Transportation Impact Study

Southeast Georgetown -Russell Farm Subdivision

March 2025 | Project # 100160
Russell Pine Property Corp.

TYLin

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1 INTRODUCTION

1.1 Scope and Objective

TYLin was retained by Russell Pines Property Corp. to prepare a Transportation Impact Study in support of the proposed residential draft plan of Russell Farm Subdivision located in the northeast corner of 10th line and 10 Side Road in the southeast Georgetown the Town of Halton Hills, Ontario.

The study consists of the following:

- A review of the area transportation context in the site vicinity;
- A summary of expected impacts from the proposed development, background growth and background developments in the study area for the planning horizon of 2029 and 2031;
- A subdivision review of the site with applicable design standards;
- A Transportation Demand Management Plan consisting of recommended measures to be implemented;
- An Active Transportation Plan consisting of proposed pedestrian, cycling, and transit routes within the Draft Plan.

The purpose of this document is to determine the traffic volumes anticipated to be generated by the proposed development during the weekday AM and PM peak periods, assess the impact of this traffic on the existing and future road network, recommend improvements to accommodate the projected traffic generated, where required, and to confirm that the site plan network is consistent with applicable standards.

A Terms of Reference was submitted by TYLin to the Town of Halton Hills and Halton Region for review and comments. The Terms of Reference can be found in **Appendix A**.

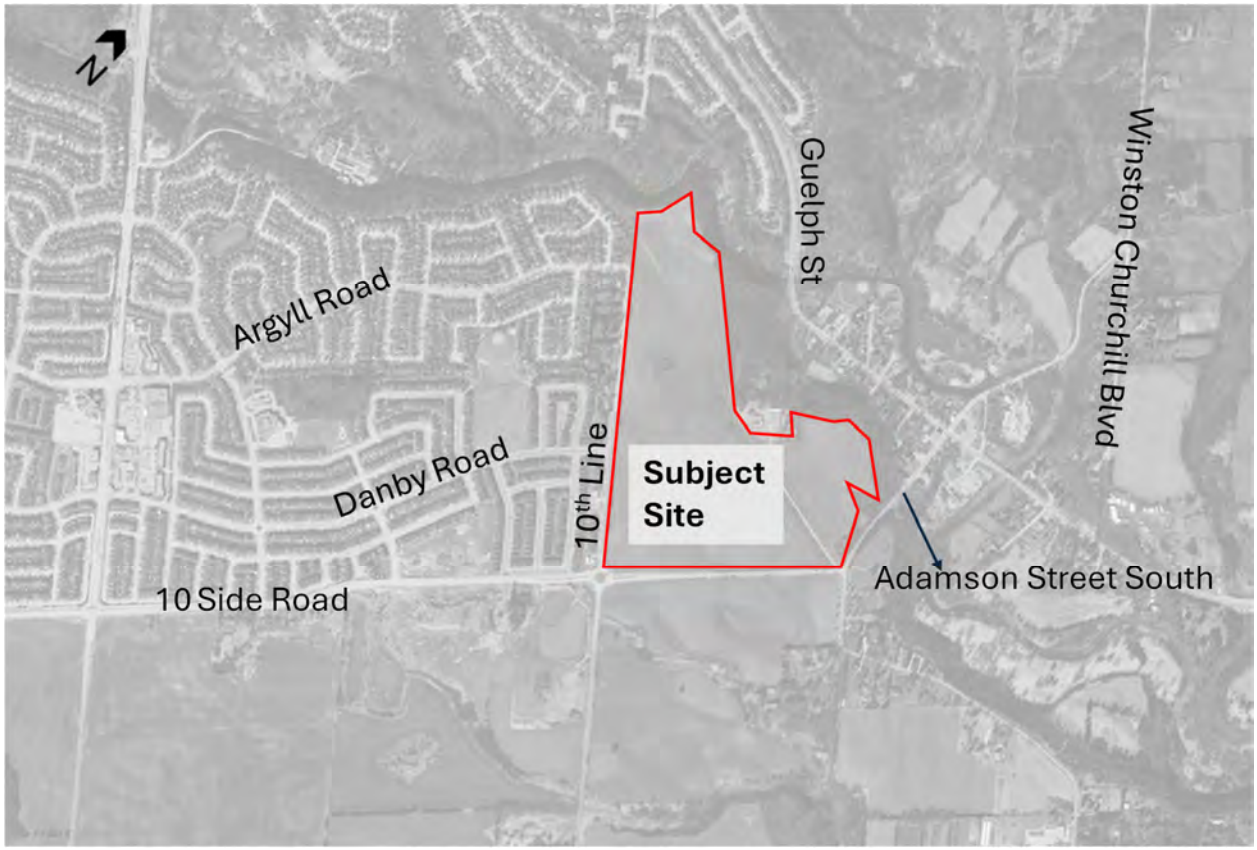
2 SITE CHARACTERISTICS

2.1 Study Environment

The subject site is located within the northeast quadrant of 10th Line and 10 Side Road in southeast Georgetown in the Town of Halton Hills, Ontario. The subject site proposes two access on 10th Line, an access on 10 Side Road and another access on the proposed Norval Bypass.

The proposed site and surrounding road network are shown in **Figure 2-1.**

Figure 2-1 Site Location



2.2 Development Context

The Russell farm subdivision is proposed to be developed phase-wise, one being the ultimate phase (phase 2) where the Norval Bypass and associated 10 Side Road realignment is anticipated to be constructed by forecast year 2031 with potential to start as early as 2028 and an interim phase (phase 1) where the proposed development located west of Norval Bypass proceeds in advance of Norval Bypass and associated 10 Side Road realignment. The interim phase is anticipated to be built out by 2029 horizon year.

As per the information provided by the client, a mixed-use commercial block is proposed to be built with 20,000 square feet of commercial space. As construction of this block is post 2031 an addendum to this report will be prepared for the site plan application of this block. Under phase 1, development proposes to build 274 single detached homes, 374 townhouses which includes 16 residential reserve units, with a total of 648 units. Under phase 2, additional 112 townhouses are proposed to be constructed. Access to the subject lands is proposed via two public roads connections to 10th Line at Danby Road and Argyll Road and one on 10 Side Road during phase 1. An addition connection at Norval Bypass is proposed under phase 2 for the east part of the subject lands.

For the purpose of analysis and reporting the draft plan of the subdivision has been divided into 5 zones as shown in the proposed site plan is shown in **Figure 2-2** and in full in **Appendix B**. The unit count information for each of the section is summarized in **Table 2-1**.

Figure 2-2 Draft Plan of Subdivision

Table 2-1 Unit Count Information

Zone Number	ITE Land Use Code (LUC)				
	210 #Units	215 #Units	Total Residential #Units	821 ft^2	Total Non-Residential ft^2
Phase 1					
1	274	-	274	-	-
2		304	304	-	-
3	-	70	70	-	-
4	-	-	-	20,000	20,000
Phase 1 Total	***274***	***374***	***648***	***20,000***	***20,000***
Phase 2					
5	-	112	112	-	-
Phase 2 Total	***-***	***112***	***112***	***-***	***-***
Net Total	**274**	**486**	**760**	**20,000**	**20,000**

The ITE Land Use Codes (LUC) identified in the table above correspond to the following land uses:

- **LUC 210:** Single Family Detached
- **LUC 215:** Single Family Attached
- **LUC 821:** Shopping Plaza

2.3 Study Area

The following intersections have been included in the study area as per the terms of reference:

- 10 Side Road and 10th Line
- 10 Side Road at Winston Churchill Boulevard/Adamson Street South
- 10th Line at Danby Road/proposed Street A
- 10th Line at Argyll Road/proposed Street E
- Proposed Street A at Street B
- Proposed Street B at 10 Side Road
- Proposed Street T at proposed Norval West Bypass

3 SUBDIVISION DESIGN REVIEW

This section provides a review of design elements for proposed residential subdivision development. Transportation Association of Canada (TAC) Geometric Design Guidelines (GDG) and applicable engineering standards for the Town of Halton Hills and Halton Region were referenced where appropriate.

3.1 Right-of-Way (ROW)

As shown in the draft plan of subdivision the proposed collector roads are consistent with the Section 8 of the Georgetown Secondary Plan. Street A is classified a 23m collector road, Street B and Street E are identified as 26m collector roads. To align with Danby Road, Street A widens to 26m ROW at the 10th Line intersection and provide additional pavement width for a dedicated left-turn as required. Additional widening at the 26m collector road intersections at 10 Side Road and 10th Line is not required since a dedicated left-turn lane (if required) can be accommodated within the proposed 26m ROW width when the parking lanes a dropped ahead of the intersection to prohibit on-street parking at the intersections.

All local roads within the subdivision have ROW of 20m per Town Standard 402 Residential Local Road. The 26-meter collector road proposes two 3.5m travel lanes, 1.8-2.1m sidewalks, 2.4m parking and 1.8m bike lanes on both sides of the roadway. The 23m collector road cross-section road proposes two 3.5m travel lane, one-sided 2.4m parking, 1.8-2.1m sidewalk and 1.8m bike lanes on both sides of the roadway. The cross-section of 20 meters local road is based on Town's standard design guidelines for 20m ROW cross section and would include two 4.25m travel lane and a 1.5m sidewalk on both sides of the roadway.

Both 10 Side Road and Norval Bypass will be classified as Regional C(3) Urban roadway with 42m ROW width. This cross-section would include four lane cross-sections with two travel lanes in each direction, double sided 3.0m multi-use path, and a median width up to 5.0m to accommodate left turn lanes as required.

The cross section for each of these roadways are provided in **Appendix C**.

3.2 Intersection Spacing

As per Town of Halton Hills Subdivision Manual, section 2.1.3 TAC Guidelines are to be used for basic design elements. As per section 9.4.2.2 of TAC Guidelines, minimum intersection spacing of 60m is required for four-legged intersection and 40m for three-legged intersection. Minimum regional road intersection spacing for full moves access is 300m for Urban Corridor (C3 type) as per Halton Region Access Management Guidelines.

The proposed subdivision road network satisfies the above requirements except for spacing along 10 Side Road between Street B and 10th Line, and the planned Norval West Bypass roundabout. This sub-standard spacing has been agreed with Region staff through previous letter and memos through the Norval West Bypass EA process. The dimensions are as illustrated in **Appendix C**.

3.3 Intersection Angle

As per Halton Hills Subdivision Manual, Halton Region Access Management guidelines and TAC Guidelines minimum intersection angle required is stated below:

Halton Hills:

- 85-90 degrees at intersections to arterial and collector roads
- 70-90 degrees at intersections to local roadways and laneways

Halton Region and TAC:

- 70-90 degrees at intersections

Prior to 10 Side Road widening and realignment, a 75° intersection angle at Street B and 10 Side Road is proposed under interim conditions and deemed acceptable per Halton Region and TAC road design criteria. Ultimately, post 10 Side Road widening, the Street B intersection angle will increase to 90°.

The proposed subdivision road network satisfies the above requirements as illustrated in **Appendix C.**

3.4 Daylight Triangle

As per Halton Hills Subdivision Manual and Halton Region Access Management guidelines daylight triangles are required to be designed with the following minimum requirements:

Halton Hills:

- 4.5mx4.5m for local-local intersections
- 7x7m local or collector to collector roads
- 12x12m local or collector to Regional Roads

Halton Region

- 15x15m local or collector to Regional Roads

The proposed subdivision road network satisfies the above requirements as illustrated in **Appendix C.**

3.5 Corner Clearance

Minimum corner clearance for signalized intersections is 70m for arterial roads. For unsignalized intersections, minimum corner clearance is 35m for arterial roads and 20m for collector roads based on TAC Guidelines.

Blocks 317 and 318 street townhouses propose direct driveway access to Street T. The driveway locations for the westerly units will be located approximately 11.0m form the street corner measured from the end of the future 15.0m corner radius at the Norval West Bypass intersection, satisfying TAC's the minimum 2.0m suggested minimum driveways spacing. The driveways provide an approximate 25.0m collector road corner clearance meeting the TAC suggested 20.0m distance for driveways adjacent to major intersections.

The proposed subdivision road network satisfies the above requirements at all access points as illustrated in **Appendix C.**

3.6 Sight Distance

As per Table 1 Geometric Design Elements of Town of Halton Hills Subdivision Manual, minimum stopping sight distance is required to be 85m for local roads, 110m for collector roads. As per the Region's Access Management Guideline:

"*A safe sight distance is the distance needed by a driver on a Major Arterial, or a driver exiting a driveway of street to verify that the road is clear and to avoid conflicts with other vehicles.*

Adequate sight distance must be provided for both movements into and out of an access with a minimum of hazard and disruption to traffic. Sight distance requirements must be considered both for vehicles approaching the access and departing from the stopped position at the access."

Stopping sight distances were reviewed at potential critical locations along the study area road network, and based on the intersection angles noted in **Section 3.3** and the straight vertical and horizontal alignments of study area roadways, none were identified as substandard to the above guidelines.

3.7 Access Circulation Analysis

Vehicle swept path analyses were performed to ensure that all design vehicles i.e., emergency vehicle, waste collection vehicle, snow removal vehicle and loading vehicle can navigate through the internal roadways and curves/bend nodes without conflict. It was observed that all design vehicles can navigate through the site without conflicts. Detailed swept path drawings for the design vehicles of the site are provided in **Appendix C**.

3.8 On-Street Parking Plan

A conceptual on-street parking plan has been shown in **Appendix C.** The on-street parking plan is subject to refinement at the detailed design stage once residential driveways and all utilities are confirmed.

4 EXISTING CONDITIONS

4.1 Road Network

The following existing roads are included in the transportation study network:

10 Side Road is an east-west major arterial roadway under the jurisdiction of Halton Region. Within the study area it operates with a two-lane undivided cross section (one-lane in each direction and a posted speed limit of 60 km/h.

10th Line is a north-south collector roadway under the jurisdiction of the Town of Halton Hills. In the vicinity of the site, 10th Line operates with a two-lane undivided cross section (one-lane in each direction with a posted speed limit of 50 km/h north of 10 Side Road and 60 km/hr south of 10 Side Road.

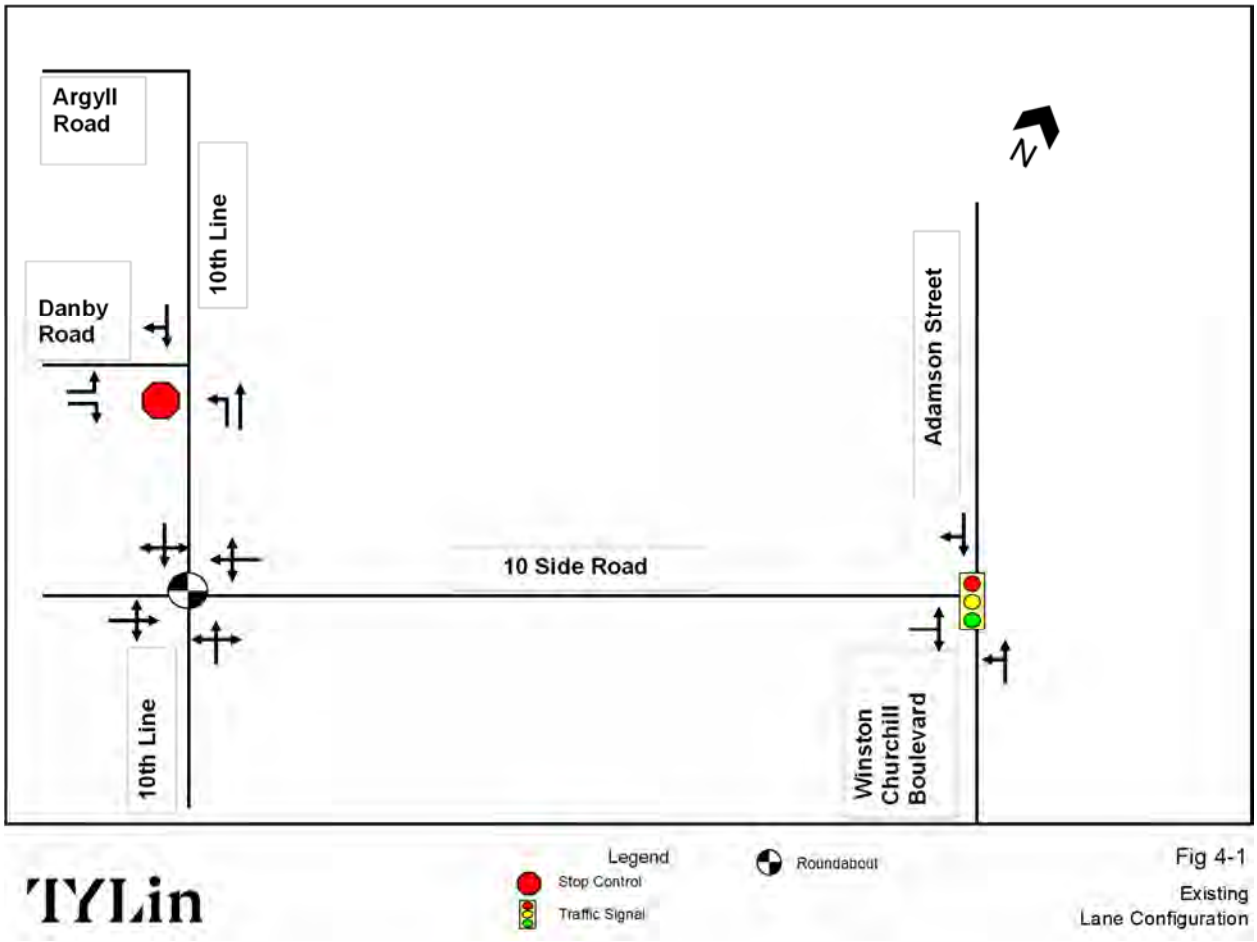
Danby Road is an east-west collector roadway under the jurisdiction of the Town of Halton Hills Within the study area it operates with a two-lane undivided cross section (one-lane in each direction) with a posted speed limit of 50 km/h.

Argyll Road is an east-west collector roadway under the jurisdiction of the Town of Halton Hills. Within the study area it operates with a two-lane undivided cross section (one-lane in each direction) with a posted speed limit of 50 km/h.

Adamson Street South/Winston Churchill Boulevard is a north-south major arterial roadway under the jurisdiction of the Halton Region. In the vicinity of the site, this road operates with a two-lane undivided cross section (one-lane in each direction with a posted speed limit of 50 km/h.

Figure 4-1 shows the existing lane configuration of the study intersections.

Figure 4-1 Existing Lane Configuration



4.2 Transit Network

The study area is currently bounded by few transit options. GO bus transit routes 31, 33 services the residential community east of the study area with bus stops located at the intersection of Noble Street and Guelph Street:

GO bus route 31 provides east-west service from Union Station Bus Terminal to Georgetown GO Station. The route provides 20-minute frequency or better during the weekday daytime peak, 55-minute frequency or better during the Saturday and Sunday daytime peak. GO bus route 33 provides east-west service from University of Guelph to Georgetown GO Station. The route provides 120-minute frequency or better during the weekday daytime peak. The closest stop is located at Noble Street and Guelph Street intersection, approximately 1.5 km or 20 minutes from the proposed development.

Other transit options available are Halton Hills ActiVan that provides public transportation within the municipality for persons with a physical, medical or cognitive disability and for all seniors 65 or older.

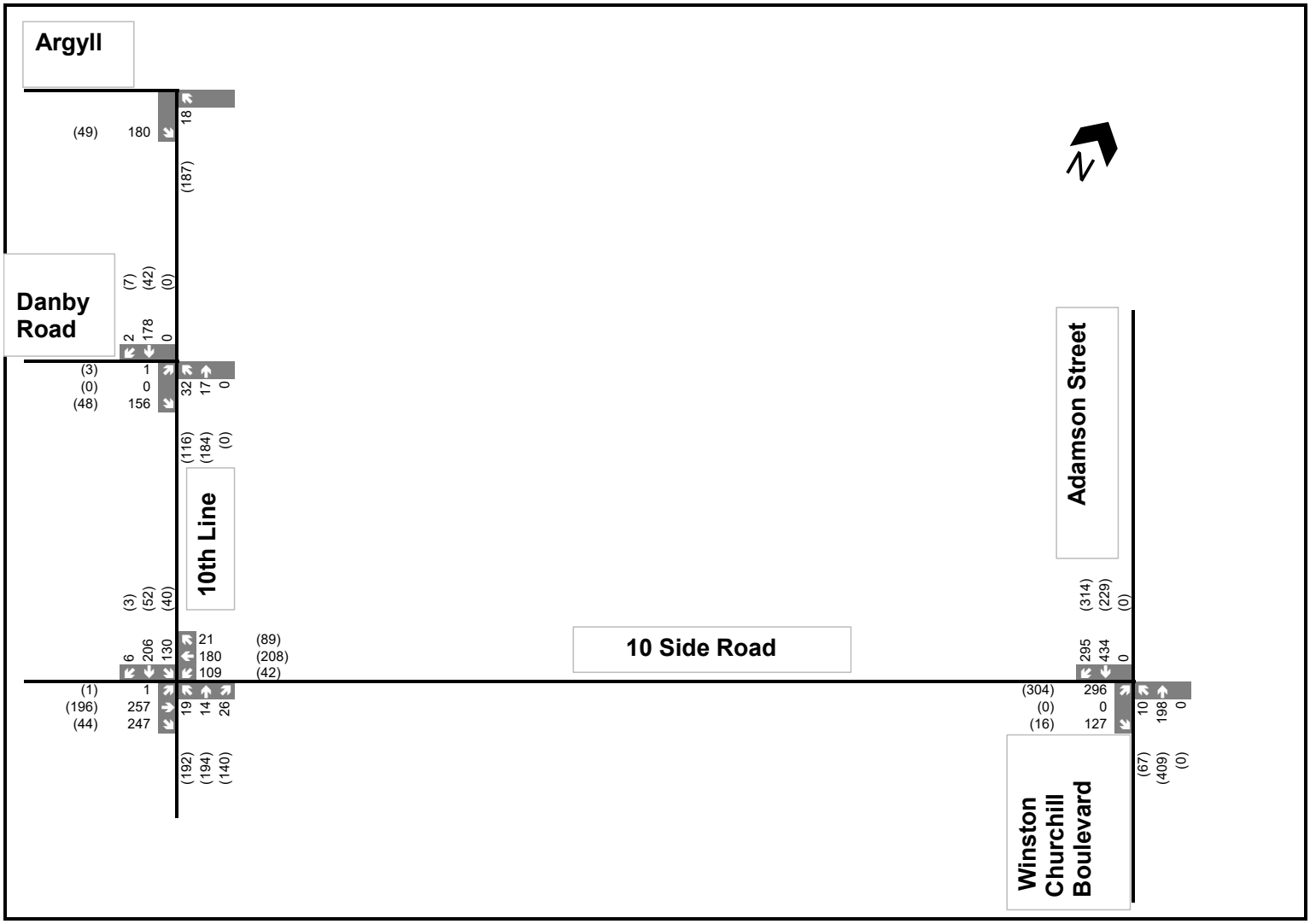
4.3 Active Transportation Network

The study area is currently bounded by few pedestrian and cycling facilities, as the existing area is predominately greenfield. Currently, sidewalks are provided along both sides of Argyll Road, Danby Road and along west side of 10th Line between section of 10 Side Road and north of Danby Road. No sidewalk facilities are present along 10 Side Road between section of 10th Line and Winston Churchill/Adamson Street. The on-road facilities currently present in the study area are a multi-use trail situated along 10 Side Road, terminating at10th Line.

4.4 Existing Traffic

Existing turning movement count data for all study intersections were surveyed on January 23, 2025.

Turning movement count and signal timing plan data can be found in **Appendix D**. The existing traffic volumes are shown in **Figure 4-2.**



Legend

xx A.M. Peak Hour Traffic
(xx) P.M. Peak Hour Traffic

Fig 4-2

Existing
Traffic Volumes

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5 FUTURE BACKGROUND CONDITIONS

5.1 Study Horizon Year

The proposed development is anticipated to be build phase wise. As stated in **section 2.2**, phase 1 west of Norval Bypass is proposed to be built out by horizon year 2029 and phase 2 located east of Norval Bypass is proposed to be built out by the horizon year 2031 with potential to start as early as 2028.

5.2 Background Corridor Growth

A growth rate of 1% was utilized for all regional roadways. The growth rate has been confirmed by the Region based on the terms of reference. For the Town roadways, growth rate was estimated using historic counts (2017) obtained from the Southeast Georgetown Secondary Plan and existing turning movement count data at the intersection of 10th Line and 10 Side Road. The growth rate was found to be 4% per annum.

5.3 Planned Transportation Improvements

5.3.1 Road Improvements

Based on a review of the Halton Region's planned construction projects and consultation with Region, the following roadway improvements are planned for the study network:

Under the jurisdiction of Halton Region:

- Winston Churchill Boulevard (Regional Road 19) - Widening from 2 to 4 lanes from 2km south of 5 Side Road to potential by-pass. The construction is anticipated to begin during the year 2029.
- 10 Side Road (Regional Road 10) - Widening from 2 to 4 lanes from Trafalgar Road to Winston Churchill Boulevard. The construction is anticipated to begin during the year 2031.
- Norval West Bypass- As per Municipal Class Environmental Assessment (Municipal Class EA) study Norval West Bypass is proposed from Guelph Street (Highway 7) to 10 Side Road (Regional Road 10). It is anticipated to be constructed by 2031.

5.3.2 Transit Improvements

Town of Halton Hills Transit Service Strategy report (June 2019) recommends that the town initiate the planning and budgeting process for the introduction of the Universal Access Service, which includes fixed routes along Ninth Line and Guelph Street and connections to Georgetown GO.

5.3.3 Future Active Transportation Improvements

Based on a review of the Town and Region's Active Transportation Master Plan, the following improvements are planned for the study network within the horizon years:

- Multi-use paths on both sides of 10 Side Road
- A buffered bike lane, north of 10 Side Road, along Argyll Road
- An in-boulevard multi use path along 10th Line
- A bike lane along Danby Road
- Paved shoulder along Adamson Street/Winston Churchill Boulevard
- An in-boulevard multi use path along Winston Churchill Boulevard

5.4 Background Developments

The following background development has been identified for the future background conditions:

- **0 10 Side Road**– Adult lifestyle community comprising of 46 single detached dwelling, 21 townhouse dwellings, and 21 rear lane townhouse dwelling units. The background trip volumes for the development were collected from the TIS addendum prepared by CGH transportation in December 2023.

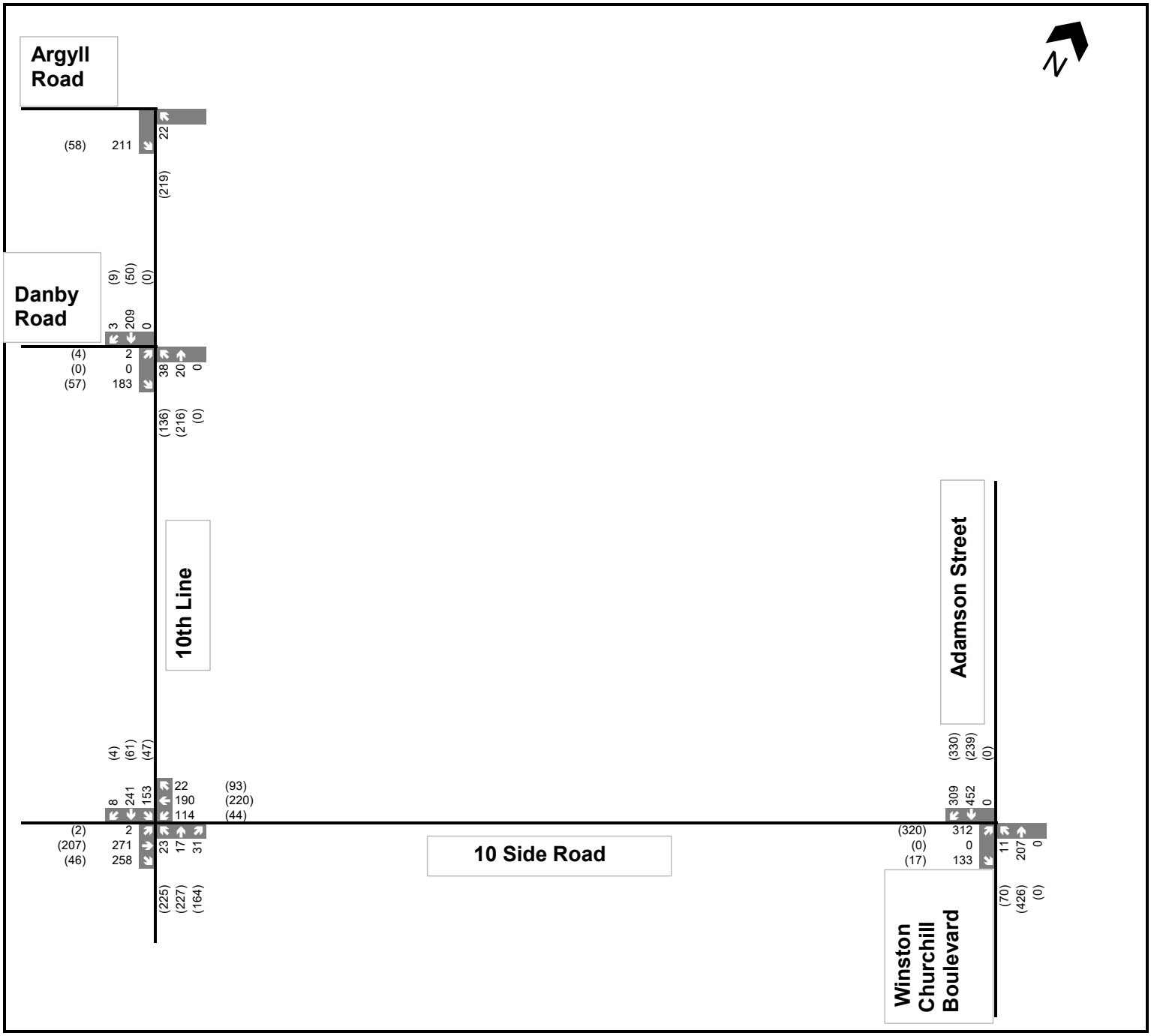
Trip generation data for the background development was obtained from Table 4 of the TIS addendum. Based on the trip distribution applied in this study (**Table 6-3**) background development trips were assigned on the study network.

Relevant excerpts of the background development TIS can be found in **Appendix E**.

5.5 Future Background Traffic Volumes

The 2029 future background weekday AM and PM traffic volumes which include the existing traffic volumes, corridor growth traffic volumes, and background development traffic volumes are shown in **Figure 5-1.** 2031 future background weekday AM and PM traffic volumes which include the existing traffic volumes, corridor growth traffic volumes, and background development traffic volumes are shown in **Figure 5-2**.

Under 2031 future background conditions PM peak hour traffic volumes at the proposed 10 Side Road/Adamson Street/ Norval Bypass and Winston Churchill Road roundabout were provided by the Region. As a conservative estimate, these volumes have been carried across to estimate the eastbound and westbound through volumes at the 10th Line and 10 Side Road roundabout. To obtain AM peak hour volumes, PM peak hour volumes have been transposed for all of the movements at this roundabout. **Figure 5-2a** shows the 2031 future background traffic volumes at the proposed roundabout.



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xx A.M. Peak Hour Traffic
(xx) P.M. Peak Hour Traffic

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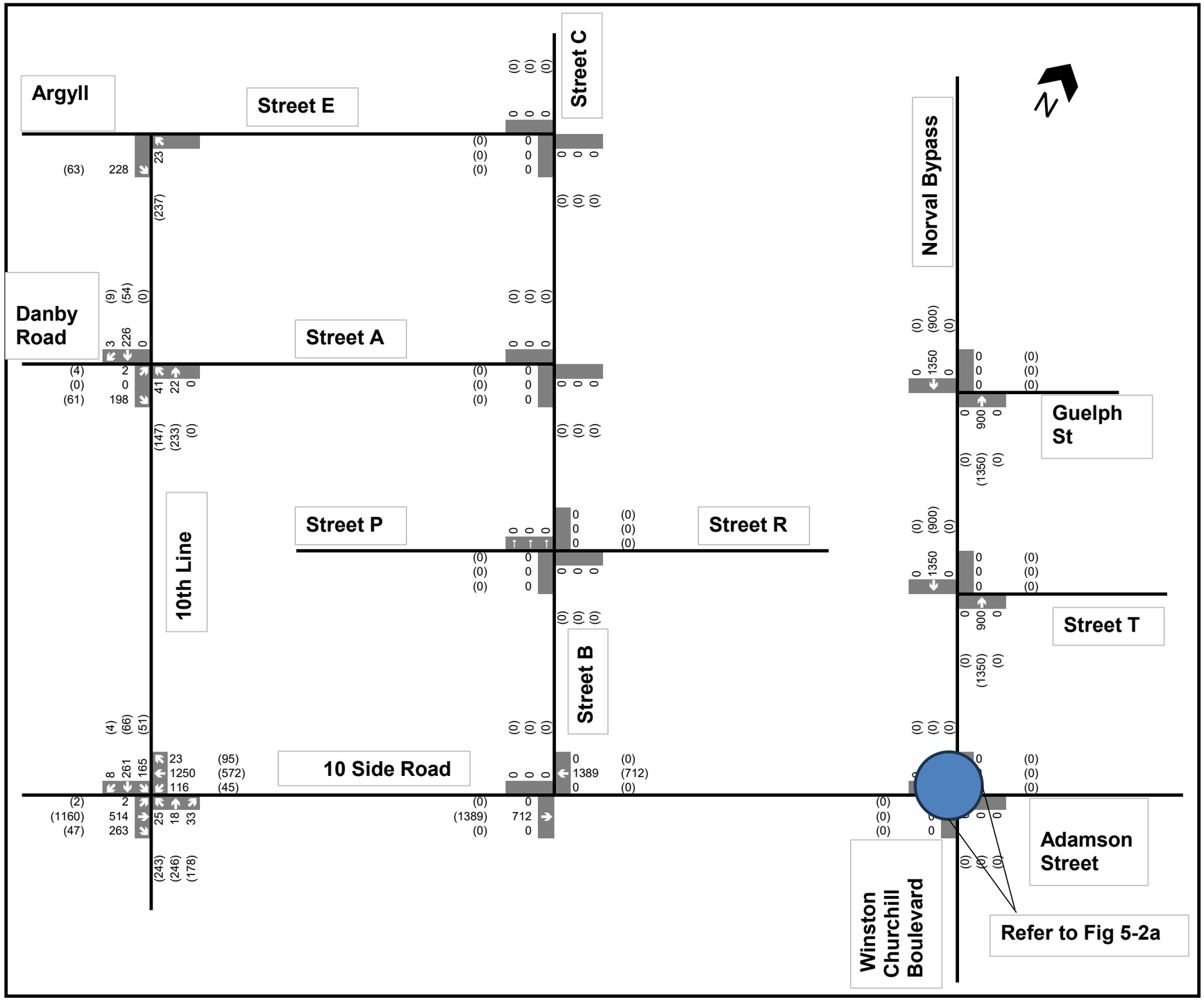
Fig 5-1

2029 Background Traffic Volumes



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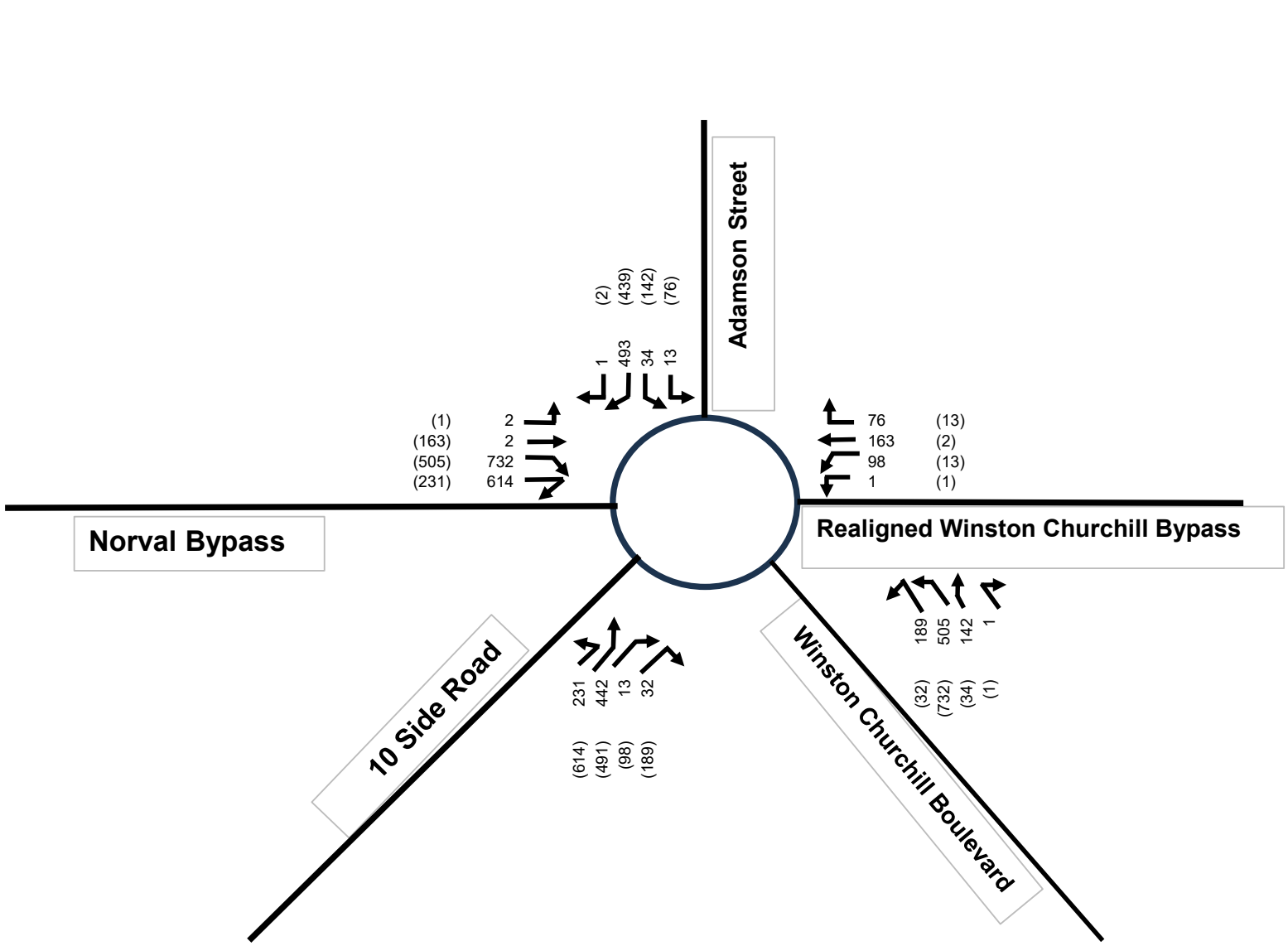
xx A.M. Peak Hour Traffic
(xx) P.M. Peak Hour Traffic

TYLin

Fig 5-2

2031 Future Background Traffic Volumes



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xx A.M. Peak Hour Traffic
(xx) P.M. Peak Hour Traffic

Fig 5-2a

2031 Future Background
Roundabout Traffic Volumes

TYLin

6 SITE GENERATED TRAFFIC

6.1 Existing Travel Patterns

The mode splits were estimated using 2016 Transportation Tomorrow Survey (TTS) data as shown in **Table 6-1.** Traffic Analysis zones (TAZ) 4159, 4160 and 4161 were used for estimation of mode split.

Table 6-1 Existing Modal Split

Mode	AM Peak	PM Peak
Auto Driver	90%	93%
Auto Passenger	3%	6%
Walk	7%	1%
Total	100%	100%
Non-Auto	**10%**	**7%**

Percentage of non-auto trips were obtained by combining % trips made by non-auto modes like walk and vehicle auto passenger. The subsequent residential mode splits percentages were applied to the AM and PM peak hour trip generation as shown in **Table 6-3.**

6.2 Site Trip Generation

Site trip generation was estimated for each of the zones stated in **section 2.2** according to the Institute of Transportation Engineers (ITE) 11th Edition Trip generation manual for each phase. **Table 6-2** summarizes the phase-wise trip generation for the proposed development.

Table 6-2 Site Trip Generation

Zone / Unit Count and GFA	Land Use	Parameters	Peak Hour Trip Generation (T)					
			AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Phase 1								
1 Units: 274	Single Family Detached (LUC 210)	Average Rate	0.70			0.94		
		Trip Distribution	25%	75%	100%	63%	37%	100%
		Person Trips	51	151	202	171	101	272
		Modal Split	10%			7%		
		Net Trips	46	136	182	159	94	253
2 Units: 304	Single Family Attached (LUC 215)	Average Rate	0.48			0.57		
		Trip Distribution	25%	75%	100%	59%	41%	100%
		Person Trips	39	115	154	107	75	182
		Modal Split	10%			7%		
		Net Trips	35	103	138	100	70	170
3 Units: 70	Single Family Attached (LUC 215)	Average Rate	0.48			0.57		
		Trip Distribution	25%	75%	100%	59%	41%	100%
		Person Trips	9	27	36	25	17	42
		Modal Split	10%			7%		
		Net Trips	8	24	32	23	16	39
4 GFA: 20,000ft^2	Shopping Plaza (40-150k) (LUC 821)	Average Rate	1.73			5.19		
		Trip Distribution	62%	38%	100%	49%	51%	100%
		Person Trips	23	14	37	53	56	109
		Modal Split	10%			7%		
		Net Trips	21	13	34	49	52	101
Phase 1 Total			***110***	***276***	***386***	***331***	***232***	***563***
Phase 2								
5	Single	Average Rate	0.48			0.57		

Zone / Unit Count and GFA	Land Use	Parameters	Peak Hour Trip Generation (T)					
			AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Units: 112	Family Attached (LUC 215)	Trip Distribution	25%	75%	100%	59%	41%	100%
		Person Trips	14	43	57	40	27	67
		Modal Split	10%			7%		
		Net Trips	13	39	52	37	25	62
Phase 2 Total			***13***	***39***	***52***	***37***	***25***	***62***
Net Total (Phase 1 + Phase 2)			**123**	**315**	**438**	**368**	**257**	**625**

In terms of person trips, under phase 1, the proposed development is expected to generate a total of 429 new two-way person trips during the weekday a.m. peak hour, consisting of 122 inbound and 307 outbound trips. During the weekday p.m. peak hour, the development is expected to generate 605 new two-way person trips, consisting of 356 inbound and 249 outbound trips. Under phase 2, the proposed development is expected to generate a total of 57 new two-way person trips during the weekday a.m. peak hour, consisting of 14 inbound and 43 outbound trips. During the weekday p.m. peak hour, the development is expected to generate 67 new two-way person trips, consisting of 40 inbound and 27 outbound trips. Under combined phase 1 and phase 2, the proposed development is expected to generate a total of 486 new two-way person trips during the weekday a.m. peak hour, consisting of 136 inbound and 350 outbound trips. During the weekday p.m. peak hour, the development is expected to generate 672 new two-way person trips, consisting of 396 inbound and 276 outbound trips.

After applying non-auto mode split reduction, under phase 1, the proposed development is expected to generate a total of 386 new two-way vehicle trips during the weekday a.m. peak hour, consisting of 110 inbound and 276 outbound trips. During the weekday p.m. peak hour, the development is expected to generate 563 new two-way vehicle trips, consisting of 331 inbound and 232 outbound trips.

Under phase 2, the proposed development is expected to generate a total of 52 new two-way vehicle trips during the weekday a.m. peak hour, consisting of 13 inbound and 39 outbound trips. During the weekday p.m. peak hour, the development is expected to generate 62 new two-way vehicle trips, consisting of 37 inbound and 25 outbound trips.

Under combined phase 1 and phase 2, the proposed development is expected to generate a total of 438 new two-way vehicle trips during the weekday a.m. peak hour, consisting of 123

inbound and 315 outbound trips. During the weekday p.m. peak hour, the development is expected to generate 625 new two-way vehicle trips, consisting of 368 inbound and 257 outbound trips.

For the purpose of this analysis only vehicle trips have been taken into consideration.

6.3 Site Trip Distribution and Assignment

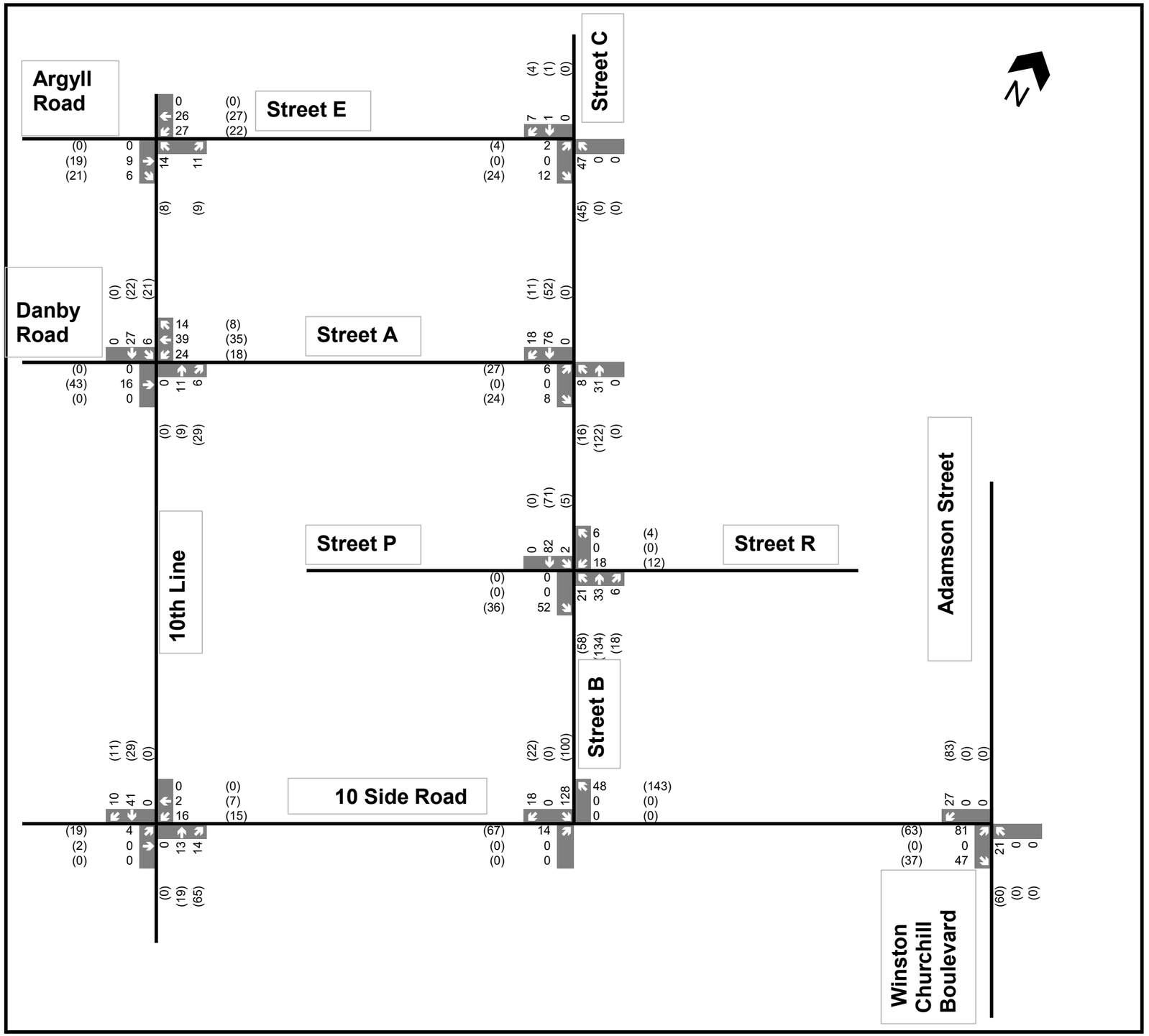
Trip distribution data was obtained from Table 6-3 of the Southeast Georgetown Secondary Plan The trip distribution percentages are presented in **Table 6-3**.

Table 6-3 Site Trip Distribution

To/From	Residential		Retail	
	Inbound	Outbound	Inbound	Outbound
North	14%	17%	13%	7%
South	44%	39%	50%	18%
East	13%	13%	14%	58%
West	29%	31%	23%	17%
Total	**100%**	**100%**	**100%**	**100%**

Figure 6-1 shows the 2029 site traffic volumes generated by the proposed development under phase 1. **Figure 6-2** shows the 2031 site traffic volumes generated by the proposed development under phase 2**. Figure 6-2a** shows the 2031 site traffic volumes at the proposed Winston Churchill/Adamson Street/10 Side Road and Norval Bypass roundabout generated by the proposed development under phase 2.

Figure 6-3 shows the 2029 future total volumes under phase 1 which include the site generated traffic volumes and the future background traffic volumes. **Figure 6-4** shows the 2031 future total volumes which include the site generated traffic volumes and the future background traffic volumes. **Figure 6-4a** shows the 2031 site traffic volumes at the proposed Winston Churchill/Adamson Street/10 Side Road and Norval Bypass roundabout generated by the proposed development under phase 2.



Legend

xx A.M. Peak Hour Traffic
(xx) P.M. Peak Hour Traffic

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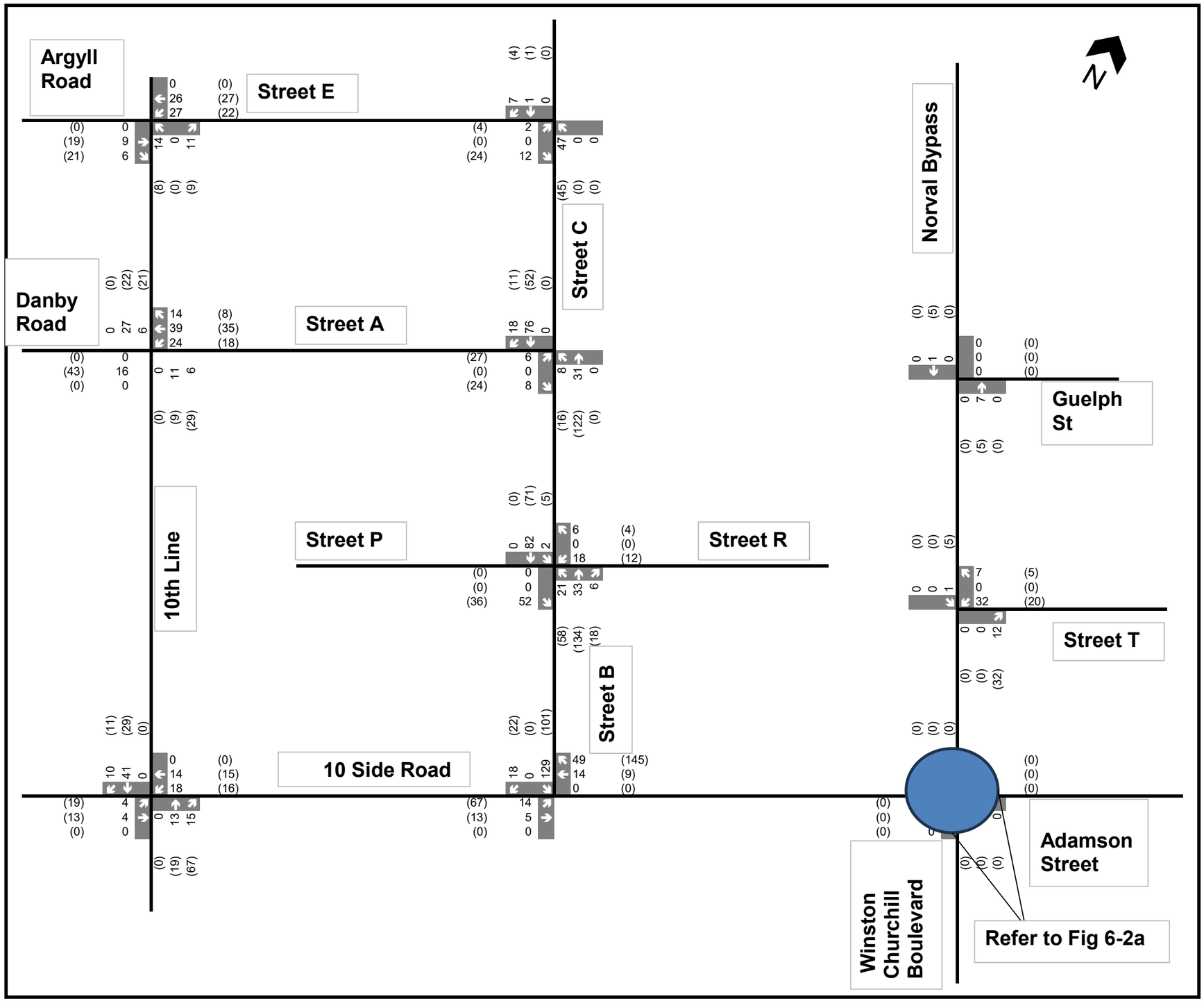
Fig 6-1

2029 Site Traffic
Traffic Volumes



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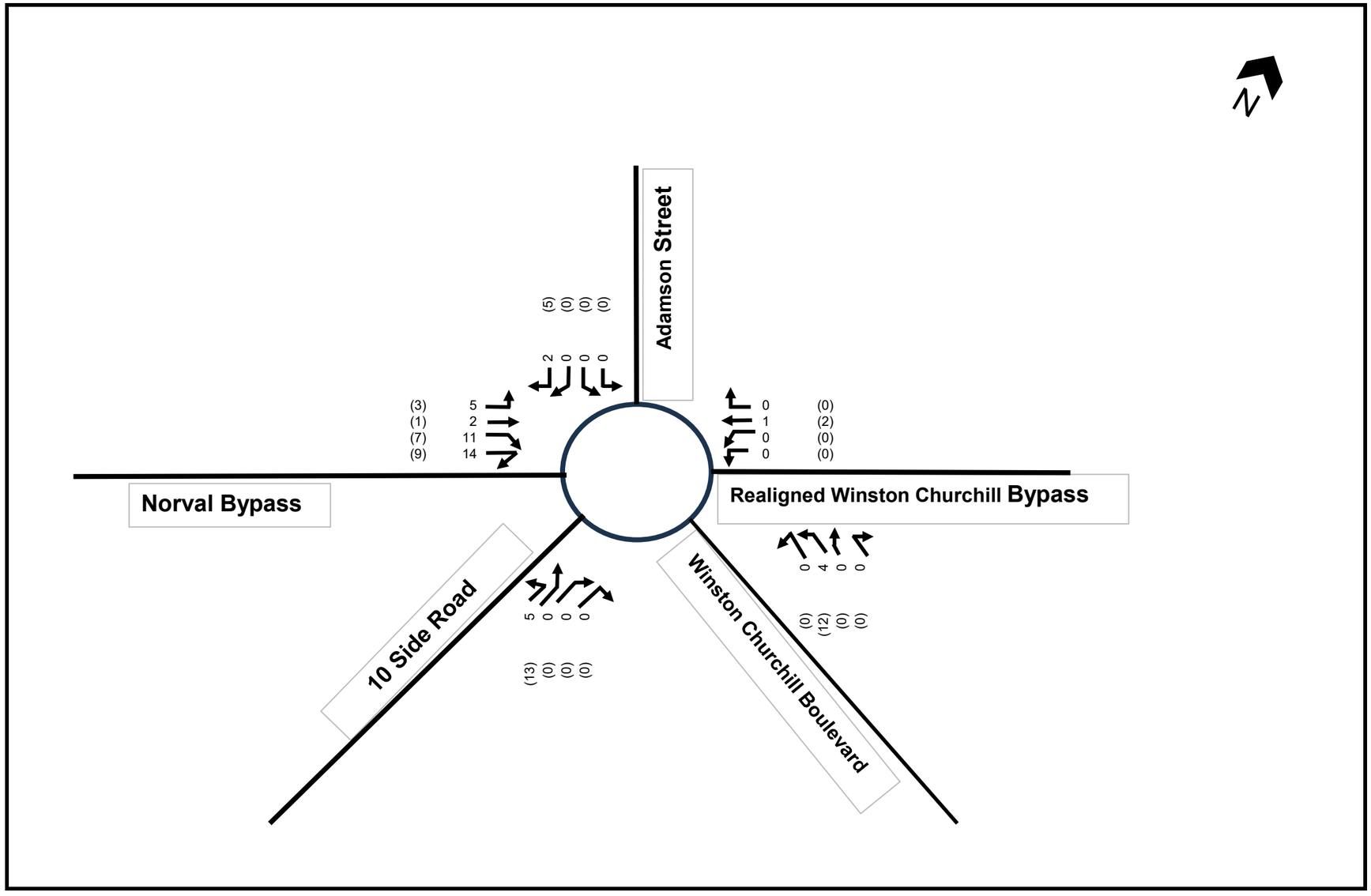
xx A.M. Peak Hour Traffic
(xx) P.M. Peak Hour Traffic

TYLin

Fig 6-2

2031 Site Traffic
Traffic Volumes



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xx A.M. Peak Hour Traffic
(xx) P.M. Peak Hour Traffic

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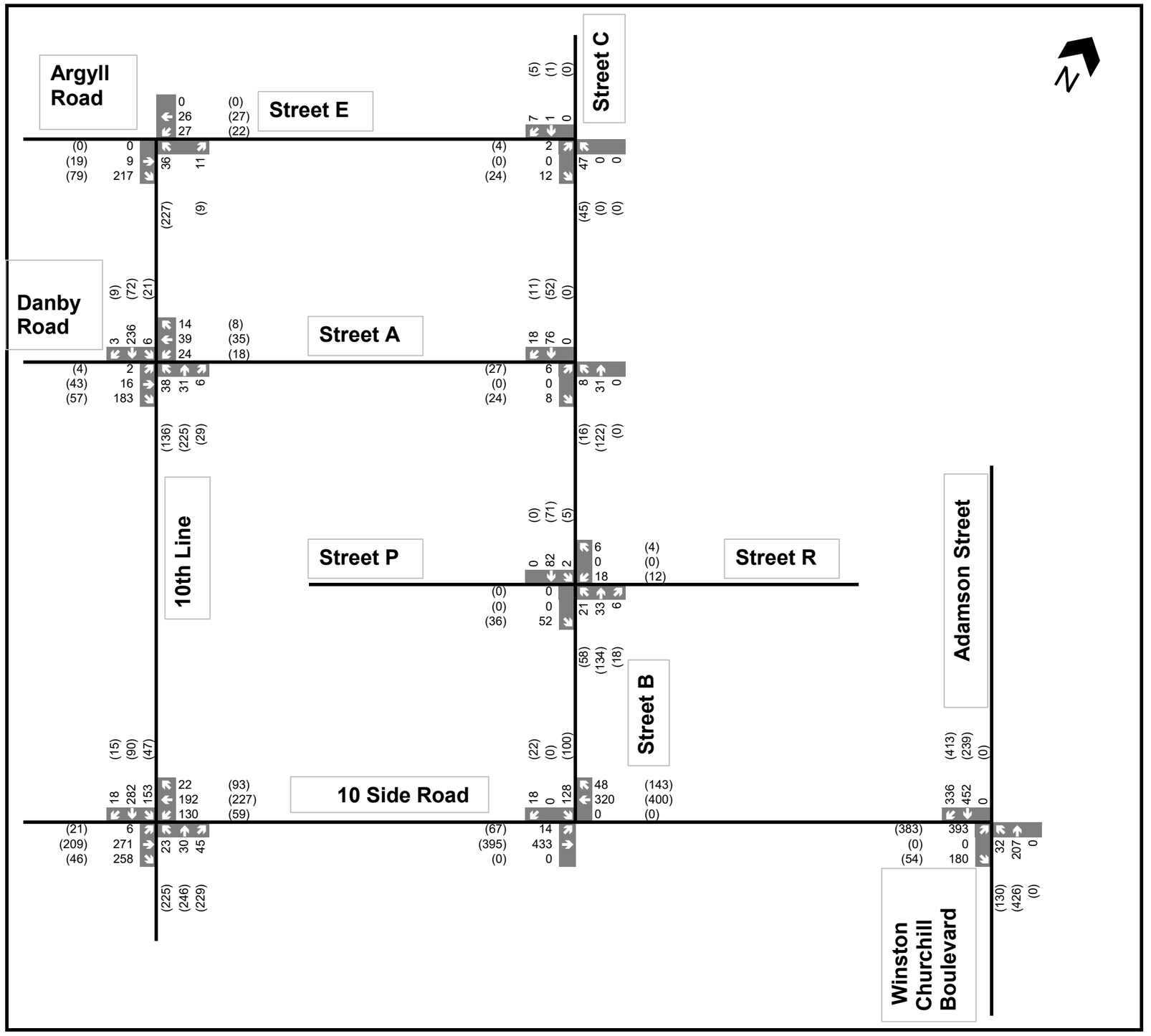
Fig 6-2a

2031 Site Traffic
Roundabout Traffic Volumes



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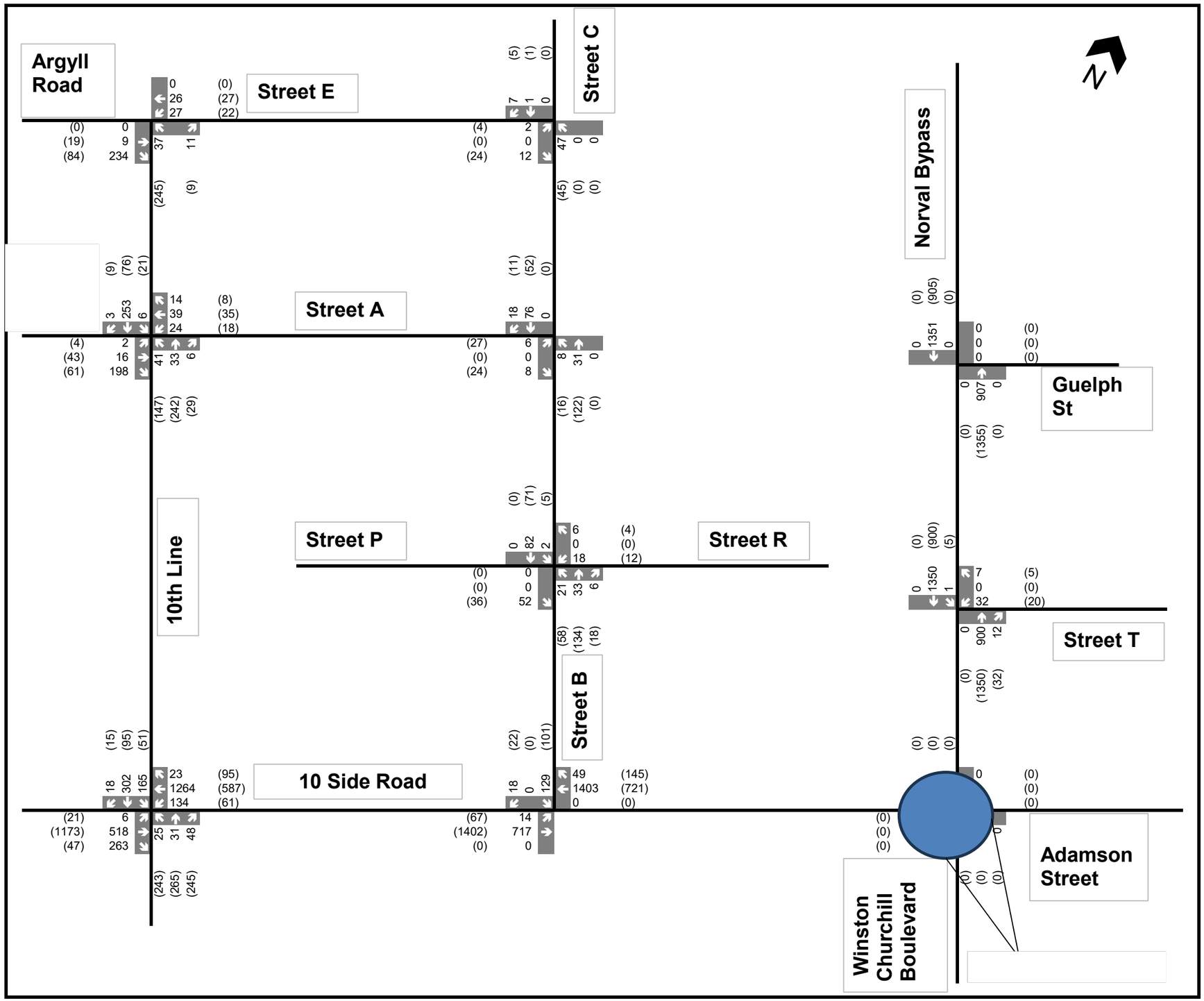
xx A.M. Peak Hour Traffic
(xx) P.M. Peak Hour Traffic

TYLin

Fig 6-3

2029 Future Total
Traffic Volumes



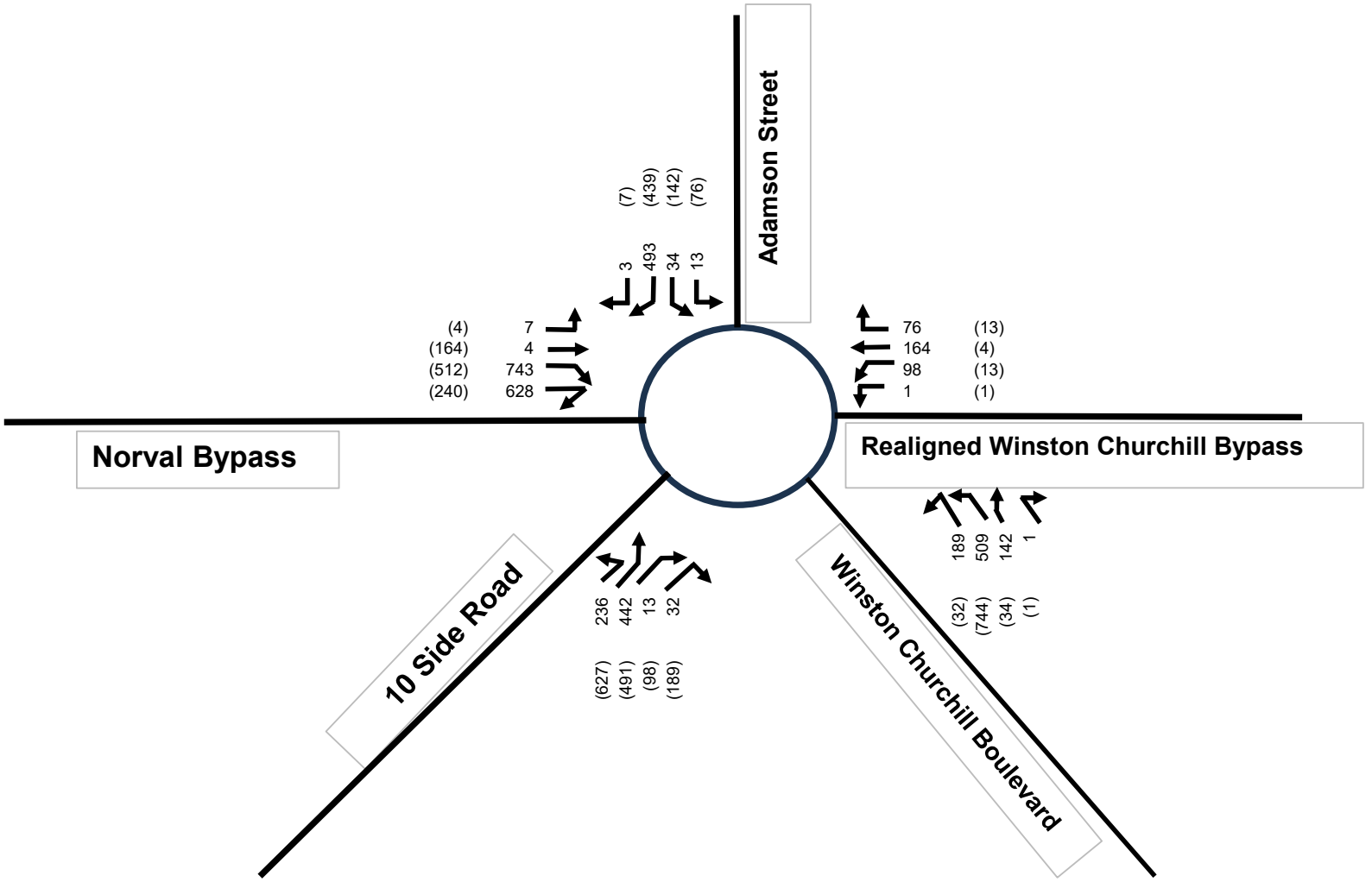
Legend

xx A.M. Peak Hour Traffic
(xx) P.M. Peak Hour Traffic

TYLin

Fig 6-4

2031 Future Total Traffic Volumes



Legend

xx A.M. Peak Hour Traffic
(xx) P.M. Peak Hour Traffic

TYLin

Fig 6-4a

2031 Future Total
Roundabout Traffic Volumes

7 TRAFFIC CONTROL TYPE WARRANT AND LEFT TURN LANE WARRANTS

7.1 Traffic Signal Warrant Analysis

Traffic signal warrant analyses were conducted for all unsignalized intersections under 2029, 2031 horizon years future total conditions. Signals were not found to be warranted under traditional means for any conditions based on projected volumes and therefore were assumed to not be required under future background and future total conditions. Although not warranted, traffic signal is proposed to be modelled for the intersection of Street B and 10 Side Road under 2031 future total conditions in order to accommodate the projected degradation in traffic operations/increase in delay. The proposed traffic signal will be discussed further under the future total analysis section. Traffic signal warrant calculations are provided in **Appendix F.**

7.2 Left-Turn Warrant Analysis

Left-turn Lane warrant analyses were conducted for the following movements under future total 2029 and 2031 conditions.

- At Street B and 10 Side Road for the eastbound movement
- At Danby Road/Street A and 10th Line for the southbound movement
- At Street T and Norval Bypass for the southbound movement

The results of the left-turn lane warrants are summarized in **Table 7-1** with the left-turn lane warrant calculations provided in **Appendix F.**

Table 7-1 Left-Turn Lane Warrant Analysis Summary

Intersection	V_L (Left Turn Traffic Volume)	V_A (Advancing Traffic Volume)	% of Left Turns in VA	V_O (Opposing Traffic Volume)	Left Turn Lane Warranted?
Future Total 2029 AM Peak Hour					
Street B and 10 Side Road	14	460	5%	374	Yes 15 m Storage
Danby Road/Street A and 10th Line	6	245	5%	77	Not warranted
Future Total 2029 PM Peak Hour					
Street B and 10 Side Road	67	466	15%	543	Yes 25 m Storage
Danby Road/Street A and 10th Line	21	104	20%	390	Not warranted
Future Total 2031 AM Peak Hour					
Street B and 10 Side Road	14	731	5%	1452	Yes 15 m Storage
Danby Road/Street A and 10th Line	6	262	5%	82	Not warranted
Street T and Norval Bypass	1	1351	5%	912	Not warranted
Future Total 2031 PM Peak Hour					
Street B and 10 Side Road	67	1469	5%	866	Yes 25 m Storage
Danby Road/Street A and 10th Line	21	108	20%	421	Not warranted
Street T and Norval Bypass	5	905	5%	1382	Not warranted

Note that despite being not warranted, a southbound left turn lane of length 15m and taper length 30m is recommended at the intersection of Norval Bypass and Street T to separate left turning traffic from through movement for the purpose of safety. Also, a southbound left turn lane of length 30m and taper length of 60m is recommended at the intersection of Street B and 10 Side Road from 2029 horizon year onwards. This is required from traffic operation perspective.

7.3 All-Way Stop Control Warrant

All-way stop-controlled warrant analysis was conducted under both 2029 and 2031 future total conditions for the following intersections based on Ontario Traffic Manual Book 5 All-Way Stop Minimum Volume Warrant: -

- Street A and Street B/C;
- Street A and 10th Line;
- Street B and 10 Side Road;
- Street B and Street P/R;
- Street E/ Argyll Road and 10th Line;
- Street T and Norval West Bypass; and
- Street E and Street C/D.

All-way stop control may be considered on collector roads or rural arterial roads where the following conditions are met:

- The total vehicle volume on all intersection approaches exceeds 375 vehicles per hour for each of the highest eight hours of the day; and,
- The combined vehicle and pedestrian volume on the minor street exceeds 150 units per hour (all vehicles plus pedestrians wishing to enter the intersection) for each of the same eight hours as the total volume; OR the combined vehicle and pedestrian volume on the minor street exceeds 120 units per hour (all vehicles plus pedestrians wishing to enter the intersection) for each of the same eight hours as the total volume, with an average delay to all minor street traffic (vehicles and pedestrians) of greater than 30 seconds for the entire eight hour period; and
- The volume split does not exceed 70/30 (that is the minor street must not be less than 30% of the total volume entering the intersection) as measured over the entire eight-hour count period. Volume on the major street is defined as vehicles only. Volume on the minor street includes all vehicles plus any pedestrians wishing to cross the major roadway. For three-legged intersections a volume split of 75/25 is permissible.

All-way stop control may be considered on urban arterial roads where the following conditions are met:

- The total vehicle volume on all intersection approaches exceeds 500 vehicles per hour for each of the highest eight hours of the day; and,
- The combined vehicle and pedestrian volume on the minor street exceeds 200 units per hour (all vehicles plus pedestrians wishing to enter the intersection) for each of the same

eight hours as the total volume; OR the combined vehicle and pedestrian volume on the minor street exceeds 150 units per hour (all vehicles plus pedestrians wishing to enter the intersection) for each of the same eight hours as the total volume, with an average delay to all minor street traffic (vehicles and pedestrians) of greater than 30 seconds for the entire eight hour period; and

- The volume split does not exceed 70/30 (that is the minor street must not be less than 30% of the total volume entering the intersection) as measured over the entire eight-hour count period. Volume on the major street is defined as vehicles only. Volume on the minor street includes all vehicles plus any pedestrians wishing to cross the major roadway. For three-legged intersections a volume split of 75/25 is permissible.

Since the subject intersections are new, existing eight-hour traffic data is not available. Therefore, hourly multiplies were derived from the highest peak eight-hour traffic volumes and applied to the a.m. and p.m. peak hour 2029 and 2031 future total volumes. None of the above intersections meet all three of the conditions noted above and therefore an all-way stop control is not warranted at the above listed intersections. All-way stop control warrant calculations are provided in **Appendix F.**

Despite being not warranted, an all-way stop control is recommended at the intersection of Street A and Street B/Street C. This is because this intersection has been identified as key pedestrian crossing as it served as gateway to Park Block 346, trail and walkway connections. Since this intersection is expected to be a high pedestrian generator, therefore, for the safety of the pedestrians an all-way stop control is recommended at the intersection of Street A and Street B/Street C.

7.4 Pedestrian Control Warrant

The intersection of Street T and Norval Bypass has been identified as a key pedestrian crossing location as per **Figure 9-1**. Based on OTM Book 15, pedestrian control warrant analysis was conducted to determine type of pedestrian crossover at the intersection of Street T and Norval Bypass. Design speed of 60 km/hr was assumed for this analysis along the Norval Bypass. The peak hour volumes under 2031 future total conditions at this intersection were converted into 4-hour volumes using a multiplication factor of 0.95 based on engineering judgement. To conduct the warrant analysis, peak hour volumes were also to convert to annual average daily traffic which were then converted into 8-hour volumes using a multiplication factor of 0.6 based on engineering judgement as per **Table 7-2**.

Table 7-2 Traffic Volumes for Pedestrian Crossover Warrants

Location	2031 FT AM	2031 FT PM	Two-Way Volumes	4-hour volume	AADT	8-hour volumes
Southbound Through volumes at Norval Bypass	1350	900	2250	9000	20532	12320
Northbound Through volumes at Norval Bypass	900	1350	2250			

Based on Table 1 of OTM Book 15, for a design speed of 60 km/hr, following conditions are applicable for Level 2 type B pedestrian crossover: -

- If 8-hour volume is between 7500 to 17500; and
- If 4-hour volume is between 3950 and 9215.

As per table above, 4-hour and 8-hour volumes fall within the range specified in OTM book 15. Therefore, TYLin recommends pedestrian cross over Level 2 Type B at the intersection of Street T and Norval Bypass to facilitate pedestrian movements between subject lands east and west of Norval Bypass.

8 TRAFFIC CAPACITY ANALYSIS

The traffic capacity analysis identifies how well the intersections and access driveway are operating and how they are expected to operate in the future. The analysis contained in this report utilized the Highway Capacity Manual (HCM) methodology within the Synchro 11 Software package. The reported intersection volume-to-capacity ratios (v/c) are a measure of the saturation volume for each turning movement, while the levels-of-service (LOS) are a measure of the average delay for each turning movement. For roundabout analysis SIDRA software has been used in this study. The methodology selected for roundabout analysis is SIDRA standard model with an environment factor of 1.1 as agreed with Halton Region staff.

As part of the capacity analysis, TYLin detailed the traffic operation at all movements at the study intersections. Critical movements were bolded in the summary table, as identified per the Region's Transportation Impact Study (TIS) Guidelines:

Signalized intersections:

- Volume/capacity (V/C) ratios for overall intersection operations, through movements, or shared through/turning movements increased to 0.85 or above;
- V/C ratios for exclusive movements increased to 0.95 or above; or
- Queues for an individual movement are projected to exceed available turning lane storage.

Unsignalized intersections:

- Level of service (LOS), based on average delay per vehicle, on individual movements exceeds LOS "D"; or
- The estimated 95th percentile queue length for an individual movement exceeds the available queue storage.

The following tables summarize the Synchro/HCM capacity for the study intersections during the weekday AM and PM peak hours under existing (2025) and future background and future total traffic conditions.

The full synchro and SIDRA capacity analysis reports can be found in **Appendix G**.

8.1 Existing Conditions

8.1.1 Synchro Capacity Analysis

The traffic capacity results for the intersections in the study area are summarized in **Table 8-1** for both the weekday AM and PM peak hours under existing conditions.

Table 8-1 2025 Existing Capacity Analysis

Intersection	Movement	Storage (m)	Weekday AM				Weekday PM			
			V/C	Delay (s)	LOS	95th % Queue	V/C	Delay (s)	LOS	95th % Queue
Winston Churchill Boulevard/ Adamson Street and 10 Side Road (Signalized)	*Overall*	-	***0.88***	*28*	*C*	-	*0.62*	*19*	*B*	-
	EBLR	-	0.82	37	D	96	0.77	40	D	80
	NBLT	-	0.26	12	B	41	0.51	11	B	87
	SBTR	-	**0.86**	27	C	209	0.53	13	B	88
10th Line and Danby Road (Unsignalized)	EBL	25	<0.01	11	B	0	0.01	13	B	0
	EBR	25	0.20	10	B	6	0.05	9	A	1
	WBLTR	-	<0.01	0	A	0	0.00	0	A	0
	NBL	30	0.03	8	A	0	0.08	8	A	2
	NBTR	-	0.01	0	A	1	0.11	0	A	0
	SBLTR	-	<0.01	0	A	0	0.00	0	A	0
10th Line and Argyll Road (Unsignalized)	NBT	-	0.01	0	A	0	0.12	0	A	0
	SBT	-	<0.01	0	A	0	0.00	0	A	0

Under 2025 existing conditions, intersections within the study area network generally operate well with excess capacity and acceptable delay except for select critical movements at the intersection of Winston Churchill Boulevard/Adamson Street and 10 Side Road. During AM peak hour, Winston Churchill Boulevard/Adamson Street and 10 Side Road intersection operates with overall v/c of 0.88. The shared southbound through and right turn movements at this intersection operates with v/c of 0.86, which is still under capacity. Apart from this movement,

there are no operational concerns for all movements under the 2025 existing conditions.

8.1.2 Roundabout Analysis

The roundabout analysis has been conducted using SIDRA version 9.1. The traffic capacity results for the roundabout of 10th Line and 10 Side Road are summarized in **Table 8-2** for both the weekday AM and PM peak hours under existing conditions.

Table 8-2 2025 Existing Conditions Roundabout Analysis

Intersection	Peak Hour	Leg of Roundabout	95% Queue (veh)	Delay (s)	v/c	LOS (leg)	LOS (Intersection)
10th Line and 10 Side Road	AM	SB	18	8	0.38	A	A
		EB	53	11	0.65	B	
		NB	3	8	0.07	A	
		WB	14	6	0.27	A	
	PM	SB	5	9	0.12	A	A
		EB	10	5	0.23	A	
		NB	31	8	0.53	A	
		WB	22	7	0.41	A	

Under 2025 existing conditions, the roundabout of 10th Line and 10 Side Road operates well with excess capacity and acceptable delay. There are no operational concerns for the approaches under the 2025 existing conditions.

8.2 Future Background Conditions

8.2.1 2029 Future Background Conditions- Synchro Capacity Analysis

The traffic capacity results for the intersections in the study area are summarized in **Table 8-3** for both the weekday AM and PM peak hours under 2029 future background conditions.

Table 8-3 2029 Future Background Capacity Analysis

Intersection	Movement	Storage (m)	Weekday AM				Weekday PM			
			V/C	Delay (s)	LOS	95th % Queue	V/C	Delay (s)	LOS	95th % Queue
Winston Churchill Boulevard/ Adamson Street and 10 Side Road (Signalized)	*Overall*	-	***0.90***	*31*	*C*	-	*0.66*	*20*	*B*	-
	EBLR	-	**0.85**	42	D	137	0.78	41	D	84
	NBLT	-	0.28	13	B	37	0.57	13	B	99
	SBTR	-	**0.87**	29	C	201	0.56	14	B	99
10th Line and Danby Road/Street A (Unsignalized)	EBL	25	<0.01	11	B	0	0.01	14	B	0
	EBR	25	0.25	11	B	8	0.06	9	A	1
	WBLTR	-	<0.01	0	A	0	<0.01	0	A	0
	NBL	30	0.03	8	A	1	0.09	8	A	2
	NBTR	-	0.01	0	A	0	0.13	0	A	0
	SBLTR	-	<0.01	0	A	0	<0.01	0	A	0
10th Line /Argyll Road & Street E (Unsignalized)	WBLR	-	<0.01	0	A	0	<0.01	0	A	0
	NBTR	-	0.01	0	A	0	0.14	0	A	0
	SBLT	-	<0.01	0	A	0	<0.01	0	A	0
10 Side Road & Street B (Unsignalized)	EBLT	-	<0.01	0	A	0	<0.01	0	A	0
	WBTR	-	0.20	0	A	0	0.26	0	A	0

Intersection	Movement	Storage (m)	Weekday AM				Weekday PM			
			V/C	Delay (s)	LOS	95th % Queue	V/C	Delay (s)	LOS	95th % Queue
	SBLR	-	<0.01	0	A	0	<0.01	0	A	0

Under 2029 future background conditions, intersections within the study area network generally operate well with excess capacity and acceptable delay except for select critical movements at the intersection of Winston Churchill Boulevard/Adamson Street and 10 Side Road. During AM peak hour, Winston Churchill Boulevard/Adamson Street and 10 Side Road intersection is expected to operate with overall v/c of 0.90. The shared southbound through and right turn and shared eastbound left and right turn movements at this intersection is expected to operate with v/c of 0.87 and 0.85 respectively, which is still under capacity. Apart from this movement, there are no operational concerns for all movements under the 2029 future background conditions.

8.2.2 Roundabout Analysis

The traffic capacity results for the roundabout of 10th Line and 10 Side Road are summarized in **Table 8-4** for both the weekday AM and PM peak hours under 2029 future background conditions.

Table 8-4 2029 Future Background Conditions Roundabout Analysis

Intersection	Peak Hour	Leg of Roundabout	95% Queue (veh)	Delay (s)	v/c	LOS (leg)	LOS (Intersection)
10th Line and 10 Side Road	AM	SB	23	9	0.45	A	B
		EB	73	14	0.75	B	
		NB	4	8	0.09	A	
		WB	15	6	0.29	A	
	PM	SB	6	9	0.15	A	A
		EB	11	5	0.25	A	
		NB	48	9	0.64	A	
		WB	27	8	0.47	A	

Under 2029 future background conditions, the roundabout of 10th Line and 10 Side Road operates well with excess capacity and acceptable delay. There are no operational concerns for the approaches under the 2029 future background conditions.

8.2.3 2031 Future Background Conditions-Synchro Capacity Analysis

The traffic capacity results for the intersections in the study area are summarized in **Table 8-5** for both the weekday AM and PM peak hours under 2031 future background conditions. It is to be noted that intersection of Winston Churchill/Adamson Street and 10 Side Road has not been analyzed under 2031 future background conditions as this intersection is proposed to be converted into a five-arm roundabout, with the implementation of proposed Norval Bypass. Additionally, proposed Norval Bypass and Guelph Street roundabout shown in the draft plan of subdivision (**Appendix B**), has not been analyzed in this study. As agreed with Region staff, TYLin defers to Norval Bypass Municipal Class Environment Assessment (MCEA) study for both proposed north and south roundabout analysis.

Table 8-5 2031 Future Background Capacity Analysis

Intersection	Movement	Storage (m)	Weekday AM				Weekday PM			
			V/C	Delay (s)	LOS	95th % Queue	V/C	Delay (s)	LOS	95th % Queue
10th Line and Danby Road/Street A (Unsignalized)	EBL	25	<0.01	11	B	0	0.01	15	B	0
	EBR	25	0.28	11	B	9	0.06	9	A	2
	WBLTR	-	<0.01	0	A	0	<0.01	0	A	0
	NBL	30	0.03	8	A	1	0.10	8	A	3
	NBTR	-	0.01	0	A	0	0.14	0	A	0
	SBLTR	-	<0.01	0	A	0	<0.01	0	A	0
10th Line /Argyll Road & Street E (Unsignalized)	WBLR	-	0.08	0	A	0	0.08	0	A	0
	NBTR	-	0.01	0	A	0	0.15	0	A	0
	SBLT	-	<0.01	0	A	0	<0.01	0	A	0
10 Side Road & Street B (Unsignalized)	EBLT	-	0.30	0	A	0	0.59	0	A	0
	WBTR	-	0.59	0	A	0	0.30	0	A	0
	SBLR	-	<0.01	0	A	0	<0.01	0	A	0

Under 2031 future background conditions, intersections within the study area network generally operate well with excess capacity and acceptable delay. There are no operational concerns for all movements under the 2031 future background conditions.

8.2.4 Roundabout Analysis

The traffic capacity results for the roundabout of 10th Line and 10 Side Road are summarized in **Table 8-6** for both the weekday AM and PM peak hours under 2031 future background conditions. As stated in **section 5.3.1,** widening of 10 Side Road from two to four lanes has been considered under this scenario.

Table 8-6 2031 Future Background Conditions Roundabout Analysis

Intersection	Peak Hour	Leg of Roundabout	95% Queue (veh)	Delay (s)	v/c	LOS (leg)	LOS (Intersection)
10th Line and 10 Side Road	AM	SB	744	778	**2.61**	**F**	**F**
		EB	21	6	0.39	A	
		NB	5	10	0.11	A	
		WB	41	5	0.54	A	
	PM	SB	9	12	0.20	B	**F**
		EB	33	5	0.52	A	
		NB	1032	619	**2.30**	**F**	
		WB	19	5	0.33	A	

Under 2031 future background conditions, select approaches of the roundabout of 10th Line and 10 Side Road are expected to be over capacity with high levels delay. During the AM peak hour, the southbound and westbound approaches are expected to operate over capacity and during the PM peak hour, the eastbound and northbound approaches are expected to operate over capacity.

As a mitigation measure, TYLin recommends two circulating lanes at the roundabout and other road improvements like localized widening along 10th Line at the approaches to the roundabout in conjunction with 10 Side Road. Additionally, TYLin also recommends that Region consider all these improvements in co-ordination with Norval Bypass to support 2031 future background traffic volumes provided by the Region.

The traffic capacity results for both the weekday AM and PM peak hours under 2031 future background conditions with recommended roadway improvements is shown in **Table 8-8** below: -

Table 8-7 2031 Future Background Conditions Roundabout Analysis with improvements

Intersection	Peak Hour	Leg of Roundabout	95% Queue (veh)	Delay (s)	v/c	LOS (leg)	LOS (Intersection)
10th Line and 10 Side Road	AM	SB	33	14	0.64	B	A
		EB	25	7	0.51	A	
		NB	2	8	0.06	A	
		WB	42	5	0.60	A	
	PM	SB	6	9	0.16	A	A
		EB	30	5	0.56	A	
		NB	51	7	0.79	B	
		WB	25	7	0.46	A	

As shown in table above, with recommended improvements along 10th Line, the roundabout of 10th Line and 10 Side Road operates well with excess capacity and acceptable delay under the 2031 future background conditions.

8.3 Future Total Conditions

8.3.1 2029 Future Total Conditions-Synchro Capacity Analysis

The traffic capacity results for the intersections in the study area are summarized in **Table 8-8** for both the weekday AM and PM peak hours under 2029 future total conditions.

Table 8-8 2029 Future Total Capacity Analysis

Intersection	Movement	Storage (m)	Weekday AM				Weekday PM			
			V/C	Delay (s)	LOS	95th % Queue	V/C	Delay (s)	LOS	95th % Queue
Winston Churchill Boulevard/ Adamson Street and 10 Side Road (Signalized)	*Overall*	-	***1.00***	*48*	*D*	-	***0.99***	*42*	*D*	-
	EBLR	-	**0.96**	57	**E**	180	**1.00**	81	**F**	150
	NBLT	-	0.60	21	C	62	**0.94**	42	D	172
	SBTR	-	**0.97**	49	D	232	0.63	16	B	100
10th Line and Danby Road/Street A (Unsignalized)	EBL	25	<0.01	13	B	0	0.01	17	C	1
	EBR	25	0.29	12	B	10	0.20	14	B	6
	WBLTR	-	0.19	15	B	6	0.19	19	C	6
	NBL	30	0.03	8	A	1	0.09	8	A	3
	NBTR	-	0.02	0	A	0	0.16	0	A	0
	SBLTR	-	0.00	0	A	0	0.02	2	A	1
10th Line /Argyll Road & Street E (Unsignalized)	WBLR	-	0.07	10	A	2	0.08	11	B	2
	NBTR	-	0.03	0	A	0	0.15	0	A	0
	SBLT	-	0.01	0	A	0	0.02	2	A	1
Street B/Street C & Street A (Unsignalized)	EBLR	-	0.02	7	A	-	0.06	8	A	-
	NBLT	-	0.05	7	A	-	0.17	8	A	-

Intersection	Movement	Storage (m)	Weekday AM				Weekday PM			
			V/C	Delay (s)	LOS	95th % Queue	V/C	Delay (s)	LOS	95th % Queue
	SBTR	-	0.11	7	A	-	0.08	7	A	-
10 Side Road & Street B (Unsignalized)	EBL	30	0.01	8	A	1	0.07	9	A	2
	EBT	-	0.28	0	A	0	0.25	0	A	0
	WBTR	-	0.24	0	A	0	0.36	0	A	0
	SBL	30	0.44	25	C	17	0.49	36	**E**	19
	SBR	-	0.03	11	B	1	0.04	12	B	1

Under 2029 future background conditions, intersections within the study area network generally operate well with excess capacity and acceptable delay except for select critical movements at the intersection of Winston Churchill Boulevard/Adamson Street and 10 Side Road. The intersection of Winston Churchill Boulevard/Adamson Street and 10 Side Road is expected to operate at capacity overall v/c of 1.00 and 0.99, during AM and PM peak hours respectively. During AM peak hour, shared southbound through and right turn movement and shared eastbound left and right turn movements at this intersection are expected to approach capacity with v/c of 0.97 and 0.96, respectively. During PM peak hour, shared northbound left and through movement at this intersection is expected to approach capacity with v/c of 0.94 and shared eastbound left and right turn movements is expected to operate at capacity with v/c of 1.00.

To cater to the anticipated traffic in future, Halton Region plans to convert this intersection to a roundabout by 2031 horizon year along with implementation of the Norval Bypass. As an interim mitigation measure, cycle length at this intersection was increased from 110 seconds to 120 seconds. Results are discussed in **section 8.3.2.**

Apart from these movements, there are no operational concerns for all movements under the 2029 future total conditions. The proposed access to the development operates well with no operational concerns.

8.3.2 2029 Future Total Conditions-With Improvements

With improvements, the traffic capacity results for the intersection of Winston Churchill Boulevard/Adamson Street and 10 Side Road in the study area are summarized in **Table 8-9** for both the weekday AM and PM peak hours under 2029 future total conditions.

Table 8-9 2029 Future Total Traffic Capacity Analysis- with improvements

Intersection	Movement	Storage (m)	Weekday AM				Weekday PM			
			V/C	Delay (s)	LOS	95th % Queue	V/C	Delay (s)	LOS	95th % Queue
Winston Churchill Boulevard/ Adamson Street and 10 Side Road (Signalized)	*Overall*	-	***0.98***	*47*	*D*	-	***0.98***	*41*	*D*	-
	EBLR	-	**0.95**	58	**E**	193	**0.97**	74	**E**	157
	NBLT	-	0.57	21	C	64	**0.95**	45	D	186
	SBTR	-	**0.95**	47	D	247	0.62	17	B	108

As shown in table above, with improvements the intersection of Winston Churchill Boulevard/Adamson Street and 10 Side Road is expected to operate with overall v/c of 0.98 each during AM and PM peak hours. During AM peak hour, shared southbound through and right turn movement and shared eastbound left and right turn movements at this intersection are expected to approach capacity with v/c of 0.95 each. During PM peak hour, shared northbound left and through movement and shared eastbound left and right turn movements at this intersection are expected to approach capacity with v/c of 0.95 and 0.97. There is a slight improvement in traffic operations at this intersection with increase in cycle length. However, the intersection still operates near capacity and requires roadway improvements like Norval Bypass to accommodate future traffic.

8.3.3 Roundabout Analysis

The traffic capacity results for the roundabout of 10th Line and 10 Side Road are summarized in **Table 8-10** for both the weekday AM and PM peak hours under 2029 future total conditions.

Table 8-10 2029 Future Total Conditions Roundabout Analysis

Intersection	Peak Hour	Leg of Roundabout	95% Queue (veh)	Delay (s)	v/c	LOS (leg)	LOS (Intersection)
10th Line and 10 Side Road	AM	SB	31	9	0.52	A	B
		EB	89	18	0.80	B	
		NB	6	8	0.13	A	
		WB	17	6	0.31	A	
	PM	SB	10	9	0.21	A	A
		EB	13	6	0.27	A	
		NB	73	11	0.74	B	
		WB	35	10	0.53	A	

Under 2029 future total conditions, the roundabout of 10th Line and 10 Side Road operates well with excess capacity and acceptable delay. There are no operational concerns for the approaches under the 2029 future total conditions.

8.3.4 2031 Future Total Conditions

The traffic capacity results for the intersections in the study area are summarized in **Table 8-11** for both the weekday AM and PM peak hours under 2031 future total conditions. As stated in section 8.2.3, intersection of Winston Churchill/Adamson Street and 10 Side Road has not been analyzed under 2031 total conditions as this intersection is proposed to be converted into a roundabout, with the implementation of proposed Norval Bypass.

Table 8-11 2031 Future Total Capacity Analysis

Intersection	Movement	Storage (m)	Weekday AM				Weekday PM			
			V/C	Delay (s)	LOS	95th % Queue	V/C	Delay (s)	LOS	95th % Queue
10th Line and Danby Road/Street A (Unsignalized)	EBL	25	<0.01	13	B	0	0.01	18	C	0
	EBR	25	0.32	12	B	11	0.21	14	B	6
	WBLTR	-	0.20	16	C	6	0.21	20	C	6
	NBL	30	0.04	8	A	1	0.10	8	A	3
	NBTR	-	0.03	0	A	0	0.17	0	A	0
	SBLTR	-	<0.01	0	A	0	0.02	2	A	1
	WBLR	-	0.07	10	A	2	0.08	11	B	2

Intersection	Movement	Storage (m)	Weekday AM				Weekday PM			
			V/C	Delay (s)	LOS	95th % Queue	V/C	Delay (s)	LOS	95th % Queue
10th Line/Argyll Road & Street E (Unsignalized)	NBTR	-	0.03	0	A	0	0.16	0	A	0
	SBLT	-	0.01	0	A	0	0.02	2	A	0
Street B/Street C & Street A (Unsignalized)	EBLR	-	0.02	7	A	-	0.06	8	A	-
	NBLT	-	0.05	7	A	-	0.17	8	A	-
	SBTR	-	0.11	7	A	-	0.08	7	A	-
10 Side Road & Street B (Unsignalized)	EBL	30	0.04	14	B	1	0.10	11	B	4
	EBT	-	0.23	0	A	0	0.45	0	A	0
	WBTR	-	0.60	0	A	0	0.31	0	A	0
	WBT	-	0.33	0	A	0	0.25	0	A	0
	SBL	30	**2.60**	**888**	**F**	**110**	**1.61**	432	**F**	73
	SBR	-	0.06	16	C	2	0.04	12	B	1
Norval Bypass & Street T	WBLR	-	0.44	69	**F**	10	0.42	97	**F**	13
	NBTR	-	0.38	0	A	0	0.58	0	A	0
	NBT	-	0.20	0	A	0	0.31	0	A	0
	SBL	15	<0.01	10	B	0	0.01	13	B	0
	SBT	-	0.43	0	A	0	0.29	0	A	0

Under 2031 future total conditions all movements continue to operate with sufficient capacity and acceptable delay except for select critical movements at the intersection of Street B and 10 Side Road and Norval Bypass and Street T. Apart from these movements, there are no operational concerns for all movements under the 2031 future total conditions.

Southbound left turn movement is expected to operate above capacity at the intersection of 10 Side Road and Street B under both AM and PM peak hours. As a mitigation measure, this intersection is proposed to be signalized although it is not warranted as stated in **section 7.1.**

Additionally, at the intersection of Norval Bypass and Street T, shared westbound left and right movement operates with level of service F under both peak hour conditions. Since v/c ratio for this movement is expected to operate under capacity, therefore no additional mitigation measure is recommended.

The capacity analysis results at the intersection of 10 Side Road and Street B with signalization is shown in **Table 8-12** below: -

Table 8-12 2031 Future Total Capacity Analysis with improvements

Intersection	Movement	Storage (m)	Weekday AM				Weekday PM			
			V/C	Delay (s)	LOS	95th % Queue	V/C	Delay (s)	LOS	95th % Queue
10 Side Road & Street B (Signalized)	*Overall*	-	*0.59*	*13*	*B*	-	*0.55*	*11*	*B*	-
	EBL	30	0.15	8	A	4	0.24	8	A	11
	EBT	-	0.37	9	A	37	0.68	11	B	93
	WBTR	-	0.75	13	B	103	0.42	8	A	44
	SBL	30	0.26	22	C	36	0.23	25	C	30
	SBR	-	0.01	19	B	6	0.01	23	C	6

As per table above, with signalization, all movements at 10 Side Road and Street B operate within capacity under 2031 future total conditions.

All proposed accesses to the development operate well with no operational concerns. Overall, the proposed development has a minimal impact of the traffic operations in the study network with movements operating similarly to the future background conditions and causing no

movements to become critical.

8.3.5 Roundabout Analysis

Improvements suggested along 10th Line stated in **section 8.2.4,** have been considered for the analysis of 10th Line and 10 Side Road roundabout under 2031 future total conditions. The traffic capacity results are summarized in **Table 8-13** for both the weekday AM and PM peak hours:

Table 8-13 2031 Future Total Conditions Roundabout Analysis

Intersection	Peak Hour	Leg of Roundabout	95% Queue (veh)	Delay (s)	v/c	LOS (leg)	LOS (Intersection)
10th Line & 10 Side Road	AM	SB	45	17	0.75	B	A
		EB	28	8	0.54	A	
		NB	3	8	0.07	A	
		WB	44	5	0.62	A	
	PM	SB	8	9	0.22	A	A
		EB	34	5	0.60	A	
		NB	65	18	0.86	B	
		WB	28	8	0.50	A	

Under 2031 future total conditions, with suggested improvements along 10th Line, the roundabout of 10th Line and 10 Side Road operates well with excess capacity and acceptable delay. There are no operational concerns for the approaches under the 2031 future total conditions.

Overall, congested at the intersection of 10th Line and 10 Side Road is due to the future background 2031 volumes provided by the Region at this intersection. The addition of site traffic is not responsible for the poor traffic operations at this intersection. As stated in **section 8.2.4,** TYLin recommends Region to continue monitoring traffic operations at this intersection and reconsider the design of the 10th Line and 10 Side Road roundabout to accommodate 2031 future total traffic volumes.

9 ACTIVE TRANSPORTATION PLAN

9.1 Proposed Facilities

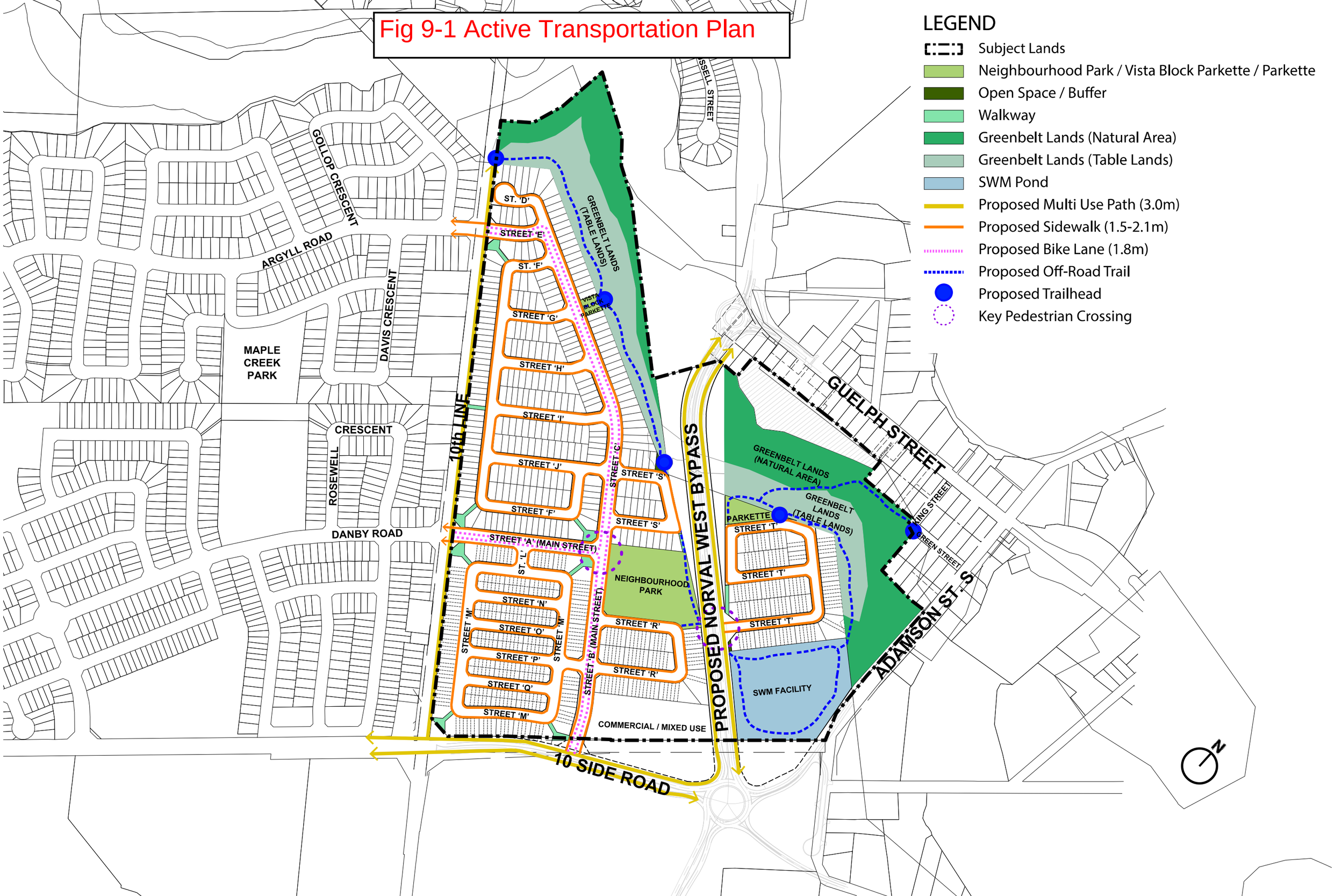
There are several active transportation facilities proposed throughout the Russell Farm Subdivision to service pedestrians and cyclists within the study area as well as to provide connections to the external road network. These proposed active transportation routes and facilities are presented in **Figure 9-1.**

The following proposed facilities are proposed within the subdivision: -

- A two-sided 1.5-2.1m sidewalk have been proposed on all internal roads at the site to facilitate pedestrian movement throughout the site and to connect pedestrians to the trail networks.
- A 3m multi-use path (MUP) is proposed on both sides of the Region Roads i.e., Norval Bypass and 10 Side Road with no bike lanes.
- A 3m multi-use path (MUP) is proposed along east side of 10th Line.
- On collector roads, a 1.8m street bike lanes and 1.5-2.1m sidewalk is proposed on both sides of road.
- Off-road trails are proposed on both east and west subject lands. These off-road trails also connect to the proposed MUPs, and sidewalks proposed on internal collector and local roads.

As stated in section 7.4, TYLin recommends pedestrian cross over Level 2 Type B at the intersection of Street T and Norval Bypass to facilitate pedestrian movements between subject lands east and west of Norval Bypass.

Fig 9-1 Active Transportation Plan



9.2 MMLOS Assessment

This Multi-Modal Level of Service (MMLOS) assessment is based on the 2021 MMLOS guidelines which were developed by the Ontario Traffic Council (OTC). The MMLOS assessment aides in evaluating the level of service at streets and intersections for all modes of travel. These guidelines help transportation professionals make design and operational decisions that align with municipal goals and network strategies. The MMLOS methodology is applicable to facilities managed by single, upper, and lower-tier municipalities across Ontario.

For this assessment, we assessed segment LOS based on the cross sections provided for Norval Bypass, 10 Side Road, Road A, Road B, Road C, and the 20m local road. The LOS assessment was conducted for the pedestrian, cyclist, transit, tuck, and car segment levels. This assessment provides a high-level analysis and can be further refined. Some parameters are currently unknown and were estimated based on our best guess or left blank, such as distance between controlled pedestrian crossings.

The results can be seen in **Table 9-1**. All MMLOS warrant spreadsheets are included in **Appendix H**

Table 9-1 MMLOS Results

Road Name		Pedestrian	Bike	Transit	Truck	Car
Norval Bypass/10 Side Road	Target LOS	E	D	B	D	D
Norval Bypass/10 Side Road	Actual LOS	D*	B*	C	A	A
Road A	Target LOS	D	B	D	-	E
Road A	Actual LOS	D	**E**	-	B	A
Road B	Target LOS	D	B	D	-	E
Road B	Actual LOS	D	**D**	-	C	B
Road C	Target LOS	D	B	D	-	E
Road C	Actual LOS	D	**D**	-	C	B
20m ROW	Target LOS	D	B	D	-	E
20m ROW	Actual LOS	D	-	-	A	A

*Pedestrian and Bike LOS have been downgraded one grade as per guidance on MUPs

Norval Bypass and10 Side Road were categorized as a Neighbourhood Connector as it has a priority on vehicles and trucks and balances service to other modes. The cross-section shows a multi-use path on either side of the vehicular lanes, which is three (3)m wide. The LOS results for pedestrian were C and for bicycle A; however, the guidelines state "For mixed AT facilities where pedestrians and cyclists share the operating space the facility should be scored based on the pedestrian and bike metrics independently and the resulting scores discounted by one grade".

Therefore, **Table 9-1** shows LOS D for pedestrians and B for bikes. Overall, Norval Bypass and 10 Side Road exceeds all target LOS except for transit.

Road A was categorized as a Neighbourhood Boulevard as it moves low to moderate volumes of cycling and vehicle movements. Road A meets or exceeds all target LOS except for the bicycle one. We believe this is largely due to the absence of a buffer between the bike lane and the vehicular lane. Furthermore, there are conflict points with parked cars as the parking lane is located on either side of the bike lane. Road B and Road C have the same cross-sections and were also categorized as a Neighbourhood Boulevard. Road B meets or exceeds all LOS targets, except for bikes. The bike LOS is better than that for Road A, as the cross-section for Road B includes a painted buffer. Based on the secondary plan cross-sections, bike lane of 1.8m is proposed on collector roads.

TYLin recommends replace 1.8m bike lanes with 1.5m bike lanes, which satisfies TAC standards and provide a 0.3m physical buffer.

The 20m ROW local road was categorized as a Neighbourhood Boulevard. The cross section shows no dedicated space for bike lanes; therefore the bike LOS has been omitted. The actual LOS exceed the target for cars and trucks and meets the target for pedestrians.

10 TRANSPORTATION DEMAND MANAGEMENT (TDM)

Transportation Demand Management (TDM) refers to various measures that are undertaken to encourage non-auto modes of travel and to reduce single-occupant vehicle (SOV) traffic. These have direct impacts to both parking and trip-related aspects of the site. TDM measures can be categorized into five categories and are listed as follows:

1. Introduction of Alternative Travel Modes
2. Core Commuter Information and Assistance
3. Financial Incentives
4. Supporting Infrastructure
5. TDM Program Support

10.1 Introduction of Alternative Travel Modes

The introduction of new modes of travel to current single-occupant vehicle drivers can be accomplished by utilizing various marketing and communication strategies. This can be accomplished through raising awareness of the availability for alternate travel modes. It is recommended that TDM marketing material be provided to all residents and that any updates to the transit/active transportation infrastructure be posted at locations with significant pedestrian foot-traffic and provided at the sale of the residential unit.

Marketing material should be prepared and provided by the Town and Region staff to ensure that the information provided is up to date. It is also important that the documents be visually appealing to be more approachable. This will help to target and encourage non-driver modes of transportation from the earliest point in the process.

Outreach events are another method to promoting TDM measures. It is recommended that an outreach event be hosted for residents of the site following a minimum of 50% occupancy. Town and Region staff should be invited to attend the event to answer any questions from residents and provide information on the existing infrastructure and planned infrastructure improvements. Future outreach events can also be planned to promote any new TDM measures and facilities. The event can be held on-site in a shared community space, nearby at a park or school, as a virtual event. Should the attendance of a TDM outreach event be insufficient to justify attendance of Town and Region staff, the TDM marketing material can be mailed to each household.

10.2 Core Commuter Information and Assistance

In addition to marketing and communicating the availability of alternative travel modes, it is important to ensure that those seeking to change their travel behaviours have the tools and information to facilitate this change. Information on the available transit routes and bus stops, active transportation network, and weather conditions should be readily available for anyone looking to travel to or from the site. This can be accomplished with television screens in centralized locations providing up to date travel information. Improving the ease of access to information of alternative travel modes increases the willingness for behavioural change amongst commuters.

It is also recommended that tools that reduce single-occupant vehicle trips such as www.ridesharing.com and carpool networking be promoted at the TDM outreach event for commuters to meet and find other commuters looking to carpool together. The information should be prepared by the Town and Region distributed at the TDM outreach event.

10.3 Financial Incentives

It is understood that one of the primary factors in behavioural change is monetary compensation. The purpose of providing financial incentives is to promote this change in behaviour and incentivize commuters with trying out new alternate travel modes. This financial support can come in the form of subsidized transit passes or other future subsidies (such as rideshares). It is recommended that a pre-loaded PRESTO card be provided for each residential unit during the first year of occupancy. The exact amount and provision of the pre-loaded PRESTO card is subject to the discretion of the Owner. The pre-loaded PRESTO card can be distributed at the TDM outreach event or mailed to each household individually.

10.4 Supporting Infrastructure

Physical infrastructure is necessary to support transit and active transportation modes. The infrastructure should be developed and improved for both the site as well as the Town and Region. For the proposed development, some examples of supportive infrastructure include:

- Wayfinding signage for active transportation paths;
- Additional protected cycling facilities along travel corridors; and
- Including dedicated car share spaces on-site.

10.5 TDM Program Support

The TDM programs can be further supported through the involvement with a Transportation Management Associations (TMA). TMA's can provide support to TDM programs through the provision of promotional material, coordination of programs and events, and recommendations on the appropriate measures to be implemented.

Facilitating the implementation and management of these TDM programs can be accomplished through the effective employment or assignment of a TDM coordinator. The role of the TDM coordinator is to implement, manage and monitor the TDM measures in place for the development. It is recommended that a TDM coordinator be assigned by the Region to ensure the success of the TDM plan for the area.

In addition to implementation of these programs, it is important to monitor both the success and the opportunities for improvement for the TDM measures. It is recommended that a baseline survey be conducted at the full build-out of the development to identify residential travel behaviours. A follow-up monitoring survey should then be conducted every two years to measure the effectiveness of the TDM programs and provide recommendations for improvements. The provision of the monitoring survey, follow-up surveys and future TDM programs would be at the discretion of the TDM coordinator.

11 CONCLUSIONS AND RECOMMENDATIONS

TYLin was retained by Russell Pines Property Corp. to prepare a Transportation Impact Study in support of the proposed residential draft plan of Russell Farm Subdivision located in the northeast corner of 10th line and 10 Side Road in the southeast Georgetown the Town of Halton Hills, Ontario.

The Russell farm subdivision is proposed to be developed phase-wise, one being the ultimate phase (phase 2) where the Norval Bypass and associated 10 Side Road realignment is anticipated to be constructed by forecast year 2031 with the potential to start as early as 2028 and an interim phase (phase 1) where the proposed development located west of Norval Bypass proceeds in advance of Norval Bypass and associated 10 Side Road realignment. The interim phase is anticipated to be built out by 2029 horizon year. As per the information provided by the client, a mixed-use commercial block is proposed to be built with 20,000 square feet of commercial space. As construction of this block is post 2031 an addendum to this report will be prepared for the site plan application of this block. Under phase 1, development proposes to build 274 single detached homes, 374 townhouses which includes 16 residential reserve units, with a total of 648 units. Under phase 2, additional 112 townhouses are proposed to be constructed. Access to the subject lands is proposed via two public roads connections to 10th Line at Danby Road and Argyll Road and one on 10 Side Road.

Subdivision review indicates that all geometric design elements for the proposed residential subdivision have been designed as per appropriate standards.

A growth rate of 1% per annum was utilized for all regional roadways and 4% per annum for Town roadways. Under 2031 future background conditions PM peak hour traffic volumes at the proposed 10 Side Road/Adamson Street/ Norval Bypass and Winston Churchill Road roundabout were provided by the Region, which were carried across to estimate the eastbound and westbound through volumes at the 10th Line and 10 Side Road roundabout. To obtain AM peak hour volumes, PM peak hour volumes have been transposed for all of the movements at this roundabout.

A non-auto mode split reduction was applied to estimate vehicle trips generated by the site. Under combined phase 1 and phase 2, the proposed development is expected to generate a total of 438 new two-way vehicle trips during the weekday a.m. peak hour, consisting of 123 inbound and 315 outbound trips. During the weekday p.m. peak hour, the development is expected to generate 625 new two-way vehicle trips, consisting of 368 inbound and 257 outbound trips.

Traffic signal and all-way stop control were not found to be warranted at any of the study intersections. Although not warranted, traffic signal is proposed to be modelled for the intersection of Norval Bypass and Street T under 2031 future total conditions and all way stop control is recommended at the intersection of Street A and Street B. An eastbound left-turn lane is warranted at the intersection of Street B and 10 Side Road. Although not warranted a southbound left-turn lane is recommended at the intersection of Norval Bypass and Street T and at the intersection of Street B and Norval Bypass.

The existing traffic operations are currently operating well within capacity and acceptable delays during both peak hours. The 2029 future conditions were identified to operate with some deficiencies at the intersection of Winston Churchill Boulevard/Adamson Street and 10 Side Road during the AM and PM peak hours. To cater to the anticipated traffic in future, Halton Region plans to convert this intersection to a five-arm roundabout by 2031 horizon year along with implementation of the Norval Bypass. Additionally, another roundabout is proposed at the intersection of Norval Bypass and Guelph Street. TYLin defers to the Norval Bypass EA study for the analysis of both proposed roundabouts.

Under 2031 future conditions were also identified to operate with some deficiencies at the intersection of 10th Line and 10 Side Road. TYLin recommends two circulating lanes at the roundabout and other road improvements like localized widening along 10th Line at the approaches to the roundabout in conjunction with 10 Side Road. Additionally, TYLin also recommends that Region consider all these improvements in co-ordination with Norval Bypass to support 2031 future background traffic volumes provided by the Region.

There are several active transportation facilities proposed throughout the Russell Farm Subdivision to service pedestrians and cyclists within the study area as well as to provide connections to the external road network as shown in active transportation plan. TYLin recommends pedestrian cross over Level 2 Type B at the intersection of Street T and Norval Bypass to facilitate pedestrian movements between subject lands east and west of Norval Bypass. Multi-modal Level of Service (MMLOS) assessment indicates that target LOS are met for all types of roadways within the subdivision except for bike LOS for the collector roads. TYLin recommends replace 1.8m bike lanes with 1.5m bike lanes, which satisfies TAC standards and provide a 0.3m physical buffer.