



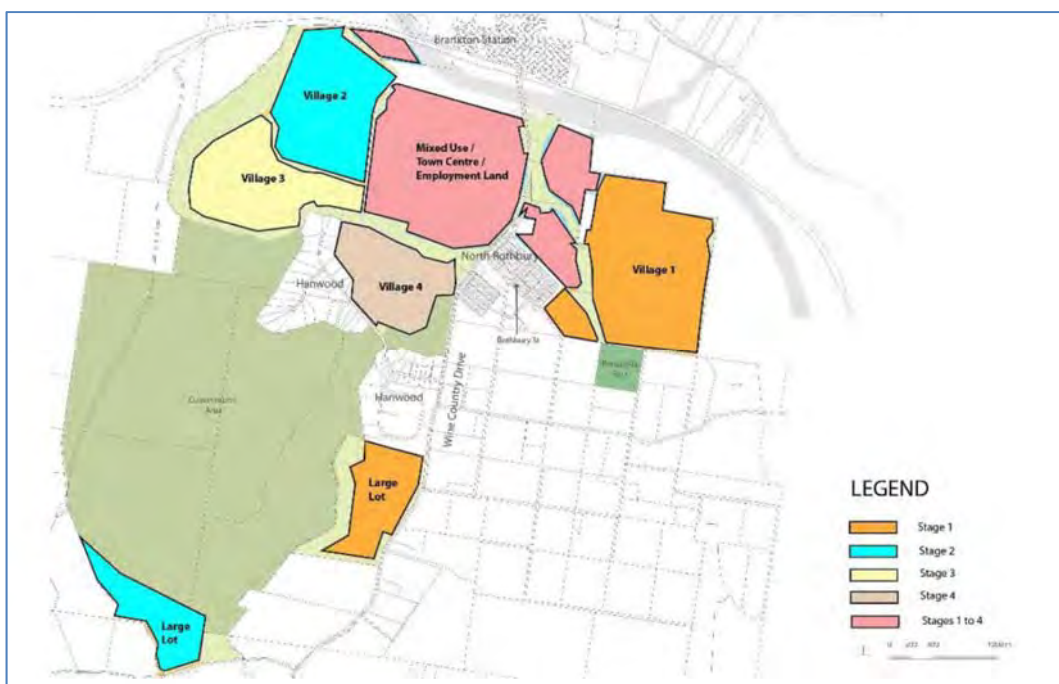
BETTER TRANSPORT FUTURES
MARK WAUGH



Huntlee New Town Stage One

Huntlee Pty Ltd

Road Infrastructure Upgrade Thresholds Sensitivity Analysis
November 2016



Mark Waugh Pty Ltd
ABN 67 106 169 180



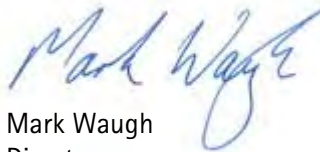
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This Traffic Engineering Sensitivity Analysis has been prepared and reviewed by suitable qualified professionals in accordance with the Guide to Traffic Generating Developments (RTA 2002) and Traffic Modelling Guidelines (RMS 2013).



Mark Waugh
 Director
 Better Transport Futures

28th November 2016

Contents

1. Executive Summary.....	1
1.1 Summary.....	1
1.2 Conclusion and Recommendations	2
1.3 Recommendations	3
2. Review Background	4
2.1 Introduction	4
2.2 Purpose of Review	4
2.3 Factors Influencing This Review	5
2.3.1 Documents Reviewed.....	5
2.3.2 Traffic Planning Considerations.....	5
2.3.3 2012 Hyder Traffic Modelling Report.....	6
2.3.4 Hunter Expressway Opening	7
2.3.5 2016 Existing Conditions	7
2.3.6 Trip Generation Assumptions	8
2.3.7 Trip Distribution and Assignment.....	8
2.3.8 RMS Correspondence dated 2 Nov 2016.....	9
3. Traffic Engineering Sensitivity Analysis	10
3.1 Application SIDRA 7 Intersection Modelling.....	10
3.2 Intersection [A-5]	10
3.3 Intersection [A-1]	11
3.4 Wine Country Drive mid-block capacity	15
3.5 Hunter Expressway Link Road mid-block capacity	15
3.6 Comparison of Trip Generation Rates	16
3.7 Future Network Modelling Considerations	16
4. Conclusions and Recommendations.....	17
4.1 Summary.....	17
4.2 Conclusions.....	Error! Bookmark not defined.
4.3 Recommendations	Error! Bookmark not defined.
Appendix A Huntlee Indicative Development Potential	19
Appendix B Hyder Report Figure E-1	20
Appendix C 2016 Traffic Surveys & Summary Data	21
Appendix D Sensitivity Analysis Traffic Flow Diagrams	22
Appendix E RMS Correspondence & Responses	23
Appendix F SIDRA Intersection Modelling Scenarios	24

1. Executive Summary

1.1 Summary

Huntlee Pty Ltd (the Proponent) has been reviewing elements of the implementation of road and intersection upgrade works for the Huntlee New town since the completion of the Traffic Modelling investigations completed in 2012 (Hyder 2012).

The purpose of reviewing this comprehensive work has not been to change the long term recommendations for road and intersection upgrades, but rather consider the effects of the Hunter Expressway (HEX, opened in 2014 after the 2012 Hyder Traffic Modelling), consider the NSW RMS 2013 update of trip generation rates, especially as they relate to residential dwellings, and also to consider the lot/ dwelling thresholds or "trigger" points nominated for various upgrade works. It is noted that several of the early "trigger points" were included in the Hyder Report as a short addendum, and did not appear to rely on any particular technical capacity review, but rather a nominal number of lots only. This report has been undertaken to confirm what the actual "trigger points" should be on a technical basis.

The work is presented as a sensitivity analysis on the key infrastructure for the Huntlee Stage One approval and includes allowance for 2345 dwellings which is UNCHANGED from the Hyder Report. (This equates to the approved 1473 residential lots, 14 super lots, school as per the approval)

It is not a comprehensive traffic network modelling exercise and relies heavily on the approved Hyder Report to inform this analysis.

It is noted that one of the Proponent's DA conditions requires another comprehensive traffic study to be completed prior to 1500 lots (dwellings), this report is not intended to be this study. No changes to the upgrades outlined in the DA are proposed, simply a review of three of the trigger points as outlined below.

The particular threshold under consideration here relate to the following works:

- 1) One access initially (Intersection [A-5]) for Huntlee Village One, with the threshold retested.
- 2) Upgrade to Intersection [A-1] a one lane roundabout to two lanes, with the threshold retested.
- 3) Upgrade of Wine Country Drive to a 4 lane dual carriageway from [A-5] to [A-1], with the threshold retested.

In addition to updating based traffic volume data using 2016 (post opening of the Hunter Expressway), sensitivity analysis was conducted that applies the RMS 2013 average trip generation rates, the Hyder report's 10% containment rates, and the RMS 2013 maximum trip generation rates. The results of this comparison are presented in Table 1 below.

Table 1 Comparison of effect of Trip Generation Rates on Lot Threshold "Triggers"

LOCATION	PROPOSED UPGRADE	THRESHOLD (Lots) by Trip Rates		
		RMS Average	Hyder	RMS Maximum
Intersection [A-5]	4 way Traffic Signals	1250	1190	1083
Wine Country Drive [A-1]	4 lane dual carriageway [A-5] to [A-1]	1100	990	880
Roundabout	2 lane circulating	1500	1325	1200

Notes:

1. Trip Rates Nominated are taken from the 2012 Hyder Report, and *Technical Direction td13-04a*, (Updated Trip Rates), NSW RMS, (August 2013)

1.2 Conclusion and Recommendations

The conclusions from this sensitivity analysis are as follows:

- The overall approach to traffic assessment is still on a sound base, with appropriate trip distributions, revised trip generation and allowance for background growth being made.
- It has been noted that several of the early "trigger points" included in the Hyder Report as a short addendum did not appear to be accompanied by any technical justification or capacity review. Rather they appear to be application of a nominal number of lots only. This report has been completed specific technical analysis to confirm what the actual "trigger points" should be.
- Traffic generation rates applied for the development - The average trip generation rates (RMS 2013) applied would result in a reduction in overall trips from previous assessment levels.
- A sensitive test was completed using the maximum rates. These still result in higher "trigger" for initial upgrades.
- Trip distribution assumptions remain unchanged from those agreed in the Hyder Transport Studies conducted at the time of considering the Huntlee Stage 1 application in 2012.
- Site access assumptions have been reviewed, and the proposed interim seagull intersection was adopted for testing of the lot yield threshold against the traffic distribution and revised flows conditions as the initial access to Huntlee Stage 1 (Village One).
- A series of tests were conducted for the range of other initial road and intersection upgrades, focussing on intersections [A-5], [A-1] and Wine Country Drive
- The analysis of the revised impacts on external roads and intersections shows there is a very good case for justification of modifications to the timing of the initial road and intersection upgrades as currently nominated in the Stage 1 development conditions.

It is concluded from this sensitivity analysis of the immediate access threshold "triggers" associated with the Huntlee Stage One Project Approval that the interim intersection [A-5] is capable of accommodating traffic flows up to a threshold "trigger" of around 1250 lots / dwellings based on RMS 2013 average trip generation rates. Further the Intersection known as [A-1], the intersection of Wine Country Drive, the HEX link road and Bridge Street is also capable of handling at least this level of traffic and more. It is also concluded that the current Wine Country Drive two lane two way configuration will perform at satisfactory service levels up to around 1100 lots / dwellings based on the agreed Hyder containment level for the Huntlee Stage 1 Development.

In the event that a more conservative view of trip generation rates is applied, and maximum trip generations used, the corresponding worst case threshold "triggers" should be:

- [A-5] Upgrade seagull priority to Signals – 1000 lots / dwellings
- Wine Country Drive 4 lane dual carriageway [A-5] to [A-1] – 900 lots / dwellings
- [A-1] Upgrade Roundabout from one lane to two lane circulating – 1000 lots / dwellings

The Hyder Report included an agreement with NSW RMS to apply a 10% self-containment rate for assessing Stage 1 development impact. Applying that agreement, the corresponding threshold "triggers" would be:

- [A-5] Upgrade seagull priority to Signals – 1100 lots / dwellings
- Wine Country Drive 4 lane dual carriageway [A-5] to [A-1] – 1000 lots
- [A-1] Upgrade Roundabout from one lane to two lane circulating – 1100 lots / dwellings

The results are substantially more than the "triggers" reported in the 2012 traffic modelling work.

Whilst not reported in detail here of significant influence also will be the eventual introduction of the [A-6] Huntlee Stage 1 (Village One) second access, which has the potential to more than halve the flows using the [A-1] roundabout and the [A-5] Triton Boulevard intersection. These will be considered as part of the revised comprehensive traffic study which has to be prepared prior to a threshold of 1500 lots as required under the DA conditions

1.3 Recommendations

It is recommended that consideration be given to:

- 1) Adjusting the threshold "triggers to match the results reported in this sensitivity analysis.
- 2) Prepare a revised comprehensive traffic study for Huntlee prior to a threshold of 1500 lots /dwellings as required under the DA conditions. This will include (but is not limited to) network modelling:
 - a. of the impact of the second Village One access (Intersection [A-6]
 - b. with updated base and development information on access to Villages 2, 3 and 4, and to the Huntlee Town Centre.

Overall the recommendations do not seek to change the long term configuration of access requirements, just the timing of the initial interim upgrades.

This work is put forward for consideration and approval by NSW Department of Planning and Environment and NSW Roads and Maritime.

2. Review Background

2.1 Introduction

Better Transport Futures (BTF) is acting under instructions from Huntlee Pty Limited to complete revised intersection modelling and sensitivity analysis of the upgrade thresholds for a range of road and intersection upgrades for the Stage 1 Development of the Huntlee project.

This work has been requested to test the voracity of the conditions imposed on the approved Stage 1 development, that require a range of road and intersection upgrades in connection with access to and operation of Wine Country Drive at lot threshold levels varying from 500 lots to 1900 lots.

The basis of establishing the thresholds as set is unclear, and so Huntlee Pty Ltd has requested this work to review the technical merits of the timing of the 'triggers' for upgrade requirements.

The nominated Thresholds for Road and Intersection Upgrades associated with Huntlee Stage 1 are summarised below in Table 2 – Huntlee Upgrade Thresholds.

Table 2 - Huntlee Upgrade Thresholds

LOCATION	PROPOSED UPGRADE	THRESHOLD (Lots)
Intersection [A-5]	4 way Traffic Signals	500
Wine Country Drive	4 lane dual carriageway [A-5] to [A-1]	500
[A-1] Roundabout	2 lane circulating	500
[A-6] Intersection	Priority Intersection	1500
HEX Link Road	4 lane dual carriageway [A-1] to Branxton Interchange	1500
Branxton Interchange	Upgrade to full 2 lane circulating with approach capacity improvements	1900

This sensitivity analysis is focussed on the upgrade works that affect the development up to and approaching a threshold of 1500 lots. (That is it falls within the Stage one approval of 1473 residential lots, 14 super lots and school.) At (or before) reaching the 1500 lot threshold a revised comprehensive traffic study is to be prepared as required under the DA conditions.

2.2 Purpose of Review

Better Transport Futures was commissioned by Huntlee Pty Ltd to conduct a review of the Huntlee New Town Stage 1 Preferred Report, Traffic Modelling (Hyder Volumes 1 & 2 July 2012) (Herein after referred to as the Hyder Report.) The purpose of that review was to understand the implications of the opening of the Hunter Expressway, the publishing of revised tip generation rates by the NSW Roads and Maritime Service (RMS), and also the voracity of the assumptions and recommendations of the Hyder Report with respect to "triggers" for nominated road and intersection upgrades.

The timing of upgrades proposed before completion of Huntlee Stage 1 (Village One) to its full capacity of 2345 dwellings appears to be at odds with the supporting Transport Studies by Hyder (Hyder 2012) for the entire development of around 7500 dwellings and associated facilities, which calls for the levels of upgrade at the triggers nominated above.

It needs to be made clear, this work is not challenging the nature or configuration of long term upgrades recommended in the Hyder Report as part of this review.

The sole purpose of this sensitivity analysis is to review and analyse the lot "triggers" by undertaking a series of sensitivity analyses utilising updated base information and assumptions.

Given the elapsed time since data collection (approaching 5 years) as well as the 2014 opening of the Hunter Expressway, this analysis is considered necessary to ensure road and infrastructure upgrades are appropriate and are provided when necessary.

2.3 Factors Influencing This Review

2.3.1 Documents Reviewed

The following reference documents have been reviewed in conducting this sensitivity analysis:

Technical manuals / guides

- *Guide to Traffic Management (2nd Edition)*, Austroads, 2013
- *Guide to Road Design*, Austroads, 2009
- *Guide to Road Safety*, Austroads, 2009
- *Guide to Traffic Generating Developments*, (RTA October 2002)
- *Traffic Modelling Guidelines*, NSW RMS, (February 2013)
- *Technical Direction td13-04a*, (Updated Trip Rates), NSW RMS, (August 2013)

Project References

- *Huntlee New Town Stage 1 Preferred Project Report, Traffic Modelling, Volumes 1 & 2, and Addendums*, Hyder for Huntlee Pty Ltd, July-August 2012

2.3.2 Traffic Planning Considerations

In reviewing the current planning for Stage 1 of Huntlee there are a number of assumptions about traffic issues that have been considered as requiring updating. These include:

1. Lot / Dwelling Yield - The original Concept Plan for the project envisaged an overall yield of around 2345 dwellings in Stage 1. The Preferred Project Report Traffic Modelling undertaken by Hyder adopted the figure of 2345 dwellings and this has not changed. (The approved lot total of 1473 residential lots and 14 super lots plus a school site is still consistent with this overall dwelling total.)
2. The assumed development levels are illustrated in the current Huntlee Stage One Masterplan. (Refer to **Appendix A** to this Review.)
3. There is component of the Huntlee development proposed as part of Stage 1 in the Town Centre to the west of Wine Country Drive. But given this is essentially trip attracting activities such as retail and employment development, the focus here is on the trip production of the residential components to the east of Wine Country Drive to avoid double counting of trips. (RMS have requested a conservative view of no containment by requesting that maximum trip generation rates be applied in the analysis. This has been dealt with in the sensitivity analysis.)

4. Trip Generation - rates applied in the traffic investigations supporting the Concept Plan and VPA work were based on the rates quoted in the RTA Guide to Traffic Generating Developments (RTA October 2002).
5. NSW RMS published revised trip generation rates in August 2013. These rates reduce the peak and daily trip generations for a number of land uses, including residential, and also recognise the difference between activity levels in Sydney, and in regional areas. (RMS have subsequently requested application of the maximum rates not the average rates which are normally considered for a residential development of this scale. This has been dealt with in the Sensitivity Analysis.)

Of note also is the RTA Guide to Traffic Generating Developments application of the standard containment for local travel of 25% of trips. The Hyder Report on Traffic Modelling for the Huntlee Project, prepared and submitted to NSW RMS consciously changed this containment level, setting it initially at ZERO, and then a maximum of 10% for a Stage 1 yield of around 2500 lots. This is in spite of the fact that Town Centre (employment generating) activities such as supermarkets, schools, hotels etc., will be developed within the Stage 1 development timeframes.

However, notwithstanding the scale and likely containment will be higher for a fully developed Stage 1 development, for the purposes of this analysis no containment has been assumed at commencement, which will be conservative. Latter stages of development (as reported by Hyder in 2012) have increased the containment level firstly to 10% and then on to 25% to be consistent with the accepted approach document in the RMS Guide to Traffic Generating Developments.

Assumptions and issues relating to the application of the traffic data include:

- Assumed level of development potential for the Project → NO CHANGE
- Traffic generation rates → RMS Technical Direction td13-04
- Trip distribution → NO CHANGE. Adopted from Hyder Report
- Road capacity → NO CHANGE
- Site access assumptions → NO CHANGE (other than testing "triggers" for upgrades)
- Internal layout, connections and relationship to site access → NO CHANGE
- Resultant impacts on external road and intersection treatments → NO CHANGE (other than potential recommendations for changes to "triggers" for upgrades)
- Sensitivity assessment

The above issues have been taken into account in this sensitivity analysis and review of the Huntlee Stage One infrastructure "triggers" for upgrade works.

2.3.3 2012 Hyder Traffic Modelling Report

Huntlee Pty Ltd commissioned Hyder in 2011 to complete a comprehensive traffic modelling exercise to satisfy the requirements of the planning approval process. This work has been reviewed as part of ongoing implementation of the Stage One development, and a number of areas of assumption and base data identified that may influence the Huntlee development:

It should be noted that this current review is a sensitivity analysis of isolated intersections associated with the first stages of Huntlee Stage One development. The brief for this work was to review the Hyder

work completed in 2012 and identify and areas where there may be a need for testing of data assumptions and parameters as they affect the initial access requirements for the project.

It needs to be made clear, this work is not challenging the nature or configuration of long term upgrades recommended in the Hyder Report as part of this review. The works as nominated are illustrated in Figure E-1 from the Hyder Report which is attached to this report as **Appendix B**.

It is possible that in time, and especially given the overall project timeline is great than 20 years that an update will be required to the wider network modelling that has informed the Huntlee project.

The issues that have been identified from the review of the Hyder Report that have been considered in this sensitivity analysis are outlined below.

2.3.4 Hunter Expressway Opening

The Hunter Expressway was officially opened in the morning of 21 March 2014, and then opened to traffic in the evening of 22 March 2014.

The Hyder Traffic Modelling Report was completed in 2012 and thereby relies on pre-opening traffic data and modelling assumptions about the conditions and effects of the Hunter Expressway. A review of actual traffic flows in 2016 is considered not only valid but essential to ensure accuracy of any analysis movement forward.

2.3.5 2016 Existing Conditions

The Hyder Traffic Modelling Report was based on Traffic Surveys conducted in March 2012. These were in fact an update of previous surveys conducted for Huntlee over the life of the approvals process.

Better Transport Futures conducted updated traffic surveys in March 2016 as follows:

- Turning movement Surveys at the intersection of Wine Country Drive / HEX Link Road / Bridge Street, conducted on Thursday 17th March 2016, and Saturday 19th March 2016
- 7 day two way volumes counts covering the period 17th March 2016 to 23rd March 2016.

Whilst the turning movement surveys were conducted only on the Thursday and Saturday, the 7 days of consecutive mid block data indicate that the Thursday data applied in the sensitivity analysis represents a higher value than that of either the Friday or Saturday recorded flows, and so is considered appropriate for use as the base for this sensitivity analysis. In fact when comparing the comparable mid-block peak flows the Thursday data is:

- 9% higher than Friday, and 26% higher than Saturday in the AM peak
- 9% higher than Friday, and 45% higher than Saturday in the PM peak

Of note is the 2016 recorded flows are generally around 15% less overall than previously collected data from before opening of the Hunter Expressway. (With the exception of PM northbound flows which are higher by a similar proportion.) This is likely to make any analysis using the previously available 2012 traffic dataset conservatively high.

It is on this basis that the traffic data recorded in 2016 and the Thursday 17th March 2016 turning movements surveys in particular are considered more than adequate for the purposes of this sensitivity analysis.

Results of the 2016 Traffic Data Collection are included in **Appendix C** to this Report.

2.3.6 Trip Generation Assumptions

Previous traffic generation rates published by the NSW RMS assumed peak hour flow factors for a variety of development uses, based on data that is now anything up to 40 years old. (RTA Guide to Traffic Generating Development (GtTGD), NSW RMS, October 2002).

Updated generation rates were published by the NSW RMS in August 2013 for a number of categories of traffic generating development. These included some of the more common types of land use such as residential, office, bulky goods and shopping centres.

Traffic Generation rates have been applied based on the latest NSW RMS trip generation rates published in August 2013.

Key revisions to residential trip generation rates include:

1. AM peak trip rate reduced from 0.85 to an average value of 0.71 for regional areas
2. PM peak trip rate reduced from 0.85 to an average value of 0.78 for regional areas
3. Daily trip rate reduced from 9 to an average value of 7.4 for regional areas

NSW RMS has requested application of the old rates as maximum value rates on the assumption that there is ZERO containment from the subject site. This is in contrast to the Hyder Report which uses a containment level of 10% in its analysis for Huntlee Stage One.

The above rates have been applied to nominated traffic generation levels taken from analysis of the current project Master Plan. A comparison of the sensitivity of these varying trip generation rates is included in this review.

2.3.7 Trip Distribution and Assignment

The Hyder Transport Study work conducted in 2012 considered the issue of trip distribution and assignment at length. The key issue arising from the review was that applying some sensitivity analysis to the original trip distribution assumptions and only of the order of up to 10% on some key issues, resulted in changes to the forecast flows on the important Wine Country Drive corridor with flows reduced to levels that altered initial decisions.

Notwithstanding the above, it was concluded that the Hyder Traffic Modelling report still represents the "best available" information in terms of trip distribution and assignment parameters, because of its comprehensive network modelling approach.

A key factor in the development of the adopted trip distribution and assignment was knowledge about the planned Hunter Expressway, and local access issues in relation to service towns such as Cessnock, Singleton and the west Maitland corridor, as well as the local centre of Branxton.

The trip distribution and assignment adopted here for the Stage 1 development is consistent with that presented in the Hyder Studies.

The distribution of the additional trips generated by the proposed Huntlee development at full development is a key factor in determining its ultimate impact on the road network.

The trip distribution on the Hunter Expressway, Wine Country Drive and New England Highway was previously estimated using the Hunter traffic model as documented in the Huntlee Traffic Modelling Report, (Hyder 2012).

The following trip distribution is assumed for assessing full development and as agreed with NSW RMS:

- About 67% trips via Branxton (Hunter Expressway) Interchange. Of that:
 - 38% trips travel to east via Hunter Expressway;
 - 18% trips travel via New England Highway to Maitland;
 - 11% trips travel to west via Hunter Expressway to Singleton and the Upper Hunter;
- 22% trips travel to south via Wine Country Drive to Cessnock; and
- 11% trips travel to north via Wine Country Drive to Branxton.

For Stage 1 assessment, Huntlee trips to Branxton (North) via Wine Country Drive were reduced to 6%. The following was the adopted trip distribution was assumed for Stage 1 Huntlee development traffic:

- About 72% trips via Branxton (Hunter Expressway) interchange. Of that:
 - 40% trips travel to east via Hunter Expressway;
 - 20% trips travel via New England Highway to Maitland;
 - 12% trips travel to west via Hunter Expressway to Singleton and the Upper Hunter;
- 22% trips travel to south via Wine Country Drive to Cessnock; and
- 6% trips travel to north via Wine Country Drive to Branxton. It is proposed to monitor Huntlee trip distribution at key approach roads as development progress.

The traffic flows adopted in the Hyder work used here as the base for analysis is included as **Appendix D** to this review.

Whether the bias in traffic flows to the north is as strong as assumed in the 2012 analysis will need to be monitored over time, as the Huntlee development is implemented.

2.3.8 RMS Correspondence dated 2 Nov 2016

NSW RMS provided a response to the NSW Department of Planning dated 2 November 2016 in which a number of issues have been raised in relation to the BTF Sensitivity Analysis.

This updated version (Revision 3) of the Sensitivity Analysis has considered the matters raised by NSW RMS, and incorporated adjustments and clarifications to the work where considered appropriate. A copy of the RMS correspondence and responses to each of the matters raised is included in **Appendix E** to this report.

3. Traffic Engineering Sensitivity Analysis

3.1 Application SIDRA 7 Intersection Modelling

Sidra⁷ Intersection is an industry accepted modelling tool for application to isolated junction modelling and assessment, and also for detailed intersection design. It is an appropriate tool to use in this sensitivity analysis because:

1. In the earliest parts of the Huntlee Stage One development, there is only one access to consider, Intersection [A-5]
2. The SIDRA⁷ analysis has made use of the networking functions to represent the seagull priority junction as defined in the SIDRA⁷ user manual.
3. At the point in time when the second junction is nominated for upgrade ([A-1] the existing one lane roundabout at the intersection of Wine Country Drive / HEX Link Road / Bridge Street), the junction is separated from other intersections so as to operate in isolation.
4. SIDRA modelling actually formed part of the comprehensive modelling performed for the Huntlee Preferred Project Report approval. (Hyder July 2012).
5. It is necessary even with application of wider network modelling and microsimulation tools such as TRANSCAD and Paramics, to apply modelling with the level of sophistication in its junction analysis to correctly assess junction capacity and performance.

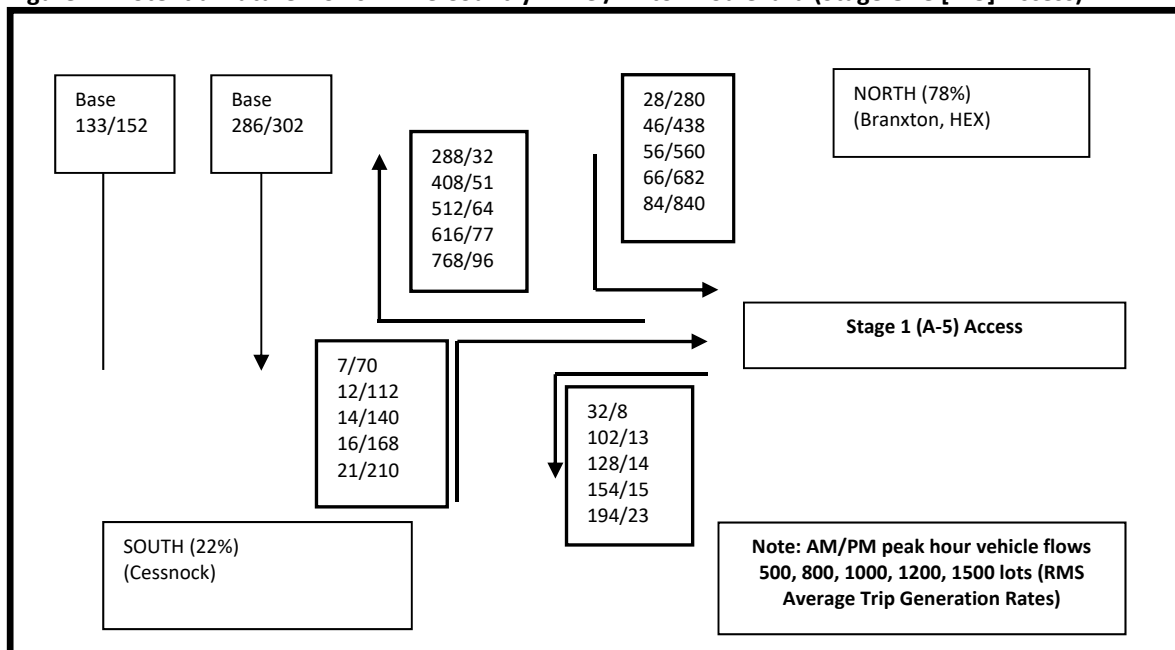
Sidra⁷ Intersection modelling was applied and is considered appropriate and consistent with the principles and practice set out in the Traffic Modelling Guidelines (RMS 2013).

3.2 Intersection [A-5]

Intersection [A-5], which is the junction of Wine Country Drive and Triton Boulevard is the 1st and only current access for Huntlee Stage One (Village One). It has been constructed in an interim layout as a priority seagull intersection, as agreed with the road authorities.

In keeping with an isolated development access, a single access a series of assessments have been made on the basis of the flows illustrated in Figure 1 below. These are the assumed Stage One development flows based on the above trip generations and distribution as described above.

Figure 1 - Potential Future Flows. Wine Country Drive / Triton Boulevard (Stage One [A-5] Access)



There are a number of points to note about these flows:

1. Stage One access is proposed initially from a single intersection on Wine Country Drive, which ultimately will form a 4 way signalised intersection. The western (4th) leg will provide direct access to the Huntlee Town Centre. The interim access is to be provided via a 3 leg intersection operating as a seagull priority controlled intersection.
2. Scenarios were tested up to an RMS Ave Trip Generation equivalent of 1500 lots.
3. Between 1200 and 1500 lots an additional test at 1250 lots was also completed.
4. It is understood that there is a current threshold "trigger" that requires the introduction of the second [A-6] access intersection for Huntlee Stage 1 (Village One) at a lot threshold of 1500 lots. This threshold is not addressed in the review of the initial interim thresholds.
5. In all cases the modelling and sensitivity analysis assessment has allowed for a 1.5% background growth in the observed 2016 through traffic flows on Wine Country Drive.
6. A significant advantage of retaining the interim (seagull) arrangement as long as possible is that through traffic flows on Wine Country Drive will remain with delay for longer.

The conclusions of this sensitivity analysis of the first access threshold "trigger" was that there is sufficient capacity in the constructed seagull junction [A-5] on Wine Country Drive to cater for the movements from a lot threshold of up to 1250 lots not 500 lots.

3.3 Intersection [A-1]

The existing [A-1] intersection operating under roundabout control was the focus of recent traffic movement surveys (March 2016) (Refer to **Appendix C**).

The significant movements at this junction are the movement to and from the HEX link road, which is where the vast majority of traffic was assumed to be heading, according to the results of modelling published in the Hyder Report.

And so by performing a series of threshold tests as before, using the flow increments nominated in the above access scenario that only allows Stage 1 access via Intersection [A-5] intersection, an indication of the technical performance of this one lane roundabout can be also achieved at this early stage of development. Additional Checks were undertaken on the traffic flows using the flow diagrams presented in **Appendix D** to this review. These covered the available flows derived from the 2016 movement data, with Stage One Huntlee flows added, and RMS 10 year growth flows (@ 15%) superimposed on the base flows.

The full range of relevant SIDRA modelling scenarios for intersections [A-5] and [A-1] that have been tested are outlined in **Appendix F** to this paper. (Electronic files covering the completed analysis will be provided to RMS along with this report as required.)

Rather than test 5 scenarios as before, a test of the 1200 and 1500 lot thresholds with an increment at 1250 was performed.

Similar SIDRA INTERSECTION Version 7 reporting of results used to illustrate the performance of Intersection [A-5] have been utilised here, with the difference being the single intersection style of reporting:

- Degree of Saturation
- Level of Service

Traditional numerical results are also available for all scenarios.

One of the outcomes of this review is presented by the AM and PM Degree of Saturation and Level of Service diagrams for the 1200 lot scenario. **Figure 2 and 3** overleaf illustrate the forecast Levels of service (LoS) for 1200 lots, the 1500 lot test was also satisfactory. More detailed results meeting RMS reporting requirements are found in **Appendix E** to this report.

What we learn from this revised threshold test is that the One lane roundabout is capable of operating far beyond the nominated, 500 lot threshold. The additional 1250 lot threshold test still shows Level of Service 'A' performance, and the 1500 lot test also shows very good performance. This would indicate that the roundabout is more than likely able to cater for significantly more traffic flows than those created by 1250 lots of Huntlee Stage One. In this case it is considered that 1250 is a practical target given the DA condition requiring a comprehensive traffic modelling re view at a 1500 lot threshold. IT is certainly more realistic as a "trigger" than the current nominal 500 lots/dwellings reported previously by Hyder.

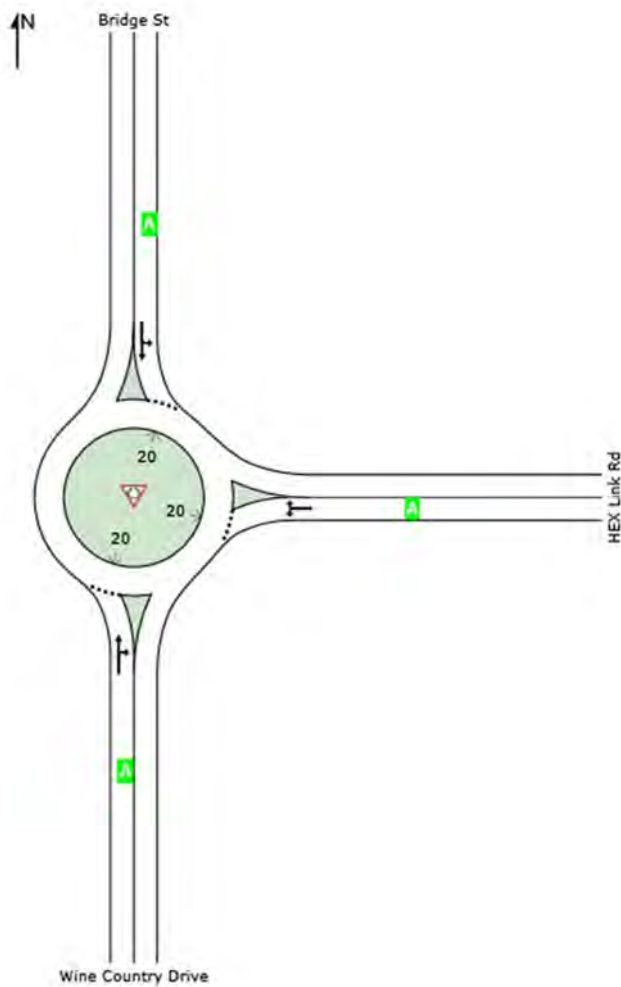
Of significant influence here and to the future revised traffic study will be the introduction of the [A-6] Huntlee Stage 1 (Village One) second access, which has the potential to more than halve the flows using this roundabout.

Figure 2 Intersection Approach Level of Service - AM

 **Site: 101 [A-1 Roundabout AM 1200]**

All Movement Classes

	South	East	North	Intersection
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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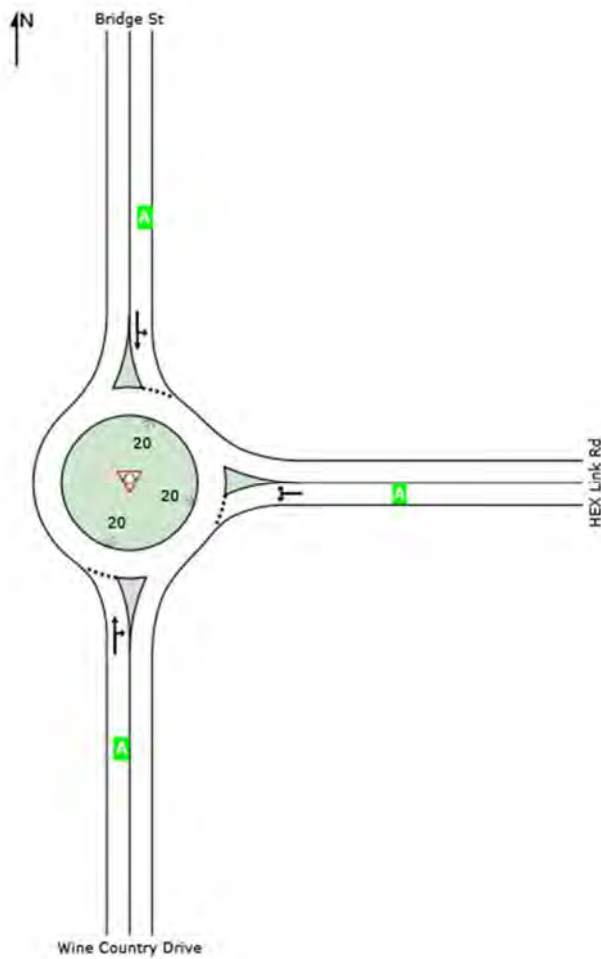
Project: C:\Users\mark.waugh\Documents\WORK\PROJECTS\BTF201649 LWP Huntlee\VARY B - Threshold Analysis\SIDRA\Huntlee WCD A-5 Threshold Analysis.sip7

Figure 3 Intersection Approach Level of Service - PM

 **Site: 101 [A-1 Roundabout PM 1200]**

All Movement Classes

	South	East	North	Intersection
LOS	A	A	A	A



Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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3.4 Wine Country Drive mid-block capacity

The forecast flows on Wine Country Drive North of intersection [A-5] can be drawn from the numbers presents in Figure 1.

For the range of lot threshold levels tested the combine background and Stage 1 traffic flows are as follows:

Table 3 Review of Wine Country Drive Forecast Flows and mid-block Levels of Service

Lot Threshold	Forecast AM N/B Flow	LoS	Forecast AM S/B Flow	LoS	Forecast PM N/B Flow	LoS	Forecast PM S/B Flow	LoS
500	533	C	256	B	313	B	493	C
800	653	D	274	B	332	B	651	D
1000	757	D	284	B	345	B	773	D
1100	830	D	320	B	373	B	879	D
1200	902	D	352	B	400	C	984	E
1500	1013	E	312	B	377	B	1053	E

Notes:

1. LoS – Level of Service: Derived from Guide to Traffic Generating Development (GtTGD). RTA Oct 2002

What the above forecast flows illustrate, and it should be noted that the through traffic flows have applied a background growth level of 1.5% per annum, is that all scenarios up to the tested 1100 lots scenario exhibit satisfactory Levels of Service at LoS 'D' or better. At 1100 lots the calculated PM southbound flow is approximately 10% over Los 'D', but still well within the 1200 to 1400 vehicles per hour per lane capacity defined in the Guide to traffic Generating Developments (RTA October 2002). Of significant influence here will be the introduction of the [A-6] Huntlee Stage 1 (Village One) second access, which has the potential to more than halve the flows using this section of Wine Country Drive. It is nominally set for introduction at 1500 lots, which means the "ultimate" load on either junction is only 1150 lots with a 50/50 split of flows

3.5 Hunter Expressway Link Road mid-block capacity

Without performing any additional analysis and assuming that all access to Huntlee Stage 1 (Village One) is STILL via intersection [A-5] and Wine Country Drive, and assuming that all development traffic is heading from the New England Highway or Hunter Expressway (conservative as some flows would be bound for Branxton,) under the same assumptions applied from the Hyder Report, then the above Levels of Service for Wine Country Drive would also apply for the HEX link road, and hence a minimum lot threshold on its upgrade would also be 1100 lots.

It is noted in the currently approved lot / dwelling "trigger" for upgrade of the HEX Link Road the nominated threshold is 1500 lots.

Of significant influence here again will be the introduction of the [A-6] Huntlee Stage 1 (Village One) second access, which has the potential to more than halve the flows using the HEX Link Road west of the [A-6] junction.

However govern the timeframe and the added complexity that introducing this intersection will have on network flows, it is recommended that this threshold remain unchanged until further (updated) network modelling is performed.

3.6 Comparison of Trip Generation Rates

A further sensitivity test has been conducted that applies the RMS average trip generation rates, the Hyder 10% containment rates assumed in the Hyder report, and the RMS maximum trip generation rates. What this means is that for the same amount of traffic, the assumption is that each individual dwelling or lot is generating more traffic. Hence for the same amount of traffic flow, the analysis reflects a lower lot / dwelling yield. The results of this comparison are presented in Table 4 below.

Table 4 Comparison of effect of Trip Generation Rates on Lot Threshold “Triggers”

LOCATION	PROPOSED UPGRADE	THRESHOLD (Lots) by Trip Rates ¹		
		RMS Average	Hyder	RMS Maximum
Intersection [A-5]	4 way Traffic Signals	1250	1125	1000
Wine Country Drive [A-1]	4 lane dual carriageway [A-5] to [A-1]	1100	1000 ²	900 ²
Roundabout	2 lane circulating	1250	1100 ²	1000 ²

Notes:

1. Trip Rates Nominated are taken from the 2012 Hyder Report, and *Technical Direction td13-04a*, (Updated Trip Rates), NSW RMS, (August 2013)
2. Thresholds rounded to nearest 50 lots.

3.7 Future Network Modelling Considerations

One of the findings of the recent review of the Hyder Report was that its detail in terms of anything other than the linear corridor from the Hunter Expressway Branxton Interchange to and along Wine Country Drive involving the Huntlee access intersection, is very limited. It is recommended that network modelling for future stages of the Huntlee Project be conducted to take into account for example the junctions serving Villages 2, 3 and 4 as well as the Huntlee Town in more detail than was conducted in the 2012 Hyder Traffic Modelling work.

4. Conclusions and Recommendations

4.1 Summary

A technical sensitivity Analysis has been undertaken of the traffic planning assumptions applied as part of the Huntlee Stage 1 Development, and the subsequent approval conditions relating to threshold "triggers on infrastructure improvements that called for upgrades of roads and intersections up to the level of development reaching 1500 lots.

The review has as its base the Hyder Report, and has considered assumptions made relating to 2016 (real) traffic flow, distribution and assignment criteria, updates on trip generation rates published by NSW RMS in August 2013, and the lot "triggers" for timing of upgrades. The sequencing of upgrades was also been reviewed. The Sensitivity analysis included adjusting trip generation rates, applying Background growth of RMS 10 year 15% (1.5% per annum) has been tested.

The conclusions from this sensitivity analysis are as follows:

- The overall approach to traffic assessment is still on a sound base, with appropriate trip distributions, revised trip generation and allowance for background growth being made.
- It has been noted that several of the early "trigger points" included in the Hyder Report as a short addendum did not appear to be accompanied by any technical justification or capacity review. Rather they appear to be application of a nominal number of lots only. This report has been completed specific technical analysis to confirm what the actual "trigger points" should be.
- Traffic generation rates applied for the development - The average trip generation rates (RMS 2013) applied would result in a reduction in overall trips from previous assessment levels.
- A sensitive test was completed using the maximum rates. These still result in higher "trigger" for initial upgrades.
- Trip distribution assumptions remain unchanged from those agreed in the Hyder Transport Studies conducted at the time of considering the Huntlee Stage 1 application in 2012.
- Site access assumptions have been reviewed, and the proposed interim seagull intersection was adopted for testing of the lot yield threshold against the traffic distribution and revised flows conditions as the initial access to Huntlee Stage 1 (Village One).
- A series of tests were conducted for the range of other initial road and intersection upgrades, focussing on intersections [A-5], [A-1] and Wine Country Drive
- The analysis of the revised impacts on external roads and intersections shows there is a very good case for justification of modifications to the timing of the initial road and intersection upgrades as currently nominated in the Stage 1 development conditions.

It is concluded from this sensitivity analysis of the immediate access threshold "triggers" associated with the Huntlee Stage One Project Approval that the interim intersection [A-5] is capable of accommodating traffic flows up to a threshold "trigger" of around 1250 lots / dwellings based on RMS 2013 average trip generation rates. Further the Intersection known as [A-1], the intersection of Wine Country Drive, the HEX link road and Bridge Street is also capable of handling at least this level of traffic and more. It is also concluded that the current Wine Country Drive two lane two way configuration will perform at satisfactory service levels up to around 1100 lots / dwellings based on the agreed Hyder containment level for the Huntlee Stage 1 Development.

In the event that a more conservative view of trip generation rates is applied, and maximum trip generations used, the corresponding worst case threshold "triggers" should be:

- [A-5] Upgrade seagull priority to Signals – 1000 lots / dwellings
- Wine Country Drive 4 lane dual carriageway [A-5] to [A-1] – 900 lots / dwellings
- [A-1] Upgrade Roundabout from one lane to two lane circulating – 1000 lots / dwellings

The Hyder Report included an agreement with NSW RMS to apply a 10% self-containment rate for assessing Stage 1 development impact. Applying that agreement, the corresponding threshold "triggers" would be:

- [A-5] Upgrade seagull priority to Signals – 1100 lots / dwellings
- Wine Country Drive 4 lane dual carriageway [A-5] to [A-1] – 1000 lots
- [A-1] Upgrade Roundabout from one lane to two lane circulating – 1100 lots / dwellings

The results are substantially more than the "triggers" reported in the 2012 traffic modelling work.

Whilst not reported in detail here of significant influence also will be the eventual introduction of the [A-6] Huntlee Stage 1 (Village One) second access, which has the potential to more than halve the flows using the [A-1] roundabout and the [A-5] Triton Boulevard intersection. These will be considered as part of the revised comprehensive traffic study which has to be prepared prior to a threshold of 1500 lots as required under the DA conditions

4.2 Recommendations

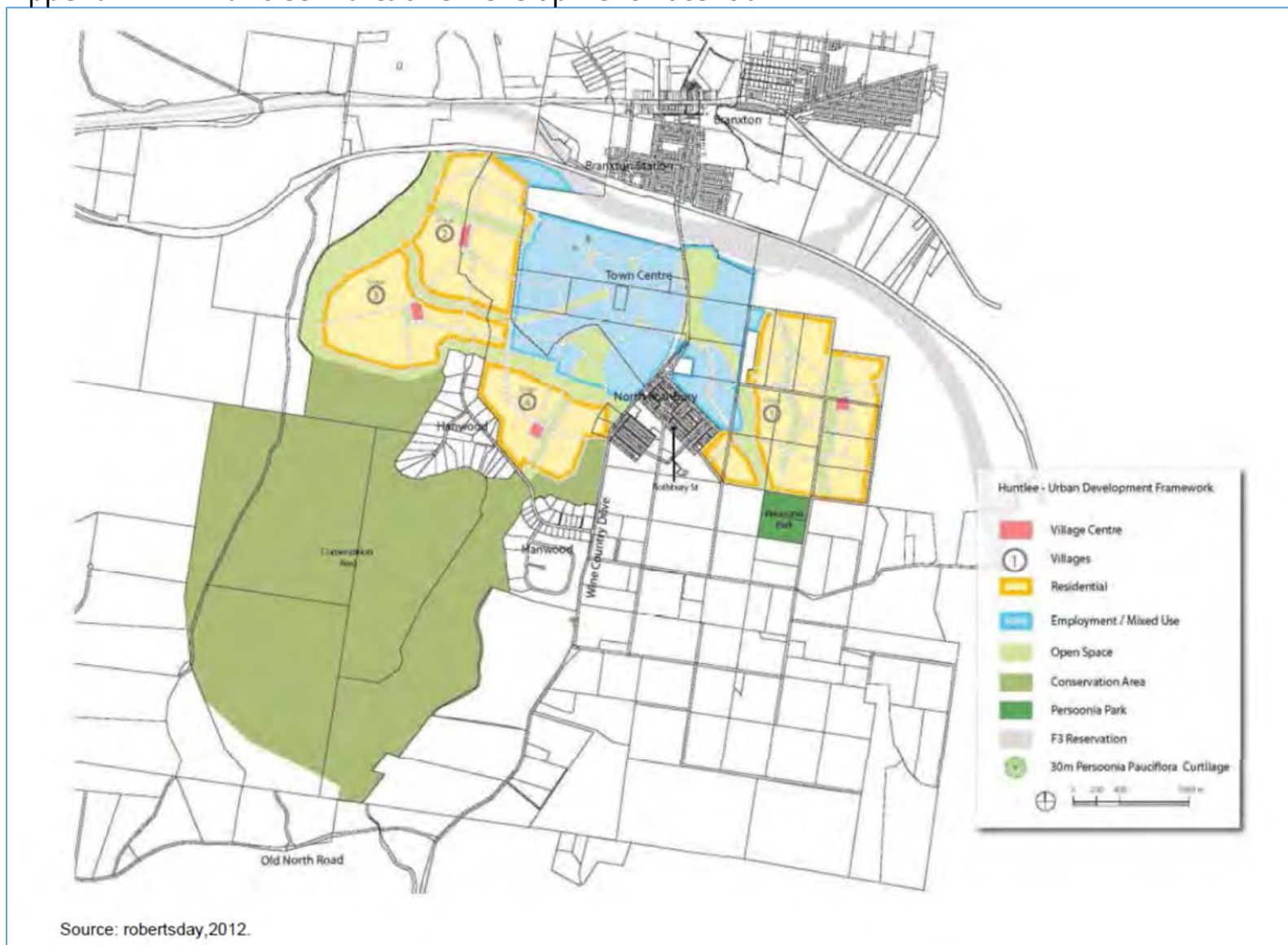
It is recommended that consideration be given to:

- 3) Adjusting the threshold "triggers to match the results reported in this sensitivity analysis.
- 4) Prepare a revised comprehensive traffic study for Huntlee prior to a threshold of 1500 lots /dwellings as required under the DA conditions. This will include (but is not limited to) network modelling:
 - a. of the impact of the second Village One access (Intersection [A-6]
 - b. with updated base and development information on access to Villages 2, 3 and 4, and to the Huntlee Town Centre.

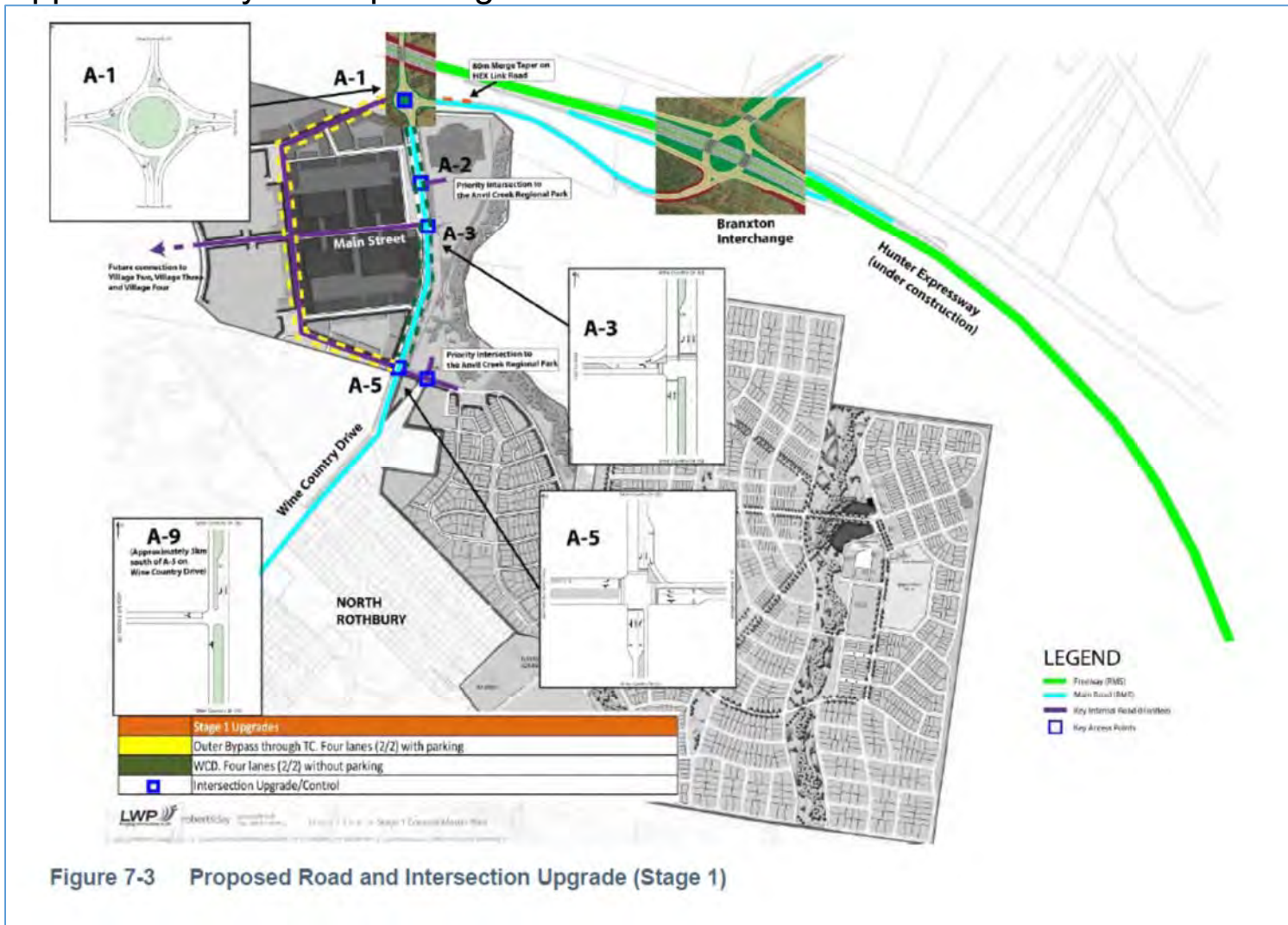
Overall the recommendations do not seek to change the long term configuration of access requirements, just the timing of the initial interim upgrades.

This work is put forward for consideration and approval by NSW Department of Planning and Environment and NSW Roads and Maritime.

Appendix A Huntlee Indicative Development Potential



Appendix B Hyder Report Figure E-1





Appendix C 2016 Traffic Surveys & Summary Data



Site Wine Country Road

Direction

[Back to Site Summary Page](#)

Day Date	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	7 days		Weekday		Weekend	
	21-03-16	22-03-16	23-03-16	17-03-16	18-03-16	19-03-16	20-03-16	Total	Average	Total	Average	Total	Average
AM Peak	09:00	10:00	10:00	06:00	07:00	09:00	11:00	N/A	09:00	N/A	06:00	N/A	09:00
PM Peak	15:00	16:00	12:00	16:00	16:00	19:00	17:00	N/A	16:00	N/A	12:00	N/A	16:00
00:00	13	17	21	26	38	32	46	193	28	115	23	78	39
01:00	12	16	11	18	11	24	28	120	17	68	14	52	26
02:00	8	7	5	12	13	16	19	80	11	45	9	35	18
03:00	11	14	15	20	10	8	8	86	12	70	14	16	8
04:00	76	82	83	68	82	35	21	447	64	391	78	56	28
05:00	230	253	242	239	263	113	72	1412	202	1227	245	185	93
06:00	329	344	361	346	325	122	79	1906	272	1705	341	201	101
07:00	392	426	429	439	391	191	152	2420	346	2077	415	343	172
08:00	468	505	467	486	444	255	128	2753	393	2370	474	383	192
09:00	360	369	374	431	366	288	251	2439	348	1900	380	539	270
10:00	315	321	302	420	347	373	293	2371	339	1705	341	666	333
11:00	314	340	344	401	378	386	397	2560	366	1777	355	783	392
12:00	270	321	327	390	347	363	374	2392	342	1655	331	737	369
13:00	292	347	363	435	443	327	295	2502	357	1880	376	622	311
14:00	375	394	380	446	443	360	328	2726	389	2038	408	688	344
15:00	467	517	473	527	442	259	337	3022	432	2426	485	596	298
16:00	440	492	451	43	459	303	306	2494	356	1885	377	609	305
17:00	440	452	486	0	484	301	275	2438	348	1862	372	576	288
18:00	228	291	308	0	310	256	186	1579	226	1137	227	442	221
19:00	163	219	204	188	246	186	120	1326	189	1020	204	306	153
20:00	97	104	127	145	103	107	80	763	109	576	115	187	94
21:00	66	76	74	83	89	78	60	526	75	388	78	138	69
22:00	49	53	77	65	80	105	27	456	65	324	65	132	66
23:00	26	41	36	23	48	49	23	246	35	174	35	72	36
Total	5441	6001	5960	5251	6162	4537	3905	37257	5321	28815	5762	8442	4226
% Heavy	7.68%	9.30%	8.84%	11.52%	6.93%	2.82%	1.33%	7.29%		8.80%		2.13%	

TURNING MOVEMENT SURVEY

Bridge St and Wine Country Dr, Branxton

Thursday, 17 March 2016

Saturday, 19 March 2016

Weather:	Overcast
Suburban:	Carnegie
Customer:	BTF

Survey Start	
AM:	7:00
PM:	15:00
Weekend	10:00

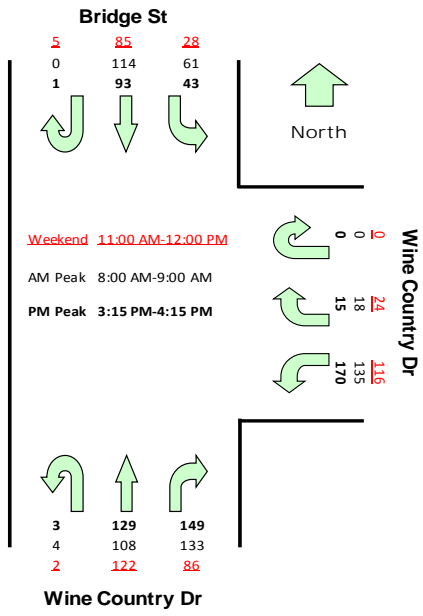
Peakhour	
AM:	8:00 AM-9:00 AM
PM:	3:15 PM-4:15 PM
Weekend	11:00 AM-12:00 PM

All vehicles

Time		North Approach Bridge St			East Approach Wine Country			Douth Approach Wine Country			Hourly Total	
Period Start	Period End	U	SB	L	U	R	L	U	R	NB	Hour	Peak
7:00	7:15	0	13	7	0	2	31	3	35	10	494	
7:15	7:30	0	17	15	0	2	36	3	25	16	513	
7:30	7:45	0	32	18	0	8	41	2	36	17	549	
7:45	8:00	0	33	8	0	6	32	0	30	16	550	
8:00	8:15	0	21	19	0	3	29	2	33	13	573	Peak
8:15	8:30	0	29	12	0	5	41	0	42	21	549	
8:30	8:45	0	28	12	0	3	39	2	29	42	495	
8:45	9:00	0	36	18	0	7	26	0	29	32	450	
9:00	9:15	0	19	11	0	2	21	0	22	21	385	
9:15	9:30	0	22	10	0	4	21	2	22	15		
9:30	9:45	0	21	7	0	3	27	0	25	27		
9:45	10:00	0	8	7	0	1	19	0	26	22		
15:00	15:15	0	22	11	0	8	31	0	30	31	597	
15:15	15:30	1	35	11	0	5	46	0	33	34	603	Peak
15:30	15:45	0	19	16	0	6	38	1	44	32	580	
15:45	16:00	0	22	6	0	3	42	1	34	35	566	
16:00	16:15	0	17	10	0	1	44	1	38	28	557	
16:15	16:30	0	15	13	0	7	36	1	35	35	418	
16:30	16:45	0	25	12	0	6	43	1	31	24	276	
16:45	17:00	0	13	12	0	7	41	0	45	16	134	
17:00	17:15	0	25	10	0	9	38	1	37	33	516	
17:15	17:30	0	26	13	0	10	42	0	33	37		
17:30	17:45	0	20	9	0	11	34	0	35	19		
17:45	18:00	0	2	4	0	6	27	0	20	15		
10:00	10:15	0	12	7	0	0	25	1	25	15	403	
10:15	10:30	0	23	4	0	2	37	0	15	20	427	
10:30	10:45	0	19	6	0	2	28	0	30	20	435	
10:45	11:00	1	20	7	0	7	25	1	23	28	447	
11:00	11:15	3	19	7	0	5	37	1	14	23	468	Peak
11:15	11:30	1	22	10	0	6	18	1	18	33	462	
11:30	11:45	1	26	5	0	6	30	0	21	28	443	
11:45	12:00	0	18	6	0	7	31	0	33	38	422	
12:00	12:15	0	14	6	0	3	27	0	22	31	386	
12:15	12:30	0	21	2	0	1	28	0	20	18	388	
12:30	12:45	0	15	7	0	4	20	1	20	29	369	
12:45	13:00	0	11	5	0	6	30	0	22	23	365	
13:00	13:15	0	16	8	0	4	28	1	24	24	349	
13:15	13:30	1	12	8	0	2	15	0	17	16		
13:30	13:45	0	18	4	0	7	25	0	28	10		
13:45	14:00	0	7	7	0	6	25	0	21	15		

Peak Time		North Approach Bridge St			East Approach Wine Country			Douth Approach Wine Country			Peak total
Period Start	Period End	U	T	L	U	R	L	U	R	T	
8:00	9:00	0	114	61	0	18	135	4	133	108	573
15:15	16:15	1	93	43	0	15	170	3	149	129	603
11:00	12:00	5	85	28	0	24	116	2	86	122	468

Graphic



Light Vehicles

Time		North Approach Bridge St			East Approach Wine Country			Douth Approach Wine Country		
Period Start	Period End	U	SB	L	U	R	L	U	R	NB
7:00	7:15	0	13	7	0	2	24	1	34	9
7:15	7:30	0	15	15	0	2	28	3	23	11
7:30	7:45	0	27	15	0	6	34	0	32	14
7:45	8:00	0	30	8	0	6	27	0	26	13
8:00	8:15	0	20	15	0	3	24	1	26	13
8:15	8:30	0	27	12	0	5	32	0	37	19
8:30	8:45	0	27	11	0	3	30	2	26	40
8:45	9:00	0	34	18	0	7	18	0	25	28
9:00	9:15	0	18	10	0	1	16	0	18	19
9:15	9:30	0	20	10	0	3	20	1	16	14
9:30	9:45	0	20	6	0	2	23	0	21	26
9:45	10:00	0	7	6	0	1	15	0	17	22
15:00	15:15	0	21	11	0	8	27	0	25	28
15:15	15:30	1	33	10	0	5	42	0	28	33
15:30	15:45	0	18	15	0	6	31	0	37	31
15:45	16:00	0	21	6	0	3	38	0	29	33
16:00	16:15	0	15	9	0	1	42	0	34	25
16:15	16:30	0	13	9	0	7	35	1	31	35
16:30	16:45	0	25	10	0	6	43	0	29	24
16:45	17:00	0	13	12	0	7	39	0	42	15
17:00	17:15	0	23	9	0	9	35	0	35	32
17:15	17:30	0	26	13	0	10	41	0	31	36
17:30	17:45	0	19	9	0	10	34	0	33	19
17:45	18:00	0	2	4	0	6	27	0	20	15
10:00	10:15	0	12	7	0	0	21	0	24	14
10:15	10:30	0	23	4	0	2	36	0	15	19
10:30	10:45	0	19	6	0	2	28	0	30	20
10:45	11:00	1	19	7	0	6	25	1	22	27
11:00	11:15	3	19	6	0	5	36	1	14	23
11:15	11:30	1	22	10	0	6	17	1	18	33
11:30	11:45	1	25	4	0	6	29	0	20	28
11:45	12:00	0	18	6	0	7	30	0	32	38
12:00	12:15	0	14	6	0	3	27	0	22	30
12:15	12:30	0	21	2	0	1	26	0	20	18
12:30	12:45	0	15	7	0	4	18	1	20	29
12:45	13:00	0	10	5	0	4	28	0	21	22
13:00	13:15	0	16	7	0	4	28	1	21	24
13:15	13:30	1	12	8	0	2	15	0	17	16
13:30	13:45	0	18	4	0	7	24	0	27	10
13:45	14:00	0	7	7	0	6	24	0	20	15

Heavy Vehicles

Time		North Approach Bridge St			East Approach Wine Country			Douth Approach Wine Country I		
Period Start	Period End	U	SB	L	U	R	L	U	R	NB
7:00	7:15	0	0	0	0	0	7	2	1	1
7:15	7:30	0	2	0	0	0	8	0	2	5
7:30	7:45	0	5	3	0	2	7	2	4	3
7:45	8:00	0	3	0	0	0	5	0	4	3
8:00	8:15	0	1	4	0	0	5	1	7	0
8:15	8:30	0	2	0	0	0	9	0	5	2
8:30	8:45	0	1	1	0	0	9	0	3	2
8:45	9:00	0	2	0	0	0	8	0	4	4
9:00	9:15	0	1	1	0	1	5	0	4	2
9:15	9:30	0	2	0	0	1	1	1	6	1
9:30	9:45	0	1	1	0	1	4	0	4	1
9:45	10:00	0	1	1	0	0	4	0	9	0
15:00	15:15	0	1	0	0	0	4	0	5	3
15:15	15:30	0	2	1	0	0	4	0	5	1
15:30	15:45	0	1	1	0	0	7	1	7	1
15:45	16:00	0	1	0	0	0	4	1	5	2
16:00	16:15	0	2	1	0	0	2	1	4	3
16:15	16:30	0	2	4	0	0	1	0	4	0
16:30	16:45	0	0	2	0	0	0	1	2	0
16:45	17:00	0	0	0	0	0	2	0	3	1
17:00	17:15	0	2	1	0	0	3	1	2	1
17:15	17:30	0	0	0	0	0	1	0	2	1
17:30	17:45	0	1	0	0	1	0	0	2	0
17:45	18:00	0	0	0	0	0	0	0	0	0
10:00	10:15	0	0	0	0	0	4	1	1	1
10:15	10:30	0	0	0	0	0	1	0	0	1
10:30	10:45	0	0	0	0	0	0	0	0	0
10:45	11:00	0	1	0	0	1	0	0	1	1
11:00	11:15	0	0	1	0	0	1	0	0	0
11:15	11:30	0	0	0	0	0	1	0	0	0
11:30	11:45	0	1	1	0	0	1	0	1	0
11:45	12:00	0	0	0	0	0	1	0	1	0
12:00	12:15	0	0	0	0	0	0	0	0	1
12:15	12:30	0	0	0	0	0	2	0	0	0
12:30	12:45	0	0	0	0	0	2	0	0	0
12:45	13:00	0	1	0	0	2	2	0	1	1
13:00	13:15	0	0	1	0	0	0	0	3	0
13:15	13:30	0	0	0	0	0	0	0	0	0
13:30	13:45	0	0	0	0	0	1	0	1	0
13:45	14:00	0	0	0	0	0	1	0	1	0



Appendix D Sensitivity Analysis Traffic Flow Diagrams

HUNTLEE BTF 2016 ACCESS REVIEW - EXISTING FLOWS

64 AM

94 PM

WINE COUNTRY DRIVE

NB AM
NB PM

U-TURN THRU LEFT

0 114 61
1 93 43

[A-1]

4 112 133
3 129 149

U-TURN THRU RIGHT

249 249
281 263

286 15% growth 286 SB AM
323 15% growth 302 SB PM

THRU LEFT

[A-5]

THRU RIGHT

HEX LINK ROAD

EB AM WB PM EB AM WB PM

18 15 RIGHT 194 192 223 221

0 0 U-TURN 15% growth

135 170 LEFT 135 170 155 196

WB AM WB PM EB AM WB PM

LEFT

RIGHT

[A-6]

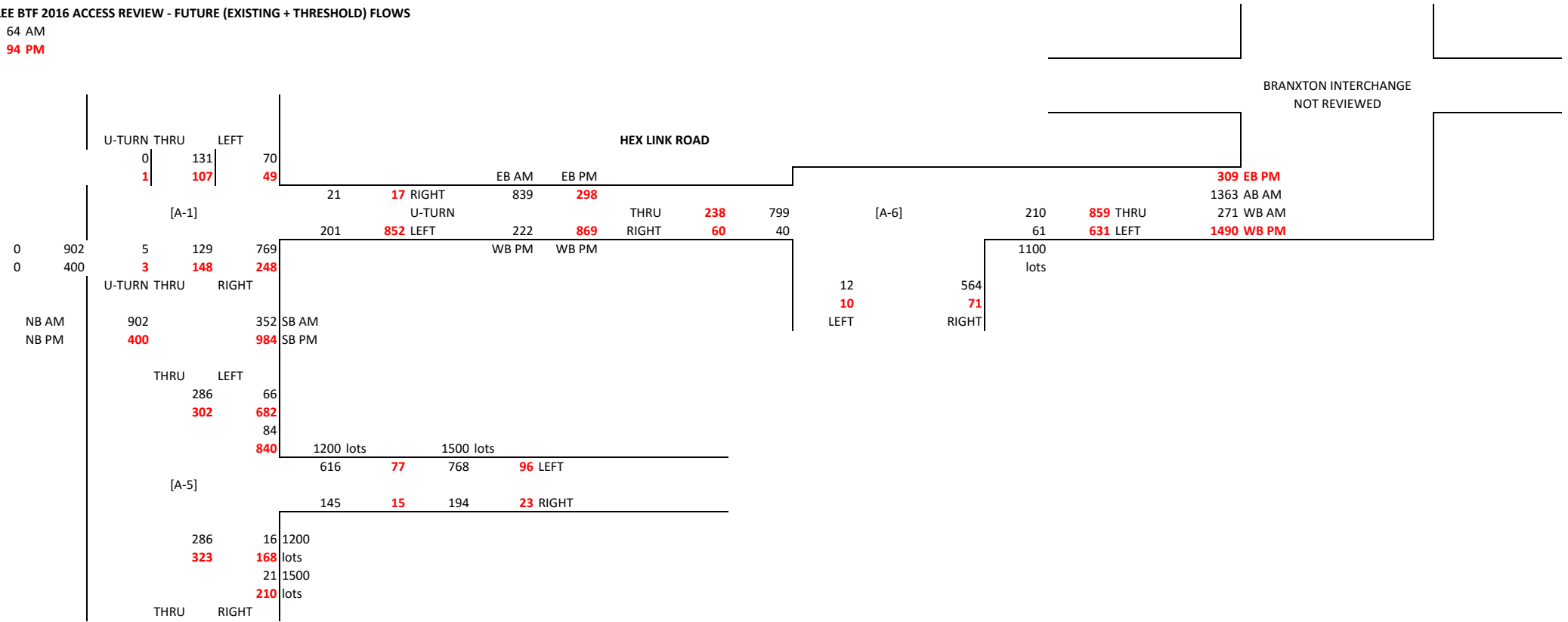
THRU
LEFT

BRANXTON INTERCHANGE
NOT REVIEWED

HUNTLEE BTF 2016 ACCESS REVIEW - FUTURE (EXISTING + THRESHOLD) FLOWS

64 AM
94 PM

WINE COUNTRY DRIVE

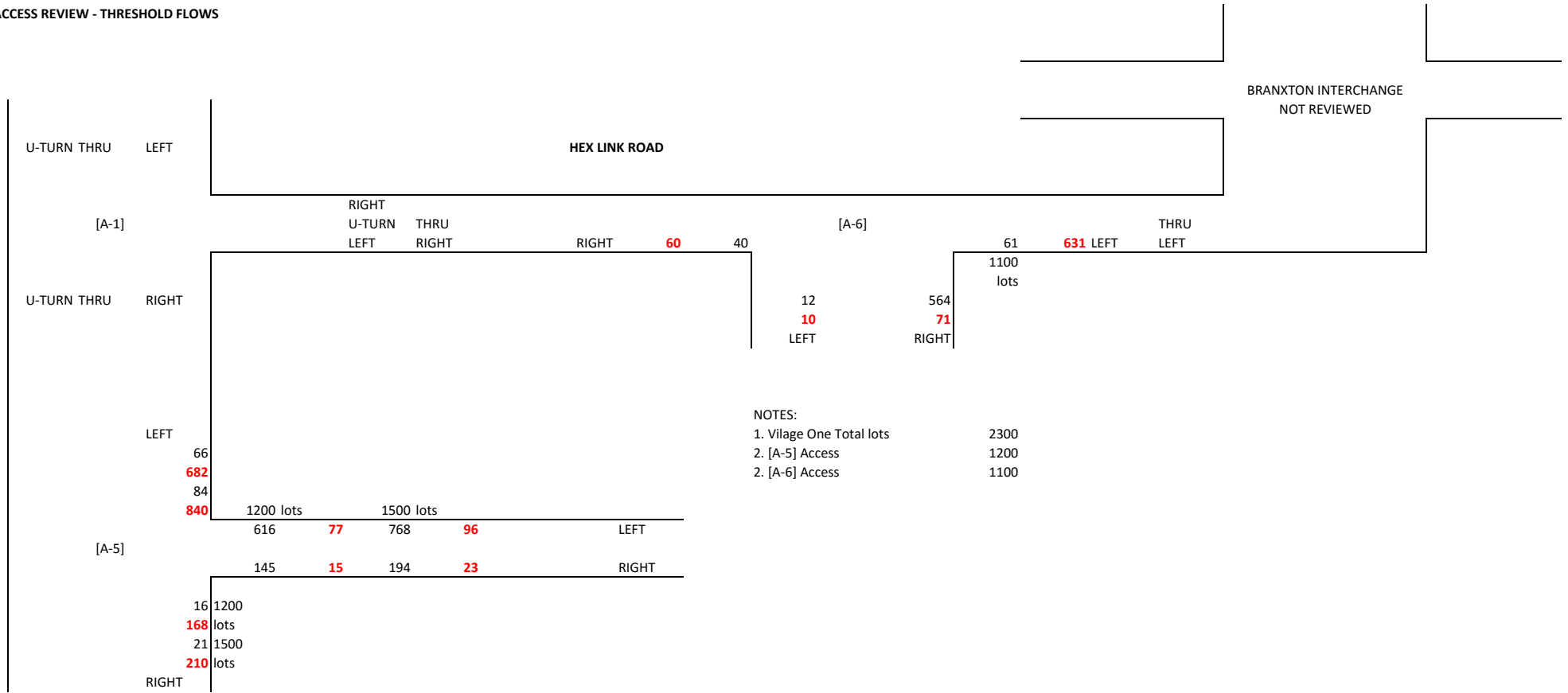


HUNTLEE BTF 2016 ACCESS REVIEW - THRESHOLD FLOWS

64 AM

94 PM

WINE COUNTRY DRIVE



NOTES:

- 1. Village One Total lots 2300
- 2. [A-5] Access 1200
- 2. [A-6] Access 1100

Appendix E RMS Correspondence & Responses

4

- Hyder Traffic Report

- The traffic analysis undertaken by Hyder was based on comprehensive modelling which included a road based micro-simulation model for the study area as well as intersection analysis, using SIDRA.
- The Hyder Traffic report clearly considers modelling of network scenarios for Stage 1 and full development of Huntlee
- The outcome of this analysis demonstrated that *Wine Country Drive widening between Entry Village One access and HEX link Road is the most critical upgrade required to accommodate Stage 1 development. Concurrently, key intersections with Wine Country Drive are required to upgrade.*
- The road and intersection improvements in Figure E-1 of the Hyder Report were recommended to cater for additional traffic from Stage 1 development.

- NO ACTION
- NO ACTION
- NO ACTION
- (Huntlee to confirm WCD Stage 2 status)
- **BTF to include Figure E-1 of the Hyder Report in updated version for reference.**

- See below

- Noted and not disputed. The Hyder report has been duly referenced and where necessary the trip distributions, assignments etc. applied in the BTF threshold analysis. The BTF work should not be viewed as a “replacement” of the Hyder Report, rather a refinement on specific issues as described below.
- Wine Country Drive Stage 1 has already been built. Wine Country Drive Stage 2 upgrade design has been finalised and construction is imminent. This completes the first stages of upgrade of Wine Country Drive from Village One access to the HEX link Road.
- Huntlee Pty Ltd commissioned BTF to conduct a review of the Hyder report in view of the following significant changes since the completion of the Hyder work (2012) and the granting of Village One Approval:
 - Opening of the Hunter Expressway in 2013
 - RMS publishing updated traffic generation rates for a range of land use types, including but not limited to residential dwellings. Also in 2013.

NOTE: Both these issues have meant that the traffic analysis and modelling work completed prior to 2013 are brought into question, both from the standpoint of actual base traffic flows post HEX opening, and also modified traffic generation rates. See below.

15/11/16

**21/11/16
DONE**

5

- Traffic Generation

- Roads and Maritime published a Technical Direction in August 2013 to supplement traffic data in the Guide to Traffic Generating Developments (2002)
- The traffic surveys for low density residential dwellings were undertaken in 2010 as noted in the document.

- NO ACTION
- NO ACTION

- See Below

- Noted, agreed and applied. The average rates as nominated have been applied.
- Noted, not disputed.
- Noted, not disputed.

	<ul style="list-style-type: none"> ○ The updated trip rates for the PM peak hour is 0.78 (max 0.9) and the AM peak hr is 0.71 (max 0.85) per dwelling in regional areas. ○ Roads and Maritime does not accept the revised trip rates in the BTF report which are based on minimum rates. It is considered that the maximum rate should be adopted for a new urban release area on a Greenfield site with minimum public transport options and no existing commercial facilities. 	<ul style="list-style-type: none"> ○ BTF just clarifying the Hyder versus BTF versus RMS max rates. 	<ul style="list-style-type: none"> ○ BTF applied the RMS published “average” trip rates. The scale of the Huntlee village, including the associated town centre activity, school, and village centre suggests the village will not be a completely isolated development as it develops. ○ The Hyder Report includes reference to a specific agreement with NSW RMS to apply 10% self-containment to Huntlee Stage 1 <p>Notwithstanding this, Additional analysis has been completed applying the RMS maximum rates, and the Hyder / RMS agreed 10% self-containment Rates. The results of this additional sensitivity test show that the Stage One Village One threshold should be set at a minimum of lot threshold as follows:</p> <ul style="list-style-type: none"> ▪ 1250 lots (BTF using RMS average rates) ▪ ~ 1000 lots (using RMS maximum rates) ▪ ~ 1100 lots (using previously agreed Hyder / RMS rates) <p>BTF Sensitivity Analysis Threshold “trigger” has been updated to reflect these results.</p>	21/11/16
6	<p>- Traffic Surveys</p> <ul style="list-style-type: none"> ○ Hyder undertook an extensive data collection as part of their traffic analysis which included key roads and intersections in the study area. Three types of data were collected by traffic surveys including mid-block counts, intersection turning movements Counts and queue length surveys at critical intersections. 	<p>- Clarification Only. NO ACTION REQUIRED</p>	<p>- The traffic data collection by Hyder (in 2012 or earlier) was all completed before the Hunter Expressway opening. It is therefore quite sensible and good practice to conduct new surveys as the data is now:</p> <ul style="list-style-type: none"> ○ More than 4 years old ○ Does not reflect posts opening Hunter Expressway flows on Wine Country Drive. <p>- BTF commissioned two types of surveys in early 2016, focussed on Wine Country Drive operations and the immediate access requirements of Huntlee Stage One:</p> <ul style="list-style-type: none"> ○ Turning movement surveys at Wine Country Drive and Bridge Street on Thursday 1th arch 2016 and Saturday 19th March 2016 ○ A 7 day two way mid-block count was undertaken on Wine Country Drive south of the Bridge Street / Wine Country Drive intersection. 	

		<p>- BTF – UPDATE DOING THIS NOW</p>	<p>- The BTF DN has been updated to include the mid-block count data which shows that the Thursday Peak data applied in the threshold analysis represents the highest peak flows over the consecutive Thursday Friday Saturday flow period.</p>	<p>21/11/16</p>
	<p>- Application of RMS Traffic Modelling Guidelines (2013) - The traffic report for the proposed modification shall be prepared in accordance with the Roads and Maritime’s <i>Traffic Modelling Guidelines (2013)</i> and is to include but not be limited to the following: - <ul style="list-style-type: none"> o Identification of the relevant vehicular traffic routes and intersections for access to / from the subject site. o Current traffic counts for all of the traffic routes and intersections, including but not limited to the Wine Country Drive / Bridge Street intersection. o The anticipated additional vehicular traffic generated (Both heavy and light vehicles) from both the construction and completed stages of the development. o The distribution on the road network of the trips generated by the proposed development. It is requested that the predicated traffic flows are shown diagrammatically to a level of detail sufficient for easy interpretation. o Consideration of the traffic impacts on existing and proposed intersections and the capacity of the local and classified road network to safely and efficiently cater for the additional vehicular traffic generated by the proposed development </p>	<p>- BTF Comment - Consider MW Modelling CV to updated Report. - Clarification Only. NO ACTION REQUIRED - BTF to add 7 day data to updated report. - Clarification Only. NO ACTION REQUIRED - Clarification Only. NO ACTION REQUIRED. - Clarification Only. NO ACTION REQUIRED.</p>	<p>- BTF has been performing Traffic Impact Analysis and Traffic Modelling work for over 25 years and is fully conversant with these RMS Guidelines. Tools applied have included (but have not been not limited to) NETANAL, SATURN, EMME/2, Paramics, TransCAD, Transyt, PICADY, ARCADY, SIDRA. - SIDRA Analysis was applied for this sensitivity analysis using the distributions as nominated in the approved Hyder Work. <ul style="list-style-type: none"> o Village One has one access point to Wine Country Drive (Triton Boulevard) [A-5] until access {a-6} is built connecting to the HEX link road at 1900 lots. As such SIDRA analysis is considered very appropriate for considering the detailed operation of this junction for dwelling numbers up to that second access around 1900 lots. o March 2016 data has been collected and is considered that this covers this RMS request. o It is assumed that the comprehensive Hyder Report that has been approved by RMS has covered these longer term issues. The Current threshold review is a sensitivity analysis of the triggers for upgrades, and is not seeking to change the long term form of any road infrastructure improvement noted in the project approvals. o Turning movement diagrams have already been prepared for the critical intersections under consideration in this threshold review. The distribution on the road network has been taken from the data published in the comprehensive Hyder Traffic Report. o It is assumed that the comprehensive Hyder Report that has been approved by RMS has covered these longer term issues. The Current threshold review is a sensitivity analysis of the triggers for upgrades, and is not seeking to change </p>	<p>21/11/16</p>

	<p>during the construction and completed stages. Traffic Impact shall also include the cumulative traffic impact of other proposed developments in the area.</p> <ul style="list-style-type: none"> ○ Traffic analysis of any major / relevant intersections impacted, using SIDRA or similar traffic model, including: <ul style="list-style-type: none"> ▪ Current traffic Counts and 10 year traffic growth projections ▪ With and Without development scenarios ▪ 95th Percentile back of queue lengths ▪ Delays and level of service on all legs for the relevant intersections ▪ Electronic data for Roads and Maritime review. 	<ul style="list-style-type: none"> - BTF to provide Electronic Data. 	<p>the long term form of any road infrastructure improvement noted in the project approvals.</p> <ul style="list-style-type: none"> ○ The relevant intersections are considered to be those nominated in the Hyder Traffic Report, and which have been approved for upgrade as part of the Development consent. <ul style="list-style-type: none"> ▪ BTF have applied these as standard practice and the Threshold Analysis Design Note confirms this. ▪ Each of these requests can be met and data provided as is standard practice. Notice of when / where and to whom this data should be provided is required. 	
8	<ul style="list-style-type: none"> - Other closing matters - Roads and Maritime considers that the traffic analysis undertaken by BTF is not adequate as it only considers individual intersection capacity of future upgrades and does not consider a future network of intersections which form part of the Stage 1 Huntlee Approval. <p>- Roads and Maritime requires the intersection analysis to include a network based model which includes all intersections upgrades as</p>	<ul style="list-style-type: none"> - Clarification Only. NO ACTION REQUIRED. 	<ul style="list-style-type: none"> - The comprehensive Hyder Traffic Report was completed at considerable expense by Huntlee Pty Ltd to satisfy the approval requirements of NSW Government agencies. Its long term results and agreed road infrastructure upgrades are not being challenged by the BTF work. - BTF was commissioned only to complete a series of sensitivity tests on the isolated junctions, the first of which is a stand-alone single intersection for Village One for potentially a considerable length of time. - The two intersections of most significance here are: <ul style="list-style-type: none"> ▪ Intersection [A-5] where the sensitivity tests suggest an increase in the lot threshold from 500 lots to between 1000- and 1200 lots ▪ Intersection [A-1] (Wine Country Drive / Bridge Street Roundabout where the sensitivity tests suggest an increase in the lot threshold from 500 lots to between 1000- and 1200 lots ▪ The lower value quoted here is a result of applying the RMS maximum values for trip rates as a further sensitivity test. 	

	<p>part of Stage 1 to be prepared in accordance with RMS Traffic Modelling Guidelines.</p> <ul style="list-style-type: none">- Roads and Maritime objects to the proposed modifications to Condition E7 of the consent and requires that the issues raised above be clarified and additional information be provided for further review and considerations.	<ul style="list-style-type: none">- Clarification Only. <p>NO ACTION REQUIRED.</p>	<ul style="list-style-type: none">- Network modelling where there is only a single intersection is not only costly, it is unnecessary for this particular series of tests and stage of the project.- The objection is noted. Respectfully the clarifications provided here plus the updated reporting are considered to address ALL of the RMS objections.- It is recommended that a meeting between technical officers of the various parties occur to avoid further misinterpretation of the technical work, and also further unnecessary delays.	
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2 November 2016

CR2016/004474
SF2012/004409
TR

NSW Department of Planning & Environment
Modification Assessments
GPO Box 39
SYDNEY NSW 2001

Attention: Fiona Gibson

WINE COUNTRY DRIVE (B82): NOTIFICATION OF SECTION 75W MODIFICATION TO STAGE 1 PROJECT APPROVAL FOR HUNTLEE NEW TOWN, WINE COUNTRY DRIVE, BRANXTON (MP 10_0137 MOD 6)

Reference is made to the Department's email dated 14 September 2016, regarding the modification application to the Huntlee Stage 1 Project Approval which was referred to Roads and Maritime Services (Roads and Maritime) for comment.

Roads and Maritime understands that the modification to the Stage 1 Project Approval seeks to amend conditions relating to:

- The timing of the provision of road infrastructure upgrades
- Requirements for remediation
- The provision of a substation
- Changes to the Overall Stage 1 Masterplan for the addition of two lots

In particular the modification seeks to provide revised timeframes for the upgrade and completion of various traffic intersection and infrastructure works required under Condition E7 Road Network of the Stage 1 Consent (MP10_0137).

Roads and Maritime response and requirements

Roads and Maritime has reviewed the information provided including the Better Transport Futures Project Design Note titled *Intersection & Road Upgrade Threshold Analysis Review* dated 12 August 2016 and the McLaren Traffic Engineering's *Peer Review of Huntlee Threshold Analysis of Huntlee Stage One at Huntlee Town Centre* dated 3rd August 2016. It should be noted that the McLaren Traffic Engineering peer review was based on a Better Transport Futures report dated 18 July 2016 that was not provided to Roads and Maritime and did not form part of this assessment.

Notwithstanding the above, Roads and Maritime provides the following comments for the Department's consideration:

- There appears to be some discrepancy in the proposed lot yield for Stage 1 of the Huntlee development, which is required to be clarified in the traffic report.
 - The Stage 1 Preferred Project Report, Traffic modelling Vol 1 by Hyder (July 2012) – states that Stage 1 subdivision will include 2,345 dwellings.
 - Project Design Note, Better Transport Futures (August 2016) states that Stage 1 (Village One) full capacity of around 2,300 dwellings.
 - Stage 1 Huntlee MP10_0137 – 1,473 residential lots, 14 super lots, 1 primary school lot, drainage and open reserves.

Hyder Traffic Report

- The traffic analysis undertaken by Hyder was based on comprehensive modelling which included a road based micro-simulation model for the study area as well as intersection analysis, using SIDRA.
- The Hyder report clearly considers modelling of network scenarios for Stage 1 and full development of Huntlee.
- The outcome of this analysis demonstrated that *Wine Country Drive widening between Entry Village one access and HEX Link Road is the most critical upgrade required to accommodate Stage 1 development. Concurrently, key intersections with the Wine Country Drive are required to upgrade.*
- The road and intersection improvements in Figure E-1 of the Hyder report were recommended to cater for additional traffic from the Stage 1 development.

Traffic Generation

- Roads and Maritime published a Technical Direction in August 2013 to supplement traffic data in the Guide to Traffic Generating Developments (2002).
- The traffic surveys for low density residential dwellings were undertaken in 2010 as noted in the document.
- The updated trip rates for the PM peak hour is 0.78 (max 0.9) and the AM peak hour is 0.71 (max 0.85) per dwelling in regional areas.
- Roads and Maritime does not accept the revised trip rates in the BTF report which are based on minimum rates. It is considered that the maximum trip rate should be adopted for a new urban release area on a greenfield site with minimum public transport options and no existing commercial facilities.

Traffic Surveys

- Hyder undertook an extensive data collection as part of their traffic analysis which included key roads and intersections in the study area. Three types of data were collected by traffic surveys including midblock counts, intersection turning movement counts and queue length surveys at critical intersections.
- Attachment C of the BTF report includes the updated traffic surveys undertaken in March 2016. The 'Turning Movement' survey provides counts at the intersection of Wine Country Drive and Bridge Street for one week day (Thursday March 17th) and one Saturday (March 19th).
- Roads and Maritime does not consider the updated traffic survey data adequate for the purpose of providing accurate current traffic volumes
- As a minimum, Roads and Maritime requires 3 consecutive days of traffic surveys to determine an accurate indication of traffic volumes at this location.

Furthermore, the traffic report for the proposed modification shall be prepared in accordance with the Roads and Maritime's *Traffic Modelling Guidelines (2013)* and is to include (but not be limited to) the following:

- Identification of the relevant vehicular traffic routes and intersections for access to / from the subject site.
- Current traffic counts for all of the traffic routes and intersections, including but not limited to the Wine Country Drive / Bridge Street intersection.
- The anticipated additional vehicular traffic generated (both heavy and light vehicles) from both the construction and completed stages of the development.
- The distribution on the road network of the trips generated by the proposed development. It is requested that the predicted traffic flows are shown diagrammatically to a level of detail sufficient for easy interpretation.
- Consideration of the traffic impacts on existing and proposed intersections and the capacity of the local and classified road network to safely and efficiently cater for the additional vehicular traffic generated by the proposed development during the construction and completed stages. The traffic impact shall also include the cumulative traffic impact of other proposed developments in the area.
- Traffic analysis of any major / relevant intersections impacted, using SIDRA or similar traffic model, including:
 - Current traffic counts and 10 year traffic growth projections
 - With and without development scenarios
 - 95th percentile back of queue lengths
 - Delays and level of service on all legs for the relevant intersections
 - Electronic data for Roads and Maritime review.

Roads and Maritime considers that the traffic analysis undertaken by BTF is not adequate as it only considers individual intersection capacity of future upgrades and does not consider a future network of intersections which form part of the Stage 1 Huntlee approval.

Roads and Maritime requires the intersection analysis to include a network based model which includes all intersection upgrades as part of Stage 1 to be prepared in accordance with RMS Traffic Modelling Guidelines.

Accordingly, Roads and Maritime objects to the proposed modifications to Condition E7 of the consent and requires that the issues raised above be clarified and additional information be provided for further review and consideration.

On the Minister's determination of this matter, please forward a copy of the determination to Roads and Maritime for record and / or action purposes. Should you require further information please contact David Collaguazo on 4924 0334 or by email at development.hunter@rms.nsw.gov.au

Yours sincerely



David Collaguazo
A/Manager Land Use Assessment
Hunter Region

Appendix F SIDRA Intersection Modelling Scenarios

Huntlee Stage 1 Review
Dataset is May 2016

Model Applied: SIDRA INTERSECTION⁷
VERSION 7.0.1.6263
Licensed to: Mark Waugh Pty Ltd
Licence ID: 6029099
Licence Type: NETWORK / 1PC

Junctions reviewed: Wine Country Drive Stage One Access [A-5], [A-6], Roundabout [A-1]

Land use Scenarios: Huntlee Stage 1 (Village 1): UP to 2345 dwellings

Electronic SIDRA Files are available and provided to an Authorised officer of the road authorities as per Better Transport Futures Terms and Conditions.

Scenarios tested:

Existing (2016) (POST HUNTER EXPRESSWAY)

1. A-5 Priority Seagull Intersection 2016 AM
2. A-5 Priority Seagull Intersection 2016 PM
3. A-1 Roundabout Intersection 2016 AM
4. A-1 Roundabout Intersection 2016 PM

“With” Development – Seagull Intersection [A-5]

5. A-5 Priority Seagull Intersection 2016 AM – 1200 Lots
6. A-5 Priority Seagull Intersection 2016 PM – 1200 Lots
7. A-5 Priority Seagull Intersection 2016 AM – 1250 Lots
8. A-5 Priority Seagull Intersection 2016 PM – 1250 Lots
9. A-5 Priority Seagull Intersection 2016 AM – 1500 Lots
10. A-5 Priority Seagull Intersection 2016 PM – 1500 Lots

“With” Development – Roundabout Intersection [A-1]

11. A-1 Roundabout Intersection 2016 AM – 1200 Lots
12. A-1 Roundabout Intersection 2016 PM – 1200 Lots
13. A-1 Roundabout Intersection 2016 AM – 1500 Lots
14. A-1 Roundabout Intersection 2016 PM – 1500 Lots

Note on Nominated Lots – the Nominated Lots in each scenario represent the RMS Average trip generation profile. Hyder 10% containment and RMS Maximum Trip Generation Rates are a simple numerical factorisation of these scenarios.

MOVEMENT SUMMARY - Intersection of WCD / Bridge/ HEXL Link Rd

 Site: 101 [A-1 AM+1500(RMSAveTG)]

A-1 Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
South: Wine Country Drive											
2	T1	157	0.0	0.711	4.4	LOS A	9.9	69.3	0.29	0.55	52.8
3	R2	1003	0.0	0.711	9.0	LOS A	9.9	69.3	0.29	0.55	52.8
Approach		1160	0.0	0.711	8.4	LOS A	9.9	69.3	0.29	0.55	52.8
East: HEX Link Rd											
4	L2	284	0.0	0.259	4.8	LOS A	1.8	12.5	0.44	0.54	53.9
6	R2	27	0.0	0.259	9.6	LOS A	1.8	12.5	0.44	0.54	55.2
Approach		312	0.0	0.259	5.2	LOS A	1.8	12.5	0.44	0.54	54.0
North: Bridge St											
7	L2	89	0.0	0.442	14.6	LOS B	3.5	24.7	0.93	1.01	47.9
8	T1	166	0.0	0.442	14.9	LOS B	3.5	24.7	0.93	1.01	48.9
Approach		256	0.0	0.442	14.8	LOS B	3.5	24.7	0.93	1.01	48.5
All Vehicles		1727	0.0	0.711	8.7	LOS A	9.9	69.3	0.41	0.62	52.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

 Site: 101 [A-1 PM+1500(RMSAveTG)]

A-1 Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
South: Wine Country Drive											
2	T1	187	0.0	0.318	4.2	LOS A	2.6	18.0	0.16	0.55	54.0
3	R2	318	0.0	0.318	8.8	LOS A	2.6	18.0	0.16	0.55	54.0
Approach		505	0.0	0.318	7.1	LOS A	2.6	18.0	0.16	0.55	54.0
East: HEX Link Rd											
4	L2	1144	0.0	0.853	5.9	LOS A	14.3	100.0	0.86	0.59	52.7
6	R2	23	0.0	0.853	10.8	LOS A	14.3	100.0	0.86	0.59	54.0
Approach		1167	0.0	0.853	6.0	LOS A	14.3	100.0	0.86	0.59	52.7
North: Bridge St											
7	L2	63	0.0	0.183	5.5	LOS A	1.0	7.0	0.48	0.56	53.5
8	T1	135	0.0	0.183	5.7	LOS A	1.0	7.0	0.48	0.56	54.8
Approach		198	0.0	0.183	5.7	LOS A	1.0	7.0	0.48	0.56	54.4
All Vehicles		1871	0.0	0.853	6.3	LOS A	14.3	100.0	0.63	0.57	53.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: C:\Users\mark.waugh\Documents\WORK\PROJECTS ACTIVE\ACTIVE\BTF201649 LWP Huntlee\VARY K - RMS Response\SIDRA\Huntlee 2016 Threshold Analysis - RMS Response File.sip7

MOVEMENT SUMMARY – AM WCD Triton Bvd (1250 Lots (RMS AveTG))

▽ Site: WCD NB [A-5 WCD NB AM Base+1250(RMSAveTG)]

Huntlee Stage 1 A-5 & Wine Country Drive Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
South: RoadName											
2	T1	298	0.0	0.153	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		298	0.0	0.153	0.0	NA	0.0	0.0	0.00	0.00	60.0
East: RoadName											
6	R2	676	0.0	0.595	8.3	LOS A	4.7	33.0	0.51	0.80	46.5
Approach		676	0.0	0.595	8.3	LOS A	4.7	33.0	0.51	0.80	46.5
All Vehicles		974	0.0	0.595	5.8	NA	4.7	33.0	0.35	0.56	51.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Organisation: MARK WAUGH PTY LTD (BTF) | Processed: Saturday, November 26, 2016 3:27:58 PM

Project: C:\Users\mark.waugh\Documents\WORK\PROJECTS ACTIVE\ACTIVE\BTF201649 LWP Huntlee\VARY K - RMS Response\SIDRA\Huntlee 2016 Threshold Analysis - RMS Response File.sip7

MOVEMENT SUMMARY

▽ Site: WCD SB [A-5 WCD SB AM Base+1250(RMSAveTG)]

Huntlee Stage 1 A-5 & Wine Country Drive Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
South: Wine Country Drive											
3	R2	18	0.0	0.018	7.1	LOS A	0.1	0.5	0.42	0.61	52.2
Approach		18	0.0	0.018	7.1	NA	0.1	0.5	0.42	0.61	52.2
East: Huntlee Stage 1 A-5											
4	L2	169	0.0	0.136	6.6	LOS A	0.6	3.9	0.38	0.62	52.4
5	T1	676	0.0	0.852	18.4	LOS B	17.5	122.7	0.91	1.50	39.3
Approach		845	0.0	0.852	16.1	LOS B	17.5	122.7	0.80	1.32	42.3
North: Wine Country Drive											
7	L2	73	0.0	0.039	5.5	LOS A	0.0	0.0	0.00	0.58	53.6
8	T1	302	0.0	0.155	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		375	0.0	0.155	1.1	NA	0.0	0.0	0.00	0.11	58.6
All Vehicles		1238	0.0	0.852	11.4	NA	17.5	122.7	0.55	0.95	47.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY – PM WCD Triton Bvd (1250 Lots (RMS AveTG))

Site: WCD NB [A-5 WCD NB PM Base+1250(RMSAveTG)]

Huntlee Stage 1 A-5 & Wine Country Drive Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
South: RoadName											
2	T1	345	0.0	0.177	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		345	0.0	0.177	0.0	NA	0.0	0.0	0.00	0.00	60.0
East: RoadName											
6	R2	85	0.0	0.078	6.8	LOS A	0.2	1.7	0.34	0.67	48.0
Approach		85	0.0	0.078	6.8	LOS A	0.2	1.7	0.34	0.67	48.0
All Vehicles		431	0.0	0.177	1.4	NA	0.2	1.7	0.07	0.13	58.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: WCD SB [A-5 WCD SB PM Base+1250(RMSAveTG)]

Huntlee Stage 1 A-5 & Wine Country Drive Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
South: Wine Country Drive											
3	R2	184	0.0	0.501	19.4	LOS B	2.3	16.4	0.85	1.05	44.4
Approach		184	0.0	0.501	19.4	NA	2.3	16.4	0.85	1.05	44.4
East: Huntlee Stage 1 A-5											
4	L2	17	0.0	0.014	6.5	LOS A	0.1	0.4	0.36	0.57	52.5
5	T1	85	0.0	0.223	13.7	LOS A	0.9	6.2	0.74	0.89	42.8
Approach		102	0.0	0.223	12.5	LOS A	0.9	6.2	0.68	0.84	44.8
North: Wine Country Drive											
7	L2	751	0.0	0.404	5.6	LOS A	0.0	0.0	0.00	0.58	53.6
8	T1	311	0.0	0.159	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		1061	0.0	0.404	4.0	NA	0.0	0.0	0.00	0.41	55.3
All Vehicles		1347	0.0	0.501	6.7	NA	2.3	16.4	0.17	0.53	52.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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