Central Transit Corridor (CTC) Monitoring Program

Kitchener-Cambridge-Waterloo

MONITORING CHANGE IN THE CTC 2017 REPORT

MARCH 2019

Region of Waterloo

Document Number: 2726178

ACKNOWLEDGMENTS

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1. Background

1.1 Summary

The Region of Waterloo has recognized the importance of monitoring change in the Central Transit Corridor (CTC) over time in order to understand the changing nature of the social, economic and environmental characteristics of the corridor. The CTC monitoring program is a multi-year project to monitor the corridor from the baseline year of 2011 until at least 2021, after ION is constructed, opened for service, and is functioning within the community. There are 16 baseline indicators, as well as themed indicators, each one selected for their capacity to describe key aspects of the corridor. The indicators provide a lens for monitoring change in the corridor, as well as the protection of the community's important assets, such as heritage resources and affordable housing. Further, through a partnership with the University of Waterloo, the influence of rapid transit on urban growth and land use changes is being explored.

1.2 About ION

ION, the Region of Waterloo's rapid transit service, which was approved by Council in June 2011, is a visionary plan that will help shape our community for the future by bringing LRT to the region in two stages. Stage one includes a 19-kilometre LRT route from the Conestoga Mall transit terminal in Waterloo to the Fairview Park Mall transit terminal in Kitchener. Construction of Stage one ION LRT was completed in 2017 and train testing began late in the year. The service is set to launch in spring 2019. Stage two currently features a 17-kilometre route of BRT from the Ainslie Street transit terminal in Cambridge to the Fairview Park Mall transit terminal in Kitchener. The Stage two ION BRT service began operating in September 2015. Stage two ION will see the Region replace the BRT line with LRT thereby creating a seamless LRT route across the community's three urban centres.

More information about ION can be found in the Region of Waterloo's ION Story report:
http://rapidtransit.regionofwaterloo.ca/en/resourcesGeneral/ION-Story-Fall-2016-access.pdf;
and at the project website:
http://rapidtransit.regionofwaterloo.ca/en/index.asp.

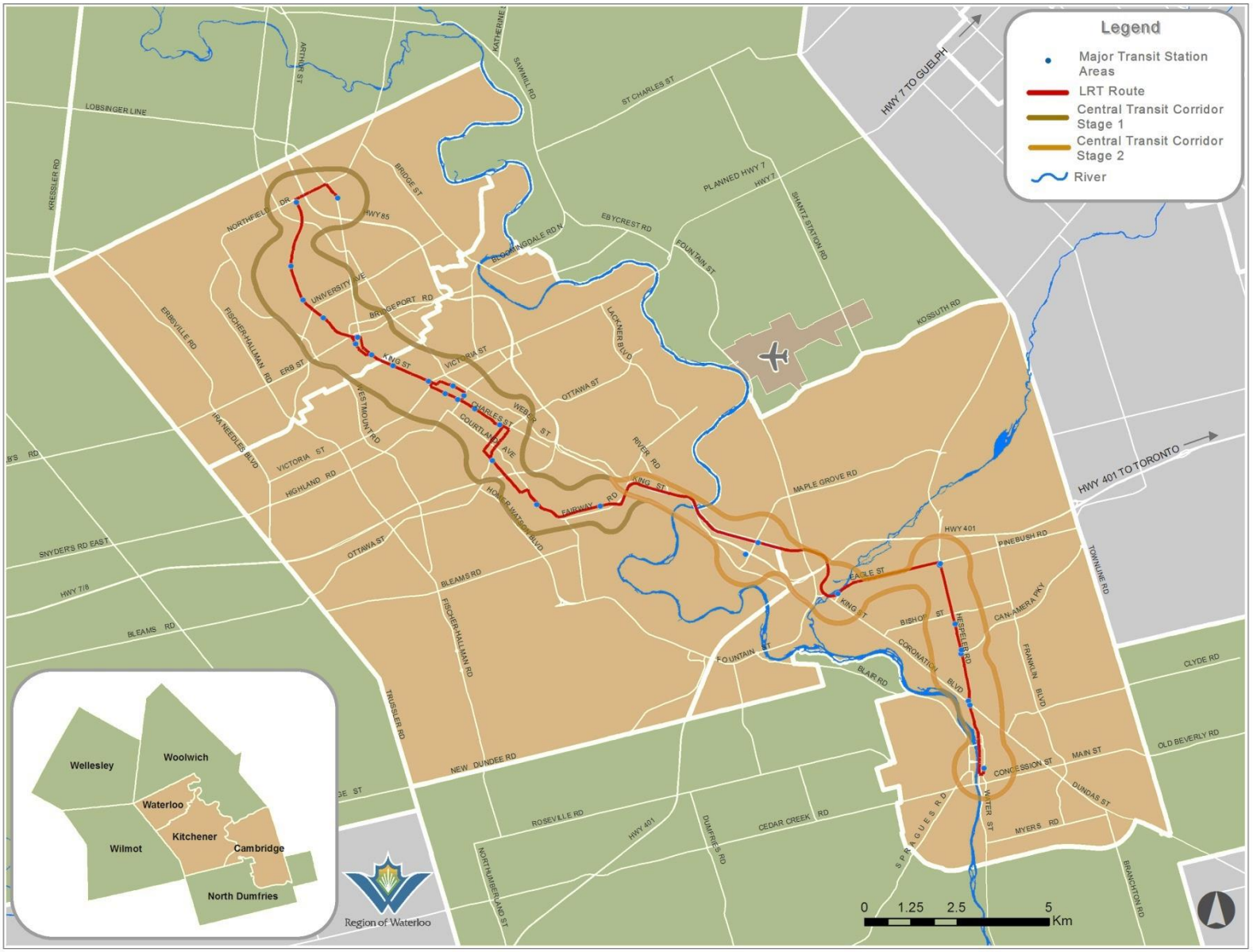
Along with ION, GRT will create an efficient, integrated, easy-to-use public transit system for all residents in Waterloo Region. New iXpress routes will be added for convenient crosstown travel, local bus service will increase along with improved frequency in neighbourhoods, and there will be one fare for all GRT and ION services. An expanded network of trails and paths for cycling and walking will complement the ION and iXpress bus routes and allow for connections between transportation modes.

1.3 The ION Central Transit Corridor

The Central Transit Corridor (CTC) is the area within approximately 800 metres of ION Light Rail Transit (LRT) stations, and the lands connecting these, to form a continuous corridor. The 800-metre distance is generally accepted as the length people will walk (roughly ten minutes) to access rapid transit. The CTC connects the three Urban Growth Centres (UGCs) of downtown Cambridge, downtown Kitchener and uptown Waterloo, as well as 23 rapid transit station areas. The geography of the CTC includes areas within the corridor that are expected to re-urbanize over time by incorporating the station area planning work that the Area Municipalities are undertaking, including secondary plans, and follows pre-established boundaries such as roads, rivers, property boundaries, and statistical boundaries already being used for monitoring.

As of end of year 2017, there were public consultations underway to offer residents with the opportunity to provide feedback on options presented for the preliminary preferred route of stage 2 ION. The CTC will be adjusted when stage 2 of the route is finalized. Until that time, the corridor includes the area around the preliminary stage 2 LRT stations.

Map 1 – Central Transit Corridor



2. The Central Transit Corridor Monitoring Program

2.1 Purpose of the Monitoring Program

Since Council's commitment to implement Light Rail Transit (LRT) in 2011, the Region of Waterloo has recognized the importance of monitoring change in the Central Transit Corridor (CTC) over time. The new rapid transit system will do more than just increase transit access throughout the Region. It also creates an opportunity to build healthy and vibrant communities along the route. The Central Transit Corridor Community Building Strategy (CBS) published on December 3, 2013, recommended how the community should grow around rapid transit stations. It also included a recommendation to establish and implement baseline metrics pertaining to transit investment in the Central Transit Corridor and to report to Council with periodic updates. The CBS has also informed the development of the monitoring program, and continues to guide planning initiatives directed towards achieving the community-building goals of ION.

2.2 Monitoring ION's Goals

To monitor ION's two goals of moving people and building community, the monitoring program for the CTC explores the changing social, economic and environmental state of the Region's rapid transit corridor, by using data to look at the various ways the CTC will be transformed by ION. Nine dimensions are explored as shown in Table 1.

2.3 Baseline and Annual Indicators

For each dimension, one or more indicators have been chosen. These indicators will be collected and reported on annually. In total, sixteen indicators have been developed through the CTC Monitoring Program. Some of the baseline indicators cannot be measured each year due to constraints in data availability. Thirteen of the 16 baseline indicators have been updated for the 2017 reporting year.

Table 1. Goals, Dimensions and Indicators

Goal	Dimension	Indicator	Metric
Moving People	Mobility	Transit Ridership	Number of trips made using Grand River Transit (million)
		Daily Transit Activity	Per cent of daily average transit activity which occurred in the CTC
	Sustainable Modes of Transportation	Transit Mode Share	Per cent of mode of travel share which was on transit across the CTC
		Active Transportation	Per cent of mode of travel share which was pedestrian and cyclist in the CTC
		Walkability	Per cent of population living in "high" or “very high” walkable areas in the CTC
Building Community	Vibrant Communities	Land Use Mix	Per cent of all regional land uses which were found in the CTC
		Population	Per cent of Region’s residents who live in the CTC
	Art and Culture	Cultural Vibrancy	Number of arts and culture establishments in the CTC
		Restaurants	Per cent of the Region’s restaurants in the CTC
	Heritage	Heritage Resource Retention	Number of demolition permits on pre-1920 and designated built heritage resources in the CTC
	Investment	Building Activity	Dollar value of building permits in the CTC for new construction (million)
		Assessment Value	Assessed value of properties in the CTC (billion)
	Environment	Emissions	Tonnes of net air emissions per capita in Cambridge, Kitchener and Waterloo
	Crime and Safety	Perception of Safety	Per cent of people in Cambridge, Kitchener and Waterloo who perceive that their downtowns are safe at night
		Calls for Service	Per cent of police calls for service which were related to potential public perception in the CTC
	Inclusive Community	Affordability of Home Ownership Transactions	Per cent of housing transactions which were affordable to low and moderate income households in the CTC

2.4 Themed Indicators

Each year, the CTC monitoring program focuses on an area of interest and explores that area through the development of themed indicators. In the previous report, published in 2017, the theme of focus was "Building Investment". This year, the theme chosen is "Housing Affordability" which falls under the "Inclusive Community" dimension. The proposed schedule for future themes and some potential indicators are presented in Table 2. The schedule accounts for the time when data will be available for the indicators. In 2021, a ten-year review of the indicators is proposed.

Table 2. Proposed Future Themes

Reporting Year	Dimension	Potential Indicator
2019	Mobility	Way-finding
		Vehicular Miles
		Efficiency
	Sustainable Modes of Transportation	Mode Share
		Active Mobility
		Connectivity
		Walkability
2020	Vibrant Communities	Density of Population and Employees
		Cultural Employment and Clustering
		Employment Density
	Art and Culture	Great Places to Visit
		Creative Public Spaces
		Public Art
	Heritage	Streetscapes
	Architecture and Design	High Quality Urban Places
		Surface parking lots
	Crime and Safety	Perception of Safety
		Traffic Collisions
2021	10 Year Review	

3. Monitoring Results and Analysis

The CTC monitoring program will measure change through the various stages of implementation of ION, from Council endorsement (2011 – 2014), through construction (2015 – 2017), to service start (2019), and early operation (2019 - 2021). These stages are not discrete – for example, although ION was announced in 2011, there was anticipation of its approval by council in the years leading up to the final council decision. However, the stages are generally useful to consider in understanding the changes occurring in the corridor.

The first report from the monitoring program was the Monitoring Change in the Central Transit Corridor – Baseline Report, dated November 17, 2015, which described key aspects of the corridor in the post-announcement period from 2011 to 2014. Results from the baseline monitoring are summarized in Table 3. Since construction of ION had not yet been started, these results did not reflect the direct effects of ION infrastructure, but may show indications of change in the CTC in anticipation of ION.

The second report in the program, Monitoring Change in the CTC - 2015 Annual Update, dated November 2016, provided a first look at the state of the CTC during the first full year of ION construction and an update on 12 of the 16 key indicators that could be measured annually. That report also took a deeper dive into the first of the annual themes: the environment. Results from the 2015 environment theme are summarized in Table 4.

The third report in the program, Monitoring Change in the CTC - 2016 Report, dated November 2017, provided a look at the state of the CTC during the second year of ION construction and an update on 13 of the 16 key indicators that could be measured annually. That report also took a deeper dive on the second annual theme: investment. Results from the 2016 investment theme are summarized in Table 5.

This fourth report in the program, Monitoring Change in the CTC - 2017 Report, provides another look on the state of the CTC as ION construction continued, as well as updates to 14 of the 16 key indicators that can be measured annually. Results of the monitoring project up to 2017 are summarized in Table 3. This report also presents the third theme area: Housing Affordability. Results from the 2017 Housing Affordability theme are summarized in Table 6.

It is recognized that there are many factors that influence each of these indicators. The economy, policies, programs and political decisions at many levels of government are large influences on change in the Region, both inside the CTC and more broadly.

The CTC monitoring program will continue to measure and report on indicators until at least 2021. This provides an opportunity for a comprehensive review of the change happening in the corridor along the LRT route before, during, and after the construction and operation of ION. These metrics are important in helping to tell the story about the different ways ION is moving people and shaping the future of our communities.

Table 3. Indicators for the CTC Monitoring Program (2011 to 2017)

Goal	Dimension	Indicator	Metric	2011	2012	2013	2014	2015	2016	2017
Moving People	Mobility	Transit Ridership	Number of trips made using Grand River Transit (million)	19.7	21.3	22.0	21.6	20.3	19.7	19.7
		Daily Transit Activity	Per cent of daily average transit activity in the CTC	67%	65%	67%	64%	63%	63%	61%
	Sustainable Modes of Transportation	Transit Mode Share	Per cent of mode of travel share on transit across the CTC	-	-	-	-	5%	-	-
		Active Transportation	Per cent of mode of travel share which was pedestrian and cyclist in the CTC	5%	-	-	-	-	8.6%	-
		Walkability	Per cent of population living in "high" or “very high” walkable areas in the CTC	55%	55%	56%	56%	56%	57%	57%
Building Community	Vibrant Communities	Land Use Mix	Per cent of all regional land uses found in the CTC	69%	69%	69%	70%	69%	70%	70%
		Population	Per cent of Region’s residents who live in the CTC	17.5%	17.6%	17.7%	17.8%	17.9%	17.8%	18.1%
	Art and Culture	Cultural Vibrancy	Number of arts and culture establishments in the CTC	192	-	-	-	-	271	-
		Restaurants	Per cent of the Region’s restaurants in the CTC	50%	51%	52%	52%	52%	52%	54%
	Heritage	Heritage Resource Retention	Number of demolition permits on pre-1920 and designated built heritage resources in the CTC	13	36	11	9	12	17	20
	Investment	Building Activity	Dollar value of building permits in the CTC for new construction (million, adjusted)	$491	$262	$227	$548	$259	$308	$222
		Assessment Value	Assessed value of properties in the CTC (billion)	$10.0	-	-	$12.0	$12.8	$13.6	$14.7
	Environment	Emissions	Tonnes of net air emissions per capita in Cambridge, Kitchener and Waterloo	2.52	2.42	2.40	2.57	2.61	2.54	2.66
	Crime and Safety	Perception of Safety	Per cent of people in the Tri-Cities who perceive that their downtowns are safe at night	65%	-	-	-	-		64%
		Calls for Service	Per cent of police calls for service related to potential public perception in the CTC	40%	41%	43%	43%	43%	43%	-
	Inclusive Community	Affordability of Home Ownership Transactions	Per cent of affordable housing transactions to low and moderate income households in the CTC	55%	56%	53%	54%	57%	57%	36%[1]

[1] The Home Ownership Affordability indicator is measured using the Provincial Policy Statement’s definition of affordability which is a threshold definition of the lower of two approaches: “income” and “market”. From 2011 to 2016 the lower of the two approaches was the market approach. This changed in 2017 when for the first time since monitoring began the income approach produced the lower threshold. For more information on this change please refer to this indicator section in the report.

Table 4. The Environment in the CTC

Dimension	Indicator	Metric	Indicator Value
Environment (2015) [2]	Trails and Pathways	Length of trails and pathways in the CTC	78 Kilometres
	Public Greenspaces	Area of public greenspaces in the CTC	398 hectares

Table 5. Investment in the CTC

Dimension	Indicator	Metric	2011	2012	2013	2014	2015	2016
Investment (2016)[3]	Transaction Values	Dollar value of transaction values in the CTC (million, adjusted)	$619	$764	$821	$916	$898	$1,030
	Building Improvements	Dollar value of building permits for property improvements in the CTC (million, adjusted)	$74	$80	$93	$80	$96	$166

[2] For more information on the 2015 Environment thematic indicators including methodology and detailed results refer to the 2015 Monitoring Report available on the Region of Waterloo's website at: http://www.regionofwaterloo.ca/en/aboutTheEnvironment/resources/Monitoring_Change_in_the_CTC__2015_Report-access.pdf

[3] For more information on the 2016 Investment thematic indicators including methodology and detailed results refer to the 2016 Monitoring Report available on the Region of Waterloo's website at: https://www.regionofwaterloo.ca/en/resources/Monitoring_Change_in_the_CTC__2016_Report.pdf

Table 6. Inclusive Community in the CTC

Dimension	Indicator	Metric	2006	2011	2012	2013	2014	2015	2016	2017
Inclusive Community	Affordability of Home Ownership Transactions	Per cent of housing transactions which were affordable to low and moderate income households in the CTC		55%	56%	53%	54%	57%	57%	36%
	Renter Affordability	Per cent of renters spending less than 30% of their household income on shelter related costs in the CTC	59%	64%					61%	
	Supply of Community Housing	Number of community housing units in the CTC		2,687	2,610	2,631	2,631	2,633	2,645	2,645
	Location of Households Receiving Rent Assistance	Per cent of Housing Allowances with Supports (HAWS) in the CTC						50%	60%	56%

3.1 Goal: Moving People

Together with public sector investments in the active transportation network and planned improvements to service levels and the regional transit network, the ION rapid transit system has the opportunity to greatly enhance mobility within and between Cambridge, Kitchener and Waterloo.

The year 2017 was characterized by the completion of construction of the LRT infrastructure in stage one of the corridor, the testing of the first trains, and streetscape enhancements. It is unlikely for the indicators measuring mobility to portray improvements in the CTC during the post-announcement and construction phases of ION. Nevertheless, monitoring these indicators will allow for tracking of travel behaviour change over the years since ION was announced, and after ION has been constructed, opened for service, and is functioning within the community.

3.1.1 Mobility: Total Transit Ridership

19,742,606 trips were made across Waterloo Region using Grand River Transit in 2017

Total transit ridership within the Region increased by 20,640 trips between 2011 and 2017 to over 19.74 million trips, which is slightly above ridership levels of 2011 (Table 1). On a per capita basis, the total transit ridership in the service area declined from 45.6 to 42.9 annual trips between 2011 and 2017. This indicates that on average, a person living in the service area would have taken 42.9 trips on the GRT in 2017.

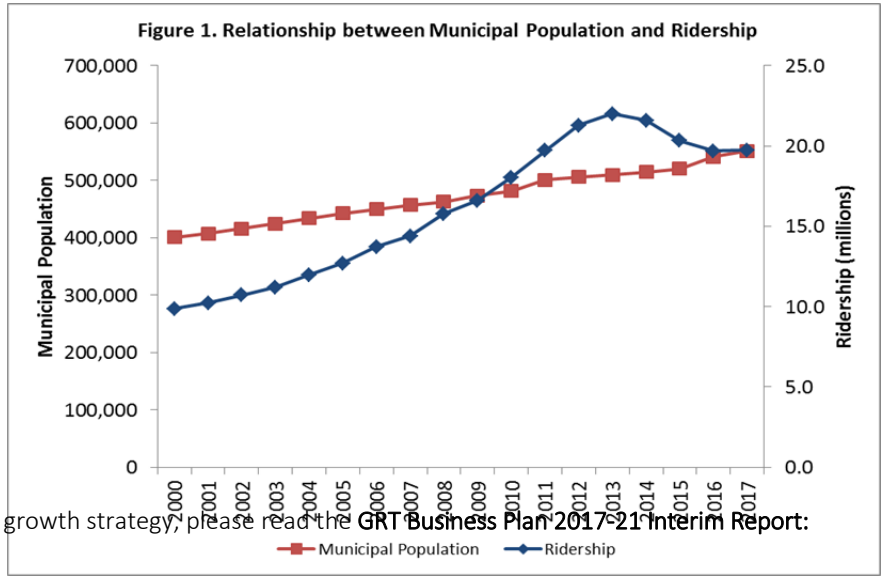
Table 1. Total Transit Ridership per capita within the Transit Service Area from 2011 to 2017

	2011	2012	2013	2014	2015	2016	2017	Growth (%)
Total Transit Ridership	19,721,966	21,274,042	22,000,737	21,596,989	20,327,109	19,691,267	19,742,606	0.1%
Municipal Population (for settlements with bus service)	500,700	505,920	509,445	514,611	520,670	541,395	551,598	10%
Transit Service Area Population	432,266	438,563	435,780	434,437	434,988	452,684	460,104	6%
Total Transit Ridership per capita (Service Area)	45.6	48.5	50.5	49.7	46.7	43.5	42.9	-6%

For 2017, there is stabilization with the completion of construction and return of normal routings schedules. With the planned service improvements in 2017-2021 with no fare increase planned for 2018 and launch of ION rapid transit, ridership is now expected to continually increase.[4]

A decline in transit ridership was experienced in 2014, 2015 and, at a much smaller rate, in 2016. As described in the Grand River Transit (GRT) Business Plan 2017-2021 Interim Report (TES-TRS-16-17, August 9, 2016), this decline was due to several factors: i) loss of school board funded high school trips; ii) service impacts due to construction detours; and iii) fare increases above inflation coupled with service reductions in 2013 and 2014. Other factors include lower fuel prices and perhaps transit trips shifts to ride-sharing services. The significant decrease in the rate of decline in 2016 with the slight increase in 2017 suggests that this trend may continue.

Figure 1. Relationship between Municipal Population and Ridership



[4] For information on service improvements to the regional transit network and planned ridership growth strategy, please read the GRT Business Plan 2017-21 Interim Report: http://www.grt.ca/en/aboutus/grtbusinessplan2017.asp

3.1.2 Mobility: Total Daily Transit Activity

61 per cent of the daily average transit activity in the Region occurred within the CTC in 2017

In 2017, there were 137,703 people per day who boarded or alighted a Grand River Transit (GRT) bus within the CTC, an increase of over 3,300 per day between 2016 and 2017 (Table 1). Due to improvements in the method of calculating the boardings and alightings by station, data is not comparable between the 2001-2015 datapoints and the 2016/2017 data.

Table 1. Total Daily Activity from 2011 to 2017

Scale	2011	2012	2013	2014	2015	2016	2017	Growth 2016-2017 (%)
CTC	**108,291**	**114,917**	**122,199**	**119,248**	**116,135**	**134,392**	**137,703**	**2.5%**
Not in CTC	53,839	61,243	59,133	68,371	68,233	76,546	87,848	14.8%
Region	162,130	176,160	181,332	187,619	184,368	210,938	225,551	6.9%

The CTC is continuing to capture more than half of the transit activity occurring within the Region (Table 2). In 2017, approximately 61 per cent of the total daily activity in the Region occurred within the CTC, indicating that six out of ten riders on transit travelling in the Region had gotten on or off a GRT bus stop within the CTC. Though the proportion of CTC activity to non-CTC activity has decreased, this is not indicative of a ridership decline in the CTC. Both CTC and non-ridership grew from 2016 however the ridership outside of the CTC grew at a faster pace. This can mostly be attributed to significant service improvements made in 2017 outside the CTC, such as the 201 and 202 iXpress routes changing from a 15-minute to 10-minute frequency. Future service improvements that will come from the network redesign in tandem with the launch of ION will likely see accelerated growth in the CTC.

Table 2. Distribution of Total Daily Activity within Region

Scale	2011	2012	2013	2014	2015	2016	2017
CTC	67%	65%	67%	64%	63%	64%	61%
Not in CTC	33%	35%	33%	36%	37%	36%	39%
Region	100%	100%	100%	100%	100%	100%	100%

3.1.3 Sustainable Modes of Transportation: Active Transportation

8.8 per cent of mode of travel share was pedestrian and cyclist in the CTC in 2016

The Transportation Master Plan (TMP) plans for various transportation modes to be used in different proportions known as mode shares. Mode shares represent the percentage of people using that mode to get around within any time of the day. The 2018 TMP has set a Region wide mode share target of 8.4 per cent for walking and 2.3 per cent for cycling for all trips made between 2:30 PM – 5:30 PM by 2031.

For the purpose of this report, the 2016 Transportation Tomorrow Survey (TTS) was used to determine the mode share for cycling and walking in the CTC. The TTS is a household travel survey for which a five per cent sample of residents within municipalities in the Greater Golden Horseshoe (GGH) are contacted and asked about the details of each trip taken by each member of their household during a selected twenty-four hour period. The cycling and walking mode share was computed for the people who live in the CTC. The results indicate an active transportation mode share of 8.8 per cent in the CTC, for 2016 as seen in Table 1.

Within the CTC, these results show an increase in walking mode share from four per cent in 2011 to 6.7 per cent in 2016, and an increase in cycling mode share from 0.9 per cent in 2011 to 2.1 per cent in 2016. These trends are much in line towards achieving the overall Regional mode share targets for cycling and walking set in the 2018 TMP.

Meanwhile for bus mode, gradual increase is evident and remains consistent with transit ridership results. However, possible hindrances would include the construction of the CTC and fare increase, as well as the appeal of car share businesses. The Region of Waterloo is committed to increasing transportation choice and promoting active living. The Region's 2018 TMP ensures transportation design choices will prioritize walking and cycling within future high-density growth nodes and transit station areas.

Table 1. Average Mode Share within CTC by years (TTS)

Mode	2011	2016	2031 Goal
Bus	5.0%	6.6%	-
Cycle	0.9%	2.1%	3.0%
Walk	4.0%	6.7%	9.0%
Auto Driver	72.0%	68.5%	-
Auto Passenger	16.0%	13.8%	-
School bus	2.0%	1.5%	-
Other	0.5%	0.7%	-

3.1.4 Sustainable Modes of Transportation: Walkability

57 per cent of the population living in the CTC lived in "very high" or "high" walkable areas in 2017

Approximately 107,786 people live in the Central Transit Corridor, of which 61,538 live in very high or high walkable areas in 2017. Over half (57 per cent) of the population within the CTC live in very high or high walkable areas while 34,653 (32 per cent) live in moderate walkable areas, and 11,595 (11 per cent) live in very low and low walkable areas in 2017 (Table 1). In the period between 2011 and 2017, there has been a shift in the proportion of the population living in high or very high walkable areas of the CTC from 55 per cent to 57 per cent. This shift resulted from population growth of 7,962 people in more walkable areas, compared to 1,502 in moderate and 1,424 growth in low walkable areas of the CTC.

Table 1. Estimated Population in Walkability Ratings within the CTC

Walkability Rating	2011		2012		2013		2014		2015		2016		2017	
	Population	%	Population	%	Population	%	Population	%	Population	%	Population	%	Population	%
Very High Walkable	22,676	23%	22,422	23%	22,582	23%	23,158	23%	23,360	23%	24,002	23%	25,047	23%
High Walkable	30,900	32%	31,401	32%	32,573	33%	33,578	33%	34,538	34%	34,704	34%	36,491	34%
Very High & High Walkable	53,576	55%	53,823	55%	55,156	56%	56,736	56%	57,898	56%	58,706	57%	61,538	57%
Moderate	33,151	34%	33,828	35%	34,141	34%	34,408	34%	34,356	34%	34,305	33%	34,653	32%
Low	4,417	5%	4,209	4%	4,264	4%	4,116	4%	4,521	4%	4,912	5%	5,841	5%
Very Low	5,563	6%	5,410	6%	5,617	6%	5,737	6%	5,778	6%	5,769	6%	5,754	5%
Low & Very Low	9,980	10%	9,620	10%	9,881	10%	9,853	10%	10,299	10%	10,681	10%	11,595	11%
Total Population in CTC	**96,707**		**97,270**		**99,177**		**100,997**		**102,553**		**103,692**		**107,786**	

Areas that are considered walkable are those that are characterized by residential land uses in proximity to a variety of destinations (retail, schools, etc.) and small block sizes that are conducive to walking. Residents living in more walkable neighborhoods have been shown to walk, cycle and use transit more and own fewer cars than those living in less walkable areas in Waterloo Region. Continuing population growth in very high or high walkable areas is helpful in creating safer, more vibrant communities, and is enhanced by more dense and mixed-use development, as well as greater

connections to the corridor. Research has also shown that increasing numbers of people walking and cycling in neighbourhoods decreases the incidence rates of collisions with motor vehicles.

3.2 Goal: Building Community

ION is a catalyst for building community in the CTC. Indicators that monitor the 'building community' goal of ION strive to tell a story about how the ION LRT system may influence social, economic, and environmental aspects in the CTC and contribute to change in the community. Measuring these dimensions provides snapshots of the ways people and the market may be adapting to a new higher-order transit service over the pre-and-post implementation phases of ION.

3.2.1 Vibrant Communities: Land Use Mix

70 per cent of Waterloo Region's land uses were found within the CTC in 2017

There were 193 unique land uses within Waterloo Region in 2017 of which 135 were found within the CTC. In other words, of all the types of land uses in Waterloo Region, 70 per cent of them can be found within the CTC. The number of land uses within the corridor has been relatively stable since 2011, with a net increase of four land uses from 131 in 2011 to 135 in 2017 (Table 1).

Table 1. Unique Land Use Codes in the CTC							
	2011	2012	2013	2014	2015	2016	2017
CTC	131	132	131	132	135	136	135
Region	191	192	190	190	196	194	193
Per cent in CTC	69%	69%	69%	70%	69%	70%	70%

In 2017, a new land use code was created for a new form of commercial use: 'Entertainment complex - with a large cinema as anchor tenant.' The property under this code is 225 Fairway Road South, across from the future Fairway LRT Station, which will consist of a variety of retail, office, and commercial uses. The property's previous land use code was 'Vacant Commercial Land'. Thirty-five properties in total which has been previously assessed as 'Vacant' (including vacant residential, industrial and multi-residential lands) are becoming developed within the CTC.

3.2.2 Vibrant Communities: Population

Over 18 per cent of the Region's residents were living in the CTC in 2017

Approximately 107,800 people lived in the CTC in 2017, representing 18.1 per cent of Waterloo Region's population. From 2011 to 2017, population within the CTC has been increasing at a faster rate (2.3 per cent annually) than the population outside the CTC (1.4 per cent annually) and across the Region as a whole (1.6 per cent annually) (Table 1).

From 2011 to 2017, the population of the CTC grew by over 11,000 residents. The number of residents in stage one has been increasing at 2.9 per cent annually over the same time period. Approximately 82,140 residents in the CTC were living in stage one in 2017, which is 14 per cent of the total population living within the whole Region. Stage one contained 76 per cent of the total population in the CTC in 2017. The remaining 24 percent, or 25,647 people, (4 per cent of the Region's total population) resided in stage 2. The average annual rate of population growth in the CTC is 2.3 per cent. These population figures include students who are living in Waterloo Region while they study at the local college and universities

Table 1. Population living within the CTC from 2011 to 2017 including students

	2011	2012	2013	2014	2015	2016	2017	Average Annual % Growth	Population Growth 2011-2017
Stage one	71,698	72,573	74,182	75,817	77,144	78,163	82,140	2.9%	10,442
Stage two	25,009	24,697	24,996	25,180	25,409	25,529	25,647	0.5%	638
Total in CTC	96,707	97,270	99,177	100,997	102,553	103,692	107,786	2.3%	11,079
Total Outside CTC	454,929	456,705	462,011	466,899	471,901	479,332	486,314	1.4%	31,385
Total in Region	551,636	553,975	561,188	567,896	574,454	583,023	594,100	1.5%	42,464
Per cent in stage one	74%	75%	75%	75%	75%	75%	76%		
Per cent in stage two	26%	25%	25%	25%	25%	25%	24%		
Per cent in CTC	**17.5%**	**17.6%**	**17.7%**	**17.8%**	**17.9%**	**17.8%**	**18.1%**		

3.2.3 Art and Culture: Restaurants

54 per cent of restaurants in the Region were located within the CTC in 2017.

In 2017, 559 restaurants were within the CTC, an increase of 52 restaurants (or 10 per cent) since 2011. Approximately 408 restaurants were within stage one, and 151 restaurants within stage two (Table 1). The distribution of restaurants has increased in the CTC between 2011 and 2017, with over half of the region's restaurants located in the CTC since 2011 (Table 2). Specifically, stage one experienced an increase in the number of restaurants, with an increase of 60 restaurants (or 17 per cent) during the time between 2011 and 2017.

Table 1. Number of Restaurants (2011-2017)

Scale	2011	2012	2013	2014	2015	2016	2017
Stage one	348	357	357	372	376	391	408
Stage two	159	161	162	162	157	149	151
CTC	**507**	**518**	**519**	**534**	**533**	**540**	**559**
Outside CTC	499	496	486	499	500	498	477
Region	1,006	1,014	1,005	1,033	1,033	1,038	1,036

Table 2. Distribution of Restaurants within the Region (2011-2017)

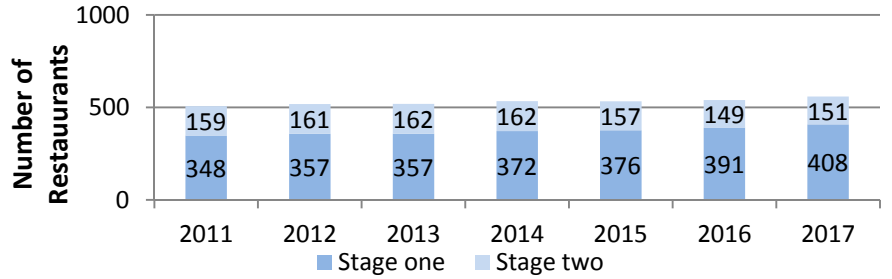
Scale	2011	2012	2013	2014	2015	2016	2017
Stage one	35%	35%	36%	36%	36%	38%	39%
Stage two	16%	16%	16%	16%	15%	14%	15%
CTC	**50%**	**51%**	**52%**	**52%**	**52%**	**52%**	**54%**
Outside CTC	50%	49%	48%	48%	48%	48%	46%
Region	100%	100%	100%	100%	100%	100%	100%

The vibrancy of the core areas is reflected in the density of restaurants in the CTC. In 2017, the density of restaurants per 1,000 people remained significantly higher in the CTC than elsewhere in the Region. In 2017, there were 5.2 restaurants per 1,000 people[5] in the CTC compared to 1.0 outside of the CTC (Table 3). The 2011 to 2017 data shows that number of restaurants reported to be operating within both stages of the CTC has generally increased, despite the ongoing construction within the corridor (Figure 1). Three restaurants that were impacted by ION directly in 2017 include Crabby Joes and Burger King on Fairway Road and the Corner Pub on Ottawa Street closed during 2017.

Table 3. Restaurants per 1,000 people (2011-2017)

Scale	2011	2012	2013	2014	2015	2016	2017
Stage one	4.9	4.9	4.8	4.9	4.9	5.0	5.0
Stage two	6.4	6.5	6.5	6.4	6.2	5.8	5.9
CTC	**5.2**	**5.3**	**5.2**	**5.3**	**5.2**	**5.2**	**5.2**
Outside CTC	1.1	1.1	1.1	1.1	1.1	1.0	1.0
Region	1.8	1.8	1.8	1.8	1.8	1.8	1.7

Figure 1. Number of Restaurants in the CTC (2011 - 2017)



[5] Please refer to the Population indicator to see the estimated year-end population numbers used to calculate the number of restaurants per 1,000 people from 2011 to 2017.

3.2.4 Heritage: Heritage Resource Retention

20 demolition permits were issued for formally recognized and pre-1920 built heritage resources in the CTC in 2017

In 2017, 20 demolition permits were issued for built heritage structures in the CTC, five of which were for a formally recognized resource (i.e., listed on the Municipal Heritage Register or designated under the Ontario Heritage Act) (Table 1). Of the 20 demolition permits, 16 were complete demolitions of the built heritage structure, 1 permit was for a near-complete demolition retaining only the designated heritage brick façade and there were three permits where either the work had not yet been undertaken (by 2018) or where the work was entirely within the heritage structure. These 20 demolition permits represent about 27% of the total demolition permits issued within the CTC in 2017. Eighteen of the demolition permits issued in 2017 were for heritage structures located in the Stage 1 section of the ION LRT project, and 2 were found within the Stage 2 section of the project (within the City of Cambridge).

Table 1. Number of Demolition Permits on Formally Recognized and Pre-1920 Heritage Buildings

Year	Stage one	Stage two	CTC	Formally Recognized (Listed/Designated)
2011	13	0	13	5
2012	34	2	36	2
2013	11	0	11	0
2014	9	0	9	1
2015	11	1	12	3
2016	17	0	17	1
2017	18	2	20	5
Total 2011-2017	113	5	118	17
Total 1995-2011	66	15	81	23

With the completion of the construction of Stage 1 ION LRT, none of the demolition permits issued for built heritage structures in 2017 were directly related to this project. It should be noted that the majority of permits were issued for reurbanization projects which may make the demolitions an indirect impact of rapid transit development. Please note that the spike in demolitions observed in 2012 (Table 1) was related to a road widening project.

Another unfortunately expected, but concerning trend, can be observed from demolition permit data. In the 16 years leading up to the Regional Council approval of the ION LRT project, the number of demolition permits issued for built heritage structures located within the CTC averaged roughly 5 per year. In the years subsequent to the approval of the ION LRT project, the number of demolition permits issued for built heritage structures within the CTC has increased to an average of 17 per year. Some examples of demolition permits issued for built heritage structures in 2017 include: 181 King Street South, Waterloo (the Brick Brewery); 168-180 Benton Street Kitchener; and, 600 Fountain Street North in Cambridge.

It is likely that the number of demolition permits issued for built heritage structures in the CTC will increase in the coming years with the construction of Stage 2 ION LRT.

Within the demolition permit data for heritage structures several observations were made that may require further research. With Provincial and Regional policy direction to increase reurbanization, particularly around LRT ION station areas, it could be expected that the demolition permits issued for heritage structures would result in the construction of higher density built form. However, in 2017, demolition permits were issued for three single detached residential heritage homes, in good repair, that were replaced with modern single detached homes. Additionally, a built heritage structure was demolished to permit the construction of a paved parking lot, and four other built heritage structures were demolished, and at the time of monitoring in August 2018, had yet to be developed. The last observation might reflect an unexpected interval necessitated by complex planning approvals. It could also reflect a trend that may require future policy intervention, to protect existing housing stock until approvals for a higher and better landuse are in place.

Table 2. Number of Demolition Permits on Residential and Non-residential Built Heritage Resources by Location and Building Type

	2011			2012			2013			2014			2015			2016			2017		
Scale	Res	Non-Res	Mixed-use	Res	Non-Res	Mixed-use	Res	Non-Res	Mixed-use	Res	Non-Res	Mixed-use	Res	Non-Res	Mixed-use	Res	Non-Res	Mixed-use	Res	Non-Res	Mixed-use
Stage one	11	1	1	27	5	2	10	1	0	9	0	0	9	2	0	14	1	2	14	3	1
Stage two	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0
CTC	11	1	1	28	6	2	10	1	0	9	0	0	9	3	0	14	1	2	16	3	1

3.2.5 Investment: Building Activity

$222 million in new building permits value was issued within the CTC in 2017

In 2017, building permit activity for new employment floor space and residential units within the CTC was estimated at $222.2 million, representing almost a quarter of the new construction in Waterloo Region. Of the building activity[6] in the CTC, approximately $93 million in construction value was for 1,118 new residential units, which represented a third of the total 3,229 residential units across the Region (Table 1). In the non-residential sector, $129.4 million was invested in industrial, commercial and institutional projects in the corridor creating over 590,000 square feet of new floor space, 27 per cent of the total new non-residential square feet across the Region.

Building permit construction value for new residential units and new employment floor space for the seven years between 2011 and 2017 in the CTC was $2.3 billion (Figure 1).

Specifically in 2017, there were 23 properties that had a non-residential building permit worth more than $1 million in the CTC, of which five had a building permit worth $10 million. This includes:

- $25 million permit for the expansion of the Student Life Centre and physical activities complex at the University of Waterloo,
- $21 million three storey office building located on Wes Graham Way adjacent to the Research + Technology ION stop in the David Johnston Research & Technology Park.

On the residential side, 14 properties had a building permit worth more than $1 million, of which five had building permits worth over $10 million. New residential developments include:

- 8 storey retirement residence in downtown Cambridge,
- 6 storey mixed use condominium,
- two 13 storey apartment buildings with ground floor commercial, all three of which are located on Sunview Street in the Northdale neighbourhood of Waterloo.

These new residential developments are a marker of continued intensified forms of housing and mixed use within the CTC

[6] Only building permits that are for new residential units or new employment space are monitored in this indicator. Other building activity such as renovation of existing space, façade improvements, or accessory buildings is in addition to these figures.

Table 1. Building Activity from 2011 to 2017 in the CTC Valued in Millions (Adjusted to 2011 dollars)

Structure Type	2011		2012		2013		2014		2015		2016		2017	
Residential	Value (MM)	Units	Value (MM)	Units	Value (MM)	Units	Value (MM)	Units	Value (MM)	Units	Value (MM)	Units	Value (MM)	Units
Singles	$4.2	13	$3.4	12	$3.1	11	$3.4	10	$1.5	5	$1.8	7	$4.3	13
Semi-detached	$0.2	1	$0.9	7	$1.3	6	$1.3	6	$0.5	2	$1.4	7	$0.9	3
Townhouses	$6.2	44	$26.8	179	$7.8	48	$14.7	92	$5.8	50	$5.3	55	$2.9	26
Apartments	$198.7	1147	$96.1	623	$127.1	624	$300.7	1623	$108.1	1096	$242.7	1791	$84.6	1076
Total	$209.1	1205	$127.2	821	$139.4	689	$320.1	1731	$115.9	1153	$251.3	1860	$92.8	1118
Structure Type	2011		2012		2013		2014		2015		2016		2017	
Non-Residential	Value (MM)	Sq.Ft	Value (MM)	Sq.Ft	Value (MM)	Sq.Ft	Value (MM)	Sq.Ft	Value (MM)	Sq.Ft	Value (MM)	Sq.Ft	Value (MM)	Sq.Ft
Commercial	$46.1	318,002	$45.5	392,408	$21.4	77,131	$40.5	176,871	$81.4	519,751	$41.9	134,373	$53.5	294,502
Industrial	$8.5	3,600	$2.4	20,909	$3.7	29,349	$14.5	8,818	$8.3	115,860	$12.1	54,736	$18.6	68,376
Institutional	$227.2	121,503	$87.3	269,053	$62.8	236,186	$173.2	321,145	$53.1	155,164	$2.6	14,530	$57.3	228,047
Total	$281.8	443,105	$135.3	682,370	$88	342,666	$228.2	506,834	$142.8	790,775	$56.6	203,639	$129.4	590,925
Total Value	$490.9		$262.4		$227.3		$548.2		$258.7		$307.9		$222.2	

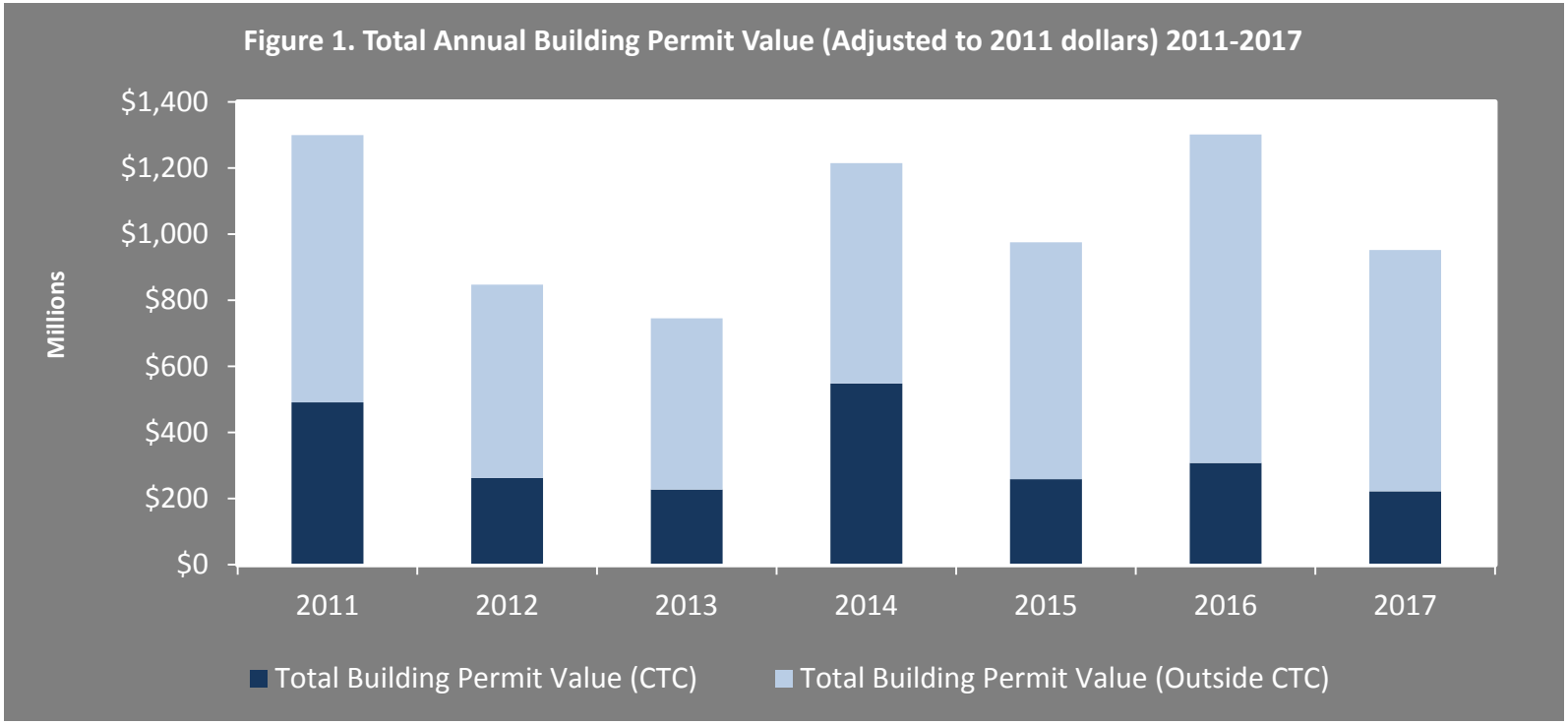


Figure 1. Total Annual Building Permit Value (Adjusted to 2011 dollars) 2011-2017
Millions
$1,400
$1,200
$1,000
$800
$600
$400
$200
$0
2011
2012
2013
2014
2015
2016
2017
Total Building Permit Value (CTC)
Total Building Permit Value (Outside CTC)

3.2.6 Investment: Assessment Value

Property in the CTC was valued at $14.7 billion in 2017

Assessment values have been on the rise since 2011 for both the CTC and the Region (Table 1). An increase in property assessment values may indicate a relationship between the investment in ION and economic growth within the corridor. There have been a number of new high value and high quality developments as well as renovations of existing buildings as evidenced by the current growth in assessment value from $10 billion in 2011 to $14.7 billion in 2017. This is an increase of an average of $674 million (6.8 per cent) annually from 2011 to 2017 (Table 2).

Table 1. Assessment and Tax Revenue in CTC from 2011 to 2017 (in millions of dollars)

Scale		2011	2014	2015	2016	2017
Stage One	**Assessment Value**	$6,901.2	$8,485.7	$9,030.1	$9,804.9	$10,710.4
	Tax Revenue	$88.9	$94.6	$104.6	$112.1	$121.8
Stage Two	**Assessment Value**	$3,081.6	$3,559.0	$3,720.1	$3,815.7	$3,990.5
	Tax Revenue	$44.7	$44.6	$50.5	$51.7	$54.0
CTC	**Assessment Value**	**$9,982.8**	**$12,044.6**	**$12,750.1**	**$13,620.6**	**$14,700.9**
	Tax Revenue	**$133.5**	**$139.2**	**$155.1**	**$163.8**	**$175.7**
Outside CTC	**Assessment Value**	$44,330.8	$53,601.6	$56,351.5	$58,968.6	$61,828.7
	Tax Revenue	$489.1	$548.0	$581.9	$602.9	$627.4
Region	**Assessment Value**	$54,313.5	$65,646.3	$69,101.6	$72,589.3	$76,529.6
	Tax Revenue	$622.6	$687.2	$737.0	$766.7	$803.1

Table 2. Assessment and Tax Revenue Change from 2011 to 2017					
Scale		**Change from 2011 to 2017 (millions)**	**Per Cent Change**	**Average Annual Change (millions)**	**Average Annual Per Cent Change**
Stage One	**Assessment Value**	$3,809.1	55.2%	$544.2	7.9%
	Tax Revenue	$32.9	37.1%	$4.7	5.3%
Stage Two	**Assessment Value**	$909.0	29.5%	$129.9	4.2%
	Tax Revenue	$9.3	20.7%	$1.3	3.0%
CTC	**Assessment Value**	**$4,718.1**	**47.3%**	**$674.0**	**6.8%**
	Tax Revenue	**$42.2**	**31.6%**	**$6.0**	**4.5%**
Outside CTC	**Assessment Value**	$17,498.0	39.5%	$2,499.7	5.6%
	Tax Revenue	$138.3	28.3%	$19.8	4.0%
Region	**Assessment Value**	$22,216.1	40.9%	$3,173.7	5.8%
	Tax Revenue	$180.5	29.0%	$25.8	4.1%

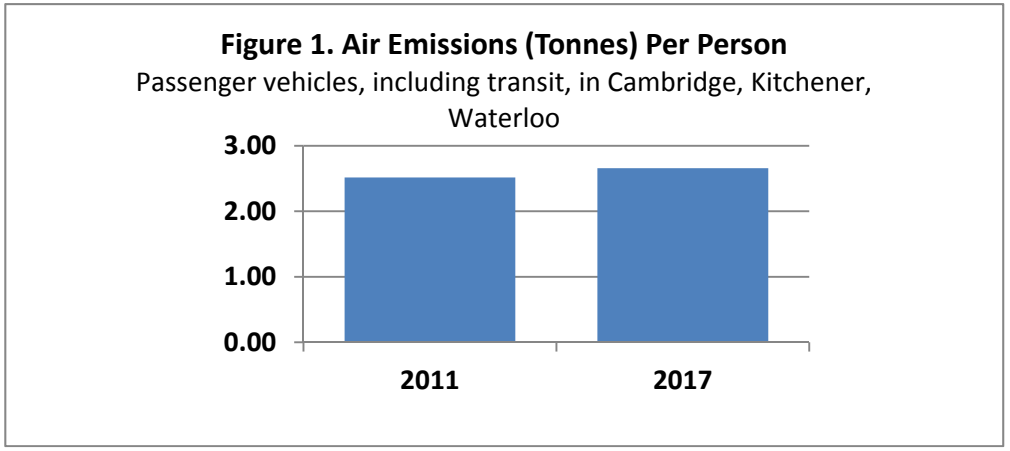
Municipal taxes (regional and area municipal) generated on properties within the CTC were estimated at $176 million in 2017. Between 2011 and 2017, the change in taxes generated was 31.6 per cent within the CTC, resulting in a yearly average rate of change of 4.5 per cent (Table 2). Stage one had a 37.1 per cent increase in taxes generated over six years, surpassing stage two ION and outside the CTC which had a 20.7 per cent and a 28.3 per cent increase in taxes generated respectively.

While assessment value is a good indicator of the change in value of properties, not all changes in assessment result in an increase in taxes generated. Reassessments and the resulting assessment phase-ins are included in the year-to-year assessment change; however, reassessments do not generate additional property tax revenue. Additionally, several of these new/improved buildings (such as hospitals or municipal buildings) will not generate taxes due to their tax-exempt status. Of the $14.7 billion total assessment value in the CTC in 2017, $2.0 billion was on tax-exempt properties. As a result, the taxes generated in the CTC increased at a lower rate than the change in taxes generated across the Regio

3.2.7 Environment: Emissions

2.66 tonnes per person of net air emissions was seen from local passenger transportation in Cambridge, Kitchener and Waterloo in 2017

There was a 6 per cent increase in emissions per person from local passenger transportation from 2011 to 2017.This equates to 2.66 tonnes of air emissions for each person in the three cities in 2017 compared to 2.52 tonnes in 2011 (Figure 1). Multiplied by a growing population of 7.3 per cent over the same period, the total air emissions grew to 1.4 million tonnes in 2017 from 1.2 million tonnes in 2011, a 13.4 per cent growth over those 6 years.



The change in emissions between 2011 and 2017 is still as expected until the ION becomes fully operational in 2019. It is anticipated that it will take a few complete years of ION service to allow the impact of the LRT system to influence local transportation choices and associated emissions. Therefore, increases in emissions from local transportation in the three cities are likely to continue for a couple more years until use of local transit and non-motorized transportation modes increase more substantially as the Region invests in infrastructure to support this shift. Another potential downward influence on emissions could be observed in the near future as more automobile drivers switch to alternatively fuelled cars such as electric vehicles, which have zero tailpipe emissions. A noticeable downward emission trend could be seen in future CTC monitoring reports if increases in transit ridership become greater than the growth in vehicle kilometers travelled by private motorized passenger vehicles registered within Waterloo Region. Increases in localized use of car sharing and ride sharing services along with more trips made by cycling and walking will also help drive down emissions per person over time if it is a part of a shift away from using motorized modes of local travel.

This indicator estimates changes in air emissions from passenger transportation (i.e. non-freight) originating within the Cities of Cambridge, Kitchener and Waterloo. Emissions included in this indicator are Carbon Dioxide (CO_2), Methane (CH4), Nitrogen Oxides (NOx), Carbon Monoxide (CO), Volatile Organic Compounds (VOCs), Particulate Matter (PM) and Sulphur Dioxide (SO_2). Emission calculations are estimated based on local vehicle registrations, estimated kilometers travelled and fuel consumption for cars, SUVs, pick-ups, school buses, motorcycles as well as Grand River Transit vehicles.

3.2.8 Crime and Safety: Perception of Safety

64 per cent of people in Cambridge, Kitchener and Waterloo perceive that their downtown communities are safe at night in 2017

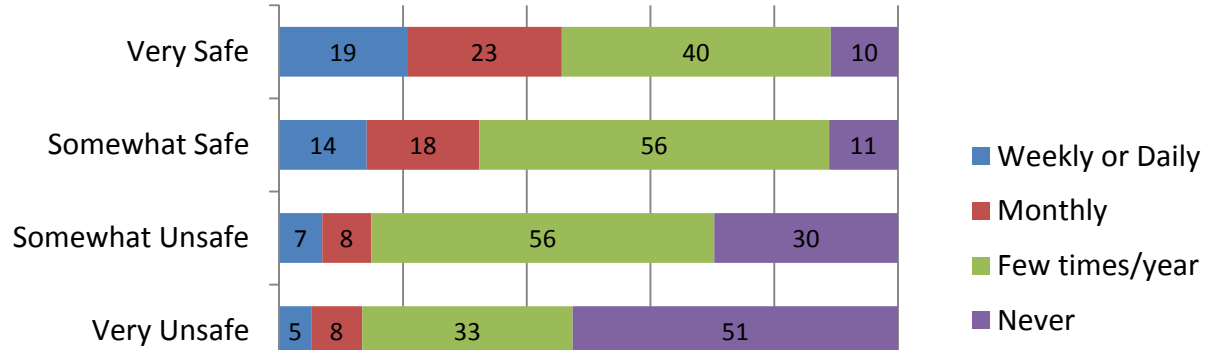
In 2017, 15 per cent of respondents felt very safe in their downtown area at night, while 49 per cent felt somewhat safe (Table 1). Twenty-five per cent of the respondents felt somewhat unsafe and 11 per cent felt very unsafe. When very safe and somewhat safe are combined, a total of 64 per cent of people feel their downtowns are safe in 2017, compared to 65 per cent in 2011, a statistically negligible difference.

Table 1. Perceptions of Safety in People's Downtowns

Year	Very safe	Somewhat safe	Somewhat unsafe	Very unsafe
2011	19%	46%	25%	10%
2017	15%	49%	25%	11%

The more often people visit the downtown at night, the higher the feelings of safety they report about being in the downtown at night. A significant difference on the 'feelings of safety in the downtown' scale was found based on respondents' reported frequency of visits to the downtown at night (Figure 2). The more often respondents report to visiting the downtown at night, the higher the feelings of safety they report about being in the downtown at night. In particular, the biggest difference was seen between those who report to "never" go to the downtown at night and those who visit the downtown at any frequency, even if it is just once or twice per year.

Figure 2. Feelings of Safety in the downtown at night by frequency of visits to downtown at night (CKW only, N=341)



*The data has been weighted to adjust for the demographic profiles of Cambridge, Kitchener and Waterloo (CKW)

3.2.9 Crime and Safety: Police Calls for Service

43 per cent of police calls for service related to potential public perception of safety occurred within the CTC in 2016[7]

There were just over 47,000 calls for police service within Waterloo Region in 2016 that were identified as potentially being related to public perception of safety, and of those, approximately 20,797 calls (43 per cent) took place within the CTC (Table 1). The subset of police calls for service that are included in this count are those that a member of the public might notice, such as graffiti, intoxicated person, or break and enter (See Appendix D).

Police calls for service do not necessarily represent actual criminal activity; the majority of calls for service that police respond to are not criminal in nature. However, the selected calls for service are tracked in this report as they may affect public perceptions of safety.

Table 1. Percentage of Police Calls for Service Related to Potential Public Perception

Scale		2011	2012	2013	2014	2015	2016	Average Annual Change (%)
CTC	Number of Calls	17,024	17,549	17,601	17,447	19,097	20,724	**5.4%**
	% in CTC	**40%**	**41%**	**43%**	**43%**	**42%**	**43%**	
Outside CTC	Number of Calls	25,400	25,299	23,738	23,562	25,908	27,049	**1.6%**
	% outside CTC	**60%**	**59%**	**57%**	**57%**	**58%**	**57%**	
Region	Number of Calls	42,423	42,847	41,339	41,009	45,004	47,773	**3.2%**

The number of selected calls for service made within the CTC has been relatively consistent, experiencing an increase since 2011 (5.4 per cent annually), however it remains consistently less than half of all the calls made within the Region. Four of the top five citizen generated call types to experience the greatest growth (by number of calls) across the Region between 2014 and 2016 are included in the subset of call types monitored in this indicator. The increases in the selected calls for service within the CTC may be due to a variety of factors: population growth, changes in police procedures, and increases in citizen engagement and reporting. On a per capita basis, there were 19.2 calls per 100 people living in the CTC in 2016 (Table 2). The number of calls made per 100 people living in the CTC has been relatively consistent, increasing by about 2.3 per cent per year since 2011.

[7] 2016 was the most recent year for which data was available at the time of the writing of this report

Table 2. Police Calls for Service Related to Potential Public Perception per 100 People

Scale		2011	2012	2013	2014	2015	2016	Average Annual Change (%)
CTC	Calls within CTC	17,024	17,549	17,601	17,447	19,097	20,724	5.4%
	Population within the CTC	96,707	97,270	99,177	100,997	102,553	107,786	2.9%
	Calls per 100 people in CTC	**17.6**	**18.0**	**17.7**	**17.3**	**18.6**	**19.2**	**2.3%**
Outside CTC	Calls outside CTC	25,400	25,299	23,738	23,562	25,908	27,049	1.6%
	Population outside the CTC	454,929	456,705	462,011	466,899	471,901	486,314	1.7%
	Calls per 100 people outside CTC	**5.6**	**5.5**	**5.1**	**5.0**	**5.5**	**5.6**	**-0.1%**
Region	Calls within Region	42,423	42,847	41,339	41,009	45,004	47,773	3.2%
	Population within Region	551,636	553,975	561,188	567,896	574,454	594,100	1.9%
	Calls per 100 People within Region	**7.7**	**7.7**	**7.4**	**7.2**	**7.8**	**8.0**	**1.1%**

For 2017, 'calls for service' data were further examined for each occurrence type. An occurrence type is the recorded incidence for each call that is made and remains as an attribute associated with the call. The number of calls for each type has been identified for each reported year (2011-2016) to display trends of call types in stage one and stage two of the CTC as well as outside the CTC. One particular type identified as trending upward is Unwanted Person. Within the CTC, there were 1475 calls in 2011 and 3625 in 2016 (146 per cent increase) and in stage two, an increase from 492 in 2011 to 1440 in 2016 (193 per cent increase). Outside the CTC similarly experienced an increase, from 1689 in 2011 to 3050 in 2016 (81 per cent increase).

It should be noted that a single call might cover a variety of different types. Communicators do categorize the most appropriate initial call type for each dispatch based on the information made available. Officers who are involved in a call are responsible for closing the call with the most appropriate occurrence type. The relevant and critical information about the involved persons and the situation goes into the report so it is captured, however this is usually under one occurrence and one occurrence type. Due to how the occurrence is captured, there may be some variation in the types being reported.

4. Monitoring Housing Affordability in the Central Transit Corridor

Each year, the CTC monitoring program focuses on an area of interest and explores that area through the development of additional indicators. This year, the theme is housing affordability. Research suggests that the presence of an LRT system can impact housing affordability along transit corridors.

4.1 Changes in housing in the CTC

Since the announcement of ION in 2011, investment in the corridor around the route has been strong[8], resulting in many new high- and medium-rise condominiums and rental apartments. Over 8,500 new units have been created in the CTC since 2011. The number of residents has increased by over 11,000 people, which is a growth rate of 2.3 per cent annually, almost double the growth rate outside the CTC (1.4 per cent annually).

Both rental units and condominium units are being created. The target market for many of these new housing developments includes downsizing homeowners (often of the baby-boom generation), young professionals (often employed in the burgeoning high-tech sector whose workplaces are frequently located in the corridor in or near the ION station areas), and students.

To date, most new housing has been clustered in Uptown Waterloo, Northdale, and in the Innovation Area of Kitchener. Elsewhere in the corridor, there are positive signs of forthcoming new housing such as the redevelopment of the former Maple Leaf Foods site located near the Borden station and the Gaslight development in Galt.

4.2 Housing costs in Waterloo Region

The examination of housing affordability in the Central Transit Corridor requires recognition of some of the broader regional trends in housing affordability. According to the Canada Mortgage and Housing Corp. (CMHC), house prices in Waterloo Region are influenced by the housing market in the Greater Toronto Area (GTA). Over the past few years, the GTA has experienced significant house price increases. These increases have been motivating some buyers to purchase more affordable homes in surrounding municipalities, driving up prices in those communities. In the past, house price spillovers from the GTA were mainly prevalent in Hamilton, Barrie, and Guelph. More recently, such house price spillovers have been occurring farther out to include communities in Niagara Region and Waterloo Region.

[8] Investment in the CTC has been due to a number of factors in addition to the ION announcement, including the core exemption area funding, an interest in downtowns and adaptive reuse building, the growth of the tech-sector, as well as programs such as the City of Kitchener's economic investment strategy.

The peak of the housing market in the Kitchener-Cambridge-Waterloo area occurred in April 2017, according to CMHC. From that same month a year earlier, the average Multiple Listing Service house price increased from $367,000 to $507,000. In June 2017, the previous government introduced a series of measures under its "Fair Housing Plan" to help stabilize the GTA housing market. While these measures led to a sharp decrease in average housing prices in Waterloo Region, the average condo apartment sale, which had increased from approximately $200,000 to $275,000 over the period from 2011 to 2017, has been reported at over $300,000 in 2018 according to the local association of realtors.

According to CMHC, house prices in Waterloo Region are expected to continue to rise at a steady rate, but will be tempered by the declining interest from home buyers from the GTA. Price increases could also be moderated by the Federal government's new mortgage "stress tests" that took effect in January 2018. The new mortgage rules have reduced the amount potential homeowners can afford to borrow by approximately 20 percent, putting downward pressure on house prices.

4.3 Rental Costs in Waterloo Region

With respect to the rental market, the average rent was 5.7 per cent higher in 2018 than the previous year, well above the 1.8 per cent provincial guideline increase. At the same time, there was an increase in supply of 1,666 rental units in 2018 across the Region. Waterloo Region has experienced relatively low vacancy rates over the past 20 years, however, according to CMHC's 2018 Rental Market Report for the Kitchener-Cambridge-Waterloo Census Metropolitan Area, the overall vacancy rate increased to 2.9 per cent in October 2018, up a percentage point from 1.9 per cent in 2017. CMHC partially attributes this increase to the fact that the increase in supply of new rental housing outpaced new demand. A three percent vacancy rate is generally considered the target for a healthy rental market.

4.4 Affordability: Relationship of Housing Costs to Income

The affordability of housing is the relationship of a household's income to the cost of housing. At the same time as the cost of housing is increasing, household incomes have been stable across Waterloo Region. Median household income for Waterloo Region increased from $76,327 in 2005 to $77,530 in 2015. This represents a 1.6 per cent increase over the last 10 years.

However, specifically in the corridor, the median incomes have been increasing at a higher rate than the Region in general. Uptown Waterloo's median income has increased from $49,464 in 2005 according to Census data, to $68,651 in 2015. Similarly, downtown Kitchener's median income has risen from $29,101 to $41,088. Galt's median income, which was higher in 2011 than the other core areas, has remained stable.

The increase in median income in the downtown areas of the corridor is likely related to the arrival of new residents who are choosing to live in the corridor, rather than rising incomes for those currently living there, although Census data does not provide information that can identify the incomes of existing residents from those who move into the CTC.

4.5 Measuring affordability: housing transactions

To track the affordability of housing as an annual indicator of change, the CTC monitoring program uses the indicator 'Affordability of Home Ownership Transactions'. This indicator measures the housing transactions that are affordable to low and moderate income households in the CTC. 'Housing transactions' is used as the indicator of housing affordability in the monitoring program's annual report because data is available each year to measure ownership costs for transactions in the CTC, whereas other data such as rental data is not available annually at a CTC-level basis.

The CTC monitoring indicator measuring the price of housing purchases over time has been showing that over half (55 per cent to 57 per cent of transactions) have been considered affordable to low- and moderate-income households since 2011. However, in 2017, the price of housing in the corridor (as well as elsewhere across the Region) increased more quickly than incomes, resulting in only 33 per cent of transactions in 2017 being affordable to low- and moderate- income households.

This 'affordability of home ownership transactions' is a complicated indicator to understand. The formula is set out in the Provincial Policy Statement (PPS), and uses either the average regional transaction value (less 10 per cent) of a resale unit OR the purchase price for which a low-to-moderate household would not have to pay more than 30 per cent of their gross household income on annual shelter costs, whichever one is lower (low-to moderate income earners have incomes in the lowest 60 per cent of the income distribution). In a situation where the incomes are high relative to average purchase price, the indicator requires measurement of affordability based on the purchase price. When the reverse is true, and the cost of housing is higher, the income for which a low to moderate household would spend less than 30 per cent on housing is used.

In the years 2011 to 2016, this monitoring report used the 'transaction approach' to measure affordability, because it was the lower of the two approaches. Using this measure, we saw that that between 55 and 57 per cent of transactions in the corridor were affordable to the lowest 60 per cent of households in the income distribution living in the area.

However, in this 2017 report, the lower of the two approaches is the 'income approach.' The important thing to understand about this method is that it focuses on the ability of low- to medium-income earners to use a reasonable fraction (30 per cent) of their income to pay for their housing purchase. When those low- and medium-income earners pay more than 30 per cent of their incomes on housing, then the indicator tells us that their housing purchase was unaffordable, whether or not the purchaser intentionally chose to spend a higher proportion of their income. For low- to

medium-income people who live in the CTC, that amount is about $350,000 dollars[9]. When we look at the transactions within the CTC, only 33 per cent of the transactions were below $350,000. In other words, 60 per cent of the households in the CTC would be able to afford only 33 per cent of the transactions.

Seemingly, this mismatch (between the 60 per cent of households who could afford to spend up to $350,000 on housing, and the 33 per cent of units that are available below that price level) is an issue. However, we know from the increase in the median income over time of people living in the CTC that there are people moving into the area that have a higher income profile than those previously living in the area. The evidence is that the median income of people living in the downtown cores of the CTC, which is the income amount at which half of the households earn less than this amount, and the other half earn more, rose almost 20 per cent from 2005 to 2015. Similarly the median income of the residents across the whole Region rose only 20 per cent. This rapid increase in median income in the CTC is not likely due to rising incomes of people living in the area, but more likely primarily due to the arrival of new residents who have higher incomes than the previous median. Therefore, the new arrivals (who would primarily be those that are participating in the housing transactions in the corridor as they buy in to the area) would likely be able to afford higher housing prices than the $350,000 mentioned in the previous paragraph. Therefore, while this provincially-defined calculation method likely works well in a 'closed system' in which residents of an area are those who would be buying houses, and low- to medium-income earners would need access to housing at an affordable level relative to their income, it may not be as accurate in a situation in which new housing is coming onto the market simultaneously with new residents arriving in the area.

4.6 Measuring affordability: market rental housing, supported rentals and community housing

To broaden the concept of affordability to include different segments of the population, this report goes beyond measuring the affordability of home purchasers. It examines the situation for people who rent housing, because they are generally more vulnerable to increases in housing prices. It also looks at the most vulnerable of our residents, those who either require assistance to pay market rents, or are housed in 'community housing' funded by the Region of Waterloo, a not-for-profit housing corporation, or by a landlord receiving government funds to offset rent for qualified low-income earners.

Framing questions were created and indicators were developed against these questions to ensure that they were representing important aspects of affordability within the CTC. The framing questions selected for the analysis of the theme were as follows:

- If affordability is changing in the CTC, is it changing differently than in the rest of Waterloo Region?
- Is affordability in the CTC a concern? If so, are some residents affected more than others?
- Are affordable units disappearing? Are new affordable units being created?

[9] The income of the bottom 6th decile in 2015 was $94,900, which translates into an ability to pay up to $349,500

In determining which indicators to include for the theme of affordability, several criteria were considered: the indicators needed to be associated with the change through the advent of ION, there needed to be reliable data available to measure each indicator and the data had to be available for the area encompassed by the CTC. Three additional affordability indicators were developed: Renter Affordability; Supply of Community Housing; and the Location of Housing Allowances (Table 1).

Table 1. Affordability Indicators

Opportunity	Dimension	Indicator	Metric	2011	2012	2013	2014	2015	2016	2017
Building Community	Inclusive Community	Affordability of Home Ownership Transactions	Per cent of housing transactions which were affordable to low and moderate income households in the CTC	55%	56%	53%	54%	57%	57%	33%
		Renter Affordability	Per cent of renters spending less than 30% of their household income on shelter related costs in the CTC	64%					61%	

		Supply of Community Housing	Number of community housing units in the CTC	2,687	2,610	2,631	2,631	2,633	2,645	2,645
		Location of Households Receiving Rent Assistance	Per cent of 'Housing Allowance with Supports' (HAWS) in the CTC					50%	60%	56%

The results of this analysis show:

- There was a lower percentage of housing purchases that were 'affordable' (below the affordability threshold) in 2017 than in previous years, and an increasing percentage over time of renters in 'unaffordable' situations (paying more than 30 per cent of their income in rent) in 2016;
- The number of Region-funded community housing units in the corridor has remained stable, sitting at 2,645 units in the CTC in 2017.
- The percentage of people who receive housing allowances to rent at market rates has not declined in the CTC. The significance of this is that these people, who are considered to be vulnerable in their ability to afford housing, are seemingly not 'getting pushed out' of the CTC.

From the evidence produced for this report, it is too early in the implementation of ION to report any clear indications of associated housing affordability issues. Housing prices have increased in the CTC, but so have the median incomes as new residents are attracted to the area. This increase in the number of people living in the corridor is an intended result of the investment in ION and has the benefit of bringing vibrancy to the area. Housing affordability has decreased in the corridor, as it has across Waterloo Region and the Greater Toronto and Hamilton Area (GTHA). Whether existing residents are being 'pushed out' of the corridor, or potentially 'pushed along' the corridor to areas that remain more affordable than the downtown cores, is not yet clear. Having developed these expanded affordability indicators will allow for on-going monitoring of the corridor, to ensure awareness and to allow for supports to be targeted to areas of most need.

4.7 Affordability is complex and driven by a number of interrelated factors and behaviours

Measuring housing affordability is complex, and is driven by a number of interrelated factors and behaviours including the demand and supply of housing, land costs, local and external markets, wages, demographics, household formations, personal preferences, location of employment, and transit options. The indicators selected for the themed indicator do not explore the relationships between these factors, however they do provide a broader understanding of different segments of the population who are encountering affordability challenges and whether this occurs to a greater extent within or outside the CTC. The indicators also look at how housing affordability challenges are changing over time in the CTC.

4.8 Definitions of Affordability

Housing affordability can be viewed from different perspectives and approaches. Housing in the Region is provided by private, public, cooperative, and not-for-profit sectors and includes both owner and renter-occupied housing. The indicators selected for this theme fall under different parts of this housing continuum and broaden our understanding of affordability within the CTC by including an analysis of renter affordability, subsidized Community Housing Units as well as private owner-occupied units.

Two definitions used in this report include the PPS definition of "Affordable" and the Statistics Canada definition that uses a shelter-to-income ratio. Both definitions are based on a housing affordability threshold. Under the PPS definition an affordable house (or rental unit) is the least expensive of two calculations, one based on income and the other based on the regional housing market. Statistics Canada's shelter-to-income ratio defines a house (or rental unit) as affordable if the proportion of average monthly income that is spent on shelter costs is less than 30 per cent.

4.9 Affordability and Gentrification

A concern with the changes happening in the CTC is the potential for "gentrification" to occur. Much academic literature is dedicated to understanding the drivers and impacts of gentrification. One driver of gentrification is transit investment. Studies have shown that higher order transit has attracted higher income populations to station areas. As demand for housing in these areas increases, increasing property values typically follow. Investment in transit infrastructure also signals an investment in the area itself, which can attract more people and spur further demand for local amenities and services. A concern with gentrification is the potential to displace low-income populations who originally lived in the area. These are people who stood to gain positively from the increase in transit accessibility but potentially find themselves in a position where they can no longer afford the cost of housing or new amenities that are often passed down through increased rents.

Within the CTC there are indications of gentrification, particularly in certain station areas. Visible signs include the construction of several condominium, rental housing and commercial developments. Other indicators support the case for gentrification as well. Since 2011, when LRT was approved by Council, building permit investment and property assessment values have increased in the CTC. The 2016 Census provides further evidence. A look at household income by census tract shows that most census tracts that intersect the CTC have seen increases in the median household income between 2006 and 2016. Census tracts that comprise most of the cores of Waterloo and Kitchener, where construction of Stage 1

of ION was completed in 2017, have seen increases in median household income of 18 and 20 per cent respectively compared to an overall Regional increase in household income of 1.6 per cent. All of these changes suggest that gentrification is taking place within the CTC.

While gentrification may be occurring, it is less clear whether displacement of residents is occurring as a result. Rising incomes within the CTC suggest an influx of more affluent people but does not conclude that less affluent people are being pushed out of the CTC. While the census can be used to see changes in average incomes and in other demographic characteristics, it provides only averages (or medians) of the area and not longitudinal data for tracking the movement of specific residents. Rising median incomes as a result of the arrival of higher earners in new condos or apartments can occur without the displacement of existing residents. Similarly, an increase in average rents may be due to new units coming onto the market without necessarily significantly changing the rents of existing units.

4.10 What does the literature tell us?

The 2011 CTC Baseline Monitoring Report published in November 2015 included a literature review of the connections between LRT and Housing Affordability. Titled **"Housing Affordability Impacts of LRT and TOD"**[10] by Babin, R and Moos, M. (2015), the literature review explored definitions of affordability and associations between economic theory, gentrification and LRT.

4.10.1 Housing Affordability Impacts of LRT and TOD Authors: Babin, R. & Moos, M.[11]

The Canadian Mortgage and Housing Corporation (CMHC) (2014) defines affordable housing as housing, owned or rented, that costs the household less than 30 per cent of their before-tax income. However, higher income earners who spend more than 30 per cent of their income on housing may not necessarily be experiencing affordability concerns. It is therefore commonplace to employ both affordability and income thresholds when examining the extent of affordability concerns. Housing affordability pressures are generally most harshly felt by low and middle-income households (Glanville, 2013). Housing affordability needs to be distinguished from 'affordable housing' that is sometimes used to describe subsidized or otherbelow-market-rate housing.

It is important to note that transportation costs also affect housing affordability. Thus, the concept of 'location affordability' holds promise in portraying a more accurate picture of being able to afford to live in a particular location by accounting for expected transportation costs as well as housing costs —although data used to measure location affordability are generally more difficult to come by than traditional housing affordability measures. Location affordability can be seen as the incorporation of the location efficiency concept, which will be discussed further in this review, into affordability measures.

Due to data limitations, housing affordability it often assessed by comparing average incomes to the average cost of home ownership, generally at a city-wide or regional level. This metric is called the price to income ratio (PIR) (Lin, Chang, & Chen, 2014). Desjardins has developed a housing affordability index similar to PIR, which uses the ratio between average household disposable income and the qualifying income needed to secure a mortgage and pay for property taxes. The latest of their reports indicate a slight increase in affordability in the Kitchener metropolitan area in the first quarter of 2015 (Desjardins, 2015)[12].

[10] "Housing Affordability Impacts of LRT and TOD" is available is available on the Region of Waterloo's website at: https://www.regionofwaterloo.ca/en/resources/Monitoring_Change_in_the_CTC__Baseline_Report-June-Update.pdf (pgs 95-102)
[11] A complete reference list is available in Appendix D
[12] See Addendum at the end of this section for the 2018 Dejardins Affordability Index

While this index, and other PIRs, identifies Kitchener as affordable, it deals only with average values across the metropolitan area. It does not explicitly identify spatial variations in affordability, it does not differentiate between owners and renters, nor does it consider affordability issues experienced by different kinds of demographic groups. Therefore, perhaps not surprisingly, aggregate PIRs using median values have been found to underestimate housing affordability concerns for low-income residents (Gan & Hill, 2006). Lin, Chang, & Chen (2014) recommend investigating micro-PIR, which involves identifying PIRs for individual properties and households rather than entire metropolitan areas or cities. The individual/household level approach, considering affordability for different populations, is considered best practice in housing research in general.

Housing suitability also requires consideration in the context of affordability policy—a particular property may 'look' affordable from a cost perspective but may not be suitable to all demographic groups and household types (e.g., a studio apartment might be affordable to a middle-class, two-earner household with children but would likely not be considered suitable in terms of size). In this report, we discuss housing affordability in a more general sense and make use of specific definitions when necessary.

LRT, and TOD in general, can impact housing affordability by increasing the value of a particular location. This increases land and housing costs, thus making LRT-served locations less affordable. Densification near LRT stations and in TOD also contribute to the development of smaller housing units, impacting the suitability of housing near LRT for larger households. This section will outline some of the research documenting these effects. Voith and Wachter (2009) argue that growth is the predominate source of affordability issues in contemporary cities, attributing this growth to many simultaneous socio-economic processes including the transition from a manufacturing to a knowledge-based economy and a growing desire by residents to live, work, and recreate locally.

Housing costs are partly a function of land costs, which are determined by location. The growing amenity provision in cities, and people's desire to live near them, are thus contributing to increasing housing costs. Addison, Zhang, and Coomes (2013) add that growth management strategies carried out by municipalities can lead to undesirable affordability outcomes for low and moderate-income residents, although in general the impact of growth boundaries on housing costs remain contested.

The research suggests that affordability is directly related to the presence of an LRT and station area planning, although the net effects of this relationship are neither clear nor straightforward to identify. A number of hedonic studies have found and explained significant positive price effects on residences near transit stations as well as within communities that contain elements of TOD (Baum-Snow & Kahn, 2000; Cervero & Duncan, 2002; Dziauddin, Powe, & Alvanides, 2014; Hess & Almeida, 2007; Krause and Bitter, 2013; Duncan, 2010).

It has also been noted in some cases that homes immediately adjacent to rail lines and stops received a negative or null price effect, which has been attributed to either nuisance, crime and vandalism, or a lack of transit-supportive land uses nearby (Bowes & Ihlanfeldt, 2011; Cervero, 2003). Whether LRT contributes to land value decline of nearby properties hence depends in large part on noise mitigation levels, station area design and socio-economic conditions. Billings (2011) explains that hedonic studies estimating the price impacts of LRT vary greatly in the way they define and measure access or proximity. This is because there are different interpretations and measurements of what constitutes proximity. However, one consistent finding is that LRT station areas that developed with the guidance of explicit land use plans to support mixed-use, walkability and densified environments see the largest land value increases (Atkinson-Palombo, 2010; Mejia-Dorantes & Lucas, 2009).

One overarching survey of the research identified twenty-two studies showing an increase in housing values resulting from TOD, New Urbanism, and urban infill and revitalization; two studies also found a negative relationship between urban infill and revitalization and affordability (Addison, Zhang & Coomes, 2013).

Whether LRT leads to lesser or greater overall housing affordability is also confounded by how LRT influences transportation costs. Location efficiency is the concept that by living in more compact, well-transit-served neighbourhoods, residents are able to spend less on transportation and so are able to afford higher home prices or rents (Blackman & Krupnick, 2001; Belzer & Autler, 2002). In Addison, Zhang, & Coomes' (2013) study of the relationship between smart growth and housing affordability, they note that the increase in property values attributable to new transit infrastructure may be partially or entirely offset by the reduced transportation costs that these transit systems provide.

Therefore, while nearby homes themselves may become more expensive with LRT, living in them may become less or more affordable overall depending on the extent of transportation cost reductions they provide. This assumes that potential transportation savings are actually realized by households; although research on location efficiency generally supports affordability improvements from investments in public transportation infrastructure. For example, a study of Auckland that indicated when commuting costs were considered in the investigation of housing affordability, outlying suburban home were in fact less affordable than their transit-served urban counterparts (Mattingly & Morrissey, 2014).

There is also an element of temporal complexity related to housing affordability and TOD. Some studies found price effects occurred during the development of LRT (McMillen & McDonald, 2004) while others found them only once the system was operational (Yan, Delmelle, & Duncan, 2012). Golub, Guhathakurta, & Sollapuram (2012) add that property value impacts may exist at all stages of LRT implementation—during planning, construction, and operation—but that the magnitude of these impacts differ.

Gentrification:

While a goal of LRT implementation is often urban regeneration and revitalization, attention should be paid to the potential for these efforts to result in gentrification. Grube-Cavers & Patterson (2014) synthesised contemporary literature to define gentrification as: increases in the social status of poor or working class neighbourhoods along with concomitant increases in rents and property values that occur at a faster rate than the city's average. Increases of land values as well as increases in residents' levels of education, income and engagement in professional occupations are often variables used to measure the occurrence of gentrification (Grube-Cavers & Patterson, 2014). Therefore, understanding of whether gentrification is occurring near LRT can lend insight into whether an area is becoming unaffordable for groups with lower-than-average incomes, or whether lower income earners may even be displaced in re-developed areas.

There are various interrelated factors that shape whether and how gentrification occurs. It was found that proximity to both transit and previously gentrified areas significantly impacted the occurrence of gentrification—particularly that gentrification most often occurred in areas near but not directly adjacent to the transit lines (Grube-Cavers & Patterson, 2014). Kahn (2007) adds from his study of 14 cases of TOD around rail transit systems (some LRT and some subway) that gentrification was more likely to occur around walk-and-ride stations rather than park-and ride stations.

An additional element of spatial complexity is in the codetermination of value increases by the moderating impacts of multiple built form and land use variables (Duncan, 2010), for example: It was found access to retail significantly increased nearby property values only when located in pedestrian-oriented environments (Matthews & Turnbull, 2007). Nonetheless, if LRT is promoted in part as a strategy to increase retail and residential developments in the core, the research would suggest that it will lead to the development of the kinds of neighbourhoods attractive to gentrifiers—and hence a decline of affordability near LRT for some households. It has been shown that poverty de-concentration—the push of low-income groups from central concentrations to disperse across a region—results partly from capital investments, such as LRT. These policies intend to increase competitiveness of central areas, and in doing so precede the onset of neighbourhood scale gentrification (Reese, Deverteuil, & Thach, 2010).

Gentrification is somewhat self-perpetuating once it has begun. As increases in high-end retail and restaurants, improvements in school quality, and increased provision of amenities take place, lower income earners are priced out of the area as land and housing values increase (Kahn, 2007).

Summary

Economic theory connects housing prices and rents to the value of land. The value of land is a function of accessibility and proximity to desirable locations (Skaburskis & Moos, 2010). Despite some disagreements regarding its implementation, LRT has generally become

accepted as a value-enhancing amenity that can function to attract investment to urban areas in a context of growing regions (Handy, 2002).

Evidence from research examining specific impacts of LRT on housing and land values (Cervero,2003; Hess & Almeida, 2007), as well as broader assessments of how LRT contributes to gentrification (Quastel, Moos, & Lynch, 2012) suggests that LRT raises land values. In the instances where LRT contributes to decreases in land values, it is occurring in the absence of supportive station area planning and larger socio-economic issues already present in a community.

Overall, there are valid concerns regarding the impacts of LRT on affordability. It must be remembered, however, that most of the developments reviewed took place in a context of disinvestment in affordable housing and dismantling of housing policies (Hulchanski &Shapcott, 2004). Thus, negative impacts of LRT on affordability are not inevitable if supported by appropriate housing policies. Further research is required to evaluate existing (and if deemed necessary derive new) housing policy options appropriate in the context of Waterloo region LRT.

Addendum to "Housing Affordability Impacts of LRT and TOD" (Babin, R. & Moos, M)

The literature review by Babin and Moos (2015) refers to a report from Desjardins published in 2015. The report describes the Desjardins Affordability Index (DAI) for the Kitchener-Cambridge-Waterloo Census Metropolitan Area (CMA) that had shown a slight increase in affordability in the CMA during the first quarter of 2015. However, the most recent copy of the DAI report, published in November 2018, shows that the affordability index has continually decreased for the CMA since that time meaning that it is becoming more difficult for households to purchase a property (DAI, 2017).[13]

4.10.2 LRT and Affordability for Renters and Low-Income Households (author: Wilkin, T.)[14]

To add to this existing literature review, the work referenced below expands to studies of the populations of interest included in this year's indicators for Housing Affordability, namely renters and low-income households. The review looks at work that has studied the association with affordability and transit oriented development (TOD).

[13] Desjardins Economic Studies (2018). Retrieved from https://www.desjardins.com/ressources/pdf/Kitchener_ANG.pdf?resVer=1541536563000

[14] A complete reference list is available in Appendix E

While a goal of LRT is to improve accessibility to all residents, public transit investment is seen as a way of benefiting low-income households in cities by increasing accessibility to these populations who are more likely to have limited mobility options (Bernick & Cervero, 1997). A Montreal study by Manaugh & El-Geneidy (2012) found that at a regional scale, transit investment near the Central Business District (CBD) improved accessibility to employment centres for low-income neighbourhoods. A concern associated with transit investment is that it will lead to transit-induced gentrification which could potentially displace those same households that stood to benefit the most from the transit system but find themselves unable to afford the increasing land and property values.

Renter households (as opposed to owner-occupied households) are typically less able to adapt to rising land value and property costs associated with gentrification. Whereas property value increases for owners may be offset through increases in home equity, renter households may have to absorb these changes as increases to their monthly rents. Renters also earn less income than owner households (Rayle, 2015), putting them at greater risk of encountering affordability challenges should increases in shelter cost arise. People living in subsidized housing can also experience housing affordability issues associated with shelter costs. While subsidies can assist with shelter expenses, these households typically have lower incomes (Luffman, 2006). Any increases in shelter-related expenses can lead to becoming cost-burdened.

Evidence as to whether or not gentrification takes place as a direct result of transit investment is mixed in the literature. One reason for this may have to do with varying definitions and contexts for gentrification. Gentrification has been described by some as a process that brings about positive change by revitalizing areas that were previously in decline and promoting intensification. However, literature also highlights the adverse effects of gentrification, which can include increased rents and the potential to displace existing residents (Slater, 2004). In their study of Canada's largest metropolitan areas, Grube-Cavers & Patterson (2015), found a positive relationship between the presence of an LRT station and the likelihood of gentrification for the Cities of Montreal and Toronto but not in Vancouver.

Whether or not displacement of renters or low-income households occurs as a result of transit-induced-gentrification is unclear. However, the reality for renter households and low-income households is that they are more susceptible to housing affordability challenges when prices increase, whether or not that the increases stem from transit-induced-gentrification.

4.11.1 Inclusive Communities: Home Ownership Affordability

Indicator

33 per cent of the housing transactions in 2017 were affordable to low and moderate-income households within the CTC.

Results

In 2017, fewer residential property transactions were below the 'income approach' affordability cut-off price of $349,500 than above it in the CTC. Of the 796 residential resale transactions within the CTC, 33 per cent (259 transactions) were at a price below the affordability cut-off while 67 per cent (537) of the residential transactions exceeded the cut-off (Table 1). The number of transactions below the threshold has remained relatively stable in the CTC from 2011 to 2015, however, by 2017, upward pressure in the housing market decreased the number of affordable transactions both inside the corridor and across the region in general.

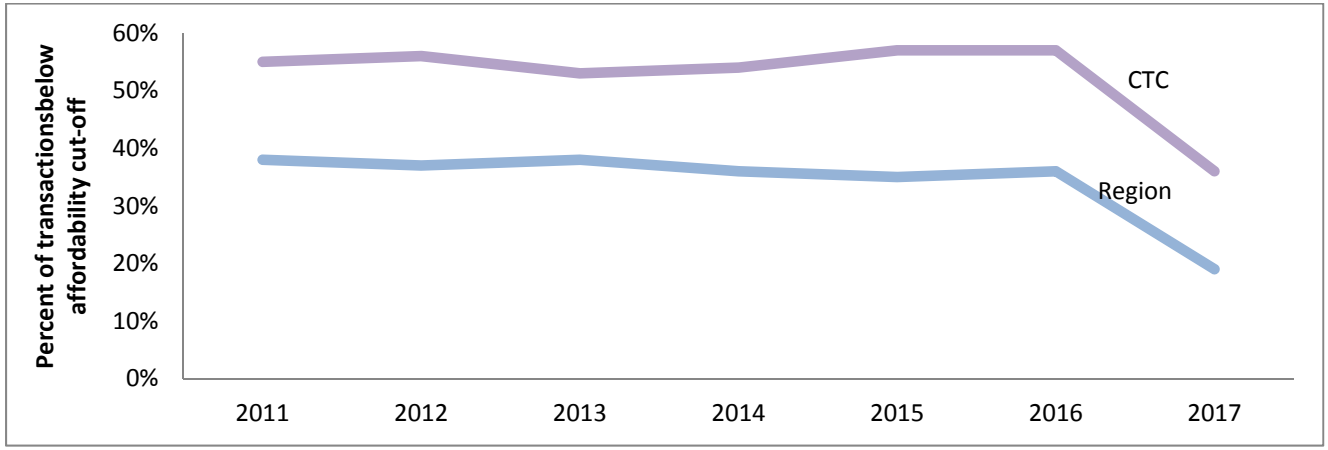
Table 1. Residential Units Under the Affordability Cut off (transactions over $10,000)

Year		2011	2012	2013	2014	2015	2016	2017
Affordability Cut-off		**$263,349**	**$270,967**	**$281,678**	**$290,778**	**$300,857**	**$337,035**	**$349,500**
# of Transactions Below Cut Off	**Stage one**	202	240	195	202	216	247	128
	Stage two	156	139	141	154	176	205	131
	CTC	358	379	336	356	392	452	259
	Region	2,364	2,322	2,416	2,289	2,384	2,727	1,218
# of Transactions	**Stage one**	373	442	384	397	409	481	478
	Stage two	282	233	256	268	284	319	318
	CTC	655	675	640	665	693	800	796
	Region	6,209	6,296	6,421	6,354	6,883	7,532	7,890
% of Transactions Below Cut Off	**CTC**	55%	56%	53%	54%	57%	57%	33%
	Region	38%	37%	38%	36%	35%	36%	15%

The relative stability of the number of affordable transactions in the CTC until 2016 suggests that low and moderate income households have been to be able to obtain affordable housing within the CTC. The increase though in the number of transactions in the CTC that are 'unaffordable' especially between 2016 and 2017 may represent that it is becoming increasingly difficult for low-to-moderate income households to secure affordable housing and that for some households the reality is that they will be spending more than 30 per cent of their income on housing.

In the CTC, only 33 per cent of residential transactions met the affordability cut-off in 2017, compared to 57 per cent in 2016. However, a similar change in affordability was experienced across the Region, with only 15 per cent (1,218 out of 7,890 residential unit transactions) met the affordability cut-off as shown in Figure 2. Transactions within the CTC are considered more affordable than transactions elsewhere in the Region.

Figure 2. Affordable home ownership transactions for low- to moderate- income earners



There were more transactions in general in Stage 1 (478) than in stage 2 (318) which is not surprising given the amount of residential investment occurring in stage one compared to stage 2, however a greater percentage of transactions were affordable in stage 2 (41 per cent) than in stage 1 (27 per cent). In 2017, the median residential unit transaction value of $400,000 within stage one was over the affordability cut-off by $50,500 (Table 2). In stage two, the median transaction value of $363,750 was $14,250 more than the affordability cut-off. A median transaction value of $460,000 was found outside the CTC which is $110,500 (32 per cent) higher than the affordability cut-off.

Table 2. Median Transaction ($) Values from 2011 to 2017							
Scale	2011	2012	2013	2014	2015	2016	2017
Stage one	$257,300	$263,500	$280,500	$290,000	$299,000	$331,200	$400,000
Stage two	$235,500	$245,000	$257,750	$267,500	$275,000	$300,000	$363,750
CTC	**$248,000**	**$256,000**	**$274,625**	**$283,000**	**$288,000**	**$322,950**	**$385,000**
Outside CTC	$288,500	$299,900	$205,000	$322,500	$335,625	$375,000	$460,000
Region	$284,000	$294,950	$304,900	$318,250	$330,000	$370,000	$450,300

Note: The median value is the value at which half of the transactions were higher and half were at a lower value.

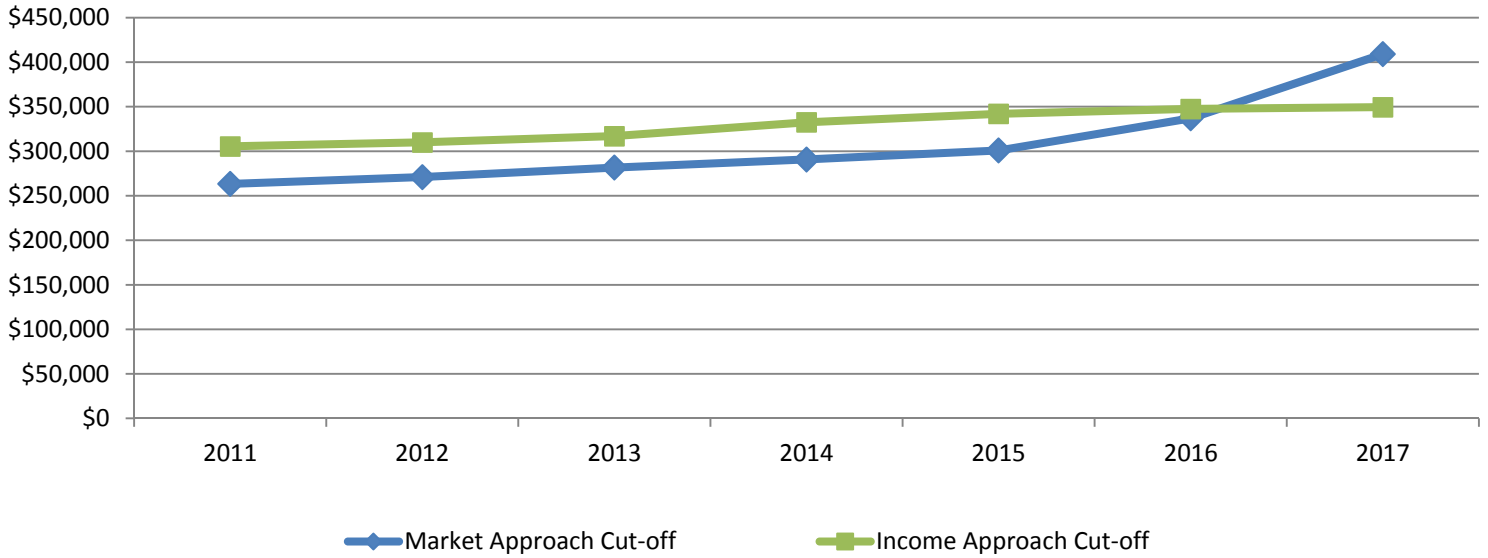
The median value of housing transactions is influenced by the mix of housing types sold. A housing mix that includes a greater proportion of large single detached houses will have a higher median value than a mix with more apartment units. Of the 1,528 apartment units added in the Region in 2017, seventy per cent (1,076 units) were located in the CTC, and of the singles sold in the Region, only 1.3 per cent were in the CTC. This housing mix explains in part the greater affordability in the CTC compared to the Region as a whole.

Methodology

Whether or not a housing transaction is deemed "affordable" is determined by using the lower of the 'income approach' and the 'market approach' as defined by the Provincial Policy Statement. Prior to 2017, the 'market approach' produced the lower cut-off. In 2017, for the first time since the CTC monitoring project began, the 'income approach' produced the lower cut-off as shown in Figure 1.

A look at both thresholds shows that the income approach cut-off, which represents the income at which low-to-moderate households can pay for housing without spending more than 30 per cent of their income, had remained fairly stable since 2014, while the market approach cut-off, which represents the average purchase price for a unit in the Region (less 10 per cent) had been increasing steadily since 2011. The average purchase price for a unit increased by $108,000 during this two year period. This is representative of changes that were occurring in the housing market in general for the Region during this period. The income approach cut-off which had been previously tracking slightly above the market approach cut-off was surpassed by the jump experienced in 2017 of the market-approach cut-off thereby making the income-approach the lower of the two approaches for the first time since 2011. Transactions included in the analysis are those that exceed $10,000 (to reflect accurate market values). Only resale transactions are used in this indicator. Corporate transactions, those between family members or transactions because of estate transactions are not included in the analysis.

Figure 1. Market and Income Cut-off thresholds 2011 – 2017



4.11.2 Inclusive Community: Renter Affordability

Indicator

61 per cent of renter households in the CTC spent less than 30% of their household income on shelter-related costs in 2016.

Importance

Renters can be impacted differently than owners when faced with increasing affordability challenges. CMHC conducts an annual rental market survey[15] for the Kitchener -Cambridge-Waterloo CMA and reported that average rents increased by 5.7 percent from 2017 to 2018 with a one-bedroom now averaging $1,254 per month. Rising property values for owners may be offset by corresponding gains in home equity, whereas this is not the case for renters who typically experience increasing rents because of property value increases. These rent increases are based on the Provincial guideline, or on what the market will bear. Renters also have, on average, lower incomes than owners. In Waterloo Region, the median owner-occupied household income in 2011 was $98,869 compared to $46,402 for renters. Lower incomes put renters at greater risk of encountering affordability challenges if rents increase at a faster rate than income. According to census data renters accounted for almost 44 per cent of households in the CTC in 2016. It should be noted that the census data for 2016 comes before the 2017 housing peak that was experienced across the Region. Given the substantive population of renters in the CTC and the greater susceptibility for renters in general to encounter affordability challenges makes them an important group to analyse with respect to how affordability may be changing for this population within the CTC.

Methodology

Renter affordability data was obtained through the Community Data Program (CDP), which creates custom data tabulations using Census data. The data was downloaded for 2006[16], 2011 and 2016 for renter and owner households that spend less than 30% of their household income on shelter-related expenses (including monthly rent or mortgage payments, property taxes and condominium fees (for owners), and the cost of electricity, heat, municipal services, etc.)[17]. The datasets were downloaded for census tracts, which are small, relatively stable geographic areas with a population between 2,500 and 8,000 people[18][19]. Weights were applied for census tracts that intersected the boundary of the CTC, based on the population residing inside and outside the CTC boundary. The timing and use of census data for this indicator is well aligned with LRT development in the corridor. This indicator is measured in 2006, before the LRT announcement, in 2011, when the LRT was approved (before construction begins) and

[15] CMHC, Rental Market Report: Kitchener-Cambridge-Waterloo CMA, 2018

[16] For indicators that use Census data three years of data are used in the analysis, 2006, 2011 and 2016. This is done partially because of alignment with LRT development but also because of quality concerns with 2011 NHS data.

[17] Includes private households in non-farm, non-band, non-reserve households with household incomes greater than zero and shelter-cost-to-income ratios less than 100%.

[18] See Statistics Canada definition of Census Tracts: https://www150.statcan.gc.ca/n1/pub/92-195-x/2011001/geo/ct-sr/def-eng.htm

[19] Census Subdivision (municipality) data was downloaded for the Townships of Wilmot (in 2006 & 2011) & Wellesley (in 2016) as these area municipalities were not subdivided into Census Tracts for these census years.

again in 2016 when construction is nearing completion. The data will next be available for 2021, which will allow for further analysis when ION is up and running.

Results

For each of the three years measured in the analysis, a smaller proportion of renters were found in the CTC to be spending less than 30 per cent of their household income on shelter related expenses. For example, in 2016, sixty-one per cent of renter households in the CTC were considered to be affordable, while 69 per cent renting outside the CTC were considered affordable (Table 1). Between 2006 and 2016 there has been a increase of 2 per cent of renter households that are considered affordable in the CTC compared to an increase of only 0.2 per cent outside the CTC. This has played out differently in stage 1 and stage 2; in stage 1 where LRT is soon to be operating, affordability has improved for renters, whereas in stage 2 it has remained fairly stable for renter households at 58 per cent. With many potential factors at play and given that these changes are very small, it is difficult to be definitive about the cause.

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Table 1. Per cent of renter households spending less than 30% of household income on shelter related costs

	2006	2011 NHS	2016	Percent Change 2006-2016
Stage one	59%	66%	62%	3%
Stage two	59%	60%	58%	-1%
Total in CTC	59%	64%	61%	2%
Total Outside CTC	69%	73%	69%	0.2%
Total in Region	66%	70%	67%	1%

Analysis

It is possible that some renters in the CTC are absorbing greater shelter-to-income ratios because they work in the CTC and therefore spend a smaller percentage of their income on transportation allowing more income to go towards housing. However, the lower percentage of renter households within the CTC that are considered affordable suggests that should rents increase at a faster rate than income within the CTC as a result of increasing property values, these households would be at greater risk of affordability than renter households outside the CTC.

Comparing data for renter households for each census year does not clearly show whether the affordability situation for renters within the CTC is becoming more problematic. With many potential factors at play, and given that these changes are very small, it is difficult to be definitive about the cause. However, given that median incomes in the areas of Uptown Waterloo and Downtown Kitchener have increased over the same period, this may be a result of an influx of higher income households in the CTC who have incomes that are high enough to meet the affordability standard. Therefore, the increase in the percentage of renter households considered to be affordable using the shelter-to-income ratio threshold of 30 per cent in stage 1 may be a reflection of new rental accommodation such as Barrelyards that are attractive to higher-income earners.

Interestingly renter household affordability was lower in stage 2 than in stage 1 where most of the development is occurring. This was consistently the case for each time period. A look at median household income change between 2006 and 2011 in stage 2 shows that only one census tract experienced a decrease in median household income. All of the other census tracts within stage 2 of the CTC experienced increases in median household income. Whether or how this changes when stage 2 ION construction begins remains to be seen. Finally, given that the peak of the housing market for the Region occurred in 2017 after the census 2016 data was published it is unclear as to whether or not a trend of an increasing percentage of renters becoming cost-burdened in the CTC is emerging. Data for the next census will not be available until after 2021.

Comparing renter households to owner households, overall, the percentage of renters paying less than 30 per cent of their income on housing is lower than that of owner-occupied households, and this has remained the case going back to 2006.

4.11.3 Inclusive Community: Supply of Community Housing

Indicator
2,645 Community Housing units were located within the CTC in 2017.

Importance
This indicator tracks the supply of Community Housing within the corridor. Housing and transportation costs are often the largest expenses for households. Locating affordable housing near transit can reduce transportation costs for some households if they are able to also access employment centres through transit and remove the need for owning and operating a vehicle. Reducing transportation costs in this way may allow families to meet other household expenses, and may provide savings towards other forms of housing. It is therefore important that affordable housing units are not 'pushed out' from access to the CTC.

Methodology
Community Housing data is maintained by Region of Waterloo Housing Services. This data includes properties which are owned by the Region of Waterloo as well as those for which the owners have funding agreements with the Region of Waterloo. All of these properties have rents that are either geared to the income of the tenant or set at/or below average market rents. In addition to these units, the Region of Waterloo provides funding for emergency shelters and supportive housing units that have not been included in this analysis. Community Housing data was analyzed temporally to see changes since the baseline year (2011), as well as spatially to see the percentage of Community Housing located within the CTC. Only those non-profit housing providers that sold their properties were removed from the count of Community Housing units.

Results
In 2017, there were 2,645 Community Housing units located within the CTC and this supply has remained relatively stable since 2011. Since the LRT announcement in 2011, to the end of 2018, there have been 384 units of Community Housing created in Waterloo Region and 152 of them (40 per cent) have been in the CTC. During this same time period two former Community Housing providers sold their properties, one of which was in the CTC. This provider had supplied 77 units. The result of these changes has been a small net loss of 42 units of Community Housing in the CTC by 2017.

One property within the Community Housing portfolio that has undergone a change that has resulted in more affordable housing units being built within the CTC is the property at 35 David Street in Kitchener. Kitchener Housing Inc., a municipal non-profit organization that develops and manages affordable housing, owns the property which was redeveloped to provide more affordable housing units. Initially, the property had four quadplexes

which provided sixteen units of housing. The units were replaced by two adjoining buildings in 2009 and 2013 that now provide thirty-seven units of affordable housing.

Table 1. Number of Community Housing Units

Year	Total Community Housing Units in the CTC	Per cent of Community Housing Units in the CTC	Total Community Housing Units not in the CTC	Annual Change in Number of Community Housing Units
2011	2,687	30%	6,258	
2012	2,610	29%	6,260	-77
2013	2,631	30%	6,265	+21
2014	2,631	29%	6,305	0
2015	2,633	30%	6,305	+2
2016	2,645	30%	6,259	+12
2017	2,645	30%	6,306	0

Analysis

Community Housing, defined as housing in which rents are supported by government funding, became the responsibility of the Region in 2001 when the province transferred to municipalities a number of funding responsibilities including social housing. The inherited properties of that time, many of which still exist today, pre-dated the LRT. Since 2011 when LRT was approved, Region-issued requests for proposals for new Community Housing projects have placed a greater weighting on projects that are proposed to be located in the corridor or along major transit routes thereby recognizing the value of having affordable units in proximity to public transportation.

The stock of Community Housing can increase as private and non-profit developers build new units. The stock of Community Housing can decrease as non-profit housing providers with federal housing agreements reach the end of their agreements. Once they reach the end of their agreement, they are no longer obligated to provide their housing at affordable rents, although most continue to do so as providing affordable housing is part of their non-profit mandate. Some housing providers choose to sell their properties at this time if they are no longer interested or able to provide affordable housing.

4.11.5 Inclusive Community: Households receiving rent assistance and living in the CTC

Indicator

56 per cent of households receiving rent assistance found housing in the CTC in 2017.

Importance

The Region provides flexible rent assistance for up to 100 households through the Housing Assistance with Supports (HAWS) program. The focus for this rent assistance program is to house those who are, or are at risk of becoming, chronically homeless. Participants, with the help of their support workers, are required to find housing in the private rental market for which they will receive a monthly allowance. Rental units are only eligible if they are below a certain threshold. Participants are supported to maintain their housing. The program was initiated as part of the Region's Out of the Cold Response Plan in 2014. Tracking the percentage of households in the HAWS program who live within the CTC is important as it indicates whether affordable units exist for rent for this population. By monitoring this indicator over time, the Region can track whether less people receiving these supports are continuing to locate within the CTC.

Results

Beginning in 2015 when the HAWS program began, to 2017 when the program had grown to assist almost 100 households, more than half of the participants were living within the CTC. This has remained relatively consistent over the program's duration, indicating that households can continue to find housing in the CTC that is affordable under the terms of this program.

Table 2. Location of HAWS households since the program began in 2015

	2015	2016	2017
Stage one	44%	54%	40%
Stage two	6%	6%	16%
Total in CTC	50%	60%	56%
Total Outside CTC	50%	40%	44%
Total in Region	100%	100%	100%

Analysis

Further geographic analysis revealed that by looking just another 500 metres beyond the CTC, three out of four of those receiving supports are finding housing. Almost all who were living outside the CTC in 2017 are within 800m (standard walking distance) of a GRT stop with at least one bus that will take them into the CTC without requiring a transfer.

While it would be difficult to track all individual participants within the program, this indicator is still useful to track the number of times participants find housing at or below the acceptable threshold within the CTC. Currently, participants were able to find rental accommodation below the threshold within the CTC 55 out of 96 times. With increasing costs for rental housing across the Region in 2017, it will be interesting to continue to track this over time to see if program participants continue to be able to find rental units within the CTC – as participants change over time and if a potential expansion to the program occurs. Although this is currently just a sample of 100, it represents the most vulnerable population when it comes to housing stability.

Methodology

The location of households within the HAWS program is tracked by the Region of Waterloo Housing Services. Addresses were geocoded to determine their location related to the CTC. This data begins in 2015 when the HAWS Program began receiving funding, and includes up to 2017 when the program reached the maximum number of participants that the funding could support.

5. Updates to Indicators

5.1 Adjustments and Corrections in Data and Definitions

Two indicators have updated previous figures that reflect changes in either the source data or adjustments and corrections in the definitions used to query the indicator values. Comparisons between the data shown in the 2017 and 2016 update reports and the original baseline monitoring report may not be valid for the following indicators; however, the previous reports' data has been updated in this report.

Restaurants

Updates to this indicator have refined restaurants to include only establishments that are categorized as a restaurant, and removes establishments that are categorized as baked goods – retail, cocktail bar/nightclub, food take out, and ice cream/yogurt vendor. Additionally, updates have been made to count only establishments with an open facility status, not counting closed or preoperational restaurants.

Daily Transit Activity

The daily transit activity indicator is an output of a database updated annually by GRT that records the average daily boarding's and alighting's for every stop in the transit network. Initially this was done using only data from the month of November because of the slow nature of querying and processing data for the entire network. This methodology was used in the baseline report.

In 2014, improvements were made to the output process that allow for all records from the full fall signup period (September to mid-December) to be included in the average, which GRT now uses instead for the database. This updated methodology was used since the 2015 update report. Increasing the sample size from November only to all of fall provides a truer average. Additionally, adapting the time range of the indicator to match that of the GRT database promotes consistency amongst different regional departments and simplifies the update process. An analysis was conducted to ensure that this change to the time window of samples did not have a significant effect on the trends or quantities reported.

In 2018, further improvements were made to the process of calculating daily transit activity. The calculation relies on taking the average activity of every trip that serves every bus stop, and then summing those averages for a daily total. A flaw in the previous methodology was that the formula taking the sum of these averages could not distinguish between two discrete trips for a route that shared a start time, for example if two separate trips for Route 7 depart at 8:00:00 AM exactly. Since trips that were separate were being averaged together rather than summed, this meant artificially lower daily totals than what was actually occurring in the system. The new methodology was used for the 2017 update, meaning that values before and after that year are not directly comparable.

5.2 Anticipated Changes in Future Reports

Potential or anticipated changes to data may require published years to be restated to ensure that the indicators value reflect the most up-to-date and current information.

Emissions

Data used in the model will be acquired every second year. On years when the data is not acquired, figures will be generated from the model's output and will be updated in the subsequent year.

6. Data Sources

The data presented in this report is the best available at the time of publication. Data is typically acquired from external agencies, and occasionally changes over time. All such changes to indicators over the course of the monitoring program are fully documented.

Indicator: Transit Ridership

Scale: Regional
Measurement Interval: Annual
Data Source: GRT ridership indicator is calculated based on daily data obtained from the electronic fare boxes on buses, as well as the sales of various passes, and published on GRT's website at: http://www.grt.ca/en/about-grt/performance-measures.aspx

Indicator: Daily Transit Activity

Scale: CTC
Measurement Interval: Annual
Data Source: The data for the ridership information comes from MOBILEstatistics, which allows for Automatic Passenger Counter (APC) data queries to be made and downloaded by GRT.

Indicator: Walkability

Scale: CTC
Measurement Interval: Annual
Data Source: The five walkability categories were determined from the NEWPATH study that was performed in 2009, which assessed the walkability of Kitchener, Waterloo and Cambridge.

Indicator: Land Use Mix

Scale: CTC
Measurement Interval: Annual
Data Source: The Municipal Property Assessment Corporation (MPAC) provides data on each land parcel within the Region, including land use information.

Indicator: Population
Scale: CTC
Measurement Interval: Annual
Data Source: The total resident population of Waterloo Region is estimated annually, based on Census of Canada results, building activity, vacancy rates, and long-term changes in the average number persons per units for various dwelling types. The year-end estimates include usual residents in both private and collective dwellings, temporary postsecondary students not counted by the Census, other foreign and temporary residents, as well as an adjustment for the net undercount of the population.

Indicator: Cultural Vibrancy
Scale: CTC
Measurement Interval: 2011, 2016
Data Source: The arts and culture establishments were counted from the 2016 Workplace Count, a survey of places of employment in the Region.

Indicator: Restaurants
Scale: CTC
Measurement Interval: Annual
Data Source: The list of restaurants is derived from the Region of Waterloo Public Health food inspection data.

Indicator: Heritage Resource Retention
Scale: CTC
Measurement Interval: Annual
Data Source: An inventory of formally recognized (listed and/or designated) and pre-1920 built heritage resources is compared to demolition permits acquired from Area Municipalities.

Indicator: Building Activity
Scale: CTC
Measurement Interval: Annual

Data Source: Figures on building activity in both the residential and non-residential sectors are compiled annually by Regional staff, based on data supplied by the Area Municipalities.

Indicator: Assessment Value

Scale: CTC
Measurement Interval: 2011, 2014, 2015, 2016, 2017
Data Source: The most updated parcels for the fourth quarter of 2016 were sourced from MPAC (Municipal Property Assessment Corporation) under license, and used to determine the total assessment of parcels within the CTC.

Indicator: Emissions

Scale: Cities of Cambridge, Kitchener, and Waterloo
Measurement Interval: Annual
Data Source: Greenhouse gas (GHG) emissions and Criteria Air Contaminants (CAC) were estimated using data inputs involving: vehicle in operation (VIO - (by vehicle class, fuel type and fuel efficiency rating), mode share, peak hour person trips, transit ridership, and average annual distance travelled (AADT).

Indicator: Perception of Safety

Scale: CTC
Measurement Interval: 2011, 2017
Data Source: The perception of safety data is obtained from the Waterloo Region Area Survey by the Crime Prevention Council of Waterloo Region.

Indicator: Calls for Service

Scale: CTC
Measurement Interval: Annual
Data Source: The annual Waterloo Regional Police Service (WRPS) occurrence data is obtained through open source data from the Waterloo Regional Police Service website.

Indicator: Home Ownership Affordability
Scale: CTC
Measurement Interval: Annual
Data Source: Average re-sale residential prices are obtained through the MLS® System provided by the Kitchener-Waterloo Association of REALTORS® and Cambridge Association of REALTORS®.

Indicator: Transaction Values
Scale: CTC
Measurement Interval: 2011 to 2017
Data Source: Transaction data is obtained under license from Teranet.

Indicator: Building Permits
Scale: CTC
Measurement Interval: 2016 Only
Data Source: Building permit data was obtained from the Cities of Waterloo (open source), Kitchener (open source) and Cambridge (by request).

For a more comprehensive explanation of the use of data and methodology for each indicator, please read the Baseline Monitoring report.

7. Partnership with the University of Waterloo

The Region of Waterloo entered a partnership with researchers from the University of Waterloo (UW) to engage in a three-year study to quantify, monitor and measure the socio-economic, and core-area intensification impacts of ION on the CTC. The project, called 'Light Rail Transit and Core Area Intensification: Unpacking Causal Relationships' is led by Dr. Dawn Parker, with Dr. Jennifer Dean serving as co-investigator. Many PhD, Masters, and undergraduate students from the University also participate. This project is part of related work in Dr. Parker's "Urban Growth and Change" research group in the School of Planning at UW.

The goal of the partnership is to explore and understand the causal dynamics between the anticipated developments of ION, intensification of the core area and socio-economic changes in the CTC. This research complements the CTC monitoring work conducted at the Region of Waterloo. Below is a summary of new research conducted by this group that is relevant for understanding changes in the CTC and their possible causes. Over the last year since the last monitoring metrics report:

Jinny Tran's undergraduate honours thesis, "Understanding Developer's Decision Making in the Region of Waterloo" has been posted on the University of Waterloo thesis archive and is available for download at https://uwspace.uwaterloo.ca/handle/10012/11163 .

Xinyue Pi completed analysis of a survey of 290 local renters on residential location choice, renting experience and behaviours and perceptions towards the upcoming LRT. In addition to detailed analysis of the survey responses, she estimated a regression model, very similar to Robert Babin's from 2016 (https://uwspace.uwaterloo.ca/handle/10012/10936), which helps to identify the independent influence of multiple factors on rental prices. Results of the thesis are summarized at https://uwaterloo.ca/environment/sites/ca.environment/files/uploads/files/renter_survey_outreach_24oct2017.pdf. The complete thesis is available for download at https://uwspace.uwaterloo.ca/handle/10012/12431 .

Justin Cook, a masters student working under the supervision of Dr. Dean, is completing a thesis that explores the perspective of local real estate professionals. An executive summary of results related to the LRT, "Investigating realtor perspectives on the impact of the ION LRT on the real estate market in the Region of Waterloo" is available at

Yu Huang, PhD student, is continuing to work on her thesis "Understanding residential location choice behaviour: an empirical agent-based housing market model for Kitchener-Waterloo." She is currently analyzing a sample of almost 500 KW home buyers and sellers from May 2017 through April 2017. The structure of her survey is very similar to Pi's rental survey, with CTC specific questions. She is testing new statistical methods to better understand how to characterize how housing preferences differ among demographic groups and how these differences influence buying and selling behaviour.

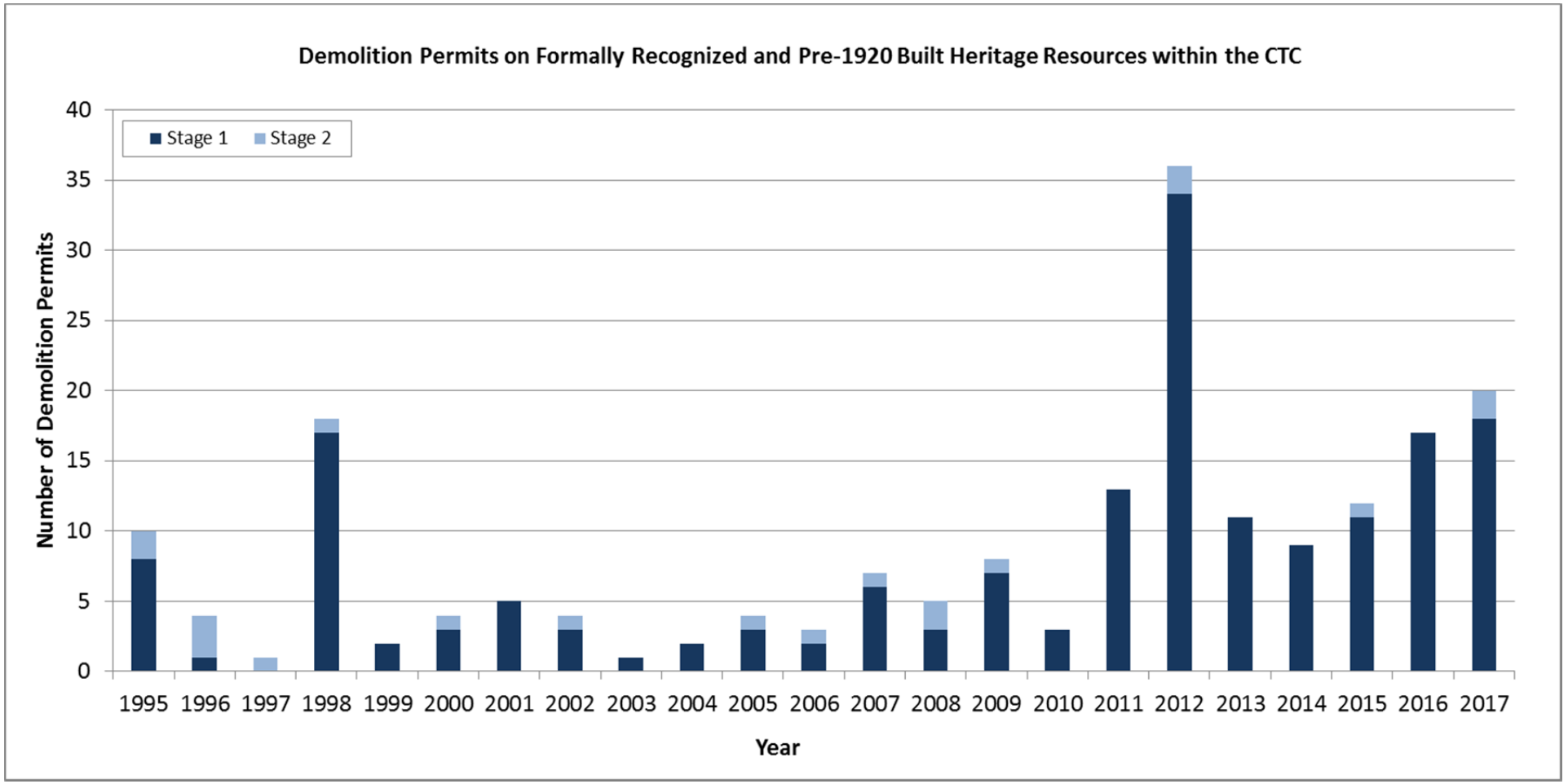
More information on ongoing research is available at: **http://research.wici.ca/ugc/**

Appendix A

Per cent of Demolition Permits on Formally Recognized and Pre-1920 Heritage Buildings within the CTC

Year	Total Formally Recognized Permits	Total Demolition Permits in CTC	Per cent Formally Recognized
1995	10	29	34%
1996	4	31	13%
1997	1	9	11%
1998	18	23	78%
1999	2	39	5%
2000	4	23	17%
2001	5	30	17%
2002	4	56	7%
2003	1	41	2%
2004	2	29	7%
2005	4	34	12%
2006	3	33	9%
2007	7	36	19%
2008	5	54	9%
2009	8	37	22%
2010	3	41	7%
2011	13	75	17%
2012	36	62	58%
2013	11	76	14%
2014	9	94	10%
2015	12	72	17%
2016	17	57	30%
2017	20	71	28%
Total 1995-2017	199	1052	19%
Total 2011-2017	118	507	23%

Out of the total 507 demolition permits issued within the CTC between 2011 and 2017, there were 118 demolition permits issued for pre-1920 and recognized built heritage resources.



Between 1995 and 2017, forty of the demolished buildings were issued on formally recognized heritage resources, while the remainder were on built heritage resources constructed pre-1920. During the same time period, approximately 89.7 per cent of the 195 demolition permits for on built heritage resources in the CTC were for buildings located in stage one.

Appendix B

Building Activity from 2011 to 2017 in the CTC (Unadjusted)										
Structure Type	2011		2012		2013		2014		2015	
Residential	Value (million)	Units	Value (million)	Units	Value (million)	Units	Value (million)	Units	Value (million)	Units
Singles	$4.2	13	$3.4	12	$3.2	11	$3.4	10	$1.6	5
Semi-detached	$0.2	1	$0.9	7	$1.3	6	$1.4	6	$0.5	2
Townhouses	$6.2	44	$27.2	179	$8.0	48	$15.4	92	$6.1	50
Apartments	$198.7	1147	$97.5	623	$130.2	624	$314.0	1623	$114.1	1096
Total	$209.1	1205	$129.1	821	$142.7	689	$334.2	1731	$122.4	1153
Structure Type	2011		2012		2013		2014		2015	
Non-Residential	Value (million)	Sq.Ft	Value (million)	Sq.Ft	Value (million)	Sq.Ft	Value (million)	Sq.Ft	Value (million)	Sq.Ft
Commercial	$46.1	318,002	$46.1	392,408	$22.0	77,131	$42.3	176,871	$85.9	519,751
Industrial	$8.5	3,600	$2.5	20,909	$3.8	29,349	$15.1	8,818	$8.8	115,860
Institutional	$227.2	121,503	$88.7	269,053	$64.3	236,186	$180.8	321,145	$56.1	155,164
Total	$281.8	443,105	$137.3	682,370	$90.1	342,666	$238.3	506,834	$150.8	790,775
Total Value	$490.9		$266.4		$232.8		$572.5		$273.2	

Building Activity from 2011 to 2017 in the CTC (Unadjusted) continued

Structure Type	2016		2017	
Residential	Value (million)	Units	Value (million)	Units
Singles	$1.9	7	$4.7	13
Semi-detached	$1.6	7	$1.1	3
Townhouses	$5.7	55	$3.2	26
Apartments	$259.9	1791	$92.0	1076
Total	$269.1	1860	$100.9	1118
Structure Type	**2011**		**2012**	
Non-Residential	Value (million)	Sq.Ft	Value (million)	Sq.Ft
Commercial	$44.8	134,373	$58.1	294,502
Industrial	$13.0	54,736	$20.3	68,376
Institutional	$2.7	14,530	$62.3	228,047
Total	$60.6	203,639	$140.7	590,925
Total Value	$329.7		$241.6	

Building Activity from 2011 to 2017 in the Region (Adjusted to 2011 dollars)										
Structure Type	2011		2012		2013		2014		2015	
Residential	Value (million)	Units	Value (million)	Units	Value (million)	Units	Value (million)	Units	Value (million)	Units
Singles	$382.0	1336	$281.7	927	$258.7	846	$299.9	949	$364.0	1093
Semi-detached	$10.1	71	$10.3	54	$8.2	38	$12.1	70	$9.4	47
Townhouses	$43.7	306	$75.1	476	$81.9	524	$105.0	675	$113.0	688
Apartments	$297.6	1886	$137.8	954	$181.8	1161	$367.8	2113	$190.2	1730
Total	$733.4	3599	$505.0	2411	$530.7	2569	$784.9	3807	$676.6	3558
Structure Type	2011		2012		2013		2014		2015	
Non-Residential	Value (million)	Sq.Ft	Value (million)	Sq.Ft	Value (million)	Sq.Ft	Value (million)	Sq.Ft	Value (million)	Sq.Ft
Commercial	$102.5	689,686	$110.8	856,445	$62.8	386,549	$106.6	680,223	$111.0	780,636
Industrial	$82.6	435,198	$42.4	328,556	$37.8	391,153	$87.5	1,014,395	$46.8	534,095
Institutional	$380.9	552,403	$189.2	725,845	$113.9	534,528	$236.1	489,511	$141.2	466,555
Total	$566.0	1,677,287	$342.4	1,910,846	$214.5	1,312,230	$430.2	2,184,129	$299.0	1,781,286
Total Value	$1,299.5		$847.3		$745.3		$1,215.0		$975.6	

Building Activity from 2011 to 2017 in the Region (Adjusted to 2011 dollars) continued

Structure Type	2016		2017	
Residential	Value (million)	Units	Value (million)	Units
Singles	$556.6	1703	$355.5	992
Semi-detached	$21.1	110	$13.1	48
Townhouses	$139.9	946	$108.5	661
Apartments	$352.1	2615	$138.1	1528
Total	$1,069.7		$615.2	3229
Structure Type	**2016**		**2017**	
Non-Residential	**Value (million)**	**Sq.Ft**	**Value (million)**	**Sq.Ft**
Commercial	$90.8	754,154	$95.3	643,500
Industrial	$84.4	766,448	$123.6	978,749
Institutional	$56.8	323,156	$118.1	573,082
Total	$232.0	1,843,738	$337.0	2,195,331
Total Value	$1,301.6		$952.2	

Appendix C

A list of the WRPS call type codes used to count the number of total police calls for service in the CTC Public Order Maintenance; Police Reported Violent Occurrences Against a Person; and Police Reported Non Violent Occurrences

Public Order Maintenance		Police Reported Violent Occurrences Against a Person		Police Reported Non Violent Occurrences	
9190	Prostitution	9000	Bomb Threat	9110	Break and Enter
9200	Gaming and Betting	9010	Homicide	9120	Theft over $5000
9210	Drugs	9040	Sex Offence	9130	Motor Vehicle Theft
9290	Unwanted Contact	9060	Threatening	9790	Theft Under $5000
9350	Intoxicated Person	9070	Assault	9180	Property Damage
9360	Unwanted Person	9080	Abduction	9920	Graffiti
9370	Mentally Ill	9090	Robbery		
9380	Public Mischief	9100	Extortion		
9470	Suspicious Person	9170	Offensive Weapon		
9480	Suspicious Vehicle	9460	Prowler		
9600	Abandoned Vehicle	9850	Human Trafficking		
9610	Liquor Offence	9900	Criminal Harassment		
9650	Youth Complaint	9050	Indecent Act		
		9310	Dispute		

Appendix D

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Appendix E

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