

# Wesbrook Place

## Traffic Analysis of Redistributed Dwelling Units

### 1 Summary

This report presents an analysis of the changes in traffic volumes in the Wesbrook Place neighbourhood associated with a redistribution of residential dwelling units from re-designated lands south of West 16<sup>th</sup> Avenue.

As compared with the original 2005 neighbourhood plan, the proposed redistribution of dwelling units would increase traffic volumes on Wesbrook Mall and reduce traffic volumes on East Mall south of 16<sup>th</sup> Avenue. The only potential impact of this increased traffic is that it might be necessary to construct a southbound left turn lane and signalize the Wesbrook Mall/Berton Avenue intersection, which is currently controlled by a four-way stop configuration. No other changes to traffic controls and roadways would be necessary, including the roundabout at the Wesbrook Mall/16<sup>th</sup> Avenue intersection, which could accommodate the increased traffic.

### 2 Land Uses

Dwelling unit calculations from the 2005 neighbourhood plan are summarized in Table 1, together with dwelling unit calculations for the proposed 2011 amended neighbourhood plan. The 2005 neighbourhood plan authorizes a total of 2,495 dwelling units that have been built, or were planned to be built, within the 2005 neighbourhood plan area. In addition to these units, 2,250 dwelling units had been contemplated south of West 16<sup>th</sup> Avenue on lands outside the 2005 neighbourhood plan area that would have used the road network within the plan area. Some of those lands have been re-designated for academic purposes. Therefore, for the purposes of the traffic analysis, the build-out total of 4,731 residential units is used to compare the traffic volumes under the 2005 neighbourhood plan with traffic volumes under the build-out of the proposed 2011 amended neighbourhood plan. This compensates for the adjustments to the neighbourhood and green academic land designations of the Land Use Plan (2011).

**Table 1 – Wesbrook Place Residential Dwelling Units**

Document	Land Use	2005 Plan	2011 Proposed Amended Plan
		Average unit size = 1,340 sq ft	Average unit size = 925 sq ft
Neighbourhood Plan (2005)	Built or committed as of October 2011	1,297	1,297
	Undeveloped lots in the neighbourhood plan area	1,184	3,312
Land Use Plan (2011)	Re-designated lands	2,250	1,691
<b>Build-out totals</b>		<b>4,731</b>	<b>6,300</b>

The proposed redistribution of dwelling units shifts development to undeveloped lots within the neighbourhood plan area, including new lots on the former BC Research site. Under this proposed amendment to the neighbourhood plan, the number of dwelling units within an expanded Wesbrook Place would total 6,300. The average size of new dwelling units would decrease from 1,340 square feet per unit as originally anticipated, to 925 square feet per unit. Though this will increase the total number of units because the units are now smaller, it is anticipated that the population for the area will remain similar to what was originally projected for the south campus.

Table 2 provides a summary of other, non-residential land uses in Wesbrook Place which have also been included in the traffic analysis.

**Table 2 – Wesbrook Place Non-Residential Land Uses**

Use		Location	Size
Commercial	Supermarket	Village (lot 48)	32,400 sq. ft.
	Other retail	Village (lot 48)	42,600 sq. ft.
Office		Village (lot 48)	50,000 sq. ft.
School	High school		800 students
	Elementary school	Lot 43	300 students
Community	Community centre	Village (lot 46)	30,000 sq. ft.
	Daycare in community centre	Village (lot 46)	6,000 sq. ft.
	Daycare freestanding	Neighbourhood	3 x 2,500 sq. ft.
Agriculture	UBC Farm		

### 3 Traffic Volumes

Traffic generated by existing and future development within Wesbrook Place was estimated using peak hour trip generation rates, as described below. In most cases, assumed trip generation rates in Wesbrook Place were based on rates published by the Institute of Transportation

Engineers (ITE). Because ITE rates reflect typical suburban North American conditions, these rates were adjusted as described below. Where actual trip generation rates for UBC conditions were available, these were used in preference to ITE rates, to provide the most accurate possible estimates of future traffic volumes.

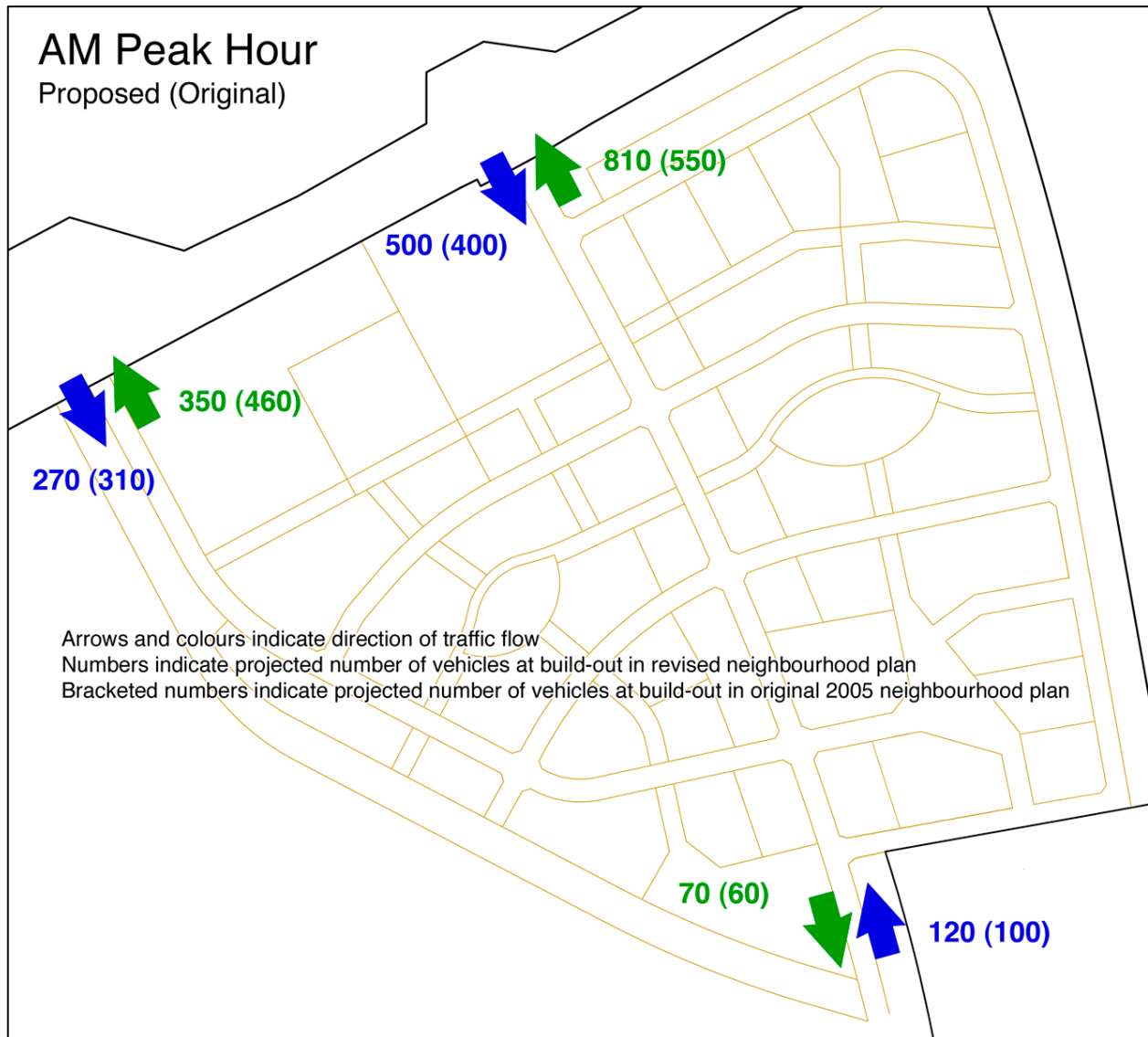
- Residential trip generation rates were based on observed trip generation rates in other residential neighbourhoods at UBC in Fall 2007. Residential trip generation rates at UBC during the morning and afternoon peak hours are only 58% to 67% of typical ITE trip generation rates for comparable developments. For future residential development under the proposed redistribution of dwelling units, these trip generation rates were reduced by 10% to account for the smaller dwelling units in Wesbrook Place, as the numbers of persons and automobiles per unit are typically less for smaller units.
- Commercial and office trip generation rates were based on rates published by ITE. Because ITE rates reflect typical suburban North American conditions with higher rates of automobile use and lower rates of walking, cycling and transit use in residential neighbourhoods at UBC, the ITE trip generation rates were reduced by 25% to 40% to reflect conditions at UBC.
- School, community centre and daycare trip generation rates were also based on published ITE rates, and were reduced by 50% to 67% to reflect higher rates of walking, cycling and transit use at UBC as compared with typical suburban conditions.
- Trip generation rates for the UBC Farm were calculated from estimates of traffic volumes in 2020 provided by staff in the Faculty of Land and Food Systems. These estimates assume a new farm centre and residential college.

The estimated generated traffic was assigned to three access/egress points into and out of the neighbourhood — Wesbrook Mall at 16<sup>th</sup> Avenue, East Mall at 16<sup>th</sup> Avenue, and Wesbrook Mall at the south end of the neighbourhood (leading to Southwest Marine Drive). In assigning traffic to these access points, it was assumed that motorists travelling via 16<sup>th</sup> Avenue would avoid Wesbrook Mall and use East Mall instead where it would benefit them to do so and would not increase their travel time. In general, it was assumed that residents living on the west side of the neighbourhood would use East Mall predominantly, and residents living on the east side of the neighbourhood would use Wesbrook Mall predominantly.

Figures 1 and 2 summarize the estimated traffic entering and exiting the neighbourhood during the morning and afternoon peak hours, respectively. The indicated traffic volumes represent all traffic generated by all uses in Wesbrook Place. It should be noted that for the purposes of the traffic analysis, it is assumed that it would be possible to access the neighbourhood via Wesbrook Mall at SW Marine Drive, as is the case at present.

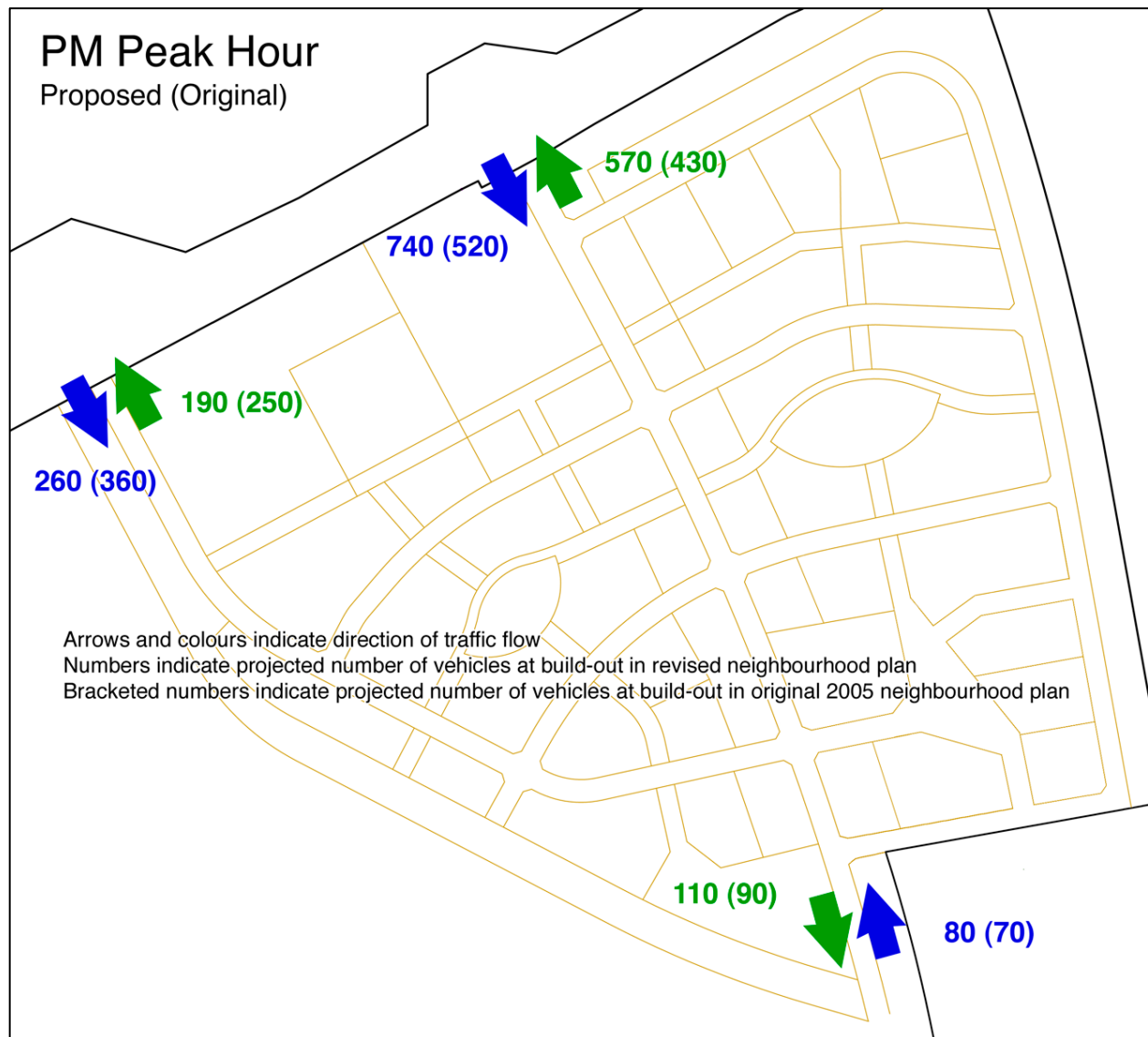
“Proposed” traffic volumes in Figures 1 and 2 reflect the proposed amendments to the neighbourhood plan, whereas “original” traffic volumes reflect the dwelling units authorized in the 2005 neighbourhood plan plus the potential for development on other lands south of West 16<sup>th</sup> Avenue.

**Figure 1 – Generated Traffic in Wesbrook Place, AM Peak Hour**



The total volume of traffic generated under the proposed redistribution of dwelling units represents an increase of 12% in the morning peak hour and 13% in the afternoon peak hour, as compared with the original scenario. The significant difference between the two scenarios is a shift in traffic from East Mall to Wesbrook Mall. Traffic volumes on Wesbrook Mall south of the 16<sup>th</sup> Avenue intersection are 38% and 37% higher in the morning and afternoon peak hours under the proposed redistribution of dwelling units.

**Figure 2 – Generated Traffic in Wesbrook Place, PM Peak Hour**



The neighbourhood plan identified an option to construct a right-out egress from the Berton Avenue/Binning Road intersection in the northeast corner of the neighbourhood to eastbound 16<sup>th</sup> Avenue, if needed to reduce traffic volumes and intersection delays on Wesbrook Mall. This option would reduce northbound traffic volumes on Wesbrook Mall by 50 vehicles (from 570 to 520 vehicles) during the afternoon peak hour. Southbound traffic volumes would not be affected, and an analysis of the benefits of this right-out egress indicated that it would make little overall difference in traffic conditions on Wesbrook Mall. For this reason, the right-out egress option is not presented in the traffic analysis results. It is worth noting that 16<sup>th</sup> Avenue is the jurisdiction of the Ministry of Transportation and Infrastructure, and construction of an additional access to 16<sup>th</sup> Avenue would require MoTI approval.

## 4 Traffic Operations

As described above, the significant effect of redistributing dwelling units in Wesbrook Place is to increase traffic volumes on Wesbrook Mall south of 16<sup>th</sup> Avenue, while decreasing traffic volumes on East Mall. Traffic volumes are highest on this section of Wesbrook Mall, and consequently the intersections most likely to experience operational problems as a result of increased traffic would be the roundabout at Wesbrook Mall/16<sup>th</sup> Avenue and the four-way stop at Wesbrook Mall/Berton Avenue.

Table 3 provides a summary of traffic operations at the Wesbrook Mall/16<sup>th</sup> Avenue roundabout during both the morning and afternoon peak hours. The key measure of the operation of a roundabout is the volume/capacity ratio, which is a ratio of the maximum number of vehicles that could travel through the roundabout during one hour to the forecast number of vehicles. In practice, it is desirable to maintain a V/C ratio of 0.85 or less, and below this level motorists will experience acceptable levels of delay entering and exiting the roundabout. As indicated in Table 3, even with the increased traffic as a result of the redistribution of dwelling units, the peak hour V/C ratios would be well below the 0.85 limit at 0.70 during the morning and afternoon peak hours.

**Table 3 – Wesbrook Mall/16<sup>th</sup> Avenue Traffic Operations**

Time Period		Volume/Capacity Ratios			
		Eastbound	Westbound	Northbound	Southbound
AM peak hour	Proposed	0.43	<b>0.70</b>	0.62	0.29
	Original	0.39	<b>0.63</b>	0.39	0.25
PM peak hour	Proposed	<b>0.70</b>	0.48	0.47	0.42
	Original	<b>0.60</b>	0.41	0.34	0.35

Table 4 provides a summary of afternoon peak hour traffic operations at the Wesbrook Mall/Berton Avenue intersection (the first intersection south of 16<sup>th</sup> Avenue). The key measure of the operation of a conventional intersection is level of service, which is based on the average delay a motorist would experience at the intersection, as summarized in Table 5. During peak period conditions, levels of service of A through D are considered acceptable, level of service E is marginal but acceptable if it occurs on only on one approach, and level of service F is unacceptable.

**Table 4 – Wesbrook Mall/Berton Avenue Traffic Operations**

PM Peak Hour		Levels of Service			
		Eastbound	Westbound	Northbound	Southbound
Proposed	4-way stop	C	B	C	<b>F</b>
	2-way stop	<b>F</b>	C	A	A
	Traffic signal	C	B	A	B
Original	4-way stop	B	B	B	D

As Table 4 indicates, the existing four-way stop configuration at this intersection would accommodate the original forecast traffic volumes at acceptable levels of service, but could not accommodate the increased traffic as a result of the redistribution of dwelling units. Removing the northbound and southbound stop signs to create a two-way stop condition would alleviate delays for southbound traffic, but would create unacceptable delays for eastbound traffic, and consequently two-way stop control would also not accommodate the increased traffic.

The solution would be to signalize the Wesbrook Mall/Berton Avenue intersection, and to reconfigure the southbound approach to provide a left turn lane separate from the lane for southbound through and right-turning traffic. This would improve the levels of service to acceptable levels on all approaches to the intersection.

It is important to note that the indicated need for a traffic signal is based on assumptions regarding trip generation rates and the distribution of traffic in the neighbourhood. If less traffic is generated or more motorists choose to drive into and out of the neighbourhood via East Mall than has been assumed, the traffic volumes on Wesbrook Mall would be less than estimated, and a traffic signal might not be required.

**Table 5 – Intersection Levels of Service**

Level of Service	Average Vehicle Control Delay	
	Unsignalized Intersection	Signalized Intersection
A	≤ 10 sec	≤ 10 sec
B	10–15 sec	10–20 sec
C	15–25 sec	20–35 sec
D	25–35 sec	35–55 sec
E	35–50 sec	55–80 sec
F	≥ 50 sec	≥ 80 sec