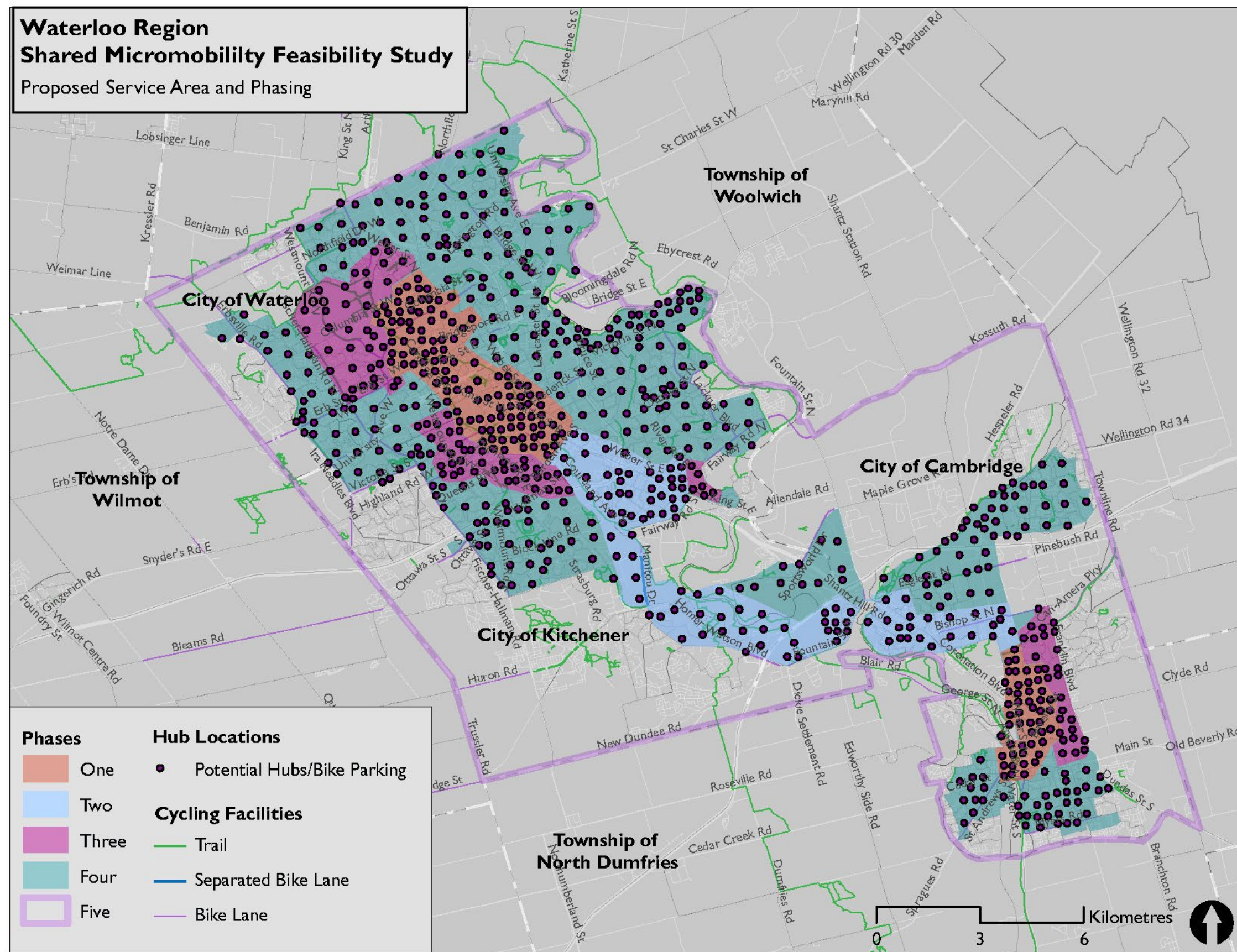


FIGURE 18. RECOMMENDED SERVICE AREA AND PHASING

System Service Area Phasing Strategy

Recommendations for increasing the scale of shared micromobility in the region are described in Table 8 and Table 9. Although bike share and e-scooter share systems operate within the same service area and phasing time periods, they differ in terms of parking facilities and number of vehicles. Please note that recommendations in these tables are *minimum* values.

Neighbourhoods immediately ready for bike share and e-scooters are included in Phase One. These areas scored the highest within the market analysis. Phase One also includes areas of the region identified by the Province of Ontario as scoring within the “most deprived” quintile for material deprivation.^{vi} The Province defines material deprivation as, “closely connected to poverty and refers to inability for individuals and communities to access and attain basic material needs.” This section also describes programming options to develop equitable shared micromobility.^{vii} Future phases could include an expansion to nearby townships. A similar market analysis, conducted by Waterloo Region or Township staff, is recommended to investigate potential service areas within an expanded area. Future expansion could also occur as low stress cycling infrastructure is installed throughout the region. The current phasing analysis recommends placing bike share hubs or bikes along local streets, separated bike lanes, bike lanes, and multi-use trails.

The following are examples of high priority areas (Phase One):

Waterloo

- Waterloo Park
- Uptown Waterloo
- University of Waterloo
- Wilfrid Laurier University

Kitchener

- Downtown Kitchener
- Victoria Park
- Fairview Park Mall / Fairway Station
- Midtown / Belmont Village

Cambridge

- Downtown Galt
- Cambridge Centre Mall

The following are examples of expansion areas (Phases Two to Four):

Waterloo

- Lakeshore Village
- Westmount
- Conestoga Mall
- Conestoga College
- Westvale

Kitchener

- Heritage Park
- Southdale

Cambridge

- Preston Centre
- Hespeler Village

TABLE 8. BIKE SHARE PHASING RECOMMENDATIONS

Recommendation Category	Phase One	Phase Two	Phase Three	Phase Four	Phase Five
Projected Number of Trips per Year (under medium assumption)	620,500	985,500	1,387,000	1,825,000	2,190,000
Recommended timing of implementation	Launch	Implement Phase Two: 12 months after Phase One and/or Achieve/trending to achieve Phase One's Annual Trip Projection Trips.	12 months (following Phase Two)	12 months (following Phase Three)	As viable/ 12 months (following Phase Four)
System Operations and ownership	- Permit-based system operated and owned by at least one private vendor. - Operations oversight by Region and Area Municipalities (see Business Plan section).			Potential for Region/city financial contribution to established vendor(s) and/or potential for procurement based system	Potential for Region/city financial contribution to established vendor(s) and/or potential for procurement based system
End of trip facility <i>The list indicates the main types of parking facilities added during each phase</i>	- System branded bike corrals / hubs. - System branded bike racks (e.g., inverted U racks”). - Non-bike share specific bike racks, sign posts, or other immovable objects.		Non-bike share specific bike racks, sign posts, or other immovable objects.		
Recommended density of bikes / end-of-trip facility	300m spacing of bikes / end-of-trip facility	Mix of 300m and 600m spacing	Mix of 300m and 600m spacing	Mix of 300m and 600m spacing	Mix of 300m and 600m spacing
Recommended minimum number of bike share specific corrals / hubs <i>Not inclusive of other end of trip facilities</i>	200 hubs (with average 10 spaces per hub)	600 hubs (with average 10 spaces per hub)	1,000 hubs (with average 10 spaces per hub)	1,500 hubs (with average 10 spaces per hub)	2,000 hubs (with average 10 spaces per hub)

Recommendation Category	Phase One	Phase Two	Phase Three	Phase Four	Phase Five
Recommended minimum number of bike share bikes/e-bikes <i>Meets ITDP target of 10-30 bikes per 1,000 residents</i>	850	+ 500 added to previous phase = 1,350	+ 550 added to previous phase = 1,900	+ 600 added to previous phase = 2,500	+500 added to previous phase =3,000
Roadway characteristics for typical use, hub placement	- Local streets (not sidewalks). - Separated Bike Lane / Bike Lane. - Multi Use Trails.				

TABLE 9. E-SCOOTER PHASING RECOMMENDATIONS

Recommendation Category	Phase One	Phase Two	Phase Three	Phase Four	Phase Five
Projected Number of Trips per Year (under medium assumption)	465,375	739,125	1,040,250	1,368,750	1,642,500
Recommended timing of implementation	12 months	12 months (following Phase One)	12 months (following Phase Two)	12 months (following Phase Three)	As viable/ 12 months (following Phase Four)
System operations and ownership	- Operations and ownership by at least one private vendor. - Operations oversight by Region and Area Municipalities.				
End of trip facility	- System branded hubs. - Free-standing e-scooters parked outside of the accessible pedestrian walkway.				
Recommended minimum number of e-scooters	425	675	950	1,250	1,500
Roadway characteristics for typical use, hub placement	- Local streets (not sidewalks). - Separated Bike Lane / Bike Lane. - Multi Use Trails.				

The recommended number of e-scooters is half the recommended minimum

number of bike share bikes. This decision allows the Region to incrementally offer

this form of car-free transportation to residents. Limiting the number of e-scooters would address limited sidewalk right-of-way. Generally, a bike share system would better align with the Region's micromobility goals.

E-scooter Regulations

The Province of Ontario established a five year pilot in 2019 to enable an investigation of the role e-scooters could play in the province. The Province provided regulations on many of the specifications and use around e-scooters including vehicle speed, power, and ages permitted to use. The regulations can be viewed on the Ministry of Transportation's website for the pilot.^{viii}

The pilot allows municipalities to create their own regulations regarding whether they are permitted in the municipality, where they are allowed to be ridden, and where they should park. Based on this study's findings, the following regulations are recommended based on the Ministry of Transportation's municipal considerations in the Best Practices document.^{ix} More detailed best practice recommendations are included in the Implementation section.

Parking

- E-scooters must be parked outside of the sidewalk clearway, preferably in designated areas within the right-of-way, or designated areas on private property recognized with agreements made with property owners.
- The Region should penalize operators if they do not respond to requests to move improperly parked e-scooters.

Operating Parameters

- Permit businesses to operate e-scooter share with a permit. Recommended permit terms are provided in the implementation section of this document.
- E-scooters should be available for riding throughout the day, including overnight.
- E-scooters should not be allowed to be operated on sidewalks. They should be allowed to be used on roads, bikeways, paths and trails.
- Restricting e-scooters on certain roadways (e.g., based on posted speed limit). E-scooters should be restricted from limited access freeways in the same manner as people walking and bicycling are currently restricted.
- Operators should be required to remove any vehicles that are not functioning properly.

Bike Parking within the Service Area

The recommended service area also proposes density guidelines for bike share vehicles and parking locations. **End-of-trip facilities are only recommended for installation on trails, streets with in-boulevard paths, on streets with bike lanes, or on local streets.** The type of parking configuration varies according to location within the region.

Areas with high demand for micromobility and high social need are recommended for branded bike share hubs or additional investment in standard bike corrals / racks. Figure 19 shows an example hub.

Hubs store multiple bicycles and can be branded to represent the system or the region. **The recommended spacing between hubs or free-floating bikes is 300m.** This means that hubs or bikes are located within a five minute walking distance of each other and conforms to National Association of City Transportation Officials (NACTO) guidance for station spacing that encourages ridership. Additional investment in standard bike corrals / racks within high demand areas would increase the parking availability for both bike share and privately-owned bikes. Figure 20 shows shared e-bikes parked in an on-street bike corral.

Outside of the highest demand / social need areas, a spacing density of 600m is recommended. This spreads coverage throughout the service area. Standard bike racks are recommended for parking in these areas.

In some cases, the prevalence of existing bike racks may be sufficient for the increase in bike share bikes. Other places may benefit from the installation of new racks.

It is recommended that the Region and Area Municipalities generally add additional bike parking that equals the amount converted/utilized for bike share hubs.



FIGURE 19. "HYBRID / LOCK-TO" BIKE SHARE HUB (IMAGE: CITY OF ORLANDO)



FIGURE 20. "HYBRID / LOCK-TO" BIKES LOCKED TO AN ON-STREET BIKE CORRAL

At transit stops, shared micromobility vehicle parking should be added as close to the stop as space permits. **Utilizing the boulevard space in Figure 21.** is the preferred approach for consistent provision of parking space for vehicles. In order for the boulevard space to accommodate micromobility vehicles, the

boulevard space must be at least 1.8 m in width to ensure that the vehicles do not interfere with the sidewalk clearway. Additional placement and spacing considerations can be found in the Association of Pedestrian and Bicycle Professionals (APBP) Essentials of Bike Parking guidelines.^x

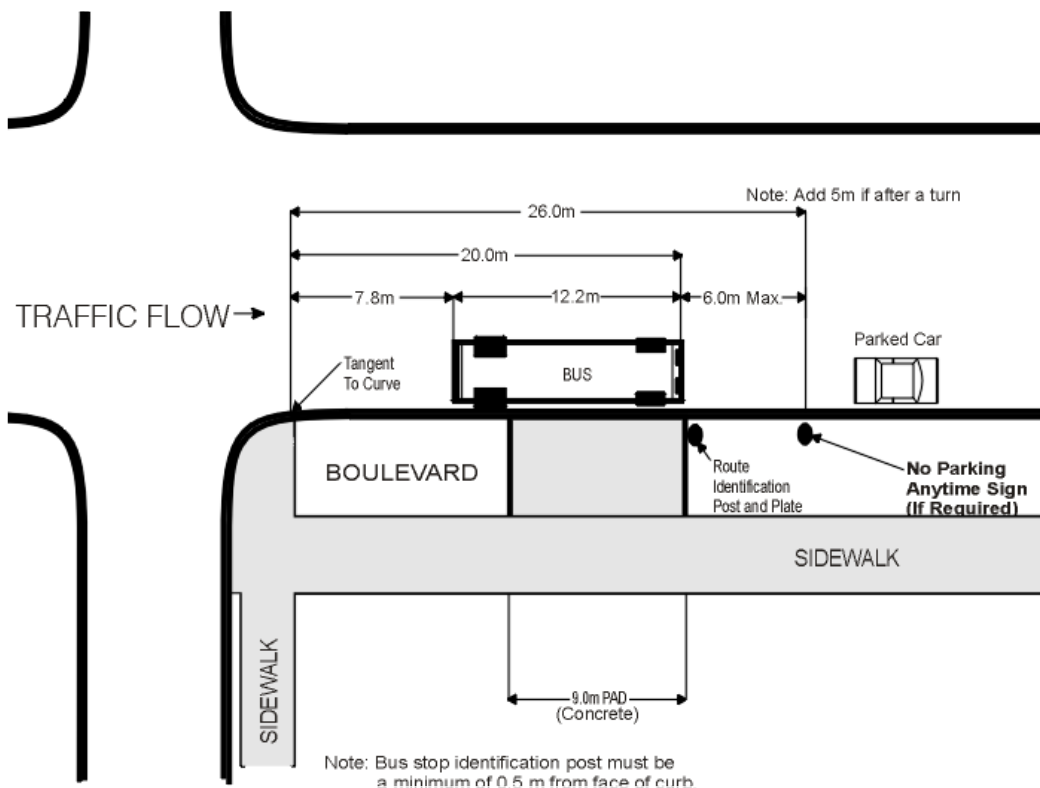


FIGURE 21. TYPICAL GRT FARSIDE BUS STOP

5.IMPLEMENTATION

Implementation Recommendations by Form of Shared Micromobility

Wherever possible, this document presents recommendations that encompass both bike share (including conventional pedal bikes and e-bikes) and e-scooter systems. Recommendations that use the term ‘shared micromobility’ apply to both bikes and e-scooters. Nonetheless, approaches to launching, managing, and evaluating the systems may sometimes differ. The graphic below organizes background information and recommendations according to applicability to bikes, scooters, or both. For example, the Regulatory and Organizational Framework identifies high priority implementation steps to reference for both bike share and/or scooter share systems. Parking guidelines and fleet size targets are also included as items of interest.

	E-scooters and Bikes	Scooter Share ("e-scooters")	Bike Share
Permitting or Procurement	Permit-based system is recommended in short-term. Procurement could be considered in the future	Typically permit-based system, rather than procurement	The planning process compared costs and revenue to recommend a permit-based process.
Funding Mechanisms	See adjacent columns	Private operator, public agency staff time	Public sector, grants, sponsors, advertising
Fleet Size Targets	Setting a target to half the number of bikes could help reduce concerns of launching a scooter system that does not meet the region's goals.	See adjacent column	See left column
Collective Impact Framework	The framework should be used to implement both modes	See adjacent column	See left column
NACTO Guidelines	Categories pertain to both modes: scope and operations oversight, public engagement, mobility data and user privacy, infrastructure	See adjacent column	See left column
Parking Guidelines	See adjacent columns	Combination freestanding scooters and painted hubs	Combination bike share-specific racks, public racks

FIGURE 22. RECOMMENDATIONS AND RELATION TO FORM OF SHARED MICROMOBILITY

Collective Impact Framework

This section introduces the concept of a Collective Impact Framework within the context of shared micromobility, the five conditions for collective impact, and key roles and responsibilities of the Region, Area Municipalities, and private vendors. As collaborative process designers, LURA **recommends that the Region and partners apply Collective Impact as the implementation model for this project.** The model focuses on relationship building and efficiency and acts as a tool regardless of shared micromobility mode (e.g., bike or scooter).

The Collective Impact Framework is an implementation approach that relies on collaboration to achieve large-scale social change developed in 2011. Collective Impact is comprised of five key components that are essential to ensuring social influence. They are:

1. a coordinating organization,
2. a common agenda for change,
3. a shared measurement for data and results,
4. mutually reinforcing activities, and
5. open and continuous communications.

As shared micromobility continues to evolve, a behavior and social change lens, such as this, should be applied to consider key actors, initiatives, coordination and communication. This lens should adapt during the implementation, evolution and evaluation stages of Waterloo's micromobility systems.

This section introduces the concept of a Collective Impact Framework within the context of shared micromobility, the five conditions for collective impact, and key roles and responsibilities of the Region, Area Municipalities, and private vendors. As collaborative process designers, LURA recommends that the Region and partners apply Collective Impact as the implementation model for this project. The model focuses on relationship building and efficiency and acts as a tool regardless of shared micromobility mode (e.g., bike or scooter).



FIGURE 23. COLLECTIVE IMPACT COMPONENTS (UNITED WAY)

Implementing The Collective Impact Approach

Waterloo Region has established a strong foundation to support the Collective Impact Framework through key partnerships with shared goals to support shared micromobility.

LURA Consulting recommends the following short-term next steps:

- Continue a dialogue with community stakeholders to build support for shared micromobility.
- The Region of Waterloo acted as the “Strong Backbone” (organizational lead) during this study. This role should continue.
- Municipalities and Region continue open communication.
- Municipalities and Region work together to implement this plan’s recommendations, thereby illustrating the common agenda.

In the longer-term, there are several recommendations for Waterloo Region to consider to ensure the successful implementation of the Collective Impact Framework. It is recommended that each of the five components of collective impact are considered equally, as all parts work towards the success of the approach as a whole. The following section provides suggested steps that the Region can take to encourage social change related to the introduction of a shared micromobility program.

Coordinating Organization

It is strongly recommended that one organization act as the lead implementing body. A centralized leadership role places control in the hands of one organization, preventing confusion or a lack of clarity related to roles and responsibilities. The designated coordinating organization also allows for delegation as well as an established party responsible for tracking progress.

- Waterloo Region should continue to act as the coordinating organization.
- Waterloo Region should be responsible for delegating responsibilities, timelines, and for tracking progress.
- Regular progress meetings should be scheduled to track the program’s progress.

A Common Agenda for Change

A guiding document should be developed to summarize the role of the Region, the Area Municipalities and other key partners in implementation. The Region and Area Municipalities should use the program’s vision statement, goals and objectives to act as the common agenda for change. The guiding document should be developed in partnership with all key partners and should be collectively agreed to.

- A Terms of Reference (ToR) or Memorandum of Understanding (MoU) document should be considered to explain roles and

responsibilities of all involved parties. The ToR or MoU should include the project's vision, goals and objectives.

- This guiding document should be reviewed periodically and/or when new staff members are assigned to the project.

Shared Measurement of Data and Results

To understand the progress of the shared micromobility program, all parties should agree to a set standard for measuring results. Agreement on a shared set of metrics to evaluate the program will assist all parties in understanding where the program is having success and where potential problems are occurring.

- A standardized reporting template should be developed to support the sharing of data and results.
- It is recommended that a regular reporting interval be determined that is reasonable and feasible to ensure that the program can be accurately monitored.
- The project's goals and objectives should be paired with indicators and metrics to weigh data and results against to assess the success of the program.

Mutually Reinforcing Activities

The success of collective impact is contingent on engagement with a diverse set of stakeholders across multiple

sectors. A range of interests should be considered when engaging stakeholders and should include representation from multiple regional and municipal departments, active transportation advocates, public transportation advocates, resident associations, business associations and others. These stakeholders can play a dual role in a) providing more nuanced information related to the relative success of the program and b) in playing a communications role to encourage awareness and uptake.

- Establish a multi-sectoral working group to provide additional insight into the success of the program and to play a communications role.
- Meet with the multi-sectoral working group at set intervals.
- Consider empowering resident and community organizations to act as project champions by offering funding for promotional events.

Open and Continuous Communications

Communication is key to the success of any program. An open and continuous communications loop should be established between Waterloo Region and all internal and external partner organizations and stakeholders. Partners, stakeholders, and members of the public should know where to turn and who to contact regarding the program. A communications program should also be established to raise awareness about shared micromobility in Waterloo Region.

- Maintain communications through regularly scheduled progress meetings with internal partners and multi-sectoral stakeholder meetings with external partners.
- Appoint lead communication contacts within the Region and Area Municipalities. This should be paired with a communications hierarchy protocol to ensure that

the appropriate individuals are responding to internal and external inquiries.

- A communications strategy should be developed annually (or perhaps quarterly or semi-annually in early months) to raise public awareness about the program, announce updates, and keep the public informed about the roll-out of shared micromobility in the region.

Regulating and Organizational Framework

The following section provides a checklist of requirements and other considerations for a shared micromobility implementation terms of reference. The lists are based on the NACTO Guidelines for Regulating Shared Micromobility document^{xi}. Each row indicates the type of system which would apply to that recommendation. Unless specified in the description, the recommendations are pertinent for implementing bike share, e-bike share, and/or e-scooters.

General Provisions

TABLE 10. RECOMMENDATIONS FOR GENERAL PROVISIONS

Overview		Lead Partner
General Provisions	Require legal permission to operate in public right-of-way.	Municipality
	Prohibit companies based on conduct or prior conduct.	Municipality
	Limit duration of licenses and permits to fixed time period (6-12 months), require re-application.	Municipality
	Require operators to demonstrate experience operating in similar size jurisdiction and/or demonstrate system is prepared for launch.	Municipality
Insurance, Bonds & Fees	Require operators to remain in good standing (fees, fines, reporting and other requirements).	Municipality
	Require operators to reimburse Licensee for incurring costs related to maintenance (retrieval from waterway, impounding fees, etc.). Security deposit should be issued per vehicle.	Municipality
	Require operators to indemnify the Licensee and hold appropriate insurance.	Municipality
	Require operators to hold in escrow sufficient funds to cover cost of removing all equipment from public right-of-way.	Municipality
Enforcing Permit Terms	Reserve right to issue fines, suspend, revoke, and modify permits on: • Operations in a manner of nuisance, injurious to public. • Violates any condition of permit or applicable laws. • Fails to collect its vehicles within 15 days of receiving written notice from Licensee of impoundment. • Fails to reimburse any costs accrued from vendor noncompliance.	Municipality

Scope and Operations Oversight

TABLE 11. RECOMMENDATIONS FOR SCOPE AND OPERATIONS OVERSIGHT

Scope & Operations Oversight		Action Responsibility
Fleet Size and Service Area	Reserve right to: - Require minimum and maximum number of vehicles available. - Require operators to deploy a share or absolute number of vehicles that meet certain vehicle types (e-assist, adaptive). - Revoke permits if operator does not deploy a minimum number of vehicles within a certain time of permit issuance. - Increase and decrease total number of vehicles permitted per operator – dynamic fleet caps or reflect Licensee priorities.	Municipality
	Number of permitted vehicles and the service area for each operator must be approved in writing prior to implementation.	Municipality
	Operators cannot have below permitted minimum fleet size or above maximum unless approved in writing.	Municipality
Fleet Removal/Relocation	Require operators to: - Remove inoperable, damaged, or unsafe vehicles. Vehicles must be removed from service immediately when a user or other person notifies the operator (e.g., status changes to maintenance mode). - Remove vehicles that interfere with, impede, or obstruct clear passage or accessibility of public right-of-way as soon as practicable or necessitated by the situation. - Recover vehicles that are irretrievable by general public within 24 hours, or sooner, depending on location and risk to the general public. - Dispose of equipment if company ceases operations within 48 hours of closure.	Municipality
	Reserve right to move, remove, and permanently dispose of vehicles at operator's expense.	Municipality
	Require operators to develop emergency management plans to address fleet removals in case of severe weather.	Municipality
	Require operators to demonstrate they can remotely lock vehicles that are reported or believed to be inoperable.	Municipality
Rebalancing & Fleet Distribution	Require operators to rebalance vehicles within permitted service area.	Municipality

Scope & Operations Oversight		Action Responsibility
Equipment and Vehicle Maintenance	Require operators to develop and share operations plans with the Licensee including: • Full maintenance checks on each vehicle in their fleet once a month at minimum. • Weekly on-street checks. • Provide signed certification for all maintenance. • Keep a record of maintenance activities.	Municipality
	Require operators inform the Licensee of any incidents immediately.	Municipality
	Must provide Licensee with the name and contact phone number for a senior-level local staff person available to liaise 24/7.	Operator
	All vehicles must comply with Consumer Product Safety Commission and/or any federal, provincial, or local safety standards.	Operator
	Maximum motor assist speed should be no greater than 24 km/h, maximum 500W power output. Note: applicable to e-scooters, e-bikes.	Operator
	Unique identifier number prominently displayed on both sides of each vehicle.	Operator
	Each vehicle equipped with on-board GPS, capable of providing real-time location data.	Operator
	Meet all local, provincial requirements including lights, brakes, reflectors, etc. Example MTO requirements are available here: http://www.mto.gov.on.ca/english/vehicles/electric/electric-scooters.shtml .	Operator
	In case of immediate safety issue, require vehicle(s) are locked and removed.	Operator
	Provide customers with specified mechanisms to notify operator that there is a safety or maintenance issue.	Operator
Customer Service	Phone-based customer service centre with information about pricing, cash access, and discount membership services.	Operator
	Support by phone, online, and in-person during specified hours.	Operator
	Ability to reroute calls from the Region of Waterloo helpline (519-575-4400, as of February 2020) and municipal customer service lines.	Operator / Municipality

Scope & Operations Oversight		Action Responsibility
Operator/Vendor Staffing and Workforce Development	Require operators to comply with local, provincial, and federal workplace safety and wage requirements	Municipality
	Require local vendor staffing to include roles such as: • General manager. • Local fleet operations manager. • Local public outreach manager. • 24 hour contact person(s). • One person may take on multiple roles.	Municipality
	Require operators to show they made efforts to hire locally by reporting workforce demographics	Municipality
Pricing	Require that: • Operators to offer income-based discounted payment plans and/or subsidized equity programs, likely via public-private partnership. • Operators provide two-month advance notice of user price increases. • Operators develop a cash-based payment program.	Municipality

Public Engagement

TABLE 12. RECOMMENDATIONS FOR PUBLIC ENGAGEMENT

Public Engagement		Action Responsibility
Staffing & Events	Require companies to develop and share outreach plans with Licensee.	Municipality
Pricing & Discount Programs	All fees and costs (including penalties), terms of service, and user instructions should be easily accessible to the public online and in print (e.g., for distribution at public / community buildings).	Municipality and operator
	Information of income-based discounts and cash-access programs should be heavily advertised and accessible.	Municipality and operator
Outreach Materials & Campaigns	Require public-facing communications to be provided in languages identified by the Licensee.	Municipality

Mobility Data and User Privacy

TABLE 13. RECOMMENDATIONS FOR MOBILITY DATA AND USER PRIVACY

Mobility Data & User Privacy		Action Responsibility
Data and User Privacy	Require operators provide trip data at level of detail and frequency that allows them to accurately determine permit compliance, evaluate performance and impact.	Municipality
	Require companies make real-time available vehicle location data available to the public for use.	Municipality
	Require operators to develop, implement, and share a privacy policy that complies with municipal, provincial and federal laws, including: • Recognition that trip data can become personally identifiable when combined with other data sources. • Defined limitations on collection, storage, or usage. • Protocols for who has access to data and what to do in case of data breach. • Protocols for records retention.	Municipality
	Require operators to prove they are in compliance with contractual requirements, industry standards, laws regarding data privacy and consumer data protection.	Municipality

Infrastructure

TABLE 14. RECOMMENDATIONS FOR INFRASTRUCTURE

Infrastructure		Action Responsibility
Shared Micromobility Parking	On street option includes corrals and docking points. Installs can replace parking spots or be used to daylight intersections. Scooters typically use painted “hubs” or park as freestanding devices.	Municipality and Operator
	In-boulevard options include corrals, painted sidewalk or marked location.	Municipality and Operator
	Require operators develop and share a parking management plan with Licensee including: • Geofencing, if dockless or hybrid system. • Communicate with customers about appropriate parking locations. • Detect and move improperly parked vehicles. • Staff rebalancing services.	Municipality
	At Licensee’s request, geofence special parking zones, special events, and other locations in app within 48 hours of notice.	Operator

Infrastructure		Action Responsibility
	Note: Applicable to dockless or hybrid system.	
	- Vehicles should comply with requirements for clear space by crosswalks and curb ramps. - Vehicles parked on sidewalks may only be parked in the street furniture zone, unless otherwise permitted by the Licensee. Licensee will review and approve sidewalk locations for snow clearance and accessibility. - Maintain a required clear path for all sidewalk corral locations.	Municipality and Operator
	Ability to communicate with user if parked in non-permitted area.	Operator
	Parking should be distinct and should include signage and/or decals to inform customers where to park.	Municipality and Operator
Providing Safe Place to Ride	Prioritize development of bikeways that are safe and comfortable for users of all ages and abilities.	Municipality
	Convene to discuss how street design standards may need to change to accommodate a wider array of low-to-moderate speed micromobility vehicles.	Municipality
	Integrate with public transit via vehicle siting, future integration with transit payment systems, and regular communication. Monitor the number of trips beginning or ending at transit stations.	Grand River Transit, Municipality, Region
Restricted/Limited Access Areas	Require operators to limit speeds to appropriate levels.	Municipality
	Operators comply with geofencing requests to prohibit vehicle use.	Operator

6. BUSINESS PLAN

Cost/Revenue Assessment

Shared micromobility system costs and revenue ratios are similar to public transit systems; there is typically a gap between costs and revenue. A bike share system's farebox recovery rate is typically between 25-45% of the cost of the system. From a public sector perspective, this is less of a concern when a system is privately owned and operated. The private vendor would be primarily concerned with system finances. Primary revenue sources are user fees, sponsorship opportunities, and advertising. Costs are incurred when the system is launched and on an ongoing basis. This section presents three cost / revenue scenarios for shared micromobility in the region:

- Near-term recommendation: Permit-based, privately owned system.
- Near-term alternative: Procurement-based, privately owned system. This option would be explored if the recommendation above is unsuccessful.
- Long-term alternative: Procurement-based, publicly owned system.

Near-term Recommendation: Permit-based, Privately Owned System

This plan recommends pursuing permit-based micromobility for a privately owned system (e.g., owned by one or more vendors). As such, the majority of program costs would be incurred by private operators. Nonetheless, Region and Area Municipalities would need to contribute staff time toward oversight of the parameters covered in future Licence Agreements. Costs are shown in Table 15.

TABLE 15. SHARED MICROMOBILITY COSTS – RECOMMENDED PERMIT-BASED SYSTEM

Category	Cost Description	Lead Funding	Expected Public Sector Contribution
Launch Costs	Establish the system, (e.g., hiring employees, warehouse fees, pre-launch marketing).	Private vendor	- Hire 1 to 2 FTE employees within Region of Waterloo as Shared Micromobility Coordinators. - New FTE and other staff time to manage permitting process.
Capital Costs	Purchase stations, bicycles, and bike share specific parking.	Private vendor	- Leverage existing bike parking funding source for the creation of new bike parking. - Increase funding for new bike parking. This study recommends 200 bike share specific parking corrals, funded by private operators. The Region and Area Municipalities should also add another 200 general use bike parking corrals to address public concern about parking scarcity, with 40 corrals added per year. The approximate cost is \$500,000 for a maximum of 2,000 bike parking spaces.
Operational Costs	On-going costs for management, redistribution, and maintenance.	Private vendor	- Communicate regarding Licence Agreement. - Provide funding for equity programming (e.g., subsidized memberships).
Marketing Costs	Ongoing costs for promoting the system and proper usage.	Private vendor	Distribute marketing materials, invite vendor to relevant public agency-led community events.

Near-term Alternative: Procurement-based, Privately Owned System

This alternative should be considered if no operators come forward to operate in the permit system by 2022. This alternative could also be triggered if the service under the permit system does not meet the Region's goals and objectives for shared micromobility.

Private shared micromobility operators' business models continue to evolve in order to provide their products to public agencies and members of the public. Dropbike is one example. They provided the year 2019 pilot at no cost to public agencies. However, they have indicated that they would require public sector funding to provide service in future years. They have not yet provided any quotes on the cost for their services. There are other operators that also offer similar services with various fleet options. These services would have an annual cost, as well as the cost for parking corrals. Dropbike has since provided an expression of interest for 2020 season to provide service for \$5,000/month with fewer bikes and no operations in Cambridge. The Region and Area Municipalities should still consider the costs for additional public bicycle parking corrals in addition to the cost of the service.

Long-term Alternative: Procurement-based, Publicly Owned System

During the process of this study, a high-level pro forma was completed to provide conceptual costs of a procured, publicly operated bike share system to support decision-making. The pro-forma is provided below in Table 16 to provide those costs for reference and consideration in how they impacted the study's recommendations. Based on the costs presented in the pro-forma, **public ownership and operation of a bike share system was identified as unrealistic due to the funding shortfall based on current municipal budgets.** If future shared micromobility trends point toward a resurgence of procurement-based, publicly owned systems, the Region could investigate funding options for this approach, as presented in the pro forma. At this time, a permit-based, privately owned system is recommended.

The pro-forma does not include potential revenue from system sponsorship or advertising, as Community Access Bikeshare reported challenges with both revenue streams. Generally, revenue from these sources can vary greatly depending on market and opportunity. A discussion and examples of potential funding mechanisms is provided in the following section.

TABLE 16. REGION OF WATERLOO BIKE SHARE PRO-FORMA – PROCUREMENT-BASED PUBLICLY OWNED SYSTEM (LONG-TERM ALTERNATIVE – NOT RECOMMENDED AT THIS TIME)

Phase	1: Initial Set-up	1: System Operation	2	3	4	5	All
# of new stations	85	0	50	55	60	50	300
# of stations (cumulative)	85	85	135	190	250	300	300
# of bikes	850	850	1350	1900	2500	3000	3000
COSTS							
Launch costs (\$2,000/bike, est.)	\$1,700,000	\$0	\$1,000,000	\$792,000	\$864,000	\$720,000	\$5,076,000
Capital costs (\$3,000/bike, est.)	\$2,550,000	\$0	\$1,500,000	\$1,669,250	\$1,821,000	\$1,517,500	\$9,057,750
Operations costs (\$2,000/bike/year, est.)	\$0	\$1,700,000	\$2,700,000	\$3,800,000	\$5,000,000	\$6,000,000	\$19,200,000
Costs sub-total	\$4,250,000	\$1,700,000	\$5,200,000	\$6,261,250	\$7,685,000	\$8,237,500	\$33,333,750
Costs Cumulative	\$4,250,000	\$5,950,000	\$11,150,000	\$17,411,250	\$25,096,250	\$33,333,750	
REVENUE PROJECTIONS							
Estimated "Farebox Recovery" rate	N/A	25.0%	30.0%	35.0%	35.0%	35.0%	35.0%
User-fees	\$0	\$425,000	\$810,000	\$1,330,000	\$1,750,000	\$2,100,000	\$6,415,000
Public funds/grants	\$125,000	\$125,000	\$125,000	\$125,000	\$125,000	\$125,000	\$750,000
Revenue sub-total	\$125,000	\$550,000	\$935,000	\$1,455,000	\$1,875,000	\$2,225,000	\$7,165,000
Revenue Cumulative	\$125,000	\$675,000	\$1,610,000	\$3,065,000	\$4,940,000	\$7,165,000	
FINANCIAL GAP							
Annual need	-\$4,125,000	-\$1,150,000	-\$4,265,000	-\$4,806,250	-\$5,810,000	-\$6,012,500	-\$26,168,750
Cumulative need	-\$4,125,000	-\$5,275,000	-\$9,540,000	-\$14,346,250	-\$20,156,250	-\$26,168,750	

Future Funding Mechanisms

This plan is a living document that is flexible enough to respond to industry changes. **Funding for a permitted system is mainly carried by the private operator.** Public agencies contribute staff time to develop system regulations and to enforce these regulations. Nonetheless, funding mechanisms are outlined in this section for consideration, as needed.

Government Funding

Municipalities generate revenues and set annual budgets for funding infrastructure and services, including recreational programming and transportation infrastructure projects.

The Region and Cities may consider funding through existing programs, such as parking. Toronto Bike Share is owned by the Toronto Parking Authority, which allows revenue from on-street and city-owned lots to be used for the system.^{xii}

The Province and Federal levels of government may contribute funding towards a shared micromobility program. Through the federal Public Transit Infrastructure Fund (PTIF) the City of Toronto matched a \$4 million contribution for funding an expansion of the Toronto Bike Share system in 2018.^{xiii} The province has previously provided funding to Toronto and Hamilton's bike share systems through Metrolinx. Hamilton received \$1.6 million from Metrolinx in capital funding.^{xiv}

Grand River Transit (GRT) could play a potential role in providing funding and/or providing staff time. Integration with transit is a major goal of providing shared micromobility services in the region. A partnership between operators and GRT is crucial to result in technological integration, such as giving users the ability to use one payment method to purchase multiple mobility services (e.g., transit and bike share / e-scooter trips). Vendors and GRT should work together to explore adding each other's mobility services to mobile apps and websites.

Grant Funding

Organizations such as the Federation of Canadian Municipalities (FCM) have previously contributed grant funding towards bike share projects, including this feasibility study, and the Everyone Rides Initiative in Hamilton which received \$274,500 from FCM.^{xv}

The regularity of these funding programs varies and cannot be relied upon as a continuous on-going source of funding. For the Everyone Rides Initiative funding was also provided by two local foundations as well as the City of Hamilton. Developing relationships with foundations and organization with grant programs will be helpful for developing grant applications and opportunities for funding of programs or expansions.

Sponsorship

Sponsorship and advertising are more common on publicly owned or procured systems as opposed to privately owned systems. The value of sponsorship will vary significantly between cities. Sponsorship may also be inconsistent from one year to the next. The examples below show other cities' experiences with sponsorship. However, sponsorship amounts have even fluctuated within these communities over time.

Advertising

There is a subtle difference between advertising and sponsorship. Advertising includes a contract with a company to provide a regularly changing graphic display and message, which could be independent of the bike share station or other street furniture. The advertiser and/or message may not be associated with bike sharing or bicycling in general. Sponsorship typically involves a longer-term relationship between the sponsor and the vendor. Sponsorship entails brand alignment and may include naming rights. Hamilton Bike Share in Hamilton, ON (pop. 580,000) is sponsored by the City of Hamilton, Metrolinx, and McMaster University. The system operates through this combination of



sponsorship by the Greater
Mutual company.

FIGURE 24. HAMILTON HYBRID HUB
(THEPUBLICRECORD.CA / JOEY
COLEMAN)

Greenhouse Gas Emission Avoidance

Overview

The energy used to power the transportation sector is Canada's second largest source of greenhouse gas emissions, accounting for 28% of all emissions. Most of these emissions come from road transportation, including personal transportation and heavy-duty vehicles. While Canada has achieved large reductions in GHG in other sectors like public electricity and heat production, emissions from transportation increased by 5% from 2005 to 2017. The growth in emissions was mostly due to more driving.

In 2015, the transportation sector was Waterloo's largest emitter of CO₂ at 49% of total emissions. Under the medium uptake scenario in phase 5, bike share trips would make up 15.8% of the 3% Regional Transportation Master Plan target mode share for cycling trips by 2041.

Shared Micromobility and Potential GHG Emission Avoidance

Together, bike share and e-scooter share could reduce emissions from transportation by as much as 2,300 metric tonnes of CO₂ per year by phase five under the high uptake scenario. This would mean that both bike and e-scooter share systems are exceeding average results for shared micromobility systems.

Achieving the high scenario in phase five would be roughly the equivalent of planting 38,000 trees and allowing them to grow and sequester CO₂ for ten years.

More detailed information on the calculations and evaluation of bike share and e-scooter share systems and emission avoidance under different ridership uptake scenarios are available in Appendix A.

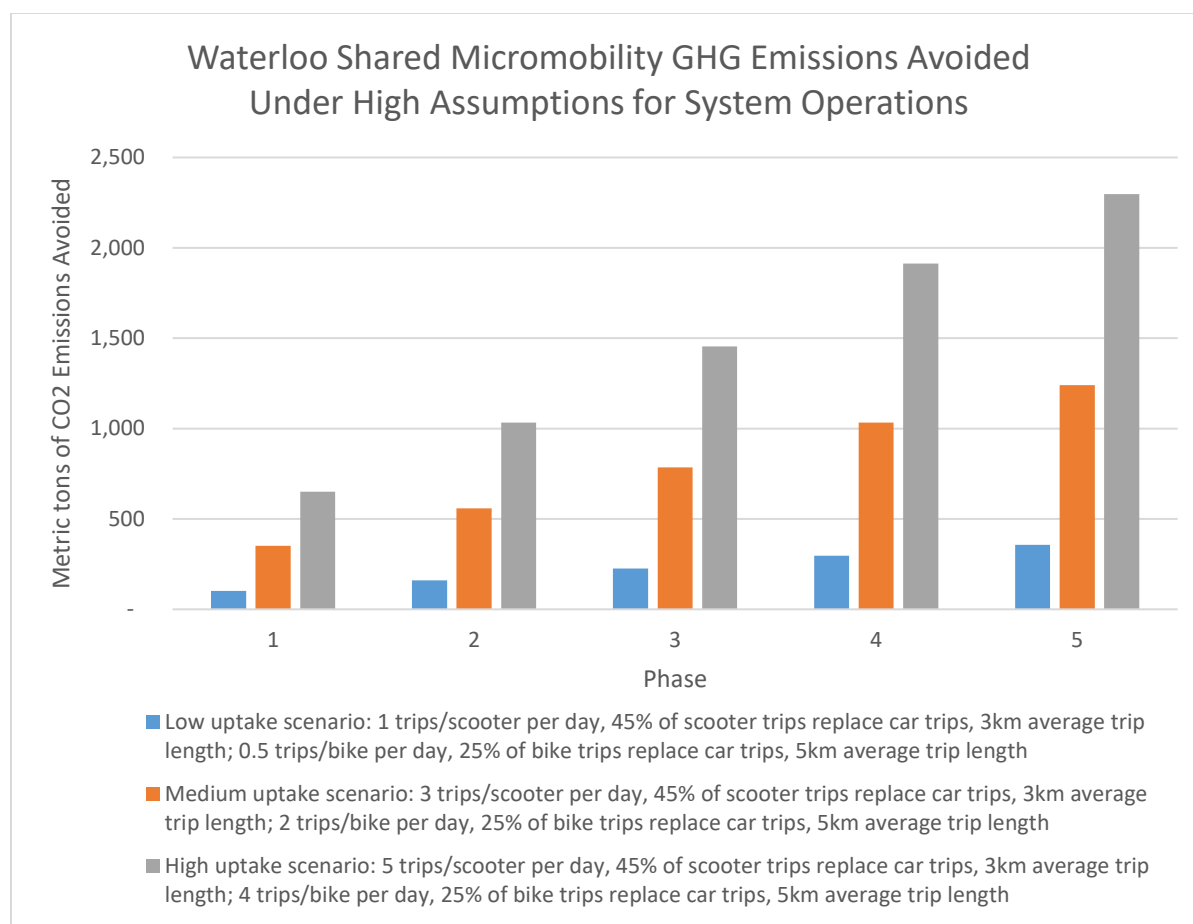


FIGURE 25. SHARED MICROMOBILITY GHG EMISSIONS AVOIDED UNDER HIGH ASSUMPTIONS FOR SYSTEM OPERATIONS

Policy Opportunities to Maximize GHG Emission Avoidance

Provision of bikes and e-scooters alone is not enough to encourage the high frequency of use necessary to achieve significant GHG emissions reductions. Launching shared micromobility in Waterloo in conjunction with elements of the Region’s transportation demand management (TDM) strategy can further reduce emissions from transportation. For example, outreach to employers and colleges / universities can highlight bike and e-scooter share and encourage use of

the system. Improvements to bicycle infrastructure in the shared micromobility service area can lead to more and longer trips per day, increasing emissions avoided. Area Municipalities can also implement TDM strategies in coordination with shared micromobility. For example, cities can charge a market price for parking in areas served by shared micromobility to discourage car use and encourage use of the shared micromobility system, while also generating revenue that could be used to support shared micromobility. The system’s visibility could also support behaviour change (e.g. people seeing more people incorporating bikes as part of their daily transportation).

7. MARKETING THE SYSTEM

This section considers target audiences for shared micromobility services in the region. The target audiences were developed in consideration with the vision, goals, and objectives and findings from the Dropbike pilot. They consider how the Region, private operators, and others might message shared micromobility services to these audiences. The list is not exhaustive. The marketing methods section suggests focused outreach and engagement for shared micromobility services.

Target Audiences

Post-secondary Students

There are 65,000 students at post-secondary institutions in the region.^{xvi} Many of these students may have to travel throughout the day at off-peak transit times, or travel between campuses. Many of these students may have moved to the region to continue their education and do not have access to a bicycle or car.

Older Adults

By 2021, 29% of people living in Waterloo Region will be aged 55 or older.^{xvii} Making the system accessible for this segment of the population will also support the Region's goals for older adults' enhanced transportation, mobility, and recreation as identified in the Region of Waterloo Seniors' Strategy (2014). E-bike usage

studies show strong ridership statistics by older adults. E-bikes, pedal bikes, and other improved transportation choices can help older adults age in place. By remaining in their neighborhoods as they age, older adults benefit from decreased social isolation and access to errands, such as doctor visits.

Tourists

Annually, 4.8 million visitors come to the region. Explore Waterloo, the Region's tourism agency, is actively looking to further develop the tourism industry in the region. The Region is currently a bronze certified sustainable tourism destination.^{xviii} Shared micromobility services would provide a way for many of these visitors to travel around the region.

Commuters

The current workforce in the region is 303,400 people. The region has seen the most significant growth in the technology labour pool in Canada, with more than 7,400 tech jobs added between 2014 and 2016.^{xix} Commuters are an important target audience because of the regularity of their trips. Providing a reliable mobility option is essential for attracting this target audience. Toronto Bike Share offers workplace memberships through the City's Smart Commute program. The Region's TravelWise program could pursue a similar agreement or work to promote the system to member businesses.

Transit Users

Grand River Transit (GRT) provided 19.7 million riders in 2017, and has a ridership

target of 28 million annual riders by 2021.^{xx} The transit system launched the ION LRT service in 2019 and is focusing on providing more direct and efficient service to customers on frequent routes. Shared micromobility can provide a first/last kilometre option to get people to/from frequent transit service to their destination. The system implemented the EasyGO fare card system to streamline payment. It is recommended to explore/encourage vendors to provide discounts to transit pass holders and/or integrated payment through GRT system?

People with Low Incomes

Currently 15% of the region's population are considered to have low incomes.^{xxi} It was identified during engagement on this study that there should be a focus on providing an affordable option for people with low incomes. Access to reliable transportation can be a major barrier to people being able to get to work, appointments, and taking care of their families.

Marketing Methods

The Region should include provisions in shared micromobility permitting documents to require operators' responsibility for marketing their system and/or provide funding and in-kind design support for co-branded material. Some jurisdictions, such as Portland, OR, require potential operators to submit a Communication and Outreach Plan as a component of the permit application process. Another approach is to dedicate a portion of permit application fees toward outreach, education, and marketing.^{xxii} One successful approach to marketing is

partnering with local non-profits to help with outreach, as these groups are already actively involved in the community.

System operators would lead each of the following action items. Opportunities to coordinate with public agencies and local organizations are also identified. The following recommended marketing methods consider the target audiences outlined in the previous section. They also consider findings from the Dropbike pilot survey related to residents' feedback.

Transit Integration

Studies indicate that e-scooters are often used to reach transit or to fill gaps in public transit systems. Therefore, rebalancing shared micromobility vehicles and parking opportunities near transit is crucial.* Moreover, technologically integrating the services could encourage their usage. Operators and GRT should coordinate possibilities such as offering shared micromobility access to transit passholders (particularly those eligible for GRT/Community Services' Affordable Transit Program), providing multimodal trip planning tools (e.g., apps, website), and regular communication.

Advertising

- Any advertising materials should reflect the diversity of the region's residents and visitors.
- Specific advertising materials should be developed for each of the target audience groups.
- Work with Explore Waterloo to develop tours and itineraries for tourism.
- Promote shared micromobility services through the Region's, municipalities', and other social media channels.

Education

In the Dropbike survey 9% of respondents indicated they didn't know how to use the system, and 15% said that they do not ride Dropbike or a personal bike. Only 8% of survey respondents who used Dropbike were between 55-64 years of age, and only 11% were between 45-54 years old. Each of these percentages are much lower than the population distribution of people living in the region.

- Create easy to understand materials to show people how to use the system, available in a variety of formats (e.g., signs and decals on or near operators' parking facilities and bikes, website content, content for the Region and municipalities to distribute).
- Host workshops on how to use the system and the rules of the road.
- Organize themed group rides to empower people to try riding in a social setting and have an opportunity to explore the community.

- Education and workshops help hesitant potential riders feel comfortable riding a e-bike or e-scooter. These events should reach people where they are, such as the pop-up booths listed in the following section.

Pop-Up Booths

An effective way to reach out to people who are passing by, not just people who self-selected to attend an event. In the Dropbike pilot survey, 21% of respondents indicated that there weren't any bikes near them. Pop-ups should be coordinated with an effort to distribute vehicles around the area.

- Host a booth on post-secondary campuses.
- Participate in local events (e.g., Culture Days, Blues Festival, Jazz Festival).
- Partner with organizations and municipalities hosting cycling related events or bike parking services (e.g. Bike Check, Bike Valet, etc.).
- Operate an employer-based outreach program to coordinate potential corporate and individual memberships.
- Coordinate with other public sector events and initiatives, as they arise (e.g., Transportation Demand Management, Public Health).
- Host a booth during community group events. Bring bikes or scooters for residents to try in a low stress environment.

Incentives and Equity Program Options

Twelve percent of Dropbike survey respondents couldn't use the system because using a smartphone was a requirement, or because of the \$50 deposit requirement. Cost is related to a system's public perception and its ability to attract new users. Cost is also tied to creating an equitable system.

- Linking payment to the EasyGO payment system.
- Employer program to buy or subsidize employee memberships.
- Promotional rates, such as a free weekend or week's worth of access could help people spontaneously try the service.
- Work with staff who operate the TravelWise workplace program. This program encourages employees to use other transportation options besides driving alone. People who enroll in the program have access to discounted transit passes.



FIGURE 26. GRT EASYGO PAYMENT POINT (GRT.CA)

8. CONCLUSION

There is strong potential for shared micromobility in the Region of Waterloo. Its success will depend on strong public-private partnerships. This study developed a framework for facilitating next steps toward long-term shared micromobility systems. Public investment is needed to establish the permit process and parameters, using the recommendations presented in this study.

In the near-term, **it is recommended that the Region of Waterloo and Area Municipalities establish a permit system that allows for one or more operators to deliver shared micromobility vehicles** (e.g., traditional bikes, e-bikes, e-scooters) in the areas identified in this report. Inviting operators to apply to provide their services in the region will significantly limit public investment required to achieve the recommended phased implementation of shared micromobility across Waterloo Region.

However, some public investment is still needed to establish the permit process and parameters, using the recommendations presented in this study. Public investment in new staff time, as well as increased investment in bike parking and low stress infrastructure throughout the region will be required in order for shared micromobility programs to reach their potential. The Market Analysis portion of this study describes how shared micromobility planning was structured around existing low stress roadways and cycling infrastructure. Continuing to develop infrastructure that encourages cycling, e-scooters, walking, and transit is crucial to the success of shared micromobility. Area Municipalities and the Region must increase efforts to build connected networks that serve people of all ages and abilities.

Greenhouse gas emissions avoidance from shared micromobility primarily occurs from trip replacement from specifically car usage. Together, bike share and e-scooter share could reduce emissions from transportation by as much as 2,300 metric tonnes of CO₂ per year by phase five under the high uptake scenario. Provision of bikes and e-scooters should be paired with other policy changes. This is necessary to achieve GHG emissions reduction targets.

ENDNOTES

- i <http://www.mto.gov.on.ca/english/vehicles/electric/electric-scooters.shtml>
- ii <https://bikeshare.itdp.org/>
- iii <https://news.ontario.ca/mto/en/2019/11/ontario-announces-e-scooter-pilot-to-help-grow-ontarios-economy.html>
- iv Brown, Bensinger, and Roof (December 9, 2018). The Wall Street Journal: <https://www.wsj.com/articles/scooter-startups-cool-fundraising-wheels-1544356923> and Sandler, Rachel (June 28, 2018). Business Insider: <https://www.businessinsider.com/scooter-startup-bird-raises-400-million-in-4-months-rockets-to-2-billion-valuation-2018-6>
- v The City of Edmonton's "Bike Sharing Program Viability" report discusses regulatory frameworks for privately owned and operating systems: <http://sirepub.edmonton.ca/sirepub/cache/2/1hwbnrbcpetweowheygcdeva/80790801182019120048309.PDF>
- vi <https://www.publichealthontario.ca/en/data-and-analysis/commonly-used-products/maps/social-determinants-of-health> and <https://www.publichealthontario.ca/-/media/documents/userguide-on-marg.pdf?la=en>, page 8.
- vii NACTO guidance regarding "While systems around [the US] have experimented with deeply discounted memberships and options for low-income residents and the unbanked, less attention has been paid to ensuring that there are enough stations in low-income neighborhoods to make bike share a useful transportation option. Bike share trips are overwhelmingly short (less than 15 minutes) and local. As a result, users need a dense network of station options from which to pick up and return a bike." https://nacto.org/wp-content/uploads/2015/09/NACTO_Walkable-Station-Spacing-Is-Key-For-Bike-Share_Sc.pdf
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- ix <http://www.mto.gov.on.ca/english/vehicles/pdf/e-scooter-best-practices.pdf>
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- xvi <https://www.regionofwaterloo.ca/en/living-here/education-and-schools.aspx>
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* <https://chi.streetsblog.org/2019/08/22/depaul-study-scooters-are-being-used-for-trips-to-transit-and-in-low-income-areas/>

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