
MEMORANDUM

TO: Nishan Kugan, Pavarani Holdings Inc.	DATE: September 26, 2019
FROM: Daniel Riendeau	PROJECT #: 19-011
PROJECT: Gas Station and Restaurant, 575 King Street East, Gananoque	
SUBJECT: Traffic Study	

1. Introduction

The purpose of this technical memorandum is to review the traffic impact of a proposed gas station and take-out restaurant to be located at 575 King Street East, Gananoque, Ontario. The site location is shown on **Figure 1**. A site plan is included in **Appendix A**.

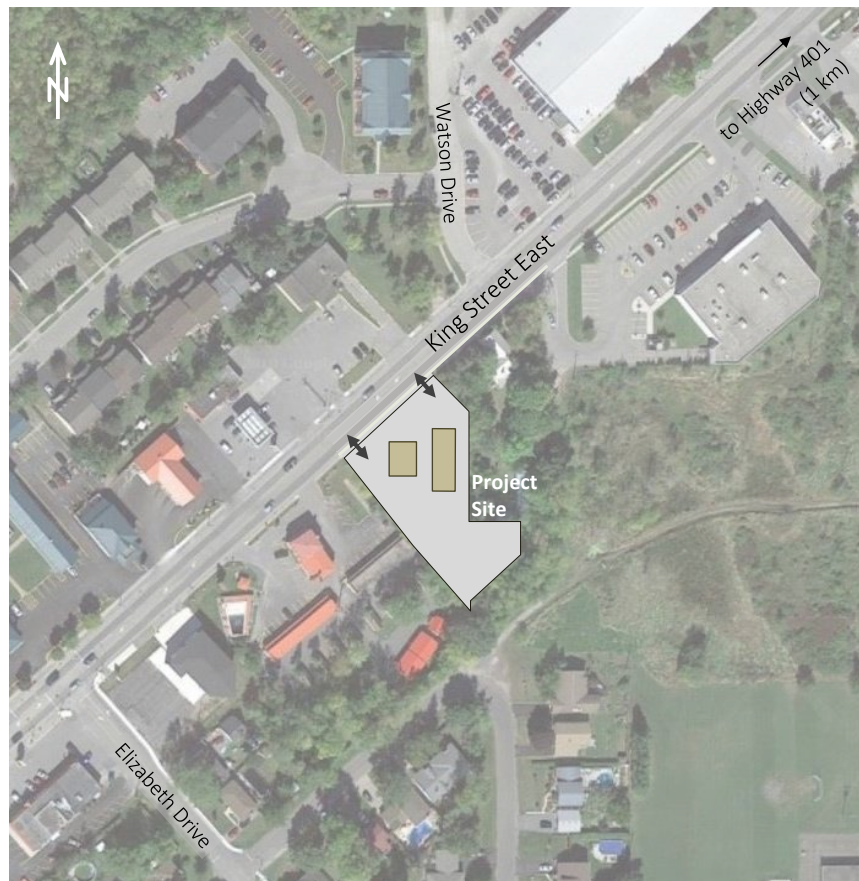


Figure 1: Site Location

2. Existing Conditions

The project site is located on King Street East in a light commercial area near Thousand Islands Parkway and Highway 401. Near the project site, King Street East is a 3-lane roadway including a 2-way left turn lane (TWLTL).

King Street East is an arterial roadway located east of Gananoque River. It is the main roadway through the Town of Gananoque and connects the downtown area to Thousand Islands Parkway and Highway 401. Its posted speed limit is 50 km/h.

Between the eastern town limits and Highway 401, it becomes Highway 2. According to MTO's Provincial Highway Traffic Volumes document, Highway 2 has experienced a 1% growth from 2006 to 2016. East of Highway 401, it becomes Leeds & Grenville Road 2.

Traffic counts were conducted on King Street East near Carmichael Road by the Town of Gananoque from Friday August 7 to Friday August 14, 2015. The hourly volume for an average weekday (Monday to Thursday) is illustrated in **Figure 2**.

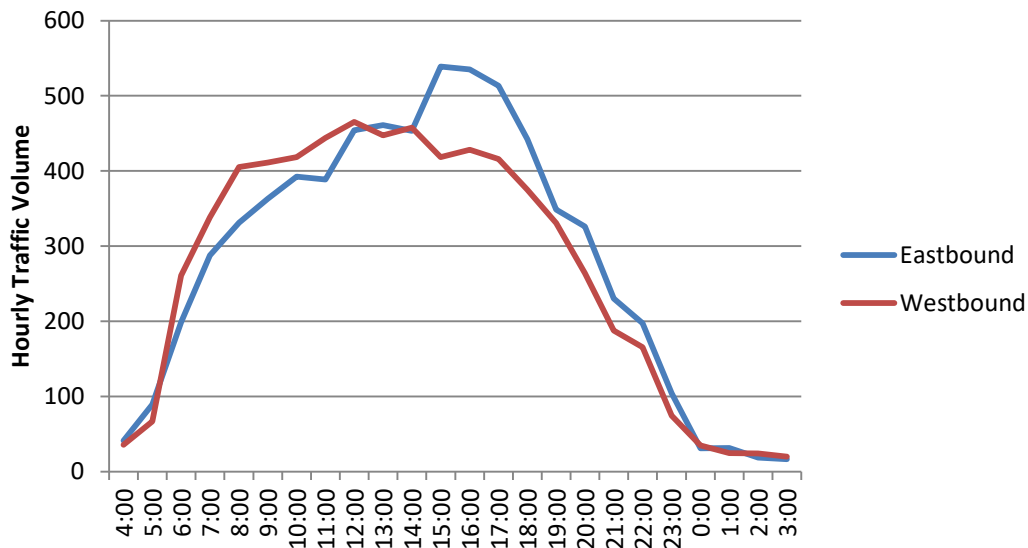


Figure 2: Average Weekday Hourly Traffic Volume on King Street East, August 2015

The traffic count data indicate that the weekend peak hours were very similar to the average weekday peak hours. Therefore, the average weekday peak hours were used for analysis.

Another traffic count was conducted by BT Engineering on Wednesday April 17, 2019 between 3:00 and 5:30 p.m. at the project site. The traffic volume measured during that period was found to be 1.14 times higher than the traffic volume measured during the same period in August 2015 near Carmichael Road. The peak hour volumes provided by the Town were therefore adjusted to reflect existing (2019) traffic volumes.

The existing traffic volumes near the project site are presented in **Table 1**.

Table 1: Existing (2019) Traffic Volumes

	Morning Peak Hour	Afternoon Peak Hour
Westbound	405	428
Eastbound	377	609

3. 2024 Background Traffic

Future background conditions represent the anticipated traffic volumes resulting from general development growth within the region. It is anticipated that the proposed development will be completed in 2019. Therefore, the year 2024, i.e. 5 years from build-out, has been selected as the planning horizon. An annual growth rate of 1% has been assumed for analysis.

The 2024 background traffic volumes are presented in **Table 2**.

Table 2: Background (2024) Traffic Volumes

	Morning Peak Hour	Afternoon Peak Hour
Westbound	426	450
Eastbound	396	640

4. Trip Generation

The proposed development consists of a gas station with a convenience store and a take-out restaurant. The gas station is equipped with 8 pumps under a canopy. The convenience store and the restaurant are within a single building with a total floor area of 204 m² (2,200 sq. ft.). The building also includes a small 68 m² apartment on the second floor.

The Institute of Transportation Engineering’s (ITE) Trip Generation Manual is used as a reference to determine the number of trips that will be generated by the development. The “Super Convenience Market/Gas Station” land use (ITE land use 960) has been selected to determine the trip generation rates. The apartment unit on the second floor is not expected to have a significant impact on traffic and is therefore not included in the trip generation calculation.

Table 3 presents the number of trips anticipated for the overall development.

Table 3: Trip Generation

Land Use (ITE Code)	Unit	Item	Morning Peak Hour			Afternoon Peak Hour		
			Total	In	Out	Total	In	Out
Super Convenience Market/Gas Station (960)	1,000 sq. ft. gross floor area	Quantity	2.2			2.2		
		ITE Trip Rate	83.14			69.28		
		Pass-By	60%			60%		
		Distribution	100%	50%	50%	100%	50%	50%
		Net Trips	74	37	37	60	30	30
		Pass-By Trips	110	55	55	92	46	46

The proposed development is located in the eastern part of the Town of Gananoque. Part of the net generated trips is expected to come from the town core while the balance is expected to come from Highway 401 or Thousand Islands Parkway. Therefore, it is assumed that 50% of the net generated trips will be to/from the east and the other 50% to/from the west.

As for the pass-by trips, their distribution is anticipated to be consistent with the current traffic distribution (eastbound/westbound), i.e. 48% eastbound / 52% westbound during the morning peak hour and 59% / 41% during the afternoon peak hour.

The two proposed driveways are modeled as one. This is a worst case scenario as trips will actually be distributed between the proposed full access on the west side and the right-in/right-out access on the east side; traffic performance at either access will be similar to that of one full access.

Figure 3 presents the trip assignments for the proposed development.

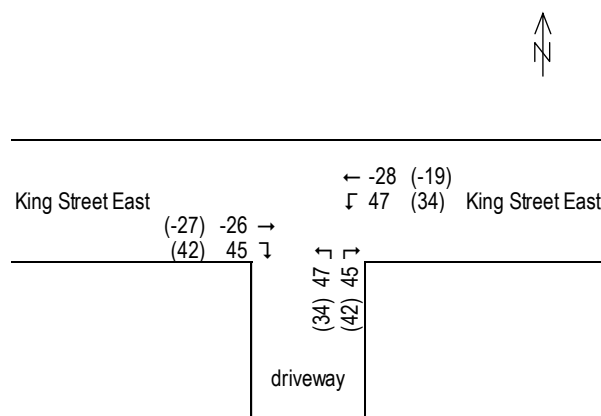


Figure 3: Trip Generation, AM (PM) Peak Hour

5. 2024 Total Traffic

The total traffic volumes, reflecting the combined growth in background and site generated traffic, projected for the 2024 planning horizon, are presented in **Figure 4**.

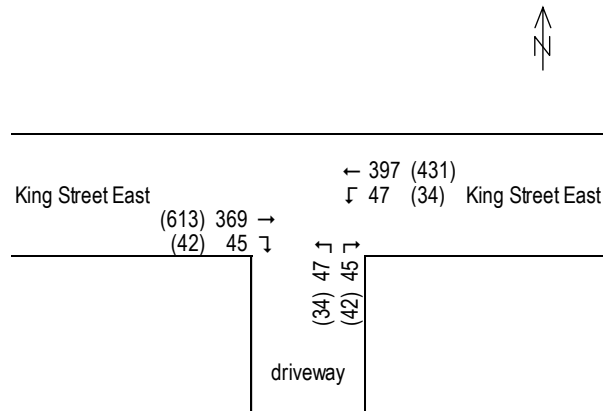


Figure 4: 2024 Total Traffic Volumes, AM (PM) Peak Hour

A traffic capacity analysis of the projected traffic volumes with the proposed development was performed using Synchro 9, a traffic analysis tool using methodologies from the Highway Capacity Manual (HCM) to determine the volume-to-capacity (V/C) ratio, average delay per vehicle and 95th percentile queue length for each vehicular movement. The “level of service” (LOS) is directly based on the average delay per vehicle, as described in **Table 4**. Typically, a LOS D is deemed satisfactory. A LOS E or F may require corrective measures depending on the context.

Table 4: Level of Service Definitions for Unsignalized Intersections

Delay (s)	LOS
≤ 10	A
≤ 15	B
≤ 25	C
≤ 35	D
≤ 50	E
> 50	F

The results of the traffic capacity analysis are presented in **Table 5**. For the purpose of the analysis, nearby driveways were not included as they are not expected to significantly impact the capacity analysis. Synchro reports are provided in **Appendix C**.

Table 5: Intersection Performance, 2024 Total Traffic

Intersection	Movement ¹	Morning Peak Hour				Afternoon Peak Hour			
		V/C Ratio	Delay (s)	Level of Service	95th Queue (m)	V/C Ratio	Delay (s)	Level of Service	95th Queue (m)
King Street East / proposed access (NB stop)	EBT/R	0.26	0	A	0	0.42	0	A	0
	WBL/T	0.05	1	A	1	0.04	1	A	1
	NBL	0.11	13	B	3	0.09	15	B	2
	NBR	0.08	11	B	2	0.10	14	B	2

¹EB = eastbound, WB = westbound, NB = northbound, L = left turn, T = through, R = right turn

The overall impact of the proposed development is minor and there are no issues anticipated at the proposed driveways within the 2024 planning horizon.

6. Conclusion

The project site is located on King Street East in a light commercial area near Thousand Islands Parkway and Highway 401. The posted speed limit is 50 km/h and a 2-way left-turn lane (TWLTL) is provided to facilitate left-turn movements to businesses on each side of the street.

The above analysis determined that no traffic capacity issue is expected to result from the proposed development of a gas station with a take-out restaurant. The proposed driveways are expected to operate satisfactorily and, as a result, no roadway improvements to accommodate traffic are required.



Subject: Traffic Study

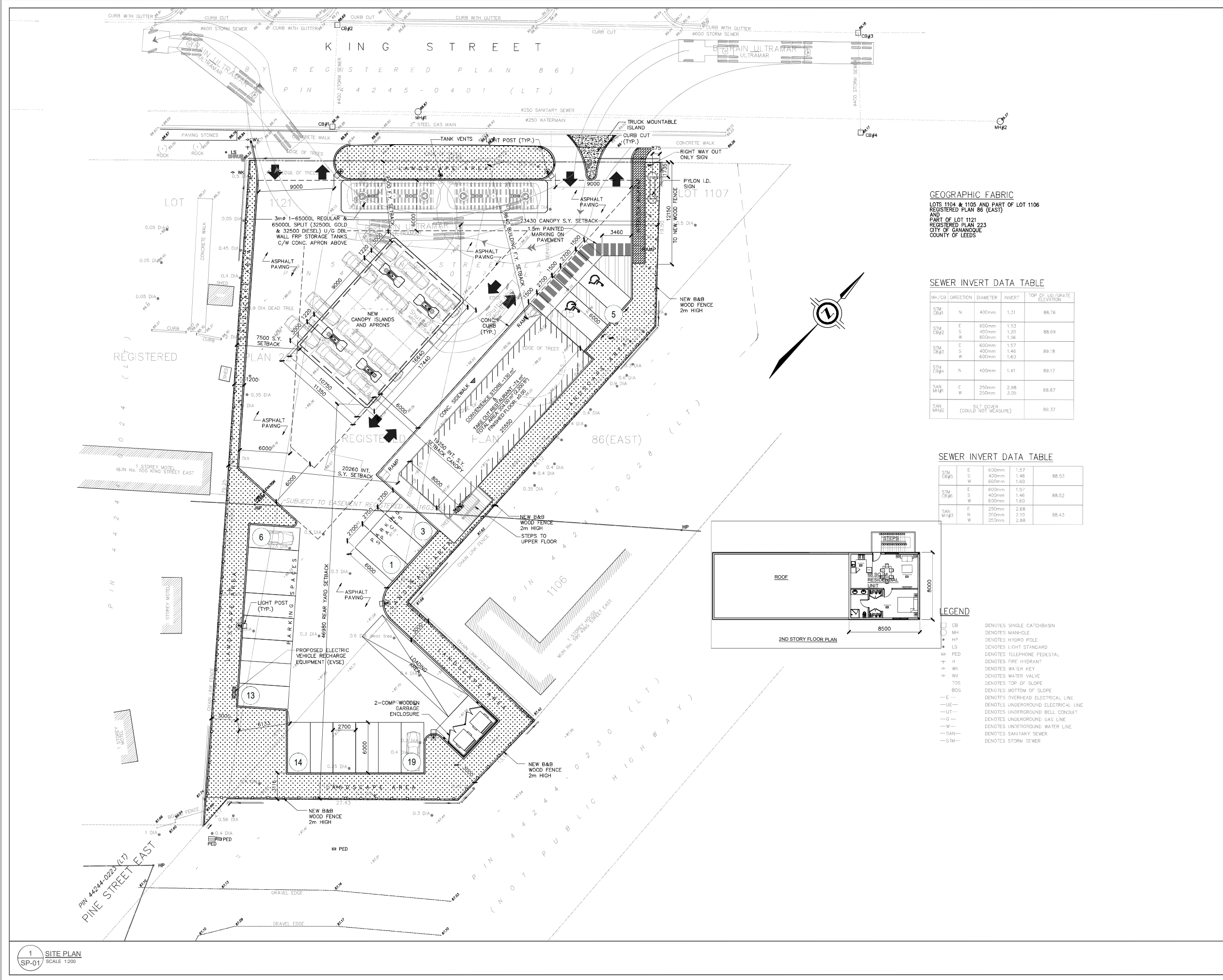
Project: 19-011 Gas Station and Restaurant, 575 King Street East, Gananoque

Date: September 26, 2019



Appendix A

Site Plan



KEY PLAN
 PLAN OF SURVEY OF
 LOTS 1104 & 1105 AND PART OF LOT 1106
 REGISTERED PLAN 86 (EAST) AND
 PART OF LOT 1121 REGISTERED PLAN 223
 CITY OF GANANOQUE, COUNTY OF LEEDS

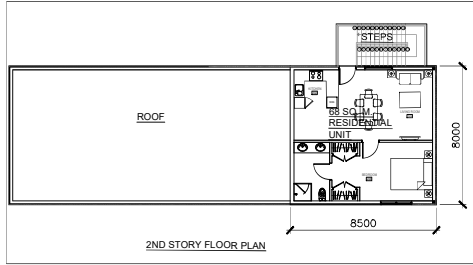
GEOGRAPHIC FABRIC
 LOTS 1104 & 1105 AND PART OF LOT 1106
 REGISTERED PLAN 86 (EAST)
 AND
 PART OF LOT 1121
 REGISTERED PLAN 223
 CITY OF GANANOQUE
 COUNTY OF LEEDS

SEWER INVERT DATA TABLE

MH/CB	DIRECTION	DIAMETER	INVERT	TOP OF LIU/GRADE ELEVATION
SIM CB#1	N	400mm	1.31	88.76
STM CB#2	E	600mm	1.53	88.69
	S	400mm	1.20	
STM CB#3	E	600mm	1.57	89.18
	W	600mm	1.60	
STM CB#4	N	400mm	1.41	89.17
	S	400mm	1.46	
SAN MH#1	E	250mm	2.98	88.87
	W	250mm	3.05	
SAN MH#2	SILT COVER (COULD NOT MEASURE)			89.37

SEWER INVERT DATA TABLE

STM	CB#	DIRECTION	DIAMETER	INVERT	TOP OF LIU/GRADE ELEVATION
STM CB#5	E	600mm	1.57	88.53	
	S	400mm	1.46		
STM CB#6	E	600mm	1.50	88.52	
	W	600mm	1.60		
SAN MH#5	E	250mm	2.88	88.43	
	W	250mm	2.88		



LEGEND

- CB DENOTES SINGLE CATCHBASIN
- MH DENOTES MAN-HOLE
- HP DENOTES HYDRO POLE
- LS DENOTES LIGHT STANDARD
- PED DENOTES TELEPHONE FEDESTAL
- H DENOTES FIRE HYDRANT
- WK DENOTES WATER KEY
- WV DENOTES WATER VALVE
- TOS DENOTES TOP OF SLOPE
- BOS DENOTES BOTTOM OF SLOPE
- OE DENOTES OVERHEAD ELECTRICAL LINE
- UE DENOTES UNDERGROUND ELECTRICAL LINE
- UC DENOTES UNDERGROUND CABLE CONDUIT
- UG DENOTES UNDERGROUND GAS LINE
- UW DENOTES UNDERGROUND WATER LINE
- SAN DENOTES SANITARY SEWER
- SIM DENOTES STORM SEWER

ZONING: PROGRESSIVE COMMERCIAL DISTRICT	PROVIDED	BY-LAW REQUIREMENT
	TOTAL LOT AREA	2902.64 m ²
TOTAL DEVELOPMENT AREA	AREA (SQ.M)	-
	AREA (% OF TOTAL)	100.00 %
LOT FRONTAGE	48.80 m	15.00 m (min)
LOT DEPTH	77.11 m	-
GROSS FLOOR AREA	204.37 m ²	-
LOT COVERAGE	TOTAL (SQ.M)	204.37 m ²
	TOTAL (% OF DEV.)	7.04 %
	60 % (max)	-
FRONT YARD SETBACK (King Street)	C-STORE/QR/RESID.	18.64 m
	CANOPY	9.50 m
REAR YARD SETBACK (Residential)	C-STORE/QR/RESID.	33.45 m
	CANOPY	46.98 m
INTERIOR SIDE YARD SETBACK (EAST) (Residential)	C-STORE/QR/RESID.	3.00 m
	CANOPY	19.25 m
INTERIOR SIDE YARD SETBACK (WEST) (MOTEL)	C-STORE/QR/RESID.	20.26 m
	CANOPY	7.50 m
HEIGHT	C-STORE/QR/RESID.	12.00 m
	CANOPY	5.30 m
LANDSCAPED OPEN SPACE	AREA (SQ.M)	622.03 m ²
	AREA (% OF DEV.)	21.42 %
ASPHALT AREA	AREA (SQ.M)	1717.91 m ²
	AREA (% OF DEV.)	59.18 %
GARBAGE ENCLOSURE	25 m ²	-
PARKING SPACES	20 (INCL. BIF)	-
	PARKING REQUIREMENTS AS PER SECTION 3.32: GAS BAR - EMPLOYEE + 1 REQ'D RESTAURANT - 100m ² + 3 REQ'D RESTAURANT - 50m ² + 3 REQ'D RESIDENTIAL - 1 UNIT + 2 REQ'D TOTAL PARKING SPACES REQUIRED: 13	
BARRIER FREE PARKING SPACES	2	1
LOADING AREA DIMENSIONS	4.00 x 14.0 m	-
ENTRANCE AND EXIT WIDTHS	9.00 m	-

No.	DATE	REVISIONS	INITIAL	CHECKED
9	AUG.01.19	REV'D AS PER TOWN COMMENTS	WT	WAM
7	JUL.25.19	REV'D AS PER TOWN COMMENTS	WT	WAM
6	JUL.19.19	REV'D AS PER TOWN ZONING BY-LAW	WT	WAM
5	JUL.09.19	REV'D AS PER TOWN COMMENTS	WT	WAM
4	JUN.24.19	REV'D AS PER TOWN COMMENTS	WT	WAM
3	MAR.21.19	ISSUED FOR STARBUCKS REVIEW	WT	WAM
2	SEP.28.18	ISSUED TO TOWN FOR COMMENTS	RS	WAM
1	JUL.14.18	REV'D AS PER CLIENT COMMENTS	AA	WAM

GAMA Engineering Inc.
 8611 Weston Road, Suite 35B - Vaughan, Ontario - L4L 9P1
 Tel: 905-264-9295 www.gamaeng-inc.com

CLIENT/OWNER:
PAVARANI HOLDINGS INC. 1096791-2
 138 EARLTON ROAD
 SCARBOROUGH, ONTARIO M1T 2R9

PROJECT/ADDRESS:
 575 KING STREET EAST,
 GANANOQUE, ONTARIO

TITLE:
PROPOSED SITE PLAN

DESIGN:	WM	DWN BY:	AA	DRAWING No. SP-01
SCALE:	AS SHOWN	DWG. FILE:	1830-SP-01	
DATE:	JUL.10.18	PROJ. No.:	1830	

Subject: Traffic Study

Project: 19-011 Gas Station and Restaurant, 575 King Street East, Gananoque

Date: September 26, 2019



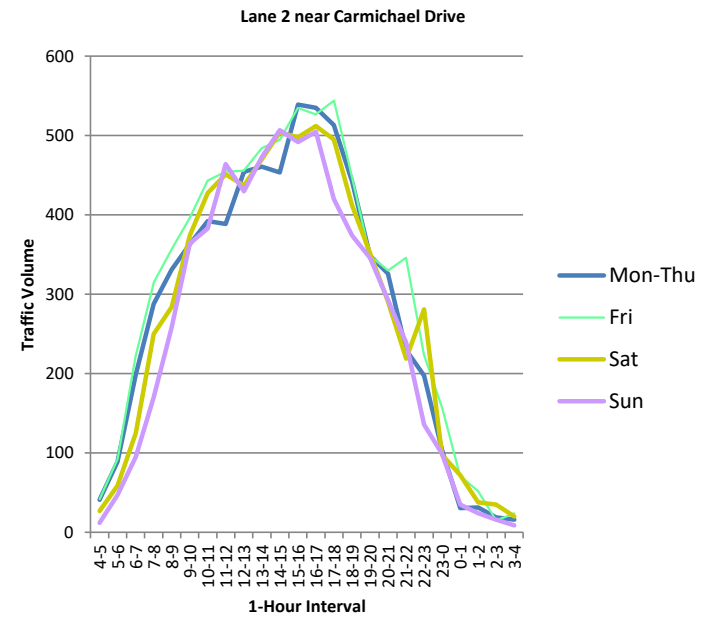
Appendix B

Traffic Count Data

Roadway
King Street East in Gananoque, ON

Location
Lane 1 near Carmichael Drive

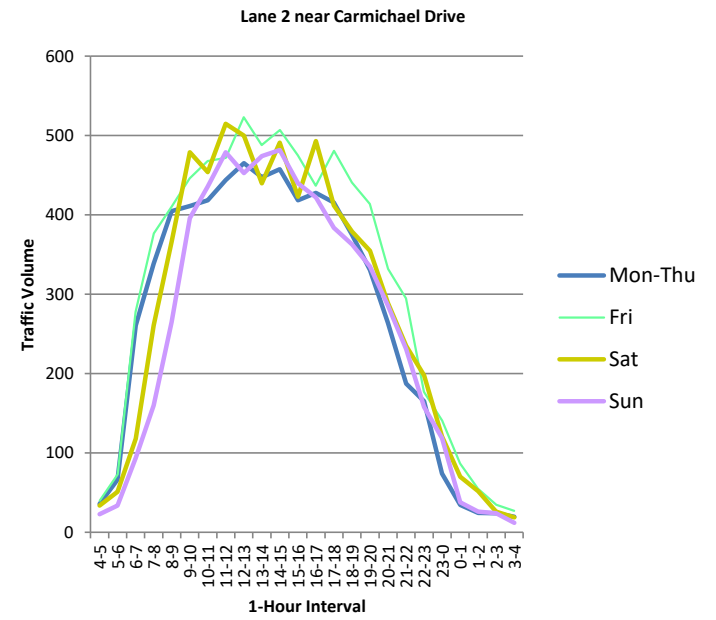
		7 Aug 2015	8	9	10	11	12	13	14
Start	End	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri
0:00	1:00		71	72	35	38	22	24	39
1:00	2:00		52	38	24	35	32	24	35
2:00	3:00		15	35	16	18	18	27	12
3:00	4:00		24	20	9	5	14	22	24
4:00	5:00		27	12	33	62	36	33	42
5:00	6:00		59	47	71	102	92	92	93
6:00	7:00		125	95	221	191	176	207	222
7:00	8:00		250	170	300	271	285	295	315
8:00	9:00	350	284	258	351	323	309	341	364
9:00	10:00	373	374	364	364	373	336	380	419
10:00	11:00	445	428	383	410	373	386	401	442
11:00	12:00	450	451	464	395	364	389	407	459
12:00	13:00	456	437	430	420	442	478	477	
13:00	14:00	484	470	473	498	438	455	453	
14:00	15:00	495	504	507	486	432	467	429	
15:00	16:00	535	498	492	562	503	557	534	
16:00	17:00	527	512	505	531	511	535	563	
17:00	18:00	544	495	420	516	479	538	521	
18:00	19:00	448	412	374	474	437	406	452	
19:00	20:00	349	352	346	352	322	351	370	
20:00	21:00	330	291	293	321	295	308	380	
21:00	22:00	346	219	239	194	214	208	304	
22:00	23:00	224	281	136	135	204	218	233	
23:00	0:00	157	98	99	108	95	96	117	



Roadway
King Street East in Gananoque, ON

Location
Lane 2 near Carmichael Drive

		7 Aug 2015	8	9	10	11	12	13	14
Start	End	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri
0:00	1:00		87	70	38	36	35	29	39
1:00	2:00		55	52	26	17	32	25	24
2:00	3:00		35	26	24	26	26	24	20
3:00	4:00		27	19	12	10	15	32	22
4:00	5:00		34	23	34	38	32	39	40
5:00	6:00		51	34	58	76	69	63	73
6:00	7:00		118	94	277	246	253	268	278
7:00	8:00		261	160	357	302	340	355	377
8:00	9:00	434	366	265	403	392	396	429	387
9:00	10:00	451	479	396	430	399	400	416	441
10:00	11:00	459	454	436	449	414	409	402	477
11:00	12:00	472	515	479	443	419	465	448	472
12:00	13:00	523	500	453	453	461	473	474	
13:00	14:00	488	440	474	438	464	466	422	
14:00	15:00	507	491	482	464	449	454	464	
15:00	16:00	475	423	440	395	417	448	414	
16:00	17:00	437	493	422	398	414	427	473	
17:00	18:00	481	412	384	397	409	405	452	
18:00	19:00	441	379	363	319	376	411	394	
19:00	20:00	414	355	335	316	302	334	370	
20:00	21:00	332	289	286	243	253	254	306	
21:00	22:00	295	235	231	167	199	171	213	
22:00	23:00	177	198	158	135	158	174	195	
23:00	0:00	141	121	119	84	71	57	85	



WED 17/ APR.
3.30-5.30 PM

TRAFFIC COUNT - WEST BOUND KINGSTRE, GANANOQUE
AT WILSON

									90
									100
									80
									90
									90
									90
									110
									110
									100
									88
TOTAL									1018

Subject: Traffic Study

Project: 19-011 Gas Station and Restaurant, 575 King Street East, Gananoque

Date: September 26, 2019



Appendix C

Synchro Analysis

19-011 Gas Station in Gananoque
 HCM Unsignalized Intersection Capacity Analysis

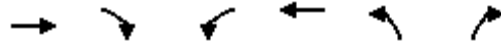
1: driveway & King St E
 2024 AM



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩			↩	↩	↩
Traffic Volume (veh/h)	369	45	47	397	47	45
Future Volume (Veh/h)	369	45	47	397	47	45
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	401	49	51	432	51	49
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL		TWLTL			
Median storage veh)	2		2			
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			450		960	426
vC1, stage 1 conf vol					426	
vC2, stage 2 conf vol					534	
vCu, unblocked vol			450		960	426
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			95		89	92
cM capacity (veh/h)			1110		479	629
Direction, Lane #	EB 1	WB 1	NB 1	NB 2		
Volume Total	450	483	51	49		
Volume Left	0	51	51	0		
Volume Right	49	0	0	49		
cSH	1700	1110	479	629		
Volume to Capacity	0.26	0.05	0.11	0.08		
Queue Length 95th (m)	0.0	1.0	2.5	1.8		
Control Delay (s)	0.0	1.3	13.4	11.2		
Lane LOS		A	B	B		
Approach Delay (s)	0.0	1.3	12.3			
Approach LOS			B			
Intersection Summary						
Average Delay			1.8			
Intersection Capacity Utilization			61.5%	ICU Level of Service		B
Analysis Period (min)			15			

19-011 Gas Station in Gananoque
 HCM Unsignalized Intersection Capacity Analysis

1: driveway & King St E
 2024 PM



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩			↩	↩	↩
Traffic Volume (veh/h)	613	42	34	431	34	42
Future Volume (Veh/h)	613	42	34	431	34	42
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	666	46	37	468	37	46
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL		TWLTL			
Median storage veh)	2		2			
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			712		1231	689
vC1, stage 1 conf vol					689	
vC2, stage 2 conf vol					542	
vCu, unblocked vol			712		1231	689
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			96		91	90
cM capacity (veh/h)			888		403	446
Direction, Lane #	EB 1	WB 1	NB 1	NB 2		
Volume Total	712	505	37	46		
Volume Left	0	37	37	0		
Volume Right	46	0	0	46		
cSH	1700	888	403	446		
Volume to Capacity	0.42	0.04	0.09	0.10		
Queue Length 95th (m)	0.0	0.9	2.1	2.4		
Control Delay (s)	0.0	1.2	14.8	14.0		
Lane LOS		A	B	B		
Approach Delay (s)	0.0	1.2	14.4			
Approach LOS			B			
Intersection Summary						
Average Delay			1.4			
Intersection Capacity Utilization			63.5%	ICU Level of Service		B
Analysis Period (min)			15			