PACIFIC HIGHWAY

Wyong Road intersection upgrade

OPTIONS REPORT

MAY 2011
# Table of contents

1.0 Introduction ........................................................................................................................................................................ 3

2.0 Project objectives and reasons for the project .......................................................................................................................... 3

3.0 Background ............................................................................................................................................................................. 3

3.1 Traffic and congestion analysis ..................................................................................................................................................... 7

3.2 Crash analysis ............................................................................................................................................................................ 8

3.3 Traffic modelling ....................................................................................................................................................................... 9

3.4 Existing geometry .................................................................................................................................................................... 9

3.5 Environmental issues ......................................................................................................................................................... 10

4.0 Options investigated ............................................................................................................................................................ 10

4.1 Do nothing option – retain roundabout .................................................................................................................................. 10

4.2 Replacement of roundabout with traffic lights without bridge widening .................................................................................. 11

4.3 Replacement of roundabout with traffic lights as well as widen the bridge over the rail line .......................................................... 12

4.4 Grade separation .................................................................................................................................................................... 13

4.5 Replacement of roundabout with traffic lights as well as widen bridge over the rail line and Wyong Road .................................... 15

5.0 Assessment and RTA favoured option .................................................................................................................................... 16

Appendix A - Option assessment matrix ........................................................................................................................................ 17

Appendix B - Layout of Options A to E ........................................................................................................................................ 18
1.0 Introduction
This report summarises options that the RTA has investigated for the upgrade of the Pacific Highway and Wyong Road intersection at Tuggerah.

2.0 Project objectives and reasons for the project

Objectives
- Reduce congestion and improve traffic efficiency for all road users.
- Improve safety and reduce the crash rate from the current value of 78.9 per 100MVKT to less than the stereotype 35 per 100MVKT.
- Reduce the casualty crash rate per km per year from the current 5.7 to less than class average of 5.5.
- Provide a solution that represents value for money and is assessed to perform well into the future considering the planned developments in the area.
- Guide development and cater for predicted traffic growth expected over the next 20 years.
- Ensure the project can fit with future plans to expand Tuggerah shopping complex and a new Tuggerah Town Centre as proposed by the Department of Planning and Infrastructure.

Reasons for the project
- There are significant delays during morning and afternoon peak periods on Wyong Road which affects traffic heading to and from Wyong Town Centre, Tuggerah and the F3 Freeway.
- The sight distance over the existing railway bridge limits sight lines to extensive queues and this results a number of rear end crashes westbound on Wyong Road occur.
- Congestion and small gaps leads to risk taking and numerous crashes occur at the roundabout itself.

3.0 Background

The Pacific Highway and Wyong Road intersection is currently a four leg dual lane circulating roundabout. The Pacific Highway forms the northern and southern legs of the intersection, while Wyong Road forms the eastern and western legs. The roundabout provides a main connection between the F3 freeway and The Entrance, carrying about 52,000 vehicle movements per day in total, 34,800 vehicles on Wyong Road and 29,900 vehicles on Pacific Highway.

The Pacific Highway to the south of Wyong Road between Ourimbah and Tuggerah was declassified in April 2010 from State road, and is now a local road under the care of Wyong Shire Council.
Figure 1 - Locality Map.

Figure 2 - Current layout of Pacific Highway and Wyong Road
State context

- The proposed upgrade directly addresses priorities identified in the NSW State Plan by improving the efficiency of the road network, improving road safety and increasing the opportunity for walking and cycling. In the 2010 update this project is specifically listed on page 91 item 30 as forming part of the $140 billion State Infrastructure Strategy 2007-18.

- Department of Planning (DoP) has declared the proposed Tuggerah Town Centre development, adjacent to the interchange, a State Significant site. RTA is presently working with DoP on road implications for that proposal. The proposed intersection upgrade is to be compatible with the currently planned development for the proposed Tuggerah Town Centre.

Regional context

- The Wyong Road corridor supports Wyong’s development by providing connectivity between the Sydney-Newcastle Freeway and Tuggerah-Wyong and The Entrance.

- The Pacific Highway corridor supports the Wyong Town Centre, the future Warnervale precinct as well as currently displayed proposal (by DoP) for significant additional development in the north of Wyong, (North Wyong Structure Plan).

Local context

- Wyong Road provides the main connection from the Long Jetty, Bateau Bay and coastal area to the F3 freeway. It also provides access from the F3 freeway to the Tuggerah Westfield shopping centre and the Tuggerah Business Park.

- Wyong Road currently carries about 34,800 vehicles per day (AADT).

- Wyong Road consists of two lanes in each direction east of the F3 Freeway with roundabout control at most side roads. Congestion regularly occurs for traffic particularly during peak periods.

- Pacific Highway runs (locally) between Gosford and Wyong providing a major connector alternative for local traffic other than the F3 Freeway.

The roundabout at the intersection of Wyong Road and the Pacific Highway currently has a high crash rate and traffic is congested during peak hours.

Stakeholder consultation

The RTA will be working with the Department of Planning, Wyong Shire Council, property owners, residents and other stakeholders to improve the project and minimise impacts on the community. A review of environmental factors on the preferred option is to be prepared in order to obtain approval to proceed with the project. The project is currently at the “Display of the Option” stage.

Following representations from the Department of Planning, the RTA assisted in undertaking additional traffic analysis and strategic road design in association with assessing impacts from the proposed new Tuggerah Town Centre. During this process, the RTA revised the assumptions of background traffic generation (based on new advice from Council and the Department of Planning), revisited the RTA’s strategic emme2 traffic model and updated the Paramics traffic model for this project.
Community updates describing the project will be distributed to all local stakeholders as well as displays placed at various locations showing the proposal and requesting community input and comment.

The comments received from the community will be used to improve the project if applicable and provide input for the review of environmental factors (REF).
3.1 Traffic and congestion analysis

In 2008, a traffic assessment was carried out for various options for the intersection upgrade. The traffic volume at this intersection is about 52,000 vehicles/day combined directions (2010 estimated), and is currently growing at rate of about 1.7% (approximately 880 vehicles) per year. The annual average daily traffic (AADT) was listed below.

Wyong Road AADT
1999: 30223
2004: 35,266 (east of the intersection)
2008: 33,706
2010: 34,800 (estimated from intersection count)

Pacific Highway (north) AADT
1998: 30,800
2004: 26,900
2008: 28,000
2010: 29,900 (estimated from intersection count)

Pacific Highway (south) AADT
1998: 7,500
2004: 6,750
2008: not recorded
2010: 5,000 (estimated from intersection count)

2021 AADT projected traffic (all directions combined)
Without Tuggerah Town Centre 62,000
With Tuggerah Town Centre 69,000

2031 AADT projected traffic (all directions combined)
Without Tuggerah Town Centre 74,000
With Tuggerah Town Centre 88,000

The overall traffic volumes are high for the road capacity, and inspection of travel times for the existing traffic suggest a significant increase in overall travel time for all the movements in the future demand scenario suggesting that the intersection is approaching capacity.
3.2 Crash analysis

Crash history period: Jan 2005 to Dec 2009

<table>
<thead>
<tr>
<th>Adjacent approaches</th>
<th>Opposing direction</th>
<th>Rear-end collision</th>
<th>Head on</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>12</td>
<td>36</td>
<td>4</td>
<td>41</td>
<td>106</td>
</tr>
</tbody>
</table>

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<tbody>
<tr>
<td>Crashes</td>
<td>106</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Casualty crashes</td>
<td>33</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Casualties</td>
<td>34</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years</td>
<td>5</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>AADT</td>
<td>52,000</td>
<td></td>
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<tr>
<td>Length (km)</td>
<td>1.15</td>
<td></td>
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<tr>
<td>Crash rate per 100M VKT</td>
<td>97.1</td>
<td></td>
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<tr>
<td>Casualty crashes per km per year</td>
<td>5.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Casualty crash rate per 100MVKT</td>
<td>30.2</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Total crashes per km per year</td>
<td>18.4</td>
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</tbody>
</table>

A map of crashes over the analysis period is provided below.

Figure 3 – Crash plot
### 3.3 Traffic modelling

The RTA commissioned Halcrow to undertake micro simulation modelling of the options to allow for a comparison of their relative performance. For the purposes of comparison, future demand scenarios were also tested on the existing intersection configuration.

The modelling covers the morning and evening weekday peak periods. Different options were modelled in future demand scenarios representing Council estimates of traffic growth on the Pacific Highway and Wyong Road intersection in 2021 and 2031, both with and without the (Department of Planning) proposed additional development in the Tuggerah Town Centre, and also included a number of additional network upgrades being developed that will be complemented by this project. These include:

- F3 and Wyong Road Interchange at Tuggerah
- Wyong Town Centre Study
- Tuggerah Town Centre.

Paramics modelling of the existing roundabout produces results as follows:

**Existing roundabout layout (intersection average)**

<table>
<thead>
<tr>
<th></th>
<th>Current - LoS F# AM delay 155 secs</th>
<th>PM delay 90 secs</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021 - LoS F AM delay &gt;210* secs</td>
<td>PM delay &gt; 154* secs</td>
<td></td>
</tr>
<tr>
<td>2031 - LoS F AM delay &gt;210* secs</td>
<td>PM delay &gt; 154* secs</td>
<td></td>
</tr>
</tbody>
</table>

#LoS: Level of Service, with rating of “A” as good through to “F” as very poor.

*Gridlock during peak hours and traffic flows well in excess of capacity resulting in vehicles not able to enter the network and therefore whose delay is not reflected in the analysis.

The modelling shows that there are significant delays during morning and afternoon peak periods on Wyong Road which affects traffic heading to and from Wyong Town Centre, Tuggerah and the F3 Freeway. The sight distance over the existing railway bridge for westbound traffic limits sight lines to queued traffic and these results in a number of rear end crashes westbound on Wyong Road. Due to the high volume of the right turn traffic westbound on Wyong Road to northbound on the Pacific Highway, the bridge crossing over the railway would need to be amplified to accommodate additional right turn lanes.

The modelling of the current intersection configuration and the existing traffic volumes shows that there is a need to improve the operation of this intersection especially if traffic is expected in to increase through the intersection as projected.

### 3.4 Existing geometry

The existing west bound vertical geometry over the rail line was designed for 70km/hr with queue lengths that were modelled at the time of design. The works were constructed approximately 20 years ago. The predicted queues would have been significantly shorter than those being experienced presently as it is believed that the predicted annual traffic growth was exceeded. With the current queue lengths the west bound vertical geometry does not provide stopping sight distance for 70 km/h as required in the current AUSTROADS road design guide and RTA supplements. This possibly is one of the key
factors leading to rear-end collisions shown in section 3.2. The proposed preferred option will ensure this issue is adequately addressed to improve road safety.

### 3.5 Environmental issues

The proposed project is in the heavily urbanised and disturbed area, it is not expected to trigger any environmental or cultural legislation. Further environmental assessment will be carried out during the development stage of the project and all the comments received from the community consultation will be used as an input to the project and Review of Environmental Factors (REF).

### 4.0 Options investigated

Several options to upgrade the intersection were considered such as:

- Do Nothing Option - Retain roundabout (including possible modifications to improve capacity).
- A number of ways traffic signals could operate, including:
  - traffic signals with 4 lanes on Wyong Road;
  - traffic signals with 6 lanes on Wyong Road.
- A bridge elevating one of the roads over the other.

Options that were considered during the preliminary stages of concept design were;

#### 4.1 Do nothing option – retain roundabout

**Option A**

As detailed in section 3.1, the combined traffic volume through this intersection is very high, with volumes of approximately 52,000 vehicles per day, all directions combined (2010 estimated), and is currently growing at an estimated rate of about 1.7% per year.

As shown in section 3.3 the capacity of the existing two-lane intersection is already exceeded during peak periods. The existing Level of Service (LoS) of the intersection is F in both peak periods with an average delay of more than 155s for the morning peak. Inspection of the intersection LoS suggests that average delays for vehicles passing through the Pacific Highway and Wyong Road intersection increases to unacceptable levels under the Do Nothing Option. Modelling of the “Do Nothing Option” shows that there is a need to improve the operation of this intersection to accommodate projected traffic growth. This also confirms that the intersection has reached its capacity and requires alternative treatment.

Alterations to the existing roundabout to improve capacity were also investigated. Once these were modelled the results indicated that all roundabout options did not meet the project objectives to reduce congestion and improve traffic efficiency, and subsequently all roundabout options were discarded.
4.2 Replacement of roundabout with traffic lights without bridge widening

Option B

This option proposed to replace the roundabout with traffic lights and allow for double right and left turn lanes without major modification or widening of the existing bridge over the railway with four lanes on Wyong Road in each direction. This option removes or reduces the conflict between different movements and improves the capacity of the intersection. The future modelling showed however that the intersection performance was very poor with the predicted future traffic in 2031, excluding the proposed Tuggerah Town Centre traffic generation. This option therefore did not meet the project objectives.

Figure 4 - Traffic Signal Design four lanes without bridge widening
4.3 Replacement of roundabout with traffic lights as well as widen the bridge over the rail line.

Option C

This is similar to the option described in 4.2 but includes the widening of the bridge over the railway on Wyong Road east to accommodate additional length for the turning lanes towards Wyong. This option would cost more than Option B as it involves a new bridge and a large amount of additional pavement. This option was assessed to be satisfactory for more than ten (10) years, (without Tuggerah Town centre predicted traffic) and to reduce the queue length and crash risk for westbound traffic. However delays and queues increase with predicted traffic to an unacceptable level beyond 15 years, thus this option has a relatively short life.

The main issues found in the traffic model for this option were that the 85th percentile queues on both the through lanes and the short right turn lane on the Wyong Road (east) approach and both right turn lanes on the Pacific Highway (north) approach would exceed the available storage length of the lane during the morning and evening peak hour in 2021 (without Tuggerah Town Centre development).

The projected intersection LoS (intersection average) and average delay for this Option are shown below.

On opening - LoS D AM delay 50 seconds   PM delay 40 secs

Without Tuggerah Town Centre development traffic

2021 - LoS E AM delay > 65 seconds   PM delay > 60 secs
2031 - LoS F AM delay > 77 seconds   PM delay > 85 secs

With Tuggerah Town Centre development traffic

2021 - LoS F AM delay > 70 seconds   PM delay > 76 secs
2031 - LoS F AM delay > - *   PM delay > - *

*Modelling indicated traffic flows well in excess of the available capacity resulting in gridlock, where vehicles outside of the network could not enter thus delays would not be accurately reflected.
Sensitivity testing of Option C (as shown in Appendix B) with additional projected demand associated with the proposed new Tuggerah Town Centre showed that there would not be sufficient capacity in the network to accommodate this additional traffic over and above the projected traffic demand associated with Wyong Town Centre.

### 4.4 Grade separation

**Option D**

This option investigated grade separating Wyong Road over the Pacific Highway allowing free flow east and west on Wyong Road. This option reduced the conflicts between different movements, and also provides adequate capacity for the intersection well into the future, including traffic generated by any known proposed new development.

Although this option addresses the crash risk and would have good capacity in the future, this option has major impacts with a large high structure, requiring full replacement of the existing bridge over the rail line. It is not compatible with current planning by the Department of Planning for the proposed Tuggerah Town Centre development, and has a significant higher cost and a lower Benefit Cost Ratio (BCR).

This option would also necessitate the immediate upgrade of Wyong Road at Gavenlock Road which would restrict the entry into the Westfield site from Gavenlock Road to left in and out only. In order to then provide for right turn entry into the Westfield site another set of traffic signals would be required at the mid block entry (see Figure 8). These additional works outside the scope of the project would cost in the order of an additional $15m to $20m, further reducing the overall benefit/cost ratio of this proposal.
Given that Option D does not satisfy the objectives, in particular not fitting with future plans to provide access to a new Tuggerah Town Centre, an expanded Tuggerah shopping complex, Option D is not regarded as a feasible option.

Figure 7 Possible additional treatments required at Westfields for grade separation (Option D)
4.5 Replacement of roundabout with traffic lights as well as widen bridge over the rail line and Wyong Road

Option E

To improve the capacity and thus the life of Option C as discussed in 4.3, Option E proposes additional lanes on Wyong Road (three lanes in each direction).

This option has been modelled and designed to provide sufficient capacity for predicted background traffic growth and can be augmented without major reconstruction to provide additional capacity should the new Tuggerah Town Centre eventuate and its predicted traffic realised.

Figure 8 - Replace the roundabout with signals, widen the railway bridge and provide 6 lanes along Wyong Road

Option E includes three (3) through lanes (in each direction) on Wyong Road on the approach and departure to the intersection instead of the current two (2) lanes. Testing of this option showed that there is sufficient capacity at the intersection of Pacific Highway and Wyong Road intersection to cater for the projected 2031 traffic demand with and without the proposed Tuggerah Town Centre development. This option has a BCR of 5.0 and meets the project objectives.

The projected intersection LoS (intersection average) and average delay for this option are shown below.

On opening - LoS C AM delay 40 seconds  PM delay 37 secs

Without Tuggerah Town Centre development traffic
2021 - LoS D AM delay 44 seconds  PM delay 44 secs
2031 - LoS E AM delay 57 seconds  PM delay 67 secs

With Tuggerah Town Centre development traffic
2021 - LoS D AM delay 56 seconds  PM delay 50 secs
2031 - LoS E AM delay 67 seconds  PM delay 76 secs
5.0 Assessment and RTA favoured option

Option assessment matrix in Appendix A shows the comparison between the options, where Option D and E are identified as the only options that meet the project objectives for capacity and safety. Option D, grade separation has a significant number of dis-benefits including the very high overall cost and the need to immediately upgrade adjacent intersections and to alter the entry into Westfield Tuggerah. It is considered to be incompatible with the surrounding network as well as the proposal for the Tuggerah Town Centre. These dis-benefits outweigh the traffic benefit gained in capacity.

Option E (replace the roundabout with signals as well as widening the rail bridge and widen Wyong Road to 6 lanes for approaches), is considered to be the better overall solution to the existing issues of capacity deficiency and safety. The results from traffic modelling and safety analysis indicate that without providing three through lanes in each direction on Wyong Road, the intersection will not have the desired traffic life of a minimum 20 years.

Option E would offer the greatest value, and meet project objectives taking into consideration the balance of impacts for all road users, and accordingly has been identified as the best performing option that meets the projects objectives. It is therefore recommended as the favoured option to be displayed for community comment.
<table>
<thead>
<tr>
<th>Option</th>
<th>Meets Traffic criteria</th>
<th>Meets Safety criteria</th>
<th>Value for Money</th>
<th>Meet project life expectancy</th>
<th>Compatible with DoP plans for Tuggerah Town Centre</th>
<th>Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>A The Do Nothing Option</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Does not meet current or longer term target capacity objectives.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Does not address increased traffic demand from future Tuggerah development.</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>No improvements in safety.</td>
</tr>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>Does not meet project objectives.</td>
</tr>
<tr>
<td>B</td>
<td>No.</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Traffic signals facilitate better access at the Pacific Highway and Wyong Road intersection by controlling each movement and providing priority where and when required, sharing the delays around the intersection.</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Minimal land acquisition.</td>
</tr>
<tr>
<td>C</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>2 full property acquisitions.</td>
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<td></td>
<td></td>
<td></td>
<td>6 partial acquisitions.</td>
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<tr>
<td>D</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes.</td>
<td>No</td>
<td>Impacts on adjacent intersection and access to Westfield Tuggerah and would require immediate upgrading of Wyong Road and Gavenlock Road as well as grade separated pedestrian bridges in order to achieve overall benefits. These would add significantly to the cost and expand the scope well in excess of that required to treat the issues being experienced.</td>
</tr>
<tr>
<td>E</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>2 full property acquisitions.</td>
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<tr>
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<td></td>
<td>6 partial acquisitions.</td>
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Appendix B - Layout of Options A to E
Option A