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Summary

This report covers the preliminary investigations into potential responses to the road safety concern that has been identified on the Kings Highway either side of Braidwood.

During a consultation period in late 2011, Roads and Maritime Services (RMS) talked with people from the local community and other stakeholders about the problem, aspects of the environment that are considered important and suggestions of what could be done to help reduce the number and severity of crashes.

Following that period of consultation, RMS has undertaken further analysis and investigation into possible treatments that are considered to be feasible and effective in reducing the impact of crashes.

Whilst all fatal crashes between 1 June 2004 and 31 May 2011 in the areas of investigation had involved impact with a tree, one of the clear messages from most of the local community was that RMS should investigate options to preserve roadside trees that form part of the identity of Braidwood.

This report proposes a combination of two engineering treatments that are aligned with that feedback and are also considered to be feasible and effective. These treatments are:

- Profile line marking – also known as rumble strips along the edges and centre of the road; and
- Safety barrier fencing – in most cases wire rope or steel guardrail.

RMS has undertaken a speed zone review on the Kings Highway in and around Braidwood, this report includes the RMS outcomes of that review and the proposal to remove the 60km/h speed zone and extend the 50 km/h speed zone.

This review was completed in response to the feedback received during the consultation in 2011. It is important to note, RMS does not consider changes to the speed limit to be an effective response to the recent crash history as speed is not identified as a significant characteristic of the crashes. Speed surveys recently undertaken by RMS have indicated excessive speed is not a factor in these sections near Braidwood.
Other suggestions put forward during the consultation period have been considered by RMS and determined not to be feasible or effective in addressing the existing road safety concern.

The suggestions that are not being considered further (in response to the crash history near Braidwood) include:

- A bypass of Braidwood or other realignments and duplication;
- Additional overtaking lanes, changes to centre line markings or median barriers;
- A reduction of the speed limit at the avenues of poplars/trees;
- Installation of speed cameras;
- Speed humps and rumble strips across the road;
- Installation of signs that advise motorists of the trees, particular areas of high crash rates or wildlife;
- Changes / additions to existing Driver Reviver and rest area sites;
- Changes to the road environment within the township of Braidwood and other locations outside the two lengths of road being investigated which are considered to be out of scope.

The following sections of this report provide more detail about the process and investigations concerned specifically with road safety on the Kings Highway near Braidwood.

### 1. Background

The Kings Highway is a key arterial road connecting the Princes Highway at Batemans Bay in the Eurobodalla Local Government Area, through the township of Braidwood in Palerang Local Government Area, to Queanbeyan in the west.

Near Braidwood, the Kings Highway is a rural, undivided, two-lane, two-way road. There are mostly broken centre lines with sealed road shoulders which vary from one to one and a half metres in width. The speed limit is 100km/h with a 60km/h speed limit closer to the township of Braidwood.

RMS identified a road safety problem on the Kings Highway approaches to Braidwood. In September 2011 RMS released a discussion paper outlining the details of the problem for community comment.

From 19 September to 31 October 2011 RMS undertook community consultation based on the discussion paper to understand community concerns. Comments and feedback relating to the discussion paper and general concerns from the community were collated via an online forum, written submissions and at a community workshop that was held in Braidwood.

In November 2011 RMS released an Issues Report describing the communication and consultation activities undertaken from 19 September 2011 to 31 October 2011 regarding the road safety concerns on the Kings Highway near Braidwood. This report also provided a compilation of the issues raised in written submissions, the workshop, online forum comments and discussions during this period. A total of 160 submissions were received during the consultation period.
The issues raised during the consultation period have been considered during the preliminary investigations to address the road safety problem. The majority of issues raised were grouped under five main topics. These were:

- Speed
- Trees
- Driver behaviour
- Road environment
- Increased traffic volume

In this *Preliminary Investigations Report* RMS considered the issues raised by the community, while also assessing the feasibility and effectiveness of the treatments suggested by the community. RMS also identified where further detailed investigations were required. The report includes:

- Factors that need to be considered/investigated for each potential response to the road safety problem;
- Relevant information that is already available;
- Options that are assessed as not feasible or unlikely to provide a significant reduction in the number and/or severity of crashes;
- Studies/investigations that need to be undertaken to adequately assess options;

Our options to reduce the impact of crashes need to be:

- Workable and acceptable to the community.
- Affordable.
- Considerate of this special landscape/environment.

Following this initial assessment and completion of more detailed investigations, the community suggestions will be further refined in order to develop a set of feasible and effective options. The outcomes of this detailed investigation phase will be captured in an Options Report which will be made available for public comment. It is expected that the Options Report will be completed by the end of June 2012.

Submissions providing feedback on the Options Report will then be received and considered prior to any final proposal being prepared. There will be opportunity for community comment throughout this process.

Following two tragic crashes on the Kings Highway east of Braidwood over the weekend of 9-12 March 2012 the NSW Government has initiated a wider road safety review of the Kings Highway. This wider review will take as input, the community feedback and RMS investigations that have been made during the process aimed at improving road safety on the two sections of the Kings Highway in the immediate vicinity of Braidwood (i.e. 4km east and 2km west).

### 2. The road safety problem

For the purpose of this project the two lengths of the Kings Highway that are being considered are:

- East of Braidwood (Batemans Bay side) - around 3.8kms of road from the edge of town, just east of Monkittee Street.
- North of Braidwood (Canberra side) - around 1.8kms of road between Nerriga Road and Deloraine Lane.
These road lengths have a range of distinct road safety risks and hazards that may impact on potential improvement options.

There have been 171 crashes, including five fatal crashes on the two lengths of the Kings Highway being reviewed near Braidwood between 1 June 2004 and 31 May 2011. More than half of these crashes involved a collision into roadside objects. In all five fatal crashes a vehicle collided with a tree.

Roadside hazards in this area include trees, culverts (drains), and Mona Creek where it is located close to the road.

The key issue is that the severity of these crashes is extreme – people have been hurt and died.

In response to questions raised at the workshop held in October 2011, RMS undertook further analysis of the crash history around Braidwood. For comparison, this analysis has extended both the time period considered and the length of road reviewed.

A key outcome of this analysis has confirmed a concentration of fatal crashes along both approaches to Braidwood. Over the 15 year period from 1996-2010, 17% of all fatal crashes on the entire length of the Kings Highway (approximately 130kms) occurred on the two approaches to Braidwood (less than 6 kms in total).

Although it is recognised that there are many other locations on the NSW State road network and Kings Highway where there are hazards close to the road, the crash data identifies a concentration of crashes around Braidwood. This suggests a particular complex combination of factors that apply to the two sections of road either side of Braidwood.

The scope of this road safety investigation focuses on two lengths of the Highway that share similar road characteristics (straight alignment, flat road, many hazards close to the road) and similar crash characteristics (single vehicle, run off road into object, fatigue).

RMS's approach to addressing an existing road safety problem is guided by two key considerations:

1. To identify treatments that are effective in reducing the risk and consequences of similar types of crashes.
2. To apply the Safe Systems Approach which allows for human error and provides a forgiving road environment.

### 3. Safe systems

RMS employs the Safe Systems Approach to reduce death and injury on NSW roads. This approach recognises that human error is inevitable. RMS aims to reduce the severity of crashes through the introduction of safer speeds, safer roads and safer vehicles, as well as increased driver education and the use of road safety technology.

The Safe Systems Approach to road safety recognises the need for responsible and compliant road user behaviour, but as previously stated it also accepts that human error

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1 This number of crashes includes those recorded in the RMS database as at 9 August 2011. Data for the period from 1/1/2011 may be incomplete and is subject to change.
is inevitable. It aims to create a road transport system that makes allowance for errors and minimises the consequences, in particular, the risk of death or serious injury. The three core components operate in an environment where road users are encouraged to be alert to risk and compliant with the rules of the system.

This means our role as individuals is critical in achieving the common goal of reducing deaths and injuries on our roads which is impossible unless we share our responsibility as road users with vehicle designers, road authorities and the road system itself.

RMS endeavours to design, construct and maintain roads to reduce the risk of crashes and to reduce harm to people if a crash does occur.

A clear zone is a concept used in road design to provide a hazard free roadside which allows drivers leaving the road to regain control or avoid an impact that may cause death or serious injury. This concept assumes that vehicles may leave the road for a variety of reasons and aims to minimise the consequences.

On a new road with a speed limit of 100km/h and a reasonably flat roadside area, standards require a minimum clear zone width of nine metres. On existing roads, RMS aims to achieve maximum possible clear zones. The two sections of the Kings Highway either side of Braidwood have many trees and some culvert headwalls within five metres of the travel lanes, and in several places much closer.

4. Community consultation

4.1 Consultation activity

The consultation activities undertaken from 19 September to 31 October 2011 aimed to provide information about the road safety problem on the Kings Highway near Braidwood.

The objectives of the communication and consultation activities were to:

- Ensure the local community and stakeholders were aware of the road safety problem.
- Provide the community and stakeholders with an opportunity to provide feedback, ask questions and identify areas of concern with respect to the road safety problem.
- Reassure the community that RMS had not yet made a decision about a treatment for the road safety problem.

The activities during the consultation period to collect community issues and suggestions are provided below.

4.1.1 Online forum

The ‘Roadside hazards on the Kings Highway near Braidwood’ online discussion forum was opened on 19 September 2011. This forum provided the community and other stakeholders with access to the discussion paper and background information.

The online forum provided a platform for the community and other stakeholders to provide feedback on three key subject areas:

1. The road safety problem
2. The history of tree planting
3. Who else should be involved
A total of 97 comments were received through the online discussion forum. Submissions were also made via post, email and phone.

The forum was closed for comment on the 31 October 2011.

4.1.2 Community workshop

A community workshop was held on 13 October 2011 at the National Theatre Community Centre in Braidwood. The aim of this workshop was to provide the community with more information regarding the project and provide a forum where the community could raise issues and suggestions and ask questions.

RMS staff worked with community members to discuss the three key subject areas being addressed on the online forum. A total of 52 community members attended the workshop.

Individual feedback forms were received on the night from 25 workshop attendees. Reply paid envelopes were provided to attendees who wanted to send their feedback forms via mail after the workshop. Group feedback and outcomes from the workshop are available on the RMS project website.

RMS has followed up on a number of requests and actions that were raised during the community workshop. These actions and responses are covered throughout this report.

4.2 Community concerns

A total of 160 submissions were received from up to 150 different people/groups between 19 September and 31 October 2011. Submissions received included 25 feedback forms (from the community workshop), 24 emails, 14 letters (including feedback forms) and 97 online forum comments. Many submissions contained comments about more than one issue and/or solution and some people provided multiple submissions.

Respondents identified themselves as local residents, local business owners, road users, community groups or government agencies.

Issues and suggestions captured during the community workshop have been considered in preparing this report.

4.2.1 Speed

Speed was raised as an issue in 111 submissions.

The majority of submissions relating to speed suggested the considered sections of the Kings Highway have their speed zones reviewed. These responses suggested speed was a contributing factor to crashes on the Kings Highway and raised concerns about the excessive speed of motorists on the sections of the Kings Highway being reviewed. Reduction of the speed limit was a regular topic of discussion on the online forum, in written responses and at the community workshop.

\[2\] RMS was not always able to identify multiple feedback that may have been from the same person
4.2.2 Trees

The trees on the approaches to Braidwood were raised in 103 submissions.

The majority of submissions highlighted the importance of the trees to the identity of Braidwood. The trees were described as having both aesthetic and heritage value and add to the beauty and uniqueness of Braidwood. It was identified in the community consultation period the trees were not only significant to the history of Braidwood but also significant to the history and emotions of residents.

People in support of the preservation of trees often identified that the trees did not cause crashes. Six submissions stated that “trees do not jump out in front of traffic” and rather it is driver behaviour that is the cause of the crashes on the Kings Highway near Braidwood.

Of the 103 submissions received in relation to the trees 99 supported the preservation of the avenues of trees on the approaches to Braidwood while eight supported the removal of all or some of the trees.

4.2.3 Driver behaviour

A total of 92 submissions addressed driver behaviour as an issue on the Kings Highway near Braidwood. Seventy-seven of the 92 submissions generally stated driver behaviour was an issue on the Kings Highway near Braidwood. Forty-seven of the 92 submissions received identified that dangerous overtaking was a common issue while 15 submissions received on driver behaviour specifically mentioned fatigue as an issue.

4.2.4 Road environment

A total of 61 submissions raised the road environment as an issue on the Kings Highway near Braidwood. Five submissions identified the sections of the Kings Highway near Braidwood as having good road conditions. Forty-seven of the 61 submissions discussed a lack of overtaking lanes on the Kings Highway as an issue. Other submissions discussed issues such as poor signage and road alignment as contributing factors to the crash rates on these sections of the Kings Highway.

4.2.5 Increased traffic volumes

The issue of increased traffic volumes on weekends, public holidays and holiday seasons was raised in 35 submissions. Increases in heavy vehicle volumes were also raised as an area of concern.

4.2.6 Other ungrouped issues

There were a number of community issues and suggestions that could not be grouped. These responses identified issues and hazards including wildlife on the Kings Highway, funding and motorcyclists.
The community also offered suggestions including a funding contribution by the ACT Government to improve the Kings Highway; changing licensing laws; providing additional pull over areas and improving drainage to stop the flooding of Mona Creek.

4.2.7 Other locations – outside the areas being considered in this project

Issues and/or suggestions related to “Other locations” outside the areas being considered were raised in 23 submissions.
5. Preliminary investigations

Following the consultation in late 2011, RMS has undertaken further analysis and investigation into possible treatments that are considered to be feasible and effective in reducing the impact of crashes similar to those that have occurred in the past.

Some suggestions put forward during the consultation period have been considered and determined not to be feasible or effective. The most popular suggestions that are not being considered further on the Kings Highway near Braidwood are:

- A bypass, other realignments or duplication;
- Additional overtaking lanes/opportunities;
- A reduction of the speed limit at the avenues of poplars/trees;

On a new road similar to the Kings Highway near Braidwood a nine metre area clear of any hazards would be desirable. When considering how to address a concern with roadside hazards, the first option considered is the removal of hazards. That is, the best road safety outcome would be to remove all hazards/trees in the clear zone.

One of the clear messages from most of the local community was that RMS should investigate options that provide for the preservation of roadside trees that form part of the identity of Braidwood. After further investigation by RMS, profile line marking and safety barrier fencing were considered the engineering treatments that best aligned with community feedback. A combination of these treatments is considered to be feasible and effective.

Profile line marking  Wire rope safety barrier

Given the constraints of the environment on the Kings Highway near Braidwood, the use of safety barrier fencing would require the removal of some trees. RMS is working with the community to achieve the required safety outcomes while still retaining most trees and maintaining the overall effect of the avenues. This is an area that requires further explanation and discussion between the community, Palerang Council and RMS.

For the long term management of the avenues of trees, RMS proposes joint development of a Tree Management Plan by the community, council and RMS.
5.1 Speed

One of the key concerns raised throughout the consultation process in 2011 was that of excessive speed. Speeding was identified by many in the community as a problem both within the township of Braidwood and along the full length of the Kings Highway.

RMS accepts the concerns of the local community and that research shows inappropriate speeding is a key factor in the cause and severity of crashes in general across NSW.

Speed has not been identified as a key factor in the crashes that have been occurring on the immediate approaches to Braidwood. RMS’s response to concerns about speeding is not considered to be a treatment for the type of crashes that have occurred in this area in the past.

RMS has initiated a number of actions in response to this concern including:
- Temporary use of electronic message boards to display speeding messages
- A review of existing vehicle speeds
- A speed zone review.

5.1.1 Electronic Message Boards (VMS)

 Shortly after the workshop in October 2011, RMS positioned variable (electronic) message signs (VMS) on both approaches to Braidwood. The two VMS on the approaches to Braidwood are part of a program which uses 25 VMS on key roads in RMS’s Southern Region, including four on the Kings Highway, to highlight road safety issues. In addition to seasonal messages about double demerit points and school zones, these VMS have been providing speed and fatigue related messages to passing motorists. More recently, these VMS have been fitted with speed radars to draw the attention of drivers to their actual speed at those locations.

5.1.2 Speed survey

To collect data about both the speed and volume of traffic around Braidwood, RMS surveyed both directions at three locations on both sides of Braidwood from mid December 2011 to mid February 2012. The location of these survey points are shown on the diagram below.
A summary of the speed data collected between December 2011 and February 2012 is shown in the table below. The 85th % column in the table indicates that 85% of motorists were travelling at or below the listed speed. These results are generally in line with expectations for the corresponding sections of road.

Table 1: Summary of speed monitoring from December 2011 to February 2012

<table>
<thead>
<tr>
<th>ID</th>
<th>Survey Location Description</th>
<th>85th % - km/h</th>
<th>Existing Speed Limit (km/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Eastbound</td>
<td>Westbound</td>
</tr>
<tr>
<td>West of Braidwood</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33.770</td>
<td>40m W Braidwood Showground Entrance</td>
<td>102.2</td>
<td>105.5</td>
</tr>
<tr>
<td>33.771</td>
<td>20m E Station St Braidwood</td>
<td>77.0</td>
<td>86.8</td>
</tr>
<tr>
<td>33.772</td>
<td>80m W Glenmore Rd Braidwood</td>
<td>68.4</td>
<td>69.1</td>
</tr>
<tr>
<td>East of Braidwood</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33.773</td>
<td>100m E Monkittee St Braidwood</td>
<td>72.0</td>
<td>61.6</td>
</tr>
<tr>
<td>33.775</td>
<td>490m E Monkittee St Braidwood</td>
<td>94.0</td>
<td>87.5</td>
</tr>
<tr>
<td>33.774</td>
<td>900m E Monkittee St Braidwood</td>
<td>95.4</td>
<td>101.5</td>
</tr>
</tbody>
</table>

5.1.3 Speed zone review

RMS uses the NSW Speed Zoning Guidelines (v4.0) to determine the appropriate speed zone for all roads across the state. In response to concerns raised by the local community, RMS has undertaken a review of the speed zones in and around Braidwood.

Implementing the recommendations from this review is subject to approval by the RMS Chief Executive, however, the recommended speed zones are shown in Figure 3 below and in summary include:
- Replacing the existing 60km/h zones with a 50km/h limit
- Simplifying speed zones by having only two speed limits – 50km/h within the township and 100km/h on the Kings Highway immediately outside of Braidwood
- No change to the 80km/h zone on the road from Araluen

**Figure 2: Existing speed zones on the Kings Highway through Braidwood**

**Figure 3: Proposed speed zones on the Kings Highway through Braidwood**

### 5.1.4 Other speed related issues

Other speed related issues/suggestions raised by the community are listed below along with the RMS response to each. RMS does not plan to take specific actions related to these issues as part of the current project to address the road safety concerns on the approaches to Braidwood.
### Speed cameras

RMS has investigated the possibility of installing fixed speed cameras in response to the crash history on the immediate approaches to Braidwood. As stated previously, speed has not been identified as a significant factor contributing to the crashes that have occurred. Nevertheless, RMS has assessed the locations either side of Braidwood against the criteria for assessing the suitability of locations for fixed speed cameras and determined that neither location meets the requirements.

### Enforcement

The Kings Highway Road Safety Partnership involves Eurobodalla, Shoalhaven and Queanbeyan councils, ACT government, NRMA ACT Road Safety Trust, Police from Queanbeyan, ACT and Batemans Bay, and RMS. These partners work together to provide media campaigns during holiday times using press and radio advertising in both NSW and ACT, additional VMS, and breath testing machines in Batemans Bay licensed venues.

The Kings Highway Road Safety Partnership provides a coordinated approach between enforcement and public education and is focused on making enforcement as effective as possible across jurisdictions.

### Speed signage

Signs associated with proposed speed zone changes have been reviewed, considering the location, sizes, ‘ahead’ signs and duplication of the signs. The determination of appropriate speeds is primarily related to the road environment and is a separate issue to the conceptual town boundaries.

### Speed humps & rumble strips across the road

Speed humps and rumble strips across the road are not recommended for extensive use and are more appropriate in low speed urban environments. They can also be hazardous for motorcyclists in wet conditions. They are only used in limited circumstances where other conventional measures have proven to be ineffective. This treatment is not appropriate to manage the speed of vehicles well outside the Braidwood urban environment.

### 5.2 Trees

From the initial community engagement held in late 2011, there was a clear message to RMS that the roadside trees on the approaches to Braidwood were very important to the local community and that options other than removal of trees should be thoroughly investigated. Much of the feedback received also drew attention to the heritage listing of ‘Braidwood and its Surrounds’, including the roadside trees and approach views.

The feedback generally did not distinguish between the various sections of road and the different tree plantings. However, the understanding of RMS is that it is the overall affect of the trees that is important and the Golden Poplars on the north/western side of Braidwood are particularly valued.
Sections of the Highway being reviewed and the associated roadside trees include at least five distinct environments.

**Figure 4: Images of environments on the Kings Highway either side of Braidwood**

- Golden Poplars near the Showground and Racecourse
- Lombardy Poplars near the Showground and Racecourse
- Pin Oaks south of the Racecourse
- Lombardy Poplars 2-3km east of Monkittee Street
Pin Oaks and other trees east of Monkittee Street

Pin Oaks and other trees east of Monkittee Street

From further investigations and discussions since the community workshop in October 2011, RMS has collected the following information about these separate plantings.

Table 2: Information on separate tree plantings on the Kings Highway near Braidwood

<table>
<thead>
<tr>
<th>Tree Planting</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Golden Poplars near the Showground and Racecourse</td>
<td>Planted around 1936 to celebrate the 25th year of King George V's reign.</td>
</tr>
<tr>
<td>Lombardy Poplars near the Showground and Racecourse</td>
<td>Possibly planted around 1936 with the Golden Poplars to celebrate the 25th year of King George V's reign.</td>
</tr>
<tr>
<td>Pin Oaks east of Monkittee Street</td>
<td>History unclear.</td>
</tr>
<tr>
<td>Lombardy Poplars 2-3km east of Monkittee Street</td>
<td>Initial group on the south side of the Kings Highway near Mona Creek was planted on private property around 1960. The remaining avenue was planted by the Apex Club between 1960 and 1970.</td>
</tr>
</tbody>
</table>

Considering the feedback and suggestions for possible treatments, RMS has investigated options that would be effective in reducing the impact of the type of crashes that have been occurring while maintaining the valued aspects of the roadside trees. This has led to proposing the concept of using a combination of raised profile line marking (along the edges and centre of the road) and safety barriers which are discussed later under the heading of ‘Roadside Environment’

Some trees would need to be removed to address the existing road safety concern.

Preliminary discussions with the Office of Environment and Heritage (OEH) suggested that a helpful way forward would be to prepare a long term Tree Management Plan. The Tree Management Plan would include guidelines for the planting of replacement trees, species to be used, appropriate locations and activities required for safe planting,
establishment and management of the roadside trees. To this end, RMS is keen to work together with the Braidwood community and Palerang Council to develop this Plan.

Development of a long term Tree Management Plan would be supplemented with a report by a qualified arborist to establish the health and expected life of those trees covered. An arborist’s report will also include a range of arboricultural options for the ongoing management of trees in those locations.

The local community has suggested the possibility of using signs to draw attention to the importance and value of the trees. While this action would not be effective in addressing the road safety problem, it may serve to promote the cultural and community values of Braidwood. Interpretative signs could be considered in the preparation of the Tree Management Plan.

5.3 Driver behavior

Together with ‘speed’, poor driver behaviour was identified as one of the key concerns of the local community.

Addressing driver behaviour (the ‘Safer People’ aspect of the Safe Systems Approach) is an area of particular concern and focus of many programs within RMS. Existing programs addressing driver behaviour include:

- School education programs
- Graduated licensing scheme
- Media campaigns – such as RMS’s current driver fatigue campaign run on television, radio, outdoor and online. This advertising provides a broad awareness of the early warning signs of driver fatigue.

Driver fatigue is the result of a complex set of factors (circadian rhythms, sleep debt and sleep inertia) and is indicated by an equally complex set of symptoms such as yawning, poor concentration, slow reactions and oversteering.

With driver fatigue there is no specific way to detect which drivers are at risk and directly intervene (unlike speed or drink driving).

Figure 5: RMS statewide fatigue campaign – “Stop, Revive, Survive”
Profile line marking (also known as rumble strips along the edges and centre of the road) is an engineering treatment that was suggested by many people as an unobtrusive option to decrease the number and severity of crashes related to unsafe driver behaviour and fatigue. This option, in combination with using safety barriers, is discussed later under the heading of ‘Roadside Environment’.

RMS directly supports strategic policing through enforcement, fines, demerits and the Enhanced Enforcement Program. RMS also supports enforcement by using targeted advertising in print and radio which increases the perception of being caught by police.

**Figure 6: RMS statewide seat belts campaign – “Buckle Up. You’re in our sights.”**

In addition to the RMS programs in place, driver behaviour on the Kings Highway is the particular focus of the Kings Highway Road Safety Partnership.

The Kings Highway Road Safety Partnership involves

- Eurobodalla, Shoalhaven and Queanbeyan councils
- ACT government
- NRMA-ACT Road Safety Trust
- Police from Queanbeyan, ACT and Batemans Bay
- Roads and Maritime Services

These partners work together to provide media campaigns during holiday times using press and radio advertising in both NSW and ACT, additional VMS, and breath testing machines in Batemans Bay licensed venues. It also provides a coordinated approach between enforcement and public education focused on making enforcement as effective as possible across jurisdictions.
Specifically in response to the feedback received from the local Braidwood community, RMS has also positioned electronic variable message signs (VMS) on the Kings Highway approaching Braidwood from each direction.

A driver reviver currently operates in Braidwood during holiday periods. RMS promotes the operating times of this site and also provides support with signage and electricity supply. The support of driver reviver operations and the provision of rest areas provide some benefits to address the problem of driver fatigue.

Light vehicle drivers are able to stop in Nelligen, Braidwood and Bungendore, as well as light vehicle rest areas at Warri, 13km west of Braidwood, and Brooks Hill, 7km west of Bungendore.

5.4 Road environment

Near Braidwood, the Kings Highway is a rural, undivided, two-lane, two-way road. There are mostly broken centre lines with sealed road shoulders which vary from one to one and a half metres in width. The speed limit is 100km/h with a 60km/h speed limit closer to the township of Braidwood.

Generally, the sections of road covered by this review are straight and flat and the road surface is in good condition. However, along most of these two sections of road there are many hazards close to the edge of the road and the sealed shoulder is generally one to one and a half metres wide.

Most feedback received about the need to improve the road alignment and provide more overtaking lanes applies to areas outside the two sections of road being reviewed.

5.4.1 Raised profile line marking

Raised profile line marking (also known as rumble strips along the edges and centre of the road) is a treatment that was suggested by several people during the consultation period in late 2011. It is an enhanced treatment used in certain circumstances, particularly where fatigue has been identified as an issue or where foggy conditions apply. Profile line marking is an appropriate treatment on the approaches to Braidwood that can assist in reducing the risk of vehicles leaving the road. Profile line marking on the centre line can also assist in reducing the risk of vehicles crossing to the wrong side of the road.
Figure 8 below shows the detail of profile line marking. The profile line marking provides an audio tactile response when it comes into contact with the wheel of a moving vehicle.

**Figure 8: Details of how profile line marking is applied**

As profile line marking is designed to generate a noise when crossed by the wheel of a vehicle, RMS has guidelines that limit the use of profile line marking in the vicinity of residences due to this noise. RMS needs to consult with residents living within 500m of the proposed profile line marking. This line marking is not proposed within 200m of residences. The images below show the areas where RMS is proposing the use of profile line marking.

**Figure 9: Proposed Location for Profile Line Marking – West of Braidwood**
Figure 10: Proposed Location for Profile Line Marking – East of Braidwood
5.4.2 Safety barriers

Safety barriers are another treatment that was suggested by several people during the initial consultation period. There is a range of barrier types that can be used to reduce the risks associated with impacting a roadside hazard and provide an alternative to the removal of roadside hazards. The use of safety barriers can reduce the severity of a crash when a vehicle leaves the road compared to the impact with a hazard such as a tree, culvert headwall or a steep drop.

The use of safety barriers is considered to be the most effective treatment to address the road safety concern near Braidwood without the removal of all trees growing close to the road or relocating culvert headwalls.

There are three key factors to consider with the use of safety barriers near Braidwood.

1. **The type of barrier** – which can be a variety of wire rope, steel guardrail or concrete. Table 3 below shows the types of barrier that have been considered during preliminary investigations and lists some of the advantages and disadvantages of each.

2. **The minimum distance between the barrier and the hazard** – defined by the ‘dynamic deflection’ plus the 'barrier width'. This is the space that is required for the barrier to absorb energy from the vehicle while preventing severe impact with the hazard. Typically wire rope and guardrail require a distance of 1.8m (between the barrier and the hazard) subject to manufacturer and installation details. Thriebeam and concrete barriers can be used with smaller distances between the barrier and the hazard. Figure 11 shows how a wire rope barrier needs to deflect when impacted.

3. **The distance between the barrier and the travel lane** (known as the shoulder) – the shoulder width determines the space available for vehicles to move off the road to stop. The shoulder is also an area which allows the driver of an errant vehicle to regain control. RMS Network performance measures and network Planning Targets for a road similar to the Kings Highway is to provide a minimum of two metre sealed shoulders alongside a safety barrier (noting that 2m is insufficient space to pull off the road and exit/enter the vehicle while remaining clear of the travel lane). Figure 12 below shows a typical road cross-section that would apply on the Kings Highway approaching Braidwood.

Other considerations include:

- Minimum lane width targets of 3.5 metres
- The number of heavy vehicles
- Road network planning targets to provide a five metre clear zone (nine metres is the standard for new roads)
- The relative severity of impacting different barriers
- Horizontal and vertical alignments of the road
- The slope of adjoining land
- Emergency pull over bays
<table>
<thead>
<tr>
<th>Barrier type</th>
<th>Typical advantages</th>
<th>Typical disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wire rope</td>
<td>▪ Less visual impact</td>
<td>▪ Approx 1.8m deflection</td>
</tr>
<tr>
<td></td>
<td>▪ Terminals are part of the system</td>
<td>▪ Following impact, longer sections are ineffective</td>
</tr>
<tr>
<td></td>
<td>▪ Repairs are generally less expensive than guardrail</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ Lower impact severity than alternatives</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ Approx 1.8m deflection</td>
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<tr>
<td></td>
<td>▪ Following impact, longer sections are ineffective</td>
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</tr>
<tr>
<td>Guardrail</td>
<td>▪ Following impact, smaller sections are ineffective</td>
<td>▪ Approx 1.8m deflection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ More visual impact</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ More costly to repair</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Higher impact severity than wire rope</td>
</tr>
<tr>
<td>Thriebeam</td>
<td>▪ Approx 1.3m deflection</td>
<td>▪ Higher impact severity than wire rope</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ More costly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Greater visual impact than guardrail or wire rope</td>
</tr>
<tr>
<td>Concrete</td>
<td>▪ Effectively 0m deflection if cast in situ</td>
<td>▪ Footings would impact on tree root systems</td>
</tr>
<tr>
<td></td>
<td>▪ Cast in situ generally does not need repair for minor impacts</td>
<td>▪ Higher impact severity than alternatives</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Terminals very costly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Possible drainage issues</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Impedes fauna movement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ More costly</td>
</tr>
</tbody>
</table>
Figure 11: An example of wire rope operation and deflection

Figure 12: Indicative cross sections that may apply near Braidwood
Figure 12 above indicates the considerations and implications of using safety barriers. Although the diagram shows a distance of 3.0m from the edge of the lane to the tree, the actual distance is a low as two metres in some locations near Braidwood. The diagram also presents a one metre shoulder (narrower than RMS standards) and how a stopped vehicle remains in the travel lane.

Using a wire rope or guardrail safety barrier to protect a hazard and meet safety standards requires approximately 3.8m from the edge of the travel lane to the hazard. This would provide a two metre shoulder and a barrier deflection of 1.8m.

The distance between the edge of the travel lane and many roadside trees along the Kings Highway near Braidwood is less than 3.8m and in some cases this distance is as low as two metres.

The use of safety barriers has been investigated as an option to allow trees which are important to the Braidwood environment to be preserved in their current position. In some sections of the Highway near Braidwood, this treatment is only possible if shoulder widths are compromised. Particularly west of Braidwood (between Nerriga Road and Deloraine Lane), where in most cases, it is only possible to provide around a one metre shoulder. This means that a vehicle needing to stop would not be able to move clear of the travel lane, resulting in another serious safety risk.

To offset this risk, there is a need to provide regular spaces (between sections of safety barrier) to allow for emergency stopping. Generally this would require the removal of some trees. RMS’s proposal is that sections of narrow shoulder beside a safety barrier should only be 300-500m in length between pull over areas. Figure 13 below shows the typical layout of an emergency stopping bay.

![Figure 13: Typical layout of an emergency stopping bay](image)

**5.4.3 Lack of overtaking lanes**

Forty-seven submissions received identified that dangerous overtaking was a common issue and raised a lack of overtaking lanes on the Kings Highway.

Overtaking lanes are appropriate on uphill sections of road (where there are greater speed differentials) to achieve the desired benefits and would not be appropriate on the flat sections of the Highway approaching Braidwood. Similarly, reversing the direction of the overtaking lane north of Braidwood would not be appropriate. An overtaking lane on
a downhill section of road would lead to excessive speeding and greatly reduced overtaking benefits.

Opportunities for overtaking need to be considered as part of a highway-wide strategy.

The provision of additional overtaking lanes is not considered to be an effective treatment in addressing the crash history on the immediate approaches to Braidwood and is not being considered further as part of this project.

### 5.4.4 Turning lanes

A small number of submissions received identified the need for turning lanes at specific locations including the Nerriga Road junction, the showground and racecourse access roads and the entrance to Mona.

There is a range of treatments that are applied to junctions and access points on the Highway to address the traffic efficiency and road safety issues associated with turning traffic. The appropriate level of treatment is assessed based on the profile of traffic volumes. At the high end, separated turning lanes (which require additional road width) allow turning traffic to slow down and wait without blocking the movement of through traffic. In many cases, a basic treatment, which allows through traffic to pass around a turning vehicle, is appropriate. Examples of basic right turn treatments already exist at Black Sallee Lane and the entrance to Mona.

The junction with Nerriga Road has a higher level of right turn treatment. The proposed new speed zones will implement a 50km/h speed limit at the junction of Nerriga Road with the Kings Highway which will assist the left turn movement at that location.

Apart from particular events, the showground and racecourse access roads north/west of Braidwood experience infrequent usage and do not warrant the provision of dedicated turning lanes. However, RMS has considered the issues associated with providing basic right turn treatments (a wider shoulder) and larger directional signs at these locations.

### 5.5 Increased traffic volumes

The issue of increased traffic volumes on weekends, public holidays and holiday seasons was raised in 35 submissions. Increases in heavy vehicle volumes were also raised as an area of concern.

#### 5.5.1. Bypass and duplication

The suggestion of constructing a bypass of Braidwood was put forward by 28 submissions with two submissions against the proposal of a bypass. A small number of submissions made other suggestions including: duplication of the Kings Highway and implementing a toll.

RMS has discounted the option of building a bypass as a feasible short term option to address the specific road safety concern on the Kings Highway approaches to Braidwood.
The process of constructing a bypass (or other duplication options) involves a complex series of actions and is subject to funding prioritisation on a state-wide basis.

Long term monitoring of traffic volumes around Braidwood (since 1990) identifies a linear growth rate of approximately 2% per year as shown in Figure 14 below for Wallace Street in Braidwood. These volumes include both local Braidwood traffic and through traffic. Between December 2011 and February 2012, monitoring showed an average of approximately 5-7% of heavy vehicles. The growth rate is slightly higher than typical.

**Figure 14: Annual Average Daily Traffic (AADT) trends in Braidwood – 1990-2010**

5.6 Other ungrouped community issues and suggestions

A small number of other issues and suggestions were also raised during the consultation period and documented in Section 4.6 of the Issues Report distributed in November 2011.

These issues and suggestions have been assessed and generally considered likely not to be effective in addressing the type of crashes that have occurred on the two lengths of the Kings Highway being reviewed.

As covered in the section on ‘Driver behaviour’, the ACT government actively participates in and supports the Kings Highway Road Safety Partnership.

Other suggestions listed under this heading are not being considered further as part of this project.
5.7 Other locations – outside the areas being considered

Some feedback received during the consultation period focussed on issues and suggestions applicable to locations outside the areas being considered.

Issues documented in Section 4.7 of the Issues Report distributed in November 2011 that have been addressed or noted as part of this project include:

- Speed zones within Braidwood township have been included in the overall speed zone review.
- Black Sallee Lane has been reviewed and found to have an appropriate level of treatment including signage, sight distance and a basic right turn treatment.
- Nerriga Road and route options west of Nerriga are being investigated in a study jointly commissioned by several councils.
- Other trees presenting hazards are found along the Kings Highway, however this project is focussed on two sections of road that are highlighted by a history of fatal crashes, as discussed in the section covering ‘The Road Safety Problem’.
- Dinner Creek is an area where RMS is progressing improvements separately to this project.

Some other issues raised (under the heading of ‘Clyde Mountain’) are appropriate for consideration in the broader safety review of the Kings Highway and will be considered as part of that investigation.

Other issues raised that apply within the township of Braidwood are the responsibility of Palerang Council or NSW Police.

6. Next steps

The next steps in addressing the road safety concern on the Kings Highway near Braidwood proposed by RMS are:

1. Maintain (temporarily) the VMS on the Kings Highway approaching Braidwood.
2. Implement the proposed speed zone changes as described in Section 5.1.3.
3. Continue to support the Kings Highway Road Safety Partnership.
4. Install profile line marking as described in Section 5.4.1
5. Establish a group to develop a long term Tree Management Plan. This group would include representatives from the local Braidwood community, Palerang Council and Roads and Maritime Services
6. Prepare an Options Report including a detailed proposal for the installation of safety barriers. Feedback on this Preliminary Investigations Report will be further considered during the development of proposed options.
7. Apply for funding to progress agreed and potential actions.
7. References

- RMS Web Site for Kings Highway projects

- RMS Web Site for Braidwood Hazards

- Documents available from the project web site, including:
  - Discussion Paper
  - Issues Report
  - NSW Speed Zoning Guidelines (v4.0)
  - NSW Centre for Road Safety Fact Sheets