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CRESSEY DEVELOPMENT GROUP

1503 KINGSWAY TRAFFIC IMPACT STUDY

DRAFT

OCTOBER 7, 2019



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CRESSEY DEVELOPMENT GROUP

DRAFT

PROJECT NO.: 19M-01026-00 DATE: OCTOBER 7, 2019

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SIGNATURES

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- A SITE PLAN
- **B** TERMS OF REFERENCE
- C SIGNAL WARRANT ANALYSIS
- D AUTOTURN ANALYSIS

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1 INTRODUCTION

Cressey Development Group is proposing a new mixed-used development at 1503 Kingsway, Vancouver, BC. The proposed development will be a 13-story residential/commercial building including 2 levels of underground parking. The project will consist of 113 apartment units, 41 townhouse units, and 23,247 ft² of commercial space.

As part of the Development Permit application, Cressey Development Group retained WSP to prepare a Traffic Impact Assessment of the study area. The objectives of this study are to:

- Collect traffic counts at 22 Avenue/Fleming Street, 22 Avenue/Dumfries Street, 22 Avenue/Lanark Street, Kingsway/Knight Street, Fleming Street/Perry Street, Kingsway/Perry Street, East King Edward Avenue/Kingsway, and Kingsway/Dumfries Street intersections;
- Investigate the current traffic distribution at the study intersection during the AM and PM peak-hour periods using the newly obtained information;
- Determine and analyze the existing and projected traffic volumes resulting from the development, and evaluate their impacts on the study intersections for the AM and PM peak hours under the 2020 and 2030 planning horizon traffic conditions;
- Identify physical and operational mitigations required to offset network impacts from the development, including TAC signal warrant analysis where applicable, and an assessment of Kingsway and Dumfries Street intersection with and without a full signal, including potential left-turn bays and left-turn signal phasing; and,
- Review the parking bylaw requirements and the provisions of the planned development, including an AutoTurn assessment of vehicle maneuvering.

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2 SITE CONTEXT

2.1 SITE LOCATION AND STUDY AREA

The site is located on the northeast corner of Kingsway and Dumfries Street, which was previously occupied by a Rona Home Center. The proposed site plan is shown in Appendix A of this report. The proposed development will be a 13-story residential/commercial building including 2 levels of underground parking. The project will consist of 113 apartment units, 41 townhouse units, and 23,247 ft² of commercial space. This will be divided into 5 separate buildings, including 4 townhouse complexes and one 13 story apartment building with ground level retail space. Access to the development will be provided through a mews connecting Dumfries Street and Fleming Street, which leads to an underground parkade entrance.



Figure 2-1 – Study Area

2.2 LOCAL TRANSPORTATION NETWORK

ROAD NETWORK

Kingsway is a major arterial road which provides a connection between the downtown core and Burnaby. The road profile consists of 6 travel lanes with sidewalks on the side and a landscaped median. Curbside on-street parking is provided during off-peak hours. Parking is prohibited in the AM peak for westbound traffic and during the PM peak for eastbound traffic to prioritize through traffic and bus travel. Various driveway accesses are provided for residential and commercial developments along the road. Multiple traffic signals control traffic flow along the route. The study intersection of Kingsway and East King Edward Avenue is provided with a permissive/protected westbound left turn signal to facilitate the north-westbound left-turn movement and the right turn movement

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from King Edward Avenue to Kingsway. During the site visit, it was overserved that the permissive/protected westbound left turn signal at Kingsway and East King Edward Avenue shares the same controller of Kingsway and Dumfries Street pedestrian signal.

Knight Street is a major arterial road which provides a key north-south connection in the area. The road is the city's busiest truck route¹. The road profile consists of 6 travel lanes and a raised median. It transitions to 4 lanes approximately 100m north of Kingsway. Knight Street intersects Kingsway at a skewed intersection. Left turn bays are provided on all legs of the intersection. Only northbound and southbound left turning traffic are provided with protected permissive left-turn signals.

East 22 Avenue provides an important east-west connection for the neighbourhood, connecting Knight Street to Sidney Street. East 22 Avenue is a two-lane local road with curb-side on-street parking. It is a traffic calmed street, with multiple speed humps installed west of Dumfries Street as well as 30km/h advisory speed. Knight Street and East 22 Avenue intersection is a right-in/right-out controlled intersection. Several local roads intersect East 22 Avenue, including Lanark Street, Fleming Street, Perry Street, and Dumfries Street. Traffic along East 22 Avenue is prioritized along all the study intersections excluding the all-way stop controlled Dumfries Street and East 22 Avenue intersection.

Dumfries Street is a north-south local road which will serve as a key site access point. The street intersects East 22 Avenue at an allway stop and to Kingsway in the south at a 2-way stop with a pedestrian signal. The road south of the Kingsway is a one-way street accommodating southbound traffic only. The northbound direction is reserved for bike access only.

EXISTING PEDESTRIAN NETWORK

Sidewalks have been provided on both sides of most roads in the area along with grass boulevards. The only exceptions are Kingsway and Fleming Street. Kingsway has provided sidewalks with curb barriers to separate pedestrians and vehicles. Fleming Street is a narrow road with no sidewalks for pedestrian access.

Several crossing facilities are provided in the area. A pedestrian signal has been installed along Kingsway at Dumfries Street to facilitate pedestrians crossing Kingsway, especially for the bus stops provided on either side of the road at this location.

To cross Knight Street, pedestrians may use the Knight Street and Kingsway intersection, which provides marked crosswalks on all four legs of the intersection.

CYCLING NETWORK

Dumfries Street serves as a local street bikeway in the area, providing a north-south cycle route. Bike push-buttons are provided at Dumfries and Kingsway to allow cyclists to cross Kingsway. Various pavement markings and bike route signs have been provided to mark the bike route.

TRANSIT NETWORK

The site is well-served by transit that connects to Downtown, UBC, Metrotown station, Brentwood station and Stanley Park. The bus routes are as follows:

- 1. Route 019/N19 10-minute frequency service along Kingsway between Metrotown station and Stanley Park.
- 2. Route 25 10-minute frequency service between UBC and Brentwood station. The westbound stop is located south of the development on East King Edward Avenue and the eastbound stop is located on Kingsway east of Perry Street.
- 3. Route 22 10-minute frequency service between Downtown and Marine Drive/Knight Street Station. The northbound and southbound stops are located south of the Knight Street and Kingsway intersection.

¹ According to Transportation 2040, Knight Street has an 8% truck usage, the highest in the city.

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3 TRAFFIC VOLUMES

3.1 EXISTING TRAFFIC VOLUMES

Peak hour traffic volumes at the study intersection was based on the traffic counts collected on September 11, 2019. Morning and afternoon peak hour traffic volumes are shown in Figure 3-1.



NOTE: The intersections of Dumfries St and E King Edward Ave with Kingsway share the same controller.

Figure 3-1 – Existing Traffic Volume (2019)

3.2 DEVELOPMENT TRAFFIC

3.2.1 TRIP GENERATION FIGURES

The development-generated traffic was estimated using the ITE Trip Generation Handbook, 10th Edition. The trip generation rates and land use codes are as per the Terms of Reference shown in Appendix B, and then revised based on the latest site plan dated May 2019. The ITE trip generation codes are shown in Table 3-1.

Table 3-1 – Proposed Land Uses

Proposed Land Use	ITE Land Use	ITE Land Use Code	Trip Generation Unit	Planned Number
Residential	Townhouses	220	Townhouse Units	41
Residential	Condos	222	Condo Units	113
Commercial	Supermarket	850	1000 sq. ft	10.497
Commercial	Health/Fitness	492	1000 sq. ft	10.245
Commercial	General Office Building	710	1000 sq. ft	2.505

Due to the mixed-use nature of the development, there is potential for internal trips. It has been assumed that 20 percent of the trips will be internal (between the various land uses within the development). Assuming the above land uses and ITE trip generation codes, Table 3-2 shows the estimated trip generation for the proposed development. The trips generated were based on ITE *Trip Generation Manual*, 20th Edition (September 2017). This development is anticipated to generate approximately 114 vehicles during the AM peak hour and 150 vehicles during the PM peak hour not taking into consideration the expected site vehicle trip generated reduction as the result of the transportation mode splits described below.

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		Trip Gene	ration Rate				Numbe	er of T	rips	
ITE Land Use	Peak Hour	ITE Average Trip Generation Rate	Adjusted Trip Generation Rate*	Proposed		In	Out	In	Out	Total
Townhouses (Peak Hour of	AM	0.46	0.37	<i>A</i> 1	Units	0.23	0.77	3	12	15
Adjacent Street Traffic)	PM	0.56	0.45	71	Onits	0.63	0.37	12	7	18
Condos (Peak Hour of	AM	0.31	0.25	112	. In the	0.24	0.76	7	21	28
Adjacent Street Traffic)	PM	0.36	0.29	113	Units	0.61	0.39	20	13	33
Supermarket	AM	6.67	5.34	10407	ca ft	0.52	0.48	29	27	56
the Generator)	PM	7.6	6.08	10497	sq.rt	0.52	0.48	33	31	64
Health/Fitness Club	AM	1.4	1.12	10245	an ft	0.46	0.54	5	6	11
(Peak Hour of the Generator)	PM	3.92	3.14	10245	sq.tt	0.52	0.48	17	15	32
General Office Building	AM	1.47	1.18	2505	ca ft	0.88	0.12	3	0	3
(Peak Hour of the Generator)	PM	1.42	1.14	2505	sq.1t	0.18	0.82	1	2	3
* The calculated	vehicle	volumes wer	e reduced by	Т	otal AM	Frips		47	66	114
the expected internal trip numbers for mixed use development trip assumptions (20%)				т	otal PM 1	rips		82	68	150

Table 3-2 – Trips Generated in the AM and PM Peak Hours

3.2.2 MODAL SPLIT

The 2011 National Household Survey (NHS) provides transportation mode splits for trips to/from work. WSP compared Canada's overall transportation mode split with the City's and development neighbourhood's (Vancouver-Kingsway) transportation mode split. Table 3-3 obtained from the Terms of Reference in Appendix B shows Canada's, the City's and development neighbourhood's 2011 National Household Survey transportation mode splits. The modal split identified for the development of the Terms of Reference is used to reduce the number of vehicle trips into and out of the development by 47%. The 47% reduction was verified using the traffic count collection at the four adjacent intersections of Fleming Street/22nd Avenue, Perry Street/Fleming Street, Dumfries Street/22nd Avenue to the proposed site by comparing the frequency of vehicles, pedestrian and cyclists traveling toward/outward the site. As shown in Table 3-4, the proposed development is anticipated to generate approximately 60 vehicles during the AM peak hour and 79 vehicles during the PM peak hour taking into consideration the transportation modal split reduction.

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Table 3-3 – Transportation Mode Split

Transportation Mode	Canada	Vancouver	Development Neighbourhood (Vancouver-Kingsway)*
Vehicle (driver)	74%	48%	53%
Vehicle (passenger)	6%	4%	5%**
Transit	12%	30%	26.04
Walk	6%	13%	20 %
Bicycle	1%	4%	15%
Other	1%	2%	1%**

*The proportions are estimated based on the traffic counts collected on July 19, 2019. The high bicycle usage is correlated to the summer month season. ** Default assumptions.

Table 3-4 – Trips Generated in AM and PM Peak Hours (With Modal Split Reduction)

	In	Out	Total
Total AM Trips	25	35	60
Total PM Trips	43	36	79

3.2.3 TRIP DISTRIBUTION AND TRAFFIC ASSIGNMENT

Site-generated traffic distribution was based on the approximate proportions of the existing traffic volumes. The conservative approach of assuming 90% of vehicles accessing the site using the Dumfries and Kingsway intersection was used, as it is the closest intersection to the site access. Site-generated traffic was distributed as shown in Table 3-5 and in Figure 3-2 below.

	AM Pea	ık Hour	PM Pea	ık Hour				
Entrance/Exit	Inbound Traffic (%)	Outbound Traffic (%)	Inbound Traffic (%)	Outbound Traffic (%)				
Knight St North	9%	22%	19%	16%				
Knight St South	14%	12%	17% 16%					
Kingsway West	10%	23%	24%	13%				
Kingsway East	58%	8%	31%	11%				
King Edward St West	9%	0%	9%	0%				
Dumfries South	0%	22%	0%	29%				
E 22 nd St East	0%	13%	0%	15%				

Table 3-5 – Site Trip Distribution

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NOTE: The intersections of Dumfries St and E King Edward Ave with Kingsway share the same controller.

Figure 3-2 – Proposed Site Generated Traffic

3.3 PRE-DEVELOPMENT FUTURE TRAFFIC VOLUMES

The existing traffic volumes were projected based on an annual growth rate of 2.7%, as per the approved Terms of Reference, to estimate the background traffic volumes without the proposed development traffic for the planning horizon years of 2020 and 2030. Figure 3-3 and Figure 3-4 summarize the background traffic volumes for the future planning horizons of 2020 and 2030 respectively without the development generated trips.



NOTE: The intersections of Dumfries St and E King Edward Ave with Kingsway share the same controller.

Figure 3-3 – Pre-Development Traffic Volumes in 2020

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NOTE: The intersections of Dumfries St and E King Edward Ave with Kingsway share the same controller.

Figure 3-4 – Pre-Development Traffic Volumes in 2030

3.4 POST-DEVELOPMENT FUTURE TRAFFIC VOLUMES

The 2020 and 2030 post development traffic volumes were determined by adding the site generated volumes to the background traffic volumes. The post-development traffic volumes for the weekday morning and weekday afternoon peak hours under the 2020 and 2030 planning horizons are illustrated in Figure 3-5 and Figure 3-6, respectively.



NOTE: The intersections of Dumfries St and E King Edward Ave with Kingsway share the same controller.

Figure 3-5 – Post-Development Peak Hour Traffic Volumes in 2020

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NOTE: The intersections of Dumfries St and E King Edward Ave with Kingsway share the same controller.

Figure 3-6 – Post-Development Peak Hour Traffic Volumes in 2030

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4 TRAFFIC ANALYSIS

4.1 TRAFFIC ANALYSIS METHODOLOGY

The existing and proposed intersection geometries and traffic controls were modeled using Synchro 10 software.

An intersection capacity analysis provides an indication of traffic operations based on calculations of the volume-to-capacity (v/c) ratio and delays for individual movements at an intersection. The v/c ratio, also referred to as degree of saturation, represents the sufficiency of an intersection to accommodate the vehicular demand. As the v/c ratio approaches 1.00, traffic flow may become unstable resulting in delay and queuing. Once the demand exceeds the capacity (i.e. a v/c ratio greater than 1.00), traffic flow is unstable and excessive delay and queuing is expected.

The Level of Service (LOS) for an intersection provides an indication of the quality of traffic operations and relates to the delay being experienced by vehicles. Intersection LOS denoted by letter grades 'A' through 'D' indicates a satisfactory level of operations, with 'A' being free flow and level 'D' representing conditions approaching congestion. Levels designated 'E' and 'F' represent increasingly congested traffic conditions.

As a target or design parameter, the following is considered appropriate for the study area:

- Signalized Intersections LOS D and v/c <0.90 for all individual movements; and,
- Non-signalized Intersections LOS D for individual movements.

The following assumptions were made in the model:

- The signalized intersections were modeled using the existing signal timing plans provided by the City of Vancouver. For comparison purposes, the cycle lengths and splits were kept as per existing signal timing sheets.
- The signalized Kingsway and Dumfries Street intersection shares the same controller as the Kingsway and East King Edward Street intersection resulting in synchronized green phases.
- In the AM peak hour, 2 through lanes were assumed for the eastbound direction as opposed to 3 lanes due to the peak hour parking restrictions. Similarly, in the PM peak hour, 2 through lanes were assumed for the westbound direction.
- The peak hour factor (PHF) for each intersection and truck % for each movement were estimated based on the traffic counts collected on September 11, 2019.

4.2 INTERSECTION PERFORMANCE

Traffic conditions for existing conditions were prepared and analyzed for both the weekday morning and weekday afternoon peak periods. The 2020 planning horizon and 2030 planning horizon scenarios were modeled to establish traffic operations with and without the proposed development in the future conditions.

4.2.1 2019 EXISTING CONDITIONS

As shown in Table 4-1, the intersections are expected to operate under acceptable conditions excluding:

- Kingsway and Perry Street intersection operates over capacity at LOS F for both the southbound and northbound movements during AM peak hour. The delay issues on northbound and southbound movements are the result of the northbound and southbound turning traffic attempting to find a gap in the high westbound traffic volumes on Kingsway (2356 vehicles per hour during AM peak hour)
- The Kingsway and Knight Street intersection experiences long delays for all the left turn movements during AM peak hour. Also, the westbound through movement and southbound left turn movement are expected to approach capacity (v/c=0.92) during AM peak hour and PM peak hour, respectively.

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Table 4-1 – Existing Intersection Performance

				_									-		
Intersection	Overall Intersection	Peak	Performance	E	astbour	nd	v	/estbou	nd	N	orthbou	nd	50	uthbou	nd
		Time		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
	V/C = 0.92		Traffic Volume	61	820	196	40	1627	164	285	1173	33	123	765	22
	10S = C		105	F	C	C	C		0.	C	C	C		C	
	Delay(s) = 32.0	AM	V/C	0.89	0.53	0.53	0 31	0.92	0.92	0.80	0.74	0.74	0.49	0.50	0.50
Kingsway and	Delay (3) = 32.0	-	95th Queue Length(m)	#38 7	67.9	67.9	15.8	#153.6	#153.6	#59.6	971	97 1	26.2	59.3	59.3
Knight St	v/c = 0.02		Traffic Volumo	02	1512	207	13.0	020	120	224	1057	26	267	1107	27
Kinght St	V/C = 0.55	_		55	1512	257	-44 E	530	120 D	234 E	1057	- 30 - C	207	110/	57
	Dolov - 24.0	PM	V/C	0.77	0.02	0.02	0.50	0.66	0.21	0.00	0.65	0.65	0.92	0.72	0.72
	Deldy - 54.9	-	V/C	0.77 #AC 0	0.95 #160 F	0.95	0.59 #25 7	102.1	10.21	0.00 #75 C	0.05	0.05	0.92 #01 C	0.72	0.72
	V/C- 07		Traffia Valuma	#40.0	#100.5	12	#25.7	105.1	10.5	#75.0	04.5	04.5	#01.0	90.1	22
	V/C= 0.7	_	Traffic Volume	6	915	13		1891	19				5	14	33
	LOS = A	AM	LOS	A	A	A		A	A				C	0.15	C
	Delay (s) = 7.4	_	V/C	0.38	0.38	0.01		0.51	0.51				0.15	0.15	0.15
Kingsway and			95th Queue Length(m)	57.6	57.6	3.1		87.9	87.9				14.3	14.3	14.3
Dumfries St	V/C = 0.86		Traffic Volume	21	1685	22		1123	25				8	21	31
	LOS = A	РМ	LOS	A	A	A		A	A				В	В	В
	Delay (s) = 8.7		V/C	0.53	0.53	0.53		0.45	0.02				0.17	0.17	0.17
			95th Queue Length(m)	75.9	75.9	75.9		68.6	2.1				13.6	13.6	13.6
	V/C = 0.7		Traffic Volume			382				552	1835			986	
	LOS = A	АМ	LOS			С				A	A			A	
	Delay (s) = 4.3	/	V/C			0.70				0.32	0.37			0.58	
Kingsway and E			95th Queue Length(m)			67.8				0.0	0.0			10.6	
King Edward St	V/C = 0.86		Traffic Volume			485				508	1081			1782	
	LOS = A	DM	LOS			D				Α	Α			А	
	Delay (s) = 8.7	PIVI	V/C			0.86				0.29	0.31			0.70	
			95th Queue Length(m)			#137.0				0.0	0.0			12.5	
	V/C = 3.76		Traffic Volume	11	1306	11	10	2356	10	2	1	31	1	0	25
	LOS = F	-	LOS	А	А	А	А	А	А	F	F	F	F	F	F
Kingsway and Perry St	Delay(s) = 71.3	AM	V/C	0.06	0.53	0.01	0.02	0.71	0.36	0.61	0.61	0.61	3.76	3,76	3.76
			95th Queue Length(m)	1.6	1.6	0.0	0.4	0.4	0.0	20.0	20.0	20.0	ERR	ERR	ERR
	V/C = 0.66		Traffic Volume	34	2183	21	15	1550	26	0	0	15	1	0	38
	105 - A	-			210J	 	15	1550	20 A	٥ ٨	٥ ٨	15	C I	C C	50
	Delay(s) = 0.9	PM	V/C	0.09	0.66	0.34	0.04	0.63	0.02	0.02	0.02	0.02	0.17	0.17	0.17
	Delay (3) = 0.5	-	0Eth Quoue Longth(m)	2.05	2.00	0.34	1 1	1.1	0.02	0.02	0.02	0.02	10.17	1.0	1.0
	v/c0.22		Traffia Values a	2.5	2.5	0.0	1.1	1.1	0.0	0.5	1220	0.5	4.0	4.0	4.0
	V/C = 0.32	-							42		1330	68		910	
	LOS = A	AM	LOS						A		A	A		A	
	Delay (s) = 0.2	_	V/C						0.05		0.32	0.20		0.18	
Knight St and E			95th Queue Length(m)						1.3		0.0	0.0	<u> </u>	0.0	
22nd Ave	V/C = 0.3	_	Traffic Volume						56		1142	128		1491	
	LOS = A	РМ	LOS						В		A	A		A	
	Delay (s) = 0.2		V/C						0.07		0.27	0.21		0.30	
		_	95th Queue Length(m)						1.9		0.0	0.0		0.0	
	V/C = 0.03		Traffic Volume	1	67			38	1				3		4
	LOS = A	ΔM	LOS	Α	A			А	Α				Α		Α
	Delay (s) = 0.6	/	V/C	0.00	0.00			0.03	0.03				0.01		0.01
E 22nd Ave and			95th Queue Length(m)	0.0	0.0			0.0	0.0				0.2		0.2
Lanark St	V/C = 0.03		Traffic Volume	6	122			35	3				2		3
	LOS = A	DM	LOS	А	Α			А	Α				А		А
	Delay (s) = 0.6	PIVI	V/C	0.01	0.01			0.03	0.03				0.01		0.01
			95th Queue Length(m)	0.1	0.1			0.0	0.0				0.2		0.2
	V/C = 0.13		Traffic Volume	1	64	12	45	31	5	13	3	8	8	12	2
	LOS = A		LOS	А	А	А	А	А	Α	А	Α	А	А	А	Α
	Delay (s) = 7.7	AIVI	V/C	0.11	0.11	0.11	0.13	0.13	0.13	0.04	0.04	0.04	0.04	0.04	0.04
E 22nd Ave and			95th Queue Length(m)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dumfries St	V/C = 0.2		Traffic Volume	3	103	27	28	22	4	15	9	30	4	7	0
	LOS = A		LOS	Α	Α	А	Α	Α	Α	Α	Α	Α	А	Α	Α
	Delay (s) = 7.9	PM	V/C	0.20	0.20	0.20	0.09	0.09	0.09	0.09	0.09	0.09	0.02	0.02	0.02
		1	95th Queue Length(m)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	V/C = 0.05	1	Traffic Volume	· ·	68	5	3	76		4		4			
	LOS = A	1	LOS		A	A	A	A		R		B			
	Delay(s) = 0.7	AM	 /C		0.05	0.05	0.00	0.00		0.01		0.01			
E 22nd Ave and	D = (3) = 0.7	-	95th Oueuro Longth/m)		0.05	0.05	0.00	0.00		0.01		0.01			
Fleming St	V/C- 01	+	Traffic Volume		175	10	1.0	40		U.S F		0.3 F			
(West)	V/C- U.1	-			125	10	4	49		5		0			
	LO3 - A	PM			A	A	A	A		A		A			
	Delay (s) = 0.7	4			0.10	0.10	0.00	0.00		0.02		0.02			
			95th Queue Length(m)		0.0	0.0	0.1	0.1		0.4		0.4			
	V/C = 0.01	4	Traffic Volume	2	0	5	2	1	2	6	9	3	5	19	5
	LOS = A	AM	LOS	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
	Delay = 3.2	-	V/C	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
Perry St and			95th Queue Length(m)	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
Perry St and Fleming St	V/C = 0.05	4	Traffic Volume	11	4	17	2	0	4	30	17	7	3	24	7
	LOS = A	рм	LOS	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
	Delay (s) = 5.0	FIVI	V/C	0.05	0.05	0.05	0.01	0.01	0.01	0.03	0.03	0.03	0.03	0.00	0.00
		1	95th Queue Length(m)	1.3	1.3	1.3	0.2	0.2	0.2	0.6	0.6	0.6	0.1	0.1	0.1

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4.2.2 2020 BACKGROUND

The capacity and delay issues at the Kingsway/Perry Street and Kingsway/Knight Street intersections in the existing conditions are expected to deteriorate in the 2020 year without the development as shown in Table 4-2. Other study intersections are performing acceptably.

		Peak		E	astbour	nd	W	/estbou	nd	No	orthbou	nd	So	uthbou	ind
Intersection	Overall Intersection	Time	Performance	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
	V/C- 0.94		Traffic Volume	62	942	201	41	1671	169	202	1205	24	126	796	22
	LOS = C	1	LOS	F	042 C	201 C	41 C	D	108 D	233 D	1205 C	C	120 C	780 C	23 C
	Delay (s) = 33.4	AM	V/C	0.91	0.54	0.54	0.33	0.94	0.94	0.83	0.76	0.76	0.50	0.51	0.51
Kingsway and		1	95th Queue Length(m)	#40.0	70.0	70.0	16.4	#167.7	#167.7	#66.4	100.5	100.5	27.1	60.9	60.9
Knight St	V/C = 0.96		Traffic Volume	96	1553	305	45	955	123	240	1086	37	274	1219	38
	LOS = D	PM	LOS	F	D	D	E	С	В	E	С	С	E	С	С
	Delay (s) = 37.1	-	V/C	0.84	0.95	0.95	0.60	0.68	0.21	0.90	0.67	0.67	0.96	0.73	0.73
	V/C- 0.71		Traffic Volume	#50.1 6	#108.7	12	#20.0	106.9	20	#/8.5	87.0	87.0	#87.9 5	99.4	99.4 24
		-	10S	Δ	Δ	15 A		Δ	20 A				C C	14	- 14 C
	Delay (s) = 7.5	AM	V/C	0.39	0.39	0.01		0.52	0.52				0.16	0.16	0.16
Kingsway and			95th Queue Length(m)	60.0	60.0	3.1		91.9	91.9				14.6	14.6	14.6
Dumfries St	V/C = 0.88		Traffic Volume	22	1730	23		1153	26				8	22	32
	LOS = A	PM	LOS	Α	Α	Α		A	Α				В	В	В
	Delay (s) = 8.7	-	V/C	0.54	0.54	0.54		0.46	0.03				0.18	0.18	0.18
	V/C = 0.71		95th Queue Length(m)	79.3	79.3	79.3		/1.4	2.2	567	1005		13.7	13.7	13.7
	10S = A	-				592 C				Δ	1005 A			1015 A	Δ
	Delay (s) = 4.4	AM	V/C			0.71				0.33	0.38			0.60	0.60
Kingsway and E		1	95th Queue Length(m)			71.4				0.0	0.0			11.0	11.0
King Edward St	V/C = 0.88		Traffic Volume			498				522	1110			1830	1
	LOS = A	PM	LOS			D				Α	Α			A	A
	Delay (s) = 9.3	-	V/C			0.88				0.30	0.31			0.72	0.72
	V/C = 5.83		Traffic Volume	11	13/1	#142.7 11	10	2420	10	0.0	0.0	32	1	12.8	12.8
	10S = F		10S	Δ	Δ	A 11	10 A	2420 A	10 A	F	F	52 F	F	F	- 20 F
	Delay (s) = 72.5	AM	V/C	0.07	0.54	0.01	0.02	0.73	0.37	0.75	0.75	0.75	5.83	5.83	5.83
Kingsway and		1	95th Queue Length(m)	1.8	1.8	0.0	0.4	0.4	0.0	24.1	24.1	24.1	ERR	ERR	ERR
Perry St	V/C = 0.68		Traffic Volume	35	2242	22	15	1592	27	0	0	15	1	0	39
	LOS = A	PM	LOS	Α	Α	Α	Α	Α	Α	В	В	В	С	С	С
	Delay (s) = 0.9		V/C	0.09	0.68	0.35	0.05	0.64	0.02	0.02	0.02	0.02	0.18	0.18	0.18
	V/C 0.22		95th Queue Length(m)	2.4	2.4	0.0	1.2	1.2	0.0	0.5	0.5	0.5	5.2	5.2	5.2
	V/C = 0.33	-							43 A		1300	70 A		935	
	Delay (s) = 0.2	AM	V/C						0.05		0.33	0.21		0.19	
Knight St and E		1	95th Queue Length(m)						1.4		0.0	0.0		0.0	
22nd Ave	V/C = 0.3		Traffic Volume						58		1173	131		1531	
	LOS = A	PM	LOS						В		Α	Α		Α	
	Delay (s) = 0.2		V/C						0.08		0.28	0.22		0.30	
	V/C 0.02		95th Queue Length(m)		60			20	2.0		0.0	0.0	2	0.0	
	V/C = 0.03	-		1	69 A			39	1				3 4		4 A
	Delay (s) = 0.6	AM	V/C	0.00	0.00			0.03	0.03				0.01		0.01
E 22nd Ave and		1	95th Queue Length(m)	0.0	0.0			0.0	0.0				0.2		0.2
Lanark St	V/C = 0.04		Traffic Volume	6	125			36	3				2		3
	LOS = A	PM	LOS	Α	Α			Α	Α				Α		А
	Delay (s) = 0.6		V/C	0.01	0.01			0.04	0.04				0.01		0.01
	V/C 0.12		95th Queue Length(m)	0.1	0.1	12	40	0.0	0.0	10	2	0	0.2	12	0.2
	V/C= 0.13	1	LOS	1	00 A	12 A	46 A	32 A	5 ۵	13	3 A	ð A	ð A	12	2 A
	Delay (s) = 7.7	AM	V/C	0.12	0.12	0.12	0.13	0.13	0.13	0.04	0.04	0.04	0.04	0.04	0.04
E 22nd Ave and		1	95th Queue Length(m)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dumfries St	V/C = 0.21		Traffic Volume	3	106	28	29	23	4	15	9	31	4	7	0
	LOS = A	PM	LOS	Α	Α	Α	Α	Α	А	Α	Α	Α	Α	Α	Α
	Delay (s) = 7.9		V/C	0.21	0.21	0.21	0.09	0.09	0.09	0.09	0.09	0.09	0.02	0.02	0.02
	V/C - 0.06		Traffic Volume	N/A	N/A 70	N/A	N/A 2	N/A 79	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	LOS = A	1.	LOS		A	A	A	A		+ B		B			
5.00.11	Delay (s) = 0.7	AM	V/C		0.06	0.06	0.00	0.00		0.01		0.01			
E 22nd Ave and		1	95th Queue Length(m)		0.0	0.0	0.1	0.1		0.3		0.3			
(Wpct)	V/C = 0.1		Traffic Volume		128	10	4	50		5		6			
(******)	LOS = A	PM	LOS		Α	Α	Α	Α		Α		Α			
	Delay (s) = 0.7	-	V/C		0.10	0.10	0.00	0.00		0.02		0.02			
	V/C - 0.01		Soth Queue Length(m)	2	0.0	0.0	0.1	0.1	2	U.4	0	0.4	F	20	
	LOS = A	1	LOS	2 A	A	2 A	2 A	A	2 A	o A	9 A	3 A	د ۵	20 A	د ۸
	Delay (s) = 3.2	AM	V/C	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Perry St and		1	95th Queue Length(m)	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
Perry St and Fleming St L	V/C = 0.05		Traffic Volume	11	4	17	2	0	4	31	17	7	3	25	7
	LOS = A	PM	LOS	Α	А	А	А	Α	А	А	А	А	А	Α	А
	Delay (s) = 4.9		V/C	0.05	0.05	0.05	0.01	0.01	0.01	0.03	0.03	0.03	0.00	0.00	0.00
			95th Queue Length(m)	1.3	1.3	1.3	0.2	0.2	0.2	0.6	0.6	0.6	0.1	0.1	0.1

Table 4-2 – 2020 Background Conditions- Intersection Performance

4.2.3 2020 POST-DEVELOPMENT

The site generated traffic is expected to have a marginal effect on study intersections' performance. Consistent with existing and 2020 background conditions, the Kingsway/Perry Street and Kingsway/Knight Street intersections are expected to perform with delay and capacity issues as shown in Table 4-3. Other study intersections are expected to perform acceptably under the 2020 planning horizon.

		Peak		E	astbour	nd	w	estbou	nd	No	orthbou	nd	So	uthbou	nd
Intersection	Overall Intersection	Time	Performance	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
	V/C - 0.05		Traffic Volume	62	0/6	201	45	1670	172	202	1205	20	120	706	22
	105 = 0.93	-		F	643 C	201	43 C	1079 D	1/2 D	295 D	1203	30 C	120	780 C	23
	Delay(s) = 33.8	AM	V/C	0.91	0.54	0.54	0 37	0.95	0.95	0.83	0.76	0.76	0.51	0.51	0.51
Kingswav and	Delay (5) = 55.0	-	95th Queue Length(m)	#40.0	70.2	70.2	18.2	#169.8	#169.8	#66.4	100.9	100.9	27.8	60.9	60.9
Knight St	V/C = 0.96		Traffic Volume	96	1564	305	51	959	128	240	1086	44	274	1219	46
0	LOS = D		LOS	F	D	D	E	С	В	E	С	С	Е	С	С
	Delay (s) = 37.6	РМ	V/C	0.85	0.96	0.96	0.69	0.68	0.22	0.90	0.67	0.67	0.96	0.74	0.74
			95th Queue Length(m)	#50.3	#170.1	#170.1	#31.3	107.3	19.9	#78.5	87.7	87.7	#88.3	100.1	100.1
	V/C = 0.74		Traffic Volume	14	940	13		1942	34				8	22	52
	LOS = A	ΔМ	LOS	Α	Α	Α		Α	Α				С	С	С
	Delay (s) = 8.9	AW	V/C	0.45	0.45	0.01		0.58	0.58				0.25	0.25	0.25
Kingsway and			95th Queue Length(m)	62.6	62.6	62.6		93.0	93.0				20.9	20.9	20.9
Dumfries St	V/C = 0.89	_	Traffic Volume	48	1730	23		1153	39				12	32	47
	LOS = A	PM	LOS	A	A	A		A	A				В	В	В
	Delay (s) = 9.1	-	V/C	0.58	0.58	0.58		0.46	0.04				0.26	0.26	0.26
	V/C - 0.74		95th Queue Length(m)	85.2	85.2	85.2		/1.4	3.6	567	1900		17.9	17.9	17.9
	V/C = 0.74	-				394 C				507	1999			1010	0
	Delay(c) = 4.3	AM	U			0.74				0.33	0.38			0.56	0.56
Kingsway and F	Delay (3) = 4.5	-	95th Queue Length(m)			72 1				0.55	0.58			11 1	11 1
King Edward St	V/C = 0.89		Traffic Volume			502				522	1123			1834	1
0	LOS = A		LOS			D				A	A			A	A
	Delay (s) = 9.3	РМ	V/C			0.89				0.30	0.32			0.72	0.72
			95th Queue Length(m)			#144.5				0.0	0.0			13.0	13.0
	V/C = 6.53		Traffic Volume	13	1344	11	10	2434	10	2	1	36	1	0	26
	LOS = F		LOS	Α	Α	Α	Α	Α	Α	F	F	F	F	F	F
	Delay (s) = 72.4	Alvi	V/C	0.08	0.54	0.01	0.02	0.74	0.37	0.79	0.79	0.79	6.53	6.53	6.53
Kingsway and			95th Queue Length(m)	2.1	2.1	0.0	0.4	0.4	0.0	26.1	26.1	26.1	ERR	ERR	ERR
Perry St	V/C = 0.68		Traffic Volume	39	2246	22	15	1605	27	0	0	22	2	0	42
	LOS = A	РМ	LOS	A	A	A	A	Α	Α	В	В	В	D	D	D
	Delay (s) = 1.1		V/C	0.10	0.68	0.35	0.05	0.65	0.02	0.03	0.03	0.03	0.24	0.24	0.24
			95th Queue Length(m)	2.8	2.8	0.0	1.2	1.2	0.0	0.8	0.8	0.8	7.1	7.1	7.1
	V/C = 0.33	-	Traffic Volume						45		1372	70		937	
	LOS = A	AM	LUS						A		A	A		A	
Knight Stand E	Delay(s) = 0.2	-	V/C 0Eth Quoue Longth(m)						1 5		0.55	0.21		0.19	
22nd Ave	V/C- 03		Traffic Volume						50		1178	121		1530	
2210 / 10									B		Δ	Δ		Δ	
	Delay(s) = 0.2	PM	V/C						0.08		0.28	0.22		0.30	
			95th Queue Length(m)						2.0		0.0	0.0		0.0	
	V/C = 0.03		Traffic Volume	1	69			41	1				3		4
	LOS = A		LOS	А	Α			Α	Α				Α		Α
	Delay (s) = 0.6	AIVI	V/C	0.00	0.00			0.03	0.03				0.01		0.01
E 22nd Ave and			95th Queue Length(m)	0.0	0.0			0.0	0.0				0.2		0.2
Lanark St	V/C = 0.04		Traffic Volume	6	125			37	3				2		3
	LOS = A	РМ	LOS	A	A			Α	Α				Α		Α
	Delay (s) = 0.6		V/C	0.01	0.01			0.04	0.04				0.01		0.01
			95th Queue Length(m)	0.1	0.1			0.0	0.0		-	-	0.2		0.2
	v/C = 0.13	-	Trattic Volume	1	66	12	46	32	5	15	3	9	8	12	2
	LUS = A	AM	LOS	A	A	A	A	A	A	A	A	A	A	A	A
E 22nd Aug and	Deldy(s) = 7.8	-	V/L 95th Oueuro Longth/~~)	U.12	U.12	U.12	U.13	U.13	U.13	0.04 N/A	0.04 N/A	0.04 N/A	0.04 N/A	0.04 N/A	0.04 N/A
Dumfries St	V/C = 0.21		Traffic Volume	2	106	28	30	23	цу/М Q	15	цу/А Q	38	лу/А А	7	8
Dumines St	LOS = A	-	LOS	A	Δ	Δ	A	 A	A	A	A	A	Ā	Á	A
	Delay (s) = 8	PM	V/C	0,21	0,21	0,21	0,10	0,10	0,10	0,10	0,10	0,10	0.03	0.03	0.03
			95th Queue Length(m)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	V/C = 0.06		Traffic Volume	,	71	5	3	, 78	,	4	,	8		,	
	LOS = A		LOS		Α	A	A	A		В		В			
E Dand Arrent	Delay (s) = 0.9	AM	V/C		0.06	0.06	0.00	0.00		0.02		0.02			
E 22nd Ave and			95th Queue Length(m)		0.0	0.0	0.1	0.1		0.5		0.5			
(West)	V/C = 0.1		Traffic Volume		130	10	4	50		5		10			
(west)	LOS = A	DM	LOS		А	A	А	А		А		А			
	Delay (s) = 0.8	r'ivi	V/C		0.10	0.10	0.00	0.00		0.02		0.02			
L			95th Queue Length(m)		0.0	0.0	0.1	0.1		0.6		0.6			
	V/C = 0.01	-	Traffic Volume	2	0	5	2	1	2	8	9	3	5	20	5
	LOS = A	AM	LOS	A	A	A	A	A	A	Α	A	A	Α	A	Α
	Delay (s) = 3.3	-	V/C	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
Perry St and	1/10 0.05		95th Queue Length(m)	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
Fleming St	v/c = 0.06	-	I rattic Volume	11	4	21	2	0	4	35	17	7	3	25	/
	LUS = A Delay (c) = 5.2	PM		A	A	A	A	A	A	A	A	A	A	A	A
	Deidy (5) - 3.2	-	95th Oueue Length/m)	1.00	1 5	1.00	0.01	0.01	0.01	0.03	0.03	0.03	0.00	0.00	0.00
1	1	1	Jun Queue Lengun(III)	1.0	1.0	1.0	0.5	0.5	0.5	0.7	0.7	0.7	0.1	U.1	0.1

Table 4-3 – 2020 Post Development Conditions- Intersection Performance

4.2.4 2030 BACKGROUND

The capacity and delay issues at the Kingsway/Perry Street and Kingsway/Knight Street intersections in the existing conditions are expected to deteriorate in the year 2030 without the development as shown in Table 4-4. The right turn movement from East King Edward Avenue to Kingsway is expected to perform over capacity during the PM peak hour under the 2030 planning horizon without the development traffic. Other study intersections are expected to perform acceptably.

	Overall Intersection	Peak		E	astbour	nd	w	/estbou	nd	No	orthbou	nd	So	uthbou	nd
Intersection	Overall Intersection	Time	Performance	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
				Len		- and the second	Len		night	Len			Len		night
	$V/C = \frac{1.32}{5}$		I raffic Volume	82	1100	263	54	2182	220	382	1573	44	165	1026	30
	LOS = F	AM	LOS	F	C	C	F	F	F	F	D	D	C	C	C
Kinen	Delay (s) = 81.8		V/C	1.20	0./1	0./1	0.80	1.23	1.23	1.32	0.99	0.99	0.65	0.66	0.66
Kingsway and			95th Queue Length(m)	#51.9	99.0	99.0	#34.2	#259.1	#259.1	#140.7	#158.7	#158.7	#41.9	83.1	83.1
Knight St	V/C = 1.7		Traffic Volume	125	2028	398	59	1247	161	314	1417	48	358	1592	50
	LOS = F	PM	LOS	F	F	F	F	D	B	F	D	D	F	D	D
	Delay(s) = 89.2		V/C	1.70	1.25	1.25	0.80	0.88	0.28	1.18	0.87	0.87	1.32	0.96	0.96
			95th Queue Length(m)	#61.5	#259.6	#259.6	#35.9	#158.6	27.0	#116.7	122.6	122.6	#137.4	#155.6	#155.2
	V/C = 0.88		I raffic Volume	8	1227	1/		2536	25				/	19	44
	LOS = B	AM	LOS	A	A	A		B	B 0.72				0.25	0.25	0.25
Kin and the second	Delay(s) = 10.9		V/C	0.56	0.56	0.02		0.73	0.73				0.25	0.25	0.25
Kingsway and	V/0 4.0		95th Queue Length(m)	90.9	90.9	3.7		150.6	150.6				19.4	19.4	19.4
Dummes St	V/C = 1.2		I raffic Volume	28	2260	30		1506	34				11	28	42
	LUS = B	PM	LUS	B	8	8		A	A				C	C	C
	Delay (s) = 11.1		V/C	0.72	0.72	0.72		0.59	0.03				0.26	0.26	0.26
			95th Queue Length(m)	132.1	132.1	132.1		108.8	m2.9	740			19.1	19.1	19.1
	V/C = 0.88		I raffic Volume			512				/40	2461			1322	0
	LUS = A	AM	LUS			0.00				A	A			8	8
Kin and F	Delay (s) = 7		V/C			0.88				0.43	0.49			0.77	0.77
King Edward Ct	12		Traffia Malura			#130.9				0.0	0.0			13.8	15.0
King Euwaru St	V/C = 1.2				<u> </u>	650				081	1450			2390	1
	LUS = C	PM				F				A 0.20	A 0.41			0.00	D 0.00
	Deidy (5) = 23.1	1	V/L 0Eth Quous Length()			1.20				0.39	0.41			0.88	0.68
			Traffia Malura	45	4754	#207.5	42	2450	42	0.0	0.0	42		22.0	22.0
				15	1/51	15	13	3159	13	5	1	42	1	0	34
	LUS = F	AM	LUS	0.20	A	A	A	A	A	F	F	F			1
Kingguyou and	Delay (s) = EKK		V/C	0.20	0.71	0.01	0.03	0.96	0.49	19.74	19.74	19.74	EKK	EKK	EKK
Ningsway anu	V/C - 0.80		Traffia Valuma	5.4	2027	0.0	0.9	0.9	0.0	EKK	EKK	20		EKK	
Perry St	V/C = 0.89			40	2927	28	20	2079	35	0	0	20	1	0	51
	LO3 = A Dolow (c) = 2.0	PM	LU3	0.10	0.00	0.46	0.12	0.94	0.02	0.04	0.04	0.04	P 0.46	0.46	F 0.46
	Delay(s) = 2.9		V/C	0.19	0.89	0.40	2.2	0.84	0.02	0.04	0.04	0.04	16.1	16.1	0.46
	V/C - 0.42		Traffia Valuma	5.5	5.5	0.0	3.3	3.3	0.0	0.9	1704	0.9	10.1	10.1	10.1
	V/C = 0.43								20 D		1/84	91		1220	
	LOS = A Dolow (c) = 0.2	AM							0.09		A 0.42	A 0.27		A 0.24	
Knight St and F	Delay (5) = 0.2		95th Oueue Length(m)						2.00		0.45	0.27		0.24	
	V/C- 0.4		Traffie Volume						2.1		15.21	172		1000	
22110 AVE	V/C = 0.4								73 P		1551	1/2		1999	
	Delay(s) = 0.2	PM	U						0.11		0.36	0.28		0.40	
	Delay (3) = 0.2		95th Oueue Length(m)						3.0		0.30	0.20		0.40	
	V/C - 0.04		Traffic Volume	1	90			51	1		0.0	0.0	4	0.0	5
				Δ	Δ			Δ	Δ				Δ		Δ
	Delay(s) = 0.6	AM	V/C	0.00	0.00			0.04	0.04				0.01		0.01
F 22nd Ave and	Delay (5) 010		95th Queue Length(m)	0.0	0.0			0.0	0.0				0.3		0.3
Lanark St	V/C = 0.05		Traffic Volume	8	164			47	4				3		4
	LOS = A		LOS	A				A	A				A		A
	Delay (s) = 0.6	PM	V/C	0.01	0.01			0.05	0.05				0.01		0.01
			95th Queue Length(m)	0.2	0.2			0.0	0.0				0.3		0.3
	V/C = 0.17		Traffic Volume	1	86	16	60	42	7	17	4	11	11	16	3
	LOS = A	1	LOS	А	A	A	A	Α	А	Α	А	А	А	A	А
	Delay (s) = 8	AM	V/C	0.16	0.16	0.16	0.17	0.17	0.17	0.05	0.05	0.05	0.05	0.05	0.05
E 22nd Ave and		1	95th Queue Length(m)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dumfries St	V/C = 0.28		Traffic Volume	4	138	36	38	30	5	20	12	40	5	9	0
	LOS = A	DA4	LOS	Α	Α	А	А	А	А	Α	А	А	А	Α	А
	Delay (s) = 8.4	PIVI	V/C	0.28	0.28	0.28	0.12	0.12	0.12	0.12	0.12	0.12	0.03	0.03	0.03
			95th Queue Length(m)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	V/C = 0.07		Traffic Volume		91	7	4	102		5		5			
	LOS = A	A.M.4	LOS		А	А	А	Α		В		В			
E 22nd Ave and	Delay (s) = 0.6		V/C		0.07	0.07	0.00	0.00		0.02		0.02			
E 22110 Ave and			95th Queue Length(m)		0.0	0.0	0.1	0.1		0.4		0.4			
(Weet)	V/C = 0.13		Traffic Volume		168	13	5	66		7		8			
(wvest)	LOS = A	DM	LOS		Α	Α	Α	Α		В		В			
	Delay (s) = 0.7	r ivi	V/C		0.13	0.13	0.00	0.00		0.03		0.03			
			95th Queue Length(m)		0.0	0.0	0.1	0.1		0.7		0.7			
	V/C = 0.02		Traffic Volume	3	0	7	3	1	3	8	12	4	7	25	7
	LOS = A	ΔN4	LOS	Α	Α	Α	Α	Α	А	Α	А	Α	А	Α	А
	Delay (s) = 3.4	AW	V/C	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Perry St and Fleming St			95th Queue Length(m)	0.4	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2
	V/C = 0.07		Traffic Volume	15	5	23	3	0	5	40	23	9	4	32	9
	LOS = A	РМ	LOS	В	В	В	В	В	В	Α	Α	Α	Α	Α	А
ſ	Delay (s) = 5		V/C	0.07	0.07	0.07	0.01	0.01	0.01	0.03	0.03	0.03	0.00	0.00	0.00
			95th Queue Length(m)	1.9	1.9	1.9	0.3	0.3	0.3	0.8	0.8	0.8	0.1	0.1	0.1

Table 4-4 – 2030 Background Conditions- Intersection Performance

4.2.5 2030 POST-DEVELOPMENT

The site generated traffic is expected to have a marginal effect on the study intersections' performances. Consistent with the existing 2030 background conditions, the Kingsway/Perry Street and Kingsway/Knight Street intersections are expected to perform with issues as shown in Table 4-3. The eastbound right turn movement from East King Edward to Kingsway is anticipated to continue operating with capacity and delay issues during the PM peak hour. Other study intersections are expected to perform acceptably under the 2030 planning horizon.

		Peak		E	astbour	nd	w	/estbou	nd	N	orthbou	nd	So	uthbou	.nd
Intersection	Overall Intersection	Time	Performance	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
	V/C = 1.32		Traffic Volume	82	1103	263	58	2190	224	382	1573	48	167	1026	30
	LOS = F	AM	LOS	F	С	С	F	F	F	F	D	D	С	С	С
K.	Delay (s) = 83.2		V/C	1.20	0.71	0.71	0.86	1.24	1.24	1.32	0.99	0.99	0.66	0.66	0.66
Kingsway and Knight St	V/C - 17		Traffic Volume	#51.9 125	2020	202	#37.2	#261.3	#261.3 166	#140.7 214	#159.3	#159.3	#43.2 259	83.1 1502	59
Kinght St	LOS = F		LOS	F	2035 F	558 F	F	D	100 B	- 514 F	D	D	558 F	1352 D	D
	Delay (s) = 90.2	PM	V/C	1.70	1.25	1.25	0.88	0.89	0.29	1.18	0.88	0.88	1.32	0.97	0.97
			95th Queue Length(m)	#61.5	#261.4	#261.4	#39.7	#160.4	28.1	#116.7	123.5	123.5	#137.4	#156.4	<mark>#156.4</mark>
	V/C = 0.88	_	Traffic Volume	16	1227	17		2536	39				10	27	62
	LOS = B Delay (s) = 11.6	AM	LOS	B	B	A		B	B				C	C	C
Kingswav and	Delay (3) - 11.0	-	95th Queue Length(m)	98.0	98.0	3.7		153.1	153.1				25.9	25.9	25.9
Dumfries St	V/C = 1.2		Traffic Volume	54	2260	30		1506	47				15	38	57
	LOS = B	PM	LOS	В	В	В		Α	Α				С	С	С
	Delay (s) = 12.6		V/C	0.78	0.78	0.78		0.59	0.04				0.34	0.34	0.34
	V/C - 0.99		95th Queue Length(m)	#155.8	#155.8	#155.8		108.8	4.0	740	2475		25.4	25.4	25.4
	LOS = A	-	LOS			D				740 A	2475 A			1525 A	A
	Delay (s) = 6.9	AM	V/C			0.88				0.43	0.50			0.77	0.77
Kingsway and E			95th Queue Length(m)			#131.6				0.0	0.0			14.0	14.0
King Edward St	V/C = 1.2	_	Traffic Volume			654				681	1463			2394	1
	LOS = C	PM	LOS			F				A	A			B	B
	Delay (5) - 25.2	-	95th Queue Length(m)			#209.0				0.39	0.41			26.6	26.6
	V/C = ERR		Traffic Volume	17	1754	15	13	3173	13	3	1	46	1	0	34
	LOS = F	ΔМ	LOS	С	Α	Α	Α	Α	А	F	F	F	F	F	F
	Delay (s) = ERR		V/C	0.24	0.71	0.01	0.03	0.96	0.49	22.30	22.30	22.30	ERR	ERR	ERR
Kingsway and	V/C - 0.80		95th Queue Length(m)	6.7	6.7	0.0	0.9	0.9	0.0	ERR	ERR	ERR	ERR	ERR	ERR
Perry St	V/C = 0.89	-		50 A	2931 A	28 A	20 A	2092 A	35 A	B	B	27 B	F	F	54 F
	Delay (s) = 3.7	PM	V/C	0.21	0.89	0.46	0.12	0.85	0.02	0.05	0.05	0.05	0.69	0.69	0.69
			95th Queue Length(m)	6.3	6.3	0.0	3.3	3.3	0.0	1.2	1.2	1.2	26.6	26.6	26.6
	V/C = 0.43		Traffic Volume						58		1790	1		1222	
	LOS = A	AM	LOS						B		A	A		A	
Knight St and F	Delay (5) = 0.2	-	95th Queue Length(m)						2.08		0.45	0.27		0.24	
22nd Ave	V/C = 0.4		Traffic Volume						76		1536	172		76	
	LOS = A	PM	LOS						В		Α	Α		А	
	Delay (s) = 0.2		V/C						0.11		0.37	0.28		0.40	
	V/C - 0.04		95th Queue Length(m)	1	00			52	3.0		0.0	0.0	4	0.0	
	LOS = A	-	LOS	A	90 A			A	A				4 A		A
	Delay (s) = 0.5	AM	V/C	0.00	0.00			0.00	0.00				0.00		0.00
E 22nd Ave and			95th Queue Length(m)	0.0	0.0			0.0	0.0				0.3		0.3
Lanark St	V/C = 0.05	_	Traffic Volume	8	164			48	4				3		4
	LOS = A	PM	LOS	A	A			A	A				A		A
	Delay (S) = 0.0	-	95th Queue Length(m)	0.01	0.01			0.03	0.03				0.01		0.01
	V/C = 0.17		Traffic Volume	1	86	16	60	42	7	19	4	12	11	16	3
	LOS = A	АМ	LOS	А	Α	А	Α	Α	Α	А	Α	А	Α	А	Α
	Delay (s) = 8.1		V/C	0.16	0.16	0.16	0.17	0.17	0.17	0.06	0.06	0.06	0.05	0.05	0.05
E 22nd Ave and Dumfries St	V/C- 0.28	-	95th Queue Length(m)	N/A	N/A 129	N/A 26	N/A 20	N/A 20	N/A 10	N/A	N/A 12	N/A	N/A 5	N/A o	N/A
Dumies Sc	LOS = A		LOS	A	138 A	A	A	A	A	20 A	A 12	47 A	A	A	A
	Delay (s) = 8.5	PM	V/C	0.28	0.28	0.28	0.14	0.14	0.14	0.13	0.13	0.13	0.04	0.04	0.04
			95th Queue Length(m)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	V/C = 0.07	_	Traffic Volume		92	7	4	102		5		9			
	LOS = A	AM	LOS		A	A	A	A		B		B			
E 22nd Ave and	Delay (3) = 0.0	1	95th Queue Length(m)		0.07	0.07	0.1	0.00		0.02		0.02			
Fleming St	V/C = 0.14		Traffic Volume		170	13	5	66		7		12			
(vvest)	LOS = A	РМ	LOS		А	А	А	Α		В		В			
	Delay (s) = 0.9	-	V/C		0.14	0.14	0.00	0.00		0.03		0.03			
	V/C = 0.02		95th Queue Length(m) Traffic Volume	2	0.0	U.U 7	0.1 2	U.1 1	2	U.8	12	0.8	7	25	7
	LOS = A	-	LOS	A	A	A	A	A	A	A	12 A	4 A	A	25 A	A
	Delay (s) = 3.5	AM	V/C	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Perry St and			95th Queue Length(m)	0.5	0.5	0.5	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2
Fleming St	V/C = 0.08	4	Traffic Volume	15	5	27	3	0	5	44	23	9	4	32	9
	LUS = A Delay (s) = 5.2	PM	LOS	B	B	B	B	B	B	A	A	A	A	A	A
	Deidy (5) - 5.2	-	95th Queue Length(m)	2.08	2.08	2.08	0.01	0.01	0.01	0.04	0.04	0.04	0.00	0.00	0.00

4.3 IMPROVEMENT MEASURES

4.3.1 PERRY STREET/KINGSWAY INTERSECTION

As part of the Traffic Impact Assessment, the City of Vancouver requested that signal warrant studies be completed at the required intersections including the expected over-capacity Kingsway and Perry Street intersection. As shown in Appendix C, the warrant study was completed using standards set out by the Transportation Association of Canada (TAC), namely using the *Traffic Signal Warrant Spreadsheet* – v2.0 (TAC 2014). The conservative approach of using the projected 2030 post development traffic volumes was taken to assess the signal warrant for the Perry Street and Kingsway intersection. Midday traffic data are unavailable for this study, so the conservative approach of assuming the midday traffic volume is a combination of PM peak hour and AM peak hours is taken. Based on the traffic signal warrant guidelines provided by TAC, a traffic signal is not warranted at Perry Street intersection as the result of the minimal traffic volumes on Perry Street. According to TAC, the minor street warrant threshold is 75 vehicles per hour.

The entire Kingsway corridor operates as a system in which the upstream intersections affect traffic operations downstream. Since Miller Street and Kingsway intersection was not part of the study area, the westbound traffic volumes at Kingsway/Perry Street intersection do not account for the arrival patterns resulting from a signal at that location. Consequently, it is likely that the delay issues summarized above for Kingsway and Perry Street intersection may be overestimated. It is anticipated that the upstream signal would produce gaps in the traffic arriving at the Perry Street and Kingsway intersection. This assumption was validated by adding the Miller Street/Kingsway signalized intersection to the Synchro model for 2030 post development conditions. The signal timing and traffic volumes at the Miller Street and Kingsway intersection is assumed to be similar to Dumfries Street and Kingsway intersection for this validation study. As shown in Table 4-6, it is expected that the Perry Street/Kingsway intersection operates acceptably in practice excluding the westbound through movement which is approaching capacity (v/c=0.96) in the AM peak hour during the 2030 planning horizon.

Table 4-6 – 2030 Post Development Conditions at Kingsway and Perry Street intersection – Signalized Miller Street/Kingsway intersection metering effect incorporated

la transition	0		Deale The s	Declamation	E	astboui	nd	v	'estbou	nd	No	orthbou	nd	Sc	outhbou	ind
Intersection	Overall Ir	itersection	Реак Пте	Performance	Left	Thru	Right									
	V/C =	0.96		Traffic Volume	17	1754	15	13	3173	13	3	1	46	1	0	34
Kingsway and	LOS =	А	0.54	LOS	Α	Α	Α	А	Α	А	С	С	С	С	С	С
Perry St	Delay (s) =	0.9	Alvi	V/C	0.08	0.71	0.01	0.03	0.96	0.49	0.16	0.16	0.16	0.12	0.12	0.12
				95th Queue Length(m)	2.1	2.1	0.0	0.9	0.9	0.0	4.4	4.4	4.4	3.2	3.2	3.2

It is recommended that the Perry Street/Kingsway intersection be monitored to ensure the signalized Miller Street/Kingsway intersection provides gaps in the westbound movement for the northbound and southbound traffic. Consequently, if delay issues are still experienced by the northbound and southbound vehicles despite of the gap, it is recommended that the through and left turn movements (maximum 3 vehicles per hour during the AM peak hour in the 2030 post development conditions) be prohibited from Perry Street, and Perry Street modified to a right-out only approach. As shown in Table 4-7, Perry Street and Kingsway intersection is expected to perform within acceptable performance measures if modified to right-out only.

Table 4-7 – 2030 Post Development Conditions at Kingsway and Perry Street intersection – Perry Street modified to Right Out Only

					E	astbour	nd	w	'estbou	nd	No	orthbou	nd	So	uthbou	ind
Intersection	Ove	erall Intersection	Peak Time	Performance	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
	V/C =	0.96		Traffic Volume	17	1754	15	13	3173	13			46			34
Kingsway and	LOS =	А	0.54	LOS	С	А	А	А	А	А			В			D
Perry St	Delay (s) =	3.6	AIVI	V/C	0.24	0.71	0.01	0.03	0.96	0.49			0.06			0.19
				95th Queue Length(m)	6.7	6.7	0.0	0.9	0.9	0.0			1.7			5.4

4.3.2 KINGSWAY & DUMFRIES STREET INTERSECTION

The Kingsway and Dumfries Street intersection is a skewed intersection with a two-way stop control along Dumfries Street and a pedestrian and bike activated signal along Kingsway. The Kingsway and Dumfries Street intersection is anticipated to operate with acceptable capacity at LOS C or better under the 2030 planning horizon. The southbound movement is anticipated to operate with acceptable delay due to the high pedestrian signal activation rate as shown in Figure 5-1. The high activation rate provides a gap for southbound left-turning and through vehicles to cross the intersection.



NOTE: Summer bicycle movement was 27 (16) in the Northbound direction and 18 (6) in the Southbound direction.

Figure 4-1 – Kingsway and Dumfries Traffic Count – (2019)

As requested by the City of Vancouver, the Dumfries and Kingsway intersection was analyzed using standards set out by the Transportation Association of Canada (TAC), namely the *Traffic Signal Warrant Spreadsheet* – v2.0 (TAC 2014) and the projected 2020 pre- and post- development traffic volumes shown in Appendix C. Since mid-day traffic data was unavailable for this study, the midday peak hours are assumed to be a combination of PM peak hour and AM peak hours. Based on the traffic signal warrant analysis provided by TAC, a traffic signal is warranted at Dumfries Street intersection under the 2020 planning horizon. However, the intersection currently has a pedestrian signal and all the associated movements are expected to perform at LOS C or better in the 2030 post development planning horizon based on the Synchro 10 models. Also, the only approach which might experience delay issues is southbound movement during the absent of pedestrians. So, it is recommended that a vehicle detector loop is installed on Dumfries Street for southbound vehicles to activate the pedestrian signal upon the vehicle arrival in the absent of pedestrians. This can be set with a delay so as to not unnecessarily stop Kingsway traffic.

A warrant assessment was conducted using the *Ministry of Transportation and Infrastructure (MOTI) Electrical and Traffic Engineering Manual* for "use of separate left turn movements" as requested by the City of Vancouver. According to the manual, a left turn lane is not warranted on Kingsway at Dumfries Street as the product of the left turning volume and the opposing through volumes does not exceed 90,000 (vehicles per hour)² for two opposing through lanes. This finding was affirmed by the Synchro 10 modelling as the intersection is performing under capacity with acceptable LOS C or better on all movements.

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5 SITE ACCESS

This section reviews the proposed site accesses configuration, location and accessibility to accommodate delivery vehicles servicing the site. The circulation around the parkade is also reviewed to ensure sufficient maneuvering space is provided. The design review is based on drawings received from Rositech Hemphill Architects on October 2nd, 2019.

The proposed site access will be through a mews connecting Dumfries Street and Fleming Street approximately 30 m north of Kingsway along Dumfries Street. A ramp to the underground parkade will be provided midway through the mews. Sidewalks are currently installed along Dumfries Street and are planned to be installed along Fleming Street to provide pedestrian access to the site from Kingsway. At present, all movements will be permitted at the access.

Tracking drawings are shown and noted in Appendix D of this report. The issues identified thorough the tracking analysis are as follows:

- The SU-9M Single Unit Truck is expected to experience conflict issues exiting/entering the Class B loading space when:
 - a The other designated Class B loading spaces is being used; and,
 - b There is less than a 1 m buffer space between the parked trucks.
- Concurrent SU-9M truck movements are not feasible to/from the south on Fleming Street.
- A Light Single Unit (LSU) truck will not be able to fit into the 2.75 m wide Class A loading spot.
- Concurrent passenger car movements might experience conflicts into and out of the parkade and also in the parkade.

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6 PARKING STUDY

Since the development application was submitted prior to January 1, 2019, the date when the updated *Parking Bylaw 6059, 2019* came into effect, the provisions of the previous parking bylaw have been applied to this development. This was previously confirmed by the City in a correspondence on June 27, 2019 with Cressey Development Group. So, as per the City of Vancouver confirmation, the development is required to meet the requirements of *Parking Bylaw 6059* in terms of off-street parking, bicycle parking, and loading.

OFF-STREET VEHICLE PARKING REQUIREMENTS

The development's proposed 261 parking spaces meet the required 244 spaces required by the bylaw as shown in Table 6-1.

Table 6-1 – Parking Bylaw 6059 - Vehicle Parking Requirements

Component	Number of Units / Area	By-Law Parking Ratio	Parking Requirement (Spaces)	Proposed Parking Supply (Spaces)
Fitness Centre	952 m ²	4.2.4.4 Fitness Center 1 per 18.6 m ²	51	51
Office Space	233 m ²	 4.2.5.1 Office Uses and Retail Uses 1 per 100 m² up to 300 m² and 1 additional space for each additional 50 m² 	2	2
Grocery Store	975 m ²	4.2.5.3 Grocery Store or Drug Store 1 per 100 m ² up to 300 m ² and 1 additional space for each additional 20 m ² up to 2300 m ²	37	37
Apartment	113 DU 7816 m ²	 4.2.1.3 Three or more residential units 0.6 per DU and 1 space per each 200 m² of GFA 	107	107
Townhouse	41 DU 4497 m ²	 4.2.1.3 Three or more residential units 0.6 per DU and 1 space per each 200 m² of GFA 	47	64
TOTAL			244	261

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BICYCLE SPACE REQUIREMENTS

The proposed 200 Class A spaces meet the required 199 Class A bicycle spaces in the bylaw. The proposed 12 Class B bicycle spaces meet the required 12 Class B spaces based on the bylaw as shown in Table 6-2.

Fable 6-2 – Parking Bylav	v 6059 - Bicycle	Space Requirements
---------------------------	------------------	--------------------

Component	Number of Units / Area	Class A Requirement	Class B Requirement	Class A Requirement (Spaces)	Class B Requirement (Spaces)	Class A Provided (Spaces)	Class B Provided (Spaces)
Fitness Centre	952 m ²	6.2.3.3 A minimum of 1 space for each 250 square metres of gross floor area.	6.2.3.3 A minimum of 6 spaces for any portion of each 500 square metres of gross floor area.	4	6	4	0
Office Space	233 m ²	6.2.4.1 A minimum of 1 space for each 500 square metres of gross floor area.	6.2.4.1 A minimum of 6 spaces for any development containing a minimum of 2,000 square metres of gross floor area.	0	0	1	0
Grocery Store	975 m²	6.2.5.1 A minimum of 1 space for each 500 square metres of gross floor area.	6.2.5.1 A minimum of 6 spaces for any development containing a minimum of 1,000 square metres of gross floor area	2	0	2	6
Apartment	113 DU	6.2.1.2	6.2.1.2 A minimum of	141			
Townhouse	41 DU	1.25 spaces for every dwelling unit	development containing a minimum of 20 dwelling units.	51	6	193	6
TOTAL				199	12	200	12

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LOADING REQUIREMENTS

Parking Bylaw 6059 requires 2 Class B loading spaces. The developer plans to provide 2 Class B loading spaces as shown in Table 6-3. Also, the developer plans to provide 1 Class A loading space while no Class A loading space is required as per the bylaw.

Component	Number of Units / Area	Class A Requirement	Class B Requirement	Class A Requirement (Spaces)	Class B Requirement (Spaces)	Class A Provided (Spaces)	Class B Provided (Spaces)
		5.2.3	5.2.3				
Fitness Centre	952 m ²	No requirement	No requirement for less than 100 square metres of gross floor area	0	0	0	0
			A minimum of one space for each 2800 square metres of gross floor area.				
		5.2.7	5.2.7				
Office Space	233 m ²	No requirement for less than 1000 square metres of gross floor area	No requirement for less than 500 square metres of gross floor area	0	0	1	0
		5.2.5	5.2.5				
		No requirement	No requirement for less than 100 square metres of gross floor area.				
Grocery Store	975 m²		A minimum of one space for the first 465 square metres of gross floor area plus one space for any portion of the next 1 860 square metres and one additional space for each additional 2 325 square metres.	0	1	0	2
Apartment	113 DU	5.2.1	5.2.1				
Townhouse	41 DU	No requirement	At least one space for 100 to 299 dwelling units	0	1	0	0
TOTAL				0	2	1	2

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7 SUMMARY AND RECOMMENDATIONS

The findings and recommendations for the proposed 1503 Kingsway mixed use development traffic impact assessment in Vancouver, BC are summarized as follows:

- Cressey Development Group is proposing a new mixed-used development at 1503 Kingsway, Vancouver, BC. The proposed development will be a 13-story residential/commercial building including 2 levels of underground parking. The project will consist of 113 apartment units, 41 townhouse units, and 23,247 ft² of commercial space. The proposed development is anticipated to generate approximately 60 vehicle trips during the AM peak hour and 79 vehicle trips during the PM peak hour taking into consideration the expected site vehicle trip generated reduction as the result of the transportation mode splits.
- The site generated traffic is expected to have a marginal effect on the study intersections' performances except for the Dumfries Street and Kingsway intersection. The Dumfries Street and Kingsway intersection is controlled by a pedestrian signal, and expected to perform at LOS C or better during the peak hours under the 2030 post development planning horizon due to the high pedestrian activation rate. Delay issues might be expected for southbound vehicles in the absence of pedestrians. So, it is recommended that a vehicle detector loop is installed on Dumfries Street for southbound vehicles to activate the pedestrian signal upon the vehicle arrival. This can be set with a delay so as to not unnecessarily stop Kingsway traffic.
- The Kingsway and Perry Street intersection operates with capacity issues at LOS F on both the southbound and northbound movements during the AM peak hour according to the Synchro 10 model. The delay issues for the northbound and southbound movements are the result of the northbound and southbound turning traffic attempting to find a gap in the high westbound traffic volumes on Kingsway (2356 vehicles per hour during AM peak hour). Since the Miller Street and Kingsway intersection was not part of the study area, the westbound traffic volumes at Kingsway/Perry Street intersection do not account for the metered arrival patterns. Consequently, it is likely that the delay issues summarized above for the Kingsway and Perry Street intersection may be overestimated. It is anticipated that the upstream signal would result in metered traffic arrival at the Perry Street and Kingsway intersection. This assumption was validated by adding the Miller Street/Kingsway signalized intersection to the Synchro model for 2030 post development conditions. It is expected that the Perry Street/Kingsway intersection will operate acceptably in practice excluding the westbound through movement which will be approaching capacity (v/c=0.96) in the AM peak hour under the 2030 planning horizon.
- It is recommended that the Perry Street/Kingsway intersection be monitored to ensure the signalized Miller Street/Kingsway intersection provides gap in the westbound movement for the northbound and southbound traffic. Consequently, if delay issues are experienced by the northbound and southbound vehicles despite of the gap, it is recommended that the through and left turn movements (maximum 3 vehicles per hour during the AM peak hour in the 2030 post development conditions) be prohibited from Perry Street, and Perry Street modified to a right-out only approach. Perry Street and Kingsway intersection is expected to perform within acceptable performance measures if modified to right-out only.
- The Kingsway and Knight Street intersection is expected to perform with delay issues on all left turn movements during the AM peak hour under existing conditions. Also, the westbound through movement and southbound left turn movement are expected to approach capacity (v/c=0.92) during the AM peak hour and the PM peak hour under existing conditions. These conditions are expected to deteriorate in future conditions.
- The right turn movement from East King Edward Avenue to Kingsway is expected to operate over capacity during the PM peak hour under the 2030 planning horizon without the development traffic.
- The development plan includes a total of 261 vehicle parking spaces which is above the minimum requirement of 244 spaces per bylaw calculations. Also, it is noted 200 bicycle Class A parking spots and 12 Class B spots will be provided meeting the required 199 and 12 spaces as per the bylaw, respectively. The developer plans to provide 2 Class B loading spaces meeting the bylaw's requirement. The developer plans to provide 1 Class A loading space while no Class A loading space is required as per the bylaw.
- Vehicle tracking drawings are shown and noted in Appendix D of this report. The issues identified thorough the tracking analysis are as follows:
 - a The SU-9M Single Unit Truck is expected to experience conflict issues exiting/entering the Class B loading space when:
 - i The other designated Class B loading spaces is being used; and,
 - ii There is less than a 1 m buffer space between the parked trucks.
 - b Concurrent SU-9M truck movements are not feasible to/from the south on Fleming Street.
 - c A Light Single Unit (LSU) truck will not be able to fit into the 2.75 m wide Class A loading spot.
 - d Concurrent passenger car movements might experience conflicts into and out of the parkade and also in the parkade.

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APPENDIX

A SITE PLAN

Rona Site

Mixed-use Commercial, Apartments and Townhomes Development 1503 Kingsway, Vancouver, British Columbia V5N 3W3

PROJECT DIRECTORY

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204-15585 24th Ave
Surrey BC, V4A 2J4

Surrey BC, V4A 2J4				
PROJECT STATIST	ICS			
Lot Area:	6,226.64	m ²	67,023	Ft ²
	Allowed	-	Propos	ed
FSR		2.50		2.50
GFA		167,558		167,569
FSR	Allowed		Propos	ed
Permitted	Area	FSR	Area	FSR
Commercial	23,458	0.35	23,247	0.35
Residential	144,099	2.15	144,322	2.15
Gross Floor Area (all areas	s in square feet,	uno)		
TH BIK 1		17,319		
TH Blk 2	0.034	13,821		000 01
TH BIk 3		7,849		40,000
TH Blk 4		9,400		
Commercial				23,247
Tower (13 Storey)			1	00,893
Less Total Storage Area (113 a	pt + 11 TH units x 40	9 Ft ²)		4,960
Less Total Enclosed Balconies	(Ft ²)			0
Total GFA			1	67,569
FSR				2.50
Total # of Units				154
OVERALL GFA				
OVERALL GFA				

11 11 10

a à la b b b

11 II

TUT

TT

PARKING

Grocery Store

4.2.5.3 1/100m² GFA up to 300m², 1/20m2 up to 2,300 m², 1/30m² over 2,300 m²

10,497

Fitness Centre (12 -

80%

1/18.6m² (200 Ft²) GFA

10,245

20%)

1/100m² GFA up to 300m²

2,505

4.2.5.1 4.2.4.4 Uses arking

Floor Area (Ft²)

#of Units

of Cars

of Cars

Provided

Required

Provided Car Stalls	R ²	4,960			e Storage	w/ in-suite	1 units TH	t units) + 1	t unit (113	ige pei ap	10 ft ² stor	Less 4						
	Ft ²	3,685			ivel 1 & 2	enity at Le	Indoor Am	Less I										
Total	154	176,214	868	6,500	6,500	6,500	6,500	6,500	6,500	6,500	11,719	11,719	14,400	25,479	33,015	30,267	3,218	TOTAL
Residential Visito	6	9,400												1,739	2,930	2,978	1,753	TH - 4
	5	7,849												1,450	2,443	2,491	1,465	TH - 3
Townhouse Row	11	13,821											901	4,408	4,256	4,256		TH - 2
Townhouse Stack	15	17,319											1,122	5,505	5,343	5,349		TH - 1
TH in the Apt Bldg		3,685													2,666	1,019	AMENITY	APT - /
	ω	3,337													1,669	1,669	TH (portion)	APT - 1
Apartments	113	97,556	898	6,500	6,500	6,500	6,500	6,500	6,500	6,500	11,719	11,719	12,377	12,377	958	2,008	RESIDENTIAL	APT - F
		23,247													12,750	10,497	OMMERCIAL	APT - O
	# of Units	Total	Roaf Deck Circulation	113	L12	11	110	61	81	IJ	16	5	ц	٤	21	ы	PI	
Office Uses (L2 - 2																	LLL GFA	OVERA

167 558	ECR & linuar
167,569	For FSR
0	Less Total Inclosed Balcony sa, footage
4,960	rage per apt unit (113 units) + 11 units TH w/ in-suite Storage
	and the second second as a second as a

. સ.સ.સ્સ્

Stacked 1.0 car / unit 1.0 car Plus it > 50m* unit unit 200

& 1/50m2 of GFA nit < 50m2, 0.5 car / unit , 0.6 car / unit of Apt 84,129 100% 0% 113

171

1.0 car 1.4 cors

SITE AREA

6,226.64 M²

ots 1 to 3, Block 6, District Lot 352, Plan 2497.

EGAL DESCRIPTION

0.05 spaces per on 29 6 226 **261** 154 H 27 245 238 27 片 ω 261 261 N 39

2.0 cars

NING

BUILDING HEIGH

PROPOSED ALLOWED

48.00 M 13.80 M 39 68 51 37 0 N 107 51 37 N 8 As per require As per requ PROJECT DESCRIPTION PROJECT DESCRIPTION PROPOSED MIXED-USE COMMERCIAL, APARTMENTS MUNICIPAL ADDRESS 503 Kingsway, Vancouver BC V5N 3W3

LOCATION PLAN



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E:\ACADJOB\2016\1617 - RONA SITE - CRESSEY\DP\1617-A0.0.DWG

Open Balconies (Ft²)

Enclosed Balconies (Ft²)

Apt No. of Units

Level

Level 4

Level

,126 ,000 126

> Level 4 level Level 2 Level

Total No. Units

154 38

Sicycle Spaces Require

Commercial:

Retail and Services Uses

Class A: 1/each Class B: min 6

500 n

² (5,382 Ft²)

RONT Along Kingsway back of existing curb) **RONT Along Dumfries St.**

> 18.0 m 0.6 m

ONT Along Dumfries St. SETBACKS

Res

70

PROPOSED 2.50 ALLOWED 2.50

ONT Along Fleming St. Resid

3.70 m

MIN

0.6 m 3.7 m

Office Uses

Class & 1/each 500 m² (5,382 Ft²) Class A: 1/each 250 m² (2,691 Ft²)

itness Centre

otal Commercial Bicycle Spaces

Residential

Residential Bicycle Spaces

199

SMALL

2.5 x 5.5 m 2.3 x 4.6 m 4.0 x 5.5 m

CESSIBLE

REGULAR

ARKING STALL DE (North Property Line) **RONT Along Fleming St. Commercial**

193

13

BICYCLE

Retail and Services Uses

Class B: 1 for 465 sq

Commercial

ing Require

disabilty standard Total

TH No. Units TH in Apt Building

Level 5 Level 6 Level 7

6 of open balconies

otal Open Balconies

ta

Level 11 Level 12

604 604 604 604 604 604 604 7,614 7.5%

Level

Tota

Level 9 Level 10 Level 11 Level 12

Level 8

Level 10 Level Level 8 **OPEN & ENCLOSED BALCONIES**



0	DRAV	VINGLIST	
	PAGE	mue	SCALE
-	A0.0	COVER PAGE & STATISTICS	NA
E.	A0.0b	STATISTICS	NIA
	A0.1	CONTEXT PLAN	NA
	A0.2	CONTEXT PHOTOS	NIA
No.	A0.3	MASSING VIEV/S	NIA
8	A0.4	MASSING VIEV/S	NIA
2.	A0.5	MASSING VIEWS	NIA
	A0.6	MASSING VIEWS	NIA
	A0.7	MASSING VIEWS	NIA
	AO.B	SHADOW DIAGRAMS	N/A
	PLANS		
	A1.0	SITE PLAN	"0".1=.31/L
1	A2.0	PARKING LEVEL 1	1/18"=1"-0"
	A2.1	PARKING LEVEL 2	1/18"=1"-0"
Bidh	A3.0	LEVEL 1 PLAN	1/16"=1'-0"
ő.	A3.1	LEVEL 2 TH-5 UPPER FLOOR	1/16"=1-0"
	A3.2	LEVEL 2 COMNERCIAL	1/16"=1'-0"
	A3.3	LEVEL 3, 4 & 5	1/16"=1"-0"
	A3.4	LEVEL 6	1/18"=1"-0"
	A3.5	LEVEL 7, 8, 9 & 10	1/16"=1"-0"
	A3.6	LEVEL 11 & 12	1/16"=1'-0"
	A3.7	ROOF PLAN / MECH PENTHOUSE	1/16"=1'-0"
	A3.8	TOWNHOUSE, P1 BASEMENT FLAN	"0-1="8/1"
	A3.9	TOWNHOUSE, LEVEL 1	1/8"=1-0"
	A3.10	TOWNHOUSE, LEVEL 2	1/8"=1'-0"
	A3.11	TOWNHOUSE, LEVEL 3	1/8"=1'-0"
	A3.12	TOWNHOUSE, LEVEL 4 ROOF DECKS	1/8"=1"-0"
	A3.13	TOWNHOUSE, ROOF PLANS	1/8"=1'-0"
	ELEVA.	TIONS	
	A4.0a	MATERIALS - CONCRETE BUILDING	NIA
	A4.0b	MATERIALS - TOWNHOUSE STACKED	N/A
	A4.0c	MATERIALS - TOWNHOUSE ROW	NIA
	A4.1	BUILDING ELEVATIONS	1/16"=1"-0"
	A4.1.1	KINGS/WAY - STREETSCAPE	1/32"=1'-0"
	A4.2	BUILDING ELEVATIONS STREETSCAPE	1/18"=1'-0"
	A4.3	BUILDING ELEVATIONS STREETS CAPE	1/16"=1"-0"
	A4.4	TOWNHOUSE ELEVATIONS	1/8"=1"-0"
	A4.5	TOWNHOUSE ELEVATIONS	1/8"=1'-0"
	A4.6	TOWNHOUSE COURTYARD ELEVATIONS	1/8"=1'-0"
	BUILD	NG SECTIONS	
	A5.0	BUILDING SECTIONS	1/16"=1"-0"
	A5.1	BUILDING SECTIONS	1/16"=1'-0"
	A5.1	BUILDING SECTIONS	1/16"=1"-0"
	A5.3	BUILDING SECTIONS	1/16"=1'-0"

7'-6" x 15'-1" 13'-2" x 18'-0"	8'-2" x 18'-0"	JMUM SIZE	12.14 Feet	1.97 Feet	12.14 Feet	59.06 Feet	1,97 Feet	12.14 Feet	EQUIRED	167,569 Ft ²	167,558 Ft ²	157.5 Ft 13 STOP	45.3 Ft 4 STOR		D TOWNHOMES DEVELOP
27 x 4.6 m 4.0 x 5.5 m	27 x 5.5 m		3.70 m	0.6 m	3.7 m	18.0 m	0.6 m	3.70 m	7			REY REFER TO E	EY	 67,023.00 Fl ²	MENT.
8-10" x 15-1" 13'-2" x 18'-0"	8'-10' x 18'-0"	PROVIDED	12.14 Feet	1.97 Feet	12.14 Ft Avera	59.06 Feet	1.97 Feet	12.14 Ft Avera	ROPOSED			LEVATIONS AND SECT			



Rositch Hemphill Architects

120 Powell Street, Unit 10 Vancouver, BC Canada V6A 1G1

www rharchitects ca

ISSUED: 1. DPA 2. DP RE-SUBMISSION

DATE: 28 SEPT 2018 00 MAY 2019

DRAFT PROGRESS FOR REVIEW 07 MAY 2019

NO. REVISION:

This drawing as an instrument of service is the property of Realech Hernphili Architects and may not be encoduced without the firm's permission. All information shown on the drawing is for use in this specific project only and shall not be used ontervices whole writers persisten from the bear of the service and the information of the office. Concretors shall writerly and be responsible for all dimensions on the job and this office shall be informed of any disorpancies and variations shown on drawing.

TOTAL

41







CHECKED DRAWN PLOT DATE : SCALE DATABASE : 07 MAY 2019

1617-A0.0.dwg NA

COVER PAGE PROJECT STATISTICS

VING TITLE

RONA SITE MIXED-USE RESIDENTIAL TOWNHOUSE DEVELOPMENT 1503 KINGSWAY, VANCOUVER, B.C.

ARCHITECTURAL SEAL:

DATE:



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APPENDIX

B TERMS OF REFERENCE

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The proposed development will be a 12-story residential/commercial building with an additional 2 levels of underground parking. It is to be located on the north side of Kingsway between Dumfries Street and Fleming Street. A draft site plan is shown in Figure 2.

Cressey is commissioning a TIA to support their application of a mixed-use development by:

- Quantifying impacts of the proposed development in the immediate road network to the satisfaction of the City of Vancouver's (the City's) TIA Terms of Reference (ToR) guidelines in their Transportation Assessment and Management Study Guidelines for Consultants (2008) (TAMS Guidelines); and,
- Demonstrating mitigation efforts where those effects are shown to be significant from the perspective of the City.

This ToR is based on the updated design provided to WSP in an email on September 21, 2018.

The purpose of this ToR is to establish the parameters of which this TIA will be conducted, with consideration and agreement from the City.

STUDY AREA

The development traffic is anticipated to use the following intersections within the vicinity of the proposed site:

- 22 Avenue at Fleming Street
- 22 Avenue at Dumfries Street
- 22 Avenue at Lanark Street
- 22 Avenue at Knight Street
- Fleming Street at Perry Street
- Kingsway at Perry Street
- Kingsway at King Edward Avenue
- Kingsway at Dumfries Street
- Kingsway at Knight Street

NEARBY STREET FACILITIES

WSP will assess the existing walking, cycling, transit and driving facilities within the area shown in Figure 3 to determine if any upgrades will be required due to the proposed development.

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Figure 2: Proposed Site Plan Source: Rositch Hemphill Architects

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Figure 3 Proposed Study Boundary Source: Google Earth

The roads to be reviewed include:

- 22 Avenue between Knight Street and Perry Street (north boundary)
- Perry Street between 22 Avenue and Kingsway (east boundary)
- Kingsway between Perry Street and Knight Street (portion of south boundary)
- King Edward Avenue between Kingsway and Knight Street (portion of south boundary)
- Knight Street between King Edward Avenue and 22 Avenue (west boundary)
- Dumfries Street between King Edward Avenue and 22 Avenue
- Fleming Street between 22 Avenue and Perry Street

EXISTING TRAFFIC VOLUMES

WSP obtained historic traffic volumes for the area from the City's website. The most recent data for the area was 2009 and not at all required intersections. Assuming the City cannot provide WSP with newer counts, WSP proposes to conduct one day of am and pm peak hour traffic counts at the intersections identified below.

- Kingsway at Perry Street
- Kingsway at Dumfries Street
- Kingsway at Knight Street

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The counts will be conducted on a weekday at times approved by the City. The suggested times are from 7:00am to 9:00am and 3:30pm to 5:30pm.

GROWTH RATE

WSP obtained historic traffic volumes along Kingsway from the City's website. A summary of the volumes is provided below:

Table 1 Historic	Volumes at	Kingsway	and Knight	Street	Intersection
			<u> </u>		

YEAR	COUNT DAYS	AVERAGE 2-WAY DAILY VEHICLE VOLUMES	PERCENT ANNUAL INCREASE
2013	3	38,585	2.7
2011	2	36,633	-

Based on the available data, the average annual growth rate is 2.7 percent. WSP proposed to apply this growth rate to the existing traffic volumes to determine future background traffic volumes.

DEVELOPMENT INFORMATION

Cressey is seeking to construct a mixed-use development at 1503 Kingsway. The planned development will have a total GFA of 175,758 square feet and will consist of the following:

- Townhouses (38 units)
- Condo (128 units)
- Commercial:
 - Grocery Store (10,500 sq.ft)
 - Fitness centre (10,320 sq. ft)
 - Office space (2,580 sq. ft)

TRIP GENERATION

City Guidelines indicate that the ITE Trip Generation Manual should be used wherever possible. The following ITE codes will be used for trip generations.

Table 2 Proposed Land Uses

			TRIP	
PROPOSED		ITE LAND	GENERATION	PLANNED
LAND USE	ITE LAND USE	USE CODE	UNIT	NUMBER
Residential	Townhouses	220	Townhouse Units	38
Residential	Condos	222	Condo Units	128
Commercial	Supermarket	850	1,000 sq. Feet	10,500 sq. Feet
Commercial	Health/Fitness Club	492	1,000 sq. Feet	10,320 sq. Feet
Commercial	General Office Building	710	1000 sq. Feet	2,580 sq. Feet

Due to the mixed-use nature of the development, there is potential for internal trips. WSP suggests 20 percent of trips will be internal (between the various land uses within the development).

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Assuming the above land uses and ITE trip generation codes, Table 3 shows the estimated trip generation for the proposed development. The trips generated were based on ITE Trip Generation Manual, 10th edition (September 2017).

Table 3: Trips Generated in the AM and PM Peak Hours

				NO.	OF TI	RIPS				
ITE Land Use	Peak Hour	ITE Average Trip Generation Rate	Adjusted Trip Generation Rate*	Proposed		In	Out	In	Out	Total
Townhouses	AM	0.46	0.37	38	Units	0.23	0.77	3	11	14
(Peak Hour of Adjacent Street Traffic)	PM	0.56	0.45			0.63	0.37	11	6	17
Condos (Peak Hour of	AM	0.31	0.25	128	Units	0.24	0.76	8	24	32
Adjacent Street Traffic)	РМ	0.36	0.29			0.61	0.39	22	14	36
Supermarket (Peak Hour of the	AM	6.67	5.34	10,500	sq.ft	0.52	0.48	29	27	56
Generator)	PM	7.6	6.08			0.52	0.48	33	31	64
Health/Fitness Club	AM	1.4	1.12	10,320	sq.ft	0.46	0.54	5	6	11
(Peak Hour of the Generator)	PM	3.92	3.14			0.52	0.48	17	16	33
General Office Building	AM	1.47	1.18	2,580	sq.ft	0.88	0.12	3	0	3
(Peak Hour of the Generator)	PM	1.42	1.14			0.18	0.82	1	2	3
* The calculated vehicl	le volume	es were reduced	d by the	Total AM Trips:				48	68	116
expected internal trip in trip assumptions (20%)	lumbers j).	for mixed use a	levelopment	Tot	al PM	Trips:		84	69	153

ADDITIONAL TRIP TYPES

WSP reviewed potential pass-by and diverted-link trips for the commercial development and assumes there will be negligible trips of these types. As such, no diverted link or pass-by trips were incorporated into the assumptions.

TRIP DISTRIBUTION AND ASSIGNMENT

The trip distribution (by percent) for the development is shown in Figure 4.

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Figure 4 Development Trip Assignments (%) Source: Google Earth

MODAL SPLIT

The 2011 National Household Survey (NHS) provides transportation mode splits for trips to/from work. We compared Canada's overall transportation mode split with the City's and development neighbourhood's (Vancouver-Kingsway) transportation mode split. Table 4 shows Canada's, the City's, and development neighbourhood's 2011 NHS transportation mode splits.

Table 4 Transportation Mode Split (NHS 2011)

TRANSPORTATION MODE	CANADA	VANCOUVER	DEVELOPMENT NEIGHBOURHOOD (VANCOUVER- KINGSWAY)
Vehicle (driver)	74%	48%	53%
Vehicle (passenger)	6%	4%	5%
Public Transit	12%	30%	33%
Walk	6%	13%	4%
Bicycle	1%	4%	4%
Other	1%	2%	1%

The modal split identified in Table 4 for the development is used to reduce the number of vehicle trips into and out of the development by 47%. WSP will take note of the actual modal split of pedestrians and cyclist during the traffic counts and will adjust if they are significantly different than the above numbers for cyclist and pedestrians. The modal split of Transit, Vehicle Passengers, and Other will remain as indicated in Table 4.

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The number of development trips which take into consideration modal split and internal site trips during the morning and afternoon peak hours are presented in Figure and Figure 6. Note that any discrepancies with number totals is due to rounding.



Figure 5 Development AM Trips Source: Google Earth



Figure 6 Development PM Trips Source: Google Earth

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ASSESSMENT YEARS/SCENARIOS

WSP will conduct an analysis for the following scenarios during peak hour traffic volumes.

Table 5 Assessment Years

ASSESSMENT YEAR	ASSESSMENT SCENARIOS
Current Year (2018)	Background
Development Completion (est. 2020)	Background; Background + Development
10 Years After Development Completion (est. 2030)	Background; Background + Development

COMBINED TRIPS

WSP will superimpose the estimated traffic volumes generated by the proposed development on the future background horizon year traffic volumes to assess the impacts of the development traffic compared to the background traffic growth.

INTERSECTION PERFORMANCE

If it is found that further analysis is required beyond what is outlined in the ToR, WSP will determine the intersection performance for the locations identified as requiring further analysis using Trafficware Synchro modelling. The software, utilizes the Highway Capacity Manual (HCM) 5th Edition (2010) for assessing the Level of Service (LOS) at each approach and overall intersection performance. The HCM criteria for the Two-Way Stop Controlled (TWSC) and Signalized intersections are provided below.

The following intersections may require further analysis:

- Kingsway/Dumfries Street
- Kingsway/Knight Street
- Kingsway/Perry Street

Table 6 TWSC Intersection Level of Service Criteria (2010 HCM)

CONTROL DELAY	LOS BY VOLUME-TO-CAPACITY RATIO				
(SECONDS/VEHICLE)	V/C ≤ 1.0	V/C ≥ 1.0			
0 - 10	А	F			
< 10 - 15	В	F			
< 15 - 25	С	F			
< 25 - 35	D	F			
< 35 - 50	Е	F			
>50	F	F			

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CONTROL DELAY	LOS BY VOLUME-TO-CAPACITY RATIO				
(SECONDS/VEHICLE)	$V/C \le 1.0$	V/C ≥ 1.0			
≤ 10	А	F			
> 10 ≤ 20	В	F			
> 20 ≤ 35	С	F			
> 35 ≤ 55	D	F			
> 55 ≤ 80	Е	F			
> 80	F	F			

Table 7 Signalized Intersection Level of Service Criteria (2010 HCM)

WSP will note the LOS at each intersection and suggest mitigation measures where the following conditions are met/exceeded:

- Level of Service (LOS): D
- v/c: 0.90 (each movement)

WSP proposes to use the following Synchro parameters when analyzing the intersection performance.

Table 8 Synchro Input Parameters

PROPOSED VALUE
7.5m
12.5m
1900 for all movements
0
Synchro default
2m
Synchro default
Calculated from traffic volume counts
Calculated from traffic volume counts

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INPUT PARAMETER	PROPOSED VALUE
Peak hour factor	0.95
Growth factor	1.0 (separate from annual traffic volume growth)
Heavy vehicles	Calculated from traffic volume counts; or 2.0%
Bus blockages	Enter from transit schedules:
	– Kingsway: 19, 25
	– Knight: 22
Link OD volumes	Synchro default
Lane group flow	Synchro default
Vehicle clearances and existing timings	To be provided by City if required
Minimum initial main street	To be provided by City if required
Minimum initial side street	To be provided by City if required
Minimum split	Synchro default

RESULTS

WSP will produce a report discussing the results of the Synchro analysis. A summary table will be included in the final report; the table will show the LOS, 95th percentile queue length, volume to capacity (v/c) ratio, and approach delay for each intersection approach lane, in addition to the overall intersection LOS. Synchro result reports will be provided as an appendix in the final report.

Any approach lanes and intersections performing below specified performance parameter thresholds will be identified. If any performance criteria drop below requirements in any scenario, WSP will make mitigation recommendations.

OPERATIONAL/SAFETY REVIEW

WSP will conduct a high-level operational/safety review of the existing layout of the area and determine what, if any, issues may arise due to the additional traffic. This will include the access intersections and on-site movements. The operational/safety review will consider people arriving by different modes and assess sight lines, any conflicts between different modes and where onsite parking and vertical/horizontal grades are an issue.

PARKING

WSP will provide comments on the currently proposed parking garage layout and access roads into/out of it as part of the TIA with reference to the City of Vancouver Parking and Loading Design Supplement. The review will include determining if the number of parking spaces are sufficient and if the layout allows for safe and efficient movements. The design will be reviewed to ensure SU-9M vehicles can access the proposed loading spaces.

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RECOMMENDATIONS

WSP will identify the required mitigation measures (if any) to the City's road network within the vicinity of the development area considering all modes of transportation that will be necessary to accommodate the proposed development.

FINAL TIA REPORT

WSP will produce a draft report outlining the results of the transportation study, first submitted to the Developer and once approved submitted to the City in electronic (PDF) form for review. Upon receipt of the City's comments and confirmation of all revisions, we will submit the Final report in electronic (PDF) format.

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Jesse Arsenault, P.Eng. Transportation Engineer, Transportation

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APPENDIX



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APPENDIX









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CONCURRENT TRUCK MOVEMENTS NOT POSSIBLE AT THIS LOCATION WHILE PASSENGER CARS COULD MOVE SIMULTANEOUSLY.



	motoro
Width	: 2.44
Track	: 2.44
Lock to Lock Time	: 6.0
Steering Angle	: 31.8

motore

1503 KINGSWAY TRAFFIC ASSESSMENT 19M-01026-00

VEHICLE TRACKING DESIGN SPEED: 5 km/h DESIGN VEHICLE: AASHTO SU-9M

SHEET 3 COMMERCIAL LOADING (CLASS B)







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