TRANSPORTATION PLANNERS AND ENGINEERS

537 20 Ave SW

Transportation Impact Statement

Version 2

Prepared for

Unitii Corp

Date

May 22, 2024

Project Number

02-24-0039

City File Number

LOC2024-0041

Bunt & Associates acknowledges and respects the Traditional Territories upon which our work spans, and from which we benefit. We are grateful for the unique cultures and histories of Indigenous Peoples that enrich our understanding and connection to the lands we call home. We honour learning, listening, and truth in our journey to reconciliation.

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PERMIT TO PRACTICE
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The Association of Professional Engineers
Geologists and Geophysicists of Alberta

APEGA Company Permit to Practice

PROFESSIONAL ENGINEER ALBERTA
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May 22, 2024
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Engineer's Stamp

Written with respect and gratitude for the Traditional Territories upon which we work and live.

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CHANGE LOG

This report has been updated to address a set of comments provided by the City of Calgary on May 22, 2024 in relation to the first version of this report (dated April 2024). City comments (identified in blue), and how they were addressed by Bunt & Associates in this update are outlined below.

Appendix A – The Mar 2024 ped count shows 0 peds crossing the north side over 6 hours, and about 130 on south side. Were all ped volumes on the north side grouped into the south volumes as well? Or is there literally 0 peds counted on the north side, which seems very odd.

> The traffic count in Appendix A has been corrected in this version. A total of 16 pedestrians crossed on the north side during the 6-hour count.
>
> The signal warrants (Section 3.2.3 and Appendix B) have been updated to include pedestrians crossing on the north side. Conclusions remain unchanged.

Section 3.2.3, we would expect pedestrian warrant score to be higher after development and not remain the same at 20. Please update the warrant to account for additional pedestrians after development. You may use engineering judgement to simply assume a reasonable amount of pedestrians, without providing detailed ped generation calcs.

> The After Development pedestrian volumes have been updated in the signal warrant. Conclusions remain unchanged.

Section 3.2.4, discuss how much site traffic adds to the overall collision potential. Compare site traffic volume with existing volumes to see if it's a tangible increase (i.e X% overall increase)

> A statement has been added discussing the limited traffic increase expected (+1.3%) and associated negligible change to collision potential.

1. EXECUTIVE SUMMARY

A land use redesignation (from M-C2 & M-CGd111 to M-H1f3.3h22) is proposed to accommodate a new 5-story multi-family development with 71 dwelling units, 60 parking stalls, and 79 bicycle stalls at 537 20 Avenue SW. A Transportation Impact Statement (TIS) was prepared to provide a transportation overview of the proposal. Study findings are outlined below.

Vehicles

Trip Generation		- The development will generate 15 new peak hour trips, which is below the 100 trips per hour threshold for requiring a Transportation Impact Assessment (TIA).
5 Street & Royal Avenue SW	Configuration	- At the intersection of 5 Street SW, the Lane servicing the site is off-set from Royal Avenue SW.
	Capacity	- Intersection analysis confirms 5 Street & Royal Avenue SW/Lane will continue to operate within City of Calgary standards after site development.
	Signal Warrant	- A traffic signal will remain not warranted after site development.
	Collisions	- A review of collision history did not identify a need for control or geometric changes. On-street parking prohibitions on 5 Street SW (west curb – 15m on either side of from Royal Avenue) would improve visibility but are not required based on collision history.
Road Capacity		- All adjacent roadways will continue to carry traffic volumes below guidelines after the addition of the proposed development.

Active Transportation

Pedestrian	- The site is in a mixed-use community near many amenities. No pedestrian facility changes are required.
Cycling	- An on-Street bikeways is provided on 5 Street SW connecting to the Elbow River pathway and Centre City Cycle Track network.
Transit	- Bus service is provided within 200 metres on 4 Street SW. Frequent bus service is provided by route #3 with additional service provided by routes #17 and 449.

Parking

Bylaw	- Vehicle and bicycle parking requirements will be met.
On-Street	- Parking restrictions (permit and time) are in place in the area.

2. INTRODUCTION

2.1 Scope of Work

The scope of this study is identified below.

Vehicles

- *Trip Generation* – Calculate anticipated new development trips and compare with Transportation Impact Assessment (TIA) guidelines.
- *5 Street & Royal Avenue SW/Lane* – Review operations at the intersection.
  - *Volumes* – Identify After Development volumes.
  - *Analysis* – Complete intersection capacity and signal warrant analysis.
  - *Collisions* – Review collision history.
- *Roadway Capacity* – Identify After Development daily traffic volumes on area roadways. Confirm volumes will remain within City guidelines.

Active Transportation

- *Pedestrian* – Review sidewalk connectivity and crossing controls near the site.
- *Cycling* – Review connectivity to cycling facilities.
- *Transit* – Review service levels and connectivity to transit stops.

Parking

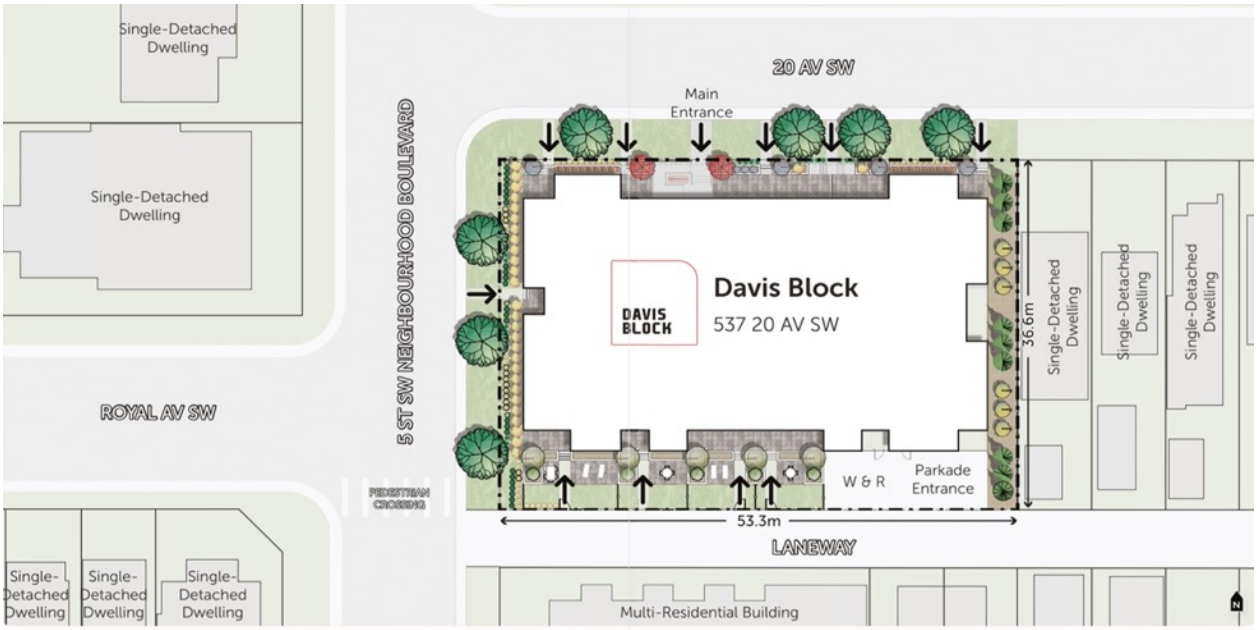
- *Bylaw Requirement* – Compare vehicle and bicycle parking requirements with anticipated supply.
- *On-Street Parking* – Identify area parking restrictions.

2.2 Site Context

The site is in the community of Cliff Bungalow and bounded by 20 Avenue SW to the north, existing residential lots to the east, a laneway to the south, and 5 Street SW to the west. The site context is illustrated in **Figure 2.1**. The conceptual site plan is illustrated in **Figure 2.2**.

Figure 2.1: Site Context

Figure 2.2: Concept Plan



**Note: Design is conceptual and for illustrative purposes only. Details to be determined through the Development Permit application.*

3. VEHICLES

3.1 Trip Generation

The City of Calgary's *Transportation Impact Assessment (TIA) Guidelines* states a TIA will be required if a development has the potential for generating more than 100 new hourly trips.

The following density change is proposed from existing development:

- Proposed: 71 dwelling units
- Existing: 18 dwelling units
- Net Increase: 53 dwelling units

The expected increase in vehicle trips is summarized in **Table 3.1** based on the Institute of Transportation Engineers (ITE) *Trip Generation Manual* (11th Edition). The development will generate 17 new hourly vehicle trips, which is below the 100 trips per hour threshold identified by the City of Calgary for requiring a TIA.

Table 3.1: Trip Generation (Vehicle)

USE	DENSITY	TRIP GENERATION RATES		TRIP GENERATION	
		AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Residential	53 Units	0.28 per unit (14% In, 86% Out)	0.26 per unit (74% In, 26% Out)	15 (2 In, 13 Out)	14 (10 In, 4 Out)

*Trip Generation Source: ITE Land use #221 (Multifamily Housing Residential – Urban)

3.2 5 Street & Royal Avenue SW

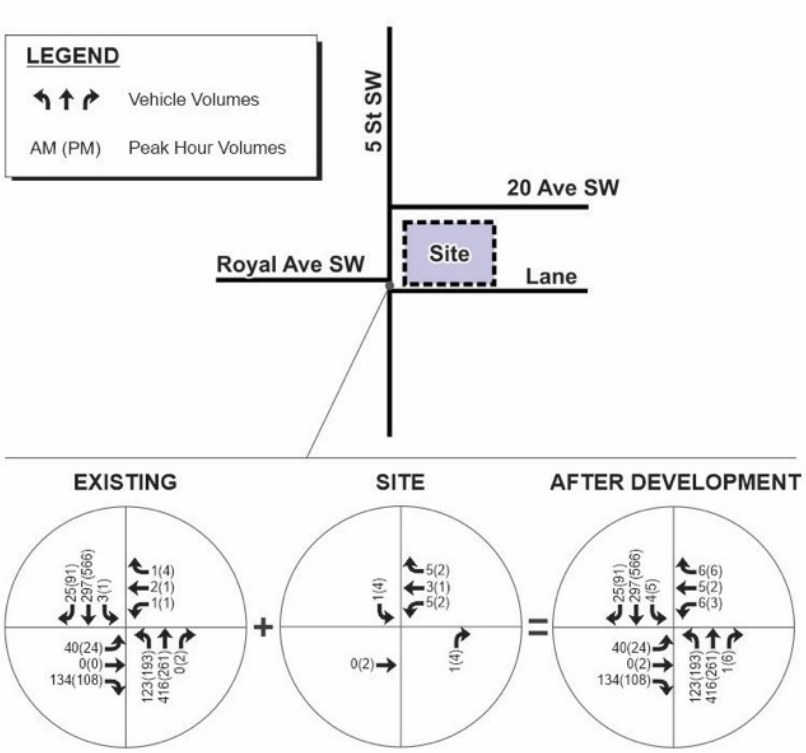
The intersection of 5 Street & Royal Avenue SW is off-set from the Lane as illustrated in **Figure 3.1** with east-west movements stop controlled. While not required by City TIA guidelines, a further review of this intersection is completed to review the net impact of the development.

Figure 3.1: 5 Street & Royal Avenue SW Intersection

3.2.1 Volumes

Existing traffic volumes were determined from a traffic count completed on March 12, 2024 and included in **Appendix A**. To be conservative, all site vehicle trips were assigned to/from the Lane at 5 Street SW. Resulting After Development traffic volumes are illustrated in **Figure 3.2**.

Figure 3.2: Traffic Volumes



3.2.2 Intersection Analysis

Synchro 11 traffic analysis software was used to complete intersection capacity analysis based on the methods outlined in the Highway Capacity Manual (2000). Traffic operations were assessed using performance measures that include volume-to-capacity (v/c) and Level of Service (LOS).

The volume-to-capacity (v/c) ratio of an intersection movement represents the ratio between the demand volume and available lane capacity. A v/c ratio over 1.0 indicates a congested intersection where drivers may have to wait through more than one signal cycle. The Level of Service (LOS) rating is based on average vehicle delays, which ranges from LOS A (minimal delay) to LOS F (significant delay).

Analysis was completed per City of Calgary TIA guidelines. Synchro output reports are provided in **Appendix B**. Volume to capacity (v/c) ratios, levels of service, average control delays (seconds), and 95th percentile queues (metres) are summarized in **Table 3.2.**

Table 3.2: Intersection Analysis (5 Street SW and Royal Ave SW/Lane)

INTERSECTION	HORIZON	MOVEMENT & LANES		AM PEAK HOUR v/c	AM PEAK HOUR LOS	AM PEAK HOUR Delay	AM PEAK HOUR Queue	PM PEAK HOUR v/c	PM PEAK HOUR LOS	PM PEAK HOUR Delay	PM PEAK HOUR Queue
5 Street SW& Royal Avenue SW/Lane *(East-West Stop)*	Existing	EB	1	0.46	C	22	18	0.54	D	34	22
		WB	1	0.02	C	25	<5	0.03	D	27	<5
		NB	1	0.11	A	3	<5	0.23	A	6	7
		SB	1	<0.02	A	0	<5	<0.02	A	0	<5
		Overall		-	*A*	*5.2*	-	-	*A*	*5.9*	-
	After Development	EB	1	0.47	C	22	19	0.56	E	37	24
		WB	1	0.09	D	27	<5	0.09	E	36	<5
		NB	1	0.11	A	3	<5	0.23	A	6	7
		SB	1	<0.02	A	0	<5	<0.02	A	0	<5
		Overall		-	*A*	*5.5*	-	-	*A*	*6.4*	-

The intersection capacity analysis indicates the study intersection of 5 Street & Royal Avenue SW/Lane is expected to continue operating within acceptable limits. While the Lane was off-set in the Synchro analysis input settings, Synchro analysis may not fully account for the off-set impact. That said, the Lane volume is low, and the analysis confirms the westbound (Lane) movement operates well below capacity.

3.2.3 Signal Warrant Analysis

Signal warrant analysis was completed for 5 Street SW and Royal Ave SW/Lane based on the Transportation Association of Canada (TAC) *Traffic Signal and Pedestrian Signal Head Warrant Handbook* (2014). A score of 100 points or more indicates a traffic signal is warranted. The warrant analysis is summarized in **Table 3.3** and included in **Appendix B**.

Table 3.3: Signal Warrant Analysis

INTERSECTION	HORIZON	SIGNAL WARRANT SCORE Total	SIGNAL WARRANT SCORE Vehicle	SIGNAL WARRANT SCORE Pedestrian	COMMENT
5 Street SW & Royal Ave SW	Existing	74/100	52	22	Not warranted
	After Development	79/100	55	24	

**6-hour volumes generated by applying an observed factor of 2.47 applied to AM+PM peak hour volumes.*

Signal warrant analysis indicated that a traffic signal remains not warranted at 5 Street & Royal Ave SW/Lane after the site development.

3.2.4 Collisions

Collision history for 5 Street & Royal Avenue SW/Lane was obtained from the City for the last 8-year period (2016-2023). Data is summarized in **Table 3.4**. All collisions were property damage only (no injuries).

Table 3.4: 8-Year Collision History (5 Street SW)

COLLISION TYPE	8-YEAR COLLISION TOTAL	ANNUAL AVERAGE
Rear End	12	1.50
Side Swipe – Same Direction	2	0.25
Side Swipe – Opposite Direction	1	0.13
Passing – Left Turn	1	0.12
Right Angle	3	0.38
TOTAL	19	2.38

The predominate collision type was rear end due to vehicles stopping on 5 Street SW waiting to turn or let pedestrians cross the street. The 3 right-angle collisions over the 8-year period were from drivers/riders (2 vehicles; 1 e-scooter) on Royal Avenue SW turning onto 5 Street SW without an adequate gap. The e-scooter collision is noted as the rider losing brakes and entering the intersection without stopping.

The RRFB (rectangular rapid flashing beacon) crosswalk added in 2019/2020 provides pedestrian visibility and reduces pedestrian collision risk. As is common in inner city locations, on-street parking reduces vehicle visibility for vehicles turning from Royal Avenue SW onto 5 Street SW; on-street parking prohibitions on 5 Street SW within 15 metres of the intersection (west side) would improve visibility but are not necessarily required based on collision history.

Development traffic would represent a 1.3% uplift of turning movement volumes at 5 Street & Royal Avenue SW/Lane. This uplift in traffic would not be expected to appreciably impact collision potential.

3.3 Road Network Capacity

Site frontages on 5 Street SW (2-lane Neighbourhood Boulevard), 20 Avenue SW (Residential), and the Lane are illustrated in **Figure 3.3**. Daily vehicle traffic volumes on nearby frontages are calculated and compared to City of Calgary guidelines in **Table 3.5**. The review confirms that all adjacent roadways will continue to carry traffic volumes within their respective guidelines after the addition of the proposed development.

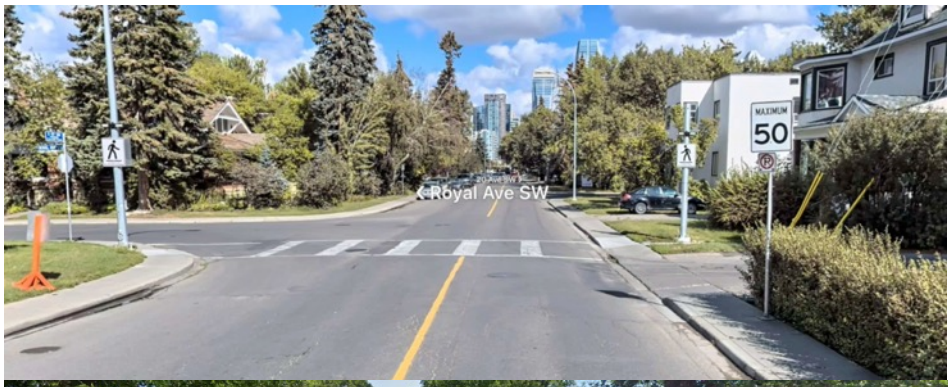
Table 3.5: Daily Volume Analysis

ROADWAY	TYPE	DAILY VOLUME GUIDELINE	DAILY VOLUMES	
			Existing	After Development
5 Street SW	Neighborhood Boulevard	12,500 – 22,500	13,100	13,240
Royal Ave SW	Collector	2,000 – 8,000	4,250	4,275
Lane	Lane	≤ 1,500	110	250

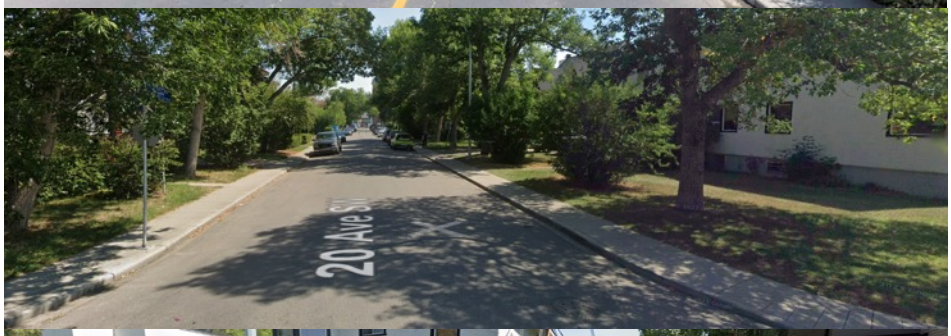
**Existing daily volumes are determined by applying an expansion factor of 2.5 to 6-hour volumes. Site traffic added by applying a factor of 10 to PM peak hour volumes.*

Figure 3.3: Site Frontages

5 Street SW



20 Avenue SW



Lane

4. ACTIVE TRANSPORTATION

4.1 Pedestrian

Pedestrian infrastructure within the study area is illustrated in **Figure 4.1**. The site is located within a walkable mixed-use neighbourhood near numerous amenities. A pedestrian facility review identifies:

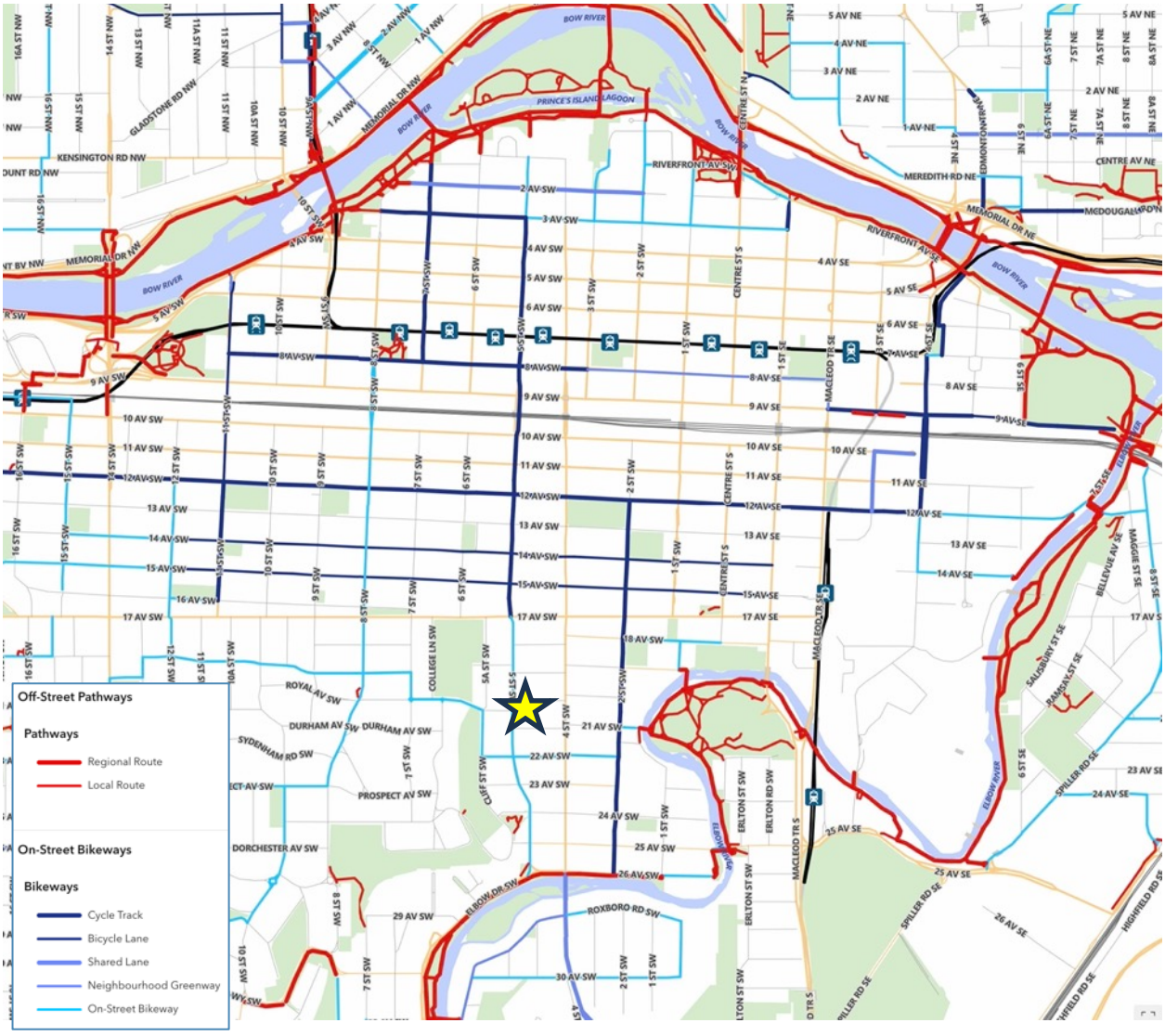
- *Sidewalks* – There are no missing links impacting site connectivity.
- *Crossings* – The current RRFB (rectangular rapid flashing beacon) crosswalk at 5 Street & Royal Avenue SW is consistent with Transportation Association of Canada (TAC) guidelines. No control changes are warranted.

Figure 4.1: Pedestrian Network

4.2 Cycling

Cycling facilities near the site are illustrated in **Figure 4.2**. An on-street bikeway on 5 Street SW (shared vehicle/bicycle lane) provides connectivity to the Elbow River pathway system and Centre City Cycle Track network.

Figure 4.2: Cycling Network



4.3 Transit

Transit service (route #3, 17, 449) is provided on 4 Street SW with bus stops within 200 metres walk. The existing area transit network is illustrated in **Figure 4.3** and summarized in **Table 4.1**.

Figure 4.3: Transit Service

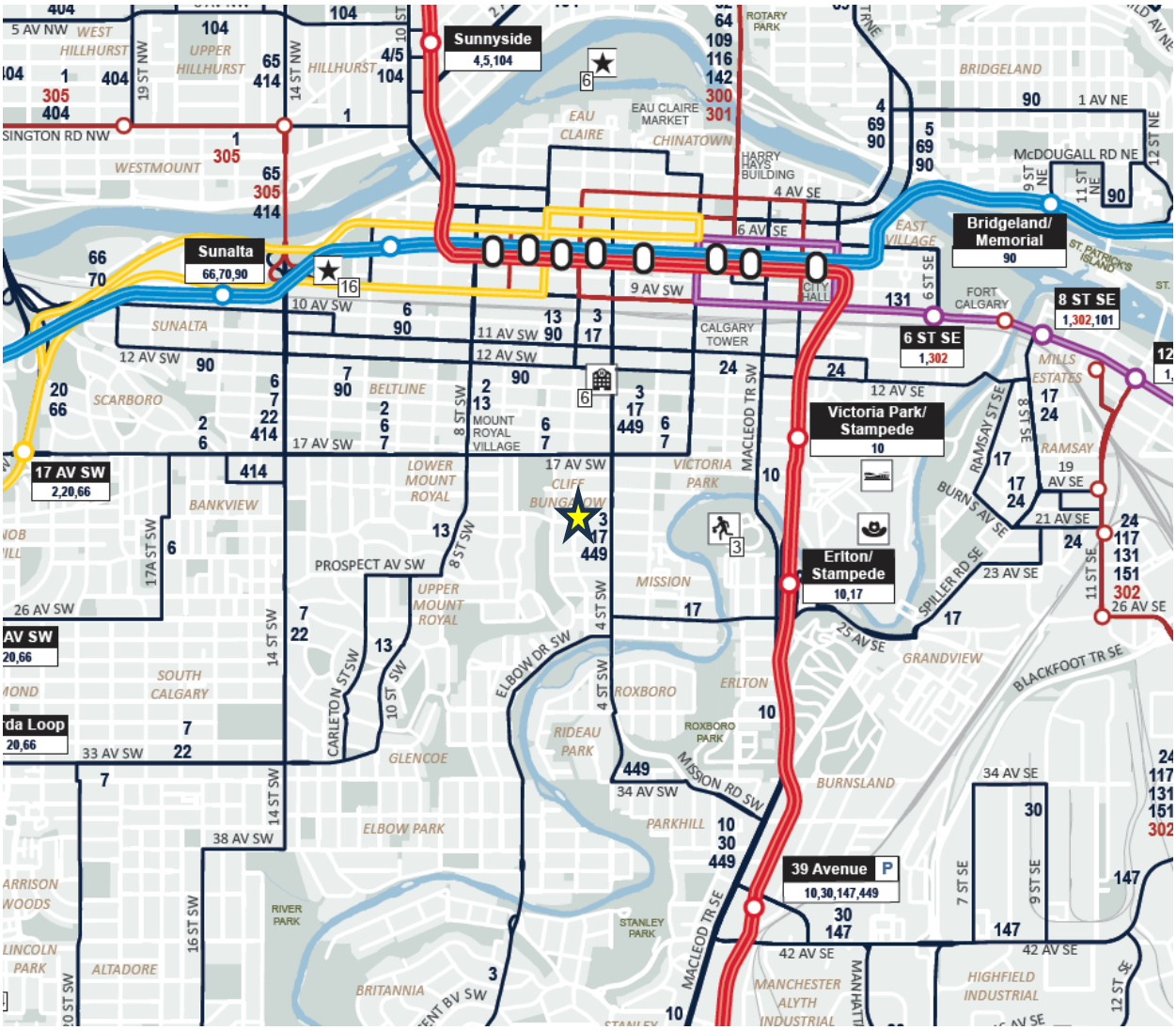


Table 4.1: Transit Frequency

ROUTE		DISTANCE TO STOP	FREQUENCY (MINUTES)	
#	Name		Peak	Off-Peak
3	Sandstone/Elbow Dr SW	200 m	6-7 minutes	15-20 minutes
17	Renfrew/Ramsay	200 m	32 minutes	45 minutes
449	Eau Claire/Parkhill	200 m	50 minutes	50 minutes

5. PARKING

5.1 Bylaw

Bylaw parking requirements are calculated in **Table 5.1** in accordance with Land Use Bylaw 1P2007 (Part 6 – Multi-Residential districts). The development will meet or exceed all bylaw parking requirements.

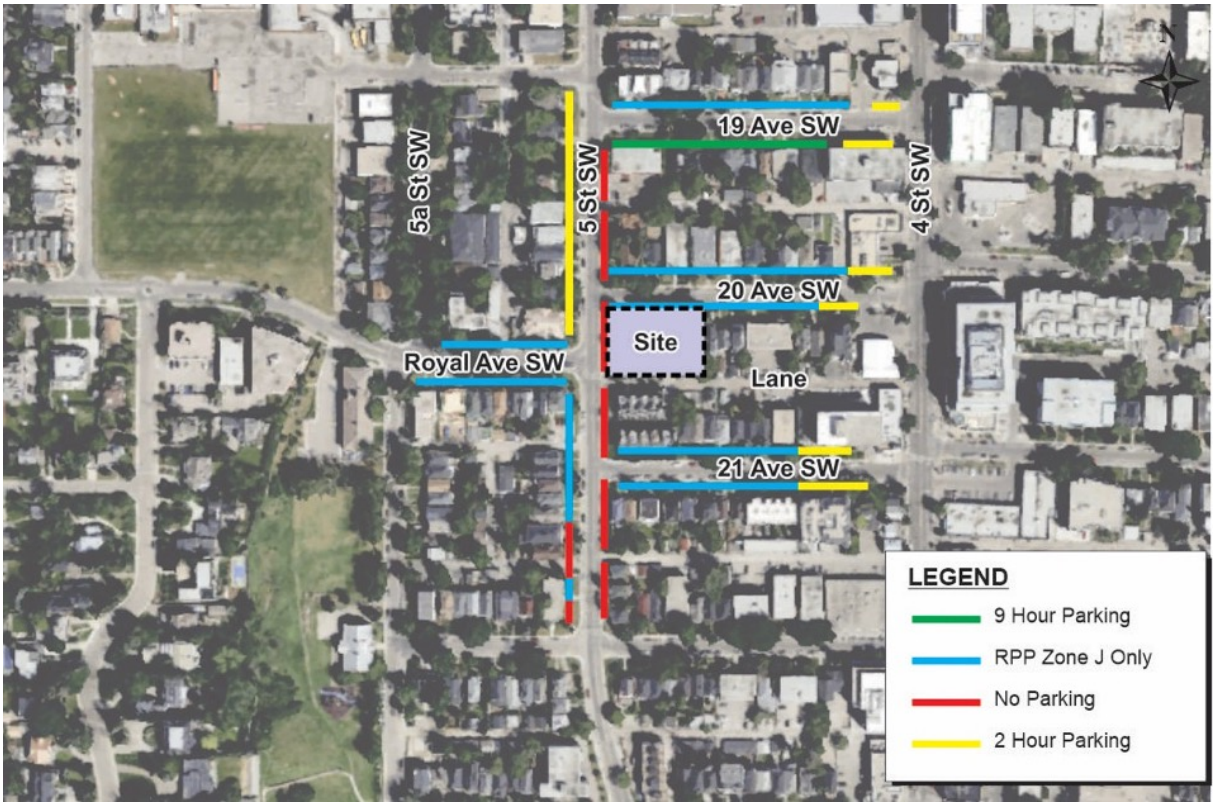
Table 5.1: Bylaw Parking Requirement

STALL TYPE		DENSITY	BYLAW MINIMUM RATIO	STALLS		
				Bylaw	Proposed	Difference
Vehicle	Resident	71 Units	0.625 stalls per unit -25% transit supportive reduction	34	60	+26
Bicycle	Class 1		1.00 stalls per unit	71	71	0
	Class 2		0.10 stalls per unit	8	8	0

5.2 On-Street

On-street parking restrictions are illustrated in **Figure 5.1**. The site is within Residential Parking Permit (RPP) zone J. As a multi-unit development exceeding 20 units, the development would be eligible for market permits and not residential parking permits.

Figure 5.1: On-Street Parking Restrictions



APPENDIX A

Traffic Data

Intersection Turning Movement Count Summary: 5 Street SW & Royal Avenue SW / Lane

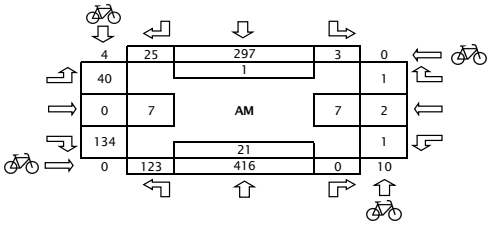
N/S Road: 5 Street SW
E/W Road: Royal Avenue SW / Lane
Count Date: March 12, 2024 Tuesday
Weather: Sunny
Road Condition: Clear
Project #: 02-24-0039

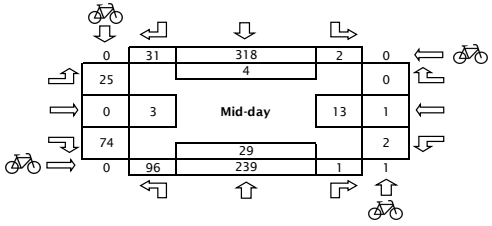
AM Peak Hour: 8:00 AM to 9:00 AM
Mid-day Peak Hour: 11:45 AM to 12:45 PM
PM Peak Hour: 4:30 PM to 5:30 PM

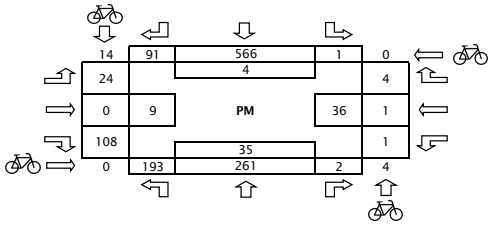
PHF (AM Peak Hour): 0.94
PHF (Mid-day Peak Hour): 0.94
PHF (PM Peak Hour): 0.95

	5 Street SW												Royal Avenue SW / Lane																			
	Northbound (South Leg)						Southbound (North Leg)						Westbound (East Leg)						Eastbound (West Leg)								Pedestrians				Cyclists			
Time Starting	Left		Through		Right		Left		Through		Right		Left		Through		Right		Left		Through		Right		Total Vehicles		West Side	East Side	North Side	South Side				
	Car	Truck	Car	Truck	Car	Truck	Car	Truck	Car	Truck	Car	Truck	Car	Truck	Car	Truck	Car	Truck	Car	Truck	Car	Truck	Car	Truck	15 Min	Hourly					NB	SB	WB	EB
7:00	13	0	44	2	1	0	0	0	52	0	6	0	0	0	0	0	0	0	3	0	0	0	13	0	134		0	0	0	0	0	0	0	0
7:15	11	0	71	2	0	0	0	0	60	0	3	0	0	0	0	0	0	0	2	0	1	0	13	0	163		1	5	0	3	4	1	0	0
7:30	22	0	86	1	0	0	0	0	64	1	4	0	0	0	0	0	0	0	2	0	0	0	18	0	198		2	7	1	6	4	1	0	0
7:45	26	0	111	0	0	0	0	0	58	1	7	0	1	1	0	0	0	0	7	0	0	0	24	0	236	731	1	5	1	3	9	0	0	2
8:00	26	1	95	3	0	0	2	0	70	1	4	0	0	0	0	0	1	0	11	0	0	0	22	0	236	833	0	0	0	7	4	1	0	0
8:15	28	1	112	0	0	0	0	0	68	2	5	0	0	1	0	0	0	0	10	0	0	0	27	0	254	924	2	4	0	6	4	2	0	0
8:30	34	0	107	0	0	0	0	0	84	2	7	0	0	0	0	0	0	0	9	0	0	0	31	0	274	1000	1	1	1	4	0	1	0	0
8:45	33	0	98	1	0	0	0	1	69	1	9	0	0	0	2	0	0	0	10	0	0	0	54	0	278	1042	4	2	0	4	2	0	0	0
2 Hour Total	193	2	724	9	1	0	2	1	525	8	45	0	1	2	2	0	1	0	54	0	1	0	202	0			11	24	3	33	27	6	0	2
		195		733		1		3		533		45		3		2		1		54		1		202	1773									
Peak Hour Total	**121**	**2**	**412**	**4**	**0**	**0**	**2**	**1**	**291**	**6**	**25**	**0**	**0**	**1**	**2**	**0**	**1**	**0**	**40**	**0**	**0**	**0**	**134**	**0**			**7**	**7**	**1**	**21**	**10**	**4**	**0**	**0**
		123		**416**		**0**		**3**		**297**		**25**		**1**		**2**		**1**		**40**		**0**		**134**		**1042**								
11:00	17	0	40	0	1	0	0	1	68	0	3	0	0	0	1	0	0	0	2	0	0	0	11	0	144		1	3	1	2	0	0	0	0
11:15	16	0	55	0	0	0	1	0	73	2	4	0	0	0	0	0	1	0	2	0	0	0	16	1	171		0	3	0	2	1	1	0	0
11:30	20	0	56	0	3	0	0	0	68	0	8	0	0	0	0	0	0	0	4	0	0	0	16	0	175		0	3	1	1	1	0	0	0
11:45	23	0	62	1	0	0	0	0	87	2	10	1	0	0	1	0	0	0	5	0	0	0	17	1	210	700	1	4	0	8	0	0	0	0
12:00	17	0	60	2	1	0	1	0	89	0	6	0	0	0	0	0	0	0	5	1	0	0	18	0	200	756	1	2	0	6	1	0	0	0
12:15	32	0	60	0	0	0	0	0	70	1	7	0	0	0	0	0	0	0	6	2	0	0	16	3	197	782	1	5	0	6	0	0	0	0
12:30	24	0	54	0	0	0	1	0	68	1	7	0	2	0	0	0	0	0	5	1	0	0	19	0	182	789	0	2	4	9	0	0	0	0
12:45	19	0	59	1	0	0	0	0	87	1	9	0	0	0	1	0	0	0	3	0	0	0	16	0	196	775	0	9	3	7	0	1	0	0
2 Hour Total	168	0	446	4	5	0	3	1	610	7	54	1	2	0	3	0	1	0	32	4	0	0	129	5			4	31	9	41	3	2	0	0
		168		450		5		4		617		55		2		3		1		36		0		134	1475									
Peak Hour Total	**96**	**0**	**236**	**3**	**1**	**0**	**2**	**0**	**314**	**4**	**30**	**1**	**2**	**0**	**1**	**0**	**0**	**0**	**21**	**4**	**0**	**0**	**70**	**4**			**3**	**13**	**4**	**29**	**1**	**0**	**0**	**0**
		96		**239**		**1**		**2**		**318**		**31**		**2**		**1**		**0**		**25**		**0**		**74**		**789**								
16:00	37	0	56	1	1	0	1	0	130	2	13	0	0	0	0	0	0	0	8	0	0	0	32	0	281		0	1	0	4	0	4	0	0
16:15	46	0	48	1	0	0	2	0	142	0	14	0	0	0	1	0	0	0	3	0	0	0	26	0	283		2	4	0	9	0	3	0	0
16:30	53	0	72	0	1	0	0	0	141	1	20	0	0	0	0	0	1	0	7	0	0	0	19	0	315		1	9	0	14	0	4	0	0
16:45	54	0	55	0	0	0	0	0	128	1	20	0	0	0	0	0	0	0	4	0	0	0	31	1	294	1173	4	6	2	5	1	4	0	0
17:00	39	0	71	1	1	0	1	0	151	0	29	0	1	0	1	0	3	0	4	1	0	0	26	0	329	1221	1	13	0	4	0	2	0	0
17:15	47	0	61	1	0	0	0	0	143	1	22	0	0	0	0	0	0	0	8	0	0	0	31	0	314	1252	3	8	2	12	3	4	0	0
17:30	55	1	77	0	0	0	0	0	119	1	24	0	2	0	0	0	0	0	5	0	0	0	24	0	308	1245	0	8	0	6	2	4	0	0
17:45	40	0	67	1	0	0	1	0	119	0	13	0	0	0	0	0	1	0	8	0	0	0	39	0	289	1240	0	7	0	5	0	2	0	0
2 Hour Total	371	1	507	5	3	0	5	0	1073	6	155	0	3	0	2	0	5	0	47	1	0	0	228	1			11	56	4	59	6	27	0	0
		372		512		3		5		1079		155		3		2		5		48		0		229	2413									
Peak Hour Total	**193**	**0**	**259**	**2**	**2**	**0**	**1**	**0**	**563**	**3**	**91**	**0**	**1**	**0**	**1**	**0**	**4**	**0**	**23**	**1**	**0**	**0**	**107**	**1**			**9**	**36**	**4**	**35**	**4**	**14**	**0**	**0**
		193		**261**		**2**		**1**		**566**		**91**		**1**		**1**		**4**		**24**		**0**		**108**		**1252**								
6 Hour Total	**732**	**3**	**1677**	**18**	**9**	**0**	**10**	**2**	**2208**	**21**	**254**	**1**	**6**	**2**	**7**	**0**	**7**	**0**	**133**	**5**	**1**	**0**	**559**	**6**			**26**	**111**	**16**	**133**	**36**	**35**	**0**	**2**
		735		**1695**		**9**		**12**		**2229**		**255**		**8**		**7**		**7**		**138**		**1**		**565**		**5661**								

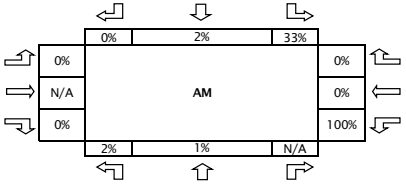
Peak Hour Volumes

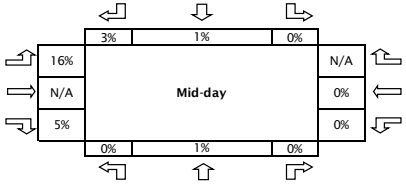


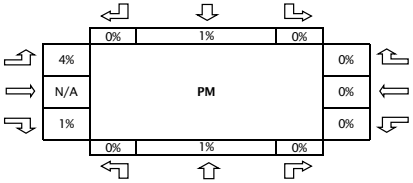




Heavy Vehicle Percentage







APPENDIX B

Analysis Outputs

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	0	134	1	2	1	123	416	0	3	297	25
Future Volume (Veh/h)	40	0	134	1	2	1	123	416	0	3	297	25
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	43	0	143	1	2	1	131	443	0	3	316	27
Pedestrians		7			7			21			21	
Lane Width (m)		3.5			3.5			3.5			3.5	
Walking Speed (m/s)		1.1			1.1			1.1			1.1	
Percent Blockage		1			1			2			2	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1070	1054	358	1212	1068	471	350			450		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1070	1054	358	1212	1068	471	350			450		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	75	100	79	99	99	100	89			100		
cM capacity (veh/h)	174	198	670	111	195	578	1201			1104		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	186	4	574	346
Volume Left	43	1	131	3
Volume Right	143	1	0	27
cSH	404	190	1201	1104
Volume to Capacity	0.46	0.02	0.11	0.00
Queue Length 95th (m)	17.9	0.5	2.8	0.1
Control Delay (s)	21.3	24.4	2.9	0.1
Lane LOS	C	C	A	A
Approach Delay (s)	21.3	24.4	2.9	0.1
Approach LOS	C	C		

Intersection Summary					
Average Delay		5.2			
Intersection Capacity Utilization	72.8%	ICU Level of Service		C	
Analysis Period (min)	15				

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	24	0	108	1	1	4	193	261	2	1	566	91
Future Volume (Veh/h)	24	0	108	1	1	4	193	261	2	1	566	91
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	25	0	114	1	1	4	203	275	2	1	596	96
Pedestrians		9			36			35			35	
Lane Width (m)		3.5			3.5			3.5			3.5	
Walking Speed (m/s)		1.1			1.1			1.1			1.1	
Percent Blockage		1			3			3			3	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1376	1374	688	1513	1421	347	701			313		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1376	1374	688	1513	1421	347	701			313		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	73	100	73	98	99	99	77			100		
cM capacity (veh/h)	93	108	429	54	101	653	889			1208		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	139	6	480	693
Volume Left	25	1	203	1
Volume Right	114	4	2	96
cSH	260	174	889	1208
Volume to Capacity	0.54	0.03	0.23	0.00
Queue Length 95th (m)	22.0	0.8	6.7	0.0
Control Delay (s)	33.8	26.4	5.9	0.0
Lane LOS	D	D	A	A
Approach Delay (s)	33.8	26.4	5.9	0.0
Approach LOS	D	D		

Intersection Summary					
Average Delay		5.9			
Intersection Capacity Utilization	85.5%	ICU Level of Service		E	
Analysis Period (min)	15				

1: 5 Street SW & Royal Ave SW/Lane — AM Peak Hour
04/04/2024 — After Development

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	0	134	6	5	6	123	416	1	4	297	25
Future Volume (Veh/h)	40	0	134	6	5	6	123	416	1	4	297	25
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	43	0	143	6	5	6	131	443	1	4	316	27
Pedestrians		7			7			21			21	
Lane Width (m)		3.5			3.5			3.5			3.5	
Walking Speed (m/s)		1.1			1.1			1.1			1.1	
Percent Blockage		1			1			2			2	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1080	1058	358	1214	1070	472	350			451		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1080	1058	358	1214	1070	472	350			451		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	74	100	79	95	97	99	89			100		
cM capacity (veh/h)	168	197	670	110	194	578	1201			1103		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	186	17	575	347
Volume Left	43	6	131	4
Volume Right	143	6	1	27
cSH	396	187	1201	1103
Volume to Capacity	0.47	0.09	0.11	0.00
Queue Length 95th (m)	18.5	2.2	2.8	0.1
Control Delay (s)	21.9	26.1	2.9	0.1
Lane LOS	C	D	A	A
Approach Delay (s)	21.9	26.1	2.9	0.1
Approach LOS	C	D		

Intersection Summary					
Average Delay		5.5			
Intersection Capacity Utilization	71.5%	ICU Level of Service		C	
Analysis Period (min)		15			

1: 5 Street SW & Royal Ave SW/Lane — PM Peak Hour
04/04/2024 — After Development

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	24	2	108	3	2	6	193	261	6	5	566	91
Future Volume (Veh/h)	24	2	108	3	2	6	193	261	6	5	566	91
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	25	2	114	3	2	6	203	275	6	5	596	96
Pedestrians		9			36			35			35	
Lane Width (m)		3.5			3.5			3.5			3.5	
Walking Speed (m/s)		1.1			1.1			1.1			1.1	
Percent Blockage		1			3			3			3	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1389	1386	688	1524	1431	349	701			317		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1389	1386	688	1524	1431	349	701			317		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	72	98	73	94	98	99	77			100		
cM capacity (veh/h)	90	106	429	52	99	651	889			1204		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	141	11	484	697
Volume Left	25	3	203	5
Volume Right	114	6	6	96
cSH	250	127	889	1204
Volume to Capacity	0.56	0.09	0.23	0.00
Queue Length 95th (m)	23.9	2.1	6.7	0.1
Control Delay (s)	36.4	36.0	5.9	0.1
Lane LOS	E	E	A	A
Approach Delay (s)	36.4	36.0	5.9	0.1
Approach LOS	E	E		

Intersection Summary					
Average Delay		6.4			
Intersection Capacity Utilization	85.2%	ICU Level of Service		E	
Analysis Period (min)		15			

City of Calgary - Traffic Signal Warrant Analysis

Main Street (name)	5 Street SW	Direction (EW or NS)	NS
Side Street (name)	Royal Avenue SW	Direction (EW or NS)	EW
Quadrant / Int #		Comments	Existing
for Warrant Calculation Results, please hit 'Page Down'	CHECK SHEET		

Road Authority:	City of Calgary
City:	Calgary
Analysis Date:	2024 May 22, Wed
Count Date:	2024 Mar 12, Tue
Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
5 Street SW	NB				1				1
5 Street SW	SB				1				1
Royal Avenue SW	WB				1				
Royal Avenue SW	EB				1				

Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	1,500,000
Central Business District	(y/n)	n

Are the Royal Avenue SW WB right turns significantly impeded by through movements? (y/n) n
Are the Royal Avenue SW EB right turns significantly impeded by through movements? (y/n) n

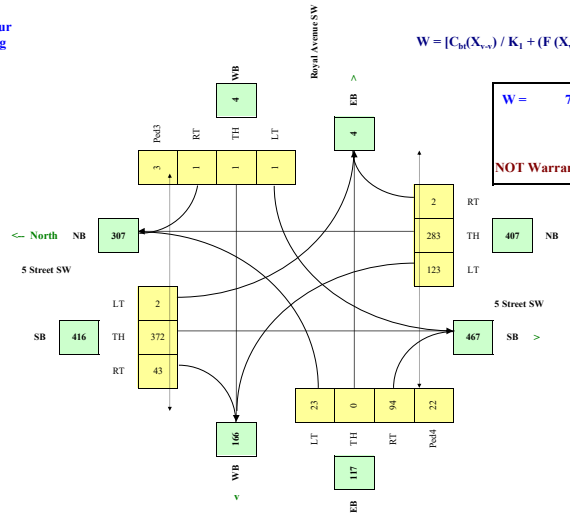
Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
5 Street SW	NS	50	2.0%	n	0.0
Royal Avenue SW	EW		2.0%	n	

Set Peak Hours

Traffic Input	NB			SB			WB			EB			Ped1	Ped2	Ped3	Ped4
	NS			NS			EW			EW			NS	NS	EW	EW
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side
Existing (6-Hour)	735	1695	9	12	2229	255	8	7	7	138	1	565	26	111	16	133
Total (6-hour peak)	735	1,695	9	12	2,229	255	8	7	7	138	1	565	26	111	16	133
Average (6-hour peak)	123	283	2	2	372	43	1	1	1	23	0	94	4	19	3	22

Average 6-hour Peak Turning Movements

$$W = [C_{bt}(X_{v-x}) / K_1 + (F(X_{v-p}) L) / K_2] \times C_i$$



W =	74	52	22
		Veh	Ped

NOT Warranted

RESET SHEET

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City of Calgary - Traffic Signal Warrant Analysis

Main Street (name)	5 Street SW	Direction (EW or NS)	NS
Side Street (name)	Royal Avenue SW	Direction (EW or NS)	EW
Quadrant / Int #		Comments	After Development
for Warrant Calculation Results, please hit 'Page Down'	CHECK SHEET		

Road Authority:	City of Calgary
City:	Calgary
Analysis Date:	2024 May 22, Wed
Count Date:	2024 Mar 12, Tue
Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
5 Street SW	NB				1				1
5 Street SW	SB				1				1
Royal Avenue SW	WB				1				
Royal Avenue SW	EB				1				

Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	1,500,000
Central Business District	(y/n)	n

Are the Royal Avenue SW WB right turns significantly impeded by through movements? (y/n) n
Are the Royal Avenue SW EB right turns significantly impeded by through movements? (y/n) n

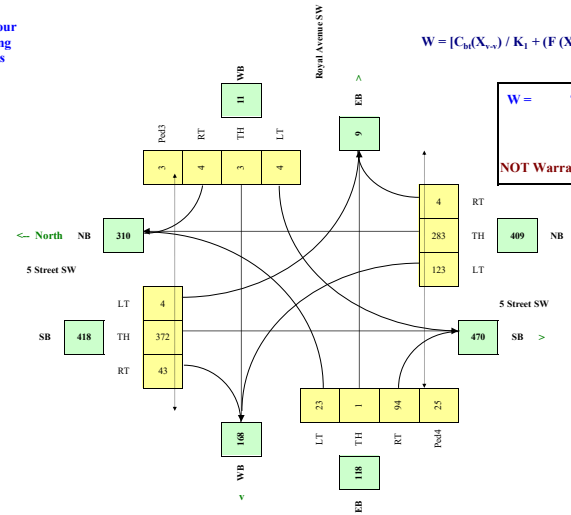
Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
5 Street SW	NS	50	2.0%	n	0.0
Royal Avenue SW	EW		2.0%	n	

Set Peak Hours

Traffic Input	NB			SB			WB			EB			Ped1	Ped2	Ped3	Ped4
	NS			NS			EW			EW			NS	NS	EW	EW
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	E Side	N Side	S Side
Existing (6-hour)	735	1695	9	12	2229	255	8	7	7	138	1	565	26	111	16	133
Site Traffic - (AM+PM)*2.47			12	12			17	8	17		6		5	25	0	15
Total (6-hour peak)	735	1,695	21	24	2,229	255	25	15	24	138	7	565	31	136	16	148
Average (6-hour peak)	123	283	4	4	372	43	4	3	4	23	1	94	5	23	3	25

Average 6-hour Peak Turning Movements

$$W = [C_{bt}(X_{v-x}) / K_1 + (F(X_{v-p}) L) / K_2] \times C_i$$



W =	79	55	24
		Veh	Ped

NOT Warranted

RESET SHEET

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