Innisfil Transit System Performance

May 2017 to February 2020

Final Report

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TRANSFORM

Table of Contents

Executive Summary

E-1. Background

This report is designed to explore the Innisfil Transit system performance levels between the program's inception in May 2017 and February 2020. Innisfil Transit is a publicly supported means of accessing on-demand ride hailing which entails select fixed-fare destinations in Innisfil as well as reduced fare on-demand ride hailing trips starting or ending in Innisfil for a reduced fare. This report describes the geography and the changes in performance over time, providing indications of the level of service experienced by different neighborhoods and residents. Ultimately, this study compares the existing Innisfil Transit service level and public expenditures with those expected from alternative transit delivery methods contemplated in the Town of Innisfil Transit Feasibility Study (MMM Group Limited, 2015).

E-2. Research Design

This study uses data provided by Uber to estimate Innisfil Transit system performance measures.

1. *What are the geographic and temporal patterns of using and providing Innisfil Transit?*
2. *How has mobility changed over time since Innisfil Transit has been provided?*
3. *How productive is the Innisfil Transit system in terms of the use of public resources?*
4. *How does Innisfil Transit compare with the bus services contemplated in the Town of Innisfil Transit Feasibility Study* (MMM Group Limited, 2015)*?*

Towards answering these questions, data at the Dissemination Area (DA) level is used, which was provided by Uber, Inc. System performance measures are estimated, including travel demand (trips per resident, trips per square kilometer, and trips per hour), travel and wait times (travel times, wait times, and vehicle-kilometer traveled), and expenditures (total, public, and private). Accessibility metrics are estimated to explore the potential for residents to reach destinations in the Town of Innisfil based on available transportation services. Innisfil Transit trips within the geographic boundaries of the two bus systems considered by MMM Group (2015) are identified and compared with broader system performance measures.

E-3. Results

Overall system performance measures are displayed (Section 3.1, p. 15) before travel demand (Section 3.2., p. 17), travel and wait times (Section 3.3., p. 25), expenditures (Section 3.4., p. 33), and accessibility patterns (Section 3.5, p. 48) are discussed. Towards identifying the relative value of Innisfil Transit, Section 3.5 compares Innisfil Transit accessibility and trip performance measures with both Uber (without the Innisfil Transit subsidy) and with the geographic and

temporal extent of the one-bus (Option 1) and two-bus (Option 4) alternatives contemplated in the Town of Innisfil Transit Feasibility Study (MMM Group Limited, 2015).

Over 220,000 Innisfil Transit trips took place between May 2017 and February 2020 (Table 2 and Table 3). Typical trips were nine kilometers in length, took approximately 11 minutes, and entailed approximately 6 minutes of wait time for the Innisfil Transit vehicle to arrive. Overall (public plus private) fares for trips were approximately $17, of which, approximately $7 were typically paid through private fares and $10 were publicly subsidized by the Town of Innisfil. Between May 2017 and February 2017, typical annual ridership was approximately 80,000 users.

E-4.Take Aways

First, while the highest public subsidies (on a per resident and on a per trip basis) are allocated in more rural portions of the town, the highest public subsidies and highest travel demand (on a per unit land area basis) are concentrated in more urban neighborhoods.

Second, the highest Innisfil Transit service levels and the lowest costs per trip are concentrated in the most urbanized parts of the town. Innisfil Transit provides accessibility levels almost four times as high as through the contemplated bus system. Accessibility is measured based on the total number of Town of Innisfil residents accessible within a certain threshold (e.g. for less than $6 or within 20 minutes).

Third, while the public cost of providing Innisfil Transit has increased over time on a per passenger basis (from approximately $6 to approximately $11 per trip), the cost is comparable to that of providing fixed-route transit to urbanized areas of under one million in population (which ranges from approximately 1 USD to 46 USD with a median of approximately 7 USD, or 10 CAD) (Office of Budget and Policy, 2016, pp. 26-27).

Fourth, 63% of Innisfil Transit trips took place during time periods during which the considered bus service alternatives would be available and not all of these would be feasible based on geographies of the bus ridership sheds. Based on the expanded ridership shed assumption, approximately 37% of Innisfil Transit trips occurred within the area that would be served by the proposed bus routes and during proposed bus service hours. Approximately 33% of Innisfil Transit trips occurred in the proposed one-bus (Option 1) ridership area and service hours, and 37% of Innisfil Transit trips occurred in the proposed two-bus (Option 4) ridership area and service hours. Based on the constrained ridership shed assumptions, the share of Innisfil Trips accommodated by the one-bus and two-bus alternatives would be between 24 and 29%.

Fifth, using correlations between Innisfil Transit ridership and select demographic variables, it appears that the highest ridership levels are associated with highest population densities and

there is weak evidence of the highest ridership levels being correlated with the lowest population shares with a bachelor's degree or higher. Other correlations were statistically insignificant.

Finally, Innisfil Transit balances the priorities of providing mobility for low-density and rural communities while using the advantages of scale to provide high service levels at lower public costs to residents in established neighborhoods.

1. Background

This report is designed to explore the Innisfil Transit system performance levels between the program's inception in May 2017 and February 2020, just before the Covid-19 pandemic. This report describes the geography and the changes in performance over time, providing indications of the level of service experienced by different neighborhoods and residents. Ultimately, this study compares the existing Innisfil Transit service level and public expenditures with those expected from alternative transit delivery methods – notably the one-bus (Option 1) and two-bus (Option 4) alternatives contemplated in the Town of Innisfil Transit Feasibility Study (MMM Group Limited, 2015).

The Town of Innisfil is located approximately 100 kilometers north of Toronto, Ontario and is immediately southeast of and adjacent to Barrie, Ontario. The Town of Innisfil has a population of almost 40,000 but is characterized by rural and small-town development patterns. While Innisfil has experienced recent population growth, significant swaths of the Town remain relatively rural and low-density, making conventional fixed-route transit alternatives more challenging to use as tools to support transit ridership.

The Innisfil Transit service is a program which offers publicly subsidized mobility services provided by a private on-demand ride hailing service provider. The primary service features and program changes included:

- On May 15, 2017 Innisfil Transit services included $3 fixed fare to/from the Innisfil Recreational Complex / Town Hall area; $4 fixed fare to/from GO bus stops in Innisfil along Yonge Street; $5 fixed fare to/from the Innisfil Heights Employment Area; and a $5 discount for custom destinations to/from Innisfil (Town of Innisfil, 2018).
- In March 2018, services were expanded to include $3 fixed fare trips to/from the Alcona Lakeshore Library and the Lefroy Community Centre (Town of Innisfil, 2018).
- On April 1, 2019, services were adjusted, and a ridership cap was put in place, such that individuals could only use 30 trips per month – unless they had applied for and been granted an exemption. The fixed-fare costs were increased by $1; the Barrie South GO train station became a $6 fixed-fare destination; and custom destination request discounts were reduced to $4 (from $5) (Town of Innisfil, 2019).

While the Innisfil Transit services have evolved over time, this study is designed to estimate service levels for Innisfil residents.

2. Research Design

This study uses data provided by Uber to estimate Innisfil Transit system performance measures.

2.1. Research Questions

1. *What are the geographic and temporal patterns of using and providing Innisfil Transit?*
2. *How has mobility changed over time since Innisfil Transit has been provided?*
3. *How productive is the Innisfil Transit system in terms of the use of public resources?*
4. *How does Innisfil Transit compare with the bus services contemplated in the Town of Innisfil Transit Feasibility Study* (MMM Group Limited, 2015)*?*

Towards answering these questions, data is used which was provided by Uber, Inc. Due to data masking to protect trip privacy, missing data is imputed using generalized linear modeling frameworks. By combining the observed and imputed data, system performance measures are estimated, including travel demand (trips per resident, trips per square kilometer, and trips per hour), travel and wait times (travel times, wait times, and vehicle-kilometer traveled), and expenditures (total, public, and private). Beyond global measures and metrics which are calculated for local zones (Statistics Canada Dissemination Areas), trips within the geographic boundaries of the two bus systems considered by MMM Group (2015) are identified and compared with broader system performance measures.

2.2. Study Data

Study data is provided to the study team by Uber for trips between Statistics Canada Dissemination Areas (DAs) which are geographic zones used for data collection (of which there are 57). Study data extends from May 2016 (one year before Innisfil Transit started) to February 2020. Data include all trips by Uber and by Innisfil Transit and provides data on the following key characteristics:

- Trip Counts
- Uber Type (Innisfil Transit or other)
- Time Period (based on peak periods)
- Trip distance (mean, median, standard deviation, max, min)
- Fare (mean, median, standard deviation, max, min)
- Travel Time, minutes (mean, median, standard deviation, max, min)
- Stops, intermediate (mean, median, standard deviation, max, min)
- Weekday (distinguishes weekdays from weekend only)
- Month (January through December)
- Year (2016 through 2019)

When fewer than five trips occur during to or from a DA during a specific typical time period, data are suppressed (masked), as is the custom by Statistics Canada – as described in Table 1.

Table 1. Uber Data Types and Masking according to Uber, Inc.

Dataset	Time Aggregation	Trips Masked (%)	Rows Masked (%)
Origin – Destination	Quarter of year, weekday/weekend	19%	76%
Origin Only	Calendar year, month, weekend / weekday, time period	12%	58%
Destination Only	Calendar year, month, weekend / weekday, time period	11%	57%

2.3. Methods

Study methods focus on descriptive statistics extracted from the study data using the R software.

2.3.1. Overall Approach

Overall, the study is conducted in the following steps.

First, missing data is imputed. As ten to 20 percent of study trips are masked (see Table 1), an inferential modeling framework is used to impute missing data. In select cases – notably when performance is in terms of public or private expenditures per trip – the raw data is used to minimize the impacts of limitations in imputing fare data (which have related private and public components which sum to a global total).

Second, select overall system performance measures are extracted from the dataset (see Section 3.1). These include trip taking, vehicle-kilometers traveled, travel times, wait times, and fares.

Third, overall system performance measures are estimated at the Statistics Canada Dissemination Area (DA) level to explore the geography of Innisfil Transit performance. Findings are mapped to identify the spatial patterns in service levels across the Town of Innisfil. Results broken down by each month between May 2017 and February 2020 are further shown.

Fourth, overall monthly performance measures are estimated to identify how Innisfil Transit services and use have changed between May 2017 and February 2020.

Fifth, daily variations in Innisfil Transit system performance and use are estimated for key time periods for both weekdays and weekends. Those time periods are:

- AM Peak – 6am-10am
- Midday – 10am-3pm
- PM Peak – 3pm-7pm
- Evening – 7pm-10pm
- Night – 10pm-6am

Using these components, Innisfil Transit performance and use measures are estimated to explore their spatial patterns across the Town of Innisfil.

2.3.2. Bus Alternative Comparisons

Before Innisfil Transit was adopted as an on-demand ride-hailing solution, the Town of Innisfil Transit Feasibility Study (MMM Group Limited, 2015) considered two fixed-route bus options. As part of this scope of services, this study compares the observed Innisfil Transit trip taking and service conditions with the prospective bus routes using two approaches:

First, the bus route is compared with Innisfil Transit using accessibility metrics. Accessibility is defined as, "the *potential* of opportunities or interaction (Hansen, 1959, p. 73)." A common measure of accessibility is based on cumulative opportunities (often residents or jobs) which can be reached from a geographic location based on a given travel price (often monetary or temporal travel costs). To compare the transportation services for the bus routes with those of the adopted Innisfil Transit service, accessibility measures are estimated using the cumulative opportunity metric based on the number of Town of Innisfil residents which can be accessed within 20 minutes.

Several assumptions are made which, together, serve to establish an upper estimate of the potential trips served by the contemplated bus routes. As a basis of comparison, the potential trips and accessibility enabled by walking is likewise calculated. Key assumptions are as follows:

- Bus trips are assumed to be from DA centroid to DA centroid by Euclidian distance
- Bus in-vehicle speeds (including stops) were assumed to be 30 kilometers per hour
- For bus trips, walking access + walking egress + waiting time + scheduling times were assumed to be 10 minutes total.
- Walking trips are assumed to be from DA centroid to DA centroid by Euclidian distance
- Walking speeds are assumed to be 5 kilometers per hour

Second, the two bus options are compared with the selected on-demand Innisfil Transit option based on expected ridership levels. While the expected ridership of the bus routes are estimated in the Town of Innisfil Transit Feasibility Study (MMM Group Limited, 2015), the observed Innisfil Transit on-demand trip data are used to sub-select only those trips which could have been

geographically within the bus route ridership sheds. The ridership sheds were determined using DA geographies, such that each DA (even if only a small portion of a DA) which overlapped within 800 meters of the previously proposed bus routes (approximately a ten-minute walk) was selected. The implication of this assumption is that the number of trips estimated to be met using the bus routes is higher than the likely ridership, should users be unwilling to walk longer distances (which can be several kilometers for some DAs near the bus routes) to access a bus stop. In addition, these estimations are based on shortest-path travel distance to the bus route, and as a result, the actual distance between home and a bus stop could be even longer. This simplifying assumption inherently overestimates the share of Innisfil Trips estimated to fall within the two bus routes. On the other hand, because data on Innisfil Transit services to the Barrie GO Station were not disaggregated from other trips to Barrie, bus routes are expected to have higher ridership than that captured in these metrics. Trips to the Barrie GO Station (in the case of the one-bus option) or to other corridors in south Barrie (in the case of the two-bus option) cannot be distinguished from trips elsewhere in Barrie – leading them to be left out of the bus alternative estimates and therefore leading to a source of downward bias which counteracts the other sources of overestimation listed above.

The geography of DAs considered to be served by the one-bus and two-bus options is illustrated in Figure 1 and Figure 2. It is notable that two different ridership sheds are considered: the expanded ridership shed (which includes all DAs which overlap within 800 meters of the bus route) and the constrained ridership shed (which includes only DAs whose geographic centroids spatially fall within an 800-meter buffer around the bus route). The *expanded* and *constrained* ridership sheds are designed to serve as bookends for upper and lower-end estimates of bus service levels. It is notable that fixed-route transit services depend critically on localized transit access and egress. Given that the Dissemination Areas are relatively large geographies, they are inherently not designed for localized transit ridership assessments. As such, both the *expanded* and the *constrained* ridership sheds are designed to provide guidance with respect to an order of magnitude – rather than specific point estimates. It is notable that according to Sweet, Mitra, and Chemilian (2020, p. 28), less than 20 percent of respondents indicated a willingness to travel more than ten minutes to a transit stop – meaning that the ridership sheds assumed in this analysis are more extensive than approximately 80 percent of survey respondents reached through the Innisfil Transit survey.

The bus ridership estimates are further refined by accounting for the differences in service hours between Innisfil Transit delivered on-demand (24 hours per day, seven days per week) and the bus alternative (12 hours per day on weekdays and 8 hours per day on Saturdays).

Towards identifying the current Innisfil Transit service performance within those areas potentially served by the one-bus and two-bus options, several assumptions are used in combination with the study data to explore potential service levels.

- To illustrate the impact of bus service hours (listed above), analyses of observed Innisfil Transit trips accommodated by Bus 1 or Bus 2 are based on two scenarios:
    - Geography Only - trip strictly connecting trip origins and destinations identified as being within the bus ridership DAs,
    - Geography and Service Times - a combination of the geography of DAs served by the bus routes and considering the times during which the one-bus and two-bus options run (approximately 62.5% of Innisfil Transit trips occur during the contemplated bus service hours)

The two bus options are titled Option 1 (MMM Group Limited, 2015, Figure 28), and Option 4 (MMM Group Limited, 2015, Figure 29) and discussed as the one-bus option (Option 1) and the two-bus option (Option 4), as these are the number of buses required for service delivery. Based on the feasibility study, the one-bus (Option 1) and two-bus (Option 4) alternatives were as follows:

- Option 1 - the one-bus option is expected to circulate 32 kilometers per hour for 3,488 hours per year (7am-7pm Mondays-Fridays and 9am-5pm Saturdays). The average ridership in the first five years was expected to be 22,200 (17,000 + 21,000 + 23,000 + 24,000 + 26,000)/5.
- Option 4 - the two-bus option is expected to circulate 21 kilometers per bus (42 kilometers in total) per hour for a total of 6,976 hours per year (3,488 hours per bus). Average ridership in the first five years was expected to be 37,000 per year for the two-bus option (28,000 + 35,000 + 38,000 + 42,000 + 42,000)/5.

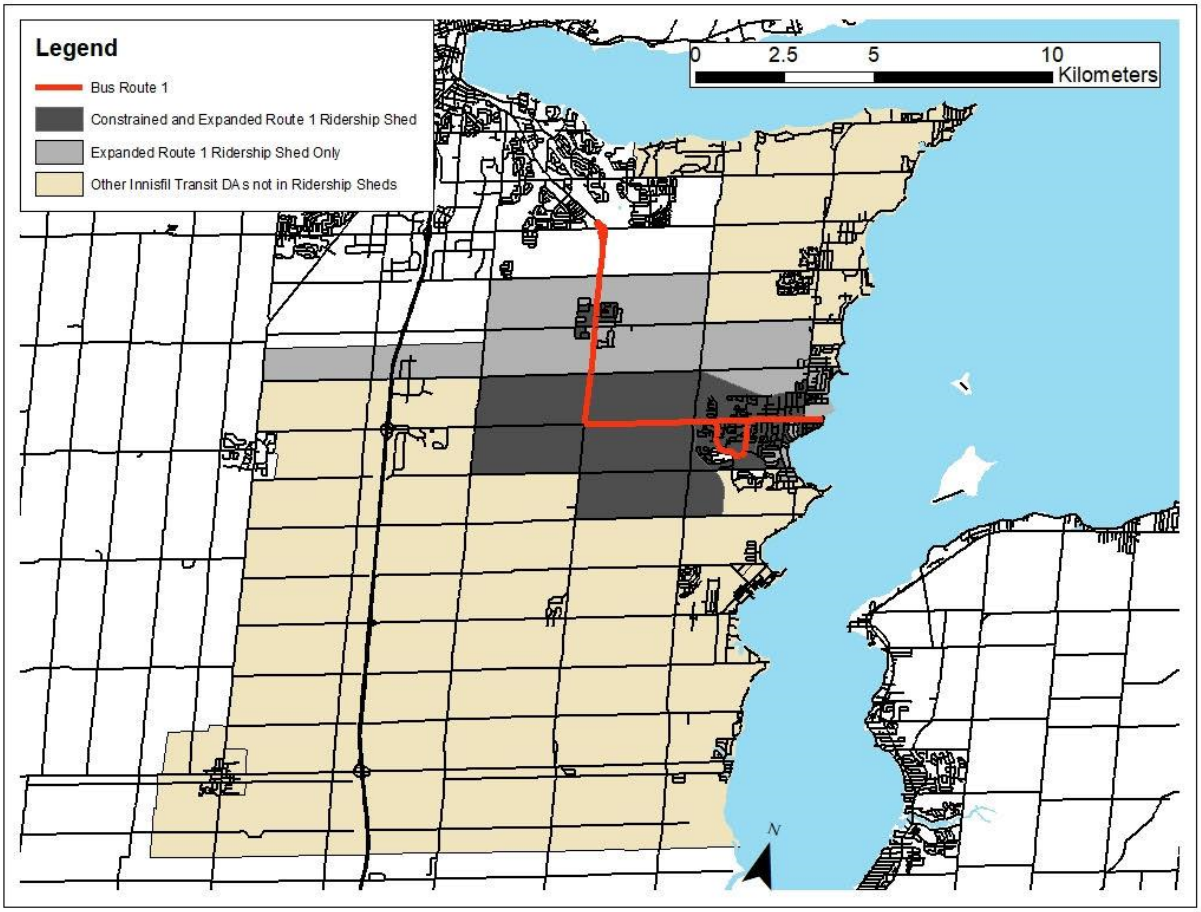

Figure 1. One-bus option (Alternative 1) and DAs identified as overlapping with 800-meter ridership sheds based on constrained and expanded ridership interpretations of the Town of Innisfil Transit Feasibility Study (MMM Group Limited, 2015)[1]

[1] *The expanded ridership shed includes all DAs which overlap within 800 meters of the bus route, while the constrained ridership shed includes only DAs whose geographic centroids spatially fall within an 800-meter buffer around the bus route.*

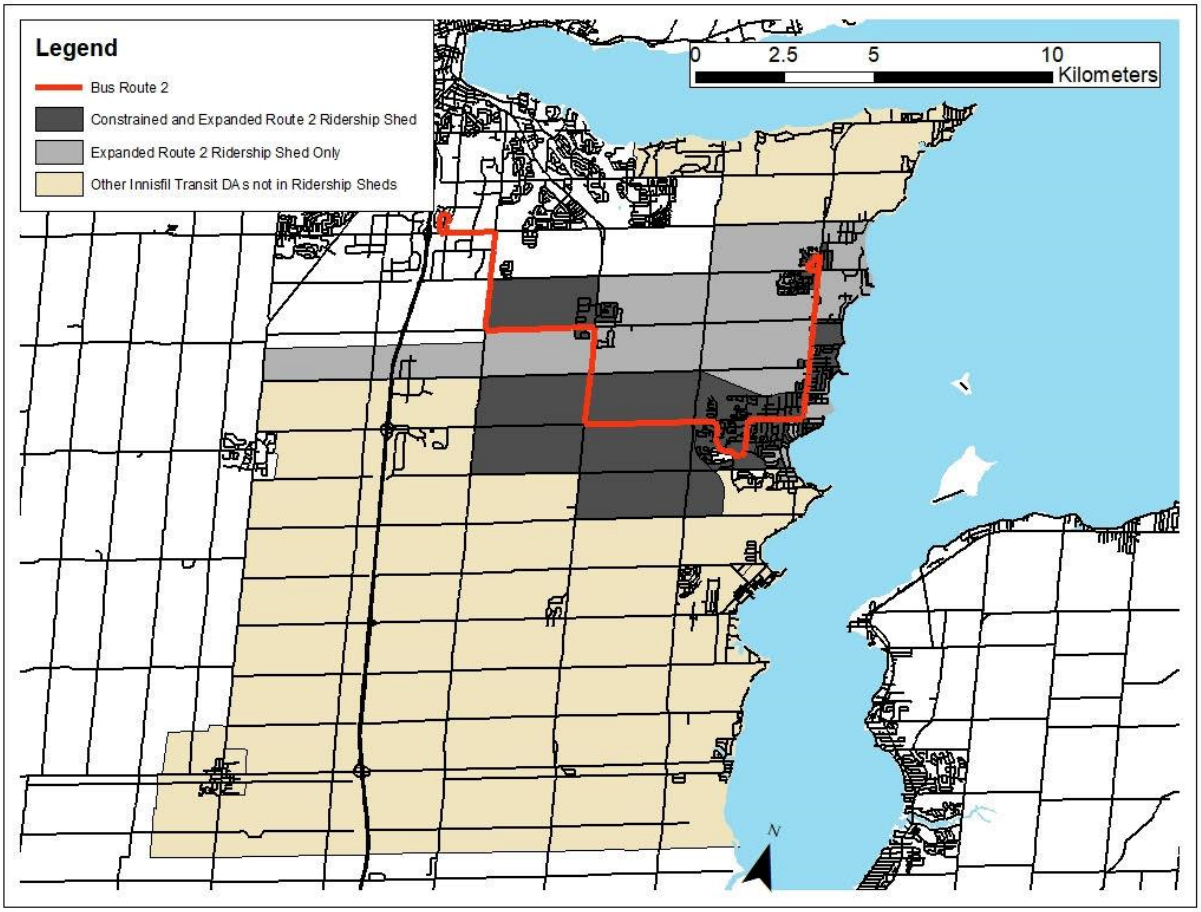

Figure 2. Two-bus option (Alternative 4) and DAs identified as overlapping with 800-meter ridership sheds based on constrained and expanded ridership interpretations of the Town of Innisfil Transit Feasibility Study (MMM Group Limited, 2015)[2]

In sum, these assumptions are designed for the one-bus, two-bus, and walking options to be assessed as competitively as possible compared with Innisfil Transit. Metrics of prospective bus riders and/or service levels should be viewed as upper bounds (ridership would likely be lower and service levels would likely be poorer). There are several reasons for this, most notably:

- While the DAs identified as being served by the one-bus or two-bus options are partially connected to the bus routes, these analyses assume that the entire DA zone is equally well

[2] *The expanded ridership shed includes all DAs which overlap within 800 meters of the bus route, while the constrained ridership shed includes only DAs whose geographic centroids spatially fall within an 800-meter buffer around the bus route.*

served (comparable to the best service levels). Given how large several of these zones are, this assumption clearly overstates the potential service level of the bus system.

- Euclidian ("as the crow flies") distances underestimate actual distances, which are based on the less-direct road network. In addition, the shortest distance to the bus route was estimated, which underestimates the actual distance to a bus stop.
- Ten minutes significantly underestimates the sum of waiting, access, scheduling, and egress travel times. All four of these generalized travel costs are cited as being more burdensome than in-vehicle travel times – leading this assumption to significantly underestimate travel times by bus – as experienced by users.
- Walking at 5 kilometers an hour assumes that transit riders are working-age adults with good health. Children, older adults and those with poor health conditions or with mobility impairment would have slower walking speeds.
- Analyses not considering the one-bus and two-bus service hours (7am-7pm Monday-Friday and 9am-5pm on Saturday) do not consider that Innisfil Transit is currently offered 24-hours a day. Instead analyses are also conducted in considering the constrained times of services for the one-bus and two-bus services, leading to 62.5% as high trip shares between 2017 and 2020.

3. Results

Results are presented below before they are further discussed in Section 4.0. Overall system performance measures are displayed (Section 3.1, p.15) before travel demand (Section 3.2., p. 17), travel and wait times (Section 3.3., p. 25), expenditures (Section 3.4., p. 33), and accessibility patterns (Section 3.5, p. 48) are discussed. Towards identifying the relative value of Innisfil Transit, Section 3.5 compares Innisfil Transit accessibility and trip performance measures with both Uber (without the Innisfil Transit subsidy) and with the geographic and temporal extent of the one-bus (Option 1) and two-bus (Option 4) alternatives contemplated in the Town of Innisfil Transit Feasibility Study (MMM Group Limited, 2015).

System performance metrics reflect average conditions between May 2017 and February 2020 even though usage changed over time and Innisfil Transit services changed as a result of policy measures.

3.1. Overall System Performance Measures

As shown in Table 2 and Table 3, over 220,000 Innisfil Transit trips took place between May 2017 and February 2020. Approximately 15 percent of trips were from non-Innisfil origins and approximately 15 percent of trips were to non-Innisfil destinations – meaning that approximately 70% of trip origins and destination pairs were both in the Town of Innisfil. Typical trips were nine kilometers in length, took approximately 11 minutes, and entailed approximately 6 minutes of wait time for the Innisfil Transit vehicle to arrive. Overall (public plus private) fares for trips were approximately $17, of which, approximately $7 were typically paid through private fares and $10 were publicly subsidized by the Town of Innisfil. Between May 2017 and February 2017, typical annual ridership is approximately 80,000 users (220,000 total trips * 12 months / year / 34 months).

Table 2. Overall System Performance Measures based on Trip Destination Zone

Includes all Innisfil Transit Trips Between May 2017 and February 2020 - based on Trip Destinations				
	All Trip Destinations	Innisfil Destinations	Non-Innisfil Destinations	Share to Innisfil
Total Trips	223,163	190,273	32,889	85.3%
Total vehicle-kilometers traveled	2,023,054	1,527,169	495,885	75.5%
Total Travel Time (Hours)	40,017	31,201	8,816	78.0%
Total Wait Time (Hours)	21,667	17,865	3,801	82.5%
Total Fares	$3,753,929	$2,968,739	$785,190	79.1%
Total Private Fares	$1,582,928	$1,251,531	$331,396	79.1%
Total Public Fares	$2,171,002	$1,717,208	$453,793	79.1%
VKT per Trip	9.1	8.0	15.1	
Travel Time per Trip (Min.)	10.8	9.8	16.1	
Wait Time per Trip (Min.)	5.8	5.6	6.9	
Total Fares per Trip	$16.82	$15.60	$23.87	
Total Private Fares per Trip	$7.09	$6.58	$10.08	
Total Public Fares per Trip	$9.73	$9.02	$13.80	

Table 3. Overall System Performance Measures based on Trip Origin Zone

Includes all Innisfil Transit Trips Between May 2017 and February 2020 - based on Trip Origins				
	All Trip Origins	Innisfil Origins	Non-Innisfil Origins	Share to Innisfil
Total Trips	224,170	189,080	35,090	84.3%
Total vehicle-kilometers traveled	2,029,361	1,537,387	491,974	75.8%
Total Travel Time (Hours)	40,154	30,808	9,346	78.0%
Total Wait Time (Hours)	21,921	19,262	2,659	82.5%
Total Fares	$3,769,363	$2,981,587	$787,777	79.1%
Total Private Fares	$1,594,540	$1,239,730	$354,810	77.7%
Total Public Fares	$2,174,823	$1,741,857	$432,966	80.1%
VKT per Trip	9.1	8.1	14.0	
Travel Time per Trip (Min.)	10.7	9.8	16.0	
Wait Time per Trip (Min.)	5.9	6.1	4.5	
Total Fares per Trip	$16.81	$15.77	$22.45	
Total Private Fares per Trip	$7.11	$6.56	$10.11	
Total Public Fares per Trip	$9.70	$9.21	$12.34	

3.2. Travel Demand

Innisfil Transit ridership is estimated based on several different metrics. To identify typical Innisfil Transit use patterns, first, estimates are calculated of the geography of the most intense spatial concentrations of Innisfil Transit use, based on ridership per unit area according to both trip origins and trip destination DAs. Next, trips per resident are estimated by fusing Innisfil Transit data with Statistics Canada data on residential population in each DA. Finally, typical ridership per hour is estimated based on different times of the day, weekdays vs. weekends, and different months of the year.

3.2.1. Trips per Square Kilometer

As shown in Figure 3 and Figure 4, the highest ridership rates per square kilometer are primarily in the Town of Alcona, with additional high-ridership clusters in Lefroy, Stroud, and Sandy Cove. Generally, more rural areas have significantly lower ridership rates on a per unit area basis. Measures of trips per square kilometer based on trip origin DA (Figure 3) or based on trip destination DA (Figure 4) are virtually identical. The highest density of ridership over the 34-month period is concentrated in the most urbanized areas with ridership of 900 trips per square

kilometer or more. In calculating these ridership levels into daily averages, a rate of 900 trips per square kilometer would be equivalent to approximately one ride per square kilometer per day (900 rides / 1,020 days).

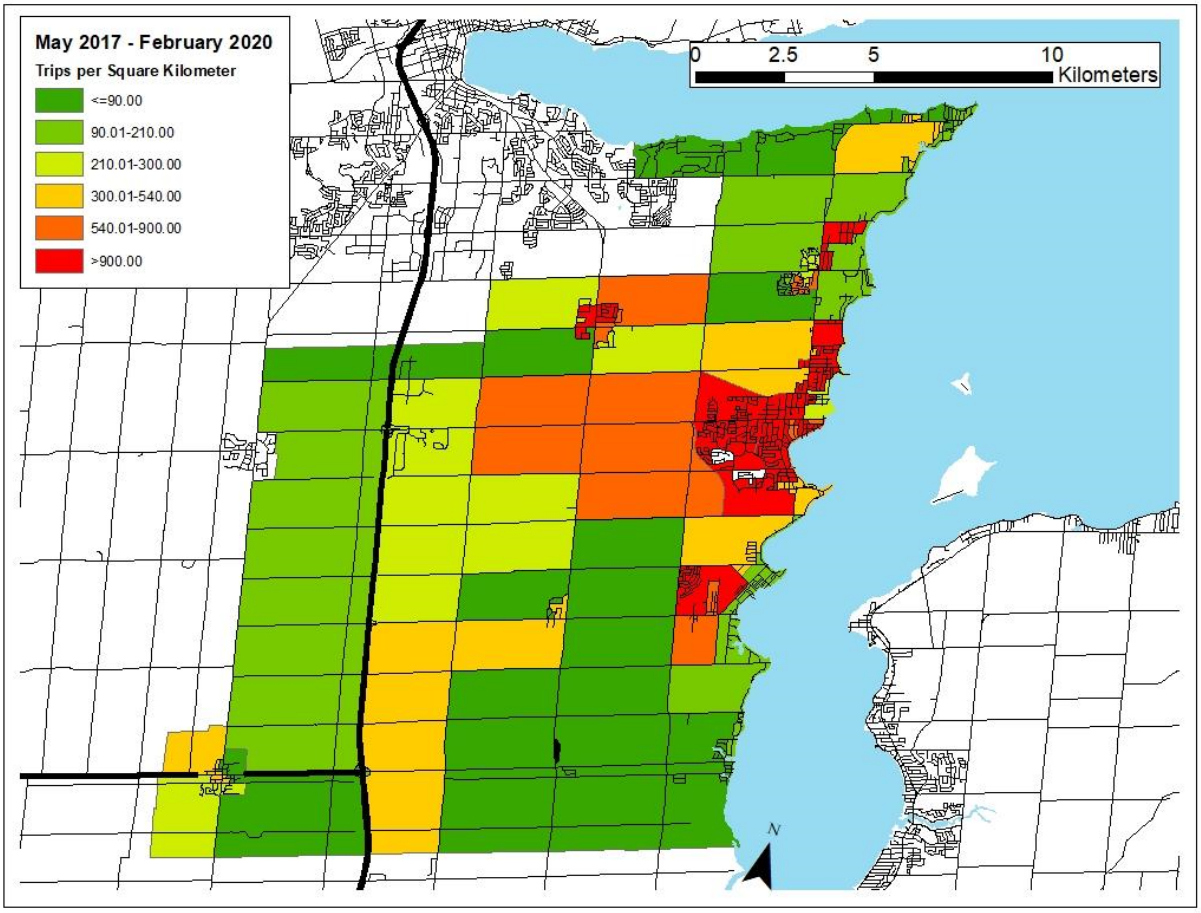

Figure 3. Total Trips per Square Kilometer based on DA of Trip Origin (May 2017 to February 2020)

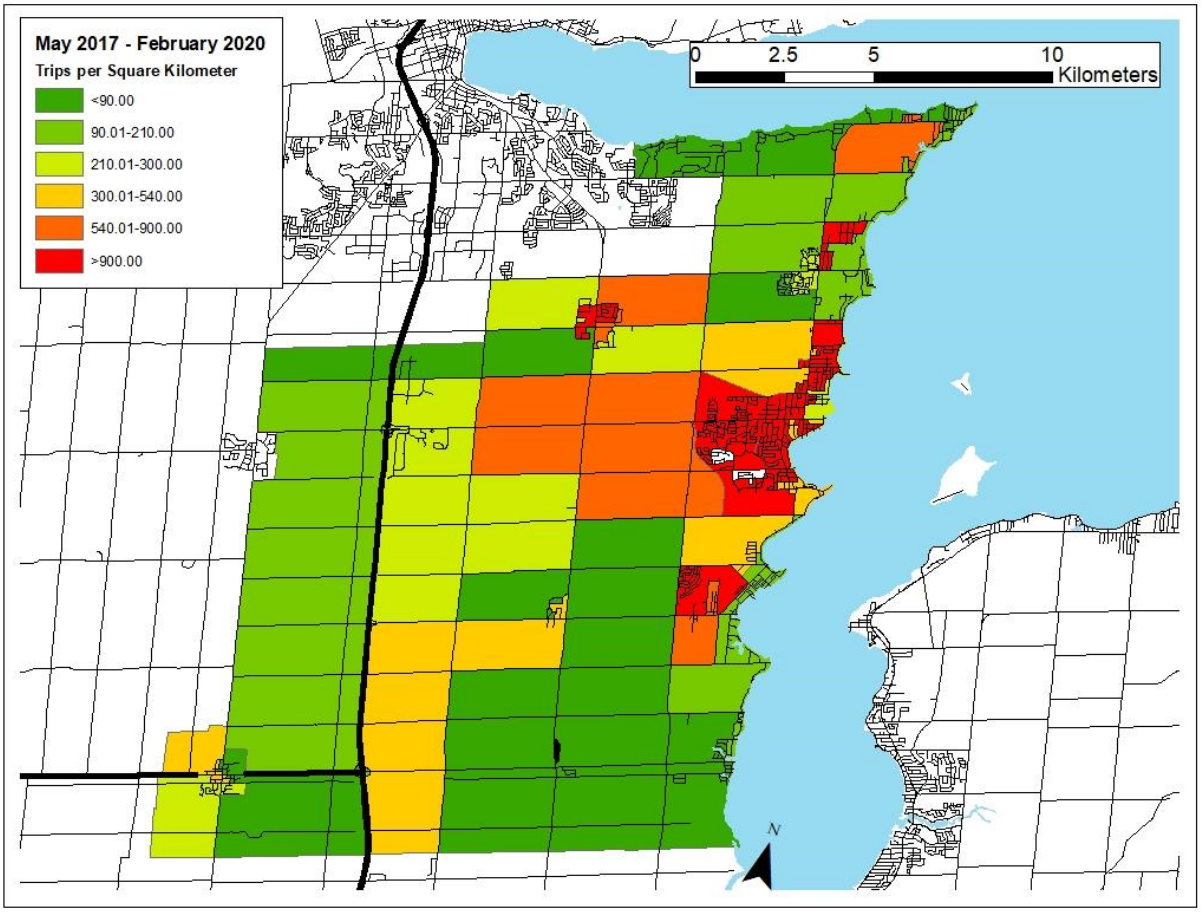

Figure 4. Total Trips per Square Kilometer based on DA of Trip Destination (May 2017 to February 2020)

3.2.2. Trips per Resident

In contrast to the metrics of trips per square kilometer, the highest trip taking rates per Innisfil resident are in central Innisfil, just west of Alcona, in the western DAs, along Highway 400, and in select DAs in downtown Alcona (see Figure 5 and Figure 6). Many of the high ridership neighborhoods are also areas designated as fixed-fare destinations available through Innisfil Transit – suggesting links between service levels and ridership.

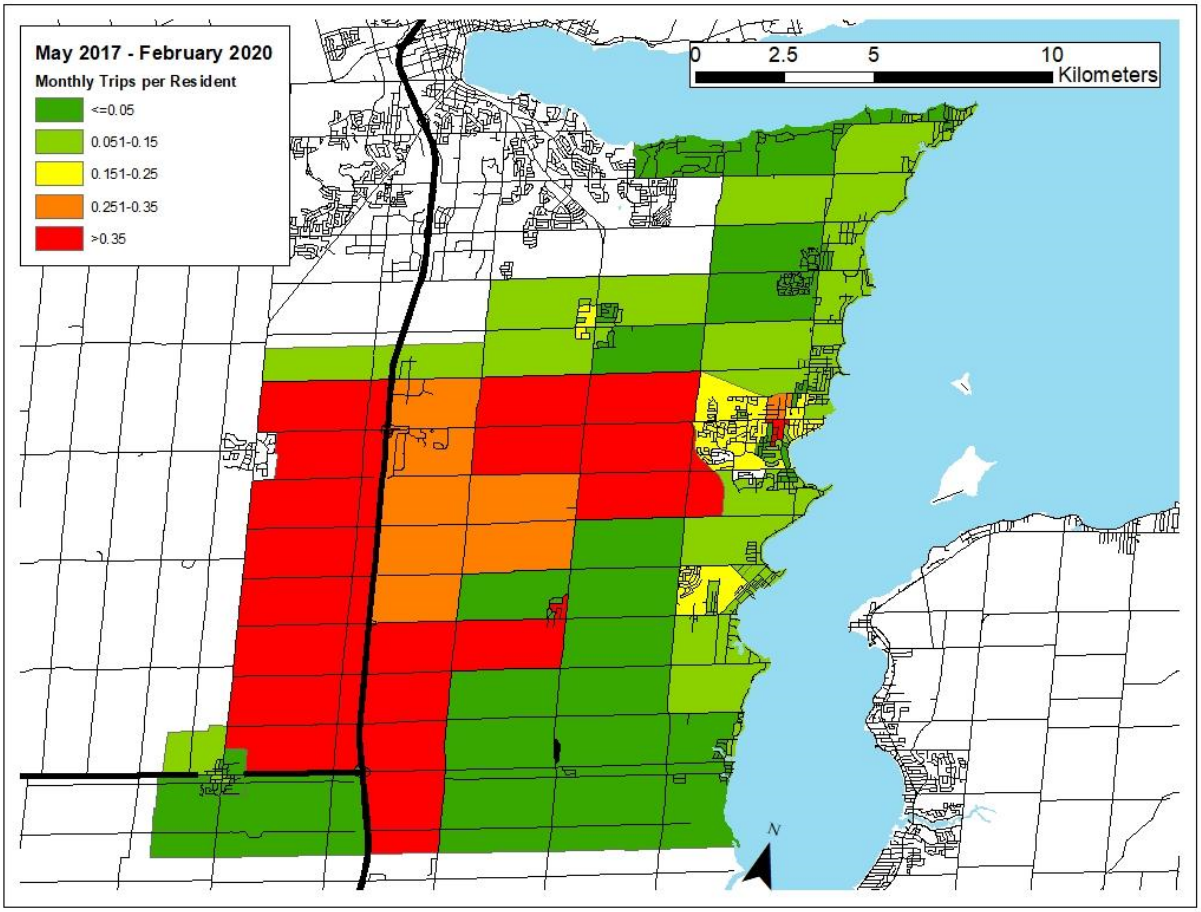

Figure 5. Monthly Trips per Resident based on DA of Trip Origin (May 2017 to February 2020)

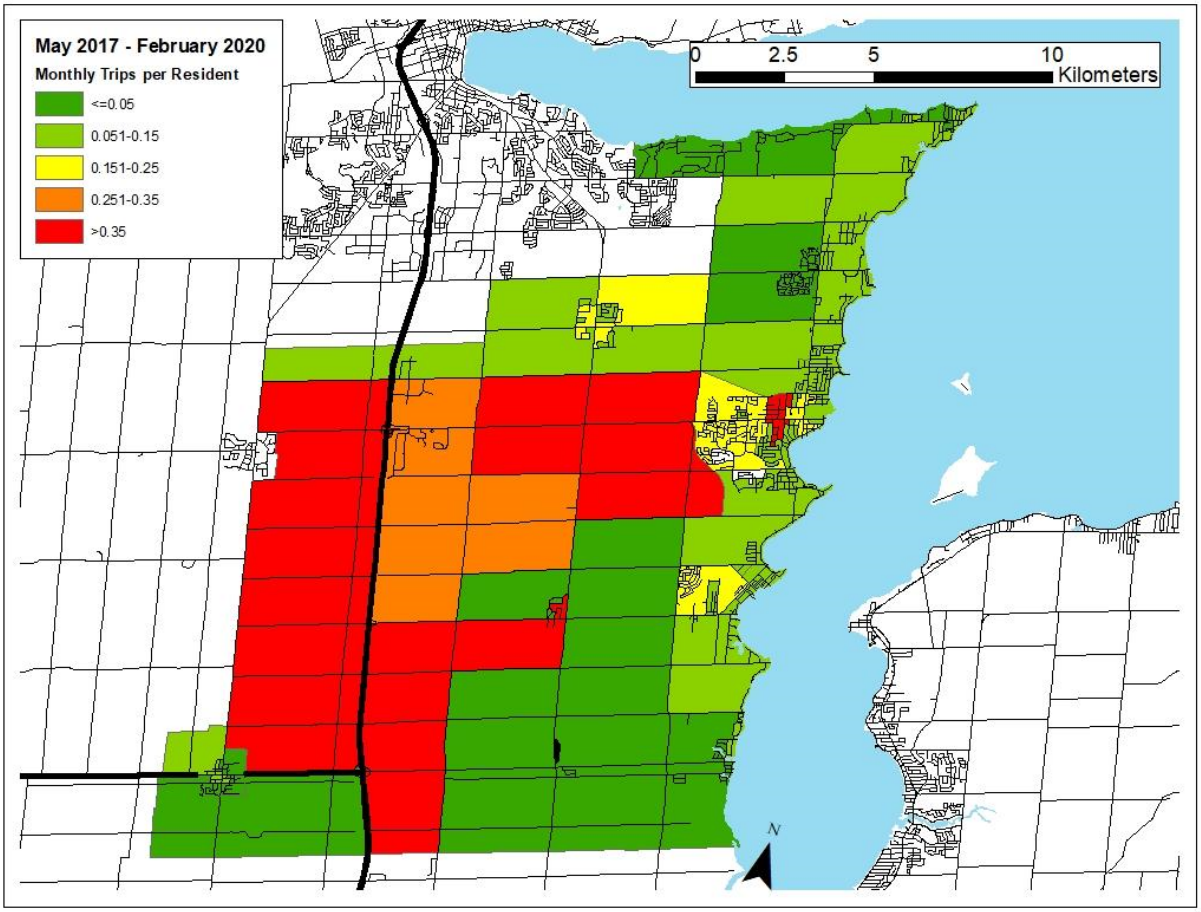

Figure 6. Monthly Trips per Resident based on DA of Trip Destination (May 2017 to February 2020)

3.2.3. Trips per Hour

To further explore Innisfil Transit ridership patterns, the data is used to portray typical ridership levels (per hour) between May 2017 and February 2020 and during different periods of the weekday and weekend. As shown in Figure 7, hourly ridership across the Town of Innisfil began at less than two trips per hour, but by mid-2018, the typical hourly ridership was approximately ten trips during both a typical weekday and a typical weekend. The metrics shown in Figure 7 aggregate all trips for 24 hours per day during both weekdays and weekends, which ignores hourly variations. While ridership is moderately higher during weekdays than during weekends, the differences are typically less than 25 percent.

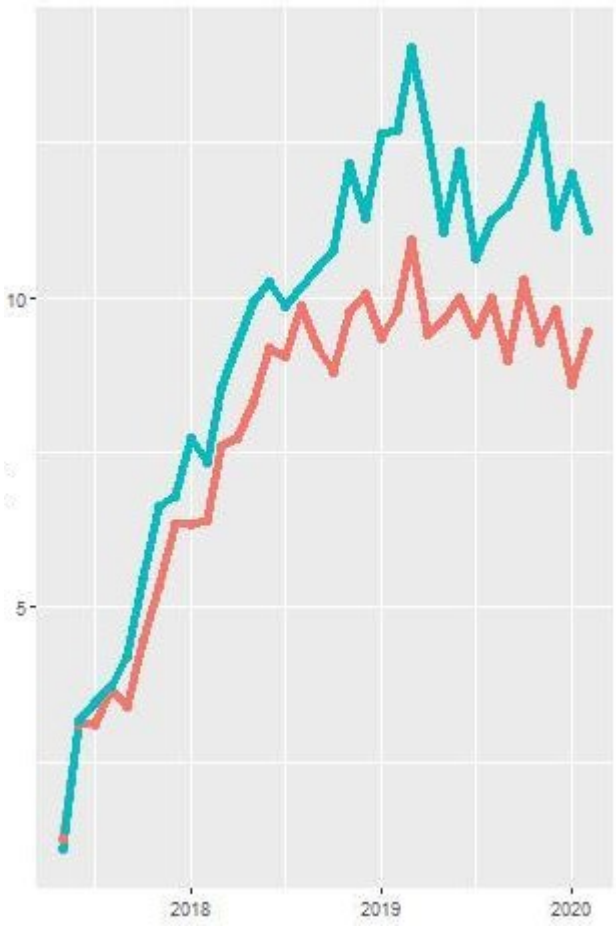

Figure 1. Trips per Hour for Typical Weekdays (blue) and Weekends (red) between May 2017 and February 2020

As shown in Figure 7 and Figure 8, ridership is typically higher during weekdays (in blue) than during weekends (in red). Based on Figure 8, only during the night period (from 10am to 6pm) is weekend trip taking (6.3 trips per hour) higher than on the weekdays (3.4 trips per hour).

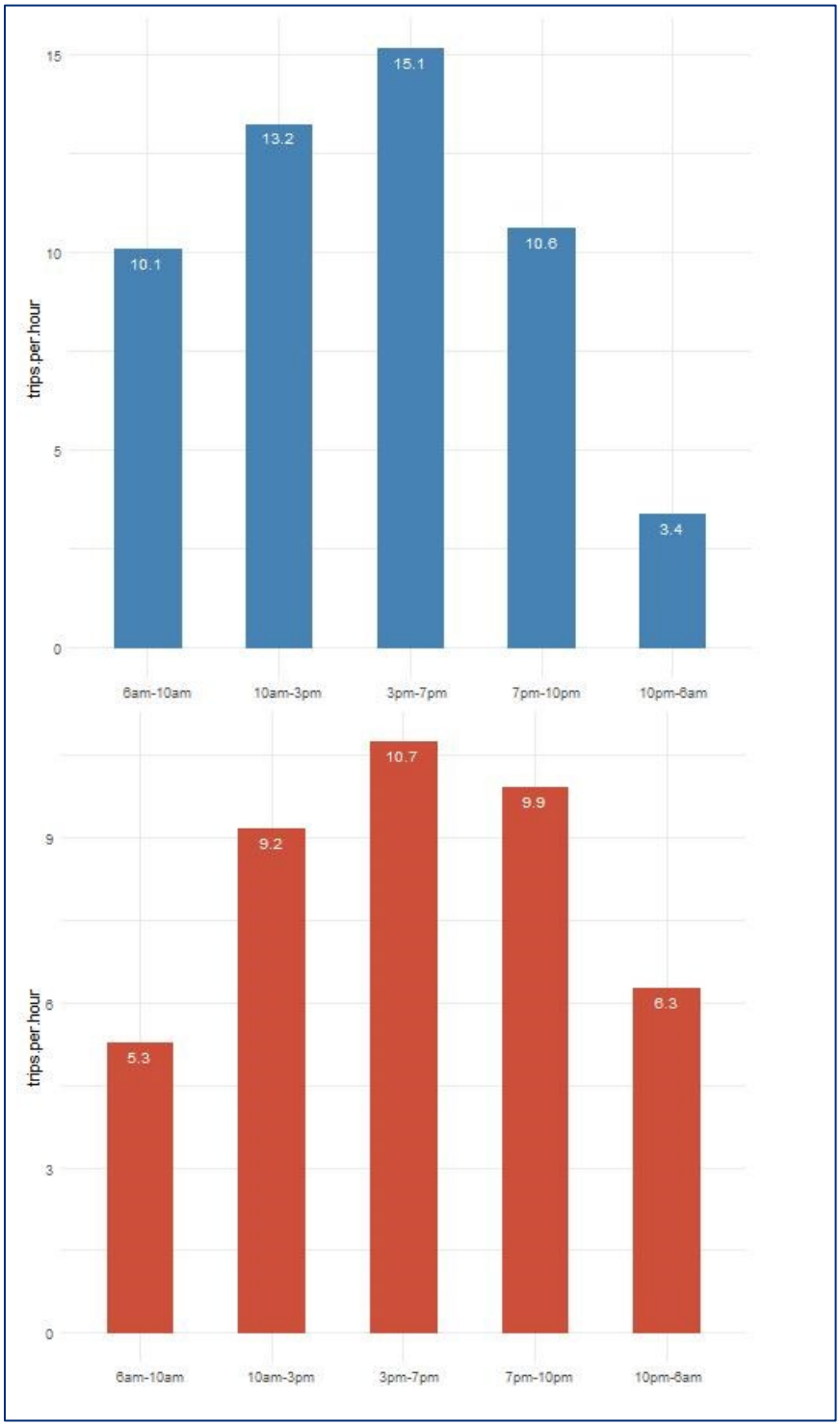

Figure 8. Innisfil Transit Trips per Hour (May 2017 - February 2020) on Weekdays (top) and Weekends (bottom) by Period of Day

3.2.4. Travel Demand and Demographic Correlations

Finally, Pearson's product-moment correlation tests are run between select household and demographic data from Statistics Canada and trip taking metrics. Metrics of travel demand include trips per square kilometer, trips per resident, and total trips taken per Dissemination Area. These are each correlated with household income, population density, education levels (the share of residents with a bachelor's degree or higher) and age (the share of residents who are 65 years old or more).

Table 4. Correlations between Travel Demand and Select Demographic Variables (by destination Dissemination Area)

Correlation Coefficients	Based on Trip Destination Dissemination Area		
Variables	Trips per Square Kilometer	Trips per Resident	Total Trips in Dissemination Area
Household income (mean)	-0.158	0.021	-0.007
Population density (per sq. km.)	0.568***	-0.053	0.084
Population share with bachelor's degree or higher	-0.231*	-0.111	-0.101
Population share over 65	-0.153	-0.099	-0.18
Correlation Coefficients	Based on Trip Origin Dissemination Area		
Variables	Trips per Square Kilometer	Trips per Resident	Total Trips in Dissemination Area
Household income (mean)	-0.165	0.013	-0.013
Population density (per sq. km.)	0.66***	-0.034	0.098
Population share with bachelor's degree or higher	-0.186	-0.091	-0.089
Population share over 65	-0.17	-0.101	-0.182

*Note that "***" denotes significance at 0.01-level; "**" denotes significance at 0.05-levl; "*" denotes significance at 0.10-level; and no annotation denotes insignificance.*

There is a strong correlation between population density and trips per square kilometer (Pearson's correlation coefficients of over 0.55) – unsurprisingly because both terms have unit area in their denominators (see Table 4). The share of a DA population with a bachelor's degree or higher is negatively correlated with trips per square kilometer (although only significant at the 0.10-level) for trip destinations. No other correlations are statistically significant. Correlation

coefficients provide an indication of the covariation of two variables and they range from -1 to +1, according to which a coefficient close to zero signifies no relationship (akin to randomness). In contrast coefficients closer to -1 signify that as one metric increases, another metric is expected to decrease, while a coefficient closer to +1 implies that both metrics increase (or decrease) in tandem. Results imply very little correlation between trip taking rates and these fundamental variables based on a bivariate exploration.

3.3. Travel and Wait Times

Innisfil Transit service levels experienced by users, metrics of typical in-vehicle travel and wait times are estimated. Together, these illustrate that both travel times and wait times (especially from the trip origin) are lowest in more central lying zones, such as Alcona. These trips only include trips by Innisfil Transit, which (by definition) start and/or end in the Town of Innisfil.

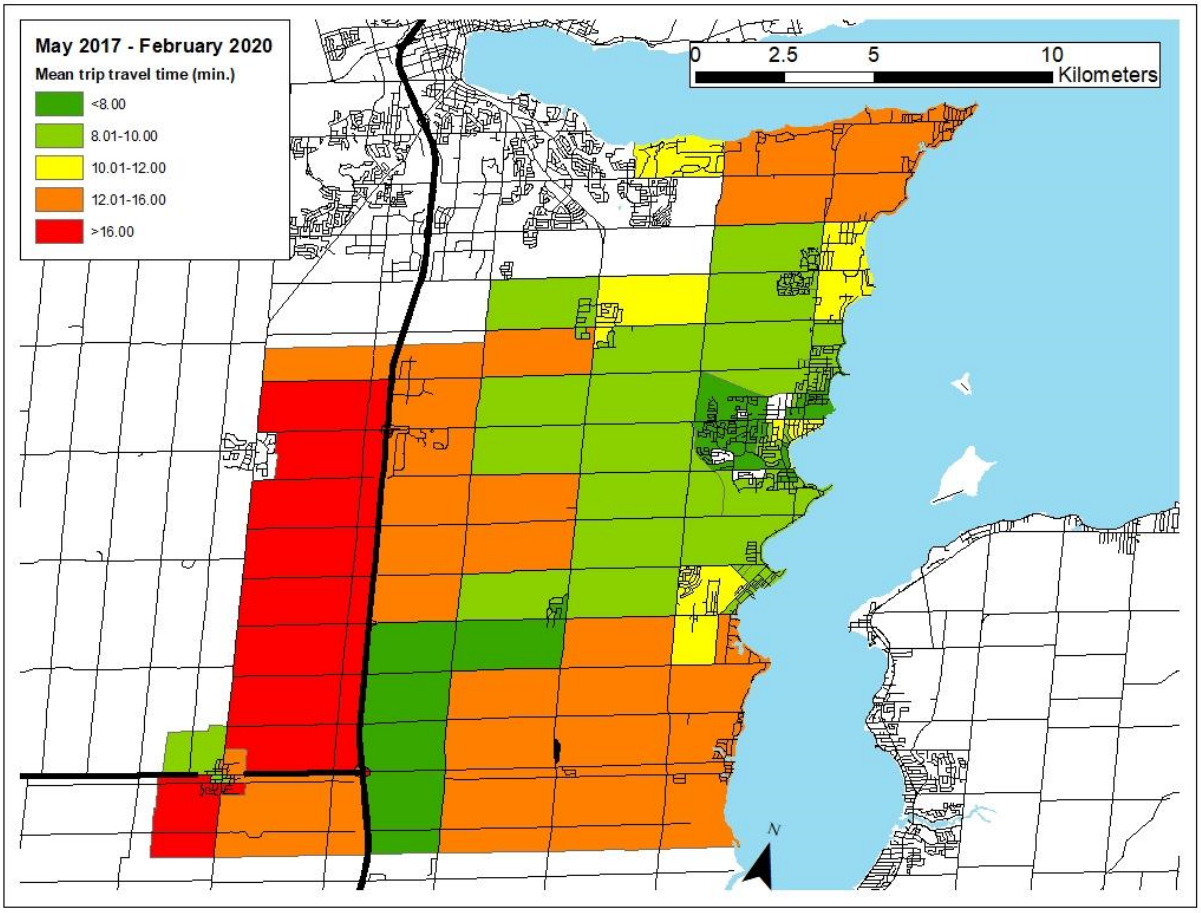

Figure 9. Average In-Vehicle Travel Times for Innisfil Transit Trips based on DA of Trip Origin (May 2017 to February 2020)

3.3.1. In-Vehicle Travel Times per Trip

As shown in Figure 9 and Figure 10, Innisfil Transit trips in the neighborhoods of Alcona and its general vicinity are typically less than 10 minutes, on average. In contrast, more outer lying areas, notably west of Highway 400, have average in-vehicle travel times in excess of 16 minutes, on average.

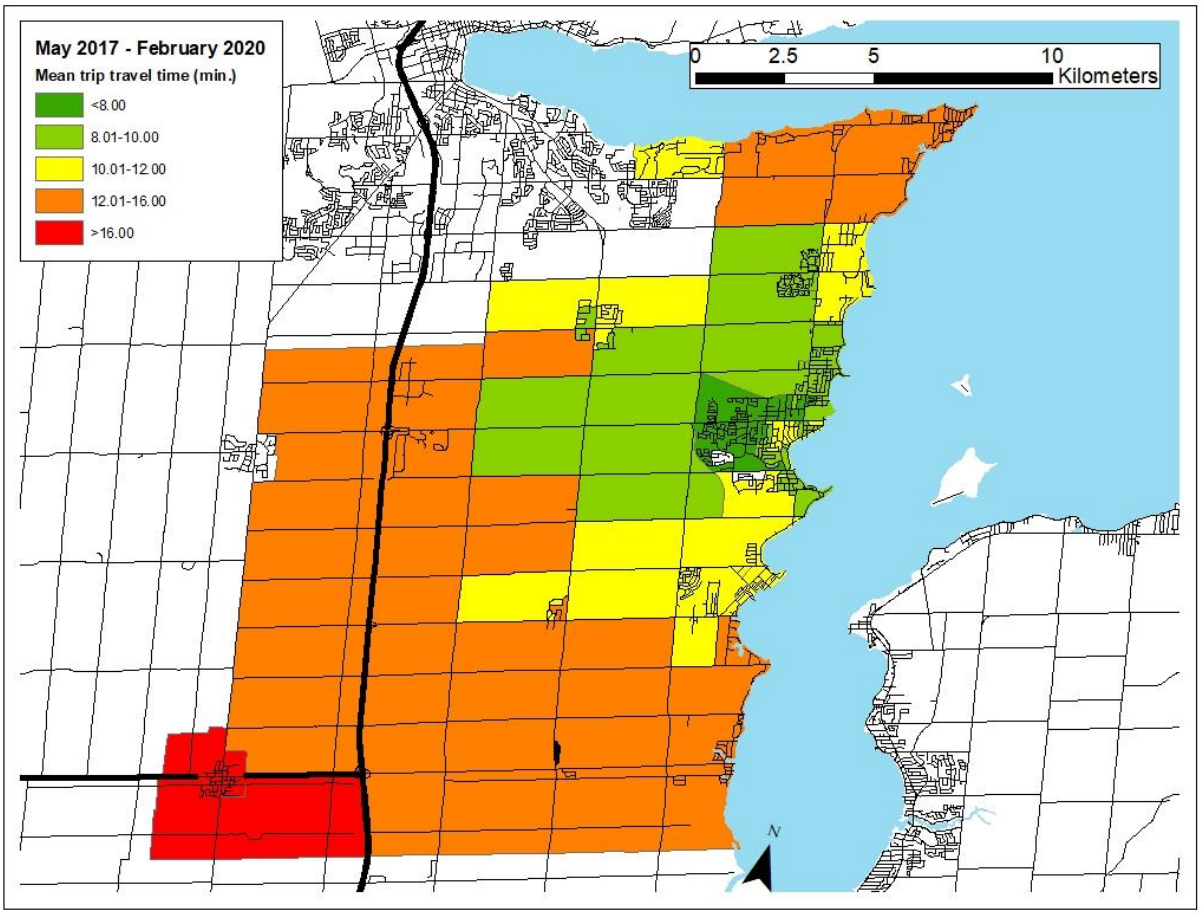

Figure 10. Average In-Vehicle Travel Times for Innisfil Transit Trips based on DA of Trip Destination (May 2017 to February 2020)

Figure 11. In-Vehicle Travel Times per Trip for Weekdays (blue) and Weekends (red) between May 2017 and February 2020

While there is seasonal variation in typical travel times, typical in-vehicle travel times decreased by almost two minutes between May 2017 and February 2020 (see Figure 11). It is likely that these reductions in travel times stem from changes in how residents have used the system by taking shorter trips (perhaps suggesting changes in trip purposes over time).

Estimates of variations in in-vehicle travel times across periods of weekday and weekend days suggest that there is very little overall daily variation in typical in-vehicle travel times. While midday travel times are somewhat lower (9.8 minutes compared with between 10.5 and 11.2 during other times of the day) during weekdays, in-vehicle travel times are virtually identical during all periods of the day during weekends (see Figure 12).

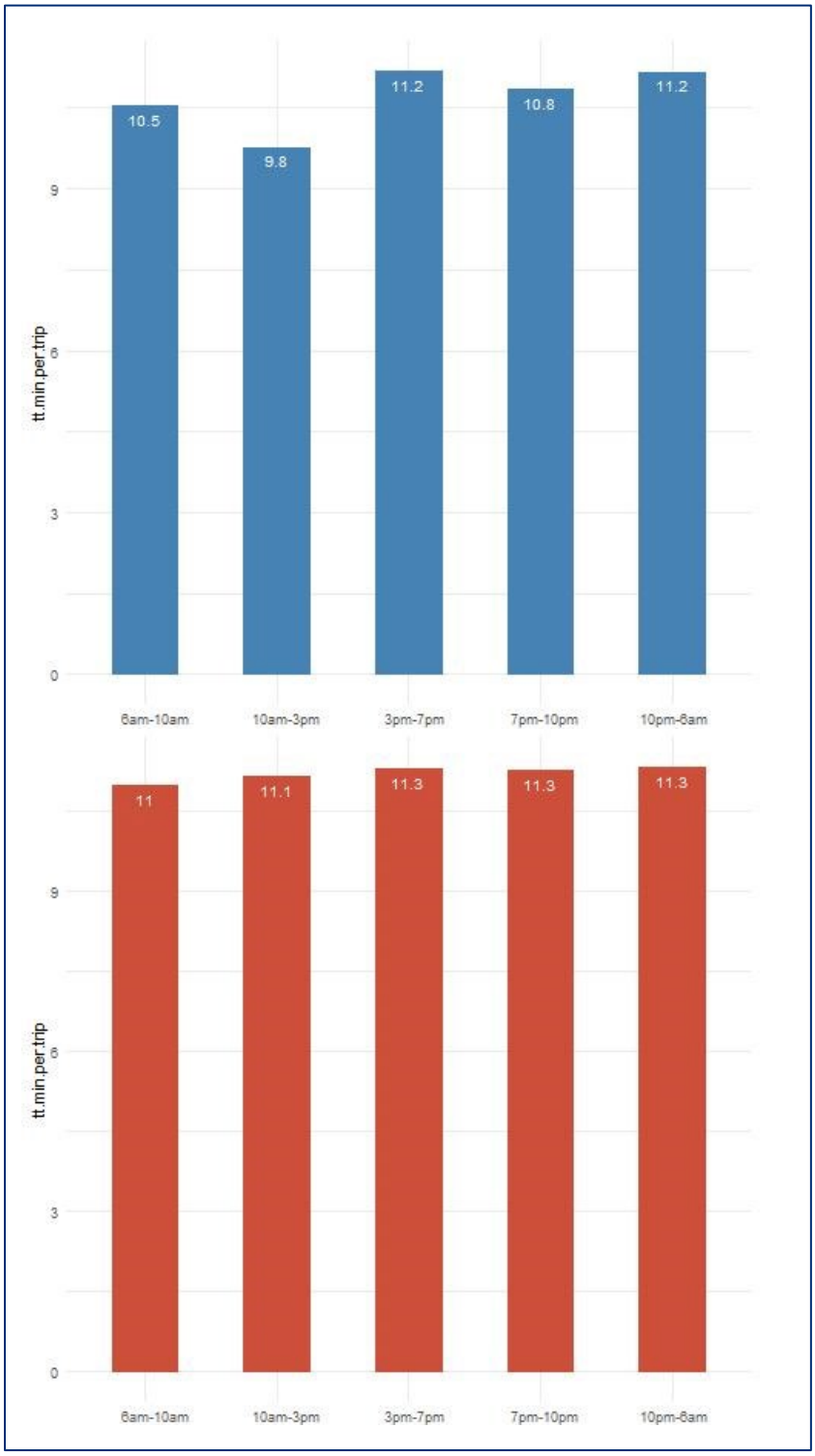

Figure 12. Innisfil Transit In-Vehicle Travel Times in Minutes (May 2017 - February 2020) on Weekdays (top) and Weekends (bottom) by Period of Day

3.3.2. Wait Times per Trip

In contrast to metrics of in-vehicle travel times, wait times are significantly different depending on whether trip origin DAs or trip destination DAs are the unit of analysis. There is significant geographic variation in wait times, depending on the origin DA of a trip. As shown in Figure 13, more central-lying and urban neighborhoods have significantly lower wait times which are typically lower than six minutes, on average. More outer lying zones – notably in the southwest, southeast, and northeast – have wait times which are typically more than ten minutes. This is likely due to the geography of prospective Innisfil Transit service providers and their locations upon receiving a ride request from a resident. In contrast (see Figure 14), depending on the destination of a given trip, differences in wait times across neighborhoods are much less significant.

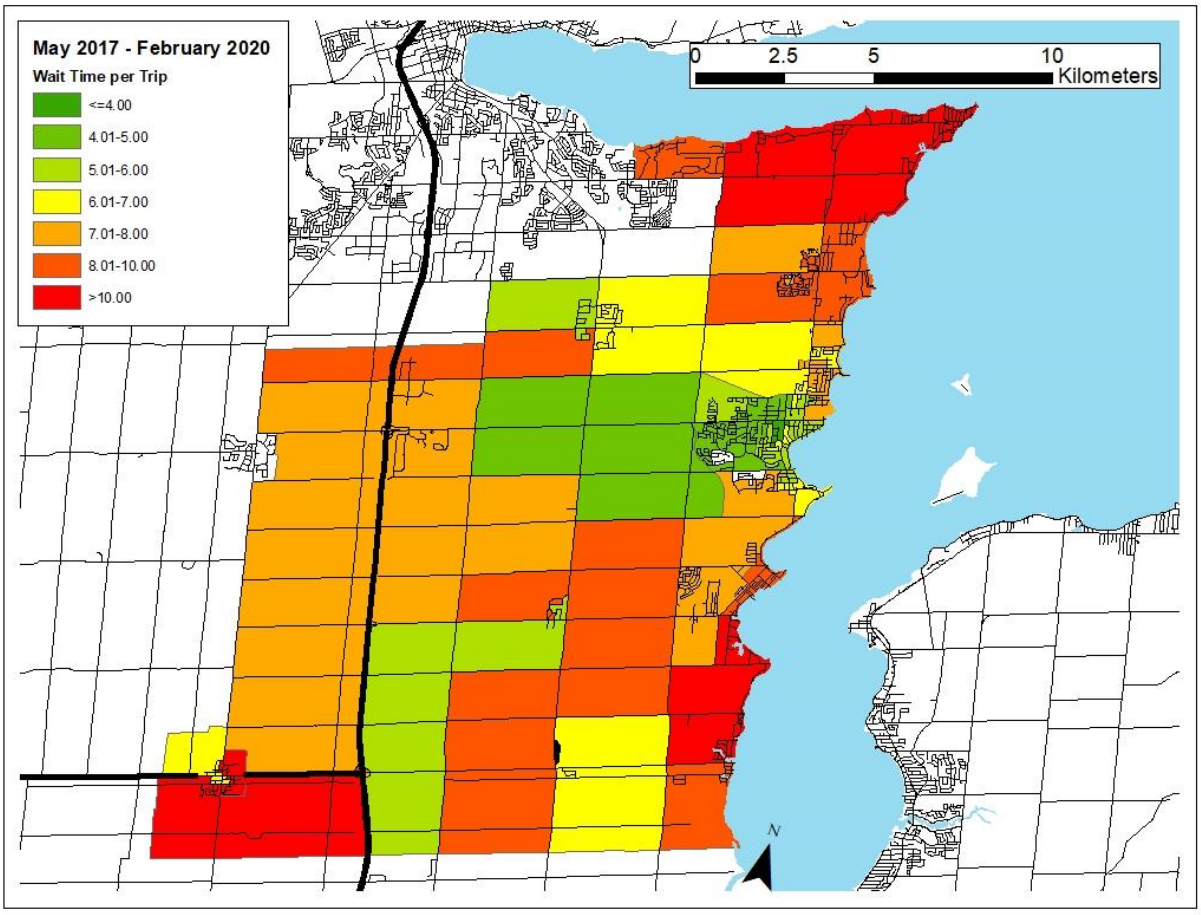

Figure 13. Average Wait Times (Minutes) for Innisfil Transit Trips based on DA of Trip Origin (May 2017 to February 2020)

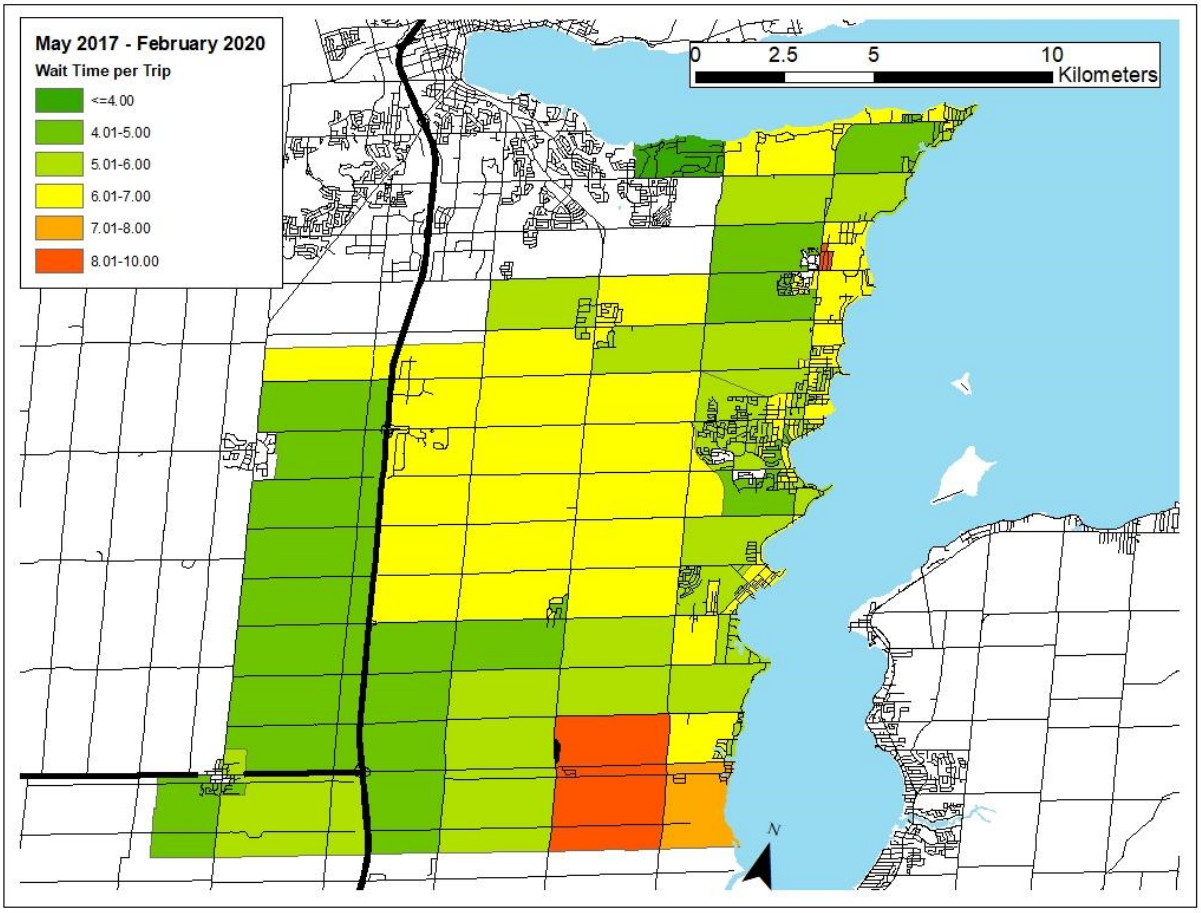

Figure 14. Average Wait Times (Minutes) for Innisfil Transit Trips based on DA of Trip Destination (May 2017 to February 2020)

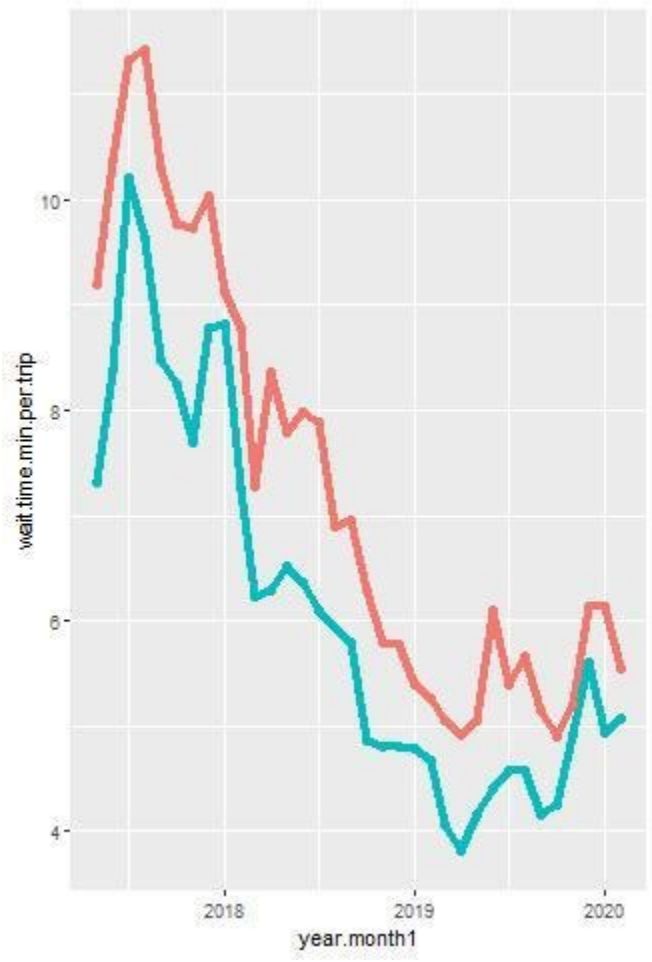

Figure 15. Wait Times per Trip for Weekdays (blue) and Weekends (red) between May 2017 and February 2020

Typical wait times per trip have decreased between May 2017 to February 2020 (see Figure 15). While wait times were typically more than eight minutes per trip during most of 2017, by 2019, wait times were typically less than six minutes per trip.

Daily variations in wait times are more significant than variations in in-vehicle travel times. While average wait times are less than five minutes between 10am and 3pm on weekdays, they are more than seven minutes between 10pm and 6am (see Figure 16, below). Midday wait times are also lowest on weekends, although weekend wait times tend to be approximately one minute longer.

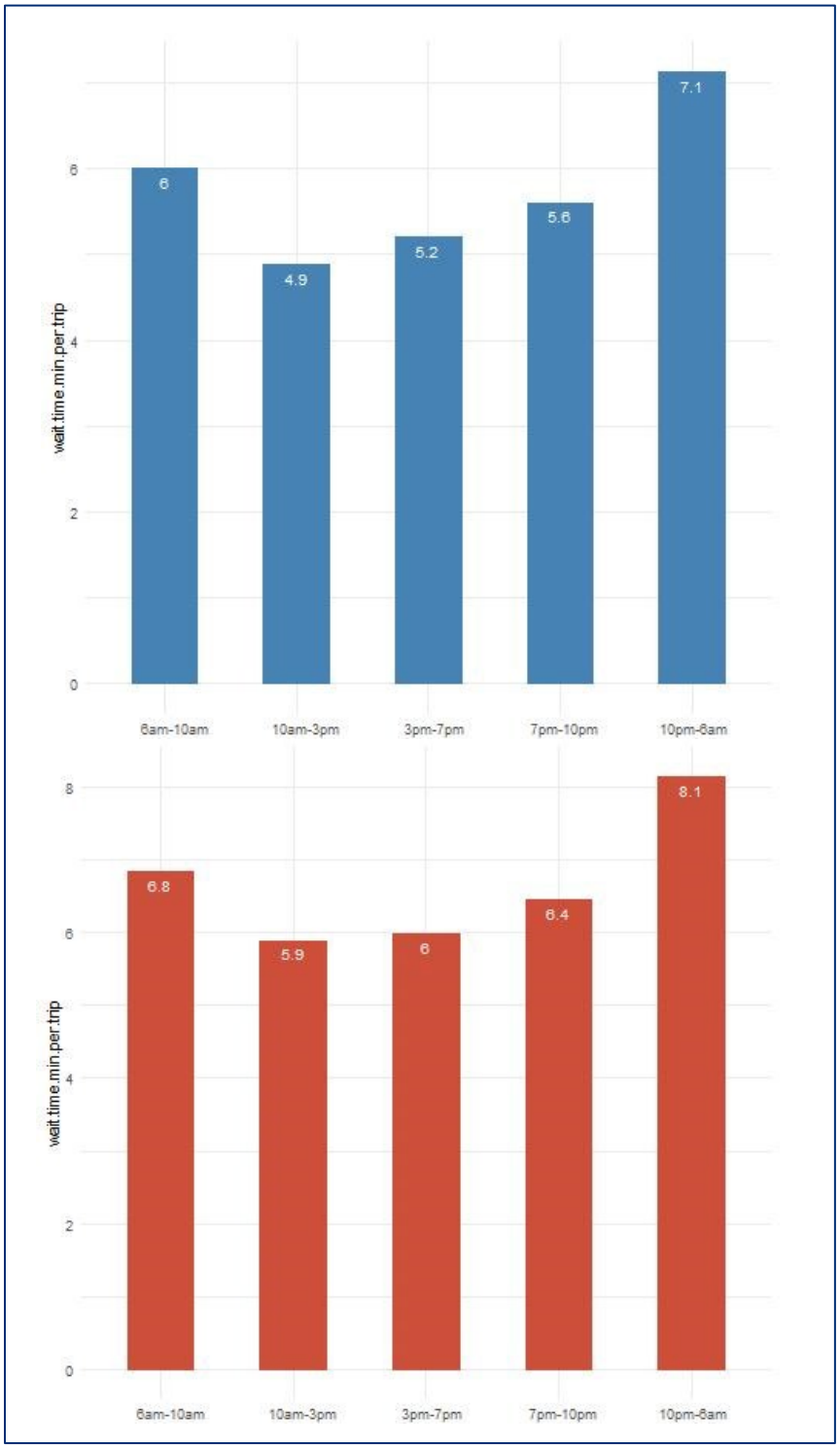

Figure 16. Innisfil Transit Wait Times in Minutes (May 2017 - February 2020) on Weekdays (top) and Weekends (bottom) by Period of Day

3.4. Expenditures

Towards exploring the resources involved in providing Innisfil Transit, metrics are estimated based on total expenditures (public plus private), public expenditures (the portion of an Innisfil Transit fare which is publicly subsidized), and private expenditures (the trip fare which is privately paid by a user). In the MMM Group the feasibility study, the two contemplated bus services were expected to cost between $188,000 to $367,000 annually, or $14 to $17 net per rider (costs – fares).

3.4.1. Total Expenditure

The total expenditure for Innisfil Transit has been approximately $10 per rider (public expenditures) from May 2017 to February 2020, or $10 net per rider. As shown in Figure 17 and Figure 18, geography plays a key role in the total cost of delivering Innisfil Transit trips. In mirroring metrics of trips per unit area (see Figure 3 and Figure 4), the total (public plus private) cost of Innisfil Transit is the highest in more western areas (along Highway 400) and lowest near Alcona – ranging from less than $13 to more than $22 per trip.

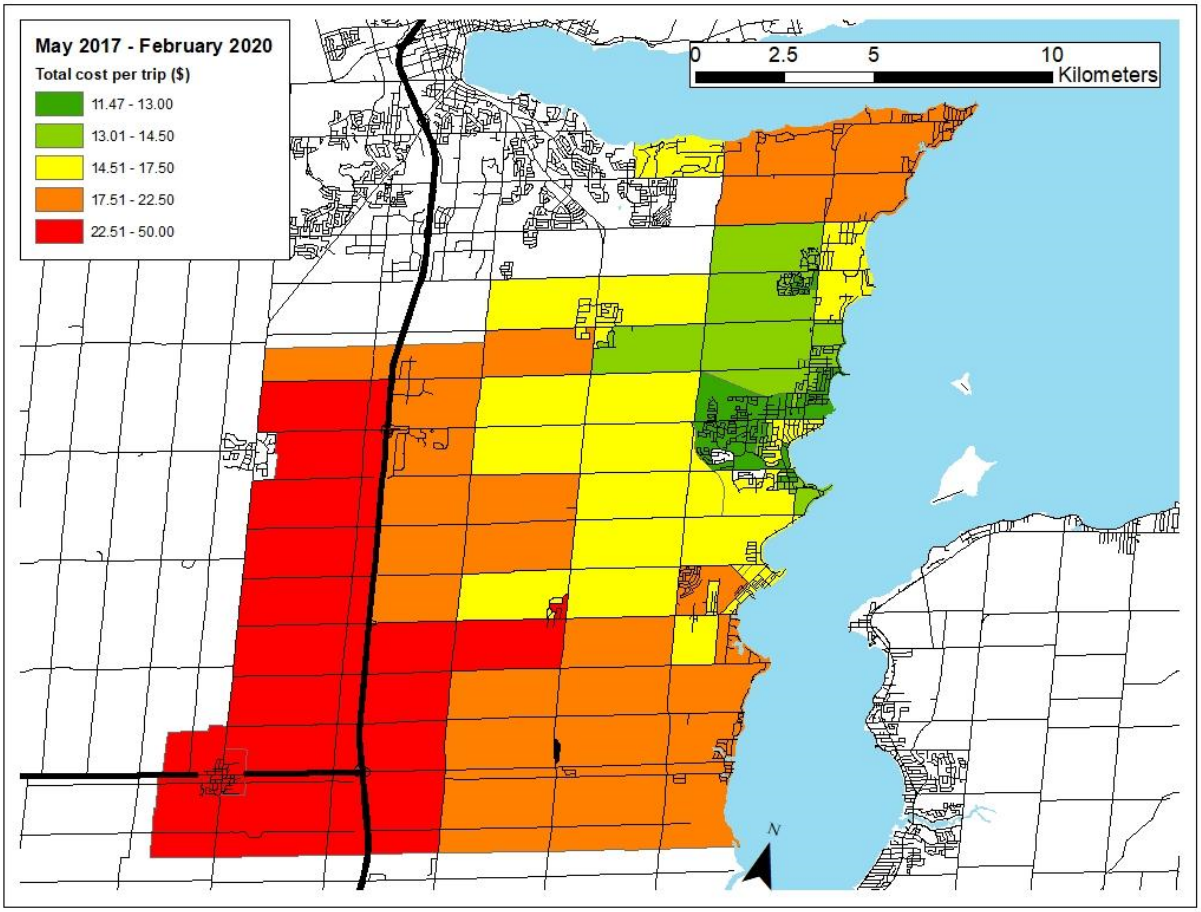

Figure 17. Total Public and Private Expenditure for Innisfil Transit Trips based on DA of Trip Origin (May 2017 to February 2020)

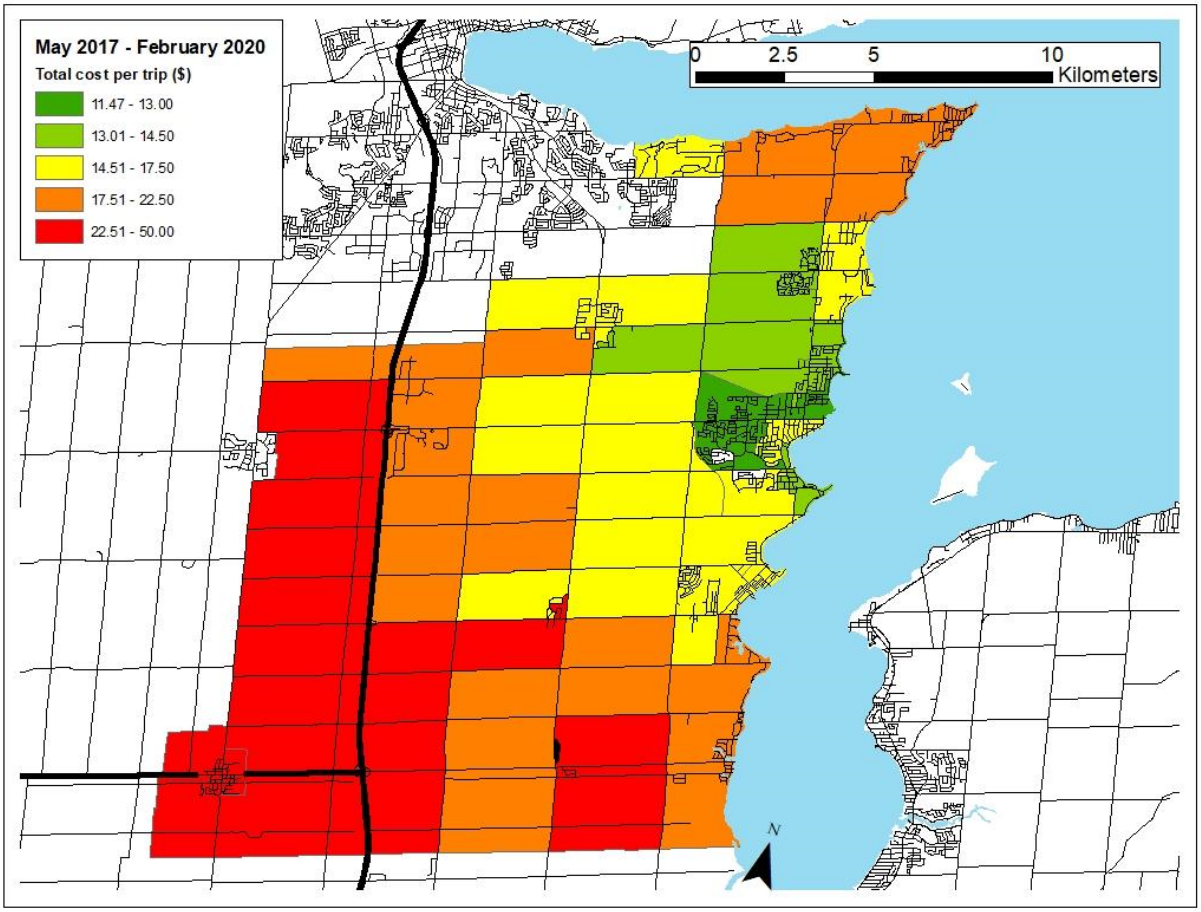

Figure 18. Total Public and Private Expenditure for Innisfil Transit Trips based on DA of Trip Destination (May 2017 to February 2020)

Figure 19. Total Fares per Trip for Weekdays (blue) and Weekends (red) between May 2017 and February 2020

As shown in Figure 19, the total fares per trip have significant seasonal variation (and are generally highest during summer months) but have increased only modestly between 2017 and 2018 by approximately one dollar. As these metrics do not account for changes in inflation, these differences would be even less based on real dollars.

While total fares are generally less during weekdays than during weekends (see both Figure 19 and Figure 20), daily variations are minimal during weekends (ranging from $17 to $18.10 per trip – regardless of time of day) and modest during weekdays – ranging from $15.40 per trip between 10am and 3pm to $17.60 per trip between 10pm and 6am (see Figure 20).

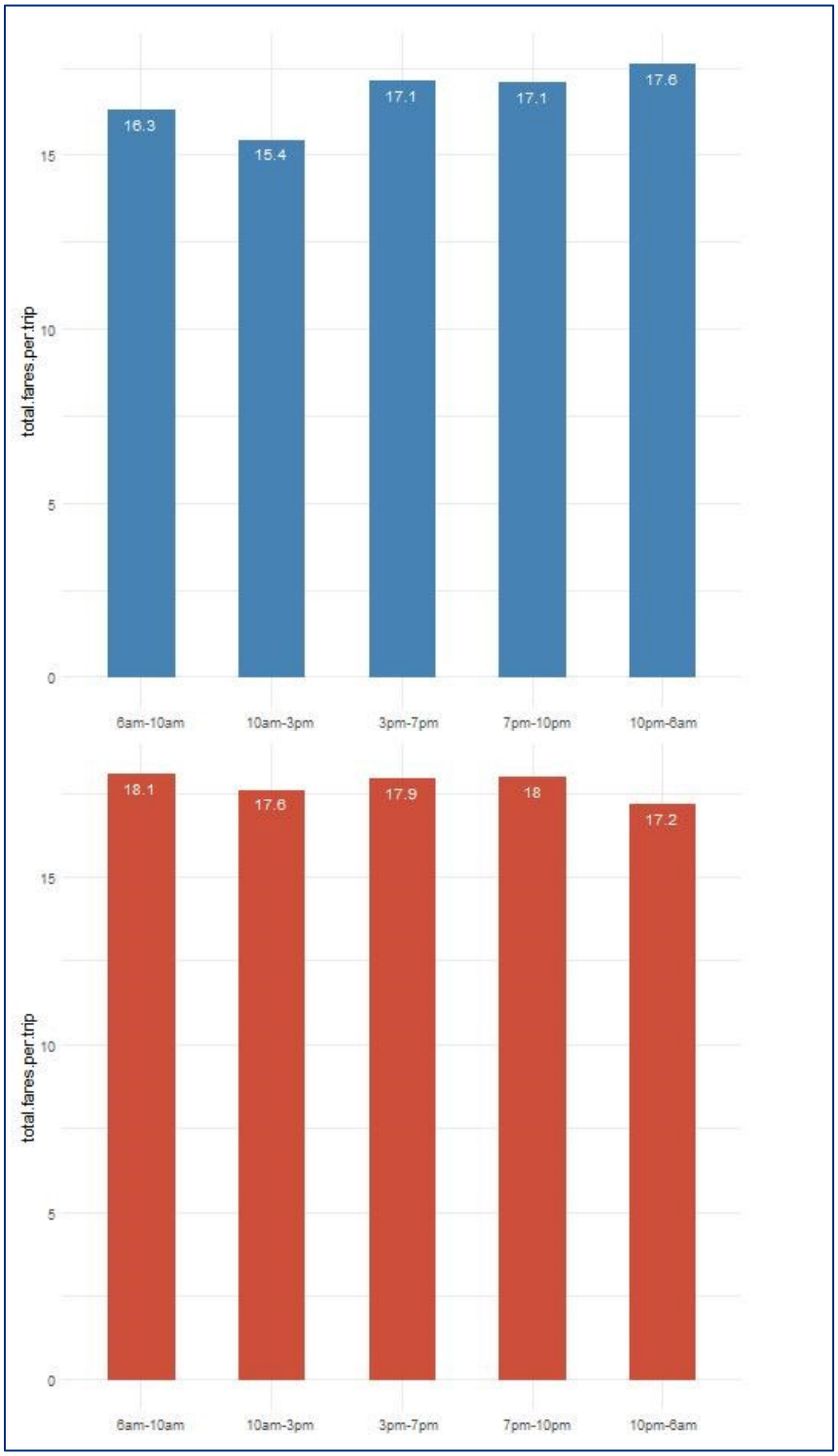

Figure 20. Innisfil Transit Total Fares per Trip (May 2017 - February 2020) on Weekdays (top) and Weekends (bottom) by Period of Day

3.4.2. Public Expenditure

Metrics of public expenditure per trip are further estimated. Like metrics of total expenditures, neighborhoods in and near Alcona typically entail lower per-trip public expenditures (regardless whether metrics are based on trip origins or destinations) than more western neighborhoods along Highway 400 (see Figure 21 and Figure 22). There is significant variation in the level of public subsidy involved in providing trips: while average subsidies are $8 or less in much of Alcona and Sandy Cove, typical subsidies near Highway 400 are in excess of $16. These figures reflect average monthly performance.

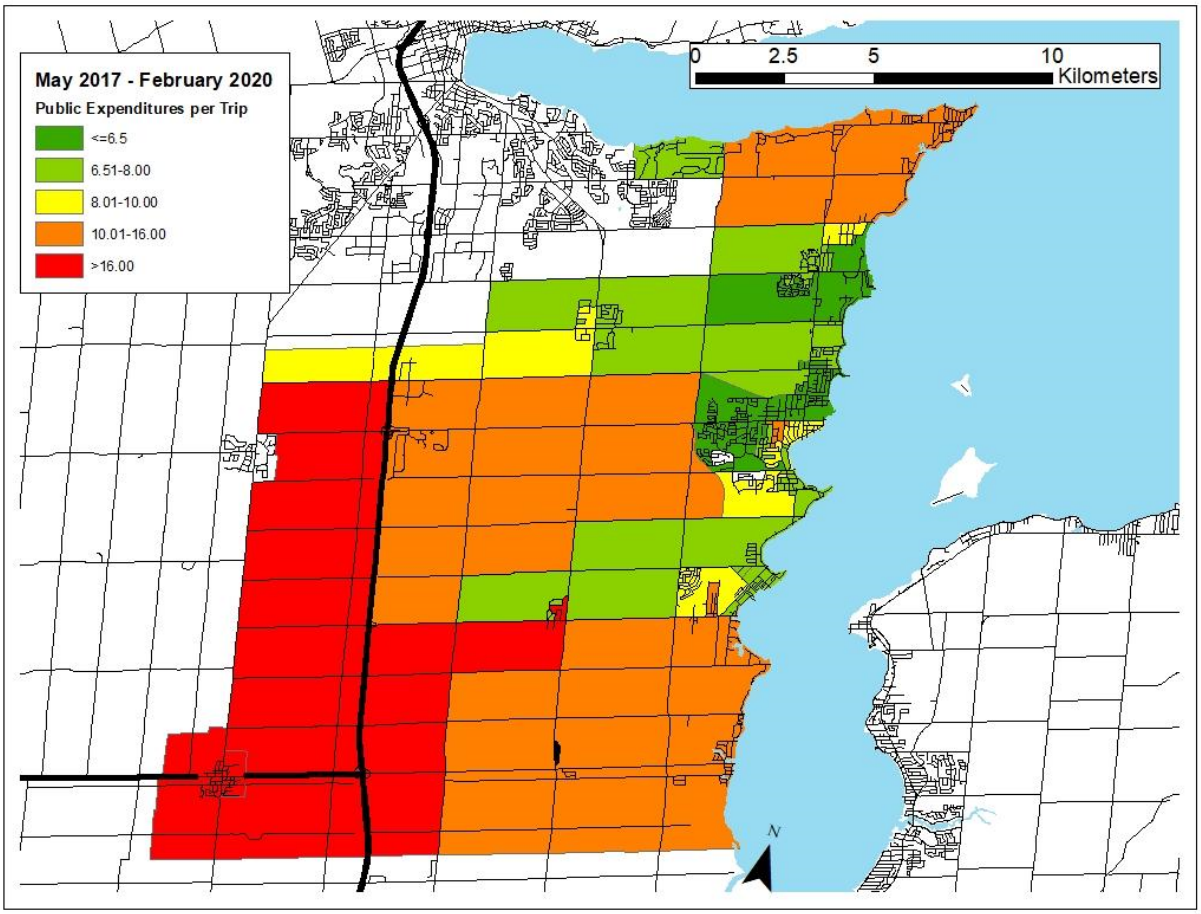

Figure 21. Public Expenditure for Innisfil Transit Trips based on DA of Trip Origin (May 2017 to February 2020)

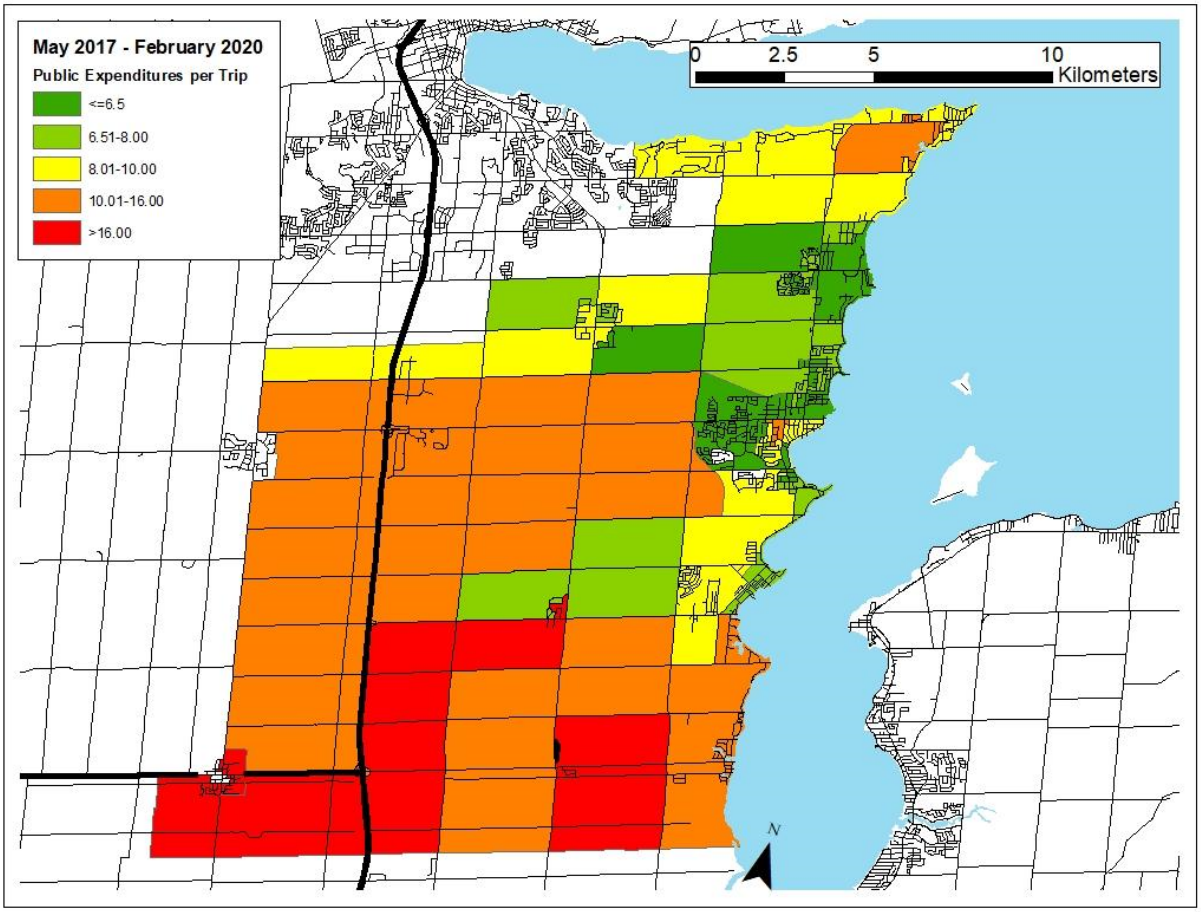

Figure 22. Public Expenditure for Innisfil Transit Trips based on DA of Trip Destination (May 2017 to February 2020)

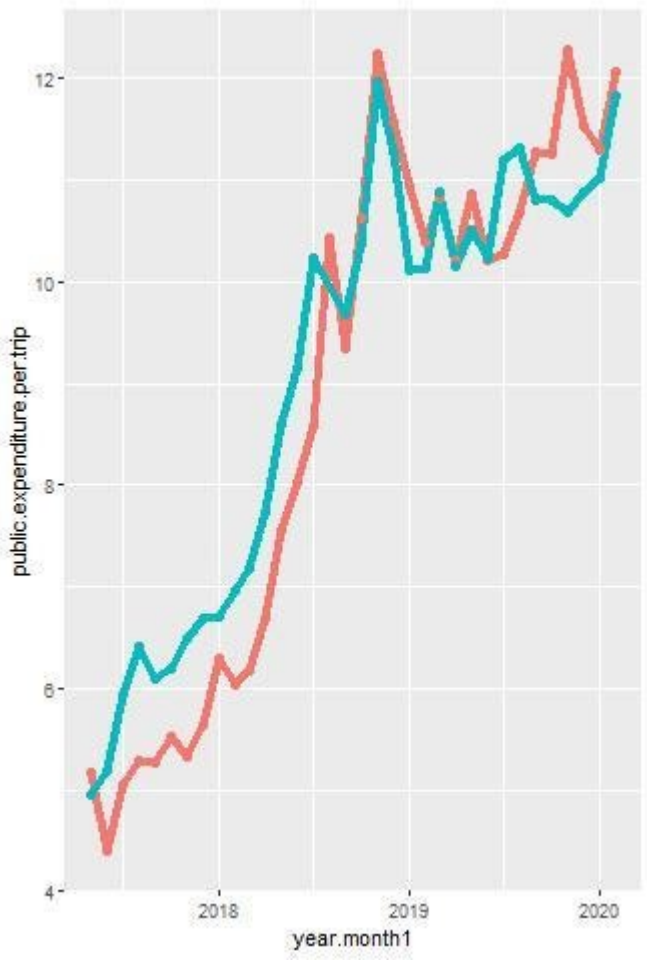

Figure 23. Total Public Subsidy per Innisfil Transit Trip for Weekdays (blue) and Weekends (red) between May 2017 and February 2020

Public subsidies per trip have almost doubled between May 2017 and February 2020 from less than $6 per trip to approximately $11 per trip (see Figure 23).

Variations in public subsidies per trip have been very modest for both weekdays and weekends by different times of the day (see Figure 24) with one exception. On weekends between 10am and 6pm, public subsidies have been less than $7 on average, compared with approximately ten dollars per trip during other weekend time periods. This is expected to be a result of the high share of weekend night trips connecting Innisfil with other trip destinations – which entails a fixed rebate, rather than a fixed fare.

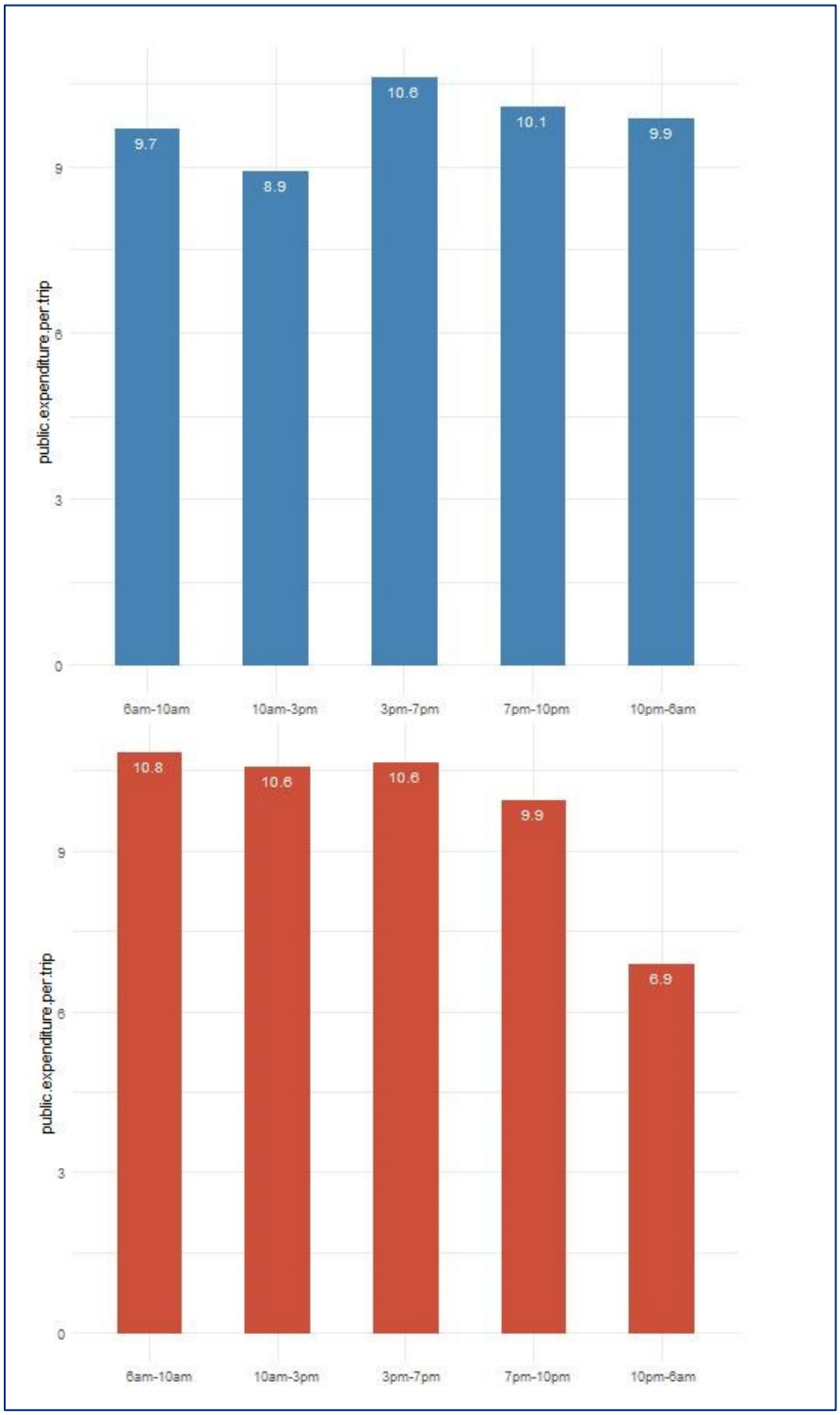

Figure 24. Innisfil Transit Public Fares per Trip (May 2017 - February 2020) on Weekdays (top) and Weekends (bottom) by Period of Day

Overall, while public expenditures per trip have been highest in areas outside of Alcona – primarily near Highway 400 (see Figure 21 and Figure 22), the highest rates of expenditure per unit area of land have been in more populated and urbanized areas (see Figure 25 and Figure 26).

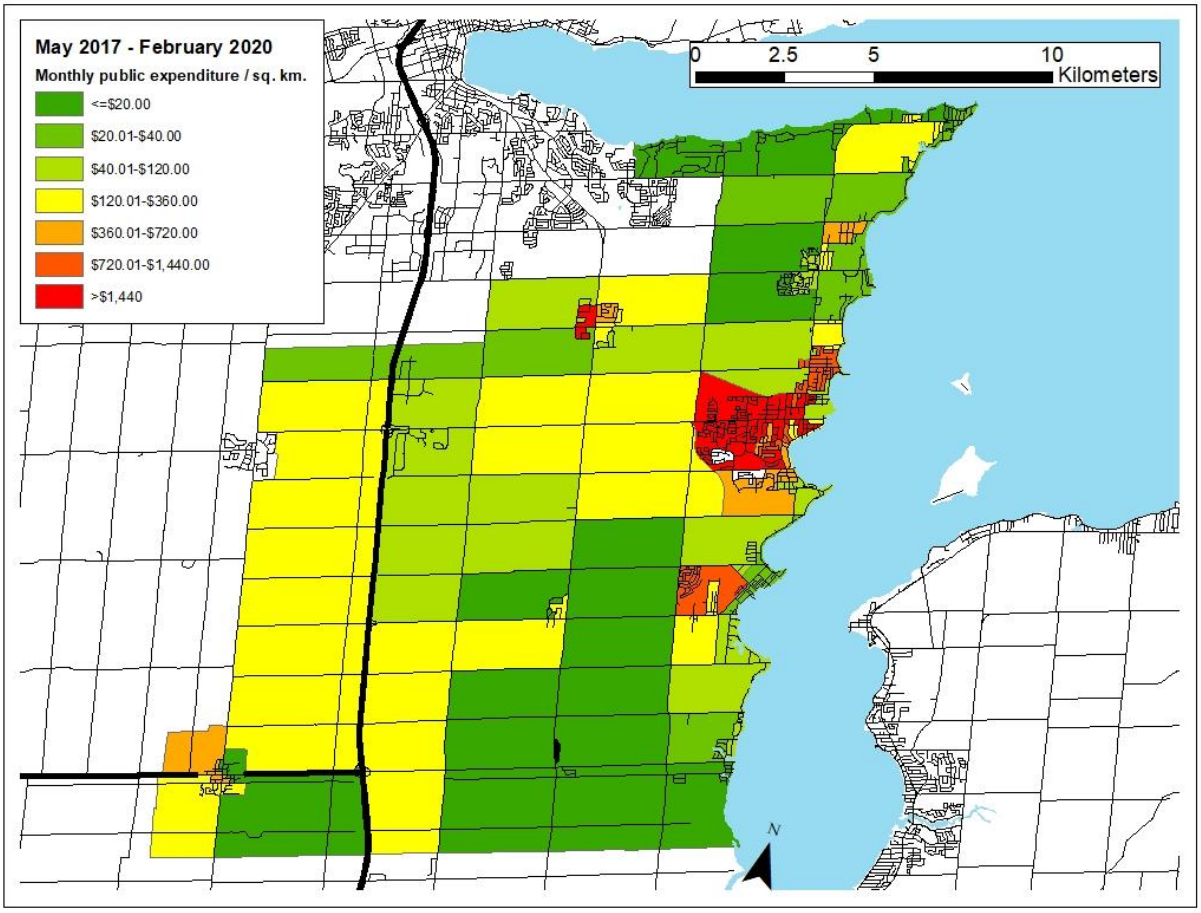

Figure 25. Monthly Public Expenditure per Square Kilometer for Innisfil Transit Trips based on DA of Trip Origin (May 2017 to February 2020)

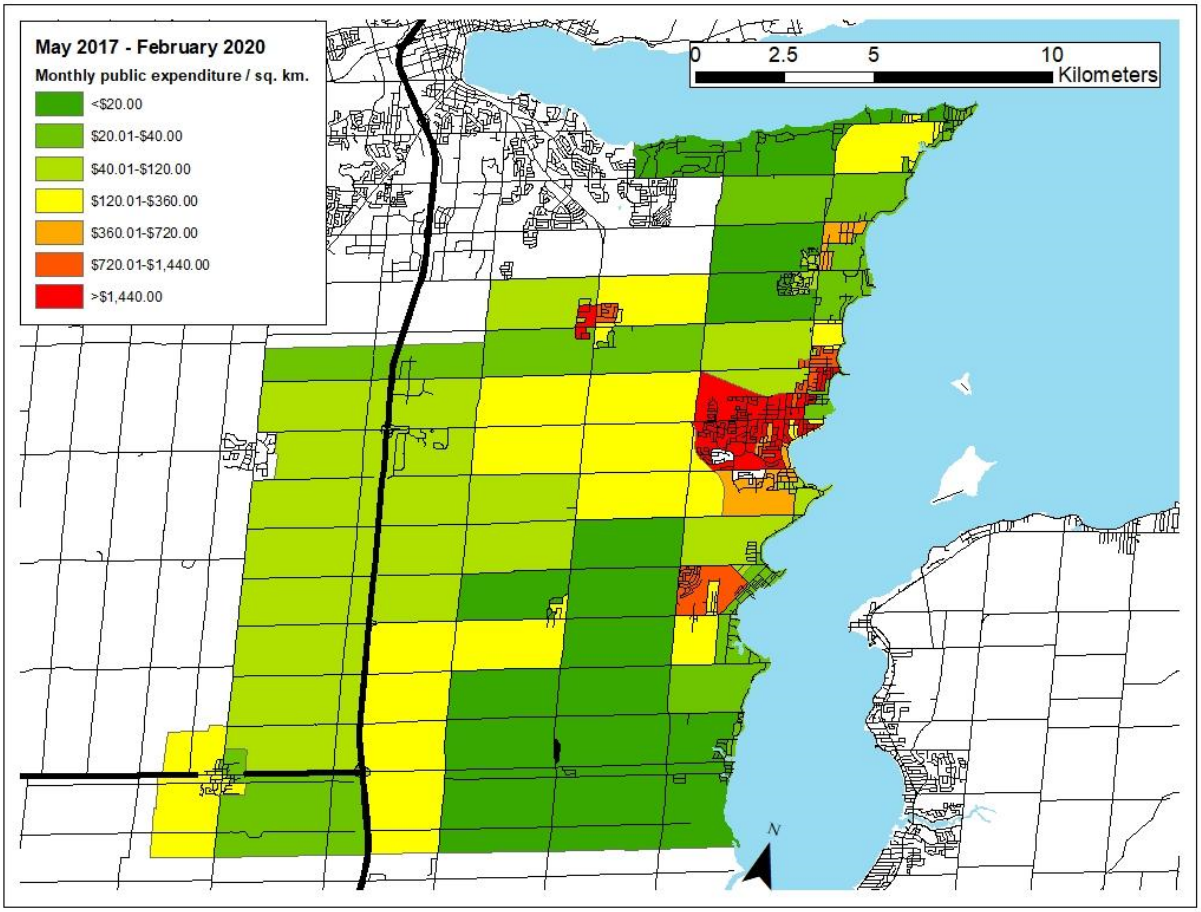

Figure 26. Monthly Public Expenditure per Square Kilometer for Innisfil Transit Trips based on DA of Trip Destination (May 2017 to February 2020)

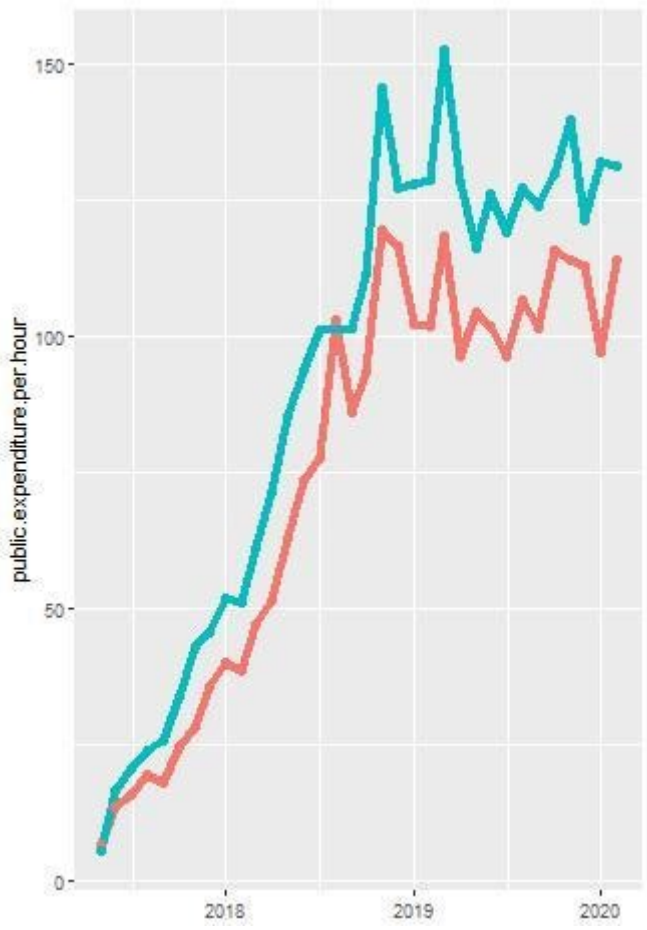

Figure 27. Total Public Expenditure per Hour per Innisfil Transit Trip for Weekdays (blue) and Weekends (red) between May 2017 and February 2020

Public expenditures per hour on Innisfil Transit increased after the program's commencement in May 2017 but have remained essentially unchanged between fall of 2018 and winter of 2020.

There are significant variations between weekday and weekend public expenditures per hour, as these estimates are subject to typical hourly ridership and public expenditures per trip. As such, while more than $160 per hour of public funding is used for Innisfil Transit (on average) during weekday evening peak (3pm to 7pm) periods, expenditures are less than $50 per hour during the weekday nights (10pm to 6am), weekend nights (10pm to 6am) and weekday mornings (6am to 10am) – see Figure 28.

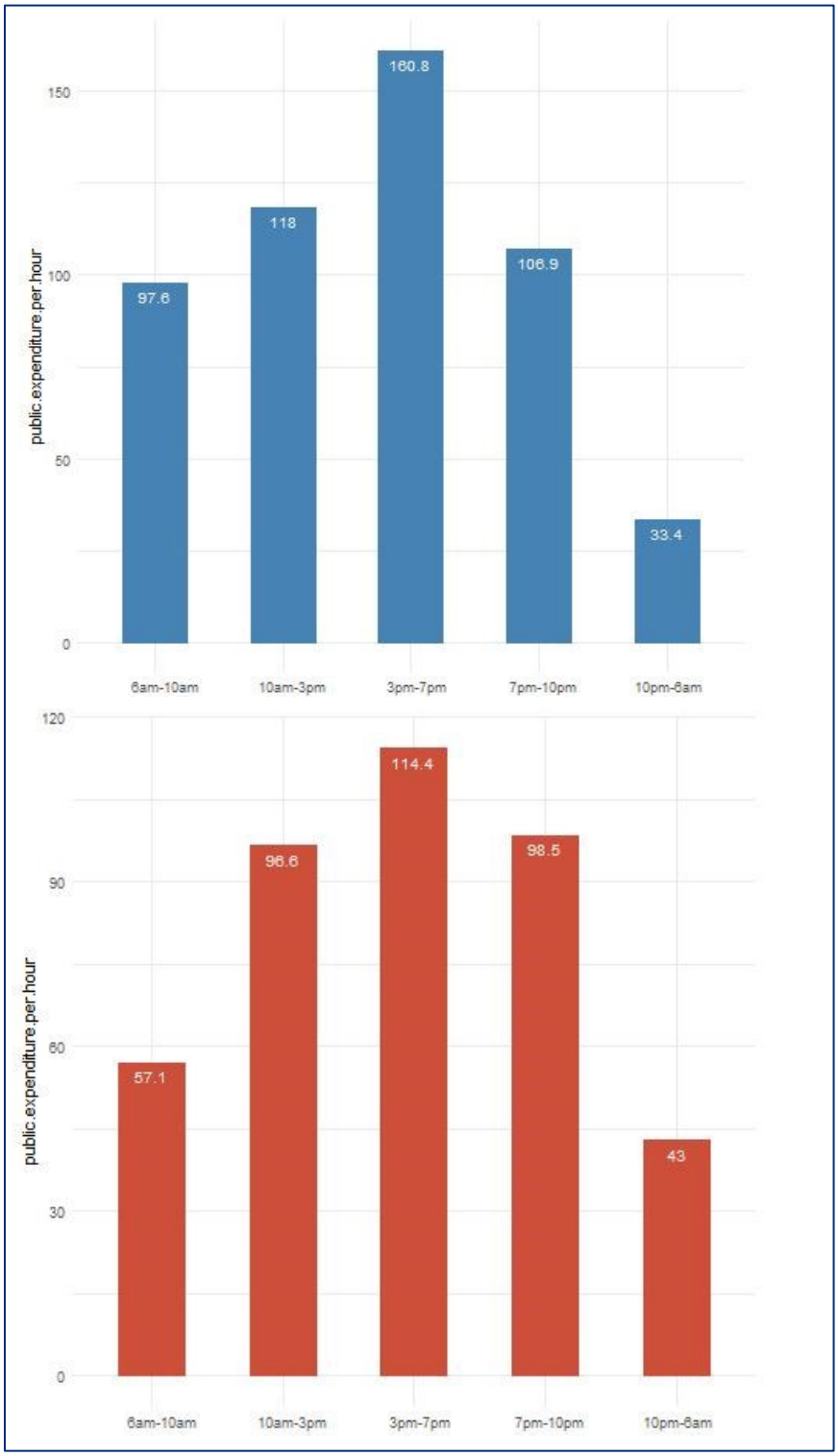

Figure 28. Innisfil Transit Public Expenditures per Hour (May 2017 - February 2020) on Weekdays (top) and Weekends (bottom) by Period of Day

3.4.3. Private Expenditure

In contrast to public and total expenditures on Innisfil Transit trips, private expenditures per trip have decreased significantly between May 2017 and February 2020. Fare policy changes in the fall of 2019 appear to have stemmed the drop in private fare dollars spent per trip – leading to a recent equilibrium of approximately $6 to $7 per trip since May of 2019 (see Figure 29).

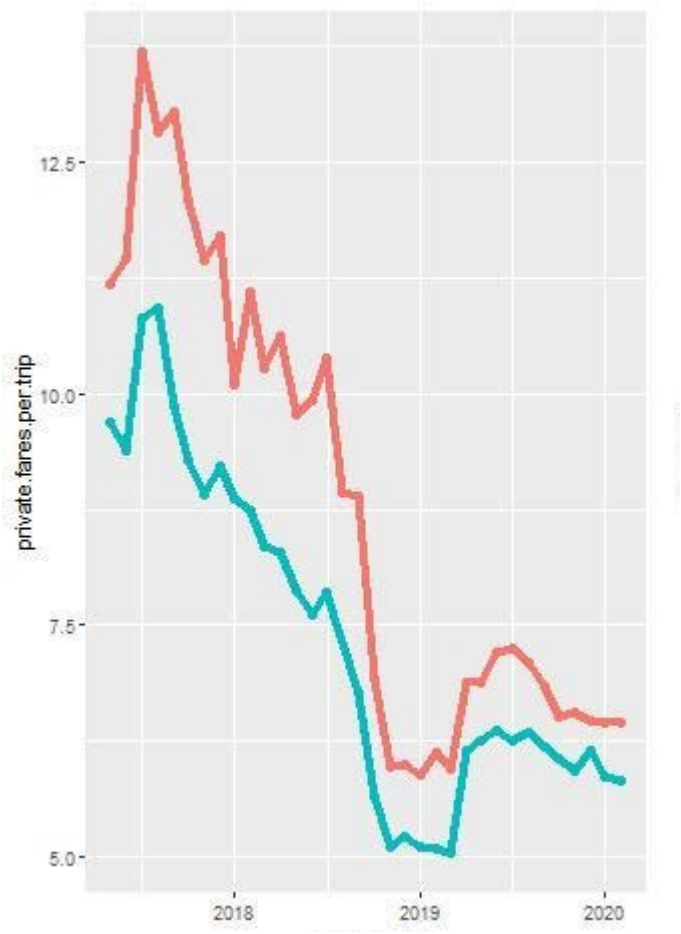

Figure 29. Total Private Fares per Innisfil Transit Trip for Weekdays (blue) and Weekends (red) between May 2017 and February 2020

In contrast to metrics of public expenditure per trip, private expenditures per trip appear to be highest during the night hours (10pm and 6am) – most notably on weekends (see Figure 30).

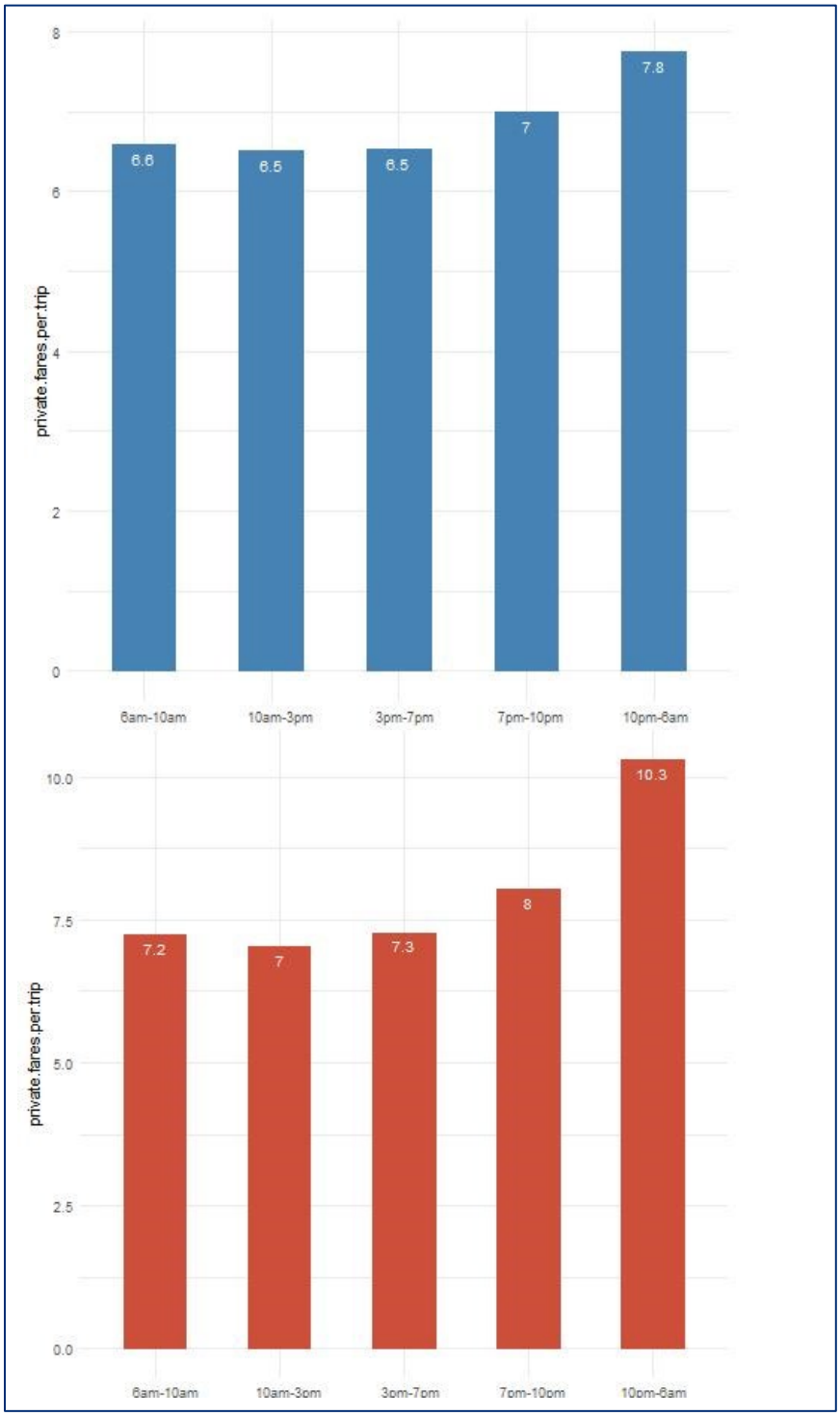

Figure 30. Innisfil Transit Private Fares per Trip (May 2017 - February 2020) on Weekdays (top) and Weekends (bottom) by Period of Day

3.5. Accessibility Patterns

Finally, metrics of accessibility are estimated based both on financial costs (fares) and travel times (in minutes). These metrics are first compared between Innisfil Transit and Uber (without the Innisfil Transit subsidy, see Section 3.5.1. Accessibility Patterns: Innisfil Transit and Uber) before comparisons are made between Innisfil Transit and the two contemplated bus routes (see Section 3.5.2. Accessibility Patterns: Innisfil Transit and Contemplated Bus Routes) identified in the Town of Innisfil Transit Feasibility Study (MMM Group Limited, 2015). Ultimately, Innisfil Transit ridership estimates are compared within the prospective bus ridership sheds, and Innisfil Transit service area (see Section 3.5.3. Innisfil Transit Trips – Bus Ridership Shed).

3.5.1. Accessibility Patterns: Innisfil Transit and Uber

Figure 31 illustrates the number of Innisfil Transit residents one can reach for an average $4 Innisfil Transit fare (private fare only) based on the origin DA zone. While there are many types of opportunities to which individuals need access, the metric of access to other Innisfil residents serves as a proxy for community connectivity and broader access to opportunities. Thus, as metrics indicate higher access to other Innisfil residents, this indicates higher levels of service and system performance.

Based on a $4 average Innisfil Transit fare, most neighborhoods of Innisfil have relatively low levels of accessibility which typically indicate access to fewer than 2,500 residents (usually in the same zone of residence for any given household). Select zones appear to have somewhat higher levels of access – notably west of Alcona and in select parts of Alcona (see Figure 31).

Based on a $5 average fare, accessibility levels are significantly higher in Alcona and neighborhoods west of Alcona using Innisfil Transit (see Figure 32). In contrast, based on an average private fare of $5 via Uber (without the Innisfil Transit subsidy), almost all zones still have the lowest accessibility levels. In comparing accessibility via Uber and accessibility via Innisfil Transit at the average $5 threshold, accessibility levels (on average) are more than 10 times as high using Innisfil Transit (indicating access to more than 25,000 residents compared with less than 2,500).

Based on a $6 (see Figure 33) or $7 (see Figure 34) average private fare, accessibility levels increase significantly (as these entail higher private fares), but incremental accessibility improvements from Innisfil Transit relative to Uber only (without the Innisfil Transit subsidy) are significant. Significant accessibility improvements from Innisfil Transit emerge at the $6 and $7 average private fare levels in western areas near Highway 400.

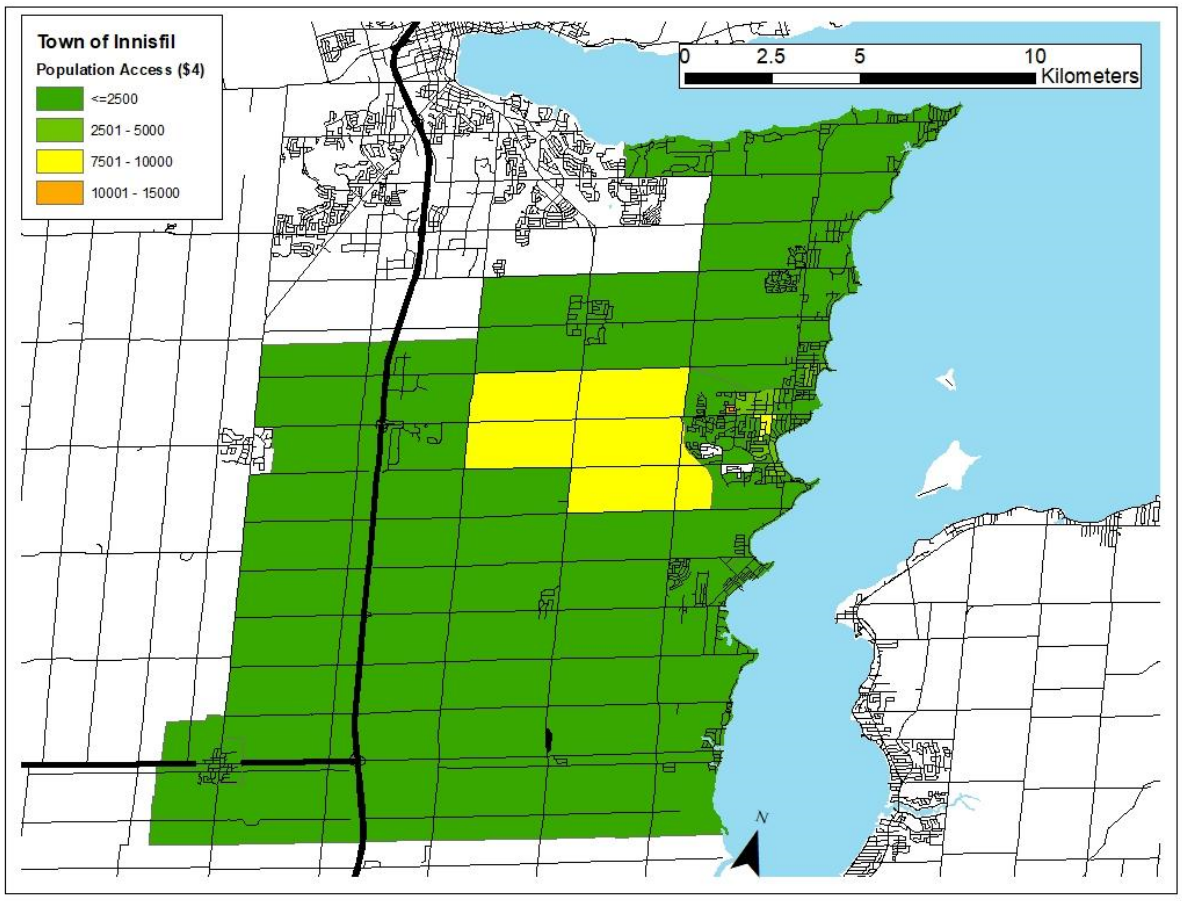

Figure 31. Access to Residents for a $4 Average Innisfil Transit fare

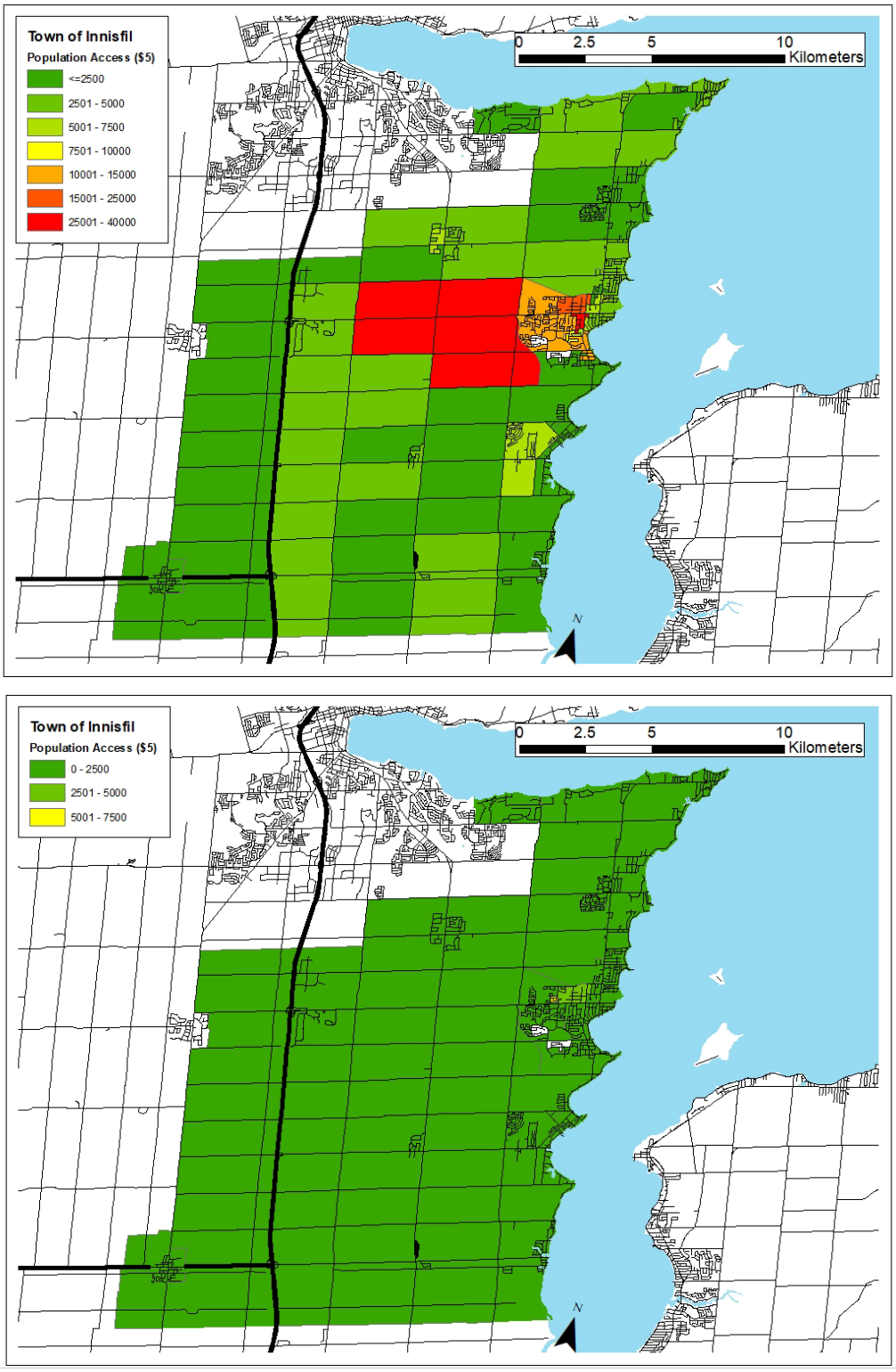

Figure 32. Access to Residents for a $5 average fare: Innisfil Transit (top) vs. Uber (bottom)

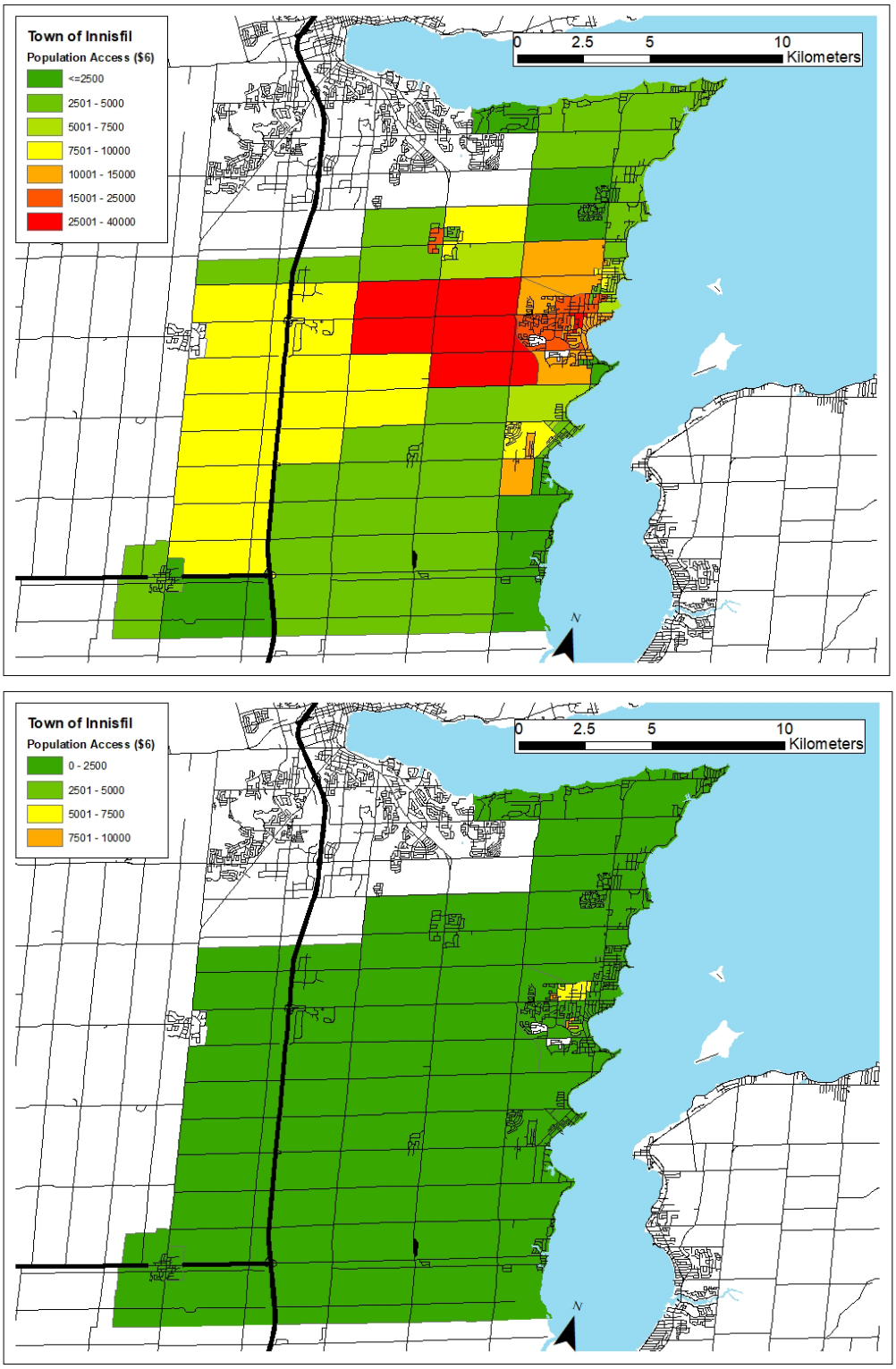

Figure 33. Access to Residents for a $6 average fare: Innisfil Transit (top) vs. Uber (bottom)

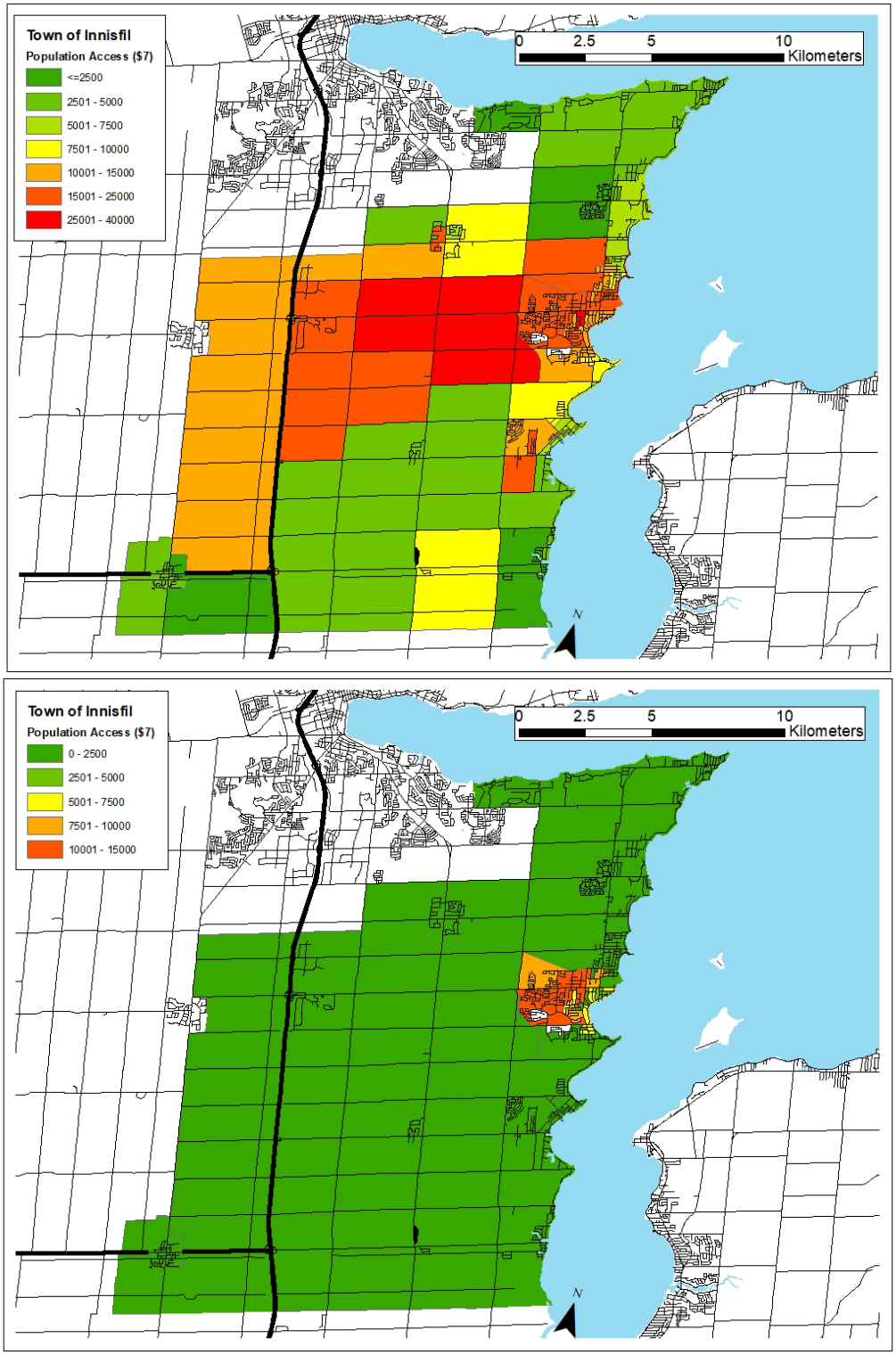

Figure 34. Access to Residents for a $7 average fare: Innisfil Transit (top) vs. Uber (bottom)

3.5.2. Accessibility Patterns: Innisfil Transit and Contemplated Bus Routes

Accessibility metrics are further calculated to explore the number of Innisfil residents to which one has access based on 20-minute travel times. Accessibility to residents using Innisfil Transit within 20 minutes is calculated based on both wait and travel times – meaning that in-vehicle trip travel times are typically less than 14 minutes, on average, while wait times are typically approximately 6 minutes. The highest accessibility levels via Innisfil Transit are in Alcona and west of Alcona – whereby a resident of these areas could access between 25,000 and 40,000 Town of Innisfil residents within a 20-minute Innisfil Transit ride. Western, northern, and southeastern areas are typically least accessible.

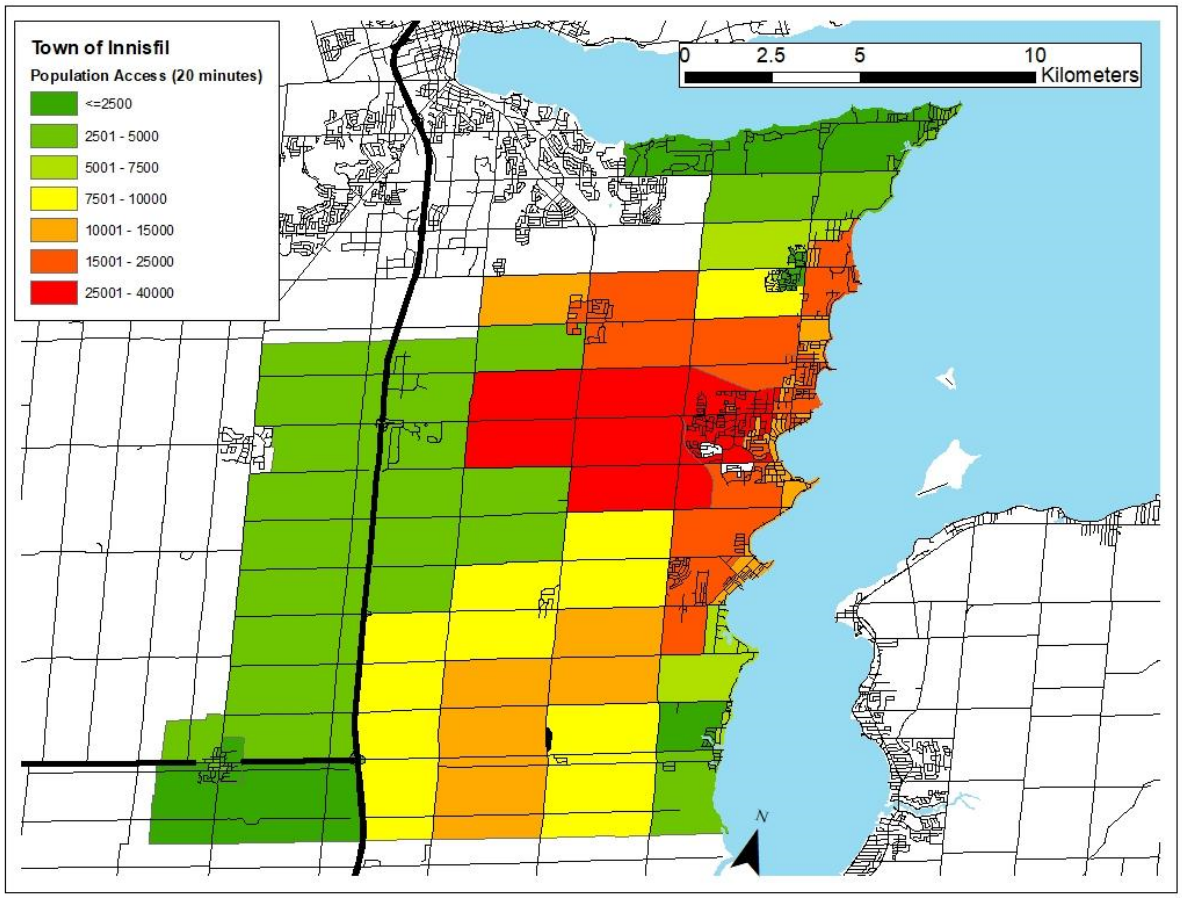

Figure 35. Accessibility to Residents within 20 Minutes using Innisfil Transit

Travel times and accessibility metrics are estimated for zonal origin-destination pairs based on the estimated ridership sheds of the contemplated one-bus and two-bus options (see Section 2.3.2. Bus Alternative Comparisons for a full description of the methodology). Bus accessibility metrics correspond to the number of Innisfil residents accessible within a 20-minute bus ride based on the travel services from one DA zone's centroid to other DA centroids. As such, the centroids of the DA zones are used as proxies for the "average" physical address of residents. Travel time estimates between origin and destination zones are based on (assumed) 30-kilometer per hour speeds, Euclidian distances (meaning the distance from the zone centroid of one DA to each other "as the crow flies"), and ten-minutes of time for access (getting to the bus station), egress (getting from the bus station to the ultimate destination), scheduling (the inconvenience of departing at specific times, rather than as desired), and waiting times (the time spent at the bus station waiting for the bus). Particularly given that access, egress, waiting, and scheduling times are generally viewed as higher burdens than in-vehicle (on the bus) travel times (Casello, Nour, & Hellinga, 2009), these accessibility metrics by bus are expected to represent an upper-bound based on both the one-bus and two-bus options.

Accessibility levels using the one-bus and two-bus options indicate that the highest levels of accessibility are in Alcona and its immediate vicinity (see Figure 36 and Figure 37). Accessibility levels are significantly lower than using Innisfil Transit (see Figure 35). Each of these accessibility maps uses the same set of symbology definitions, making them directly comparable. On average, the accessibility levels by Innisfil Transit (within 20 minutes) are 3.9 times as high as the one-bus option but 3.6 times as high as the two-bus option.

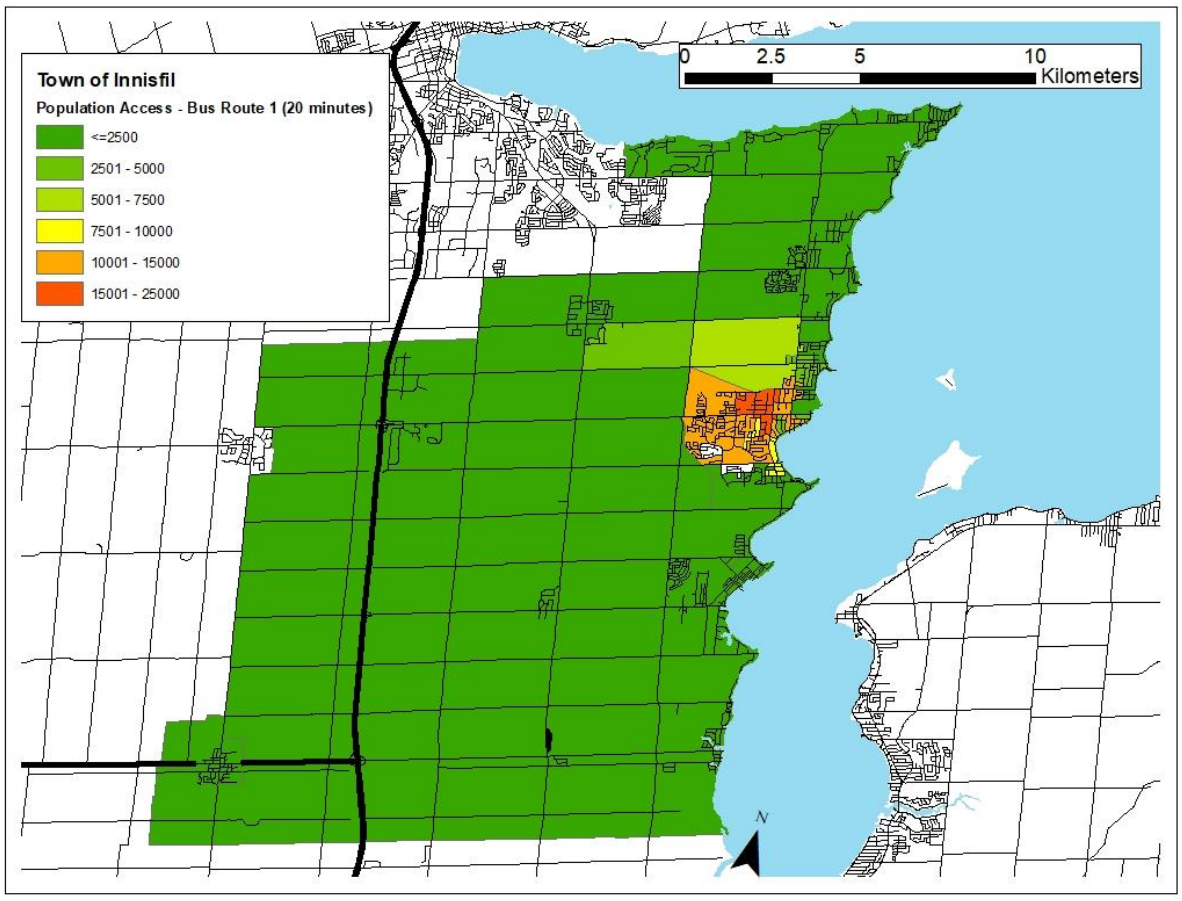

Figure 36. Accessibility to Residents within 20 Minutes using the One-Bus Option based on Expanded Ridership Shed Assumption

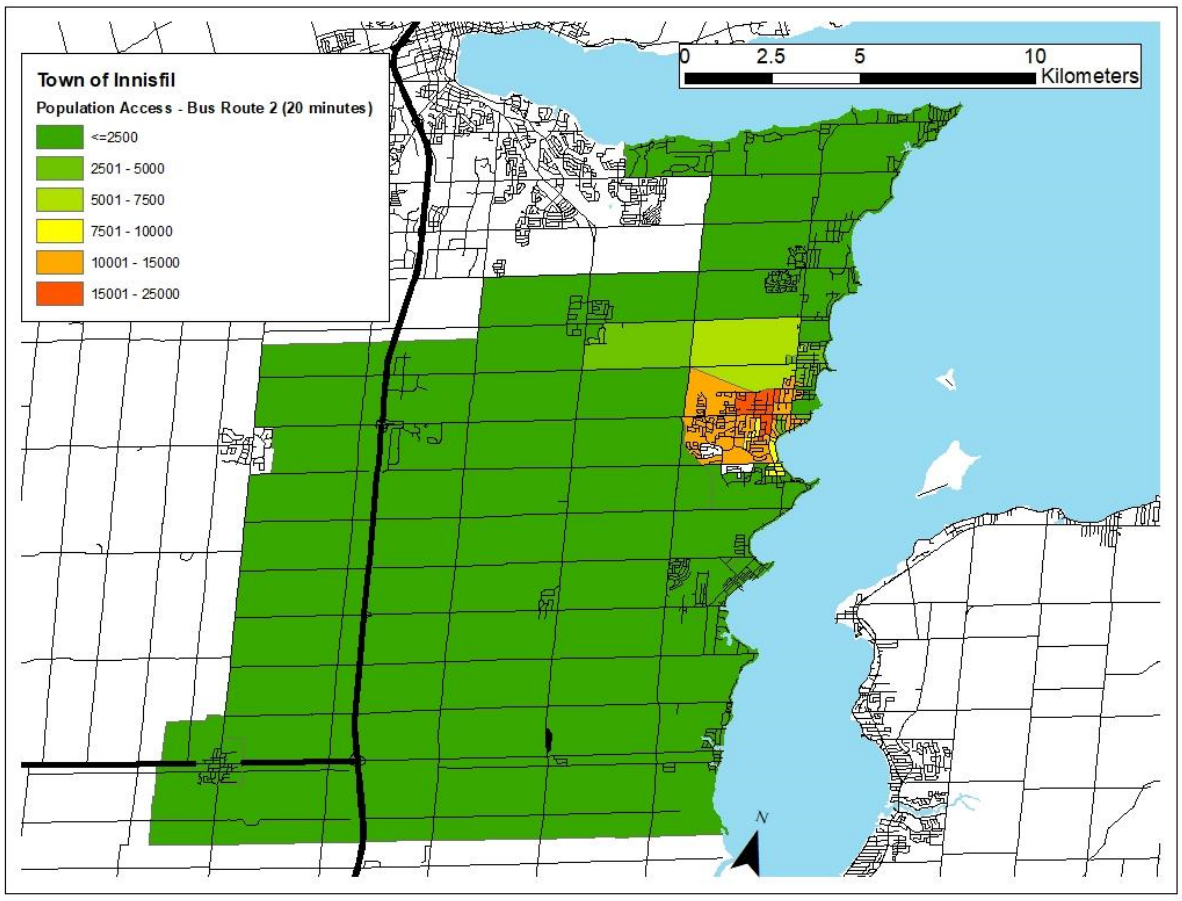

Figure 37. Accessibility to Residents within 20 Minutes using Two-Bus Option based on Expanded Ridership Shed Assumption

3.5.3. Innisfil Transit Trips – Bus Ridership Shed

Finally, based on the one-bus (Option 1) and two-bus (Option 4) alternatives contemplated in the Town of Innisfil Transit Feasibility study (MMM Group Limited, 2015), the shares of observed Innisfil Transit trips connecting origin-destination pairs within the bus ridership sheds are estimated. While these are not perfect means of comparing the bus alternatives with the on-demand Innisfil Transit service, as implemented, it provides guidance on the share of current Innisfil Transit trips which could be accommodated by bus. As Innisfil Transit delivers direct point-to-point services, while a bus entails additional, access, egress, waiting, and scheduling times, one inherently expects the service level of Innisfil Transit (as provided through the on-demand service) to be significantly higher than the bus. On the other hand, the expected private fares of the

contemplated bus alternatives were less than $3 per trip, while Innisfil Transit fares are typically $6 or more. As significant research on public transit ridership suggests that users are more sensitive to service levels than to fares (Taylor & Fink, 2013), it is unlikely to imagine each Innisfil Transit (which travel at approximately 50 kilometers per hour = 2 million kilometers / 40,000 hours of travel) trip could be equally well served by bus (which travels at approximately 30 kilometers per hour) – even within the same ridership shed. Given the already optimistic assumptions in this report about the extent of the bus ridership sheds (which would be smaller than those depicted in Figure 1 and Figure 2), these comparisons are designed to portray the one-bus (Option 1) and two-bus (Option 4) alternatives in as positive a light as possible.

Based on the one-bus alternative (Option 1), most trips from some DAs have their trip origins and destinations within zones identified as part of the one-bus ridership shed (see Figure 38). But for a vast majority of geographic spaces within Innisfil, none of the current Innisfil Transit trips could be accommodated using the one-bus option. Results are estimated using the expanded (Figure 38 and Figure 39) and constrained (Figure 40 and Figure 41) ridership sheds. Of the trips occurring by Innisfil Transit, only approximately 62.5% of those trips occurred during the scheduled service hours of the contemplated bus services (7am-7pm Mondays-Fridays and 9am-5pm Saturdays). A reduction in the share of trips accommodated by the transit alternative in comparison with Innisfil Transit (62.5% as many) sheerly based on operating hours closely mirrors the findings in Sweet, Mitra, and Chemilian (2020, p. 29). Once accounting for the actual service hours for the one-bus alternative, between 24 (constrained assumption) and 33 (expanded assumption) percent of all Innisfil Transit trips in the town would have origin-destination pairs during bus service hours within those zones identified as part of the bus ridership shed.

As shown in Figure 39, while the two-bus alternative (Option 4) performs better than the one-bus alternative, the differences are relatively small (between 4 and 5 percent): between 29 (constrained assumption) and 37 (expanded assumption) of Innisfil Transit trips in the town would have origin-destination pairs during bus service hours within zones identified as part of the bus ridership shed and the neighborhoods most affected would be in in the vicinity of Sandy Cove.

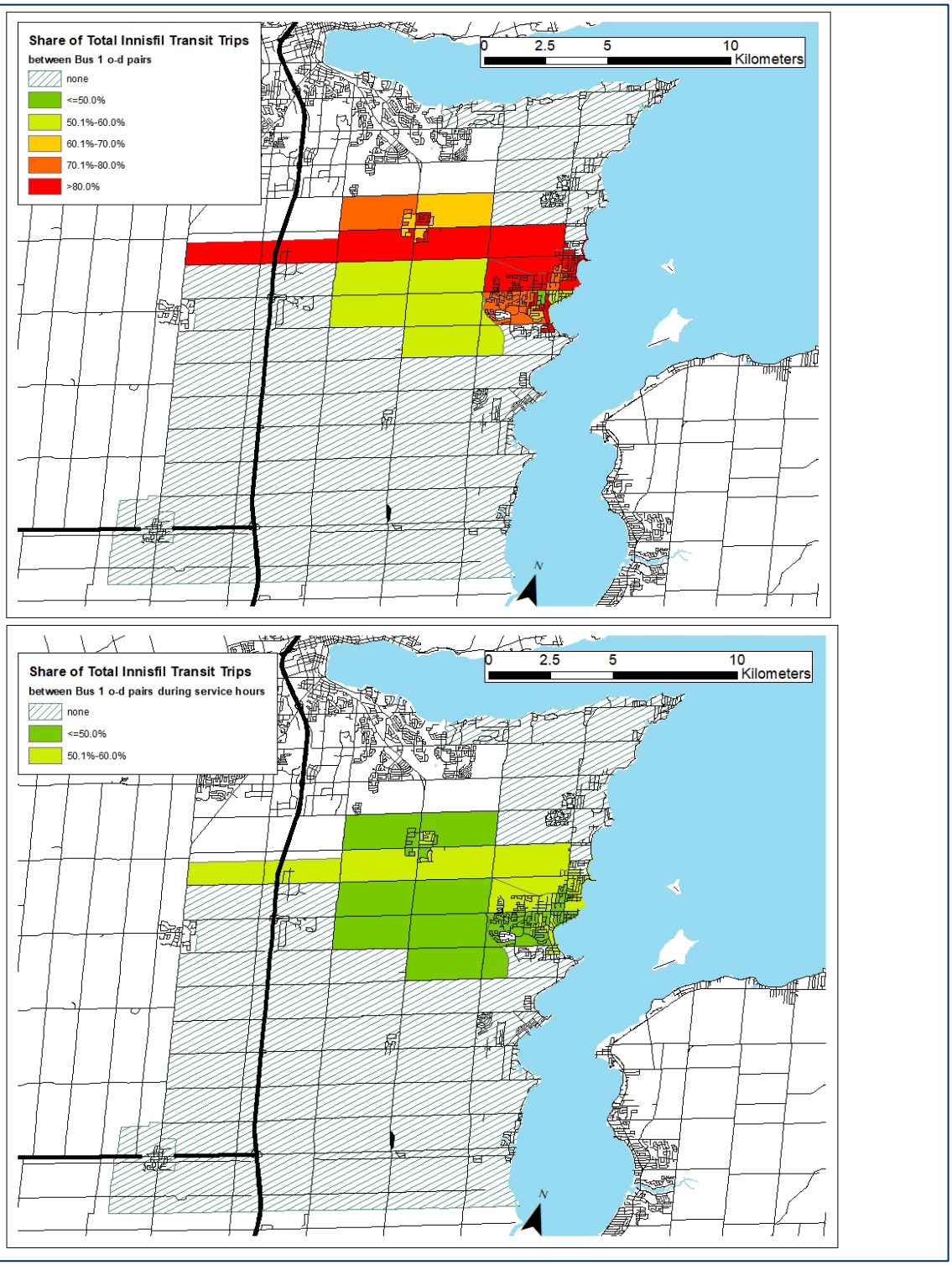

Figure 38. Share of Innisfil Transit Trips in DAs (expanded ridership shed) served by 1-bus alternative: total (top, total is 52%) and during bus service hours only (bottom, total is 33%)

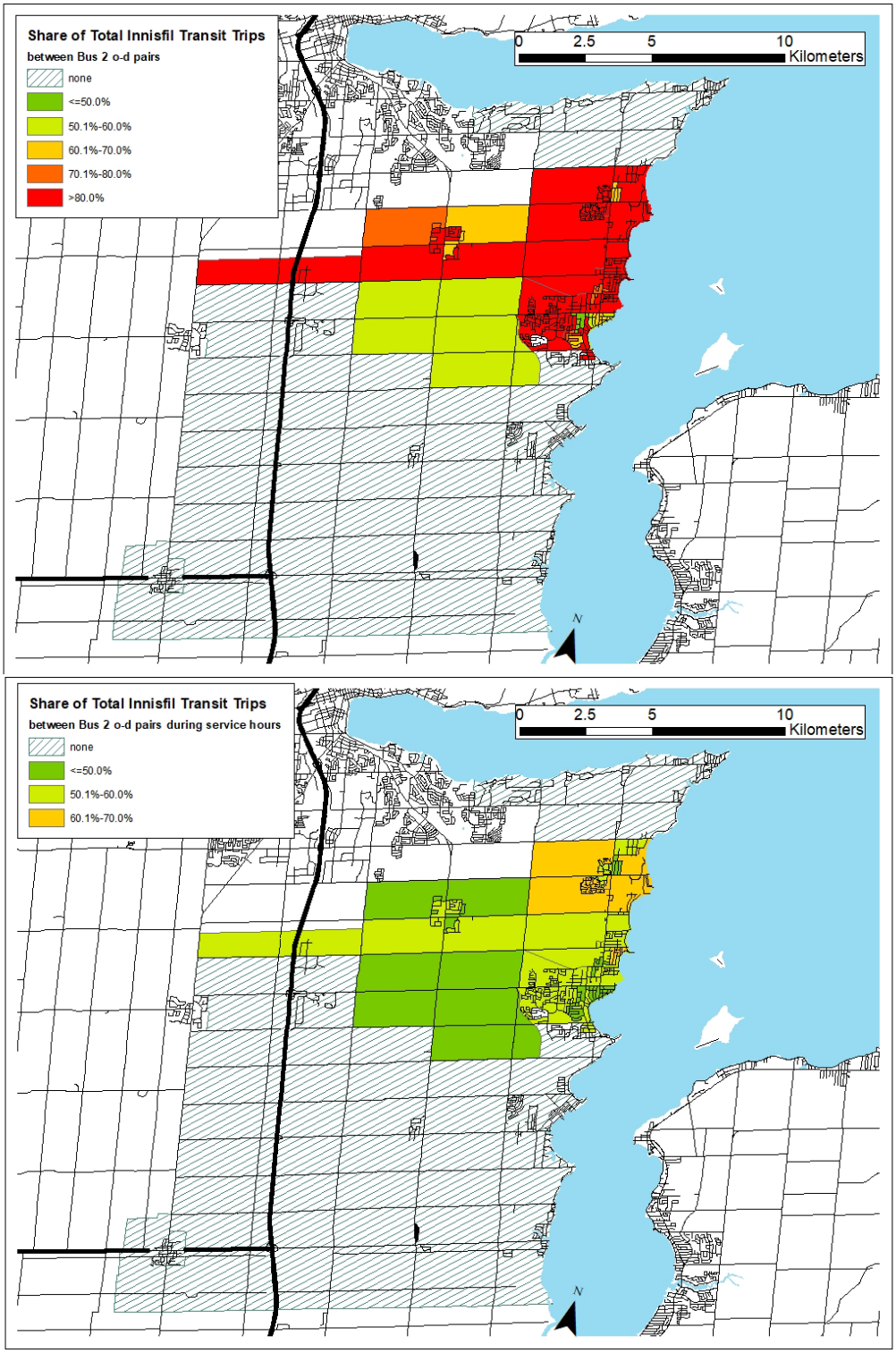

Figure 39. Share of Innisfil Transit Trips in DAs (expanded ridership shed) served by 2-bus alternative: total (top, total is 59%) and during bus service hours only (bottom, total is 37%)

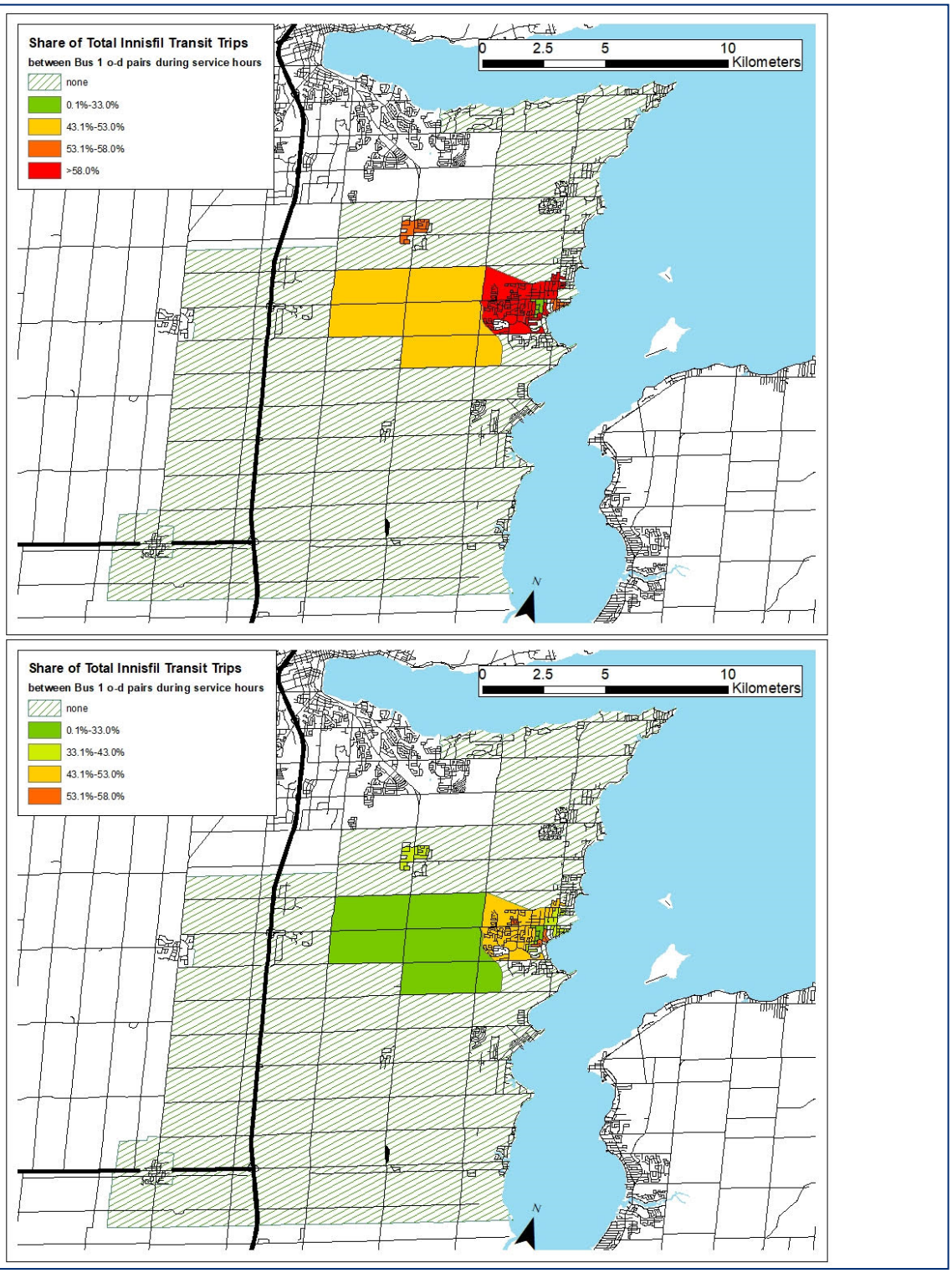

Figure 40. Share of Innisfil Transit Trips in DAs (constrained ridership shed) served by 1-bus alternative: total (top, total is 39%) and during bus service hours (bottom, total is 24%)

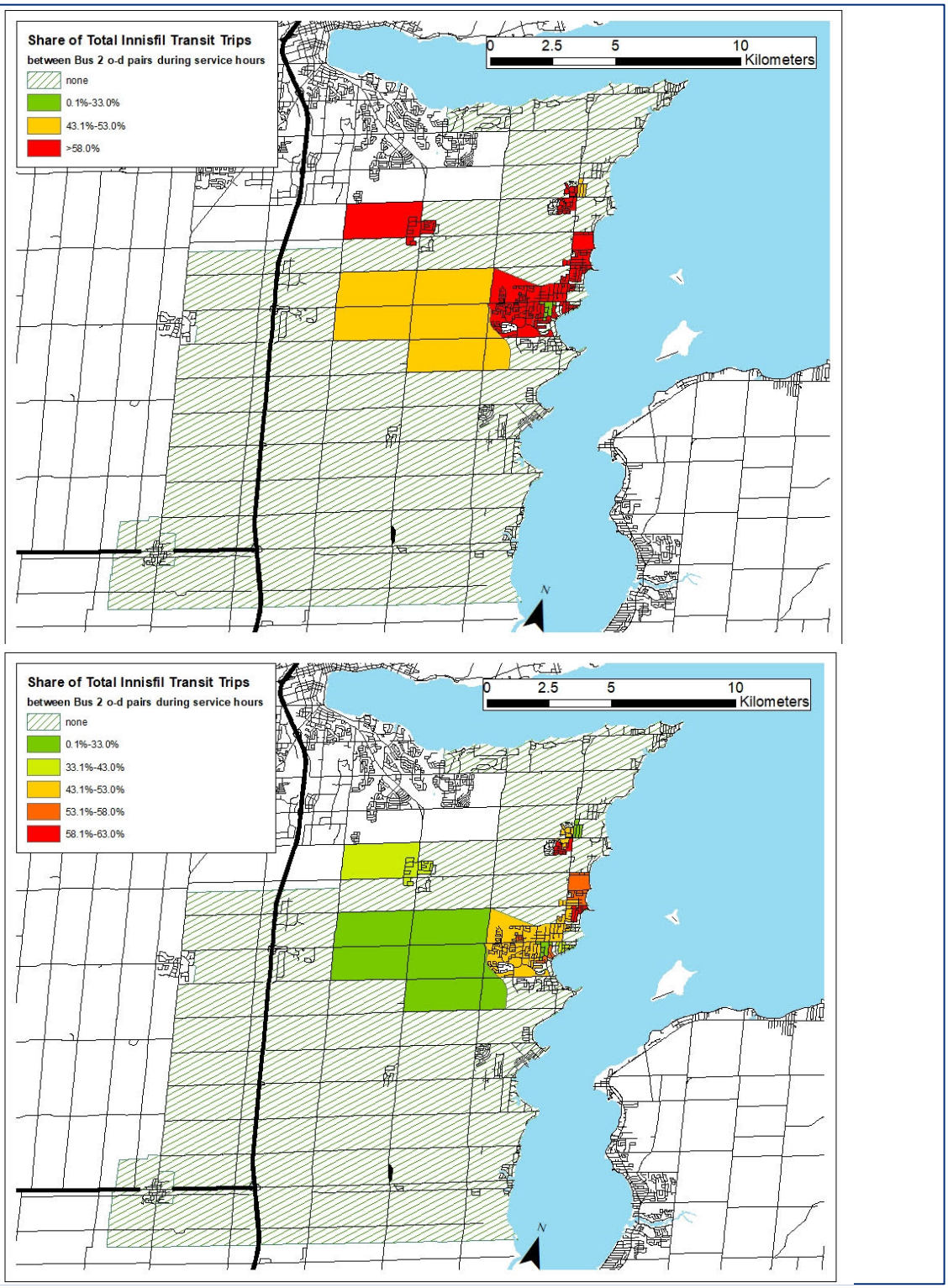

Figure 41. Share of Innisfil Transit Trips in DAs (expanded ridership shed) served by 2-bus alternative: total (top, total is 46%) and during bus service hours only (bottom, total is 29%)

Finally, the shares of Innisfil Transit trips which would have been accommodated by contemplated bus alternatives are estimated for seven key destinations identified by the Town of Innisfil. It is notable that while the Barrie South GO Station was contemplated as part of this analysis, because data were not sufficiently granular, this destination was omitted. Those destinations are included Figure 42.

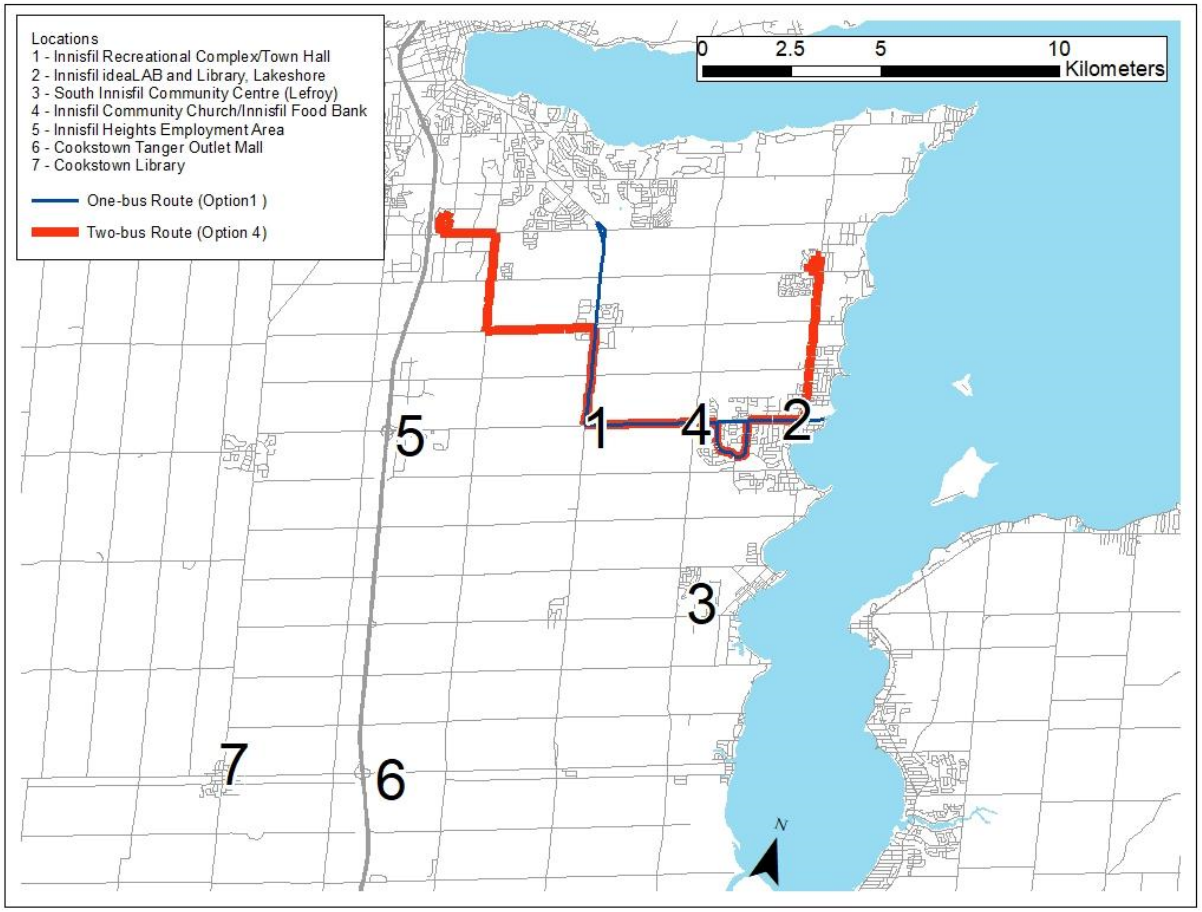

Figure 42. One-bus and two-bus alternatives relative to select key locations

As Figure 42 shows that three of the seven key destinations are connected to the bus transit alternatives, bus alternatives are only expected to connect three of these trip generators with other neighborhoods in Innisfil. While a more local analysis of trips to these specific destinations would be recommended, the analysis below estimates the total share of all Innisfil Transit trips which connect Dissemination Areas identified in the constrained (low-end) or expanded (high-end) ridership sheds. As such, any origin destination pair between DAs identified within the bus ridership sheds would be considered as being accommodated based on either bus alternative. Based on the results, neither bus alternative connected four of the key trip

destinations, while between 15 and 40 percent of trips would be connected to or from the DAs in which three of the key locations are located. Given the large geographies of Dissemination Areas, these estimates are highly in-precise: while the Innisfil Recreation Complex and Innisfil Community Church are more than two kilometers apart on Innisfil Beach Road, they are both in the same zone due to large zone sizes. As such, results should be interpreted as orders of magnitude, rather than point estimates.

Table 5. Share of Innisfil Transit trips connecting DA pairs based on ridership shed for one-bus alternative - during operating hours only

Bus Route		One-bus route (Option 1)			
Location Number	Ridership Shed Assumption	Expanded Ridership Shed Assumption		Constrained Ridership Shed Assumption	
	Location Name / Trip Origin or Destination	Origins	Destinations	Origins	Destinations
1	Innisfil Recreation Complex / Town Hall	36%	38%	28%	31%
2	Innisfil ideaLAB and Library, Lakeshore Branch	21%	20%	15%	15%
3	South Innisfil Community Centre (Lefroy)	0%	0%	0%	0%
4	Innisfil Community Church / Innisfil Food Bank	36%	38%	28%	31%
5	Innisfil Heights Employment Area	0%	0%	0%	0%
6	Cookstown Tanger Outlet Mall	0%	0%	0%	0%
7	Cookstown Library	0%	0%	0%	0%

Table 6. Share of Innisfil Transit trips connecting DA pairs based on ridership shed for two-bus alternative - during operating hours only

Bus Route		Two-bus route (Option 4)			
Location Number	Ridership Shed Assumption	Expanded Ridership Shed Assumption		Constrained Ridership Shed Assumption	
	Location Name / Trip Origin or Destination	Origins	Destinations	Origins	Destinations
1	Innisfil Recreation Complex / Town Hall	37%	40%	32%	34%
2	Innisfil ideaLAB and Library, Lakeshore Branch	28%	26%	19%	19%
3	South Innisfil Community Centre (Lefroy)	0%	0%	0%	0%
4	Innisfil Community Church / Innisfil Food Bank	37%	40%	32%	34%
5	Innisfil Heights Employment Area	0%	0%	0%	0%
6	Cookstown Tanger Outlet Mall	0%	0%	0%	0%
7	Cookstown Library	0%	0%	0%	0%

4. Conclusions

Based on the results presented in Section 3, there are five key areas which warrant additional discussion.

First, while the highest public subsidies (on a per resident and on a per trip basis) are allocated in more rural western (along Highway 400), northern, and southeastern portions of the Town of Innisfil, the highest public subsidies and travel demand (on a per unit area basis) are concentrated in Alcona and select other neighborhoods, including Lefroy, Stroud, and Sandy Cove.

Second, the highest Innisfil Transit service levels and the lowest costs per trip are concentrated in the most urbanized parts of the town – most notably in Alcona. Compared with accessibility via the one-bus alternative (Option 1) and the two-bus alternative (Option 4), Innisfil Transit provides accessibility levels approximately four times as high. Accessibility is measured based on the total number of Town of Innisfil residents accessible within a certain threshold (e.g. for less than $6 or within 20 minutes).

Third, the public cost of providing Innisfil Transit on a per passenger basis (approximately $10 per trip) is comparable to that expected of fixed-route bus systems based on the Town of Innisfil Transit Feasibility Study. Moreover, the cost of providing Innisfil Transit is comparable to the operating cost (excluding capital costs) of providing fixed-route transit to urbanized areas of under 1 million in population (Office of Budget and Policy, 2016, pp. 26-27). An overview comparing Innisfil Transit with the contemplated bus routes is provided in Table 7

Fourth, it is expected that the one-bus (Option 1) and two-bus (Option 4) ridership levels would be (at most) 33 to 37 percent as high during service hours as those of Innisfil Transit. These estimates represent upper bounds with respect to the bus ridership levels. The more constrained estimates in this study indicate that the one-bus and two-bus ridership levels would be between 24% and 29% as high as those of Innisfil Transit.

Fifth, using correlations between Innisfil Transit ridership and select demographic variables, it appears that the highest ridership levels are associated with the highest population densities. There is weak evidence of the highest ridership levels being in areas with lower shares of individuals with bachelor's degrees or higher. Other correlations were statistically insignificant.

Finally, Innisfil Transit represents both a novel approach for the public sector to provide mobility services in rural and smaller communities and represents an approach towards balancing different objectives. As currently designed, the service balances the priorities of providing mobility for low-density and rural communities (where the costs are higher – notably in the west, near Highway 400) while using the advantages of scale to provide higher service levels at lower public costs to residents in established neighborhoods (notably Alcona, Lefroy, Stroud, and Sandy Cove).

Table 7. Comparison Overview between Innisfil Transit and Contemplated Bus Routes

	Fixed Bus Route	Innisfil Transit	Comparison	Section
Capital cost	$200,000 per bus	$0	N/A for Innisfil Transit	N/A
Annual net operating cost	$160,000 to $300,000 (Average annual net costs excluding capital costs for one and two bus scenarios)	$240,000 in 2017 to $640,000 in 2018 (Increase from 2017 to 2018 due to increased ridership)	Innisfil Transit has a higher annual operating cost	3.4
Net cost per rider	$14 to $17	$6 to $11	Innisfil Transit has a lower public expenditure per rider	3.4.2
Service Hours	7:00am to 7:00pm on weekdays and 9:00am to 5:00pm on Saturdays	24-hour service, 7 days a week	One third of Innisfil Transit trips occurred outside of proposed bus service hours	3.5.3
Route	Fixed	Any location	Between approximately two thirds to three quarters of Innisfil Transit trips occurred outside of the bus ridership shed or service hours (Depending on the assumptions used and whether one or two buses were selected)	3.5.3
Annual Ridership	22,000 (one bus) and 37,000 (two bus)	80,000	Innisfil Transit has higher annual ridership than the proposed bus routes	3.1
Fare Structure	Users pay a $3 fare per ride.	A combination of the fixed fares and fixed rebates, where both the user and Innisfil pay Uber.	Innisfil Transit costs users an average fare of $7 across the town and approximately $6 within the bus ridership sheds, which are larger than the fixed bus routes.	3.1
Accessibility within 20 minutes through Innisfil	3,500- 3,800 residents per zone (Figures 36-37) (Number of residents accessible within a 20-minute bus ride)	13,500 residents per zone (Figure 35) (Number of residents accessible within 20 minutes)	Innisfil Transit accessibility is 3.6-3.8 times as high as the proposed bus routes	3.5.1

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