

MEMO

TO: Eric Farrell, Owiso Makuku
Farrell Properties
FROM: Mark Smith, PE
DATE: September 12, 2018
SUBJECT: Cambrian Rise – Traffic Considerations Due to Development Program Changes
(Act 250 Permit #4C1301) DRAFT

Several changes to the mix and size of land uses within the Cambrian Rise development project on North Avenue in Burlington, Vermont have been proposed since the publication of the Transportation Impact Assessment (TIA), and subsequent update 12/28/16. This memorandum is provided as a further supplement to the TIA, documenting the latest changes and their effect on the traffic analysis results.

1.0 PREVIOUSLY APPROVED TRIP ESTIMATED

Table 1 summarizes the development land uses and expected external trips, as approved by the City and Act 250 Commission. Note these figures do not include the Liberty House apartments¹ (65 units) which were previously approved and accounted for separately. The estimate does include an accounting for internal capture (trips beginning and ending within the development itself), pass-by trips (new business patrons that are diverted from the existing adjacent traffic stream), and a reduction for Transportation Demand Management measures.

TABLE 1. PREVIOUSLY APPROVED DEVELOPMENT PLAN AND EXTERNAL TRIP ESTIMATE

ITE LUC	Description	Units/size		AM Peak		PM Peak	
				enter	exit	enter	exit
223	Mid-Rise Apartment	673	d.u.	80	176	172	122
311	All-Suites Hotel	42	room	8	5	6	8
540	Junior/Community College	16,550	s.f.	33	12	22	16
565	Daycare Center	4,025	s.f.	16	13	14	16
710	General Office Building	22,541	s.f.	22	1	2	24
826	Specialty Retail Center	2,675	s.f.	0	0	1	2
932	High-Turnover (Sit-Down) Restaurant	2,650	s.f.	8	7	13	8
	sub-total			167	214	230	196
	total			381		425	

¹ The Liberty House was a renovation of the existing Burlington College building (and before that the Catholic Diocese orphanage) on-site.

2.0 PROPOSED CHANGES

The development has been revised to eliminate the building use designated as Junior/Community College entirely, and will now include the following revised components:

1. 1 additional apartment dwelling unit (d.u.)
2. A smaller daycare center (3,000 vs. 4,025 s.f.)
3. More office space (60,250 vs. 22,541 s.f.)
4. More retail space, including;
 - o 2,000 s.f. convenience store
 - o 4,350 s.f. general retail (e.g. shopping center)
5. Slightly more restaurant space (3,000 vs. 2,650 s.f.), and
6. A new business collaboration center (the Vermont Innovation Commons), which includes:
 - o A 40 room “dormitory style” hotel, and
 - o 40,000 s.f. of office space for business collaboration (best described for trip generation purposes as Research and Development Office space).

Most of these changes are predictable and conform to well documented land use categories, however the Vermont Innovation Commons (VIC) is a relatively new concept. While it includes building spaces that are similar to the land use categories selected (hotel, and research and development office space), the way that these spaces are used is likely to create fewer peak hour external trips compared to the traditional (surveyed) uses, as follows:

In this case, the living accommodations are integral to the office space and occupied by many (if not all) of the same people. Stays in the living space will be extended, up to six weeks or more, thus many trips typical of these separate uses will be on-site and the standard trip generation and internal capture methods used in this analysis do not reflect this.

In addition, the VIC will include many exclusive on-site accommodations that reduce the need to look for services elsewhere, thus reducing external trips, such as:

- Dining facilities
- Café/lounge
- Laundry
- Fitness studio
- Yoga studio

3.0 VEHICLE TRIP GENERATION

Expected primary vehicle trips from the entire development, as now proposed, have been revised using the Institute of Transportation Engineers *Trip Generation Manual*, updated using the latest survey data set (10th Edition), and are summarized by land use code (ITE LUC) in Table 1.



TABLE 2. PRIMARY TRIPS

ITE LUC	Description	Units/size		AM Peak		PM Peak	
				enter	exit	enter	exit
221	Mid-Rise Apartment	674	d.u.	80	164	169	108
311	All-Suites Hotel	50	room	9	8	9	9
311	Hotel (VIC)	40	room	9	6	7	7
565	Daycare Center	3,000	s.f.	17	16	16	18
710	General Office Building	60,250	s.f.	60	10	11	58
760	R&D Office (VIC)	40,000	s.f.	13	4	3	17
820	Retail (e.g. Shopping Center)	4,350	s.f.	2	1	5	6
826	Convenience Market	2,000	s.f.	24	24	20	19
932	High-Turnover (Sit-Down) Restaurant	3,000	s.f.	16	13	10	6
		sub-total		231	247	249	248
		total		478		498	

Primary trips are those trips expected from isolated suburban developments, not accounting for trips already on the road network that would be diverted from the adjacent highway to the new development (referred to as pass-by trips), or trips that would be made within the project due to the mix of land use (referred to as internal capture), or trips due to the effects of Transportation Demand Management, which take advantage of the availability of alternate transportation modes (i.e. biking, walking transit, etc.).

Pass-by trips are estimated using the average pass-by rates surveyed by ITE² for that land use. These trips are anticipated in addition to the primary trips. In this case only the retail, convenience market and restaurant are expected to attract pass-by trips.

TABLE 3. PASS-BY TRIPS

ITE LUC	Description	Units/size		AM Peak		PM Peak	
				enter	exit	enter	exit
221	Mid-Rise Apartment	674	d.u.				
311	All-Suites Hotel	50	room				
311	Hotel (VIC)	40	room				
565	Daycare Center	3,000	s.f.				
710	General Office Building	60,250	s.f.				
760	R&D Office (VIC)	40,000	s.f.				
820	Retail (e.g. Shopping Center)	4,350	s.f.	1	0	3	3
826	Convenience Market	2,000	s.f.	38	38	31	29
932	High-Turnover (Sit-Down) Restaurant	3,000	s.f.	0	0	8	5
		sub-total		39	39	41	37
		total		77		78	

² Trip generation handbook, 2nd edition.



Trips that are associated with each land use but are expected to take advantage of other uses within the development have been estimated using the recommended methodology in the latest ITE Trip Generation Manual³, and are shown in Table 4.

TABLE 4. INTERNAL CAPTURE TRIPS

ITE LUC	Description	Units/size		AM Peak		PM Peak	
				enter	exit	enter	exit
221	Mid-Rise Apartment	674	d.u.	1	6	6	8
311	All-Suites Hotel	50	room	0	2	2	0
311	Hotel (VIC)	40	room	0	2	1	0
565	Daycare Center	3,000	s.f.	9	8	8	9
710	General Office Building	60,250	s.f.	5	4	2	1
760	R&D Office (VIC)	40,000	s.f.	4	2	2	1
820	Retail (e.g. Shopping Center)	4,350	s.f.	1	0	2	1
826	Convenience Market	2,000	s.f.	5	5	2	6
932	High-Turnover (Sit-Down) Restaurant	3,000	s.f.	9	4	3	3
		sub-total		34	33	28	29
		total		67		57	

Accounting for the anticipated effects of Transportation Demand Management, as suggested in the VTrans TDM Guidance, a 15% reduction in trips results in the values shown in Table 5.

TABLE 5. MULTIMODAL / TDM TRIP REDUCTION

ITE LUC	Description	Units/size		AM Peak		PM Peak	
				enter	exit	enter	exit
221	Mid-Rise Apartment	674	d.u.	12	25	25	16
311	All-Suites Hotel	50	room	1	1	1	1
311	Hotel (VIC)	40	room	1	1	1	1
565	Daycare Center	3,000	s.f.	3	2	2	3
710	General Office Building	60,250	s.f.	9	1	2	9
760	R&D Office (VIC)	40,000	s.f.	2	1	0	2
820	Retail (e.g. Shopping Center)	4,350	s.f.	0	0	1	1
826	Convenience Market	2,000	s.f.	9	9	8	7
932	High-Turnover (Sit-Down) Restaurant	3,000	s.f.	2	2	3	2
		sub-total		40	43	44	43
		total		83		86	

In summary, the expected total external vehicle trips (traffic entering and leaving the project site) due to the revised land uses are shown in Table 6.

³ NCHRP Report 6842 - Internal Capture



TABLE 6. TOTAL EXTERNAL VEHICLE TRIPS

ITE LUC	Description	Units/size		AM Peak		PM Peak	
				enter	exit	enter	exit
221	Mid-Rise Apartment	674	d.u.	67	134	138	84
311	All-Suites Hotel	50	room	8	5	5	8
311	Hotel (VIC)	40	room	8	3	5	6
565	Daycare Center	3,000	s.f.	6	5	5	6
710	General Office Building	60,250	s.f.	46	4	7	48
760	R&D Office (VIC)	40,000	s.f.	7	2	0	13
820	Retail (e.g. Shopping Center)	4,350	s.f.	1	1	5	6
826	Convenience Market	2,000	s.f.	48	48	41	35
932	High-Turnover (Sit-Down) Restaurant	3,000	s.f.	5	7	12	6
		sub-total		195	210	219	214
		total		405		433	

The net effect of the development program change is an additional 24 trips in the AM peak hour and 8 trips in the PM peak hour. The total daily trip generation is expected to be 5,028 vehicles per day, an increase of 401 trips.

4.0 CONCLUSIONS

The changes in the development program include adding a convenience market which significantly increased the expected total pass-by trips - 77/78 in the AM/PM peak hours. Noting that these are not new trips, and are already on the adjacent street, but are expected to turn into the development to patronize the new convenience store (and to a lesser degree the retail use and restaurant). Thus, the additional impact is only at the development access points, as these trips turn off and then return onto the street network. These intersections are expected to operate at good levels of service in both the AM and PM peak hours.

In addition, the intent of the convenience market is to serve residents and occupants of the development (there currently exists a convenience store across North Avenue at the Shell Station). Thus, external trips are likely overestimated here.

In conclusion, the aggregate impact of the proposed development land use changes on the adjacent street network is expected to be less than the previous (approved) iteration of development land use, in both the AM and PM peak hours.

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MEMO

DEPARTMENT OF
PLANNING & ZONING

TO: Eric Farrell, Owiso Makuku, Charlie Pughe
FROM: Mark Smith, PE.
DATE: July 19, 2018
SUBJECT: Cambrian Rise – Traffic Considerations due to Development Changes (Act 250 Permit #4C1301) DRAFT

Several changes to the mix of land use within this project are proposed since the Transportation Impact Assessment (TIA), and subsequent update 12/28/16 (submitted and approved by the Environmental Commission 1/26/18) for the Cambrian Rise development project on North Avenue in Burlington, Vermont.

This memorandum is provided as a further supplement to the TIA, documenting these changes and their effects on the traffic analysis presented in the original Assessment cited above.

1.0 PREVIOUSLY APPROVED TRIP ESTIMATED

Table 1 summarizes the development land uses and expected external trips, as approved. Note these figures do not include the Liberty House apartments (65 units) which were previously approved and accounted for separately. The estimate does include an accounting for internal capture (trips beginning and ending within the development itself), some pass-by trips for the restaurant, and a reduction for Transportation Demand Management measures.

TABLE 1. PREVIOUSLY APPROVED DEVELOPMENT PLAN AND EXTERNAL TRIP ESTIMATE

ITE LUC	Description	Units/size		AM Peak		PM Peak	
				enter	exit	enter	exit
223	Mid-Rise Apartment	673	d.u.	80	176	172	122
311	All-Suites Hotel	42	room	8	5	6	8
540	Junior/Community College	16,550	s.f.	33	12	22	16
565	Daycare Center	4,025	s.f.	16	13	14	16
710	General Office Building	22,541	s.f.	22	1	2	24
826	Specialty Retail Center	2,675	s.f.	0	0	1	2
932	High-Turnover (Sit-Down) Restaurant	2,650	s.f.	8	7	13	8
	sub-total			167	214	230	196
	total			381		425	



2.0 PROPOSED CHANGES

The development has been revised to eliminate the building space designated as Junior/Community College entirely, and will now include the following components:

1. 32 additional apartment units
2. A smaller daycare center (3,000 vs. 4,025 s.f.)
3. More general office space (27,126 vs. 22,541 s.f.)
4. More retail space, including;
 - o 3,000 s.f. convenience store
 - o 3,547 s.f. general retail (e.g. shopping center)
5. Slightly more restaurant space (3,000 vs. 2,650 s.f.)
6. A new business collaboration center (the Vermont Innovation Commons), which includes:
 - o A 40 room “dormitory style” hotel, and
 - o 43,437 s.f. of office space for business collaboration (best described as Research and Development Office space).

While most of these changes are predictable and conform to well documented land use categories, the Vermont Innovation Commons is a fairly new concept. While it includes building spaces that fit well within the categories selected (hotel, and research and development office space), the way that these spaces are used are very likely to create fewer peak hour external trips, as follows:

In this case, the living accommodations are integral to the office space and occupied by many of the same people. Stays in the living space will be extended, up to six weeks, thus many trips from “home to work” and vice versa will be on-site and the standard trip generation and internal capture methods used in this analysis do not reflect this.

3.0 VEHICLE TRIP GENERATION

Expected primary vehicle trips from the entire development, as now proposed, have been revised using the Institute of Transportation Engineers *Trip Generation Manual*, updated from the 9th Edition using the latest survey data set (10th Edition), and are summarized by land use code (ITE LUC) in Table 1.

TABLE 2. PRIMARY TRIPS

ITE LUC	Description	Units/size		AM Peak		PM Peak	
				enter	exit	enter	exit
221	Mid-Rise Apartment	705	d.u.	84	172	176	113
311	All-Suites Hotel	42	room	8	7	7	8
310	Hotel	40	room	11	8	12	12
565	Daycare Center	3,000	s.f.	17	16	16	18
710	General Office Building	27,126	s.f.	27	4	5	26
760	Research and Development Center	40,437	s.f.	14	5	3	18
820	Retail (e.g. Shopping Center)	3,547	s.f.	2	1	4	5
826	Convenience Market	3,000	s.f.	37	37	29	28
932	High-Turnover (Sit-Down) Restaurant	3,000	s.f.	16	13	10	6
		sub-total	sub-total	215	262	264	233
		Total	total	476		497	



Primary trips are those trips expected from isolated suburban developments, not accounting for trips already on the road network that would be diverted from the adjacent highway to the new development (pass-by trips), or trips that would be made within the project due to the mix of land use (referred to as internal capture), or trips due to the effects of Transportation Demand Management, which take advantage of the availability of alternate transportation modes (biking, walking transit, etc.).

Pass-by trips are estimated using the average pass-by rates surveyed by ITE¹ for that land use. These trips are anticipated in addition to the primary trips.

TABLE 3. PASS-BY TRIPS

ITE LUC	Description	Units/size		AM Peak		PM Peak	
				enter	exit	enter	exit
221	Mid-Rise Apartment	705	d.u.				
311	All-Suites Hotel	42	room				
310	Hotel	40	room				
565	Daycare Center	3,000	s.f.				
710	General Office Building	27,126	s.f.				
760	Research and Development Center	40,437	s.f.				
820	Retail (e.g. Shopping Center)	3,547	s.f.	1	0	2	2
826	Convenience Market	3,000	s.f.	57	57	46	44
932	High-Turnover (Sit-Down) Restaurant	3,000	s.f.	0	0	8	5
	sub-total	sub-total		58	58	56	51
	Total	total		115		107	

Trips that are associated with each land use but are expected to take advantage of other uses within the development have been estimated using the recommended methodology in the latest ITE Trip Generation Manual², and are shown in Table 4.

TABLE 4. INTERNAL CAPTURE TRIPS

ITE LUC	Description	Units/size		AM Peak		PM Peak	
				enter	exit	enter	exit
221	Mid-Rise Apartment	705	d.u.	3	6	22	15
311	All-Suites Hotel	42	room	0	2	3	2
310	Hotel	40	room	0	2	3	1
565	Daycare Center	3,000	s.f.	5	5	6	6
710	General Office Building	27,126	s.f.	4	3	4	3
760	Research and Development Center	40,437	s.f.	4	3	3	3
820	Retail (e.g. Shopping Center)	3,547	s.f.	2	1	2	2
826	Convenience Market	3,000	s.f.	7	11	16	27
932	High-Turnover (Sit-Down) Restaurant	3,000	s.f.	15	7	8	8
	sub-total	sub-total		40	40	67	67
	Total	total		81		133	

Accounting for the anticipated effects of Transportation Demand Management, as suggested in the VTrans TDM Guidance, a 15% reduction in trips results in the values shown in Table 5.

¹ Trip generation handbook, 2nd edition.

² NCHRP Report 6842 - Internal Capture



TABLE 5. MULTIMODAL / TDM TRIP REDUCTION

ITE LUC	Description	Units/size		AM Peak		PM Peak	
				enter	exit	enter	exit
221	Mid-Rise Apartment	705	d.u.	12	25	23	15
311	All-Suites Hotel	42	room	1	1	1	1
310	Hotel	40	room	2	1	1	2
565	Daycare Center	3,000	s.f.	2	2	2	2
710	General Office Building	27,126	s.f.	3	0	0	3
760	Research and Development Center	40,437	s.f.	1	0	0	2
826	Convenience Market	3,000	s.f.	13	12	9	7
932	High-Turnover (Sit-Down) Restaurant	3,000	s.f.	0	1	2	0
	sub-total	sub-total		35	42	38	33
	Total	total		77		71	

In summary, the expected total external vehicle trips (traffic entering and leaving the project site) due to the revised land uses are shown in Table 6.

TABLE 6. TOTAL EXTERNAL VEHICLE TRIPS

ITE LUC	Description	Units/size		enter	exit	enter	exit
221	Mid-Rise Apartment	705	d.u.	68	141	131	83
311	All-Suites Hotel	42	room	6	4	4	5
310	Hotel	40	room	9	5	8	9
565	Daycare Center	3,000	s.f.	10	9	9	10
710	General Office Building	27,126	s.f.	20	1	1	20
760	Research and Development Center	40,437	s.f.	8	1	0	13
820	Retail (e.g.Shopping Center)	3,547	s.f.	0	0	4	4
826	Convenience Market	3,000	s.f.	74	70	50	38
932	High-Turnover (Sit-Down) Restaurant	3,000	s.f.	1	5	9	3
	sub-total	sub-total		197	237	215	185
	Total	total		434		400	

The net effect of the additional land use is an addition 53 trips in the AM peak hour and reduction of 25 trips in the PM peak hour. The total daily trip generation is expected to be 5,042 vehicles per day and increase of 422 trips.

4.0 CONCLUSIONS

The estimated change in traffic entering and leaving the project due to the changes in land use are only significant in the AM peak hour.

The changes include adding a convenience market which has a significant pass-by rate, resulting in 115 trips in the AM peak hour. Noting that these 115 trips are already on the adjacent street but are expected to turn into the development to patronize the new convenience store, the impact is only on the development access, as these trips turn off and then return onto the street network. These intersections are expected to operate at good levels of service in both the AM and PM peak hours

In addition, the intent of the convenience market is to serve residents and occupants of the development (there currently exists a convenience store across North Avenue at the Shell Station). Thus, external trips are likely overestimated here.



In conclusion, the aggregate impact of the proposed development land use changes on the adjacent street network is expected to be significantly less than the previous (approved) iteration of development land use in both the AM and PM peak hours.

END OF MEMO

