PARSONS

1223 Michael Street, Suite 100 | Ottawa, Ontario K1J7T2
P: +1 613.738.4160 | www.parsons.com

February 19, 2019

BY EMAIL: ktaggart@taggart.ca
Reference: 476573-01000

Taggart Group of Companies (Tamarack)
3187 Albion Road South
Ottawa, Ontario
K1V 8Y3

Attention: Keith Taggart

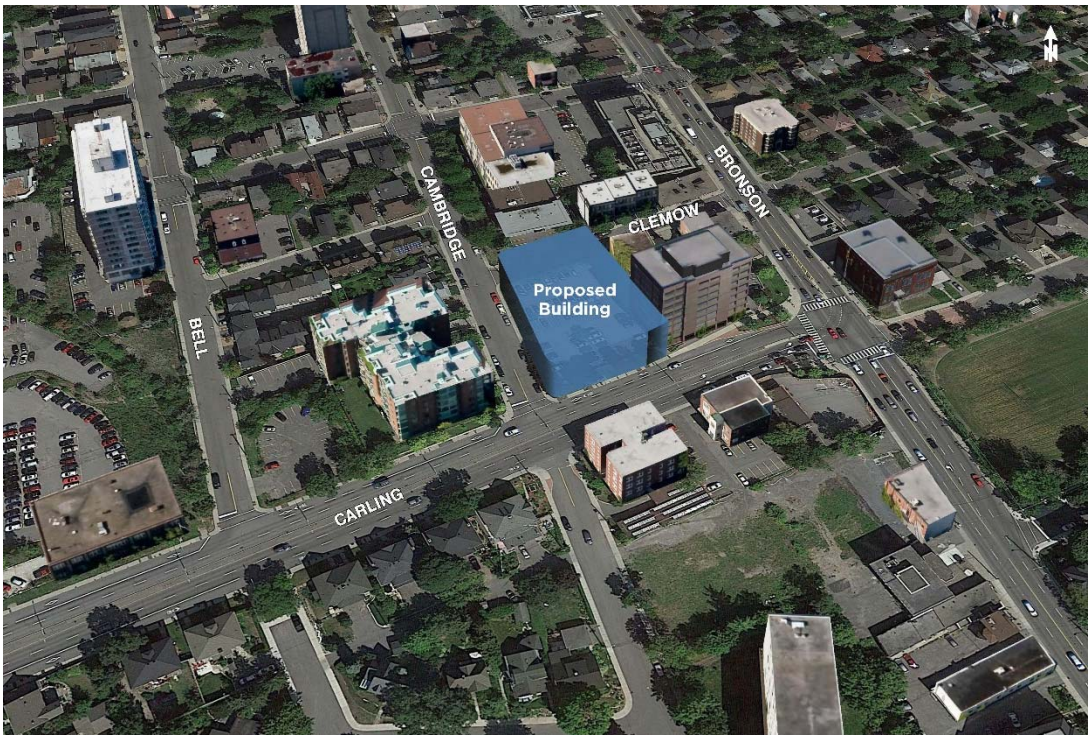
Dear Keith:

Re: 1504 – 275 Carling Avenue
Transportation Brief: Addendum #2 -Update

1. Background

The above-noted site as depicted in Figure 1: Site Context, is located in the north-east quadrant of the Carling/Cambridge intersection, was the subject of a rezoning application in 2012. At that time, the proposed development was comprised of 149 condo units, 11 line/row townhouses, 88 m^2 of commercial and 190 below-grade parking spaces. It was replacing an approximate 60 space parking lot. In support of the rezoning, Parsons (then Delcan) had prepared a Transportation Brief (August 2012) and an Addendum #1 (September 2012) to address ensuring City comments on the Brief. These are included as Appendices A and B.

Figure 1: Site Context



Due to appeals and possibly market conditions, the rezoning process was lengthy such that the rezoning was only approved on November 16, 2017.

Given the change in the market since 2012, the current development proposal has changed, however, it remains compatible with the rezoning. Key changes relevant to transportation analysis, include:

- The 160 condo/town units are being replaced by 168 senior/retirements units;
- The 190 below-grade parking spaces are being reduced to approximately 179 spaces. Approximately 52 of these spaces are for those patrons who currently park in the existing surface lot;
- The 950 ft^2 of commercial is being replaced with a 1,160 ft^2 pharmacy and 1,206 ft^2 hair and nail salon; and
- A drop-off/pick-up loop is proposed on Cambridge at the building's front entrance.

What has not changed from the previously-approved Site Plan is the location and design of the parking garage ramp connection to Clemow Avenue at the eastern limit of the site. The new Site Plan is provided as Figure 2.

2. Scope of Work

Related to the new Site Plan, Parsons had advised Wally Dubyk (Project Manager – Transportation Approvals, City of Ottawa) that the net result compared to the previously approved plan, is lower site traffic generation and no change to the approved site vehicle access. As such, Mr. Dubyk advised that it was not necessary to follow the City's new TIA Guidelines, and that an Addendum to the previously approved submissions would be sufficient. This Addendum is provided herein.

3. Existing Conditions

3.1 Traffic Operations

The initial Transportation Brief included 2010 traffic counts at the Bronson/Carling intersection and 2012 counts at Cambridge/Carling and Clemow/Bronson intersection. As a 2015 City count for the Carling/Bronson intersection is now available, it is included as Appendix C and assessed herein. With regard to the other two counts, as there is no new significant infill development in the northwest quadrant of the Carling/Bronson intersection, these counts remain valid with regard to traffic volumes on Cambridge and Clemow adjacent to the site. As show in the Appendix A report, as each of the Cambridge/Carling, Cambridge/Clemow and Clemow/Bronson intersections were operation at a level of service in the A to B range for the "critical movement", they will continue to be operating at a good level of service.

The more current 2015 count at the Carling/Bronson intersection reflects higher volumes than the 2010 count. The following Table 1 provides a comparison of the intersection's levels of service for the 2012 and 2015 conditions. The SYNCHRO analysis is included in Appendix C.

As shown by the Table 1 comparison, the level of service at the adjacent Carling/Bronson intersection has deteriorated since 2012 due to higher volumes and to a new 5 second advance walk phase in the east-west direction which takes time away from the eastbound traffic movement. As noted in Table 1, the northbound left-turn movement from Bronson to Carling, and the right-turn movement from Carling to Bronson are the critical movements with v/c's in the 1.08 to 1.34 range.

Table 1: Carling/Bronson Level of Service Comparisons

Time Period	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a whole'		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Year 2010 (June)	E(F)	0.92(1.32)	NBL(NBL)	29.8(40.9)	D(E)	0.84(0.94)
Year 2015 (April)	F(F)	1.08(1.34)	NBL(EBR)	37.3(72.9)	D(F)	0.89(1.07)
Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

Figure 2: Site Plan

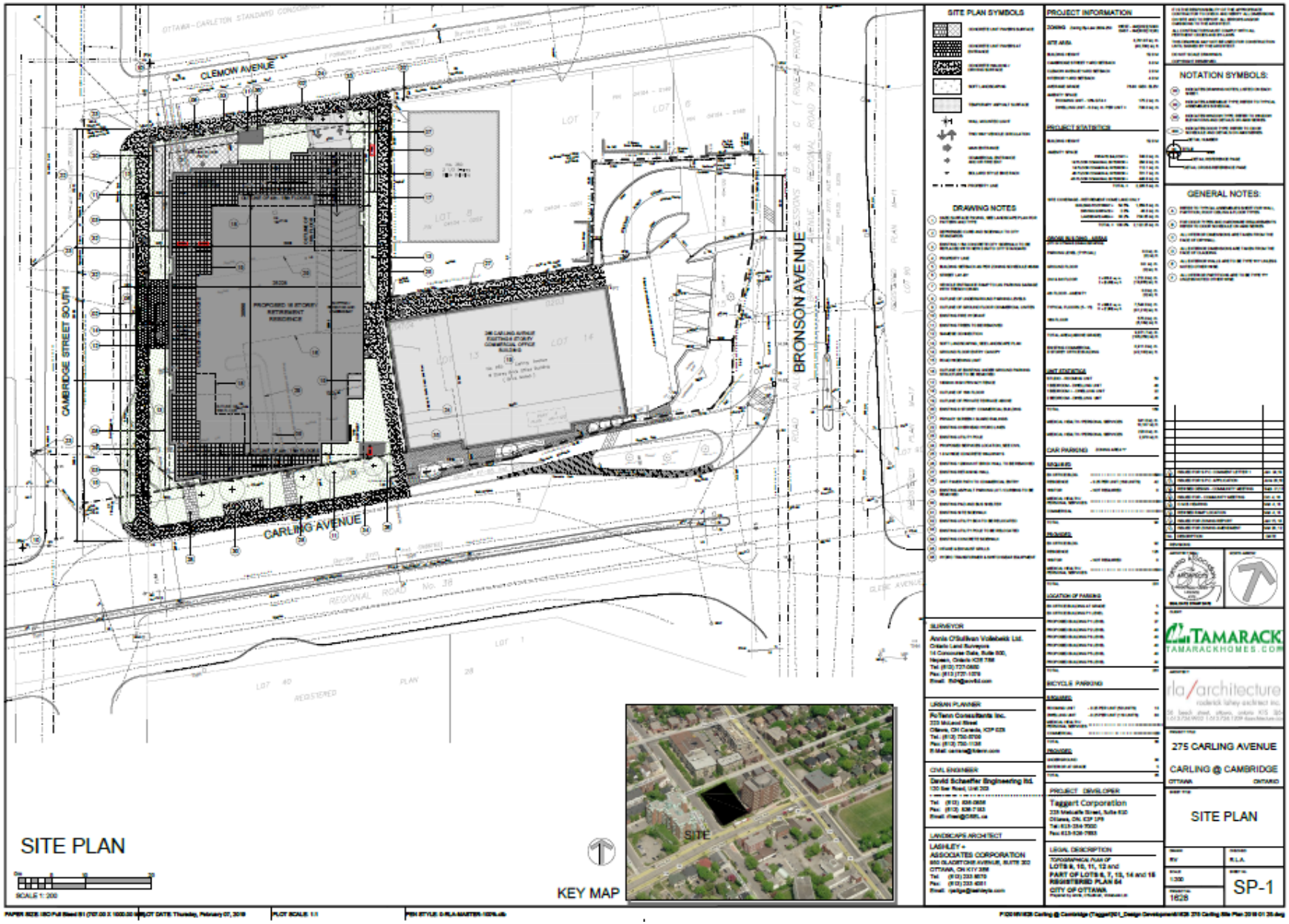
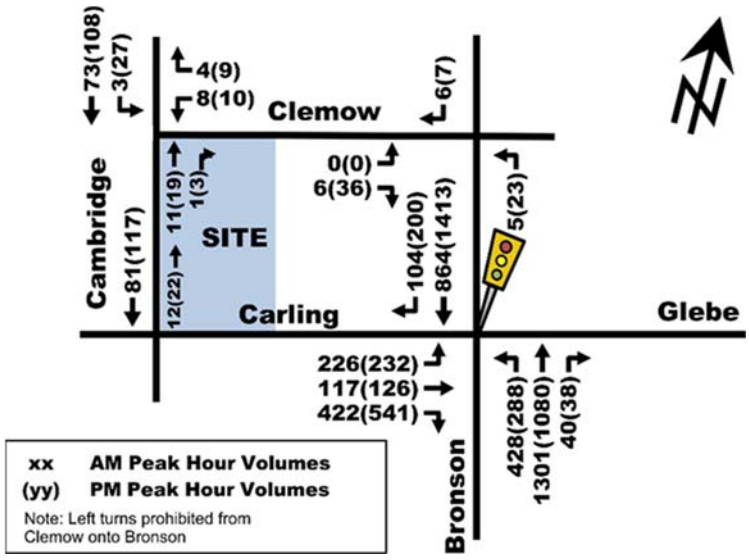


Figure 3: Current Peak Hour Traffic Volumes



In review of study area traffic distribution it is noteworthy that the Cambridge intersection with Carling Avenue is right-in/right-out only and at the Clemlow intersection with Carling, eastbound left turns from Clemow to Carling are prohibited.

3.2 Non-Auto Facilities

With regard to facilities for non-auto modes, the Carling/Bronson has been recently reconstructed to be more attractive and pedestrian/bicycle friendly. Non-auto facilities adjacent to, or in close proximity to the site, include:

- Sidewalks on both sides of all adjacent streets;
- Shared transit-bike lanes on westbound Carling adjacent to the site and on eastbound Carling west of Cambridge; and
- Bus stop on Carling westbound adjacent to the site, on Carling eastbound just west of Cambridge, on Bronson southbound just north of Clemow and just south of Carling, and on Bronson northbound just north and south of Carling.

4. Site Traffic Generation

Appropriate trip generation rates for the proposed development consisting of 120 senior apartments, 48 retirement residential units, a 1,160 ft^2 pharmacy and a 1,206 ft^2 hair and nail salon were obtained from the ITE Trip Generation Manual (9th Edition). These rates are summarized in Table 2.

Table 2: ITE Trip Generation Rates

Land Use	ITE Land Use Code	Trip Rates	
		AM Peak	PM Peak
Senior Adult Housing - Attached	ITE 252	T = 0.20(du); T = 0.20(du) – 0.13	T = 0.25(du); T = 0.24(du) + 1.64
Congregate Care Facility/ Retirement Units	ITE 253	T = 0.08(du)	T = 0.22(du)
Pharmacy	ITE 880	T = 2.94(X)	T = 8.51(X)
Hair Salon	ITE 918	T = 1.21(X)	T = 1.45(X)

Notes: *T = Average Vehicle Trip Ends*
du = Dwelling units
X= Gross Floor Area in 1,000 feet squared

As ITE trip generation surveys only record vehicle trips and typically reflect highly suburban locations (with little to no access by travel modes other than private automobiles), adjustment factors appropriate to the more urban study area context were applied to attain estimates of person trips for the proposed development.

To convert ITE vehicle trip rates to person trips, an auto occupancy factor and a non-auto trip factor were applied to the ITE vehicle trip rates. Based on the TIA Guidelines and our review of available literature, a combined factor of approximately 1.28 is considered reasonable to account for typical North American auto occupancy values of approximately 1.15 and combined transit/non-motorized modal shares of 10%. As such, the person trip generation for the proposed development is summarized in Table 3.

Table 3: Modified Person Trip Generation - Retail

Land Use	Area	AM Peak (Person Trip/h)			PM Peak (Person Trip/h)		
		In	Out	Total	In	Out	Total
Senior Adult Housing - Attached	120 units	10	21	31	21	18	39
Congregate Care Facility/ Retirement Units	48 units	2	2	4	6	5	11
Pharmacy	1,160 ft^2	2	2	4	6	7	13
Hair Salon	1,206 ft^2	1	1	2	0	2	2
Total Person Trips		**15**	**26**	**41**	**33**	**32**	**65**

The person trips shown in Table 3 for the proposed development were then reduced by modal share values based on the site's location and proximity to adjacent communities, employment, shopping uses and transit availability. Based on the OD Survey, the modal share values for this area (Ottawa Inner Area) show approximately 40% to 45% driver mode splits and 10% to 40% transit mode splits. Based on the land use, it is expected that a higher percentage of residents to this development will drive or get driven to/from the building. However, as the tenants will be mostly retired, the trips to/from the site often occur outside of the commuter peak hours. Modal share values for the proposed residential development are summarized in Table 4 and the modal share values for the proposed retail are summarized in Table 5.

Table 4: Residential Modal Site Trip Generation

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	55%	7	13	20	15	13	28
Auto Passenger	10%	2	3	5	3	3	6
Transit	20%	2	4	6	5	4	9
Non-motorized	15%	1	3	4	4	3	7
Total Person Trips	**100%**	**12**	**23**	**35**	**27**	**23**	**50**

Table 5: Retail Modal Site Trip Generation

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	45%	2	2	4	3	5	8
Auto Passenger	10%	0	0	0	1	1	2
Transit	5%	0	0	0	0	0	0
Non-motorized	40%	1	1	2	2	3	5
Total Person Trips	**100%**	**3**	**3**	**6**	**6**	**9**	**15**

Table 4 and 5 were combined and the total people trips by mode are provided in Table 6.

Table 6: Combined Residential and Retail Modal Site Trip Generation

Travel Mode	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
	In	Out	Total	In	Out	Total
Auto Driver	9	15	24	18	18	36
Auto Passenger	2	3	5	4	4	8
Transit	2	4	6	5	4	9
Non-motorized	2	4	6	6	6	12
Total Person Trips	**15**	**26**	**41**	**33**	**32**	**65**

As shown in Table 6, the total number of person trips projected to be generated by this development is approximately 41 and 65 persons/h during the weekday commuter peak hours. Of this total, 6 to 12 persons/h are walking, biking or taking transit. The total amount of 'new' vehicle traffic to the study area is projected to be 24 to 36 veh/h during the peak hours. This is the "worst case" site traffic generation as it does not account for existing traffic to/from the surface parking lot that is to be replaced. This amount of traffic equates to approximately 1 new vehicle every 2 minutes during peak hours, which is quite infrequent and not problematic.

A comparison of the site traffic generation from the 2012 study to those of the current proposal is summarized in Table 6, is provided in Table 7. As can be seen from review of Table 7, two-way peak hour site-generated traffic is estimated to be between 23 veh/h and 7 veh/h less with the new senior/retirement development proposal and therefore its negligible impact and area streets and intersections will be even less.

Table 7: Site Traffic Generation Comparison

Proposed Development	Number of Units	AM Peak (Person Trip/h)			PM Peak (Person Trip/h)		
		In	Out	Total	In	Out	Total
Year 2012	160 condo/ townhouses	10	37	47	26	17	43
Year 2018	168 retirement units + Retail	9	15	24	18	18	36
	Net Difference	**-1**	**-22**	**-23**	**-8**	**1**	**-7**

5. Site-Generated Traffic Distribution and Assignment

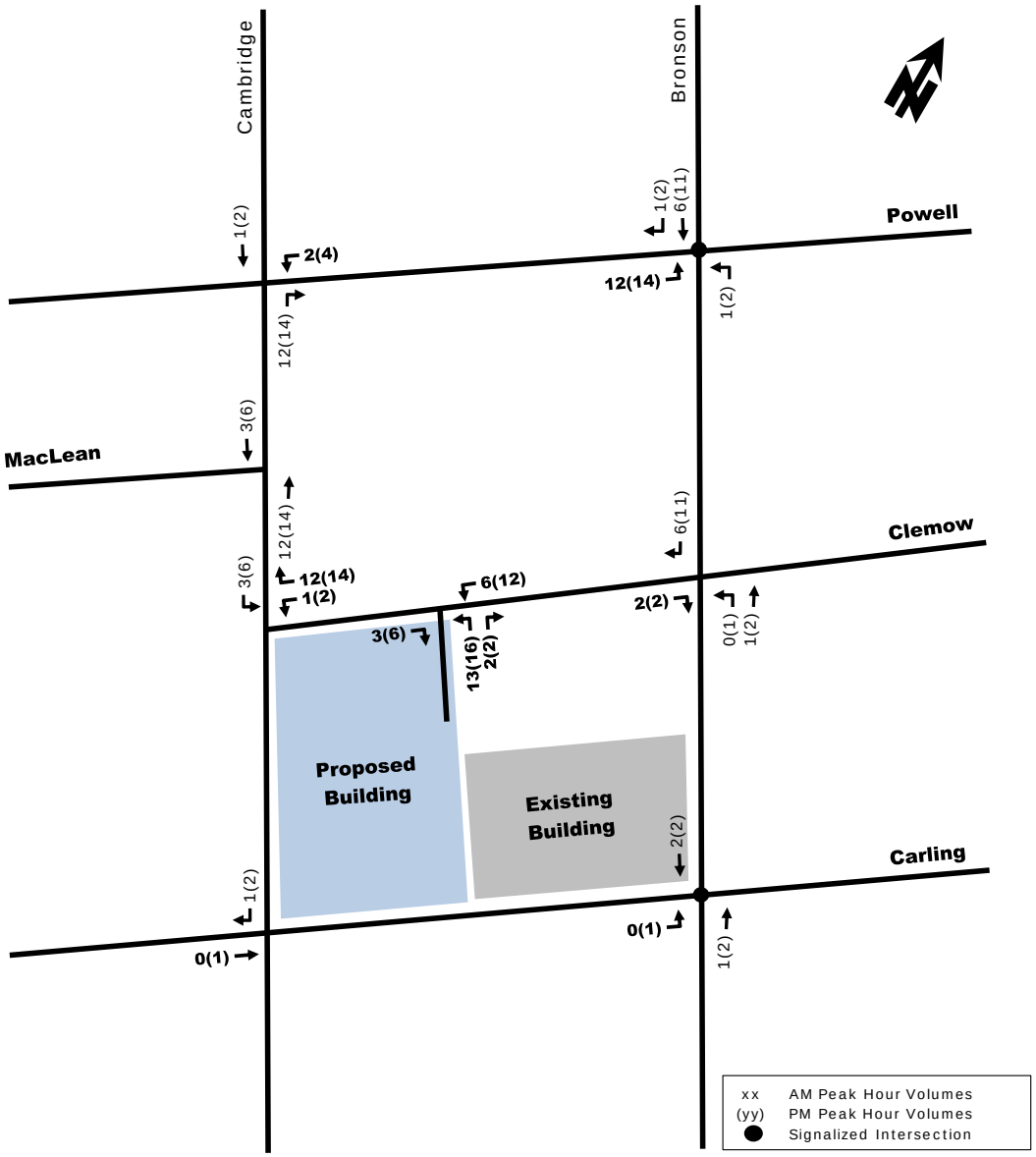
Traffic distribution was based on the site's connectivity to the existing road network and our knowledge of the surrounding area. The resultant distribution is outlined as follows:

- 60% to/from the north via Bronson Avenue and Cambridge;
- 10% to/from the south via Bronson Avenue;
- 15% to/from the west via Carling Avenue; and
- 15% to/from the east via Powell Avenue

100%

The 'new' auto trips generated by the proposed development are depicted in Figure 4.

Figure 4: 'New' Auto Trips



6. Neighbourhood Impacts

The following paragraph was extracted from the 2012 report as it remains valid for "neighbourhood impacts" even though site-generated traffic from the proposed new development will be significantly less than for the 2012 proposal.

"Given the site's proposed garage driveway connection to a local roadway (Clemow Avenue), its proximity to a sometimes congested arterial (Bronson Avenue) from which eastbound left turns are not permitted, and the restricted access to an arterial with a raised center median (Carling Avenue), there will be neighbourhood impacts with respect to site-generated cut through traffic. However, some cut through traffic already exists on Cambridge Street southbound due to its connections to Plymouth Street, Powell Avenue and Clemow Avenue which currently provide a detour around the congested Bronson Avenue to access Carling Avenue westbound. Additional neighbourhood cut through traffic caused by the proposed development would be due to the raised median on Carling Avenue, where traffic destined for the proposed site heading eastbound on Carling Avenue would have to make four left turns at intersections (2 signalized) to reach their destination. This lengthy route makes Booth Street to Clemow Avenue a viable alternative. However, as the proposed development's cut through traffic is less than 5 vph, it is not considered a meaningful or significant amount of traffic."

7. Site Plan Review

This section provides an overview of site access, parking requirements, pedestrian circulation and transit accessibility. The proposed Site Plan was previously illustrated in Figure 2.

7.1 Access Requirements

The garage driveway connection proposed to serve the development is located at the northeast corner of the site and will be a full-movement access to Clemow Avenue. The driveway is 6.0 m wide. City By-Law requirements state that a private approach serving a parking area of more than 50 vehicles should not exceed a grade of 2% for a distance of 9 m from the edge of sidewalk. The Site Plan, however, shows an approximate 3 m 'clear zone' with a 2% grade between the sidewalk and the beginning of the ramp to the underground garage. This is followed by an approximate 10% grade for 33 m to access the first level of the parking garage. Based on projected volumes, neither signalized intersection control or turn lane modifications are warranted at the proposed driveway connection to Clemow. While the By-Law requirements of 9 m from the property line at 2% is not met, given the combination of good visibility (building set backs) at the top of the proposed ramp and the proposed 10% ramp grade, we consider this situation to be safe and acceptable, however, a variance may be required.

7.2 Parking

By-Law requirements for vehicle parking total 97 spaces. A total supply of 179 spaces is proposed, of which 52 are for the adjacent building (replacing those lost from the surface parking lot) and 120 are for the new building residents. As such, the vehicle parking requirements are met. It is noteworthy that the 20 parking spaces in the one level garage in the building adjacent to the east is proposed to connect to the P1 level of the new garage. As the grades are compatible, this connection is not problematic.

7.3 Pedestrians/Transit

The proposed site fronts Carling Avenue to the south where sidewalks are provided along the both sides of the roadway, connecting pedestrians to transit service, recreational pathways, Booth Street Governments District and other adjacent developments. The frontage to Cambridge Street and Clemow Avenue also has sidewalks provided on both sides of the road providing access to Bronson Ave. Transit stops on Carling Avenue are located directly in front of the proposed development, and these bus routes can shuttle transit riders to the Carling Avenue O-Train station located at Preston Street, 850 m to the west.

7.4 On-Site Circulation

With regard to the garage layout, aisle widths are 6 m, the floor and ramp grades are 3.75%, and the parking spaces are 5.2 m long and 2.6, wide. All these dimensions meet By-Law requirements; thus, the garage will operate very well.

7.5 Bicycles

Secure bicycle parking will be provided on each floor of the parking garage. By-Law requirements call for approximately 95 spaces and the architect has advised that these will be provided and as such, the By-Law requirements are met. There is also the potential for another 90 bicycle spaces within the storage lockers.

7.6 Drop-off/Pick-up Loop

As previously mentioned, an approximate 4 m wide drop-off/pick-up loop is proposed at the building's front door on Cambridge Street. This loop is desirable given the building's senior and retirement resident mix. As shown on the Figure 2: Site Plan, the location of the loop allows the sidewalk on the east side of Cambridge to remain, although it would be depressed across the loop lane. Being only 4.0 m wide, the lane would be for quick drop-off/pick-up as it is not sufficiently wide for two vehicles to pass. It is of sufficient length to accommodate 3 or 4 vehicles parked in a queue.

8. Findings, Conclusions and Recommendations

Based on the foregoing, the conclusions and recommendations of this Transportation Brief are as follows:

- Study area intersections 'as a whole' are currently operating at an acceptable LoS during the weekday morning and afternoon peak hours, with the exception of the Bronson/Carling intersection which currently operates at LoS 'F' during the morning and afternoon peak periods;
- The proposed development is projected to generate approximately 24 and 36 veh/h two-way total trips during the weekday morning and afternoon peak hours, respectively. These volumes equate to approximately 1 new vehicle 2 minutes during peak hours, and are considered relatively insignificant to the operation of area roads and intersections. It is very noteworthy that these volumes are 23 vph to 7 vph less than what was to be generated by the previous Site Plan, and the City has accepted/approved the Traffic Study done for that Site Plan.
- Future traffic conditions at study area intersections are projected to operate similar to existing conditions, indicating negligible site impact;
- A total of 179 vehicle parking spaces and a minimum of 95 bicycle parking spaces are proposed to serve the development, both of which meet the City's Zoning By-Law requirements;
- The proposed ramp design ay 6.0 m wide with a 10% grade is considered safe and acceptable, but will require a variance as it has only 3 m of 2% grade back from the sidewalk;
- The internal garage circulation is well laid out and is expected to operate efficiently, and all aisle and parking spaced dimensions meet By-Law requirements;
- The site has excellent sidewalk connectivity and is well served by transit so as to maximize the walk/transit modes: and
- The proposed development fits well into the context of the surrounding area, and its location and design servers to promote the use of walking, cycling, and transit modes, thus supporting City of Ottawa policies, goals and objectives with respect to the redevelopment, intensification and modal share.

Based on the foregoing, and given that the current development proposal generates approximately 15% to 50% fewer vehicle trips than the previous development proposal for which its Transportation Study was accepted by the City in support of the site's rezoning, approval of the proposed development is recommended from a transportation perspective.

Prepared by:

Ronald Jack, P.Eng.
Senior Transportation Engineer

Updated February 2019 by:

André Sponder, P.Eng.
Transportation Engineer

Attachments

Appendix A

2012 Transportation Brief

265 Carling Avenue
Residential Development

• TRANSPORTATION
BRIEF •

April 10, 2012

Delcan
TRANSPORTATION • INFORMATION TECHNOLOGY • WATER

Address 265 Carling Avenue TB Modified

File # TO3073TOB

Date 10 April, 2012

Check List

☑ Municipal address;

☑ Location relative to major elements of the existing transportation system (e.g., the site is located in the southwest quadrant of the intersection of Main Street/ First Street, 600 metres from the Maple Street Rapid Transit Station);

☑ Existing land uses or permitted use provisions in the Official Plan, Zoning By-law, etc.;

☑ Proposed land uses and relevant planning regulations to be used in the analysis;

☑ Proposed development size (building size, number of residential units, etc.) and location on site;

☐ Estimated date of occupancy;

☐ Planned phasing of development;

☑ Proposed number of parking spaces (not relevant for Draft Plans of Subdivision); and

☑ Proposed access points and type of access (full turns, right-in/ right-out, turning restrictions, etc.

☑ Study area;

☐ Time periods and phasing; and

☐ Horizon years (include reference to phased development).

Existing Conditions

☑ Existing roads and ramps in the study area, including jurisdiction, classification, number of lanes, and posted speed limit;

☑ Existing intersections, indicating type of control, lane configurations, turning restrictions, and any other relevant data (e.g., extraordinary lane widths, grades, etc.);

☐ Existing access points to adjacent developments (both sides of all roads bordering the site);

☑ Existing transit system, including stations and stops;

☑ Existing on- and off-road bicycle facilities and pedestrian sidewalks and pathway networks;

☑ Existing system operations (V/C, LOS); and

☑ Major trip generators/ attractors within the Study Area should be indicated.

Demand Forecasting

☑ Trip generation forecasts

Impact Analysis

☑ Qualitative assessment of impacts on capacity; non-auto modes; on-site circulation; community

☑ Synchro Files

265 Carling Avenue Residential Development

Transportation Brief

Prepared for:

Taggart Corporation
225 Metcalfe Street, Suite 610
Ottawa, ON K2P 1P9

Prepared by:

1223 Michael Street
Suite 100
Ottawa, ON K1J 7T2

TO3073TOB00

April 2012

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1. INTRODUCTION

Taggart is proposing to redevelop a part of the property located at 265 Carling Avenue, which is currently occupied by a surface parking lot (approximately 60 parking spaces). The parking lot is located at the north-east corner of the Carling/Cambridge intersection and is adjacent to an 8 storey office building located on the same site but closer to the Bronson/Carling intersection. From the information provided, we understand that the proposed development will consist of approximately 149 high-rise condominium/apartment units, 11 live/work townhomes and an 88 m² commercial unit.

Based on the ensuing trip generation and our review of the City's Transportation Assessment Guidelines (TIA), the proposed development is projected to generate less than the City's 75 veh/h TIA guideline for any assessment. Therefore, from a transportation perspective, it is more appropriate to conduct a Modified Transportation Brief (TB) to capture only the relevant transportation issues. On this basis, this TB will address only the following:

- existing traffic conditions at key adjacent intersections;
- future site trip generation and distribution;
- off-site traffic control requirements (if any); and
- Site Plan issues, including proposed access, parking, loading and circulation layout.

The site's local context is depicted in Figure 1 and the Site Plan is depicted in Figure 2.

Figure 1: Local Context

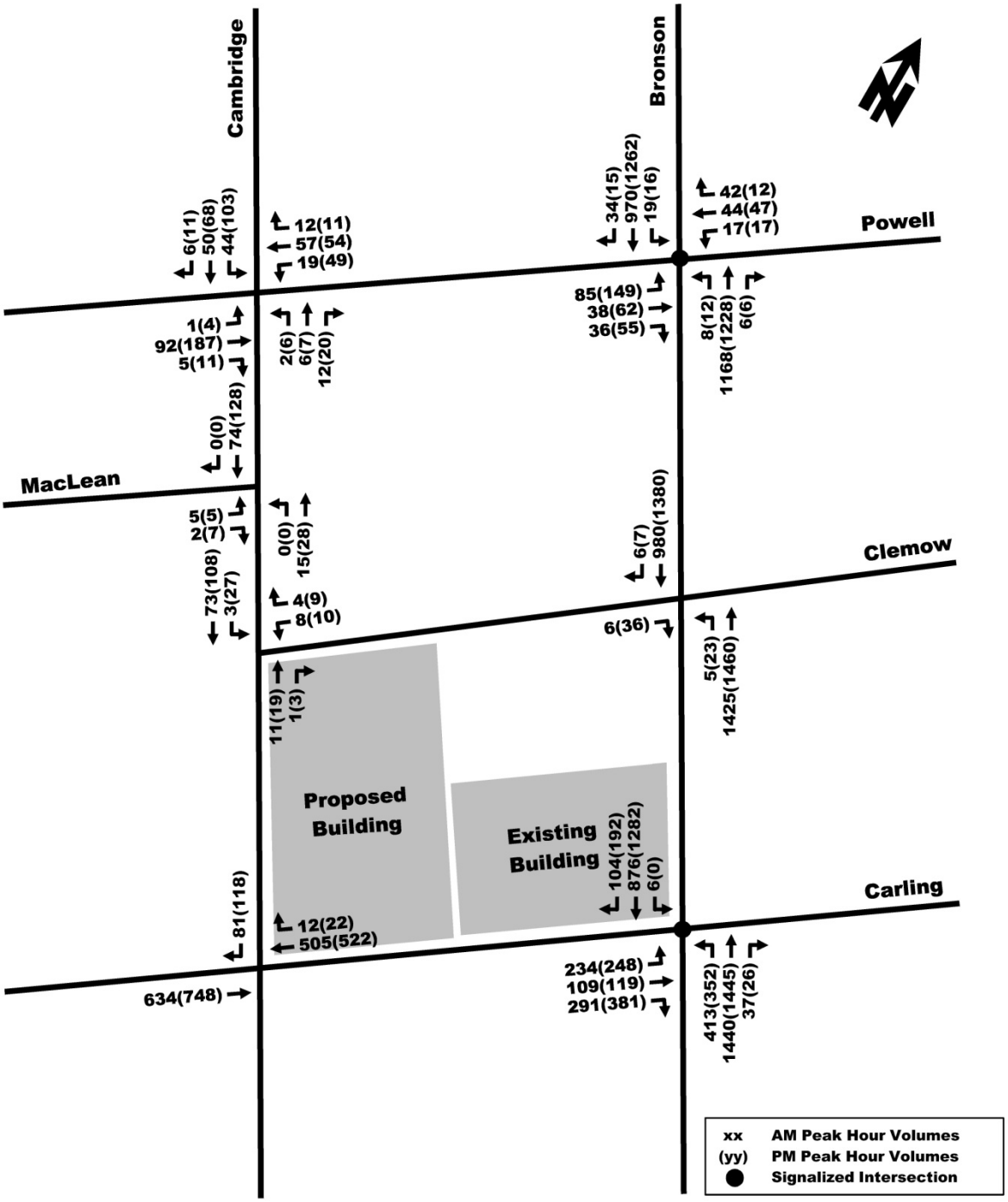
2. EXISTING TRAFFIC OPERATIONS

Recent weekday morning and afternoon peak hour traffic counts were obtained from the City of Ottawa for the signalized Bronson/Carling and Bronson/Powell intersections. Existing weekday morning and afternoon peak hour traffic volumes were collected by Delcan at the Cambridge/Powell, Cambridge/Clemow and Bronson/Clemow intersections. Current peak hour traffic volumes are illustrated in Figure 3 and are included as Appendix A.

As per the City's Transportation Master Plan, Bronson Avenue and Carling Avenue are designated as arterial roads. Cambridge Street, Clemow Avenue and Powell Avenue are designated as local roadways roads. Speed limits within the study area are posted at 40 km/h along Cambridge, Clemow, Powell and Carling (east of Bronson), 50 km/h along Bronson and 60 km/h along Carling (west of Bronson).

Figure 2: Site Plan

Figure 3: Existing Traffic Volumes



The ensuing Table 1 provides a summary of existing traffic operations at study area intersections based on the Synchro (V8) traffic analysis software. The subject intersections were assessed in terms of the volume-to-capacity (v/c) ratio and the corresponding Level of Service (LoS) for the critical movement(s). The subject intersections, 'as a whole', were assessed based on a weighted v/c ratio. The Synchro model output of existing conditions are provided within Appendix B.

Table 1: Existing Performance at Study Area Intersections

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Bronson/Carling	E(F)	0.92(1.32)	NBL(NBL)	29.8(40.9)	D(E)	0.84(0.94)
Bronson/Powell	D(E)	0.83(0.91)	EBT(EBT)	11.6(20.8)	A(B)	0.52(0.63)
Bronson/Clemow	B(B)	10.0(10.3)	EBR(EBR)	0.1(0.5)	A(A)	-
Cambridge/Powell	A(A)	8.1(9.6)	SBL(SBL)	7.9(9.2)	A(A)	-
Cambridge/MacLean	A(A)	8.9(9.2)	EBL(EBL)	0.7(0.7)	A(A)	-
Cambridge/Clemow	A(A)	8.8(9.1)	WBL(WBL)	1.3(2.2)	A(A)	-
Cambridge/Carling	B(B)	10.6(11.1)	SBR(SBR)	0.7(0.9)	A(A)	-
Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

As shown in Table 1, study area intersections, 'as a whole', are currently operating at an acceptable overall LoS 'A' or better, with the exception of the Bronson/Carling and Bronson/Powell intersections during the morning and afternoon peak hours. With regard to the 'critical movements' at study area intersections, they are currently operating at an acceptable LoS 'B' or better during peak hours, with the exception of the Bronson/Carling intersection operation at a LoS E(F) and Bronson/Powell intersection operation at a LoS D(E) during the morning and afternoon peak hours, respectively.

2.1 Site Vehicle Trip Generation

The proposed development will consist of approximately 149 high-rise condominium/apartment units, 11 live/work townhomes and an 88 m² commercial unit. The appropriate trip generation rate for the proposed land use was obtained from the 8th Edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual and is summarized in Table 2. It should be noted that the ITE rate used for the live/work townhome land use is 50% of that for a residential condominium/townhome, due to the fact that these units can be used for both living and working it is assumed that only 50% will be making trips to/from their destinations during the peak hours. It is also assumed that the commercial unit would be a convenience store/service centre for the building and would generate no new trips to/from the site.

Table 2: ITE Trip Generation Rates

Land Use	Data Source	Trip Rates	
		AM Peak	PM Peak
High-Rise Condominium	ITE 232	T = 0.34(du); T = 0.29(du)+28.86	T = 0.38(du); T = 0.34(du)+15.47
Residential Condo/Town	ITE 230	T = 0.44 Ln(T) = 0.80LN(du)+0.26	T = 0.52 Ln(T) = 0.82LN(du)+0.32
Notes: T = Average Vehicle Trip Ends du = Dwelling Units			

As ITE trip generation surveys only record vehicle trips and typically reflect highly suburban locations (with little to no access by travel modes other than private automobiles), adjustment factors appropriate to the more urban study area context were applied to attain estimates of person trips for the proposed development. This approach is considered appropriate within the industry for urban infill developments.

To convert ITE vehicle trip rates to person trips, an auto occupancy factor and a non-auto trip factor were applied to the ITE vehicle trip rates. Our review of the available literature suggests that a combined factor of approximately 1.3 is considered reasonable to account for typical North American auto occupancy values of approximately 1.15 and combined transit and non-motorized modal shares of less than 10%. The person trip generation for the proposed site is summarized in Table 3.

Table 3: Modified Person Trip Generation

Land Use	Data Source	Area	AM Peak (persons)			PM Peak (persons)		
			In	Out	Total	In	Out	Total
High-Rise Condominium	ITE 232	149 Du	17	77	94	53	33	86
Townhouse Live/Work	ITE 230	11 Du	3	3	6	3	4	7
Note: 1.3 factor to account for typical North American auto occupancy values of approximately 1.15 and combined transit and non-motorized modal shares of less than 10%								

The person trips shown in Table 3 for the proposed site were then reduced by modal share values based on the 2005 TRANS O-D survey to reflect the site's location and proximity to employment, shopping uses and transit availability. Modal share values for the proposed site are summarized in Table 4.

Table 4: Modal Site Trip Generation

High-Rise Condo Trip Generation

Travel Mode	Mode Share	AM Peak (Persons/hr)			PM Peak (Persons/hr)		
		In	Out	Total	In	Out	Total
Auto Driver	45%	8	35	43	24	15	39
Auto Passenger	10%	1	7	8	5	3	8
Transit	30%	6	23	29	16	10	26
Non-motorized	15%	2	12	14	8	5	13
Total Person Trips	100%	17	77	94	53	33	86
Less Pass-by (0%)		0	0	0	0	0	0
Total 'New' High-Rise Condo Auto Trips		**8**	**35**	**43**	**24**	**15**	**39**

Townhouse Live/Work Trip Generation

Travel Mode	Mode Share	AM Peak (Persons/hr)			PM Peak (Persons/hr)		
		In	Out	Total	In	Out	Total
Auto Driver	45%	2	2	4	2	2	4
Auto Passenger	10%	0	0	0	0	0	0
Transit	30%	1	1	2	1	2	3
Non-motorized	15%	0	0	0	0	0	0
Total Person Trips	100%	3	3	6	3	4	7
Less Pass-by (0%)		0	0	0	0	0	0
Total 'New' Townhouse Live/Work Auto Trips		**2**	**2**	**4**	**2**	**2**	**4**

Total Site Trip Generation

Travel Mode	Mode Share	AM Peak (veh/hr)			PM Peak (veh/hr)		
		In	Out	Total	In	Out	Total
High-Rise Condo Auto Trips		8	35	43	24	15	39
Townhouse Live/Work Auto Trips		2	2	4	2	2	4
Total New Auto Trips		**10**	**37**	**47**	**26**	**17**	**43**

As shown in Table 4, the resulting number of potential 'new' two-way vehicle trips for the proposed site is 47 and 43 veh/h during the weekday morning and afternoon peak hours, respectively. These volumes equate to approximately 1 new vehicle every 75 seconds, and are well below the City's guideline of 75 veh/h for requiring a formal TIA.

2.2 Traffic Distribution and Assignment

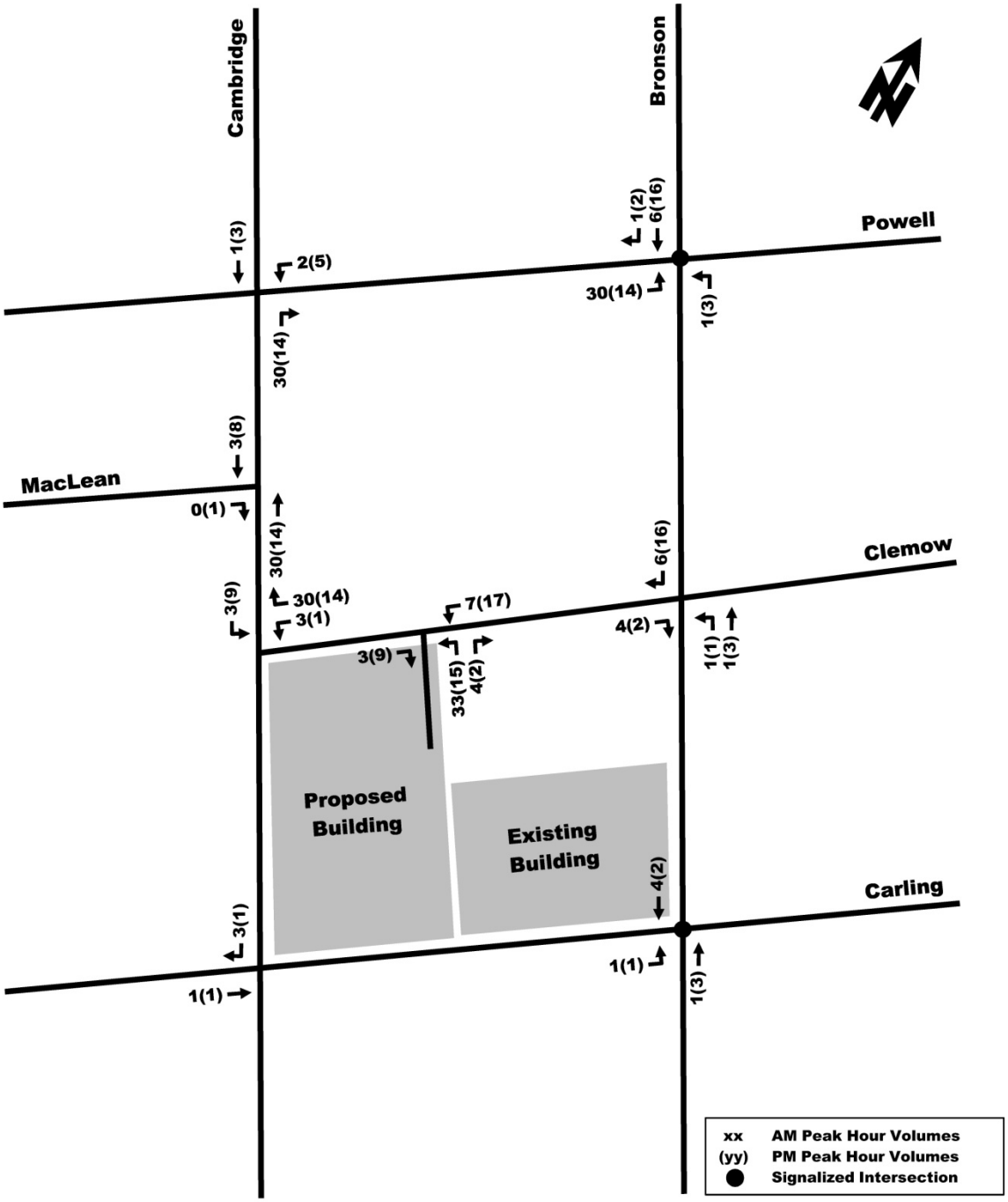
Traffic distribution was based on the site's connectivity to the existing road network and our knowledge of the surrounding area. The resultant distribution is outlined as follows:

- 80% to/from the north via Bronson Avenue;
- 10% to/from the south via Bronson Avenue; and
- 10% to/from the west via Carling Avenue;

100%

The 'new' auto trips generated by the site are depicted in Figure 4.

Figure 4: 'New' Residential Auto Trips



3. FUTURE TRAFFIC OPERATIONS

For the purpose of this study, the total projected traffic volumes were derived by superimposing site-generated traffic (Figure 4) on to existing traffic volumes (Figure 3). The resulting total projected traffic volumes are illustrated as Figure 5. No background traffic growth was assumed as this study is not a formal TIA, and the City's Traffic Impact Assessment Guidelines indicate that no traffic analysis is required.

Table 5 provides a summary of projected performance of the study area intersections. The Synchro model output of projected conditions are provided within Appendix C.

Table 5: Projected Performance at Study Area Intersection

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Bronson/Carling	E(F)	0.92(1.32)	NBL(NBL)	30.0(40.7)	D(E)	0.85(0.94)
Bronson/Powell	E(E)	0.95(0.93)	EBT(EBT)	14.2(22.0)	A(B)	0.54(0.65)
Bronson/Clemow	A(B)	10.0(10.1)	EBR(EBR)	0.1(0.5)	-	-
Cambridge/Powell	A(A)	8.2(9.7)	SBL(SBL)	7.9(9.3)	-	-
Cambridge/MacLean	A(A)	9.1(9.2)	EBL(EBL)	0.5(0.6)	-	-
Cambridge/Clemow	A(A)	8.7(9.0)	WBL(WBL)	3.2(2.9)	-	-
Cambridge/Carling	B(B)	10.6(11.1)	SBR(SBR)	0.7(0.9)	-	-
Clemow/Site Access	A(A)	8.8(9.1)	NBL(NBL)	5.8(2.9)	-	-

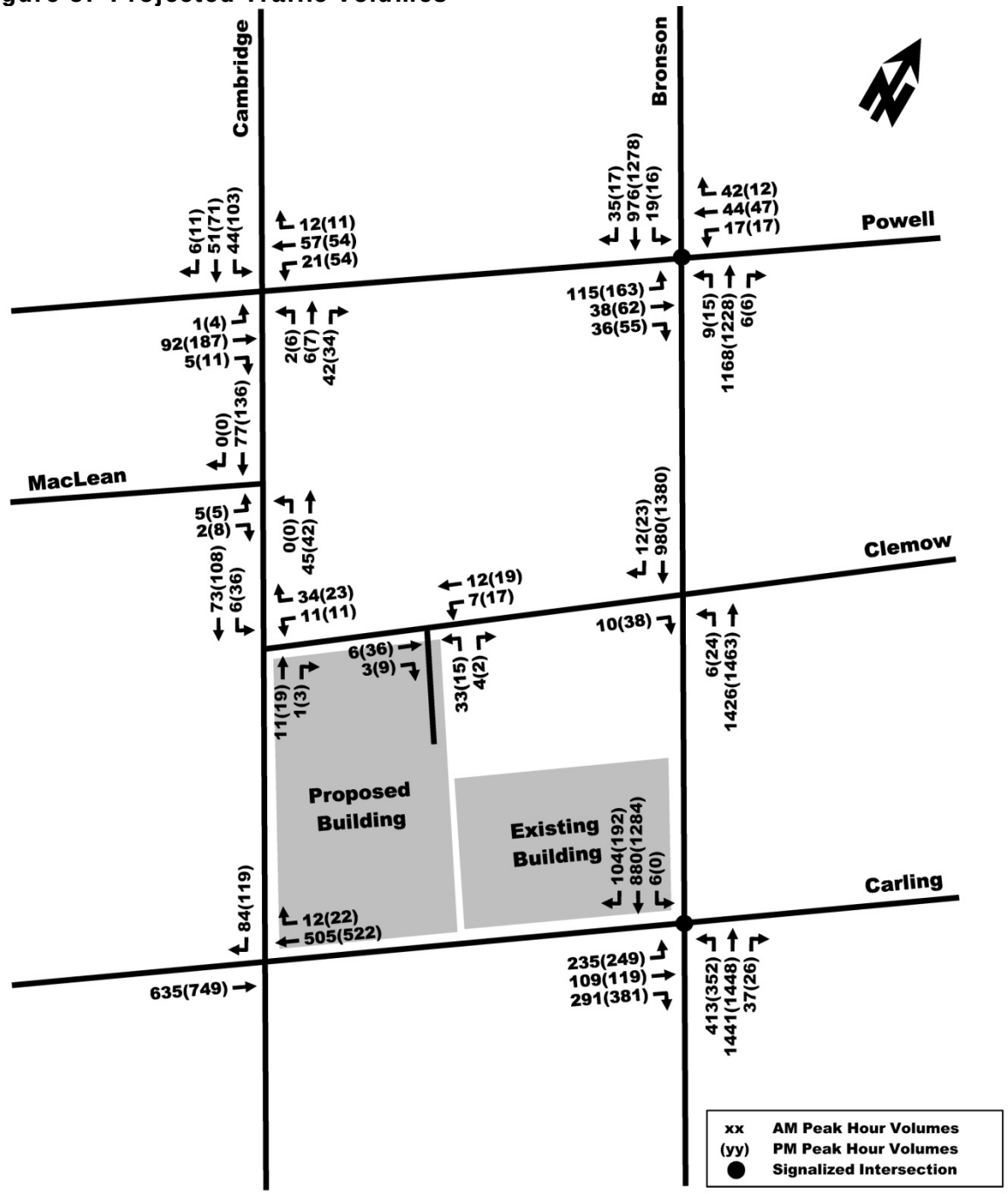
Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.

As shown in Table 5, with no signal timing plan modifications, the signalized study area intersections, 'as a whole', are projected to operate similar as compared to existing conditions. With regard to the 'critical movements' at study area intersections, they are also projected to operate similar as compared to existing conditions, with the exception of the Bronson/Powell intersection during the morning peak hour where the critical movement has increased to a LoS E (existing LoS D). Existing performance at study area intersections is summarized in Table 1.

The proposed site driveway connection is projected to operate with acceptable delays of 0 to 9 seconds during peak hours with 95th percentile queues ranging from 0 to 1 meter (no more than 1 vehicle in queue). Traffic Signal control and auxiliary turn lanes are not warranted at these proposed driveway connections.

The overall increase in projected traffic at study area intersections at/approaching capacity is approximately 0.16% and 1.38% at the Bronson/Carling and Bronson/Powell intersections, respectively. This amount of additional traffic is not considered significant and it is projected to have a negligible effect on the Level of Service at study area intersections.

Figure 5: Projected Traffic Volumes



4. NEIGHBOURHOOD IMPACTS

Given the site's proposed garage driveway connection to a local roadway (Clemow Avenue), its proximity to a sometimes congested arterial (Bronson Avenue) and the restricted access to an arterial with a raised center median (Carling Avenue), there will be neighbourhood impacts with respect to site-generate cut through traffic. However, some cut through traffic already exists on Cambridge Street southbound due to its connections to Plymouth Street, Powell Avenue and Clemow Avenue which currently provide a detour around the congested Bronson Avenue to access Carling Avenue westbound. Additional neighbourhood cut through traffic caused by the proposed development would be due to the raised median on Carling Avenue, where traffic destined for the proposed site heading eastbound on Carling Avenue would have to make four left turns at intersections (2 signalized) to reach their destination. This lengthy route makes Booth Street to Clemow Avenue a viable alternative. However, as the proposed development's cut through traffic is less than 5 vph, it is not considered a meaningful or significant amount of traffic.

5. SITE PLAN REVIEW

This section provides an overview of site access, parking requirements, pedestrian circulation and transit accessibility. The proposed Site Plan was previously illustrated in Figure 2.

Access Requirements
The proposed garage driveway connection proposed to serve the development is located at the north end of the site and will be full-movement access to Clemow Avenue. The driveway is 6.7 m wide which satisfies minimum Private Approach By-Law requirements. City By-Law requirements state that a private approach serving a parking area of more than 50 vehicles should not exceed a grade of 2% for a distance of 9 m from the edge of sidewalk. However, the site has provided a 7.2 m 'clear zone' with a 4% grade between the sidewalk and the beginning of the ramp to the underground garage. This is followed by a 2.4 m transition grade of 9% at the top and bottom of the main ramp which declines at an 18% grade for 33 m to access the second level of the parking garage. Based on projected volumes, neither signalized intersection control or turn lane modifications are warranted at the proposed driveway connections. While the By-Law requirements of 9m from the property line at 2% is not met, given the combination of good visibility at the top of the proposed ramp and the proposed 7.2 m at a 4% grade, we consider this situation to be safe and acceptable. The City may require a variance.

Parking
A total of 190 vehicle parking spaces are proposed to serve the development. This amount of parking is does not meet the City's Zoning By-Law requirement of a minimum 213 parking spaces. However, the amount of visitor parking (30 spaces) does satisfy By-Law requirements. This reduction in resident parking spaces will require a variance.

Pedestrians/Transit
The proposed site fronts Carling Avenue to the south where sidewalks are currently provided along the both sides of the roadway, connecting pedestrians to transit service, recreational pathways, Booth Street Governments District and other adjacent developments. The frontage to Cambridge Street and Clemow Avenue also has sidewalks provided on both sides of the road providing access to Bronson Ave. Transit stops on Carling Avenue are located directly in front of the proposed development and service regular route #101 and peak hour routes #6 and #102. All routes can shuttle transit riders to the Carling Avenue O-Train rail station located 850 m to the west.

Bicycles
The location of bicycle parking has been identified at-grade (20 spaces) and underground (80 spaces) which meets minimum City By-Law requirements;

Site Circulation
Regarding on-site circulation, the drive aisles and parking stall dimensions satisfy City By-Law requirements and the proposed parking garage is expected to operate efficiently.

The existing building adjacent to the east of the site has a single level underground garage that encroaches under the footprint of the proposed development, this causes the proposed access/egress ramp to Clemow Avenue to descend under the existing garage to the second level of the parking garage. Accessing the second level of the parking garage from Clemow Avenue requires a ramp with a proposed width of approximately 6.7 m, an 18% down grade for approximately 33 m and 9% transition grades for approximately 2.4 m at the top and bottom of the ramp. As a guideline, the City's Private Approach By-Law states that a private approach may be greater than 6% but shall not exceed 12% provided that a subsurface melting device sufficient to keep the private approach free of ice at all times is installed and properly maintained. Our review of the available industry literature and recent site visits to garages that have ramps in the 15% to 20% range indicates that the proposed ramp at 18% grade will operate acceptably.

6. FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Based on the foregoing, the conclusions and recommendations of this Transportation Brief are as follows:

- Study area intersections 'as a whole' are currently operating at an acceptable LoS during the weekday morning and afternoon peak hours, with the exception of the Bronson/Carling intersection which currently operates at LoS 'D' and 'E' during the morning and afternoon peak periods;

- The proposed development is projected to generate 47 and 43 veh/h two-way total trips during the weekday morning and afternoon peak hours, respectively. These volumes equate to approximately 1 new vehicle every 75 seconds during peak hours, and are considered relatively insignificant. Also, according to the City's Transportation Impact Assessment Guidelines, this Site Plan requires no traffic analysis;

- Future traffic conditions at study area intersections are projected to operate similar to existing conditions, indicating negligible site impact;

- A total of 190 vehicle parking spaces are proposed to serve the development which is does not meet the City's Zoning By-Law requirements and will require a variance, however, the 30 visitor parking spaces does satisfy By-Law requirements;

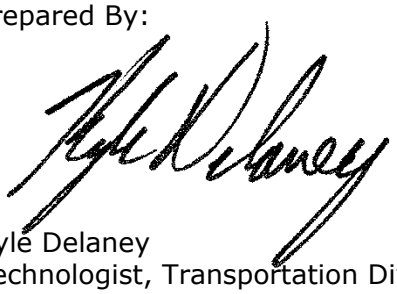
- The proposed ramp design is considered safe and acceptable, but will require a variance;

- The internal garage circulation is well laid out and is expected to operate efficiently; and

- The proposed development fits well into the context of the surrounding area, and its location and design servers to promote the use of walking, cycling, and transit modes, thus supporting City of Ottawa policies, goals and objectives with respect to the redevelopment, intensification and modal share.

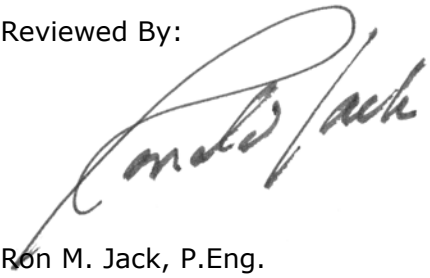
Based on the above, approval of the proposed development is recommended from a transportation perspective.

Prepared By:



Kyle Delaney
Technologist, Transportation Division
Ottawa Operations

Reviewed By:



Ron M. Jack, P.Eng.
Vice President Transportation
Manager Ottawa Operations

Appendix A
Current Peak Hour Volumes

Ottawa *Public Works and Services Department*

Count ID 2797

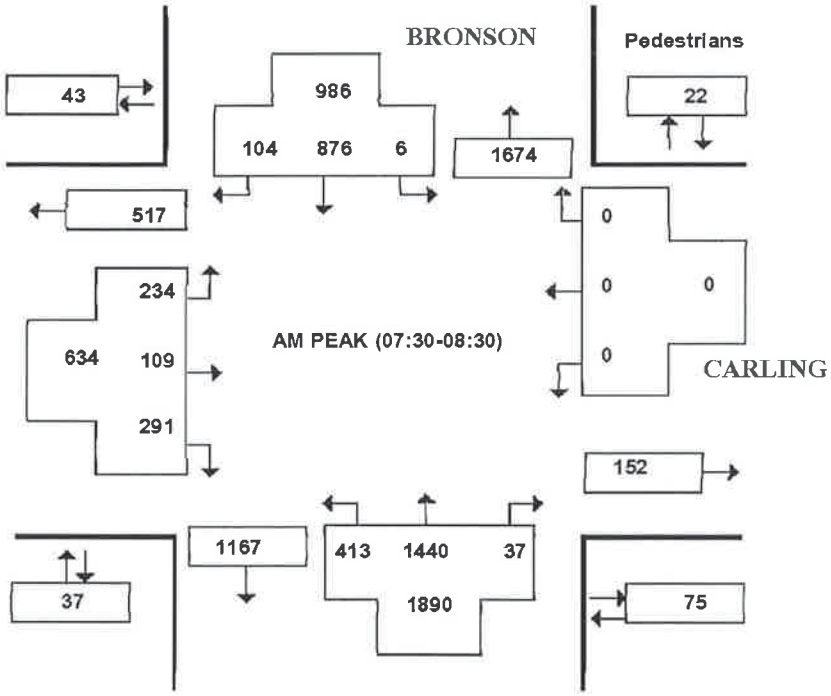
BRONSON AVE and CARLING AVE

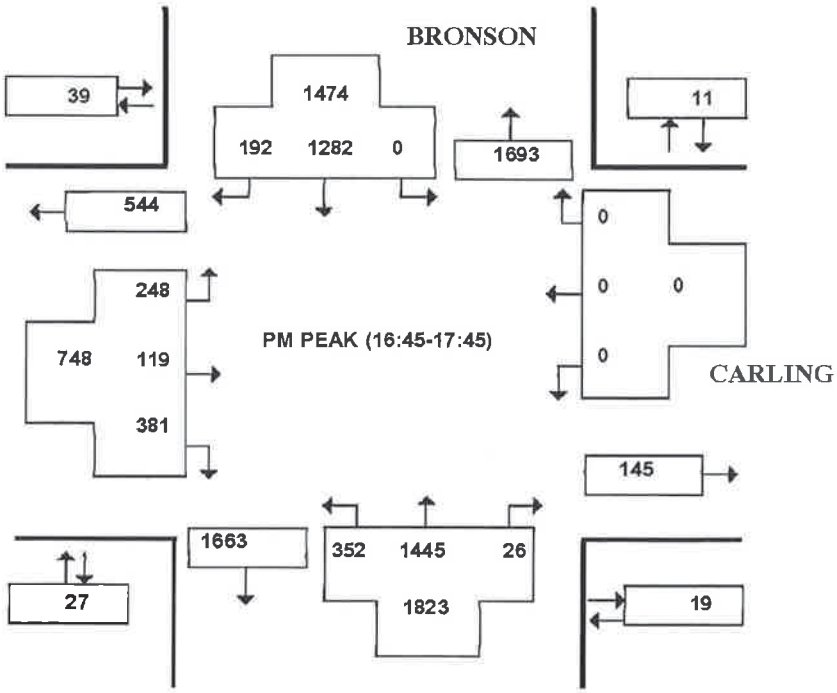
(ULRS Listing BRONSON & CARLING)

Survey Date: Wednesday 2 June 2010
Conditions: dry
Start Time: 0700

Total Observed U-Turns
Northbound: 0 Southbound: 2
Eastbound: 8 Westbound: 0

AADT Factor
Wednesday in June i:
9





Approved by : AW

Printed on : 23/03/2011

Public Works and Services Department

Count ID 2721

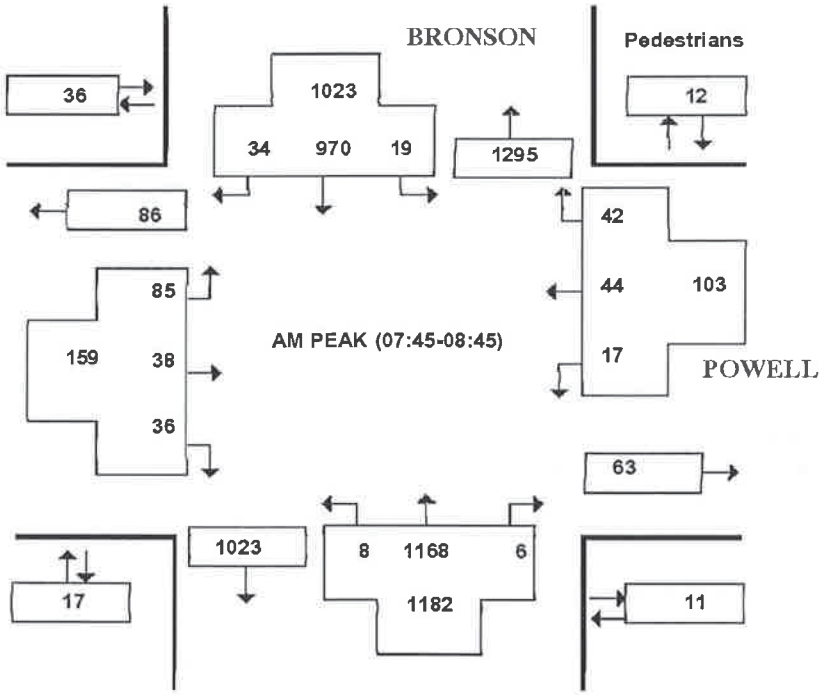
BRONSON AVE and POWELL AVE

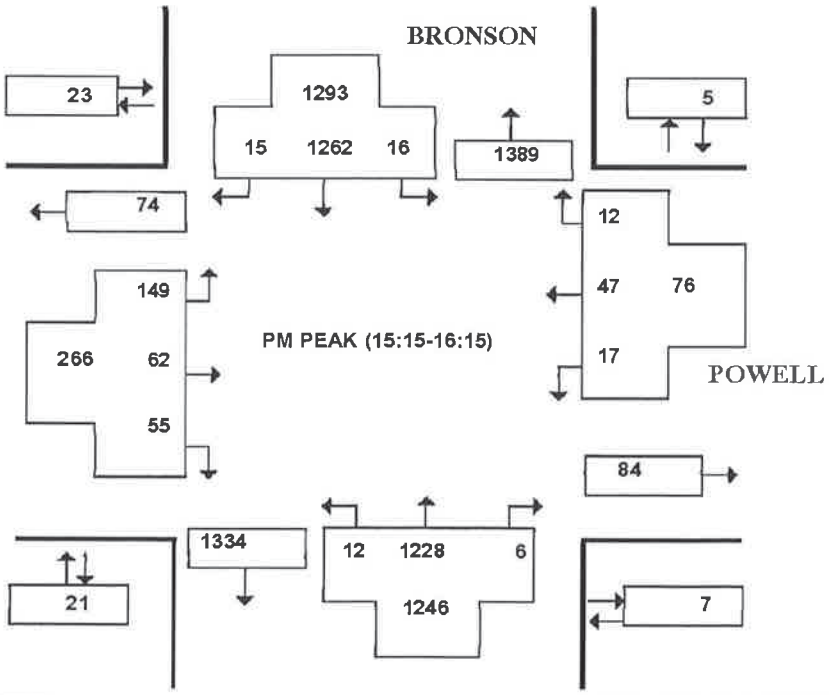
(ULRS Listing BRONSON & POWELL)

Survey Date: Wednesday 21 July 2010
Conditions: dry
Start Time: 0700

Total Observed U-Turns
Northbound: 0 Southbound: 0
Eastbound: 0 Westbound: 0

AADT Factor
Wednesday in July is 9





Approved by : DT

Printed on : 23/03/2011

DIRECTIONAL TRAFFIC FLOW

Intersection: **Bronson** at **Clemow**

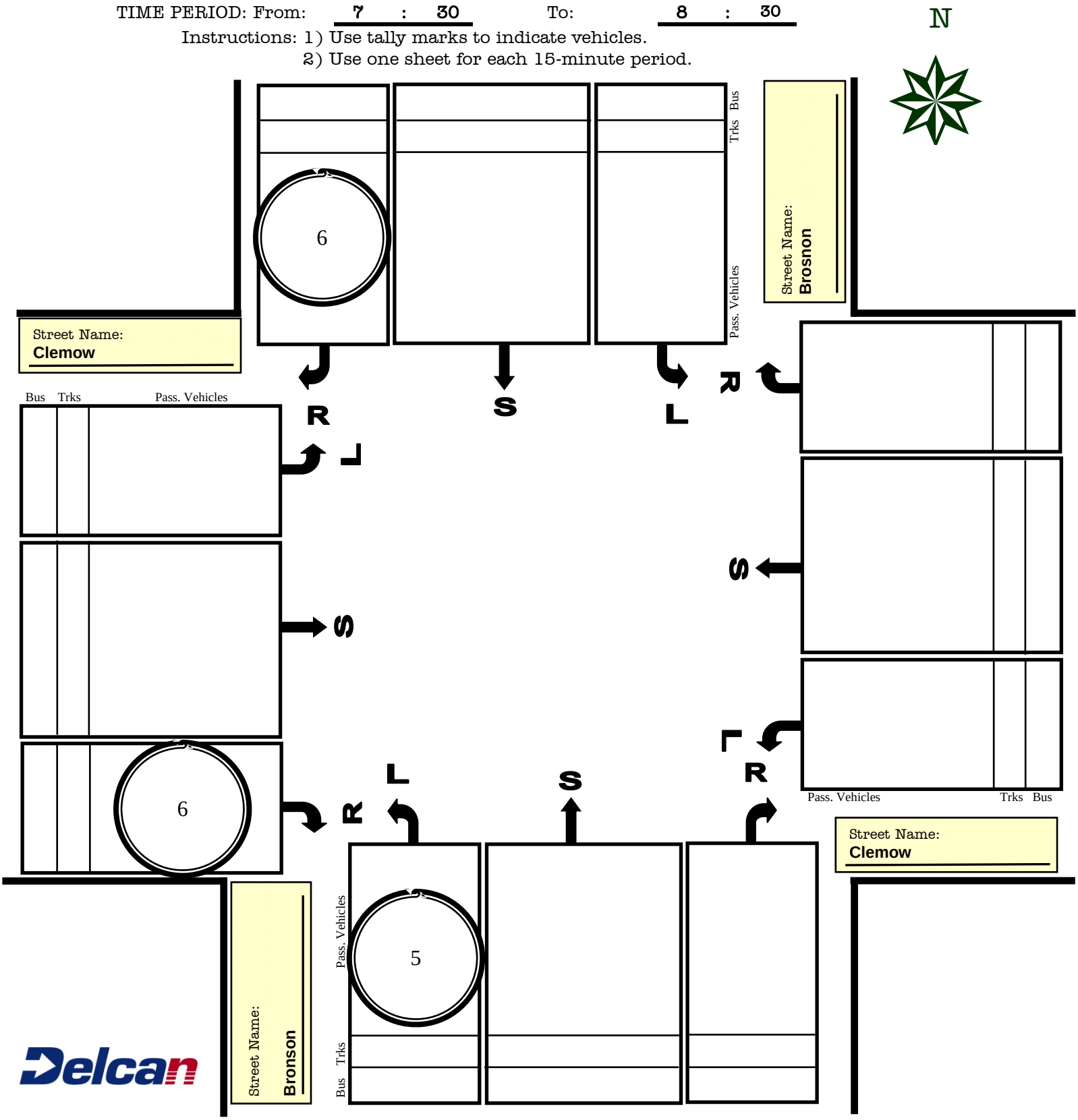
DATE: Day: **12** Month: **January** Year: **2012** Day of Week: **Thursday**

Observer: **Pam Holbrook** Weather: **Overcast**

Chkd by: ---------- Date: ----------

TIME PERIOD: From: **7 : 30** To: **8 : 30**

Instructions: 1) Use tally marks to indicate vehicles.
2) Use one sheet for each 15-minute period.



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DIRECTIONAL TRAFFIC FLOW

Intersection: **Bronson** at **Clemow**

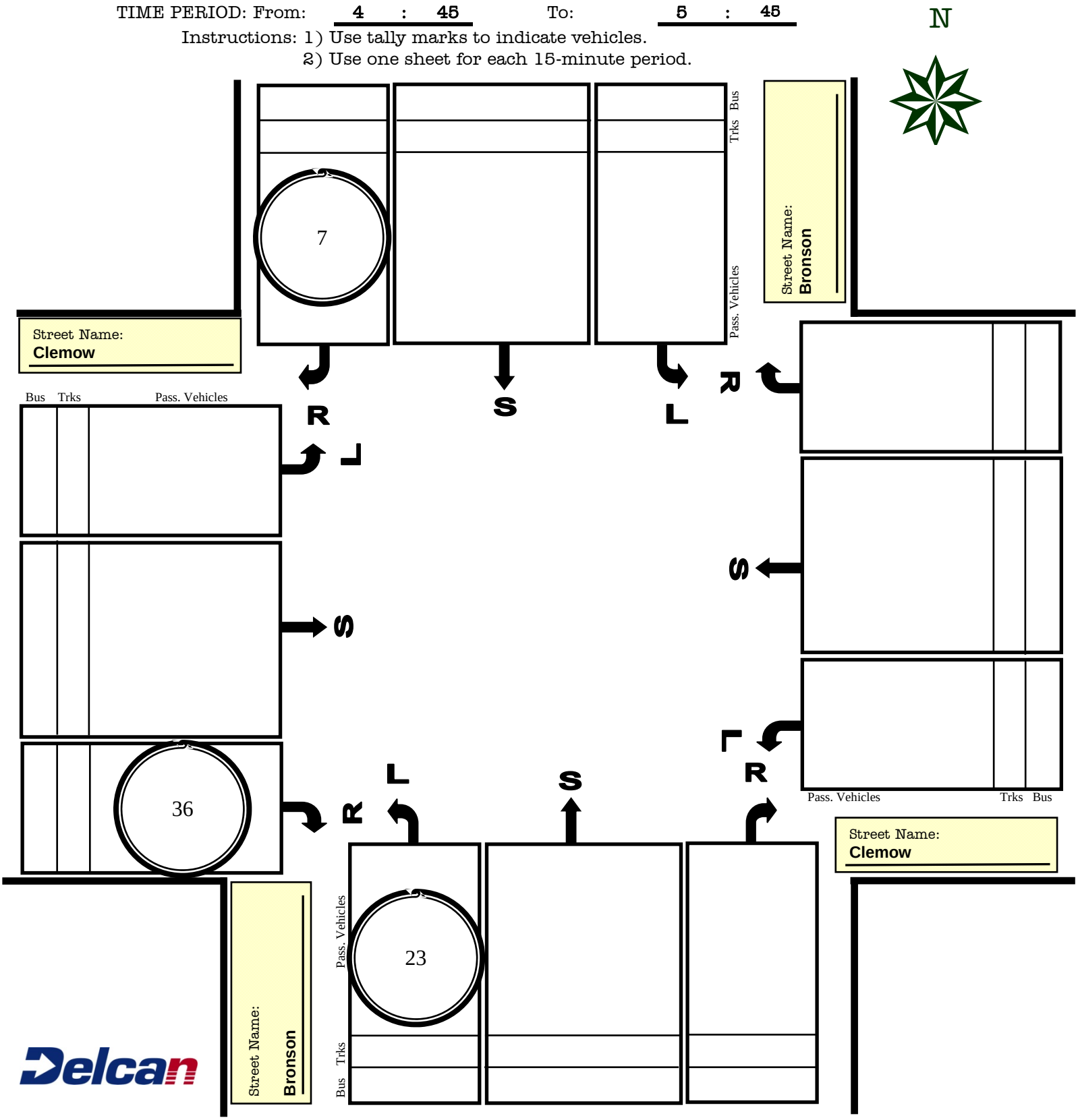
DATE: Day: **12** Month: **January** Year: **2012** Day of Week: **Thursday**

Observer: **Pam Holbrook** Weather: **Overcast**

Chkd by: ---------- Date: ----------

TIME PERIOD: From: **4 : 45** To: **5 : 45**

Instructions: 1) Use tally marks to indicate vehicles.
2) Use one sheet for each 15-minute period.



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DIRECTIONAL TRAFFIC FLOW

Intersection: Cambridge at Powell

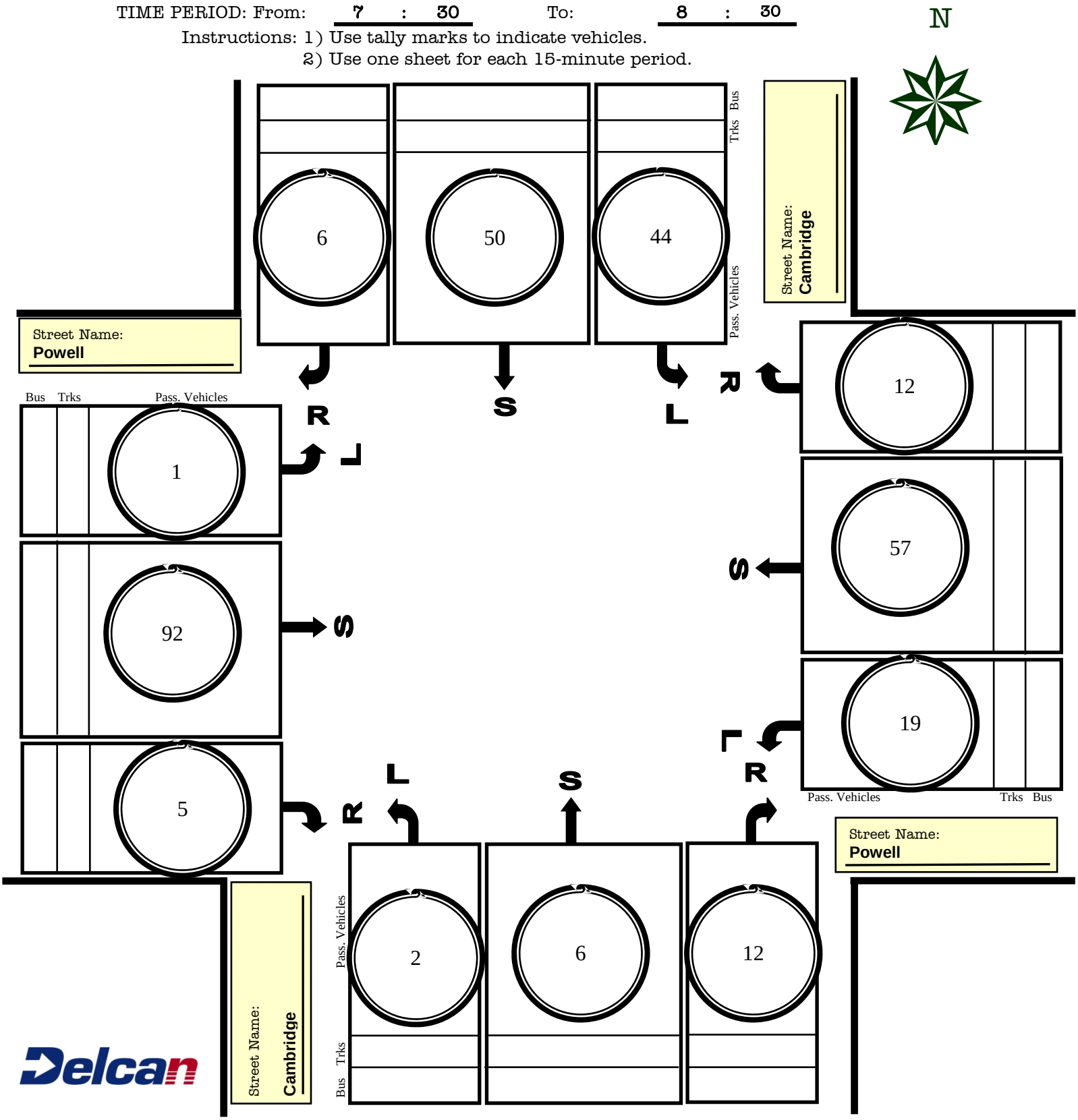
DATE: Day: 11 Month: January Year: 2012 Day of Week: Wednesday

Observer: Pam Holbrook Weather: Clear

Chkd by: ..... Date: .....

TIME PERIOD: From: 7 : 30 To: 8 : 30

Instructions: 1) Use tally marks to indicate vehicles.
2) Use one sheet for each 15-minute period.



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DIRECTIONAL TRAFFIC FLOW

Intersection: Cambridge at Powell

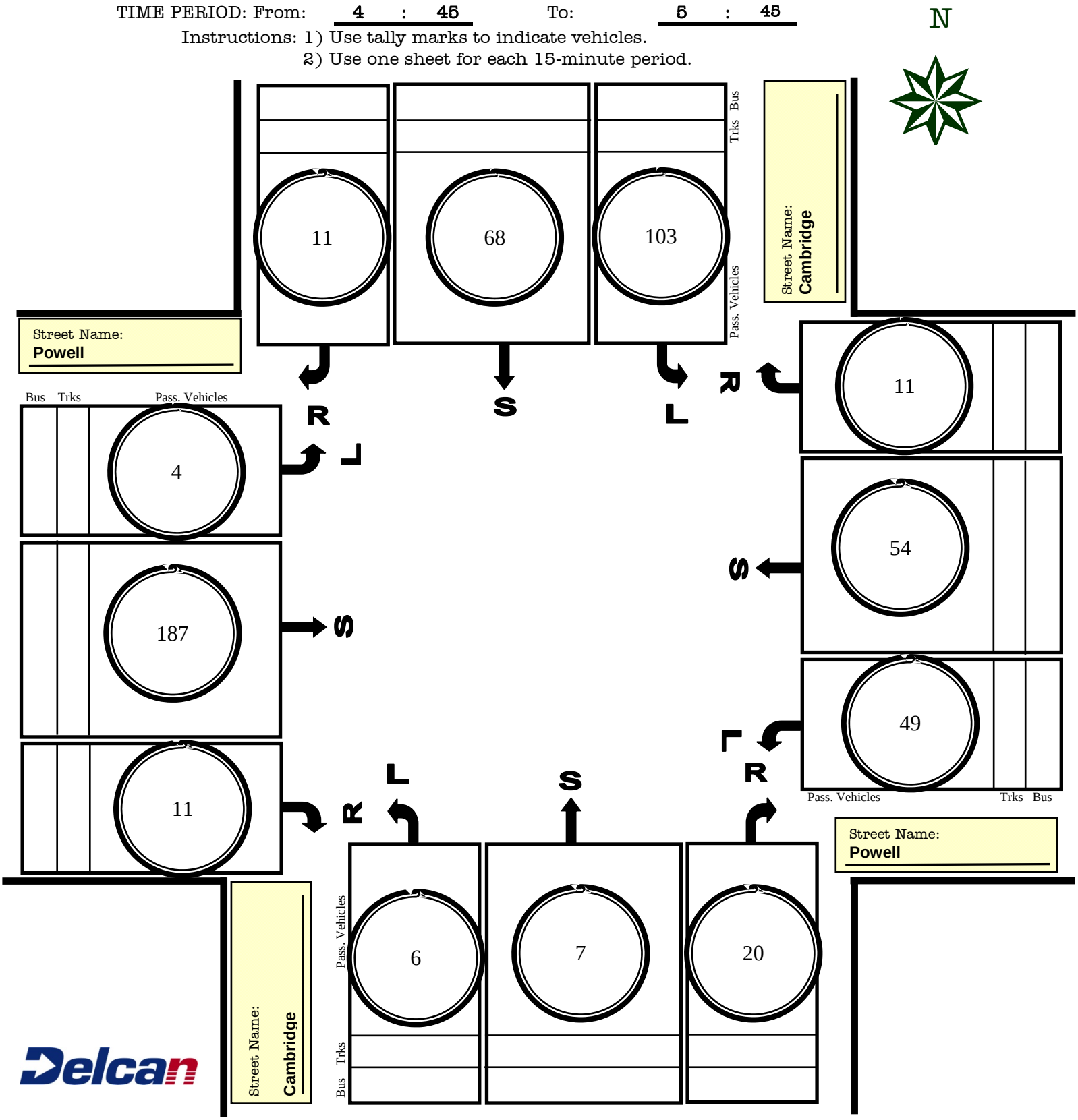
DATE: Day: 11 Month: January Year: 2012 Day of Week: Wednesday

Observer: Pam Holbrook Weather: Clear

Chkd by: ..... Date: .....

TIME PERIOD: From: 4 : 45 To: 5 : 45

Instructions: 1) Use tally marks to indicate vehicles.
2) Use one sheet for each 15-minute period.



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DIRECTIONAL TRAFFIC FLOW

Intersection: Cambridge at Clemow

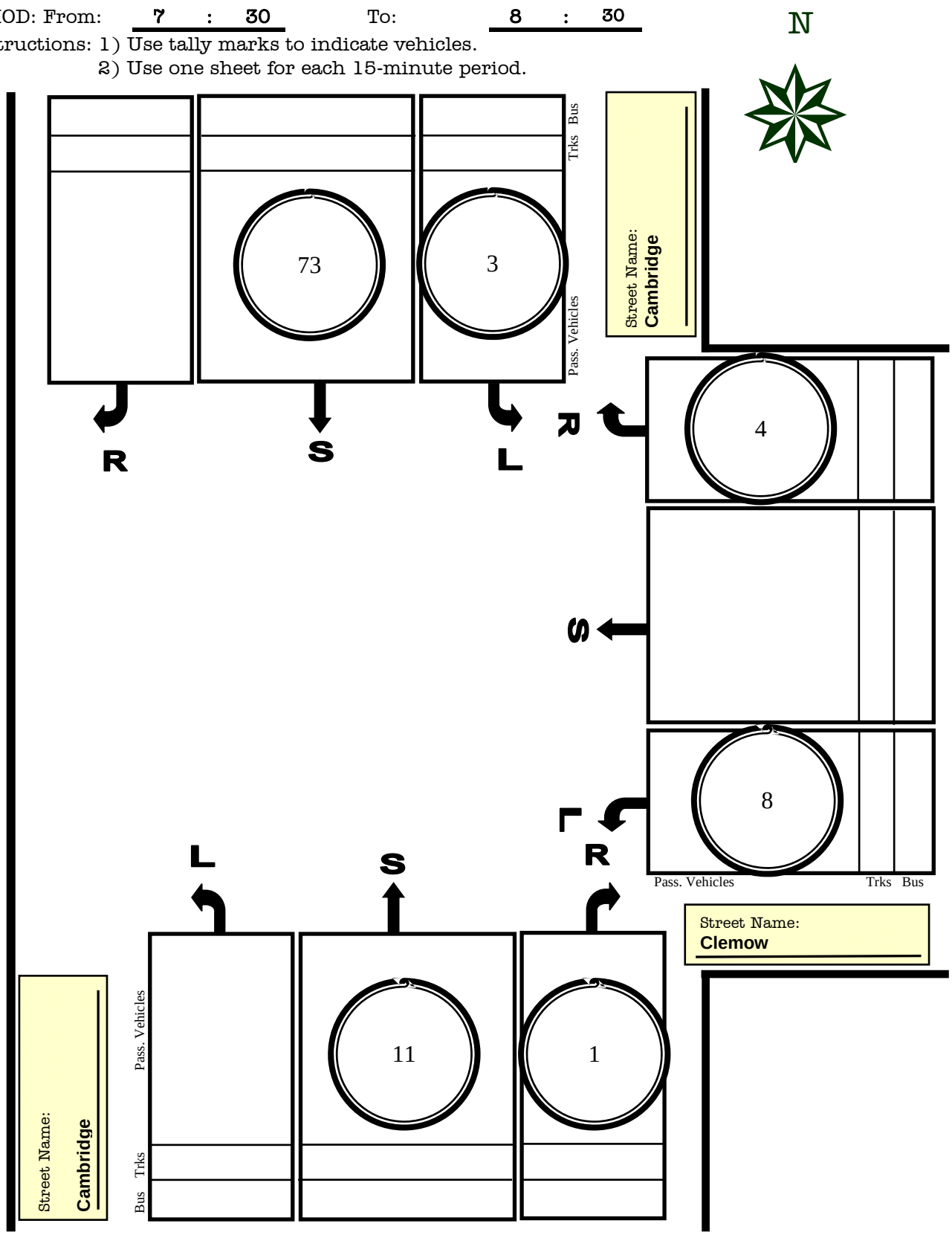
DATE: Day: 11 Month: January Year: 2012 Day of Week: Wednesday

Observer: Pam Holbrook Weather: Clear

Chkd by: ---------- Date: ----------

TIME PERIOD: From: 7 : 30 To: 8 : 30

Instructions: 1) Use tally marks to indicate vehicles.
2) Use one sheet for each 15-minute period.



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DIRECTIONAL TRAFFIC FLOW

Intersection: Cambridge at Clemow

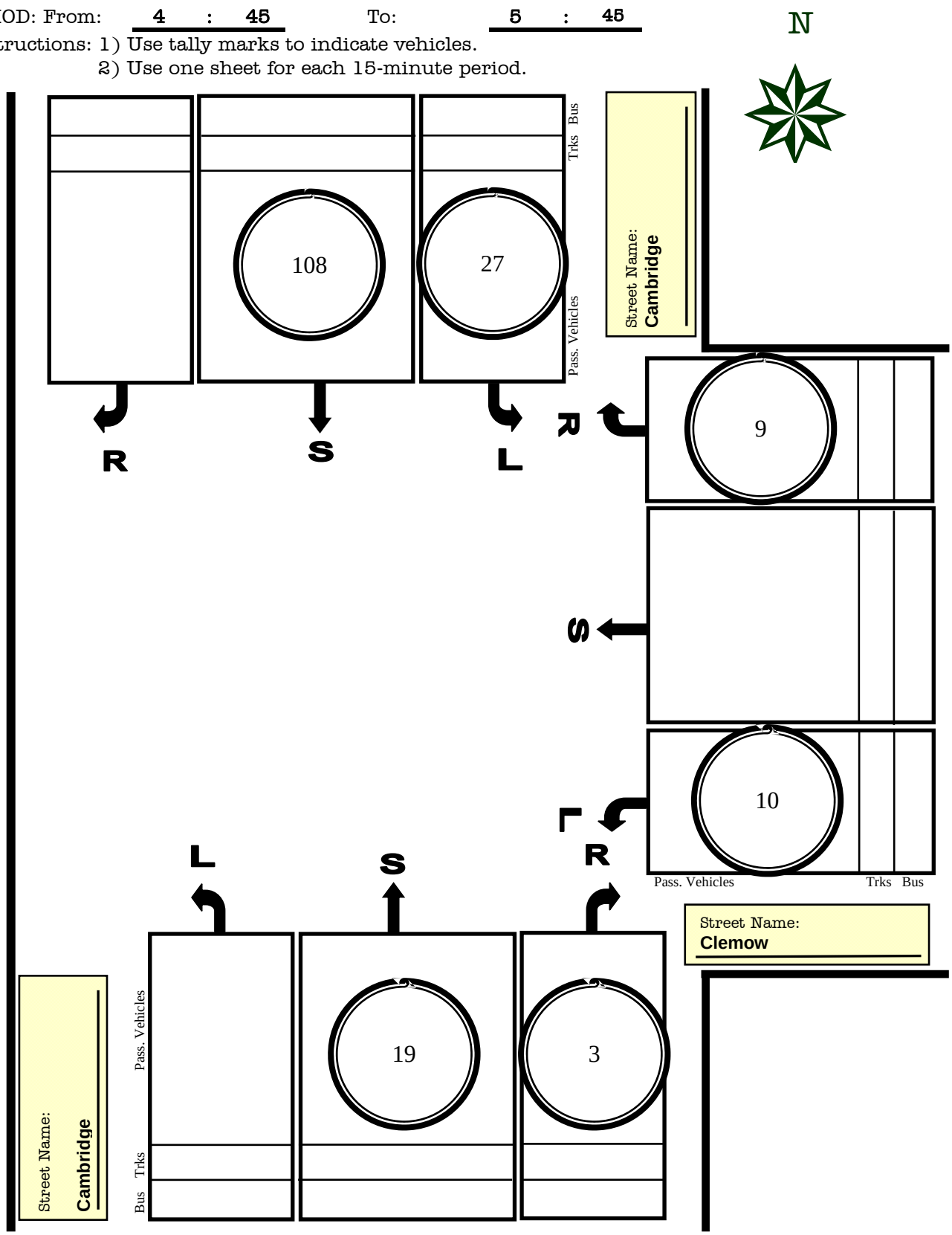
DATE: Day: 11 Month: January Year: 2012 Day of Week: Wednesday

Observer: Pam Holbrook Weather: Clear

Chkd by: ---------- Date: ----------

TIME PERIOD: From: 4 : 45 To: 5 : 45

Instructions: 1) Use tally marks to indicate vehicles.
2) Use one sheet for each 15-minute period.



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Appendix B
Existing Peak Hour Capacity Analysis

Lane Group	EBL	EBT	EBR	NBL	NBT	SBL	SBT
Lane Configurations							
Volume (vph)	234	109	291	413	1440	6	876
Lane Group Flow (vph)	177	184	306	435	1555	0	1037
Turn Type	Perm	NA	pm+ov	Prot	NA	Perm	NA
Protected Phases		4	5	5	2		6
Permitted Phases	4		4			6	
Detector Phase	4	4	5	5	2	6	6
Switch Phase							
Minimum Initial (s)	10.0	10.0	5.0	5.0	10.0	10.0	10.0
Minimum Split (s)	27.0	27.0	11.0	11.0	18.0	32.0	32.0
Total Split (s)	34.0	34.0	27.0	27.0	76.0	49.0	49.0
Total Split (%)	30.9%	30.9%	24.5%	24.5%	69.1%	44.5%	44.5%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0		6.0
Lead/Lag			Lead	Lead		Lag	Lag
Lead-Lag Optimize?			Yes	Yes		Yes	Yes
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max
Act Effct Green (s)	18.3	18.3	49.0	30.7	79.7		43.0
Actuated g/C Ratio	0.17	0.17	0.45	0.28	0.72		0.39
v/c Ratio	0.71	0.68	0.46	0.92	0.64		0.84
Control Delay	57.8	55.1	18.4	66.4	10.1		37.8
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.4
Total Delay	57.8	55.1	18.4	66.4	10.1		38.2
LOS	E	E	B	E	B		D
Approach Delay		39.0			22.4		38.2
Approach LOS		D			C		D
Queue Length 50th (m)	38.2	39.5	34.6	90.4	77.4		103.8
Queue Length 95th (m)	57.5	58.9	55.3	#175.0	126.5		131.6
Internal Link Dist (m)		89.9			71.9		51.3
Turn Bay Length (m)			55.0	50.0			
Base Capacity (vph)	382	413	663	472	2440		1229
Starvation Cap Reductn	0	0	0	0	0		28
Spillback Cap Reductn	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0		0
Reduced v/c Ratio	0.46	0.45	0.46	0.92	0.64		0.86

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 53 (48%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 29.8 — Intersection LOS: C
Intersection Capacity Utilization 104.8% — ICU Level of Service G
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

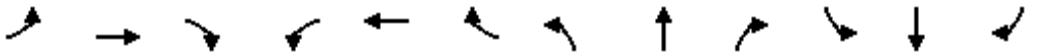
Splits and Phases: 1: Bronson & Carling

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	85	38	17	44	8	1168	19	970
Lane Group Flow (vph)	0	167	0	108	0	1243	0	1077
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	20.7	20.7	20.7	20.7	27.3	27.3	27.3	27.3
Total Split (s)	21.0	21.0	21.0	21.0	74.0	74.0	74.0	74.0
Total Split (%)	22.1%	22.1%	22.1%	22.1%	77.9%	77.9%	77.9%	77.9%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3
All-Red Time (s)	2.7	2.7	2.7	2.7	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0		0.0		0.0
Total Lost Time (s)		5.7		5.7		5.3		5.3
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)		14.2		14.2		69.8		69.8
Actuated g/C Ratio		0.15		0.15		0.73		0.73
v/c Ratio		0.83		0.43		0.53		0.47
Control Delay		67.9		31.6		6.6		6.1
Queue Delay		0.0		0.0		0.4		0.0
Total Delay		67.9		31.6		7.0		6.1
LOS		E		C		A		A
Approach Delay		67.9		31.6		7.0		6.1
Approach LOS		E		C		A		A
Queue Length 50th (m)		27.4		12.6		45.8		37.0
Queue Length 95th (m)		#59.6		28.3		58.9		48.2
Internal Link Dist (m)		86.6		108.3		65.5		55.9
Turn Bay Length (m)								
Base Capacity (vph)		217		269		2360		2268
Starvation Cap Reductn		0		0		558		0
Spillback Cap Reductn		0		0		0		0
Storage Cap Reductn		0		0		0		0
Reduced v/c Ratio		0.77		0.40		0.69		0.47

Intersection Summary

Cycle Length: 95
Actuated Cycle Length: 95
Offset: 21 (22%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 11.6 — Intersection LOS: B
Intersection Capacity Utilization 69.3% — ICU Level of Service C
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

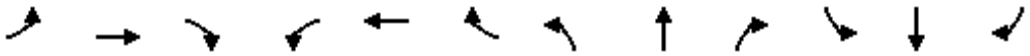
Splits and Phases: 2: Bronson & Powell



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	6	0	0	0	5	1425	0	0	980	6
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)	0	0	6	0	0	0	5	1500	0	0	1032	6
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								75			90	
pX, platoon unblocked	0.83	0.83	0.88	0.83	0.83	0.77	0.88			0.77		
vC, conflicting volume	1795	2545	519	2033	2548	750	1038			1500		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	926	1828	195	1212	1832	92	782			1061		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	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 %	100	100	99	100	100	100	99			100		
cM capacity (veh/h)	185	63	719	113	62	733	736			505		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	6	0	755	750	516	522
Volume Left	0	0	5	0	0	0
Volume Right	6	0	0	0	0	6
cSH	719	1700	736	1700	505	1700
Volume to Capacity	0.01	0.00	0.01	0.44	0.00	0.31
Queue Length 95th (m)	0.2	0.0	0.2	0.0	0.0	0.0
Control Delay (s)	10.0	0.0	0.2	0.0	0.0	0.0
Lane LOS	B	A	A			
Approach Delay (s)	10.0	0.0	0.1		0.0	
Approach LOS	B	A				

Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	55.3%	ICU Level of Service	B	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	1	92	5	19	57	12	2	6	12	44	50	6
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)	1	97	5	20	60	13	2	6	13	46	53	6

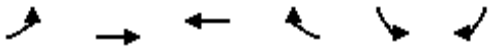
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	103	93	21	105
Volume Left (vph)	1	20	2	46
Volume Right (vph)	5	13	13	6
Hadj (s)	0.01	0.00	-0.31	0.09
Departure Headway (s)	4.3	4.3	4.2	4.5
Degree Utilization, x	0.12	0.11	0.02	0.13
Capacity (veh/h)	807	807	812	764
Control Delay (s)	7.9	7.8	7.3	8.1
Approach Delay (s)	7.9	7.8	7.3	8.1
Approach LOS	A	A	A	A

Intersection Summary				
Delay	7.9			
HCM Level of Service	A			
Intersection Capacity Utilization	30.8%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	8	4	11	1	3	73
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	8	4	12	1	3	77
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	95	12			13	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	95	12			13	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			100	
cM capacity (veh/h)	902	1068			1606	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	13	13	80
Volume Left	8	0	3
Volume Right	4	1	0
cSH	952	1700	1606
Volume to Capacity	0.01	0.01	0.00
Queue Length 95th (m)	0.3	0.0	0.0
Control Delay (s)	8.8	0.0	0.3
Lane LOS	A		A
Approach Delay (s)	8.8	0.0	0.3
Approach LOS	A		

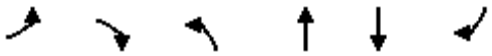
Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	16.6%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	634	505	12	0	81
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	667	532	13	0	85
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)			114			
pX, platoon unblocked						
vC, conflicting volume	544				872	272
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	544				872	272
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	88
cM capacity (veh/h)	1021				290	726

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	334	334	354	190	85
Volume Left	0	0	0	0	0
Volume Right	0	0	0	13	85
cSH	1700	1700	1700	1700	726
Volume to Capacity	0.20	0.20	0.21	0.11	0.12
Queue Length 95th (m)	0.0	0.0	0.0	0.0	3.0
Control Delay (s)	0.0	0.0	0.0	0.0	10.6
Lane LOS					B
Approach Delay (s)	0.0		0.0		10.6
Approach LOS					B

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	27.1%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	5	2	0	15	74	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	5	2	0	16	78	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	94	78	78			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	94	78	78			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	906	983	1521			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	7	16	78
Volume Left	5	0	0
Volume Right	2	0	0
cSH	927	1521	1700
Volume to Capacity	0.01	0.00	0.05
Queue Length 95th (m)	0.2	0.0	0.0
Control Delay (s)	8.9	0.0	0.0
Lane LOS	A		
Approach Delay (s)	8.9	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	14.1%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	NBL	NBT	SBT
Lane Configurations						
Volume (vph)	248	119	381	352	1445	1282
Lane Group Flow (vph)	191	195	401	371	1548	1551
Turn Type	Perm	NA	pm+ov	Prot	NA	NA
Protected Phases		4	5	5	2	6
Permitted Phases	4		4			
Detector Phase	4	4	5	5	2	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	5.0	5.0	10.0	10.0
Minimum Split (s)	27.0	27.0	11.0	11.0	18.0	32.0
Total Split (s)	27.0	27.0	26.0	26.0	103.0	77.0
Total Split (%)	20.8%	20.8%	20.0%	20.0%	79.2%	59.2%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.7	2.7	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag			Lead	Lead		Lag
Lead-Lag Optimize?			Yes	Yes		Yes
Recall Mode	None	None	None	None	C-Max	C-Max
Act Effct Green (s)	19.4	19.4	41.0	21.6	98.6	71.0
Actuated g/C Ratio	0.15	0.15	0.32	0.17	0.76	0.55
v/c Ratio	0.86	0.81	0.82	1.32	0.60	0.86
Control Delay	86.0	77.6	49.3	207.8	8.4	20.7
Queue Delay	0.0	0.0	0.0	0.0	0.1	0.2
Total Delay	86.0	77.6	49.3	207.8	8.5	20.9
LOS	F	E	D	F	A	C
Approach Delay		65.2			47.0	20.9
Approach LOS		E			D	C
Queue Length 50th (m)	50.1	50.7	80.6	~128.1	85.5	61.8
Queue Length 95th (m)	#89.2	#85.7	#129.6	#188.2	102.6	98.8
Internal Link Dist (m)		89.9			71.9	51.3
Turn Bay Length (m)			55.0	50.0		
Base Capacity (vph)	241	262	491	282	2560	1811
Starvation Cap Reductn	0	0	0	0	0	28
Spillback Cap Reductn	0	0	0	0	112	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.79	0.74	0.82	1.32	0.63	0.87

Intersection Summary

Cycle Length: 130
Actuated Cycle Length: 130
Offset: 46 (35%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.32
Intersection Signal Delay: 40.9 Intersection LOS: D
Intersection Capacity Utilization 93.6% ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

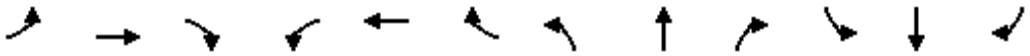
Splits and Phases: 1: Bronson & Carling

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	149	62	17	47	12	1228	16	1262
Lane Group Flow (vph)	0	280	0	80	0	1312	0	1361
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	20.7	20.7	20.7	20.7	27.3	27.3	27.3	27.3
Total Split (s)	38.0	38.0	38.0	38.0	92.0	92.0	92.0	92.0
Total Split (%)	29.2%	29.2%	29.2%	29.2%	70.8%	70.8%	70.8%	70.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3
All-Red Time (s)	2.7	2.7	2.7	2.7	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0		0.0		0.0
Total Lost Time (s)		5.7		5.7		5.3		5.3
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)		29.6		29.6		89.4		89.4
Actuated g/C Ratio		0.23		0.23		0.69		0.69
v/c Ratio		0.91		0.22		0.60		0.63
Control Delay		79.3		37.8		14.5		13.4
Queue Delay		0.0		0.0		0.3		0.1
Total Delay		79.3		37.8		14.8		13.5
LOS		E		D		B		B
Approach Delay		79.3		37.8		14.8		13.5
Approach LOS		E		D		B		B
Queue Length 50th (m)		66.2		14.9		122.4		99.9
Queue Length 95th (m)		#112.8		28.4		145.8		121.4
Internal Link Dist (m)		86.6		108.3		65.5		55.9
Turn Bay Length (m)								
Base Capacity (vph)		336		391		2169		2146
Starvation Cap Reductn		0		0		319		0
Spillback Cap Reductn		0		0		0		128
Storage Cap Reductn		0		0		0		0
Reduced v/c Ratio		0.83		0.20		0.71		0.67

Intersection Summary

Cycle Length: 130
Actuated Cycle Length: 130
Offset: 46 (35%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.91
Intersection Signal Delay: 20.8 Intersection LOS: C
Intersection Capacity Utilization 81.0% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

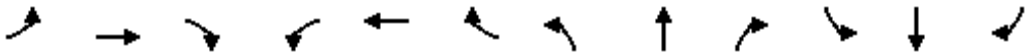
Splits and Phases: 2: Bronson & Powell



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	36	0	0	0	23	1460	0	0	1380	7
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)	0	0	38	0	0	0	24	1537	0	0	1453	7
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								75			90	
pX, platoon unblocked	0.89	0.89	0.79	0.89	0.89	0.80	0.79			0.80		
vC, conflicting volume	2273	3042	730	2349	3045	768	1460			1537		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1168	2035	113	1254	2039	213	1042			1173		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	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 %	100	100	95	100	100	100	95			100		
cM capacity (veh/h)	127	48	722	104	47	634	522			474		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	38	0	793	768	726	734
Volume Left	0	0	24	0	0	0
Volume Right	38	0	0	0	0	7
cSH	722	1700	522	1700	474	1700
Volume to Capacity	0.05	0.00	0.05	0.45	0.00	0.43
Queue Length 95th (m)	1.3	0.0	1.1	0.0	0.0	0.0
Control Delay (s)	10.3	0.0	1.4	0.0	0.0	0.0
Lane LOS	B	A	A			
Approach Delay (s)	10.3	0.0	0.7		0.0	
Approach LOS	B	A				

Intersection Summary					
Average Delay	0.5				
Intersection Capacity Utilization	69.8%	ICU Level of Service		C	
Analysis Period (min)	15				



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	4	187	11	49	54	11	6	7	20	103	68	11
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)	4	197	12	52	57	12	6	7	21	108	72	12

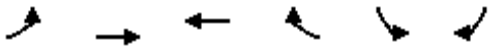
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	213	120	35	192
Volume Left (vph)	4	52	6	108
Volume Right (vph)	12	12	21	12
Hadj (s)	0.01	0.06	-0.29	0.11
Departure Headway (s)	4.6	4.8	4.7	4.9
Degree Utilization, x	0.27	0.16	0.05	0.26
Capacity (veh/h)	733	701	696	692
Control Delay (s)	9.4	8.7	7.9	9.6
Approach Delay (s)	9.4	8.7	7.9	9.6
Approach LOS	A	A	A	A

Intersection Summary				
Delay			9.2	
HCM Level of Service			A	
Intersection Capacity Utilization			45.1%	ICU Level of Service
Analysis Period (min)			15	

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	10	9	19	3	27	108
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	9	20	3	28	114
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	192	22			23	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	192	22			23	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	99			98	
cM capacity (veh/h)	783	1056			1592	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	20	23	142
Volume Left	11	0	28
Volume Right	9	3	0
cSH	892	1700	1592
Volume to Capacity	0.02	0.01	0.02
Queue Length 95th (m)	0.5	0.0	0.4
Control Delay (s)	9.1	0.0	1.6
Lane LOS	A		A
Approach Delay (s)	9.1	0.0	1.6
Approach LOS	A		

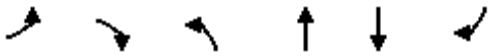
Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	24.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	748	522	22	0	118
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	787	549	23	0	124
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)			114			
pX, platoon unblocked						
vC, conflicting volume	573				955	286
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	573				955	286
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	83
cM capacity (veh/h)	996				256	710

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	394	394	366	206	124
Volume Left	0	0	0	0	0
Volume Right	0	0	0	23	124
cSH	1700	1700	1700	1700	710
Volume to Capacity	0.23	0.23	0.22	0.12	0.17
Queue Length 95th (m)	0.0	0.0	0.0	0.0	4.8
Control Delay (s)	0.0	0.0	0.0	0.0	11.1
Lane LOS					B
Approach Delay (s)	0.0		0.0		11.1
Approach LOS					B

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	30.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	5	7	0	28	128	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	5	7	0	29	135	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	164	135	135			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	164	135	135			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	99	100			
cM capacity (veh/h)	826	914	1450			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	13	29	135
Volume Left	5	0	0
Volume Right	7	0	0
cSH	875	1450	1700
Volume to Capacity	0.01	0.00	0.08
Queue Length 95th (m)	0.3	0.0	0.0
Control Delay (s)	9.2	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.2	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	17.1%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix C
Projected Peak Hour Capacity Analysis

Lane Group	EBL	EBT	EBR	NBL	NBT	SBL	SBT
Lane Configurations							
Volume (vph)	235	109	291	413	1441	6	880
Lane Group Flow (vph)	178	184	306	435	1556	0	1041
Turn Type	Perm	NA	pm+ov	Prot	NA	Perm	NA
Protected Phases		4	5	5	2		6
Permitted Phases	4		4			6	
Detector Phase	4	4	5	5	2	6	6
Switch Phase							
Minimum Initial (s)	10.0	10.0	5.0	5.0	10.0	10.0	10.0
Minimum Split (s)	27.0	27.0	11.0	11.0	18.0	32.0	32.0
Total Split (s)	34.0	34.0	27.0	27.0	76.0	49.0	49.0
Total Split (%)	30.9%	30.9%	24.5%	24.5%	69.1%	44.5%	44.5%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0		6.0
Lead/Lag			Lead	Lead		Lag	Lag
Lead-Lag Optimize?			Yes	Yes		Yes	Yes
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max
Act Effct Green (s)	18.4	18.4	49.0	30.6	79.6		43.0
Actuated g/C Ratio	0.17	0.17	0.45	0.28	0.72		0.39
v/c Ratio	0.71	0.68	0.46	0.92	0.64		0.85
Control Delay	57.8	54.8	18.5	66.9	10.1		38.0
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.4
Total Delay	57.8	54.8	18.5	66.9	10.1		38.4
LOS	E	D	B	E	B		D
Approach Delay		38.9			22.5		38.4
Approach LOS		D			C		D
Queue Length 50th (m)	38.4	39.4	34.6	90.5	77.9		104.3
Queue Length 95th (m)	58.1	58.9	55.3	#175.0	126.6		132.4
Internal Link Dist (m)		89.9			71.9		51.3
Turn Bay Length (m)			55.0	50.0			
Base Capacity (vph)	382	413	663	471	2437		1229
Starvation Cap Reductn	0	0	0	0	0		28
Spillback Cap Reductn	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0		0
Reduced v/c Ratio	0.47	0.45	0.46	0.92	0.64		0.87

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 53 (48%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 30.0 — Intersection LOS: C
Intersection Capacity Utilization 104.9% — ICU Level of Service G
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

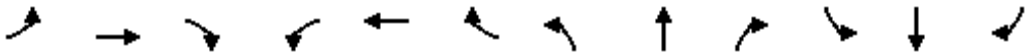
Splits and Phases: 1: Bronson & Carling

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	115	38	17	44	9	1168	19	976
Lane Group Flow (vph)	0	199	0	108	0	1244	0	1084
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	20.7	20.7	20.7	20.7	27.3	27.3	27.3	27.3
Total Split (s)	21.0	21.0	21.0	21.0	74.0	74.0	74.0	74.0
Total Split (%)	22.1%	22.1%	22.1%	22.1%	77.9%	77.9%	77.9%	77.9%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3
All-Red Time (s)	2.7	2.7	2.7	2.7	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0		0.0		0.0
Total Lost Time (s)		5.7		5.7		5.3		5.3
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)		15.3		15.3		68.7		68.7
Actuated g/C Ratio		0.16		0.16		0.72		0.72
v/c Ratio		0.95		0.40		0.54		0.49
Control Delay		89.5		30.6		7.0		6.4
Queue Delay		0.0		0.0		0.5		0.0
Total Delay		89.5		30.6		7.4		6.4
LOS		F		C		A		A
Approach Delay		89.5		30.6		7.4		6.4
Approach LOS		F		C		A		A
Queue Length 50th (m)		34.6		12.6		45.7		37.3
Queue Length 95th (m)		#76.9		28.3		59.0		48.6
Internal Link Dist (m)		86.6		108.3		65.5		55.9
Turn Bay Length (m)								
Base Capacity (vph)		210		269		2317		2230
Starvation Cap Reductn		0		0		553		0
Spillback Cap Reductn		0		0		0		0
Storage Cap Reductn		0		0		0		0
Reduced v/c Ratio		0.95		0.40		0.71		0.49

Intersection Summary	
Cycle Length: 95	
Actuated Cycle Length: 95	
Offset: 21 (22%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.95	
Intersection Signal Delay: 14.2	Intersection LOS: B
Intersection Capacity Utilization 71.2%	ICU Level of Service C
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

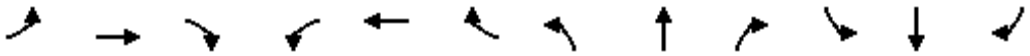
Splits and Phases: 2: Bronson & Powell



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	10	0	0	0	6	1426	0	0	980	12
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)	0	0	11	0	0	0	6	1501	0	0	1032	13
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								75			90	
pX, platoon unblocked	0.83	0.83	0.88	0.83	0.83	0.77	0.88			0.77		
vC, conflicting volume	1801	2552	522	2040	2558	751	1044			1501		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	901	1802	176	1188	1809	88	771			1060		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	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 %	100	100	99	100	100	100	99			100		
cM capacity (veh/h)	193	65	734	117	64	736	737			504		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	11	0	757	751	516	528
Volume Left	0	0	6	0	0	0
Volume Right	11	0	0	0	0	13
cSH	734	1700	737	1700	504	1700
Volume to Capacity	0.01	0.00	0.01	0.44	0.00	0.31
Queue Length 95th (m)	0.3	0.0	0.2	0.0	0.0	0.0
Control Delay (s)	10.0	0.0	0.2	0.0	0.0	0.0
Lane LOS	A	A	A			
Approach Delay (s)	10.0	0.0	0.1		0.0	
Approach LOS	A	A				

Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	56.0%	ICU Level of Service	B	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	1	92	5	21	57	12	2	6	42	44	51	6
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)	1	97	5	22	60	13	2	6	44	46	54	6

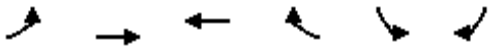
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	103	95	53	106
Volume Left (vph)	1	22	2	46
Volume Right (vph)	5	13	44	6
Hadj (s)	0.01	0.00	-0.46	0.09
Departure Headway (s)	4.4	4.4	4.0	4.5
Degree Utilization, x	0.13	0.12	0.06	0.13
Capacity (veh/h)	788	778	841	756
Control Delay (s)	8.0	7.9	7.3	8.2
Approach Delay (s)	8.0	7.9	7.3	8.2
Approach LOS	A	A	A	A

Intersection Summary				
Delay	7.9			
HCM Level of Service	A			
Intersection Capacity Utilization	30.9%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	11	34	11	1	6	73
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	12	36	12	1	6	77
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	102	12			13	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	102	12			13	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	97			100	
cM capacity (veh/h)	893	1068			1606	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	47	13	83
Volume Left	12	0	6
Volume Right	36	1	0
cSH	1020	1700	1606
Volume to Capacity	0.05	0.01	0.00
Queue Length 95th (m)	1.1	0.0	0.1
Control Delay (s)	8.7	0.0	0.6
Lane LOS	A		A
Approach Delay (s)	8.7	0.0	0.6
Approach LOS	A		

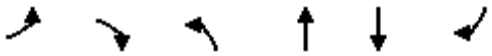
Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	19.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	635	505	12	0	84
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	668	532	13	0	88
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)			114			
pX, platoon unblocked						
vC, conflicting volume	544				872	272
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	544				872	272
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	88
cM capacity (veh/h)	1021				290	726

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	334	334	354	190	88
Volume Left	0	0	0	0	0
Volume Right	0	0	0	13	88
cSH	1700	1700	1700	1700	726
Volume to Capacity	0.20	0.20	0.21	0.11	0.12
Queue Length 95th (m)	0.0	0.0	0.0	0.0	3.1
Control Delay (s)	0.0	0.0	0.0	0.0	10.6
Lane LOS					B
Approach Delay (s)	0.0		0.0		10.6
Approach LOS					B

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	27.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	5	2	0	45	77	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	5	2	0	47	81	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	128	81	81			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	128	81	81			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	866	979	1517			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	7	47	81
Volume Left	5	0	0
Volume Right	2	0	0
cSH	895	1517	1700
Volume to Capacity	0.01	0.00	0.05
Queue Length 95th (m)	0.2	0.0	0.0
Control Delay (s)	9.1	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.1	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	14.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	6	3	7	12	33	4
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	6	3	7	13	35	4
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			9		35	8
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			9		35	8
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		96	100
cM capacity (veh/h)			1610		973	1074

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	9	20	39
Volume Left	0	7	35
Volume Right	3	0	4
cSH	1700	1610	983
Volume to Capacity	0.01	0.00	0.04
Queue Length 95th (m)	0.0	0.1	0.9
Control Delay (s)	0.0	2.7	8.8
Lane LOS		A	A
Approach Delay (s)	0.0	2.7	8.8
Approach LOS			A

Intersection Summary			
Average Delay	5.8		
Intersection Capacity Utilization	17.2%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	NBL	NBT	SBT
Lane Configurations						
Volume (vph)	249	119	381	352	1448	1284
Lane Group Flow (vph)	191	196	401	371	1551	1554
Turn Type	Perm	NA	pm+ov	Prot	NA	NA
Protected Phases		4	5	5	2	6
Permitted Phases	4		4			
Detector Phase	4	4	5	5	2	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	5.0	5.0	10.0	10.0
Minimum Split (s)	27.0	27.0	11.0	11.0	18.0	32.0
Total Split (s)	27.0	27.0	26.0	26.0	103.0	77.0
Total Split (%)	20.8%	20.8%	20.0%	20.0%	79.2%	59.2%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.7	2.7	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag			Lead	Lead		Lag
Lead-Lag Optimize?			Yes	Yes		Yes
Recall Mode	None	None	None	None	C-Max	C-Max
Act Effct Green (s)	19.4	19.4	41.0	21.6	98.6	71.0
Actuated g/C Ratio	0.15	0.15	0.32	0.17	0.76	0.55
v/c Ratio	0.86	0.81	0.82	1.32	0.61	0.86
Control Delay	86.0	78.0	49.3	207.8	8.4	20.1
Queue Delay	0.0	0.0	0.0	0.0	0.1	0.3
Total Delay	86.0	78.0	49.3	207.8	8.5	20.4
LOS	F	E	D	F	A	C
Approach Delay		65.3			47.0	20.4
Approach LOS		E			D	C
Queue Length 50th (m)	50.1	51.0	80.6	~128.1	85.9	61.9
Queue Length 95th (m)	#89.2	#86.3	#129.6	#188.2	103.0	95.0
Internal Link Dist (m)		89.9			71.9	51.3
Turn Bay Length (m)			55.0	50.0		
Base Capacity (vph)	241	262	491	282	2560	1813
Starvation Cap Reductn	0	0	0	0	0	37
Spillback Cap Reductn	0	0	0	0	118	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.79	0.75	0.82	1.32	0.64	0.88

Intersection Summary

Cycle Length: 130
Actuated Cycle Length: 130
Offset: 46 (35%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.32
Intersection Signal Delay: 40.7 — Intersection LOS: D
Intersection Capacity Utilization 93.7% — ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

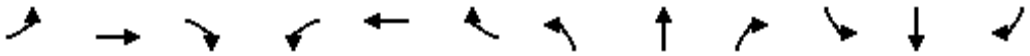
Splits and Phases: 1: Bronson & Carling

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	163	62	17	47	15	1228	16	1278
Lane Group Flow (vph)	0	295	0	80	0	1315	0	1380
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	20.7	20.7	20.7	20.7	27.3	27.3	27.3	27.3
Total Split (s)	38.0	38.0	38.0	38.0	92.0	92.0	92.0	92.0
Total Split (%)	29.2%	29.2%	29.2%	29.2%	70.8%	70.8%	70.8%	70.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3
All-Red Time (s)	2.7	2.7	2.7	2.7	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0		0.0		0.0
Total Lost Time (s)		5.7		5.7		5.3		5.3
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)		30.7		30.7		88.3		88.3
Actuated g/C Ratio		0.24		0.24		0.68		0.68
v/c Ratio		0.93		0.22		0.62		0.65
Control Delay		82.6		37.3		15.3		14.1
Queue Delay		0.0		0.0		0.4		0.1
Total Delay		82.6		37.3		15.7		14.2
LOS		F		D		B		B
Approach Delay		82.6		37.3		15.7		14.2
Approach LOS		F		D		B		B
Queue Length 50th (m)		71.3		14.9		123.5		102.4
Queue Length 95th (m)		#123.0		28.4		147.4		124.5
Internal Link Dist (m)		86.6		108.3		65.5		55.9
Turn Bay Length (m)								
Base Capacity (vph)		333		391		2120		2119
Starvation Cap Reductn		0		0		306		0
Spillback Cap Reductn		0		0		0		120
Storage Cap Reductn		0		0		0		0
Reduced v/c Ratio		0.89		0.20		0.72		0.69

Intersection Summary

Cycle Length: 130
Actuated Cycle Length: 130
Offset: 46 (35%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 22.0 Intersection LOS: C
Intersection Capacity Utilization 82.3% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

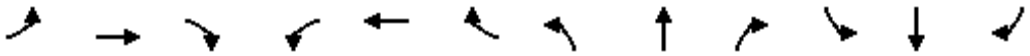
Splits and Phases: 2: Bronson & Powell



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	38	0	0	0	24	1463	0	0	1380	23
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)	0	0	40	0	0	0	25	1540	0	0	1453	24
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)								75			90	
pX, platoon unblocked	0.88	0.88	0.78	0.88	0.88	0.80	0.78			0.80		
vC, conflicting volume	2285	3055	738	2357	3067	770	1477			1540		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1155	2034	83	1236	2048	212	1035			1175		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	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 %	100	100	95	100	100	100	95			100		
cM capacity (veh/h)	128	47	745	105	46	634	517			472		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	40	0	795	770	726	751
Volume Left	0	0	25	0	0	0
Volume Right	40	0	0	0	0	24
cSH	745	1700	517	1700	472	1700
Volume to Capacity	0.05	0.00	0.05	0.45	0.00	0.44
Queue Length 95th (m)	1.3	0.0	1.2	0.0	0.0	0.0
Control Delay (s)	10.1	0.0	1.5	0.0	0.0	0.0
Lane LOS	B	A	A			
Approach Delay (s)	10.1	0.0	0.7		0.0	
Approach LOS	B	A				

Intersection Summary				
Average Delay	0.5			
Intersection Capacity Utilization	70.6%	ICU Level of Service	C	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	4	187	11	54	54	11	6	7	34	103	71	11
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)	4	197	12	57	57	12	6	7	36	108	75	12

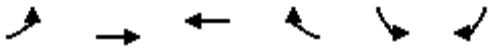
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	213	125	49	195
Volume Left (vph)	4	57	6	108
Volume Right (vph)	12	12	36	12
Hadj (s)	0.01	0.07	-0.37	0.11
Departure Headway (s)	4.7	4.9	4.6	4.9
Degree Utilization, x	0.28	0.17	0.06	0.27
Capacity (veh/h)	722	691	702	686
Control Delay (s)	9.5	8.8	7.9	9.7
Approach Delay (s)	9.5	8.8	7.9	9.7
Approach LOS	A	A	A	A

Intersection Summary				
Delay			9.3	
HCM Level of Service			A	
Intersection Capacity Utilization			45.5%	ICU Level of Service
Analysis Period (min)			15	
				A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	11	23	19	3	36	108
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	12	24	20	3	38	114
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	211	22			23	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	211	22			23	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	98			98	
cM capacity (veh/h)	759	1056			1592	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	36	23	152
Volume Left	12	0	38
Volume Right	24	3	0
cSH	937	1700	1592
Volume to Capacity	0.04	0.01	0.02
Queue Length 95th (m)	0.9	0.0	0.6
Control Delay (s)	9.0	0.0	2.0
Lane LOS	A		A
Approach Delay (s)	9.0	0.0	2.0
Approach LOS	A		

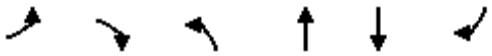
Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	24.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	749	522	22	0	119
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	788	549	23	0	125
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)			114			
pX, platoon unblocked						
vC, conflicting volume	573				955	286
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	573				955	286
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	82
cM capacity (veh/h)	996				256	710

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	394	394	366	206	125
Volume Left	0	0	0	0	0
Volume Right	0	0	0	23	125
cSH	1700	1700	1700	1700	710
Volume to Capacity	0.23	0.23	0.22	0.12	0.18
Queue Length 95th (m)	0.0	0.0	0.0	0.0	4.8
Control Delay (s)	0.0	0.0	0.0	0.0	11.1
Lane LOS					B
Approach Delay (s)	0.0		0.0		11.1
Approach LOS					B

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	30.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	5	8	0	42	136	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	5	8	0	44	143	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	187	143	143			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	187	143	143			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	99	100			
cM capacity (veh/h)	802	904	1439			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	14	44	143
Volume Left	5	0	0
Volume Right	8	0	0
cSH	862	1439	1700
Volume to Capacity	0.02	0.00	0.08
Queue Length 95th (m)	0.4	0.0	0.0
Control Delay (s)	9.2	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.2	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	17.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	36	9	17	19	15	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	38	9	18	20	16	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			47		98	43
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			47		98	43
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		98	100
cM capacity (veh/h)			1560		890	1028

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	47	38	18
Volume Left	0	18	16
Volume Right	9	0	2
cSH	1700	1560	904
Volume to Capacity	0.03	0.01	0.02
Queue Length 95th (m)	0.0	0.3	0.5
Control Delay (s)	0.0	3.5	9.1
Lane LOS		A	A
Approach Delay (s)	0.0	3.5	9.1
Approach LOS			A

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	18.7%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix B

2012 Transportation Brief – Addendum #1

1223 Michael Street, Suite 100, Ottawa, ON K1J 7T2
Tel: 613.738.4160 • Fax: 613.739.7105
www.delcan.com

September 10, 2012

OUR REF: TO3073TOB00
BY EMAIL: ktaggart@taggart.ca

Taggart Corporation
225 Metcalfe Street
Ottawa, Ontario K2P 1P9

Attention: Mr. Keith Taggart,

Dear Sir:

RE: 265 Carling Avenue
Transportation Brief: Addendum #1

The following is provided in response to comments received April 10th, 2012 on the above-noted Transportation Brief.

Comment 1: *If there are any proposed changes to the existing roadway geometry, the City of Ottawa Streetlight Asset Management Group is required to provide a full streetlight design. Be advised that the applicant will be 100% responsible for all costs associated with any streetlight design as a result of the roadway geometry change.*

Response 1: Noted and forwarded to the developer/architect.

Comment 2: *The intersection of Bronson Avenue and Powell Avenue does not have the ability to accommodate the project increase in eastbound traffic volumes directly related to the proposed site development without the provision of an eastbound left turn lane.*

Response 2: Today the subject eastbound movement operates in the LoS range of 'D' to 'E'. Although an EBLT lane is not warranted (see warrant attached), if one could be provided it would improve the intersection LoS, under projected conditions, to the following:

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Without EBLT Lane	E(E)	0.95(0.93)	EBT(EBT)	14.2(22.0)	A(B)	0.54(0.65)
With EBLT Lane	C(C)	0.75(0.80)	EBL(EBL)	10.7(16.4)	A(A)	0.52(0.59)
Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

It should be noted that there may be insufficient ROW width to implement an EBLT at Bronson/Powell. If there were sufficient width, parking would

need to be prohibited in the area of the EBLT lane, the bus stop located on the south side of Powell Avenue may need to be moved further west and the westbound through travel lane on Powell Avenue crossing Bronson Avenue would need to be realigned to avoid conflicts with EBLT traffic. Further review would be required to determine if these possible modifications to Powell Avenue are feasible and desired, or whether the best solution is a delayed left-turn movement during the two or three peak hours of the day.

Comment 3: *The Study Report undertakes the approach of vph which are estimated to generate instead of 'number of units' to be built by the proposed development. This approach requires careful consideration as it also affects the requirement of conducting transportation impact analysis for horizon period(s). This becomes more critical when analysing impacts along a corridor such as Bronson Ave in Ottawa Inner Area district.*

Response 3: It is our approach that the need for traffic impact studies and related traffic analysis should be based on traffic generation and not on units or floor area. A project's proximity to bus service, rapid transit, mixed-use development and the Central Area greatly affects its peak hour traffic generation, thus the use of one vehicle generation rate for all parts of the City is inappropriate and overestimates traffic impact and related impacts and requirements.

Comment 4: *The threshold numbers provided (in Table 4 of TIS Guidelines) under Forecasted Site Trip Generation Triggers which determine the type of TIA Report that is required for a development proposal, assumes a trip generation rate of 1.01 (PM) per unit. Therefore, a study assuming any other trip generation rates for traffic impact assessments, should not use these threshold numbers to justify TIA Report requirements. Rather 'number of unit' approach seems more appropriate in such case(s).*

Response 4: See Response 2.

Comment 5: *For the above mentioned reasons, the build out/full occupancy + 5 years horizon year analysis should also be completed for this study.*

Response 5: For the projected site traffic generation, no traffic analysis is required based on the TIA Guidelines. As such, we have prepared a slightly reduced scope Transportation Brief that focuses on the development-specific traffic concerns.

Comment 6: *The Study Report also did not take into account the impacts of other development(s) in the neighbourhood e.g. 505 Preston Street which is few blocks west of the subject site and proposing a 42-storey tower building comprising residential and commercial space.*

Response 6: There are likely 10 significant residential infill/intensification projects within four to eight blocks of the Carling/Preston intersection that could total in the order of 2000 new residential units. As the subject project is estimated to generate only approximately 40 veh/h two-way total, with less than 5veh/h two-way total using Carling Avenue, it is not realistic for this project to try to account for the peak hour traffic from 2000 units four to eight blocks away.

Comment 7: *Allocation of 55% trips to auto passenger and non-auto modes appear on high side.*

Response 7: The proposed modal share is in accordance with the '2005 Origin-Destination Survey' and reflects accessibility to transit, to a large employment node (Booth Street Complex), and is within 500 m of the NCC Capital Pathway system and within walking distance of Bank Street and the Glebe.

Comment 8: *As shown in 'Total Site Trip Generation' table, the proposed development which consists of 160 units (149 condominium and 11 live/work town-homes) is estimated to generate only 47 vph and 43 vph in AM & PM peak hours. The trip generation/unit ratio is 0.29 and 0.27 for AM & PM peak hours respectively. Unless, a reasonable justification could be provided, we strongly believe that the Total Site Trip estimates are on low side. It also has the potential to affect traffic analysis assumptions/results.*

Response 8: The trip generation rates were taken from the 8th Edition ITE Trip Generation Manual as stated in the TIA Guidelines under 'Forecasted Site Trip Generation Triggers' and then adjusted for the modal share breakdown justified in Response 6. We do not think for this very central location that 55% of site travellers being in cars and 45% using transit/bike/walk is out of whack. However, for discussion purposes, if we were to reduce the transit to 20% and the bike/walk to 10% (auto persons are 70%), the net traffic increase would be only 15 veh/h two-way total. It is our view that the City is encouraging intensification around transit stations in, and adjacent to the Central Area to reduce vehicle trips and increase the transit/bike/walk modal share. Assuming 70% auto share for a project at this very central location seams quite contrary to why the City is encouraging intensification.

Comment 9: *Further clarification is required on the rationale of traffic distribution assumptions, 80% traffic to/from Bronson North and only 10% each to/from south and west via Bronson and Carling Ave respectively do not seem to reflect traffic patterns in the area. It is important to note that the proposed development is expected to add only 1 and 3 vph in NB direction during AM & PM peak hour respectively at Carling/Bronson intersection. Couple of movements at this intersection are already at LoS E or F.*

Response 9: As the proposed development is a residential condominium the traffic distribution reflects travel patterns to and from the major employment areas, 80% of the traffic to/from Bronson North reflects access to/from Highway 417 eastbound and westbound and access to/from the downtown core and the Outaouais, and access to the Booth Street Complex. It should also be noted that if the entire traffic generated by the proposed development (47 and 43 veh/h) were to be distributed south, the Carling/Bronson intersection 'as a whole' and the effected movements (NBT and SBT) would continue to operate at existing levels of service.

Comment 10: *Section 4 of the Report (Neighbourhood Impacts) notes that cut through traffic is already an issue in the neighbourhood. Any additional traffic (regardless of its scale) will only aggravate the cut through traffic problem through the community.*

Response 10: Agreed.

Comment 11: *Section 6 of the Report (Findings, Conclusions and Recommendations) should also mention that the proposed development will aggravate EBT traffic problems at Bronson/Powell intersection. Unless the extra capacity from conflicting movements are available in order to reduce the magnitude of critical movement, the concept of 'operation of an intersection as a whole at acceptable LoS' is meaningless.*

Response 11: The proposed development is projected to add 30(14) veh/h during the morning and afternoon peak hours, respectively, to the EBT movement. Provision of an EBLT lane was mentioned in Response 1, however, by optimizing the signal timing plan at Bronson/Powell, as shown in the following table. The critical movement's (EBT) LoS can be reduced to an acceptable range without increasing the cycle length or affecting the LoS of other movements.

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Existing	D(E)	0.83(0.91)	EBT(EBT)	11.6(20.8)	A(B)	0.52(0.63)
Projected	E(E)	0.95(0.93)	EBT(EBT)	14.2(22.0)	A(B)	0.54(0.65)
Optimized	C(D)	0.75(0.86)	EBT(EBT)	13.5(21.3)	A(B)	0.55(0.66)
Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

Comment 12: *The Ottawa Cycling Plan identifies bike lanes as being required along the length of Carling Avenue and consequently the city is working towards adding these bike lanes as components of various infrastructure projects along different road segments, taking place at different times. The segment of Carling Avenue from the O-Train overpass to Bronson Avenue has been redesigned to better accommodate changing traffic and mobility needs, including painted and separated bike lanes. There were however*

land constraints at the easternmost end of Carling and the road design was not able to extend the bike lanes all the way to Bronson. This would be a significant constraint to encouraging or supporting cycling transportation along this stretch, and contrary to city objectives.

Response 12: Currently dedicated bus lanes exist on either side of Carling Avenue, from Cambridge Street to Booth Street and the only routes that currently use them are Route 6 (peak hour service only) and Route 101 (regular service) eastbound only. With the dedicated bus lanes currently being underutilized it may be reasonable that bicycle sharrows could be considered and the dedicated bus lane could become a shared-use lane, as is planned for the dedicated bus lanes on the reconstructed section of Rideau Street east of King Edward Avenue.

Also, FoTenn Consultants have advised us that in February 2012, City Staff confirmed that a 34.1 metre right-of-way (ROW) width adjacent to the subject site would allow enough room for a new lay-by for the existing bus stop located on the north side of Carling Avenue and for a new bicycle lane along the north side of Carling Avenue. The concept plan submitted with the Zoning By-law Amendment application respects this ROW width.

Comment 13: *Consequently, any opportunity to widen the city ROW along this segment of Carling (Lebreton to Bronson) to permit bike lane increments should be taken. This implies approximately 2.0 m of extra ROW in this section for the westbound bike lane and the land could be reserved and worked into the road design which will be implemented in the post LRT construction time frame.*

Response 13: Noted and forwarded to the developer/architect.

Comment 14: *Regardless of "site visit to garages", the access grades do not adhere to Bylaw requirements and must be revised. A variance for this substandard access will have to be justified.*

Response 14: Noted and forwarded to the developer/architect.

We hope the foregoing responds satisfactorily to your concerns. Please call if you have any questions.

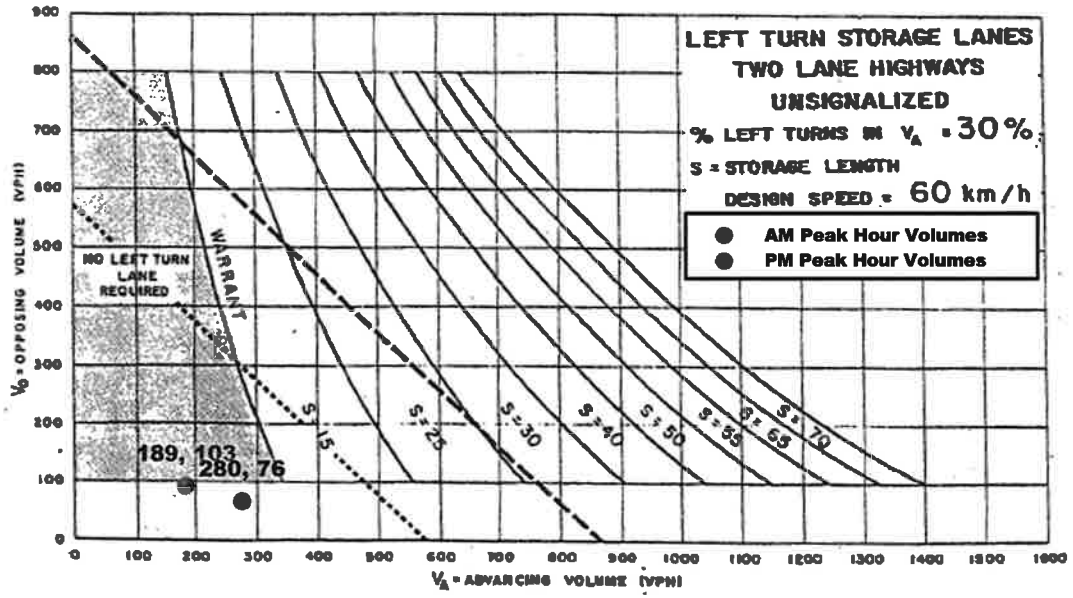
Sincerely,

Ronald M. Jack, P.Eng.
Vice President Transportation
Manager Ottawa Operations

H:\ISO\ASP\TO3073\TOB\DOCS\265 Carling TB_Addendum_08Aug2012.docx

	Design Speed	Advancing Traffic Volume (V_A)		Opposing Traffic Volume (V_O)		Left Turn Traffic Volume (V_L)		% of Left Turning Traffic		Warrant Left Turn Lane
		AM	PM	AM	PM	AM	PM	AM	PM	
Projected										
Bronson/Powell	60	189	280	103	76	115	163	61%	58%	No

Peak	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
							Warrant?					
AM	9	1168	6	19	976	35	115	38	36	17	44	42
PM	15	1228	6	16	1278	17	163	62	55	17	47	12



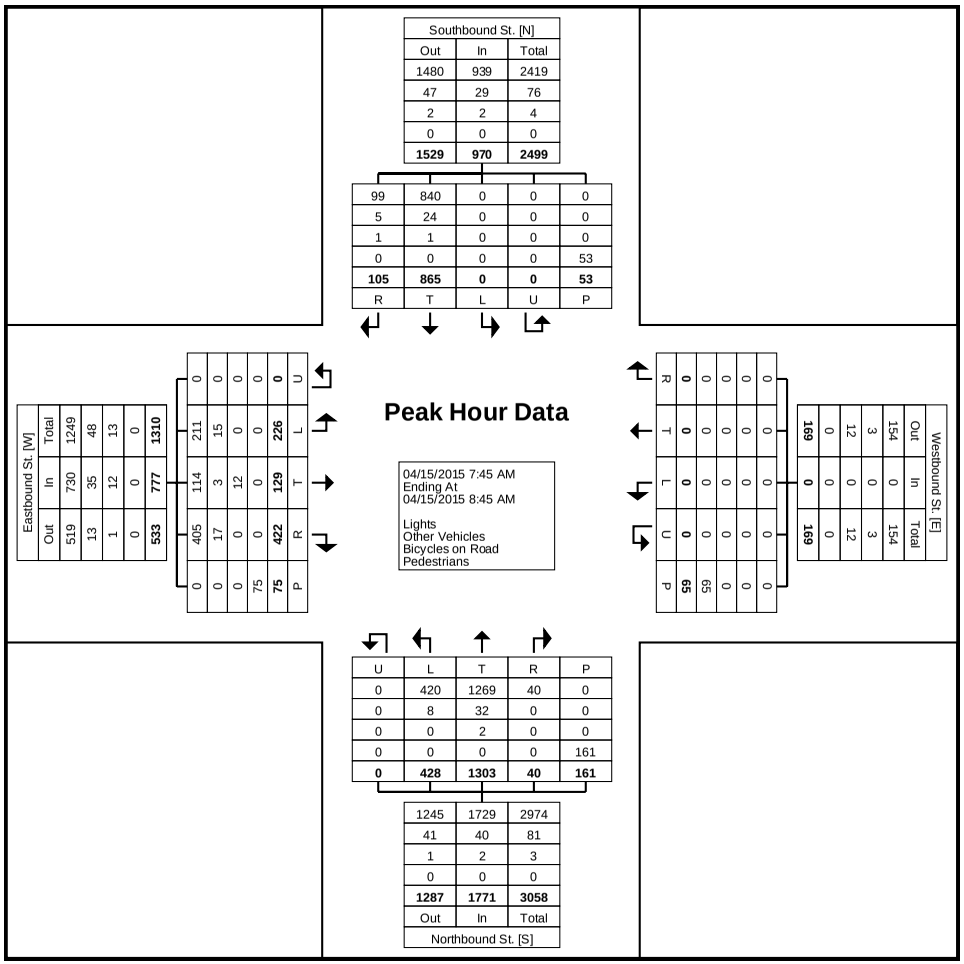
Appendix C

Carling/Bronson Intersection 2015 Traffic Count and SYNCHRO Analysis

City of Ottawa
110 Laurier Ave West

Ottawa, Ontario, Canada K1P 1J1
613-580-2424

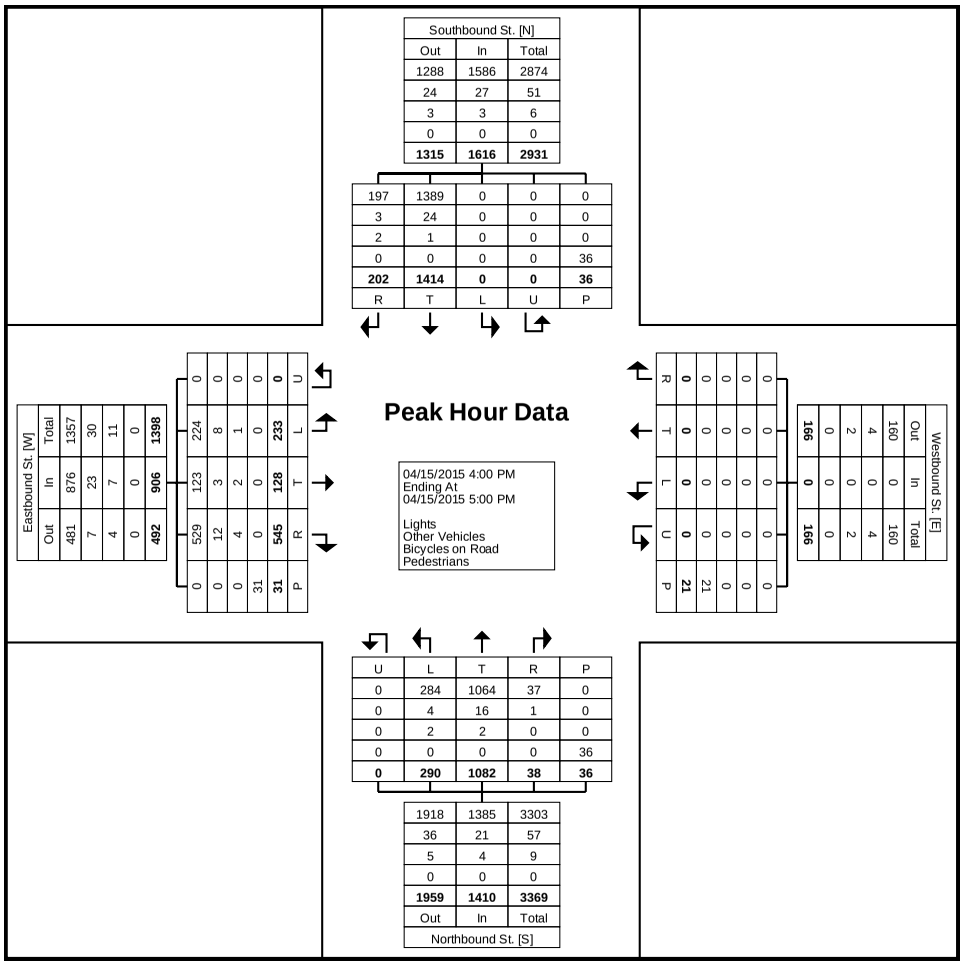
Count Name: 5177963- Bronson and Carling/Glebe- Apr-15th
Site Code: 34475103
Start Date: 04/15/2015



Turning Movement Peak Hour Data Plot (7:45 AM)

City of Ottawa
110 Laurier Ave West

Ottawa, Ontario, Canada K1P 1J1
613-580-2424



Turning Movement Peak Hour Data Plot (4:00 PM)

Lane Group	EBL	EBT	EBR	NBL	NBT	SBT	Ø3
Lane Configurations							
Traffic Volume (vph)	226	117	422	428	1301	864	
Future Volume (vph)	226	117	422	428	1301	864	
Lane Group Flow (vph)	188	193	469	476	1490	1076	
Turn Type	Perm	NA	pm+ov	Prot	NA	NA	
Protected Phases		4	5	5	2	6	3
Permitted Phases	4		4				
Detector Phase	4	4	5	5	2	6	
Switch Phase							
Minimum Initial (s)	10.0	10.0	5.0	5.0	10.0	10.0	1.0
Minimum Split (s)	22.0	22.0	11.0	11.0	18.0	32.0	5.0
Total Split (s)	22.0	22.0	34.0	34.0	83.0	49.0	5.0
Total Split (%)	20.0%	20.0%	30.9%	30.9%	75.5%	44.5%	5%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	2.0
All-Red Time (s)	2.7	2.7	2.7	2.7	2.7	2.7	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	
Lead/Lag	Lag	Lag	Lead	Lead		Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		Yes	Yes
Recall Mode	Min	Min	Min	Min	C-Max	C-Max	Max
Act Effct Green (s)	15.3	15.3	44.0	28.7	77.7	43.0	
Actuated g/C Ratio	0.14	0.14	0.40	0.26	0.71	0.39	
v/c Ratio	0.85	0.84	0.71	1.08	0.63	0.82	
Control Delay	78.3	75.4	25.6	105.3	10.0	36.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	78.3	75.4	25.6	105.3	10.0	36.0	
LOS	E	E	C	F	B	D	
Approach Delay		48.6			33.1	36.0	
Approach LOS		D			C	D	
Queue Length 50th (m)	41.6	42.7	57.7	~116.6	79.8	106.2	
Queue Length 95th (m)	#79.6	#80.6	92.3	#177.9	98.8	133.5	
Internal Link Dist (m)		122.5			152.5	148.4	
Turn Bay Length (m)			55.0	45.0			
Base Capacity (vph)	231	241	662	441	2379	1310	
Starvation Cap Reductn	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.81	0.80	0.71	1.08	0.63	0.82	

Intersection Summary	
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 53 (48%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.08	
Intersection Signal Delay: 37.3	Intersection LOS: D
Intersection Capacity Utilization 85.3%	ICU Level of Service E
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Bronson & Carling/Glebe

Lane Group	EBL	EBT	EBR	NBL	NBT	SBT	Ø3
Lane Configurations							
Traffic Volume (vph)	232	126	541	288	1080	1413	
Future Volume (vph)	232	126	541	288	1080	1413	
Lane Group Flow (vph)	196	202	601	320	1242	1792	
Turn Type	Perm	NA	pm+ov	Prot	NA	NA	
Protected Phases		4	5	5	2	6	3
Permitted Phases	4		4				
Detector Phase	4	4	5	5	2	6	
Switch Phase							
Minimum Initial (s)	10.0	10.0	5.0	5.0	10.0	10.0	1.0
Minimum Split (s)	22.0	22.0	11.0	11.0	18.0	32.0	5.0
Total Split (s)	22.0	22.0	28.0	28.0	113.0	85.0	5.0
Total Split (%)	15.7%	15.7%	20.0%	20.0%	80.7%	60.7%	4%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	2.0
All-Red Time (s)	2.7	2.7	2.7	2.7	2.7	2.7	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	
Lead/Lag	Lag	Lag	Lead	Lead		Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		Yes	Yes
Recall Mode	Min	Min	Min	Min	C-Max	C-Max	Max
Act Effct Green (s)	16.0	16.0	38.0	22.0	107.0	79.0	
Actuated g/C Ratio	0.11	0.11	0.27	0.16	0.76	0.56	
v/c Ratio	1.10	1.07	1.34	1.20	0.48	0.95	
Control Delay	152.6	142.1	202.7	170.4	6.9	41.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	152.6	142.1	202.7	170.4	6.9	41.1	
LOS	F	F	F	F	A	D	
Approach Delay		180.6			40.4	41.1	
Approach LOS		F			D	D	
Queue Length 50th (m)	~64.5	~64.9	~204.7	~107.3	58.8	235.6	
Queue Length 95th (m)	#116.5	#117.5	#277.0	#165.9	70.1	#298.5	
Internal Link Dist (m)		122.5			152.5	148.4	
Turn Bay Length (m)			55.0	45.0			
Base Capacity (vph)	178	189	448	266	2564	1880	
Starvation Cap Reductn	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	1.10	1.07	1.34	1.20	0.48	0.95	

Intersection Summary	
Cycle Length: 140	
Actuated Cycle Length: 140	
Offset: 46 (33%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 120	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.34	
Intersection Signal Delay: 72.9	Intersection LOS: E
Intersection Capacity Utilization 96.8%	ICU Level of Service F
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 1: Bronson & Carling/Glebe