

Our Ref: 16133

20 February 2020

Windsor Star 88 Pty Ltd
c/o Dyldam
Level 1
74 Macquarie Street
PARRAMATTA NSW 2150

Attention: Ms Chemaine Shehadeh

Dear Chemaine,

**RE: 360-378 WINDSOR ROAD, BAULKHAM HILLS
ADDENDUM TRAFFIC ASSESSMENT**

As requested, please find herein The Transport Planning Partnership (TPPP) addendum traffic assessment for the above proposed development.

Background

This traffic assessment is an addendum to the planning proposal traffic impact assessment prepared by GTA Consultant, dated 9 October 2015 in relation to the planning proposal for a proposed mixed use development at 360-378 Windsor Road, Baulkham Hills.

Roads and Maritime Services (Roads and Maritime) has provided comments on the addendum traffic assessment prepared by TPPP in 7 September 2018.

The planning proposal seeks to amend The Hills Local Environmental Plan 2012 (LEP) to rezone the site and increase the permissible building height and floor space ratio. This will allow the redevelopment of the site to provide a mixed use development comprising residential use with retail and commercial spaces and other community uses.

The response of Roads and Maritime in relation to the September 2018 traffic assessment is summarised as follows:

- Traffic generation rates of 0.19 vehicle trips per hour (vtp/h) per dwelling and 0.15 vtp/h per dwelling for the morning and evening peak periods respectively may not be appropriate for the subject site as these rates have been derived from surveys

undertaken at locations with significantly higher accessibility and mode share to public transport.

- The retail trip generation rates applied for the study appear to be quite low (i.e. 2.3vtp/h in the morning peak period and 4.6 vtp/h in the evening peak period). Recent surveys undertaken on behalf of Roads and Maritime at retail developments less than 10,000 m² across Sydney have shown higher trip generation rates than those applied for the subject study.
- Roads and Maritime requires that all future vehicular accesses to the proposed development on Seven Hills Road and Windsor Road be restricted to provide for left-in and left-out traffic movements only. A left-turn deceleration lane may be required to facilitate safe and efficient access into the site, in accordance with Austroads warrants and design requirements.
- Grade separation of Seven Hills Road-Old Northern Road-Windsor Road intersection is unlikely to be viable due to construction constraints and significant costs involved in such a proposal.
- Roads and Maritime strongly recommends that consideration is given to incorporate a continuation of setback requirements to apply to the subject site to allow for future widening. A minimum front setback requirement of 10 metres for the Seven Hills Road frontage and 11 metres along the Windsor Road frontage of the subject site should be incorporated.

TTPP has reviewed the Roads and Maritime comments. Our responses to the comments including additional modelling results are contained herein.

Development Yield

In preparing the current addendum traffic assessment it is noted that the proposed development yield has been changed since the previous traffic assessment (dated 7 September 2018). The updated development yield is summarised in Table 1.

Table 1: Comparison of Development Yield

Land Use	September 2018 Yield	New Proposed Yield	Net Difference
Residential	200 units	199 units	- 1 unit
Commercial	4,890 m ² GFA	3,892 m ² GFA	- 998 m ² GFA
Retail	1,240 m ² GFA	997 m ² GFA	- 243 m ² GFA
Library / Community Centre*	2,500 m ² GFA Assumed Library* area: 1,800 m ² Assumed Community Centre* area: 700 m ²	2,502 m ² GFA Assumed Library* area: 1,800 m ² Assumed Community Centre* area: 702 m ²	+ 2 m ² GFA
Hotel/ Pub	1,150 m ² GFA	1,153 m ² GFA	+ 3 m ² GFA

* The size of the library and community facilities is indicative only
Subject to discussions with Council, further traffic investigation may be required at a later stage.

Changes to the development yield arise from the reduction in the proposed floor areas for the commercial and retail uses.

Traffic Generation

With consideration to the Roads and Maritime's comments, the following peak hour traffic generation rates have been adopted to estimate the potential traffic impact of the proposed mixed use development.

Residential Use

Traffic generation estimates for the proposed residential use have been sourced from the recent Roads and Maritime's *Trip Generation Surveys – High Density Residential (Car Based) Analysis and Data* reports issued on 20th October 2017.

A total of 28 sites were surveyed as part of the study comprising eight Sydney metropolitan, Sydney sub-metropolitan and 11 regional sites.

Trip rates adopted for the proposed residential use are based on the results obtained from 38 Solent Circuit, Baulkham Hills which is one of the eight surveyed Sydney sub-metropolitan sites. This site has been selected as a benchmark as it is within the same suburb as the subject site and has comparable public transport accessibility and mode share characteristics.

The following peak hour traffic generation rates have been obtained from the benchmark site:

- morning peak hour: 0.40 vehicle trips per unit, and
- evening peak hour: 0.47 vehicle trips per unit.

In their comments, Roads and Maritime recommended that the trip rate for the subject site should be obtained from a site with comparable mode share and accessibility characteristics

such as the Liberty Grove site surveyed as part of the TDT 2013/04a. The trip rates for the Liberty Grove site are 0.28vtph in the morning peak hour and 0.41vtph in the evening peak hour. It is noted that the trip rates associated with the benchmark site at Baulkham Hills are higher, and thus would yield more conservative results.

Commercial Use

The trip generation rates for the commercial use from the previous assessment have been retained. These rates are as follow.

- morning peak hour: 1.6 vehicle trips per 100 m² gross floor area (GFA), and
- evening peak hour: 1.2 vehicle trips per 100 m² gross floor area.

Retail Use

TTPP has reviewed the trip generation rates collected by Roads and Maritime in the recent *Small Suburban Shopping Centres Analysis and Data* report which was issued on 7th November 2018.

A total of 20 shopping centres with less than 10,000m² gross leasable floor area (GLFA) have been surveyed comprising 11 sites within greater Sydney and nine regional sites. Of the 11 Sydney sites, five sites are solely supermarkets (i.e. Woolworths, Coles, ALDI) whilst the remaining sites are shopping centres and villages.

The average Thursday trip rates obtained from surveyed Sydney sites have been used. It is noted that the proposed retail use is likely to consist of various small shops within the development site. As such, the trips obtained from solely supermarket sites have been excluded due to their different trip generating characteristics as compared with the nature of the proposed retail use.

Based on the above assumptions, the following trip rates have been sourced from the average of the six surveyed shopping centres and villages in Sydney:

- morning peak hour: 7.88 vehicle trips per 100m² GLFA, and
- evening peak hour: 11.10 vehicle trips per 100m² GLFA.

At this stage, gross leasable floor areas for the proposed retail uses have not been provided. Accordingly, from a comparison of available GFA and GLFA data for the sites surveyed in the recent Roads and Maritime study it was found that GLFA is approximately 80% of the total GFA i.e. 1m² GFA is approximately 0.8m² GLFA.

It is noted that the adopted traffic generation rates for the retail use are considered to be high. The nature and scale of the proposed retail use is such that it has a local catchment serving generally residents and employees living and working in the nearby existing and future developments including those from the proposed development. As such, the proposed retail uses would draw its customers from predominantly walk in pedestrians. Any

development traffic arising from the retail use would be those generated by the shop owners and retail staff which would occur outside of the typical morning and evening peak periods.

It is further noted that the adopted retail traffic generation rates have sourced from surveys conducted on behalf of Roads and Maritime at retail centres that are anchored by supermarkets. Although the assessment has excluded retail development traffic associated with the supermarket uses, nevertheless the underlying supermarket traffic generating characteristic would continue to exist in the adopted retail traffic generation rates. As such, the proposed retail use at this proposed development is unlikely to generate the same level of development traffic as that predicted.

Library and Community Centre

The methodology used in estimating the traffic generation for the proposed library and community centre has been sourced from the *Supplementary Traffic Assessment* prepared by GTA consultants on 3rd February 2016 for the subject site. The GTA assessment has made the following assumptions:

- 25% of parking spaces will be accessed during morning peak hour
- 50% of parking spaces will be accessed during evening peak hour
- parking requirement of library at 1 space per 40m² of public floor area, and
- parking requirement of community centre at 15 spaces per 100m².

Hotel and Pub

Based on GTA's *Planning Proposal Traffic Impact Assessment* (9th October 2015), the existing Bull and Bush Hotel has an estimated floor area of 1,340 m². Based on the traffic surveys conducted for the 2016 traffic report, it was found out that the existing hotel/ pub generates approximately 6 vehicles per hour (vph) and 139 vph during the morning and evening peak periods, respectively.

It is noted that the hotel will be redeveloped as part of the proposed scheme however the floor area will be reduced to 1,153 m².

For a conservative assessment, it has been assumed the proposed hotel would continue to generate the same level of traffic thus the existing development traffic has not been discounted to take account the reduction of the hotel/ pub hotel area.

The potential traffic generation based on the above trip generation rates and assumptions is summarised in Table 2.

Table 2: Updated Traffic Generation

Land Use	Updated Peak Hour Trip Generation Rate (vtph)		September 2018 Yield	New Proposed Yield	September 2018 Yield Vehicle Movements		New Proposed Yield Vehicle Movements	
	AM	PM			AM	PM	AM	PM
Residential	0.40 per unit	0.47 per unit	200 units	199 units	80	94	80	94
Commercial	1.6 per 100m ² GFA	1.2 per 100m ² GFA	4,890 m ² GFA	3,892 m ² GFA	78	59	62	47
Retail	8.01 per 100m ² GLFA	11.32 per 100m ² GLFA	1,240 m ² GFA	997 m ² GFA	79	112	64	90
Library	0.25 per 40m ² GFA	0.5 per 40m ² GFA	1,800 m ² GFA	1,800 m ² GFA	11	23	11	23
Community Centre	3.75 per 100m ² GFA	7.5 per 100m ² GFA	700 m ² GFA	702 m ² GFA	26	53	26	53
Hotel	-	-	1,150 m ² GFA	1,153 m ² GFA	6	139	6	139
Total	-	-	-	-	280	480	249	446

Overall, the traffic generation due to yield changes has slightly decreased from 280 to 249 vehicles per hour during the morning peak hour and from 480 to 446 vehicles per hour during the evening peak period, based on the new and higher trip rates adopted in response to the Roads and Maritime comments.

Traffic Distribution

The following assumptions have been made in relation to the inbound and outbound traffic proportion of each land use:

- for residential trips, it has been assumed that 20% of the trips would be inbound and 80% of the trips would be outbound in the morning peak hour, and these would be reversed in the PM peak hour
- for commercial use, it has been assumed that 80% of the trips would inbound and 20% would be outbound in the morning peak hour, and the reverse would apply in the evening peak hour
- for the retail use, it has been assumed that 50% of the trips would be inbound and 50% would be outbound in both peak hours, and
- for the library and community centre trips, it has been assumed that 90% of the morning peak hour trips would be inbound and 10% would be outbound and the reverse would apply in the evening peak.

The proportion of inbound and outbound traffic for each land use is summarised in Table 3.

Table 3: Assumed Inbound and Outbound Trip Distribution

Land Use	AM Peak			PM Peak		
	In	Out	Two-Way	In	Out	Two-Way
Residential	20%	80%	100%	80%	20%	100%
Commercial	80%	20%	100%	20%	80%	100%
Retail	80%	20%	100%	50%	50%	100%
Library / Community Centre	90%	10%	100%	10%	90%	100%
Hotel	Per survey					

In addition, the development traffic has been distributed based on the recent 2016 Census data for the residential and commercial land uses. The Census data provides travel information for people living and working in the vicinity of Baulkham Hills Town Centre.

The most likely routes of people living and working in Baulkham Hills have been determined with consideration on the following restrictions:

- left-in, left-out access only on Seven Hills Road and Windsor Road, and
- no grade separation of Seven Hills Road-Old Northern Road-Windsor Road intersection.

In addition, the following assumptions have been made in distributing the development traffic:

- retail, library and community centre trips has been distributed evenly to surrounding road network
- traffic from the north will travel via Windsor Road and local streets and enter the site via a left turning movement at the Seven Hills Road site access
- traffic from the east will travel via local streets and will exit from Cook Street until it reaches Windsor Road (south) and then will turn left into the site via Windsor Road access, and
- local traffic that will travel to the west will exit through Windsor Road access, turn right to Olive Street and Old Northern Road then continue travelling westbound to Seven Hills Road.

The assumed directional distribution based on the above considerations is presented in Table 4 and Table 5.

Table 4: Inbound Directional Distribution

From	Residential	Commercial	Retail / Library / Community Centre
Windsor Road (South)	52%	58%	50%
Seven Hills Road (West)	48%	42%	50%
Total	100%	100%	100%

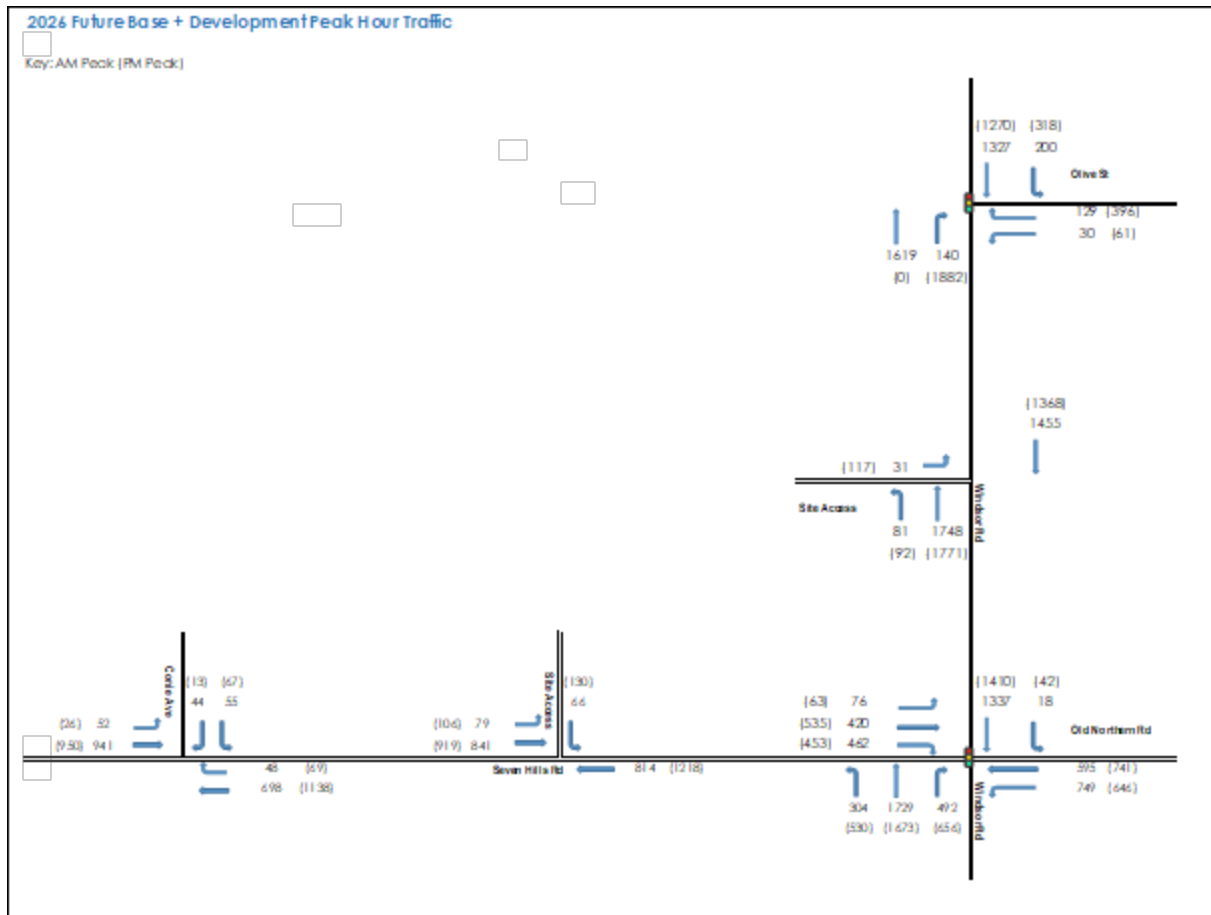
Table 5: Outbound Directional Distribution

To	Residential	Commercial	Retail / Library / Community Centre
Windsor Road (South)	57%	61%	25%
Windsor Road (North)	16%	19%	25%
Old Northern Road (East)	17%	17%	25%
Seven Hills Road (West)	10%	3%	25%
Total	100%	100%	100%

Traffic Modelling

The estimated additional traffic associated with the proposed development has been added to the future 10-year background network traffic sourced from the GTA report (February 2016). This is presented in Figure 1.

Figure 1: 2026 Peak Hour Traffic – Future Base with Development



Additional traffic modelling of the nominated intersections has been conducted in SIDRA 8. Modelling results for the end state scenario from the previous 2018 assessment are shown in Table 6. The updated results taking into account the Roads and Maritime comments as well as the recent changes to the development yield and new access arrangements are shown in Table 7.

It is noted that only the end state modelling results have been provided herein as the modelling results for the existing conditions and future base case scenarios have not changed. A comparison of the existing and future scenarios is summarised in Table 8 and Table 9. The intersection performances for the existing conditions and future base case have been sourced from the original traffic impact assessment report to this proposed development prepared by GTA Consultant (9 October 2015).

Furthermore, in all future cases it is assumed that all assessed intersections would continue to operate with existing intersection layout and configuration.

Table 6: Intersection Modelling Results (Previous Traffic Assessment Results)

Location	Intersection Control	AM Peak		PM Peak	
		Average Delay (s)	LoS	Average Delay (s)	LoS
Windsor Road – Seven Hills Road	Signalised	77	F	126	F
Windsor Road Access	Priority	38	C	41	C
Seven Hills Road Access	Priority	6	A	6	A

Table 7: Intersection Modelling Results (Updated Modelling Results)

Location	Intersection Control	AM Peak		PM Peak	
		Average Delay (s)	LoS	Average Delay (s)	LoS
Windsor Road – Seven Hills Road	Signalised	83	F	136	F
Windsor Road Access	Priority	8	A	8	A
Seven Hills Road Access	Priority	6	A	6	A

Table 8: Comparison of Existing and Future Intersection Modelling Results – AM Peak

Location	Intersection Control	Existing		Future Base		Future Base + Development (Updated Modelling)	
		Average Delay (s)	LoS	Average Delay (s)	LoS	Average Delay (s)	LoS
Windsor Road – Seven Hills Road	Signalised	50	D	74	F	83	F
Windsor Road Access	Priority	22	B	28	B	8	A
Seven Hills Road Access	Priority	6	A	6	A	6	A

Table 9: Comparison of Existing and Future Intersection Modelling Results – PM Peak

Location	Intersection Control	Existing		Future Base		Future Base + Development (Updated Modelling)	
		Average Delay (s)	LoS	Average Delay (s)	LoS	Average Delay (s)	LoS
Windsor Road – Seven Hills Road	Signalised	70	E	117	F	136	F
Windsor Road Access	Priority	24	B	32	C	8	A
Seven Hills Road Access	Priority	6	A	6	A	6	A

The revised modelling results indicate that the Windsor Road access would have its intersection performance improved from LoS C to LoS A in both peak periods. The Windsor Road intersection with Seven Hills Road would operate with similar performance as that predicted in the September 2018 assessment albeit with a slight increase in the overall average intersection delay.

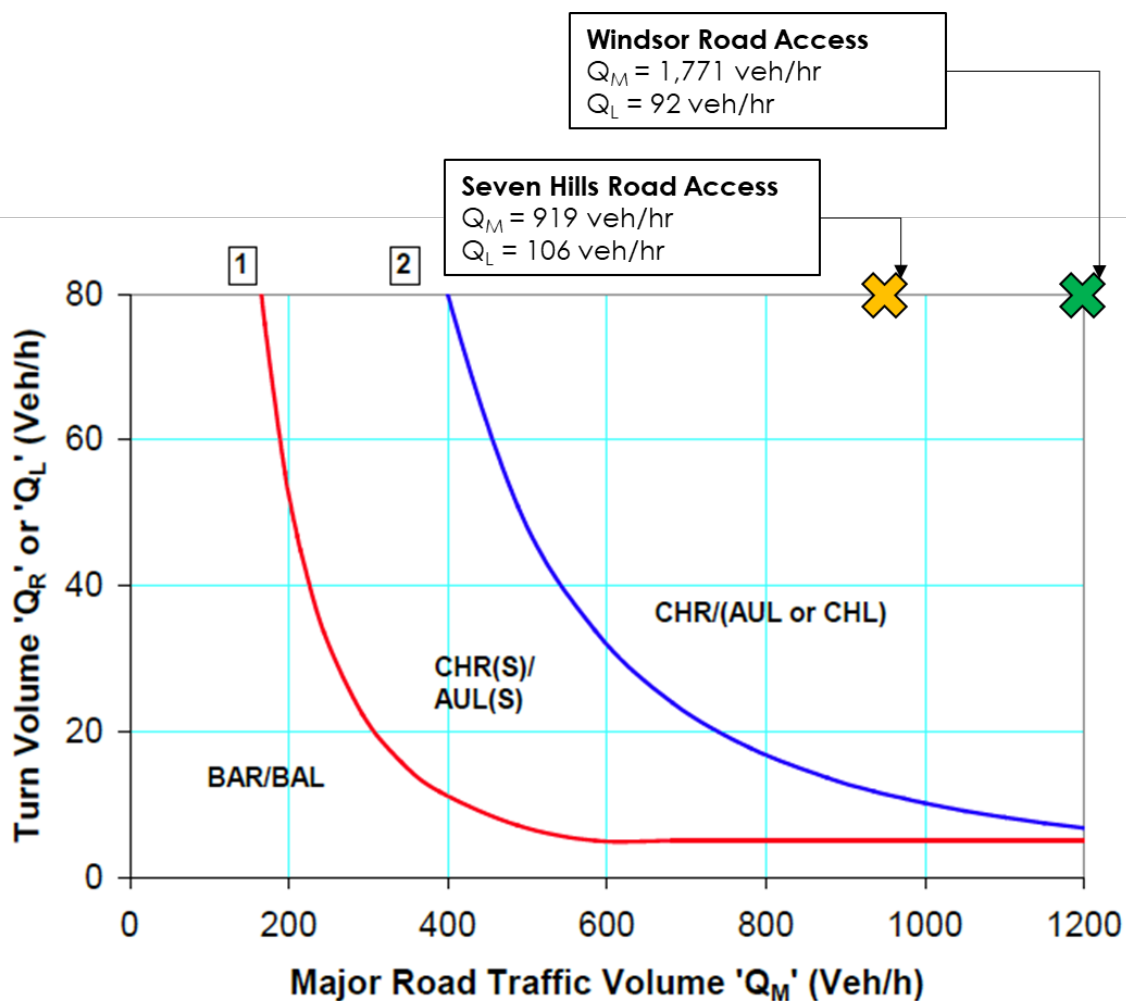
It is further noted that in reality the assessed intersections (including the Windsor Road intersection) would operate better than that reported as an overly conservative traffic generation rate for the retail use have been adopted as discussed in the preceding section.

Warrants for Turn Treatments

The proposed access arrangements have been reviewed against the Austroads' *Guide to Road Design Part 4* (2017) to assess the recommended turn treatments based on the traffic volumes.

Figure 2 shows the warrants for left turn treatments based on the traffic volumes at the intersection where the posted speed limit is less than 100 km/h.

Figure 2: Warrants for Left Turn Treatments on Major Road (Design Speed < 100 km/h)



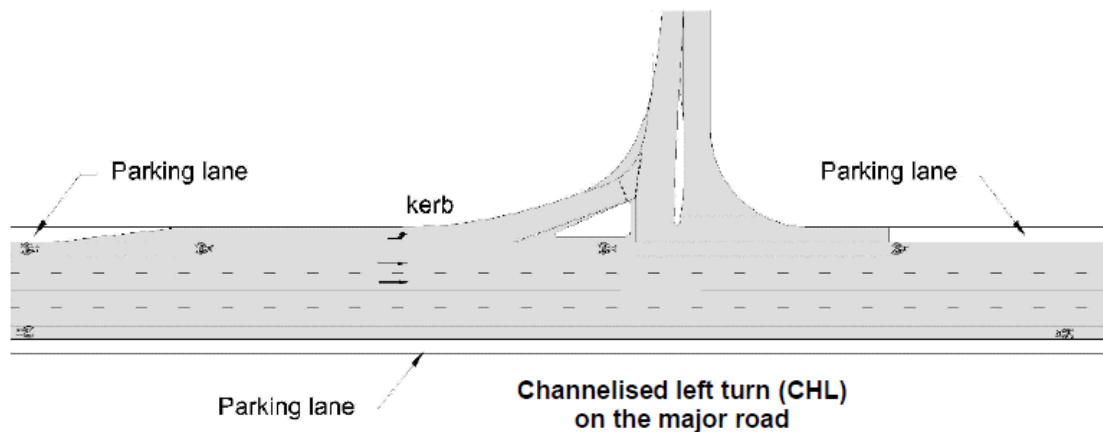
Source: Austroads Guide to Road Design

The assessment indicates that both access points meet the warrant for auxiliary left turn (AUL) or channelised left turn (CHL).

However, Austroads recommends that a channelised left turn treatment be provided at unsignalised intersections for safety reasons. A channelised left turn provides a clear line of sign for vehicles turning from the minor road.

Figure 3 shows the typical layout and key features of a CHL:

Figure 3: Typical Urban Channelised Left Turn (CHL) Layout



According to Austroads' *Guide to Road Design Part 4a* (2017), an approach road with speed of 60 km/h and exit curve speed of 30 km/h would require a deceleration lane with 40m length. This includes a taper length of 20m.

On this basis, it would be reasonable for the consent authorities to include a consent condition requiring the deceleration lane to be provided on both Windsor Road and Seven Hills Road including any required land dedication for such purposes.

Summary and Conclusion

Based on the analysis and discussions presented within this report, the following conclusions are made:

- The potential traffic generation of the site has been estimated based on the updated trip generation rates, development yield and traffic distribution
- The proposed development would generate additional 243 vehicle trips per hour during the morning peak period and 307 vehicle trips per hour during the evening peak period.
- Intersection analysis undertaken with consideration to the comments raised by Roads and Maritime indicates that the assessed intersections would continue to operate with similar intersection performance as that previously assessed, in particular noting the conservative nature of the revised assessment.
- Traffic volumes at Windsor Road and Seven Hills Road access warrant a channelised left turn treatment.

We trust the above is to your satisfaction. Should you have any queries regarding the above or require further information, please do not hesitate to contact the undersigned on 8437 7800.

Yours sincerely,



Ken Hollyoak
Director