125 Pirie Drive, Hamilton ON Transportation Impact Assessment, Parking Study, and TDM Study

Paradigm Transportation Solutions Limited

November 2020
200221

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Project Summary

Project Number
200221

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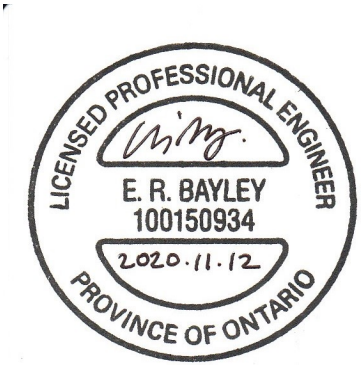

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Executive Summary

Content

FGL Pirie Inc. has retained Paradigm Transportation Solutions Limited (Paradigm) to conduct this Transportation Impact Assessment (TIA), Parking Study (PS), and Transportation Demand Management (TDM) plan for a proposed retirement development located at 125 Pirie Drive in the City of Hamilton (Dundas).

This study determines the impacts of the development traffic on the surrounding road network and identifies the recommended improvements to accommodate the site generated traffic. The study also assesses the site's parking needs and Transportation Demand Management measures proposed to support the development application.

Development Concept

The proposed retirement development consists of 17 single storey townhouse units and 155 apartment style units in a 3-4 storey building. The 155 apartment style units compose of 84 senior apartments and 71 retirement suites that will be marketed toward seniors who require different levels of care. Build-out of the site is anticipated to occur by Year 2024.

Parking for the townhouse units is proposed at 34 spaces (2.0 spaces per unit.) Parking for the 3-4 storey building is proposed at 133 spaces (119 structured spaces + 14 at-grade spaces). Parking for the 3-4 storey building is proposed at 0.85 spaces per unit.

Conclusion

The main findings and conclusions of this study are as follows:

- **Existing Traffic**: The study area intersections are generally operating with acceptable levels of service during the weekday AM and PM peak hours. A minor queuing issue is identified for the southbound left-turn movement from Davidson Boulevard to Governors Road. Modifications to the existing pavement marking could be considered to address the issue.
- **Site Concept**: The proposed retirement development consists of 17 single storey townhouse units and 155 apartment style units in a 3-4 storey building. The 155 apartment style units compose of 84 senior apartments and 71 retirement suites that

will be marketed toward seniors who require different levels of care. Build-out of the site is anticipated to occur by Year 2024.

Vehicle access for the townhouse units is proposed by private driveway connections to Pirie Drive and driveways are consolidated where possible to limit the number of new connections. The townhouse unit driveways will impact the existing bus stop at Pirie Drive and Newcombe Road.

Vehicle access for the 3-4 storey building is proposed by three private driveways:

- Driveway 'A' is located approximately 50 m (CL to CL) north of Governors Road. This driveway connects to the site's parking structure. This driveway will function as the main entrance for residents / employees and any structured visitor parking.
- Driveway 'B' is located approximately 80 m (CL to CL) east of Pirie Drive and connects to the building's principal entrance. This driveway is expected to accommodate the site's pick-up/drop-off activity and visitor parking.
- Driveway 'C' is located approximately 90 m (CL to CL) north of Governors Road. This driveway is a service entrance. Regular traffic is not expected to use this driveway. The volume and frequency of service vehicles is expected to be low and can be scheduled/managed by the site operator.

The proposed Driveway 'B' conflicts with the existing HSR layby across the site's Governors Road frontage. Consultation with HSR will be required to relocate / redesign the layby transit stop.

- **Parking Supply**: The on-site parking supply consists of 34 spaces for the townhouse units (2.0 spaces per unit) and 133 spaces for the retirement units (0.85 spaces per unit).

  Relying on empirical survey data collected for a retirement home, the forecast parking demand for the 3-4 storey building is estimated to be 73 spaces (51 resident spaces, 13 visitor spaces, and 9 employee spaces).

  The site's parking demand is estimated to be contained on-site.

- **Trip Generation**: The site's trip generation is estimated to be approximately 40 AM peak hour vehicle trips and 53 PM peak hour vehicle trips.

- **Sight Distance**: The stopping and decision sight distances at Driveway 'A', Driveway 'C', and the townhouse private driveways are impacted by the existing horizontal curvature of Pirie Drive. This condition exists for all residential units fronting

onto or having access to Pirie Drive between Governors Road and Newcombe Road.

The existing horizontal curvature of Pirie Drive requires drivers to reduce speed prior to entering the curve. Travel speeds approaching the curve are expected to be low with drivers accelerating or maintaining their travel speed upon exit.

- **Background Traffic**: The study area intersections are forecast to continue to operate with acceptable levels of service during the weekday AM and PM peak hours. No additional critical movements are identified. The queuing issue for the southbound left-turn movement from Davidson Boulevard to Governors Road is expected to continue to occur. Modifications to the existing pavement marking could be considered to address the issue.
- **Total Traffic**: The study area intersections are forecast to operate with similar levels of service as the background traffic conditions. No additional critical movements are noted at the study area intersections over background conditions. The site driveways are forecast to operate with delays in the LOS A to B range with v/c ratios of less than 0.35.
- **TDM Measures**: The site plan includes Transportation Demand Management (TDM) measures to help improve transportation efficiency (reduced congestion), encouraging use of alternative modes, reducing reliance on single occupant vehicles, and encouraging a change in behaviour.

Recommendations

Based on the findings of this study, it is recommended that:

- Hamilton Street Railway review the design/location of the existing layby transit stop at the intersection of Governors Road and Pirie Drive.
- The City of Hamilton consider revising the existing pavement marking for the southbound left-turn lane at the Governors Road intersection with Davidson Boulevard to provide for 35 m of total storage.
- The TDM measures included in **Section 3.2** be designed for in the final site plan/development program. Some elements of the TDM plan can be designed directly into the site plan while other elements are amenities that can only be achieved after occupancy.

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Appendices

Figures

Tables

1 Introduction

1.1 Overview

FGL Pirie Inc. has retained Paradigm Transportation Solutions Limited (Paradigm) to conduct this Transportation Impact Assessment (TIA), Parking Study (PS), and Transportation Demand Management (TDM) plan for a proposed retirement development located at 125 Pirie Drive in the City of Hamilton (Dundas).

Figure 1.1 illustrates the location of the subject site.

The scope of the study includes:

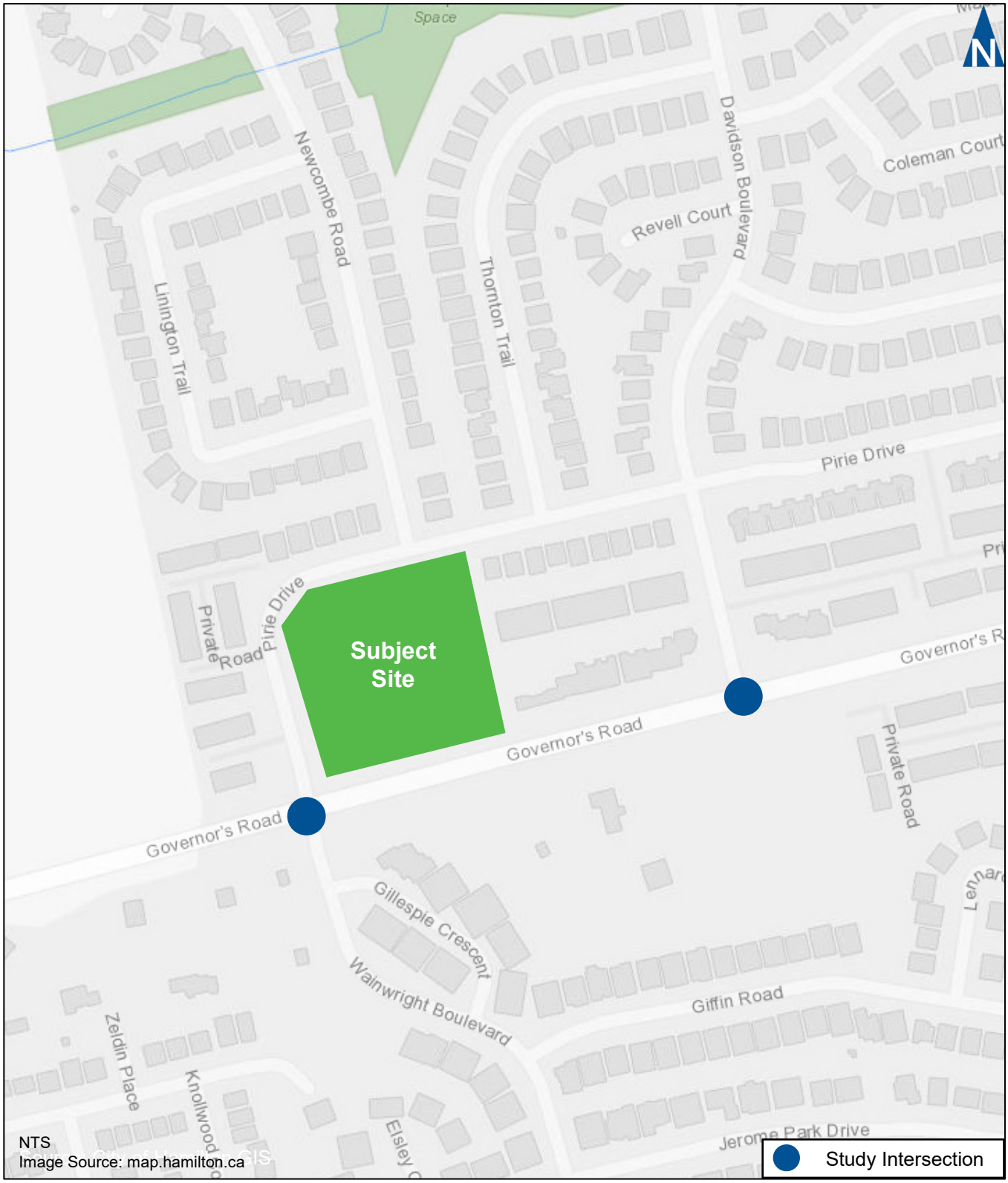
- Determine and assess the current study area traffic conditions;
- Forecast the additional traffic generated by the proposed development;
- Analyze the impacts of this additional traffic on the study area street network;
- Recommend any necessary remedial measures required to mitigate these impacts.
- Review Transportation Demand Management (TDM) strategies; and
- Forecast the site's parking demand.

Appendix A contains the pre-study consultation material and responses from the City of Hamilton. The study follows the City of Hamilton's Traffic Impact Study Guidelines[1].

The study area intersections assessed in this study include:

- Governors Road at Pirie Drive / Wainwright Boulevard (unsignalized);
- Governors Road at Davidson Boulevard (signalized); and
- The proposed site driveways to Governors Road and Pirie Drive (unsignalized).

[1] *Traffic Impact Study Guidelines*, City of Hamilton, July 2009.



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Location of Subject Site

125 Pirie Drive TIA PS TDM
200221

Figure 1.1

2 Existing Conditions

2.1 Road Network

The roadways of interest within the study area include:

- **Governors Road** is an east/west major arterial road[2]. The road has a two-lane rural cross-section with a posted speed limit of 50 km/h. A sidewalk is provided on the north side of the road for approximately 50 m east of the Pirie Drive intersection. The intersection with Davidson Boulevard is signalized;
- **Davidson Boulevard** is a north/south collector road. The road has a two-lane urban cross-section and an assumed posted speed limit of 50 km/h. Sidewalks are provided on both sides of the road;
- **Pirie Drive** is generally an east/west local road but runs north/south at the intersection with Governors Road. The road has a two-lane urban cross-section and a posted speed limit of 40 km/h. Sidewalk is provided on the north and west side of the road between Governors Road and Newcombe Road. East of Newcombe Road, sidewalks are provided along the south side of the road; and
- **Wainwright Boulevard** is a north/south local road. The road has a two-lane urban cross-section and an assumed posted speed limit of 50 km/h. A sidewalk is provided on the east side of the road.

Figure 2.1 illustrates the existing lane configuration and traffic control at the study area intersections. All roadways within the study area are under the jurisdiction of the City of Hamilton.

[2] *Urban Hamilton Official Plan Schedule C*, City of Hamilton, 9 July 2009.

Existing Traffic Control and Lane Configuration

2.2 Cycling Network

The City's cycling infrastructure consists of on-street and off-street facilities. On-street facilities comprise of cycling lanes, signed cycling routes, and paved shoulders. Off-street facilities are in the form of multi-use or informal trails.

Governors Road has a Designated Bicycle Lane[3] east of the Governors Road and Pirie Drive / Wainwright Boulevard intersection. **Figure 2.2** illustrates the existing cycling network.

The City of Hamilton's Transportation Master Plan[4] identifies the planned cycling network for the city. The City intends to have a transportation system that offers a choice of integrated travel modes, emphasizing active transportation (walking and cycling), public transit and carpooling. The Master Plan identifies a Planned Paved Shoulder on Governors Road west of the Pirie Drive / Wainwright Boulevard intersection.

[3] *Bikeways Map*, City of Hamilton, March 2020.
[4] *2018 Planned Cycling Network – Map 2 - Cycling Master Plan Review and Update*, City of Hamilton.

Source: City of Hamilton Bikeways Map

Existing Cycling Network

2.3 Transit Service

Hamilton Street Railway (HSR) operates the public transit system in the City of Hamilton. The area is currently serviced by the **5 DELAWARE** bus route. This route generally runs east / west and serves Dundas, Ancaster, Hamilton, and Stoney Creek. Service runs 7 days a week from approximately 5:00 AM to 1:00 AM. Weekday headways range from 15-45 minutes, depending on the time of day. Weekend headways are in the order of 30-45 minutes, depending on the time of day.

Figure 2.3 illustrates the existing transit network. **Figure 2.4** illustrates the existing transit stops within 500 m of the subject site.

There is an existing layby transit stop on the east leg of the Governors Road intersection with Pirie Drive. The proposed site driveway to the 3-4 storey building will impact the existing layby. The development of the townhouse units will impact the existing bus stop at Pirie Drive and Newcombe Road. Consultation with HSR will be required to relocate / redesign the local area transit stops.

Source: Hamilton Street Railway System Map – December 2019

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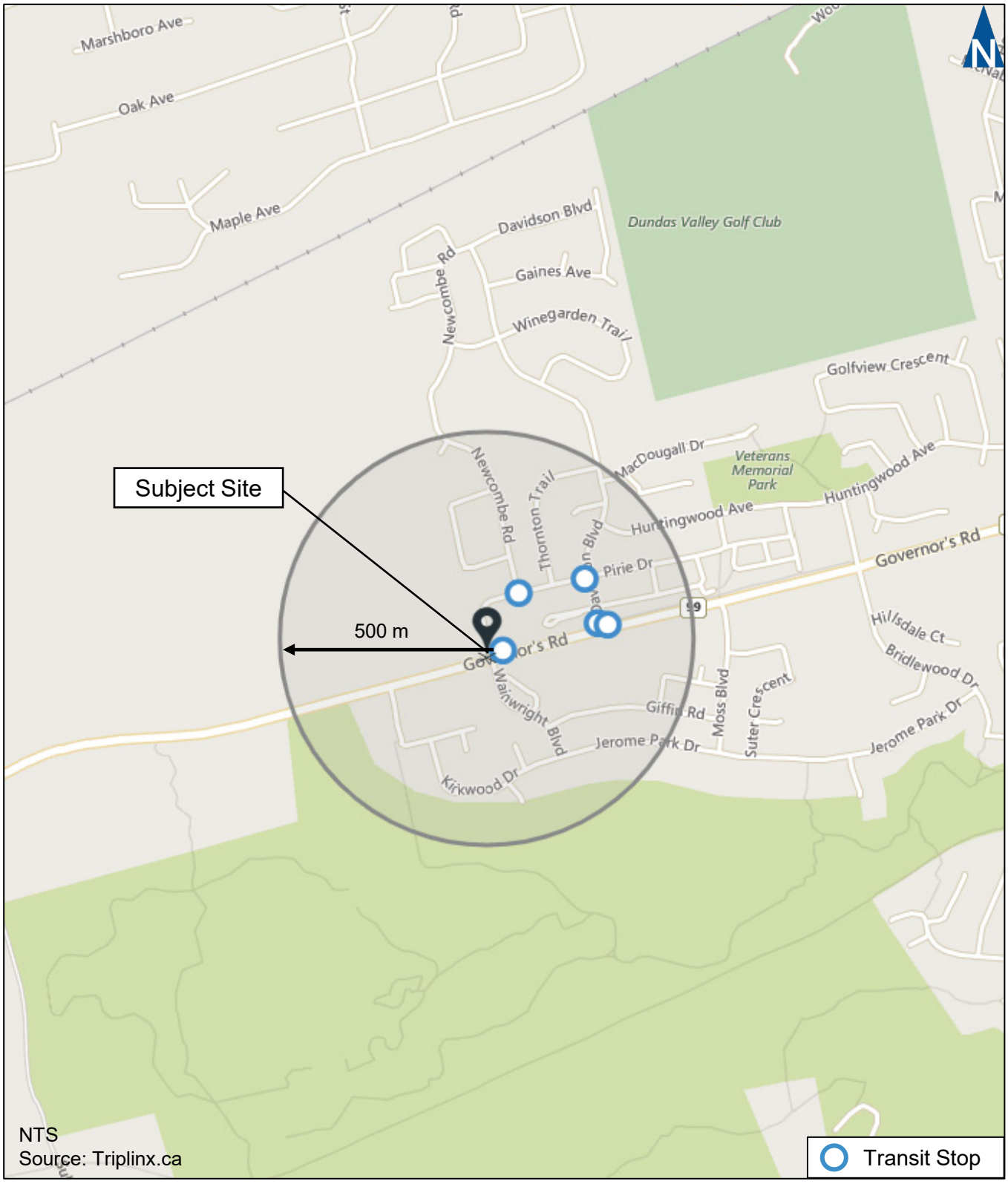
Existing Transit Network



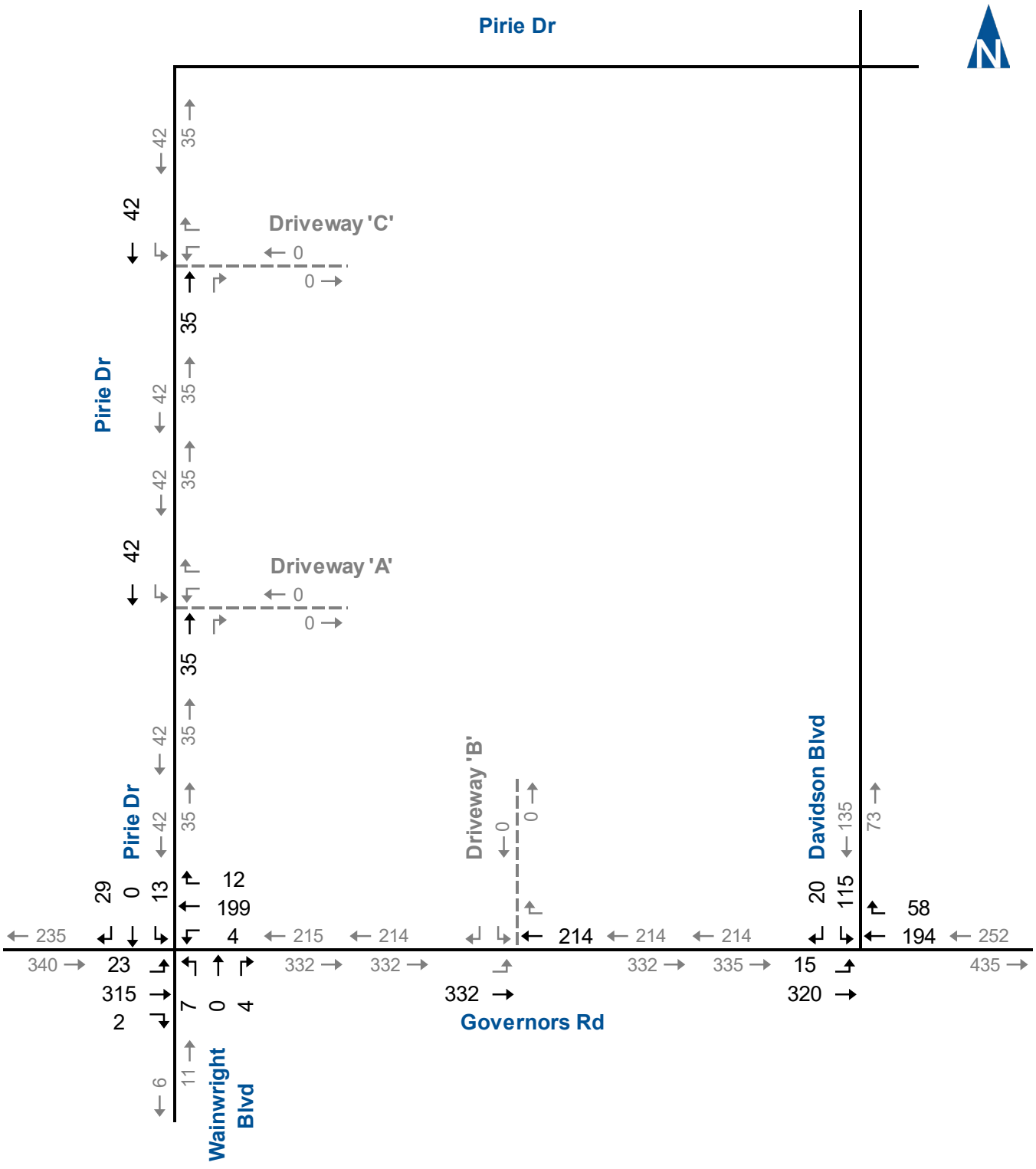
Existing Nearby Transit Stops

125 Pirie Drive TIA PS TDM
200221

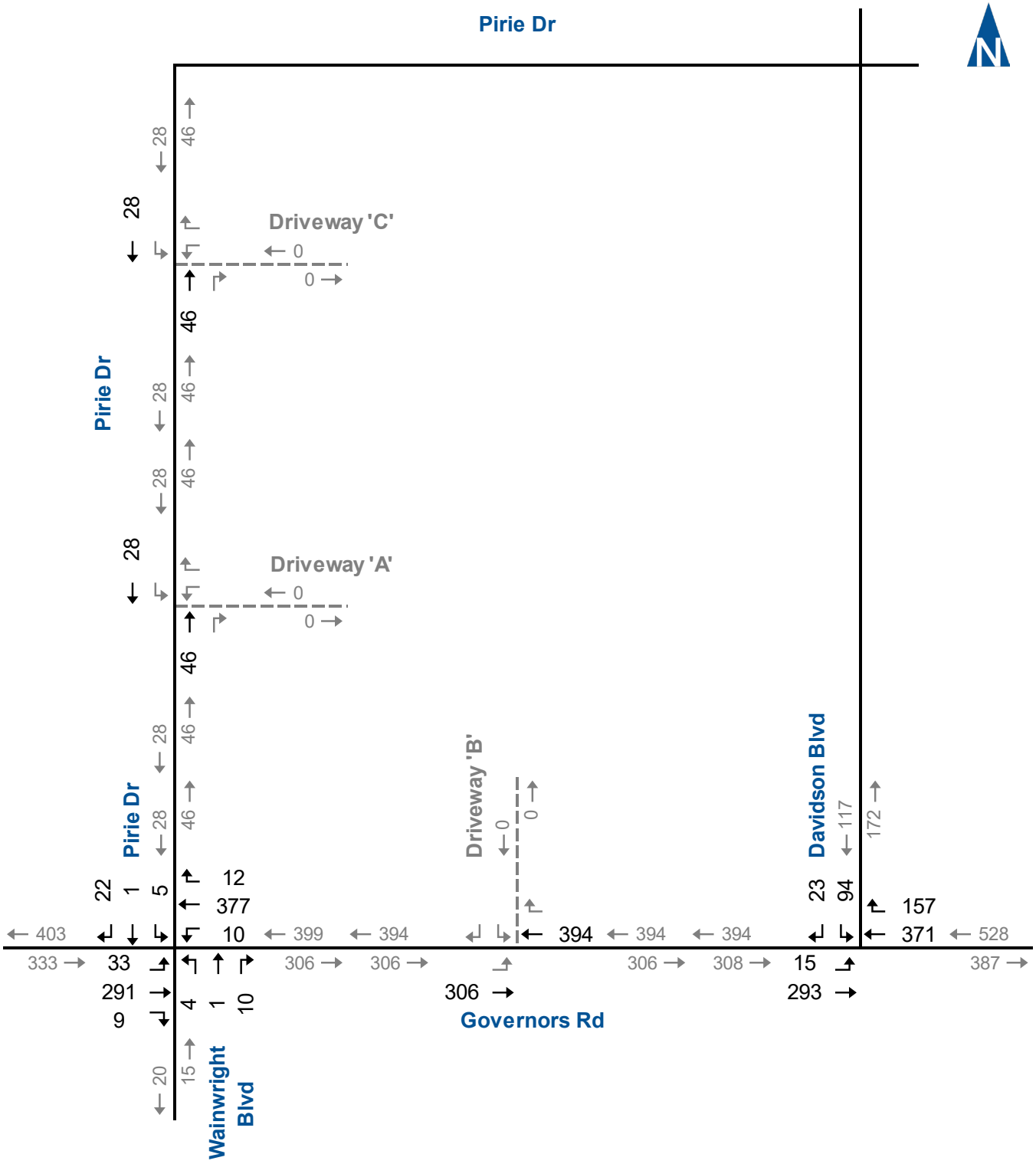
Figure 2.4

2.4 Traffic Volumes

Figure 2.5 and **Figure 2.6** illustrate the existing weekday AM and PM peak hour turning movement count volumes, respectively, collected by Pyramid Traffic Incorporated in September 2020. **Appendix B** contains the turning movement data.



Existing Traffic Volumes
AM Peak Hour



Existing Traffic Volumes PM Peak Hour

2.5 Traffic Operations

Intersection level of service (LOS) is a recognized method of quantifying the efficiency of traffic flow at intersections. It is based on the delay experienced by individual vehicles executing the various movements. The delay is related to the number of vehicles wanting to make a movement, compared to the estimated capacity for that movement. The capacity is based on several criteria related to the opposing traffic flows. The highest possible rating is LOS A, under which the average total delay is equal or less than 10.0 seconds per vehicle. When the average delay exceeds 80 seconds at signalized intersections (50 seconds at unsignalized), the movement is considered to have a LOS F and remedial measures are usually implemented if they are feasible.

The operations of the intersections in the study area were evaluated using the existing lane configuration, signal timings, and traffic control along with the existing traffic volumes. The intersection analysis considered three separate measures of performance:

- The LOS for each turning movement;
- The volume to capacity ratio (v/c) for each movement; and
- The 95th percentile queue lengths using Synchro 9.

Under the City's TIS Guidelines, the operational analysis must include identification of signalized and unsignalized intersections where:

- Volume to Capacity ratios (v/c) for through or shared through / turning movements that exceed 0.85 at a signalized intersection;
- v/c ratios for exclusive turning movements that exceed 0.90 at a signalized intersection;
- The 95th percentile queues for an individual movement are projected to exceed available turning lane storage; and
- LOS, based on average delay per vehicle on individual movements, operate at LOS E or LOS F for unsignalized intersections.

The operations of the study area intersections were evaluated with the existing turning movement volumes using Synchro 9. **Table 2.1** summarizes the level of service conditions.

The study intersections are generally estimated to be operating within acceptable levels of service, with the exception of the southbound left-turn movement on Davidson Boulevard at Governors Road where the 95th percentile queue length is estimated to exceed the current available storage length during the AM peak hour by approximately 5 m (30 m total).

The southbound left-turn lane can be extended to include 35 m of storage by modifying the existing pavement markings.

Appendix C contains the detailed Synchro 9 reports.

TABLE 2.1: EXISTING TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																OVERALL
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Governors Rd & Pirie Dr / Wainwright Blvd	TWSC	LOS	A	A	>	**A**	A	A	>	**A**	<	B	>	**B**	<	B	>	**B**	
			Delay	8	0	>	**1**	9	0	>	**0**	<	13	>	**13**	<	12	>	**12**	
			V/C	0.02	0.19	>		0.00	0.13	>		<	0.02	>		<	0.07	>		
			95th	1	0	>		0	0	>		<	1	>		<	2	>		
			Storage	20	-	>		35	-	>		<	-	>		<	-	>		
			Avail.	20	-	>		35	-	>		<	-	>		<	-	>		
	Governors Rd & Davidson Blvd	TCS	LOS	A	A	>	**A**	<	A	>	**A**					C	-	B	**C**	**A**
			Delay	4	5	>	**5**	<	4	>	**4**					30	-	11	**28**	**9**
			V/C	0.03	0.27	>		<	0.23	>						0.44	-	0.08		
			95th	3	30	>		<	22	>						30	-	5		
			Storage	35	-	>		<	-	>						25	-	-		
			Avail.	32	-	>		<	-	>						-5	-	-		
PM Peak Hour	Governors Rd & Pirie Dr / Wainwright Blvd	TWSC	LOS	A	A	>	**A**	A	A	>	**A**	<	B	>	**B**	<	B	>	**B**	
			Delay	8	0	>	**1**	8	0	>	**0**	<	13	>	**13**	<	13	>	**13**	
			V/C	0.03	0.18	>		0.01	0.24	>		<	0.03	>		<	0.06	>		
			95th	1	0	>		0	0	>		<	1	>		<	2	>		
			Storage	20	-	>		35	-	>		<	-	>		<	-	>		
			Avail.	19	-	>		35	-	>		<	-	>		<	-	>		
	Governors Rd & Davidson Blvd	TCS	LOS	A	A	>	**A**	<	A	>	**A**					C	-	B	**C**	**A**
			Delay	4	5	>	**5**	<	6	>	**6**					29	-	11	**26**	**8**
			V/C	0.03	0.23	>		<	0.43	>						0.37	-	0.09		
			95th	3	25	>		<	48	>						24	-	6		
			Storage	35	-	>		<	-	>						25	-	-		
			Avail.	33	-	>		<	-	>						1	-	-		

TWSC - Two-Way Stop Control *LOS - Level of Service* *> - Shared Right-Turn Lane*

TCS - Traffic Control Signal *V/C - Volume to Capacity Ratio* *< - Shared Left-Turn Lane*

MOE - Measure of Effectiveness *Avail. - Available Storage (m)*

3 Development Concept

3.1 Description

The subject site is located at 125 Pirie Drive in the City of Hamilton (Dundas). The site is bound by Governors Road to the south, Pirie Drive to the west and north, and residential land uses to the east.

The proposed retirement development consists of 17 single storey townhouse units and 155 apartment style units in a 3-4 storey building. The 155 apartment style units compose of 84 senior apartments and 71 retirement suites that will be marketed toward seniors who require different levels of care. Build-out of the site is anticipated to occur by Year 2024.

Vehicle access for the townhouse units is proposed by private driveway connections to Pirie Drive for each unit. Driveways are consolidated where possible to limit the number of new connections and to allow for on-street parking opportunities. The townhouse unit driveways will impact the existing bus stop at Pirie Drive and Newcombe Road.

Vehicle access for the 3-4 storey building is proposed by three private driveways. The driveways are positioned and described as follows:

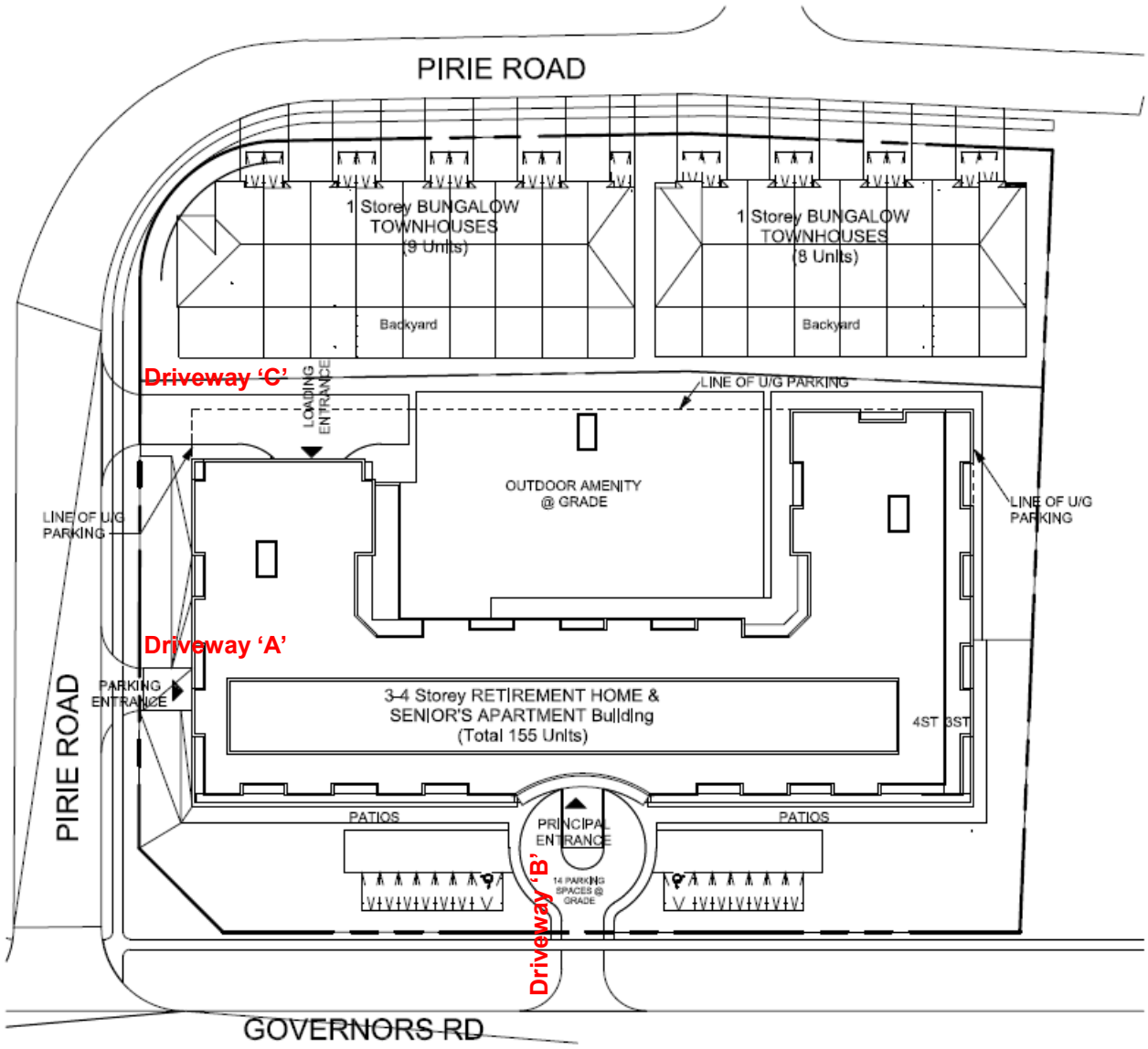
- Driveway ‘A’ – located approximately 50 m (CL to CL) north of Governors Road. This driveway connects to the site’s parking structure. This driveway will function as the main entrance for residents/employees and any structured visitor parking
- Driveway ‘B’ – located approximately 80 m (CL to CL) east of Pirie Drive. This driveway connects to the building’s principal entrance. Approximately 14 at-grade parking spaces are proposed in front of the building. This driveway is expected to accommodate the site’s pick-up/drop-off activity and visitor parking.

  The proposed driveway conflicts with the existing HSR layby across the site’s Governors Road frontage. Consultation with HSR will be required to relocate / redesign the layby transit stop.
- Driveway ‘C’– located approximately 90 m (CL to CL) north of Governors Road. This driveway is a service entrance. Regular traffic is not expected to use this driveway. The volume and frequency of service vehicles is expected to be low and can be scheduled/managed by the site operator.

Each townhouse unit is proposed to have parking for two vehicles (driveway + garage). A total of 34 spaces are proposed for these units.

Parking for the 3-4 storey building is proposed at 133 spaces (119 structured spaces + 14 at-grade spaces). Parking for the 3-4 storey building is proposed at 0.85 spaces per unit.

Figure 3.1 illustrates the proposed site plan.



NTS

Site Concept Plan

125 Pirie Drive TIA PS TDM
200221

Figure 3.1

3.2 TDM Measures

The site plan includes Transportation Demand Management (TDM) measures to help improve transportation efficiency (reduced congestion), encouraging use of alternative modes, reducing reliance on single occupant vehicles, and encouraging a change in behaviour.

The proposed TDM measures include in the current development concept include:

3.2.1 Cycling

No cycling infrastructure or bicycle parking is identified on the site plan.

The garages for the townhouse units can accommodate bicycle parking for each unit.

3.2.2 Walking

Each townhouse unit has direct pedestrian access to Pirie Drive.

The 3-4 storey building has direct sidewalk connections to Governors Road. Sidewalks are proposed along both sides of the Driveway ‘B’ connection.

At grade patios are identified on the site plan for the retirement units fronting Governors Road.

No other on-site pedestrian amenities are illustrated on the site plan. Pedestrian amenities (benches, landscaping, lighting, etc.) can be included in the outdoor amenity area.

3.2.3 Transit

An existing bus layby area with a covered shelter is located at the southwest corner of the subject site adjacent to Driveway ‘B’. Additionally, an existing bus stop with a bench on Pirie Drive is located outside the proposed townhouse units at the northeast corner of the subject site.

Hamilton residents 80 years of age and older are eligible for a HSR Golden Age Pass which permits free travel on the HSR network.

3.2.4 Parking

The site's parking supply is designed to meet the site's forecast parking demand. Most of the parking is contained in the proposed parking structure.

Parking for residents of the 3-4 storey building will be unbundled from the cost of units. Further information regarding the parking supply can be found in **Section 5**.

3.2.5 Shuttle Service, Carshare, & Bikeshare

A shuttle service is currently being considered for the site. The shuttle service would provide residents with fully accessible transportation services to/from local area destinations.

A carshare service is currently being considered for the site. A carshare service can provide benefits to occupants, nearby residents, as well as nearby businesses.

Bikeshare facilities are not currently proposed on site.

3.2.6 Wayfinding and Travel Planning

Wayfinding and travel planning resources will be provided to residents. Residents will be provided with a welcome package, which will contain active transportation maps and other community resources.

3.2.7 Education / Promotion and Incentives

TDM elements in the site plan and site's location relative to existing and future active transportation opportunities will be highlighted in the sale and rental marketing material for the site.

3.3 Sight Distance

The existing sight distances at the proposed site driveway locations on Governors Road and Pirie Drive were reviewed in the field in August 2020. Governors Road is generally flat and straight across the frontage of the subject site.

Pirie Drive has a vertical and horizontal curve along the frontage of the subject site. The existing right-angle horizontal curve is located approximately 130 m north of the Governors Road intersection.

Table 3.1 summarizes the minimum stopping[5] and decision[6] [7] sight distance requirements for design speeds of 10-20 km/h over the posted speed limits as described by the Transportation Association of Canada Geometric Design Guide for Canadian Roads (TAC Guide).

[5] Table 2.5.2: Stopping Sight Distance on level roadways for Automobiles, Transportation Association of Canada Geometric Design Guide for Canadian Roads, 2017.
[6] TAC Table 9.9.4: Design Intersection Sight Distance – Case B1, Left Turn from Stop.
[7] TAC Table 9.9.6: Design Intersection Sight Distance – Case B2, Right Turn from Stop.

TABLE 3.1: TAC SIGHT DISTANCE REQUIREMENTS

Design Speed (km/h)	Minimum Sight Distance (m)		
	Stopping	Decision	
		Left Turn	Right Turn
60	85	130	110
70	105	150	130

Based on field measurements, no sight distance issues are noted for the Driveway 'B' intersection with Governors Road.

The stopping and decision sight distances at Driveway 'A', Driveway 'C', and the townhouse private driveways are impacted by the existing horizontal curvature of Pirie Drive. This condition exists for all residential units fronting onto or having access to Pirie Drive between Governors Road and Newcombe Road.

The existing horizontal curvature of Pirie Drive requires drivers to reduce speed prior to entering the curve. Travel speeds approaching the curve are expected to be low with drivers accelerating or maintaining their travel speed upon exit.

Driveway 'A' is positioned to allow for unobstructed sightlines to the south (Governors Road) and for approximately 90 m to the north. The sight distance to the north is limited by the existing horizontal curvature of Pirie Drive.

Driveway 'C' is positioned to allow for unobstructed sightlines to the south (Governors Road) and for approximately 60 m to the north. The sight distance to the north is limited by the existing horizontal curvature of Pirie Drive.

3.4 Trip Generation

The Institute of Transportation Engineers (ITE) Trip Generation[8] methods are used to estimate the site trip generation. The following Land Use Codes (LUC) were used to estimate the site trip generation using regression equations:

- LUC 220 – Multifamily Housing (Low Rise); and
- LUC 252 – Senior Adult Housing (Attached).

[8] *Trip Generation Tenth Edition*, Institute of Transportation Engineers, Washington D.C., 2017

To remain conservative, no modal split adjustments have been applied to the trip generation estimate to account for active transportation or transit-oriented trips.

Table 3.2 summarizes the estimated trip generation. The subject site is forecast to generate approximately 40 and 53 vehicle trips during the AM and PM peak hours, respectively.

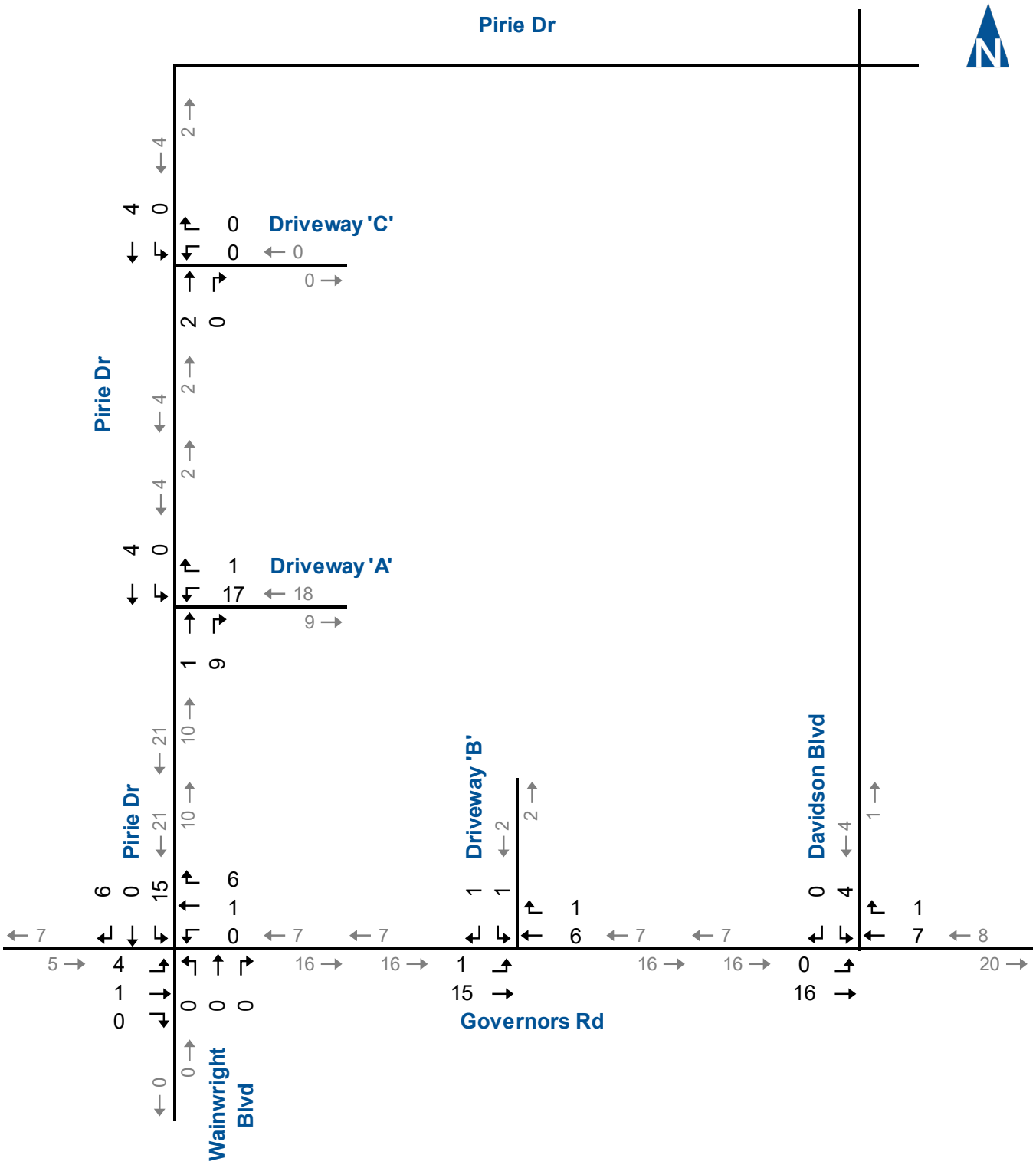
TABLE 3.2: SITE GENERATED TRAFFIC

Land Use Code	Number of Units	AM Peak Hour			PM Peak Hour		
		In	Out	Sum	In	Out	Sum
220: Multifamily Housing (Low Rise)	17	2	7	**9**	8	5	**13**
252: Senior Adult Housing (Attached)	155	11	20	**31**	22	18	**40**
Total Trip Generation		**13**	**27**	**40**	**30**	**23**	**53**

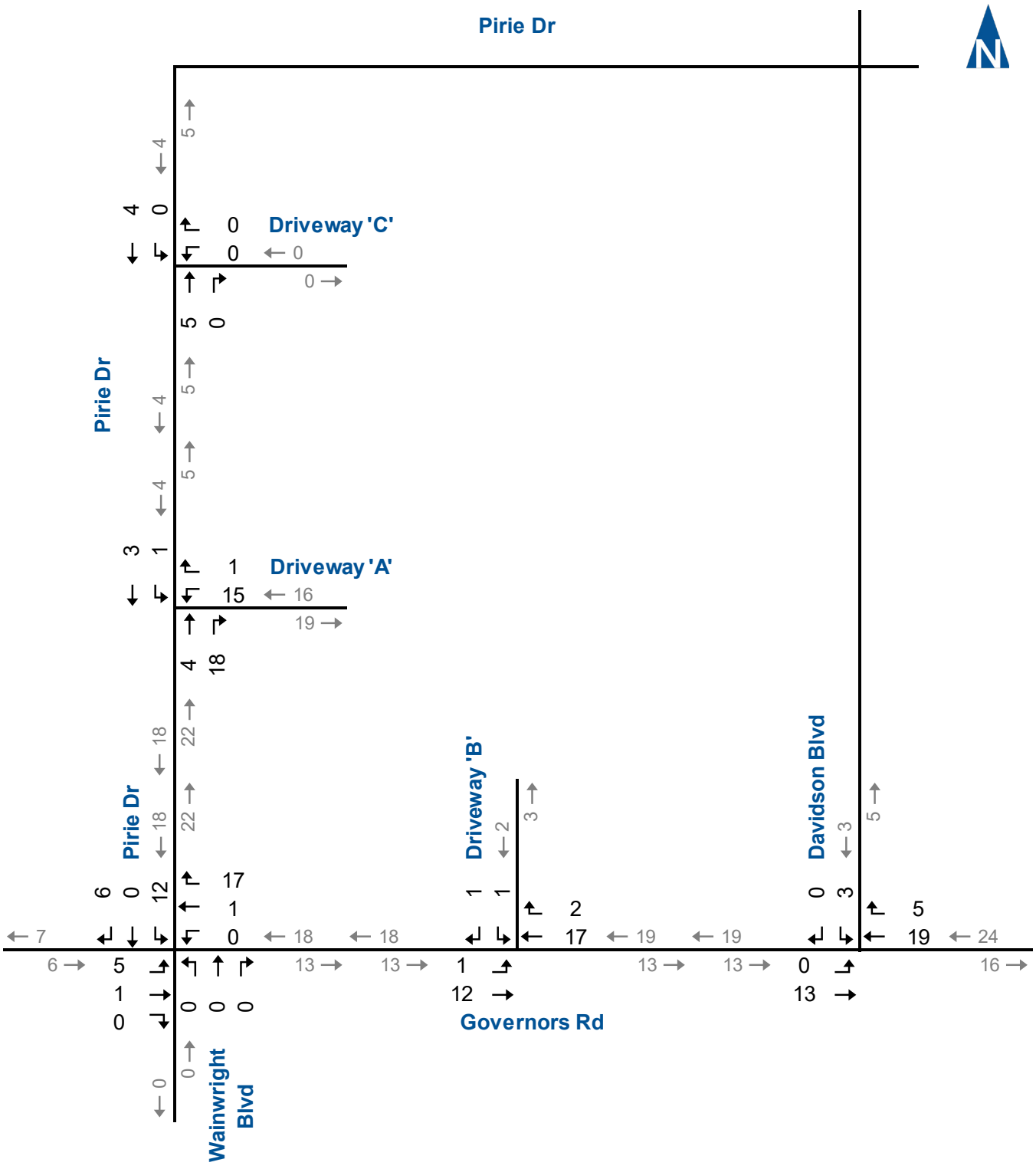
Table 3.3 summarizes the estimated trip distribution. Site generated traffic is expected to follow the same general residential pattern of traffic as documented in the existing conditions. **Figure 3.2** and **Figure 3.3** illustrate the site-generated traffic volumes for the AM and PM peak hours, respectively.

TABLE 3.3: ESTIMATED TRIP DISTRIBUTION

Distribution	AM Peak Hour		PM Peak Hour	
	In	Out	AM	PM
East via Governors Road	65%	75%	80%	70%
West via Governors Road	35%	25%	20%	30%
Total	**100%**	**100%**	**100%**	**100%**



Forecast Site Traffic
AM Peak Hour



Forecast Site Traffic
PM Peak Hour

4 Future Traffic Conditions

The assessment of future conditions in this section includes the following components:

- Future background traffic estimates;
- Level of service analysis for background traffic (pre-development);
- Future total traffic estimates; and
- Level of service analysis for total traffic (post-development).

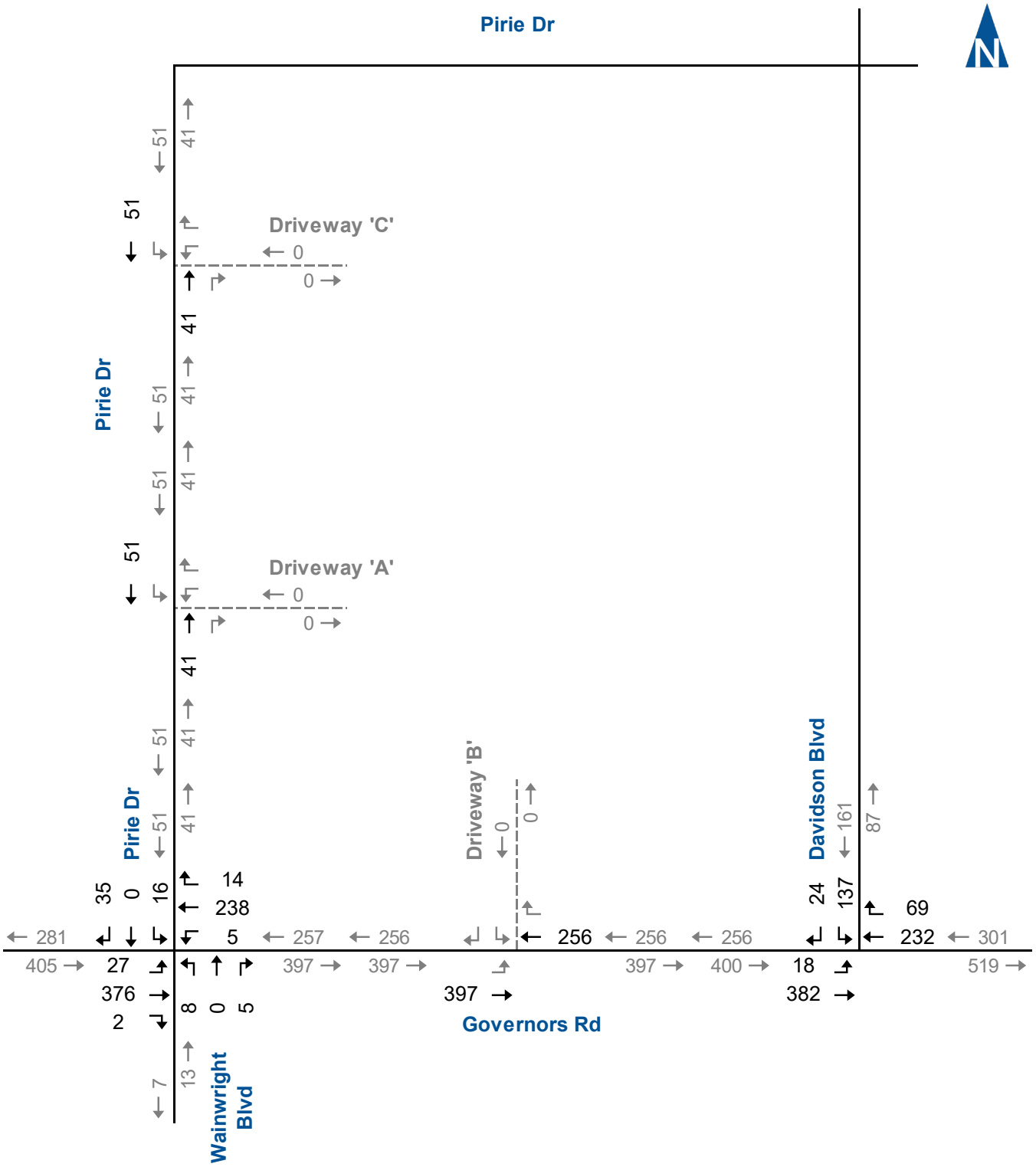
4.1 Forecast Traffic

A five-year horizon (Year 2029) following the expected build-out of the site has been assessed. The likely future traffic volumes near the subject site are estimated to consist of:

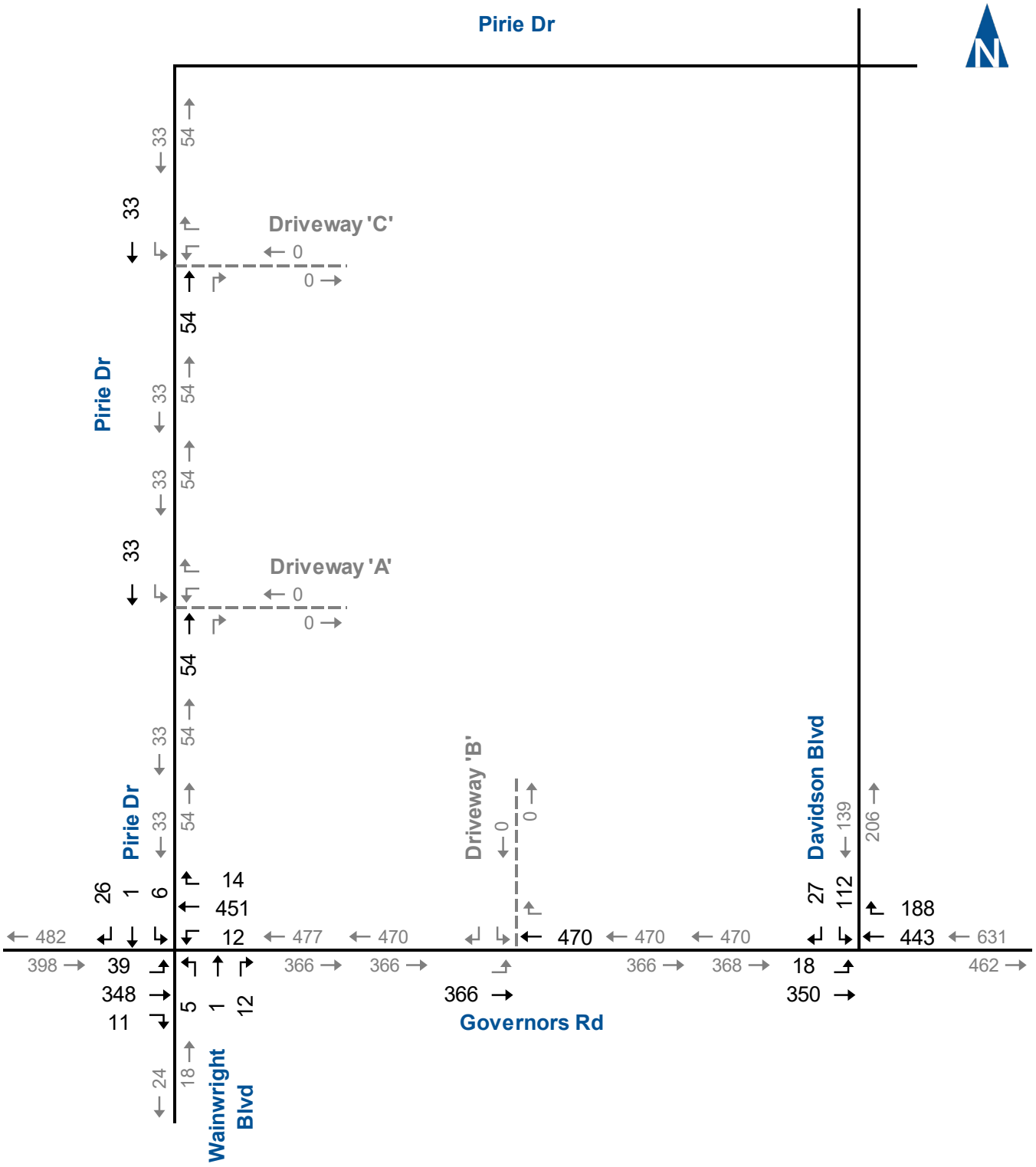
- Increased non-site traffic (generalized background traffic growth);
- Traffic generated by nearby in-stream developments; and
- Traffic generated by the proposed development.

During pre-study consultations, City staff confirmed a background growth rate of 2% per annum which includes the trip generation for the 29 proposed townhouse units at the 264 Governors Road development.

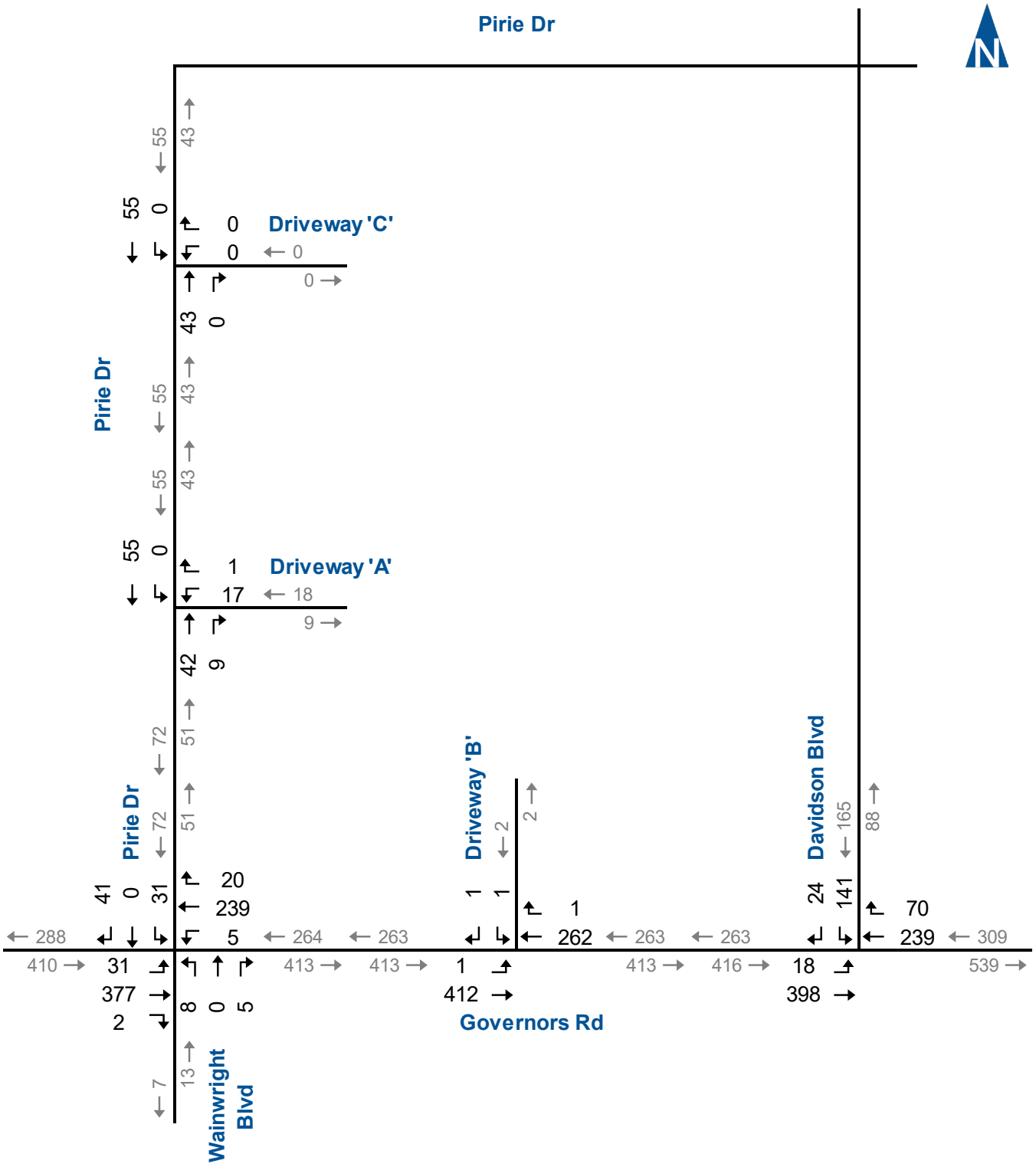
Figure 4.1 and **Figure 4.2** illustrate the forecast background traffic volumes for the AM and PM peak hours, respectively. **Figure 4.3** and **Figure 4.4** illustrate the forecast total traffic volumes for the AM and PM peak hours, respectively.



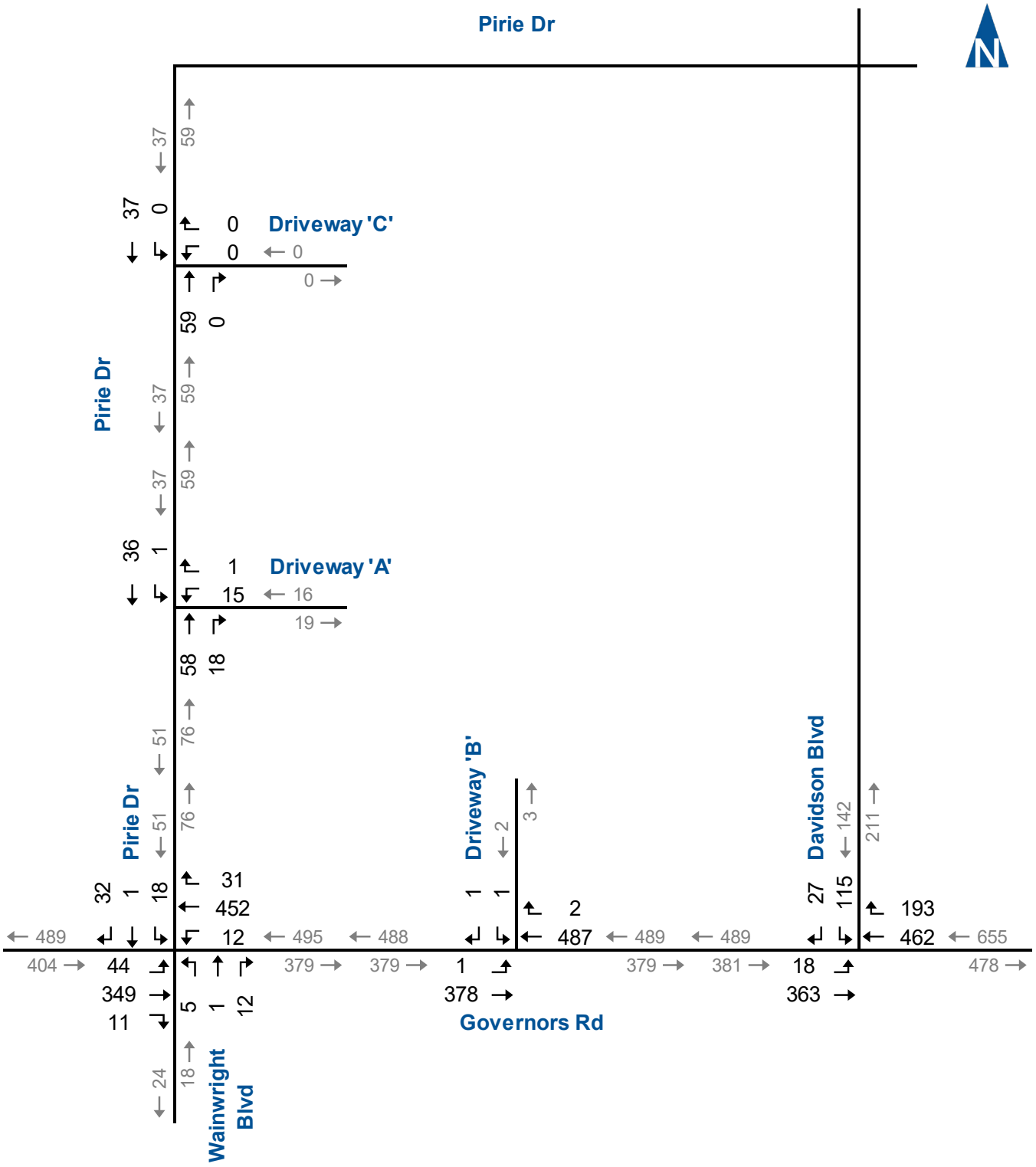
Forecast Background Traffic AM Peak Hour



Forecast Background Traffic
PM Peak Hour



Forecast Total Traffic
AM Peak Hour



Forecast Total Traffic
PM Peak Hour

4.2 Forecast Traffic Operations

4.2.1 Background Traffic Operations

The study area intersection operations analyses followed the same methodology used for existing conditions. No changes to the existing lane configurations or signal timings are assumed.

Table 4.1 summarizes the level of service conditions.

The 95th percentile queue length for the southbound left-turn movement at the Davidson Boulevard intersection with Governors Road is forecast to exceed the current available storage length during the AM and PM peak hours. Approximately 10 m of additional storage is needed (35 m total).

The southbound left-turn lane can be extended to include 35 m of storage by modifying the existing pavement markings.

No other critical movements are forecast to occur at the study area intersections.

Appendix D contains the detailed Synchro 9 reports.

TABLE 4.1: BACKGROUND TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																OVERALL
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Governors Rd & Pirie Dr / Wainwright Blvd	TWSC	LOS	A	A	>	**A**	A	A	>	**A**	<	C	>	**C**	<	B	>	**B**	
			Delay	8	0	>	**1**	9	0	>	**0**	<	15	>	**15**	<	13	>	**13**	
			V/C	0.02	0.23	>		0.00	0.15	>		<	0.03	>		<	0.09	>		
			95th	1	0	>		0	0	>		<	1	>		<	3	>		
			Storage	20	-	>		35	-	>		<	-	>		<	-	>		
			Avail.	19	-	>		35	-	>		<	-	>		<	-	>		
	Governors Rd & Davidson Blvd	TCS	LOS	A	A	>	**A**	<	A	>	**A**					C	-	B	**C**	**A**
			Delay	5	6	>	**6**	<	5	>	**5**					31	-	11	**28**	**10**
			V/C	0.03	0.33	>		<	0.27	>						0.49	-	0.09		
			95th	3	40	>		<	29	>						34	-	6		
			Storage	35	-	>		<	-	>						25	-	-		
			Avail.	32	-	>		<	-	>						-9	-	-		
PM Peak Hour	Governors Rd & Pirie Dr / Wainwright Blvd	TWSC	LOS	A	A	>	**A**	A	A	>	**A**	<	B	>	**B**	<	B	>	**B**	
			Delay	9	0	>	**1**	8	0	>	**0**	<	14	>	**14**	<	14	>	**14**	
			V/C	0.04	0.22	>		0.01	0.28	>		<	0.04	>		<	0.08	>		
			95th	1	0	>		0	0	>		<	1	>		<	2	>		
			Storage	20	-	>		35	-	>		<	-	>		<	-	>		
			Avail.	19	-	>		35	-	>		<	-	>		<	-	>		
	Governors Rd & Davidson Blvd	TCS	LOS	A	A	>	**A**	<	A	>	**A**					C	-	B	**C**	**A**
			Delay	5	5	>	**5**	<	7	>	**7**					30	-	11	**27**	**9**
			V/C	0.04	0.28	>		<	0.51	>						0.43	-	0.10		
			95th	3	32	>		<	67	>						28	-	6		
			Storage	35	-	>		<	-	>						25	-	-		
			Avail.	32	-	>		<	-	>						-3	-	-		

TWSC - Two-Way Stop Control
TCS - Traffic Control Signal
MOE - Measure of Effectiveness
LOS - Level of Service
V/C - Volume to Capacity Ratio
Avail. - Available Storage (m)
> - Shared Right-Turn Lane
< - Shared Left-Turn Lane

4.2.2 Total Traffic Operations

The study area intersection operations analyses followed the same methodology used for existing conditions. No changes to the existing lane configurations or signal timings are assumed.

Table 4.2 summarizes the level of service conditions.

Total traffic operations are forecast to operate like background conditions and no additional critical movements are noted. Additional storage is needed at the Davidson Boulevard intersection with Governors Road to accommodate the forecast queue length for the southbound left-turn movement, as described under forecast background conditions.

No other critical movements are forecast to occur at the study area intersections.

The site driveways are anticipated to operate with acceptable levels of service.

Appendix E contains the detailed Synchro 9 reports.

TABLE 4.2: TOTAL TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																OVERALL
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Governors Rd & Pirie Dr / Wainwright Blvd	TWSC	LOS	A	A	>	**A**	A	A	>	**A**	<	C	>	**C**	<	B	>	**B**	
			Delay	8	0	>	**1**	9	0	>	**0**	<	15	>	**15**	<	14	>	**14**	
			V/C	0.03	0.23	>		0.00	0.16	>		<	0.03	>		<	0.16	>		
			95th	1	0	>		0	0	>		<	1	>		<	4	>		
			Storage	20	-	>		35	-	>		<	-	>		<	-	>		
			Avail.	19	-	>		35	-	>		<	-	>		<	-	>		
	Governors Rd & Davidson Blvd	TCS	LOS	A	A	>	**A**	<	A	>	**A**					C	-	B	**C**	**A**
			Delay	5	7	>	**7**	<	6	>	**6**					32	-	11	**29**	**10**
			V/C	0.04	0.38	>		<	0.31	>						0.51	-	0.09		
			95th	3	43	>		<	30	>						35	-	6		
			Storage	35	-	>		<	-	>						25	-	-		
			Avail.	32	-	>		<	-	>						-10	-	-		
	Pirie Dr & Driveway 'A'	TWSC	LOS					A	-	>	**A**	-	A	>	**A**	<	A	-	**A**	
			Delay					9	-	>	**9**	-	0	>	**0**	<	0	-	**0**	
			V/C					0.02	-	>		-	0.03	>		<	0.00	-		
			95th					1	-	>		-	0	>		<	0	-		
	Pirie Dr & Driveway 'B'	TWSC	LOS	<	A	-	**A**	-	A	>	**A**					B	-	>	**B**	
			Delay	<	0	-	**0**	-	0	>	**0**					12	-	>	**12**	
			V/C	<	0.00	-		-	0.17	>						0.00	-	>		
			95th	<	0	-		-	0	>						0	-	>		
	Pirie Dr & Driveway 'C'	TWSC	LOS					A	-	>	**A**	-	A	>	**A**	<	A	-	**A**	
			Delay					0	-	>	**0**	-	0	>	**0**	<	0	-	**0**	
			V/C					0.00	-	>		-	0.03	>		<	0.00	-		
			95th					0	-	>		-	0	>		<	0	-		
PM Peak Hour	Governors Rd & Pirie Dr / Wainwright Blvd	TWSC	LOS	A	A	>	**A**	A	A	>	**A**	<	B	>	**B**	<	C	>	**C**	
			Delay	9	0	>	**1**	8	0	>	**0**	<	14	>	**14**	<	18	>	**18**	
			V/C	0.04	0.22	>		0.01	0.30	>		<	0.04	>		<	0.16	>		
			95th	1	0	>		0	0	>		<	1	>		<	5	>		
			Storage	20	-	>		35	-	>		<	-	>		<	-	>		
			Avail.	19	-	>		35	-	>		<	-	>		<	-	>		
	Governors Rd & Davidson Blvd	TCS	LOS	A	A	>	**A**	<	A	>	**A**					C	-	B	**C**	**A**
			Delay	5	5	>	**5**	<	7	>	**7**					31	-	11	**27**	**9**
			V/C	0.04	0.29	>		<	0.53	>						0.43	-	0.10		
			95th	3	34	>		<	73	>						29	-	6		
			Storage	35	-	>		<	-	>						25	-	-		
			Avail.	32	-	>		<	-	>						-4	-	-		
	Pirie Dr & Driveway 'A'	TWSC	LOS					A	-	>	**A**	-	A	>	**A**	<	A	-	**A**	
			Delay					9	-	>	**9**	-	0	>	**0**	<	0	-	**0**	
			V/C					0.02	-	>		-	0.05	>		<	0.00	-		
			95th					1	-	>		-	0	>		<	0	-		
	Pirie Dr & Driveway 'B'	TWSC	LOS	<	A	-	**A**	-	A	>	**A**					B	-	>	**B**	
			Delay	<	0	-	**0**	-	0	>	**0**					15	-	>	**15**	
			V/C	<	0.00	-		-	0.31	>						0.01	-	>		
			95th	<	0	-		-	0	>						0	-	>		
	Pirie Dr & Driveway 'C'	TWSC	LOS					A	-	>	**A**	-	A	>	**A**	<	A	-	**A**	
			Delay					0	-	>	**0**	-	0	>	**0**	<	0	-	**0**	
			V/C					0.00	-	>		-	0.04	>		<	0.00	-		
			95th					0	-	>		-	0	>		<	0	-		

TWSC - Two-Way Stop Control
TCS - Traffic Control Signal
MOE - Measure of Effectiveness
LOS - Level of Service
V/C - Volume to Capacity Ratio
Avail. - Available Storage (m)
> - Shared Right-Turn Lane
< - Shared Left-Turn Lane

5 Parking Justification

5.1 Parking Supply

The on-site parking supply consists of 34 spaces for the townhouse units (2.0 spaces per unit) and 133 spaces for the retirement units (0.85 spaces per unit).

5.2 Parking Demand

5.2.1 ITE Parking Demand Estimate

An accepted industry standard for the determination of potential parking demand is ITE's Parking Generation Manual[9]. ITE provides data on surveys across the USA and Canada of peak parking demand for different land uses. ITE Parking Generation is generally regarded as the best source for measured parking demands other than local data collected at similar land uses.

Land Use Code 220 (Multifamily Housing) and LUC 252 (Senior Adult Housing) [10] is used to estimate the site's parking generation. **Table 5.1** summarizes the estimated peak parking generation for the subject site.

The subject site parking demand is estimated to be 19 spaces for the townhouse units and 95 spaces for the 3-4 storey building.

The parking demand for both the townhouse units and the retirement units is estimated to be less than the proposed supply.

[9] *Parking Generation – Fifth Edition*, Institute of Transportation Engineers, Washington D.C.

[10] LUC 220 Fitted Curve Equation (Ln(spaces) = 0.99 Ln (Units) + 0.15) = 19 spaces, LUC 252 Average Rate = 0.61 spaces/unit.

TABLE 5.1: ITE PARKING GENERATION

Type of Unit	Equation	Expected Parking Demand
220 Multifamily Housing (Low-Rise) ~ Townhouses	Ln(S) = 0.99 Ln(U) +0.15	19
252 (Senior Adult Housing – Attached) ~ 3-4 Storey Building	S = 0.61 * U	95
Parking Demand		**114**

* S = Parking Demand (spaces), U = Number of Units

5.2.2 Parking Utilization Survey

A parking utilization survey was conducted at the Richmond Woods Retirement Village proxy site in the City of London, which consists of 102 seniors independent living units and 130 retirement dwelling units (apartment). Surveys were conducted during typical weekdays in December 2017 and a typical Saturday and Sunday in October 2018[11]. The results of the survey suggest the following peak parking rates:

- Resident parking demand – 0.33 spaces per unit;
- Visitor parking demand – 0.08 spaces per unit; and
- Employee parking demand - 0.06 spaces per unit.

Table 5.2 summarizes the peak parking rates collected during the noted time periods.

[11] *Erinview Independent Senior's Living Parking Justification*, Paradigm Transportation Solutions Limited, October 2018

TABLE 5.2: PARKING DEMAND RATE SUMMARY

Day	Date	Peak Parking Demand		
		Resident	Visitor	Employee
Weekday	Wed, 13 Dec 2017	0.32	0.05	0.07
	Thru, 14 Dec 2017	0.32	0.06	0.07
	Wed, 20 Dec 2017	0.31	0.06	0.06
	Thru, 21 Dec 2017	0.31	0.06	0.08
Weekend	Sat, 20 Oct 2018	0.33	0.08	0.06
	Sun, 21 Oct 2018	0.31	0.06	0.05
Weekday	**Average**	**0.32**	**0.06**	**0.07**
	Peak	**0.32**	**0.06**	**0.08**
Weekend	**Average**	**0.32**	**0.07**	**0.06**
	Peak	**0.33**	**.08**	**.06**

The overall weekday and weekend parking demands appear to be similar. Resident and visitor parking rates were observed to be slightly higher during the weekend period and employee parking demands were observed to be slightly lower during the weekend period.

Table 5.3 summarizes the forecast resident, visitor, and employee parking demand for the proposed 155 retirement units. The parking demand is estimated to be approximately 73 spaces. With 133 spaces proposed, the site's parking demand for the retirement units is estimated to be less than the proposed supply.

TABLE 5.3: FORECAST PARKING DEMAND – PROXY SITE DATA

Peak Parking Demand Rate per Unit		3-4 Storey Building Parking Demand
Resident	0.33	51
Visitor	0.08	13
Employee	0.06	9
Total		**73**

6 Conclusions and Recommendations

6.1 Conclusions

The main findings and conclusions of this study are as follows:

- **Existing Traffic**: The study area intersections are generally operating with acceptable levels of service during the weekday AM and PM peak hours. A minor queuing issue is identified for the southbound left-turn movement from Davidson Boulevard to Governors Road. Modifications to the existing pavement marking could be considered to address the issue.
- **Site Concept**: The proposed retirement development consists of 17 single storey townhouse units and 155 apartment style units in a 3-4 storey building. The 155 apartment style units compose of 84 senior apartments and 71 retirement suites that will be marketed toward seniors who require different levels of care. Build-out of the site is anticipated to occur by Year 2024.

  Vehicle access for the townhouse units is proposed by private driveway connections to Pirie Drive and driveways are consolidated where possible to limit the number of new connections. The townhouse unit driveways will impact the existing bus stop at Pirie Drive and Newcombe Road.

  Vehicle access for the 3-4 storey building is proposed by three private driveways:

  - Driveway ‘A’ is located approximately 50 m (CL to CL) north of Governors Road. This driveway connects to the site’s parking structure. This driveway will function as the main entrance for residents / employees and any structured visitor parking.
  - Driveway ‘B’ is located approximately 80 m (CL to CL) east of Pirie Drive and connects to the building’s principal entrance. This driveway is expected to accommodate the site’s pick-up/drop-off activity and visitor parking.
  - Driveway ‘C’ is located approximately 90 m (CL to CL) north of Governors Road. This driveway is a service entrance. Regular traffic is not expected to use this driveway. The volume and frequency of service vehicles is expected to be low and can be scheduled/managed by the site operator.

The proposed Driveway 'B' conflicts with the existing HSR layby across the site's Governors Road frontage. Consultation with HSR will be required to relocate / redesign the layby transit stop.

- **Parking Supply**: The on-site parking supply consists of 34 spaces for the townhouse units (2.0 spaces per unit) and 133 spaces for the retirement units (0.85 spaces per unit).

  Relying on empirical survey data collected for a retirement home, the forecast parking demand for the 3-4 storey building is estimated to be 73 spaces (51 resident spaces, 13 visitor spaces, and 9 employee spaces).

  The site's parking demand is estimated to be contained on-site.

- **Trip Generation**: The site's trip generation is estimated to be approximately 40 AM peak hour vehicle trips and 53 PM peak hour vehicle trips.

- **Sight Distance**: The stopping and decision sight distances at Driveway 'A', Driveway 'C', and the townhouse private driveways are impacted by the existing horizontal curvature of Pirie Drive. This condition exists for all residential units fronting onto or having access to Pirie Drive between Governors Road and Newcombe Road.

  The existing horizontal curvature of Pirie Drive requires drivers to reduce speed prior to entering the curve. Travel speeds approaching the curve are expected to be low with drivers accelerating or maintaining their travel speed upon exit.

- **Background Traffic**: The study area intersections are forecast to continue to operate with acceptable levels of service during the weekday AM and PM peak hours. No additional critical movements are identified. The queuing issue for the southbound left-turn movement from Davidson Boulevard to Governors Road is expected to continue to occur. Modifications to the existing pavement marking could be considered to address the issue.

- **Total Traffic**: The study area intersections are forecast to operate with similar levels of service as the background traffic conditions. No additional critical movements are noted at the study area intersections over background conditions. The site driveways are forecast to operate with delays in the LOS A to B range with v/c ratios of less than 0.35.

- **TDM Measures**: The site plan includes Transportation Demand Management (TDM) measures to help improve transportation efficiency (reduced congestion), encouraging use of alternative modes, reducing reliance on single occupant vehicles, and encouraging a change in behaviour.

6.2 Recommendations

Based on the findings of this study, it is recommended that:

- Hamilton Street Railway review the design/location of the existing layby transit stop at the intersection of Governors Road and Pirie Drive.
- The City of Hamilton consider revising the existing pavement marking for the southbound left-turn lane at the Governors Road intersection with Davidson Boulevard to provide for 35 m of total storage.
- The TDM measures included in **Section 3.2** be designed for in the final site plan/development program. Some elements of the TDM plan can be designed directly into the site plan while other elements are amenities that can only be achieved after occupancy.

Appendix A

Pre-Study Consultation

Scott Catton

From: Stefan Hajgato
Sent: Wednesday, 19 August, 2020 08:23 AM
To: Scott Catton
Subject: FW: FC-20-018 (200221: 125 Pirie TIS PS TDM) Terms of Reference

Stefan Hajgato, P.Eng.
Transportation Engineer

Paradigm Transportation Solutions Limited
p: 519.896.3163 x209

From: Transportation Planning <Transportation.Planning@hamilton.ca>
Sent: August 19, 2020 8:21 AM
To: Stefan Hajgato <shajgato@ptsl.com>
Subject: RE: FC-20-018 (200221: 125 Pirie TIS PS TDM) Terms of Reference

Hi Stefan,

Please see my comments related to your proposed scope below:

Study Area:

- Governor's Road at Davidson Blvd shall also be included. Pirie Drive to Davidson Blvd to Governor's Road would be an attractive route for the townhome portion of the development, and possibly the apartments since this intersection is signalized
- There are 2 proposed accesses to Pirie Drive and an access to Governor's Road identified on the site plan. All municipal road accesses shall be reviewed

Growth Rate:

- Confirmed at 2%

Data Collection:

- City of Hamilton traffic data for Governor's Road at Pirie Drive and Davidson Blvd is outdated and new traffic counts are required
- Paradigm may conduct new traffic counts at these locations, after September 8th when School resumes

Geometric Improvements:

- Governor's Road was recently reconstructed east of Davidson Drive. No improvements are anticipated in the horizon at the Governor's Road at Pirie Drive intersection. Please note a recent Hamilton Street Railway layby was installed on the north side of Governor's Road, by Pirie Drive. Proposed access to the site will need to avoid conflict with this layby.

Planned or Approved Developments

- A nearby development of 29 units at 264 Governor's Road, is proposed, but since this is minor in nature, the background growth growth rate of 2% is sufficient.

Let me know if you have any questions.

Jeff Cornwell, C.E.T.
Project Manager, Transportation Planning Development Approvals
Transportation Planning
Planning and Economic Development Department
City of Hamilton

From: Stefan Hajgato <shajgato@ptsl.com>
Sent: August 10, 2020 11:41 AM
To: Transportation Planning <Transportation.Planning@hamilton.ca>
Cc: Scott Catton <scatton@ptsl.com>
Subject: FW: FC-20-018 (200221: 125 Pirie TIS PS TDM) Terms of Reference

Hello,

Further to below, please see the attached site concept plan. Note the driveway connections to the mid-rise component of the development are as follows:

- One proposed driveway to Governors Road.
- Two proposed driveways to Pirie Drive. However, one will only be used for deliveries and traffic volumes are expected to be very low.

Regards,

Stefan Hajgato, P.Eng.
Transportation Engineer

Paradigm Transportation Solutions Limited
p: 519.896.3163 x209

From: Stefan Hajgato
Sent: August 6, 2020 10:55 AM
To: Transportation.Planning@hamilton.ca
Cc: Scott Catton
Subject: FC-20-018 (200221: 125 Pirie TIS PS TDM) Terms of Reference

Hello,

Paradigm has been retained to complete a Transportation Impact Study, Parking Study, and Transportation Demand Management Study for a proposed retirement development located at 125 Pirie Drive in Hamilton (Dundas). There are 17 proposed townhouse units and 155 apartment style units. We are proposing the following scope:

Study Area

- Governors Road at Pirie Drive / Wainwright Boulevard (unsignalized); and
- Two proposed site driveways to Governors Road.

Development

- Senior oriented land uses
- 17 townhouse units;
- Mid-rise building (155 units)
    - 84 independent living units; and
    - 71 retirement home units.
- Year of build-out estimated to be 2022.

Parking

- 2 spaces per townhouse unit (2.0 spaces / unit); and
- 133 underground and at grade spaces (0.85 spaces per unit).

Horizon Years

- Existing (Year 2020); and
- 5-years from site build-out (Year 2027).

Growth Rate: 2.0% per annum – **Please Confirm**
Analysis Periods: Weekday AM & PM peak hours.
Trip Generation:

- ITE 10th Edition; preliminary estimates indicate approximately 40 trips during the AM peak hour and approximately 53 trips during the PM peak hour.
- No modal split reductions will be applied.

Data Collection

We are proposing to collect turning movement counts at the Governors Road at Pirie Drive / Wainwright Boulevard intersection as mobility data indicates that traffic volumes are similar to pre-pandemic levels now that we are in Stage 3 of reopening as shown here:
https://www.apple.com/covid19/mobility

If this is not deemed appropriate for use in the study, we propose to collect data at the Governors Road and Ogilvie Street intersection. Using the City's 2019 TMC for this intersection we will develop a factor to adjust the Governors Road at Pirie Drive TMC data to a baseline condition.

Could you please provide:

- Traffic studies for any approved or pending developments in the area that should be included in the traffic forecast.
- Information on any planned geometric improvements for the study area that we should consider in the analysis.

Thank you,

Stefan Hajgato, P.Eng.
Transportation Engineer

Paradigm Transportation Solutions Limited
150 Pinebush Road, Unit 5A, Cambridge ON N1R 8J8
p: 519.896.3163 x209
e: shajgato@ptsl.com

w: www.ptsl.com

Since 1998, our unique "work at home" business model has enabled us to harness technology, offer high quality service and strong communication with our clients and now allows us to carry on our work for you during COVID-19.

Let's stay safe and look out for each other. We will get through this together.

Appendix B

Existing Data

Governors Rd @ Prie Dr

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 10:00:00

One Hour Peak
From: 7:45:00
To: 8:45:00

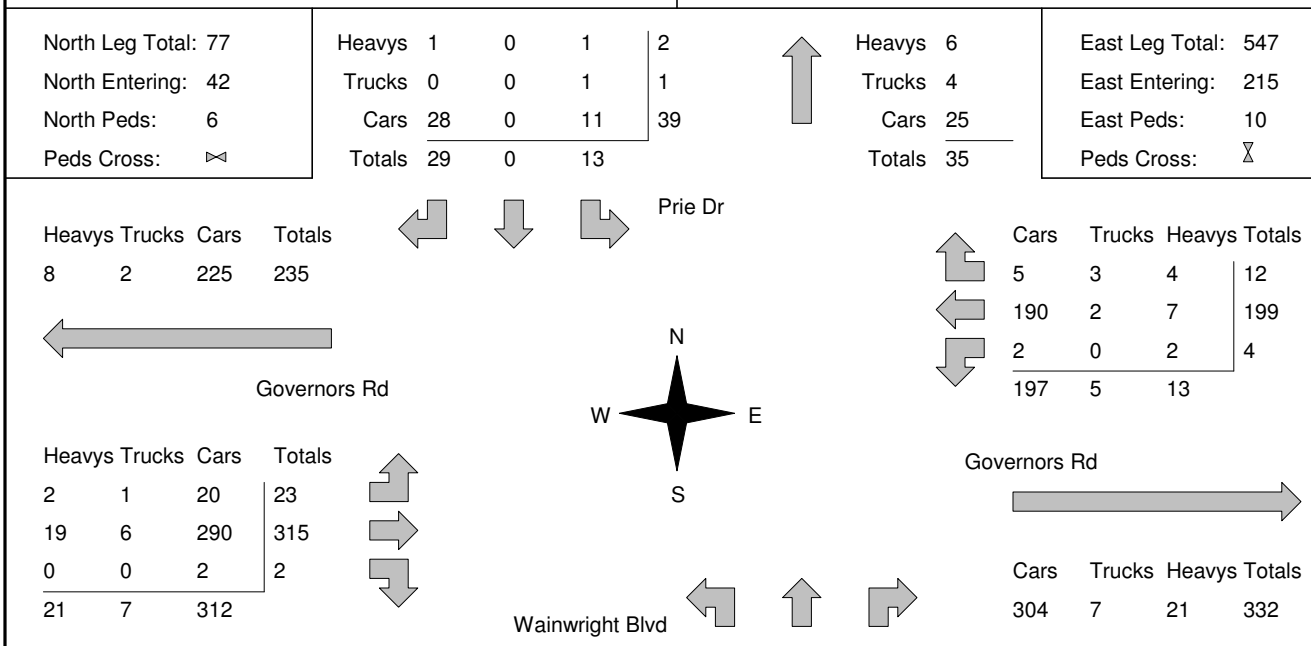
Municipality: Hamilton
Site #: 0000000001
Intersection: Governors Rd & Prie Dr
TFR File #: 1
Count date: 24-Sep-2020

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Governors Rd runs W/E



Comments

Governors Rd @ Prie Dr

Mid-day Peak Diagram

Specified Period
From: 11:30:00
To: 13:30:00

One Hour Peak
From: 12:30:00
To: 13:30:00

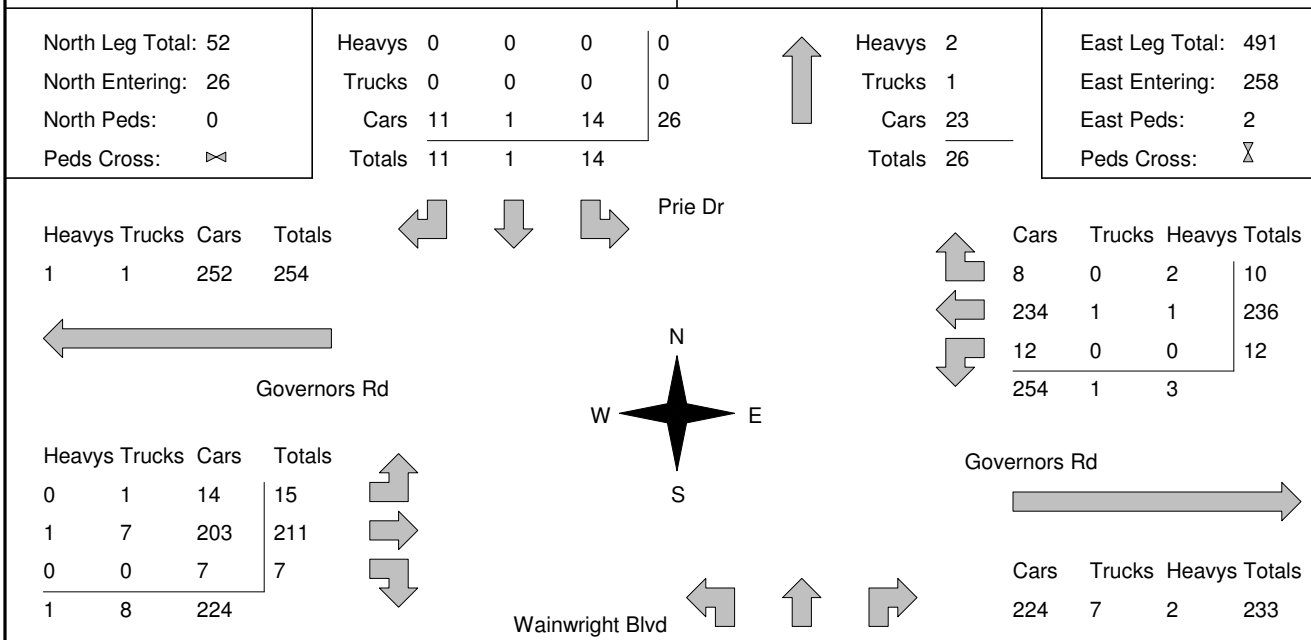
Municipality: Hamilton
Site #: 0000000001
Intersection: Governors Rd & Prie Dr
TFR File #: 1
Count date: 24-Sep-2020

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Governors Rd runs W/E



Comments

Governors Rd @ Prie Dr

Afternoon Peak Diagram

Specified Period
From: 16:00:00
To: 19:00:00

One Hour Peak
From: 16:00:00
To: 17:00:00

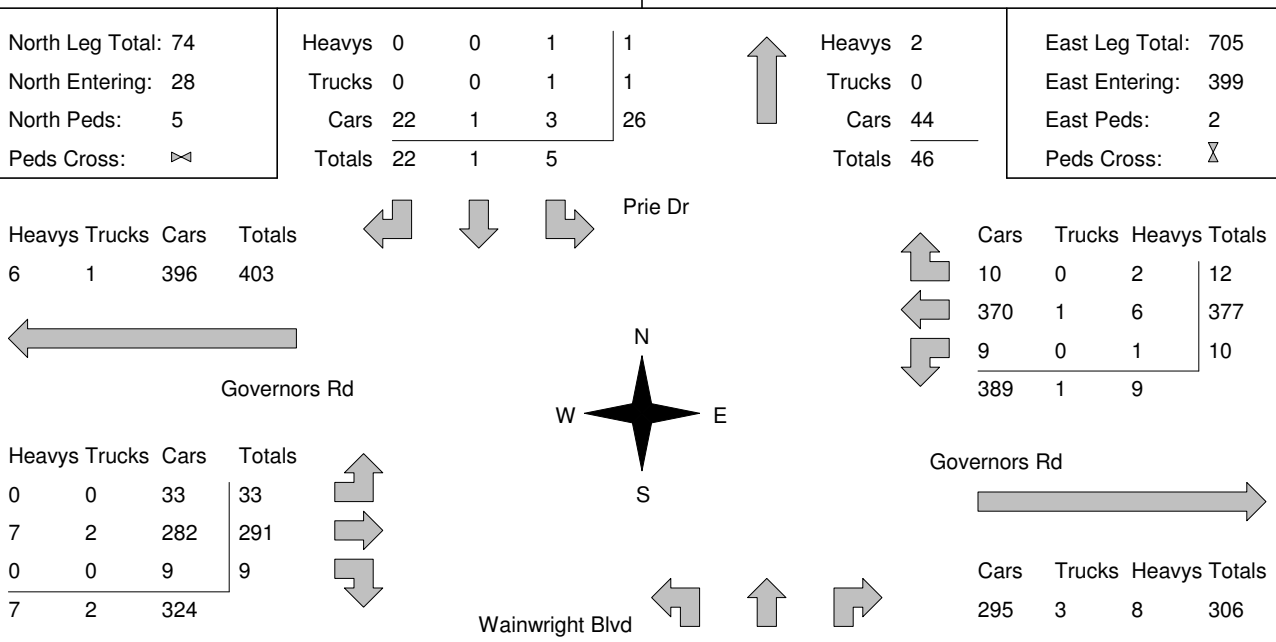
Municipality: Hamilton
Site #: 0000000001
Intersection: Governors Rd & Prie Dr
TFR File #: 1
Count date: 24-Sep-2020

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Governors Rd runs W/E



Comments

Governors Rd @ Prie Dr

Total Count Diagram

Municipality: Hamilton
Site #: 0000000001
Intersection: Governors Rd & Prie Dr
TFR File #: 1
Count date: 24-Sep-2020

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Governors Rd runs W/E

North Leg Total:	519			
North Entering:	240			
North Peds:	18			
Peds Cross:	⋈			
Heavys	3	0	2	5
Trucks	2	0	5	7
Cars	147	6	75	228
Totals	152	6	82	
Heavys	23			
Trucks	6			
Cars	250			
Totals	279			
East Leg Total:	4164			
East Entering:	2068			
East Peds:	28			
Peds Cross:	⧖			

Prie Dr

Heavys	Trucks	Cars	Totals
43	19	2062	2124

Cars	Trucks	Heavys	Totals
60	4	20	84
1862	17	40	1919
62	0	3	65
1984	21	63	

Governors Rd

N
W E
S

Heavys	Trucks	Cars	Totals
3	2	181	186
47	28	1881	1956
0	0	55	55
50	30	2117	

Governors Rd

Cars	Trucks	Heavys	Totals
2012	33	51	2096

Wainwright Blvd

Peds Cross:	⧖			
West Peds:	11			
West Entering:	2197			
West Leg Total:	4321			
Cars	123			
Trucks	0			
Heavys	3			
Totals	126			
Cars	53	9	56	118
Trucks	0	0	0	0
Heavys	0	0	2	2
Totals	53	9	58	
Peds Cross:	⋈			
South Peds:	19			
South Entering:	120			
South Leg Total:	246			

Comments

Governors Rd @ Davidson Blvd

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 10:00:00

One Hour Peak
From: 7:45:00
To: 8:45:00

Municipality: Hamilton
Site #: 0000000002
Intersection: Governors Rd & Davidson Blvd
TFR File #: 2
Count date: 24-Sep-2020

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

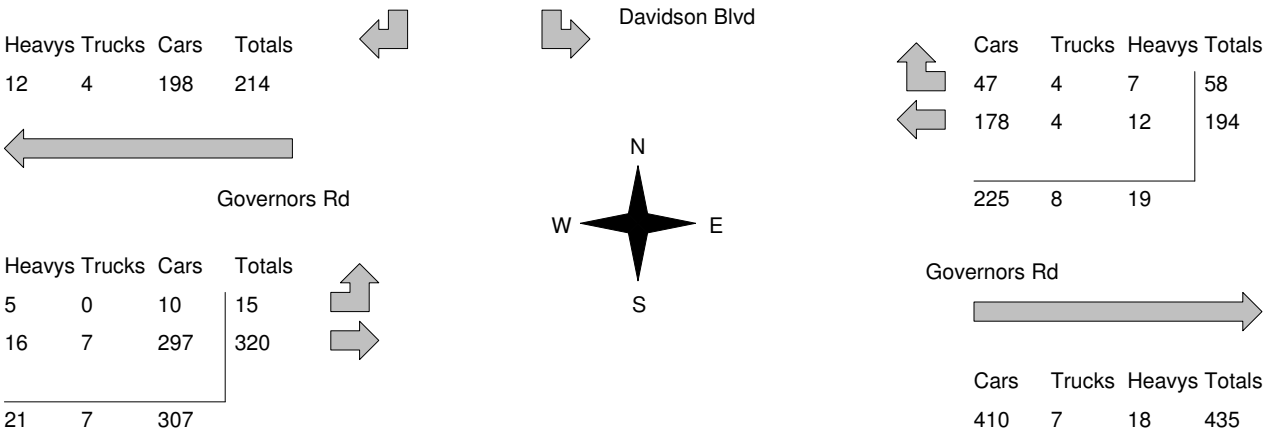
Major Road: Governors Rd runs W/E

North Leg Total: 208
North Entering: 135
North Peds: 10
Peds Cross: ⋈

Heavys	0	2	2
Trucks	0	0	0
Cars	20	113	133
Totals	20	115	

Heavys	12
Trucks	4
Cars	57
Totals	73

East Leg Total: 687
East Entering: 252
East Peds: 0
Peds Cross: ⧖



Heavys	Trucks	Cars	Totals
12	4	198	214

Cars	Trucks	Heavys	Totals
47	4	7	58
178	4	12	194
225	8	19	

Heavys	Trucks	Cars	Totals
5	0	10	15
16	7	297	320
21	7	307	

Cars	Trucks	Heavys	Totals
410	7	18	435

Peds Cross: ⧖
West Peds: 0
West Entering: 335
West Leg Total: 549

Comments

Governors Rd @ Davidson Blvd

Mid-day Peak Diagram

Specified Period
From: 11:30:00
To: 13:30:00

One Hour Peak
From: 12:30:00
To: 13:30:00

Municipality: Hamilton
Site #: 0000000002
Intersection: Governors Rd & Davidson Blvd
TFR File #: 2
Count date: 24-Sep-2020

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Governors Rd runs W/E

North Leg Total: 205
North Entering: 100
North Peds: 4
Peds Cross: ⋈

Heavys	0	2	2
Trucks	0	2	2
Cars	16	80	96
Totals	16	84	

Heavys	0
Trucks	1
Cars	104
Totals	105

East Leg Total: 638
East Entering: 333
East Peds: 0
Peds Cross: ⧖

Davidson Blvd

Heavys	Trucks	Cars	Totals
3	1	254	258

Cars	Trucks	Heavys	Totals
90	1	0	91
238	1	3	242
328	2	3	

Governors Rd

N
W E
S

Heavys	Trucks	Cars	Totals
0	0	14	14
2	6	213	221
2	6	227	

Governors Rd

Cars	Trucks	Heavys	Totals
293	8	4	305

Peds Cross: ⧖
West Peds: 0
West Entering: 235
West Leg Total: 493

Comments

Governors Rd @ Davidson Blvd

Afternoon Peak Diagram

Specified Period
From: 16:00:00
To: 19:00:00

One Hour Peak
From: 16:00:00
To: 17:00:00

Municipality: Hamilton
Site #: 0000000002
Intersection: Governors Rd & Davidson Blvd
TFR File #: 2
Count date: 24-Sep-2020

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

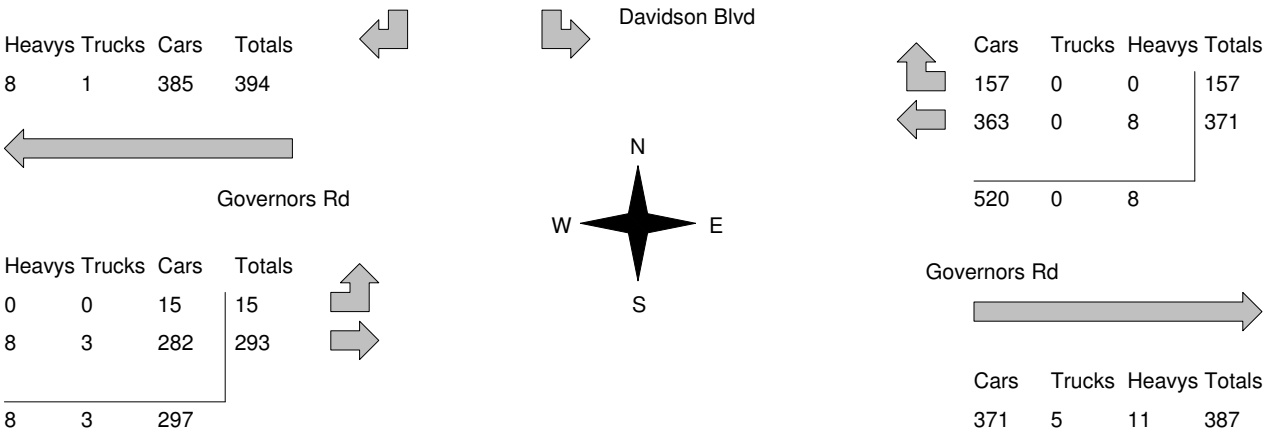
Major Road: Governors Rd runs W/E

North Leg Total: 289
North Entering: 117
North Peds: 4
Peds Cross: ⋈

Heavys	0	3	3
Trucks	1	2	3
Cars	22	89	111
Totals	23	94	

Heavys	0
Trucks	0
Cars	172
Totals	172

East Leg Total: 915
East Entering: 528
East Peds: 0
Peds Cross: ⧖



Heavys	Trucks	Cars	Totals
8	1	385	394

Cars	Trucks	Heavys	Totals
157	0	0	157
363	0	8	371
520	0	8	

Heavys	Trucks	Cars	Totals
0	0	15	15
8	3	282	293
8	3	297	

Cars	Trucks	Heavys	Totals
371	5	11	387

Peds Cross: ⧖
West Peds: 0
West Entering: 308
West Leg Total: 702

Comments

Governors Rd @ Davidson Blvd

Total Count Diagram

Municipality: Hamilton
Site #: 0000000002
Intersection: Governors Rd & Davidson Blvd
TFR File #: 2
Count date: 24-Sep-2020

Weather conditions:
Cloudy/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Governors Rd runs W/E

North Leg Total: 1746
North Entering: 888
North Peds: 41
Peds Cross: ⋈

Heavys	2	23	25
Trucks	2	8	10
Cars	143	710	853
Totals	147	741	

Heavys	13
Trucks	15
Cars	830
Totals	858

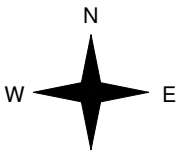
East Leg Total: 5419
East Entering: 2676
East Peds: 4
Peds Cross: ⧖

Davidson Blvd

Heavys	Trucks	Cars	Totals
57	19	1986	2062

Cars	Trucks	Heavys	Totals
739	14	8	761
1843	17	55	1915
2582	31	63	

Governors Rd



Heavys	Trucks	Cars	Totals
5	1	91	97
45	31	1926	2002
50	32	2017	

Governors Rd

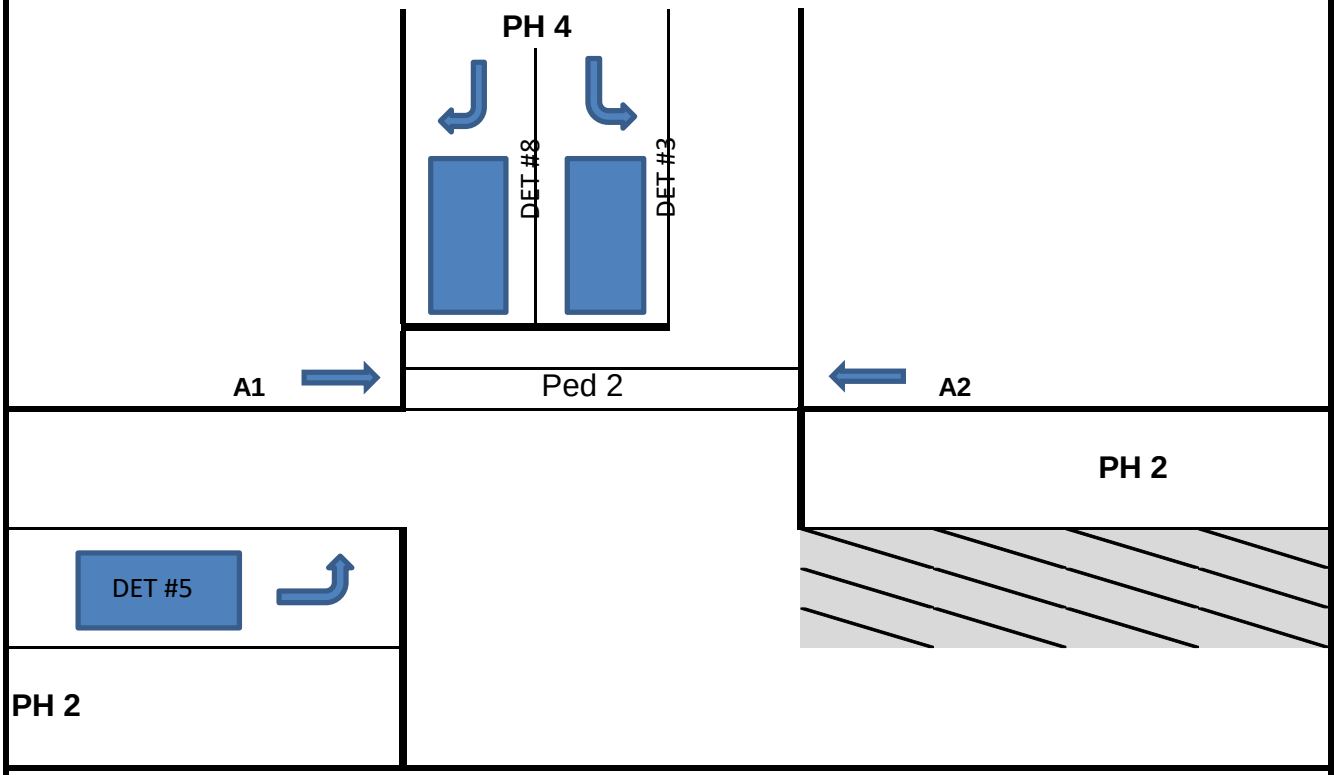
Cars	Trucks	Heavys	Totals
2636	39	68	2743

Peds Cross: ⧖
West Peds: 0
West Entering: 2099
West Leg Total: 4161

Comments

City of Hamilton - Traffic
Traffic Signal Controller Timing Data

Intersection: **Davidson & Governors**
Controller Type: **3000E** Page **1** of **12**
Programmed By: **EM** Installed By: **EM**
Date: **April 30th,2020** Date: **April 30th,2020**
Reason: Change from Fully Actuated to Semi-Actuated



ϕ1:
ϕ2: **Governors - EB / WB & North Xwalk**
ϕ3:
ϕ4: **Davidson - SB**
ϕ5:
ϕ6:
ϕ7:
ϕ8:

*DET #5 for future use

Flash Operation: **Red: Governors**
Red: Davidson

SEQUENCE/START-UP (MM-3-1-1)

START-UP PHASES/INTERVAL/SEQUENCE

(X = Enable for start-up phases. Must be compatible if more than one)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
START-UP	Phases				X												
	Interval	0	(0=Red, 1=Yel, 2= Grn, determines color of selected phases above on start-up)														
	Flash	10	(0-255 seconds start-up flash time)														
	Red	5.0	(0-25.5 secs = length of first red after start-up if start-up in yellow or red)														
	Sequence	2	(2=single ring, 3=dual ring, 4=123/567+48, 5=12/56+3478, 6=1234/56+78, 7=1234/5678, 8=dual quad, 9=12ph														

PHASE RING ASSIGNMENTS

X = Phase assigned to ring (if used). Phases in different rings but same co-phase group can time together.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
RING	Ring 1		X		X												
	Ring 2																
	Ring 3																
	Ring 4																

CO-PHASE GRP 1-4 ASSIGNMENTS

X = phase assigned to co-phase group. All ph's assigned to rings must be assigned to co-phase group.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CO-PHASE	CO PH 1		X														
	CO PH 2				X												
	CO PH 3																
	CO PH 4																

CONTROLLER DATA

PHASE RECALLS/MODES; MIN, MAX, etc. (MM-3-1-2-1-PGDN, etc.) USE 1 TO ALL 4 TIMING PLANS

TP1 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK				X												
	VEH OMIT																
	PED OMIT				X												
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

TP2 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK				X												
	VEH OMIT																
	PED OMIT				X												
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

CONTROLLER DATA

TP3 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK				X												
	VEH OMIT																
	PED OMIT				X												
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

TP4 PHASE RECALLS

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	MIN RCL																
	MAX RCL																
	PED RCL																
	SOFT REC																
	NON-LOCK				X												
	VEH OMIT																
	PED OMIT				X												
	WLK REST																
	MAX II																
	RED REST																
	NO SKIP																

CONTROLLER DATA

PHASE RECALLS/MODES; CNA, INH MAX, PED OPTIONS, etc. (MM-3-1-2-2) ONLY 1 PLAN PER UNIT

(X = ENABLE)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE RECALLS	CNA 1		X														
	CNA 2																
	CNA 3																
	CNA 4																
	WRM		X														
	INH MAX																
	PED RECY		X														
	FL WALK																
	FDW->YEL																
	FDW->RED																
	COND PED																

PHASE TIMES (MM-3-1-3-PGDN, etc.) USE 1 TO ALL 4 TIMING PLANS

TP1

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		**30**		**10**												
	Passage		**3.0**		**3.0**												
	Yellow		**3.7**		**3.3**												
	Red		**1.9**		**2.1**												
	Walk		**20**														
	Ped Clr		**10**														
	Max 1		**30**		**15**												
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

CONTROLLER DATA

TP2

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		**45**		**10**												
	Passage		**3.0**		**3.0**												
	Yellow		**3.7**		**3.3**												
	Red		**1.9**		**2.1**												
	Walk		**35**														
	Ped Clr		**10**														
	Max 1		**45**		**25**												
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

TP3

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		**45**		**10**												
	Passage		**3.0**		**3.0**												
	Yellow		**3.7**		**3.3**												
	Red		**1.9**		**2.1**												
	Walk		**35**														
	Ped Clr		**10**														
	Max 1		**45**		**20**												
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

CONTROLLER DATA

		TP4															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PHASE TIMES	Initial		**30**		**10**												
	Passage		**3.0**		**3.0**												
	Yellow		**3.7**		**3.3**												
	Red		**1.9**		**2.1**												
	Walk		**20**														
	Ped Clr		**10**														
	Max 1		**30**		**20**												
	Max 2																
	Mx 3 Lim																
	Mx 3 Adh																
	TBR																
	TTR																
	Min Gap																
	AI/Act																
	Max In																

VEHICLE DETECTOR ASSIGNMENTS (MM-3-1-4-1, PGDN etc.)

(X = ASSIGN VEH DETECTOR TO THAT PHASE)

	DET/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VEH DET ASSIGN-MENTS	1		**X**														
	2		**X**														
	3				**X**												
	4				**X**												
	5																
	6		**X**														
	7				**X**												
	8				**X**												

PED DETECTOR ASSIGNMENTS (MM-3-1-4-2)

(X = ASSIGN PED DETECTOR TO THAT PHASE)

	DET/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PED	1																
DET	2		X														
ASSIGN-	3																
MENTS	4																
	5																
	6																
	7																
	8																

DETECTOR MODES (MM-3-1-4-3)

	DET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
VEH DET	Mode	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**2**								
MODES																	

DETECTOR TIMES (MM-3-1-4-4)

USE 1 TO ALL 3 DETECTOR TIMING PLANS

	TP1								
	DET	1	2	3	4	5	6	7	8
DET	Delay	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**10**
TIMES	Str/Stp	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

SELECTION SOURCE (MM-3-2-2)

Entries determine how parameters get selected

Cycle Source:	**0**	0=TOD, 1=CL, 2=INT
Split Source:	**0**	0=TOD, 1=CL, 2=INT
Offset Source:	**0**	0=TOD, 1=CL, 2=INT

Free Source:	**0**	0=TOD, 1=CL, 2=INT
Flash Source:	**0**	0=TOD, 1=CL, 2=INT
Inter-TOD Revert:	**255**	0-255 SECS

TOD = Time of day control by internal clock, CL = Closed loop (comm), INT = Interconnect. Inter-TOD Revert is time allowed after failed interconnect before unit reverts to TOD (Time Base) control.

DAY PLANS (MM-3-3-1-#)

	HH	MM	CIRCUIT PLAN	C	O	S	CKT	ON/OFF
1	00	00					11(FRE)	ON
	08	00					16(TP4)	ON
	22	00					16(TP4)	OFF
2	00	00					11(FRE)	ON
	06	30					14(TP2)	ON
	10	00					14(TP2)	OFF
	10	00					16(TP4)	ON
	14	30					16(TP4)	OFF
	14	30					15(TP3)	ON
	18	30					15(TP3)	OFF
	18	30					16(TP4)	ON
	22	00					16(TP4)	OFF

WEEK PLANS (MM-3-3-3)

Plan	SUN	MON	TUE	WED	THU	FRI	SAT
1	1	2	2	2	2	2	1
2							
3							
4							
5							

CIRCUIT OVERRIDES (MM-3-3-6)

For each ciruit specify TOD (time of day controlled), or manually ON or OFF. Default = TOD

CIRCUIT OVER-RIDES	Circuit	**73**	74	75	76	**77**	78	79	80
	Function	**CN1**	CN2	CN3	CN4	**WRM**	MIN	DIM	CVS
	State	**ON**				**ON**			
	Circuit	81	82	83	84	85	86	**87**	**88**
	Function	TIA	TIB	TIC	N/U	N/U	N/U	**PR1**	**PR2**
	State							**ON**	**ON**
CIRCUIT OVER-RIDES	Circuit	113	114	115	116	117	118	119	120
	Function	UD1	UD2	UD3	UD4	UD5	UD6	UD7	UD8
	State								
	Circuit	121	122	123	124	**125**	**126**	127	128
	Function	PH2	DP2	DP3	3CD	**EVL**	**EML**	ASC	DCP
	State					**ON**	**ON**		

DAYLIGHT SAVINGS (MM-3-3-7)

DAY LIGHT SAVINGS	Spring		Fall	
	(0-12)	(0-5)	(0-12)	(0-5)
	Month	WOM	Month	WOM
	3	**2**	**11**	**1**

Enter Month and Week of Month for Spring Forward and Fall Back days
(typical 4 - 1 and 10 - 5). Unit will adjust at 2AM on Sunday of week specified.
Enter zero (or leave blank) if Daylight Savings not used.

SYNC REFERENCE MODE (MM-3-3-8)

Mode:	**0**	0 = Time dependent, 1 = C/O/S Event

	HH	MM	
Time Clock Reset:	**00**	**00**	TOD clock reset to by TBC input
Interrupter:		**N**	Y/N; Y = Interrupter pulses provided
Pulses:		**0**	0-6 = Number of interrupter pulses

TIME DEPENDENT CYCLE REFERENCES

	HH	MM
CYC 1:	**00**	**00**
CYC 2:	**00**	**00**
CYC 3:	**00**	**00**
CYC 4:	**00**	**00**
CYC 5:	**00**	**00**
CYC 6:	**00**	**00**

When mode = Time dependent, enter reference times of day for each cycle. Default = 00:00 = midnight = most commonly used reference.
When mode = C/O/S Event, cycle restarts on each COS change. Only use this mode for specific reasons. Time dependent most common used mode.

CLOSED LOOP ID (MM-3-5-1)

CLOSED LOOP ID	Master Type:	**1**	0 = None, 1 = 3000 Series Master, 2 = 3800 EL master
	Intersection ID	**14**	0-255
	Master Identification	**37**	0-255
	Allow Comm Xfer Between Ports 2 & 3		Y/N: Y = Incoming signal on Master port (2 or 3), gets echo'd on other port

COMM SET-UP (MM-3-5-2)

PG1 PORT ASSIGN	Master (CL) Port:		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used to receive Master Comm)
	Monitor Port		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used for Monitor Data Upload)
	Central Port:		0 = None, 2 = Port 2, 3 = Port 3 (Port to be used for Direct Dial-up Modem)

PG2 PORT 2 SETUP	Data Rate:	**9600**	1200, 2400, 4800, 9600, 14400, 19200
	Parity	**0**	0 = None, 1 = Odd, 2=Even
	Data bits	**1**	0 = 7 bits, 1 = 8 bits

PG3 PORT 3 SETUP	Data Rate:	**1200**	1200, 2400, 4800, 9600, 14400, 19200
	Parity	**0**	0 = None, 1 = Odd, 2=Even
	Data bits	**1**	0 = 7 bits, 1 = 8 bits

PG4	Modem Set-up String:		Up to 40 charaters; A-Z, or # @ = , ! ; % \ &

PHONE NUMBERS (MM-3-5-3)

PHONE NUM-BERS	Tone:		Y/N
	Phone 1:		Number & control characters (W , ; # ' / T P) if used
	Phone 2:		Number & control characters (W , ; # ' / T P) if used

LOG DATA (MM-3-5-5)

PG1 SAMPLE	Volume Log Sample period:	**60**	0, 6, 10, 15, 20, 30, 60 minutes, Enabled by TOD Ckt. 125 (EVL)
	MOE Log Sample period:	**60**	0, 6, 10, 15, 20, 30, 60 minutes, Enabled by TOD Ckt. 126 (EML)

Appendix C

Base Year Traffic Operations Reports

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	315	2	4	199	12	7	0	4	13	0	29
Future Volume (vph)	23	315	2	4	199	12	7	0	4	13	0	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	20.0		0.0	35.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. 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
Ped Bike Factor												
Frt		0.999			0.992			0.951			0.906	
Flt Protected	0.950			0.950				0.969			0.985	
Satd. Flow (prot)	1544	1700	0	1163	1688	0	0	1551	0	0	1537	0
Flt Permitted	0.950			0.950				0.969			0.985	
Satd. Flow (perm)	1544	1700	0	1163	1688	0	0	1551	0	0	1537	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		222.8			83.0			100.0			43.4	
Travel Time (s)		16.0			6.0			7.2			3.1	
Confl. Peds. (#/hr)	6		4	4		6	5		10	10		5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	13%	8%	0%	50%	5%	58%	0%	0%	25%	15%	0%	3%
Adj. Flow (vph)	24	325	2	4	205	12	7	0	4	13	0	30
Shared Lane Traffic (%)												
Lane Group Flow (vph)	24	327	0	4	217	0	0	11	0	0	43	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 31.9%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	315	2	4	199	12	7	0	4	13	0	29
Future Volume (Veh/h)	23	315	2	4	199	12	7	0	4	13	0	29
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	24	325	2	4	205	12	7	0	4	13	0	30
Pedestrians		5			10			4			6	
Lane Width (m)		3.3			3.3			3.3			3.3	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			1			0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)					276							
pX, platoon unblocked												
vC, conflicting volume	223			331			626	609	340	612	604	222
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	223			331			626	609	340	612	604	222
tC, single (s)	4.2			4.6			7.1	6.5	6.5	7.2	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.7			3.5	4.0	3.5	3.6	4.0	3.3
p0 queue free %	98			100			98	100	99	96	100	96
cM capacity (veh/h)	1278			1000			373	400	646	371	403	808

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	24	327	4	217	11	43
Volume Left	24	0	4	0	7	13
Volume Right	0	2	0	12	4	30
cSH	1278	1700	1000	1700	441	596
Volume to Capacity	0.02	0.19	0.00	0.13	0.02	0.07
Queue Length 95th (m)	0.5	0.0	0.1	0.0	0.6	1.9
Control Delay (s)	7.9	0.0	8.6	0.0	13.4	11.5
Lane LOS	A		A		B	B
Approach Delay (s)	0.5		0.2		13.4	11.5
Approach LOS					B	B

Intersection Summary				
Average Delay	1.4			
Intersection Capacity Utilization	31.9%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	15	320	194	58	115	20
Future Volume (vph)	15	320	194	58	115	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	35.0			0.0	25.0	0.0
Storage Lanes	1			0	1	1
Taper Length (m)	7.5				7.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99		0.99			
Frt			0.969			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1312	1717	1600	0	1711	1561
Flt Permitted	0.593				0.950	
Satd. Flow (perm)	814	1717	1600	0	1711	1561
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			30			22
Link Speed (k/h)		50	50		50	
Link Distance (m)		192.8	214.0		194.1	
Travel Time (s)		13.9	15.4		14.0	
Confl. Peds. (#/hr)	10			10		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	33%	7%	8%	19%	2%	0%
Adj. Flow (vph)	16	344	209	62	124	22
Shared Lane Traffic (%)						
Lane Group Flow (vph)	16	344	271	0	124	22
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		2	2		4	
Permitted Phases	2					4
Detector Phase	2	2	2		4	4
Switch Phase						
Minimum Initial (s)	45.0	45.0	45.0		10.0	10.0
Minimum Split (s)	50.6	50.6	50.6		15.4	15.4
Total Split (s)	50.6	50.6	50.6		30.4	30.4
Total Split (%)	62.5%	62.5%	62.5%		37.5%	37.5%
Yellow Time (s)	3.7	3.7	3.7		3.3	3.3
All-Red Time (s)	1.9	1.9	1.9		2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.6	5.6	5.6		5.4	5.4
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	Min	Min	Min		None	None
Act Effct Green (s)	49.2	49.2	49.2		11.1	11.1
Actuated g/C Ratio	0.73	0.73	0.73		0.17	0.17
v/c Ratio	0.03	0.27	0.23		0.44	0.08
Control Delay	4.3	5.1	4.4		30.4	11.3
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	4.3	5.1	4.4		30.4	11.3
LOS	A	A	A		C	B
Approach Delay		5.1	4.4		27.6	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Approach LOS		A	A		C	
Queue Length 50th (m)	0.6	14.3	9.5		14.9	0.0
Queue Length 95th (m)	2.6	30.4	21.8		29.5	5.4
Internal Link Dist (m)		168.8	190.0		170.1	
Turn Bay Length (m)	35.0				25.0	
Base Capacity (vph)	598	1260	1183		638	596
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.03	0.27	0.23		0.19	0.04

Intersection Summary			
Area Type:	Other		
Cycle Length: 81			
Actuated Cycle Length: 67			
Natural Cycle: 70			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.44			
Intersection Signal Delay: 9.1		Intersection LOS: A	
Intersection Capacity Utilization 55.0%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 2: Governors Rd & Davidson Blvd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	33	291	9	10	377	12	4	1	10	5	1	22
Future Volume (vph)	33	291	9	10	377	12	4	1	10	5	1	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	20.0		0.0	35.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. 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
Ped Bike Factor												
Frt		0.996			0.995			0.910			0.893	
Flt Protected	0.950			0.950				0.987			0.991	
Satd. Flow (prot)	1745	1778	0	1586	1783	0	0	1650	0	0	1521	0
Flt Permitted	0.950			0.950				0.987			0.991	
Satd. Flow (perm)	1745	1778	0	1586	1783	0	0	1650	0	0	1521	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		222.8			83.0			100.0			43.4	
Travel Time (s)		16.0			6.0			7.2			3.1	
Confl. Peds. (#/hr)	5					5			2	2		
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	3%	0%	10%	2%	17%	0%	0%	0%	40%	0%	0%
Adj. Flow (vph)	34	303	9	10	393	13	4	1	10	5	1	23
Shared Lane Traffic (%)												
Lane Group Flow (vph)	34	312	0	10	406	0	0	15	0	0	29	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 37.9%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	33	291	9	10	377	12	4	1	10	5	1	22
Future Volume (Veh/h)	33	291	9	10	377	12	4	1	10	5	1	22
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	34	303	9	10	393	13	4	1	10	5	1	23
Pedestrians					2						5	
Lane Width (m)					3.3						3.3	
Walking Speed (m/s)					1.2						1.2	
Percent Blockage					0						0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)					276							
pX, platoon unblocked												
vC, conflicting volume	411			312			812	806	310	808	804	404
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	411			312			812	806	310	808	804	404
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.5	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.9	4.0	3.3
p0 queue free %	97			99			99	100	99	98	100	96
cM capacity (veh/h)	1154			1204			279	305	734	245	305	648

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	34	312	10	406	15	29
Volume Left	34	0	10	0	4	5
Volume Right	0	9	0	13	10	23
cSH	1154	1700	1204	1700	480	490
Volume to Capacity	0.03	0.18	0.01	0.24	0.03	0.06
Queue Length 95th (m)	0.7	0.0	0.2	0.0	0.8	1.5
Control Delay (s)	8.2	0.0	8.0	0.0	12.7	12.8
Lane LOS	A		A		B	B
Approach Delay (s)	0.8		0.2		12.7	12.8
Approach LOS					B	B

Intersection Summary				
Average Delay	1.1			
Intersection Capacity Utilization	37.9%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	15	293	371	157	94	23
Future Volume (vph)	15	293	371	157	94	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	35.0			0.0	25.0	0.0
Storage Lanes	1			0	1	1
Taper Length (m)	7.5				7.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00		0.99			
Frt			0.960			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1745	1766	1727	0	1662	1501
Flt Permitted	0.430				0.950	
Satd. Flow (perm)	788	1766	1727	0	1662	1501
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			49			24
Link Speed (k/h)		50	50		50	
Link Distance (m)		192.8	214.0		194.1	
Travel Time (s)		13.9	15.4		14.0	
Confl. Peds. (#/hr)	4			4		
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	4%	2%	0%	5%	4%
Adj. Flow (vph)	16	305	386	164	98	24
Shared Lane Traffic (%)						
Lane Group Flow (vph)	16	305	550	0	98	24
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		2	2		4	
Permitted Phases	2					4
Detector Phase	2	2	2		4	4
Switch Phase						
Minimum Initial (s)	45.0	45.0	45.0		10.0	10.0
Minimum Split (s)	50.6	50.6	50.6		15.4	15.4
Total Split (s)	50.6	50.6	50.6		25.4	25.4
Total Split (%)	66.6%	66.6%	66.6%		33.4%	33.4%
Yellow Time (s)	3.7	3.7	3.7		3.3	3.3
All-Red Time (s)	1.9	1.9	1.9		2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.6	5.6	5.6		5.4	5.4
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	Min	Min	Min		None	None
Act Effct Green (s)	49.2	49.2	49.2		10.7	10.7
Actuated g/C Ratio	0.74	0.74	0.74		0.16	0.16
v/c Ratio	0.03	0.23	0.43		0.37	0.09
Control Delay	4.1	4.6	5.6		29.3	11.4
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	4.1	4.6	5.6		29.3	11.4
LOS	A	A	A		C	B
Approach Delay		4.6	5.6		25.8	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Approach LOS		A	A		C	
Queue Length 50th (m)	0.6	12.3	23.6		11.6	0.0
Queue Length 95th (m)	2.5	24.8	47.6		24.4	5.8
Internal Link Dist (m)		168.8	190.0		170.1	
Turn Bay Length (m)	35.0				25.0	
Base Capacity (vph)	582	1304	1288		499	467
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.03	0.23	0.43		0.20	0.05

Intersection Summary			
Area Type:	Other		
Cycle Length: 76			
Actuated Cycle Length: 66.6			
Natural Cycle: 70			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.43			
Intersection Signal Delay: 7.8		Intersection LOS: A	
Intersection Capacity Utilization 55.0%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 2: Governors Rd & Davidson Blvd

Appendix D

Background Traffic Operations Reports

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	361	2	4	228	13	8	0	4	14	0	33
Future Volume (vph)	26	361	2	4	228	13	8	0	4	14	0	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	20.0		0.0	35.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. 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
Ped Bike Factor												
Frt		0.999			0.992			0.955			0.904	
Flt Protected	0.950			0.950				0.968			0.986	
Satd. Flow (prot)	1544	1700	0	1163	1690	0	0	1567	0	0	1537	0
Flt Permitted	0.950			0.950				0.968			0.986	
Satd. Flow (perm)	1544	1700	0	1163	1690	0	0	1567	0	0	1537	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		222.8			83.0			100.0			43.4	
Travel Time (s)		16.0			6.0			7.2			3.1	
Confl. Peds. (#/hr)	6		4	4		6	5		10	10		5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	13%	8%	0%	50%	5%	58%	0%	0%	25%	15%	0%	3%
Adj. Flow (vph)	27	372	2	4	235	13	8	0	4	14	0	34
Shared Lane Traffic (%)												
Lane Group Flow (vph)	27	374	0	4	248	0	0	12	0	0	48	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 34.4%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	26	361	2	4	228	13	8	0	4	14	0	33
Future Volume (Veh/h)	26	361	2	4	228	13	8	0	4	14	0	33
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	27	372	2	4	235	13	8	0	4	14	0	34
Pedestrians		5			10			4			6	
Lane Width (m)		3.3			3.3			3.3			3.3	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			1			0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)					276							
pX, platoon unblocked												
vC, conflicting volume	254			378			713	693	387	696	688	252
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	254			378			713	693	387	696	688	252
tC, single (s)	4.2			4.6			7.1	6.5	6.5	7.2	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.7			3.5	4.0	3.5	3.6	4.0	3.3
p0 queue free %	98			100			98	100	99	96	100	96
cM capacity (veh/h)	1244			957			323	357	607	325	360	777

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	27	374	4	248	12	48
Volume Left	27	0	4	0	8	14
Volume Right	0	2	0	13	4	34
cSH	1244	1700	957	1700	383	553
Volume to Capacity	0.02	0.22	0.00	0.15	0.03	0.09
Queue Length 95th (m)	0.5	0.0	0.1	0.0	0.8	2.3
Control Delay (s)	8.0	0.0	8.8	0.0	14.7	12.1
Lane LOS	A		A		B	B
Approach Delay (s)	0.5		0.1		14.7	12.1
Approach LOS					B	B

Intersection Summary				
Average Delay		1.4		
Intersection Capacity Utilization		34.4%	ICU Level of Service	A
Analysis Period (min)		15		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	17	367	222	66	132	22
Future Volume (vph)	17	367	222	66	132	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	35.0			0.0	25.0	0.0
Storage Lanes	1			0	1	1
Taper Length (m)	7.5				7.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99		0.99			
Frt			0.969			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1312	1717	1600	0	1711	1561
Flt Permitted	0.572				0.950	
Satd. Flow (perm)	785	1717	1600	0	1711	1561
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			30			24
Link Speed (k/h)		50	50		50	
Link Distance (m)		192.8	214.0		194.1	
Travel Time (s)		13.9	15.4		14.0	
Confl. Peds. (#/hr)	10			10		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	33%	7%	8%	19%	2%	0%
Adj. Flow (vph)	18	395	239	71	142	24
Shared Lane Traffic (%)						
Lane Group Flow (vph)	18	395	310	0	142	24
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		2	2		4	
Permitted Phases	2					4
Detector Phase	2	2	2		4	4
Switch Phase						
Minimum Initial (s)	45.0	45.0	45.0		10.0	10.0
Minimum Split (s)	50.6	50.6	50.6		15.4	15.4
Total Split (s)	50.6	50.6	50.6		30.4	30.4
Total Split (%)	62.5%	62.5%	62.5%		37.5%	37.5%
Yellow Time (s)	3.7	3.7	3.7		3.3	3.3
All-Red Time (s)	1.9	1.9	1.9		2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.6	5.6	5.6		5.4	5.4
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	Min	Min	Min		None	None
Act Effct Green (s)	49.3	49.3	49.3		11.6	11.6
Actuated g/C Ratio	0.73	0.73	0.73		0.17	0.17
v/c Ratio	0.03	0.32	0.26		0.48	0.08
Control Delay	4.7	5.7	4.9		31.1	10.9
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	4.7	5.7	4.9		31.1	10.9
LOS	A	A	A		C	B
Approach Delay		5.7	4.9		28.2	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Approach LOS		A	A		C	
Queue Length 50th (m)	0.7	17.9	11.9		17.2	0.0
Queue Length 95th (m)	3.0	37.8	27.0		33.0	5.6
Internal Link Dist (m)		168.8	190.0		170.1	
Turn Bay Length (m)	35.0				25.0	
Base Capacity (vph)	572	1251	1174		633	592
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.03	0.32	0.26		0.22	0.04

Intersection Summary			
Area Type:	Other		
Cycle Length: 81			
Actuated Cycle Length: 67.6			
Natural Cycle: 70			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.48			
Intersection Signal Delay: 9.6		Intersection LOS: A	
Intersection Capacity Utilization 55.0%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 2: Governors Rd & Davidson Blvd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	334	10	11	433	13	4	1	11	5	1	25
Future Volume (vph)	37	334	10	11	433	13	4	1	11	5	1	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	20.0		0.0	35.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. 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
Ped Bike Factor												
Frt		0.996			0.995			0.907			0.890	
Flt Protected	0.950			0.950				0.988			0.992	
Satd. Flow (prot)	1745	1777	0	1586	1784	0	0	1646	0	0	1526	0
Flt Permitted	0.950			0.950				0.988			0.992	
Satd. Flow (perm)	1745	1777	0	1586	1784	0	0	1646	0	0	1526	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		222.8			83.0			100.0			43.4	
Travel Time (s)		16.0			6.0			7.2			3.1	
Confl. Peds. (#/hr)	5					5			2	2		
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	3%	0%	10%	2%	17%	0%	0%	0%	40%	0%	0%
Adj. Flow (vph)	39	348	10	11	451	14	4	1	11	5	1	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	39	358	0	11	465	0	0	16	0	0	32	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 40.9%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	37	334	10	11	433	13	4	1	11	5	1	25
Future Volume (Veh/h)	37	334	10	11	433	13	4	1	11	5	1	25
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	39	348	10	11	451	14	4	1	11	5	1	26
Pedestrians					2						5	
Lane Width (m)					3.3						3.3	
Walking Speed (m/s)					1.2						1.2	
Percent Blockage					0						0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)					276							
pX, platoon unblocked												
vC, conflicting volume	470			358			930	923	355	924	921	463
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	470			358			930	923	355	924	921	463
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.5	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.9	4.0	3.3
p0 queue free %	96			99			98	100	98	98	100	96
cM capacity (veh/h)	1098			1158			229	259	692	201	259	601

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	39	358	11	465	16	32
Volume Left	39	0	11	0	4	5
Volume Right	0	10	0	14	11	26
cSH	1098	1700	1158	1700	430	445
Volume to Capacity	0.04	0.21	0.01	0.27	0.04	0.07
Queue Length 95th (m)	0.9	0.0	0.2	0.0	0.9	1.9
Control Delay (s)	8.4	0.0	8.1	0.0	13.7	13.7
Lane LOS	A		A		B	B
Approach Delay (s)	0.8		0.2		13.7	13.7
Approach LOS					B	B

Intersection Summary				
Average Delay	1.2			
Intersection Capacity Utilization	40.9%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	17	336	426	180	107	26
Future Volume (vph)	17	336	426	180	107	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	35.0			0.0	25.0	0.0
Storage Lanes	1			0	1	1
Taper Length (m)	7.5				7.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00		0.99			
Frt			0.960			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1745	1766	1727	0	1662	1501
Flt Permitted	0.379				0.950	
Satd. Flow (perm)	695	1766	1727	0	1662	1501
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			49			27
Link Speed (k/h)		50	50		50	
Link Distance (m)		192.8	214.0		194.1	
Travel Time (s)		13.9	15.4		14.0	
Confl. Peds. (#/hr)	4			4		
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	4%	2%	0%	5%	4%
Adj. Flow (vph)	18	350	444	188	111	27
Shared Lane Traffic (%)						
Lane Group Flow (vph)	18	350	632	0	111	27
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		2	2		4	
Permitted Phases	2					4
Detector Phase	2	2	2		4	4
Switch Phase						
Minimum Initial (s)	45.0	45.0	45.0		10.0	10.0
Minimum Split (s)	50.6	50.6	50.6		15.4	15.4
Total Split (s)	50.6	50.6	50.6		25.4	25.4
Total Split (%)	66.6%	66.6%	66.6%		33.4%	33.4%
Yellow Time (s)	3.7	3.7	3.7		3.3	3.3
All-Red Time (s)	1.9	1.9	1.9		2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.6	5.6	5.6		5.4	5.4
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	Min	Min	Min		None	None
Act Effct Green (s)	49.2	49.2	49.2		10.9	10.9
Actuated g/C Ratio	0.74	0.74	0.74		0.16	0.16
v/c Ratio	0.04	0.27	0.49		0.41	0.10
Control Delay	4.4	5.0	6.5		30.0	10.9
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	4.4	5.0	6.5		30.0	10.9
LOS	A	A	A		C	B
Approach Delay		5.0	6.5		26.3	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Approach LOS		A	A		C	
Queue Length 50th (m)	0.6	14.5	29.7		13.2	0.0
Queue Length 95th (m)	2.8	30.0	61.9		27.0	6.0
Internal Link Dist (m)		168.8	190.0		170.1	
Turn Bay Length (m)	35.0				25.0	
Base Capacity (vph)	511	1299	1284		497	467
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.04	0.27	0.49		0.22	0.06

Intersection Summary			
Area Type:	Other		
Cycle Length: 76			
Actuated Cycle Length: 66.9			
Natural Cycle: 70			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.49			
Intersection Signal Delay: 8.4		Intersection LOS: A	
Intersection Capacity Utilization 55.0%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 2: Governors Rd & Davidson Blvd

Appendix E

Total Traffic Operations Reports

Lanes, Volumes, Timings
1: Wainwright Blvd/Pirie Dr & Governors Rd

200221
2027 Total AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	362	2	4	229	19	8	0	4	29	0	39
Future Volume (vph)	30	362	2	4	229	19	8	0	4	29	0	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	20.0		0.0	35.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. 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
Ped Bike Factor												
Frt		0.999			0.988			0.955			0.923	
Flt Protected	0.950			0.950				0.968			0.979	
Satd. Flow (prot)	1544	1700	0	1163	1663	0	0	1567	0	0	1535	0
Flt Permitted	0.950			0.950				0.968			0.979	
Satd. Flow (perm)	1544	1700	0	1163	1663	0	0	1567	0	0	1535	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		222.8			83.0			100.0			43.4	
Travel Time (s)		16.0			6.0			7.2			3.1	
Confl. Peds. (#/hr)	6		4	4		6	5		10	10		5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	13%	8%	0%	50%	5%	58%	0%	0%	25%	15%	0%	3%
Adj. Flow (vph)	31	373	2	4	236	20	8	0	4	30	0	40
Shared Lane Traffic (%)												
Lane Group Flow (vph)	31	375	0	4	256	0	0	12	0	0	70	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 37.8%		ICU Level of Service A	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
1: Wainwright Blvd/Pirie Dr & Governors Rd

200221
2027 Total AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	362	2	4	229	19	8	0	4	29	0	39
Future Volume (Veh/h)	30	362	2	4	229	19	8	0	4	29	0	39
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	31	373	2	4	236	20	8	0	4	30	0	40
Pedestrians		5			10			4			6	
Lane Width (m)		3.3			3.3			3.3			3.3	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		0			1			0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)					276							
pX, platoon unblocked												
vC, conflicting volume	262			379			729	710	388	709	701	257
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	262			379			729	710	388	709	701	257
tC, single (s)	4.2			4.6			7.1	6.5	6.5	7.2	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.7			3.5	4.0	3.5	3.6	4.0	3.3
p0 queue free %	97			100			97	100	99	91	100	95
cM capacity (veh/h)	1235			956			312	348	606	317	352	773

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	31	375	4	256	12	70
Volume Left	31	0	4	0	8	30
Volume Right	0	2	0	20	4	40
cSH	1235	1700	956	1700	372	478
Volume to Capacity	0.03	0.22	0.00	0.15	0.03	0.15
Queue Length 95th (m)	0.6	0.0	0.1	0.0	0.8	4.1
Control Delay (s)	8.0	0.0	8.8	0.0	15.0	13.8
Lane LOS	A		A		B	B
Approach Delay (s)	0.6		0.1		15.0	13.8
Approach LOS					B	B

Intersection Summary				
Average Delay	1.9			
Intersection Capacity Utilization	37.8%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	17	383	229	67	136	22
Future Volume (vph)	17	383	229	67	136	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	35.0			0.0	25.0	0.0
Storage Lanes	1			0	1	1
Taper Length (m)	7.5				7.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99		0.99			
Frt			0.969			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1312	1717	1600	0	1711	1561
Flt Permitted	0.568				0.950	
Satd. Flow (perm)	780	1717	1600	0	1711	1561
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			29			24
Link Speed (k/h)		50	50		50	
Link Distance (m)		192.8	214.0		194.1	
Travel Time (s)		13.9	15.4		14.0	
Confl. Peds. (#/hr)	10			10		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	33%	7%	8%	19%	2%	0%
Adj. Flow (vph)	18	412	246	72	146	24
Shared Lane Traffic (%)						
Lane Group Flow (vph)	18	412	318	0	146	24
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		2	2		4	
Permitted Phases	2					4
Detector Phase	2	2	2		4	4
Switch Phase						
Minimum Initial (s)	45.0	45.0	45.0		10.0	10.0
Minimum Split (s)	50.6	50.6	50.6		15.4	15.4
Total Split (s)	50.6	50.6	50.6		30.4	30.4
Total Split (%)	62.5%	62.5%	62.5%		37.5%	37.5%
Yellow Time (s)	3.7	3.7	3.7		3.3	3.3
All-Red Time (s)	1.9	1.9	1.9		2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.6	5.6	5.6		5.4	5.4
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	Min	Min	Min		None	None
Act Effct Green (s)	48.9	48.9	48.9		11.7	11.7
Actuated g/C Ratio	0.73	0.73	0.73		0.17	0.17
v/c Ratio	0.03	0.33	0.27		0.49	0.08
Control Delay	4.8	5.9	5.1		31.2	10.9
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	4.8	5.9	5.1		31.2	10.9
LOS	A	A	A		C	B
Approach Delay		5.8	5.1		28.3	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Approach LOS		A	A		C	
Queue Length 50th (m)	0.7	19.2	12.5		17.7	0.0
Queue Length 95th (m)	3.0	40.2	28.1		33.8	5.6
Internal Link Dist (m)		168.8	190.0		170.1	
Turn Bay Length (m)	35.0				25.0	
Base Capacity (vph)	567	1249	1172		637	596
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.03	0.33	0.27		0.23	0.04

Intersection Summary			
Area Type:	Other		
Cycle Length: 81			
Actuated Cycle Length: 67.2			
Natural Cycle: 70			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.49			
Intersection Signal Delay: 9.7		Intersection LOS: A	
Intersection Capacity Utilization 55.0%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 2: Governors Rd & Davidson Blvd

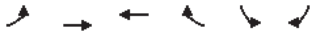
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	17	1	41	9	0	52
Future Volume (vph)	17	1	41	9	0	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.993		0.975			
Flt Protected	0.955					
Satd. Flow (prot)	1708	0	1756	0	0	1801
Flt Permitted	0.955					
Satd. Flow (perm)	1708	0	1756	0	0	1801
Link Speed (k/h)	50		50			50
Link Distance (m)	55.5		43.4			40.0
Travel Time (s)	4.0		3.1			2.9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	18	1	45	10	0	57
Shared Lane Traffic (%)						
Lane Group Flow (vph)	19	0	55	0	0	57
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	17	1	41	9	0	52
Future Volume (Veh/h)	17	1	41	9	0	52
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	1	45	10	0	57
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	107	50			55	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	107	50			55	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	100			100	
cM capacity (veh/h)	891	1018			1550	

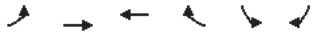
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	19	55	57
Volume Left	18	0	0
Volume Right	1	10	0
cSH	896	1700	1550
Volume to Capacity	0.02	0.03	0.00
Queue Length 95th (m)	0.5	0.0	0.0
Control Delay (s)	9.1	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.1	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	1	397	252	1	1	1
Future Volume (vph)	1	397	252	1	1	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.932	
Flt Protected					0.976	
Satd. Flow (prot)	0	1801	1801	0	1638	0
Flt Permitted					0.976	
Satd. Flow (perm)	0	1801	1801	0	1638	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		83.0	192.8		60.1	
Travel Time (s)		6.0	13.9		4.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	432	274	1	1	1
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	433	275	0	2	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	31.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	397	252	1	1	1
Future Volume (Veh/h)	1	397	252	1	1	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	432	274	1	1	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)			193			
pX, platoon unblocked						
vC, conflicting volume	275				708	274
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	275				708	274
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1288				401	764

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	433	275	2
Volume Left	1	0	1
Volume Right	0	1	1
cSH	1288	1700	526
Volume to Capacity	0.00	0.16	0.00
Queue Length 95th (m)	0.0	0.0	0.1
Control Delay (s)	0.0	0.0	11.9
Lane LOS	A		B
Approach Delay (s)	0.0	0.0	11.9
Approach LOS			B

Intersection Summary				
Average Delay		0.0		
Intersection Capacity Utilization		31.7%	ICU Level of Service	A
Analysis Period (min)		15		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	0	42	0	0	52
Future Volume (vph)	0	0	42	0	0	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	1801	0	1801	0	0	1801
Flt Permitted						
Satd. Flow (perm)	1801	0	1801	0	0	1801
Link Speed (k/h)	50		50			50
Link Distance (m)	57.2		40.0			55.7
Travel Time (s)	4.1		2.9			4.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	46	0	0	57
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	46	0	0	57
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	6.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	0	42	0	0	52
Future Volume (Veh/h)	0	0	42	0	0	52
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	46	0	0	57
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	103	46			46	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	103	46			46	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	895	1023			1562	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	0	46	57
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1562
Volume to Capacity	0.00	0.03	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	6.7%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	42	335	10	11	434	30	4	1	11	17	1	31
Future Volume (vph)	42	335	10	11	434	30	4	1	11	17	1	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	20.0		0.0	35.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. 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
Ped Bike Factor												
Frt		0.996			0.990			0.907			0.915	
Flt Protected	0.950			0.950				0.988			0.983	
Satd. Flow (prot)	1745	1777	0	1586	1766	0	0	1646	0	0	1448	0
Flt Permitted	0.950			0.950				0.988			0.983	
Satd. Flow (perm)	1745	1777	0	1586	1766	0	0	1646	0	0	1448	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		222.8			83.0			100.0			43.4	
Travel Time (s)		16.0			6.0			7.2			3.1	
Confl. Peds. (#/hr)	5					5			2	2		
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	3%	0%	10%	2%	17%	0%	0%	0%	40%	0%	0%
Adj. Flow (vph)	44	349	10	11	452	31	4	1	11	18	1	32
Shared Lane Traffic (%)												
Lane Group Flow (vph)	44	359	0	11	483	0	0	16	0	0	51	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	42.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	42	335	10	11	434	30	4	1	11	17	1	31
Future Volume (Veh/h)	42	335	10	11	434	30	4	1	11	17	1	31
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	44	349	10	11	452	31	4	1	11	18	1	32
Pedestrians					2						5	
Lane Width (m)					3.3						3.3	
Walking Speed (m/s)					1.2						1.2	
Percent Blockage					0						0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)					276							
pX, platoon unblocked												
vC, conflicting volume	488			359			948	952	356	945	942	472
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	488			359			948	952	356	945	942	472
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.5	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.9	4.0	3.3
p0 queue free %	96			99			98	100	98	91	100	95
cM capacity (veh/h)	1081			1157			219	247	691	194	251	593

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	44	359	11	483	16	51
Volume Left	44	0	11	0	4	18
Volume Right	0	10	0	31	11	32
cSH	1081	1700	1157	1700	419	338
Volume to Capacity	0.04	0.21	0.01	0.28	0.04	0.15
Queue Length 95th (m)	1.0	0.0	0.2	0.0	1.0	4.2
Control Delay (s)	8.5	0.0	8.1	0.0	13.9	17.5
Lane LOS	A		A		B	C
Approach Delay (s)	0.9		0.2		13.9	17.5
Approach LOS					B	C

Intersection Summary					
Average Delay	1.6				
Intersection Capacity Utilization	42.5%	ICU Level of Service		A	
Analysis Period (min)	15				

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	17	349	445	185	110	26
Future Volume (vph)	17	349	445	185	110	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	35.0			0.0	25.0	0.0
Storage Lanes	1			0	1	1
Taper Length (m)	7.5				7.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00		0.99			
Frt			0.960			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1745	1766	1727	0	1662	1501
Flt Permitted	0.364				0.950	
Satd. Flow (perm)	668	1766	1727	0	1662	1501
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			48			27
Link Speed (k/h)		50	50		50	
Link Distance (m)		192.8	214.0		194.1	
Travel Time (s)		13.9	15.4		14.0	
Confl. Peds. (#/hr)	4			4		
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	4%	2%	0%	5%	4%
Adj. Flow (vph)	18	364	464	193	115	27
Shared Lane Traffic (%)						
Lane Group Flow (vph)	18	364	657	0	115	27
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		2	2		4	
Permitted Phases	2					4
Detector Phase	2	2	2		4	4
Switch Phase						
Minimum Initial (s)	45.0	45.0	45.0		10.0	10.0
Minimum Split (s)	50.6	50.6	50.6		15.4	15.4
Total Split (s)	50.6	50.6	50.6		25.4	25.4
Total Split (%)	66.6%	66.6%	66.6%		33.4%	33.4%
Yellow Time (s)	3.7	3.7	3.7		3.3	3.3
All-Red Time (s)	1.9	1.9	1.9		2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.6	5.6	5.6		5.4	5.4
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	Min	Min	Min		None	None
Act Effct Green (s)	49.2	49.2	49.2		11.0	11.0
Actuated g/C Ratio	0.73	0.73	0.73		0.16	0.16
v/c Ratio	0.04	0.28	0.51		0.42	0.10
Control Delay	4.5	5.1	6.9		30.2	10.9
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	4.5	5.1	6.9		30.2	10.9
LOS	A	A	A		C	B
Approach Delay		5.1	6.9		26.5	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Approach LOS		A	A		C	
Queue Length 50th (m)	0.6	15.3	31.9		13.7	0.0
Queue Length 95th (m)	2.8	31.9	67.5		27.9	6.0
Internal Link Dist (m)		168.8	190.0		170.1	
Turn Bay Length (m)	35.0				25.0	
Base Capacity (vph)	491	1298	1281		496	467
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.04	0.28	0.51		0.23	0.06

Intersection Summary			
Area Type:	Other		
Cycle Length: 76			
Actuated Cycle Length: 67			
Natural Cycle: 70			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.51			
Intersection Signal Delay: 8.7		Intersection LOS: A	
Intersection Capacity Utilization 55.0%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 2: Governors Rd & Davidson Blvd

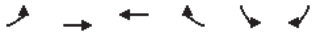
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	15	1	57	18	1	35
Future Volume (vph)	15	1	57	18	1	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.992		0.967			
Flt Protected	0.955					0.999
Satd. Flow (prot)	1706	0	1741	0	0	1799
Flt Permitted	0.955					0.999
Satd. Flow (perm)	1706	0	1741	0	0	1799
Link Speed (k/h)	50		50			50
Link Distance (m)	55.5		43.4			40.0
Travel Time (s)	4.0		3.1			2.9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	1	62	20	1	38
Shared Lane Traffic (%)						
Lane Group Flow (vph)	17	0	82	0	0	39
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	14.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	15	1	57	18	1	35
Future Volume (Veh/h)	15	1	57	18	1	35
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	1	62	20	1	38
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	112	72			82	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	112	72			82	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	100			100	
cM capacity (veh/h)	884	990			1515	

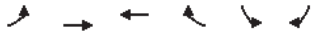
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	17	82	39
Volume Left	16	0	1
Volume Right	1	20	0
cSH	890	1700	1515
Volume to Capacity	0.02	0.05	0.00
Queue Length 95th (m)	0.5	0.0	0.0
Control Delay (s)	9.1	0.0	0.2
Lane LOS	A		A
Approach Delay (s)	9.1	0.0	0.2
Approach LOS	A		

Intersection Summary				
Average Delay		1.2		
Intersection Capacity Utilization		14.1%	ICU Level of Service	A
Analysis Period (min)		15		



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	1	363	469	2	1	1
Future Volume (vph)	1	363	469	2	1	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.999		0.932	
Flt Protected					0.976	
Satd. Flow (prot)	0	1801	1799	0	1638	0
Flt Permitted					0.976	
Satd. Flow (perm)	0	1801	1799	0	1638	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		83.0	192.8		60.1	
Travel Time (s)		6.0	13.9		4.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	395	510	2	1	1
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	396	512	0	2	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	34.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	1	363	469	2	1	1
Future Volume (Veh/h)	1	363	469	2	1	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	395	510	2	1	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)			193			
pX, platoon unblocked	0.92				0.92	0.92
vC, conflicting volume	512				908	511
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	422				854	421
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1042				301	580

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	396	512	2
Volume Left	1	0	1
Volume Right	0	2	1
cSH	1042	1700	397
Volume to Capacity	0.00	0.30	0.01
Queue Length 95th (m)	0.0	0.0	0.1
Control Delay (s)	0.0	0.0	14.1
Lane LOS	A		B
Approach Delay (s)	0.0	0.0	14.1
Approach LOS			B

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	34.8%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	0	58	0	0	36
Future Volume (vph)	0	0	58	0	0	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	1801	0	1801	0	0	1801
Flt Permitted						
Satd. Flow (perm)	1801	0	1801	0	0	1801
Link Speed (k/h)	50		50			50
Link Distance (m)	57.2		40.0			55.7
Travel Time (s)	4.1		2.9			4.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	63	0	0	39
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	63	0	0	39
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 6.7%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	0	58	0	0	36
Future Volume (Veh/h)	0	0	58	0	0	36
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	63	0	0	39
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	102	63			63	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	102	63			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 %	100	100			100	
cM capacity (veh/h)	896	1002			1540	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	0	63	39
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1540
Volume to Capacity	0.00	0.04	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay		0.0	
Intersection Capacity Utilization		6.7%	ICU Level of Service A
Analysis Period (min)		15	