

Huntlee New Town, North Rothbury

Updated Traffic Impact Assessment (TIA) for Modification 21 (MOD21)

Date 16/06/2023
Revision B
To Huntlee team/ Transport for NSW (TfNSW)
From Arcadis Australia Pacific Pty Ltd (Arcadis)
Project Name Huntlee development, North Rothbury
Subject **Updated Traffic Impact Assessment (TIA) for Modification 21 (MOD 21)**

1. Report purpose

This updated Traffic Impact Assessment Report (TIA, June 2023) has been prepared by Arcadis on behalf of Huntlee Pty Ltd to support the development application of a Proposal within the Huntlee Town Centre (herein referred to as MOD 21).

In September 2022, Arcadis prepared a traffic impact assessment report for MOD 21 titled “*Huntlee New Town, Modification 21 (MOD 21), Traffic Impact Assessment, September 2022*” (TIA, Sept 2022). This June 2023 MOD 21 TIA does not supersede earlier Sept 2022 MOD 21 TIA report, however, provides additional traffic modelling and assessment undertaken to address TfNSW comments.

This updated traffic impact assessment has addressed Transport for NSW's comments titled “*MP10-0137-MOD-21 - Modification 21 – 1823 Wine Country Drive North Rothbury*” dated 1 December 2022. Additional traffic modelling has been undertaken for the following two areas of investigation including:

- Amendment to development lot triggers in Conditions E7 ix, x and xi (hereinafter referred to as Consent 9, 10 and 11) for Stage 1. Detailed technical investigation is documented in **Attachment A**.
- Cumulative traffic assessment for MOD 21 given that the DA amendment is expected to increase the total traffic generation of the Stage 1 DA. Detailed technical investigation is documented in **Attachment B**.

2. Response to TfNSW comments

Arcadis has prepared this response table addressing TfNSW comments dated 1 December 2022 in relation to development lot triggers in conditions for Stage 1 and MOD 21, which takes into consideration and summarises the outcomes of the detailed investigations included as Attachment A and B.

TfNSW comments	Huntlee Pty Ltd /Arcadis response
1. It is understood that the subject application seeks to delay necessary staged upgrade works along the State road network. These are currently identified as development lot triggers in Conditions E7(a)(iii) and E7(a)(x).	<p>Condition E7(a)(iii):</p> <p><i>a) Road Infrastructure Requirements</i></p> <p><i>(iii) The Wine Country Drive / HEX Link Road (A-1) intersection shall be upgraded, to a 2 lane circulating roundabout prior to 1500 1750 dwellings for which a subdivision certificate has been issued, or 1 December 2023, whichever occurs first.</i></p> <p>It is proposed to amend this condition E7(a)(iii) to increase the dwelling lot number but keep the date the same as Huntlee has a significant construction program in 2023 to create a large number of residential lots which will likely be delivered in the last quarter of 2023.</p>

TfNSW comments	Huntlee Pty Ltd /Arcadis response
	<p>Whilst the number of lots titled will be higher as the roundabout upgrade construction nears completion, none of these extra lots will be creating any traffic impacts. The time lag from lots being titled to a completed and occupied home is currently at least 12 months at best. The current number of occupied homes as at 2022 is only approximately 867 dwellings, despite nearly 1200 lots being titled. It is also noted the original Stage 1 traffic modelling on which this original condition was based assumed a significantly higher amount of commercial GFA would be occupied than is currently evident, again significantly reducing the traffic numbers impacting this intersection.</p> <p>As TfNSW are aware, the roundabout upgrade is currently under construction and progressing well..</p> <p>Condition E7(a)(x)</p> <p><i>x) The HEx Branxton interchange (A-11) shall be upgraded to include:</i></p> <ul style="list-style-type: none"> <i>A continuous left turn slip lane / ramp from the northbound off ramp onto HEx Link Road.</i> <i>A continuous left turn slip lane / ramp from the New England Highway extension to the HEx southbound on ramp.</i> <i>Extension of the HEx southbound off ramp to cater for expected queuing.</i> <i>Adjustments to line marking are also likely in stages to ensure appropriate operation of the interchange.</i> <p><i>(Prior to 1900 dwellings for which a subdivision certificate has been issued.)</i></p> <p>It is proposed to amend this Condition E7(a)(x). The proposed amendment is shown by the insertion of the <u>bold and underlined</u> words / numbers and deletion of the struck out as follows:</p> <p><i>x) The HEx Branxton interchange (A-11) shall be upgraded to include:</i></p> <ul style="list-style-type: none"> <i>A continuous left turn slip lane / ramp from the northbound off ramp onto HEx Link Road.</i> <i>A continuous left turn slip lane / ramp from the New England Highway extension to the HEx southbound on ramp.</i> <i>Extension of the HEx southbound off ramp to cater for expected queuing.</i> <i>Adjustments to line marking are also likely in stages to ensure appropriate operation of the interchange.</i> <p><i>(Prior to <u>2525</u> 1900 dwellings for which a subdivision certificate has been issued.)</i></p> <p>The previous development threshold for Condition E7(a)(x) was 1,900 dwellings and 17.1 ha GFA mixed used/commercial. As previously outlined, this modelled figure of 171,000 sqm of gross floor area significantly overstates the likely short to medium term take up of commercial development in the Huntlee Town Centre. Since the project commenced construction in 2014 and the first lots were titled in 2015, only approximately 10,500sqm of commercial development has been opened.</p> <p>In the next 3-5 years the Huntlee Project would expect to reach the 2,525 dwelling hurdle, triggering the need for the HEx Branxton interchange upgrade, however it is still not expected that the commercial GFA occupied would grow from the current 1.1Ha to 4.3Ha in this timeframe, a 400% increase, so the proposed dwelling trigger for the HEx Branxton interchange upgrade is still considered conservative.</p>

TfNSW comments	Huntlee Pty Ltd /Arcadis response
	<p>It is proposed to revise threshold for Condition E7(a)(x) to be 2,525 dwellings, whilst noting that the modelling also includes for 4.3 ha GFA mixed used/commercial.</p> <p>A continuous left turn slip lane/ramp from the northbound off ramp onto HEx Link Road would be delivered prior to 2,525 dwellings and 4.3 ha GFA of mixed use/commercial.</p> <p>The remaining road works (in points 2, 3 and 4 in Condition E7(a)(x) were identified for the full development of Huntlee, not for Stage 1. The current Huntlee Stage 2 DA traffic modelling currently also in progress by Arcadis will confirm the required dwelling trigger for this infrastructure to be included within those future DA conditions.</p> <p>The supporting technical analysis and modelling for the proposed revised threshold of 2,525 dwellings and 4.3 ha GFA is included in Attachment A.</p>
<p>2. In addition, the subject application seeks to intensify the land use assumptions made in the original traffic model for this precinct. This in turn generates an increased traffic generation throughout the surrounding road network for the subject and ultimate Huntlee development scenarios.</p>	<p>The development, as proposed to be modified, is substantially the same development as that originally modelled in the Hyder traffic report in that:</p> <ul style="list-style-type: none"> • The modified development retains the same activity and proposed land uses as the approved development that was considered and approved for the town centre area • The scale and density of the development are generally commensurate to that previously approved for the Huntlee development. • The original Hyder traffic report associated with the Stage 1 approval was based on development yields of 2,345 dwellings and 21.4Ha of mixed use GFA. Overall with MID 21 proposal, the total new amended Stage 1 development yield will consist of 3,014 dwellings and 14.3Ha of GFA. • The amended Stage 1 development yield has been tested on the surrounding road network as outlined below in response items 3 and 4.
<p>3. The submitted TIA has undertaken an assessment of the subject development with respects to the operation of the existing road network, in particular intersections A-1, A-3 & A-5.</p>	<p>The MOD 21 proposal is an extension of the Huntlee Stage 1 development boundary. The MOD 21 proposal will result in the modified Stage 1 proposal consisting of 3,014 dwellings and 14.3 ha GFA.</p> <p>Additional traffic modelling has been undertaken to assess traffic impact of the modified Stage 1 proposal. The analysis shows that:</p> <ul style="list-style-type: none"> • Further upgrade would be required at Wine Country Drive / Bridge Street / Tollbar Avenue roundabout (A-1) to provide two lanes on the northern approach (Bridge Street). This additional upgrade at A-1 is proposed to be delivered prior to 2,600 lots being developed. • Wine Country Drive / Empire Street intersection (A-3) and Wine Country Drive / Triton Boulevard intersection (A-5) would provide adequate capacity to accommodate traffic generation from the modified Stage 1 proposal. <p>The supporting analysis for MOD 21 proposal is included in Attachment B.</p>

TfNSW comments	Huntlee Pty Ltd /Arcadis response
<p>4. Revised information is sought demonstrating that the proposed delays in critical infrastructure at intersections A-1 & A-11 can safely, and efficiency be accommodated. TfNSW would appreciate an understanding of whether additional upgrades are necessary to manage the development of the ultimate scenario safely and efficiently. Do some of the identified staged upgrades need to be brought forward to the subject application?</p>	<p>It is proposed to deliver the following three upgrade works in “one package un-staged” in relation to Condition E7(ix), (x) and (xi) prior to 2,525 dwellings and 4.3 ha GFA mixed use/commercial:</p> <ol style="list-style-type: none"> 1. New traffic signals at HEx Link Road / Kesterton Rise intersection 2. HEx Link Road widening to four lanes between Wine Country Drive and the Hex interchange 3. A new continuous left turn slip lane/ramp from the northbound off-ramp onto HEx Link Road <p>It is proposed to upgrade Wine Country Drive / Bridge Street / Tollbar Avenue roundabout to provide two lanes on the northern approach (Bridge Street) prior to 2,600 based on the MOD 21 amended DA plan.</p>
<p>5. The assumed background growth rate of 0.5% seems a little low. A value in between 0.5% and the rate provided in the STFM data already supplied should be used in this instance.</p>	<p>Future background traffic growth has been updated to 1% per annum. Future background traffic growth on Wine Country Drive was estimated from TfNSW’ Sydney Traffic Forecasting Model (STFM, version 2022), provided by TfNSW.</p> <p>The updated traffic modelling results documented in Attachments A and B used 1.0 per cent per annum background traffic growth.</p>

ATTACHMENT A

Technical Advice on Modifications to Stage 1 Conditions E7 ix, x and xi (Consent 9, 10 and 11)

1 Introduction

This Technical Advice has been prepared by Arcadis to document traffic modelling and assessment undertaken to support the modifications to Conditions E7 ix, x and xi (hereinafter referred to as Consent 9, 10 and 11). The Consent 9, 10 and 11 are relevant to Stage 1 Huntlee Project Approval MP10_0137 for Huntlee New Town, Branxton.

Arcadis previously submitted a traffic report titled “*Huntlee New Town, Stage 1 Preferred Project Report (PPR) Traffic Modelling*” prepared by Hyder Consulting (currently rebranded as Arcadis Australia Pacific Pty Ltd) in July 2012 (herein referred to as ‘July 2012 PPR Arcadis Report’).

1.1 Previous thresholds for Consent 9, 10 and 11

The following Consent 9, 10 and 11 have been extracted from Condition E7 in the development application.

- ix) HEx Link Road / Village 1 North access (A-6) intersection and link road shall be constructed during Stage 1. The intersection shall be a 2 lane circulating roundabout or traffic signals (intersection type to be determined by RMS). Further modelling will be required to provide the best outcome for the future operation of this intersection. The link road shall be one lane in each direction, allowing for a future additional one lane in each direction. (Required prior to the subdivision certificate of more than 1950 lots in Stage 1). An interim intersection specifically a left-in/left-out is to be constructed prior to June 2023 however this will be subject to upgrade to a roundabout of traffic signal controlled intersection prior to the subdivision certificate of more than 1950 lots in Stage 1 unless otherwise agreed with RMS.
- x) The HEx Branxton interchange (A-11) shall be upgraded to include:
- A continuous left turn slip lane / ramp from the northbound off ramp onto HEx Link Road.
 - A continuous left turn slip lane / ramp from the New England Highway extension to the Hex southbound on ramp.
 - Extension of the HEx southbound off ramp to cater for expected queuing.
 - Adjustments to line marking are also likely in stages to ensure appropriate operation of the interchange.
- (Prior to 1900 dwellings for which a subdivision certificate has been issued.)
- xi) The HEx Link Road shall be upgraded to 4 lanes (2 in each direction) between Wine Country Drive and the HEx interchange. (Prior to 1950 dwellings for which a subdivision certificate has been issued in Stage 1).

In July 2012 PPR Arcadis Report, Page 7 (see below extract), item 9 mentioned the need for a continuous left turn slip lane/ramp from the northbound off ramp onto HEx Link Road would be required after 1,900 dwellings and 17.1 ha GFA mixed use. This item is relevant to Consent 10 in Stage 1 DA.

3 Proposed Road and Intersection Upgrade

3.1 Stage 1

Stage 1 subdivision includes approximately 2,345 dwellings and up to 21.4 ha GFA mixed use development. To accommodate additional traffic from Stage 1 the following seven road and intersection improvements (refer to Figure 3-1 overleaf) are recommended. They are in line with previously determined July 2012 PPR Report.

1. Upgrade Wine Country Drive to a four lane (2 lanes each way) between Village 1 access and Hunter Expressway (HEX) Link Road.
2. Provision of an outer bypass through Town Centre. It would be constructed to a four lane road (2 lanes each way) with provision for parking.
3. Upgrade HEX Link Road roundabout with Wine Country Drive to a two lanes roundabout (see A-1 for indicative lane arrangement).
4. Provision of a new traffic light on Wine Country Drive with Main Street (see A-3 for indicative lane arrangement).
5. Provision of a new traffic light on Wine Country Drive with Village One access (see A-5 for indicative lane arrangement).
6. Provision of a sign control intersection on Wine Country Drive to provide access to Anvil Creek Regional Park. It is proposed to construct internal road to cater for parking requirements of the regional park.
7. Provision of a sign control intersection (see A-9 for indicative lane arrangement) to provide access from large lots being proposed as part of Stage 1 development.

In addition to above seven items, the following two items (8 and 9) are now proposed in Stage 1 work program but they would only be required after substantial developments occurred in Stage 1. Items 8 and 9 would be driven by the actual threshold targets and further confirmation through modelling and assessment when time comes.

8. The northern access from Village One to HEX Link Road. This access would be required after 1500 dwellings are built and occupied in Village One. Concurrent with this northern access, a new roundabout is proposed at Village One with HEX Link Road intersection (refer to A-6 for indicative lane arrangement). Concurrent with northern access, the HEX Link Road between Village 1 and Branxton interchange would require upgrading (refer to A-11 for indicative lane arrangement).
9. The provision of a left turn slip lane from northbound off ramp would improve Branxton interchange operation (refer to A-11 for indicative lane arrangement). The need for one additional left turn slip lane is required after 1900 dwellings are built and occupied and 17.1 ha GFA mixed use are also developed and occupied.

Based on the July 2012 PPR Arcadis Report,

- Previous threshold was 1,500 dwellings and 13.5 ha GFA mixed use/commercial for Stage 1 DA Consent 9 and 11.
- Previous threshold was 1,900 dwellings and 17.1 ha GFA mixed use/commercial for Stage 1 DA Consent 10.

1.2 Revised thresholds for Consents 9, 10 and 11

Huntlee proposes to revise the thresholds for Consents 9, 10 and 11 to 2,525 dwellings and a reduced mixed use/commercial GFA of 4.3Ha.

The reduction in mixed use/commercial GFA included in the modelling for this threshold is due to the use of a more realistic slower completion of commercial land take-up in the Town Centre as the Huntlee Project develops. Only around 1 Ha of GFA has been opened to date at Huntlee and therefore a reduced commercial / mixed use GFA estimate has been used alongside the residential dwelling completions for these road upgrade thresholds.

It is proposed to amend Consents 9, 10 and 11 as follows. The proposed amendment is shown by the insertion of the **bold and underlined** words / numbers and deletion of the struck out as follows:

- ix) HEx Link Road / Village 1 North access (A-6) intersection and link road shall be constructed during Stage
1. The intersection shall be a 2 lane circulating roundabout or traffic signals (intersection type to be determined by RMS). Further modelling will be required to provide the best outcome for the future operation of this intersection. The link road shall be one lane in each direction, allowing for a future additional one lane in each direction. (Required prior to the subdivision certificate of more than **1950** lots in **Stage 1**). **An interim intersection specifically a left-in/left-out is to be constructed prior to June 2023 however this will be subject to upgrade to a roundabout of traffic signal controlled intersection prior to 2525 lots the subdivision certificate of more than ~~1950~~ lots in ~~Stage~~ **Village 1** unless otherwise agreed with ~~RMS~~ **TfNSW**.**
- x) The HEx Branxton interchange (A-11) shall be upgraded to include:
- A continuous left turn slip lane / ramp from the northbound off ramp onto HEx Link Road.
- (Prior to **2525** ~~1900~~ dwellings for which a subdivision certificate has been issued.)
- xi) The HEx Link Road shall be upgraded to 4 lanes (2 in each direction) between Wine Country Drive and the HEx interchange. (Prior to **2525** ~~1950~~ dwellings for which a subdivision certificate has been issued **in Stage 1**).

2 Traffic modelling

2.1 Trip generation rates

The following trip generation rates are used in updated modelling:

- Trip rates for dwelling in AM peak and PM peak hour is assumed to be 0.78 trips per dwelling in AM peak hour and 0.71 trips per dwelling in PM peak hour. The trip rate for dwelling is sourced from *TfNSW Guide to Traffic Generating Developments Updated Traffic Surveys (TDT 2013/04a)*
- Trip rates for mixed use/commercial development is assumed to be 0.63 (AM) and 0.72 (PM) peak hour trips per 100m² of GFA. The trip rates are sourced from *Assessment of Hunter Valley Business Park Trip Rates, prepared by AECOM, December 2017*
- Trip rates for retail is assumed to be 3.7 (AM) and 6.2 (PM) peak hour trips per 100m² of GLFA. The trip rates are sourced from *TfNSW Guide to Traffic Generating Developments, Issue 2.2. October 2002*

Trip rates for medium-density dwelling are assumed to be 0.575 trips per dwelling in the AM and PM peak hours. For retirement village and infrastructure such as water treatment plant, trip rates are used as follows:

- Trip generation for retirement village is sourced from *TfNSW Guide to Traffic Generating Developments Updated Traffic Surveys (TDT 2013/04a)*, August 2013 and assumed to be 0.4 trips per dwelling in the AM and PM peak hour
- Trip generation for infrastructure such as water treatment plant is assumed to generate about 5 vehicle trips in the AM and PM peak hour

Table 2-1 shows comparison of trip generation rates used in the July 2012 PPR Arcadis Report and the updated traffic modelling (June 2023).

Table 2-1 Trip generation rates comparison between 2012 Study and June 2023

Development	Trip rates used in July 2012 PPR Arcadis Report	Updated trip rates (June 2023)
Residential -single dwelling	AM / PM: 0.85 trips/dwelling	AM: 0.78 trips/dwelling PM: 0.71 trips/dwelling
Residential -medium density	AM / PM: 0.575 trips/dwelling	AM / PM: 0.575 trips/dwelling
Retirement	n/a	AM / PM: 0.4 trips/dwelling
Mixed use/commercial	AM: 0.63 trips/100m ² GFA PM: 0.72 trips/100m ² GFA	AM: 0.63 trips/100m ² GFA PM: 0.72 trips/100m ² GFA
Retail	GLFA range 30,000-40,000 m ² AM: 2.8 trips/100m ² GLFA PM: 4.6 trips/100m ² GLFA	GLFA range 10,000-20,000 m ² AM: 3.7 trips/100m ² GLFA PM: 6.2 trips/100m ² GLFA
Infrastructure (water treatment plant)	n/a	AM / PM: 5 trips/hour

2.2 Change of base year and occupied dwellings

In July 2012 PPR Arcadis Report, the base year was 2012. For updated modelling, the base year has been updated to 2022 as per new traffic survey. At the time of undertaking traffic survey in July 2022, about 867 dwellings and 10,473 m² GFA were occupied. These occupied dwellings and GFA generated about 885 vehicle trips in AM peak hour and 965 vehicle trips in the PM peak hour. These trips are discounted from Stage 1 development trips.

2.3 Trip distribution

There is no change to trip distribution assumption. Consistent with the previously approved Stage 1 trip distribution assumption, the following trip distribution is assumed for updated modelling:

- About 11 per cent would travel toward the north via Bridge Street
- About 22 per cent would travel toward the south via Wine Country Drive.
- About 67 per cent would travel toward the east via Wine Country Drive / Hunter Expressway roundabout. Of that,
 - About 18 per cent would travel toward the New England Highway
 - About 38 per cent would travel toward the east via Hunter Expressway
 - About 11 per cent would travel toward the west via Hunter Expressway.

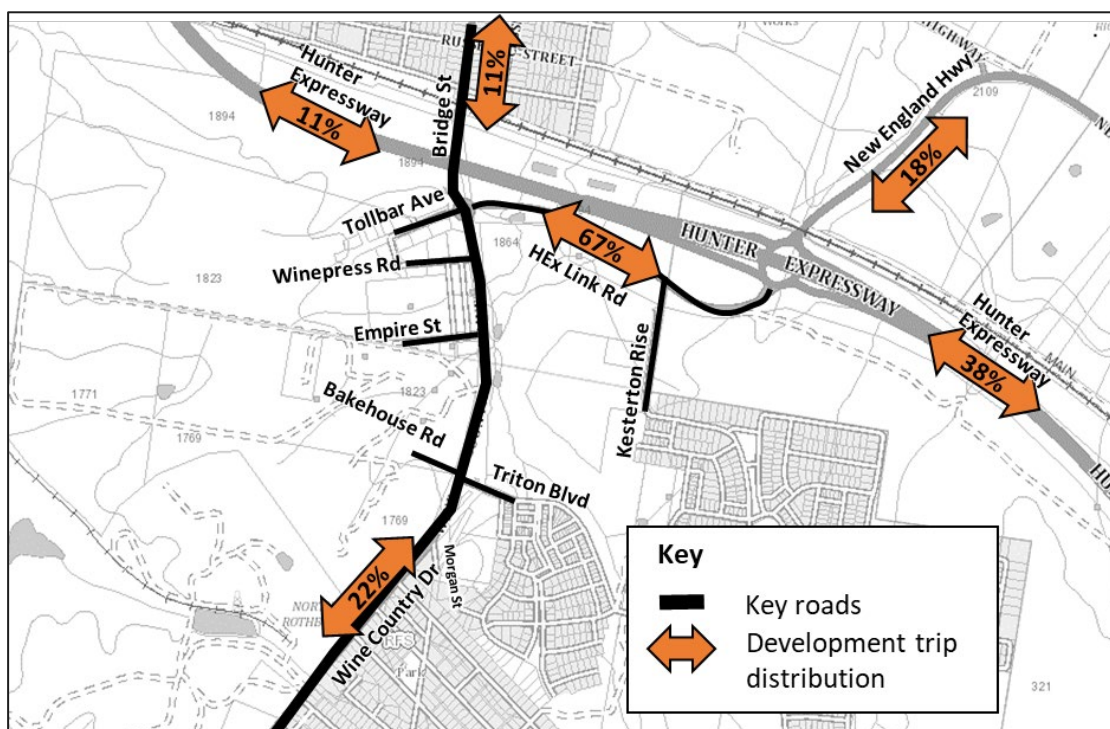


Figure 2-1 Trip distribution for development traffic

3 SIDRA modelling

For MOD 21 updated traffic modelling, SIDRA Network software (version 9) was used. Traffic modelling was undertaken for future year in 2032. Table 3-1 below shows the TfNSW standard level of service (LoS) criteria for intersection operation.

Table 3-1 Level of Service Criteria for Intersections

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	<15	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays Roundabouts require other control mode	At capacity, requires other control mode
F	>71	Unsatisfactory with excessive queuing	Unsatisfactory with excessive queuing

Source: TfNSW' Traffic Modelling Guidelines, Version 1.0, February 2013

The LoS is reported as per TfNSW's traffic modelling Guide. The Guide recommends that, for priority intersections such as a roundabout and sign-controlled intersections, the level of service value is determined by the critical movement with the highest delay. With these type of intersection controls (roundabout, Stop and Give Way sign controls), some movements may experience high levels of delay while other movements may experience minimal delay.

For a signalised intersection, the level of service criteria is related to the average intersection delay measured in seconds per vehicle.

3.1 Future background traffic growth

Future background traffic growth has been updated to 1 per cent per annum. Future background traffic growth on Wine Country Drive was estimated from TfNSW' Sydney Traffic Forecasting Model (STFM, version 2022), provided by TfNSW.

3.2 Committed road upgrades by Huntlee

The following road upgrades are being delivered by Huntlee and assumed in the future base case SIDRA model in 2032 (refer to Figure 3-1):

- Wine Country Drive / Bridge Street / Tollbar Avenue roundabout is proposed to be upgraded to dual circulating lanes and is currently under construction.
- Wine Country Drive / Triton Boulevard has been upgraded into a signalised four-way intersection with Bakehouse Road as the fourth western leg (completed April 2023).
- A left in / left out at HEx Link Road / Kesterton Rise intersection has also been completed (May 2023).

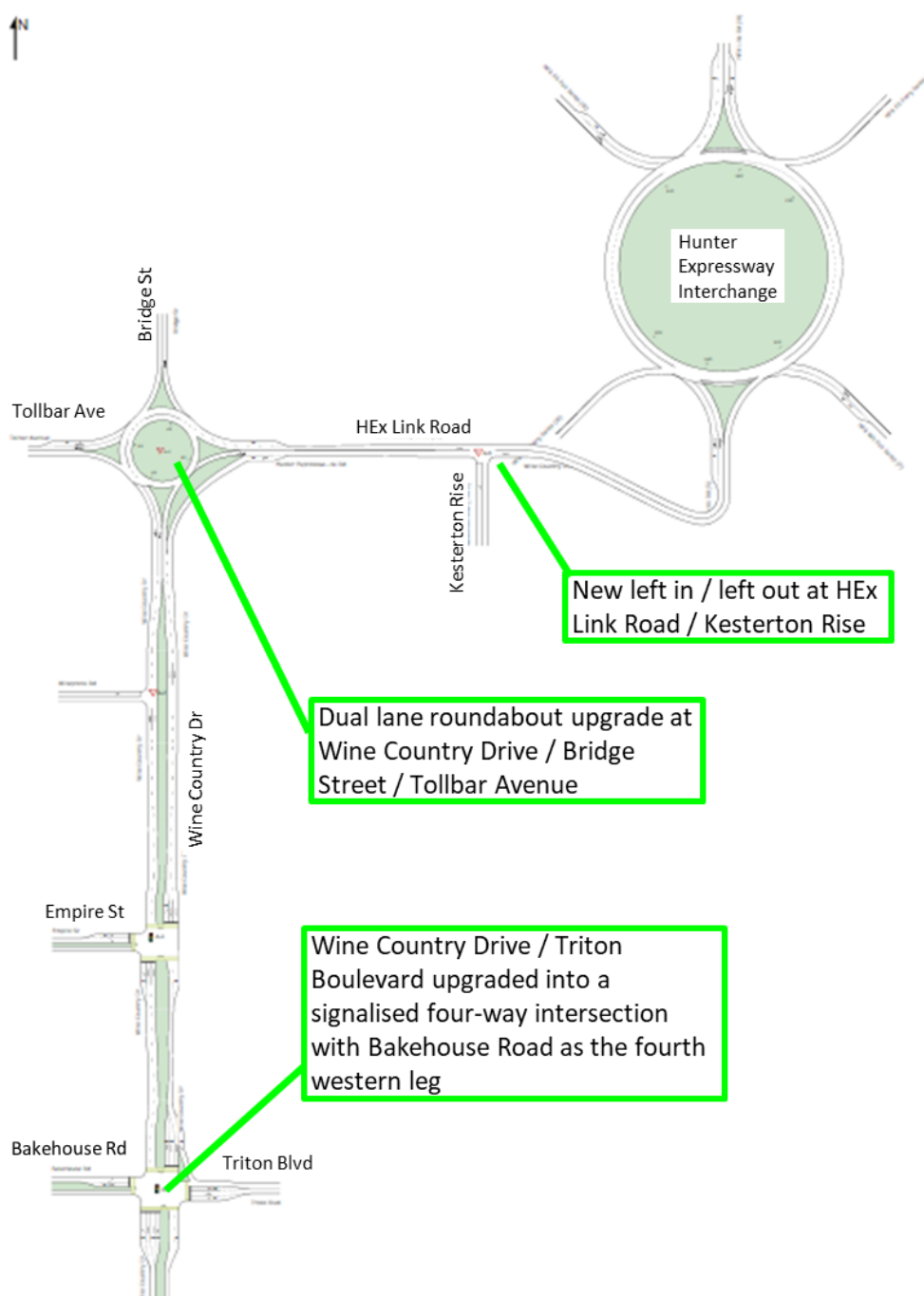


Figure 3-1 Future committed upgrades by Huntlee

4 Modelling results for Consents 9 and 11

Consent 9 relates to proposed intersection upgrades at HEx Link Road / Village 1 North access (Kesterton Rise). Consent 11 relates to HEx Link Road widening to four lanes (two lanes in each direction) between Wine Country Drive and the Hex interchange.

Table 4-1 shows the previous and revised thresholds for Consents 9 and 11.

The previous thresholds were 1,500 dwellings and about 13.5 hectares (ha) of gross floor area (GFA) of mixed use/commercial. The revised thresholds propose to increase residential development to 2,525 dwellings but reduce the GFA of mixed use/commercial to 4.3 ha GFA.

The reduction in mixed use/commercial GFA included in the modelling for this threshold is due to the use of a more realistic slower completion of commercial land take-up in the Town Centre as the Huntlee Project develops. Only around 1 Ha of GFA has been opened to date at Huntlee and therefore a reduced commercial / mixed use GFA estimate has been used alongside the residential dwelling completions for these road upgrade thresholds.

Table 4-1 Previous and revised thresholds for Consents 9 and 11

Development type	Unite	Consent 9 and 11	
		Previous threshold	Revised threshold
Standard dwelling	dwellings	1,500	1,960
Medium density dwelling	dwellings		360
Retirement	dwellings		205
Total - Residential development	dwellings	1,500	2,525
Mixed use/commercial	ha GFA	11.8	3.0
Retail	ha GFA	1.7	1.0
Infrastructure			0.3
Total - Mixed use / commercial / retail	ha GFA	13.5	4.3

Table 4-2 shows peak hour trip generation for previous and revised thresholds for Consents 9 and 11. Trip generation for previous threshold was sourced from July 2012 PPR Arcadis Report. Trip generation for revised threshold is estimated using updated trip rates (refer to Section 2.1). Traffic generation from Stage 1 is discounted for occupied dwellings and GFA (refer to Section 2.2).

Table 4-2 Peak hour trip generation for previous and revised threshold for Consent 9 and 11

Development type	Previous threshold	Peak hour trip generation		Revised threshold	Peak hour trip generation	
		AM	PM		AM	PM
Residential development	1,500 dwelling	1,280	1,280	2,525 dwelling	1,810	1,680
Mixed use/commercial/retail	13.5 ha GFA	1,040	1,420	4.3 ha GFA	475	695
Total gross traffic generation		2,320	2,700		2,285	2,375
Discounted trips from occupied dwellings and GFA		(885)	(965)		(885)	(965)
Total net traffic generation		1,435	1,735		1,400	1,410

The analysis shows that trip generation for the revised threshold is similar (AM) or lower (PM) than the previous thresholds. The trip generation from the revised threshold (2,525 dwellings and 4.3 ha GFA) does not exceed trips generation from previous threshold (1,500 dwellings and 13.5 ha GFA).

Table 4-3 and Table 4-4 show intersection level of service at Wine Country Drive / Bridge Street / Tollbar Avenue roundabout and HEx Link Road / Kesterton Rise intersection for revised threshold (2,525 dwellings and 4.3 ha GFA).

Table 4-3 Predicted intersection level of service in 2032 without upgrade at HEx Link Road / Kesterton Rise intersection

Intersection	Control	AM peak		PM peak	
		Delay (sec)	LoS	Delay (sec)	LoS
Wine Country Drive / Bridge Street / Tollbar Avenue	Dual lane roundabout	57	E	53	D
HEx Link Road / Kesterton Rise	Left in / left out	7	A	9	A

Table 4-4 Predicted intersection level of service in 2032 with signals upgrade at HEx Link Road / Kesterton Rise intersection

Intersection	Control	AM peak		PM peak	
		Delay (sec)	LoS	Delay (sec)	LoS
Wine Country Drive / Bridge Street / Tollbar Avenue	Dual lane roundabout	18	B	28	B
HEx Link Road / Kesterton Rise	New traffic signal	31	C	14	A

Traffic modelling indicates that Wine Country Drive / Bridge Street / Tollbar Avenue roundabout would become the key pressure point until HEx Link Road / Kesterton Rise intersection is upgraded to new traffic signals. Modelling data indicates level of service D/ E for Wine Country Drive / Bridge Street / Tollbar Avenue roundabout without upgrade at HEx Link Road / Kesterton Rise intersection (refer to Table 4-3).

The new traffic signals at HEx Link Road / Kesterton Rise intersection would provide alternate access to Village 1 thus improve level of service B at Wine Country Drive / Bridge Street / Tollbar Avenue roundabout. The new traffic signals at HEx Link Road / Kesterton Rise intersection would provide level of service C or better (refer to Table 4-4).

In conclusion, the updated traffic modelling and assessment supports the revised thresholds of 2,525 dwellings and 4.3 ha GFA for Consents 9 and 11.

5 Consent 10

Consent 10 relates to a new continuous left turn slip lane/ramp from the northbound off-ramp onto HEx Link Road.

Table 5-1 shows the previous and revised thresholds for Consent 10. The previous thresholds were 1,900 dwellings and about 17.1 hectares (ha) of gross floor area (GFA) of mixed use/ commercial development. The revised thresholds propose to increase residential development to 2,525 dwellings but reduce the GFA of mixed use/commercial development to 4.3 ha GFA as discussed in earlier sections.

Table 5-1 Previous and revised thresholds for Consent 10

Development type	Unite	Consent 10	
		Previous threshold	Revised threshold
Standard dwelling	dwellings	1,900	1,960
Medium density dwelling	dwellings		360
Retirement	dwellings		205
Total - Residential development	dwellings	1,900	2,525
Mixed use/commercial	ha GFA	14.9	3.0
Retail	ha GFA	2.2	1.0
Infrastructure			0.3
Total - Mixed use / commercial / retail	ha GFA	17.1	4.3

Table 5-2 shows peak hour trip generation for previous and revised thresholds for Consent 10. Trip generation from previous threshold is sourced from July 2012 PPR Arcadis Report. Trip generation from the revised threshold is estimated using updated trip rates (refer to Section 2.1). Traffic generation from Stage 1 is discounted for occupied dwellings and GFA (refer to Section 2.2).

Table 5-2 Peak hour trip generation for previous and revised thresholds for Consent 10

Development type	Previous threshold	Peak hour trip generation		Revised threshold	Peak hour trip generation	
		AM	PM		AM	PM
Residential development	1,900 dwelling	1,510	1,510	2,525 dwelling	1,810	1,680
Mixed use/commercial/retail	17.1 ha GFA	1,320	1,800	4.3 ha GFA	475	695
Total gross traffic generation		2,830	3,310		2,285	2,375
Discounted trips from occupied dwellings and GFA		(885)	(965)		(885)	(965)
Total net traffic generation		1,945	2,345		1,400	1,410

The analysis shows that trip generation from the revised threshold is lower than the previous thresholds for both AM and PM peak period. Trip generation from the revised threshold (2,525 dwellings and 4.3 ha GFA) does not exceed the trips generated from the previous threshold (1,900 dwellings and 17.1ha GFA).

SIDRA traffic modelling was undertaken for the revised threshold of 2,525 dwellings and 4.3 ha GFA assuming the following three upgrades to be delivered as one package:

1. New traffic signals at HEx Link Road / Kesterton Rise intersection
2. HEx Link Road widening to four lanes between Wine Country Drive and the HEx interchange

3. A new continuous left turn slip lane/ramp from the northbound off-ramp onto HEx Link Road

Table 5-3 shows intersection level of service at Hunter Expressway Branxton interchange with a new continuous left turn slip lane/ramp from the northbound off-ramp onto HEx Link Road.

Table 5-3 Predicted intersection level of service in 2032 with new continuous left turn slip lane/ramp from the northbound off-ramp onto HEx Link Road

Intersection	Control	AM peak		PM peak	
		Delay (sec)	LoS	Delay (sec)	LoS
Hunter Expressway Branxton interchange	Roundabout with a new northbound left turn slip lane	17	B	16	B

SIDRA model shows that proposed upgrade (ie. new continuous left turn slip lane/ramp from the northbound off-ramp onto HEx Link Road) would provide level of service B or better at Hunter Expressway Branxton interchange.

In conclusion, the analysis supports the revised thresholds of 2,525 dwellings and 4.3 ha GFA for Consent 10.

Figure 5-1 shows package of upgrading works.

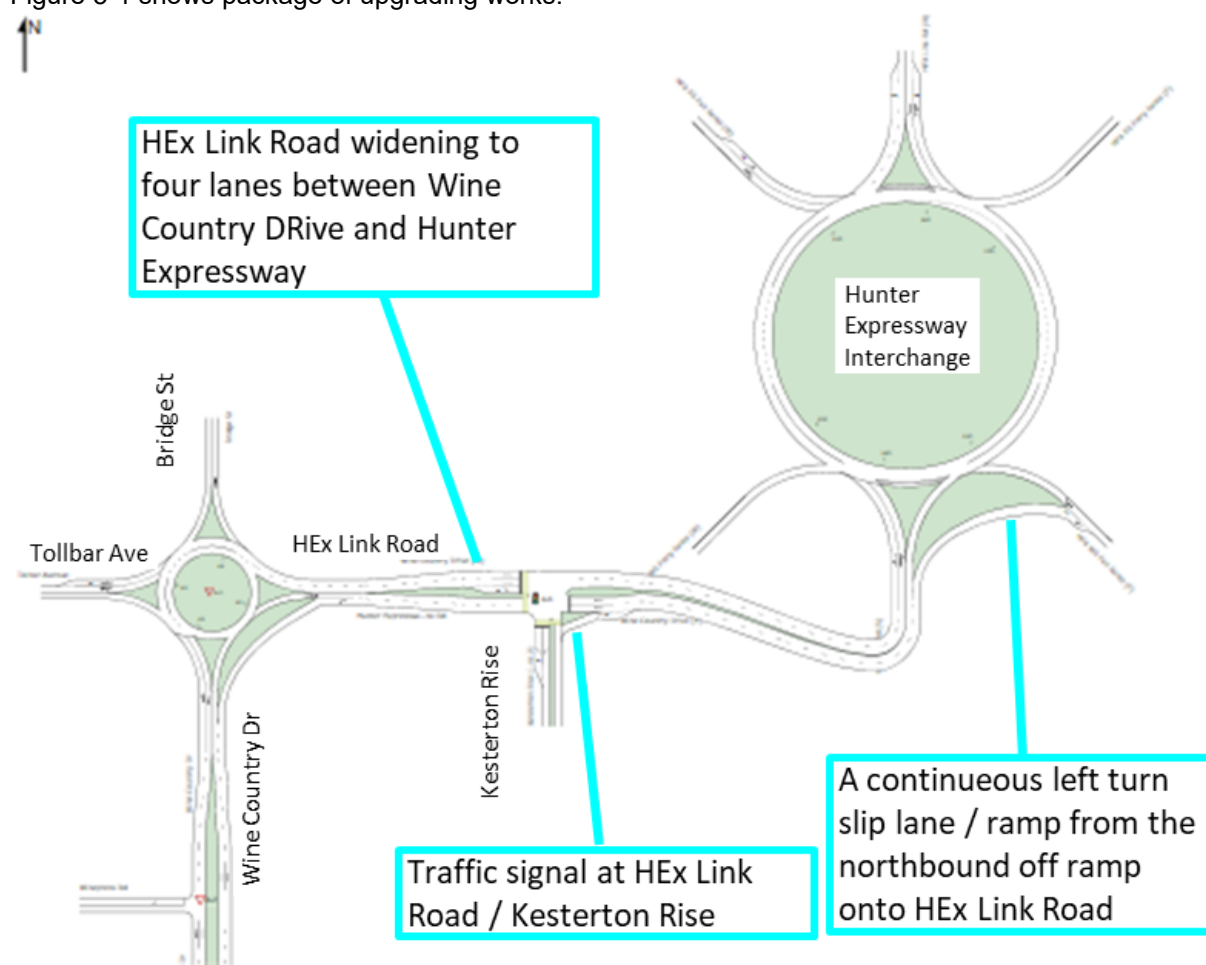


Figure 5-1 Package of upgrading works to support 2,525 dwellings and 4.3 ha GFA

ATTACHMENT B

Technical Advice on cumulative traffic assessment for MOD 21

1 Introduction

Cumulative traffic assessment for MOD 21 Proposal has been undertaken to identify whether additional traffic from MOD21 could be accommodated by the package of upgrading works shown in previous Figure 5-1 in Attachment A or additional upgrades would be required.

2 MOD 21 Proposal

The MOD 21 proposal has been revised and proposes to facilitate about 489 residential dwellings and 16 new mixed use lots along with a new infrastructure lot for an additional wastewater treatment plant. This will result in the modified Stage 1 proposal consisting of the following;

- Total 3,014 dwellings, of that
 - Standard residential lots, 2,311 dwellings
 - Medium density lots, 498 dwellings
 - Retirement Living, 205 dwellings
- Mixed use/commercial lots, 14.3 ha GFA
- Two infrastructure lots for wastewater treatment plants.

The above revised total Stage 1 development yield has been tested on the local road network as outlined in the following sections and it has been concluded that the MOD 21 proposal would trigger an additional upgrade at Wine Country Drive / Bridge Street / Tollbar Avenue roundabout. The upgrade includes:

- Widening northern leg approach to two lanes (Bridge St) (refer to Figure 2-1).

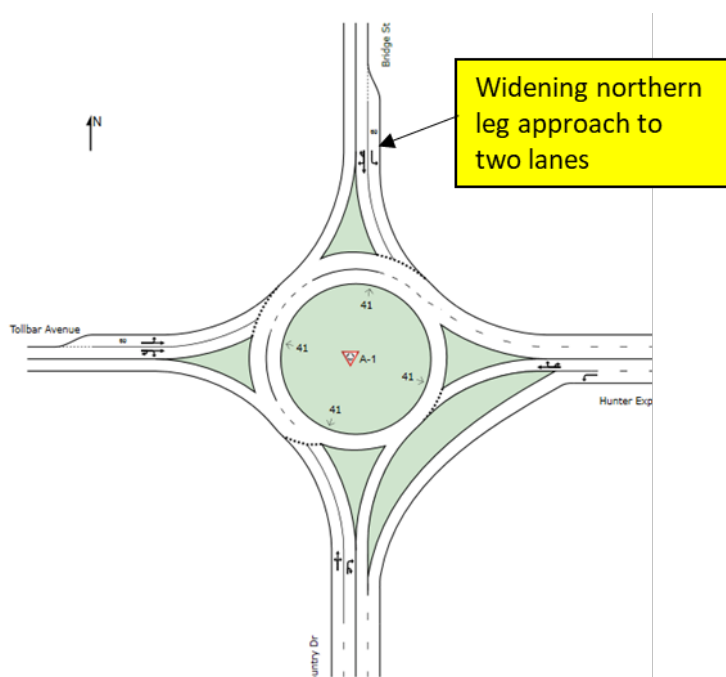


Figure 2-1 Indicative layout for Wine Country Drive / Bridge Street / Tollbar Avenue roundabout upgrade

2.1 Trip generation

The following trip generation rates are used in updated modelling:

- Trip generation for single dwellings is assumed to be 0.78 trips per dwelling in the AM peak hour and 0.71 trips per dwelling in the PM peak hour. The trip rate for dwelling is sourced from *TfNSW Guide to Traffic Generating Developments Updated Traffic Surveys (TDT 2013/04a)*
- Trip generation for medium density dwellings is assumed to be 0.575 trips per dwelling in the AM and PM peak hour. The trip rate for dwelling is sourced from *TfNSW Guide to Traffic Generating Developments, Issue 2.2. October 2002*
- Trip generation for retirement village is sourced from *TfNSW Guide to Traffic Generating Developments Updated Traffic Surveys (TDT 2013/04a)*, August 2013 and assumed to be 0.4 trips per dwelling in the AM and PM peak hour
- Trip generation for mixed use/commercial is sourced from *Assessment of Hunter Valley Business Park Trip Rates, prepared by AECOM, December 2017* and assumed to be 0.63 and 0.72 peak hour trips per 100m² of GFA.
- Trip rates for retail is assumed to be 3.7 (AM) and 6.2 (PM) peak hour trips per 100m² of GLFA. The trip rates are sourced from *TfNSW Guide to Traffic Generating Developments, Issue 2.2. October 2002*
- Trip generation for infrastructure such as treatment plant and electrical generating plant is assumed to generate about 5 vehicle trips per site in the AM and PM peak hour.

Table 2-1 shows the trip generation rates.

Table 2-1 Trip generation rates

Development	Type	Trip generation rates		
		AM peak	PM peak	Unit
Residential	Standard dwelling	0.78	0.71	trips/dwelling
	Medium density dwelling	0.575	0.575	trips/dwelling
Retirement	Retirement Living	0.4	0.4	trips/dwelling
Mixed used	Mixed use/commercial	0.63	0.72	trips/100m ² GFA
Infrastructure	Treatment plant	5	5	trips/hour

The analysis shows that modified Stage 1 proposal (3,014 dwellings and 14.3 ha GFA) would generate about 2,375 vehicle trips in the AM peak one hour and 2,445 vehicle trips in the PM peak one hour. Table 2-2 shows peak hour trip generation from the modified Stage 1 proposal.

Table 2-2 Peak hour trip generation for modified Stage 1 proposal

Development type	Yield	Peak hour trip generation	
		AM	PM
Residential development	3,014 dwelling	2,160	2,010
Mixed use/commercial/retail	14.3 ha GFA	1,100	1,400
Total gross traffic generation		3,260	3,410
Discounted trips from occupied dwellings and GFA		(885)	(965)
Total net traffic generation		2,375	2,445

2.2 Trip distribution

There is no change to trip distribution assumption shown in Section 2-3 in Attachment A.

3 Cumulative assessment

Traffic modelling for modified Stage 1 proposal was undertaken for future year in 2032.

Table 3-1 shows intersection level of service in 2032 for cumulative traffic with modified Stage 1 proposal.

Table 3-1 Predicted intersection level of service in 2032 with modified Stage 1 proposal

ID	Intersection	Control				
			AM Peak		PM Peak	
			Delay (sec)	LoS	Delay (sec)	LoS
A-1	Wine Country Drive / Bridge Street / Tollbar Avenue	Upgraded roundabout (northern approach)	22	B	56	D
A-6	HEx Link Road / Kesterton Rise	New traffic signals	30	C	12	A
A-11	Hunter Expressway	Roundabout with northbound slip lane	22	B	19	B
A-3	Wine Country Drive / Empire Street	Traffic signals	25	B	27	B
A-5	Wine Country Drive / Triton Boulevard	Traffic signals	39	C	43	D

In 2032, cumulative traffic with modified Stage 1 proposal would provide level of service between A and D for five assessed intersections.