I am concerned with the lack of 3rd party analysis of the traffic impact resulting from the intensification of the downtown area.

Looking at the 421 - 431 Brant Street Transportation Impact Study, Parking Study and TDM Options Report, it appears as though the report is forecasting a reduction in car trips originating and terminating in the downtown area even though the study assumes the addition of 740 units.

Working with this drop in downtown originating car trips, the study says that Brant and Carolina, Brant and James, and Brant and Lakeshore will be at a D level of service.

According to the, HCM 2000 and HCM 1994 procedures, the D level is met when over 80% of road capacity is reached.

At a D level, the guide states these intersections are "Approaching unstable operations where small increases in volume produce substantial increase in delay and decrease in speed", "Motorists will experience appreciable tension while driving"

If the actual number of trips originating and terminating from intensification is over the forecast volume, even by a small amount, intersections will probably become an E or F rating on a regular basis.

My fear is, this will cause an increased volume of aggressive drivers cutting through the residential streets, as they try to maneuver around the congested traffic and that a tragedy like the one that occurred on "Evans road" in May of last year will occur on Emerald, or Locust, or any of a number of other residential streets, adjacent to the intensified area.

My suggestion is to add a surcharge to all developments that exceed 11 floors; perhaps 500,000 or 1,000,000 a floor. That money will be used to mitigate traffic issues resulting from large intensification projects.

Once the developers have sold their properties, it will be very difficult to extract fees from them to address traffic issues resulting from their projects. If a fund is not established, traffic issues resulting from specific intensification projects, will be a drain on general coffers, impacting all wards.

Understanding the difficult choices all levels of government must make when creating plans and budgets, a surcharge will help reduce the impact on the general fund and ward specific initiatives, when addressing issue created by intensification in the downtown.

Ignoring the possibility an "Evans Road" like tragedy by not carefully considering the impact of large intensification projects, on the safety of the surrounding area, due to increased traffic, and not taking steps to mitigate this possible tragedy, will be a very costly decision both financially and politically.

URLS.

https://www.burlington.ca/en/services-for-you/421-431-brant-street.asp

https://www.burlington.ca/en/services-for-you/resources/Planning_and_Development/Current_Development_Projects/Ward_2/Carriage-Gate-Homes---Brant-St/Traffic-Impact-Study-Parking-Study-and-TDM-Options.pdf

https://www.therecord.com/news-story/7344047-frustration-over-safety-mounts-in-waterdown-after-10-year-old-girl-s-traffic-death/

2.5 Traffic Operations

Intersection level of service (LOS) is a recognized method of quantifying the delay experienced by drivers at intersections. The term "Level of Service" denotes how well a traffic movement operates under given traffic demands, lane arrangements, and traffic controls. Each level is determined by the average amount of control delay per vehicle. Control delay is the total delay associated with stopping for a signal or stop sign, and includes four components; deceleration delay, stopped delay, queue move up time and final acceleration delay.

Table 2.1 contains the level of service criteria for signalized and stop-controlled intersections. As shown, LOS A indicates small average control delays (less than 10 second per vehicle) whereas LOS F indicates intersection failure, which results in extensive vehicular queues and long delays (over 50 seconds per vehicle at an unsignalized intersection, and over 80 seconds per vehicle at a signalized intersection). LOS D is typically considered acceptable peak-hour performance in an urban setting, and lower LOS values are tolerable for short term time periods during peak hours when heavier traffic volumes are expected.

TABLE 2.1: VEHICLE LEVEL OF SERVICE DEFINITIONS

Level of Service	Signalized Intersections Average Total Delay (sec/veh)	Unsignalized Intersections Average Total Delay (sec/veh)
A	< = 10	< = 10
B	> 10 & < = 20	> 10 & < = 15
C	> 20 & < = 35	> 15 & < = 25
D	> 35 & < = 55	> 25 & < = 35
E	> 55 & < = 80	> 35 & < = 50
F	> 80	> 50

The operations of the intersections in the study area were evaluated with the existing turning movement volumes using Synchro 9.1 with HCM 2000 procedures. The intersection analysis considered the following measures of performance:

- The volume to capacity ratio for each intersection;
- The LOS for each turning movement. LOS is based on the average control delay per vehicle; and
- The estimated 95th percentile queue length.

Table B-5
CMP Level of Service Criteria for Arterials[a] Based on Volume-to-Capacity Ratios

Level of Service	Description	V/C[b]
A	Free-flow conditions with unimpeded maneuverability. Stopped delay at signalized intersection is minimal.	0.00 to 0.60
B	Reasonably unimpeded operations with slightly restricted maneuverability. Stopped delays are not bothersome.	0.61 to 0.70
C	Stable operations with somewhat more restrictions in making mid-block lane changes than LOS B. Motorists will experience appreciable tension while driving.	0.71 to 0.80
D	Approaching unstable operations where small increases in volume produce substantial increases in delay and decreases in speed.	0.81 to 0.90
E	Operations with significant intersection approach delays and low average speeds.	0.91 to 1.00
F	Operations with extremely low speeds caused by intersection congestion, high delay, and adverse signal progression.	Greater Than 1.00

[a] For arterials that are multilane divided or undivided with some parking, a signalized intersection density of four to eight per mile, and moderate roadside development.
[b] Volume-to-capacity ratio.

≥ greater than or equal to.
< less than.

Source: Transportation Research Board, *Highway Capacity Manual, Special Report 209* (Washington, D.C., 1994).

Equation 35: Vehicle Proximity Adjustment

$$f_v = \frac{2}{1+(1-\frac{vm}{52.8xNthxFFS})^{\wedge}0.21}$$

Following this step, is the calculation of the delay caused by turning vehicles. This accounts for vehicles turning into the flow of traffic as well turn out of the flow of traffic. Based on the number of through of lanes and the midsegment volume for the segment, use the table below to determine the delay due to turning vehicles (d_{TV}).

Table 13: Through Vehicle Delay (National Research Council . Transportation Research, 2010)

Midsegment Volume (veh/h/ln)	Through Vehicle Delay (s/veh/pt) by Number of Through Lanes		
	1 Lane	2 Lanes	3 Lanes
200	0.04	0.04	0.05
300	0.08	0.08	0.09
400	0.12	0.15	0.15
500	0.18	0.25	0.15
600	0.27	0.41	0.15
700	0.39	0.72	0.15

Running time is based on running time, FFS, length of the segment,through movement control, and delays. For our analysis of arterial sections, we are to assume each segment in the analysis has a signalized intersection. Given the assunmption, there are default values for through movement control, as well as start-up lost time.

$$① \ d_s = \sum \frac{.5c\left(1-\frac{g}{c}\right)^2}{1-\left[\min(1,X)\frac{g}{c}\right]} + 900T\left[(X-1)+\sqrt{(X-1)^2+\frac{8klX}{cT}}\right] + \frac{3600}{vT}\left(t_a \frac{Q_b+Q_e-Q_{eo}}{2}\right) + \frac{Q_e^2-Q_{eo}^2}{2c_a} - \frac{Q_b^2}{2c_a}.$$

The next calculation is the Average Travel Speed as shown in Equation 43. This is based on the segment length (in feet), Running Time, and estimated signal delay.

Note $X = \frac{V_p}{c}$ V_p – Volume, c – capacity

Thus: as car volume increases slightly delay grows non linearly

Equation 43: Average Travel Speed

$$S_t = \frac{3600L}{5280(T_R + d_s)}$$

L – segment length.
d_s – summation of all veh delays see ①
T_R – running time

Based on the travel speed determined previously and the base free flow speed of the section, the LOS can be determined from Table 14.

% = ATS / BFFS

Table 14: Level of Service Criteria Urban Arterial (National Research Council . Transportation Research, 2010)

Travel Speed as a Percentage of Base Free-Flow Speed (%)	LOS by Volume-to-Capacity Ratio[a] ≤1.0	> 1.0
>85	A	F
>67–85	B	F
>50–67	C	F
>40–50	D	F
>30–40	E	F
≤30	F	F

TABLE 4.3: 2025 TOTAL OPERATIONS SUMMARY

Analysis Period	Intersection	Control Type	MOE	Eastbound Left	Eastbound Through	Eastbound Right	Eastbound Approach	Westbound Left	Westbound Through	Westbound Right	Westbound Approach	Northbound Left	Northbound Through	Northbound Right	Northbound Approach	Southbound Left	Southbound Through	Southbound Right	Southbound Approach	Overall
AM Peak Hour	1 - Brant Street and Caroline Street	TCS	LOS	C	C	C	C	C	C	C	C	B	C	C	C	B	C	C	C	C
			Delay	21	23	21	22	23	23	23	23	14	24	24	24	15	27	27	25	24
			V/C	0.48	0.26	0.02		0.25	0.29	0.29		0.06	0.73	0.73		0.51	0.80	0.60		
			Queue	30	28	0		21	28	28		4	91	91		21	109	109		
	2 - Brant Street and Ontario Street	TWSC	LOS	B		B	B					A	A		A		A	A	A	
			Delay	14		14	14					2	2		2		0	0	0	
			V/C	0.27		0.27						0.08	0.08				0.33	0.33		
			Queue	9		9						2	2				0	0		
	3 - Brant Street and James Street	TCS	LOS					B		B	B		B	B	B	A	B		B	B
			Delay					19		17	18		17	12	16	9	15		13	15
			V/C					0.43		0.12			0.67	0.23		0.51	0.61			
			Queue					38		13			76	21		24	71			
	4 - Brant Street and Elgin Street	TWSC	LOS	D		D	D					A	A		A		A	A	A	
			Delay	25		25	25					1	1		1		0	0	0	
			V/C	0.48		0.48						0.02	0.02				0.24	0.09		
			Queue	20		20						0	0				0	0		
	5 - Brant Street and Lakeshore Road	TCS	LOS	B	A	A	A	B	B	B	B	C	C	C	C	D	C	C	C	B
			Delay	13	7	7	8	12	17	17	17	30	30	30	30	38	31	31	34	18
			V/C	0.67	0.43	0.43		0.02	0.55	0.55		0.04	0.04	0.04		0.62	0.21	0.21		
			Queue	43	66	66		3	108	108		6	6	6		52	20	20		
	6 - John Street and James Street	TWSC	LOS	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	
			Delay	1	1	1	1	8	0	0	1	14	14	14	14	12	12	12	12	
			V/C	0.04	0.04	0.04		0.02	0.15	0.15		0.09	0.09	0.09		0.18	0.18	0.18		
			Queue	1	1	1		1	0	0		2	2	2		5	5	5		
	7 - Elizabeth Street and James Street	TCS	LOS	A	A	A	A	A	A	A	A	C	C	C	C	C	C	C	C	A
			Delay	2	4	4	4	2	3	3	3	23	23	23	23	23	23	23	23	6
			V/C	0.03	0.33	0.33		0.05	0.22	0.22		0.20	0.20	0.20		0.23	0.23	0.23		
			Queue	3	25	25		4	18	18		11	11	11		11	11	11		
	8 - John Street and Driveway A	TCS	LOS	A		A	A					A	A				A	A	A	
			Delay	9		9	9					3	3				0	0	0	
			V/C	0.07		0.07						0.02	0.02				0.04	0.04		
			Queue	2		2						1	1				0	0		
PM Peak Hour	1 - Brant Street and Caroline Street	TCS	LOS	C	C	C	C	C	D	D	C	B	C	C	C	B	C	C	C	C
			Delay	27	22	20	25	26	38	38	34	16	26	26	26	16	31	31	29	29
			V/C	0.67	0.20	0.01		0.54	0.82	0.82		0.09	0.75	0.75		0.36	0.83	0.83		
			Queue	35	23	0		44	98	98		5	96	96		16	124	124		
	2 - Brant Street and Ontario Street	TWSC	LOS	C		C	C					A	A		A		A	A	A	
			Delay	17		17	17					9	9		9		0	0	0	
			V/C	0.34		0.34						0.42	0.42				0.38	0.38		
			Queue	12		12						17	17				0	0		
	3 - Brant Street and James Street	TCS	LOS					C		B	C		C	B	C	C	C			C
			Delay					31		16	24		29	16	20	20	27			25
			V/C					0.84		0.31			0.80	0.19		0.68	0.77			
			Queue					124		18			107	20		34	101			
	4 - Brant Street and Elgin Street	TWSC	LOS	E		E	E					A	A		A		A	A	A	
			Delay	43		43	43					4	4		4		0	0	0	
			V/C	0.62		0.62						0.13	0.13				0.37	0.20		
			Queue	30		30						4	4				0	0		
	5 - Brant Street and Lakeshore Road	TCS	LOS	D	A	A	B	B	C	C	C	D	D	D	D	D	D	D	D	C
			Delay	52	8	8	19	14	33	33	32	36	36	36	36	50	49	49	49	31
			V/C	0.85	0.41	0.41		0.02	0.87	0.87		0.07	0.07	0.07		0.71	0.70	0.70		
			Queue	96	65	65		3	233	223		8	8	8		73	82	82		
	6 - John Street and James Street	TWSC	LOS	A	A	A	A	A	A	A	A	C	C	C	C	C	C	C	C	
			Delay	2	2	2	2	8	0	0	0	23	23	23	23	24	24	24	24	
			V/C	0.07	0.07	0.07		0.01	0.48	0.48		0.22	0.22	0.22		0.44	0.44	0.44		
			Queue	2	2	2		0	0	0		7	7	7		17	17	17		
	7 - Elizabeth Street and James Street	TCS	LOS	A	A	A	A	A	A	A	A	C	C	C	C	C	C	C	C	B
			Delay	4	5	5	5	4	9	9	9	32	32	32	32	28	28	28	28	12
			V/C	0.08	0.31	0.31		0.13	0.64	0.64		0.55	0.55	0.55		0.20	0.20	0.20		
			Queue	5	36	36		11	123	123		40	40	40		18	18	18		
	8 - John Street and Driveway A	TCS	LOS	A		A	A					A	A				A	A	A	
			Delay	10		10	10					4	4				0	0	0	
			V/C	0.07		0.07						0.03	0.30				0.07	0.07		
			Queue	2		2						1	1				0	0		

AWSC - All-Way Stop Control
TWSC - Two-Way Stop Control
TCS - Traffic Control TCS

RBT - Roundabout

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds

V/C - Volume to Capacity Ratio
Queue (m) - 95th Percentile Queue Length