

9. Future Traffic Operations for the Preferred Alternative

The proposed changes to the roadway network in the Village combined with growth in traffic from future development both in and surrounding the Village will change traffic patterns and routes. The existing highway-based transportation network, which primarily caters to automobile traffic, will gradually change in function to a multimodal arterial corridor that better serves local traffic, transit, pedestrians, and cyclists. Moreover, the two new signalized intersections on Highway 2A at Military Trail and at the Highland Creek Overpass will also provide new ways to travel to and from the Village.

Future year turning movement level forecasts for the 2031 AM and PM peak hour were generated through the use of the sub-area travel demand model that was developed and validated as part of this study (see **Section 6.2** for details). The estimated future growth in population and employment in the study area (see **Section 6.1** for details) and the recommended roadway network of the Preferred Alternative (i.e., Alternative 1) were input into the sub-area model to support the development of turning movement forecasts. A pivot-point analysis approach was used to apply the model's forecasted growth / change in traffic at each intersection between the base year and 2031 to observed turning movement counts.

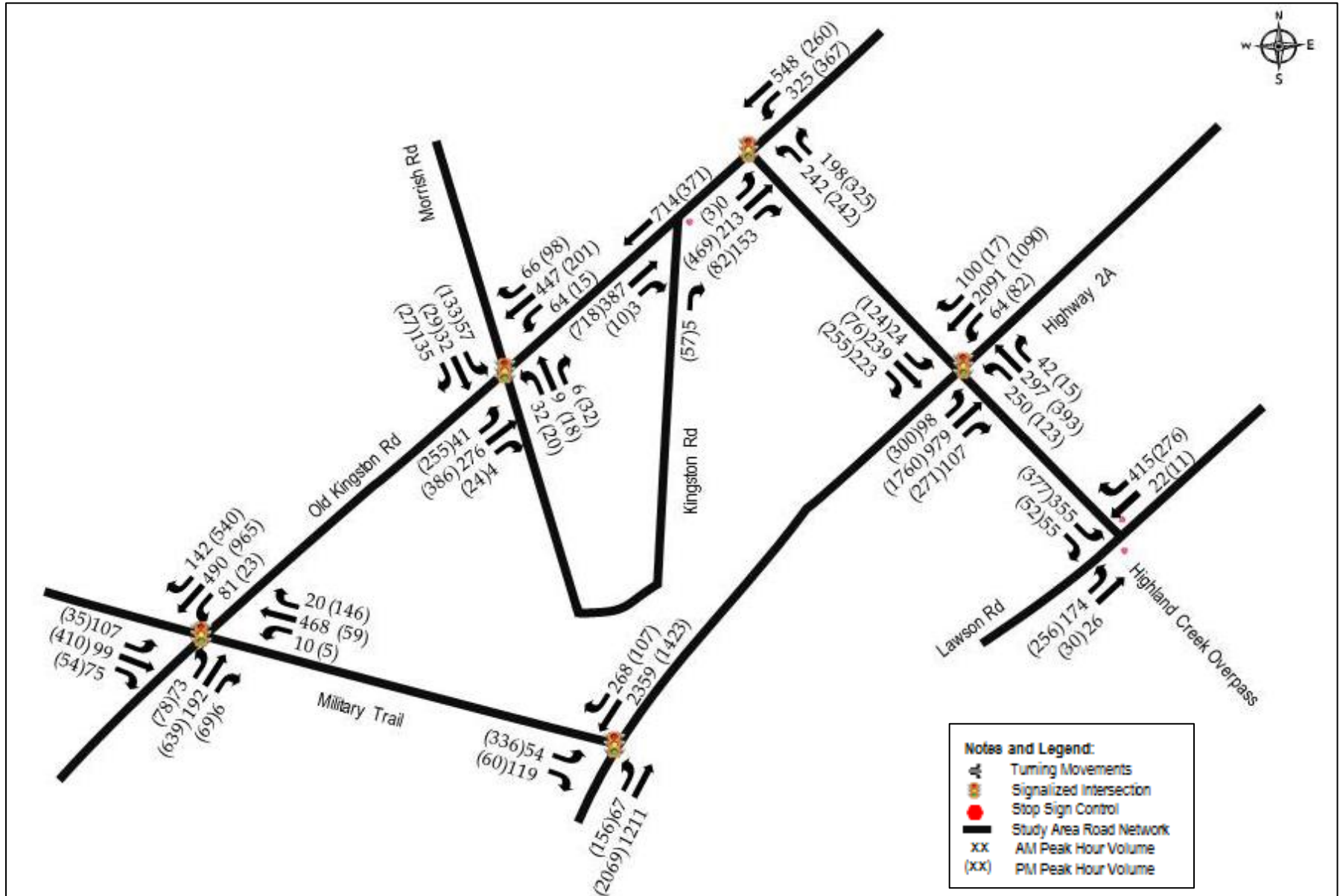
Exhibit 9-1 summarizes the forecast 2031 weekday AM and PM peak hour traffic volumes for the Preferred Alternative.

9.1 Future Intersection Operations

2031 AM and PM peak hour intersection delays, volume-to-capacity (v/c) ratios and Level of Service (LOS) were assessed using Synchro for the following intersections within the reconfigured road network:

- Military Trail and Old Kingston Road
- Morrish Road and Old Kingston Road
- Kingston Road and Old Kingston Road
- Old Kingston Road / Kingston Road / Highland Creek Overpass
- Highway 2A and Highland Creek Overpass
- Highway 2A and Military Trail (new intersection)
- Lawson Road and Highland Creek Overpass (new intersection)

Exhibit 9-1: 2031 Weekday AM (PM) Peak Hour Turn Volumes – Preferred Alternative



The City of Toronto’s Guidelines for Using Synchro were used in this study along with input from City of Toronto Transportation staff. An iterative process was used to refine the Preferred Alternative network, including intersection lane arrangements, storage lengths, and signal phasing. Each signal’s phasing and splits were optimized and adjusted in Synchro based on the forecasted volumes and to accommodate known design constraints (e.g., cross-section width limits and available turn storage lengths), while meeting City requirements for signalized intersection operations.

Exhibit 9-2 and **Exhibit 9-3** summarize the results of the intersection operations analysis for the existing and proposed signalized intersections in the 2031 weekday AM and PM peak hours, respectively. Critical movements, which are defined as through or turning lanes that have an LOS of “E” or “F” and/or a v/c ratio of 0.85 or worse, are also bolded for reference purposes.

Exhibit 9-2: 2031 Traffic Analysis (Preferred Alternative) – AM Peak Hour

Intersection	Approach / Movement		Delay(s)	LOS	v/c
Kingston Road & Highland Creek Overpass	EB	Thru	6.3	A	0.18
		Right	7.4	A	0.10
	WB	Left	10.7	B	0.50
		Thru	9.1	A	0.47
	NB	Left	38.3	D	0.69
		Right	29.2	C	0.15
Overall Intersection			15.5	B	0.55
Old Kingston Road & Morrish Road	EB	Thru/Left	8.1	A	0.31
		Right	6.1	A	0.01
	WB	Thru/Left	10.5	B	0.47
		Right	6.4	A	0.05
	NB	Thru/Left	27.4	C	0.12
		Right	26.5	C	0.01
	SB	Thru/Left	28.6	C	0.26
		Right	27.2	C	0.09
Overall Intersection			13.6	B	0.42
Old Kingston Road & Military Trail	EB	Left/Thru/Right	23.9	C	0.59
	WB	Thru/Left	22.7	C	0.76
		Right	10	A	0.15
	NB	Left	21.6	C	0.03
		Thru	37.7	D	0.82
		Right	21.5	C	0.01
	SB	Left	20.9	C	0.5
		Thru	16.9	B	0.13
		Right	16.2	B	0.05
Overall Intersection			25.1	C	0.76

Intersection	Approach / Movement		Delay(s)	LOS	v/c
Highway 2A & Highland Creek Overpass (New Intersection)	EB	Left	43	D	0.60
		Thru	16.5	B	0.43
		Right	10.7	B	0.07
	WB	Left	18.8	B	0.27
		Thru	36.3	D	0.92
		Right	17.6	B	0.07
	NB	Left	45.4	D	0.79
		Thru/Right	34.1	C	0.56
	SB	Left	44.3	D	0.16
		Thru	60.8	E	0.79
		Right	46.8	D	0.41
Overall Intersection			33.1	C	0.86
Highway 2A & Military Trail (New Intersection)	EB	Left	14.7	B	0.50
		Thru	4.3	A	0.34
	WB	Thru	6.4	A	0.71
		Right	0.4	A	0.21
	SB	Left	50.5	D	0.31
		Right	49.1	D	0.15
	Overall Intersection			7.4	A

Note: ****Bold** text in the four columns from the right denotes critical movements (LOS E or worse and/or v/c ratio ≥ 0.85)

Exhibit 9-3: 2031 Traffic Analysis (Preferred Alternative) – PM Peak Hour

Intersection	Approach / Movement		Delay(s)	LOS	v/c
Kingston Road & Highland Creek Overpass	EB	Thru	21.8	C	0.55
		Right	17	B	0.07
	WB	Left	8.8	A	0.60
		Thru	4.8	A	0.21
	NB	Left	41.4	D	0.73
		Right	30.5	C	0.22
	Overall Intersection			20.7	C
Old Kingston Road & Morrish Road	EB	Thru/Left	12.8	B	0.71
		Right	13.3	B	0.02
	WB	Thru/Left	15.7	B	0.20
		Right	33.9	C	0.07
	NB	Thru/Left	27.2	C	0.10
		Right	26.6	C	0.02
	SB	Thru/Left	31.3	C	0.51
		Right	26.6	C	0.02
Overall Intersection			18.5	B	0.66
Old Kingston Road & Military Trail	EB	Left/Thru/Right	24	C	0.80
	WB	Thru/Left	5.5	A	0.16

Intersection	Approach / Movement	Delay(s)	LOS	v/c	
	NB	Right	2.5	A	0.09
		Left	21.1	C	0.03
		Thru	21.8	C	0.1
	SB	Right	21.8	C	0.1
		Left	21.7	C	0.09
		Thru	33.1	C	0.69
		Right	21.4	C	0.06
Overall Intersection		24.7	C	0.79	
Highway 2A & Highland Creek Overpass (New Intersection)	EB	Left	37.5	D	0.83
		Thru	30.3	C	0.79
		Right	19.7	B	0.19
	WB	Left	30.6	C	0.60
		Thru	31.9	C	0.56
		Right	24.7	C	0.01
	NB	Left	34.8	C	0.31
		Thru/Right	65.9	E	0.89
	SB	Left	48.8	D	0.72
		Thru	37.9	D	0.16
Right		38.8	D	0.18	
Overall Intersection		35	C	0.85	
Highway 2A & Military Trail (New Intersection)	EB	Left	17.4	B	0.61
		Thru	17	B	0.73
	WB	Thru	21.5	C	0.57
		Right	15.5	B	0.09
	SB	Left	51.7	D	0.80
		Right	33.6	C	0.04
	Overall Intersection		21.6	C	0.78

Note: ****Bold** text in the four columns from the right denotes critical movements (LOS E or worse and/or v/c ratio ≥ 0.85)

All intersections are forecast to operate acceptably overall, with the majority of individual movements operating better than the defined critical LOS and v/c thresholds. The only exceptions are the following critical movements at the new Highway 2A and Highland Creek Overpass intersection:

- Westbound Thru (AM Peak Hour) – 36 second delay, LOS D, v/c 0.92
- Southbound Thru (AM Peak Hour) – 61 second delay, LOS E, v/c 0.79
- Northbound Thru/Right (PM Peak Hour) – 66 second delay, LOS E, v/c 0.89

The traffic signal at the Highway 2A and Highland Creek Overpass intersection must balance accommodating the heavy peak direction traffic volumes on Highway 2A (westbound in the AM peak and eastbound in the PM peak) with delays to traffic approaching the intersection from

Lawson Road to the south and from Kingston Road to the north. As outlined in this study's Problem and Opportunity statement in **Section 7**, an important goal of this study is to accommodate all roadway users, improve the pedestrian environment, and to encourage the use of transit, cycling, and walking. Consequently, additional roadway capacity beyond what is proposed in the Preferred Alternative, which is three lanes of through traffic per direction, is not recommended since the cross-section for this intersection is already wide and further increases would negatively impact the pedestrian environment and public realm (i.e., more paved area and more pavement width to cross). Furthermore, it should be stressed that these delays represent the worst case during the weekday morning and evening rush hours. During the off-peak periods, it is expected that all intersections and individual movements would operate acceptably.

9.2 Future Queue Analysis

Queues that extend past the available storage or into upstream intersections can have a significant impact on delays in the transportation network. Consequently, queuing analysis was used to recommend and confirm the turn lane storage lengths for the Preferred Alternative. Queuing analysis was undertaken for all intersections that are a part of the Preferred Alternative roadway network.

As summarized in **Exhibit 9-4**, the average and 95th percentile queue length estimates were obtained from SimTraffic simulation (5 runs) of the Preferred Alternative in the 2031 AM and PM peak hours. **Exhibit 9-4** reports the highest values during either the AM or PM peak hour to support the selection of adequate storage lengths regardless of the peak period. The available storage lengths, which are consistent with the Concept Plan of the Preferred Solution shown in **Section 13.1**, are also shown in **Exhibit 9-4**. Storage lengths were selected by considering the SimTraffic modelled queue lengths and existing geometric and property constraints. Please refer to **Appendix H** for the detailed Synchro / SimTraffic queueing reports.

Exhibit 9-4: 2031 Queue Lengths (Preferred Alternative) – AM and PM Peak

Intersection	Approach/ Movement		Available Storage (m)	Critical Time Period	Average Queue (m)	95 th Percentile Queue (m)
Kingston Road & Highland Creek Overpass	EB	Thru* ¹⁸	>100	PM	45	68
		Right	50	PM	12	36
	WB	Left	65	AM	43	76
		Thru*	43	AM	46	90
	NB	Left	75	AM	39	70
		Right	72	PM	26	47
Old Kingston Road & Morrish Road	EB	Thru/Left*	>150	PM	66	125
		Right	15	PM	5	16
	WB	Thru/Left*	>100	AM	45	80
		Right	15	AM	10	18
	NB	Thru/Left*	40	PM	7	17
		Right	15	PM	6	17
	SB	Thru/Left*	>50	PM	25	46
		Right	15	AM	13	18
Old Kingston Road & Military Trail	EB	Left/Thru/Right*	>200	PM	87	143
	WB	Thru/Left*	25	AM	98	174
		Right	30	AM	21	33
	NB	Left	70	AM	4	31
		Thru*	>150	AM	87	145
		Right	5	PM	12	15
	SB	Left	82	AM	20	34
		Thru*	72	PM	65	107
	Right	25	PM	8	28	
Highway 2A & Highland Creek Overpass (New Intersection)	EB	Left	160	PM	41	72
		Thru*	>150	PM	64	117
		Right	125	PM	13	47
	WB	Left	70	AM	23	63
		Thru*	>200	AM	113	166
		Right	55	AM	24	58
	NB	Left	50	AM	36	43
		Thru/Right*	50	PM	41	43
SB	Left	41	PM	26	42	
	Thru*	>150	AM	46	82	

18. The PM queuing/blocking report indicates that a queue penalty / blocking exists in the PM peak because the EB through traffic prevents vehicles from accessing the EB right storage lane on occasion.

Intersection	Approach/ Movement		Available Storage (m)	Critical Time Period	Average Queue (m)	95 th Percentile Queue (m)
		Right	73	AM	32	60
Highway 2A & Military Trail (New Intersection)	EB	Left	38	PM	30	41
		Thru*	>150	PM	78	92
	WB	Thru*	>150	PM	53	107
		Right	60	PM	18	54
	SB	Left	>150	PM	64	106
		Right	59	PM	21	60
Old Kingston Road and Kingston Road (New Intersection)	EB	Thru/Right*	>100	PM	18	60
	NB	Right	>50	PM	3	9
Highland Creek Overpass and Lawson Road	EB	Left	73	PM	76	76
		Thru	>150	PM	166	179
	WB	Thru/Right*	>300	PM	253	265

Note: *Distance for through lanes measured to nearest upstream intersection

Note: **Bold** text in the five columns from the right denotes movements where Average (50th percentile) queue exceeds available storage

The queue analysis indicates that the majority of the movements have adequate storage length to accommodate the forecasted 95th percentile queue lengths. In the few cases where the 95th percentile queue exceeds the available storage length the analysis demonstrates that there is sufficient storage to process the 50th percentile or average queue length. The only exceptions are highlighted in red in **Exhibit 9-4** and are described below:

Kingston Road and Highland Creek Overpass

The queue for the WB Thru movement is forecast to extend back to the upstream local intersection of Deep Dene Drive during the AM peak hour only (by approximately one car length on average). The potential blocking of the Deep Dene Drive approach could be mitigated through installation of a courtesy stop bar with signage (i.e., Do Not Block Intersection), if deemed necessary.

Old Kingston Road and Military Trail

The queue for the WB Thru/Left movement is forecast to extend past the upstream local intersection of Watson Street in the AM peak hour only. However, the WB Right turn lane extends back to Watson Street and will continue to allow local access to Old Kingston Road. It also should be stressed that both the average and 95th percentile queues for the WB Thru/Left movement do not extend back to the signalized Morrish Road intersection, which is over 200 m

away. The potential blocking of the Watson Street intersection can be mitigated through installation of a courtesy stop bar with signage (i.e., Do Not Block Intersection). Other measures may be implemented such as revised signal timing or revised signal phasing, based on actual count data collected in future years.

The NB Right turn queues are forecasted to extend beyond the minimal space that is available in the right turn channel at this intersection in the PM peak hour. Additional storage space would have a negative impact on the public realm in the vicinity of this intersection and additional storage would provide little benefit since right turners must wait in the through lane's queue, which extends 90 m on average in the AM peak, before entering the turn lane.

Lawson Road and Highland Creek Overpass

EB Left turn queues in the PM peak are forecasted to modestly exceed the available storage at this intersection (by approximately one car length). On the occasions that this has the potential to occur, the taper for the turn lane can accommodate the additional vehicle.

While there is sufficient storage to accommodate the forecast queue in the WB direction in both the AM and PM peak, the SimTraffic results suggest that the queue would extend over 250 m and 180 m on average in the PM and AM peaks respectively¹⁹. The majority of the WB traffic is destined for Highway 2A and the spillback queues are a result of the small amount of storage available to the NB Left and NB Thru/Right movements at the Highland Creek Overpass and Highway 2A intersection. It is recommended that opportunities to provide additional separation between Highway 2A and Lawson Road be examined as part of future detailed design activities. For example, the centreline of Highway 2A may be shifted to the north through this area.

Lastly, it should be reiterated that the average queue is more indicative of a typical queue and that the 95th percentile queue represents a worst-case scenario during the critical AM and PM peak periods for a typical cycle; in reality, the average queue during the AM and PM peak periods would rarely be exceeded (if at all) during other time periods.

9.3 Signal Warrant Analysis

A signal warrant analysis was conducted for the Lawson Road / Highland Creek Overpass intersection. As this T-intersection is proposed to have stop-control on the eastbound and westbound approaches, but not on the southbound approach (opposite of a typical T-

19. Driveway at Royal Canadian Legion is approximately 160 m to the east of the intersection.

intersection arrangement), there were two methods of data entry used in the signal warrant worksheet to assess operations. In both methods, the result was that signals were not warranted for this intersection for the projected horizon year 2031 traffic data.

Please refer to **Appendix H** for the detailed signal warrant analysis worksheet. In the first worksheet, the intersection arrangement is assumed to be arranged with the “main road” in an east-west orientation (i.e., Lawson Road), and the minor road is in a northwest orientation (i.e., Highland Creek Overpass, southbound approach only). Based on this warrant, signals are not warranted for the intersection.

However, as this arrangement does not entirely represent the recommended intersection configuration, a second modified geometry was assessed in an attempt to better represent the intersection operation. In the second warrant, the main street configuration was revised to a north-south orientation (i.e., southbound approach as Highland Creek Overpass and the northbound approach representing the westbound Lawson Road approach) and the minor road as the east-west orientation (i.e., the eastbound approach as Lawson Road, west of Highland Creek Overpass). The same traffic volume data were used but entered to represent the revised configuration. In this warrant assessment, signals are not warranted based on Justification 1, 2, or 3; however, Justification 4 – Four Hour Volume does show that signals are warranted. With both warrants, outside of the projected AM and PM peak hour volumes entered in the warrant, the other 6 hours of traffic volumes were approximated as a percentage of the peak hour and are considered a conservative estimate for planning purposes. For this reason, signal warrants at the Lawson Road / Highland Creek Overpass intersection should be checked again once the Highland Creek Overpass is removed and replaced with the proposed signalized intersection on Highway 2A.

9.4 Summary of Future Traffic Conditions

Based on a review of the future traffic volumes, and future levels of service and queuing analyses, the following conclusions can be made:

- The road network for the Preferred Alternative will provide adequate capacity to accommodate future year traffic volumes in the 2031 AM and PM peak hours. However, it is recognized that the conversion of Highway 2A to an arterial road will cause an increase in traffic delays in comparison to the existing freeway-based network. These delays will primarily impact through traffic, which currently travels along Highway 2A under generally free flowing conditions. However, the new traffic signals will add less than one minute of additional travel time to through traffic on Highway 2A during the AM and PM peak hours. Moreover, the new traffic signals will provide new connections to and from Highway 2A

for local traffic. The Preferred Alternative results in an efficient network that provides adequate capacity for cars, while also balancing the needs of pedestrians and cyclists and supporting redevelopment opportunities.

- The majority of movements will have adequate storage to serve forecasted queue lengths. In most cases, the available storage lengths are adequate to serve the forecasted 95th percentile queue during the 2031 AM and PM peak hours. In the remainder of cases (with the exception of the movements previously listed in **Section 9.2**), the available storage is sufficient to accommodate the 50th percentile or average queue during the 2031 AM and PM peak hours. The 95th percentile queue is rarely exceeded during the peak hours and the average queue would unlikely be exceeded during other time periods.
- The simulation results suggest that vehicles accessing Highway 2A from Lawson Road will encounter queuing delays during peak periods. The short distance between Highway 2A and Lawson Road does not allow for the provision of significant storage on the approach to the Highway 2A and Highland Creek Overpass intersection, and consequently queues are expected to extend upstream along Lawson Road. To alleviate this condition, it is recommended that opportunities to provide additional separation between Highway 2A and Lawson Road be examined as part of future detailed design activities.