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969, 979 & 989 Mapleview Drive East Phase 2

TRANSPORTATION IMPACT STUDY

Sandy Creek Estates Inc.

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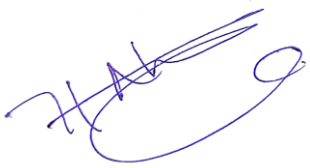	 
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Issue	Date	Description
1	January 30, 2025	Final Report

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1 Introduction

Tatham Engineering Limited was retained by Sandy Creek Estates Inc. to address the traffic impacts associated with Phase 2 of the proposed residential development to be located at 969, 979 and 989 Mapleview Drive East in the City of Barrie. The location of the development site is illustrated in Figure 1.

1.1 REPORT OBJECTIVE

The objective of this report is to present the findings of the transportation impact study and address the requirements of the City of Barrie with respect to the potential transportation impacts of the development on the local road network. In particular, the following will be discussed:

- the operations of the road system through the study area prior to the proposed development;
- the growth in the traffic volumes not otherwise attributed to the development (i.e. from overall growth in the area and/or other developments);
- the number of new trips the proposed development is likely to generate;
- the operations of the study area road system upon completion of the development; and
- the resulting impacts and need for mitigating measures (if required) to ensure acceptable overall road operations.

The study has been conducted as per agreed upon Terms of Reference provided in Appendix A.

1.2 REPORT STRUCTURE

The report is structured as follows:

- Chapter 1: introduction and study purpose;
- Chapter 2: existing conditions, detailing the road system and corresponding traffic operations;
- Chapter 3: future conditions, prior to the completion of the proposed development (referred to as future background conditions), the expected growth in traffic levels and the resulting operating conditions;
- Chapter 4: proposed development and associated details including land use, access, and traffic volumes;
- Chapter 5: future conditions, with completion of the proposed development (referred to as future total conditions); and
- Chapter 6: summary of the report and key findings.

2 Existing Conditions

This chapter will describe the road network, traffic volumes and operations under existing conditions.

2.1 ROAD NETWORK

The road network to be addressed by this study consists of the following roads and intersections:

Roads

- Mapleview Drive East
- Terry Fox Drive

Intersections

- Mapleview Drive East & Terry Fox Drive

Aerial mapping and imagery of the road system are provided in Figure 2 and Figure 3.

2.1.1 Roads

Brief descriptions of the study area roads are provided below. The functional classifications are based on those presented in *Schedule 4b – Mobility Network* of the City's *Official Plan*[1].

Mapleview Drive East

Mapleview Drive East is designated as an arterial road and is under the jurisdiction of the City of Barrie. The road is oriented east-west through the study area and has a 2-lane rural cross section (i.e. gravel shoulders and open ditches) providing 1 lane of travel per direction. Mapleview Drive East has a posted speed limit of 60 km/h through the area.

Terry Fox Drive

Terry Fox Drive is a north-south major collector road. It is currently unassumed and is being constructed as development progresses along the corridor. To date, Terry Fox Drive extends north from Mapleview Drive East to Empire Drive. The road has a 3-lane urban cross-section providing one lane of travel per direction with a continuous two-way left turn lane. As the road remains unassumed, some cross-section elements have not been implemented to date or have been partially implemented (i.e. sidewalks, curbs, pavement markings, bicycle lanes, etc.). The speed limit on Terry Fox is 50 km/h. Further details regarding the future construction and extension of Terry Fox Drive are provided in Section 3.1.2.

[1] *City of Barrie Official Plan 2051*. City of Barrie, May 2024.

2.1.2 Intersection

Mapleview Drive East & Terry Fox Drive

The intersection of Mapleview Drive East with Terry Fox Drive is a 3-leg, unsignalized intersection with stop control on the minor leg (Terry Fox Drive). The east and west approaches are single lane approaches (i.e. no exclusive turn lanes are provided), whereas the north approach consists of exclusive left and right turn lanes. While there is a westbound right taper, it is not considered a full right turn lane and thus has can be considered with the through lane (i.e. shared through-right lane).

2.2 TRAFFIC VOLUMES

To establish the existing traffic volumes through the study area traffic counts were conducted at the intersection of Mapleview Drive East and Terry Fox Drive on December 18, 2024. The observed peak hour volumes are provided in Figure 4, with detailed count sheets provided in Appendix B. While the volumes were observed in December, they are considered reflective of typical peak conditions recognizing the residential nature of the area (i.e. residential areas typically experience consistent peak hour volumes throughout the year as traffic patterns are influenced primarily by work and school based trips).

2.3 TRAFFIC OPERATIONS

To provide a baseline from which the future traffic operations can be assessed, the existing traffic operations were reviewed. As the capacity, and hence operations, of a road system is effectively dictated by its intersections, the review focused on the noted intersection, based on:

- the 2024 traffic volumes;
- the existing intersection configuration and control (including consideration for a shared westbound through-right lane); and
- procedures outlined in the *2000 Highway Capacity Manual*[2] (using Synchro v.11 software).

The analysis considers the following metrics for each lane group at signalized intersections and for the critical movements at unsignalized intersections (namely the stop-controlled movements):

- the average delay (measured in seconds);
- level of service (LOS); and

[2] *2000 Highway Capacity Manual.* Transportation Research Board. Washington DC, 2000.

- volume to capacity (v/c) ratio.

With respect to the noted metrics:

- LOS A corresponds to the best operating condition with minimal delays whereas LOS F corresponds to poor operations resulting from high intersection delays (additional details regarding Level of Service definitions are provided in Appendix C; and
- a v/c ratio of less than 1.0 indicates the intersection movement/approach is operating at less than capacity while v/c of 1.0 indicates capacity has been reached.

A summary of the operational analysis is provided in Table 1 with detailed operations worksheets provided in Appendix D.

Table 1: Intersection Operations – 2024

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
Mapleview Drive East & Terry Fox Drive	SB L	stop	11	B	0.01	12	B	0.02
	SB R	stop	9	A	0.03	9	A	0.03

L – left T – thru R – right LTR – left-thru-right LT – left-thru TR – thru-right LR – left-right

As indicated, the intersection of Mapleview Drive East with Terry Fox Drive is currently providing excellent operations (LOS B or better).

2.4 ROAD NETWORK IMPROVEMENTS

Based on the results of the operational analysis under existing conditions, no improvements are required to accommodate the existing traffic volumes.

3 Future Background Conditions

This chapter will describe the road network and background traffic volumes expected for the years 2031, 2036 and 2041. The 2031 horizon year has been adopted to reflect full build-out of Phase 2, whereas the 2036 and 2041 horizons will address the longer-term impacts (5 and 10 years beyond build-out).

3.1 ROAD NETWORK

3.1.1 Mapleview Drive

As per the City of Barrie's *2019 Capital Plan* (and also identified in the *Hewitt's Secondary Plan Class EA Study*[3] and the *Draft Plan of Subdivisions, Hewitt Landowners Group – Updated Master Transportation Study*[4]), Mapleview Drive East from Prince William Way to east of Terry Fox Drive is to be widened from its existing 2-lane cross-section to a 3-lane cross-section with 1 travel lane per direction and a continuous two-way left turn lane (centre turn lane). The improvements will also include a 3.0 metre multi-use trail along the north side of the road. The *2025 Capital Plan* notes that the improvements are to be implemented by 2031 and thus, for the purpose of this report, they have been assumed in place for the 2031 horizon.

Further to the above, as per the *City of Barrie's Transportation Master Plan*[5], Mapleview Drive East from east of Yonge Street to Terry Fox Drive will be further expanded to a 5-lane cross section by 2041, with 2 lanes in each direction and a two-way left turn lane. For the purpose of this report, the 5-lane cross-section will only be considered if dictated by the future operations of the road network.

3.1.2 Terry Fox Drive

Terry Fox Drive (identified as Collector 11 in the *Hewitt's Secondary Plan Class EA* and the *City of Barrie Transportation Master Plan*) is a major collector road planned to extend from Big Bay Point Road to Lockhart Road. It will feature a three-lane cross-section, including one travel lane per direction and a continuous two-way left-turn lane. The road design will also incorporate buffered bicycle lanes and sidewalks on both sides to support active transportation. As previously noted, the north section of Terry Fox Drive connecting Mapleview Drive East to Empire

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[3] *Hewitt's Secondary Plan Class Environmental Assessment Study.* Hatch Ltd., October 2017.
[4] *Draft Plan of Subdivisions, Hewitt Landowners Group – Updated Master Transportation Study.* LEA Consulting Ltd., February 2017.
[5] *The City of Barrie Transportation Master Plan.* WSP, June 2019.

Drive is partially complete (i.e. provides access to the adjacent residential development) but has not yet been assumed by the City.

The south leg of Terry Fox Drive will be constructed (in part) to support Phase 1 and Phase 2 of the subject development. While the subject development will only see construction of the road to the south limit of the site, it has been assumed (for the purpose of this report) that Terry Fox Drive will be connected through to Lockhart Drive by the 2031 horizon. This is consistent with the assumptions contained in the *969, 979 & 989 Mapleview Drive East, Phase 1 - Traffic Impact Study*[6] (Phase 1 TIS).

3.2 TRAFFIC VOLUMES

3.2.1 2031 Horizon

The Hewitt Landowners Group commissioned a *Draft Plan of Subdivision - Master Transportation Plan for the Hewitt's Secondary Plan Area,* which was completed in 2017 and updated in 2019 to address City comments. The study, which was comprehensive in its consideration of development in the secondary plan area, considered a 2031 ultimate horizon. The corresponding 2031 traffic volume projections have formed the basis for subsequent traffic studies completed for individual developments within the area. This same methodology has been employed in this study, with a focus on the intersection of Mapleview Drive East with Terry Fox Drive

While the 2031 traffic volume projections provided in the *Updated Master Transportation Plan* form the basis for the traffic projections considered in this study, some adjustments have been made to consider the following:

- updated traffic projections for the north leg of Terry Fox Drive as per the *Functional Design Review – Traffic Update – 932 & 970 Mapleview Drive*[7] as they pertain to the revised site plan for the proposed development at 932, 970, 1002 and 1006 Mapleview Drive East; and
- adjustments to the through volumes on Mapleview Drive East where the volumes observed during the 2024 traffic counts were greater than the future projections contained in the *Updated Master Transportation Plan* and *Functional Design Review – Traffic Update* reports (the 2024 through volumes were adjusted by a background growth rate of 2% per annum to yield 2031 volumes, as discussed below).

In addition to the above, the traffic volumes on the south leg of Terry Fox Drive were adjusted to remove the volumes associated with the overall Sandy Creek Estates development as assumed

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[6] *969, 979, 989 Mapleview Drive East Phase 1 - Traffic Impact Study.* Tatham Engineering Limited, February 2022

[7] *Functional Design Review – Traffic Update – 932 & 970 Mapleview Drive.* JD Engineering, November 2020.

in the *Updated Master Transportation Plan* which in turn were replaced with the updated trip estimates for Phase 1, as presented in the *Phase 1 TIS* (full build-out of Phase 1 is assumed prior to 2031). The assignment of Phase 1 trips to the road network is illustrated in Figure 5 for reference purposes.

3.2.2 2036 & 2041 Horizons

The 2036 and 2041 background volumes reflect the 2031 background volumes, adjusted by the following growth rates:

- Mapleview Drive East - 2% per annum; and
- Terry Fox Drive - 1% per annum.

The 2% background growth rate applied to the through volumes on Mapleview Drive East is consistent with that applied in the *Phase 1 TIS*, at the direction of City staff. A 1% background growth rate has been applied to volumes on Terry Fox Drive to ensure a conservative approach and to further recognize the anticipated completion of this road to the north and south (0% growth was otherwise assumed in the *Phase 1 TIS*).

3.2.3 Background Traffic Volumes

The 2031 traffic volumes as provided in the *Updated Master Transportation Plan* (i.e. prior to the adjustments noted in Section 3.2.1) are illustrated in Figure 6. The resulting background traffic volumes for the 2031, 2036 and 2041 horizon years (with adjustments incorporated) are illustrated in Figure 7 to Figure 9.

3.3 TRAFFIC OPERATIONS

The intersection of Mapleview Drive East and Terry Fox Drive was analyzed for each horizon year given the projected background volumes. The intersection has been assessed as a typical 4-leg intersection with stop control on Terry Fox Drive. The widening of Mapleview Drive East to a 3-lane cross-section has been assumed as complete by the 2031 horizon year. While the City's *TMP* recommends a 5-lane cross-section by the 2041 horizon, the 3-lane cross-section has nonetheless been maintained through the 2041 horizon with the recommended 5-lane cross-section only to be considered if the resulting operations require such to ensure acceptable operations.

The results of the assessment are summarized in Table 2 through Table 4 (detailed worksheets are provided in Appendix E.

Table 2: Intersection Operations - 2031 Background

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
Mapleview Drive East & Terry Fox Drive	NB L	stop	33	D	0.39	36	E	0.46
	NB TR	stop	14	B	0.09	20	C	0.18
	SB L	stop	16	C	0.13	20	C	0.04
	SB TR	stop	14	B	0.42	13	B	0.26

L – left T – thru R – right LTR – left-thru-right LT – left-thru TR – thru-right LR – left-right

Table 3: Intersection Operations - 2036 Background

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
Mapleview Drive East & Terry Fox Drive	NB L	stop	44	E	0.48	47	E	0.56
	NB TR	stop	15	B	0.10	22	C	0.21
	SB L	stop	16	C	0.15	22	C	0.04
	SB TR	stop	15	B	0.46	14	B	0.28

L – left T – thru R – right LTR – left-thru-right LT – left-thru TR – thru-right LR – left-right

Table 4: Intersection Operations - 2041 Background

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
Mapleview Drive East & Terry Fox Drive	NB L	stop	**70**	**F**	0.63	**75**	**F**	0.71
	NB TR	stop	15	C	0.11	25	C	0.24
	SB L	stop	18	C	0.17	24	C	0.05
	SB TR	stop	16	C	0.50	15	B	0.31

L – left T – thru R – right LTR – left-thru-right LT – left-thru TR – thru-right LR – left-right

As indicated, the northbound left turn movement is expected to experience poor operating conditions (LOS F) with long delays by the 2041 horizon based on the projected volumes.

While a further widening of Mapleview Drive East to 5 lanes was identified in the City's TMP for 2041, such will not otherwise address the poor intersections operations. Rather, to address the

poor operations, the implementation of traffic signals was considered. Corresponding warrants were completed following the methodologies and warrant criteria outlined under *Justification 7* of *Ontario Traffic Manual* (OTM) *Book 12 – Traffic Signals* which are provided in Appendix F. Results of the warrants indicate that traffic signals are not warranted at this intersection based on the projected future volumes. Notwithstanding the results of the signal warrants and in consideration of the otherwise poor operations, the intersection was reassessed under signal control as summarized in Table 5.

Table 5: Intersection Operations - 2041 Background + Improvements

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
Mapleview Drive East & Terry Fox Drive	EB L	signal	8	A	0.34	12	B	0.58
	EB TR	signal	7	A	0.31	6	A	0.31
	WB L	signal	5	A	0.01	4	A	0.02
	WB TR	signal	7	A	0.27	7	A	0.47
	NB L	signal	21	C	0.54	25	C	0.57
	NB TR	signal	16	B	0.11	20	B	0.18
	SB L	signal	17	B	0.23	19	B	0.05
	SB TR	signal	17	B	0.38	20	B	0.19
	overall	signal	11	B	0.40	11	B	0.58

L – left T – thru R – right LTR – left-thru-right LT – left-thru TR – thru-right LR – left-right

As indicated, signalization of the intersection will ensure that excellent overall operations (LOS B) are maintained during each peak period, with low to average delays and reserve capacity remaining ($v/c \leq 0.58$) on each movement.

3.4 ROAD NETWORK IMPROVEMENTS

Based on the operational review under background conditions, the subject intersection will experience poor operations by the 2041 horizon. To address the poor operations, traffic signals are recommended for implementation by 2041.

4 Proposed Development

This chapter will provide additional details with respect to the proposed development, including its location, the projected site generated traffic volumes and the assignment of such to the adjacent road network.

4.1 SITE LOCATION

As illustrated in Figure 1, the proposed development is to be located at 969, 979 and 989 Mapleview Drive East within the City of Barrie.

4.2 LAND-USE & PHASING

The proposed residential development will consist of the following:

- 28 single detached units;
- 231 freehold townhouse units (209 townhouses + 22 back-to-back townhouses); and
- 69 condominium townhouse units.

As part of the City's affordable housing policies, it is proposed that 10% of the freehold townhouse units (23 units) will include an accessory dwelling unit, resulting in 23 additional dwelling units. As such, overall, Phase 2 will consist of 351 dwelling units.

A draft plan of subdivision is provided in Figure 10. A single phase has been considered with full build-out and occupancy by 2031.

4.3 PARKING

As per the City's current zoning by-law (*Zoning By-Law 2009-141*[8]), a residential development is required to provide 1.5 spaces per unit. The single detached and freehold townhouses will provide 2 spaces per unit, with 1 garage space and 1 driveway space. Parking for the condominium townhouses will be resolved through the site plan approval process.

In providing 2 spaces per unit, the single detached and freehold townhouse units will satisfy the City's current zoning requirement; however, the freehold townhouse units equipped with an accessory unit will not satisfy the requirement – instead providing 1 space for the townhouse unit and 1 space for the accessory unit. These spaces will be provided in tandem, with 1 garage space and 1 driveway space.

[8] *City of Barrie Comprehensive Zoning By-law 2009-141.* City of Barrie. Office consolidated January 2024.

While not satisfying the current residential parking requirements, the proposed parking supply for the townhouses with accessory dwelling units is supported based on the following:

- proposed parking rates contained in the City's current draft Zoning By-Law[9], which require 1 space per unit for any dwelling unit type located in District 5 (as per Figure 11, the site is located within District 5); and
- policies within the City's *Official Plan*[10] which require affordable units to be provided in new greenfield developments and further note that alternative parking ratios will be considered to assist in the provision of accessory units.

With respect to tandem parking, the *Planning Act*[11] states that a parking space provided and maintained for the sole use of the occupant of an accessory unit may be a tandem parking space.

Based on the above, the proposed parking supply for the freehold townhouses with an accessory unit is considered reasonable and further supports policy initiatives of the City and Province.

4.4 MUNICIPAL ROAD NETWORK

The subject development will be served by a new municipal road network consisting of Terry Fox Drive (major collector), Fagan Boulevard (minor collector) and several other new local roads. A review of the proposed road network in context of the City's *Right-of-Way Infrastructure Standards* and the Transportation Association of Canada (TAC) *Geometric Design Guide for Canadian Roads* was completed and documented in the *969, 979 & 989 Mapleview Drive East (Sandy Creek Estates), Phase 2: Conformity Review – Transportation*[12]*.* The *Conformity Review* concluded that the proposed transportation elements serving Phase 2 are consistent with the City's design requirements and/or industry standards.

4.5 RESIDENTIAL ACCESS

4.5.1 Corner Clearance

Corner clearance is the minimum suggested distance between a proposed access and an adjacent intersection or driveway. The distance is typically measured from the near curb of the adjacent street/access to the near edge of the proposed access. Inadequate corner clearance can result in interrupted traffic flow, poor access operations and safety concerns. Appropriate corner clearance is of particular concern at intersections where stop or signal control is present

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[9] *City of Barrie Draft Comprehensive Zoning By-Law (3rd Draft).* City of Barrie, September 2024
[10] *City of Barrie Official Plan, 2051,* City of Barrie, Approved May 2024
[11] *Ontario Regulations 299/19, Additional Residential Units, Planning Act.* Ministry of Municipal Affairs and Housing.
[12] *969, 979, & 989 Mapleview Drive East (Sandy Creek Estates), Phase 2: Conformity Review – Transportation.* Tatham Engineering Limited, August 9, 2023

(i.e. stop control and traffic signals may create queues that encroach on the operations of the adjacent driveway).

The corner clearance distance consists of three measurements: the corner curb radius of the adjacent intersection or access, a tangent section and the radius of the proposed access. The tangent section provides separation between the end of the adjacent intersection corner radius and the end of the proposed access radius.

As per TAC guidelines, a residential driveway on a local or collector road should have a minimum tangent length of 2.0 meters from the nearest street corner. Recognizing the current application is for draft plan approval, the specific driveway locations for each lot have not been identified; however, the driveways will be located to comply with the noted TAC standards with respect to corner clearance.

4.5.2 Collector Roads

Terry Fox Drive (major) and Fagan Boulevard (minor) are collector roads serving the subject development. To limit the number of residential driveways along the collector road network within the development, the condominium townhouse block (Block 71) and park block (Block 72) have been located with frontage along Terry Fox Drive and Fagan Boulevard. Both the park block and condominium will have far fewer access points along their frontages (as compared to these blocks instead being developed as individual townhouse units with direct driveway access). Furthermore, locating the park and condominium blocks as proposed will also limit direct driveway access to one side of the road along these sections.

The proposed driveway density along the subject collector roads is consistent with that of other residential development within the City, including new development along Terry Fox Drive, north of Mapleview Drive East. From a traffic operations perspective, there are no concerns with the proposed driveway density on Terry Fox Drive and Fagan Boulevard.

4.6 SITE TRAFFIC

4.6.1 Trip Generation

The *Updated Master Transportation Plan* conducted for the Hewitt's Secondary Plan Area applied residential trip generation rates that were established from a proxy site survey conducted at the adjacent residential development to the west (the existing development served by Prince William Way between Mapleview Drive East and Big Bay Point Road). These rates have been consistently applied in subsequent traffic studies completed for individual developments within the secondary plan area, including Phase 1 of the subject development. As such, to maintain consistency with the *Updated Master Transportation Plan*, the trip generation rates considered therein have been

applied to the subject development. It is noted that the unit mix of the proposed development is consistent with that of the proxy site, and thus the trip generation is expected to be similar.

The proxy site trip generation rates are provided in Table 6, whereas the resulting trip estimates for the site are provided in Table 7. As indicated, the proposed development is expected to generate 168 new trips during the AM peak hour and 236 new trips during the PM peak hour.

Table 6: Trip Generation Rates

LAND USE	VARIABLE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
		In	Out	Total	In	Out	Total
residential (proxy site)	units	0.14	0.34	0.48	0.42	0.25	0.67

Table 7: Trip Estimates

LAND USE	UNITS	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
		In	Out	Total	In	Out	Total
single detached	28 unit	4	9	13	12	7	19
townhouses - freehold	231 units	32	79	111	96	59	155
accessory units	23 units	3	8	11	10	6	16
townhouses - condo	69 units	10	23	33	28	18	46
Total	**351 units**	**49**	**119**	**168**	**146**	**90**	**236**

4.6.2 Trip Distribution & Assignment

The distribution of the new trips generated by the proposed development has been established based on trip distribution data provided in the 2022 *Transportation Tomorrow Survey*. The TTS is a comprehensive travel survey conducted in the Greater Golden Horseshoe Area once every 5 years. In addition to TTS data, consideration was also given to the proximity of the site to built-up/employment areas within the City of Barrie.

The following distribution has been applied:

- to/from the south via Terry Fox Drive – 15%,
- to/from the east via Mapleview Drive - 10%; and
- to/from the west via Mapleview Drive - 75%.

While Fagan Boulevard will provide some east-west connectivity through the site, all east-west traffic has nonetheless been assigned to Mapleview Drive East, recognizing its function as an arterial road and primary travel corridor. This is considered a conservative approach in that it assumes that all site traffic travelling to/from the north, east and west will travel through the intersection of Mapleview Drive East with Terry Fox Drive. It is further noted that Fagan Drive will not provide any connectivity to the east of the site until such time that the lands to the east are developed (the timing of which is currently unknown).

The resulting site generated traffic volumes assigned to the road network are illustrated in Figure 12.

5 Future Total Conditions

This chapter will address the resulting impacts of the proposed residential development on the adjacent road system. Two areas are to be addressed:

- operations of the key intersection; and
- potential improvements to the study area road network, if necessary.

5.1 TRAFFIC VOLUMES

To assess the impacts of the increased traffic volumes resulting from the proposed development, the site generated traffic was combined with the 2031, 2036 and 2041 background traffic volumes. The resulting total traffic volumes are presented in Figure 13 through Figure 15.

5.2 TRAFFIC OPERATIONS

The operations at the intersection of Mapleview Drive East with Terry Fox Drive were re-assessed to consider the total traffic volumes for each horizon year. The results of the operational review are provided below with detailed worksheets provided in Appendix G.

5.2.1 2031 Horizon

As indicated in Table 8, the northbound movement will experience poor operations (LOS F) with long delays given the projected total traffic volumes for 2031.

Table 8: Intersection Operations – 2031 Total

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
Mapleview Drive East & Terry Fox Drive	NB L	stop	**93**	**F**	0.92	**98**	**F**	0.93
	NB TR	stop	13	B	0.11	20	C	0.21
	SB L	stop	16	C	0.14	22	C	0.04
	SB TR	stop	14	B	0.43	14	B	0.27

L – left T – thru R – right LTR – left-thru-right LT – left-thru TR – thru-right LR – left-right

To address the poor operating conditions, it is recommended that traffic signals recommended in 2041 under background conditions be accelerated to the 2031 horizon. Similar to the 2041 background conditions, the traffic signals are not warranted based on the *Justification 7* signal warrant criteria (completed warrants are provided in Appendix F) but are nonetheless

recommended to address the poor operations. The intersection was reassessed under signal control, the results of which are summarized in Table 9.

Table 9: Intersection Operations – 2031 Total + Improvements

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
Mapleview Drive East & Terry Fox Drive	EB L	signal	10	B	0.34	11	B	0.51
	EB TR	signal	10	A	0.34	8	A	0.39
	WB L	signal	7	A	0.02	5	A	0.05
	WB TR	signal	9	A	0.26	8	A	0.41
	NB L	signal	23	C	0.68	36	D	0.77
	NB TR	signal	13	B	0.08	19	B	0.14
	SB L	signal	14	B	0.15	18	B	0.04
	SB TR	signal	15	B	0.29	19	B	0.16
	overall	signal	13	B	0.47	13	B	0.57

L – left T – thru R – right LTR – left-thru-right LT – left-thru TR – thru-right LR – left-right

As indicated, signalization of the intersection will ensure that excellent overall operations (LOS B) are maintained during each peak period, with low to average delays and reserve capacity remaining ($v/c \leq 0.77$) on each movement.

5.2.2 2036 Horizon

Results of the operational analysis under 2036 total conditions (with traffic signals) are summarized in Table 10. As indicated, the intersection will provide excellent overall operations (LOS B) with low to average delays at each movement. No further improvements are required to address the 2036 conditions.

5.2.3 2041 Horizon

Results of the operational analysis under 2041 total conditions are summarized in Table 11. As indicated, the intersection will continue to provide excellent overall operations (LOS B) with low to average delays at each movement. No further improvements are required to address the 2041 conditions.

Table 10: Intersection Operations - 2036 Total

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
Mapleview Drive East & Terry Fox Drive	EB L	signal	11	B	0.36	12	B	0.57
	EB TR	signal	10	A	0.37	8	A	0.42
	WB L	signal	7	A	0.02	5	A	0.05
	WB TR	signal	9	A	0.28	8	A	0.45
	NB L	signal	25	C	0.71	37	D	0.78
	NB TR	signal	13	B	0.09	19	B	0.15
	SB L	signal	14	B	0.15	18	B	0.04
	SB TR	signal	15	B	0.31	19	B	0.16
	overall	signal	13	B	0.50	14	B	0.62

L – left T – thru R – right LTR – left-thru-right LT – left-thru TR – thru-right LR – left-right

Table 11: Intersection Operations – 2041 Total

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
Mapleview Drive East & Terry Fox Drive	EB L	signal	12	B	0.41	15	B	0.63
	EB TR	signal	11	B	0.42	8	A	0.45
	WB L	signal	8	A	0.02	5	A	0.06
	WB TR	signal	10	A	0.33	9	A	0.49
	NB L	signal	23	C	0.69	38	D	0.79
	NB TR	signal	12	B	0.08	19	B	0.16
	SB L	signal	13	B	0.16	18	B	0.04
	SB TR	signal	14	B	0.31	19	B	0.17
	overall	signal	13	B	0.53	14	B	0.67

L – left T – thru R – right LTR – left-thru-right LT – left-thru TR – thru-right LR – left-right

5.3 ROAD NETWORK IMPROVEMENTS

Based on the operational review under total conditions, the subject intersection will experience poor operations by the 2031 horizon, coinciding with full build-out of Phase 2 of the development. To address the poor operations, it is recommended that the traffic signals recommended for implementation by 2041 under background conditions be accelerated to the 2031 horizon.

It is noted that the timing of the improvements is predicated on full build-out by 2031, in addition to the completion of the various other developments considered in the *Draft Plan of Subdivision - Master Transportation Plan for the Hewitt's Secondary Plan Area*. In this respect, it is recommended that the timing for the implementation of traffic signals be reviewed as Phase 2 progresses through the site plan approval process and construction.

6 Summary

6.1 PROPOSED DEVELOPMENT

This study has addressed the transportation impacts associated with Phase 2 of the residential development located at 969, 979 and 989 Mapleview Drive East within the City of Barrie. The proposed development will consist of 351 residential units, including 23 accessory units. Upon full build-out, the development is expected to generate 168 new trips during the AM peak hour and 236 new trips during the PM peak hour.

6.2 TRAFFIC OPERATIONS

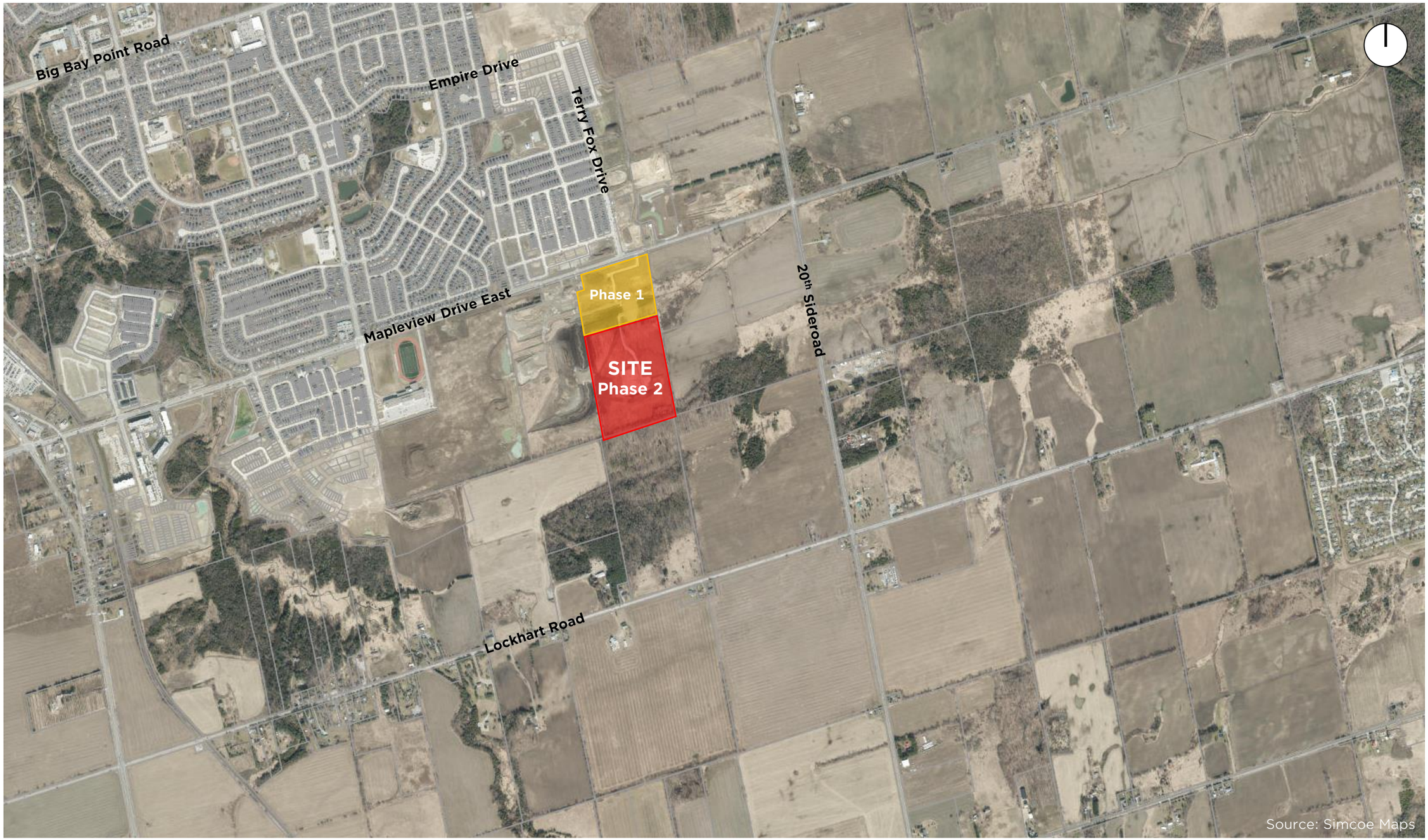
To address traffic operations within the study area, the intersection of Mapleview Drive East and Terry Fox Drive was analyzed under existing (2024) and future (2031, 2036 and 2041) horizon periods. The results of the operational assessment indicate that the intersection will operate effectively under existing and background conditions through to the 2036 horizon. By 2041, traffic signals are recommended to accommodate the future background conditions.

Under total conditions, traffic signals area recommended by the 2031 horizon year to accommodate full build-out of the development. It is noted that the timing for the implementation of traffic signals is predicated on full build-out of Phase 2 by 2031, in addition to the completion of the various other developments considered in the *Draft Plan of Subdivision - Master Transportation Plan for the Hewitt's Secondary Plan Area*. In this respect, it is recommended that the timing for the implementation of traffic signals be revisited as Phase 2 progresses through the site plan approval process and construction.

Source: Simcoe Maps

969, 979 & 989 MAPLEVIEW DRIVE EAST, PHASE 2 – TRANSPORTATION IMPACT STUDY

Figure 1: Site Location

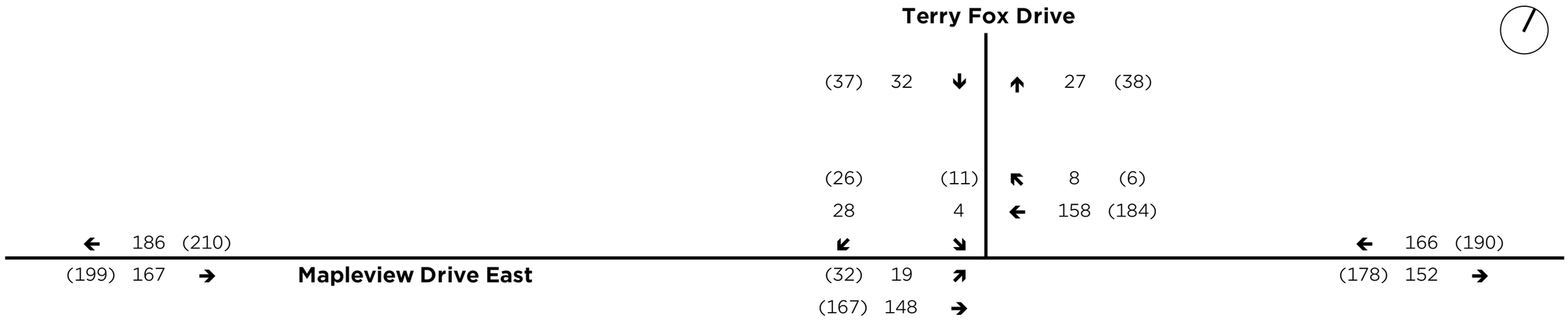


969, 979 & 989 MAPLEVIEW DRIVE EAST, PHASE 2 – TRANSPORTATION IMPACT STUDY

Figure 2: Area Road Network

969, 979 & 989 MAPLEVIEW DRIVE EAST, PHASE 2 – TRANSPORTATION IMPACT STUDY

Figure 3: Intersection Configuration



100 Weekday AM Peak Hour
(100) Weekday PM Peak Hour

Figure 4: Traffic Volumes – 2024 Existing

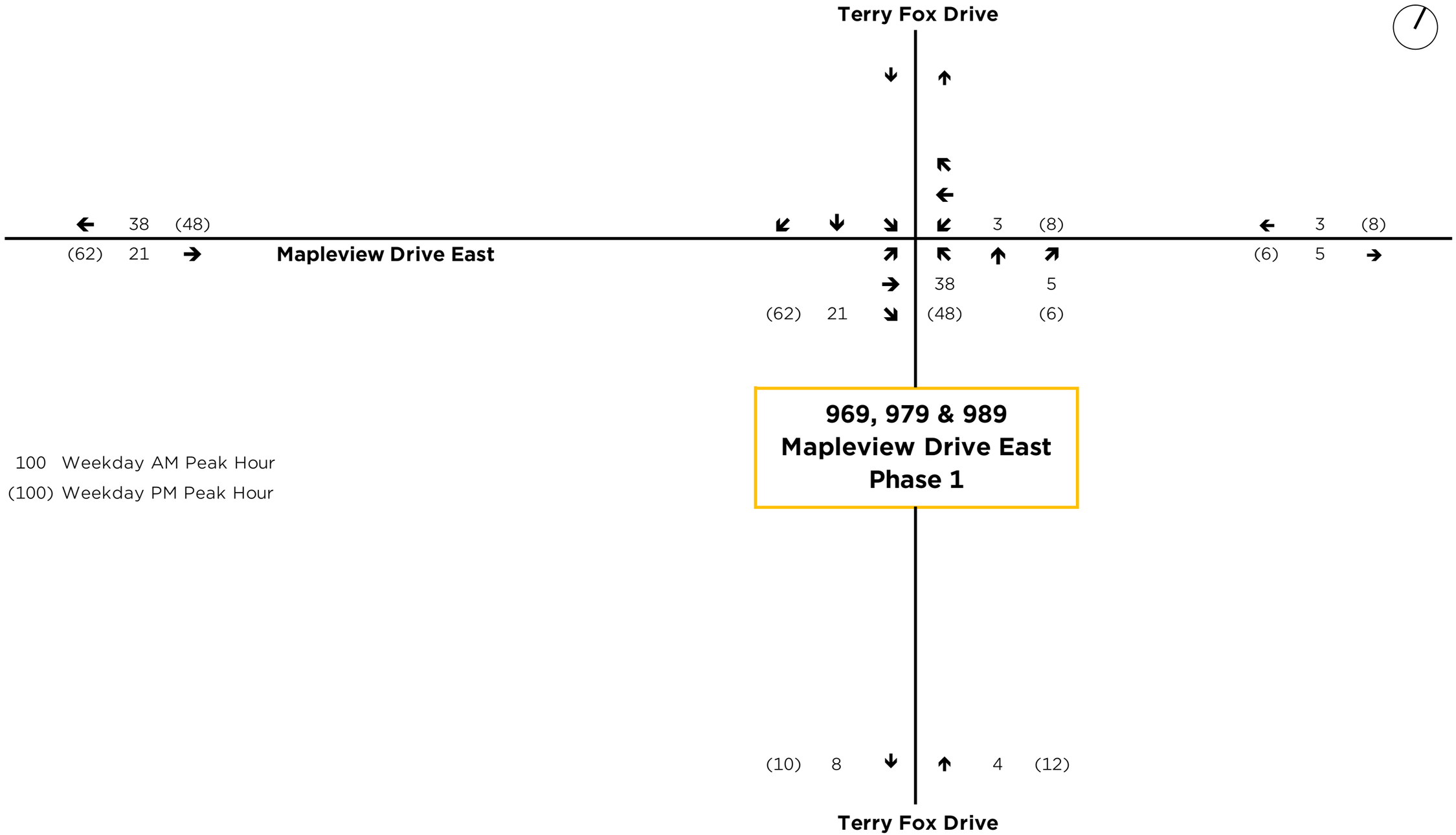
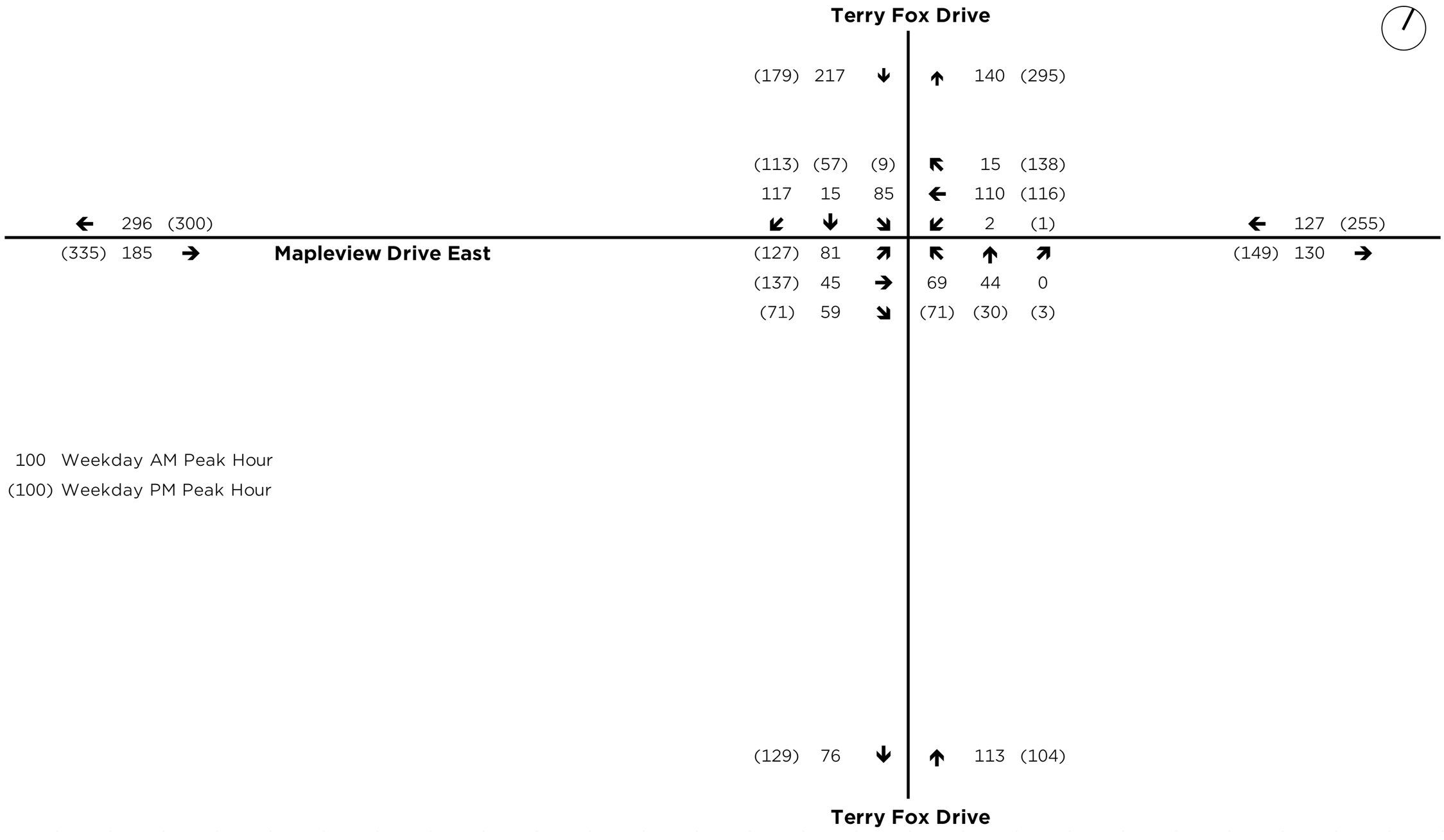


Figure 5: Site Generated Traffic – Phase 1



969, 979 & 989 MAPLEVIEW DRIVE EAST, PHASE 2 – TRANSPORTATION IMPACT STUDY

Figure 6: Updated Master Transportation Plan Study – 2031 Volumes

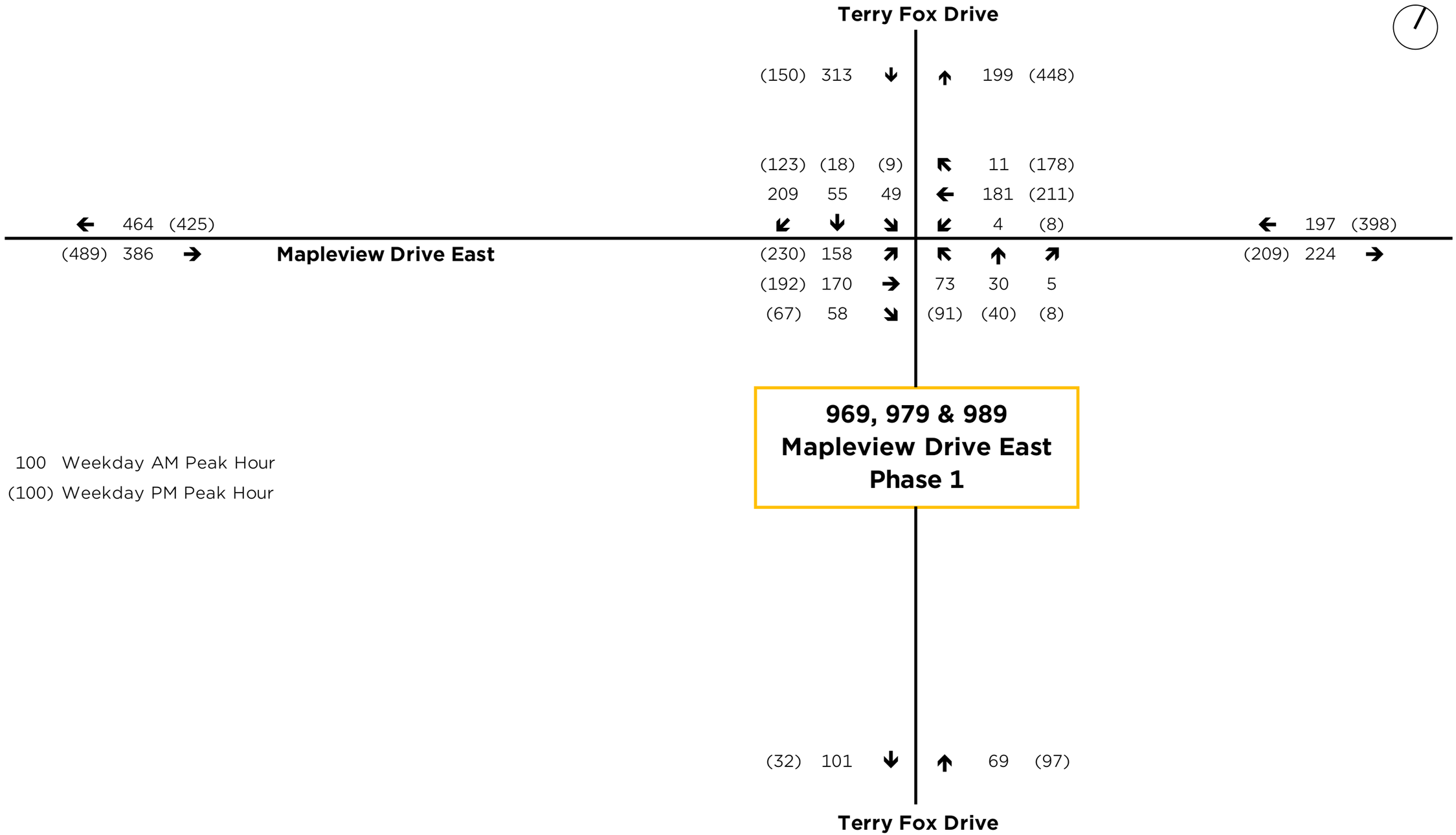


Figure 7: Traffic Volumes – 2031 Background

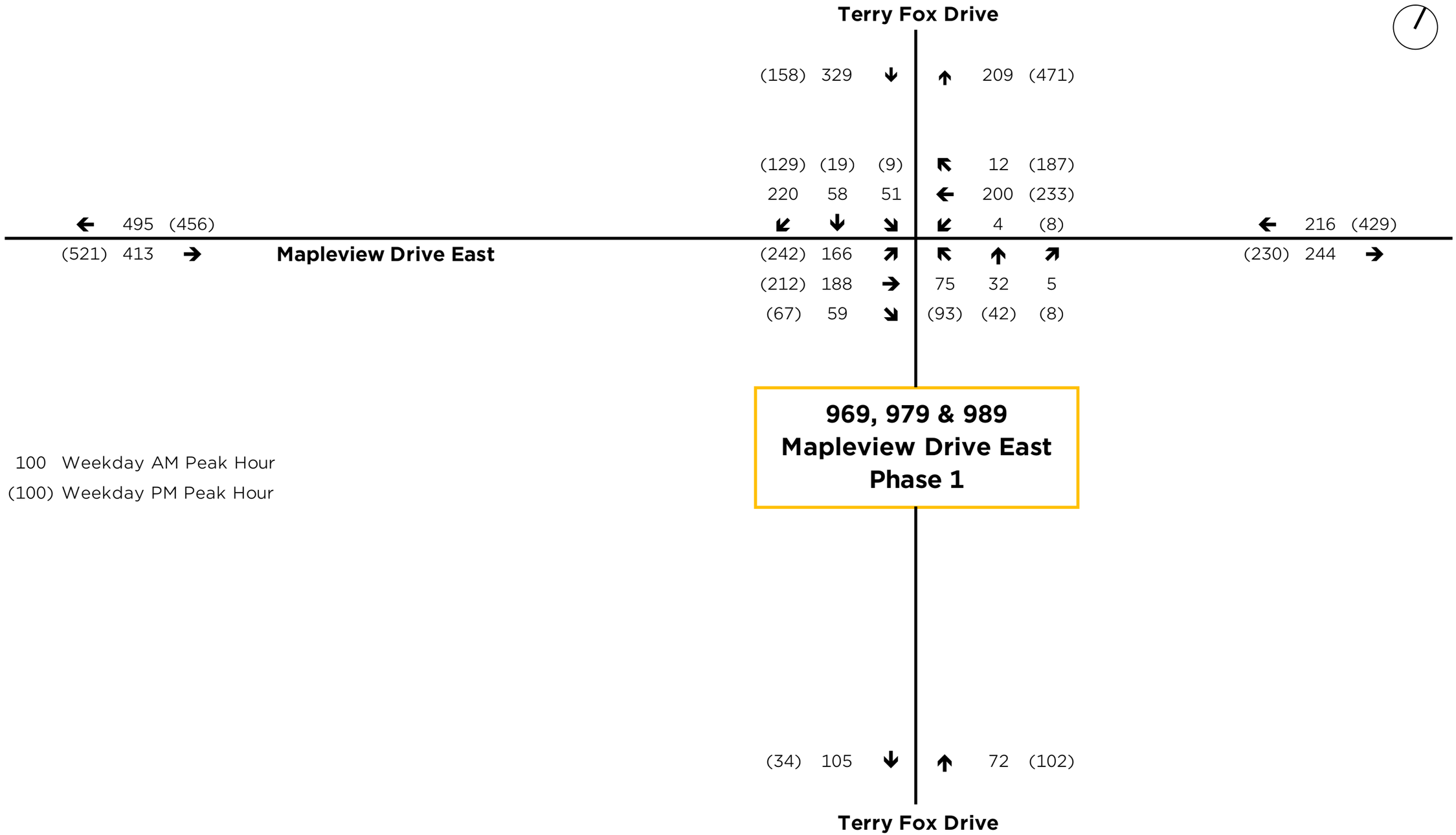


Figure 8: Traffic Volumes – 2036 Background

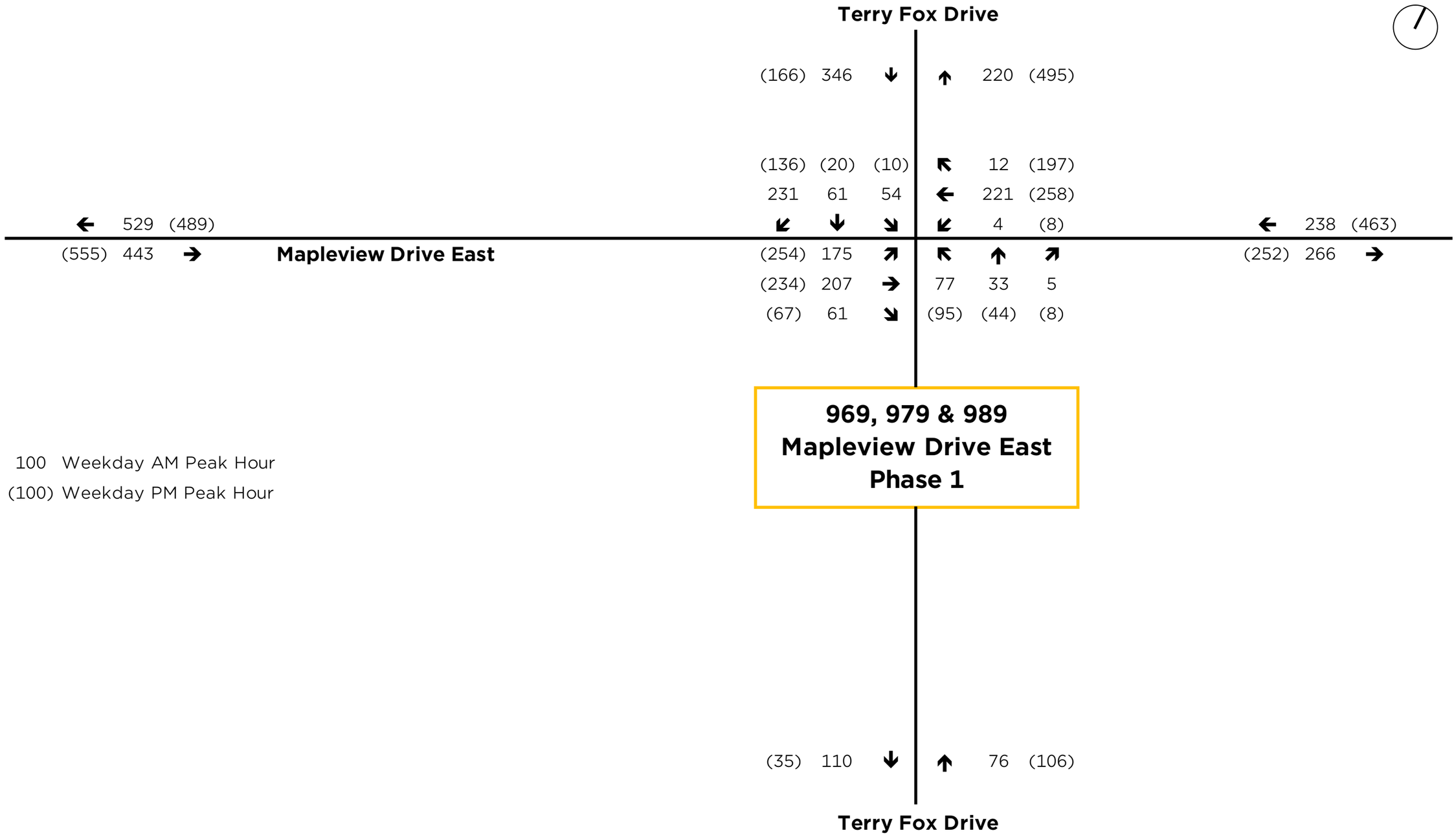
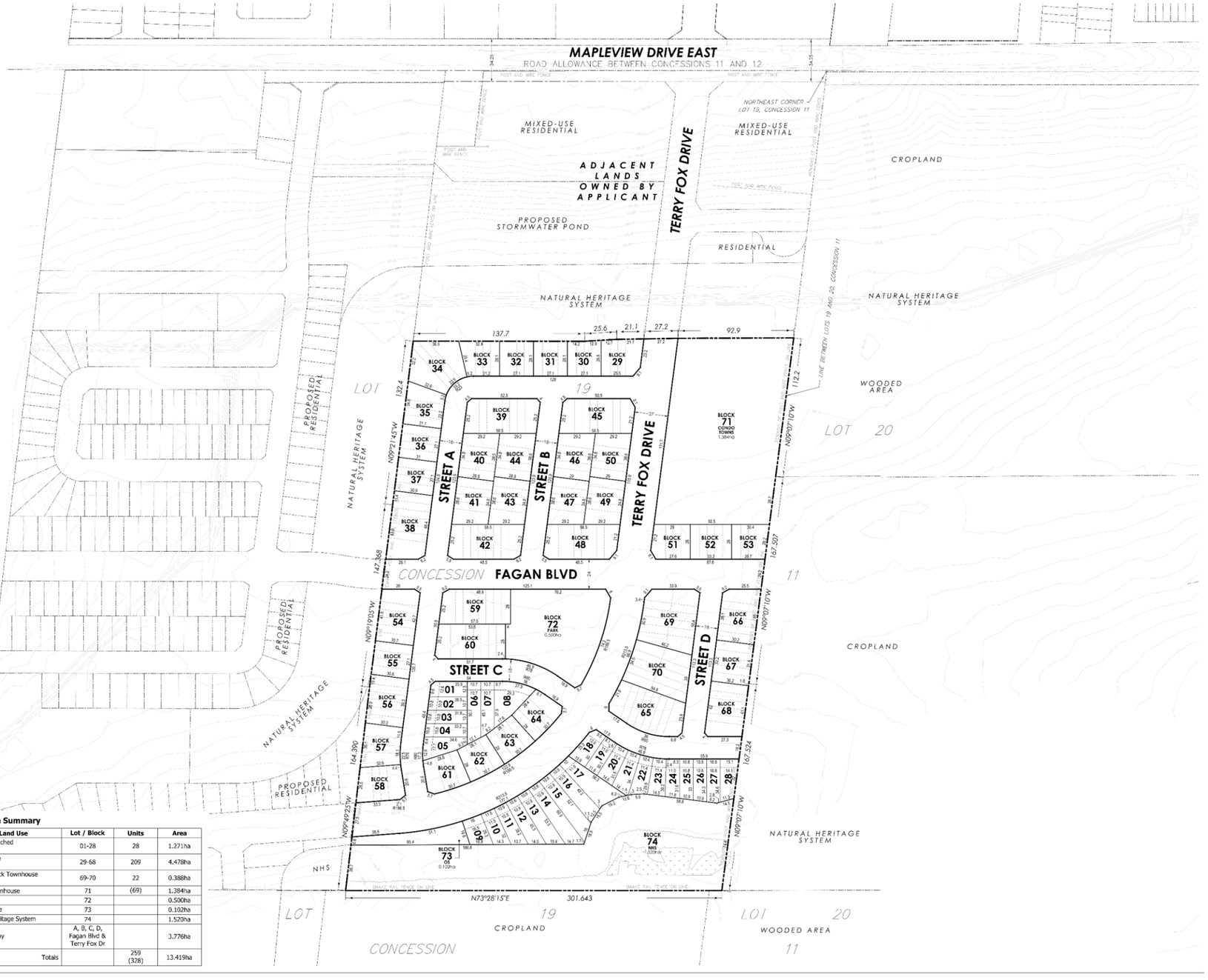


Figure 9: Traffic Volumes – 2041 Background

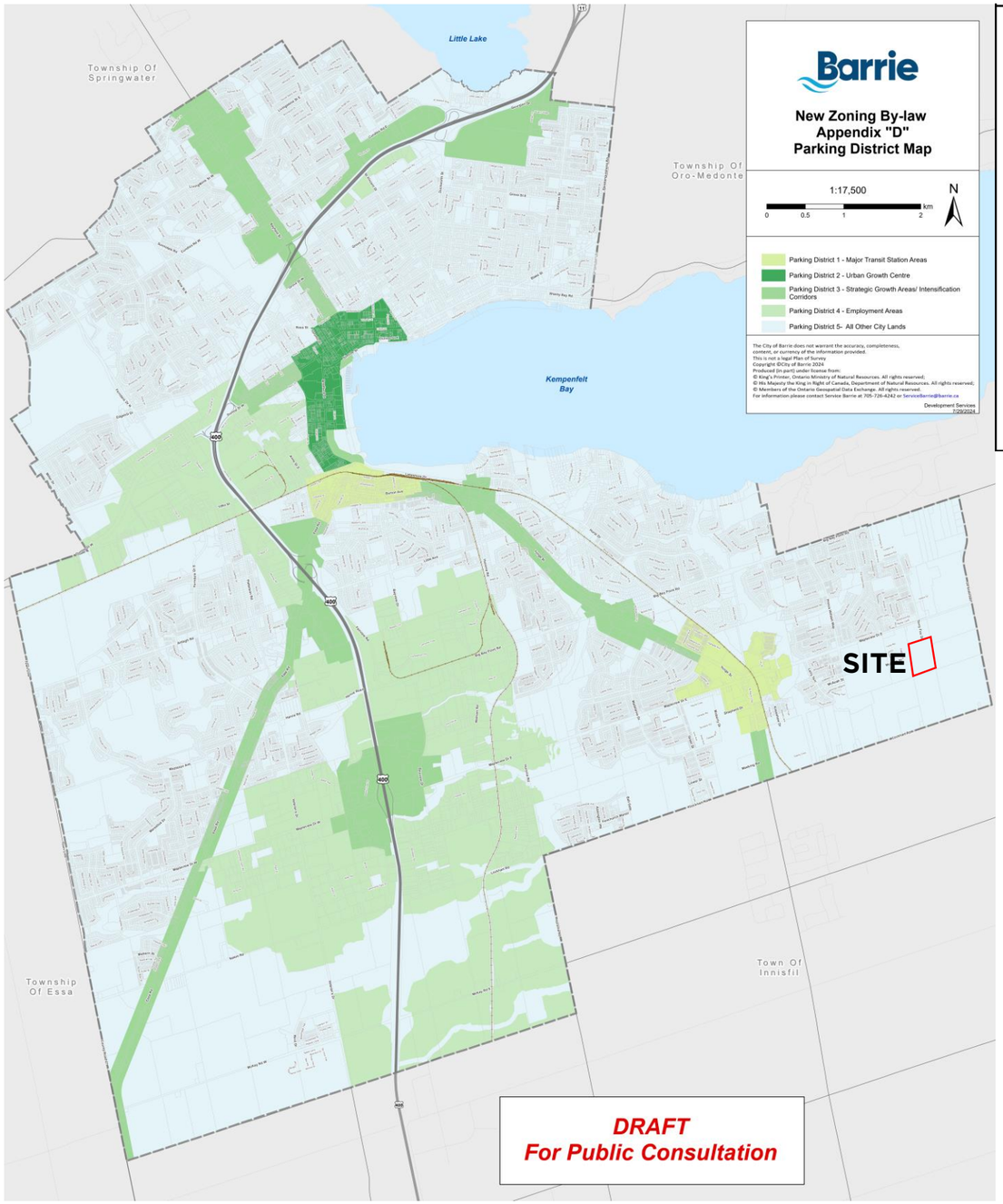


Land Use Summary

Land Use	Lot / Block	Units	Area
Single Detached 10.7m Lots	01-28	28	1.271ha
Townhouse 6.1m Units	29-68	209	4.478ha
Back-to-back Townhouse 6.4m Units	69-70	22	0.388ha
Condo Townhouse	71	(69)	1.384ha
Park	72		0.500ha
Open Space	73		0.102ha
Natural Heritage System	74		1.520ha
Right of Way	A, B, C, D, Fagan Blvd & Terry Fox Dr		3.776ha
Totals		259 (328)	13.419ha

969, 979 & 989 MAPLEVIEW DRIVE EAST, PHASE 2 – TRANSPORTATION IMPACT STUDY

Figure 10: Draft Plan of Subdivision



Parking District 1 - Major Transit Station Areas

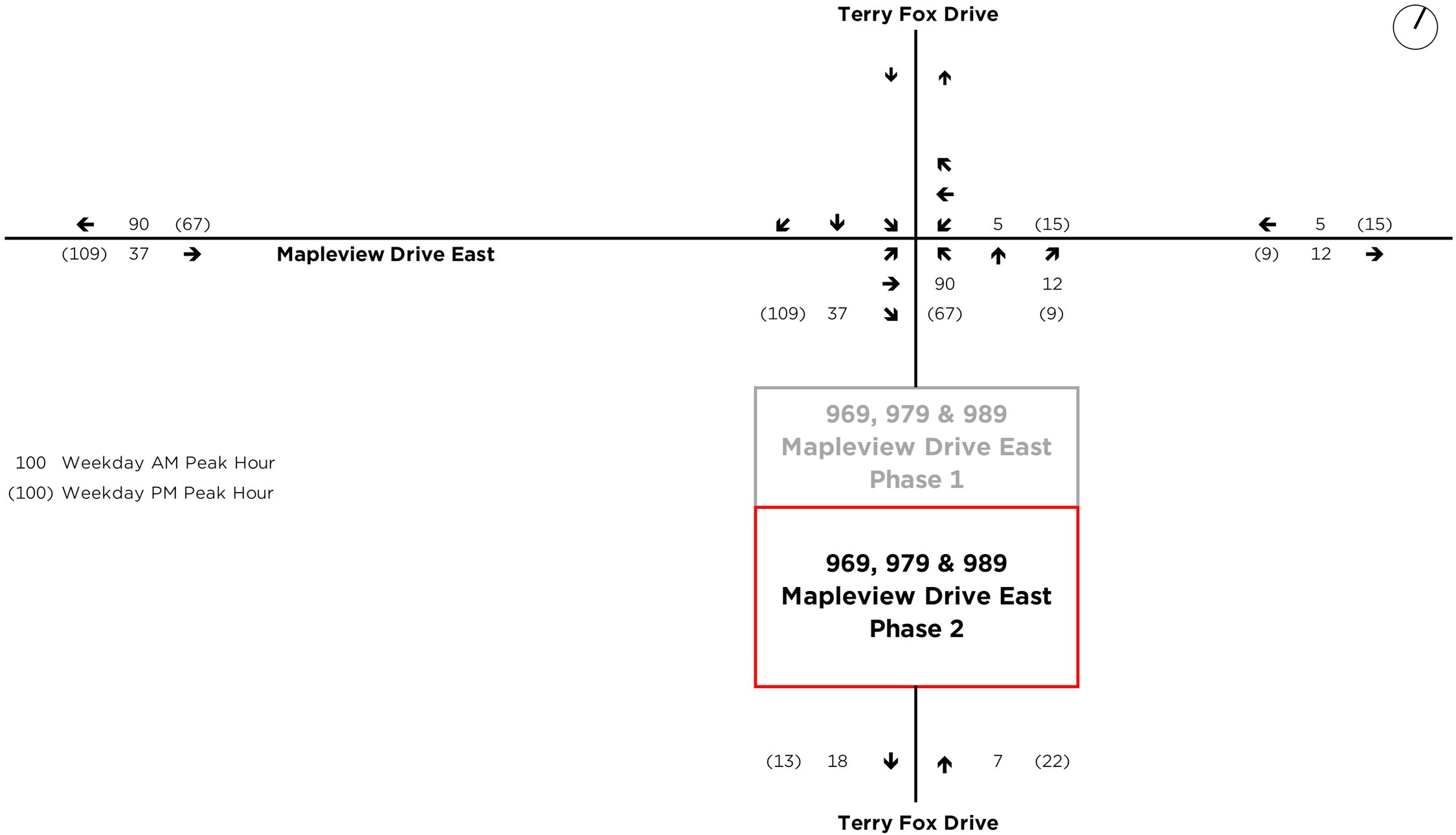
Parking District 2 - Urban Growth Centre

Parking District 3 - Strategic Growth Areas/ Intensification Corridors

Parking District 4 - Employment Areas

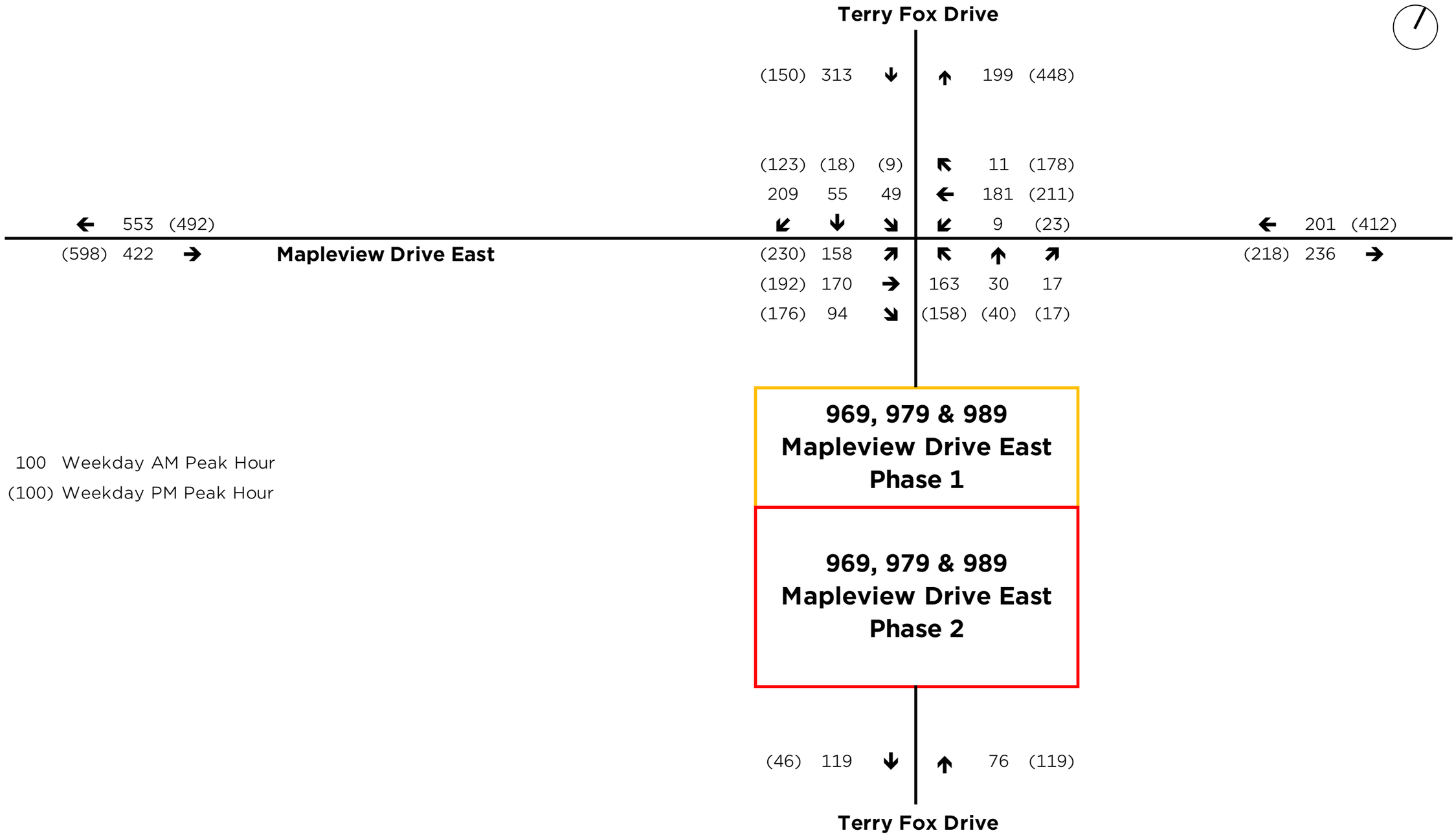
Parking District 5- All Other City Lands

Figure 11: Parking District Map – Draft Zoning By-Law



100 Weekday AM Peak Hour
(100) Weekday PM Peak Hour

Figure 12: Site Generated Traffic – Phase 2



100 Weekday AM Peak Hour
(100) Weekday PM Peak Hour

Figure 13: Traffic Volumes – 2031 Total

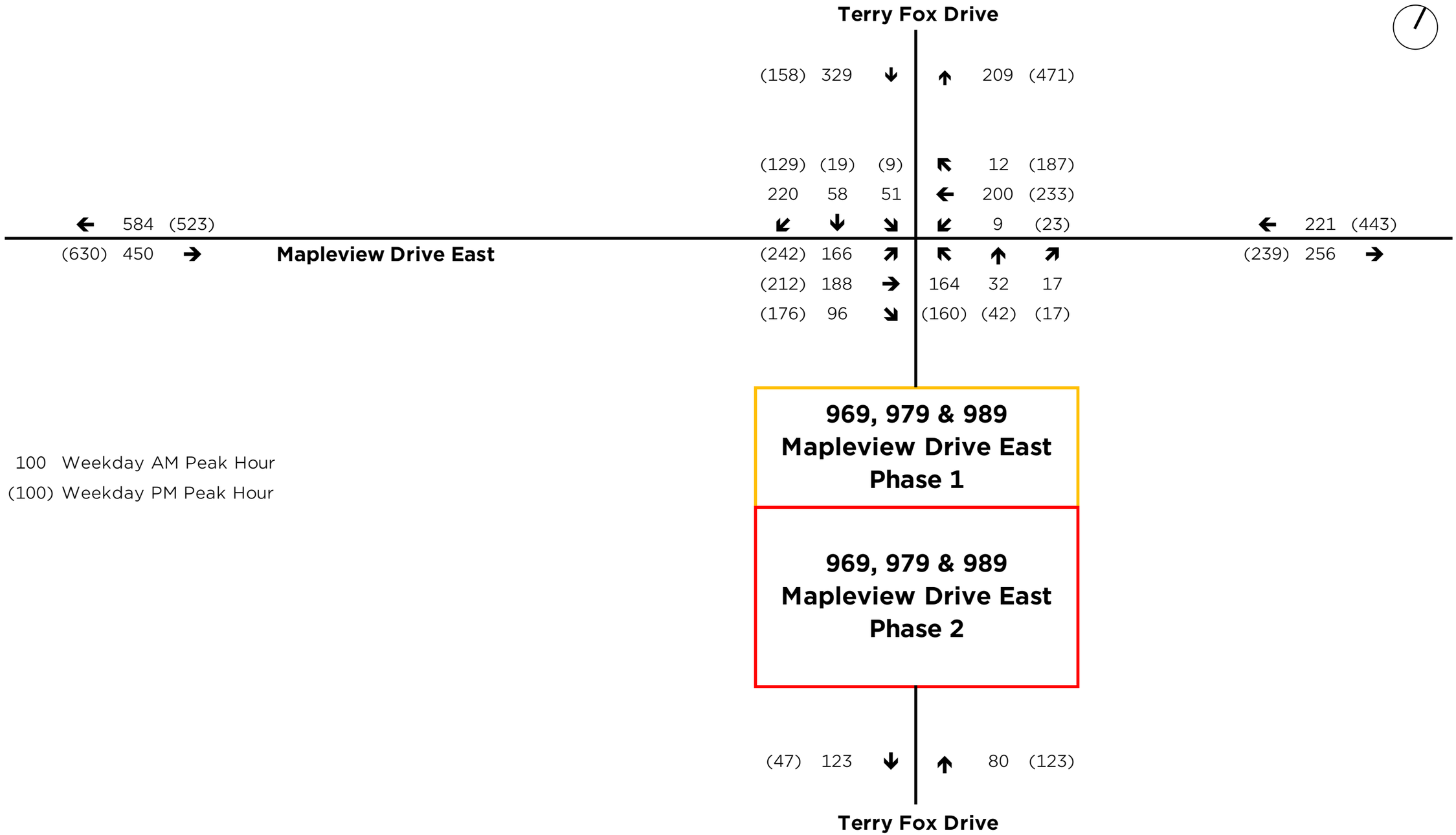
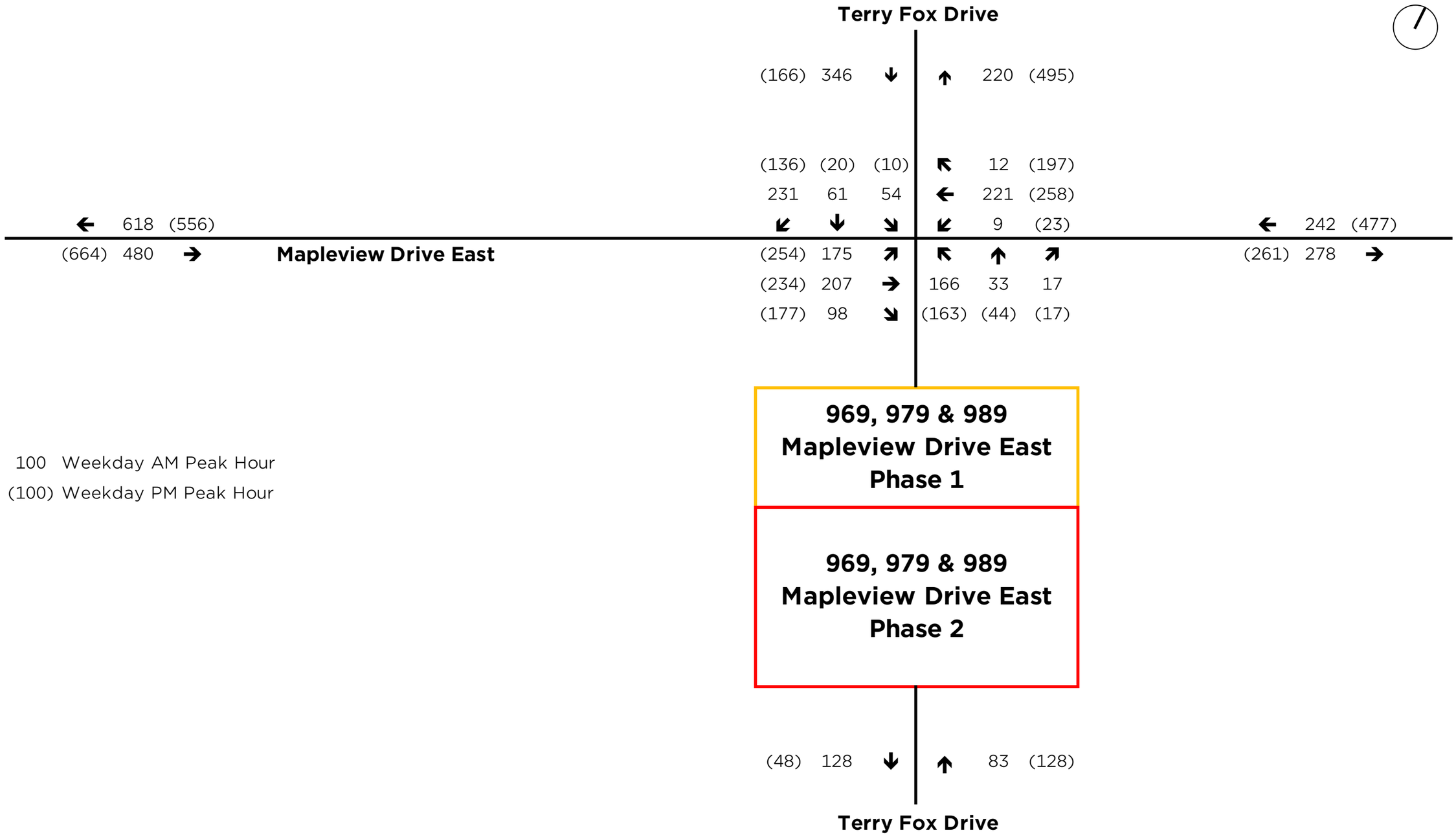


Figure 14: Traffic Volumes – 2036 Total



100 Weekday AM Peak Hour
(100) Weekday PM Peak Hour

Figure 15: Traffic Volumes – 2041 Total

Appendix A:
Terms of Reference

Hassan Naeem

From: Justin MacDonald <Justin.MacDonald@barrie.ca>
Sent: Monday, December 2, 2024 10:46 AM
To: Hassan Naeem
Cc: David Perks
Subject: RE: Traffic Impact Study for Phase 2 development at 969, 979 & 989 Mapleview Drive

No the City does not have any counts given the roadway is not assumed.

Justin MacDonald, LET, C.E.T., PTP
Project Delivery – Transportation Planning, Development Services
The City of Barrie
Mobile 705-734-8020

From: Hassan Naeem <hnaeem@tathameng.com>
Sent: Monday, December 2, 2024 10:44 AM
To: Justin MacDonald <Justin.MacDonald@barrie.ca>
Cc: David Perks <dperks@tathameng.com>
Subject: RE: Traffic Impact Study for Phase 2 development at 969, 979 & 989 Mapleview Drive

Hey Justin,

Thanks for the feedback on the TORs. As indicated in the email, does the City have any traffic counts data on the intersection of Mapleview Drive and Terry Fox Drive?

Regards,

TATHAM ENGINEERING

Hassan Naeem
Transportation Planner

hnaeem@tathameng.com **T** 705-733-9037
645 Veterans Drive, Unit D, Barrie, Ontario L4N 9H8

tathameng.com

From: Justin MacDonald <Justin.MacDonald@barrie.ca>
Sent: Monday, December 2, 2024 9:51 AM
To: Hassan Naeem <hnaeem@tathameng.com>
Cc: David Perks <dperks@tathameng.com>
Subject: RE: Traffic Impact Study for Phase 2 development at 969, 979 & 989 Mapleview Drive

Good morning Hassan,

Thanks for the follow up. I have no concerns regarding the proposed TOR.

Kind regards.

Justin MacDonald, LET, C.E.T., PTP
Project Delivery – Transportation Planning, Development Services
The City of Barrie
Mobile 705-734-8020

From: Hassan Naeem <hnaeem@tathameng.com>
Sent: Monday, December 2, 2024 9:34 AM
To: Justin MacDonald <Justin.MacDonald@barrie.ca>
Cc: David Perks <dperks@tathameng.com>
Subject: RE: Traffic Impact Study for Phase 2 development at 969, 979 & 989 Mapleview Drive

Hello Justin,

I am just following up to make sure you have received the TORs.

Regards,

TATHAM ENGINEERING

Hassan Naeem
Transportation Planner

hnaeem@tathameng.com **T** 705-733-9037
645 Veterans Drive, Unit D, Barrie, Ontario L4N 9H8

From: Hassan Naeem
Sent: Tuesday, November 26, 2024 2:03 PM
To: Justin.MacDonald@barrie.ca
Cc: David Perks <dperks@tathameng.com>
Subject: Traffic Impact Study for Phase 2 development at 969, 979 & 989 Mapleview Drive

Hello Justin,

We (Tatham Engineering Limited) have been retained to prepare a traffic impact study in support of the proposed **Phase 2 development** to be completed at 969, 979 & 989 Mapleview Drive, and have prepared the following Terms of Reference for your review and acceptance prior to commencement of the study. The phase 2 of the development proposes 328 residential units (mix of single detached and townhouse) to be serviced by an extension of Terry Fox Drive.

Terms of Reference

1. Study area to be limited to Maple View Drive East & Terry Fox Drive, and their respective intersection (3-way intersection)

2. New traffic counts will be conducted at the study intersection, unless the City of Barrie has recent count data available;
    - **Could you please provide traffic counts for the study area, particularly for the intersection of Mapleview Drive East and Terry Fox Drive?**

3. Establish future volumes for an appropriate horizon year, anticipated year of full build out for Phase 1 & 2 (2031), 5-year (2036) & 10-year (2041) horizon beyond build-out.

4. Consult and liaise with City staff as necessary to obtain relevant background information including growth projections, information on adjacent future developments and impacts associated with planned improvements to the overall network:
    - **Future traffic projections will be based on Ultimate Horizon (2031) in Hewitt Landowners Transportation Masterplan (2019) & the Traffic Impact Brief completed for Phase 1 of the subject development.**
    - **Background developments will include plans identified in Jones Consulting Development Plan 2031 (Full Buildout) as provided in the Hewitt TMP, with the additional traffic associated with Block 192 & 193 at 953 Mapleview Drive (not considered in the Hewitt TMP)**
    - **Traffic growth projection of 2%, as used in the previous Phase 1 study and other traffic studies for the area, will be utilized in the study.**
    - **Improvement of Mapleview East:**
        - **2031: Addition of a two way left turn to provide a 3-lane cross section**
        - **2041: Addition of 1 thru lane in each direction to provide a 5-lane cross section**

5. Confirm existing traffic operations on the adjacent road system for weekday AM and PM peak periods.

6. Provide details of the proposed development and estimate trip generation during AM and PM peak hours.
    - **Trip generation will be based on proxy site survey trips as utilized in the Hewitt's Transportation Study. Trips will be distributed based on 2016 Transportation Tomorrow Survey (as in Phase 1 study).**

7. Determine peak hour traffic projections within the study area, considering both background and site traffic volumes for the future planning horizons.

8. Based on the traffic projections, review the future operations of the intersection. Capacity calculations/assessment for the traffic operations will be undertaken with measures of effectiveness to include level of service, delay, and volume/capacity ratios. The operations of the study area road network will be reviewed in terms of available capacity and the impact of the additional site generated traffic volumes; following the traffic analyses, identify any road network improvements/mitigating measures required to support the development and identify the timing of such.

Thank you for your assistance, and I look forward to your reply.

Regards,

TATHAM ENGINEERING

Hassan Naeem
Transportation Planner

hnaeem@tathameng.com **T** 705-733-9037
645 Veterans Drive, Unit D, Barrie, Ontario L4N 9H8

tathameng.com

Appendix B:
Traffic Count Data

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Project #24-514 - Tatham Engineering Ltd

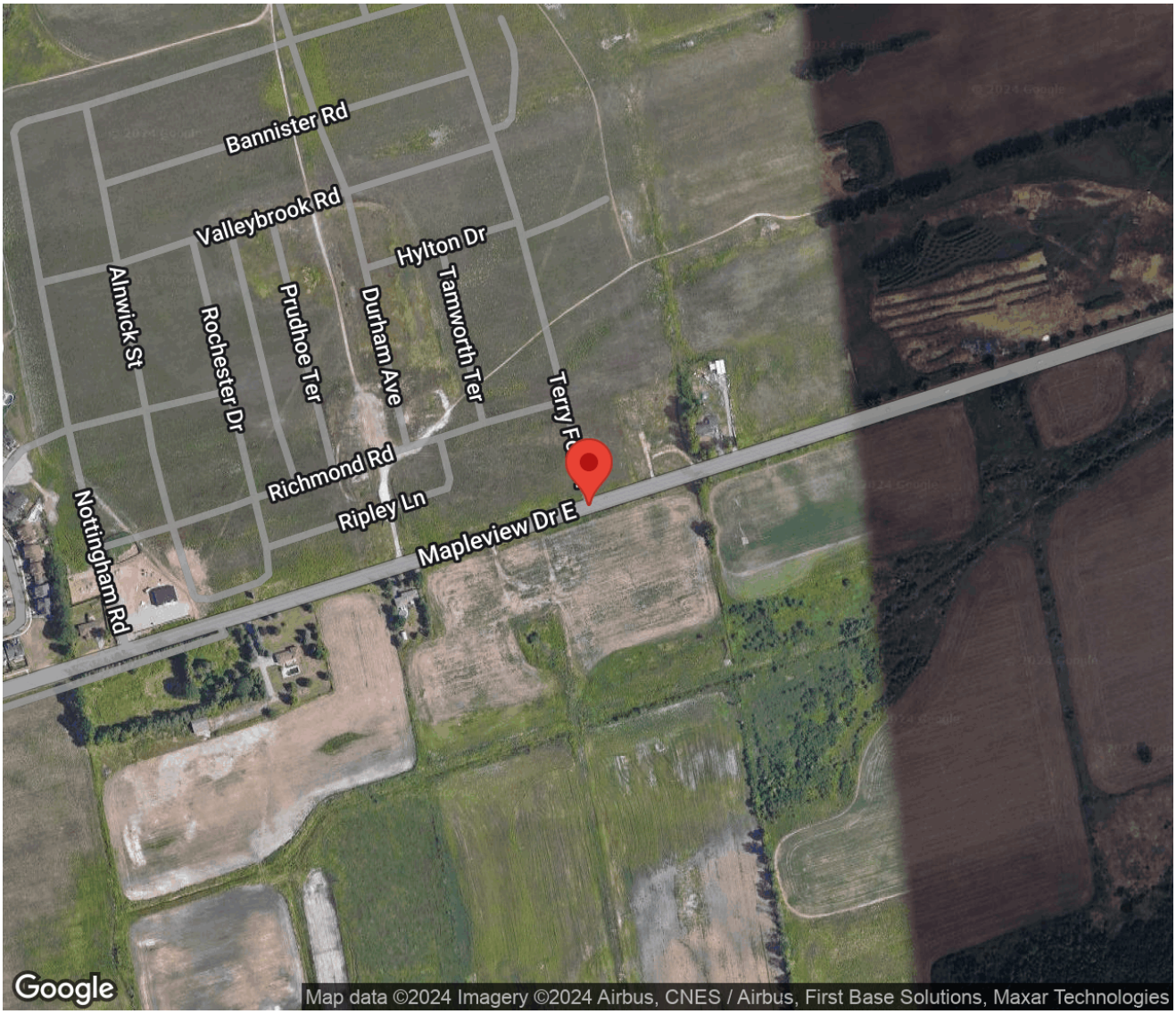
Intersection Count Report

Intersection:	Mapleview Dr E & Terry Fox Dr
Municipality:	Barrie
Count Date:	Wednesday, Dec 18, 2024
Site Code:	2451400001
Count Categories:	Cars, Trucks, Bicycles, Pedestrians
Count Period:	07:00-09:00, 11:00-14:00, 15:00-18:00
Weather:	Clear
Comments:	

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Traffic Count Map

Intersection:	Mapleview Dr E & Terry Fox Dr
Site Code:	2451400001
Municipality:	Barrie
Count Date:	Dec 18, 2024



Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Traffic Count Summary

Intersection: Mapleview Dr E & Terry Fox Dr
Site Code: 2451400001
Municipality: Barrie
Count Date: Dec 18, 2024

Terry Fox Dr - Traffic Summary

	North Approach Totals						South Approach Totals						
	Includes Cars, Trucks, Bicycles						Includes Cars, Trucks, Bicycles						
Hour	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds	Total
07:00 - 08:00	6	0	29	0	35	0	0	0	0	0	0	0	35
08:00 - 09:00	4	0	28	0	32	0	0	0	0	0	0	0	32
BREAK													
11:00 - 12:00	7	0	21	0	28	0	0	0	0	0	0	0	28
12:00 - 13:00	5	0	10	0	15	0	0	0	0	0	0	0	15
13:00 - 14:00	7	0	23	0	30	0	0	0	0	0	0	0	30
BREAK													
15:00 - 16:00	12	0	11	0	23	0	0	0	0	0	0	0	23
16:00 - 17:00	13	0	20	0	33	0	0	0	0	0	0	0	33
17:00 - 18:00	8	0	25	0	33	0	0	0	0	0	0	0	33
GRAND TOTAL	**62**	**0**	**167**	**0**	**229**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**229**

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Traffic Count Summary

Intersection: Mapleview Dr E & Terry Fox Dr
Site Code: 2451400001
Municipality: Barrie
Count Date: Dec 18, 2024

Mapleview Dr E - Traffic Summary

	East Approach Totals						West Approach Totals						
	Includes Cars, Trucks, Bicycles						Includes Cars, Trucks, Bicycles						
Hour	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds	Total
07:00 - 08:00	0	163	7	0	170	0	8	104	0	0	112	1	282
08:00 - 09:00	0	158	8	0	166	0	19	148	0	0	167	0	333
BREAK													
11:00 - 12:00	0	123	3	0	126	0	14	92	0	1	107	0	233
12:00 - 13:00	0	119	5	0	124	0	18	107	0	1	126	0	250
13:00 - 14:00	0	119	5	0	124	0	23	106	0	0	129	0	253
BREAK													
15:00 - 16:00	0	145	7	0	152	0	22	176	0	0	198	0	350
16:00 - 17:00	0	185	4	1	190	2	29	165	0	1	195	0	385
17:00 - 18:00	0	129	8	0	137	0	40	166	0	0	206	0	343
GRAND TOTAL	**0**	**1141**	**47**	**1**	**1189**	**2**	**173**	**1064**	**0**	**3**	**1240**	**1**	**2429**

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Traffic Count Data

Intersection: Mapleview Dr E & Terry Fox Dr
Site Code: 2451400001
Municipality: Barrie
Count Date: Dec 18, 2024

North Approach - Terry Fox Dr

Start Time	Cars					Trucks					Bicycles					Total Peds
	↰	↑	↱	↶	Total	↰	↑	↱	↶	Total	↰	↑	↱	↶	Total	
07:00	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	0
07:15	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	0
07:30	2	0	10	0	12	0	0	1	0	1	0	0	0	0	0	0
07:45	4	0	10	0	14	0	0	0	0	0	0	0	0	0	0	0
08:00	0	0	8	0	8	0	0	0	0	0	0	0	0	0	0	0
08:15	1	0	7	0	8	0	0	1	0	1	0	0	0	0	0	0
08:30	2	0	10	0	12	0	0	0	0	0	0	0	0	0	0	0
08:45	1	0	1	0	2	0	0	1	0	1	0	0	0	0	0	0
SUBTOTAL	10	0	54	0	64	0	0	3	0	3	0	0	0	0	0	0

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Traffic Count Data

Intersection: Mapleview Dr E & Terry Fox Dr
Site Code: 2451400001
Municipality: Barrie
Count Date: Dec 18, 2024

North Approach - Terry Fox Dr

Start Time	Cars					Trucks					Bicycles					Total Peds
	↰	↑	↱	↩	Total	↰	↑	↱	↩	Total	↰	↑	↱	↩	Total	
11:00	3	0	4	0	7	0	0	0	0	0	0	0	0	0	0	0
11:15	3	0	4	0	7	0	0	0	0	0	0	0	0	0	0	0
11:30	0	0	6	0	6	0	0	0	0	0	0	0	0	0	0	0
11:45	1	0	7	0	8	0	0	0	0	0	0	0	0	0	0	0
12:00	0	0	1	0	1	1	0	1	0	2	0	0	0	0	0	0
12:15	2	0	4	0	6	0	0	0	0	0	0	0	0	0	0	0
12:30	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0
12:45	1	0	2	0	3	1	0	0	0	1	0	0	0	0	0	0
13:00	0	0	6	0	6	0	0	1	0	1	0	0	0	0	0	0
13:15	2	0	5	0	7	0	0	0	0	0	0	0	0	0	0	0
13:30	0	0	5	0	5	0	0	0	0	0	0	0	0	0	0	0
13:45	5	0	6	0	11	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	17	0	52	0	69	2	0	2	0	4	0	0	0	0	0	0

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Traffic Count Data

Intersection: Mapleview Dr E & Terry Fox Dr
Site Code: 2451400001
Municipality: Barrie
Count Date: Dec 18, 2024

North Approach - Terry Fox Dr

Start Time	Cars					Trucks					Bicycles					Total Peds
	↰	↑	↱	↶	Total	↰	↑	↱	↶	Total	↰	↑	↱	↶	Total	
15:00	4	0	2	0	6	1	0	0	0	1	0	0	0	0	0	0
15:15	1	0	2	0	3	0	0	0	0	0	0	0	0	0	0	0
15:30	2	0	4	0	6	1	0	0	0	1	0	0	0	0	0	0
15:45	1	0	1	0	2	2	0	2	0	4	0	0	0	0	0	0
16:00	4	0	4	0	8	1	0	1	0	2	0	0	0	0	0	0
16:15	5	0	5	0	10	0	0	0	0	0	0	0	0	0	0	0
16:30	0	0	7	0	7	0	0	1	0	1	0	0	0	0	0	0
16:45	3	0	2	0	5	0	0	0	0	0	0	0	0	0	0	0
17:00	3	0	11	0	14	0	0	0	0	0	0	0	0	0	0	0
17:15	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	0
17:30	3	0	4	0	7	0	0	0	0	0	0	0	0	0	0	0
17:45	2	0	6	0	8	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	28	0	52	0	80	5	0	4	0	9	0	0	0	0	0	0
GRAND TOTAL	**55**	**0**	**158**	**0**	**213**	**7**	**0**	**9**	**0**	**16**	**0**	**0**	**0**	**0**	**0**	**0**

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Traffic Count Data

Intersection: Mapleview Dr E & Terry Fox Dr
Site Code: 2451400001
Municipality: Barrie
Count Date: Dec 18, 2024

East Approach - Mapleview Dr E

Start Time	Cars					Trucks					Bicycles					Total Peds
	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	
07:00	0	31	1	0	32	0	1	0	0	1	0	0	0	0	0	0
07:15	0	30	2	0	32	0	5	0	0	5	0	0	0	0	0	0
07:30	0	49	2	0	51	0	5	2	0	7	0	0	0	0	0	0
07:45	0	40	0	0	40	0	2	0	0	2	0	0	0	0	0	0
08:00	0	23	0	0	23	0	1	0	0	1	0	0	0	0	0	0
08:15	0	41	1	0	42	0	2	0	0	2	0	0	0	0	0	0
08:30	0	42	2	0	44	0	5	0	0	5	0	0	0	0	0	0
08:45	0	40	2	0	42	0	4	3	0	7	0	0	0	0	0	0
SUBTOTAL	0	296	10	0	306	0	25	5	0	30	0	0	0	0	0	0

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Traffic Count Data

Intersection: Mapleview Dr E & Terry Fox Dr
Site Code: 2451400001
Municipality: Barrie
Count Date: Dec 18, 2024

East Approach - Mapleview Dr E

Start Time	Cars					Trucks					Bicycles					Total Peds
	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	
11:00	0	32	0	0	32	0	2	0	0	2	0	0	0	0	0	0
11:15	0	24	1	0	25	0	1	1	0	2	0	0	0	0	0	0
11:30	0	24	0	0	24	0	4	0	0	4	0	0	0	0	0	0
11:45	0	34	1	0	35	0	2	0	0	2	0	0	0	0	0	0
12:00	0	24	0	0	24	0	0	0	0	0	0	0	0	0	0	0
12:15	0	29	2	0	31	0	1	0	0	1	0	0	0	0	0	0
12:30	0	29	0	0	29	0	0	0	0	0	0	0	0	0	0	0
12:45	0	34	3	0	37	0	2	0	0	2	0	0	0	0	0	0
13:00	0	30	1	0	31	0	1	0	0	1	0	0	0	0	0	0
13:15	0	29	0	0	29	0	2	0	0	2	0	0	0	0	0	0
13:30	0	27	2	0	29	0	4	0	0	4	0	0	0	0	0	0
13:45	0	24	2	0	26	0	2	0	0	2	0	0	0	0	0	0
SUBTOTAL	0	340	12	0	352	0	21	1	0	22	0	0	0	0	0	0

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Traffic Count Data

Intersection: Mapleview Dr E & Terry Fox Dr
Site Code: 2451400001
Municipality: Barrie
Count Date: Dec 18, 2024

East Approach - Mapleview Dr E

Start Time	Cars					Trucks					Bicycles					Total Peds
	↰	↑	↱	↷	Total	↰	↑	↱	↷	Total	↰	↑	↱	↷	Total	
15:00	0	25	0	0	25	0	3	0	0	3	0	0	0	0	0	0
15:15	0	28	0	0	28	0	4	0	0	4	0	0	0	0	0	0
15:30	0	39	3	0	42	0	0	0	0	0	0	0	0	0	0	0
15:45	0	42	4	0	46	0	3	0	0	3	0	1	0	0	1	0
16:00	0	36	1	0	37	0	1	0	0	1	0	0	0	0	0	1
16:15	0	47	2	0	49	0	3	0	0	3	0	0	0	0	0	1
16:30	0	53	1	0	54	0	2	0	0	2	0	0	0	0	0	0
16:45	0	40	0	1	41	0	3	0	0	3	0	0	0	0	0	0
17:00	0	36	3	0	39	0	0	0	0	0	0	0	0	0	0	0
17:15	0	39	1	0	40	0	0	0	0	0	0	0	0	0	0	0
17:30	0	30	3	0	33	0	0	0	0	0	0	0	0	0	0	0
17:45	0	24	1	0	25	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	0	439	19	1	459	0	19	0	0	19	0	1	0	0	1	2
GRAND TOTAL	0	1075	41	1	1117	0	65	6	0	71	0	1	0	0	1	2

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Traffic Count Data

Intersection: Mapleview Dr E & Terry Fox Dr
Site Code: 2451400001
Municipality: Barrie
Count Date: Dec 18, 2024

West Approach - Mapleview Dr E

Start Time	Cars					Trucks					Bicycles					Total Peds
	↰	↑	↱	↶	Total	↰	↑	↱	↶	Total	↰	↑	↱	↶	Total	
07:00	1	21	0	0	22	1	2	0	0	3	0	0	0	0	0	0
07:15	2	25	0	0	27	0	1	0	0	1	0	0	0	0	0	0
07:30	1	23	0	0	24	0	3	0	0	3	0	0	0	0	0	0
07:45	2	23	0	0	25	1	6	0	0	7	0	0	0	0	0	1
08:00	4	29	0	0	33	0	1	0	0	1	0	0	0	0	0	0
08:15	5	26	0	0	31	1	6	0	0	7	0	0	0	0	0	0
08:30	2	43	0	0	45	0	7	0	0	7	0	0	0	0	0	0
08:45	6	34	0	0	40	1	2	0	0	3	0	0	0	0	0	0
SUBTOTAL	23	224	0	0	247	4	28	0	0	32	0	0	0	0	0	1

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Traffic Count Data

Intersection: Mapleview Dr E & Terry Fox Dr
Site Code: 2451400001
Municipality: Barrie
Count Date: Dec 18, 2024

West Approach - Mapleview Dr E

Start Time	Cars					Trucks					Bicycles					Total Peds
	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	
11:00	4	15	0	0	19	0	1	0	0	1	0	0	0	0	0	0
11:15	1	19	0	1	21	1	3	0	0	4	0	0	0	0	0	0
11:30	3	31	0	0	34	1	2	0	0	3	0	0	0	0	0	0
11:45	4	21	0	0	25	0	0	0	0	0	0	0	0	0	0	0
12:00	2	28	0	1	31	0	1	0	0	1	0	0	0	0	0	0
12:15	5	28	0	0	33	0	1	0	0	1	0	0	0	0	0	0
12:30	6	22	0	0	28	1	2	0	0	3	0	0	0	0	0	0
12:45	4	24	0	0	28	0	1	0	0	1	0	0	0	0	0	0
13:00	6	28	0	0	34	0	5	0	0	5	0	0	0	0	0	0
13:15	5	18	0	0	23	0	1	0	0	1	0	0	0	0	0	0
13:30	4	30	0	0	34	0	0	0	0	0	0	0	0	0	0	0
13:45	8	23	0	0	31	0	1	0	0	1	0	0	0	0	0	0
SUBTOTAL	52	287	0	2	341	3	18	0	0	21	0	0	0	0	0	0

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Traffic Count Data

Intersection: Mapleview Dr E & Terry Fox Dr
Site Code: 2451400001
Municipality: Barrie
Count Date: Dec 18, 2024

West Approach - Mapleview Dr E

Start Time	Cars					Trucks					Bicycles					Total Peds
	↰	↑	↱	↶	Total	↰	↑	↱	↶	Total	↰	↑	↱	↶	Total	
15:00	6	51	0	0	57	1	3	0	0	4	0	0	0	0	0	0
15:15	2	37	0	0	39	0	2	0	0	2	0	0	0	0	0	0
15:30	9	34	0	0	43	0	2	0	0	2	0	0	0	0	0	0
15:45	3	43	0	0	46	1	3	0	0	4	0	1	0	0	1	0
16:00	8	35	0	0	43	0	4	0	0	4	0	0	0	0	0	0
16:15	7	42	0	1	50	0	1	0	0	1	0	0	0	0	0	0
16:30	8	38	0	0	46	0	2	0	0	2	0	0	0	0	0	0
16:45	6	43	0	0	49	0	0	0	0	0	0	0	0	0	0	0
17:00	11	40	0	0	51	0	1	0	0	1	0	0	0	0	0	0
17:15	7	52	0	0	59	0	0	0	0	0	0	0	0	0	0	0
17:30	12	35	0	0	47	0	0	0	0	0	0	0	0	0	0	0
17:45	10	38	0	0	48	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	89	488	0	1	578	2	18	0	0	20	0	1	0	0	1	0
GRAND TOTAL	**164**	**999**	**0**	**3**	**1166**	**9**	**64**	**0**	**0**	**73**	**0**	**1**	**0**	**0**	**1**	**1**

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Peak Hour Diagram

Specified Period		One Hour Peak	
From:	07:00:00	From:	08:00:00
To:	09:00:00	To:	09:00:00

Intersection: Mapleview Dr E & Terry Fox Dr
Site Code: 2451400001
Count Date: Dec 18, 2024

Weather conditions: Clear

**** Unsignalized Intersection ****

Major Road: Mapleview Dr E runs E/W

North Approach

	Out	In	Total
Cars	30	22	52
Trucks	2	5	7
Bicycles	0	0	0
	32	**27**	**59**

Terry Fox Dr

Bicycles	0	0	0
Trucks	2	0	0
Cars	26	4	0
Totals	**28**	**4**	**0**

East Approach

	Out	In	Total
Cars	151	136	287
Trucks	15	16	31
Bicycles	0	0	0
	166	**152**	**318**

Peds: 0

Mapleview Dr E

Bicycles	Trucks	Cars	Totals
0	0	0	**0**
0	2	17	**19**
0	16	132	**148**

Peds: 0

Peds: 0

Mapleview Dr E

Totals	Cars	Trucks	Bicycles
0	0	0	0
8	5	3	0
158	146	12	0

Peds: 0

West Approach

	Out	In	Total
Cars	149	172	321
Trucks	18	14	32
Bicycles	0	0	0
	167	**186**	**353**

Cars - Trucks - Bicycles

Comments

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Peak Hour Summary

Intersection: Mapleview Dr E & Terry Fox Dr
Site Code: 2451400001
Count Date: Dec 18, 2024
Period: 07:00 - 09:00

Peak Hour Data (08:00 - 09:00)

Start Time	North Approach Terry Fox Dr						South Approach						East Approach Mapleview Dr E						West Approach Mapleview Dr E						Total Vehicles
					Peds	Total					Peds	Total					Peds	Total					Peds	Total	
08:00	0		8	0	0	8					0			24	0	0	0	24	4	30		0	0	34	66
08:15	1		8	0	0	9					0			43	1	0	0	44	6	32		0	0	38	91
08:30	2		10	0	0	12					0			47	2	0	0	49	2	50		0	0	52	113
08:45	1		2	0	0	3					0			44	5	0	0	49	7	36		0	0	43	95
Grand Total	**4**		**28**	**0**	**0**	**32**					**0**	**0**		**158**	**8**	**0**	**0**	**166**	**19**	**148**		**0**	**0**	**167**	**365**
Approach %	12.5		87.5	0		-						-		95.2	4.8	0		-	11.4	88.6		0		-	
Totals %	1.1		7.7	0		8.8						0		43.3	2.2	0		45.5	5.2	40.5		0		45.8	
PHF	**0.5**		**0.7**	**0**		**0.67**						**0**		**0.84**	**0.4**	**0**		**0.85**	**0.68**	**0.74**		**0**		**0.8**	**0.81**
Cars	4		26	0		30						0		146	5	0		151	17	132		0		149	330
% Cars	100		92.9	0		93.8						0		92.4	62.5	0		91	89.5	89.2		0		89.2	90.4
Trucks	0		2	0		2						0		12	3	0		15	2	16		0		18	35
% Trucks	0		7.1	0		6.3						0		7.6	37.5	0		9	10.5	10.8		0		10.8	9.6
Bicycles	0		0	0		0						0		0	0	0		0	0	0		0		0	0
% Bicycles	0		0	0		0						0		0	0	0		0	0	0		0		0	0
Peds					0	-					0	-					0	-					0	-	0
% Peds					0	-					0	-					0	-					0	-	

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Peak Hour Diagram

Specified Period		One Hour Peak	
From:	11:00:00	From:	12:15:00
To:	14:00:00	To:	13:15:00

Intersection: Mapleview Dr E & Terry Fox Dr
Site Code: 2451400001
Count Date: Dec 18, 2024

Weather conditions: Clear

**** Unsignalized Intersection ****

Major Road: Mapleview Dr E runs E/W

North Approach

	Out	In	Total
Cars	17	27	44
Trucks	2	1	3
Bicycles	0	0	0
	19	**28**	**47**

Terry Fox Dr

Bicycles	0	0	0
Trucks	1	1	0
Cars	14	3	0
Totals	**15**	**4**	**0**

East Approach

	Out	In	Total
Cars	128	105	233
Trucks	4	10	14
Bicycles	0	0	0
	132	**115**	**247**

Mapleview Dr E

Bicycles	Trucks	Cars	Totals
0	0	0	**0**
0	1	21	**22**
0	9	102	**111**

Peds: 0

Peds: 0

Peds: 0

Mapleview Dr E

Totals	Cars	Trucks	Bicycles
0	0	0	0
6	6	0	0
126	122	4	0

West Approach

	Out	In	Total
Cars	123	136	259
Trucks	10	5	15
Bicycles	0	0	0
	133	**141**	**274**

Cars - Trucks - Bicycles

Comments

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Peak Hour Summary

Intersection: Mapleview Dr E & Terry Fox Dr
Site Code: 2451400001
Count Date: Dec 18, 2024
Period: 11:00 - 14:00

Peak Hour Data (12:15 - 13:15)

Start Time	North Approach Terry Fox Dr						South Approach						East Approach Mapleview Dr E						West Approach Mapleview Dr E						Total Vehicles
					Peds	Total					Peds	Total					Peds	Total					Peds	Total	
12:15	2		4	0	0	6					0			30	2	0	0	32	5	29		0	0	34	72
12:30	0		2	0	0	2					0			29	0	0	0	29	7	24		0	0	31	62
12:45	2		2	0	0	4					0			36	3	0	0	39	4	25		0	0	29	72
13:00	0		7	0	0	7					0			31	1	0	0	32	6	33		0	0	39	78
Grand Total	**4**		**15**	**0**	**0**	**19**					**0**	**0**		**126**	**6**	**0**	**0**	**132**	**22**	**111**		**0**	**0**	**133**	**284**
Approach %	21.1		78.9	0		-						-		95.5	4.5	0		-	16.5	83.5		0		-	
Totals %	1.4		5.3	0		6.7						0		44.4	2.1	0		46.5	7.7	39.1		0		46.8	
PHF	**0.5**		**0.54**	**0**		**0.68**						**0**		**0.88**	**0.5**	**0**		**0.85**	**0.79**	**0.84**		**0**		**0.85**	**0.91**
Cars	3		14	0		17						0		122	6	0		128	21	102		0		123	268
% Cars	75		93.3	0		89.5						0		96.8	100	0		97	95.5	91.9		0		92.5	94.4
Trucks	1		1	0		2						0		4	0	0		4	1	9		0		10	16
% Trucks	25		6.7	0		10.5						0		3.2	0	0		3	4.5	8.1		0		7.5	5.6
Bicycles	0		0	0		0						0		0	0	0		0	0	0		0		0	0
% Bicycles	0		0	0		0						0		0	0	0		0	0	0		0		0	0
Peds					0	-					0	-					0	-					0	-	0
% Peds					0	-					0	-					0	-					0	-	

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Peak Hour Diagram

Specified Period		One Hour Peak	
From:	15:00:00	From:	16:15:00
To:	18:00:00	To:	17:15:00

Intersection: Mapleview Dr E & Terry Fox Dr
Site Code: 2451400001
Count Date: Dec 18, 2024

Weather conditions: Clear

**** Unsignalized Intersection ****

Major Road: Mapleview Dr E runs E/W

North Approach

	Out	In	Total
Cars	36	38	74
Trucks	1	0	1
Bicycles	0	0	0
	37	**38**	**75**

Terry Fox Dr

Bicycles	0	0	0
Trucks	1	0	0
Cars	25	11	0
Totals	**26**	**11**	**0**

East Approach

	Out	In	Total
Cars	183	175	358
Trucks	8	4	12
Bicycles	0	0	0
	191	**179**	**370**

Peds: 0

Mapleview Dr E

Bicycles	Trucks	Cars	Totals
0	0	1	**1**
0	0	32	**32**
0	4	163	**167**

Peds: 0

Peds: 1

Peds: 0

Mapleview Dr E

Totals	Cars	Trucks	Bicycles
1	1	0	0
6	6	0	0
184	176	8	0

West Approach

	Out	In	Total
Cars	196	202	398
Trucks	4	9	13
Bicycles	0	0	0
	200	**211**	**411**

Cars - Trucks - Bicycles

Comments

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Peak Hour Summary

Intersection: Mapleview Dr E & Terry Fox Dr
Site Code: 2451400001
Count Date: Dec 18, 2024
Period: 15:00 - 18:00

Peak Hour Data (16:15 - 17:15)

Start Time	North Approach Terry Fox Dr						South Approach						East Approach Mapleview Dr E						West Approach Mapleview Dr E						Total Vehicles
					Peds	Total					Peds	Total					Peds	Total					Peds	Total	
16:15	5		5	0	0	10					0			50	2	0	1	52	7	43		1	0	51	113
16:30	0		8	0	0	8					0			55	1	0	0	56	8	40		0	0	48	112
16:45	3		2	0	0	5					0			43	0	1	0	44	6	43		0	0	49	98
17:00	3		11	0	0	14					0			36	3	0	0	39	11	41		0	0	52	105
Grand Total	**11**		**26**	**0**	**0**	**37**					**0**	**0**		**184**	**6**	**1**	**1**	**191**	**32**	**167**		**1**	**0**	**200**	**428**
Approach %	29.7		70.3	0		-						-		96.3	3.1	0.5		-	16	83.5		0.5		-	
Totals %	2.6		6.1	0		8.6						0		43	1.4	0.2		44.6	7.5	39		0.2		46.7	
PHF	**0.55**		**0.59**	**0**		**0.66**						**0**		**0.84**	**0.5**	**0.25**		**0.85**	**0.73**	**0.97**		**0.25**		**0.96**	**0.95**
Cars	11		25	0		36						0		176	6	1		183	32	163		1		196	415
% Cars	100		96.2	0		97.3						0		95.7	100	100		95.8	100	97.6		100		98	97
Trucks	0		1	0		1						0		8	0	0		8	0	4		0		4	13
% Trucks	0		3.8	0		2.7						0		4.3	0	0		4.2	0	2.4		0		2	3
Bicycles	0		0	0		0						0		0	0	0		0	0	0		0		0	0
% Bicycles	0		0	0		0						0		0	0	0		0	0	0		0		0	0
Peds					0	-					0	-					1	-					0	-	1
% Peds					0	-					0	-					100	-					0	-	

Appendix C:
LOS Definitions

TATHAM ENGINEERING

Level of Service – Unsignalized Intersections

Level of Service (LOS) for unsignalized intersections is defined in terms of control delay for each critical lane. Control delay includes initial deceleration, queue move-up time, stopped delay and final acceleration delay, and is a function of the service rate or capacity of the approach and degree of saturation.

The following table describes in detail the characteristics of each level of service, with A being the best and F being the worst.

LOS	EXPECTED DELAY TO STREET TRAFFIC	DELAY (sec/veh)
A	Little or no delays	$0 < d \leq 10$
B	Short traffic delays	$10 < d \leq 15$
C	Average traffic delays	$15 < d \leq 25$
D	Long traffic delays	$25 < d \leq 35$
E	Very long traffic delays	$35 < d \leq 50$
F	Extreme delays with queuing which may cause congestion affecting other traffic movements in the intersection	$50 < d$

source: 2010 Highway Capacity Manual

TATHAM ENGINEERING

Level of Service – Signalized Intersections

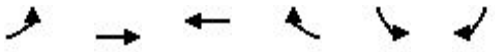
Level of Service (LOS) for signalized intersections is defined in terms of delay, which is made up of a number of factors that relate to control, geometrics, traffic and incidents. Only the portion of total delay attributed to the control facility is quantified. This control delay includes initial deceleration, queue move-up time, stopped delay and final acceleration delay.

The following table describes in detail the characteristics of each level of service, with A being the best and F being the worst.

LOS	EXPECTED DELAY TO STREET TRAFFIC	DELAY (sec/veh)
A	This level of service occurs when progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all at this LOS. Short cycle lengths may also contribute to low delay.	$0 < d \leq 10$
B	This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop at this level than at LOS A, causing longer average delays.	$10 < d \leq 20$
C	These higher delays may result from fair progression, longer cycle length, or both. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant, though many still pass through the intersection without stopping.	$20 < d \leq 35$
D	At this level, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavourable progression, long cycle lengths, or high volume to capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures become noticeable.	$35 < d \leq 55$
E	This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent occurrences.	$55 < d \leq 80$
F	At this level, oversaturation occurs when arrival flow rates exceed the design capacity of the intersection. It may also occur at high v/c ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing factors to such high delay levels. LOS F is considered to be unacceptable to most drivers.	$80 < d$

source: 2010 Highway Capacity Manual

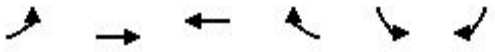
Appendix D:
Existing Conditions



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	19	148	158	8	4	28
Future Volume (Veh/h)	19	148	158	8	4	28
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	21	161	172	9	4	30
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	181				380	176
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	181				380	176
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				99	97
cM capacity (veh/h)	1394				613	867

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	182	181	4	30
Volume Left	21	0	4	0
Volume Right	0	9	0	30
cSH	1394	1700	613	867
Volume to Capacity	0.02	0.11	0.01	0.03
Queue Length 95th (m)	0.3	0.0	0.1	0.8
Control Delay (s)	1.0	0.0	10.9	9.3
Lane LOS	A		B	A
Approach Delay (s)	1.0	0.0	9.5	
Approach LOS			A	

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	31.0%	ICU Level of Service	A
Analysis Period (min)	15		

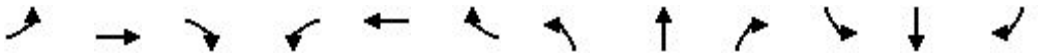


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	32	167	184	6	11	26
Future Volume (Veh/h)	32	167	184	6	11	26
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	35	182	200	7	12	28
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	207				456	204
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	207				456	204
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				98	97
cM capacity (veh/h)	1364				548	837

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	217	207	12	28
Volume Left	35	0	12	0
Volume Right	0	7	0	28
cSH	1364	1700	548	837
Volume to Capacity	0.03	0.12	0.02	0.03
Queue Length 95th (m)	0.6	0.0	0.5	0.8
Control Delay (s)	1.4	0.0	11.7	9.4
Lane LOS	A		B	A
Approach Delay (s)	1.4	0.0	10.1	
Approach LOS			B	

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	33.9%	ICU Level of Service	A
Analysis Period (min)	15		

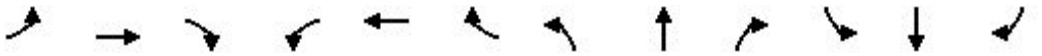
Appendix E:
Background Operations



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	158	170	58	4	181	11	73	30	5	49	55	209
Future Volume (Veh/h)	158	170	58	4	181	11	73	30	5	49	55	209
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	172	185	63	4	197	12	79	33	5	53	60	227
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh)		2			2							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	209			248			1022	778	216	762	803	203
vC1, stage 1 conf vol							560	560		211	211	
vC2, stage 2 conf vol							462	217		550	592	
vCu, unblocked vol	209			248			1022	778	216	762	803	203
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	87			100			61	92	99	87	85	73
cM capacity (veh/h)	1362			1318			204	406	823	396	406	838

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	172	248	4	209	79	38	53	287
Volume Left	172	0	4	0	79	0	53	0
Volume Right	0	63	0	12	0	5	0	227
cSH	1362	1700	1318	1700	204	435	396	685
Volume to Capacity	0.13	0.15	0.00	0.12	0.39	0.09	0.13	0.42
Queue Length 95th (m)	3.3	0.0	0.1	0.0	12.9	2.2	3.5	15.8
Control Delay (s)	8.0	0.0	7.7	0.0	33.3	14.1	15.5	14.0
Lane LOS	A		A		D	B	C	B
Approach Delay (s)	3.3		0.1		27.0		14.2	
Approach LOS					D		B	

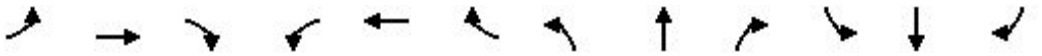
Intersection Summary				
Average Delay	8.6			
Intersection Capacity Utilization	56.4%	ICU Level of Service		B
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	230	192	67	8	211	178	91	40	8	9	18	123
Future Volume (Veh/h)	230	192	67	8	211	178	91	40	8	9	18	123
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	250	209	73	9	229	193	99	43	9	10	20	134
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh)		2			2							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	422			282			1136	1186	246	1083	1126	326
vC1, stage 1 conf vol							746	746		344	344	
vC2, stage 2 conf vol							391	440		740	782	
vCu, unblocked vol	422			282			1136	1186	246	1083	1126	326
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	78			99			54	83	99	96	93	81
cM capacity (veh/h)	1137			1280			213	260	793	253	290	716

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	250	282	9	422	99	52	10	154
Volume Left	250	0	9	0	99	0	10	0
Volume Right	0	73	0	193	0	9	0	134
cSH	1137	1700	1280	1700	213	294	253	601
Volume to Capacity	0.22	0.17	0.01	0.25	0.46	0.18	0.04	0.26
Queue Length 95th (m)	6.4	0.0	0.2	0.0	17.1	4.8	0.9	7.7
Control Delay (s)	9.1	0.0	7.8	0.0	35.7	19.9	19.8	13.0
Lane LOS	A		A		E	C	C	B
Approach Delay (s)	4.3		0.2		30.2		13.5	
Approach LOS					D		B	

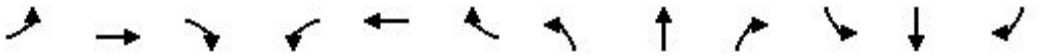
Intersection Summary				
Average Delay	7.1			
Intersection Capacity Utilization	67.0%	ICU Level of Service		C
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	166	188	59	4	200	12	75	32	5	51	58	220
Future Volume (Veh/h)	166	188	59	4	200	12	75	32	5	51	58	220
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	180	204	64	4	217	13	82	35	5	55	63	239
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh)		2			2							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	230			268			1092	834	236	818	860	224
vC1, stage 1 conf vol							596	596		232	232	
vC2, stage 2 conf vol							496	238		586	628	
vCu, unblocked vol	230			268			1092	834	236	818	860	224
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	87			100			52	91	99	85	84	71
cM capacity (veh/h)	1338			1296			170	385	803	371	386	816

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	180	268	4	230	82	40	55	302
Volume Left	180	0	4	0	82	0	55	0
Volume Right	0	64	0	13	0	5	0	239
cSH	1338	1700	1296	1700	170	412	371	662
Volume to Capacity	0.13	0.16	0.00	0.14	0.48	0.10	0.15	0.46
Queue Length 95th (m)	3.5	0.0	0.1	0.0	17.5	2.4	3.9	18.1
Control Delay (s)	8.1	0.0	7.8	0.0	44.3	14.7	16.4	14.9
Lane LOS	A		A		E	B	C	B
Approach Delay (s)	3.3		0.1		34.6		15.1	
Approach LOS					D		C	

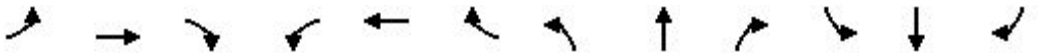
Intersection Summary				
Average Delay	9.6			
Intersection Capacity Utilization	59.1%	ICU Level of Service		B
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	242	212	67	8	233	187	93	42	8	9	19	129
Future Volume (Veh/h)	242	212	67	8	233	187	93	42	8	9	19	129
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	263	230	73	9	253	203	101	46	9	10	21	140
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh)		2			2							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	456			303			1214	1266	266	1160	1202	354
vC1, stage 1 conf vol							792	792		372	372	
vC2, stage 2 conf vol							422	474		788	829	
vCu, unblocked vol	456			303			1214	1266	266	1160	1202	354
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	76			99			44	80	99	96	92	80
cM capacity (veh/h)	1105			1258			181	235	772	227	268	689

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	263	303	9	456	101	55	10	161
Volume Left	263	0	9	0	101	0	10	0
Volume Right	0	73	0	203	0	9	0	140
cSH	1105	1700	1258	1700	181	265	227	572
Volume to Capacity	0.24	0.18	0.01	0.27	0.56	0.21	0.04	0.28
Queue Length 95th (m)	7.1	0.0	0.2	0.0	22.2	5.8	1.0	8.7
Control Delay (s)	9.3	0.0	7.9	0.0	47.3	22.1	21.6	13.7
Lane LOS	A		A		E	C	C	B
Approach Delay (s)	4.3		0.2		38.4		14.2	
Approach LOS					E		B	

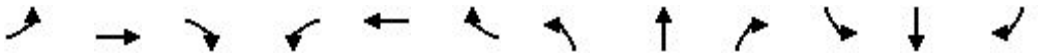
Intersection Summary				
Average Delay	8.0			
Intersection Capacity Utilization	70.2%	ICU Level of Service		C
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	175	207	61	4	221	12	77	33	5	54	61	231
Future Volume (Veh/h)	175	207	61	4	221	12	77	33	5	54	61	231
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	190	225	66	4	240	13	84	36	5	59	66	251
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh)		2			2							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	253			291			1170	899	258	882	926	246
vC1, stage 1 conf vol							638	638		254	254	
vC2, stage 2 conf vol							532	261		628	671	
vCu, unblocked vol	253			291			1170	899	258	882	926	246
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	86			100			37	90	99	83	82	68
cM capacity (veh/h)	1312			1271			133	362	781	344	364	792

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	190	291	4	253	84	41	59	317
Volume Left	190	0	4	0	84	0	59	0
Volume Right	0	66	0	13	0	5	0	251
cSH	1312	1700	1271	1700	133	387	344	636
Volume to Capacity	0.14	0.17	0.00	0.15	0.63	0.11	0.17	0.50
Queue Length 95th (m)	3.8	0.0	0.1	0.0	25.3	2.7	4.6	21.2
Control Delay (s)	8.2	0.0	7.8	0.0	69.7	15.4	17.6	16.1
Lane LOS	A		A		F	C	C	C
Approach Delay (s)	3.2		0.1		51.9		16.4	
Approach LOS					F		C	

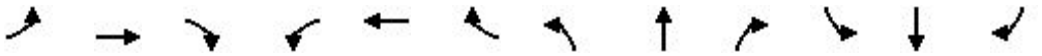
Intersection Summary				
Average Delay	11.5			
Intersection Capacity Utilization	62.0%	ICU Level of Service		B
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	254	234	67	8	258	197	95	44	8	10	20	136
Future Volume (Veh/h)	254	234	67	8	258	197	95	44	8	10	20	136
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	276	254	73	9	280	214	103	48	9	11	22	148
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh)		2			2							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	494			327			1300	1354	290	1244	1284	387
vC1, stage 1 conf vol							842	842		405	405	
vC2, stage 2 conf vol							457	512		839	879	
vCu, unblocked vol	494			327			1300	1354	290	1244	1284	387
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	74			99			29	77	99	95	91	78
cM capacity (veh/h)	1070			1233			145	210	749	201	247	661

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	276	327	9	494	103	57	11	170
Volume Left	276	0	9	0	103	0	11	0
Volume Right	0	73	0	214	0	9	0	148
cSH	1070	1700	1233	1700	145	237	201	543
Volume to Capacity	0.26	0.19	0.01	0.29	0.71	0.24	0.05	0.31
Queue Length 95th (m)	7.8	0.0	0.2	0.0	31.3	6.9	1.3	10.1
Control Delay (s)	9.5	0.0	7.9	0.0	75.0	24.9	23.9	14.6
Lane LOS	A		A		F	C	C	B
Approach Delay (s)	4.4		0.1		57.2		15.2	
Approach LOS					F		C	

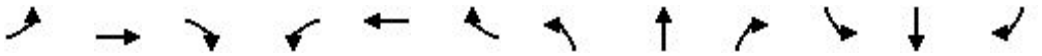
Intersection Summary				
Average Delay	10.1			
Intersection Capacity Utilization	73.8%	ICU Level of Service		D
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	175	207	61	4	221	12	77	33	5	54	61	231
Future Volume (vph)	175	207	61	4	221	12	77	33	5	54	61	231
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.99		1.00	0.98		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1610	1637		1610	1682		1610	1664		1610	1494	
Flt Permitted	0.60	1.00		0.58	1.00		0.44	1.00		0.73	1.00	
Satd. Flow (perm)	1021	1637		986	1682		748	1664		1238	1494	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	190	225	66	4	240	13	84	36	5	59	66	251
RTOR Reduction (vph)	0	14	0	0	3	0	0	4	0	0	199	0
Lane Group Flow (vph)	190	277	0	4	250	0	84	37	0	59	118	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	26.6	26.6		26.6	26.6		10.1	10.1		10.1	10.1	
Effective Green, g (s)	26.6	26.6		26.6	26.6		10.1	10.1		10.1	10.1	
Actuated g/C Ratio	0.55	0.55		0.55	0.55		0.21	0.21		0.21	0.21	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	557	894		538	918		155	345		256	309	
v/s Ratio Prot		0.17			0.15			0.02			0.08	
v/s Ratio Perm	c0.19			0.00			c0.11			0.05		
v/c Ratio	0.34	0.31		0.01	0.27		0.54	0.11		0.23	0.38	
Uniform Delay, d1	6.2	6.0		5.0	5.9		17.2	15.6		16.1	16.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.7	0.9		0.0	0.7		3.8	0.1		0.5	0.8	
Delay (s)	7.8	6.9		5.1	6.6		21.1	15.8		16.5	17.4	
Level of Service	A	A		A	A		C	B		B	B	
Approach Delay (s)		7.3			6.6			19.3			17.3	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	11.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	48.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	68.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	254	234	67	8	258	197	95	44	8	10	20	136
Future Volume (vph)	254	234	67	8	258	197	95	44	8	10	20	136
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.94		1.00	0.98		1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1610	1638		1610	1585		1610	1655		1610	1474	
Flt Permitted	0.45	1.00		0.56	1.00		0.65	1.00		0.72	1.00	
Satd. Flow (perm)	771	1638		954	1585		1101	1655		1220	1474	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	276	254	73	9	280	214	103	48	9	11	22	148
RTOR Reduction (vph)	0	13	0	0	36	0	0	8	0	0	123	0
Lane Group Flow (vph)	276	314	0	9	458	0	103	49	0	11	47	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	33.2	33.2		33.2	33.2		9.0	9.0		9.0	9.0	
Effective Green, g (s)	33.2	33.2		33.2	33.2		9.0	9.0		9.0	9.0	
Actuated g/C Ratio	0.61	0.61		0.61	0.61		0.17	0.17		0.17	0.17	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	472	1003		584	970		182	274		202	244	
v/s Ratio Prot		0.19			0.29			0.03			0.03	
v/s Ratio Perm	c0.36			0.01			c0.09			0.01		
v/c Ratio	0.58	0.31		0.02	0.47		0.57	0.18		0.05	0.19	
Uniform Delay, d1	6.3	5.0		4.1	5.7		20.8	19.4		19.0	19.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.2	0.8		0.0	1.7		4.0	0.3		0.1	0.4	
Delay (s)	11.6	5.8		4.2	7.4		24.8	19.7		19.1	19.8	
Level of Service	B	A		A	A		C	B		B	B	
Approach Delay (s)		8.5			7.3			23.0			19.8	
Approach LOS		A			A			C			B	

Intersection Summary			
HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	54.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	80.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Appendix F:
Traffic Signal Warrants

TATHAM ENGINEERING

TRAFFIC SIGNAL WARRANT

Project & No.: 969, 979 & 989 Mapleview Drive East 420406

GENERAL INFORMATION

Analyst	HN	**Jurisdiction/Area**	City of Barrie	**Date**	10 Dec 2024
Agency or Company	Tatham Engineering Limited	**East-West Street**	Mapleview Drive East		
Analysis Period	2041 Background Conditions	**North-South Street**	Terry Fox Drive		

Flow Conditions	Restricted flow (urban)	**Major Street**	East-West
T Intersection	No	**Approach Lanes per Direction**	1
		Existing or Planned Intersection	planned intersection

Additional Comments

TRAFFIC & PEDESTRIAN VOLUMES

	AM Peak Hour			PM Peak Hour			Average Hour (AM+PM) ÷ 4		
	right	thru	left	right	thru	left	right	thru	left
MAJOR STREET									
Eastbound	61	207	175	67	234	254	**32**	**110**	**107**
Westbound	12	221	4	197	258	8	**52**	**120**	**3**
MINOR STREET									
Northbound	5	33	77	8	44	95	**3**	**19**	**43**
Southbound	231	61	54	136	20	10	**92**	**20**	**16**
PEDESTRIANS									
crossing MAJOR street		0			0			**0**	
crossing MINOR street		0			0			**0**	

	AM Peak Hour			PM Peak Hour			Average Hour (AM+PM) ÷ 4		
	major	minor	total	major	minor	total	major	minor	total
APPROACH VOLUMES	680	461	1141	1018	313	1331	**425**	**194**	**618**
CROSSING VOLUMES			192			149			**85**

JUSTIFICATION 7 - PROJECTED VOLUMES

Justification	Description	Warrant Level			Warrant Adjustment	Sectional Numerical	Sectional Compliance	Entire Compliance
1. MINIMUM VEHICULAR VOLUMES	A. Vehicle volume, all approaches (average hour)	720 (1 lane approach on main road)	or	900 (2 or more lane approach on main road)	**150%**	**618**	**57%**	57%
	B. Vehicle volume, along minor streets (average hour)	170 (full intersection)	or	255 (tee intersection)	**150%**	**194**	**76%**	
2. DELAY TO CROSS TRAFFIC	A. Vehicle volume, major street (average hour)	720 (1 lane approach on main road)	or	900 (2 or more lane approach on main road)	**150%**	**425**	**39%**	39%
	B. Combined vehicle and pedestrian volume crossing artery from minor streets	75 (1 lane approach on main road)	or	170 (2 or more lane approach on main road)	**150%**	**85**	**76%**	

Signals are warranted if BOTH Justification 1A and Justification 1B OR Justification 2A and Justification 2B are 100% compliant.	Not Warranted
Signals are warranted if THE LESSER of Justification 1A or 1B AND the lesser of Justification 2A or Justification 2B are 80% compliant.	Not Warranted

Notes:

Restricted Flow Conditions
- roads with operating speeds less than 70 km/h
- normally encountered in urban areas where the traffic volumes approach or exceed practical working capacity of road

Free Flow Conditions
- roads with operating speeds greater than or equal to 70 km/h
- normally encountered in rural areas
- may also be used at intersections within the built-up area of a community with < 10 000 people and outside the commuting influence of a large urban centre, even if the speed is less than 70 km/h

TATHAM ENGINEERING

TRAFFIC SIGNAL WARRANT

Project & No.: 969, 979 & 989 Mapleview Drive East 420406

GENERAL INFORMATION

Analyst	HN	**Jurisdiction/Area**	City of Barrie	**Date**	10 Dec 2024
Agency or Company	Tatham Engineering Limited	**East-West Street**	Mapleview Drive East		
Analysis Period	2031 Total	**North-South Street**	Terry Fox Drive		

Flow Conditions	Restricted flow (urban)	**Major Street**	East-West
T Intersection	No	**Approach Lanes per Direction**	1
		Existing or Planned Intersection	planned intersection

Additional Comments

TRAFFIC & PEDESTRIAN VOLUMES

	AM Peak Hour			PM Peak Hour			Average Hour (AM+PM) ÷ 4		
	right	thru	left	right	thru	left	right	thru	left
MAJOR STREET									
Eastbound	96	170	158	180	192	230	**69**	**91**	**97**
Westbound	11	181	9	178	211	24	**47**	**98**	**8**
MINOR STREET									
Northbound	17	30	166	18	40	161	**9**	**18**	**82**
Southbound	209	55	49	123	18	9	**83**	**18**	**15**
PEDESTRIANS									
crossing MAJOR street		0			0			**0**	
crossing MINOR street		0			0			**0**	

	AM Peak Hour			PM Peak Hour			Average Hour (AM+PM) ÷ 4		
	major	minor	total	major	minor	total	major	minor	total
APPROACH VOLUMES	625	526	1151	1015	369	1384	**410**	**224**	**634**
CROSSING VOLUMES			270			210			**120**

JUSTIFICATION 7 - PROJECTED VOLUMES

Justification	Description	Warrant Level			Warrant Adjustment	Sectional Numerical	Sectional Compliance	Entire Compliance
1. MINIMUM VEHICULAR VOLUMES	A. Vehicle volume, all approaches (average hour)	720 (1 lane approach on main road)	or	900 (2 or more lane approach on main road)	**150%**	**634**	**59%**	59%
	B. Vehicle volume, along minor streets (average hour)	170 (full intersection)	or	255 (tee intersection)	**150%**	**224**	**88%**	
2. DELAY TO CROSS TRAFFIC	A. Vehicle volume, major street (average hour)	720 (1 lane approach on main road)	or	900 (2 or more lane approach on main road)	**150%**	**410**	**38%**	38%
	B. Combined vehicle and pedestrian volume crossing artery from minor streets	75 (1 lane approach on main road)	or	170 (2 or more lane approach on main road)	**150%**	**120**	**100%**	

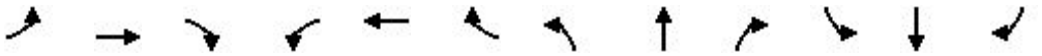
Signals are warranted if BOTH Justification 1A and Justification 1B OR Justification 2A and Justification 2B are 100% compliant.	Not Warranted
Signals are warranted if THE LESSER of Justification 1A or 1B AND the lesser of Justification 2A or Justification 2B are 80% compliant.	Not Warranted

Notes:

Restricted Flow Conditions
- roads with operating speeds less than 70 km/h
- normally encountered in urban areas where the traffic volumes approach or exceed practical working capacity of road

Free Flow Conditions
- roads with operating speeds greater than or equal to 70 km/h
- normally encountered in rural areas
- may also be used at intersections within the built-up area of a community with < 10 000 people and outside the commuting influence of a large urban centre, even if the speed is less than 70 km/h

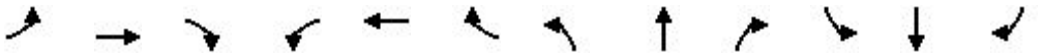
Appendix G:
Total Operations



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	158	170	96	9	181	11	166	30	17	49	55	209
Future Volume (Veh/h)	158	170	96	9	181	11	166	30	17	49	55	209
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	172	185	104	10	197	12	180	33	18	53	60	227
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh)		2			2							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	209			289			1055	810	237	786	856	203
vC1, stage 1 conf vol							581	581		223	223	
vC2, stage 2 conf vol							474	229		564	633	
vCu, unblocked vol	209			289			1055	810	237	786	856	203
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	87			99			8	92	98	86	84	73
cM capacity (veh/h)	1362			1273			197	395	802	377	383	838

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	172	289	10	209	180	51	53	287
Volume Left	172	0	10	0	180	0	53	0
Volume Right	0	104	0	12	0	18	0	227
cSH	1362	1700	1273	1700	197	481	377	671
Volume to Capacity	0.13	0.17	0.01	0.12	0.92	0.11	0.14	0.43
Queue Length 95th (m)	3.3	0.0	0.2	0.0	55.1	2.7	3.7	16.3
Control Delay (s)	8.0	0.0	7.9	0.0	93.3	13.4	16.1	14.3
Lane LOS	A		A		F	B	C	B
Approach Delay (s)	3.0		0.4		75.7		14.6	
Approach LOS					F		B	

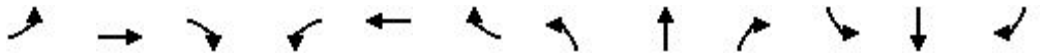
Intersection Summary				
Average Delay	19.1			
Intersection Capacity Utilization	62.1%	ICU Level of Service		B
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	230	192	180	24	211	178	161	40	18	9	18	123
Future Volume (Veh/h)	230	192	180	24	211	178	161	40	18	9	18	123
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	250	209	196	26	229	193	175	43	20	10	20	134
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			TWLTL							
Median storage veh)		2			2							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	422			405			1232	1281	307	1128	1282	326
vC1, stage 1 conf vol							807	807		378	378	
vC2, stage 2 conf vol							425	474		750	905	
vCu, unblocked vol	422			405			1232	1281	307	1128	1282	326
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	78			98			7	82	97	96	92	81
cM capacity (veh/h)	1137			1154			189	237	733	227	239	716

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	250	405	26	422	175	63	10	154
Volume Left	250	0	26	0	175	0	10	0
Volume Right	0	196	0	193	0	20	0	134
cSH	1137	1700	1154	1700	189	302	227	568
Volume to Capacity	0.22	0.24	0.02	0.25	0.93	0.21	0.04	0.27
Queue Length 95th (m)	6.4	0.0	0.5	0.0	55.3	5.9	1.0	8.3
Control Delay (s)	9.1	0.0	8.2	0.0	98.0	20.0	21.6	13.7
Lane LOS	A		A		F	C	C	B
Approach Delay (s)	3.5		0.5		77.3		14.2	
Approach LOS					F		B	

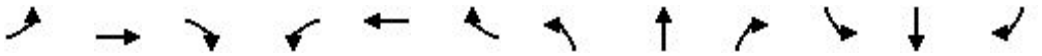
Intersection Summary				
Average Delay	15.4			
Intersection Capacity Utilization	71.3%	ICU Level of Service		C
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	158	170	96	9	181	11	166	30	17	49	55	209
Future Volume (vph)	158	170	96	9	181	11	166	30	17	49	55	209
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.99		1.00	0.95		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1610	1604		1610	1680		1610	1605		1610	1494	
Flt Permitted	0.63	1.00		0.58	1.00		0.55	1.00		0.72	1.00	
Satd. Flow (perm)	1063	1604		988	1680		930	1605		1227	1494	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	172	185	104	10	197	12	180	33	18	53	60	227
RTOR Reduction (vph)	0	29	0	0	3	0	0	13	0	0	162	0
Lane Group Flow (vph)	172	260	0	10	206	0	180	38	0	53	125	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	24.3	24.3		24.3	24.3		14.6	14.6		14.6	14.6	
Effective Green, g (s)	24.3	24.3		24.3	24.3		14.6	14.6		14.6	14.6	
Actuated g/C Ratio	0.48	0.48		0.48	0.48		0.29	0.29		0.29	0.29	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	507	765		471	802		266	460		351	428	
v/s Ratio Prot		c0.16			0.12			0.02			0.08	
v/s Ratio Perm	0.16			0.01			c0.19			0.04		
v/c Ratio	0.34	0.34		0.02	0.26		0.68	0.08		0.15	0.29	
Uniform Delay, d1	8.3	8.3		7.0	7.9		16.1	13.3		13.5	14.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.8	1.2		0.1	0.8		6.7	0.1		0.2	0.4	
Delay (s)	10.1	9.5		7.1	8.7		22.7	13.3		13.7	14.5	
Level of Service	B	A		A	A		C	B		B	B	
Approach Delay (s)		9.7			8.6			20.7			14.4	
Approach LOS		A			A			C			B	

Intersection Summary			
HCM 2000 Control Delay	12.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	50.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	68.8%	ICU Level of Service	C
Analysis Period (min)	15		

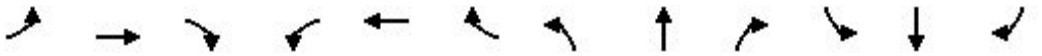
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	230	192	180	24	211	178	161	40	18	9	18	123
Future Volume (vph)	230	192	180	24	211	178	161	40	18	9	18	123
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.93		1.00	0.93		1.00	0.95		1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1610	1572		1610	1579		1610	1614		1610	1474	
Flt Permitted	0.50	1.00		0.51	1.00		0.66	1.00		0.72	1.00	
Satd. Flow (perm)	842	1572		866	1579		1117	1614		1214	1474	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	250	209	196	26	229	193	175	43	20	10	20	134
RTOR Reduction (vph)	0	47	0	0	42	0	0	16	0	0	107	0
Lane Group Flow (vph)	250	358	0	26	380	0	175	47	0	10	47	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	33.4	33.4		33.4	33.4		11.6	11.6		11.6	11.6	
Effective Green, g (s)	33.4	33.4		33.4	33.4		11.6	11.6		11.6	11.6	
Actuated g/C Ratio	0.59	0.59		0.59	0.59		0.20	0.20		0.20	0.20	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	493	921		507	925		227	328		247	299	
v/s Ratio Prot		0.23			0.24			0.03			0.03	
v/s Ratio Perm	c0.30			0.03			c0.16			0.01		
v/c Ratio	0.51	0.39		0.05	0.41		0.77	0.14		0.04	0.16	
Uniform Delay, d1	7.0	6.3		5.0	6.4		21.4	18.6		18.2	18.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.7	1.2		0.2	1.4		14.9	0.2		0.1	0.2	
Delay (s)	10.6	7.6		5.2	7.8		36.3	18.8		18.3	18.9	
Level of Service	B	A		A	A		D	B		B	B	
Approach Delay (s)		8.7			7.6			31.7			18.9	
Approach LOS		A			A			C			B	

Intersection Summary			
HCM 2000 Control Delay	13.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	57.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	78.0%	ICU Level of Service	D
Analysis Period (min)	15		

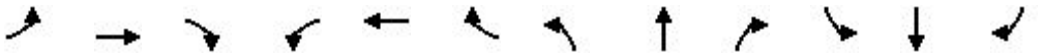
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	166	188	98	9	200	12	168	32	17	51	58	220
Future Volume (vph)	166	188	98	9	200	12	168	32	17	51	58	220
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.99		1.00	0.95		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1610	1608		1610	1681		1610	1609		1610	1494	
Flt Permitted	0.62	1.00		0.57	1.00		0.53	1.00		0.72	1.00	
Satd. Flow (perm)	1043	1608		968	1681		890	1609		1225	1494	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	180	204	107	10	217	13	183	35	18	55	63	239
RTOR Reduction (vph)	0	27	0	0	3	0	0	13	0	0	169	0
Lane Group Flow (vph)	180	284	0	10	227	0	183	40	0	55	133	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	24.3	24.3		24.3	24.3		14.9	14.9		14.9	14.9	
Effective Green, g (s)	24.3	24.3		24.3	24.3		14.9	14.9		14.9	14.9	
Actuated g/C Ratio	0.47	0.47		0.47	0.47		0.29	0.29		0.29	0.29	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	495	763		459	797		259	468		356	434	
v/s Ratio Prot		c0.18			0.13			0.03			0.09	
v/s Ratio Perm	0.17			0.01			c0.21			0.04		
v/c Ratio	0.36	0.37		0.02	0.28		0.71	0.09		0.15	0.31	
Uniform Delay, d1	8.5	8.6		7.1	8.2		16.2	13.2		13.5	14.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.1	1.4		0.1	0.9		8.5	0.1		0.2	0.4	
Delay (s)	10.6	10.0		7.2	9.1		24.7	13.3		13.7	14.5	
Level of Service	B	A		A	A		C	B		B	B	
Approach Delay (s)		10.2			9.0			22.1			14.4	
Approach LOS		B			A			C			B	

Intersection Summary			
HCM 2000 Control Delay	13.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	51.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.5%	ICU Level of Service	C
Analysis Period (min)	15		

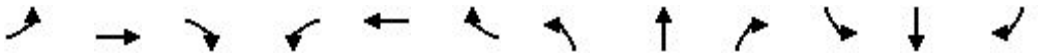
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	242	212	181	24	233	187	163	42	18	9	19	129
Future Volume (vph)	242	212	181	24	233	187	163	42	18	9	19	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.93		1.00	0.93		1.00	0.95		1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1610	1578		1610	1582		1610	1618		1610	1474	
Flt Permitted	0.47	1.00		0.49	1.00		0.66	1.00		0.71	1.00	
Satd. Flow (perm)	796	1578		835	1582		1110	1618		1210	1474	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	263	230	197	26	253	203	177	46	20	10	21	140
RTOR Reduction (vph)	0	43	0	0	40	0	0	16	0	0	111	0
Lane Group Flow (vph)	263	384	0	26	416	0	177	50	0	10	50	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	33.4	33.4		33.4	33.4		11.7	11.7		11.7	11.7	
Effective Green, g (s)	33.4	33.4		33.4	33.4		11.7	11.7		11.7	11.7	
Actuated g/C Ratio	0.58	0.58		0.58	0.58		0.20	0.20		0.20	0.20	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	465	923		488	925		227	331		247	302	
v/s Ratio Prot		0.24			0.26			0.03			0.03	
v/s Ratio Perm	c0.33			0.03			c0.16			0.01		
v/c Ratio	0.57	0.42		0.05	0.45		0.78	0.15		0.04	0.16	
Uniform Delay, d1	7.4	6.5		5.1	6.7		21.5	18.6		18.2	18.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.9	1.4		0.2	1.6		15.5	0.2		0.1	0.3	
Delay (s)	12.3	7.9		5.3	8.3		37.0	18.8		18.3	18.9	
Level of Service	B	A		A	A		D	B		B	B	
Approach Delay (s)		9.6			8.1			32.0			18.9	
Approach LOS		A			A			C			B	

Intersection Summary			
HCM 2000 Control Delay	13.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	57.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	81.2%	ICU Level of Service	D
Analysis Period (min)	15		

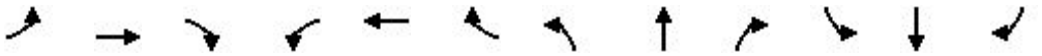
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	175	207	100	9	221	12	170	32	17	54	61	231
Future Volume (vph)	175	207	100	9	221	12	170	32	17	54	61	231
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.99		1.00	0.95		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1610	1612		1610	1682		1610	1609		1610	1494	
Flt Permitted	0.60	1.00		0.56	1.00		0.52	1.00		0.72	1.00	
Satd. Flow (perm)	1021	1612		942	1682		878	1609		1225	1494	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	190	225	109	10	240	13	185	35	18	59	66	251
RTOR Reduction (vph)	0	25	0	0	3	0	0	13	0	0	175	0
Lane Group Flow (vph)	190	309	0	10	250	0	185	40	0	59	142	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	22.3	22.3		22.3	22.3		15.0	15.0		15.0	15.0	
Effective Green, g (s)	22.3	22.3		22.3	22.3		15.0	15.0		15.0	15.0	
Actuated g/C Ratio	0.45	0.45		0.45	0.45		0.30	0.30		0.30	0.30	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	461	729		426	760		267	489		372	454	
v/s Ratio Prot		c0.19			0.15			0.03			0.10	
v/s Ratio Perm	0.19			0.01			c0.21			0.05		
v/c Ratio	0.41	0.42		0.02	0.33		0.69	0.08		0.16	0.31	
Uniform Delay, d1	9.1	9.1		7.5	8.7		15.1	12.2		12.5	13.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.7	1.8		0.1	1.2		7.6	0.1		0.2	0.4	
Delay (s)	11.8	10.9		7.6	9.8		22.7	12.3		12.7	13.6	
Level of Service	B	B		A	A		C	B		B	B	
Approach Delay (s)		11.3			9.8			20.4			13.5	
Approach LOS		B			A			C			B	

Intersection Summary			
HCM 2000 Control Delay	13.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	49.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	254	234	181	24	258	197	165	44	18	10	20	136
Future Volume (vph)	254	234	181	24	258	197	165	44	18	10	20	136
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.93		1.00	0.94		1.00	0.96		1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1610	1584		1610	1585		1610	1620		1610	1474	
Flt Permitted	0.44	1.00		0.47	1.00		0.65	1.00		0.71	1.00	
Satd. Flow (perm)	745	1584		802	1585		1101	1620		1208	1474	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	276	254	197	26	280	214	179	48	20	11	22	148
RTOR Reduction (vph)	0	39	0	0	38	0	0	16	0	0	117	0
Lane Group Flow (vph)	276	412	0	26	456	0	179	52	0	11	53	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	33.4	33.4		33.4	33.4		11.8	11.8		11.8	11.8	
Effective Green, g (s)	33.4	33.4		33.4	33.4		11.8	11.8		11.8	11.8	
Actuated g/C Ratio	0.58	0.58		0.58	0.58		0.21	0.21		0.21	0.21	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	435	924		468	925		227	334		249	304	
v/s Ratio Prot		0.26			0.29			0.03			0.04	
v/s Ratio Perm	c0.37			0.03			c0.16			0.01		
v/c Ratio	0.63	0.45		0.06	0.49		0.79	0.16		0.04	0.17	
Uniform Delay, d1	7.9	6.7		5.1	7.0		21.5	18.6		18.2	18.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.9	1.6		0.2	1.9		16.4	0.2		0.1	0.3	
Delay (s)	14.8	8.3		5.3	8.8		38.0	18.8		18.3	19.0	
Level of Service	B	A		A	A		D	B		B	B	
Approach Delay (s)		10.7			8.7			32.7			18.9	
Approach LOS		B			A			C			B	

Intersection Summary			
HCM 2000 Control Delay	14.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	57.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	84.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group