Appendix C
Travel Demand Model Documentation

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Memo

Date: Monday, November 27, 2017

Project: Innisfil Transportation Master Plan (TMP) Update 2017

To: Town of Innisfil

From: HDR

Subject: Innisfil Travel Demand Model Documentation

1. Introduction

The Town of Innisfil Model is a p.m. peak period based macro travel demand model implemented using EMME. This model is based on the daily travel demand TransCAD model from the 2013 Transportation Master Plan, which was first developed by the Simcoe County for the 2008 Simcoe TMP. Compared to the daily model that was previously used, this model is able to assess the peak traffic volumes in the Town and thus provide more detailed and critical information for the needs of the Town's transportation system. A PM peak model was developed instead of the AM peak since the PM peak hour tends to have higher traffic volumes on the Town's local roads. The PM peak period also tends to capture a wider range of trip purposes, including home-based work, shopping, and recreational trips, than the AM peak period, which is dominated by work-purpose trips. A summary of the key features of the model is in **Table 1-1**. The model follows a traditional four-step procedure as shown in **Exhibit 1-1**.

Table 1-1: Summary of the Town of Innisfil Model

Time period	PM peak period (3:30 - 6:30 p.m.) Peak hour auto assignment
Forecast year	Base year 2011 Future year 2021 Future year 2041
Geographic Scope	Town of Innisfil and external gateways to surrounding municipalities in the GGH
Trip generation purposes	HBW (home-based work) HBO (home-based other) NHB (non-home based) HBS (home-based school)
Modes	Auto, transit (GO Rail and GO Bus), walk, and bicycle Auto mode is assigned to the network
Trip distribution	Gravity models for each trip purpose (HBW, HBO, NHB, HBS)
Trip assignment	Standard auto assignment after application of auto occupancy & peak hour factors

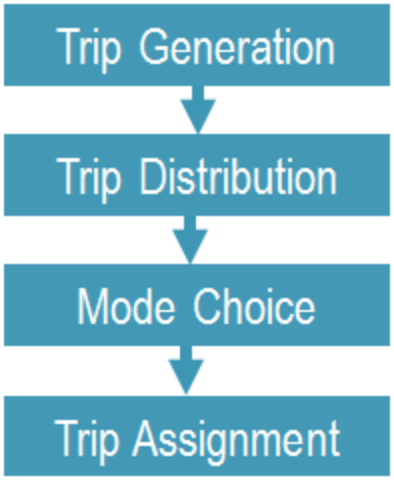

Exhibit 1-1: Model Flow Chart

2. Model Inputs

The following sources were used to develop the Innisfil Model:

- Simcoe County Model: the model network was based on the Simcoe County Model with updated network and disaggregated zone system to reflect the existing and future road conditions, as well as different population and employment centres in the Town.
- The 2011 Transportation Tomorrow Survey (TTS) was used for a variety of purposes, including calculating the trip rates and the auto, GO Rail, walking, and cycling mode share.
- The Metrolinx 2015 GO Rail survey, 2016 GO Bus survey, and the GO Rail Station Access Plan (December 2016) were used to estimate the existing and future GO trips and the mode split to access GO stations near Innisfil: Barrie South and Bradford GO Station.
- Traffic counts were obtained from the Ministry of Transportation of Ontario (MTO), the County of Simcoe, and the Town of Innisfil. Additional counts were conducted by HDR to calibrate and validate the model, mostly close to Alcona, Sandy Cove, and Big Bay Point (Friday Harbour development) where the Town is experiencing significant population and employment growth. Traffic Impact Study (TIS) reports were also obtained from the Town and relevant counts were used. **Table 2-1** shows the list of traffic counts, and their locations are shown in **Exhibit 2-1**. When two or more counts are available for a specific intersection or road segment, the latest one was used.
- The Provincial Growth Plan targets were used to project the Town's population and employment to 2031. The 2041 Simcoe County population target was used for the 2041 land use projection. The Innisfil Town-Wide Water and Waste-water Master Servicing Plan (2012) was used to allocate the population and employment projections to various settlement areas.
- School boards in the Town were contacted to obtain the school enrolment information
- Other relevant policy context was considered, including the Metrolinx Regional Express Rail (RER) plan to include all-day, two-way service on the Barrie GO Rail line, Simcoe County TMP, and Our Place, Draft Innisfil Official Plan (January 2017).

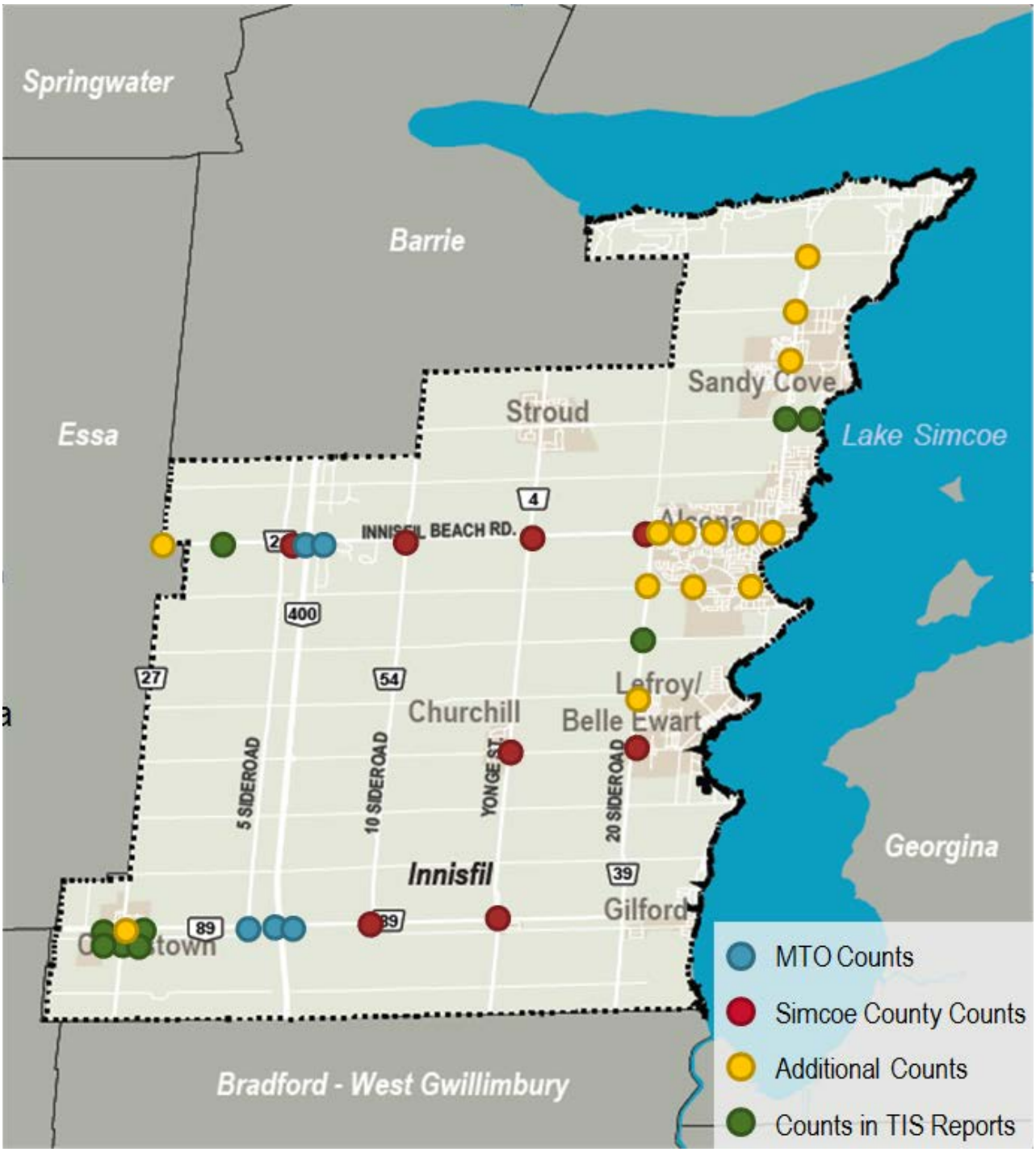

Exhibit 2-1: Traffic Count Locations

Table 2-1: Traffic Count Summary

Source	Location	Date	Peak Hour End
MTO	Hwy 400 - 2.52km N of Innisfil Beach Rd	Mar 25-31, 2015	17:00
MTO	Hwy 400 - 1.18 km N of Hwy 89	Sept 2-9, 2014	18:00
MTO	Hwy 89 @ Simcoe Rd 53 (N) Innisfil Twp Rd 5 (S)	Tue, Jul 15, 2014	17:15
MTO	Hwy 400 @ Simcoe Rd 89 (East Ramp)	Thu, May 26, 2016	16:45
MTO	Hwy 400 @ Simcoe Rd 89 (West Ramp)	Thu, May 26, 2016	16:15
MTO	Hwy 400 @ Innisfil Beach Rd (East Ramp)	Thu, May 26, 2016	17:30
MTO	Hwy 400 @ Innisfil Beach Rd (West Ramp)	Thu, May 26, 2016	18:30
Simcoe County	Yonge St (CR 4) & 4th Line	Wed, Nov 18, 2015	17:45
Simcoe County	CR 21 & 5th Side Rd	Fri, May 24, 2013	17:45
Simcoe County	CR 89 & 10th Side Rd	Fri, Apr 26, 2013	16:45
Simcoe County	Yonge/CR 4 & CR 3/89	Tue, Feb 19, 2013	17:15
Simcoe County	CR 54 & CR 21/Innisfil Beach Rd	Fri, May 3, 2013	17:15
Simcoe County	CR 4 & CR 21/Innisfil Beach Rd	Wed, Feb 20, 2013	17:00
Simcoe County	CR 39 & CR 21/Innisfil Beach Rd	Fri, Apr 26, 2013	18:00
Simcoe County	CR 39 & Killarney Beach Rd	Thu, Sep 20, 2012	17:30
Additional Counts	CR 27 & Innisfil Beach Rd	Wed, May 3, 2017	17:15
Additional Counts	20th Sideroad & CR 21/Innisfil Beach Rd	Tue, May 2, 2017	17:15
Additional Counts	Webster Blvd & CR 21/Innisfil Beach Rd	Wed, May 3, 2017	17:30
Additional Counts	Innisfil Beach Rd & Jans Blvd	Tue, May 2, 2017	16:30
Additional Counts	Innisfil Beach Rd & St Johns Blvd-Willard Ave	Tue, May 2, 2017	17:45
Additional Counts	Innisfil Beach Rd & 25th Side Rd	Wed, May 3, 2017	17:30
Additional Counts	20th Side Rd & 5th Line-Belle Aire Beach Rd	Thu, May 4, 2017	18:00
Additional Counts	20th Side Rd & 7th Line	Tue, May 2, 2017	18:00
Additional Counts	7th Line & Webster Blvd	Wed, May 3, 2017	18:00
Additional Counts	St Johns Rd & 7th Line	Thu, May 4, 2017	17:15
Additional Counts	Big Bay Point Rd - 13th Line & 25th Side Rd-Big Bay Point Rd	Tue, May 2, 2017	16:30
Additional Counts	25th Side Rd & Mapleview Dr	Wed, May 3, 2017	18:00
Additional Counts	25th Side Rd & Lockhart Rd	Thu, May 4, 2017	17:15
Additional Counts	Hwy 89 & CR 27	Tue, May 2, 2017	16:30
TIS Report [1]	20 Sideroad & 6th Line	Wed, Dec 4, 2013	n/a *
TIS Report [2]	25th Side Rd & 10th Line	Tue, Oct 11, 2016	17:30
TIS Report [2]	Ireton & 10th Line	Thu, Nov 10, 2016	17:00
TIS Report [3]	CR 21 btwn CR 53 and CR 27	Tue, Oct 11, 2016	16:00
TIS Report [4]	Hwy 89 & Dufferin St	Thu, Mar 1, 2012	n/a *
TIS Report [5]	Hwy 89 & CR 27	Thu, Mar 1, 2012	n/a *
TIS Report [6]	Hwy 89 & Albert St	Thu, Mar 1, 2012	n/a *

[1] Sleeping Lion Traffic Impact Study, 2013
[2] Innisfil Village Traffic Impact Study Updated, 2016
[3] Sleeping Lion Traffic Impact Study, 2013
[4] Sleeping Lion Traffic Impact Study, 2013
[5] Sleeping Lion Traffic Impact Study, 2013
[6] Sleeping Lion Traffic Impact Study, 2013

TIS Report [7]	Victoria St & CR 27	Thu, Mar 1, 2012	n/a *
TIS Report [8]	Victoria St & Cook St	Thu, Mar 1, 2012	n/a *
TIS Report [9]	Kidd's Lane & CR 27	Thu, Mar 1, 2012	n/a *
TIS Report [10]	Victoria St & Royal Oak Dr	Tue, Mar 1, 2016	n/a *

* Information is not available as the peak hour was not indicated in the TIS Report

3. Model Network

The network road class assumptions are shown in **Table 3-1**. Volume delay functions (VDFs) are used to calculate travel times of links as a function of traffic volumes. For example, when the traffic volumes are approaching the lane capacity, travel times are expected to be lower than the times with free-flow speeds, i.e., vehicles will experience congestion on the road. Free-flow speeds are defined differently in various models, usually as posted speed limit on local roads and 10 to 20 km/h higher on highways. These assumptions are consistent with other models in the area, namely the GTAModel v4 developed by the University of Toronto and the Greater Golden Horseshoe (GGH) Model v3 developed by MTO. The existing road network is shown in **Exhibit 3-1**.

Table 3-1: Road Class Assumption

Road Class	Type	Volume Delay Functions	Free-flow Speed (km/h)	Capacity per lane per hour
Provincial - Highway 400	10	20	120	1800
Provincial - Highway 89	11	20	80	1200
Provincial - Ramps	12	20	60	1400
County of Simcoe - Arterial Road	20	30	80	900
Town of Innisfil - Arterial Road	30	30	60	800
Town of Innisfil - Major Collector Road	31	40	50	600
Town of Innisfil - Minor Collector Road	32	40	40	50
Town of Innisfil - Local Road	33	40	40	400
Connector	90	90	40	9999

The model's zone system is based on the location of major population and employment areas. It consists of 31 internal zones, 25 external gateways connecting to surrounding municipalities, and three GO Rail park-and-ride (PnR) zones. Of the 25 external gateways zones, four are only used in the 2041 horizon year, reflecting the projected population and employment growth in Barrie (especially in the Annexed Land), which are described in detail in **Chapter 4**. The external connectors at Highway 400 and Highway 89 are connected to alternative local roads to allow traffic to shift to local roads when the highways are congested. For example, Yonge Street is an alternative route for Highway 400 when the highway is congested. For the four external zones that are only used in the 2041 horizon year, they are connected to roads close to their geographic location, allowing traffic to choose the optimal route for travel.

[7] Sleeping Lion Traffic Impact Study, 2013
[8] Sleeping Lion Traffic Impact Study, 2013
[9] Sleeping Lion Traffic Impact Study, 2013
[10] Sleeping Lion Traffic Impact Study, 2013

The three GO Rail PnR zones are Barrie South GO Station, Bradford GO Station, and the planned Innisfil GO Station located at 6th Line. The future Innisfil GO Station is not used in the existing 2011 model, but will be used in the 2041 scenarios to capture the PnR auto demand to the station.

The model network and the zones are shown in **Exhibit 3-1**.

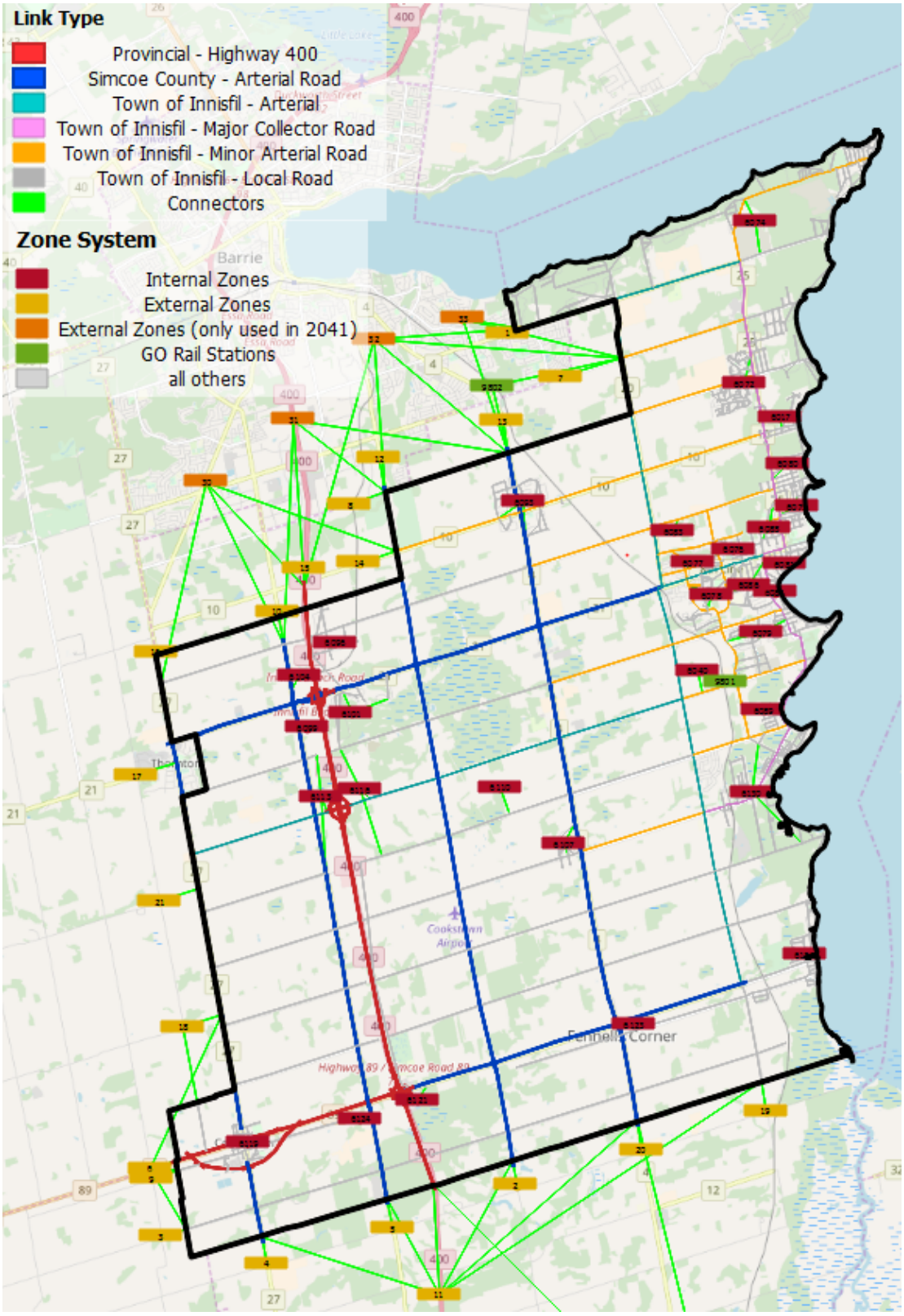

Exhibit 3-3-1: Existing Model Network

4. Land Use Forecast

Population and employment growth is a direct cause of growth in travel demand. The following section summarizes population and employment growth within Innisfil, and examines the growth assumptions in the surrounding municipalities, especially in the City of Barrie.

Town of Innisfil Growth

The land use forecast is based upon the Provincial Growth Plan targets and Simcoe County 2041 targets, and allocated amongst the various settlement areas based on the 2012 Innisfil Town-Wide Water and Wastewater Master Servicing Plan.

The Provincial Growth Plan projects a population of 56,000 people and an employment of 13,100 jobs in 2031. For 2041, the Town assumes that Innisfil will maintain the same share (13.5%) of Simcoe County's forecast population of 497,000, which leads to a total population of 67,100 people in 2041. The majority of the growth from 2041 is directed to Alcona, particularly to the area near the future GO Rail station at 6th Line. Specifically, the Sleeping Lion Town Settlement lands within the Alcona South expansion area are assumed to have a population of 5,000 to be developed by 2031. The population growth areas are illustrated in **Exhibit 4-1**.

Further to these totals, with 1600 residential units proposed in Friday Harbour (located in Big Bay Point) and assuming 2.65 persons per unit, another 4,240 persons were added to the 2031 and 2041 population forecasts. Additional population projections lead to approximately 60,300 population in 2031 and 71,400 population in 2041.

Employment remains unchanged from the Provincial Growth Plan at 13,100 jobs in 2031 and 15,070 jobs in 2041. Additional employment from 2031 was assigned to Alcona South Expansion Area and Innisfil Heights Expansion Area. The population and employment projections from 2011 to 2041 by each area are summarized in **Table 4-1**.

The location and the magnitude of 2011 and 2041 population and employment are shown in **Exhibit 4-2**.

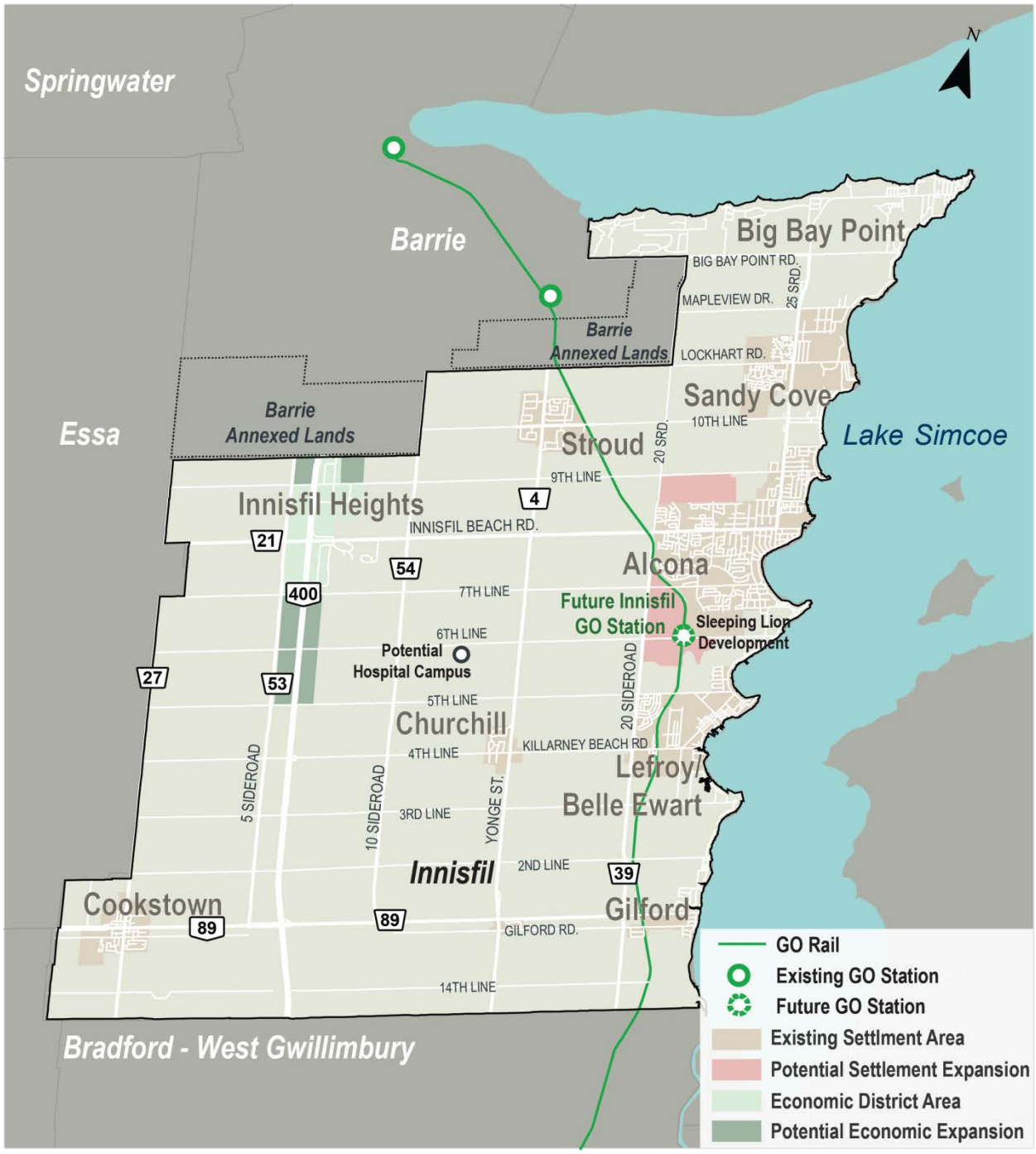

Exhibit 4-1: Future Growth Areas

Table 4-1: Population and Employment Forecast, 2011-2041

Location	Population				Employment			
	2011	2021	2031	2041	2011	2021	2031	2041
Big Bay Point	2,743	4,383	6,983	7,356	205	346	1,233	1,233
Sandy Cove	3,405	8,404	8,404	9,551	255	319	303	303
Leonard's Beach	1,232	1,232	1,238	1,238	-	-	-	-
Alcona North Expansion Area	-	-	-	4,000	-	-	-	-
Alcona North Existing Settlement	7,237	10,904	10,904	11,925	900	1,226	974	974
Alcona South Existing Settlement	7,797	10,904	10,904	11,925	730	1,056	755	755
Alcona South Expansion Area	-	-	5,000	7,150	-	-	-	770
Big Cedar Point	806	806	819	819	-	-	-	-
Lefroy - Belle Ewart	3,063	3,330	8,218	8,218	269	269	534	534
Gilford -	1,826	1,826	1,826	2,141	161	161	139	139
Fennel's Corners	196	196	196	196	-	-	-	-
Churchill	620	620	761	761	114	114	155	155
Campus Node	-	-	-	-	-	-	-	-
Stroud	2,239	2,239	2,239	2,494	413	413	509	509
Hwy 400 & 89 Employment Area	-	-	-	-	-	-	-	-
Cookstown	1,431	2,422	2,494	3,477	264	264	709	709
Innisfil Heights Expansion Area	-	-	-	-	-	-	2,400	3,600
Innisfil Heights	321	321	321	321	2,888	4,388	5,388	5,388
SUM	32,900	47,600	60,300	71,400	6,200	8,600	13,100	15,100
TARGET*	33,079	48,000	56,000	67,100	7,945	8,402	13,100	15,070

* Target: 2011 Target – Census; 2021, 2031 and 2041 Target = Provincial Growth Plan

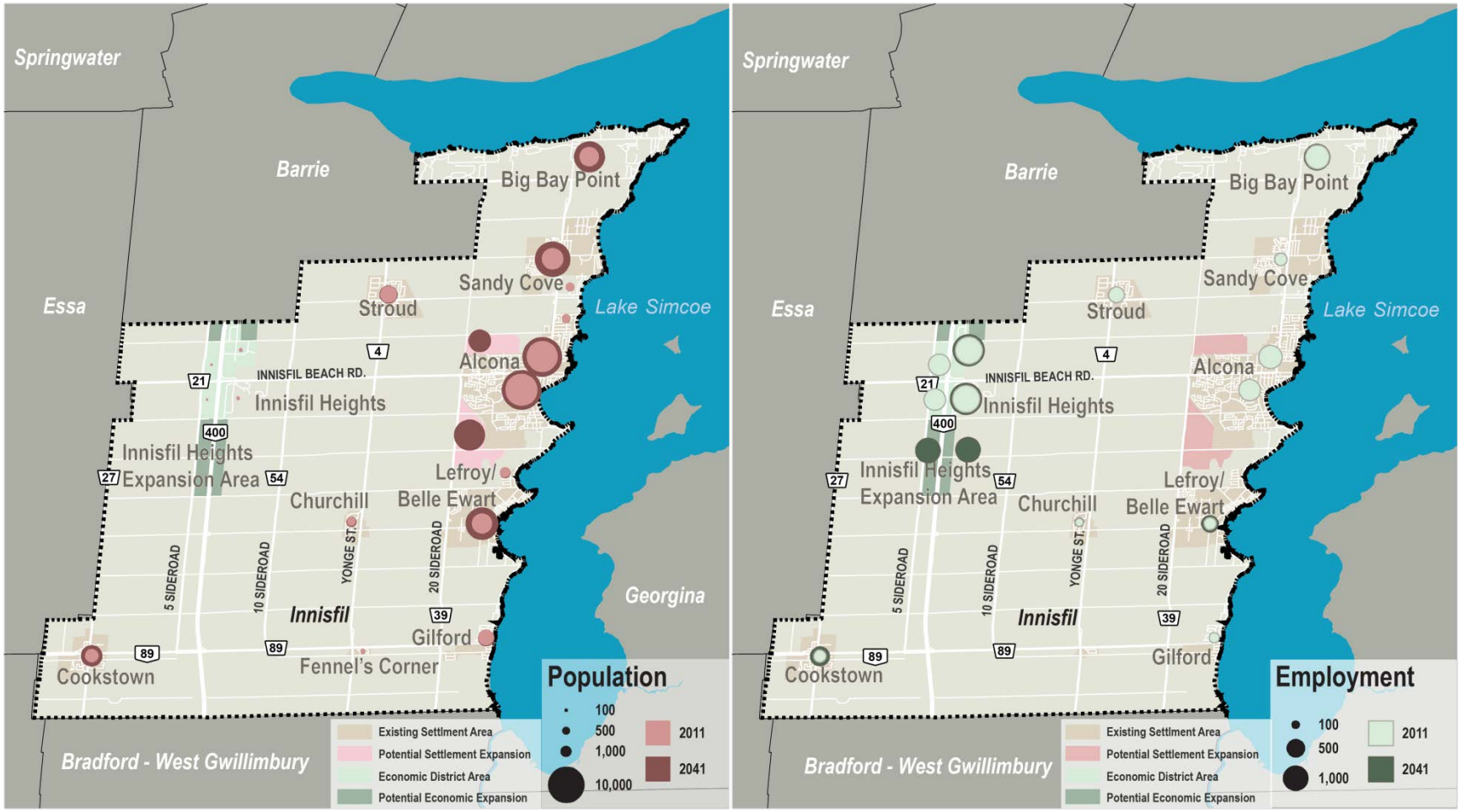

Exhibit 4-2: Existing (2011) and 2041 Population and Employment Growth

City of Barrie Growth

The City of Barrie is projected to grow from 141,000 to 253,000 residents between 2011 and 2041 and from 67,700 to 129,000 jobs during the same period.

A large portion of the growth to 2031 is expected in the "Annexed Lands" - two large parcels totalling 2,300 hectares were annexed from the Town of Innisfil in 2009. These lands are located directly north of the existing border between the City of Barrie and Town of Innisfil, and were illustrated previously in **Exhibit 4-1**. The City is projecting significant growth in these lands by 2031 – over 40,000 residents and 10,400 jobs, which will have a significant impact on County of Simcoe and Town of Innisfil roads connected to and serving the annexed lands. Generally north-south roads in the Town of Innisfil are expected to face additional through traffic originating in and destined to Barrie and this will place additional pressures on the Town to manage this growth.

A summary of the projections is provided in **Table 4-2**.

Table 4-2: Barrie Population and Employment Projections

Year	Population [1]			Employment [2]		
	Former City of Barrie Municipal Boundary	Annexed Lands	Total	Former City of Barrie Municipal Boundary	Annexed Lands	Total
2011	141,000	-	141,000	67,700	-	67,700
2021	150,700	15,900	166,600	80,000	3,400	83,400
2031	169,200	40,800	210,000	90,600	10,400	101,000
2041[3]	189,971	63,029	253,000	102,605	29,396	129,000

[1] Population including net census undercount
[2] Employment including no fixed place of work and work at home
[3] Official land use allocation is still not available. Within the former City of Barrie boundary, the growth rate from 2031 to 2041 was assumed to be the same as 2021 to 2031, and the remaining population and employment were assigned to the Annexed Lands.

This level of development directly adjacent to the Town's northern border will undoubtedly have a significant impact on traffic conditions within the Town.

Growth in Other Municipalities

The population of Simcoe County is projected to grow from 440,063 to 796,000 residents between 2011 and 2041, while employment will grow from 165,840 to 304,000 jobs. The municipalities directly adjacent to Innisfil other than Barrie are also projected for strong growth. **Table 4-3** summarizes 2011 to 2041 growth for the Town of Bradford West Gwillimbury, the Township of Essa, the Town of New Tecumseth, and the Simcoe County total (including Innisfil, Barrie, and Orillia).

Table 4-3: Provincial Growth Plan Population and Employment Estimates for Adjacent Municipalities and Simcoe County

	Population			Employment		
	2011 [1]	**2031 [2]**	**2041 [2, 3]**	**2011 [2]**	**2031 [2]**	**2041 [2 3]**
Town of Bradford West Gwillimbury	28,077	50,500	60,267	8,948	18,000	21,543

Township of Essa	18,505	21,500	25,658	7,335	9,000	10,772
Town of New Tecumseth	30,234	56,000	66,831	15,864	26,500	31,717
Simcoe County Total (including Barrie and Orillia)	446,063	667,000	796,000	165,841	254,000	304,000

[1] Source: Census
[2] Source: Places to Grow – Growth Plan 2017
[3] Source: 2011 Transportation Tomorrow Survey (TTS) Data
[3] Official allocation not available, same allocation as 2031 was assumed.

5. Methodology

The model follows a traditional four-step procedure as shown in **Exhibit 1-1** and produces p.m. peak hour assigned traffic volumes for the auto mode.

5.1. Trip Generation

The base year (2011) trip generation rates were calculated from the 2011 TTS as shown in **Table 5-1**. Due to the natures of different trip types, separate production and attraction trip rates were calculated for the different trip purposes and for internal-internal (within the Town) and internal-external trips. The model includes the following four trip purposes:

- Home-based Work (HBW), where production is solely based on population and attraction is based on employment. Trip rates are calculated by four age groups due to their different patterns of work trips.
- Home-based Other (HBO)
- Non-home Based (NHB)
- Home-based School (HBS), where only the age group between 0-17 is allowed to have school trips.

Table 5-1: Trip Generation Rate by Trip Purpose and Age Group

Purpose	Internal / External	Age Group	Population	Employment	School Enrolment
HBW Production	Internal -Internal	0-17	0.0172		
		18-24	0.0842		
		25-64	0.0465		
		65+	0.0028		
	Internal - External	0-17	-		
		18-24	0.2234		
		25-64	0.2542		
		65+	0.0166		
HBW Attraction	Internal - Internal	0-17		0.2485	
		18-24		0.1995	
		25-64		0.1380	
		65+		0.0946	
	External - Internal	0-17		-	

		18-24		0.0376	
		25-64		0.2006	
		65+		0.0811	
HBO Production	Internal - Internal	All	0.1060		
	Internal - External	All	0.1062	0.0558	
HBO Attraction	Internal - Internal	All	0.0998	0.0714	
	External - Internal	All		0.3362	
NHB *Origin /Destination	Internal - Internal	All	0.0323	0.0706	
NHB*	Internal to External	All		0.1338	
	External to Internal	All		0.2104	
HBS Production	Internal - Internal	0-17	0.0897		
	Internal - External	0-17	0.0242		
		18-24	0.0747		
HBS Attraction	Internal - Internal	0-17			0.2239
	External - Internal	0-17			0.0287

* NHB trip rates were based on origins and destinations instead of productions and attractions.

** See Section 5.2 for the difference between origin-destination and production-attraction.

5.2. Trip Distribution

The trip production and attraction matrices generated based on the trip rates were distributed using gravity models for each trip purpose (HBW, HBO, NHB, and HBS). The gravity model calculates the trips produced at i and attracted at j:

$$T_{ij} = T_i \frac{A_j f(C_{ij})}{\sum_{all\ zones} A_{j'}\ f(C_{ij'})}$$

where:

T_{ij} is the number of trips from i to j;

T_i is the number of trips from i, calculated in trip generation stage

A_j is the number trips attracted to j, calculated in the trip generation stage

$f(C_{ij})$ is the travel cost friction factor, in this model, travel times are used

As illustrated in **Exhibit 5-1**, the productions of home-based trips (HBW, HBO, and HBS) are always home, except for NHB trips where the trip productions are assumed to be trip origins, and the trip origin and destination depends on the start and end point of the trip.

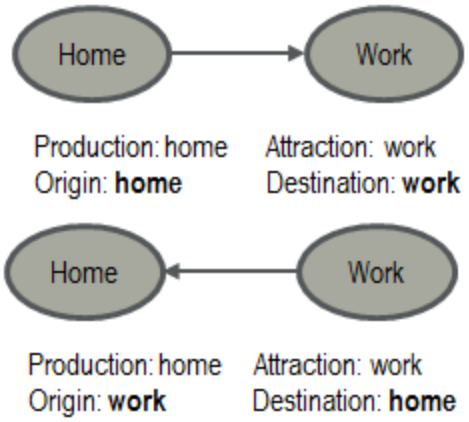

Exhibit 5-1: Comparison of Trip Production-Attraction and Trip Origin-Destination

These production-attraction (PA) matrices were then converted to origin-destination (OD) matrices based on the percentage of trips to home or to work/other/school locations extracted from 2011 TTS, as shown in **Table 5-2**.

Table 5-2: Production-Attraction to Origin-Destination Matrix Conversion

Trip Purpose	Internal/ External	Home	Work/ Other/ School	Total	% of Trips to Home	% of Trips to Work/ Other/ School
HBW	Internal	943	281	1,224	0.770	0.230
	Int-Ext	4,972	323	5,295	0.939	0.061
	Ext-Int	1,215	52	1,267	0.959	0.041
HBO	Internal	1,977	1,526	3,503	0.564	0.436
	Int-Ext	2,456	1,930	4,386	0.560	0.440
	Ext-Int	1,478	1,193	2,671	0.553	0.447
HBS	Internal	648	-	648	1.000	-
	Int-Ext	402	-	402	1.000	-
	Ext-Int	83	-	83	1.000	-

5.3. Mode Split

The transit, walk, and bike demands are subtracted from the total OD demand matrices to obtain the peak period traffic OD matrix. The mode share is based on the 2011 TTS as shown in **Table 5-3**.

Table 5-3: Existing (2011) PM Peak Period Mode Share

Direction of Travel	Trip Purpose	Auto driver/ passenger	GO Transit	School Bus	Walk/Bike	Total
Within Innisfil	HBW	0.921	-	0.016	0.064	1.000
	HBS	0.077	-	0.655	0.268	1.000
	HBO	1.000	-	-		1.000
	NHB	1.000	-	-	-	1.000

Trips From York Region and Toronto to Innisfil	HBW	0.946	0.054	-	-	1.000
	HBS	0.272	-	0.728	-	1.000
	HBO	0.972	0.028	-	-	1.000
	NHB	1.000	-	-	-	1.000

Note: directions of travel not shown in this table have 100% auto travel mode share

5.4. External-External Trips

The external to external (i.e., through) trips were extracted from 2011 TTS and distributed based on the existing traffic counts. The distribution of external trips to gateways by each direction is shown in **Table 5-4**.

Table 5-4: External Trip Split to Gateways

Gateway Zone #	Road Name	Gateway Location	Two-way Count	Split within the Same Direction
1	Big Bay Point Rd	North	320	3%
7	Mapleview Dr	North	76	1%
13	Yonge St	North	693	7%
12	Hurontario Rd	North	562	6%
8	Salem Rd	North	50*	1%
14	10th Line	North	50*	1%
15	Highway 400	North	6117	63%
10	5 Sideroad	North	916	10%
16	County Rd 27	North	854	9%
Gateways to the North of Innisfil Total				100%
17	County Rd 21	West	887	35%
21	10 Sideroad	West	50*	2%
18	5 Sideroad	West	50*	2%
6	Highway 89	West	1477	58%
9	15th Line	West	50*	2%
3	14th Line	West	50*	2%
Gateways to the West of Innisfil Total				100%
4	County Rd 27	South	526	6%
5	5th Sideroad	South	191	2%
11	Highway 400	South	6523	72%
2	10th Sideroad	South	448	5%
20	Yonge St	South	993	11%
19	20th Sideroad	South	375	4%
Gateways to the South of Innisfil Total				100%

* No counts available. The two-way hourly demand is assumed to be 50 for demand to be assigned to the specific gateway.

5.5. Auto Demand Adjustment and Trip Assignment

All internal and external O-D demand by each trip purpose is summed together to get the total auto demand in persons. Based on 2011 TTS, an auto occupancy factor 1.2105 is used to calculate the number of auto vehicles in the peak period to obtain the number of vehicles. The peak hour factor is the number of auto drive trips in the peak hour (the hour of highest demand within the overall peak period) divided by the number of auto drive trips in the peak period, which was 0.361 for the Town (based on 2011 TTS).

Before assigning the peak hour auto demand to the network, the O-D demand matrix was adjusted using the EMME tool that adjusts the demand based on traffic counts. Maximum demand adjustment factor limits (maximum of 100 or 2 times adjustments) were used to prevent extreme adjustment factors being applied. This set of traffic adjustment calibration factors is then applied to all existing and future scenarios. **Exhibit 5-1** shows the process leading towards the auto assignment.

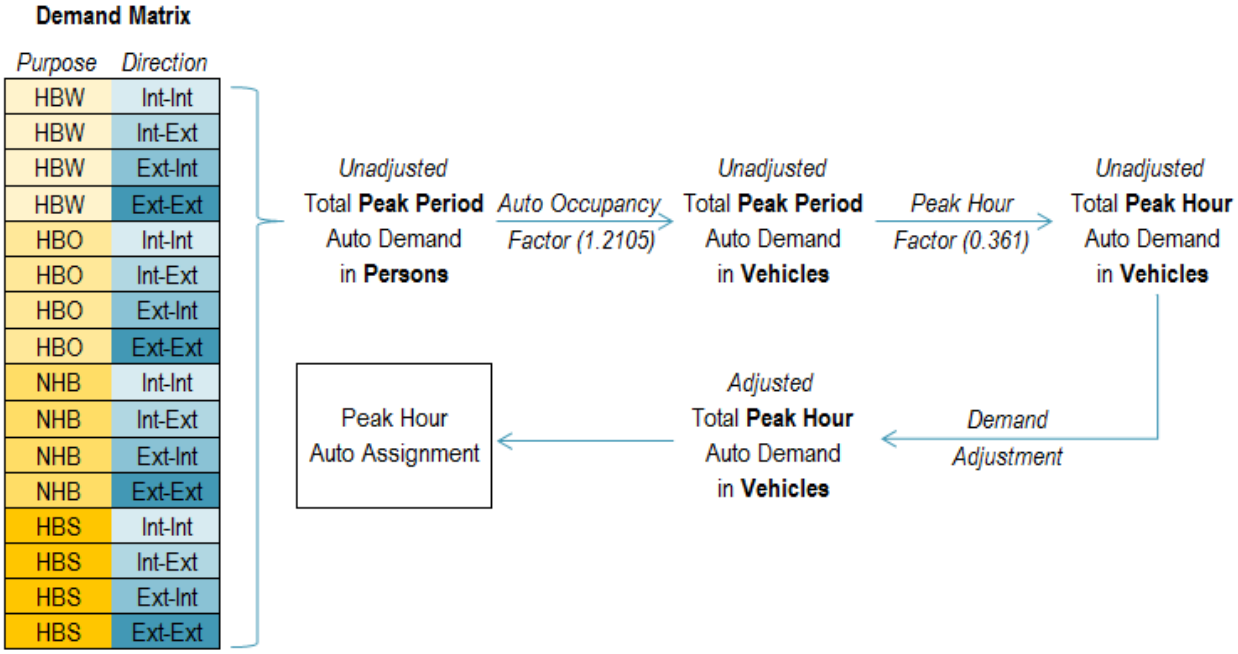

Exhibit 5-2: Procedures in the Traffic Assignment Section

6. Validation

Table 6-1 shows the comparisons between the modelled and observed peak hour traffic volumes in the 2011 scenario. Nine screenlines are selected, as shown in **Exhibit 6-1**, to capture the demand to, from and within the Town, crossing the Town boundaries and highways through the Town. Two short screenlines, screenline 8 and 9, are at the Northern boundary (at Innisfil Beach Road) of the Alcona settlement area. These two screenlines were selected since Alcona has the largest portion of population in the Town and is expecting significant growth in population and employment in the future.

Two criteria are used in the validation: modelled and observed volume ratio, and the GEH statistic. The GEH statistic is able to address both absolute and relative difference between the

modelled and observed volume. It avoids some pitfalls that occur when using simply the relative difference, namely that a very high percentage difference may reflect a very low difference in volume on low-volume roads. It is calculated as:

$$GEH = \sqrt{\frac{2(M-C)^2}{M+C}}$$

where M is modelled hourly traffic volume, and C is the equivalent observed volume (count)

Typically a GEH value less than 5 is considered a good match between the modelled and observed volume; a value between 5 and 10 may be acceptable (subject to review); and a value higher than 10 usually requires further attention for model calibration.

The modelled volumes are able to match the observed volumes (counts) reasonably well. All GEH statistics are within 5, indicating a good match between the modelled and observed volume. Only two screenlines have 10% or more difference between the modelled and observed volumes, partially due to the low traffic volumes at the screenlines. Therefore, the model is calibrated well to 2011 p.m. peak traffic counts in Innisfil.

The existing (2011) PM peak hour traffic volume is shown in **Exhibit 6-2**.

Table 6-1: Comparison of Observed and Modelled Traffic Volumes at Screenlines (2011, PM Peak Hour)

Screenline #	Screenline Description	Direction	Observed	Modelled	Modelled/ Observed	GEH
1	North of Hwy 89	NB	5,970	5,760	0.97	2.7
		SB	3,230	3,140	0.97	1.6
2	South of Innisfil Beach Road	NB	6,520	6,690	1.03	2.1
		SB	4,060	4,170	1.03	1.7
3	North of Innisfil Beach Road	NB	6,580	6,730	1.02	1.8
		SB	3,960	4,210	1.06	3.9
4	West of 5th Sideroad	EB	1,070	1,090	1.02	0.6
		WB	1,050	980	0.93	2.2
5	East of Hwy 400	EB	1,470	1,360	0.93	2.9
		WB	780	850	1.09	2.5
6	West of Yonge St	EB	1,040	1,130	1.08	2.7
		WB	600	640	1.07	1.6
7	East of Yonge St	EB	1,440	1,310	0.91	3.5
		WB	590	590	1.00	0.0
8	North of Innisfil Beach Road, east of the CN Rail (Alcona)	NB	850	830	0.98	0.7
		SB	570	490	0.86	3.5
9	South of Innisfil Beach Road, east of the CN Rail (Alcona)	NB	870	730	0.84	4.9
		SB	600	640	1.06	1.6

Legend

Difference between Modelled and Observed Volume	< 10%	10-20%	>20%
GEH	<5 (good)	5-10 (acceptable)	>10 (needs improvement)

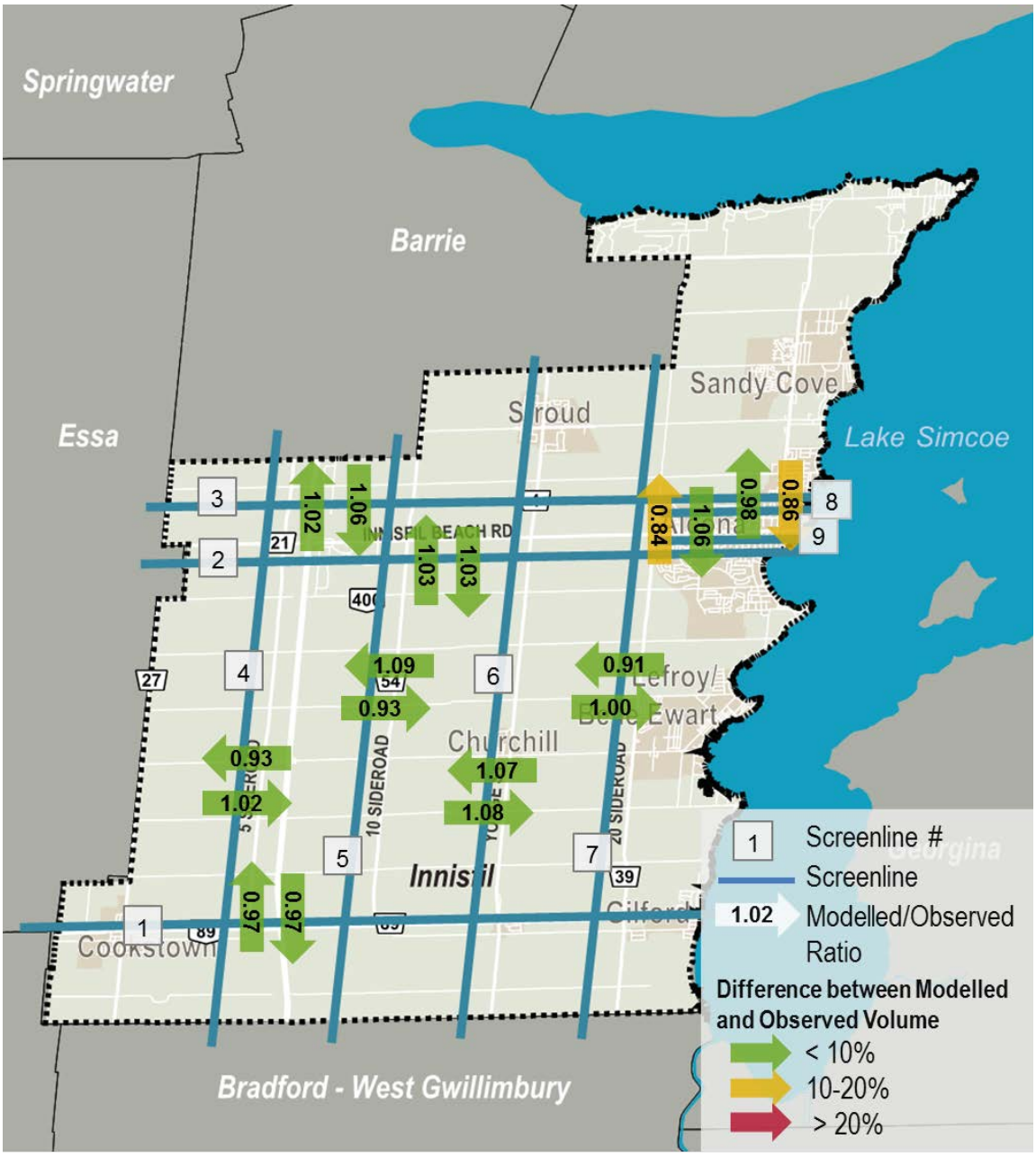

Exhibit 6-1: Difference between Modelled and Observed Volumes at Screenlines

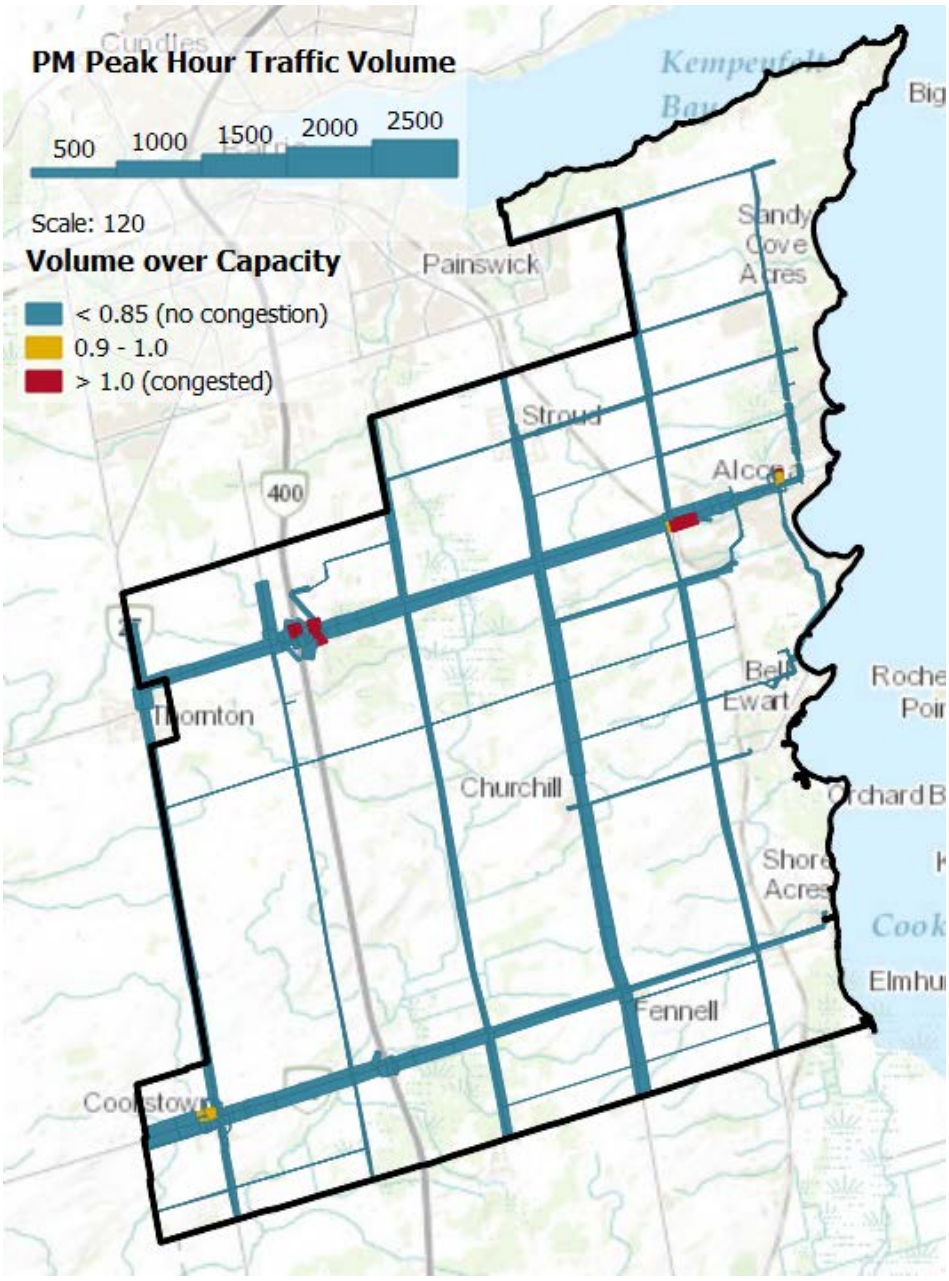

Exhibit 6-2: Existing Traffic Volume and Volume over Capacity Ratio (2011, PM Peak Hour)

Note: Volumes on Highway 400 are not shown

7. Future Model

The internal demand and internal-external demand are based on the production and attraction of population and employment in the Town, thus will be forecasted based on the Town's future land use projections as described in Section 4.

The external trips are estimated based on the growth of surrounding municipalities, including the City of Barrie, the rest of Simcoe County, York Region, and Toronto.

The future mode share can be adjusted based on different scenario assumptions and other planning context. For example, based on the Metrolinx GO Rail Station Access Plan, close to 1,000 passengers will use the future Innisfil GO station in 2031 per day. The identified mode share targets only include 50-52% drive and park trips and much higher walking (10-12%), micro-transit (16-18%), pick up / drop off (16-18%), and carpool passenger trips (5-7%), as shown in **Exhibit 7-1**. These assumptions will be reflected in the future alternatives and documented in detail in another report.

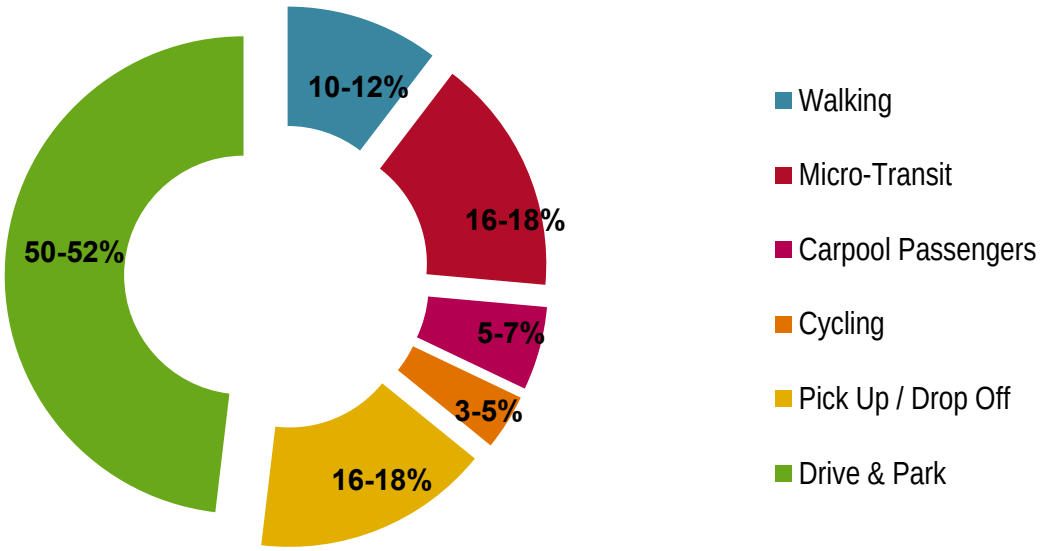

Exhibit 7-1: Future Innisfil Station Access Target Mode Share (2031)

Source: GO Rail Station Access Plan Final Report, December 2016

Descriptions of the future year (2041) alternatives and the forecasted travel demand can be found in the Innisfil Transportation Master Plan Update main report.