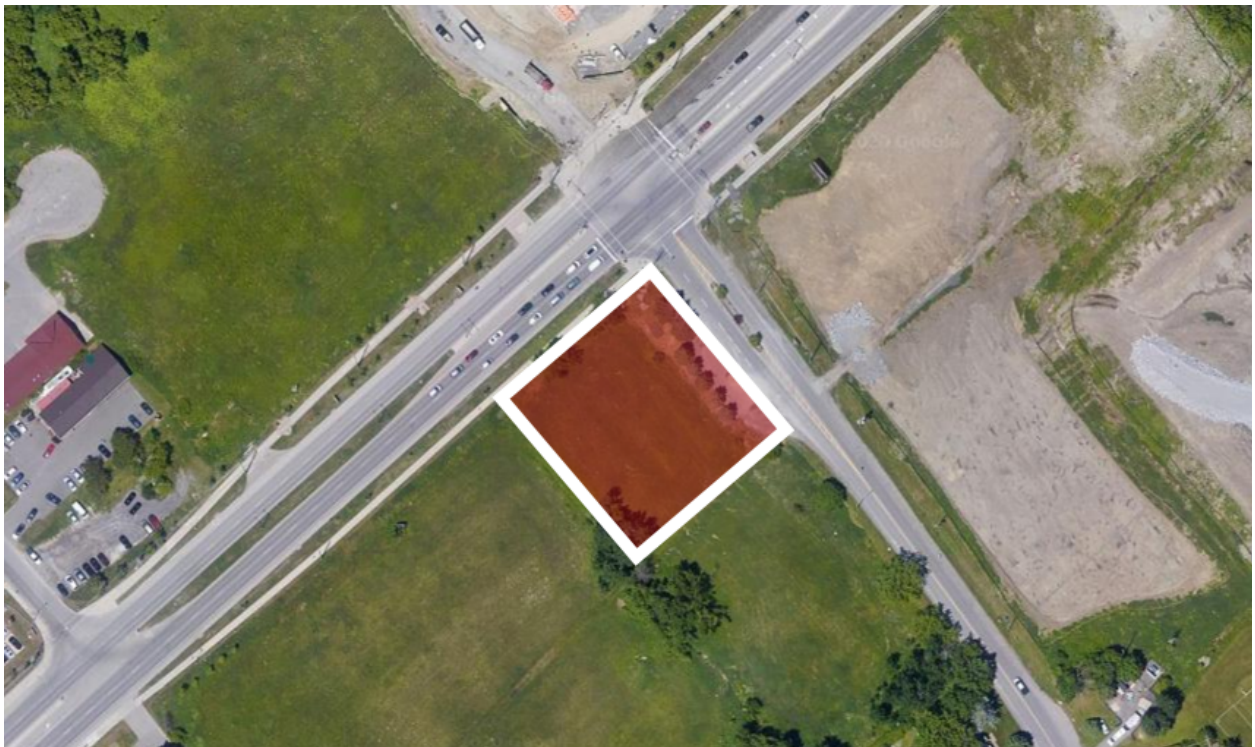


SHELL CANADA

5 ORCHARD DRIVE - SHELL LEASED LAND TRANSPORTATION IMPACT ASSESSMENT





5 ORCHARD DRIVE - SHELL LEASED LAND

TRANSPORTATION IMPACT ASSESSMENT

SHELL CANADA

PROJECT NO.: OUR REF. NO. 19M-00672-00
DATE: OCTOBER 01, 2020

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5 Orchard Drive

Transportation Impact Assessment Study Report

Dated October 1, 2020

S. McDonald

**TIA Plan Reports**

On 14 June 2017, the Council of the City of Ottawa adopted new Transportation Impact Assessment (TIA) Guidelines. In adopting the guidelines, Council established a requirement for those preparing and delivering transportation impact assessments and reports to sign a letter of certification.

Individuals submitting TIA reports will be responsible for all aspects of development-related transportation assessment and reporting, and undertaking such work, in accordance and compliance with the City of Ottawa's Official Plan, the Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines.

By submitting the attached TIA report (and any associated documents) and signing this document, the individual acknowledges that s/he meets the four criteria listed below.

CERTIFICATION

1. I have reviewed and have a sound understanding of the objectives, needs and requirements of the City of Ottawa's Official Plan, Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines;
2. I have a sound knowledge of industry standard practice with respect to the preparation of transportation impact assessment reports, including multi modal level of service review;
3. I have substantial experience (more than 5 years) in undertaking and delivering transportation impact studies (analysis, reporting and geometric design) with strong background knowledge in transportation planning, engineering or traffic operations; and
4. I am either a licensed¹ or registered² professional in good standing, whose field of expertise [check ☒ appropriate field(s)] is either transportation engineering ☐ or transportation planning ☒.

1,2 License of registration body that oversees the profession is required to have a code of conduct and ethics guidelines that will ensure appropriate conduct and representation for transportation planning and/or transportation engineering works.

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Dated at Ottawa this 1st day of October, 2020.
(City)

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Signature of Individual certifier that s/he meets the above four criteria

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5 Orchard Drive
Transportation Impact Assessment Study Report
Dated October 1, 2020
S. McDonald

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- B SITE PLAN
- C TRANS O-D RESULTS
- D CRASH DATA
- E TDM CHECKLIST
- F AUTOTURN SWEPT PATH
- G SIGNAL WORKSHEET
- H SYNCHRO
- I SIMTRAFFIC

1. SCREENING

This Transportation Impact Assessment has been prepared to support the Site Plan Control Application for a proposed gas station, convenience store and car wash situated at 5 Orchard Drive. The Transportation Impact Assessment follows the City of Ottawa's Transportation Impact Assessment Guidelines (2017) which includes five steps:

1. Screening
2. Scoping
3. Forecasting
4. Analysis
5. Transportation Impact Assessment Submission

The Screening Step determines the need to continue with a Transportation Impact Assessment (TIA) study. The development is assessed against three triggers: trip generation, location, and safety to identify the next step of the TIA study. If one or more of the triggers is satisfied, the Scoping Step must be completed. If none of the triggers are satisfied, the TIA is complete. If a trigger is satisfied, there are different components are required in the TIA depending on the combination of triggers (**Table 1-1**).

The proposed development at 5 Orchard Drive **satisfied all three triggers**. As part of the Steps Two through Five of the TIA process, the Design Review and Network Impact components will be addressed. For reference, the completed screening form (Step One) is provided in **Appendix A**.

Table 1-1. Transportation Impact Assessment (TIA) Screening Options

NEXT STEP OF TIA PROCESS	TIA TRIGGERS		
	TRIP GENERATION	LOCATION	SAFETY
Deemed Complete	No	No	No
Step Two: <i>Design Review Only</i>	No	Yes (one or both)	
Step Two: <i>Design Review and Network Impact</i>	Yes	Yes / No	Yes / No

2. SCOPING

2.1 SCREENING FORM

The completed screening form and draft site plan (dated September 30, 2020) are provided in **Appendix A** and **Appendix B** respectively.

2.2 DESCRIPTION OF PROPOSED DEVELOPMENT

The Site Plan Control Application for 5 Orchard Drive includes a proposed gas station, convenience store and car wash. The proposed development will be leased and operated by Shell Canada on a lease area of 3,065m² (33,991 ft²).

The Site is currently a vacant property in the City of Ottawa, Ontario and is located at the southwest corner of the Fringewood Drive and Hazeldean Road intersection in Stittsville. The proposed development is part of a larger commercial and residential subdivision application (Zoning By-law Amendment application: D02-02-18-0063 and Draft Plan of Subdivision application: D07-16-18-0020).

The Site is designated “Arterial Mainstreet” in the City of Official Plan (May 2003, website consolidation). The Arterial Mainstreet designation permits retail and service commercial uses. New gas bars, service stations, and drive-through facilities are permitted on Arterial Mainstreets and will be evaluated on the basis of the Design Objectives and Principles in Section 2.5.1, any applicable Council-approved design guidelines, and the Compatibility policies set out in Section 4.11.

The proposed development includes a gas station, six pump stations, a convenience store (168 m²), and a car wash (114 m²). The car wash includes a 40m long queuing lane that will be adjacent to Fringewood Drive.

The draft site plan (**Appendix B**) includes twelve vehicle parking spaces, including one accessible space, two car care spaces, and two electric vehicle charging stations. An additional two bike racks with four bicycle parking spaces have also been provided.

The estimated date of occupancy is December 2021 with construction occurring in a single phase.

Two accesses will be provided as shown in the attached site plan:

- A right-in / right-out access on Hazeldean Road, approximately 50 m west of Fringewood Drive (south side)
- A full movement access on Fringewood Drive, approximately 77 m south of Hazeldean Road (west side)

2.3 EXISTING CONDITIONS

2.3.1 ROADWAYS AND PEDESTRIAN / CYCLING FACILITIES

The five existing roads that our Transportation Impact Assessment will consider are Cedarow Court, Fringewood Drive, Hazeldean Road, Huntmar Drive, and Johnwoods Street. These roads are all under the jurisdiction of the City of Ottawa. The road classification for City of Ottawa roadways are defined in the City of Ottawa Official Plan (2003, website consolidation), Volume 1, Section 7, Annex 1 Road Classification and Rights-of-Way. Descriptions for each roadway can be found below:

Cedarow Court is a local road that runs on a north south alignment with no posted speed limit and is assumed to have a speed limit of 40 km/h. It has a single lane of traffic in each direction.

Fringewood Drive is a local road than runs on a north-south alignment with a posted speed limit of 40 km/h. It has a single lane of traffic in each direction.

Hazeldean Road is an urban arterial that runs on an east-west alignment with a posted speed limit of 60 km/h. It has two lanes of traffic in each direction and there is a centre two-way left turn lane for access to residences and businesses between Johnwoods Street/Victor Street and Cedarow Court. The Official Plan reserves a 37.5 metre Right-of-Way in the study area from Main Street North to Fringewood Drive and a 44.5 m Right-of-Way from Fringewood Drive to Terry Fox Drive.

Huntmar Drive / Iber Road is a major collector that runs on a north-south alignment with a posted speed limit of 60 km/h within the study area. South of Hazeldean Road there is a single lane of traffic in each direction; north of Hazeldean Road there are two lanes of traffic in each direction. The Official Plan protects for a 37.5 m Right-of-Way in the study area.

Johnwoods Street / Victor Street is an urban collector that runs on north-south alignment with a posted speed limit of 40 km/h. It has a single lane of traffic in each direction. The Official Plan reserves a 24 m Right-of-Way in the study area.

The existing pedestrian and cycling facilities in this area are shown in **Figure 2-1** and include:

Fringewood Drive:

- Paved shoulder on both sides of roadway from just north of Azurite Crescent to Cloverloft Court
- Concrete sidewalk on the west side of Fringewood Drive from just north of Azurite Crescent to Harry Douglas Drive

Hazeldean Road:

- Sidewalks on north and south sides of the roadway separated by a grass boulevard from Huntmar/Iber to Cedarow Court
- Sidewalks on north and south sides of the roadway from Cedarow Court to Johnwoods Street
- Shoulder bike lanes on north and south sides of the roadway throughout the study area

Huntmar Drive / Iber Road:

- Sidewalks on east and west sides of the roadway separated by a grass boulevard north of Hazeldean
- Widened Asphalt path on east and west side of road south of Hazeldean Road

Johnwoods Street / Victor Street:

- Sidewalk on west side of the roadway north of Hazeldean Road

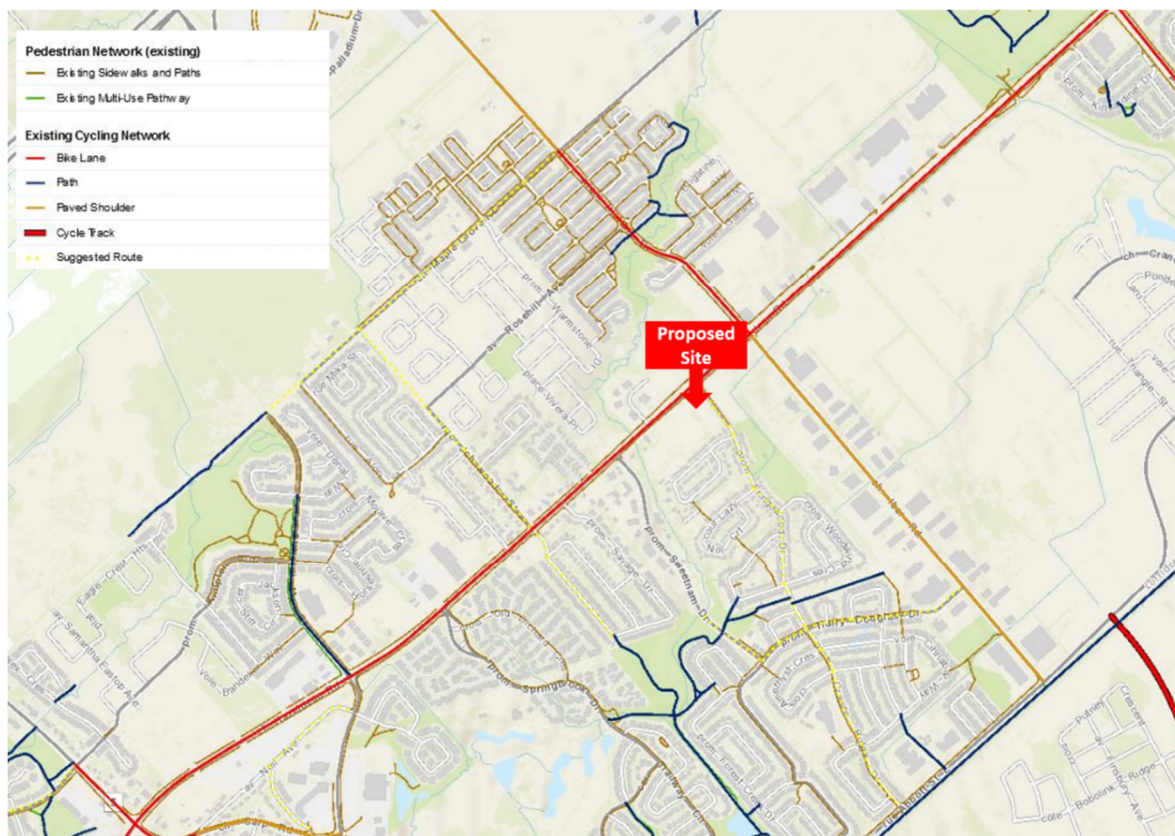


Figure 2-1. Existing Pedestrian and Cycling Facilities

(Source: GeoOttawa)

2.3.2 INTERSECTIONS

We will consider three signalized intersections and one unsignalized intersection in our Transportation Impact Assessment:

- Hazeldean Road and Huntmar Drive/Iber Road (Signalized)
- Hazeldean Road and Fringewood Drive (Signalized)
- Hazeldean Road and Johnwoods Street/Victor Street (Signalized)
- Hazeldean Road and Cedarow Court (Unsignalized)

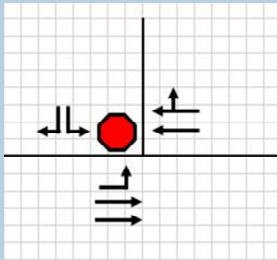
Table 2-1. Study Area Intersections

INTERSECTION DESCRIPTION	LANE ARRANGEMENT
--------------------------	------------------

Hazeldean Road and Cedarow Court
is a 3-legged unsignalized intersection with stop control on Cedarow Court and free-flow conditions along Hazeldean Road. There are no turning restrictions.

A pedestrian crossing facility is only provided on the southbound approach.

Lane Configurations

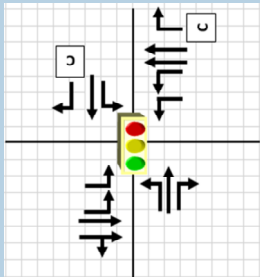


INTERSECTION DESCRIPTION LANE ARRANGEMENT

Hazeldean Road and Huntmar Drive/Iber Road is a signalized intersection with no turning restrictions.

Pedestrian crossing facilities are provided on all approaches.

Lane Configurations



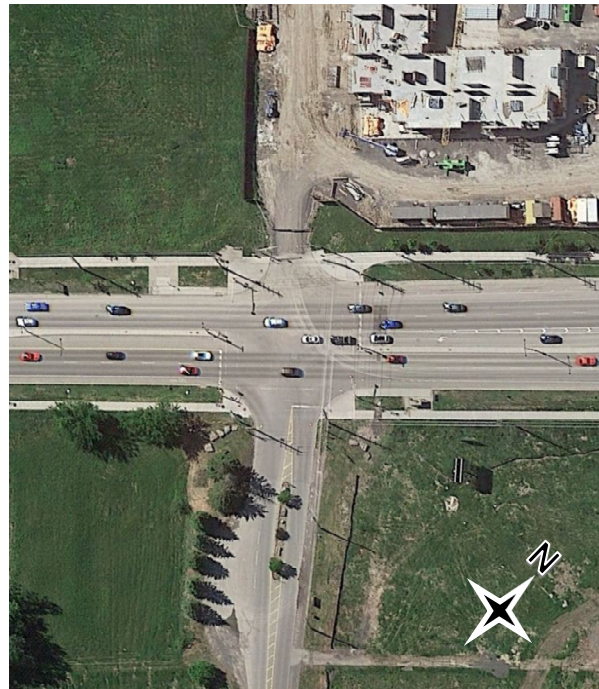
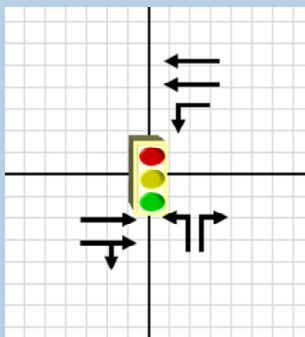
C - Channelized



Hazeldean Road and Fringewood Drive is a signalized intersection with no turning restrictions. The southbound approach is not completely developed.

Pedestrian crossing facilities are provided on all approaches.

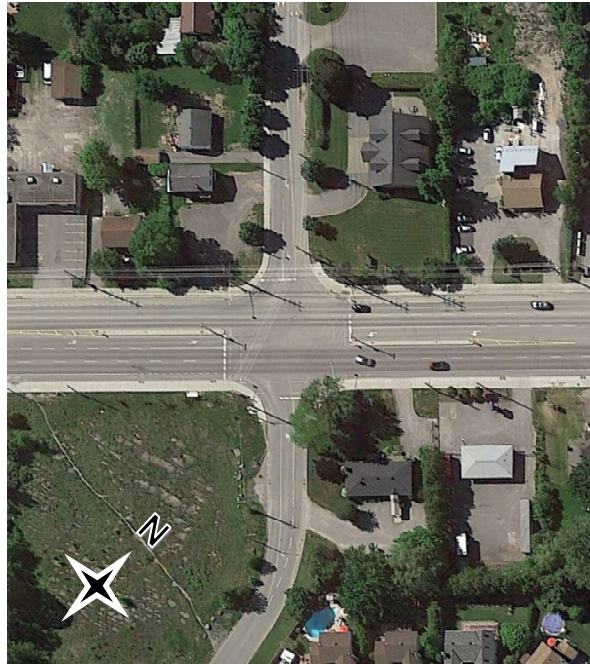
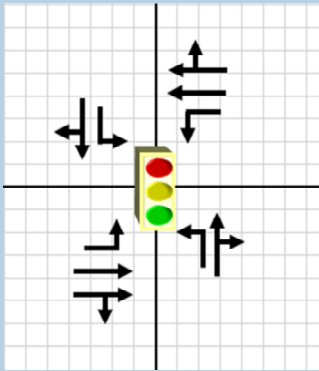
Lane Configurations



INTERSECTION DESCRIPTION LANE ARRANGEMENT

Hazeldean Road and Johnwoods Street/Victor Street is a signalized intersection with no turning restrictions. Pedestrian crossing facilities are provided on all approaches.

Lane Configurations



2.3.3 DRIVEWAYS

There are two private driveways within 200 m of the proposed access:

- One park maintenance access at 14 Fringewood Drive 180 m south of the proposed access
- One residential shared driveway at 2 and 4 Fringewood Drive 190 m south of the proposed access
- One restaurant (Cabotto's) driveway at 5816 Hazeldean Road 200 m west of the proposed access

2.3.4 TRANSIT

OC Transpo provides four transit stops in close proximity to 5 Orchard Drive:

- Eastbound Transit Stop 8612 on Hazeldean Road west of Huntmar Drive (Bus 61, 62, 261, 263, and 303), east of property (<50m)
- Westbound Transit Stop 5711 on Hazeldean Road west of Huntmar Drive/Iber Road (Bus 61, 263, and 303), west of property (<50m)
- Westbound Transit Stop 1202 on Hazeldean Road west of Huntmar Drive/Iber Road (Bus 61, 261, 263, 303), east of property (<150m)
- Southbound Transit Stop 0618 on Fringewood Drive north of Cloverloft Court (Bus 62 and 261), south of property (<200m)

- Northbound Transit Stop 0619 on Fringewood Drive north of Cloverloft Court (Bus 62 and 261), south of property (<200m)

The existing OC Transpo routes in this area are showing in **Figure 2-2**.

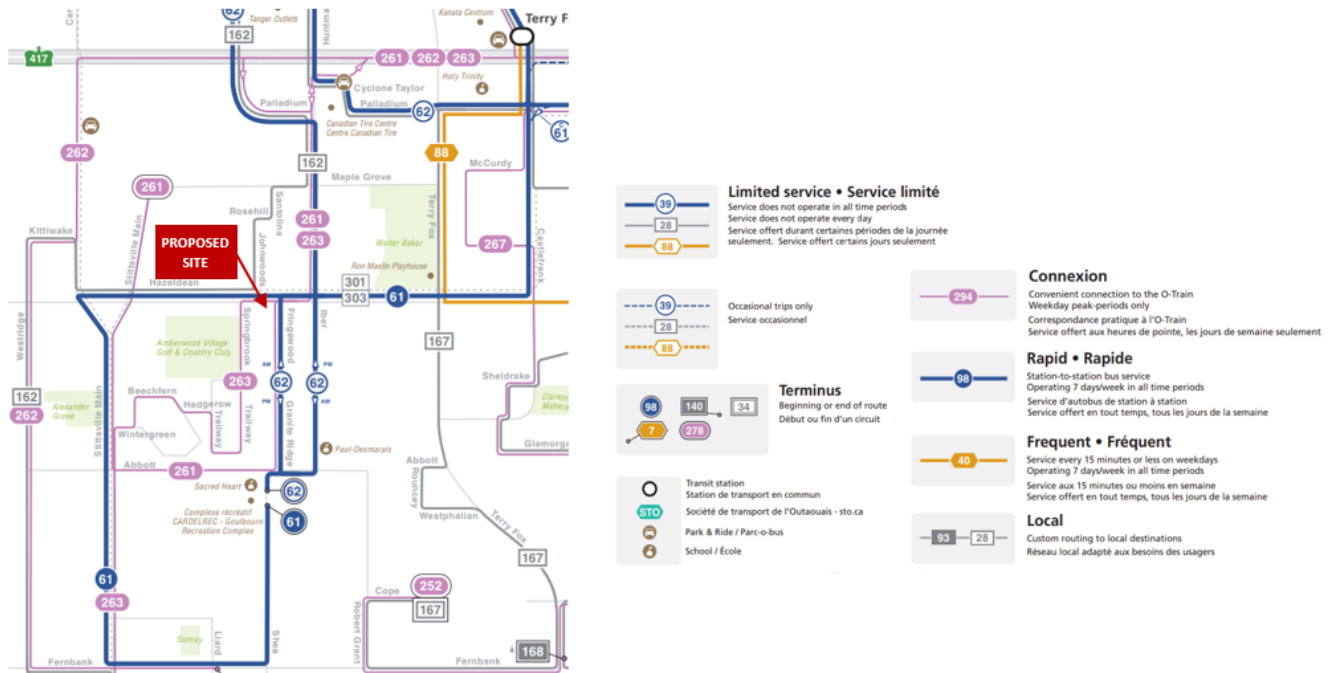


Figure 2-2. OC Transpo Routes

(Source: OC Transpo)

2.3.5 AREA TRAFFIC MANAGEMENT MEASURES

There are no existing area traffic management measures near either of the proposed vehicle accesses on Fringewood Drive and Hazeldean Road.

2.3.6 PEAK HOUR TRAVEL DEMAND

The TRANS Committee was established to co-ordinate transportation planning efforts among various planning agencies located within the National Capital Region. The proposed development is located in the Kanata/Stittsville TRANS District (500). The complete TRANS O-D results (including a map of the district area) is provided in **Appendix C**. The most recent Origin-Destination (O-D) survey was completed by TRANS in the Fall of 2011. The following table summarizes the TRANS trip data for this district.

Table 2-2. Peak Hour Travel Demand by Mode

MODE	AM PEAK (6 :30AM – 9 :00AM)			PM PEAK (3 :30PM – 6 :00PM)		
	From District	To District	Within District	From District	To District	Within District
Auto Driver	59%	74%	45%	73%	61%	57%
Auto Passenger	9%	7%	17%	17%	15%	23%
Transit	24%	8%	4%	7%	21%	2%
Bicycle	0%	1%	1%	0%	0%	1%
Walk	0%	0%	19%	0%	0%	12%
Other	7%	10%	15%	3%	3%	6%
Total Vehicles	25,970	15,660	30,350	18,960	28,920	37,470

Source: TRANS 2011 O-D Survey, District 500 Kanata/Stittsville

The primary mode of transportation within the district is by vehicle with 62% of all trip being in a vehicle (driver and passenger) in the AM peak period and 80% in the PM peak period. Transit accounts for less than 5% of in district travel, but accounts for almost 25% of all commuter traffic (working outside the district). Active transportation modes (walking and cycling) account for very little commuter traffic, but 12%-19% of all in district transportation.

2.3.7 BOUNDARY STREET CRASH HISTORY

The City of Ottawa provided the most recent five years of crash history for the sections of Hazeldean Road and Fringewood Drive adjacent to the site for review (January 2014 through December 2018). A summary of the crash history for the adjacent intersections and road segments is provided in the following table with the complete data set in **Appendix D**.

Table 2-3. Crash History on Boundary Streets between January 2014 and December 2018

LOCATION	SUMMARY	TRENDS
Intersection: Hazeldean Road at Fringewood Drive	Seven crashes with no reported fatalities Two eastbound rear-end crashes adjacent to the site (2015, 2018) Two northbound vehicles conflicting with a vulnerable road user (one pedestrian, one cyclist) while making a turning movement (2014, 2017)	No patterns with more than six crashes in five years
Segment: Hazeldean Road between Cedarow Court and Fringewood Drive	Two crashes with property damage only Both crashes were in the westbound direction on the opposite side of the centre median from the development site access. (2014, 2015)	No patterns with more than six crashes in five years
Segment: Fringewood Drive between Hazeldean Road and Cloverloft Court	One crash with property damage only Southbound “U” Turn (2015) Clear visibility in daylight conditions	No patterns with more than six crashes in five years

2.4 PLANNED CONDITIONS

2.4.1 CHANGES TO THE STUDY AREA AND TRANSPORTATION NETWORK

Fringewood Drive Traffic Calming Study - The City of Ottawa is currently undertaking an Traffic Calming study that will examine traffic conditions and driver behaviour on this roadway. The study was initiated in the Fall of 2018 with the intent of developing potential traffic calming solutions. The Existing Conditions Report has been completed and the City has begun identifying alternative options to meet the community needs.

Fringewood Drive Paved Shoulders and Sidewalks – The City of Ottawa initiated a Road Modifications Approval project (2018) that proposed changes to Fringewood Drive to improve conditions for cycling, bus stop access, and pedestrian safety. Within the Study Area, the project includes:

- a new asphalt paved shoulder on the east side of Fringewood Drive from just north of Azurite Crescent to approximately 180m south of Hazeldean Road, of which the section from just north of Azurite Crescent to Cloverloft Court was constructed in September 2019
- a new asphalt paved shoulder on the west side of Fringewood Drive from just north of Azurite Crescent to approximately 65m south of Hazeldean Road, of which the section from just north of Azurite Crescent to Cloverloft Court was constructed in September 2019

Hazeldean Road Transit Priority – The City of Ottawa’s Transportation Master Plan (2013) identifies Hazeldean Road between Stittsville Main Street and Eagleson Road as a candidate for transit signal priority and queue jump lanes at select intersections as part of the 2031 Affordable Network.

New North-South Arterial – The City of Ottawa’s Transportation Master Plan (2013) identifies a new four-lane road between Palladium Drive (at Huntmar) and Abbott Street as part of Phase 2 (2020-2025) of the 2031 Affordable Network.

2.4.2 OTHER AREA DEVELOPMENTS

Three developments are listed in the City of Ottawa’s Development Application Search tool that could influence our analysis in this Transportation Impact Assessment:

- 5 Orchard Drive Property – 67 Townhomes, 7 detached homes, 45 apartment units, 13,607 sq/ft office, and 34,966 sq/ft retail
- 5731 Hazeldean Road (D07-12-16-0046) – mixed use development consisting of four buildings; two two-storey buildings consisting of commercial uses; a four-storey residential care facility and a five-storey retirement home
- 24 Iber Road, 5734 Hazeldean Road, and 5754 Hazeldean Road (D07-12-13-0168) – Mix of retail, commercial, and office buildings, including six one-story retail buildings and two two-storey office buildings, one with ground floor retail

2.5 STUDY AREA

The limits for the Transportation Impact Assessment study area are shown in **Figure 2-3** and include:

- Hazeldean Road between Cedarow Court and Fringewood Drive
- Fringewood Drive between Hazeldean Road and Cloverloft Court
- The four intersections described in **Section 2.3.2**



Figure 2-3. Study Area

2.6 TIME PERIODS

The time periods identified for the traffic analysis as part of the Transportation Impact Assessment are:

- AM Peak Hour: 9:00am-10:00am
- PM Peak Hour: 4:15pm-5:15pm

They are consistent with the AM and PM peak hours identified in the recent turning movement counts provided by the City of Ottawa at the intersection of Hazeldean Road and Fringewood Drive (July 2019)

2.7 HORIZON YEARS

The proposed development is expected to be completed in a single phase. The target year for occupancy is 2021. Our proposed horizon periods are:

- 2021: anticipated occupancy
- 2026: occupancy plus five years

2.8 EXEMPTIONS REVIEW

Based on our review of the development and network conditions, we have identified that the following elements qualify for an exemption from this Transportation Impact Assessment.

Table 2-4. Exemptions Summary

MODULE	ELEMENT	EXEMPTION
4.1 Development Design	4.1.2 Circulation and Access	Not Exempted. This element is required for site plans.
	4.1.3 New Street Networks	Exempted This element is only required for plans of subdivision.
4.2 Parking	4.2.1 Parking Supply	Not Exempted. This element is required for site plans.
	4.2.2 Spillover Parking	Exempted. No spillover parking has been identified.
4.5 Transportation Demand Management	All elements	Exempted. Not required for site plans expected to have fewer than 60 employees and/or students on locations at any given time
4.6 Neighbourhood Traffic Management	4.6.1 Adjacent Neighbourhoods	Exempted. The City of Ottawa has initiated an Area Traffic Management Study (2018) for Fringewood Drive which will identify and develop potential traffic calming solutions for the Area.
4.8 Network Concept	-	Exempted. This development is not expected to generate more than 200 person-trips during the peak hour in excess of the equivalent volume permitted by establishing zoning.

3. FORECASTING

3.1 DEVELOPMENT GENERATED TRAFFIC

3.1.1 TRIP GENERATION

Base Trip Generation Rate. The ITE Trip Generation Manual (10th Edition) was used to determine the base trip generation rate for a *Gas/Service Station with Convenience Market* (Land Use Code 945):

- AM Base Rate: 12.47 vehicle trips per fueling station
- PM Base Rate: 13.99 vehicle trips per fueling station

Total Development-Generated Person-Trips. In accordance with the Transportation Impact Assessment Guidelines (2017), the ITE vehicle trips were multiplied by 1.28 to convert to person trips. The total development-generated person-trips (**Table 3-1**) were estimated using the projected auto trips and the trip generation multiplier.

Table 3-1. Estimated Total Development-Generated Person-Trips (Gas/Service Station with Convenience Market)

PEAK PERIOD	VEHICLE FUELING STATIONS	ITE TRIP RATE	PROJECTED AUTO TRIPS	ITE PERSON TRIP CONVERSION	TOTAL PERSON TRIPS
AM	12	12.47	150	1.28	192
PM		13.99	168		215

Existing Mode Share. The existing peak hour travel demand was identified from the most recent TRANS Origin-Destination Survey (Fall 2011) and presented in **Section 2.3.6**. The existing mode share is based on those values and is shown in the following table.

Table 3-2. Existing Mode Share

PEAK PERIOD	AUTO DRIVER	AUTO PASSENGER	TRANSIT	BICYCLE	WALK	OTHER
AM	59%	9%	24%	0%	0%	7%
PM	61%	15%	21%	0%	0%	0%

Future Mode Share Targets. The mode share targets for this development consider the service being provided: fuel and wash bays for motorized vehicles.

Table 3-3. Future Mode Share Targets for the Development

TRAVEL MODE	MODE SHARE TARGET	RATIONALE
Transit	0%	Employees may access the site using public transit, however that would only account for two person-trips during each peak period.
Walking	0%	A small number of local residents may walk or cycle to the gas station to access the convenience market, however it is anticipated that these trips would be outside the commuter peak periods.
Cycling	0%	
Auto Passenger	15%	The service being provided by the development is fueling and washing for private motorized vehicles. Therefore, the mode share is expected to be primarily auto. These auto mode share targets are consistent with the reported 2011 TRANS Origin-Destination Survey percentages for auto-only modes.
Auto Driver	85%	

Development Trips by Mode and Phase. The proposed development will be constructed in one phase. The development trips by mode and phase are shown in the following table.

Table 3-4. Development Trips by Mode and Phase

PEAK PERIOD	AUTO DRIVER	AUTO PASSENGER	TRANSIT	BICYCLE	WALK	OTHER
AM	163	29	0	0	0	0
PM	183	32	0	0	0	0

Trip Reduction Factors. This is a greenfield development and there are no existing trips to deduct. Since this is a commercial gas station, pass-by trips are anticipated to be a high percentage of the trip composition. A pass-by trip percentage of 56% will be applied in accordance with the ITE Trip

Generation Handbook. The primary trips generated by this development by mode are shown in the following table.

Table 3-5. Development Trips by Mode and Phase After Trip Reduction Factors Applied

PEAK PERIOD	AUTO DRIVER	AUTO PASSENGER	TRANSIT	BICYCLE	WALK	OTHER
AM	72	13	0	0	0	0
PM	81	14	0	0	0	0

3.1.2 TRIP DISTRIBUTION

There are two proposed vehicle accesses to the development; one on Hazeldean Road and one on Fringewood Drive. Vehicles will approach and depart from the development following the existing travel patterns. The trip distribution for the proposed development is presented as follows:

- AM: 60% of trips are traveling east and 40% of trips traveling west
- PM: 40% of trips are traveling east and 60% of trips are traveling west

The proposed access on Hazeldean Road is a right-in / right-out access. Therefore, all trips traveling west will enter and exit the Site using Fringewood Drive.

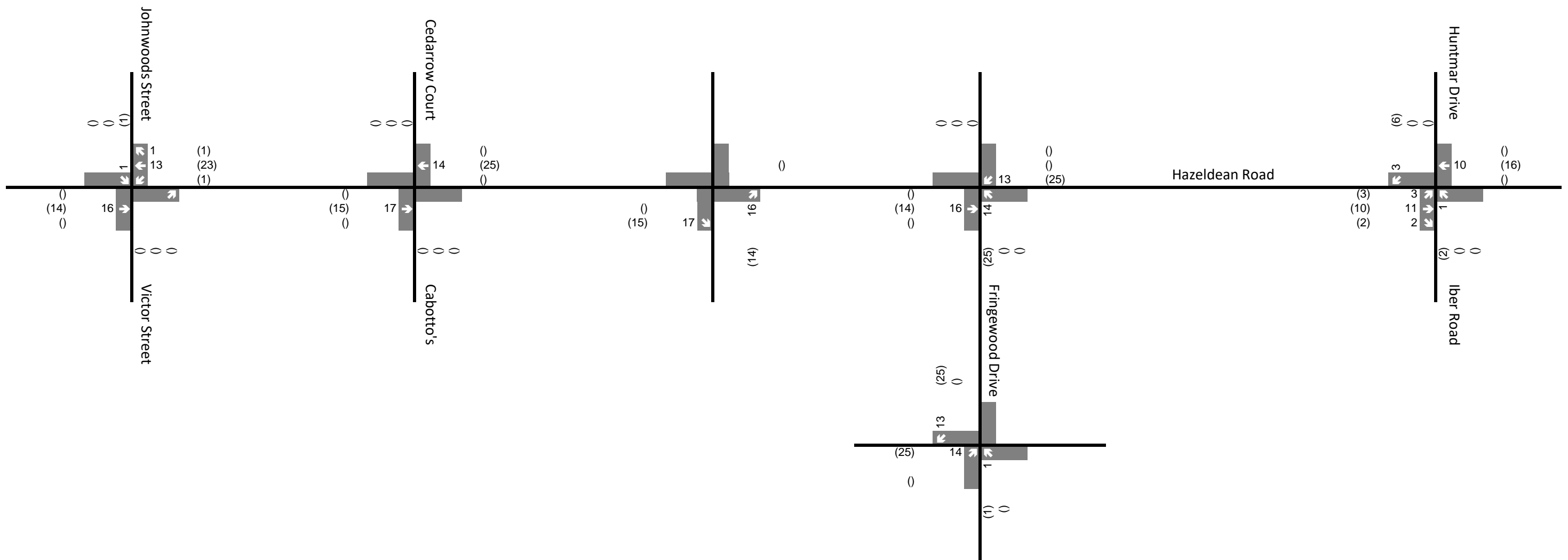
3.1.3 TRIP ASSIGNMENT

Trips were assigned to the adjacent transportation network and have been based on existing travel patterns as identified from the intersection turning movement counts; including those at the following locations:

- Hazeldean Road and Huntmar Drive/Iber Road, Wednesday July 3, 2019 (City of Ottawa)
- Hazeldean Road and Fringewood Drive, Wednesday July 3, 2019 (City of Ottawa)
- Hazeldean Road and Johnwoods Street/Victor Street, Wednesday September 11, 2019 (WSP)
- Hazeldean Road and Cedarow Court, Thursday August 1, 2019 (City of Ottawa)

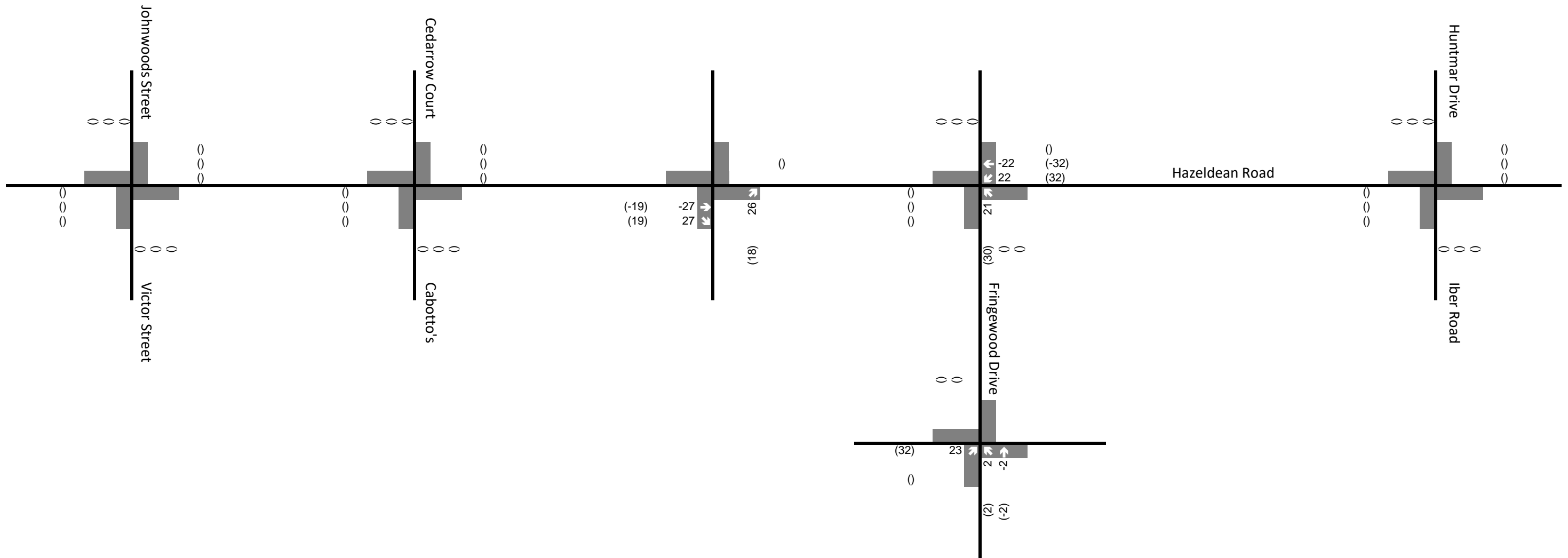
*(source of count)

The peak hour vehicle trip assignment for the peak hour vehicle trips are shown as primary trips (**Figure 3-1**) and pass by trips (**Figure 3-2**).



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

Figure 3-1
 Site Generated
 Primary Trips



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

Figure 3-2
 Site Generated Pass
 By Trips

3.2 BACKGROUND NETWORK TRAFFIC

3.2.1 CHANGES TO THE BACKGROUND TRANSPORTATION NETWORK

The City of Ottawa is currently undertaking a Traffic Calming Study to examine traffic conditions and driver behaviour on Fringewood Drive. The study was initiated in the Fall of 2018 with the intent of developing potential traffic calming solutions. The results of this study were not published when this TIA was finalized (September 2020).

A second City of Ottawa project has been initiated that proposes changes to Fringewood Drive to improve conditions for cycling, bus stop access and pedestrian safety. Within the Study Area, the project includes a new asphalt paved shoulder on the:

- East side of Fringewood Drive from just north of Azurite Crescent to approximately 180m south of Hazeldean Road, of which the section from just north of Azurite Crescent to Cloverloft Court was constructed in September 2019
- West side of Fringewood Drive from just north of Azurite Crescent to approximately 65m south of Hazeldean Road, of which the section from just north of Azurite Crescent to Cloverloft Court was constructed in September 2019

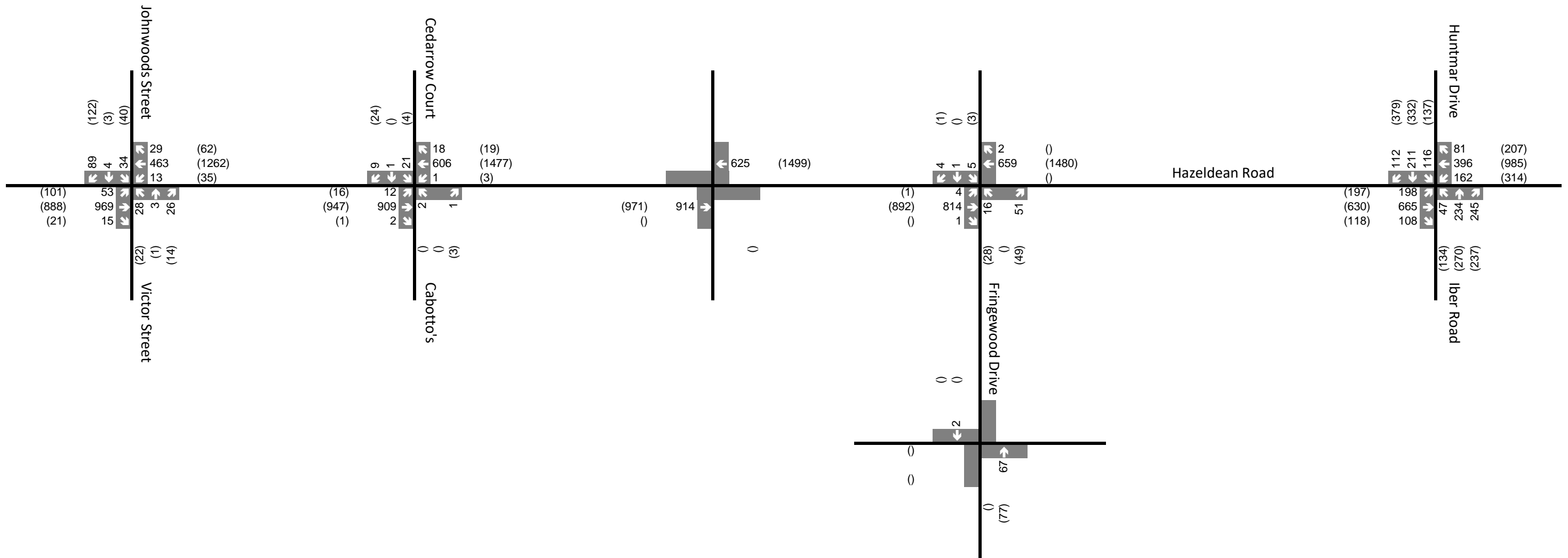
Furthermore, at the pre-consultation meeting with the City of Ottawa on July 16, 2019, the City noted that the following changes to the background transportation network would be beneficial to the neighbourhood:

- Continuous sidewalk on the west side of Fringewood Drive (adjacent to the site) from Hazeldean Road south to the extent of the paved shoulder noted above.
- Reduction of the southbound driving lane on Fringewood Drive to a minimum width of 3.5m
- All sidewalks across an entrance should be depressed and continuous (City of Ottawa Standard Drawing SC7.1 Curb Return Entrances, March 2017)

3.2.2 GENERAL BACKGROUND GROWTH RATES

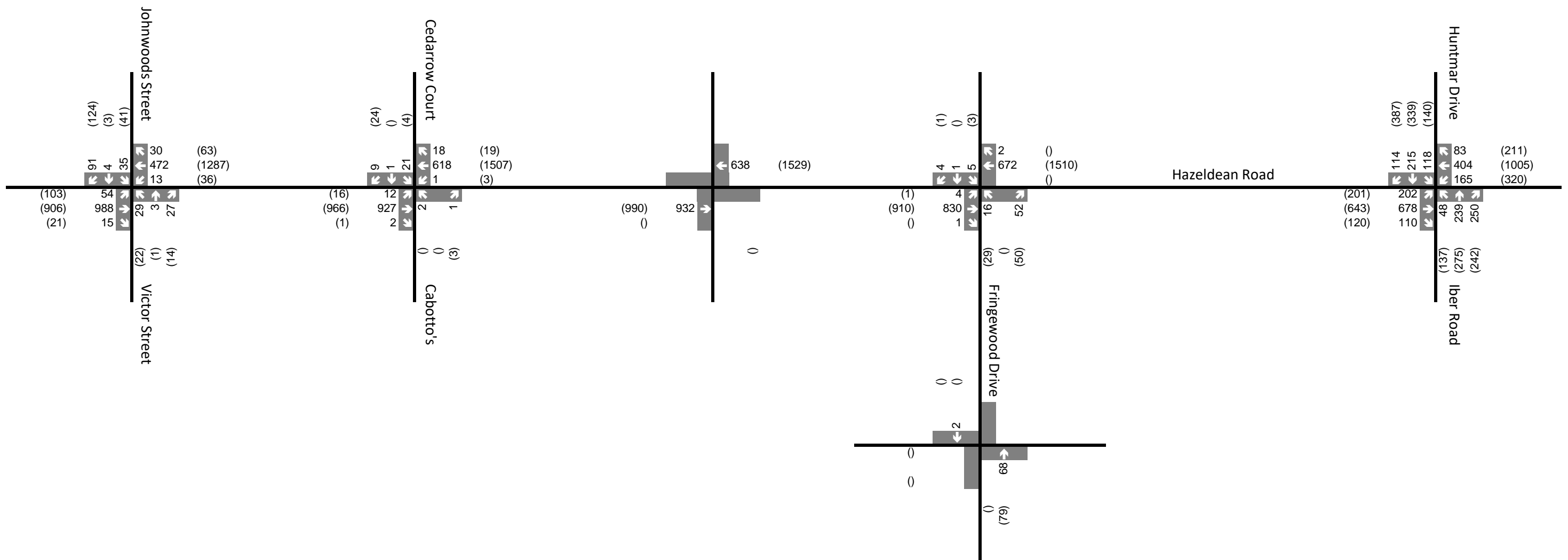
A 2.0% annual growth rate was selected to account for future development not currently within the development application process (**Section 3.2.3**). The 2.0% increase was based on background development reports that indicated the same growth rates.

The existing conditions (2020) and projected future background (2021) traffic volumes are shown in **Figure 3-3** to **Figure 3-4**. The projected future background traffic for 2026 includes expected developments (**Section 3.2.3**) and the traffic volumes are shown in **Figure 3-7**.



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

Figure 3-3
 Existing Traffic
 Volumes (2020)



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

Figure 3-4
Future Background
Traffic (2021)

3.2.3 OTHER AREA DEVELOPMENTS

In **Section 2.4.2** there were three developments identified that could impact the Transportation Impact Assessment:

- 5731 Hazeldean Road (D07-12-16-0046) – mixed use development consisting of four buildings; two two-storey buildings consisting of commercial uses; a four-storey residential care facility and a five-storey retirement home
- 24 Iber Road, 5734 Hazeldean Road, and 5754 Hazeldean Road (D07-12-13-0168) – Mix of retail, commercial, and office buildings, including six one-story retail buildings and two two-storey office buildings, one with ground floor retail

The estimated trips for the above developments were taken from their respective Transportation Impact Assessment Report.

The development for the remaining lands on the 5 Orchard Drive Property (**Figure 3-5**) was estimated at a high level based on the concept plan provided by Campanale Homes dated November 2019. This included: 67 Townhomes, 7 detached homes, 45 apartment units, 13,607 sq/ft office, and 34,966 sq/ft retail.

The estimated trips from other developments are shown in **Figure 3-6**. They were added to the 2026 planning horizon as shown in **Figure 3-7**.

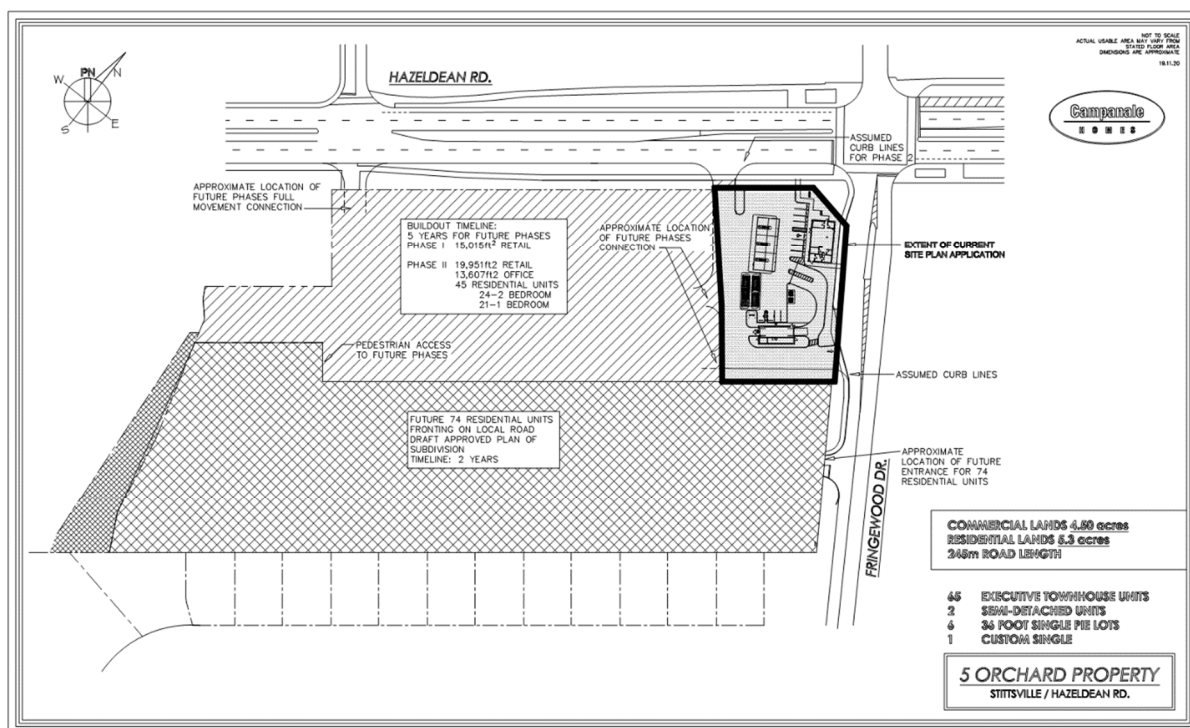
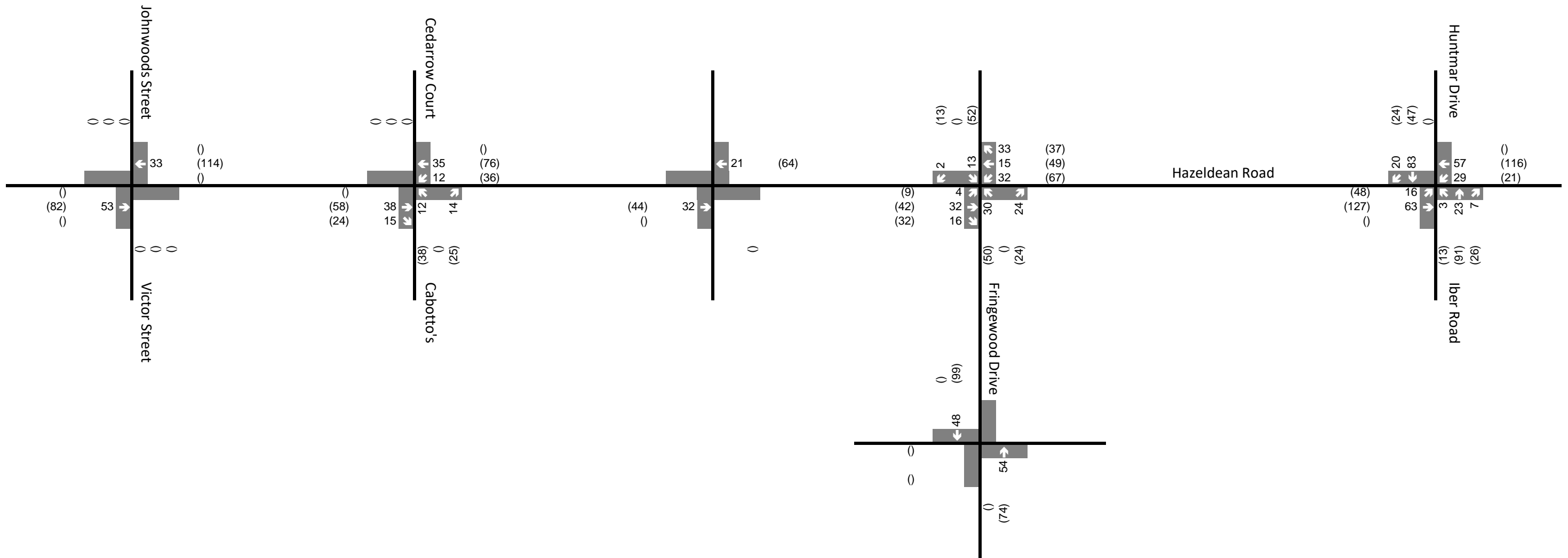
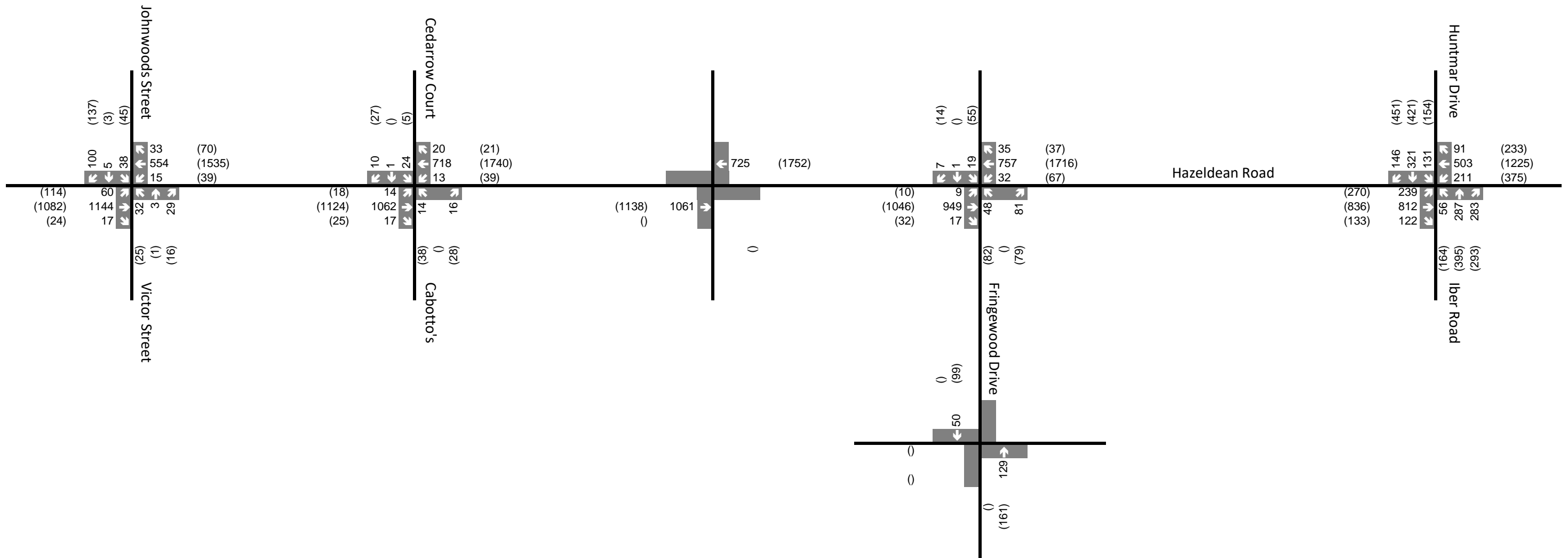


Figure 3-5. 5 Orchard Drive - Development Concept for Balance of Land





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

Figure 3-7
Future Background
Traffic (2026)

3.3 DEMAND RATIONALIZATION

3.3.1 *DESCRIPTION OF CAPACITY ISSUES(S)*

Total traffic volumes for the 2026 planning horizon were estimated by:

- Applying a 2% background growth rate to the existing traffic volumes along arterials (**Section 3.2.2**)
- Adding trips generated by other area developments (**Section 3.2.3**)
- Adding trips generated by the proposed development (**Section 3.1.3**)

The estimated total traffic volumes are presented in **Figure 3-8** and **Figure 3-9**.

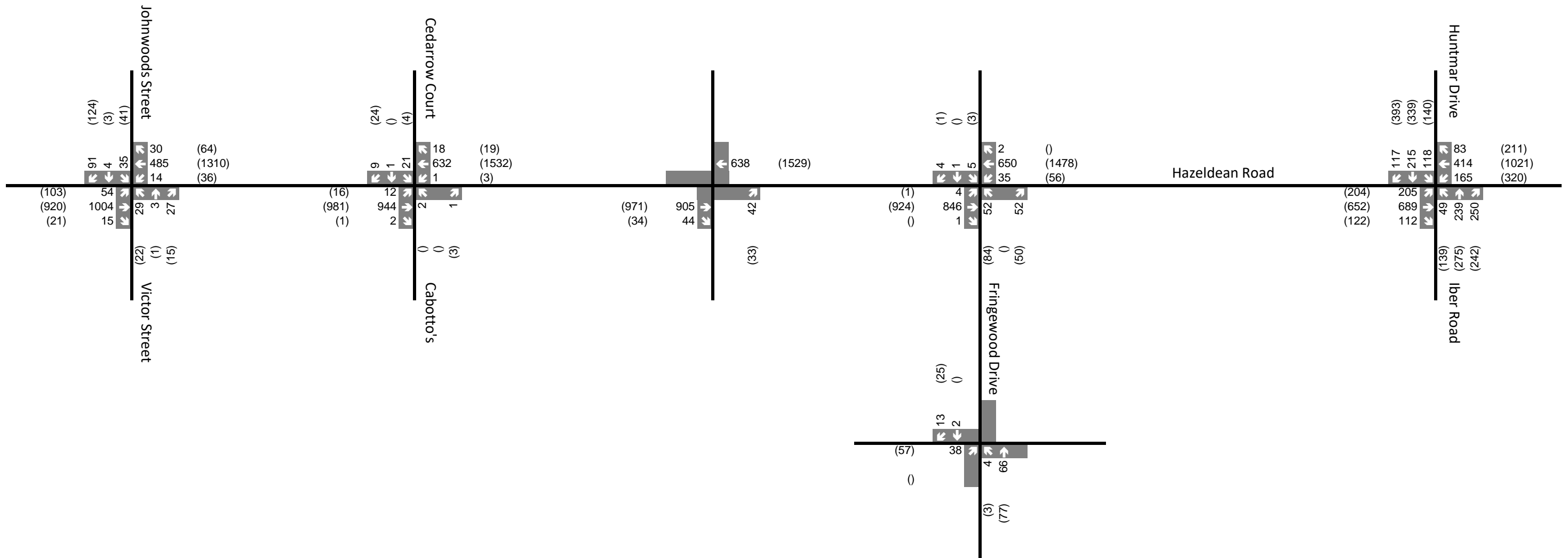
A cursory review of the results obtained from the application of Synchro (version 10) for the 2026 total traffic volumes suggest that the future auto demands will not add any new over-capacity movements within the study area. These assumptions are confirmed in **Section 4.9**.

3.3.2 *ADJUSTMENT TO DEVELOPMENT GENERATED TRAVEL DEMANDS*

Adjustments to development generated demands have not been proposed since the trips generated by the development are not expected to adversely impact the adjacent transportation network.

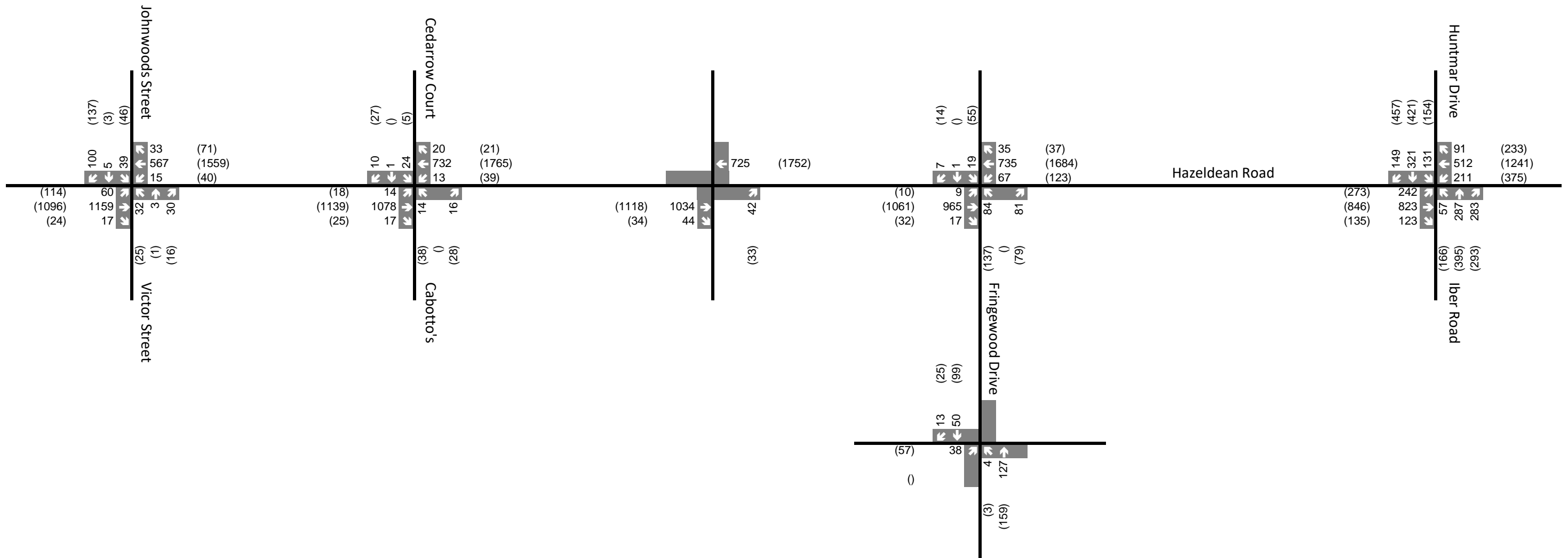
3.3.3 *ADJUSTMENTS TO BACKGROUND NETWORK TRAVEL DEMANDS*

Adjustments to background network demands have not been proposed since the cursory traffic operations analysis indicates that the future transportation roadway network will offer an acceptable Level of Service.



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

Figure 3-8
 Future Total Traffic
 (2021)



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

Figure 3-9
 Future Total Traffic
 (2026)

4. ANALYSIS

4.1 DEVELOPMENT DESIGN

4.1.1 *DESIGN FOR SUSTAINABLE MODES*

The TDM-supportive Development Design and Infrastructure Checklist includes two checklists, one for non-residential developments and one for residential developments. The non-residential development checklist was completed to assess the opportunity to implement facilities that are supportive of sustainable modes. The completed checklist is attached as **Appendix E**.

Sustainable modes include cycling, walking, and transit. As indicated in the TDM checklist and shown on the proposed site plan, the proposed development accommodates these modes by providing an improved sidewalk connection along Fringewood Drive for pedestrians and four bicycle parking spaces adjacent to the convenience store.

The development is also proposing to provide two electric vehicle charging stations.

4.1.2 *CIRCULATION AND ACCESS*

The proposed site plan (**Appendix B**) provides a continuous drive movement through the property between the two access points for fueling trucks that require limited reverse maneuvering. The site circulation was assessed using AutoTURN 10.2 to confirm suitability of the layout for a variety of design vehicles. The results are provided in the following table and the AutoTURN swept paths are provided in **Appendix F**.

Table 4-1. Swept Path Assessment

DESIGN VEHICLE	VEHICLE REPRESENTING	FINDINGS
MSU (TAC 2017)	Delivery Vehicle Moving Truck	The proposed entrance configuration on Hazeldean and Fringewood accommodates the movements of an MSU design vehicle without impacting any built features or parking spaces.
HSU (TAC 2017)	Municipal Services / Waste Removal	<p>Circulation: The proposed entrance configuration on Hazeldean and Fringewood can accommodate the movements of an HSU design vehicle without impacting any built features or parking spaces. The eastbound turn onto Hazeldean will require space on both through lanes.</p> <p>Access to Waste Containers: An HSU will be able to maneuver to and from the waste containers without conflicting the nearby parking spaces or gas pump stations.</p>
WB-23 (Alberta INFTRA- HGDG)	Fueling Truck	The proposed entrance configuration on Fringewood Avenue can accommodate the movements of a Fueling Truck. The gore along Fringewood is required to accommodate this size of vehicle.
Passenger Vehicle (TAC 2017)	Resident's vehicle	<p>Hazeldean Entrance: The proposed entrance configuration can accommodate the movements of passenger vehicles.</p> <p>Fringewood Entrance: The propose entrance configurations can accommodate the movements of passenger vehicles.</p> <p>Car Wash: The proposed layout configurations can accommodate the movements of passenger vehicles.</p>

4.1.3 NEW STREET NETWORKS

This section was exempted in the Transportation Impact Assessment Scoping Report submitted on September 5, 2019 and approved by the City of Ottawa on October 11, 2019. The approved exemptions table is found in **Section 2.8**.

4.2 PARKING

4.2.1 PARKING SUPPLY

The proposed development parking requirements, based on its location will be assessed in accordance with the Suburban Area (Area 'C') for minimum parking requirements as part of Schedule 1A to the City of Ottawa's Zoning By-Law 2008-250. The Zoning By-Law requires a convenience store in Area 'C', provide a minimum parking rate of 3.4 spaces per 100 m² of gross floor area (*Table 101, Row N27, Column IV*). The Zoning By-Law indicates that there is no requirement for parking for car washes (*Table 101, Row N19, Column IV*) or gas bars (*Table 101, Row N39, Column IV*). The Zoning By-Law further requires a minimum bicycle parking rate of 1 spaces per 250 m² of gross floor area for a convenience store (*Table 111A, I, e*).

The minimum parking supply requirements for this development compared with the proposed parking supply are highlighted in the following table.

Table 4-2. Minimum Bylaw Requirements for Parking and Proposed Parking Supply

TYPE	REQ'D	CALCULATION	SITE PLAN	COMPLIANCE WITH BY-LAW
Vehicle: Car Wash	0	-	0	Meets the minimum requirements of the Zoning By-Law.
Vehicle: Convenience Store	6	168m ² * 3.4 spaces per 100m ² of gross floor area	12	Exceeds the minimum requirements of the Zoning By-Law.
Vehicle: Gas Bar	0	-	0	Meets the minimum requirements of the Zoning By-Law.
Bicycle	1	168m ² * 1 space per 250m ² of gross floor area (convenience store) 114 m ² * 1 space per 1,500m ² of gross floor area (car wash)	4	Exceeds the minimum requirements of the Zoning By-Law.
Total	7		15	

The Institute of Transportation Engineers (ITE) publication Parking Generation (4th edition) indicates that the peak period parking demand for a gasoline / service station with a convenience market can be estimated using the following ratio:

$$\text{Average Parking Demand} = 0.75 \text{ vehicles per fueling position}$$

This results in an average parking demand of 5 vehicles. The current site plan has 11 total parking spaces which exceeds the estimated peak demand by 6 parking spaces.

4.2.2 SPILLOVER PARKING

This section was exempted in the Transportation Impact Assessment Scoping Report submitted on September 5, 2019 and approved by the City of Ottawa on October 11, 2019. The approved exemptions table is found in **Section 2.8**.

4.3 BOUNDARY STREETS

4.3.1 HAZELDEAN ROAD

Hazeldean Road is an arterial with a 37.5 metre protected right-of-way in the study area adjacent to the proposed development site. The existing cross-section (**Figure 4-1**) includes separated sidewalks, dedicated bike lanes, and vehicle lanes. The Hazeldean Road cross-section in this area is consistent with the City's complete streets philosophy and the urban design objectives for the area by following the general format of the Current Cross-Section Standard (Bike Lanes) developed as part of the Building Better and Smarter Suburbs initiatives (**Figure 4-2**).



Figure 4-1. Hazeldean Road (west of Fringewood) – Existing Cross-Section

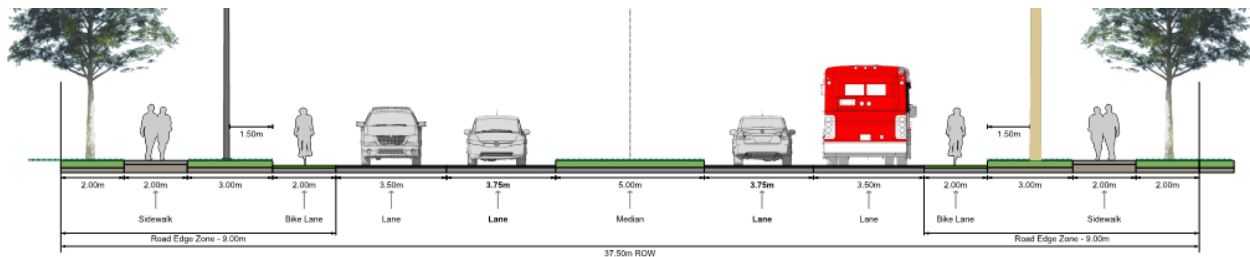


Figure 4-2. City of Ottawa Arterial Road Concept 1 – Current Cross-Section Standard

4.3.1.1 MOBILITY

The City's Multi-Modal Level of Service (MMLOS) targets consider road classification, adjacent land-use designation, and special policy areas. The segment of Hazeldean Road within the study area is identified as an Arterial Main Street in the City of Ottawa's Official Plan (2003, website consolidation), Schedule B (Urban Policy Plan). The resulting MMLOS targets and segment scores for the two scenarios are indicated in the table below.

Table 4-3. Hazeldean Road Segment MMLOS (2021)

	PLOS	BLOS	TLOS	TKLOS	VLOS
Target	C	C	D	D	VLOS Not Reported for Segments
Status Quo	D	E	D	C	

The **Status Quo** option is based on the existing conditions remaining in place along Hazeldean Road. The MMLOS was assessed as:

- An average daily curb lane traffic volume > 3000vpd and operating speeds \geq 70km/h (posted speed limit of 60km/h plus 10 km/h tolerance) = PLOS ‘D’
- An operating speed limit \geq 70km/h = BLOS ‘E’
- Transit operating in mixed traffic with limited to no parking = TLOS ‘D’
- Bi-directional traffic with travel lanes greater than 3.3m = TKLOS ‘C’

The MMLOS analysis results in **Table 4-3** indicate that the segment level of service for pedestrians (PLOS) and bicycles (BLOS) fail to meet the target scores, which are mainly due to the high operating speed of vehicles on the corridor and lack of physical separation between cyclists and vehicles.

4.3.1.2 SAFETY

Historical crash records for the study area were obtained from the City of Ottawa for the 5-years between January 2014 through December 2018. The TIA Guidelines indicate that patterns with six or more crashes should be identified. In this timeframe there were two crashes along the roadway segments (excluding the intersections) on Hazeldean Road between Cedarow Court and Fringewood Drive. There were no patterns identified with six or more crashes; therefore, no crash reduction measures have been identified for this section of roadway.

4.3.2 FRINGEWOOD DRIVE

Fringewood Drive is a local road in the study area adjacent to the proposed development site. The existing cross-section (**Figure 4-3**) includes one northbound lane and two southbound lanes. There are no formal pedestrian or cycling facilities currently provided; however, the City of Ottawa is currently improving conditions along this section of Fringewood Drive (**Section 2.4.1**) through an Traffic Calming Study and a Road Modifications Approval project.

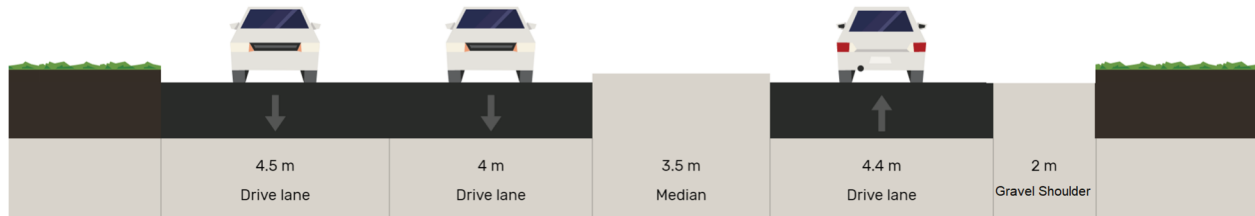


Figure 4-3. Fringewood Drive (adjacent to site) – Existing Cross-Section

As part of the proposed development, improvements are being made to the cross-section of Fringewood Drive adjacent to the site. The proposed cross-section (**Figure 4-4**) includes the following improvements:

- Addition of a 2.0m wide sidewalk with a 1.8m median on the west side of Fringewood Drive
- Removal of one southbound driving lane
- Narrowing of the southbound drive lane from 4.75m at Hazeldean Road to 4.50m at the southern edge of the centre median

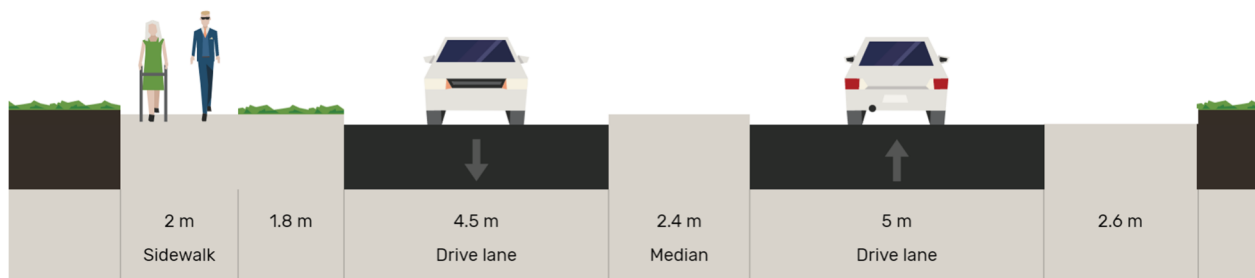


Figure 4-4. Fringewood Drive (adjacent to site) – Proposed Cross-Section

4.3.2.1 MOBILITY

The segment of Fringewood Drive within the study area is located within the General Urban Area in the City of Ottawa's Official Plan (2003, website consolidation), Schedule B (Urban Policy Plan). The resulting MMLOS targets and segment scores for the two scenarios are indicated in **Table 4-4**.

Table 4-4. Fringewood Drive Road Segment MMLOS (2021)

	PLOS	BLOS	TLOS	TKLOS	VLOS
Target	C	B	D	No Target	VLOS Not Reported for Segments
Status Quo	F	D	D	B	
Proposed	C	D	D	B	

The **Status Quo** option is based on the existing conditions remaining in place along Fringewood Drive. The MMLOS was assessed as:

- No sidewalk with an average daily curb lane traffic volume < 3000vpd and an operating speed ≥ 50 km/h (posted speed limit of 40km/h plus 10 km/h tolerance) = PLOS 'F'
- Mixed traffic for bicycles with three travel lanes and a speed limit ≥ 50 km/h = BLOS 'D'
- Transit operating in mixed traffic with limited to no parking = TLOS 'D'
- Bi-directional traffic with travel lanes > 3.7m = TKLOS 'B'

The **Proposed** option is based on the proposed cross-section being implemented along Fringewood Drive. The MMLOS was assessed as:

- No sidewalk but a 2.6m wide paved shoulder on the east side of the road with an operating speed 50 km/h = PLOS 'C'
- Mixed traffic for bicycles with two travel lanes and a speed limit ≥ 50 km/h = BLOS 'D'
- Transit operating in mixed traffic with limited to no parking = TLOS 'D'
- Bi-directional traffic with travel lanes > 3.7m = TKLOS 'B'

With the proposed Fringewood Drive cross-section, the PLOS meet the target of 'C' because of the new boulevard sidewalk on the west side and the paved shoulder on the east side. BLOS will not change due to the absence of a dedicated cycling facility on southbound.

4.3.2.2 SAFETY

Historical crash records for the study area were obtained from the City of Ottawa for the 5-years between January 2014 through December 2018. The TIA Guidelines indicate that patterns with six or more crashes should be identified. In this timeframe there was one crash along the roadway segment on Fringewood Drive between Hazeldean Road and Cloverloft Court. There were no patterns identified with six or more crashes; therefore, no crash reduction measures have been identified for this section of roadway.

4.4 ACCESS INTERSECTIONS

4.4.1 LOCATION AND DESIGN OF ACCESS

There are two access points proposed for this development and are indicated in the Site Plan (**Appendix B**), one from Hazeldean Drive and one from Fringewood Avenue.

The Hazeldean Drive access is proposed as an eastbound right-in / right-out providing a connection between the road and the parking lot to the west of the proposed gas station. This access will serve both the gas station and the development occurring on the remainder of the 5 Orchard lands.

The Fringewood Avenue is proposed as a full movement access providing access across the south edge of the development.

A design compliance check was carried out for each of the two accesses following guidelines prepared by the City of Ottawa and the Transportation Association of Canada's Geometric Design Guidelines for Canadian Roads (2017). The design compliance check is summarized in **Table 4-5** with elements not in compliance with the requirements in red.

Table 4-5. Access Intersection Design Elements

DESIGN ELEMENTS	MINIMUM REQUIRED	HAZELDEAN ACCESS	FRINGEWOOD ACCESS
Access Type	-	Eastbound Only	Full Movement
One-way vs. Two-way	<25 vpd = one-way driveway <750 vpd = two-way driveway	<100 peak hour trips Two-way	<100 peak hour trips Two-way
Entrance Width	2.0m-7.3m (TAC 2017) 6.7m for a parking lot (Ottawa) 6.0m for parking garage (Ottawa)	9.0m Including two 3.5m drive lanes and a 2.0m flush concrete centre median	9.0m
Right Turn Radius	3.0m – 4.5m (TAC 2017)	9.0 m	9.0 m
Corner Clearance	70m to traffic signals (TAC 2017)	50 m to Fringewood Avenue	75 m from Hazeldean Drive

DESIGN ELEMENTS	MINIMUM REQUIRED	HAZELDEAN ACCESS	FRINGEWOOD ACCESS
-----------------	------------------	------------------	-------------------

Sight Distance (Right turn from Minor)	105m (TAC 2017)	No obstructions	No obstructions
Sight Distance (Left turn from Minor)	105m (TAC 2017)	N/A	No obstructions
Throat Length	25m (TAC 2017) 15m (Ottawa, pre-consultation meeting)	25m from east curb radii to conflict point with vehicle exiting gas station	>25m from north curb radii to conflict point with exiting vehicles
Angle of Intersection	At or near 90°	Access intersects Hazeldean Drive at 90°	Access intersects Fringewood Avenue near 90°
Proximity to Adjacent Driveways	Restrict accesses	No private driveways within 150m west of the access point	No private driveways within 100m of access point
Pedestrian Crossing Consideration	Ottawa Standard Drawing SC7.1 (Curb Return Private Entrance – Unsignalized)	9.0m pedestrian crossing Ottawa Standard Drawing S7.1 (Curb Return Private Entrance)	9.0m pedestrian crossing Ottawa Standard Drawing S7.1 (Curb Return Private Entrance)
Cycling Crossing Consideration	Large curb return radii with narrow driveway to minimize crossing distance	9.0m shoulder bicycle crossing	10.0m shoulder bicycle crossing

Generally, the proposed accesses meet the current best practices and accepted design guidance. However, there are specific areas where specific conditions limit design opportunities, as follows:

1. The entrance widths and right-turn radii exceed the maximum suggestions to allow large fueling vehicles access the site.
2. The corner clearance on the Hazeldean access is less than 70m to the nearest signalized intersection. A review of the intersection operations and queuing is provided in **Section 4.9.2.3**.

4.4.2 INTERSECTION CONTROL

Traffic control signal warrants were carried out in accordance with the Ontario Traffic Manual (OTM) Book 12 (2012) for both proposed accesses under the future total planning horizon. Justification 7 (future volumes) were applied and traffic signal warrants were not met. The signal warrant worksheets are provided in **Appendix G**.

Pedestrian accommodation at the accesses should follow the City of Ottawa's Standard Drawing SC7.1 for Curb Return Entrances utilizing the Private / Unsignalized entrance option which includes a continuous depressed sidewalk across the access as shown below.

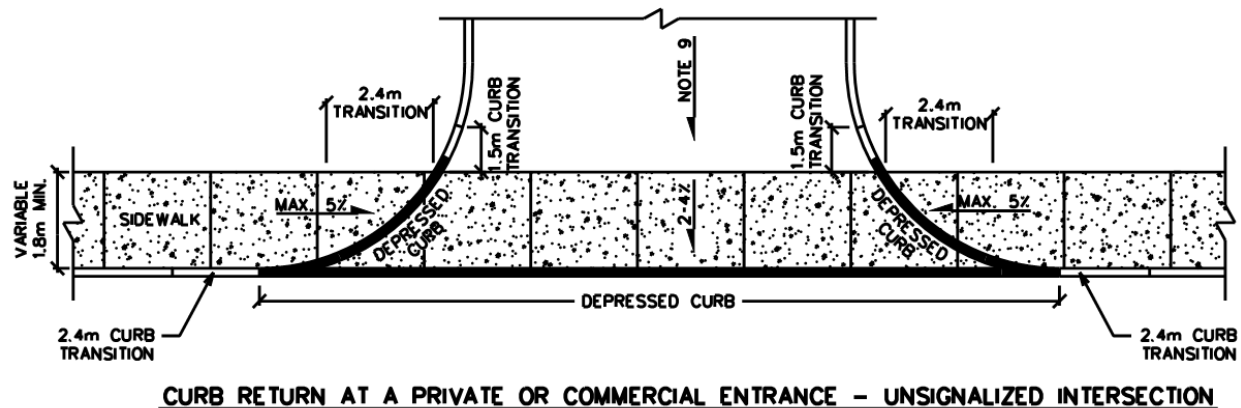


Figure 4-5. City of Ottawa, Standard Drawing SC7.1 Curb Return Entrances, Private / Unsignalized (March 2017)

Signage options for the two driveways are provided below:

Hazeldean Access: The Ontario Traffic Manual (OTM) Book 5 Regulatory Signs (March 2000) suggests using ONE-WAY signage (Rb-21) to prevent traffic from travelling in the wrong direction at the entrance to a one-way road. The DO NOT ENTER (Rb-19) and NO LEFT TURN (Rb-12) signs are often used in conjunction with the Rb-21.

Fringewood Access: Wayfinding signage indicating that this is the entrance for all westbound vehicles would provide positive guidance to all users, including emergency services.

4.4.3 INTERSECTION DESIGN

The City of Ottawa's Multi-Modal Level of Service (MMLOS) Guidelines (2015) are to be applied at signalised intersections only. The proposed site accesses are both uncontrolled and do not warrant an MMLOS evaluation.

4.5 TRANSPORTATION DEMAND MANAGEMENT

This section was exempted in the Transportation Impact Assessment Scoping Report submitted on September 5, 2019 and approved by the City of Ottawa on October 11, 2019. The approved exemptions table is found in **Section 2.8**.

4.6 NEIGHBOURHOOD TRAFFIC MANAGEMENT

This section was exempted in the Transportation Impact Assessment Scoping Report submitted on September 5, 2019 and approved by the City of Ottawa on October 11, 2019. The approved exemptions table is found in **Section 2.8**.

4.7 TRANSIT

The trip generation estimates have assumed a 0% transit mode share given the nature and services provided by gas stations. A transit analysis was not completed since there is no anticipated impact (zero new peak hour trips) to transit service resulting from the proposed development.

4.8 REVIEW OF NETWORK CONCEPT

This section was exempted in the Transportation Impact Assessment Scoping Report submitted on September 5, 2019 and approved by the City of Ottawa on October 11, 2019. The approved exemptions table is found in **Section 2.8**.

4.9 INTERSECTION DESIGN

4.9.1 INTERSECTION CONTROL

The identification of appropriate intersection controls to serve future background and future total travel demands included a roundabout screening for unsignalized intersections, a traffic signal warrant assessment, and a cursory review of transit priority measures. For this assessment we reviewed the 2026 total traffic volumes which would provide the worst-case scenario in terms of area traffic demands. The results are provided in **Table 4-6**.

The **roundabout screening** followed the siting considerations provided in the TAC Canadian Roundabout Design Guide. The roundabout screening was completed for the unsignalized intersections with consideration given to frequency and type of vehicle crashes, left turn volumes, frequency of U-turn

movements, and minor road delay. Based on these criteria, none of the intersections warrant a roundabout in the future total traffic scenario.

The **traffic signal warrant** was carried out in accordance with the Ontario Traffic Manual Book 12 (2012) methodology for future projected traffic volumes (Justification 7). Based on 2026 total traffic volumes, signal warrants were not met for the unsignalized intersections analysed. The traffic signal warrant sheets are provided in **Appendix G**.

While there is currently limited transit service in this area, the City of Ottawa's Transportation Master Plan (2013) has identified Hazeldean Road between Stittsville Main Street and Eagleson Road as a candidate for transit priority measures as part of the 2031 Affordable Network. Transit priority includes enhancements at selected intersections with measures such as transit signal priority treatments, bus queue jump lanes, and special bus stop arrangements. However, at this time, intersections within the study area are not considered as immediate candidates for **transit priority measures**.

Table 4-6. Intersection Control Summary (2026 Total)

INTERSECTION	EXISTING CONTROL	ROUNDABOUT SCREENING	TAC SIGNAL WARRANT	ISOLATED TRANSIT PRIORITY	FUTURE CONTROL
Hazeldean/Huntmar	Traffic Signal	-	-	Not at this Time	No change
Hazeldean/Fringewood	Traffic Signal	-	-	Not at this Time	No change
Hazeldean/Johnwoods/Victor	Traffic Signal	-	-	Not Warranted	No change
Hazeldean / Site Access	-	Not Warranted	Not Warranted	Not Warranted	Right-in / Right-out
Fringewood / Site Access	-	Not Warranted	Not Warranted	Not Warranted	One-Way Stop Control

4.9.2 INTERSECTION DESIGN

4.9.2.1 MULTI-MODAL LEVEL OF SERVICE ANALYSIS

A Multi-Modal Level of Service (MMLOS) analysis was carried out in accordance with the methodology outlined in the City of Ottawa's MMLOS Guidelines (2015). The Guidelines state that intersection LOS measures are to be evaluated at signalized intersections. We have prepared a MMLOS analysis for the existing conditions (2020) and future total (2026) time horizon to provide a comparison between the baseline and future condition (beyond the development period).

The three intersections along Hazeldean Drive were evaluated as an *Arterial Main Street*. The corresponding LOS targets were taken from Exhibit 22 of the MMLOS Guidelines.

The MMLOS results for the existing conditions and future total conditions (Table 4-7) indicate that pedestrian, bicycle, transit, and truck modes do not meet their target LOS. There is a small change in the forecasted MMLOS (transit and vehicle) between the time horizons.

Table 4-7 Intersection MMLOS - Existing and Future Conditions

		PLOS	BLOS	TLOS	TKLOS	VLOS
Time Horizon	Intersection with Hazeldean	C	C	D	D	D
Existing (2020)	Huntmar	F	F	F	D	D
	Fringewood	F	F	C	B	A
	Johnwoods/Victor	E	F	C	E	B
Future Total (2026)	Huntmar	F	F	F	D	F
	Fringewood	F	F	F	B	C
	Johnwoods/Victor	E	F	C	E	B

The **Pedestrian Level of Service (PLOS)** targets were not met. Following, the City of Ottawa's MMLOS Guidelines, the reported PLOS is governed by the worst of the PETSI (Pedestrian Exposure to Traffic) LOS and average pedestrian delay LOS which are reporting the same LOS for all three intersections.

The **Bicycle Level of Service (BLOS)** target of 'C' could be met if separated bicycle facilities were provided on Hazeldean Road. Arterial operating speeds and current lane configuration provide minimal opportunity for BLOS improvements.

The **Transit Level of Service (TLOS)** target of 'D' was met at the Hazeldean/Johnwoods/Victor intersection for existing and future conditions. The other two intersections do not meet the target LOS for the future conditions. The target could be met with adjustments to reduce signal timing along north and southbound approaches to under 40 seconds. However, given that it is the minor street approaches that are not meeting the target, the current LOS is considered acceptable.

The **Truck Level of Service (TkLOS)** target of 'D' was met for the Hazeldean/Huntmar and Hazeldean/Fringewood intersection. Additionally, the target could be met at the Hazeldean/Johnwoods/Victor intersection if the minor street (Johnswood and Victor) added an additional traffic lane. However, the minor roads are not designated truck routes and the current LOS is considered acceptable.

The **Vehicle Level of Service (VLOS)** targets of 'D' were met at Fringewood and Johnwoods / Victor. However, the intersection of Hazeldean Road and Huntmar Drive is operating at or near capacity under the existing and future total conditions. The detailed intersection performance analysis is provided in **Section 4.9.2.2**.

4.9.2.2 DETAILED INTERSECTION PERFORMANCE ANALYSIS

The existing and future conditions were analyzed based upon the peak hour traffic volumes presented in **Section 3**. The City of Ottawa's MMLOS Guidelines assigns the vehicle level of service (VLOS) based on ranges of volume to capacity ratio, as indicated in **Table 4-8**. The City's MMLOS Guidelines recommend targets for the Vehicle Level of Service (VLOS) based on their Official Plan Policy / Designation and Road Class and is a LOS 'D' for *Arterial Main Streets*.

Table 4-8. City of Ottawa MMLOS Guidelines, V/C Criteria

VLOS	VOLUME TO CAPACITY RATIO
A	0 – 0.60
B	0.61 – 0.70
C	0.71 – 0.80
D	0.81 – 0.90
E	0.91 – 1.00
F	> 1.00

The intersection was analyzed using Synchro 9 following the analysis parameters in the TIA Guidelines. **Appendix H** contains the detailed Synchro analysis sheets.

EXISTING CONDITIONS

The existing (2020) intersection capacity analysis results are summarized in **Table 4-9**. Under existing conditions, all intersections operate with a VLOS that does not exceed the VLOS of 'D'.

Table 4-9. Intersection Capacity Summary for Existing Conditions (2020)

INTERSECTION	INTERSECTION CONTROL	AM PEAK HOUR			PM PEAK HOUR		
		V/C Ratio	VLOS	CRITICAL MOVEMENT	V/C Ratio	VLOS	CRITICAL MOVEMENT
Hazeldean/ Johnwoods/ Victor	Signalized	0.49	A	-	0.65	B	-
Hazeldean/ Cedarow	Minor Street Stop Controlled	0.40	A	-	0.49	A	-
Hazeldean/ Fringewood	Signalized	0.46	A	-	0.57	A	-
Hazeldean/ Huntmar/ Iber	Signalized	0.74	C	-	0.88	D	-

FUTURE BACKGROUND CONDITIONS

The intersection VLOS and critical movement remain largely unchanged when compared to the existing conditions. In some instances, the 2021 future background conditions are reported more favourably than the existing conditions. This is a result of the change in Peak Hour Factor (PHF) that the City's TIA Guidelines prescribe for existing conditions (0.9) and future conditions (1.0). When volumes do not significantly change, the future VLOS can be reported as improving since the PHF of 1.0 assumes peak spreading.

Overall, the intersections continue to operate at or below the target VLOS. The intersection capacity results are summarized in **Table 4-10**.

Table 4-10. Intersection Capacity Summary for Background Conditions (2021)

INTERSECTION	INTERSECTION CONTROL	AM PEAK HOUR			PM PEAK HOUR		
		V/C RATIO	VLOS	CRITICAL MOVEMENT	V/C RATIO	VLOS	CRITICAL MOVEMENT
Hazeldean/Johnwoods/Victor	Signalized	0.48	A	-	0.58	A	-
Hazeldean/Cedarow	Minor Street Stop Controlled	0.36	A	-	0.45	A	-
Hazeldean/Fringewood	Signalized	0.42	A	-	0.53	A	-
Hazeldean/Huntmar/Iber	Signalized	0.73	C	-	0.81	D	-

The intersection capacity results for the 2026 future background conditions are summarized in **Table 4-11**. The notable change is at the Hazeldean/Huntmar/Iber intersection that experiences an PM peak hour decrease from a LOS 'D' to LOS 'F'. The decrease in LOS is a result of the traffic generated by other area developments.

Table 4-11. Intersection Capacity Summary for Background Conditions (2026)

INTERSECTION	INTERSECTION CONTROL	AM PEAK HOUR			PM PEAK HOUR		
		V/C RATIO	VLOS	CRITICAL MOVEMENT	V/C RATIO	VLOS	CRITICAL MOVEMENT
Hazeldean/Johnwoods/Victor	Signalized	0.50	A	-	0.71	C	-
Hazeldean/Cedarow	Minor Street Stop Controlled	0.42	A	-	0.52	A	-
Hazeldean/Fringewood	Signalized	0.66	B	-	0.72	C	-
Hazeldean/Huntmar/Iber	Signalized	0.75	C	-	1.07	F	WBT = 1.07 NBL = 0.97

FUTURE TOTAL CONDITIONS

The traffic operation results for the 2021 future total scenario are unchanged compared to the 2021 background scenario with all intersections are at or below the target VLOS 'D'. The intersection capacity results are summarized in **Table 4-12**.

Table 4-12. Intersection Capacity Summary for Total Conditions (2021)

INTERSECTION	INTERSECTION CONTROL	AM PEAK HOUR			PM PEAK HOUR		
		V/C RATIO	VLOS	CRITICAL MOVEMENT	V/C RATIO	VLOS	CRITICAL MOVEMENT
Hazeldean/Johnwoods/Victor	Signalized	0.50	A	-	0.59	A	-
Hazeldean/Cedarow	Minor Street Stop Controlled	0.37	A	-	0.46	A	-
Hazeldean/Fringewood	Signalized	0.63	B	-	0.68	B	-
Hazeldean/Huntmar/Iber	Signalized	0.75	C	-	0.81	D	-
Hazeldean / Site Access	Right-in / Right-out	0.35	A	-	0.35	A	-
Fringewood / Site Access	Minor Street Stop Controlled	0.04	A	-	0.04	A	-

The intersection capacity results for the 2026 future total conditions are summarized in **Table 4-13**. The additional traffic generated by the development increases the VLOS at the Hazeldean and Fringewood intersection. The other study area intersections will continue to operate below the VLOS target of 'D'.

The City of Ottawa's Transportation Master Plan identifies a new north-south arterial road in this area which could reduce the demand along Huntmar / Iber and improve operations at this intersection.

Table 4-13. Intersection Capacity Summary for Total Conditions (2026)

INTERSECTION	INTERSECTION CONTROL	AM PEAK HOUR			PM PEAK HOUR		
		V/C RATIO	VLOS	CRITICAL MOVEMENT	V/C RATIO	VLOS	CRITICAL MOVEMENT
Hazeldean/ Johnwoods/ Victor	Signalized	0.50	A	-	0.73	C	-
Hazeldean /Cedarow	Minor Street Stop Controlled	0.42	A	-	0.53	A	-
Hazeldean/ Fringewood	Signalized	0.73	C	-	0.79	C	-
Hazeldean/ Huntmar/ Iber	Signalized	0.75	C	-	1.09	F	EBTR = 0.92 WBT = 1.09 NBL = 0.98
Hazeldean / Site Access	Right-in / Right- out	0.41	A	-	0.44	A	-
Fringewood / Site Access	Minor Street Stop Controlled	0.05	A	-	0.08	A	-

4.9.2.3 DESIGN ELEMENTS

The site access from Hazeldean Road is located on the approach to the Hazeldean / Fringewood intersection with a corner clearance of 50m (**Section 4.4.1**). To determine the peak hour interaction between the intersection and the access a queueing and blocking analysis was completed using the SimTraffic v9 software. The simulation results considered ten runs of 60-minutes each for each peak hour. The average and maximum eastbound queue lengths for the at both the intersection and site access are summarized in **Table 4-14** and the SimTraffic reports are provided in **Appendix I**.

During the peak hours, the total average queue length on the eastbound approach is estimated to be between 40m and 60m. Vehicles entering and exiting at the Hazeldean site access may have to wait for the queue of one or two vehicles to clear prior to completing their maneuver. The intersection operates with reserve capacity (**Table 4-13**) during both time periods and there will be sufficient gaps in traffic for this maneuver each cycle of signalization.

There is no impact to the westbound traffic on Hazeldean Road because westbound left turns and northbound left turns are prohibited by the existing 1.8m centre median.

Table 4-14. Future Total (2026) Queue Lengths on Hazeldean Road at Site Access

QUEUE	EASTBOUND APPROACH	AM PEAK HOUR	PM PEAK HOUR
Average	Hazeldean / Fringewood	30m	38m
	Hazeldean / Site Access	8m	22m
	Total Average Queue	38m	60m
Maximum	Hazeldean / Fringewood	48m	52m
	Hazeldean / Site Access	45m	73m
	Total Maximum Queue	93m	125m

4.10 SUMMARY OF IMPROVEMENTS INDICATED AND MODIFICATION OPTIONS

A summary of transportation improvements proposed as part of this Transportation Impact Assessment are presented as follows:

1. Development Design

- Provision for sustainable modes has been provided on-site through the provision of bicycle parking and off-site through the provision of a new sidewalk on the west side of Fringewood Drive.
- Design vehicles were assessed for the Site Plan and indicate that accesses accommodate these movements without impacting on built features.

Reference: Section 4.1

2. Parking

- Peak period parking demand is five vehicles (ITE Parking Generation). The proposed parking of 12 parking spaces will meet the anticipated demand and exceed the Zoning By-Law requirement of six parking spaces.

Reference: Section 4.2

3. Boundary Street Design

- The Hazeldean Road cross-section adjacent to the proposed development is consistent with the City's complete streets philosophy and urban design objectives for the area.

- b) The Fringewood Drive cross-section adjacent to the proposed development is subject to an Area Traffic Management Study being undertaken by the City of Ottawa. As part of the proposed development a new 2.0 m sidewalk with a 1.8 m median is proposed on the west side of the roadway which would improve the pedestrian experience in that area.

Reference: Section 4.3

4. Transit

- a) There is no anticipated impact to transit service since the transit mode share for the proposed gas station is 0%.

Reference: Section 4.7

5. Intersection Design

- a) Hazeldean Access: This two-way right-in / right-out access is 9.0 m wide to accommodate a large fuel truck. The egress should include signage to provide positive wayfinding guidance to motorists exiting the site onto Hazeldean Road eastbound. The curb return should follow the City of Ottawa's Standard Drawing 7.1 (Curb Return Entrances).
- b) Fringewood Access: This two-way full movement access is 9.0 m wide to accommodate a large fuel truck. The curb return should follow the City of Ottawa's Standard Drawing 7.1 (Curb Return Entrances).
- c) Hazeldean Road / Johnwoods Street / Victor Street: No modifications are proposed.
- d) Hazeldean Road / Cedarow Court: No modifications are proposed to support the proposed gas station. Improvements should be considered to support the planned commercial and residential development occupying the remainder of the 5 Orchard Drive lands.
- e) Hazeldean Road / Fringewood Drive: No modifications are proposed.
- f) Hazeldean Road / Huntmar Drive / Iber Road: No modifications are proposed. The Synchro analysis indicates that the intersection is operating within capacity under existing conditions, but will exceed capacity under 2026 conditions during the PM peak hour. The City of Ottawa's Transportation Master Plan identifies a new north-south arterial road in this area which could reduce the demand along Huntmar / Iber and improve operations at this intersection.

Reference: Sections 4.4 and 4.9

6. Summary

Based on the results of this Transportation Impact Assessment, the proposed gas station located at 5 Orchard Drive can be accommodated without adverse impacts to planned transportation network and services associated with the future 2026 planning horizon.

APPENDIX

A SCREENING FORM



City of Ottawa 2017 TIA Guidelines Screening Form

1. Description of Proposed Development

Municipal Address	5 Orchard Drive
Description of Location	Southwest corner of Hazeldean Road / Fringewood Drive
Land Use Classification	Arterial Mainstreet [AM9]
Development Size (units)	211 sq/m Convenience Store, 198 sq/m gas bar canopy, 97 sq/m car wash
Development Size (m ²)	
Number of Accesses and Locations	1 x Fringewood, 70m south of Hazeldean 1 x Hazendean, part of Campanale Future Commercial development
Phase of Development	Single Phase
Buildout Year	2020

If available, please attach a sketch of the development or site plan to this form.

2. Trip Generation Trigger

Considering the Development's Land Use type and Size (as filled out in the previous section), please refer to the Trip Generation Trigger checks below.

Land Use Type	Minimum Development Size
Single-family homes	40 units
Townhomes or apartments	90 units
Office	3,500 m ²
Industrial	5,000 m ²
Fast-food restaurant or coffee shop	100 m ²
Destination retail	1,000 m ²
Gas station or convenience market	75 m ²

* If the development has a land use type other than what is presented in the table above, estimates of person-trip generation may be made based on average trip generation characteristics represented in the current edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual.

If the proposed development size is greater than the sizes identified above, the Trip Generation Trigger is satisfied.

Estimated 80 -110 peak hour person-trips



Transportation Impact Assessment Guidelines

3. Location Triggers

	Yes	No
Does the development propose a new driveway to a boundary street that is designated as part of the City's Transit Priority, Rapid Transit or Spine Bicycle Networks?		
Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone?*		

*DPA and TOD are identified in the City of Ottawa Official Plan (DPA in Section 2.5.1 and Schedules A and B; TOD in Annex 6). See Chapter 4 for a list of City of Ottawa Planning and Engineering documents that support the completion of TIA).

If any of the above questions were answered with 'Yes,' the Location Trigger is satisfied.

4. Safety Triggers

	Yes	No
Are posted speed limits on a boundary street are 80 km/hr or greater?		
Are there any horizontal/vertical curvatures on a boundary street limits sight lines at a proposed driveway?		
Is the proposed driveway within the area of influence of an adjacent traffic signal or roundabout (i.e. within 300 m of intersection in rural conditions, or within 150 m of intersection in urban/ suburban conditions)?		
Is the proposed driveway within auxiliary lanes of an intersection?		
Does the proposed driveway make use of an existing median break that serves an existing site?		
Is there is a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?		
Does the development include a drive-thru facility?		

If any of the above questions were answered with 'Yes,' the Safety Trigger is satisfied.

5. Summary

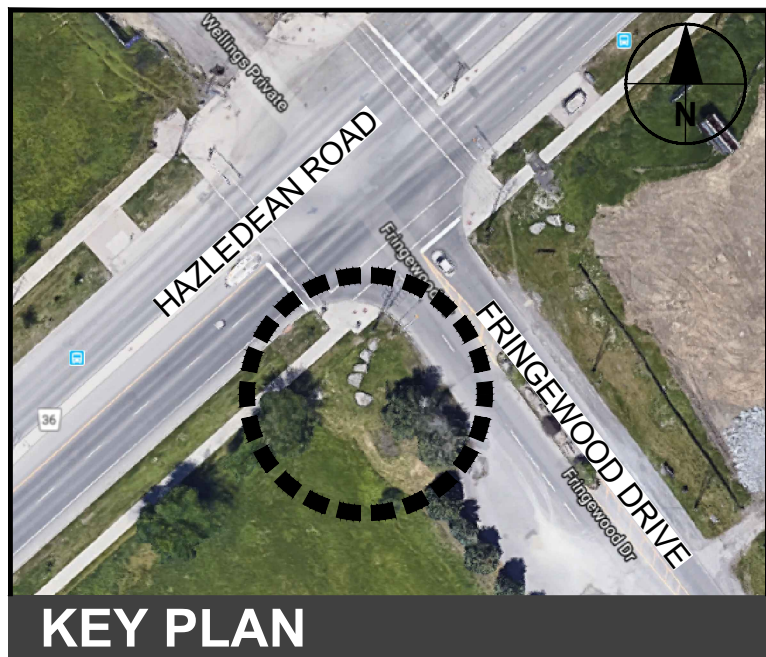
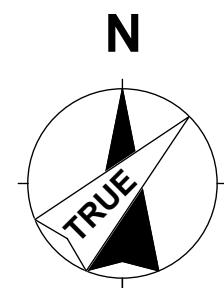
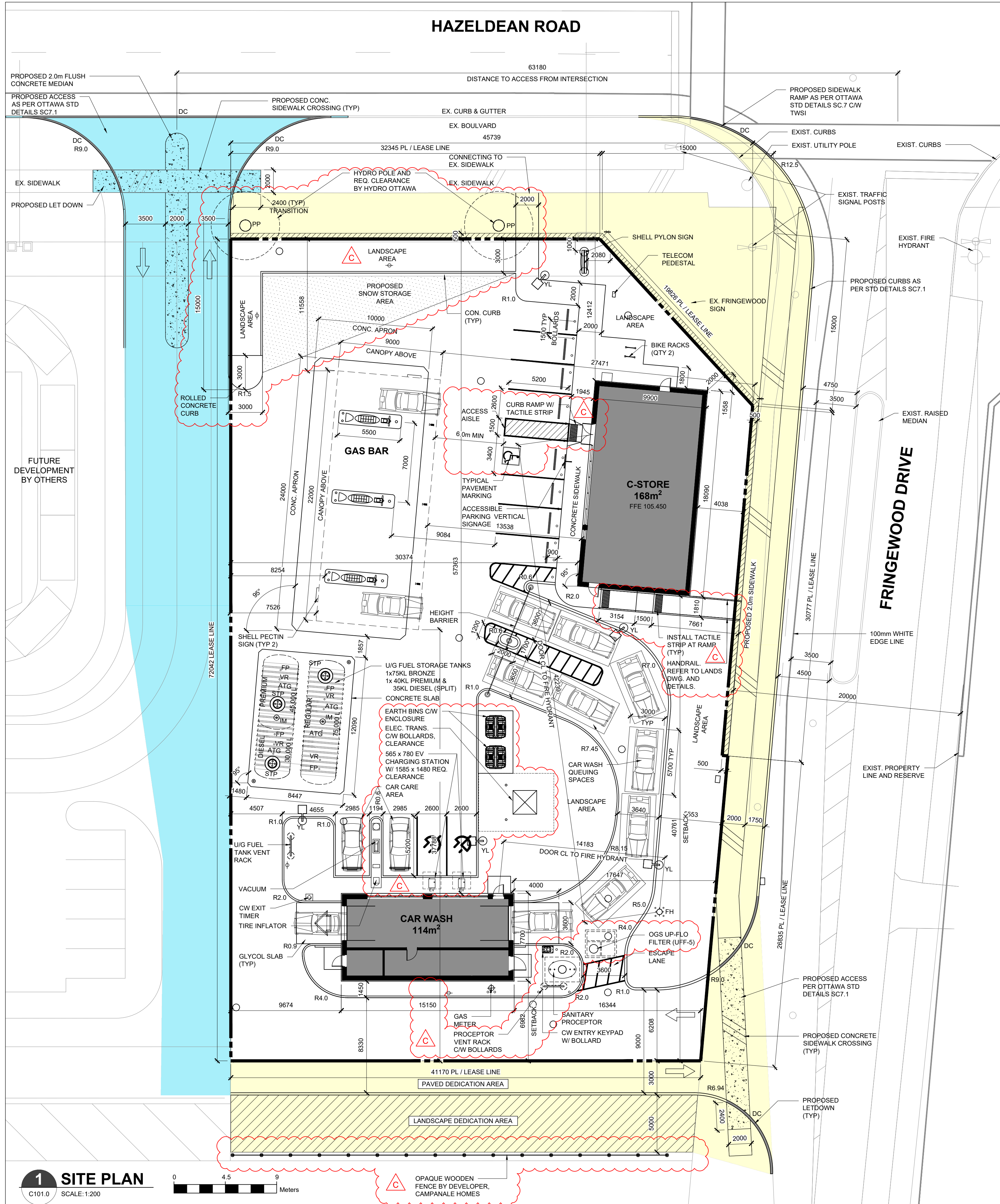
	Yes	No
Does the development satisfy the Trip Generation Trigger?	Yes	
Does the development satisfy the Location Trigger?		
Does the development satisfy the Safety Trigger?		

If none of the triggers are satisfied, the TIA Study is complete. If one or more of the triggers is satisfied, the TIA Study must continue into the next stage (Screening and Scoping).

APPENDIX

B SITE PLAN





SITE INFORMATION

MAINPANEL ADDRESS

5 ORCHARD DR
STITTSVILLE, ONTARIO

ZONING

ARTERIAL MAINSTREET SUBZONE 9 - AM9

PERMITTED USE

RETAIL & SERVICE COMMERCIAL USES: GAS BARS,
SERVICE STATIONS, DRIVE THRU FACILITIES

LEASED SITE AREA

±3.065m² (±0.76acres)

BUILDING AREAS:

PROPOSED CARWASH BUILDING	= ± 114m ²
PROPOSED C-STORE BUILDING	= ± 168m ²








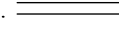
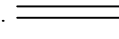


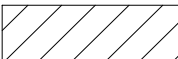
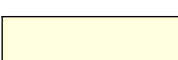



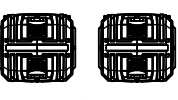
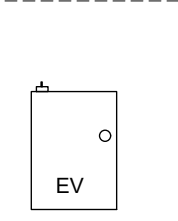
ASSOCIATED SUBDIVISION APPLICATIONS:

ZONING BY-LAW AMENDMENT APPLICATION: D02-02-18-0063
DRAFT PLAN OF SUBDIVISION APPLICATION: D07-16-18-0020


GENERAL NOTES

1. FOR GENERAL NOTES, SEE DRAWING C001.0
2. WORKS IN THE MUNICIPAL RIGHT-OF-WAY BEING PERFORMED BY THE CITY'S CONTRACTOR WILL REQUIRE A 6 TO 8 WEEKS NOTICE PRIOR TO COMMENCEMENT OF CONSTRUCTION AFTER ALL DRAWINGS HAVE BEEN APPROVED AND SECURITIES HAVE BEEN RECEIVED.
3. EXTERNAL GARBAGE ENCLOSURE TO BE COMPLIANT WITH THE URBAN DESIGN GUIDELINE #39.
4. ALL DIMENSIONS ARE IN MILLIMETERS EXCEPT CONC. CURB RADII, WHICH ARE NOTED I METERS.
5. DO NOT SCALE DRAWING.

LEGEND

CONCRETE SURVEY POST FOUND	● FD-IP
MANHOLE	○ MH
GRATED TOP MANHOLE	○ GTMH
TEST MANHOLE	○ TMH
CATCH BASIN	□ CB
OIL/WATER SEPARATOR	○ OWS
OIL/GITR SEPARATOR ADS FD-5HC	 OGS
SANITARY PROCEPTOR	
GROUNDING WELL	○ GW
FIRE HYDRANT	⊗ FH
POWER POLE	○ PP
TRAFFIC LIGHT	○ TL
TRAFFIC SIGN/SIGN POST	⊥ TS
LIGHT STANDARD	 LS
LIGHT STANDARD (SGL)	 YL
LIGHT STANDARD (2head)	 YL
LIGHT STANDARD (4head)	 YL
TELEPHONE PEDESTAL	 TP
EXIST. CONC. CURBS	
NEW CONC. CURBS	
PROPOSED PROPERTY AND LEASE LINE	
DEPRESSED CURB	 DC
LANDSCAPE DEDICATION AREA	
OFF-LEASE AREA, INCLUDING LANDSCAPE, TO BE DESIGNED, PERMITTED, AND BUILT BY SHELL	
OFF-LEASE AREA PAVING TO BE PERMITTED BY SHELL, DESIGN AND CONSTRUCTION BY CAMPANALE	
VACUUM	
TIRE INFLATOR	
EARTH BIN	
EV CHARGER C/W U/G CLEARANCE	

DETAILS OF DEVELOPMENT

DATA		REQUIRED	PROPOSED
ZONING		ARTERIAL MAINSTREET SUBZONE 9 - AM9	
SETBACKS (C-STORE)	Front Yard (Hazeldean Road) - No Min.		12.42 m
	Corner Yard (Corner Property Line) - No Min.		2.00 m
	Exterior Side Yard (Fringewood Drive) - N/A		4.05 m
	Interior Side Yard (West Lease Line) - No Min.		30.36 m
	Rear Yard (South lease line) - Min. 10 m		40.75 m
SETBACKS (CARWASH)	Front Yard (Hazeldean Road) - No Min.		57.36 m
	Exterior Side Yard (Fringewood Drive) - N/A		17.63 m
	Interior Side Yard (West lease line) - No Min.		9.67 m
	Rear Yard(South lease line) - 10 m		6.98 m
SETBACKS (CANOPY)	Front Yard (Hazeldean Road) - No Min.		11.56 m
	Exterior Side Yard (Fringewood Drive) - N/A		27.47 m
	Interior Side Yard (West Lease line) - No Min.		7.52 m
	Rear Yard (South Lease Line) - Min. 10 m		37.78 m
LOT AREA (sq.m.)		NO MIN.	3065 sq.m.
BUILDING COVERAGE (%)		NO MIN.	9.70%
LOT FRONTAGE - MIN. (m)		N/A	45.74 m
LOT DEPTH (m)		N/A	72.04 m
FLOOR AREA RATIO		NOT SPECIFIED	0.054 (C-STORE)
			0.037 (CARWASH)
LANDSCAPED AREA		NOT SPECIFIED	707 sq.m.
LANDSCAPE COVERAGE		MIN 15.00%	23.07%
BUILDING HEIGHT MAX.(m)		15m	5.14m (C-STORE)
			6.00m (CAR WASH)
			5.30m (CANOPY)
CANOPY		NOT SPECIFIED	198 sq.m.
CARWASH STACKING		10 SPACES	10 SPACES
PAVED AREA		NOT SPECIFIED	1613.50 sq.m.
LOADING SPACES (3.5m WIDE X 9m LONG X 4.2m. VERT CLEARANCE)		0	0
PARKING 		REQUIRED	PROVIDED
Barrier-Free	Spaces	1	1
	Stall Length	5.2 m (MIN)	5.2 m
	Stall Width	3.4 m (MIN)	3.4 m
Standard Parking	Spaces	6	11
	Stall Length	5.2 m (MIN) 6.7 m (MAX)	5.2m
	Stall Width	2.6 m (MIN) 3.1 m (MAX)	2.6 m
Overall Number of Spaces		7	12
Aisle Width		6.7 m (MIN)	9.0 m
Bicycle Parking		1	4
LAND USE: NORTH: AM9, AM9(474), AM7(1894) SOUTH: AM9 EAST: AM7 WEST: O1R			

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PROJECT

Shell Canada Products
HAZELDEAN RD. &
FRINGEWOOD DR. NTL

5 Orchard Drive
Stittsville, Ontario
CLIENT

Shell Canada

400-4th Avenue SW
Calgary, AB T2P 0J4
403.252.4554 tel
www.shell.ca

CONSULTANT

AECOM Canada Ltd
4th Floor, 3292 Production Way
Burnaby, BC V5A 4R4
604.444.6400 tel 604.294.8597 fax
www.aecom.com

CTM Design Services Ltd.

210, 340 Midpark Way SE
Calgary, AB T2X 1P1
403.640.0990 tel
www.ctmdesign.ca



REGISTRATION

LEGAL DESCRIPTION

PART OF BLOCK 21 OF DRAFT PLAN OF
SUBDIVISION OF PARTS OF LOTS 26 AND 27 OF
REGISTERED PLAN 4R2506 PART 3,
CONCESSION 11, GEOGRAPHIC TOWNSHIP OF
GOULBOURN (CITY OF OTTAWA)

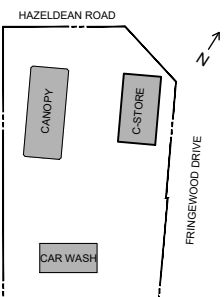
ISSUE/REVISION

C	2020-09-30	RE-ISSUED FOR SPA
B	2020-07-07	REVISED PER SPA COMMENTS
A	2020-03-31	ISSUED FOR SPA
I/R	DATE	DESCRIPTION

DRAWN BY

NAS

KEY PLAN



GLOBAL PROJECT ID NUMBER

CAN01444

SHEET TITLE

SITE

SITE PLAN

CTM DESIGN FILE NAME

2020072 C102 0

SHEET NUMBER

C102.0

APPENDIX

C TRANS O-D RESULTS

Kanata - Stittsville

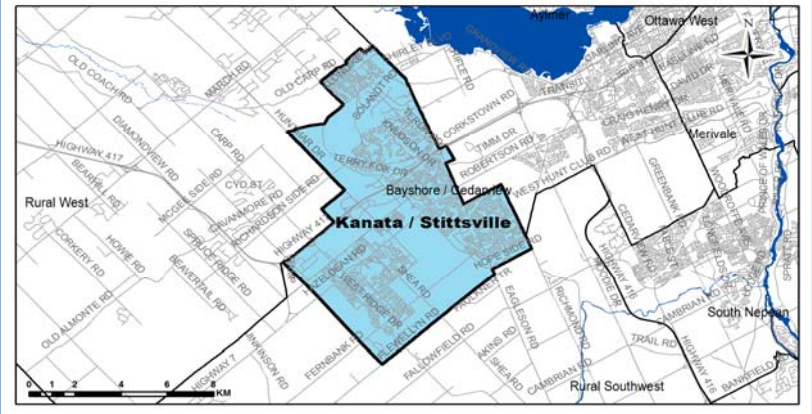
Demographic Characteristics

Population	105,210	Actively Travelled	83,460
Employed Population	49,640	Number of Vehicles	64,540
Households	38,010	Area (km ²)	82.6

Occupation Status (age 5+)	Male	Female	Total
Full Time Employed	24,670	19,590	44,260
Part Time Employed	1,540	3,840	5,380
Student	13,630	13,410	27,040
Retiree	6,480	8,350	14,820
Unemployed	850	940	1,790
Homemaker	160	3,310	3,470
Other	350	1,010	1,360
Total:	47,690	50,440	98,120

Traveller Characteristics	Male	Female	Total
Transit Pass Holders	5,940	6,920	12,860
Licensed Drivers	36,280	36,790	73,070
Telecommuters	200	380	580
Trips made by residents	135,300	143,330	278,630

Selected Indicators	
Daily Trips per Person (age 5+)	2.84
Vehicles per Person	0.61
Number of Persons per Household	2.77
Daily Trips per Household	7.33
Vehicles per Household	1.70
Workers per Household	1.31
Population Density (Pop/km ²)	1270

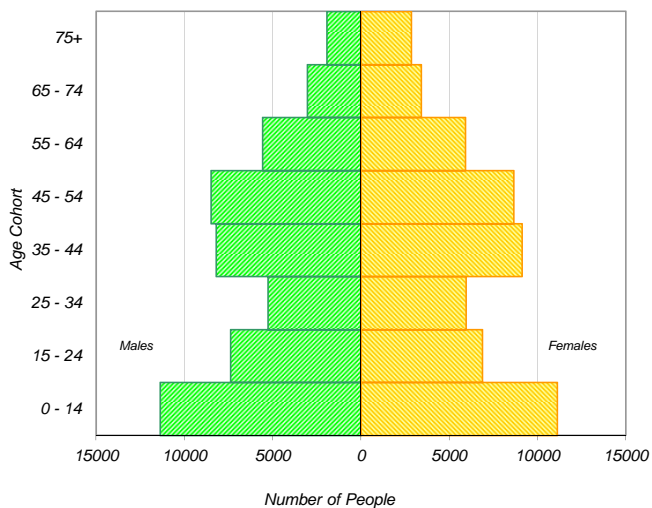


Household Size		
1 person	5,810	15%
2 persons	11,660	31%
3 persons	7,490	20%
4 persons	8,890	23%
5+ persons	4,160	11%
Total:	38,010	100%

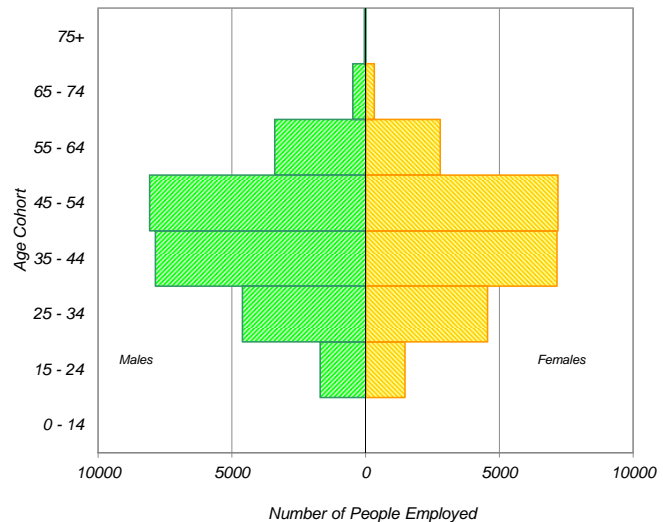
Households by Vehicle Availability		
0 vehicles	1,050	3%
1 vehicle	14,090	37%
2 vehicles	19,110	50%
3 vehicles	3,000	8%
4+ vehicles	770	2%
Total:	38,010	100%

Households by Dwelling Type		
Single-detached	21,610	57%
Semi-detached	3,890	10%
Townhouse	10,550	28%
Apartment/Condo	1,960	5%
Total:	38,010	100%

Population



Employed Population

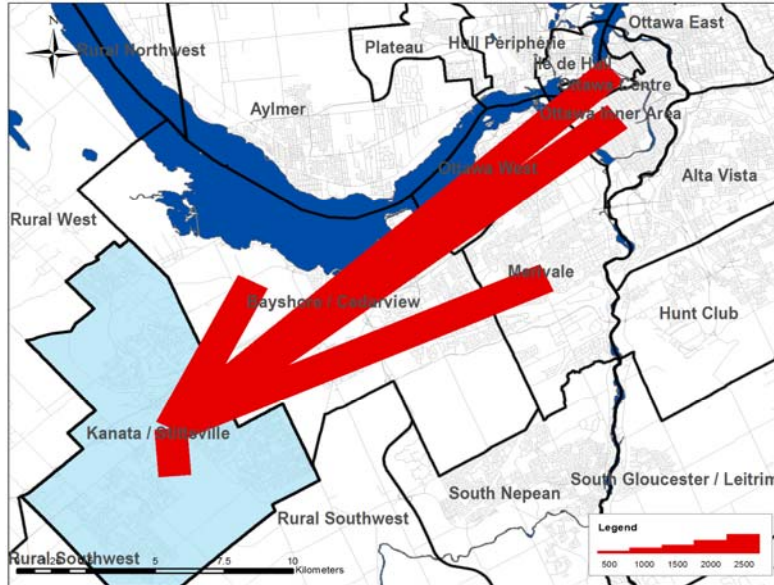


* In 2005 data was only collected for household members aged 11+ therefore these results cannot be compared to the 2011 data.

Travel Patterns

Top Five Destinations of Trips from Kanata - Stittsville

AM Peak Period



Summary of Trips to and from Kanata - Stittsville

AM Peak Period (6:30 - 8:59)

Districts	Destinations of Trips From		Origins of Trips To	
	District	% Total	District	% Total
Ottawa Centre	4,560	8%	140	0%
Ottawa Inner Area	3,350	6%	970	2%
Ottawa East	660	1%	260	1%
Beacon Hill	280	0%	170	0%
Alta Vista	1,810	3%	660	1%
Hunt Club	490	1%	420	1%
Merivale	3,410	6%	1,200	3%
Ottawa West	2,020	4%	840	2%
Bayshore / Cedarview	5,010	9%	2,420	5%
Orléans	290	1%	500	1%
Rural East	100	0%	30	0%
Rural Southeast	50	0%	260	1%
South Gloucester / Leitrim	60	0%	140	0%
South Nepean	690	1%	1,800	4%
Rural Southwest	1,130	2%	1,850	4%
Kanata / Stittsville	30,360	54%	30,360	66%
Rural West	1,050	2%	3,250	7%
Île de Hull	670	1%	30	0%
Hull Périphérie	160	0%	30	0%
Plateau	100	0%	230	0%
Aylmer	0	0%	190	0%
Rural Northwest	20	0%	60	0%
Pointe Gatineau	20	0%	80	0%
Gatineau Est	0	0%	60	0%
Rural Northeast	30	0%	50	0%
Buckingham / Masson-Angers	30	0%	10	0%
Ontario Sub-Total:	55,320	98%	45,270	98%
Québec Sub-Total:	1,030	2%	740	2%
Total:	56,350	100%	46,010	100%

Trips by Trip Purpose

24 Hours	From District		To District		Within District	
Work or related	27,180	29%	17,020	18%	14,550	9%
School	7,070	7%	2,500	3%	15,110	9%
Shopping	6,070	6%	9,150	10%	22,480	14%
Leisure	8,450	9%	10,590	11%	17,090	11%
Medical	2,520	3%	1,170	1%	2,660	2%
Pick-up / drive passenger	6,570	7%	5,470	6%	15,190	9%
Return Home	33,610	35%	45,620	48%	65,770	41%
Other	3,560	4%	3,590	4%	8,440	5%
Total:	95,030	100%	95,110	100%	161,290	100%

AM Peak (06:30 - 08:59)	From District		To District		Within District	
Work or related	18,030	69%	11,020	70%	7,430	24%
School	4,890	19%	2,280	15%	11,740	39%
Shopping	170	1%	320	2%	760	3%
Leisure	340	1%	400	3%	780	3%
Medical	330	1%	230	1%	350	1%
Pick-up / drive passenger	1,260	5%	580	4%	4,760	16%
Return Home	290	1%	380	2%	1,980	7%
Other	670	3%	430	3%	2,560	8%
Total:	25,980	100%	15,640	100%	30,360	100%

PM Peak (15:30 - 17:59)	From District		To District		Within District	
Work or related	390	2%	350	1%	930	2%
School	370	2%	0	0%	90	0%
Shopping	1,030	5%	1,910	7%	5,100	14%
Leisure	2,140	11%	3,080	11%	4,130	11%
Medical	230	1%	180	1%	400	1%
Pick-up / drive passenger	1,980	10%	1,980	7%	3,410	9%
Return Home	12,130	64%	20,550	71%	21,560	58%
Other	680	4%	860	3%	1,850	5%
Total:	18,950	100%	28,910	100%	37,470	100%

Peak Period (%)	Total:	% of 24 Hours	Within District (%)
24 Hours	351,430		46%
AM Peak Period	71,980	20%	42%
PM Peak Period	85,330	24%	44%

Trips by Primary Travel Mode

24 Hours	From District		To District		Within District	
Auto Driver	63,470	67%	63,830	67%	92,190	57%
Auto Passenger	15,220	16%	14,920	16%	31,880	20%
Transit	12,200	13%	12,270	13%	4,050	3%
Bicycle	360	0%	410	0%	960	1%
Walk	40	0%	50	0%	21,080	13%
Other	3,730	4%	3,660	4%	11,130	7%
Total:	95,020	100%	95,140	100%	161,290	100%

AM Peak (06:30 - 08:59)	From District		To District		Within District	
Auto Driver	15,360	59%	11,530	74%	13,630	45%
Auto Passenger	2,450	9%	1,160	7%	5,050	17%
Transit	6,230	24%	1,290	8%	1,210	4%
Bicycle	30	0%	80	1%	220	1%
Walk	0	0%	40	0%	5,730	19%
Other	1,900	7%	1,560	10%	4,510	15%
Total:	25,970	100%	15,660	100%	30,350	100%

PM Peak (15:30 - 17:59)	From District		To District		Within District	
Auto Driver	13,850	73%	17,660	61%	21,240	57%
Auto Passenger	3,240	17%	4,270	15%	8,570	23%
Transit	1,270	7%	5,980	21%	670	2%
Bicycle	40	0%	100	0%	260	1%
Walk	40	0%	0	0%	4,570	12%
Other	520	3%	910	3%	2,160	6%
Total:	18,960	100%	28,920	100%	37,470	100%

Avg Vehicle Occupancy	From District		To District		Within District	
24 Hours	1.24		1.23		1.35	
AM Peak Period	1.16		1.10		1.37	
PM Peak Period	1.23		1.24		1.40	

Transit Modal Split	From District		To District		Within District	
24 Hours	13%		13%		3%	
AM Peak Period	26%		9%		6%	
PM Peak Period	7%		21%		2%	

APPENDIX

D CRASH DATA





City Operations - Transportation Services

Collision Details Report - Public Version

From: January 1, 2014 **To:** December 31, 2018

Location: FRINGEWOOD DR btwn HAZELDEAN RD & CLOVERLOFT CRT

Traffic Control: No control

Total Collisions: 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2015-Jun-04, Thu,12:27	Clear	Turning movement	P.D. only	Dry	South	Making "U" turn	Pick-up truck	Other motor vehicle	
					South	Going ahead	Pick-up truck	Other motor vehicle	

Location: HAZELDEAN RD @ FRINGEWOOD DR

Traffic Control: Stop sign

Total Collisions: 7

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Sep-08, Mon,18:41	Clear	SMV other	Non-fatal injury	Dry	North	Turning left	Pick-up truck	Pedestrian	1
2015-Jun-22, Mon,16:55	Clear	Rear end	P.D. only	Dry	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2016-Jun-22, Wed,11:50	Clear	SMV other	P.D. only	Dry	North	Slowing or stopping	Pick-up truck	Ran off road	
2015-Aug-29, Sat,16:56	Rain	Turning movement	Non-fatal injury	Wet	West	Turning left	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2017-Jul-21, Fri,16:11	Clear	Angle	Non-fatal injury	Dry	West	Going ahead	Bicycle	Other motor vehicle	
					North	Turning right	Passenger van	Cyclist	

2018-Sep-11, Tue,12:39	Clear	Rear end	P.D. only	Wet	West	Going ahead	Automobile, station wagon	Other motor vehicle
					West	Stopped	Automobile, station wagon	Other motor vehicle

2018-Dec-21, Fri,15:10	Rain	Rear end	P.D. only	Wet	East	Turning left	Automobile, station wagon	Other motor vehicle
					East	Turning left	Automobile, station wagon	Other motor vehicle

Location: HAZELDEAN RD btwn CEDAROW CRT & FRINGEWOOD DR

Traffic Control: No control

Total Collisions: 2

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Sep-17, Wed,17:24	Clear	Rear end	P.D. only	Dry	West	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					West	Slowing or stopping	Automobile, station wagon	Other motor vehicle	

2015-Apr-18, Sat,10:47	Clear	Angle	P.D. only	Dry	South	Turning left	Automobile, station wagon	Cyclist
					East	Going ahead	Bicycle	Other motor vehicle

Location: HAZELDEAN RD btwn FRINGEWOOD DR & HUNTMAR DR

Traffic Control: No control

Total Collisions: 4

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Jan-09, Thu,17:44	Clear	Angle	P.D. only	Dry	South	Turning right	Unknown	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Mar-21, Fri,18:10	Clear	Sideswipe	P.D. only	Dry	West	Changing lanes	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	

2015-Feb-14, Sat,06:08	Snow	SMV other	P.D. only	Ice	East	Going ahead	Automobile, station wagon	Curb
2018-Apr-20, Fri,15:15	Clear	Angle	P.D. only	Dry	South	Turning right	Truck - tank	Other motor vehicle
					West	Going ahead	Pick-up truck	Other motor vehicle

Location: HAZELDEAN RD btwn SWEETNAM DR & CEDAROW CRT

Traffic Control: No control

Total Collisions: 2

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuvre	Vehicle type	First Event	No. Ped
2016-Dec-20, Tue,15:05	Clear	Rear end	Non-fatal injury	Wet	East	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Stopped	School bus	Other motor vehicle	
2018-Jul-19, Thu,13:33	Clear	Sideswipe	P.D. only	Dry	West	Pulling away from shoulder or curb	Pick-up truck	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	

APPENDIX

E TDM CHECKLIST



Introduction

The City of Ottawa's *Transportation Impact Assessment (TIA) Guidelines* (specifically Module 4.1—Development Design) requires proponents of qualifying developments to use the City's **TDM-Supportive Development Design and Infrastructure Checklist** to assess the opportunity to implement design elements that are supportive of sustainable modes. The goal of this assessment is to ensure that the development provides safe and efficient access for all users, while creating an environment that encourages walking, cycling and transit use.

The remaining sections of this document are:

- Using the Checklist
- Glossary
- TDM-Supportive Development Design and Infrastructure Checklist: Non-Residential Developments
- TDM-Supportive Development Design and Infrastructure Checklist: Residential Developments

Readers are encouraged to contact the City of Ottawa's TDM Officer for any guidance and assistance they require to complete this checklist.

Using the Checklist

This **TDM-Supportive Development Design and Infrastructure Checklist** document includes two actual checklists, one for non-residential developments (office, institutional, retail or industrial) and one for residential developments (multi-family or condominium only; subdivisions are exempt). Readers may download the applicable checklist in electronic format and complete it electronically, or print it out and complete it by hand. As an alternative, they may create a freestanding document that lists the design and infrastructure measures being proposed and provides additional detail on them.

Each measure in the checklist is numbered for easy reference. Each measure is also flagged as:

- **REQUIRED** —The Official Plan or Zoning By-law provides related guidance that must be followed.
- **BASIC** —The measure is generally feasible and effective, and in most cases would benefit the development and its users.
- **BETTER** —The measure could maximize support for users of sustainable modes, and optimize development performance.

Glossary

This glossary defines and describes the following measures that are identified in the **TDM-Supportive Development Design and Infrastructure Checklist**:

Walking & cycling: Routes

- Building location & access points
- Facilities for walking & cycling
- Amenities for walking & cycling

Walking & cycling: End-of-trip facilities

- Bicycle parking
- Secure bicycle parking
- Shower & change facilities
- Bicycle repair station

Transit

- Walking routes to transit
- Customer amenities

Ridesharing

- Pick-up & drop-off facilities
- Carpool parking

Carsharing & bikesharing

- Carshare parking spaces
- Bikeshare station location

Parking

- Number of parking spaces
- Separate long-term & short-term parking areas

Other

- On-site amenities to minimize off-site trips

In addition to specific references made in this glossary, readers should consult the City of Ottawa's design and planning guidelines for a variety of different land uses and contexts, available on the City's website at www.ottawa.ca. Readers may also find the following resources to be helpful:

- *Promoting Sustainable Transportation through Site Design*, Institute of Transportation Engineers, 2004 (www.cite7.org/wpdm-package/iterp-promoting-sustainable-transportation)
- *Bicycle End-of-Trip Facilities: A Guide for Canadian Municipalities and Employers*, Transport Canada, 2010 (www.fcm.ca/Documents/tools/GMF/Transport_Canada/BikeEndofTrip_EN.pdf)

► ***Walking & cycling: Routes***

Building location & access points. Correctly positioning buildings and their entrances can help make walking convenient, comfortable and safe. Minimizing travel distances and maximizing visibility are key.

Facilities for walking & cycling. The Official Plan gives clear direction on the provision and design of walking and cycling facilities for both access and circulation. On larger, busier sites (e.g. multi-building campuses) the inclusion of sidewalks, pathways, marked crossings, stop signs and traffic calming features can create a safer and more supportive environment for active transportation.

Amenities for walking & cycling. Lighting, landscaping, benches and wayfinding can make walking and cycling safer and more secure, comfortable and accessible.

► ***Walking & cycling: End-of-trip facilities***

Bicycle parking. The Official Plan and Zoning By-law both address the need for adequate bicycle parking at developments. Weather protection and theft prevention are major concerns for commuters who spend hundreds or thousands of dollars on a quality bicycle. Bicycle racks should have a design that enables secure locking while preventing damage to wheels. They should be located within sight of busy areas such as main building entrances or staffed parking kiosks.

Secure bicycle parking. Ottawa's Zoning By-law requires a secure area for bicycles at office or residential developments having more than 50 bicycle parking spaces. Lockable outdoor bike cages or indoor storage rooms that limit access to registered users are ideal.

Shower & change facilities. Longer-distance cyclists, joggers and even pedestrians can need a place to shower and change at work; the lack of such facilities is a major barrier to active commuting. Lockers and drying racks provide a place to store gear away from workspaces, and showers and grooming stations allow commuters to make themselves presentable for the office.

Bicycle repair station. Cycling commuters can experience maintenance issues that make the homeward trip difficult or impossible. A small supply of tools (e.g. air pump, Allen keys, wrenches) and supplies (e.g. inner tube patches, chain lubricant) in the workplace can help.

► ***Transit***

Customer amenities. Larger developments that feature an on-site transit stop can make transit use more attractive by providing shelters, lighting and benches. Even better, they could integrate the passenger waiting area into a building entrance.

► **Ridesharing**

Pick-up & drop-off facilities. Having a safe place to load or unload passengers (for carpools as well as taxis and ride-hailing services) without obstructing pedestrians, cyclists or other vehicles can help make carpooling work.

Carpool parking. At destinations with large parking lots (or lots that regularly fill to capacity), signed priority carpool parking spaces can be an effective ridesharing incentive. Priority spaces are frequently abused by non-carpoolers, so a system to provide registered users with vehicle identification tags is recommended.

► **Carsharing & bikesharing**

Carshare parking spaces. For developments where carsharing could be an attractive option for employees, visitors or residents, ensuring an attractive location for future carshare parking spaces can avoid challenges associated with future retrofits.

Bikeshare station location. For developments where bikesharing could be an attractive option for employees, visitor or residents, ensuring an attractive location for a future bikeshare station can avoid challenges associated with future retrofits.

► **Parking**

Number of parking spaces. Parking capacity is an important variable in development design, as it can either support or subvert the mode share targets set during the transportation impact analysis (TIA). While the Zoning By-law establishes any minimum and/or maximum requirements for parking capacity, it also allows a reduction in any minimum to reflect the existence of on-site shower, change and locker rooms provided for cyclists.

Separate long-term & short-term parking areas. Because access to unused parking spaces can be a powerful incentive to drive, developments can better manage their parking supply and travel behaviours by separating long-term from short-term parking through the use of landscaping, gated controls or signs. Doing so makes it difficult for long-term parkers (e.g. commuters) to park in short-term areas (e.g. for visitors) as long as enforcement occurs; it also protects long-term parking capacity for its intended users.

► **Other**

On-site amenities to minimize off-site trips. Developments that offer facilities to limit employees' need for a car during their commute (e.g. to drop off children at daycare) or during their workday (e.g. to hit the gym) can free employees to make the commuting decision that otherwise works best for them.

TDM-Supportive Development Design and Infrastructure Checklist: *Non-Residential Developments (office, institutional, retail or industrial)*

Legend	
REQUIRED	The Official Plan or Zoning By-law provides related guidance that must be followed
BASIC	The measure is generally feasible and effective, and in most cases would benefit the development and its users
BETTER	The measure could maximize support for users of sustainable modes, and optimize development performance

TDM-supportive design & infrastructure measures: <i>Non-residential developments</i>		Check if completed & add descriptions, explanations or plan/drawing references
1. WALKING & CYCLING: ROUTES		
1.1 Building location & access points		
BASIC	1.1.1 Locate building close to the street, and do not locate parking areas between the street and building entrances	<input checked="" type="checkbox"/>
BASIC	1.1.2 Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations	<input checked="" type="checkbox"/>
BASIC	1.1.3 Locate building doors and windows to ensure visibility of pedestrians from the building, for their security and comfort	<input checked="" type="checkbox"/>
1.2 Facilities for walking & cycling		
REQUIRED	1.2.1 Provide convenient, direct access to stations or major stops along rapid transit routes within 600 metres; minimize walking distances from buildings to rapid transit; provide pedestrian-friendly, weather-protected (where possible) environment between rapid transit accesses and building entrances; ensure quality linkages from sidewalks through building entrances to integrated stops/stations (<i>see Official Plan policy 4.3.3</i>)	<input type="checkbox"/>
REQUIRED	1.2.2 Provide safe, direct and attractive pedestrian access from public sidewalks to building entrances through such measures as: reducing distances between public sidewalks and major building entrances; providing walkways from public streets to major building entrances; within a site, providing walkways along the front of adjoining buildings, between adjacent buildings, and connecting areas where people may congregate, such as courtyards and transit stops; and providing weather protection through canopies, colonnades, and other design elements wherever possible (<i>see Official Plan policy 4.3.12</i>)	<input checked="" type="checkbox"/>

TDM-supportive design & infrastructure measures: <i>Non-residential developments</i>		Check if completed & add descriptions, explanations or plan/drawing references
REQUIRED	1.2.3 Provide sidewalks of smooth, well-drained walking surfaces of contrasting materials or treatments to differentiate pedestrian areas from vehicle areas, and provide marked pedestrian crosswalks at intersection sidewalks (<i>see Official Plan policy 4.3.10</i>)	<input checked="" type="checkbox"/>
REQUIRED	1.2.4 Make sidewalks and open space areas easily accessible through features such as gradual grade transition, depressed curbs at street corners and convenient access to extra-wide parking spaces and ramps (<i>see Official Plan policy 4.3.10</i>)	<input checked="" type="checkbox"/>
REQUIRED	1.2.5 Include adequately spaced inter-block/street cycling and pedestrian connections to facilitate travel by active transportation. Provide links to the existing or planned network of public sidewalks, multi-use pathways and on-road cycle routes. Where public sidewalks and multi-use pathways intersect with roads, consider providing traffic control devices to give priority to cyclists and pedestrians (<i>see Official Plan policy 4.3.11</i>)	<input type="checkbox"/>
BASIC	1.2.6 Provide safe, direct and attractive walking routes from building entrances to nearby transit stops	<input type="checkbox"/>
BASIC	1.2.7 Ensure that walking routes to transit stops are secure, visible, lighted, shaded and wind-protected wherever possible	<input type="checkbox"/>
BASIC	1.2.8 Design roads used for access or circulation by cyclists using a target operating speed of no more than 30 km/h, or provide a separated cycling facility	<input type="checkbox"/>
1.3 Amenities for walking & cycling		
BASIC	1.3.1 Provide lighting, landscaping and benches along walking and cycling routes between building entrances and streets, sidewalks and trails	<input type="checkbox"/>
BASIC	1.3.2 Provide wayfinding signage for site access (where required, e.g. when multiple buildings or entrances exist) and egress (where warranted, such as when directions to reach transit stops/stations, trails or other common destinations are not obvious)	<input type="checkbox"/>

TDM-supportive design & infrastructure measures: <i>Non-residential developments</i>		Check if completed & add descriptions, explanations or plan/drawing references
2. WALKING & CYCLING: END-OF-TRIP FACILITIES		
2.1 Bicycle parking		
REQUIRED	2.1.1 Provide bicycle parking in highly visible and lighted areas, sheltered from the weather wherever possible (<i>see Official Plan policy 4.3.6</i>)	<input checked="" type="checkbox"/>
REQUIRED	2.1.2 Provide the number of bicycle parking spaces specified for various land uses in different parts of Ottawa; provide convenient access to main entrances or well-used areas (<i>see Zoning By-law Section 111</i>)	<input checked="" type="checkbox"/>
REQUIRED	2.1.3 Ensure that bicycle parking spaces and access aisles meet minimum dimensions; that no more than 50% of spaces are vertical spaces; and that parking racks are securely anchored (<i>see Zoning By-law Section 111</i>)	<input type="checkbox"/>
BASIC	2.1.4 Provide bicycle parking spaces equivalent to the expected number of commuter cyclists (assuming the cycling mode share target is met), plus the expected peak number of customer/visitor cyclists	<input checked="" type="checkbox"/>
BETTER	2.1.5 Provide bicycle parking spaces equivalent to the expected number of commuter and customer/visitor cyclists, plus an additional buffer (e.g. 25 percent extra) to encourage other cyclists and ensure adequate capacity in peak cycling season	<input type="checkbox"/>
2.2 Secure bicycle parking		
REQUIRED	2.2.1 Where more than 50 bicycle parking spaces are provided for a single office building, locate at least 25% of spaces within a building/structure, a secure area (e.g. supervised parking lot or enclosure) or bicycle lockers (<i>see Zoning By-law Section 111</i>)	<input type="checkbox"/>
BETTER	2.2.2 Provide secure bicycle parking spaces equivalent to the expected number of commuter cyclists (assuming the cycling mode share target is met)	<input type="checkbox"/>
2.3 Shower & change facilities		
BASIC	2.3.1 Provide shower and change facilities for the use of active commuters	<input type="checkbox"/>
BETTER	2.3.2 In addition to shower and change facilities, provide dedicated lockers, grooming stations, drying racks and laundry facilities for the use of active commuters	<input type="checkbox"/>
2.4 Bicycle repair station		
BETTER	2.4.1 Provide a permanent bike repair station, with commonly used tools and an air pump, adjacent to the main bicycle parking area (or secure bicycle parking area, if provided)	<input type="checkbox"/>

TDM-supportive design & infrastructure measures: <i>Non-residential developments</i>		Check if completed & add descriptions, explanations or plan/drawing references
3. TRANSIT		
3.1 Customer amenities		
BASIC	3.1.1 Provide shelters, lighting and benches at any on-site transit stops	<input type="checkbox"/>
BASIC	3.1.2 Where the site abuts an off-site transit stop and insufficient space exists for a transit shelter in the public right-of-way, protect land for a shelter and/or install a shelter	<input type="checkbox"/> N/A
BETTER	3.1.3 Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	<input type="checkbox"/>
4. RIDESHARING		
4.1 Pick-up & drop-off facilities		
BASIC	4.1.1 Provide a designated area for carpool drivers (plus taxis and ride-hailing services) to drop off or pick up passengers without using fire lanes or other no-stopping zones	<input type="checkbox"/>
4.2 Carpool parking		N/A
BASIC	4.2.1 Provide signed parking spaces for carpools in a priority location close to a major building entrance, sufficient in number to accommodate the mode share target for carpools	<input type="checkbox"/>
BETTER	4.2.2 At large developments, provide spaces for carpools in a separate, access-controlled parking area to simplify enforcement	<input type="checkbox"/>
5. CARSHARING & BIKESHARING		
5.1 Carshare parking spaces		
BETTER	5.1.1 Provide carshare parking spaces in permitted non-residential zones, occupying either required or provided parking spaces (<i>see Zoning By-law Section 94</i>)	<input type="checkbox"/> N/A
5.2 Bikeshare station location		
BETTER	5.2.1 Provide a designated bikeshare station area near a major building entrance, preferably lighted and sheltered with a direct walkway connection	<input type="checkbox"/>

TDM-supportive design & infrastructure measures: <i>Non-residential developments</i>		Check if completed & add descriptions, explanations or plan/drawing references
6. PARKING		
6.1 Number of parking spaces		
REQUIRED	6.1.1 Do not provide more parking than permitted by zoning, nor less than required by zoning, unless a variance is being applied for	<input checked="" type="checkbox"/>
BASIC	6.1.2 Provide parking for long-term and short-term users that is consistent with mode share targets, considering the potential for visitors to use off-site public parking	<input type="checkbox"/>
BASIC	6.1.3 Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly (<i>see Zoning By-law Section 104</i>)	<input type="checkbox"/>
BETTER	6.1.4 Reduce the minimum number of parking spaces required by zoning by one space for each 13 square metres of gross floor area provided as shower rooms, change rooms, locker rooms and other facilities for cyclists in conjunction with bicycle parking (<i>see Zoning By-law Section 111</i>)	<input type="checkbox"/>
6.2 Separate long-term & short-term parking areas		
BETTER	6.2.1 Separate short-term and long-term parking areas using signage or physical barriers, to permit access controls and simplify enforcement (i.e. to discourage employees from parking in visitor spaces, and vice versa)	<input type="checkbox"/>
7. OTHER		
7.1 On-site amenities to minimize off-site trips		
BETTER	7.1.1 Provide on-site amenities to minimize mid-day or mid-commute errands	<input type="checkbox"/>

APPENDIX

F AUTOTURN SWEEP PATH

[illegible]

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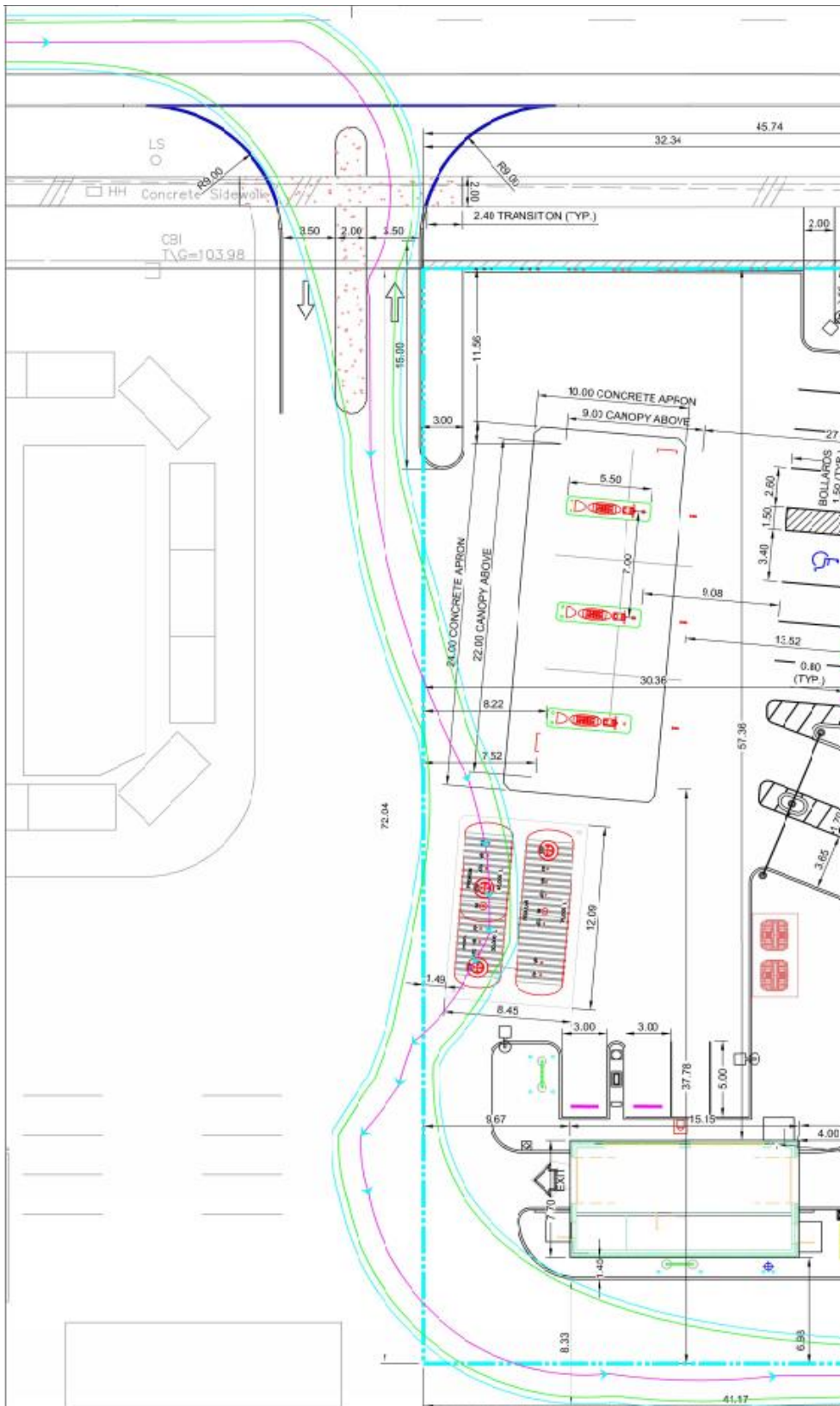


Figure 6. Fueling Truck (Alberta INFTRA-HGDG) Circulating Through Site (Hazeldean Entrance) – 1

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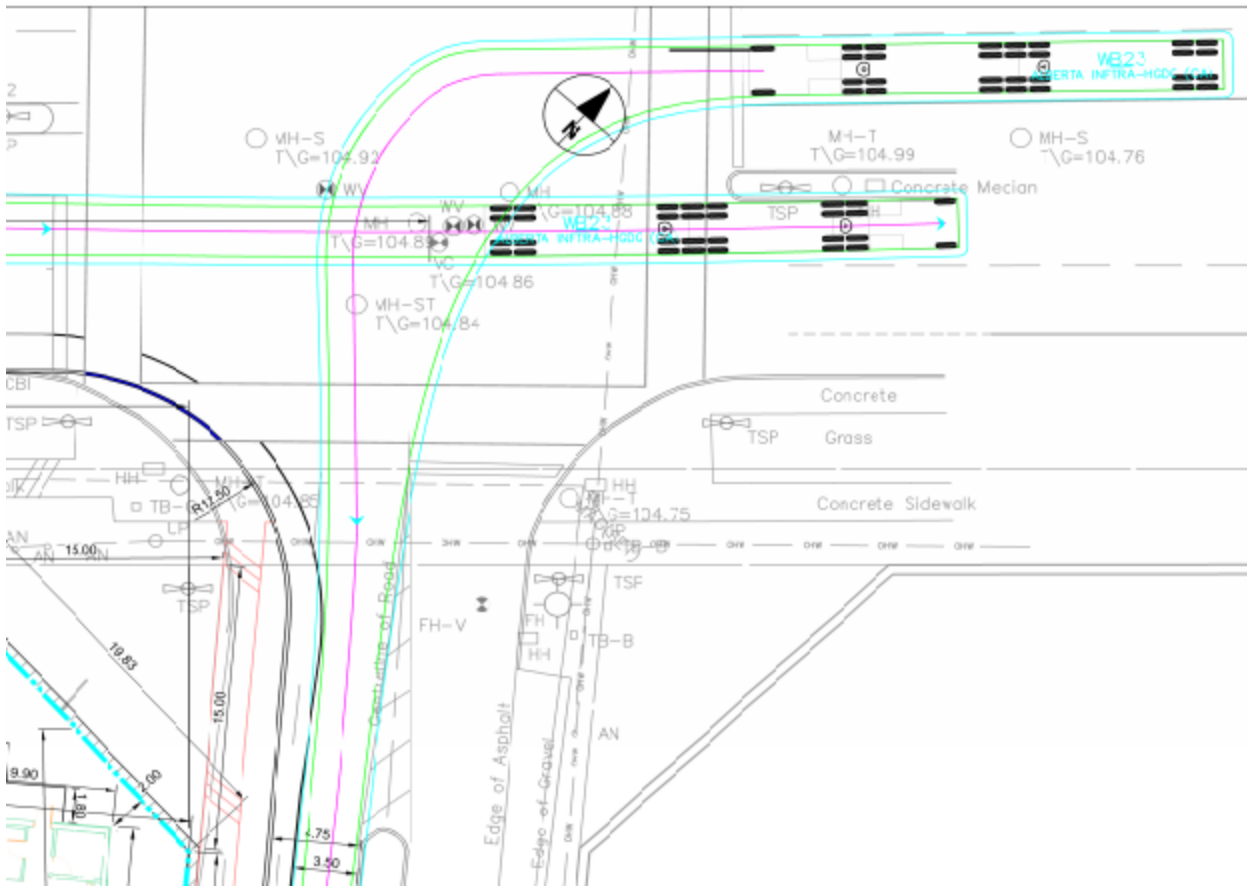


Figure 9. Fueling Truck (Alberta INFTRA-HGDG) Circulating Through Site (Fringewood Entrance) -1

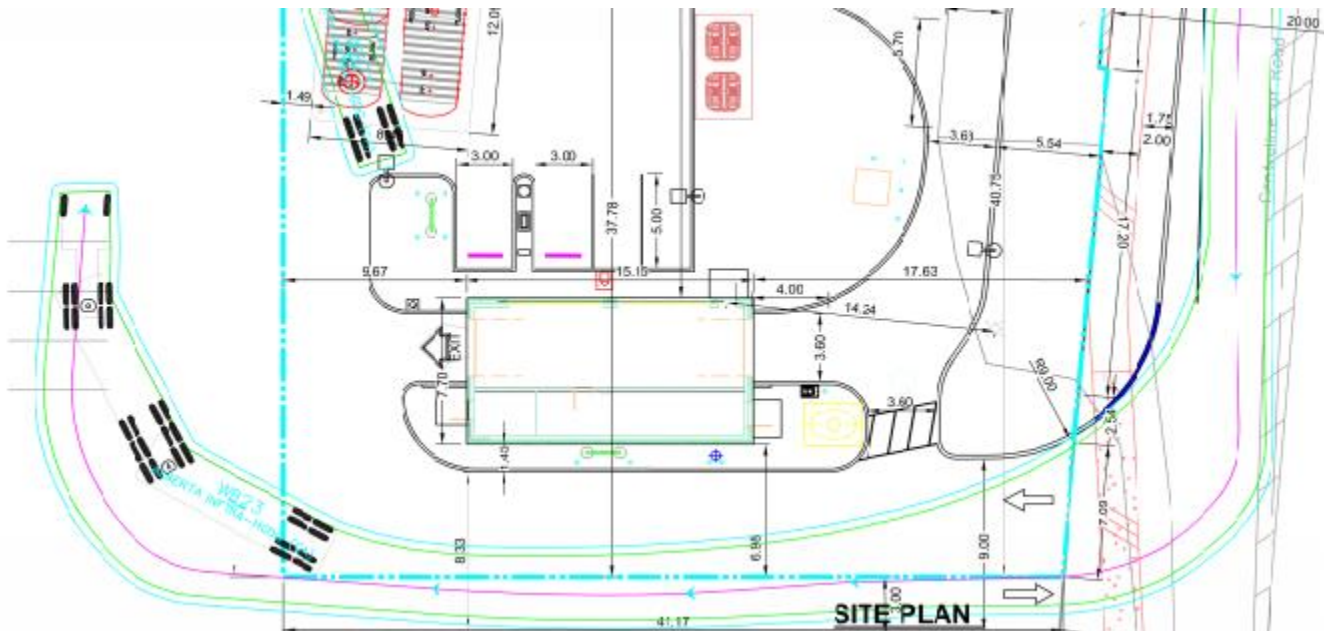


Figure 10. Fueling Truck (Alberta INFTRA-HGDG) Circulating Through Site (Fringewood Entrance) -2

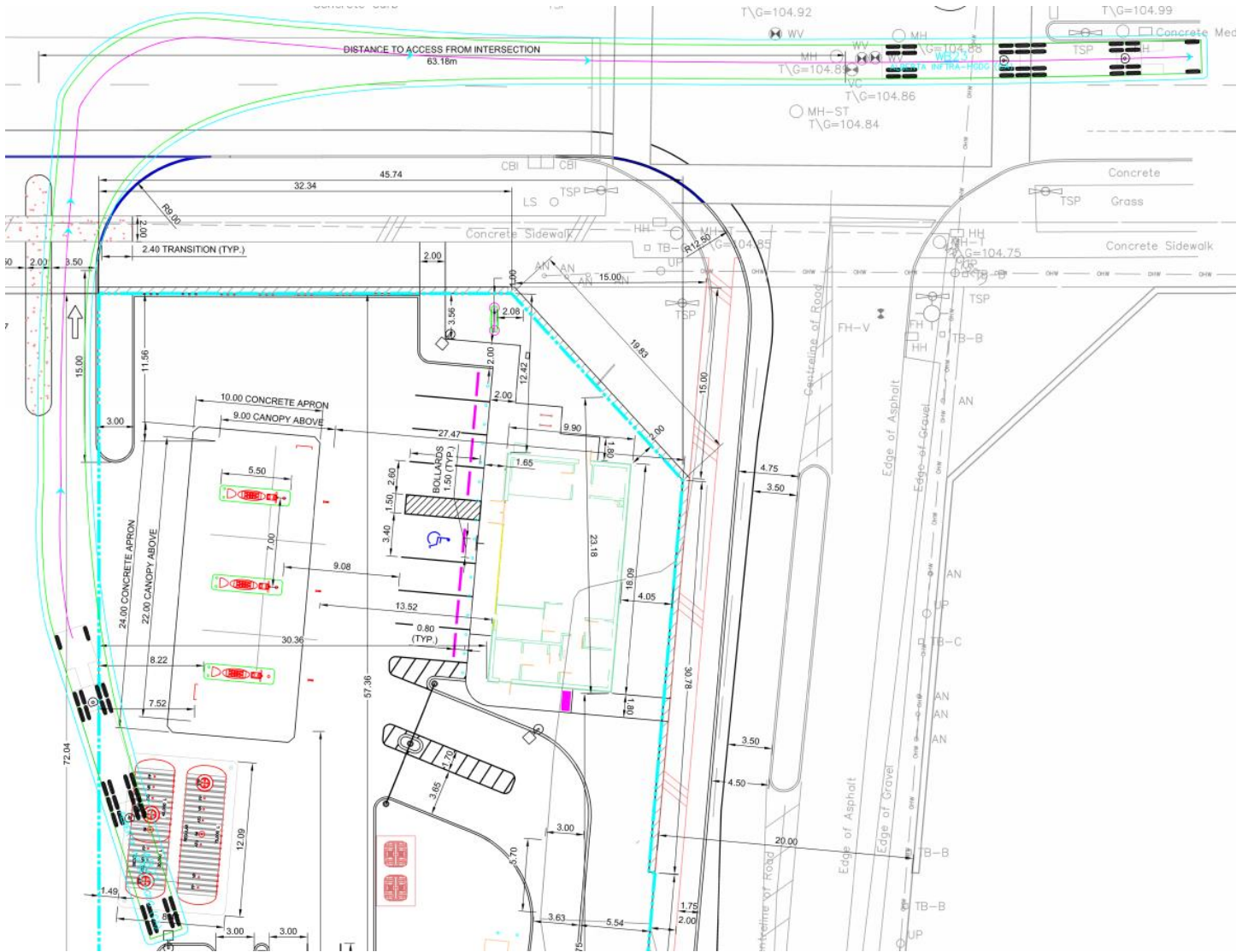


Figure 11. Fueling Truck (Alberta INFTRA-HGDG) Circulating Through Site (Fringewood Entrance) -3

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APPENDIX

G SIGNAL WORKSHEET



SCENARIO	Future Total	YEAR	2025
MAJOR ROAD	Hazeldean Drive	MINOR ROAD	Shell Access
FLOW TYPE	Restricted	ROAD TYPE	1 Lane
NEW ROAD / INT.	Yes	"T" INT.	Yes

JUSTIFICATION 7	MINIMUM REQUIREMENT			COMPLIANCE	
	FLOW	ADJ. FLOW	AHV	%	OVERALL %
1A - All Approaches	470	705	576	82%	7%
1B - Minor Road	120	270	19	7%	
2A - Major Road	480	720	538	75%	0%
2B - Crossing Major Road	50	75	0	0%	

SCENARIO	Future Total	YEAR	2025
MAJOR ROAD	Fringewood Avenue	MINOR ROAD	Shell Access
FLOW TYPE	Restricted	ROAD TYPE	1 Lane
NEW ROAD / INT.	Yes	"T" INT.	Yes

JUSTIFICATION 7	MINIMUM REQUIREMENT			COMPLIANCE	
	FLOW	ADJ. FLOW	AHV	%	OVERALL %
1A - All Approaches	470	705	144	20%	9%
1B - Minor Road	120	270	24	9%	
2A - Major Road	480	720	120	17%	17%
2B - Crossing Major Road	50	75	24	32%	

APPENDIX

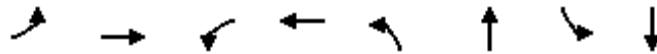
H SYNCHRO



Timings

5 Orchard Drive TIA

3: Victor St/Johnwoods St & Hazeldean Rd



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	53	969	13	463	28	3	34	4
Future Volume (vph)	53	969	13	463	28	3	34	4
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases	6	1	2	5		3		7
Permitted Phases	1		5		3		7	
Detector Phase	6	1	2	5	3	3	7	7
Switch Phase								
Minimum Initial (s)	1.0	5.0	1.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	7.1	27.1	7.1	27.1	30.6	30.6	30.6	30.6
Total Split (s)	15.0	63.0	15.0	63.0	37.0	37.0	37.0	37.0
Total Split (%)	13.0%	54.8%	13.0%	54.8%	32.2%	32.2%	32.2%	32.2%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.0	3.0	3.0
All-Red Time (s)	2.4	2.4	2.4	2.4	3.6	3.6	3.6	3.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				
Recall Mode	None	C-Max	None	C-Max	None	None	None	None

Intersection Summary

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 105 (91%), Referenced to phase 1:EBTL and 5:WBTL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated





















Splits and Phases: 3: Victor St/Johnwoods St & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis

3: Victor St/Johnwoods St & Hazeldean Rd

















5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	53	969	15	13	463	29	28	3	26	34	4	89
Future Volume (vph)	53	969	15	13	463	29	28	3	26	34	4	89
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.1	6.1		6.1	6.1		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.86		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1565	3308		1565	3287		1565	1508		1565	1493	
Flt Permitted	0.43	1.00		0.24	1.00		0.69	1.00		0.74	1.00	
Satd. Flow (perm)	711	3308		402	3287		1137	1508		1213	1493	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	59	1077	17	14	514	32	31	3	29	38	4	99
RTOR Reduction (vph)	0	1	0	0	2	0	0	27	0	0	91	0
Lane Group Flow (vph)	59	1093	0	14	544	0	31	5	0	38	12	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	6	1		2	5			3			7	
Permitted Phases	1			5			3			7		
Actuated Green, G (s)	90.0	84.7		84.2	81.8		9.1	9.1		9.1	9.1	
Effective Green, g (s)	90.0	84.7		84.2	81.8		9.1	9.1		9.1	9.1	
Actuated g/C Ratio	0.78	0.74		0.73	0.71		0.08	0.08		0.08	0.08	
Clearance Time (s)	6.1	6.1		6.1	6.1		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	595	2436		318	2338		89	119		95	118	
v/s Ratio Prot	c0.00	c0.33		0.00	0.17			0.00			0.01	
v/s Ratio Perm	0.07			0.03			0.03			c0.03		
v/c Ratio	0.10	0.45		0.04	0.23		0.35	0.04		0.40	0.10	
Uniform Delay, d1	2.9	6.0		4.3	5.7		50.1	48.9		50.4	49.2	
Progression Factor	1.00	1.00		0.19	0.38		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.6		0.1	0.2		2.4	0.2		2.8	0.4	
Delay (s)	2.9	6.6		0.9	2.4		52.5	49.1		53.1	49.5	
Level of Service	A	A		A	A		D	D		D	D	
Approach Delay (s)		6.4			2.4			50.8			50.5	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay	9.9			HCM 2000 Level of Service			A					
HCM 2000 Volume to Capacity ratio	0.44											
Actuated Cycle Length (s)	115.0			Sum of lost time (s)			18.8					
Intersection Capacity Utilization	56.4%			ICU Level of Service			B					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
















6: Hazeldean Rd & Cedarow Crt

5 Orchard Drive TIA

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (veh/h)	12	909	2	1	606	18	0	0	0	21	1	9	
Future Volume (Veh/h)	12	909	2	1	606	18	0	0	0	21	1	9	
Sign Control	Free				Free				Stop				
Grade	0%				0%				0%				
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	
Hourly flow rate (vph)	13	1010	2	1	673	20	0	0	0	23	1	10	
Pedestrians													
Lane Width (m)													
Walking Speed (m/s)													
Percent Blockage													
Right turn flare (veh)													
Median type	TWLTL				None								
Median storage veh	2												
Upstream signal (m)					249								
pX, platoon unblocked	0.99							0.99	0.99			0.99	
vC, conflicting volume	693				1012				1386	1732	506	1216	
vC1, stage 1 conf vol							1037	1037			685	685	
vC2, stage 2 conf vol							349	695			531	1038	
vCu, unblocked vol	671				1012				1371	1720	506	1199	
tC, single (s)	4.1				4.1				7.5	6.5	6.9	7.5	
tC, 2 stage (s)							6.5	5.5			6.5	5.5	
tF (s)	2.2				2.2				3.5	4.0	3.3	3.5	
p0 queue free %	99				100				100	100	100	93	
cM capacity (veh/h)	907				681				230	255	512	335	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1							
Volume Total	13	673	339	338	356	34							
Volume Left	13	0	0	1	0	23							
Volume Right	0	0	2	0	20	10							
cSH	907	1700	1700	681	1700	388							
Volume to Capacity	0.01	0.40	0.20	0.00	0.21	0.09							
Queue Length 95th (m)	0.3	0.0	0.0	0.0	0.0	2.2							
Control Delay (s)	9.0	0.0	0.0	0.0	0.0	15.2							
Lane LOS	A				A	C							
Approach Delay (s)	0.1				0.0	15.2							
Approach LOS							C						
Intersection Summary													
Average Delay				0.4									
Intersection Capacity Utilization				36.6%	ICU Level of Service				A				
Analysis Period (min)				15									

Timings 9: Fringewood Dr & Hazeldean Rd

5 Orchard Drive TIA

									
Lane Group	EBL	EBT	WBT	WBR	NBL	NBT	SBL	SBT	Ø5
Lane Configurations									
Traffic Volume (vph)	4	814	659	2	16	0	5	1	
Future Volume (vph)	4	814	659	2	16	0	5	1	
Turn Type	Perm	NA	NA	Perm	Perm	NA	Perm	NA	
Protected Phases		6	2			3		7	5
Permitted Phases	6			2	3		7		
Detector Phase	6	6	2	2	3	3	7	7	
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	32.2	32.2	32.1	32.1	34.9	34.9	34.9	34.9	10.9
Total Split (s)	64.0	64.0	79.0	79.0	36.0	36.0	36.0	36.0	15.0
Total Split (%)	55.7%	55.7%	68.7%	68.7%	31.3%	31.3%	31.3%	31.3%	13%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.0	3.0	3.0	3.5
All-Red Time (s)	2.5	2.5	2.4	2.4	3.9	3.9	3.9	3.9	2.4
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	
Total Lost Time (s)	6.2	6.2	6.1	6.1		6.9		6.9	
Lead/Lag	Lag	Lag							Lead
Lead-Lag Optimize?									Yes
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None

Intersection Summary

Cycle Length: 115

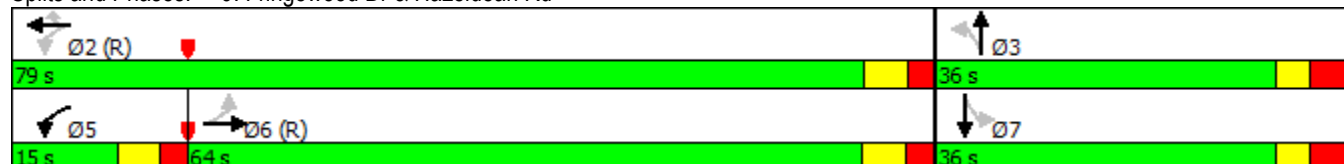
Actuated Cycle Length: 115

Offset: 52 (45%), Referenced to phase 2:WBTL and 6:EBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated




















Splits and Phases: 9: Fringewood Dr & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis



























9: Fringewood Dr & Hazeldean Rd

5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	814	1	0	659	2	16	0	51	5	1	4
Future Volume (vph)	4	814	1	0	659	2	16	0	51	5	1	4
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.2	6.2			6.1	6.1		6.9			6.9	
Lane Util. Factor	1.00	0.95			0.95	1.00		1.00			1.00	
Frt	1.00	1.00			1.00	0.85		0.90			0.95	
Flt Protected	0.95	1.00			1.00	1.00		0.99			0.97	
Satd. Flow (prot)	1565	3315			3316	1400		1547			1615	
Flt Permitted	0.37	1.00			1.00	1.00		0.91			0.85	
Satd. Flow (perm)	615	3315			3316	1400		1432			1416	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	4	904	1	0	732	2	18	0	57	6	1	4
RTOR Reduction (vph)	0	0	0	0	0	0	0	71	0	0	4	0
Lane Group Flow (vph)	4	905	0	0	732	2	0	4	0	0	7	0
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		6		5	2			3			7	
Permitted Phases	6			2		2	3			7		
Actuated Green, G (s)	96.3	96.3			96.4	96.4		5.6			5.6	
Effective Green, g (s)	96.3	96.3			96.4	96.4		5.6			5.6	
Actuated g/C Ratio	0.84	0.84			0.84	0.84		0.05			0.05	
Clearance Time (s)	6.2	6.2			6.1	6.1		6.9			6.9	
Vehicle Extension (s)	3.0	3.0			3.0	3.0		3.0			3.0	
Lane Grp Cap (vph)	514	2775			2779	1173		69			68	
v/s Ratio Prot		c0.27			0.22							
v/s Ratio Perm	0.01					0.00		0.00			c0.01	
v/c Ratio	0.01	0.33			0.26	0.00		0.05			0.11	
Uniform Delay, d1	1.5	2.1			1.9	1.5		52.2			52.3	
Progression Factor	0.17	0.43			0.45	1.00		1.00			1.00	
Incremental Delay, d2	0.0	0.3			0.2	0.0		0.3			0.7	
Delay (s)	0.3	1.2			1.1	1.5		52.5			53.0	
Level of Service	A	A			A	A		D			D	
Approach Delay (s)		1.2			1.1			52.5			53.0	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay			3.7				HCM 2000 Level of Service			A		
HCM 2000 Volume to Capacity ratio			0.33									
Actuated Cycle Length (s)			115.0				Sum of lost time (s)			19.0		
Intersection Capacity Utilization			39.2%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

Timings
12: Iber Rd/Huntmar Dr & Hazeldean Rd

5 Orchard Drive TIA

												
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø6
Lane Configurations	 	 	 	 								
Traffic Volume (vph)	198	665	162	396	81	47	234	245	116	211	112	
Future Volume (vph)	198	665	162	396	81	47	234	245	116	211	112	
Turn Type	Prot	NA	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	
Protected Phases	6 9	1	2	5		3	8		7	4		6
Permitted Phases					5	8		8	4		4	
Detector Phase	6 9	1	2	5	5	3	8	8	7	4	4	
Switch Phase												
Minimum Initial (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)		49.0	11.3	37.0	37.0	11.1	24.6	24.6	11.1	24.6	24.6	11.5
Total Split (s)		49.0	14.0	37.0	37.0	12.0	40.0	40.0	12.0	40.0	40.0	14.0
Total Split (%)		42.6%	12.2%	32.2%	32.2%	10.4%	34.8%	34.8%	10.4%	34.8%	34.8%	12%
Yellow Time (s)		3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.7
All-Red Time (s)		2.6	2.8	2.6	2.6	2.6	2.9	2.9	2.6	2.9	2.9	2.8
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.3	6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6	
Lead/Lag		Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead
Lead-Lag Optimize?		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode		C-Max	None	C-Max	C-Max	None	None	None	None	None	None	None

Intersection Summary

Cycle Length: 115

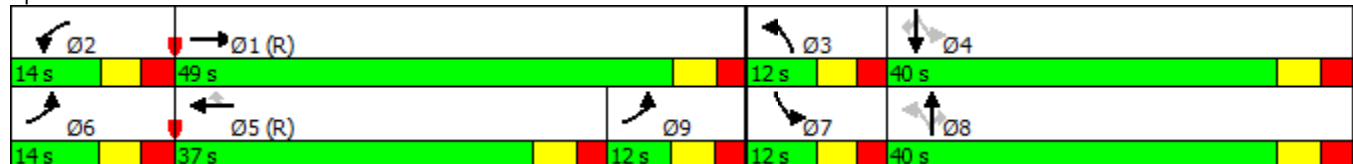
Actuated Cycle Length: 115

Offset: 62 (54%), Referenced to phase 1:EBT and 5:WBT, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Splits and Phases: 12: Iber Rd/Huntmar Dr & Hazeldean Rd


























Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	11.5
Total Split (s)	12.0
Total Split (%)	10%
Yellow Time (s)	3.7
All-Red Time (s)	2.8
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

12: Iber Rd/Huntmar Dr & Hazeldean Rd

















5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	198	665	108	162	396	81	47	234	245	116	211	112
Future Volume (vph)	198	665	108	162	396	81	47	234	245	116	211	112
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.5	6.3		6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Lane Util. Factor	0.97	0.95		0.97	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3036	3246		3036	3316	1400	1565	1745	1400	1565	1745	1400
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.47	1.00	1.00	0.36	1.00	1.00
Satd. Flow (perm)	3036	3246		3036	3316	1400	776	1745	1400	600	1745	1400
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	220	739	120	180	440	90	52	260	272	129	234	124
RTOR Reduction (vph)	0	11	0	0	0	60	0	0	212	0	0	97
Lane Group Flow (vph)	220	848	0	180	440	30	52	260	60	129	234	27
Turn Type	Prot	NA		Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	6.9	1		2	5		3	8		7	4	
Permitted Phases						5	8		8	4		4
Actuated Green, G (s)	14.4	47.8		11.8	38.5	38.5	28.9	24.2	24.2	31.3	25.4	25.4
Effective Green, g (s)	14.4	47.8		11.8	38.5	38.5	28.9	24.2	24.2	31.3	25.4	25.4
Actuated g/C Ratio	0.13	0.42		0.10	0.33	0.33	0.25	0.21	0.21	0.27	0.22	0.22
Clearance Time (s)		6.3		6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	380	1349		311	1110	468	227	367	294	212	385	309
v/s Ratio Prot	0.07	c0.26		c0.06	c0.13		0.01	c0.15		c0.03	0.13	
v/s Ratio Perm						0.02	0.05		0.04	0.13		0.02
v/c Ratio	0.58	0.63		0.58	0.40	0.06	0.23	0.71	0.21	0.61	0.61	0.09
Uniform Delay, d1	47.4	26.6		49.2	29.3	26.0	33.5	42.1	37.5	35.6	40.3	35.6
Progression Factor	0.94	0.85		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.1	2.2		2.6	1.1	0.3	0.5	6.1	0.3	4.9	2.7	0.1
Delay (s)	46.9	24.7		51.8	30.4	26.3	34.0	48.3	37.8	40.4	43.0	35.7
Level of Service	D	C		D	C	C	C	D	D	D	D	D
Approach Delay (s)		29.2			35.3			42.1			40.5	
Approach LOS		C			D			D			D	
Intersection Summary												
HCM 2000 Control Delay			35.3			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.69									
Actuated Cycle Length (s)			115.0			Sum of lost time (s)			32.0			
Intersection Capacity Utilization			68.8%			ICU Level of Service				C		
Analysis Period (min)			15									
c Critical Lane Group												

Timings

5 Orchard Drive TIA

3: Victor St/Johnwoods St & Hazeldean Rd

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	101	888	35	1262	22	1	40	3
Future Volume (vph)	101	888	35	1262	22	1	40	3
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases	6	1	2	5		3		7
Permitted Phases	1		5		3		7	
Detector Phase	6	1	2	5	3	3	7	7
Switch Phase								
Minimum Initial (s)	1.0	5.0	1.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	7.1	27.1	7.1	27.1	30.6	30.6	30.6	30.6
Total Split (s)	14.0	69.0	14.0	69.0	37.0	37.0	37.0	37.0
Total Split (%)	11.7%	57.5%	11.7%	57.5%	30.8%	30.8%	30.8%	30.8%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.0	3.0	3.0
All-Red Time (s)	2.4	2.4	2.4	2.4	3.6	3.6	3.6	3.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
Act Effct Green (s)	96.1	90.0	88.9	82.8	9.7	9.7	9.7	9.7
Actuated g/C Ratio	0.80	0.75	0.74	0.69	0.08	0.08	0.08	0.08
v/c Ratio	0.43	0.41	0.10	0.65	0.38	0.12	0.44	0.57
Control Delay	7.8	7.0	2.1	4.6	66.9	23.7	65.2	18.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.8	7.0	2.1	4.6	66.9	23.7	65.2	18.2
LOS	A	A	A	A	E	C	E	B
Approach Delay		7.1		4.5		49.0		29.5
Approach LOS		A		A		D		C

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 74 (62%), Referenced to phase 1:EBTL and 5:WBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 7.8

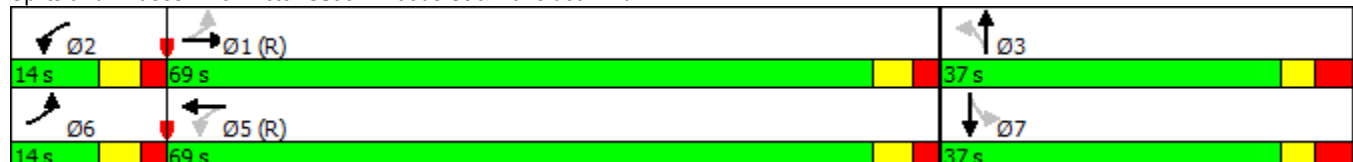
Intersection LOS: A

Intersection Capacity Utilization 78.3%

ICU Level of Service D

Analysis Period (min) 15





















Splits and Phases: 3: Victor St/Johnwoods St & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis

3: Victor St/Johnwoods St & Hazeldean Rd


















5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	101	888	21	35	1262	62	22	1	14	40	3	122
Future Volume (vph)	101	888	21	35	1262	62	22	1	14	40	3	122
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.1	6.1		6.1	6.1		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.86		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1565	3304		1565	3292		1565	1499		1565	1489	
Flt Permitted	0.12	1.00		0.27	1.00		0.49	1.00		0.75	1.00	
Satd. Flow (perm)	204	3304		452	3292		802	1499		1229	1489	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	112	987	23	39	1402	69	24	1	16	44	3	136
RTOR Reduction (vph)	0	1	0	0	2	0	0	15	0	0	125	0
Lane Group Flow (vph)	112	1009	0	39	1469	0	24	2	0	44	14	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	6	1		2	5			3			7	
Permitted Phases	1			5			3			7		
Actuated Green, G (s)	96.3	87.6		86.7	82.8		9.7	9.7		9.7	9.7	
Effective Green, g (s)	96.3	87.6		86.7	82.8		9.7	9.7		9.7	9.7	
Actuated g/C Ratio	0.80	0.73		0.72	0.69		0.08	0.08		0.08	0.08	
Clearance Time (s)	6.1	6.1		6.1	6.1		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	262	2411		362	2271		64	121		99	120	
v/s Ratio Prot	c0.03	c0.31		0.00	c0.45			0.00			0.01	
v/s Ratio Perm	0.31			0.07			0.03			c0.04		
v/c Ratio	0.43	0.42		0.11	0.65		0.38	0.02		0.44	0.12	
Uniform Delay, d1	7.3	6.3		4.8	10.4		52.3	50.8		52.6	51.2	
Progression Factor	1.00	1.00		0.53	0.29		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.1	0.5		0.1	1.2		3.7	0.1		3.2	0.4	
Delay (s)	8.5	6.8		2.7	4.2		55.9	50.8		55.7	51.6	
Level of Service	A	A		A	A		E	D		E	D	
Approach Delay (s)		7.0			4.2			53.8			52.6	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay		9.1			HCM 2000 Level of Service			A				
HCM 2000 Volume to Capacity ratio		0.61										
Actuated Cycle Length (s)		120.0			Sum of lost time (s)			18.8				
Intersection Capacity Utilization		78.3%			ICU Level of Service			D				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis













6: Hazeldean Rd & Cedarow Crt

5 Orchard Drive TIA

																		
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR						
Lane Configurations																		
Traffic Volume (veh/h)	16	947	1	3	1477	19	0	0	3	4	0	24						
Future Volume (Veh/h)	16	947	1	3	1477	19	0	0	3	4	0	24						
Sign Control	Free			Free			Stop			Stop								
Grade	0%			0%			0%			0%								
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90						
Hourly flow rate (vph)	18	1052	1	3	1641	21	0	0	3	4	0	27						
Pedestrians																		
Lane Width (m)																		
Walking Speed (m/s)																		
Percent Blockage																		
Right turn flare (veh)																		
Median type	TWLTL				None													
Median storage veh)	2																	
Upstream signal (m)					249													
pX, platoon unblocked	0.83							0.83	0.83									
vC, conflicting volume	1662				1053				1942	2756	526	2222						
vC1, stage 1 conf vol									1088	1088								
vC2, stage 2 conf vol									854	1668								
vCu, unblocked vol	1380				1053				1719	2705	526	2059						
tC, single (s)	4.1				4.1				7.5	6.5	6.9	7.5						
tC, 2 stage (s)									6.5	5.5								
tF (s)	2.2				2.2				3.5	4.0	3.3	3.5						
p0 queue free %	96				100				100	100	99	97						
cM capacity (veh/h)	407				657				194	129	496	119						
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1											
Volume Total	18	701	352	824	842	3	31											
Volume Left	18	0	0	3	0	0	4											
Volume Right	0	0	1	0	21	3	27											
cSH	407	1700	1700	657	1700	496	360											
Volume to Capacity	0.04	0.41	0.21	0.00	0.49	0.01	0.09											
Queue Length 95th (m)	1.1	0.0	0.0	0.1	0.0	0.1	2.1											
Control Delay (s)	14.3	0.0	0.0	0.1	0.0	12.3	16.0											
Lane LOS	B				A			B	C									
Approach Delay (s)	0.2				0.1			12.3	16.0									
Approach LOS									B	C								
Intersection Summary																		
Average Delay				0.3														
Intersection Capacity Utilization				58.2%	ICU Level of Service				B									
Analysis Period (min)				15														

Timings 9: Fringewood Dr & Hazeldean Rd

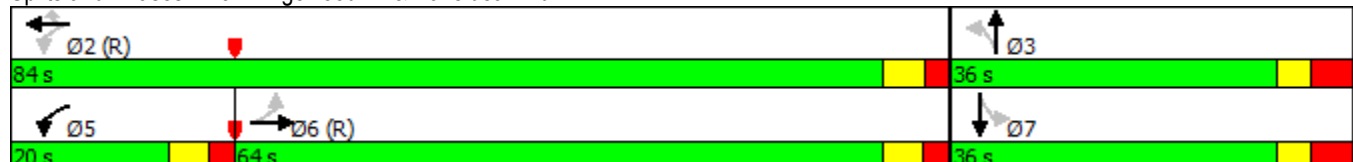
5 Orchard Drive TIA

								
Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT	Ø5
Lane Configurations								
Traffic Volume (vph)	1	892	1480	16	0	3	0	
Future Volume (vph)	1	892	1480	16	0	3	0	
Turn Type	Perm	NA	NA	Perm	NA	Perm	NA	
Protected Phases		6	2		3		7	5
Permitted Phases	6			3		7		
Detector Phase	6	6	2	3	3	7	7	
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	32.2	32.2	32.1	34.9	34.9	34.9	34.9	10.9
Total Split (s)	64.0	64.0	84.0	36.0	36.0	36.0	36.0	20.0
Total Split (%)	53.3%	53.3%	70.0%	30.0%	30.0%	30.0%	30.0%	17%
Yellow Time (s)	3.7	3.7	3.7	3.0	3.0	3.0	3.0	3.5
All-Red Time (s)	2.5	2.5	2.4	3.9	3.9	3.9	3.9	2.4
Lost Time Adjust (s)	0.0	0.0	0.0		0.0		0.0	
Total Lost Time (s)	6.2	6.2	6.1		6.9		6.9	
Lead/Lag	Lag	Lag						Lead
Lead-Lag Optimize?								Yes
Recall Mode	C-Max	C-Max	C-Max	None	None	None	None	None
Act Effct Green (s)	104.0	104.0	104.0		6.7		6.7	
Actuated g/C Ratio	0.87	0.87	0.87		0.06		0.06	
v/c Ratio	0.01	0.34	0.57		0.48		0.03	
Control Delay	6.0	6.2	3.7		19.9		0.2	
Queue Delay	0.0	0.0	0.0		0.0		0.0	
Total Delay	6.0	6.2	3.7		19.9		0.2	
LOS	A	A	A		B		A	
Approach Delay		6.2	3.7		19.9		0.3	
Approach LOS		A	A		B		A	

Intersection Summary

Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 55 (46%), Referenced to phase 2:WBTL and 6:EBTL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.57	
Intersection Signal Delay: 5.1	Intersection LOS: A
Intersection Capacity Utilization 58.2%	ICU Level of Service B
Analysis Period (min) 15	




















Splits and Phases: 9: Fringewood Dr & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis























9: Fringewood Dr & Hazeldean Rd

5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	892	0	0	1480	0	16	0	51	3	0	1
Future Volume (vph)	1	892	0	0	1480	0	16	0	51	3	0	1
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.2	6.2			6.1			6.9			6.9	
Lane Util. Factor	1.00	0.95			0.95			1.00			1.00	
Frt	1.00	1.00			1.00			0.90			0.97	
Flt Protected	0.95	1.00			1.00			0.99			0.96	
Satd. Flow (prot)	1565	3316			3316			1547			1625	
Flt Permitted	0.13	1.00			1.00			0.92			0.79	
Satd. Flow (perm)	220	3316			3316			1435			1327	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	1	991	0	0	1644	0	18	0	57	3	0	1
RTOR Reduction (vph)	0	0	0	0	0	0	0	72	0	0	4	0
Lane Group Flow (vph)	1	991	0	0	1644	0	0	4	0	0	0	0
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		6		5	2			3			7	
Permitted Phases	6			2		2	3			7		
Actuated Green, G (s)	101.3	101.3			101.4			5.6			5.6	
Effective Green, g (s)	101.3	101.3			101.4			5.6			5.6	
Actuated g/C Ratio	0.84	0.84			0.85			0.05			0.05	
Clearance Time (s)	6.2	6.2			6.1			6.9			6.9	
Vehicle Extension (s)	3.0	3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)	185	2799			2802			66			61	
v/s Ratio Prot		0.30			c0.50							
v/s Ratio Perm	0.00							c0.00			0.00	
v/c Ratio	0.01	0.35			0.59			0.05			0.00	
Uniform Delay, d1	1.5	2.1			2.9			54.7			54.5	
Progression Factor	3.05	2.72			1.07			1.00			1.00	
Incremental Delay, d2	0.0	0.3			0.5			0.3			0.0	
Delay (s)	4.5	6.0			3.6			55.0			54.6	
Level of Service	A	A			A			E			D	
Approach Delay (s)		6.0			3.6			55.0			54.6	
Approach LOS		A			A			E			D	
Intersection Summary												
HCM 2000 Control Delay			5.9			HCM 2000 Level of Service				A		
HCM 2000 Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			19.0			
Intersection Capacity Utilization			58.2%			ICU Level of Service				B		
Analysis Period (min)			15									
c Critical Lane Group												

Timings 12: Iber Rd/Huntmar Dr & Hazeldean Rd

5 Orchard Drive TIA

											
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	197	630	314	985	207	134	270	237	137	332	379
Future Volume (vph)	197	630	314	985	207	134	270	237	137	332	379
Turn Type	Prot	NA	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6	5	2		3	8		7	4	
Permitted Phases					2	8		8	4		4
Detector Phase	1	6	5	2	2	3	8	8	7	4	4
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.3	36.3	11.3	36.3	36.3	11.1	39.6	39.6	11.1	39.6	39.6
Total Split (s)	22.0	44.0	22.0	44.0	44.0	12.0	42.0	42.0	12.0	42.0	42.0
Total Split (%)	18.3%	36.7%	18.3%	36.7%	36.7%	10.0%	35.0%	35.0%	10.0%	35.0%	35.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
All-Red Time (s)	2.6	2.6	2.6	2.6	2.6	2.6	2.9	2.9	2.6	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	13.5	41.7	16.7	44.9	44.9	36.8	30.4	30.4	36.8	30.4	30.4
Actuated g/C Ratio	0.11	0.35	0.14	0.37	0.37	0.31	0.25	0.25	0.31	0.25	0.25
v/c Ratio	0.64	0.73	0.83	0.88	0.34	0.82	0.68	0.48	0.66	0.84	0.71
Control Delay	63.8	46.4	67.4	46.0	5.4	64.0	48.0	6.9	43.9	58.9	16.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.8	46.4	67.4	46.0	5.4	64.0	48.0	6.9	43.9	58.9	16.9
LOS	E	D	E	D	A	E	D	A	D	E	B
Approach Delay		50.1		44.9			36.2			37.7	
Approach LOS		D		D			D			D	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 43.1

Intersection LOS: D

Intersection Capacity Utilization 82.0%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 12: Iber Rd/Huntmar Dr & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis

12: Iber Rd/Huntmar Dr & Hazeldean Rd

















5 Orchard Drive TIA

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	197	630	118	314	985	207	134	270	237	137	332	379
Future Volume (vph)	197	630	118	314	985	207	134	270	237	137	332	379
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.3	6.3		6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Lane Util. Factor	0.97	0.95		0.97	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3036	3237		3036	3316	1400	1565	1745	1400	1565	1745	1400
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.25	1.00	1.00	0.36	1.00	1.00
Satd. Flow (perm)	3036	3237		3036	3316	1400	408	1745	1400	597	1745	1400
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	219	700	131	349	1094	230	149	300	263	152	369	421
RTOR Reduction (vph)	0	12	0	0	0	144	0	0	196	0	0	237
Lane Group Flow (vph)	219	819	0	349	1094	86	149	300	67	152	369	184
Turn Type	Prot	NA		Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases						2	8		8	4		4
Actuated Green, G (s)	13.5	41.7		16.7	44.9	44.9	36.3	30.4	30.4	36.3	30.4	30.4
Effective Green, g (s)	13.5	41.7		16.7	44.9	44.9	36.3	30.4	30.4	36.3	30.4	30.4
Actuated g/C Ratio	0.11	0.35		0.14	0.37	0.37	0.30	0.25	0.25	0.30	0.25	0.25
Clearance Time (s)	6.3	6.3		6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	341	1124		422	1240	523	180	442	354	228	442	354
v/s Ratio Prot	0.07	0.25		c0.11	c0.33		c0.04	0.17		0.03	c0.21	
v/s Ratio Perm						0.06	0.21		0.05	0.17		0.13
v/c Ratio	0.64	0.73		0.83	0.88	0.16	0.83	0.68	0.19	0.67	0.83	0.52
Uniform Delay, d1	50.9	34.2		50.2	35.1	25.0	38.5	40.4	35.1	36.5	42.4	38.5
Progression Factor	1.09	1.22		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.9	4.0		12.5	9.3	0.7	25.7	4.1	0.3	7.2	12.8	1.3
Delay (s)	59.3	45.6		62.8	44.3	25.7	64.2	44.5	35.4	43.7	55.2	39.8
Level of Service	E	D		E	D	C	E	D	D	D	E	D
Approach Delay (s)		48.5			45.6			45.3			46.5	
Approach LOS		D			D			D			D	
Intersection Summary												
HCM 2000 Control Delay			46.4			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.88									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			25.3			
Intersection Capacity Utilization			82.0%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

Timings

5 Orchard Drive TIA

3: Victor St/Johnwoods St & Hazeldean Rd

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	54	988	13	472	29	3	35	4
Future Volume (vph)	54	988	13	472	29	3	35	4
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases	6	1	2	5		3		7
Permitted Phases	1		5		3		7	
Detector Phase	6	1	2	5	3	3	7	7
Switch Phase								
Minimum Initial (s)	1.0	5.0	1.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	7.1	27.1	7.1	27.1	30.6	30.6	30.6	30.6
Total Split (s)	15.0	63.0	15.0	63.0	37.0	37.0	37.0	37.0
Total Split (%)	13.0%	54.8%	13.0%	54.8%	32.2%	32.2%	32.2%	32.2%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.0	3.0	3.0
All-Red Time (s)	2.4	2.4	2.4	2.4	3.6	3.6	3.6	3.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
Act Effct Green (s)	91.4	88.6	88.0	83.4	8.8	8.8	8.8	8.8
Actuated g/C Ratio	0.79	0.77	0.77	0.73	0.08	0.08	0.08	0.08
v/c Ratio	0.08	0.39	0.03	0.21	0.33	0.21	0.38	0.48
Control Delay	2.8	5.8	1.2	1.9	59.3	22.5	60.8	19.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	2.8	5.8	1.2	1.9	59.3	22.5	60.8	19.4
LOS	A	A	A	A	E	C	E	B
Approach Delay		5.7		1.8		40.6		30.5
Approach LOS		A		A		D		C

Intersection Summary

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 105 (91%), Referenced to phase 1:EBTL and 5:WBTL, Start of Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.48

Intersection Signal Delay: 7.6

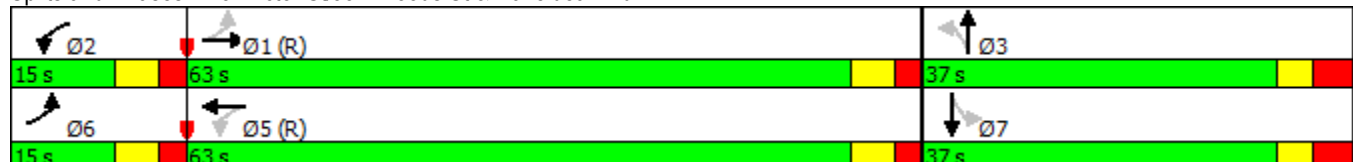
Intersection LOS: A

Intersection Capacity Utilization 57.0%

ICU Level of Service B

Analysis Period (min) 15





















Splits and Phases: 3: Victor St/Johnwoods St & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis

3: Victor St/Johnwoods St & Hazeldean Rd


















5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	54	988	15	13	472	30	29	3	27	35	4	91
Future Volume (vph)	54	988	15	13	472	30	29	3	27	35	4	91
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.1	6.1		6.1	6.1		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.86		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1565	3308		1565	3286		1565	1510		1565	1494	
Flt Permitted	0.45	1.00		0.27	1.00		0.70	1.00		0.74	1.00	
Satd. Flow (perm)	745	3308		450	3286		1145	1510		1215	1494	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	54	988	15	13	472	30	29	3	27	35	4	91
RTOR Reduction (vph)	0	1	0	0	2	0	0	25	0	0	84	0
Lane Group Flow (vph)	54	1002	0	13	500	0	29	5	0	35	11	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	6	1		2	5		3	3		7	7	
Permitted Phases	1			5			3			7		
Actuated Green, G (s)	90.2	85.0		84.6	82.2		8.8	8.8		8.8	8.8	
Effective Green, g (s)	90.2	85.0		84.6	82.2		8.8	8.8		8.8	8.8	
Actuated g/C Ratio	0.78	0.74		0.74	0.71		0.08	0.08		0.08	0.08	
Clearance Time (s)	6.1	6.1		6.1	6.1		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	621	2445		354	2348		87	115		92	114	
v/s Ratio Prot	c0.00	c0.30		0.00	0.15			0.00			0.01	
v/s Ratio Perm	0.06			0.03			0.03			c0.03		
v/c Ratio	0.09	0.41		0.04	0.21		0.33	0.04		0.38	0.10	
Uniform Delay, d1	2.8	5.6		4.1	5.5		50.3	49.2		50.5	49.4	
Progression Factor	1.00	1.00		0.39	0.28		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.5		0.0	0.2		2.3	0.2		2.6	0.4	
Delay (s)	2.9	6.1		1.6	1.8		52.6	49.4		53.1	49.8	
Level of Service	A	A		A	A		D	D		D	D	
Approach Delay (s)		6.0			1.8			50.9			50.7	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay		9.5			HCM 2000 Level of Service			A				
HCM 2000 Volume to Capacity ratio		0.40										
Actuated Cycle Length (s)		115.0			Sum of lost time (s)			18.8				
Intersection Capacity Utilization		57.0%			ICU Level of Service			B				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
















6: Hazeldean Rd & Cedarow Crt

5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	927	2	1	618	18	2	0	1	21	1	9
Future Volume (Veh/h)	12	927	2	1	618	18	2	0	1	21	1	9
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	12	927	2	1	618	18	2	0	1	21	1	9
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage veh		2										
Upstream signal (m)					249							
pX, platoon unblocked	1.00						1.00	1.00		1.00	1.00	1.00
vC, conflicting volume	636			929			1272	1590	464	1118	1582	318
vC1, stage 1 conf vol							952	952		629	629	
vC2, stage 2 conf vol							320	638		488	953	
vCu, unblocked vol	634			929			1271	1589	464	1116	1581	316
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			99	100	100	94	100	99
cM capacity (veh/h)	944			732			259	279	544	359	281	679
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1					
Volume Total	12	618	311	310	327	3	31					
Volume Left	12	0	0	1	0	2	21					
Volume Right	0	0	2	0	18	1	9					
cSH	944	1700	1700	732	1700	314	412					
Volume to Capacity	0.01	0.36	0.18	0.00	0.19	0.01	0.08					
Queue Length 95th (m)	0.3	0.0	0.0	0.0	0.0	0.2	1.8					
Control Delay (s)	8.9	0.0	0.0	0.0	0.0	16.6	14.5					
Lane LOS	A			A		C	B					
Approach Delay (s)	0.1			0.0		16.6	14.5					
Approach LOS						C	B					
Intersection Summary												
Average Delay			0.4									
Intersection Capacity Utilization			37.1%		ICU Level of Service		A					
Analysis Period (min)			15									

Timings 9: Fringewood Dr & Hazeldean Rd

5 Orchard Drive TIA

									
Lane Group	EBL	EBT	WBT	WBR	NBL	NBT	SBL	SBT	Ø5
Lane Configurations									
Traffic Volume (vph)	4	830	672	2	16	0	5	1	
Future Volume (vph)	4	830	672	2	16	0	5	1	
Turn Type	Perm	NA	NA	Perm	Perm	NA	Perm	NA	
Protected Phases		6	2			3		7	5
Permitted Phases	6			2	3		7		
Detector Phase	6	6	2	2	3	3	7	7	
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	32.2	32.2	32.1	32.1	34.9	34.9	34.9	34.9	10.9
Total Split (s)	64.0	64.0	79.0	79.0	36.0	36.0	36.0	36.0	15.0
Total Split (%)	55.7%	55.7%	68.7%	68.7%	31.3%	31.3%	31.3%	31.3%	13%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.0	3.0	3.0	3.5
All-Red Time (s)	2.5	2.5	2.4	2.4	3.9	3.9	3.9	3.9	2.4
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	
Total Lost Time (s)	6.2	6.2	6.1	6.1		6.9		6.9	
Lead/Lag	Lag	Lag							Lead
Lead-Lag Optimize?									Yes
Recall Mode	Max	Max	C-Max	C-Max	None	None	None	None	None
Act Effect Green (s)	99.2	99.2	99.2	99.2		6.5		6.5	
Actuated g/C Ratio	0.86	0.86	0.86	0.86		0.06		0.06	
v/c Ratio	0.01	0.29	0.23	0.00		0.42		0.12	
Control Delay	1.5	3.4	1.6	0.0		14.9		43.0	
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	
Total Delay	1.5	3.4	1.6	0.0		14.9		43.0	
LOS	A	A	A	A		B		D	
Approach Delay		3.4	1.6			14.9		43.0	
Approach LOS		A	A			B		D	

Intersection Summary

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 52 (45%), Referenced to phase 2:WBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.42

Intersection Signal Delay: 3.4

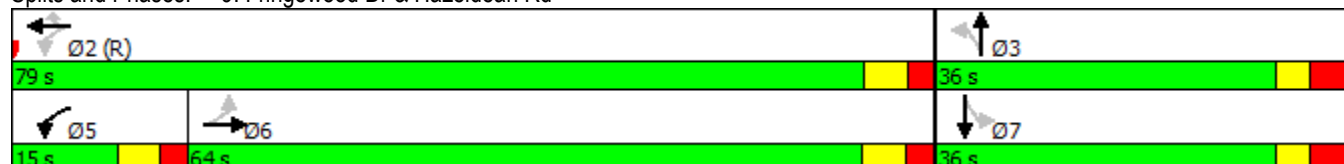
Intersection LOS: A

Intersection Capacity Utilization 39.7%

ICU Level of Service A

Analysis Period (min) 15




















Splits and Phases: 9: Fringewood Dr & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis


9: Fringewood Dr & Hazeldean Rd

5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	830	1	0	672	2	16	0	52	5	1	4
Future Volume (vph)	4	830	1	0	672	2	16	0	52	5	1	4
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.2	6.2			6.1	6.1		6.9			6.9	
Lane Util. Factor	1.00	0.95			0.95	1.00		1.00			1.00	
Frt	1.00	1.00			1.00	0.85		0.90			0.95	
Flt Protected	0.95	1.00			1.00	1.00		0.99			0.98	
Satd. Flow (prot)	1565	3315			3316	1400		1547			1611	
Flt Permitted	0.40	1.00			1.00	1.00		0.92			0.89	
Satd. Flow (perm)	653	3315			3316	1400		1433			1475	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	4	830	1	0	672	2	16	0	52	5	1	4
RTOR Reduction (vph)	0	0	0	0	0	0	0	65	0	0	4	0
Lane Group Flow (vph)	4	831	0	0	672	2	0	3	0	0	6	0
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		6		5	2			3			7	
Permitted Phases	6			2		2	3			7		
Actuated Green, G (s)	96.5	96.5			96.6	96.6		5.4			5.4	
Effective Green, g (s)	96.5	96.5			96.6	96.6		5.4			5.4	
Actuated g/C Ratio	0.84	0.84			0.84	0.84		0.05			0.05	
Clearance Time (s)	6.2	6.2			6.1	6.1		6.9			6.9	
Vehicle Extension (s)	3.0	3.0			3.0	3.0		3.0			3.0	
Lane Grp Cap (vph)	547	2781			2785	1176		67			69	
v/s Ratio Prot		c0.25			0.20							
v/s Ratio Perm	0.01					0.00		0.00			c0.00	
v/c Ratio	0.01	0.30			0.24	0.00		0.05			0.09	
Uniform Delay, d1	1.5	2.0			1.8	1.5		52.3			52.4	
Progression Factor	0.76	1.55			0.76	1.00		1.00			1.00	
Incremental Delay, d2	0.0	0.3			0.2	0.0		0.3			0.6	
Delay (s)	1.2	3.3			1.6	1.5		52.6			53.0	
Level of Service	A	A			A	A		D			D	
Approach Delay (s)		3.3			1.6			52.6			53.0	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay			5.0				HCM 2000 Level of Service			A		
HCM 2000 Volume to Capacity ratio			0.31									
Actuated Cycle Length (s)			115.0				Sum of lost time (s)			19.0		
Intersection Capacity Utilization			39.7%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

Timings 12: Iber Rd/Huntmar Dr & Hazeldean Rd

5 Orchard Drive TIA

												
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø6
Lane Configurations												
Traffic Volume (vph)	202	678	165	404	83	48	239	250	118	215	114	
Future Volume (vph)	202	678	165	404	83	48	239	250	118	215	114	
Turn Type	Prot	NA	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	
Protected Phases	6 9	1	2	5		3	8		7	4		6
Permitted Phases					5	8		8	4		4	
Detector Phase	6 9	1	2	5	5	3	8	8	7	4	4	
Switch Phase												
Minimum Initial (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)		49.0	11.3	37.0	37.0	11.1	24.6	24.6	11.1	24.6	24.6	11.5
Total Split (s)		49.0	14.0	37.0	37.0	12.0	40.0	40.0	12.0	40.0	40.0	14.0
Total Split (%)		42.6%	12.2%	32.2%	32.2%	10.4%	34.8%	34.8%	10.4%	34.8%	34.8%	12%
Yellow Time (s)		3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.7
All-Red Time (s)		2.6	2.8	2.6	2.6	2.6	2.9	2.9	2.6	2.9	2.9	2.8
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.3	6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6	
Lead/Lag		Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead
Lead-Lag Optimize?		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode		C-Max	None	C-Max	C-Max	None	None	None	None	None	None	None
Act Effct Green (s)	14.4	51.0	11.3	41.2	41.2	27.9	21.5	21.5	29.2	23.9	23.9	
Actuated g/C Ratio	0.13	0.44	0.10	0.36	0.36	0.24	0.19	0.19	0.25	0.21	0.21	
v/c Ratio	0.53	0.54	0.55	0.34	0.13	0.20	0.73	0.54	0.56	0.59	0.25	
Control Delay	38.1	20.2	56.7	29.6	0.4	29.3	56.6	8.9	42.2	48.1	1.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	38.1	20.2	56.7	29.6	0.4	29.3	56.6	8.9	42.2	48.1	1.3	
LOS	D	C	E	C	A	C	E	A	D	D	A	
Approach Delay		23.8		32.8			32.0			34.6		
Approach LOS		C		C			C			C		

Intersection Summary

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 62 (54%), Referenced to phase 1:EBT and 5:WBT, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 29.5

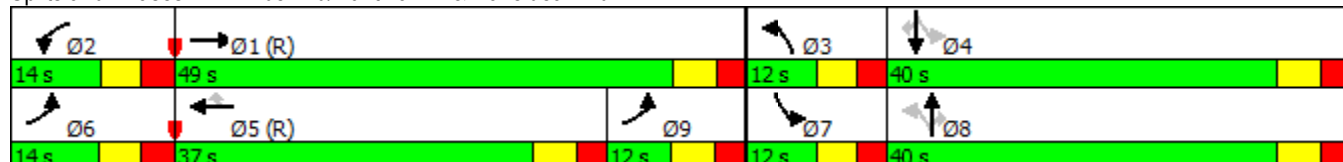
Intersection LOS: C

Intersection Capacity Utilization 69.7%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 12: Iber Rd/Huntmar Dr & Hazeldean Rd


























Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	11.5
Total Split (s)	12.0
Total Split (%)	10%
Yellow Time (s)	3.7
All-Red Time (s)	2.8
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

12: Iber Rd/Huntmar Dr & Hazeldean Rd

















5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	202	678	110	165	404	83	48	239	250	118	215	114
Future Volume (vph)	202	678	110	165	404	83	48	239	250	118	215	114
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.5	6.3		6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Lane Util. Factor	0.97	0.95		0.97	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3036	3246		3036	3316	1400	1565	1745	1400	1565	1745	1400
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.50	1.00	1.00	0.39	1.00	1.00
Satd. Flow (perm)	3036	3246		3036	3316	1400	821	1745	1400	638	1745	1400
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	202	678	110	165	404	83	48	239	250	118	215	114
RTOR Reduction (vph)	0	10	0	0	0	54	0	0	201	0	0	90
Lane Group Flow (vph)	202	778	0	165	404	29	48	239	49	118	215	24
Turn Type	Prot	NA		Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	6 9	1		2	5		3	8		7	4	
Permitted Phases						5	8		8	4		4
Actuated Green, G (s)	14.4	49.8		11.3	40.0	40.0	27.4	22.7	22.7	29.8	23.9	23.9
Effective Green, g (s)	14.4	49.8		11.3	40.0	40.0	27.4	22.7	22.7	29.8	23.9	23.9
Actuated g/C Ratio	0.13	0.43		0.10	0.35	0.35	0.24	0.20	0.20	0.26	0.21	0.21
Clearance Time (s)		6.3		6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	380	1405		298	1153	486	226	344	276	212	362	290
v/s Ratio Prot	0.07	c0.24		c0.05	0.12		0.01	c0.14		c0.03	0.12	
v/s Ratio Perm						0.02	0.04		0.04	0.12		0.02
v/c Ratio	0.53	0.55		0.55	0.35	0.06	0.21	0.69	0.18	0.56	0.59	0.08
Uniform Delay, d1	47.1	24.3		49.4	27.9	25.0	34.5	42.9	38.4	35.7	41.2	36.7
Progression Factor	1.38	0.76		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.4	1.5		2.2	0.8	0.2	0.5	6.0	0.3	3.1	2.6	0.1
Delay (s)	66.3	20.1		51.7	28.7	25.2	35.0	48.9	38.7	38.8	43.8	36.8
Level of Service	E	C		D	C	C	C	D	D	D	D	D
Approach Delay (s)		29.5			34.1			42.9			40.7	
Approach LOS		C			C			D			D	
Intersection Summary												
HCM 2000 Control Delay			35.3		HCM 2000 Level of Service					D		
HCM 2000 Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			115.0		Sum of lost time (s)					32.0		
Intersection Capacity Utilization			69.7%		ICU Level of Service					C		
Analysis Period (min)			15									
c Critical Lane Group												

Timings

5 Orchard Drive TIA

3: Victor St/Johnwoods St & Hazeldean Rd

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	103	906	36	1287	22	1	41	3
Future Volume (vph)	103	906	36	1287	22	1	41	3
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases	6	1	2	5		3		7
Permitted Phases	1		5		3		7	
Detector Phase	6	1	2	5	3	3	7	7
Switch Phase								
Minimum Initial (s)	1.0	5.0	1.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	7.1	27.1	7.1	27.1	30.6	30.6	30.6	30.6
Total Split (s)	14.0	69.0	14.0	69.0	37.0	37.0	37.0	37.0
Total Split (%)	11.7%	57.5%	11.7%	57.5%	30.8%	30.8%	30.8%	30.8%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.0	3.0	3.0
All-Red Time (s)	2.4	2.4	2.4	2.4	3.6	3.6	3.6	3.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
Act Effct Green (s)	95.2	90.4	90.5	84.5	9.5	9.5	9.5	9.5
Actuated g/C Ratio	0.79	0.75	0.75	0.70	0.08	0.08	0.08	0.08
v/c Ratio	0.37	0.37	0.08	0.58	0.31	0.11	0.42	0.55
Control Delay	6.4	6.6	1.7	3.9	62.1	24.7	64.8	18.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.4	6.6	1.7	3.9	62.1	24.7	64.8	18.6
LOS	A	A	A	A	E	C	E	B
Approach Delay		6.6		3.8		46.9		29.9
Approach LOS		A		A		D		C

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 88 (73%), Referenced to phase 1:EBTL and 5:WBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 7.2

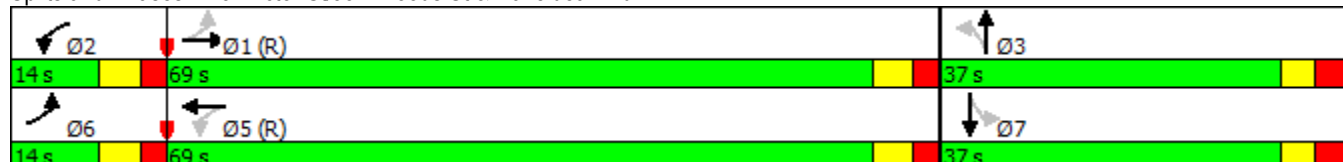
Intersection LOS: A

Intersection Capacity Utilization 79.3%

ICU Level of Service D

Analysis Period (min) 15





















Splits and Phases: 3: Victor St/Johnwoods St & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis

3: Victor St/Johnwoods St & Hazeldean Rd


















5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	103	906	21	36	1287	63	22	1	14	41	3	124
Future Volume (vph)	103	906	21	36	1287	63	22	1	14	41	3	124
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.1	6.1		6.1	6.1		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.86		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1565	3304		1565	3292		1565	1501		1565	1490	
Flt Permitted	0.15	1.00		0.30	1.00		0.55	1.00		0.75	1.00	
Satd. Flow (perm)	254	3304		493	3292		903	1501		1232	1490	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	103	906	21	36	1287	63	22	1	14	41	3	124
RTOR Reduction (vph)	0	1	0	0	2	0	0	13	0	0	114	0
Lane Group Flow (vph)	103	926	0	36	1348	0	22	2	0	41	13	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	6	1		2	5			3			7	
Permitted Phases	1			5			3			7		
Actuated Green, G (s)	95.2	87.9		88.2	84.4		9.5	9.5		9.5	9.5	
Effective Green, g (s)	95.2	87.9		88.2	84.4		9.5	9.5		9.5	9.5	
Actuated g/C Ratio	0.79	0.73		0.74	0.70		0.08	0.08		0.08	0.08	
Clearance Time (s)	6.1	6.1		6.1	6.1		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	281	2420		396	2315		71	118		97	117	
v/s Ratio Prot	c0.02	c0.28		0.00	c0.41			0.00			0.01	
v/s Ratio Perm	0.27			0.06			0.02			c0.03		
v/c Ratio	0.37	0.38		0.09	0.58		0.31	0.02		0.42	0.11	
Uniform Delay, d1	5.3	6.0		4.3	8.9		52.2	50.9		52.6	51.3	
Progression Factor	1.00	1.00		0.48	0.31		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	0.5		0.1	0.9		2.5	0.1		3.0	0.4	
Delay (s)	6.1	6.4		2.2	3.7		54.6	51.0		55.6	51.7	
Level of Service	A	A		A	A		D	D		E	D	
Approach Delay (s)		6.4			3.7			53.2			52.7	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay	8.6			HCM 2000 Level of Service			A					
HCM 2000 Volume to Capacity ratio	0.56											
Actuated Cycle Length (s)	120.0			Sum of lost time (s)			18.8					
Intersection Capacity Utilization	79.3%			ICU Level of Service			D					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis













6: Hazeldean Rd & Cedarow Crt

5 Orchard Drive TIA

																		
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR						
Lane Configurations																		
Traffic Volume (veh/h)	16	966	1	3	1507	19	0	0	3	4	0	24						
Future Volume (Veh/h)	16	966	1	3	1507	19	0	0	3	4	0	24						
Sign Control	Free			Free			Stop			Stop								
Grade	0%			0%			0%			0%								
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00						
Hourly flow rate (vph)	16	966	1	3	1507	19	0	0	3	4	0	24						
Pedestrians																		
Lane Width (m)																		
Walking Speed (m/s)																		
Percent Blockage																		
Right turn flare (veh)																		
Median type	TWLTL				None													
Median storage veh	2																	
Upstream signal (m)					249													
pX, platoon unblocked	0.86							0.86	0.86									
vC, conflicting volume	1526				967				1782	2530	484	2040						
vC1, stage 1 conf vol									998	998								
vC2, stage 2 conf vol									784	1532								
vCu, unblocked vol	1283				967				1581	2453	484	1882						
tC, single (s)	4.1				4.1				7.5	6.5	6.9	7.5						
tC, 2 stage (s)									6.5	5.5								
tF (s)	2.2				2.2				3.5	4.0	3.3	3.5						
p0 queue free %	97				100				100	100	99	97						
cM capacity (veh/h)	461				708				220	153	529	141						
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1											
Volume Total	16	644	323	756	772	3	28											
Volume Left	16	0	0	3	0	0	4											
Volume Right	0	0	1	0	19	3	24											
cSH	461	1700	1700	708	1700	529	375											
Volume to Capacity	0.03	0.38	0.19	0.00	0.45	0.01	0.07											
Queue Length 95th (m)	0.8	0.0	0.0	0.1	0.0	0.1	1.8											
Control Delay (s)	13.1	0.0	0.0	0.1	0.0	11.8	15.4											
Lane LOS	B				A				B									
Approach Delay (s)	0.2				0.1				11.8									
Approach LOS									B									
Intersection Summary																		
Average Delay				0.3														
Intersection Capacity Utilization				59.1%	ICU Level of Service				B									
Analysis Period (min)				15														

Timings 9: Fringewood Dr & Hazeldean Rd

5 Orchard Drive TIA

								
Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT	Ø5
Lane Configurations								
Traffic Volume (vph)	1	910	1510	29	0	3	0	
Future Volume (vph)	1	910	1510	29	0	3	0	
Turn Type	Perm	NA	NA	Perm	NA	Perm	NA	
Protected Phases		6	2		3		7	5
Permitted Phases	6			3		7		
Detector Phase	6	6	2	3	3	7	7	
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	32.2	32.2	32.1	34.9	34.9	34.9	34.9	10.9
Total Split (s)	64.0	64.0	84.0	36.0	36.0	36.0	36.0	20.0
Total Split (%)	53.3%	53.3%	70.0%	30.0%	30.0%	30.0%	30.0%	17%
Yellow Time (s)	3.7	3.7	3.7	3.0	3.0	3.0	3.0	3.5
All-Red Time (s)	2.5	2.5	2.4	3.9	3.9	3.9	3.9	2.4
Lost Time Adjust (s)	0.0	0.0	0.0		0.0		0.0	
Total Lost Time (s)	6.2	6.2	6.1		6.9		6.9	
Lead/Lag	Lag	Lag						Lead
Lead-Lag Optimize?								Yes
Recall Mode	C-Max	C-Max	C-Max	None	None	None	None	None
Act Effct Green (s)	103.7	103.7	103.8		6.9		6.9	
Actuated g/C Ratio	0.86	0.86	0.86		0.06		0.06	
v/c Ratio	0.00	0.32	0.53		0.50		0.03	
Control Delay	3.0	4.7	2.9		21.5		0.2	
Queue Delay	0.0	0.0	0.0		0.0		0.0	
Total Delay	3.0	4.7	2.9		21.5		0.2	
LOS	A	A	A		C		A	
Approach Delay		4.7	2.9		21.5		0.3	
Approach LOS		A	A		C		A	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 55 (46%), Referenced to phase 2:WBTL and 6:EBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.53
Intersection Signal Delay: 4.2
Intersection Capacity Utilization 59.7%
Analysis Period (min) 15

Intersection LOS: A
ICU Level of Service B









Splits and Phases: 9: Fringewood Dr & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis



























9: Fringewood Dr & Hazeldean Rd

5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	910	0	0	1510	0	29	0	50	3	0	1
Future Volume (vph)	1	910	0	0	1510	0	29	0	50	3	0	1
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.2	6.2			6.1			6.9			6.9	
Lane Util. Factor	1.00	0.95			0.95			1.00			1.00	
Frt	1.00	1.00			1.00			0.91			0.97	
Flt Protected	0.95	1.00			1.00			0.98			0.96	
Satd. Flow (prot)	1565	3316			3316			1567			1625	
Flt Permitted	0.16	1.00			1.00			0.88			0.77	
Satd. Flow (perm)	258	3316			3316			1400			1293	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1	910	0	0	1510	0	29	0	50	3	0	1
RTOR Reduction (vph)	0	0	0	0	0	0	0	75	0	0	4	0
Lane Group Flow (vph)	1	910	0	0	1510	0	0	4	0	0	0	0
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		6		5	2			3			7	
Permitted Phases	6			2		2	3			7		
Actuated Green, G (s)	101.1	101.1			101.2			5.8			5.8	
Effective Green, g (s)	101.1	101.1			101.2			5.8			5.8	
Actuated g/C Ratio	0.84	0.84			0.84			0.05			0.05	
Clearance Time (s)	6.2	6.2			6.1			6.9			6.9	
Vehicle Extension (s)	3.0	3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)	217	2793			2796			67			62	
v/s Ratio Prot		0.27			c0.46							
v/s Ratio Perm	0.00							c0.00			0.00	
v/c Ratio	0.00	0.33			0.54			0.06			0.00	
Uniform Delay, d1	1.5	2.1			2.7			54.5			54.3	
Progression Factor	1.27	2.05			0.85			1.00			1.00	
Incremental Delay, d2	0.0	0.3			0.5			0.4			0.0	
Delay (s)	1.9	4.5			2.8			54.8			54.4	
Level of Service	A	A			A			D			D	
Approach Delay (s)		4.5			2.8			54.8			54.4	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay			5.2									
HCM 2000 Volume to Capacity ratio			0.54									
Actuated Cycle Length (s)			120.0									
Intersection Capacity Utilization			59.7%									
Analysis Period (min)			15									
c Critical Lane Group												

Timings 12: Iber Rd/Huntmar Dr & Hazeldean Rd

5 Orchard Drive TIA

											
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	 	 	 							
Traffic Volume (vph)	201	643	320	1005	211	137	275	242	140	339	387
Future Volume (vph)	201	643	320	1005	211	137	275	242	140	339	387
Turn Type	Prot	NA	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6	5	2		3	8		7	4	
Permitted Phases					2	8		8	4		4
Detector Phase	1	6	5	2	2	3	8	8	7	4	4
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.3	36.3	11.3	36.3	36.3	11.1	39.6	39.6	11.1	39.6	39.6
Total Split (s)	22.0	44.0	22.0	44.0	44.0	12.0	42.0	42.0	12.0	42.0	42.0
Total Split (%)	18.3%	36.7%	18.3%	36.7%	36.7%	10.0%	35.0%	35.0%	10.0%	35.0%	35.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
All-Red Time (s)	2.6	2.6	2.6	2.6	2.6	2.6	2.9	2.9	2.6	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	12.9	43.6	16.2	46.9	46.9	35.3	28.9	28.9	35.3	28.9	28.9
Actuated g/C Ratio	0.11	0.36	0.14	0.39	0.39	0.29	0.24	0.24	0.29	0.24	0.24
v/c Ratio	0.61	0.64	0.78	0.78	0.31	0.72	0.65	0.46	0.60	0.81	0.66
Control Delay	74.0	26.3	64.0	38.6	5.3	52.4	47.9	7.1	40.6	57.5	12.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	74.0	26.3	64.0	38.6	5.3	52.4	47.9	7.1	40.6	57.5	12.8
LOS	E	C	E	D	A	D	D	A	D	E	B
Approach Delay		36.2		39.3			33.8			34.8	
Approach LOS		D		D			C			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 32 (27%), Referenced to phase 2:WBT and 6:EBT, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 36.7

Intersection LOS: D

Intersection Capacity Utilization 83.3%

ICU Level of Service E

Analysis Period (min) 15
























Splits and Phases: 12: Iber Rd/Huntmar Dr & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis

12: Iber Rd/Huntmar Dr & Hazeldean Rd

















5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	201	643	120	320	1005	211	137	275	242	140	339	387
Future Volume (vph)	201	643	120	320	1005	211	137	275	242	140	339	387
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.3	6.3		6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Lane Util. Factor	0.97	0.95		0.97	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3036	3237		3036	3316	1400	1565	1745	1400	1565	1745	1400
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.28	1.00	1.00	0.39	1.00	1.00
Satd. Flow (perm)	3036	3237		3036	3316	1400	456	1745	1400	642	1745	1400
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	201	643	120	320	1005	211	137	275	242	140	339	387
RTOR Reduction (vph)	0	12	0	0	0	128	0	0	184	0	0	248
Lane Group Flow (vph)	201	751	0	320	1005	83	137	275	58	140	339	139
Turn Type	Prot	NA		Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases						2	8		8	4		4
Actuated Green, G (s)	12.9	43.7		16.2	47.0	47.0	34.8	28.9	28.9	34.8	28.9	28.9
Effective Green, g (s)	12.9	43.7		16.2	47.0	47.0	34.8	28.9	28.9	34.8	28.9	28.9
Actuated g/C Ratio	0.11	0.36		0.13	0.39	0.39	0.29	0.24	0.24	0.29	0.24	0.24
Clearance Time (s)	6.3	6.3		6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	326	1178		409	1298	548	186	420	337	231	420	337
v/s Ratio Prot	0.07	0.23		c0.11	c0.30		c0.04	0.16		0.03	c0.19	
v/s Ratio Perm						0.06	0.18		0.04	0.15		0.10
v/c Ratio	0.62	0.64		0.78	0.77	0.15	0.74	0.65	0.17	0.61	0.81	0.41
Uniform Delay, d1	51.2	31.6		50.2	31.9	23.6	37.7	41.1	36.1	36.3	42.9	38.4
Progression Factor	1.30	0.73		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.3	2.6		9.4	4.6	0.6	14.1	3.7	0.2	4.4	10.8	0.8
Delay (s)	69.7	25.5		59.6	36.4	24.2	51.8	44.7	36.3	40.7	53.8	39.2
Level of Service	E	C		E	D	C	D	D	D	D	D	D
Approach Delay (s)		34.7			39.6			43.1			45.2	
Approach LOS		C			D			D			D	
Intersection Summary												
HCM 2000 Control Delay			40.2			HCM 2000 Level of Service			D			
HCM 2000 Volume to Capacity ratio			0.81									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			25.3			
Intersection Capacity Utilization			83.3%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

Timings

5 Orchard Drive TIA

3: Victor St/Johnwoods St & Hazeldean Rd

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	54	1004	14	485	29	3	35	4
Future Volume (vph)	54	1004	14	485	29	3	35	4
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases	6	1	2	5		3		7
Permitted Phases	1		5		3		7	
Detector Phase	6	1	2	5	3	3	7	7
Switch Phase								
Minimum Initial (s)	1.0	5.0	1.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	7.1	27.1	7.1	27.1	30.6	30.6	30.6	30.6
Total Split (s)	15.0	63.0	15.0	63.0	37.0	37.0	37.0	37.0
Total Split (%)	13.0%	54.8%	13.0%	54.8%	32.2%	32.2%	32.2%	32.2%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.0	3.0	3.0
All-Red Time (s)	2.4	2.4	2.4	2.4	3.6	3.6	3.6	3.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
Act Effct Green (s)	91.1	88.2	87.6	82.9	9.2	9.2	9.2	9.2
Actuated g/C Ratio	0.79	0.77	0.76	0.72	0.08	0.08	0.08	0.08
v/c Ratio	0.10	0.45	0.05	0.24	0.35	0.22	0.41	0.50
Control Delay	3.0	6.5	1.4	2.2	59.6	21.6	61.5	18.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.0	6.5	1.4	2.2	59.6	21.6	61.5	18.5
LOS	A	A	A	A	E	C	E	B
Approach Delay		6.3		2.2		40.3		30.1
Approach LOS		A		A		D		C

Intersection Summary

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 105 (91%), Referenced to phase 1:EBTL and 5:WBTL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.50

Intersection Signal Delay: 7.9

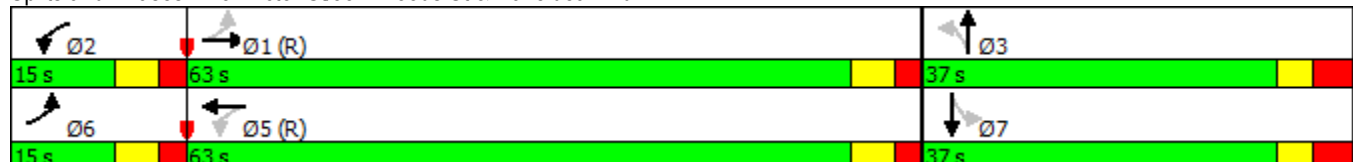
Intersection LOS: A

Intersection Capacity Utilization 57.5%

ICU Level of Service B

Analysis Period (min) 15





















Splits and Phases: 3: Victor St/Johnwoods St & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis

3: Victor St/Johnwoods St & Hazeldean Rd


















5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	54	1004	15	14	485	30	29	3	27	35	4	91
Future Volume (vph)	54	1004	15	14	485	30	29	3	27	35	4	91
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.1	6.1		6.1	6.1		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.86		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1565	3308		1565	3287		1565	1507		1565	1493	
Flt Permitted	0.42	1.00		0.23	1.00		0.69	1.00		0.74	1.00	
Satd. Flow (perm)	690	3308		383	3287		1135	1507		1212	1493	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	60	1116	17	16	539	33	32	3	30	39	4	101
RTOR Reduction (vph)	0	1	0	0	2	0	0	28	0	0	93	0
Lane Group Flow (vph)	60	1132	0	16	570	0	32	5	0	39	12	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	6	1		2	5			3			7	
Permitted Phases	1			5			3			7		
Actuated Green, G (s)	89.9	84.6		84.1	81.7		9.2	9.2		9.2	9.2	
Effective Green, g (s)	89.9	84.6		84.1	81.7		9.2	9.2		9.2	9.2	
Actuated g/C Ratio	0.78	0.74		0.73	0.71		0.08	0.08		0.08	0.08	
Clearance Time (s)	6.1	6.1		6.1	6.1		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	579	2433		304	2335		90	120		96	119	
v/s Ratio Prot	c0.00	c0.34		0.00	0.17			0.00			0.01	
v/s Ratio Perm	0.08			0.04			0.03			c0.03		
v/c Ratio	0.10	0.47		0.05	0.24		0.36	0.04		0.41	0.10	
Uniform Delay, d1	2.9	6.1		4.4	5.8		50.1	48.8		50.3	49.1	
Progression Factor	1.00	1.00		0.38	0.32		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.6		0.1	0.2		2.4	0.2		2.8	0.4	
Delay (s)	3.0	6.8		1.7	2.1		52.5	49.0		53.1	49.4	
Level of Service	A	A		A	A		D	D		D	D	
Approach Delay (s)		6.6			2.1			50.7			50.4	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay	9.9			HCM 2000 Level of Service			A					
HCM 2000 Volume to Capacity ratio	0.45											
Actuated Cycle Length (s)	115.0			Sum of lost time (s)			18.8					
Intersection Capacity Utilization	57.5%			ICU Level of Service			B					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

















6: Hazeldean Rd & Cedarow Crt

5 Orchard Drive TIA

															
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR			
Lane Configurations															
Traffic Volume (veh/h)	12	944	2	1	632	18	2	0	1	21	1	9			
Future Volume (Veh/h)	12	944	2	1	632	18	2	0	1	21	1	9			
Sign Control		Free			Free			Stop			Stop				
Grade		0%			0%			0%			0%				
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Hourly flow rate (vph)	12	944	2	1	632	18	2	0	1	21	1	9			
Pedestrians															
Lane Width (m)															
Walking Speed (m/s)															
Percent Blockage															
Right turn flare (veh)															
Median type		TWLTL			None										
Median storage veh		2													
Upstream signal (m)					249										
pX, platoon unblocked	1.00							1.00	1.00				1.00	1.00	1.00
vC, conflicting volume	650				946				1296	1621	473	1140	1613	325	
vC1, stage 1 conf vol									969	969		643	643		
vC2, stage 2 conf vol									328	652		497	970		
vCu, unblocked vol	643				946				1292	1617	473	1135	1609	318	
tC, single (s)	4.1				4.1				7.5	6.5	6.9	7.5	6.5	6.9	
tC, 2 stage (s)									6.5	5.5		6.5	5.5		
tF (s)	2.2				2.2				3.5	4.0	3.3	3.5	4.0	3.3	
p0 queue free %	99				100				99	100	100	94	100	99	
cM capacity (veh/h)	935				721				253	274	538	353	276	676	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1								
Volume Total	12	629	317	317	334	3	31								
Volume Left	12	0	0	1	0	2	21								
Volume Right	0	0	2	0	18	1	9								
cSH	935	1700	1700	721	1700	307	406								
Volume to Capacity	0.01	0.37	0.19	0.00	0.20	0.01	0.08								
Queue Length 95th (m)	0.3	0.0	0.0	0.0	0.0	0.2	1.9								
Control Delay (s)	8.9	0.0	0.0	0.0	0.0	16.8	14.6								
Lane LOS	A				A				C	B					
Approach Delay (s)	0.1				0.0				16.8	14.6					
Approach LOS									C	B					
Intersection Summary															
Average Delay	0.4														
Intersection Capacity Utilization	37.6%			ICU Level of Service					A						
Analysis Period (min)	15														

Timings 9: Fringewood Dr & Hazeldean Rd

5 Orchard Drive TIA

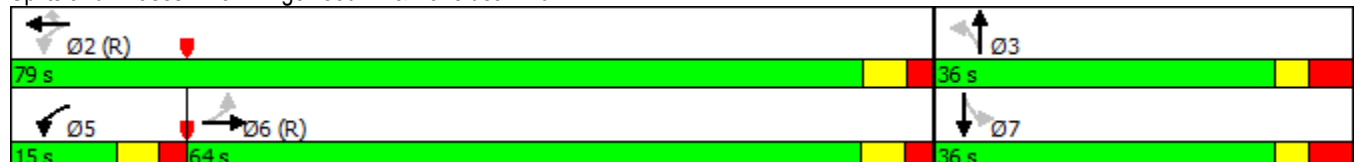
									
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	4	846	35	650	2	52	0	5	1
Future Volume (vph)	4	846	35	650	2	52	0	5	1
Turn Type	Perm	NA	pm+pt	NA	Perm	Perm	NA	Perm	NA
Protected Phases		6	5	2			3		7
Permitted Phases	6		2		2	3		7	
Detector Phase	6	6	5	2	2	3	3	7	7
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	32.2	32.2	10.9	32.1	32.1	34.9	34.9	34.9	34.9
Total Split (s)	64.0	64.0	15.0	79.0	79.0	36.0	36.0	36.0	36.0
Total Split (%)	55.7%	55.7%	13.0%	68.7%	68.7%	31.3%	31.3%	31.3%	31.3%
Yellow Time (s)	3.7	3.7	3.5	3.7	3.7	3.0	3.0	3.0	3.0
All-Red Time (s)	2.5	2.5	2.4	2.4	2.4	3.9	3.9	3.9	3.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Lost Time (s)	6.2	6.2	5.9	6.1	6.1		6.9		6.9
Lead/Lag	Lag	Lag	Lead						
Lead-Lag Optimize?			Yes						
Recall Mode	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None
Act Effct Green (s)	85.5	85.5	93.2	93.0	93.0		9.0		9.0
Actuated g/C Ratio	0.74	0.74	0.81	0.81	0.81		0.08		0.08
v/c Ratio	0.01	0.38	0.09	0.27	0.00		0.63		0.11
Control Delay	8.2	10.6	2.3	2.0	0.0		31.8		39.7
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Delay	8.2	10.6	2.3	2.0	0.0		31.8		39.7
LOS	A	B	A	A	A		C		D
Approach Delay		10.6		2.1			31.8		39.7
Approach LOS		B		A			C		D

Intersection Summary

Cycle Length: 115
 Actuated Cycle Length: 115
 Offset: 67 (58%), Referenced to phase 2:WBTL and 6:EBTL, Start of Green
 Natural Cycle: 80
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.63
 Intersection Signal Delay: 8.5
 Intersection Capacity Utilization 49.5%
 Analysis Period (min) 15

Intersection LOS: A
 ICU Level of Service A




















Splits and Phases: 9: Fringewood Dr & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis























9: Fringewood Dr & Hazeldean Rd

5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	846	1	35	650	2	52	0	52	5	1	4
Future Volume (vph)	4	846	1	35	650	2	52	0	52	5	1	4
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.2	6.2		5.9	6.1	6.1		6.9			6.9	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		1.00			1.00	
Frt	1.00	1.00		1.00	1.00	0.85		0.93			0.95	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.98			0.97	
Satd. Flow (prot)	1565	3315		1565	3316	1400		1588			1615	
Flt Permitted	0.38	1.00		0.26	1.00	1.00		0.84			0.74	
Satd. Flow (perm)	621	3315		434	3316	1400		1361			1232	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	4	940	1	39	722	2	58	0	58	6	1	4
RTOR Reduction (vph)	0	0	0	0	0	0	0	79	0	0	4	0
Lane Group Flow (vph)	4	941	0	39	722	2	0	37	0	0	7	0
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		6		5	2			3			7	
Permitted Phases	6			2		2	3			7		
Actuated Green, G (s)	83.1	83.1		93.0	93.0	93.0		9.0			9.0	
Effective Green, g (s)	83.1	83.1		93.0	93.0	93.0		9.0			9.0	
Actuated g/C Ratio	0.72	0.72		0.81	0.81	0.81		0.08			0.08	
Clearance Time (s)	6.2	6.2		5.9	6.1	6.1		6.9			6.9	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0			3.0	
Lane Grp Cap (vph)	448	2395		389	2681	1132		106			96	
v/s Ratio Prot		c0.28		0.00	c0.22							
v/s Ratio Perm	0.01			0.08		0.00		c0.03			0.01	
v/c Ratio	0.01	0.39		0.10	0.27	0.00		0.35			0.08	
Uniform Delay, d1	4.5	6.2		2.8	2.7	2.1		50.2			49.1	
Progression Factor	1.25	1.55		0.69	0.60	1.00		1.00			1.00	
Incremental Delay, d2	0.0	0.5		0.1	0.2	0.0		2.0			0.3	
Delay (s)	5.6	10.0		2.0	1.9	2.1		52.2			49.5	
Level of Service	A	B		A	A	A		D			D	
Approach Delay (s)		10.0			1.9			52.2			49.5	
Approach LOS		B			A			D			D	
Intersection Summary												
HCM 2000 Control Delay			9.5				HCM 2000 Level of Service			A		
HCM 2000 Volume to Capacity ratio			0.39									
Actuated Cycle Length (s)			115.0				Sum of lost time (s)			19.0		
Intersection Capacity Utilization			49.5%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

Timings 12: Iber Rd/Huntmar Dr & Hazeldean Rd

5 Orchard Drive TIA

												
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø6
Lane Configurations												
Traffic Volume (vph)	205	689	165	414	83	49	239	250	118	215	114	
Future Volume (vph)	205	689	165	414	83	49	239	250	118	215	114	
Turn Type	Prot	NA	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	
Protected Phases	6 9	1	2	5		3	8		7	4		6
Permitted Phases					5	8		8	4		4	
Detector Phase	6 9	1	2	5	5	3	8	8	7	4	4	
Switch Phase												
Minimum Initial (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)		49.0	11.3	37.0	37.0	11.1	24.6	24.6	11.1	24.6	24.6	11.5
Total Split (s)		49.0	14.0	37.0	37.0	12.0	40.0	40.0	12.0	40.0	40.0	14.0
Total Split (%)		42.6%	12.2%	32.2%	32.2%	10.4%	34.8%	34.8%	10.4%	34.8%	34.8%	12%
Yellow Time (s)		3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.7
All-Red Time (s)		2.6	2.8	2.6	2.6	2.6	2.9	2.9	2.6	2.9	2.9	2.8
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.3	6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6	
Lead/Lag		Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead
Lead-Lag Optimize?		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode		C-Max	None	C-Max	C-Max	None	None	None	None	None	None	None
Act Effct Green (s)	14.4	48.5	11.9	39.3	39.3	29.7	23.4	23.4	31.0	25.8	25.8	
Actuated g/C Ratio	0.13	0.42	0.10	0.34	0.34	0.26	0.20	0.20	0.27	0.22	0.22	
v/c Ratio	0.60	0.65	0.58	0.41	0.15	0.23	0.75	0.57	0.63	0.61	0.27	
Control Delay	41.7	17.8	57.4	31.9	0.5	28.3	55.7	10.2	44.5	47.1	1.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	41.7	17.8	57.4	31.9	0.5	28.3	55.7	10.2	44.5	47.1	1.4	
LOS	D	B	E	C	A	C	E	B	D	D	A	
Approach Delay		22.6		34.3			32.0			34.7		
Approach LOS		C		C			C			C		

Intersection Summary

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 62 (54%), Referenced to phase 1:EBT and 5:WBT, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 29.5

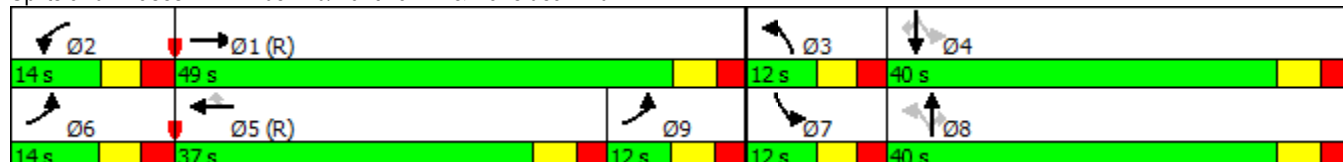
Intersection LOS: C

Intersection Capacity Utilization 70.1%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 12: Iber Rd/Huntmar Dr & Hazeldean Rd


























Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	11.5
Total Split (s)	12.0
Total Split (%)	10%
Yellow Time (s)	3.7
All-Red Time (s)	2.8
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

12: Iber Rd/Huntmar Dr & Hazeldean Rd










5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	205	689	112	165	414	83	49	239	250	118	215	114
Future Volume (vph)	205	689	112	165	414	83	49	239	250	118	215	114
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.5	6.3		6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Lane Util. Factor	0.97	0.95		0.97	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3036	3246		3036	3316	1400	1565	1745	1400	1565	1745	1400
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.46	1.00	1.00	0.36	1.00	1.00
Satd. Flow (perm)	3036	3246		3036	3316	1400	766	1745	1400	590	1745	1400
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	228	766	124	183	460	92	54	266	278	131	239	127
RTOR Reduction (vph)	0	11	0	0	0	62	0	0	205	0	0	99
Lane Group Flow (vph)	228	879	0	183	460	30	54	266	73	131	239	28
Turn Type	Prot	NA		Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	6.9	1		2	5		3	8		7	4	
Permitted Phases						5	8		8	4		4
Actuated Green, G (s)	14.4	47.3		11.9	38.1	38.1	29.3	24.6	24.6	31.7	25.8	25.8
Effective Green, g (s)	14.4	47.3		11.9	38.1	38.1	29.3	24.6	24.6	31.7	25.8	25.8
Actuated g/C Ratio	0.13	0.41		0.10	0.33	0.33	0.25	0.21	0.21	0.28	0.22	0.22
Clearance Time (s)		6.3		6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	380	1335		314	1098	463	227	373	299	212	391	314
v/s Ratio Prot	0.08	c0.27		c0.06	c0.14		0.01	c0.15		c0.03	0.14	
v/s Ratio Perm						0.02	0.05		0.05	0.14		0.02
v/c Ratio	0.60	0.66		0.58	0.42	0.07	0.24	0.71	0.24	0.62	0.61	0.09
Uniform Delay, d1	47.6	27.3		49.2	29.9	26.3	33.2	41.9	37.5	35.5	40.1	35.3
Progression Factor	1.45	0.57		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.4	2.5		2.7	1.2	0.3	0.5	6.3	0.4	5.3	2.8	0.1
Delay (s)	71.7	18.0		51.9	31.0	26.6	33.8	48.3	37.9	40.8	42.9	35.4
Level of Service	E	B		D	C	C	C	D	D	D	D	D
Approach Delay (s)		28.9			35.7			42.1			40.4	
Approach LOS		C			D			D			D	
Intersection Summary												
HCM 2000 Control Delay			35.2			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.72									
Actuated Cycle Length (s)			115.0			Sum of lost time (s)			32.0			
Intersection Capacity Utilization			70.1%			ICU Level of Service				C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

16: Site Access & Hazeldean Rd










5 Orchard Drive TIA

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	905	44	0	638	0	42
Future Volume (Veh/h)	905	44	0	638	0	42
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	905	44	0	638	0	42
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				53		
pX, platoon unblocked					0.96	
vC, conflicting volume			949		1246	474
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			949		1168	474
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	92
cM capacity (veh/h)			719		179	536
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	603	346	319	319	42	
Volume Left	0	0	0	0	0	
Volume Right	0	44	0	0	42	
cSH	1700	1700	1700	1700	536	
Volume to Capacity	0.35	0.20	0.19	0.19	0.08	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	1.9	
Control Delay (s)	0.0	0.0	0.0	0.0	12.3	
Lane LOS					B	
Approach Delay (s)	0.0		0.0		12.3	
Approach LOS					B	
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			37.9%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

18: Fringewood Dr & Site Access

















5 Orchard Drive TIA

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	38	0	4	66	2	13
Future Volume (Veh/h)	38	0	4	66	2	13
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	38	0	4	66	2	13
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)					81	
pX, platoon unblocked						
vC, conflicting volume	82	8	15			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	82	8	15			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	100	100			
cM capacity (veh/h)	917	1073	1603			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	38	70	15			
Volume Left	38	4	0			
Volume Right	0	0	13			
cSH	917	1603	1700			
Volume to Capacity	0.04	0.00	0.01			
Queue Length 95th (m)	1.0	0.1	0.0			
Control Delay (s)	9.1	0.4	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.1	0.4	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay		3.1				
Intersection Capacity Utilization		17.1%		ICU Level of Service		A
Analysis Period (min)		15				

Timings

5 Orchard Drive TIA

3: Victor St/Johnwoods St & Hazeldean Rd

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	103	920	36	1310	22	1	41	3
Future Volume (vph)	103	920	36	1310	22	1	41	3
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases	6	1	2	5		3		7
Permitted Phases	1		5		3		7	
Detector Phase	6	1	2	5	3	3	7	7
Switch Phase								
Minimum Initial (s)	1.0	5.0	1.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	7.1	27.1	7.1	27.1	30.6	30.6	30.6	30.6
Total Split (s)	14.0	69.0	14.0	69.0	37.0	37.0	37.0	37.0
Total Split (%)	11.7%	57.5%	11.7%	57.5%	30.8%	30.8%	30.8%	30.8%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.0	3.0	3.0
All-Red Time (s)	2.4	2.4	2.4	2.4	3.6	3.6	3.6	3.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
Act Effct Green (s)	95.3	90.4	90.4	84.4	9.5	9.5	9.5	9.5
Actuated g/C Ratio	0.79	0.75	0.75	0.70	0.08	0.08	0.08	0.08
v/c Ratio	0.37	0.38	0.09	0.59	0.31	0.12	0.43	0.55
Control Delay	6.5	6.6	2.6	7.6	62.1	24.6	64.9	18.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.5	6.6	2.6	7.6	62.1	24.6	64.9	18.6
LOS	A	A	A	A	E	C	E	B
Approach Delay		6.6		7.5		46.3		29.9
Approach LOS		A		A		D		C

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 88 (73%), Referenced to phase 1:EBTL and 5:WBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.59

Intersection Signal Delay: 9.1

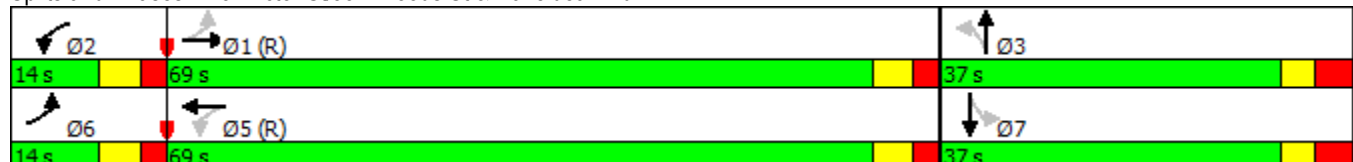
Intersection LOS: A

Intersection Capacity Utilization 80.0%

ICU Level of Service D

Analysis Period (min) 15





















Splits and Phases: 3: Victor St/Johnwoods St & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis


















3: Victor St/Johnwoods St & Hazeldean Rd

5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	103	920	21	36	1310	64	22	1	15	41	3	124
Future Volume (vph)	103	920	21	36	1310	64	22	1	15	41	3	124
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.1	6.1		6.1	6.1		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.86		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1565	3305		1565	3293		1565	1500		1565	1490	
Flt Permitted	0.15	1.00		0.29	1.00		0.55	1.00		0.75	1.00	
Satd. Flow (perm)	245	3305		486	3293		903	1500		1230	1490	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	103	920	21	36	1310	64	22	1	15	41	3	124
RTOR Reduction (vph)	0	1	0	0	2	0	0	14	0	0	114	0
Lane Group Flow (vph)	103	940	0	36	1372	0	22	2	0	41	13	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	6	1		2	5			3			7	
Permitted Phases	1			5			3			7		
Actuated Green, G (s)	95.3	87.9		88.1	84.3		9.5	9.5		9.5	9.5	
Effective Green, g (s)	95.3	87.9		88.1	84.3		9.5	9.5		9.5	9.5	
Actuated g/C Ratio	0.79	0.73		0.73	0.70		0.08	0.08		0.08	0.08	
Clearance Time (s)	6.1	6.1		6.1	6.1		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	275	2420		390	2313		71	118		97	117	
v/s Ratio Prot	c0.02	c0.28		0.00	c0.42			0.00			0.01	
v/s Ratio Perm	0.27			0.06			0.02			c0.03		
v/c Ratio	0.37	0.39		0.09	0.59		0.31	0.02		0.42	0.11	
Uniform Delay, d1	5.5	6.0		4.4	9.1		52.2	51.0		52.6	51.3	
Progression Factor	1.00	1.00		0.77	0.66		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	0.5		0.1	1.1		2.5	0.1		3.0	0.4	
Delay (s)	6.4	6.5		3.5	7.1		54.6	51.0		55.6	51.7	
Level of Service	A	A		A	A		D	D		E	D	
Approach Delay (s)		6.5			7.0			53.1			52.7	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay	10.3			HCM 2000 Level of Service			B					
HCM 2000 Volume to Capacity ratio	0.57											
Actuated Cycle Length (s)	120.0			Sum of lost time (s)			18.8					
Intersection Capacity Utilization	80.0%			ICU Level of Service			D					
Analysis Period (min)	15											
c Critical Lane Group												















HCM Unsignalized Intersection Capacity Analysis 6: Hazeldean Rd & Cedarow Crt

5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	16	981	1	3	1532	19	0	0	3	4	0	24
Future Volume (Veh/h)	16	981	1	3	1532	19	0	0	3	4	0	24
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	16	981	1	3	1532	19	0	0	3	4	0	24
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	TWLTL			None								
Median storage veh	2											
Upstream signal (m)				249								
pX, platoon unblocked												
vC, conflicting volume	1551			982			1810	2570	491	2073	2562	776
vC1, stage 1 conf vol							1014	1014		1548	1548	
vC2, stage 2 conf vol							796	1557		526	1014	
vCu, unblocked vol	1551			982			1810	2570	491	2073	2562	776
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			100			100	100	99	96	100	93
cM capacity (veh/h)	423			699			190	135	523	113	146	340
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1					
Volume Total	16	654	328	769	785	3	28					
Volume Left	16	0	0	3	0	0	4					
Volume Right	0	0	1	0	19	3	24					
cSH	423	1700	1700	699	1700	523	265					
Volume to Capacity	0.04	0.38	0.19	0.00	0.46	0.01	0.11					
Queue Length 95th (m)	0.9	0.0	0.0	0.1	0.0	0.1	2.7					
Control Delay (s)	13.8	0.0	0.0	0.1	0.0	11.9	20.2					
Lane LOS	B			A		B	C					
Approach Delay (s)	0.2			0.1		11.9	20.2					
Approach LOS						B	C					
Intersection Summary												
Average Delay	0.4											
Intersection Capacity Utilization	59.8%			ICU Level of Service				B				
Analysis Period (min)	15											

Timings 9: Fringewood Dr & Hazeldean Rd

5 Orchard Drive TIA

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	1	924	56	1478	84	0	3	0
Future Volume (vph)	1	924	56	1478	84	0	3	0
Turn Type	Perm	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases		6	5	2		3		7
Permitted Phases	6		2		3		7	
Detector Phase	6	6	5	2	3	3	7	7
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	32.2	32.2	10.9	32.1	34.9	34.9	34.9	34.9
Total Split (s)	64.0	64.0	20.0	84.0	36.0	36.0	36.0	36.0
Total Split (%)	53.3%	53.3%	16.7%	70.0%	30.0%	30.0%	30.0%	30.0%
Yellow Time (s)	3.7	3.7	3.5	3.7	3.0	3.0	3.0	3.0
All-Red Time (s)	2.5	2.5	2.4	2.4	3.9	3.9	3.9	3.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0
Total Lost Time (s)	6.2	6.2	5.9	6.1		6.9		6.9
Lead/Lag	Lag	Lag	Lead					
Lead-Lag Optimize?			Yes					
Recall Mode	C-Max	C-Max	None	C-Max	None	None	None	None
Act Effect Green (s)	86.0	86.0	96.4	96.2		10.8		10.8
Actuated g/C Ratio	0.72	0.72	0.80	0.80		0.09		0.09
v/c Ratio	0.00	0.39	0.14	0.56		0.68		0.02
Control Delay	14.0	14.0	2.4	3.3		39.1		0.2
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0
Total Delay	14.0	14.0	2.4	3.3		39.1		0.2
LOS	B	B	A	A		D		A
Approach Delay		14.0		3.2		39.1		0.3
Approach LOS		B		A		D		A

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 55 (46%), Referenced to phase 2:WBTL and 6:EBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 8.9

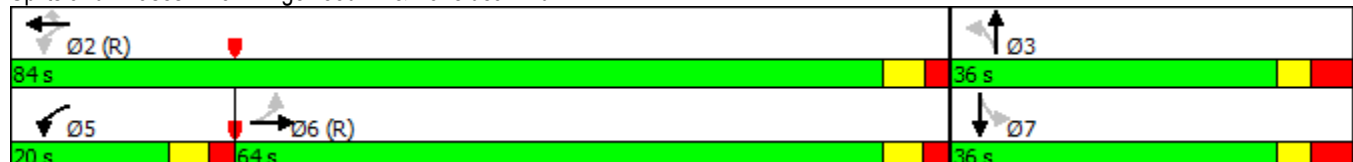
Intersection LOS: A

Intersection Capacity Utilization 68.6%

ICU Level of Service C

Analysis Period (min) 15




















Splits and Phases: 9: Fringewood Dr & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis























9: Fringewood Dr & Hazeldean Rd

5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	924	0	56	1478	0	84	0	50	3	0	1
Future Volume (vph)	1	924	0	56	1478	0	84	0	50	3	0	1
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.2	6.2		5.9	6.1			6.9			6.9	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	1.00		1.00	1.00			0.95			0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.97			0.96	
Satd. Flow (prot)	1565	3316		1565	3316			1607			1625	
Flt Permitted	0.18	1.00		0.27	1.00			0.81			0.77	
Satd. Flow (perm)	289	3316		438	3316			1338			1299	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1	924	0	56	1478	0	84	0	50	3	0	1
RTOR Reduction (vph)	0	0	0	0	0	0	0	76	0	0	4	0
Lane Group Flow (vph)	1	924	0	56	1478	0	0	58	0	0	0	0
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		6		5	2			3			7	
Permitted Phases	6			2		2	3			7		
Actuated Green, G (s)	84.9	84.9		96.2	96.2			10.8			10.8	
Effective Green, g (s)	84.9	84.9		96.2	96.2			10.8			10.8	
Actuated g/C Ratio	0.71	0.71		0.80	0.80			0.09			0.09	
Clearance Time (s)	6.2	6.2		5.9	6.1			6.9			6.9	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	204	2346		400	2658			120			116	
v/s Ratio Prot		0.28		0.01	c0.45							
v/s Ratio Perm	0.00			0.11				c0.04			0.00	
v/c Ratio	0.00	0.39		0.14	0.56			0.49			0.00	
Uniform Delay, d1	5.2	7.1		3.2	4.3			52.0			49.7	
Progression Factor	1.81	1.71		0.60	0.56			1.00			1.00	
Incremental Delay, d2	0.0	0.5		0.1	0.6			3.1			0.0	
Delay (s)	9.4	12.7		2.0	2.9			55.1			49.7	
Level of Service	A	B		A	A			E			D	
Approach Delay (s)		12.7			2.9			55.1			49.7	
Approach LOS		B			A			E			D	
Intersection Summary												
HCM 2000 Control Delay			9.1			HCM 2000 Level of Service				A		
HCM 2000 Volume to Capacity ratio			0.58									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			19.0			
Intersection Capacity Utilization			68.6%			ICU Level of Service				C		
Analysis Period (min)			15									
c Critical Lane Group												

Timings
12: Iber Rd/Huntmar Dr & Hazeldean Rd

5 Orchard Drive TIA

											
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	204	652	320	1021	211	139	275	242	140	339	393
Future Volume (vph)	204	652	320	1021	211	139	275	242	140	339	393
Turn Type	Prot	NA	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6	5	2		3	8		7	4	
Permitted Phases					2	8		8	4		4
Detector Phase	1	6	5	2	2	3	8	8	7	4	4
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.3	36.3	11.3	36.3	36.3	11.1	39.6	39.6	11.1	39.6	39.6
Total Split (s)	22.0	44.0	22.0	44.0	44.0	12.0	42.0	42.0	12.0	42.0	42.0
Total Split (%)	18.3%	36.7%	18.3%	36.7%	36.7%	10.0%	35.0%	35.0%	10.0%	35.0%	35.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
All-Red Time (s)	2.6	2.6	2.6	2.6	2.6	2.6	2.9	2.9	2.6	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	13.0	43.6	16.2	46.8	46.8	35.3	28.9	28.9	35.3	28.9	28.9
Actuated g/C Ratio	0.11	0.36	0.14	0.39	0.39	0.29	0.24	0.24	0.29	0.24	0.24
v/c Ratio	0.62	0.65	0.78	0.79	0.31	0.74	0.65	0.46	0.60	0.81	0.67
Control Delay	64.4	32.9	64.0	39.2	5.3	53.5	47.9	7.1	40.6	57.5	13.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.4	32.9	64.0	39.2	5.3	53.5	47.9	7.1	40.6	57.5	13.6
LOS	E	C	E	D	A	D	D	A	D	E	B
Approach Delay		39.5		39.7			34.1			35.0	
Approach LOS		D		D			C			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 32 (27%), Referenced to phase 2:WBT and 6:EBT, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 37.7

Intersection LOS: D

Intersection Capacity Utilization 84.0%

ICU Level of Service E

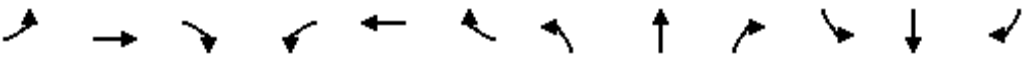











Analysis Period (min) 15

Splits and Phases: 12: Iber Rd/Huntmar Dr & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis 12: Iber Rd/Huntmar Dr & Hazeldean Rd

5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	204	652	122	320	1021	211	139	275	242	140	339	393
Future Volume (vph)	204	652	122	320	1021	211	139	275	242	140	339	393
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.3	6.3		6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Lane Util. Factor	0.97	0.95		0.97	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3036	3237		3036	3316	1400	1565	1745	1400	1565	1745	1400
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.28	1.00	1.00	0.39	1.00	1.00
Satd. Flow (perm)	3036	3237		3036	3316	1400	456	1745	1400	642	1745	1400
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	204	652	122	320	1021	211	139	275	242	140	339	393
RTOR Reduction (vph)	0	12	0	0	0	129	0	0	184	0	0	247
Lane Group Flow (vph)	204	762	0	320	1021	82	139	275	58	140	339	146
Turn Type	Prot	NA		Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases						2	8		8	4		4
Actuated Green, G (s)	13.0	43.7		16.2	46.9	46.9	34.8	28.9	28.9	34.8	28.9	28.9
Effective Green, g (s)	13.0	43.7		16.2	46.9	46.9	34.8	28.9	28.9	34.8	28.9	28.9
Actuated g/C Ratio	0.11	0.36		0.13	0.39	0.39	0.29	0.24	0.24	0.29	0.24	0.24
Clearance Time (s)	6.3	6.3		6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	328	1178		409	1296	547	186	420	337	231	420	337
v/s Ratio Prot	0.07	0.24		c0.11	c0.31		c0.04	0.16		0.03	c0.19	
v/s Ratio Perm						0.06	0.18		0.04	0.15		0.10
v/c Ratio	0.62	0.65		0.78	0.79	0.15	0.75	0.65	0.17	0.61	0.81	0.43
Uniform Delay, d1	51.2	31.7		50.2	32.2	23.7	38.0	41.1	36.1	36.3	42.9	38.6
Progression Factor	1.11	0.93		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.4	2.6		9.4	4.9	0.6	15.1	3.7	0.2	4.4	10.8	0.9
Delay (s)	60.2	32.0		59.6	37.1	24.2	53.0	44.7	36.3	40.7	53.8	39.5
Level of Service	E	C		E	D	C	D	D	D	D	D	D
Approach Delay (s)		37.9			40.0			43.4			45.2	
Approach LOS		D			D			D			D	
Intersection Summary												
HCM 2000 Control Delay			41.1			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.82									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			25.3			
Intersection Capacity Utilization			84.0%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis










16: Site Access & Hazeldean Rd

5 Orchard Drive TIA

















	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑		↗
Traffic Volume (veh/h)	905	44	0	638	0	42
Future Volume (Veh/h)	905	44	0	638	0	42
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	905	44	0	638	0	42
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)				52		
pX, platoon unblocked						
vC, conflicting volume			949		1246	474
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			949		1246	474
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	92
cM capacity (veh/h)			719		166	536
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	603	346	319	319	42	
Volume Left	0	0	0	0	0	
Volume Right	0	44	0	0	42	
cSH	1700	1700	1700	1700	536	
Volume to Capacity	0.35	0.20	0.19	0.19	0.08	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	1.9	
Control Delay (s)	0.0	0.0	0.0	0.0	12.3	
Lane LOS					B	
Approach Delay (s)	0.0		0.0		12.3	
Approach LOS					B	
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			37.9%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis 18: Fringewood Dr & Site Access

5 Orchard Drive TIA

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	38	0	4	66	13	2
Future Volume (Veh/h)	38	0	4	66	13	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	38	0	4	66	13	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)					79	
pX, platoon unblocked						
vC, conflicting volume	88	14	15			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	88	14	15			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	100	100			
cM capacity (veh/h)	911	1066	1603			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	38	70	15			
Volume Left	38	4	0			
Volume Right	0	0	2			
cSH	911	1603	1700			
Volume to Capacity	0.04	0.00	0.01			
Queue Length 95th (m)	1.0	0.1	0.0			
Control Delay (s)	9.1	0.4	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.1	0.4	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			3.1			
Intersection Capacity Utilization		17.1%		ICU Level of Service		A
Analysis Period (min)		15				

3: Victor St/Johnwoods St & Hazeldean Rd

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	60	1144	15	554	32	3	38	5
Future Volume (vph)	60	1144	15	554	32	3	38	5
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases	6	1	2	5		3		7
Permitted Phases	1		5		3		7	
Detector Phase	6	1	2	5	3	3	7	7
Switch Phase								
Minimum Initial (s)	1.0	5.0	1.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	7.1	27.1	7.1	27.1	30.6	30.6	30.6	30.6
Total Split (s)	15.0	63.0	15.0	63.0	37.0	37.0	37.0	37.0
Total Split (%)	13.0%	54.8%	13.0%	54.8%	32.2%	32.2%	32.2%	32.2%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.0	3.0	3.0
All-Red Time (s)	2.4	2.4	2.4	2.4	3.6	3.6	3.6	3.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
Act Effct Green (s)	91.2	88.3	87.6	83.0	9.1	9.1	9.1	9.1
Actuated g/C Ratio	0.79	0.77	0.76	0.72	0.08	0.08	0.08	0.08
v/c Ratio	0.10	0.46	0.04	0.25	0.36	0.22	0.40	0.50
Control Delay	3.0	6.5	1.3	2.0	60.0	22.1	61.4	19.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.0	6.5	1.3	2.0	60.0	22.1	61.4	19.0
LOS	A	A	A	A	E	C	E	B
Approach Delay		6.4		2.0		41.0		30.3
Approach LOS		A		A		D		C

Intersection Summary

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 105 (91%), Referenced to phase 1:EBTL and 5:WBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.50

Intersection Signal Delay: 7.9

Intersection LOS: A

Intersection Capacity Utilization 61.8%

ICU Level of Service B

Analysis Period (min) 15





















Splits and Phases: 3: Victor St/Johnwoods St & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis

3: Victor St/Johnwoods St & Hazeldean Rd


















5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	1144	17	15	554	33	32	3	29	38	5	100
Future Volume (vph)	60	1144	17	15	554	33	32	3	29	38	5	100
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.1	6.1		6.1	6.1		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.86		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1565	3308		1565	3288		1565	1508		1565	1496	
Flt Permitted	0.41	1.00		0.22	1.00		0.69	1.00		0.74	1.00	
Satd. Flow (perm)	678	3308		370	3288		1135	1508		1213	1496	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	60	1144	17	15	554	33	32	3	29	38	5	100
RTOR Reduction (vph)	0	1	0	0	2	0	0	27	0	0	92	0
Lane Group Flow (vph)	60	1160	0	15	585	0	32	5	0	38	13	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	6	1		2	5			3			7	
Permitted Phases	1			5			3			7		
Actuated Green, G (s)	90.0	84.7		84.2	81.8		9.1	9.1		9.1	9.1	
Effective Green, g (s)	90.0	84.7		84.2	81.8		9.1	9.1		9.1	9.1	
Actuated g/C Ratio	0.78	0.74		0.73	0.71		0.08	0.08		0.08	0.08	
Clearance Time (s)	6.1	6.1		6.1	6.1		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	571	2436		295	2338		89	119		95	118	
v/s Ratio Prot	c0.00	c0.35		0.00	0.18			0.00			0.01	
v/s Ratio Perm	0.08			0.04			0.03			c0.03		
v/c Ratio	0.11	0.48		0.05	0.25		0.36	0.04		0.40	0.11	
Uniform Delay, d1	2.9	6.1		4.4	5.8		50.2	48.9		50.4	49.2	
Progression Factor	1.00	1.00		0.36	0.29		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.7		0.1	0.3		2.5	0.2		2.8	0.4	
Delay (s)	3.0	6.8		1.6	1.9		52.7	49.1		53.1	49.6	
Level of Service	A	A		A	A		D	D		D	D	
Approach Delay (s)		6.6			1.9			50.9			50.5	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay	9.7			HCM 2000 Level of Service			A					
HCM 2000 Volume to Capacity ratio	0.46											
Actuated Cycle Length (s)	115.0			Sum of lost time (s)			18.8					
Intersection Capacity Utilization	61.8%			ICU Level of Service			B					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

















6: Hazeldean Rd & Cedarow Crt

5 Orchard Drive TIA

															
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR			
Lane Configurations															
Traffic Volume (veh/h)	14	1061	2	1	718	20	2	0	1	24	1	10			
Future Volume (Veh/h)	14	1061	2	1	718	20	2	0	1	24	1	10			
Sign Control	Free				Free				Stop						
Grade	0%				0%				0%						
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Hourly flow rate (vph)	14	1061	2	1	718	20	2	0	1	24	1	10			
Pedestrians															
Lane Width (m)															
Walking Speed (m/s)															
Percent Blockage															
Right turn flare (veh)															
Median type	TWLTL				None										
Median storage veh	2														
Upstream signal (m)					249										
pX, platoon unblocked	0.97							0.97	0.97			0.97	0.97	0.97	
vC, conflicting volume	738				1063				1462	1830	532	1290	1821	369	
vC1, stage 1 conf vol							1090	1090				730	730		
vC2, stage 2 conf vol							372	740				560	1091		
vCu, unblocked vol	675				1063				1418	1797	532	1242	1788	295	
tC, single (s)	4.1				4.1				7.5	6.5	6.9	7.5	6.5	6.9	
tC, 2 stage (s)							6.5	5.5				6.5	5.5		
tF (s)	2.2				2.2				3.5	4.0	3.3	3.5	4.0	3.3	
p0 queue free %	98				100				99	100	100	93	100	99	
cM capacity (veh/h)	888				651				215	240	492	322	243	682	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1								
Volume Total	14	707	356	360	379	3	35								
Volume Left	14	0	0	1	0	2	24								
Volume Right	0	0	2	0	20	1	10								
cSH	888	1700	1700	651	1700	264	375								
Volume to Capacity	0.02	0.42	0.21	0.00	0.22	0.01	0.09								
Queue Length 95th (m)	0.4	0.0	0.0	0.0	0.0	0.3	2.3								
Control Delay (s)	9.1	0.0	0.0	0.0	0.0	18.8	15.6								
Lane LOS	A				A				C	C					
Approach Delay (s)	0.1				0.0				18.8	15.6					
Approach LOS							C				C				
Intersection Summary															
Average Delay				0.4											
Intersection Capacity Utilization				41.0%	ICU Level of Service				A						
Analysis Period (min)				15											

Timings 9: Fringewood Dr & Hazeldean Rd

5 Orchard Drive TIA

									
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	9	949	32	757	35	48	0	19	1
Future Volume (vph)	9	949	32	757	35	48	0	19	1
Turn Type	Perm	NA	pm+pt	NA	Perm	Perm	NA	Perm	NA
Protected Phases		6	5	2			3		7
Permitted Phases	6		2		2	3		7	
Detector Phase	6	6	5	2	2	3	3	7	7
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	32.2	32.2	10.9	32.1	32.1	34.9	34.9	34.9	34.9
Total Split (s)	64.0	64.0	15.0	79.0	79.0	36.0	36.0	36.0	36.0
Total Split (%)	55.7%	55.7%	13.0%	68.7%	68.7%	31.3%	31.3%	31.3%	31.3%
Yellow Time (s)	3.7	3.7	3.5	3.7	3.7	3.0	3.0	3.0	3.0
All-Red Time (s)	2.5	2.5	2.4	2.4	2.4	3.9	3.9	3.9	3.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Lost Time (s)	6.2	6.2	5.9	6.1	6.1		6.9		6.9
Lead/Lag	Lag	Lag	Lead						
Lead-Lag Optimize?			Yes						
Recall Mode	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None
Act Effct Green (s)	84.7	84.7	92.4	92.2	92.2		9.8		9.8
Actuated g/C Ratio	0.74	0.74	0.80	0.80	0.80		0.09		0.09
v/c Ratio	0.02	0.40	0.08	0.28	0.03		0.66		0.28
Control Delay	9.1	11.6	2.4	2.3	0.5		34.9		45.1
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Delay	9.1	11.6	2.4	2.3	0.5		34.9		45.1
LOS	A	B	A	A	A		C		D
Approach Delay		11.5		2.2			34.9		45.1
Approach LOS		B		A			C		D

Intersection Summary

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 67 (58%), Referenced to phase 2:WBTL and 6:EBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 9.6

Intersection LOS: A

Intersection Capacity Utilization 47.3%

ICU Level of Service A

Analysis Period (min) 15




















Splits and Phases: 9: Fringewood Dr & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis


9: Fringewood Dr & Hazeldean Rd

5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	949	17	32	757	35	48	0	81	19	1	7
Future Volume (vph)	9	949	17	32	757	35	48	0	81	19	1	7
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.2	6.2		5.9	6.1	6.1		6.9			6.9	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		1.00			1.00	
Frt	1.00	1.00		1.00	1.00	0.85		0.92			0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.98			0.97	
Satd. Flow (prot)	1565	3307		1565	3316	1400		1568			1627	
Flt Permitted	0.36	1.00		0.25	1.00	1.00		0.87			0.62	
Satd. Flow (perm)	600	3307		419	3316	1400		1383			1044	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	9	949	17	32	757	35	48	0	81	19	1	7
RTOR Reduction (vph)	0	1	0	0	0	7	0	79	0	0	6	0
Lane Group Flow (vph)	9	965	0	32	757	28	0	50	0	0	21	0
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		6		5	2			3			7	
Permitted Phases	6			2		2	3			7		
Actuated Green, G (s)	82.4	82.4		92.2	92.2	92.2		9.8			9.8	
Effective Green, g (s)	82.4	82.4		92.2	92.2	92.2		9.8			9.8	
Actuated g/C Ratio	0.72	0.72		0.80	0.80	0.80		0.09			0.09	
Clearance Time (s)	6.2	6.2		5.9	6.1	6.1		6.9			6.9	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0			3.0	
Lane Grp Cap (vph)	429	2369		373	2658	1122		117			88	
v/s Ratio Prot		c0.29		0.00	c0.23							
v/s Ratio Perm	0.01			0.07		0.02		c0.04			0.02	
v/c Ratio	0.02	0.41		0.09	0.28	0.03		0.43			0.23	
Uniform Delay, d1	4.7	6.5		3.0	2.9	2.3		49.9			49.1	
Progression Factor	1.28	1.59		0.66	0.63	0.39		1.00			1.00	
Incremental Delay, d2	0.1	0.5		0.1	0.3	0.0		2.5			1.4	
Delay (s)	6.1	10.8		2.1	2.1	0.9		52.5			50.5	
Level of Service	A	B		A	A	A		D			D	
Approach Delay (s)		10.8			2.0			52.5			50.5	
Approach LOS		B			A			D			D	
Intersection Summary												
HCM 2000 Control Delay			10.4				HCM 2000 Level of Service				B	
HCM 2000 Volume to Capacity ratio			0.41									
Actuated Cycle Length (s)			115.0				Sum of lost time (s)			19.0		
Intersection Capacity Utilization			47.3%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

Timings 12: Iber Rd/Huntmar Dr & Hazeldean Rd

5 Orchard Drive TIA

												
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø6
Lane Configurations												
Traffic Volume (vph)	239	812	211	503	91	56	287	283	131	321	146	
Future Volume (vph)	239	812	211	503	91	56	287	283	131	321	146	
Turn Type	Prot	NA	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	
Protected Phases	6 9	1	2	5		3	8		7	4		6
Permitted Phases					5	8		8	4		4	
Detector Phase	6 9	1	2	5	5	3	8	8	7	4	4	
Switch Phase												
Minimum Initial (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)		49.0	11.3	37.0	37.0	11.1	24.6	24.6	11.1	24.6	24.6	11.5
Total Split (s)		49.0	14.0	37.0	37.0	12.0	40.0	40.0	12.0	40.0	40.0	14.0
Total Split (%)		42.6%	12.2%	32.2%	32.2%	10.4%	34.8%	34.8%	10.4%	34.8%	34.8%	12%
Yellow Time (s)		3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.7
All-Red Time (s)		2.6	2.8	2.6	2.6	2.6	2.9	2.9	2.6	2.9	2.9	2.8
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.3	6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6	
Lead/Lag		Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead
Lead-Lag Optimize?		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode		C-Max	None	C-Max	C-Max	None	None	None	None	None	None	None
Act Effect Green (s)	14.3	45.4	12.5	36.9	36.9	32.2	25.9	25.9	33.5	28.3	28.3	
Actuated g/C Ratio	0.12	0.39	0.11	0.32	0.32	0.28	0.23	0.23	0.29	0.25	0.25	
v/c Ratio	0.64	0.72	0.64	0.47	0.15	0.27	0.73	0.55	0.60	0.75	0.29	
Control Delay	42.6	21.3	59.7	34.5	0.5	27.6	51.8	10.4	40.5	51.5	2.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	42.6	21.3	59.7	34.5	0.5	27.6	51.8	10.4	40.5	51.5	2.3	
LOS	D	C	E	C	A	C	D	B	D	D	A	
Approach Delay		25.6		37.3			30.9			37.1		
Approach LOS		C		D			C			D		

Intersection Summary

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 62 (54%), Referenced to phase 1:EBT and 5:WBT, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 31.7

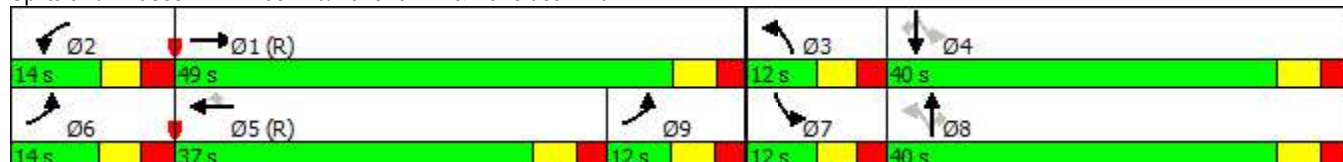
Intersection LOS: C

Intersection Capacity Utilization 78.8%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 12: Iber Rd/Huntmar Dr & Hazeldean Rd


























Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	11.5
Total Split (s)	12.0
Total Split (%)	10%
Yellow Time (s)	3.7
All-Red Time (s)	2.8
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

12: Iber Rd/Huntmar Dr & Hazeldean Rd

















5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	239	812	122	211	503	91	56	287	283	131	321	146
Future Volume (vph)	239	812	122	211	503	91	56	287	283	131	321	146
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.5	6.3		6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Lane Util. Factor	0.97	0.95		0.97	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3036	3251		3036	3316	1400	1565	1745	1400	1565	1745	1400
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.34	1.00	1.00	0.35	1.00	1.00
Satd. Flow (perm)	3036	3251		3036	3316	1400	553	1745	1400	579	1745	1400
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	239	812	122	211	503	91	56	287	283	131	321	146
RTOR Reduction (vph)	0	10	0	0	0	63	0	0	193	0	0	110
Lane Group Flow (vph)	239	924	0	211	503	28	56	287	90	131	321	36
Turn Type	Prot	NA		Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	6.9	1		2	5		3	8		7	4	
Permitted Phases						5	8		8	4		4
Actuated Green, G (s)	14.3	44.2		12.5	35.7	35.7	31.8	27.1	27.1	34.2	28.3	28.3
Effective Green, g (s)	14.3	44.2		12.5	35.7	35.7	31.8	27.1	27.1	34.2	28.3	28.3
Actuated g/C Ratio	0.12	0.38		0.11	0.31	0.31	0.28	0.24	0.24	0.30	0.25	0.25
Clearance Time (s)		6.3		6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	377	1249		330	1029	434	194	411	329	222	429	344
v/s Ratio Prot	0.08	c0.28		c0.07	c0.15		0.01	0.16		c0.03	c0.18	
v/s Ratio Perm						0.02	0.07		0.06	0.14		0.03
v/c Ratio	0.63	0.74		0.64	0.49	0.07	0.29	0.70	0.27	0.59	0.75	0.10
Uniform Delay, d1	47.9	30.5		49.1	32.2	27.9	31.8	40.2	35.9	33.5	40.1	33.5
Progression Factor	1.42	0.60		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.3	3.8		4.0	1.7	0.3	0.8	5.1	0.5	4.2	7.0	0.1
Delay (s)	71.4	21.9		53.1	33.9	28.2	32.6	45.3	36.3	37.7	47.1	33.7
Level of Service	E	C		D	C	C	C	D	D	D	D	C
Approach Delay (s)		32.0			38.3			40.1			41.7	
Approach LOS		C			D			D			D	
Intersection Summary												
HCM 2000 Control Delay			37.0			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.79									
Actuated Cycle Length (s)			115.0			Sum of lost time (s)			32.0			
Intersection Capacity Utilization			78.8%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

Timings

5 Orchard Drive TIA

3: Victor St/Johnwoods St & Hazeldean Rd

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	114	1082	39	1535	25	1	38	3
Future Volume (vph)	114	1082	39	1535	25	1	38	3
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases	6	1	2	5		3		7
Permitted Phases	1		5		3		7	
Detector Phase	6	1	2	5	3	3	7	7
Switch Phase								
Minimum Initial (s)	1.0	5.0	1.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	7.1	27.1	7.1	27.1	30.6	30.6	30.6	30.6
Total Split (s)	14.0	69.0	14.0	69.0	37.0	37.0	37.0	37.0
Total Split (%)	11.7%	57.5%	11.7%	57.5%	30.8%	30.8%	30.8%	30.8%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.0	3.0	3.0
All-Red Time (s)	2.4	2.4	2.4	2.4	3.6	3.6	3.6	3.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
Act Effct Green (s)	97.1	90.6	88.6	82.5	9.2	9.2	9.2	9.2
Actuated g/C Ratio	0.81	0.76	0.74	0.69	0.08	0.08	0.08	0.08
v/c Ratio	0.47	0.44	0.11	0.71	0.42	0.13	0.40	0.58
Control Delay	11.4	7.1	2.6	6.1	73.1	24.3	64.3	19.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.4	7.1	2.6	6.1	73.1	24.3	64.3	19.1
LOS	B	A	A	A	E	C	E	B
Approach Delay		7.5		6.0		53.3		28.7
Approach LOS		A		A		D		C

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 88 (73%), Referenced to phase 1:EBTL and 5:WBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 8.6

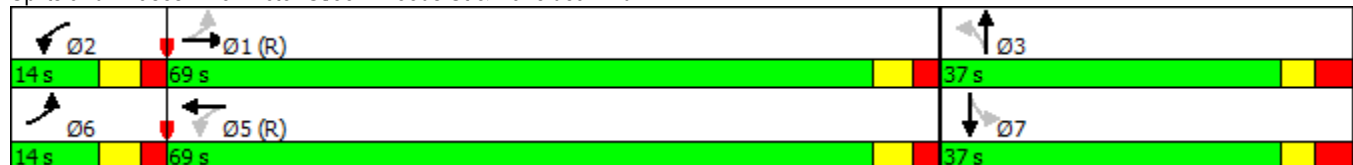
Intersection LOS: A

Intersection Capacity Utilization 88.3%

ICU Level of Service E

Analysis Period (min) 15





















Splits and Phases: 3: Victor St/Johnwoods St & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis

3: Victor St/Johnwoods St & Hazeldean Rd


















5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	114	1082	24	39	1535	70	25	1	16	38	3	137
Future Volume (vph)	114	1082	24	39	1535	70	25	1	16	38	3	137
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.1	6.1		6.1	6.1		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.86		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1565	3305		1565	3294		1565	1499		1565	1489	
Flt Permitted	0.10	1.00		0.25	1.00		0.47	1.00		0.75	1.00	
Satd. Flow (perm)	161	3305		407	3294		772	1499		1229	1489	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	114	1082	24	39	1535	70	25	1	16	38	3	137
RTOR Reduction (vph)	0	1	0	0	2	0	0	15	0	0	126	0
Lane Group Flow (vph)	114	1105	0	39	1603	0	25	2	0	38	14	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	6	1		2	5			3			7	
Permitted Phases	1			5			3			7		
Actuated Green, G (s)	97.7	88.2		86.3	82.5		9.2	9.2		9.2	9.2	
Effective Green, g (s)	97.7	88.2		86.3	82.5		9.2	9.2		9.2	9.2	
Actuated g/C Ratio	0.81	0.74		0.72	0.69		0.08	0.08		0.08	0.08	
Clearance Time (s)	6.1	6.1		6.1	6.1		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	242	2429		329	2264		59	114		94	114	
v/s Ratio Prot	c0.04	c0.33		0.00	c0.49			0.00			0.01	
v/s Ratio Perm	0.35			0.08			c0.03			0.03		
v/c Ratio	0.47	0.46		0.12	0.71		0.42	0.02		0.40	0.12	
Uniform Delay, d1	10.3	6.3		4.9	11.4		52.9	51.2		52.8	51.6	
Progression Factor	1.00	1.00		0.67	0.36		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.4	0.6		0.1	1.5		4.8	0.1		2.8	0.5	
Delay (s)	11.7	6.9		3.4	5.6		57.7	51.3		55.6	52.1	
Level of Service	B	A		A	A		E	D		E	D	
Approach Delay (s)		7.4			5.6			55.1			52.8	
Approach LOS		A			A			E			D	
Intersection Summary												
HCM 2000 Control Delay			9.7			HCM 2000 Level of Service				A		
HCM 2000 Volume to Capacity ratio			0.66									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)				18.8		
Intersection Capacity Utilization			88.3%			ICU Level of Service				E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

















6: Hazeldean Rd & Cedarow Crt

5 Orchard Drive TIA

																		
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR						
Lane Configurations																		
Traffic Volume (veh/h)	18	1124	25	39	1740	21	38	0	28	24	0	27						
Future Volume (Veh/h)	18	1124	25	39	1740	21	38	0	28	24	0	27						
Sign Control	Free			Free			Stop			Stop								
Grade	0%			0%			0%			0%								
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00						
Hourly flow rate (vph)	18	1124	25	39	1740	21	38	0	28	24	0	27						
Pedestrians																		
Lane Width (m)																		
Walking Speed (m/s)																		
Percent Blockage																		
Right turn flare (veh)																		
Median type	TWLTL				None													
Median storage veh	2																	
Upstream signal (m)					249													
pX, platoon unblocked	0.74							0.74	0.74									
vC, conflicting volume	1761				1149				2148	3012	574	2454						
vC1, stage 1 conf vol									1172	1172	1828	1828						
vC2, stage 2 conf vol									975	1839	626	1185						
vCu, unblocked vol	1325				1149				1848	3016	574	2263						
tC, single (s)	4.1				4.1				7.5	6.5	6.9	7.5						
tC, 2 stage (s)									6.5	5.5	6.5	5.5						
tF (s)	2.2				2.2				3.5	4.0	3.3	3.5						
p0 queue free %	95				94				78	100	94	74						
cM capacity (veh/h)	383				604				175	103	461	93						
											110	658						
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1											
Volume Total	18	749	400	909	891	66	51											
Volume Left	18	0	0	39	0	38	24											
Volume Right	0	0	25	0	21	28	27											
cSH	383	1700	1700	604	1700	237	171											
Volume to Capacity	0.05	0.44	0.24	0.06	0.52	0.28	0.30											
Queue Length 95th (m)	1.1	0.0	0.0	1.6	0.0	8.4	9.0											
Control Delay (s)	14.9	0.0	0.0	1.9	0.0	25.9	34.7											
Lane LOS	B				A				D	D								
Approach Delay (s)	0.2				1.0				25.9									
Approach LOS									D									
Intersection Summary																		
Average Delay				1.8														
Intersection Capacity Utilization				93.1%	ICU Level of Service				F									
Analysis Period (min)				15														

Timings 9: Fringewood Dr & Hazeldean Rd

5 Orchard Drive TIA

									
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	10	1046	67	1716	37	82	0	55	0
Future Volume (vph)	10	1046	67	1716	37	82	0	55	0
Turn Type	Perm	NA	pm+pt	NA	Perm	Perm	NA	Perm	NA
Protected Phases		6	5	2			3		7
Permitted Phases	6		2		2	3		7	
Detector Phase	6	6	5	2	2	3	3	7	7
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	32.2	32.2	10.9	32.1	32.1	34.9	34.9	34.9	34.9
Total Split (s)	64.0	64.0	20.0	84.0	84.0	36.0	36.0	36.0	36.0
Total Split (%)	53.3%	53.3%	16.7%	70.0%	70.0%	30.0%	30.0%	30.0%	30.0%
Yellow Time (s)	3.7	3.7	3.5	3.7	3.7	3.0	3.0	3.0	3.0
All-Red Time (s)	2.5	2.5	2.4	2.4	2.4	3.9	3.9	3.9	3.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Lost Time (s)	6.2	6.2	5.9	6.1	6.1		6.9		6.9
Lead/Lag	Lag	Lag	Lead						
Lead-Lag Optimize?			Yes						
Recall Mode	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None
Act Effct Green (s)	83.4	83.4	94.1	93.9	93.9		13.1		13.1
Actuated g/C Ratio	0.70	0.70	0.78	0.78	0.78		0.11		0.11
v/c Ratio	0.07	0.47	0.19	0.66	0.03		0.73		0.37
Control Delay	16.7	17.5	2.8	5.6	0.6		42.9		12.2
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Delay	16.7	17.5	2.8	5.6	0.6		42.9		12.2
LOS	B	B	A	A	A		D		B
Approach Delay		17.5		5.4			42.9		12.2
Approach LOS		B		A			D		B

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 55 (46%), Referenced to phase 2:WBTL and 6:EBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 11.7

Intersection LOS: B

Intersection Capacity Utilization 79.4%

ICU Level of Service D

Analysis Period (min) 15




















Splits and Phases: 9: Fringewood Dr & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis























9: Fringewood Dr & Hazeldean Rd

5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	1046	32	67	1716	37	82	0	79	55	0	14
Future Volume (vph)	10	1046	32	67	1716	37	82	0	79	55	0	14
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.2	6.2		5.9	6.1	6.1		6.9			6.9	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		1.00			1.00	
Frt	1.00	1.00		1.00	1.00	0.85		0.93			0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.98			0.96	
Satd. Flow (prot)	1565	3301		1565	3316	1400		1589			1632	
Flt Permitted	0.12	1.00		0.21	1.00	1.00		0.83			0.61	
Satd. Flow (perm)	205	3301		352	3316	1400		1358			1041	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	10	1046	32	67	1716	37	82	0	79	55	0	14
RTOR Reduction (vph)	0	1	0	0	0	8	0	74	0	0	61	0
Lane Group Flow (vph)	10	1077	0	67	1716	29	0	87	0	0	8	0
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		6		5	2			3			7	
Permitted Phases	6			2		2	3			7		
Actuated Green, G (s)	82.2	82.2		93.9	93.9	93.9		13.1			13.1	
Effective Green, g (s)	82.2	82.2		93.9	93.9	93.9		13.1			13.1	
Actuated g/C Ratio	0.69	0.69		0.78	0.78	0.78		0.11			0.11	
Clearance Time (s)	6.2	6.2		5.9	6.1	6.1		6.9			6.9	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0			3.0	
Lane Grp Cap (vph)	140	2261		333	2594	1095		148			113	
v/s Ratio Prot		0.33		0.01	c0.52							
v/s Ratio Perm	0.05			0.15		0.02		c0.06			0.01	
v/c Ratio	0.07	0.48		0.20	0.66	0.03		0.59			0.07	
Uniform Delay, d1	6.3	8.8		4.4	5.9	2.9		50.9			48.0	
Progression Factor	1.62	1.70		0.64	0.75	0.38		1.00			1.00	
Incremental Delay, d2	0.9	0.7		0.1	0.4	0.0		5.9			0.3	
Delay (s)	11.1	15.7		2.9	4.8	1.1		56.7			48.2	
Level of Service	B	B		A	A	A		E			D	
Approach Delay (s)		15.6			4.6			56.7			48.2	
Approach LOS		B			A			E			D	
Intersection Summary												
HCM 2000 Control Delay			12.1				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.69									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			19.0		
Intersection Capacity Utilization			79.4%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												

Timings
12: Iber Rd/Huntmar Dr & Hazeldean Rd

5 Orchard Drive TIA

											
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	270	836	375	1225	233	164	395	293	154	421	451
Future Volume (vph)	270	836	375	1225	233	164	395	293	154	421	451
Turn Type	Prot	NA	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6	5	2		3	8		7	4	
Permitted Phases					2	8		8	4		4
Detector Phase	1	6	5	2	2	3	8	8	7	4	4
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.3	36.3	11.3	36.3	36.3	11.1	39.6	39.6	11.1	39.6	39.6
Total Split (s)	22.0	44.0	22.0	44.0	44.0	12.0	42.0	42.0	12.0	42.0	42.0
Total Split (%)	18.3%	36.7%	18.3%	36.7%	36.7%	10.0%	35.0%	35.0%	10.0%	35.0%	35.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
All-Red Time (s)	2.6	2.6	2.6	2.6	2.6	2.6	2.9	2.9	2.6	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	14.5	39.3	16.6	41.3	41.3	39.3	32.9	32.9	39.3	32.9	32.9
Actuated g/C Ratio	0.12	0.33	0.14	0.34	0.34	0.33	0.27	0.27	0.33	0.27	0.27
v/c Ratio	0.74	0.90	0.89	1.07	0.37	0.97	0.83	0.49	0.82	0.88	0.74
Control Delay	65.9	52.6	75.5	87.0	5.6	94.5	55.9	6.7	63.0	61.8	20.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	65.9	52.6	75.5	87.0	5.6	94.5	55.9	6.7	63.0	61.8	20.0
LOS	E	D	E	F	A	F	E	A	E	E	C
Approach Delay		55.5		74.3			46.4			43.6	
Approach LOS		E		E			D			D	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 32 (27%), Referenced to phase 2:WBT and 6:EBT, Start of Green

Natural Cycle: 120

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.07

Intersection Signal Delay: 58.4

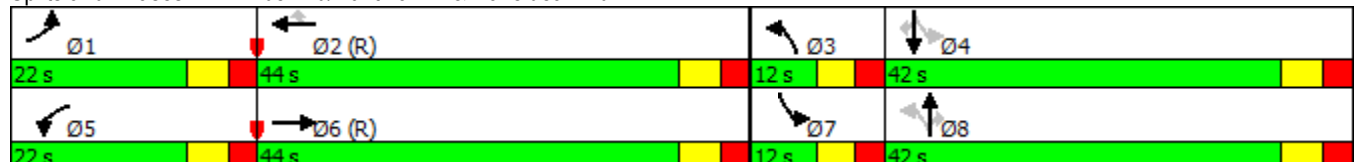
Intersection LOS: E

Intersection Capacity Utilization 97.9%

ICU Level of Service F

Analysis Period (min) 15

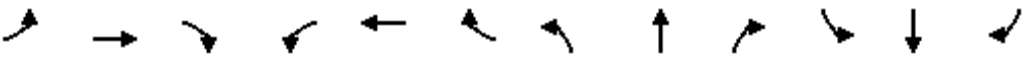
Splits and Phases: 12: Iber Rd/Huntmar Dr & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis

12: Iber Rd/Huntmar Dr & Hazeldean Rd

















5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↔↔		↔↔	↔↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	270	836	133	375	1225	233	164	395	293	154	421	451
Future Volume (vph)	270	836	133	375	1225	233	164	395	293	154	421	451
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.3	6.3		6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Lane Util. Factor	0.97	0.95		0.97	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3036	3247		3036	3316	1400	1565	1745	1400	1565	1745	1400
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.20	1.00	1.00	0.24	1.00	1.00
Satd. Flow (perm)	3036	3247		3036	3316	1400	334	1745	1400	398	1745	1400
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	270	836	133	375	1225	233	164	395	293	154	421	451
RTOR Reduction (vph)	0	10	0	0	0	153	0	0	213	0	0	224
Lane Group Flow (vph)	270	959	0	375	1225	80	164	395	80	154	421	227
Turn Type	Prot	NA		Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases						2	8		8	4		4
Actuated Green, G (s)	14.5	39.3		16.6	41.4	41.4	38.8	32.9	32.9	38.8	32.9	32.9
Effective Green, g (s)	14.5	39.3		16.6	41.4	41.4	38.8	32.9	32.9	38.8	32.9	32.9
Actuated g/C Ratio	0.12	0.33		0.14	0.34	0.34	0.32	0.27	0.27	0.32	0.27	0.27
Clearance Time (s)	6.3	6.3		6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	366	1063		419	1144	483	168	478	383	186	478	383
v/s Ratio Prot	0.09	0.30		c0.12	c0.37		c0.05	0.23		0.04	0.24	
v/s Ratio Perm						0.06	c0.27		0.06	0.23		0.16
v/c Ratio	0.74	0.90		0.89	1.07	0.17	0.98	0.83	0.21	0.83	0.88	0.59
Uniform Delay, d1	50.9	38.5		50.8	39.3	27.3	39.6	40.9	33.5	37.3	41.7	37.8
Progression Factor	1.07	1.06		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.0	11.4		20.9	47.7	0.7	61.8	11.2	0.3	25.1	17.1	2.5
Delay (s)	61.4	52.3		71.8	87.0	28.1	101.4	52.0	33.8	62.4	58.7	40.2
Level of Service	E	D		E	F	C	F	D	C	E	E	D
Approach Delay (s)		54.3			76.4			55.3			51.1	
Approach LOS		D			E			E			D	
Intersection Summary												
HCM 2000 Control Delay			62.0			HCM 2000 Level of Service			E			
HCM 2000 Volume to Capacity ratio			1.02									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			25.3			
Intersection Capacity Utilization			97.9%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

Timings

5 Orchard Drive TIA

3: Victor St/Johnwoods St & Hazeldean Rd

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	60	1159	15	567	32	3	39	5
Future Volume (vph)	60	1159	15	567	32	3	39	5
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases	6	1	2	5		3		7
Permitted Phases	1		5		3		7	
Detector Phase	6	1	2	5	3	3	7	7
Switch Phase								
Minimum Initial (s)	1.0	5.0	1.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	7.1	27.1	7.1	27.1	30.6	30.6	30.6	30.6
Total Split (s)	15.0	63.0	15.0	63.0	37.0	37.0	37.0	37.0
Total Split (%)	13.0%	54.8%	13.0%	54.8%	32.2%	32.2%	32.2%	32.2%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.0	3.0	3.0
All-Red Time (s)	2.4	2.4	2.4	2.4	3.6	3.6	3.6	3.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
Act Effct Green (s)	91.1	88.2	87.5	82.9	9.2	9.2	9.2	9.2
Actuated g/C Ratio	0.79	0.77	0.76	0.72	0.08	0.08	0.08	0.08
v/c Ratio	0.10	0.46	0.04	0.25	0.35	0.22	0.41	0.50
Control Delay	3.0	6.7	1.5	2.6	59.5	21.6	61.5	18.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.0	6.7	1.5	2.6	59.5	21.6	61.5	18.9
LOS	A	A	A	A	E	C	E	B
Approach Delay		6.5		2.5		40.3		30.4
Approach LOS		A		A		D		C

Intersection Summary

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 105 (91%), Referenced to phase 1:EBTL and 5:WBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.50

Intersection Signal Delay: 8.0

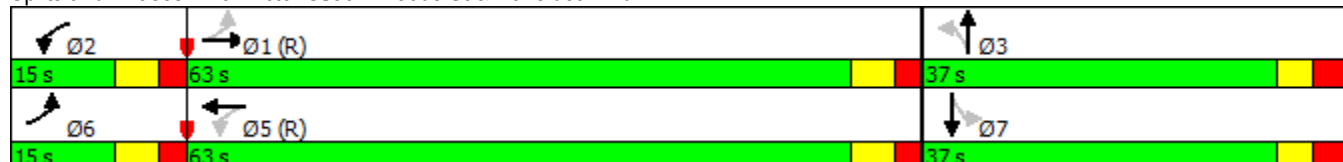
Intersection LOS: A

Intersection Capacity Utilization 62.3%

ICU Level of Service B

Analysis Period (min) 15





















Splits and Phases: 3: Victor St/Johnwoods St & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis

3: Victor St/Johnwoods St & Hazeldean Rd


















5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	1159	17	15	567	33	32	3	30	39	5	100
Future Volume (vph)	60	1159	17	15	567	33	32	3	30	39	5	100
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.1	6.1		6.1	6.1		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.86		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1565	3308		1565	3288		1565	1507		1565	1496	
Flt Permitted	0.41	1.00		0.22	1.00		0.69	1.00		0.74	1.00	
Satd. Flow (perm)	668	3308		362	3288		1135	1507		1212	1496	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	60	1159	17	15	567	33	32	3	30	39	5	100
RTOR Reduction (vph)	0	1	0	0	2	0	0	28	0	0	92	0
Lane Group Flow (vph)	60	1175	0	15	598	0	32	5	0	39	13	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	6	1		2	5			3			7	
Permitted Phases	1			5			3			7		
Actuated Green, G (s)	89.9	84.6		84.1	81.7		9.2	9.2		9.2	9.2	
Effective Green, g (s)	89.9	84.6		84.1	81.7		9.2	9.2		9.2	9.2	
Actuated g/C Ratio	0.78	0.74		0.73	0.71		0.08	0.08		0.08	0.08	
Clearance Time (s)	6.1	6.1		6.1	6.1		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	563	2433		289	2335		90	120		96	119	
v/s Ratio Prot	c0.00	c0.36		0.00	0.18			0.00			0.01	
v/s Ratio Perm	0.08			0.04			0.03			c0.03		
v/c Ratio	0.11	0.48		0.05	0.26		0.36	0.04		0.41	0.11	
Uniform Delay, d1	2.9	6.2		4.4	5.9		50.1	48.8		50.3	49.1	
Progression Factor	1.00	1.00		0.43	0.37		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.7		0.1	0.3		2.4	0.2		2.8	0.4	
Delay (s)	3.0	6.9		2.0	2.4		52.5	49.0		53.1	49.5	
Level of Service	A	A		A	A		D	D		D	D	
Approach Delay (s)		6.7			2.4			50.7			50.5	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay	9.9			HCM 2000 Level of Service			A					
HCM 2000 Volume to Capacity ratio	0.47											
Actuated Cycle Length (s)	115.0			Sum of lost time (s)			18.8					
Intersection Capacity Utilization	62.3%			ICU Level of Service			B					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

















6: Hazeldean Rd & Cedarow Crt

5 Orchard Drive TIA

																		
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR						
Lane Configurations																		
Traffic Volume (veh/h)	14	1078	17	13	732	20	14	0	16	24	1	10						
Future Volume (Veh/h)	14	1078	17	13	732	20	14	0	16	24	1	10						
Sign Control	Free				Free				Stop		Stop							
Grade	0%				0%				0%		0%							
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00						
Hourly flow rate (vph)	14	1078	17	13	732	20	14	0	16	24	1	10						
Pedestrians																		
Lane Width (m)																		
Walking Speed (m/s)																		
Percent Blockage																		
Right turn flare (veh)																		
Median type	TWLTL				None													
Median storage veh	2																	
Upstream signal (m)					249													
pX, platoon unblocked	0.97							0.97	0.97									
vC, conflicting volume	752				1095				1517	1892	548	1351						
vC1, stage 1 conf vol									1114	1114								
vC2, stage 2 conf vol									402	778								
vCu, unblocked vol	685				1095				1473	1860	548	1302						
tC, single (s)	4.1				4.1				7.5	6.5	6.9	7.5						
tC, 2 stage (s)									6.5	5.5								
tF (s)	2.2				2.2				3.5	4.0	3.3	3.5						
p0 queue free %	98				98				93	100	97	92						
cM capacity (veh/h)	878				633				206	230	481	295						
											224	678						
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1											
Volume Total	14	719	376	379	386	30	35											
Volume Left	14	0	0	13	0	14	24											
Volume Right	0	0	17	0	20	16	10											
cSH	878	1700	1700	633	1700	296	348											
Volume to Capacity	0.02	0.42	0.22	0.02	0.23	0.10	0.10											
Queue Length 95th (m)	0.4	0.0	0.0	0.5	0.0	2.5	2.5											
Control Delay (s)	9.2	0.0	0.0	0.6	0.0	18.5	16.5											
Lane LOS	A				A				C	C								
Approach Delay (s)	0.1				0.3				18.5	16.5								
Approach LOS									C	C								
Intersection Summary																		
Average Delay				0.8														
Intersection Capacity Utilization				42.0%	ICU Level of Service				A									
Analysis Period (min)				15														

Timings 9: Fringewood Dr & Hazeldean Rd

5 Orchard Drive TIA

									
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	9	965	67	735	35	84	0	19	1
Future Volume (vph)	9	965	67	735	35	84	0	19	1
Turn Type	Perm	NA	pm+pt	NA	Perm	Perm	NA	Perm	NA
Protected Phases		6	5	2			3		7
Permitted Phases	6		2		2	3		7	
Detector Phase	6	6	5	2	2	3	3	7	7
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	32.2	32.2	10.9	32.1	32.1	34.9	34.9	34.9	34.9
Total Split (s)	64.0	64.0	15.0	79.0	79.0	36.0	36.0	36.0	36.0
Total Split (%)	55.7%	55.7%	13.0%	68.7%	68.7%	31.3%	31.3%	31.3%	31.3%
Yellow Time (s)	3.7	3.7	3.5	3.7	3.7	3.0	3.0	3.0	3.0
All-Red Time (s)	2.5	2.5	2.4	2.4	2.4	3.9	3.9	3.9	3.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Lost Time (s)	6.2	6.2	5.9	6.1	6.1		6.9		6.9
Lead/Lag	Lag	Lag	Lead						
Lead-Lag Optimize?			Yes						
Recall Mode	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None
Act Effct Green (s)	78.7	78.7	89.4	89.2	89.2		12.8		12.8
Actuated g/C Ratio	0.68	0.68	0.78	0.78	0.78		0.11		0.11
v/c Ratio	0.02	0.43	0.18	0.29	0.03		0.73		0.21
Control Delay	12.0	15.2	3.7	2.8	0.5		41.8		38.5
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Delay	12.0	15.2	3.7	2.8	0.5		41.8		38.5
LOS	B	B	A	A	A		D		D
Approach Delay		15.2		2.8			41.8		38.5
Approach LOS		B		A			D		D

Intersection Summary

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 67 (58%), Referenced to phase 2:WBTL and 6:EBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 12.5

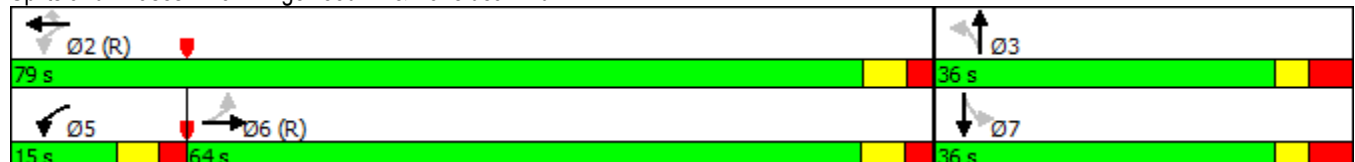
Intersection LOS: B

Intersection Capacity Utilization 59.4%

ICU Level of Service B

Analysis Period (min) 15




















Splits and Phases: 9: Fringewood Dr & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis























9: Fringewood Dr & Hazeldean Rd

5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	965	17	67	735	35	84	0	81	19	1	7
Future Volume (vph)	9	965	17	67	735	35	84	0	81	19	1	7
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.2	6.2		5.9	6.1	6.1		6.9			6.9	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		1.00			1.00	
Frt	1.00	1.00		1.00	1.00	0.85		0.93			0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.98			0.97	
Satd. Flow (prot)	1565	3307		1565	3316	1400		1589			1627	
Flt Permitted	0.37	1.00		0.24	1.00	1.00		0.83			0.64	
Satd. Flow (perm)	613	3307		395	3316	1400		1345			1083	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	9	965	17	67	735	35	84	0	81	19	1	7
RTOR Reduction (vph)	0	1	0	0	0	8	0	76	0	0	6	0
Lane Group Flow (vph)	9	981	0	67	735	27	0	89	0	0	21	0
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		6		5	2			3			7	
Permitted Phases	6			2		2	3			7		
Actuated Green, G (s)	77.5	77.5		89.2	89.2	89.2		12.8			12.8	
Effective Green, g (s)	77.5	77.5		89.2	89.2	89.2		12.8			12.8	
Actuated g/C Ratio	0.67	0.67		0.78	0.78	0.78		0.11			0.11	
Clearance Time (s)	6.2	6.2		5.9	6.1	6.1		6.9			6.9	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0			3.0	
Lane Grp Cap (vph)	413	2228		364	2572	1085		149			120	
v/s Ratio Prot		c0.30		0.01	c0.22							
v/s Ratio Perm	0.01			0.13		0.02		c0.07			0.02	
v/c Ratio	0.02	0.44		0.18	0.29	0.03		0.59			0.17	
Uniform Delay, d1	6.2	8.7		4.1	3.7	3.0		48.6			46.3	
Progression Factor	1.29	1.50		0.68	0.59	0.34		1.00			1.00	
Incremental Delay, d2	0.1	0.6		0.2	0.3	0.0		6.2			0.7	
Delay (s)	8.1	13.6		3.0	2.5	1.0		54.9			47.0	
Level of Service	A	B		A	A	A		D			D	
Approach Delay (s)		13.6			2.5			54.9			47.0	
Approach LOS		B			A			D			D	
Intersection Summary												
HCM 2000 Control Delay			12.8				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.46									
Actuated Cycle Length (s)			115.0				Sum of lost time (s)			19.0		
Intersection Capacity Utilization			59.4%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

Timings 12: Iber Rd/Huntmar Dr & Hazeldean Rd

5 Orchard Drive TIA

												
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø6
Lane Configurations												
Traffic Volume (vph)	242	823	211	512	91	57	287	283	131	321	149	
Future Volume (vph)	242	823	211	512	91	57	287	283	131	321	149	
Turn Type	Prot	NA	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	
Protected Phases	6 9	1	2	5		3	8		7	4		6
Permitted Phases					5	8		8	4		4	
Detector Phase	6 9	1	2	5	5	3	8	8	7	4	4	
Switch Phase												
Minimum Initial (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)		49.0	11.3	37.0	37.0	11.1	24.6	24.6	11.1	24.6	24.6	11.5
Total Split (s)		49.0	14.0	37.0	37.0	12.0	40.0	40.0	12.0	40.0	40.0	14.0
Total Split (%)		42.6%	12.2%	32.2%	32.2%	10.4%	34.8%	34.8%	10.4%	34.8%	34.8%	12%
Yellow Time (s)		3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.7
All-Red Time (s)		2.6	2.8	2.6	2.6	2.6	2.9	2.9	2.6	2.9	2.9	2.8
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.3	6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6	
Lead/Lag		Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead
Lead-Lag Optimize?		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode		C-Max	None	C-Max	C-Max	None	None	None	None	None	None	None
Act Effct Green (s)	14.3	45.4	12.5	36.9	36.9	32.2	25.9	25.9	33.5	28.3	28.3	
Actuated g/C Ratio	0.12	0.39	0.11	0.32	0.32	0.28	0.23	0.23	0.29	0.25	0.25	
v/c Ratio	0.64	0.73	0.64	0.48	0.15	0.28	0.73	0.56	0.60	0.75	0.30	
Control Delay	39.3	22.2	59.7	34.7	0.5	27.8	51.8	10.7	40.5	51.5	2.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	39.3	22.2	59.7	34.7	0.5	27.8	51.8	10.7	40.5	51.5	2.5	
LOS	D	C	E	C	A	C	D	B	D	D	A	
Approach Delay		25.7		37.4			31.0			37.0		
Approach LOS		C		D			C			D		

Intersection Summary

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 62 (54%), Referenced to phase 1:EBT and 5:WBT, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 31.8

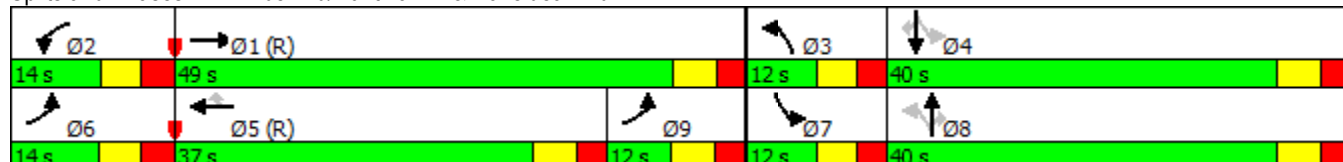
Intersection LOS: C

Intersection Capacity Utilization 79.2%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 12: Iber Rd/Huntmar Dr & Hazeldean Rd



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	11.5
Total Split (s)	12.0
Total Split (%)	10%
Yellow Time (s)	3.7
All-Red Time (s)	2.8
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Intersection Summary	

HCM Signalized Intersection Capacity Analysis

12: Iber Rd/Huntmar Dr & Hazeldean Rd










5 Orchard Drive TIA

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	242	823	123	211	512	91	57	287	283	131	321	149
Future Volume (vph)	242	823	123	211	512	91	57	287	283	131	321	149
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.5	6.3		6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Lane Util. Factor	0.97	0.95		0.97	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3036	3251		3036	3316	1400	1565	1745	1400	1565	1745	1400
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.34	1.00	1.00	0.35	1.00	1.00
Satd. Flow (perm)	3036	3251		3036	3316	1400	553	1745	1400	579	1745	1400
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	242	823	123	211	512	91	57	287	283	131	321	149
RTOR Reduction (vph)	0	10	0	0	0	63	0	0	192	0	0	112
Lane Group Flow (vph)	242	936	0	211	512	28	57	287	91	131	321	37
Turn Type	Prot	NA		Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	6.9	1		2	5		3	8		7	4	
Permitted Phases						5	8		8	4		4
Actuated Green, G (s)	14.3	44.2		12.5	35.7	35.7	31.8	27.1	27.1	34.2	28.3	28.3
Effective Green, g (s)	14.3	44.2		12.5	35.7	35.7	31.8	27.1	27.1	34.2	28.3	28.3
Actuated g/C Ratio	0.12	0.38		0.11	0.31	0.31	0.28	0.24	0.24	0.30	0.25	0.25
Clearance Time (s)		6.3		6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	377	1249		330	1029	434	194	411	329	222	429	344
v/s Ratio Prot	0.08	c0.29		c0.07	c0.15		0.01	0.16		c0.03	c0.18	
v/s Ratio Perm						0.02	0.07		0.07	0.14		0.03
v/c Ratio	0.64	0.75		0.64	0.50	0.07	0.29	0.70	0.28	0.59	0.75	0.11
Uniform Delay, d1	47.9	30.6		49.1	32.3	27.9	31.8	40.2	35.9	33.5	40.1	33.6
Progression Factor	1.28	0.62		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.5	3.9		4.0	1.7	0.3	0.8	5.1	0.5	4.2	7.0	0.1
Delay (s)	65.0	22.9		53.1	34.1	28.2	32.6	45.3	36.4	37.7	47.1	33.7
Level of Service	E	C		D	C	C	C	D	D	D	D	C
Approach Delay (s)		31.5			38.3			40.1			41.7	
Approach LOS		C			D			D			D	
Intersection Summary												
HCM 2000 Control Delay			36.8			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.80									
Actuated Cycle Length (s)			115.0			Sum of lost time (s)				32.0		
Intersection Capacity Utilization			79.2%			ICU Level of Service				D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

16: Site Access & Hazeldean Rd










5 Orchard Drive TIA

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1034	44	0	725	0	42
Future Volume (Veh/h)	1034	44	0	725	0	42
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1034	44	0	725	0	42
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)				53		
pX, platoon unblocked				0.94		
vC, conflicting volume	1078			1418 539		
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1078			1323 539		
tC, single (s)	4.1			6.8 6.9		
tC, 2 stage (s)						
tF (s)	2.2			3.5 3.3		
p0 queue free %	100			100 91		
cM capacity (veh/h)	643			139 487		
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	689	389	362	362	42	
Volume Left	0	0	0	0	0	
Volume Right	0	44	0	0	42	
cSH	1700	1700	1700	1700	487	
Volume to Capacity	0.41	0.23	0.21	0.21	0.09	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	2.1	
Control Delay (s)	0.0	0.0	0.0	0.0	13.1	
Lane LOS					B	
Approach Delay (s)	0.0		0.0		13.1	
Approach LOS					B	
Intersection Summary						
Average Delay	0.3					
Intersection Capacity Utilization	41.6%			ICU Level of Service		A
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis

18: Fringewood Dr & Site Access

















5 Orchard Drive TIA

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	38	0	4	127	50	13
Future Volume (Veh/h)	38	0	4	127	50	13
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	38	0	4	127	50	13
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)					81	
pX, platoon unblocked						
vC, conflicting volume	192	56	63			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	192	56	63			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	95	100	100			
cM capacity (veh/h)	795	1010	1540			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	38	131	63			
Volume Left	38	4	0			
Volume Right	0	0	13			
cSH	795	1540	1700			
Volume to Capacity	0.05	0.00	0.04			
Queue Length 95th (m)	1.1	0.1	0.0			
Control Delay (s)	9.8	0.2	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.8	0.2	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay		1.7				
Intersection Capacity Utilization		20.5%		ICU Level of Service		A
Analysis Period (min)		15				

Timings

5 Orchard Drive TIA

3: Victor St/Johnwoods St & Hazeldean Rd

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	114	1096	40	1559	25	1	46	3
Future Volume (vph)	114	1096	40	1559	25	1	46	3
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases	6	1	2	5		3		7
Permitted Phases	1		5		3		7	
Detector Phase	6	1	2	5	3	3	7	7
Switch Phase								
Minimum Initial (s)	1.0	5.0	1.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	7.1	27.1	7.1	27.1	30.6	30.6	30.6	30.6
Total Split (s)	14.0	69.0	14.0	69.0	37.0	37.0	37.0	37.0
Total Split (%)	11.7%	57.5%	11.7%	57.5%	30.8%	30.8%	30.8%	30.8%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.0	3.0	3.0
All-Red Time (s)	2.4	2.4	2.4	2.4	3.6	3.6	3.6	3.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.1	6.1	6.1	6.1	6.6	6.6	6.6	6.6
Lead/Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
Act Effct Green (s)	95.5	87.5	87.9	81.8	9.9	9.9	9.9	9.9
Actuated g/C Ratio	0.80	0.73	0.73	0.68	0.08	0.08	0.08	0.08
v/c Ratio	0.49	0.46	0.12	0.73	0.38	0.12	0.46	0.56
Control Delay	12.9	8.3	3.5	11.3	67.0	23.6	65.5	17.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.9	8.3	3.5	11.3	67.0	23.6	65.5	17.9
LOS	B	A	A	B	E	C	E	B
Approach Delay		8.7		11.1		49.5		29.7
Approach LOS		A		B		D		C

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 88 (73%), Referenced to phase 1:EBTL and 5:WBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 11.8

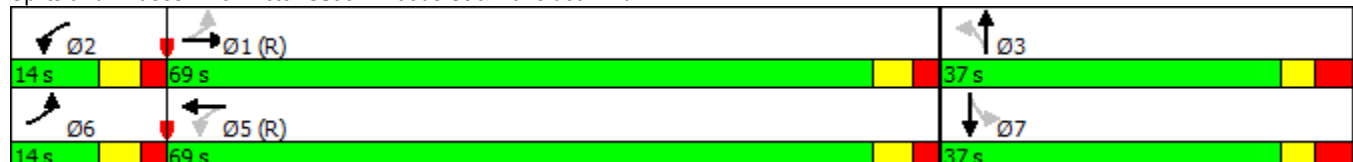
Intersection LOS: B

Intersection Capacity Utilization 89.0%

ICU Level of Service E

Analysis Period (min) 15





















Splits and Phases: 3: Victor St/Johnwoods St & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis

3: Victor St/Johnwoods St & Hazeldean Rd


















5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	114	1096	24	40	1559	71	25	1	16	46	3	137
Future Volume (vph)	114	1096	24	40	1559	71	25	1	16	46	3	137
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.1	6.1		6.1	6.1		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.86		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1565	3305		1565	3294		1565	1499		1565	1489	
Flt Permitted	0.09	1.00		0.24	1.00		0.49	1.00		0.75	1.00	
Satd. Flow (perm)	154	3305		389	3294		801	1499		1229	1489	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	114	1096	24	40	1559	71	25	1	16	46	3	137
RTOR Reduction (vph)	0	1	0	0	2	0	0	15	0	0	126	0
Lane Group Flow (vph)	114	1119	0	40	1628	0	25	2	0	46	14	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	6	1		2	5			3			7	
Permitted Phases	1			5			3			7		
Actuated Green, G (s)	95.8	86.3		86.8	81.8		9.9	9.9		9.9	9.9	
Effective Green, g (s)	95.8	86.3		86.8	81.8		9.9	9.9		9.9	9.9	
Actuated g/C Ratio	0.80	0.72		0.72	0.68		0.08	0.08		0.08	0.08	
Clearance Time (s)	6.1	6.1		6.1	6.1		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	234	2376		330	2245		66	123		101	122	
v/s Ratio Prot	c0.04	c0.34		0.01	c0.49			0.00			0.01	
v/s Ratio Perm	0.35			0.08			0.03			c0.04		
v/c Ratio	0.49	0.47		0.12	0.73		0.38	0.02		0.46	0.12	
Uniform Delay, d1	11.1	7.2		4.9	12.0		52.1	50.6		52.5	51.0	
Progression Factor	1.00	1.00		0.85	0.69		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.6	0.7		0.2	2.0		3.6	0.1		3.2	0.4	
Delay (s)	12.7	7.8		4.3	10.3		55.7	50.6		55.7	51.4	
Level of Service	B	A		A	B		E	D		E	D	
Approach Delay (s)		8.3			10.2			53.7			52.5	
Approach LOS		A			B			D			D	
Intersection Summary												
HCM 2000 Control Delay		12.5			HCM 2000 Level of Service			B				
HCM 2000 Volume to Capacity ratio		0.68										
Actuated Cycle Length (s)		120.0			Sum of lost time (s)			18.8				
Intersection Capacity Utilization		89.0%			ICU Level of Service			E				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

















6: Hazeldean Rd & Cedarow Crt

5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	1139	25	39	1765	21	14	0	16	24	1	10
Future Volume (Veh/h)	18	1139	25	39	1765	21	14	0	16	24	1	10
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	18	1139	25	39	1765	21	14	0	16	24	1	10
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	TWLTL				None							
Median storage veh	2											
Upstream signal (m)					249							
pX, platoon unblocked												
vC, conflicting volume	1786			1164			2158	3052	582	2475	3054	893
vC1, stage 1 conf vol							1188	1188		1854	1854	
vC2, stage 2 conf vol							971	1864		622	1200	
vCu, unblocked vol	1786			1164			2158	3052	582	2475	3054	893
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			93			90	100	96	65	99	96
cM capacity (veh/h)	343			596			141	86	456	68	96	285
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1					
Volume Total	18	759	405	922	904	30	35					
Volume Left	18	0	0	39	0	14	24					
Volume Right	0	0	25	0	21	16	10					
cSH	343	1700	1700	596	1700	223	88					
Volume to Capacity	0.05	0.45	0.24	0.07	0.53	0.13	0.40					
Queue Length 95th (m)	1.3	0.0	0.0	1.6	0.0	3.5	12.1					
Control Delay (s)	16.1	0.0	0.0	2.0	0.0	23.6	70.3					
Lane LOS	C			A		C	F					
Approach Delay (s)	0.2			1.0		23.6	70.3					
Approach LOS						C	F					
Intersection Summary												
Average Delay				1.7								
Intersection Capacity Utilization				91.7%	ICU Level of Service				F			
Analysis Period (min)				15								

Timings 9: Fringewood Dr & Hazeldean Rd

5 Orchard Drive TIA

									
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	10	1061	123	1684	37	137	0	55	0
Future Volume (vph)	10	1061	123	1684	37	137	0	55	0
Turn Type	Perm	NA	pm+pt	NA	Perm	Perm	NA	Perm	NA
Protected Phases		6	5	2			3		7
Permitted Phases	6		2		2	3		7	
Detector Phase	6	6	5	2	2	3	3	7	7
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	32.2	32.2	10.9	32.1	32.1	34.9	34.9	34.9	34.9
Total Split (s)	64.0	64.0	20.0	84.0	84.0	36.0	36.0	36.0	36.0
Total Split (%)	53.3%	53.3%	16.7%	70.0%	70.0%	30.0%	30.0%	30.0%	30.0%
Yellow Time (s)	3.7	3.7	3.5	3.7	3.7	3.0	3.0	3.0	3.0
All-Red Time (s)	2.5	2.5	2.4	2.4	2.4	3.9	3.9	3.9	3.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Lost Time (s)	6.2	6.2	5.9	6.1	6.1		6.9		6.9
Lead/Lag	Lag	Lag	Lead						
Lead-Lag Optimize?			Yes						
Recall Mode	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None
Act Effct Green (s)	73.9	73.9	88.6	88.4	88.4		18.6		18.6
Actuated g/C Ratio	0.62	0.62	0.74	0.74	0.74		0.16		0.16
v/c Ratio	0.08	0.54	0.38	0.69	0.04		0.79		0.28
Control Delay	22.5	25.6	6.6	6.1	0.7		48.9		8.6
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Delay	22.5	25.6	6.6	6.1	0.7		48.9		8.6
LOS	C	C	A	A	A		D		A
Approach Delay		25.6		6.0			48.9		8.6
Approach LOS		C		A			D		A

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 55 (46%), Referenced to phase 2:WBTL and 6:EBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 15.6

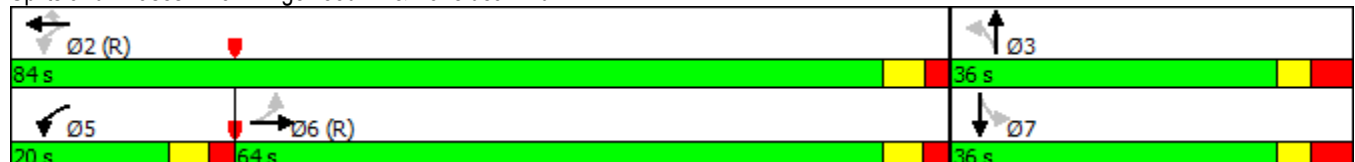
Intersection LOS: B

Intersection Capacity Utilization 82.8%

ICU Level of Service E

Analysis Period (min) 15




















Splits and Phases: 9: Fringewood Dr & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis































9: Fringewood Dr & Hazeldean Rd

5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	1061	32	123	1684	37	137	0	79	55	0	14
Future Volume (vph)	10	1061	32	123	1684	37	137	0	79	55	0	14
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.2	6.2		5.9	6.1	6.1		6.9			6.9	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		1.00			1.00	
Frt	1.00	1.00		1.00	1.00	0.85		0.95			0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.97			0.96	
Satd. Flow (prot)	1565	3301		1565	3316	1400		1608			1632	
Flt Permitted	0.12	1.00		0.19	1.00	1.00		0.79			0.67	
Satd. Flow (perm)	204	3301		315	3316	1400		1314			1132	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	10	1061	32	123	1684	37	137	0	79	55	0	14
RTOR Reduction (vph)	0	1	0	0	0	10	0	70	0	0	58	0
Lane Group Flow (vph)	10	1092	0	123	1684	27	0	146	0	0	11	0
Turn Type	Perm	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		6		5	2			3			7	
Permitted Phases	6			2		2	3			7		
Actuated Green, G (s)	73.9	73.9		88.4	88.4	88.4		18.6			18.6	
Effective Green, g (s)	73.9	73.9		88.4	88.4	88.4		18.6			18.6	
Actuated g/C Ratio	0.62	0.62		0.74	0.74	0.74		0.16			0.16	
Clearance Time (s)	6.2	6.2		5.9	6.1	6.1		6.9			6.9	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0			3.0	
Lane Grp Cap (vph)	125	2032		320	2442	1031		203			175	
v/s Ratio Prot		0.33		0.03	c0.51							
v/s Ratio Perm	0.05			0.26		0.02		c0.11			0.01	
v/c Ratio	0.08	0.54		0.38	0.69	0.03		0.72			0.06	
Uniform Delay, d1	9.3	13.2		7.2	8.5	4.2		48.2			43.3	
Progression Factor	1.50	1.65		1.01	0.56	0.30		1.00			1.00	
Incremental Delay, d2	1.2	1.0		0.2	0.4	0.0		11.5			0.1	
Delay (s)	15.1	22.8		7.4	5.2	1.3		59.7			43.4	
Level of Service	B	C		A	A	A		E			D	
Approach Delay (s)		22.7			5.2			59.7			43.4	
Approach LOS		C			A			E			D	
Intersection Summary												
HCM 2000 Control Delay			15.7				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.74									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			19.0		
Intersection Capacity Utilization			82.8%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

Timings 12: Iber Rd/Huntmar Dr & Hazeldean Rd

5 Orchard Drive TIA

											
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	 	 	 				 	 	 	 
Traffic Volume (vph)	273	846	375	1241	233	166	395	293	154	421	457
Future Volume (vph)	273	846	375	1241	233	166	395	293	154	421	457
Turn Type	Prot	NA	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6	5	2		3	8		7	4	
Permitted Phases					2	8		8	4		4
Detector Phase	1	6	5	2	2	3	8	8	7	4	4
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.3	36.3	11.3	36.3	36.3	11.1	39.6	39.6	11.1	39.6	39.6
Total Split (s)	22.0	44.0	22.0	44.0	44.0	12.0	42.0	42.0	12.0	42.0	42.0
Total Split (%)	18.3%	36.7%	18.3%	36.7%	36.7%	10.0%	35.0%	35.0%	10.0%	35.0%	35.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
All-Red Time (s)	2.6	2.6	2.6	2.6	2.6	2.6	2.9	2.9	2.6	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effct Green (s)	14.5	39.3	16.6	41.3	41.3	39.3	32.9	32.9	39.3	32.9	32.9
Actuated g/C Ratio	0.12	0.33	0.14	0.34	0.34	0.33	0.27	0.27	0.33	0.27	0.27
v/c Ratio	0.74	0.92	0.89	1.09	0.37	0.98	0.83	0.49	0.82	0.88	0.75
Control Delay	62.4	62.1	75.5	91.9	5.6	97.5	55.9	6.7	63.0	61.8	20.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.4	62.1	75.5	91.9	5.6	97.5	55.9	6.7	63.0	61.8	20.9
LOS	E	E	E	F	A	F	E	A	E	E	C
Approach Delay		62.2		77.7			47.1			43.9	
Approach LOS		E		E			D			D	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 32 (27%), Referenced to phase 2:WBT and 6:EBT, Start of Green

Natural Cycle: 130

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.09

Intersection Signal Delay: 61.6

Intersection LOS: E

Intersection Capacity Utilization 98.6%

ICU Level of Service F

Analysis Period (min) 15
























Splits and Phases: 12: Iber Rd/Huntmar Dr & Hazeldean Rd



HCM Signalized Intersection Capacity Analysis

12: Iber Rd/Huntmar Dr & Hazeldean Rd










5 Orchard Drive TIA

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	273	846	135	375	1241	233	166	395	293	154	421	457
Future Volume (vph)	273	846	135	375	1241	233	166	395	293	154	421	457
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0	3.0	3.5	3.0
Total Lost time (s)	6.3	6.3		6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Lane Util. Factor	0.97	0.95		0.97	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3036	3247		3036	3316	1400	1565	1745	1400	1565	1745	1400
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.20	1.00	1.00	0.24	1.00	1.00
Satd. Flow (perm)	3036	3247		3036	3316	1400	334	1745	1400	398	1745	1400
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	273	846	135	375	1241	233	166	395	293	154	421	457
RTOR Reduction (vph)	0	10	0	0	0	153	0	0	213	0	0	223
Lane Group Flow (vph)	273	971	0	375	1241	80	166	395	80	154	421	234
Turn Type	Prot	NA		Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6		5	2		3	8		7	4	
Permitted Phases						2	8		8	4		4
Actuated Green, G (s)	14.5	39.3		16.6	41.4	41.4	38.8	32.9	32.9	38.8	32.9	32.9
Effective Green, g (s)	14.5	39.3		16.6	41.4	41.4	38.8	32.9	32.9	38.8	32.9	32.9
Actuated g/C Ratio	0.12	0.33		0.14	0.34	0.34	0.32	0.27	0.27	0.32	0.27	0.27
Clearance Time (s)	6.3	6.3		6.3	6.3	6.3	6.1	6.6	6.6	6.1	6.6	6.6
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	366	1063		419	1144	483	168	478	383	186	478	383
v/s Ratio Prot	0.09	0.30		c0.12	c0.37		c0.05	0.23		0.04	0.24	
v/s Ratio Perm						0.06	c0.27		0.06	0.23		0.17
v/c Ratio	0.75	0.91		0.89	1.08	0.17	0.99	0.83	0.21	0.83	0.88	0.61
Uniform Delay, d1	51.0	38.7		50.8	39.3	27.3	39.8	40.9	33.5	37.3	41.7	38.0
Progression Factor	1.00	1.30		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.1	12.0		20.9	52.7	0.7	65.3	11.2	0.3	25.1	17.1	2.9
Delay (s)	58.2	62.5		71.8	92.0	28.1	105.1	52.0	33.8	62.4	58.7	40.9
Level of Service	E	E		E	F	C	F	D	C	E	E	D
Approach Delay (s)		61.6			79.9			56.1			51.4	
Approach LOS		E			E			E			D	
Intersection Summary												
HCM 2000 Control Delay			65.3			HCM 2000 Level of Service			E			
HCM 2000 Volume to Capacity ratio			1.03									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			25.3			
Intersection Capacity Utilization			98.6%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

16: Site Access & Hazeldean Rd










5 Orchard Drive TIA

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1118	34	0	725	0	42
Future Volume (Veh/h)	1118	34	0	725	0	42
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1118	34	0	725	0	42
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage veh						
Upstream signal (m)	52					
pX, platoon unblocked						
vC, conflicting volume			1152		1498	576
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1152		1498	576
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	91
cM capacity (veh/h)			602		113	460
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	745	407	362	362	42	
Volume Left	0	0	0	0	0	
Volume Right	0	34	0	0	42	
cSH	1700	1700	1700	1700	460	
Volume to Capacity	0.44	0.24	0.21	0.21	0.09	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	2.3	
Control Delay (s)	0.0	0.0	0.0	0.0	13.6	
Lane LOS						B
Approach Delay (s)	0.0		0.0		13.6	
Approach LOS						B
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			43.8%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

18: Fringewood Dr & Site Access

5 Orchard Drive TIA

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	57	0	3	157	99	25
Future Volume (Veh/h)	57	0	3	157	99	25
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	57	0	3	157	99	25
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)					79	
pX, platoon unblocked						
vC, conflicting volume	274	112	124			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	274	112	124			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	92	100	100			
cM capacity (veh/h)	714	942	1463			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	57	160	124			
Volume Left	57	3	0			
Volume Right	0	0	25			
cSH	714	1463	1700			
Volume to Capacity	0.08	0.00	0.07			
Queue Length 95th (m)	2.0	0.0	0.0			
Control Delay (s)	10.5	0.2	0.0			
Lane LOS	B	A				
Approach Delay (s)	10.5	0.2	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		1.8				
Intersection Capacity Utilization		21.3%		ICU Level of Service		A
Analysis Period (min)		15				

APPENDIX

I SIMTRAFFIC



Queuing and Blocking Report

2026 Total

05/11/2020

Intersection: 3: Victor St/Johnwoods St & Hazeldean Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	TR
Maximum Queue (m)	19.0	67.5	54.8	12.6	32.5	36.2	23.3	19.1	27.8	37.2
Average Queue (m)	6.8	26.4	16.4	2.9	9.0	12.0	8.8	5.7	9.9	13.9
95th Queue (m)	15.4	53.8	40.4	9.9	23.4	27.8	19.8	14.4	22.7	26.7
Link Distance (m)		171.5	171.5		609.8	609.8		270.9		281.6
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (m)	75.0			70.0			40.0		35.0	
Storage Blk Time (%)		0						0		1
Queuing Penalty (veh)		0						0		0

Intersection: 6: Hazeldean Rd & Cedarow Crt

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	LT	TR	LTR	LTR
Maximum Queue (m)	9.3	1.6	18.2	5.4	17.0	18.7
Average Queue (m)	1.5	0.1	2.6	0.2	6.4	7.1
95th Queue (m)	6.7	1.2	11.5	3.2	14.6	15.1
Link Distance (m)		609.8	182.0	182.0	70.6	101.8
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (m)	75.0					
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 9: Fringewood Dr & Hazeldean Rd

Movement	EB	EB	EB	WB	WB	WB	WB	NB	SB
Directions Served	L	T	TR	L	T	T	R	LTR	LTR
Maximum Queue (m)	11.7	45.8	48.0	19.1	24.1	81.0	10.2	58.0	16.1
Average Queue (m)	1.6	28.9	30.0	7.9	7.6	13.1	1.1	32.2	5.0
95th Queue (m)	8.0	50.5	52.8	16.7	19.0	54.4	5.8	54.3	13.8
Link Distance (m)		38.6	38.6		275.1	275.1		59.0	101.5
Upstream Blk Time (%)		4	4					1	
Queuing Penalty (veh)		21	24					2	
Storage Bay Dist (m)	55.0			100.0			180.0		
Storage Blk Time (%)		4							
Queuing Penalty (veh)		0							

Queuing and Blocking Report

2026 Total

05/11/2020

Intersection: 12: Iber Rd/Huntmar Dr & Hazeldean Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB
Directions Served	L	L	T	TR	L	L	T	T	R	L	T	R
Maximum Queue (m)	30.2	35.5	90.2	98.8	53.7	64.1	73.3	67.6	4.3	42.7	104.2	80.2
Average Queue (m)	14.4	20.2	46.0	51.2	26.1	41.3	42.7	35.4	0.2	12.4	51.0	28.4
95th Queue (m)	26.3	31.5	77.0	83.8	54.1	59.6	65.7	59.1	3.3	28.6	88.4	55.8
Link Distance (m)			275.1	275.1			281.2	281.2			198.4	
Upstream Blk Time (%)											0	
Queuing Penalty (veh)											0	
Storage Bay Dist (m)	90.0	90.0			115.0	115.0			245.0	70.0		65.0
Storage Blk Time (%)			0								3	0
Queuing Penalty (veh)			1								11	0

Intersection: 12: Iber Rd/Huntmar Dr & Hazeldean Rd

Movement	SB	SB	SB
Directions Served	L	T	R
Maximum Queue (m)	53.3	91.6	16.9
Average Queue (m)	26.1	54.2	1.1
95th Queue (m)	46.5	83.8	8.1
Link Distance (m)		213.9	213.9
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)	85.0		
Storage Blk Time (%)		1	
Queuing Penalty (veh)		1	

Intersection: 16: Site Access & Hazeldean Rd

Movement	EB	EB	NB
Directions Served	T	TR	R
Maximum Queue (m)	40.4	44.7	20.9
Average Queue (m)	6.3	8.1	7.8
95th Queue (m)	24.7	28.4	16.4
Link Distance (m)	182.0	182.0	50.1
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Queuing and Blocking Report

2026 Total

05/11/2020

Intersection: 18: Fringewood Dr & Site Access

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	16.0	10.4
Average Queue (m)	6.5	0.6
95th Queue (m)	13.8	6.2
Link Distance (m)	31.6	29.4
Upstream Blk Time (%)		0
Queuing Penalty (veh)		0
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 61

Queuing and Blocking Report

2026 Total

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Intersection: 3: Victor St/Johnwoods St & Hazeldean Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	TR
Maximum Queue (m)	35.4	72.8	62.8	22.0	98.9	103.9	21.2	11.3	35.7	44.5
Average Queue (m)	17.6	30.6	21.9	6.7	46.5	51.0	6.1	3.0	11.5	20.0
95th Queue (m)	30.7	59.0	49.8	14.6	81.6	87.0	16.1	9.8	26.4	36.8
Link Distance (m)		171.5	171.5		609.8	609.8		270.9		281.6
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (m)	75.0			70.0			40.0		35.0	
Storage Blk Time (%)		0			2				0	3
Queuing Penalty (veh)		0			1				1	1

Intersection: 6: Hazeldean Rd & Cedarow Crt

Movement	EB	EB	EB	WB	WB	NB	SB
Directions Served	L	T	TR	LT	TR	LTR	LTR
Maximum Queue (m)	15.2	0.7	1.9	86.9	68.5	37.0	68.5
Average Queue (m)	3.8	0.0	0.1	21.1	9.0	11.2	33.0
95th Queue (m)	11.5	0.7	1.3	64.7	42.4	29.4	82.2
Link Distance (m)		609.8	609.8	182.1	182.1	70.7	101.8
Upstream Blk Time (%)							3
Queuing Penalty (veh)							0
Storage Bay Dist (m)	75.0						
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 9: Fringewood Dr & Hazeldean Rd

Movement	EB	EB	EB	WB	WB	WB	WB	NB	SB
Directions Served	L	T	TR	L	T	T	R	LTR	LTR
Maximum Queue (m)	28.7	49.4	51.4	36.4	46.2	273.1	9.3	60.8	37.4
Average Queue (m)	3.8	36.4	37.3	13.1	19.2	41.7	1.3	43.2	13.6
95th Queue (m)	15.5	53.2	52.4	27.1	38.7	154.1	6.3	64.9	29.6
Link Distance (m)		38.7	38.7		275.1	275.1		56.6	101.5
Upstream Blk Time (%)	0	9	10			0		4	
Queuing Penalty (veh)	0	55	58			1		9	
Storage Bay Dist (m)	55.0			100.0			180.0		
Storage Blk Time (%)	0	9							
Queuing Penalty (veh)	0	1							

Queuing and Blocking Report
2026 Total

05/11/2020

Intersection: 12: Iber Rd/Huntmar Dr & Hazeldean Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB
Directions Served	L	L	T	TR	L	L	T	T	R	L	T	R
Maximum Queue (m)	53.9	122.2	169.4	176.4	67.9	195.0	295.6	294.6	275.0	93.8	177.0	90.0
Average Queue (m)	31.7	41.6	98.5	103.6	39.2	183.7	282.1	278.9	167.0	52.2	92.5	41.8
95th Queue (m)	49.8	92.8	159.0	164.9	63.6	248.6	315.4	318.3	383.4	96.4	175.8	90.3
Link Distance (m)			275.1	275.1			281.2	281.2			198.4	
Upstream Blk Time (%)							55	27			5	
Queuing Penalty (veh)							0	0			0	
Storage Bay Dist (m)	90.0	90.0			115.0	115.0			245.0	70.0		65.0
Storage Blk Time (%)			22			0	74	49		13	17	0
Queuing Penalty (veh)			61			0	276	113		91	79	1

Intersection: 12: Iber Rd/Huntmar Dr & Hazeldean Rd

Movement	SB	SB	SB
Directions Served	L	T	R
Maximum Queue (m)	108.0	164.2	90.8
Average Queue (m)	44.6	83.0	42.2
95th Queue (m)	93.5	137.2	77.8
Link Distance (m)		213.9	213.9
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)	85.0		
Storage Blk Time (%)	2	11	
Queuing Penalty (veh)	10	17	

Intersection: 16: Site Access & Hazeldean Rd

Movement	EB	EB	NB
Directions Served	T	TR	R
Maximum Queue (m)	66.9	72.8	22.1
Average Queue (m)	19.1	22.0	8.2
95th Queue (m)	53.8	59.7	18.1
Link Distance (m)	182.1	182.1	27.7
Upstream Blk Time (%)			0
Queuing Penalty (veh)			0
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 18: Fringewood Dr & Site Access

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	19.1	22.5
Average Queue (m)	8.9	2.4
95th Queue (m)	16.3	13.5
Link Distance (m)	26.0	64.3
Upstream Blk Time (%)	0	0
Queuing Penalty (veh)	0	0
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 774
