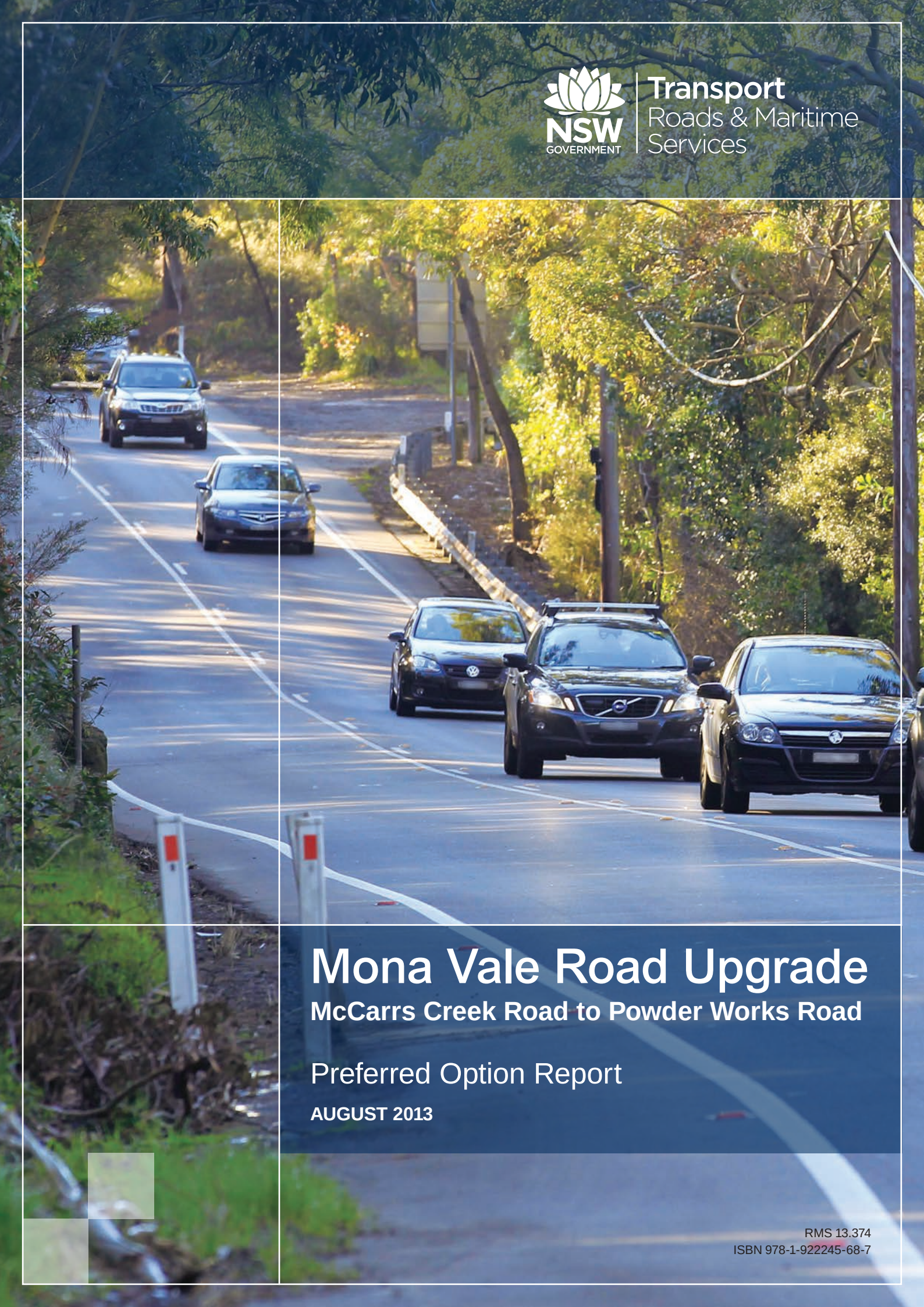

NSW GOVERNMENT
Transport
Roads & Maritime
Services

Mona Vale Road Upgrade

McCarrs Creek Road to Powder Works Road

Preferred Option Report

AUGUST 2013

RMS 13.374
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Roads and Maritime Services

Mona Vale Road Upgrade: McCarrs Creek Road to Powder Works Road

Preferred Option Report
August 2013

Prepared by Sinclair Knight Merz

Executive summary

Introduction

The 3.3-kilometre section of Mona Vale Road between McCarrs Creek Road, Terrey Hills, and Powder Works Road, Ingleside is subject to traffic congestion during peak periods. The New South Wales Long Term Transport Master Plan identifies Mona Vale Road as one of Sydney's key corridors (Sections 2.4.2 and 4.3.4).

To improve traffic flow, Roads and Maritime Services (RMS) is planning for the future upgrade of this section of the road. It has selected a preferred route for the proposed road upgrade. This report documents the process that has led to the identification of the preferred option.

Project objectives

The objectives of the project are to:

- Improve traffic capacity and efficiency for road users now and into the future.
- Improve road safety by providing a four-lane divided carriageway.
- Provide for a posted speed of 80 kilometres per hour.
- Minimise impacts on national parks, threatened species and heritage sites.
- Provide recreational and wildlife connectivity along the road corridor where appropriate.
- Provide on-road cycle facilities and an off-road path, where appropriate.
- Make provision for public transport.

The community and other stakeholders have been actively engaged in the development and consideration of the route options, and have contributed to the refinement of these objectives as project development has progressed.

Planning process to select a preferred option

RMS announced the project in May 2011. Since then, the project team has undertaken a preliminary environmental investigation (PEI) and other technical studies. These studies helped define feasible route options, which were documented in a Route Options Report (RMS, 2012a), which was publicly exhibited in October 2012.

The Route Options Report identified three feasible options. These options generally follow the existing alignment of Mona Vale Road. The main difference between the options relates to the way the road would avoid a rock outcrop located to the east of Kimbriki Road, which is a key topographical constraint within the road corridor. The three options are:

- Option 1: Existing corridor. This option would follow the existing alignment of Mona Vale Road to the south of the rock outcrop.
- Option 2: Northern alignment. This option would locate Mona Vale Road to the north of the rock outcrop.
- Option 3: Split carriageway. This option would split Mona Vale Road around the rock outcrop, with the eastbound carriageway to the north and the westbound carriageway to the south of the outcrop.

RMS has continued to refine these route options since publication of the Route Options Report.

Community consultation

RMS has worked closely with the community from the start of the project. RMS received 127 submissions in response to public exhibition of the Route Options Report (RMS, 2012a).

In general, respondents supported the proposal to upgrade Mona Vale Road. Many expressed difficulty in choosing an option at this early stage of the project development process. Of the 16% who ranked the route options, a clear preference was noted for Option 3 (split carriageway), followed by Option 2 (northern alignment).

The most common issues raised in submissions related to impacts on fauna, movement control, the project boundary and road design. The submissions have been a key input into the refinement of the route options and the selection of a preferred option.

Apart from consulting with the local community, RMS has also been working with a number of stakeholders, including Pittwater and Warringah councils, National Parks and Wildlife Service (NPWS) and the Northern Beaches Roadkill Prevention Committee.

The preferred option: Option 2 (northern alignment)

RMS undertook a comparative evaluation of the three route options through a value management study, which included a value management workshop in February 2013. The workshop reached consensus in recommending Option 2 as the preferred option for the upgrade of Mona Vale Road.

The value management study indicated that, when compared with other options, Option 2 would:

- Provide enhanced opportunities for fauna connectivity between the national parks and facilitate the early implementation of fauna mitigation measures during construction. It would also minimise fauna fencing and containment issues in the vicinity of the rocky outcrop.
- Provide the opportunity to consolidate a fragmented piece of bushland to the north of the existing road (including the rock outcrop) into Garigal National Park.
- Minimise vegetation fragmentation, especially for the national parks, and enable the old road alignment to be rehabilitated and consolidated into Garigal National Park.
- Offer confidence regarding national park land acquisition and access provisions.
- Provide a larger area for stormwater control and treatment measures, which would facilitate more effective water quality controls during the construction and operation of the project.
- Entail less traffic disruption and simpler traffic staging, limiting inconvenience to the local community and businesses during construction.
- Utilise proven constructability methods, avoid major geotechnical risks and reduce Work Health and Safety (WHS) risks.
- Provide a consistent roadside verge and shoulder width.
- Provide an efficient solution with confidence in the planned cost.

Accordingly, Option 2 was chosen as the preferred option as it:

- Ranks well with the community and has greater potential to meet community expectations.

- Is the most flexible and responsive option with respect to constructability issues.
- Was the best performing option across all evaluation criteria, including cost, when examined during the value management workshop.
- Was recommended by the value management study.

Considerations in the next stages

Option 2 is based on strategic road designs completed by RMS. As the project development process continues, RMS will refine the design to ameliorate some of the potential impacts and to improve or optimise its functionality, environmental and social outcomes, urban design and cost-benefit. In particular, RMS will further consider the following:

- Other transport modes, including cyclists, pedestrians and public transport users.
- Impacts on services and utilities.
- Topography and geology, for the extent of earthworks, the requirements for structures (especially retaining walls and viaducts) and acceptable geotechnical risks.
- Constructability, including staging, the location of adequate space for site and stockpile facilities, environmental controls and how the upgrade can be constructed under traffic.
- Biodiversity, including further investigation into the extent of impacts on endangered ecological communities and threatened flora and fauna species, and options to minimise impacts and improve connectivity along the road corridor.
- The extent of direct and indirect impacts on national parks.
- Indirect impacts on Aboriginal heritage places, and on non-Aboriginal heritage items.

RMS requests your feedback

The community and stakeholders are invited to comment on this Preferred Option Report. Further information on the public consultation process is available on the project website at http://www.rms.nsw.gov.au/roadprojects/projects/sydney_region/northern_sydney_region/mona_vale_rd_upgrade/index.html.

Ongoing consultation will be an integral part of the project as it moves ahead. Submissions are welcome at any stage of the process and can be made in writing or via the project email address and telephone number.

Mona Vale Road Upgrade
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Roads and Maritime Services
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Appendices

1 Introduction

Roads and Maritime Services (RMS) is planning for the future upgrade of the 3.3-kilometre section of Mona Vale Road between McCarrs Creek Road, Terrey Hills, and Powder Works Road, Ingleside (refer to **Figure 1-1**). It has selected a preferred route for the proposed road upgrade. This report documents how RMS selected the preferred route.

1.1 The study area

The proposed upgrade is located on Sydney's Northern Beaches, about 20 kilometres north of the Sydney central business district, and about five kilometres west of the Mona Vale town centre. It follows the boundary of the Warringah and Pittwater local government areas (LGAs), which is along Mona Vale Road. The Transport for New South Wales Long Term Transport Master Plan identifies Mona Vale Road as one of Sydney's corridors of demand (Sections 2.4.2 and 4.3.4).

The section of Mona Vale Road within the study area incorporates the intersections of McCarrs Creek Road, Kimbriki Road, Tumburra Street, Addison Road and Powder Works Road. The signposted speed limit on this section is 70 kilometres per hour. (It was once 80 kilometres per hour, but this was reduced in April 2001 to improve road safety.)

Land to the south of the road is predominantly Garigal National Park, which abuts the road corridor for about 2.5 kilometres, from east of Kimbriki Road to west of Powder Works Road. Part of the study area to the north of the road extends into Ku-ring-gai Chase National Park, which abuts the corridor for almost one kilometre, from just east of Kanangra Avenue to about 300 metres east of Kimbriki Road.

1.2 Brief history of the project

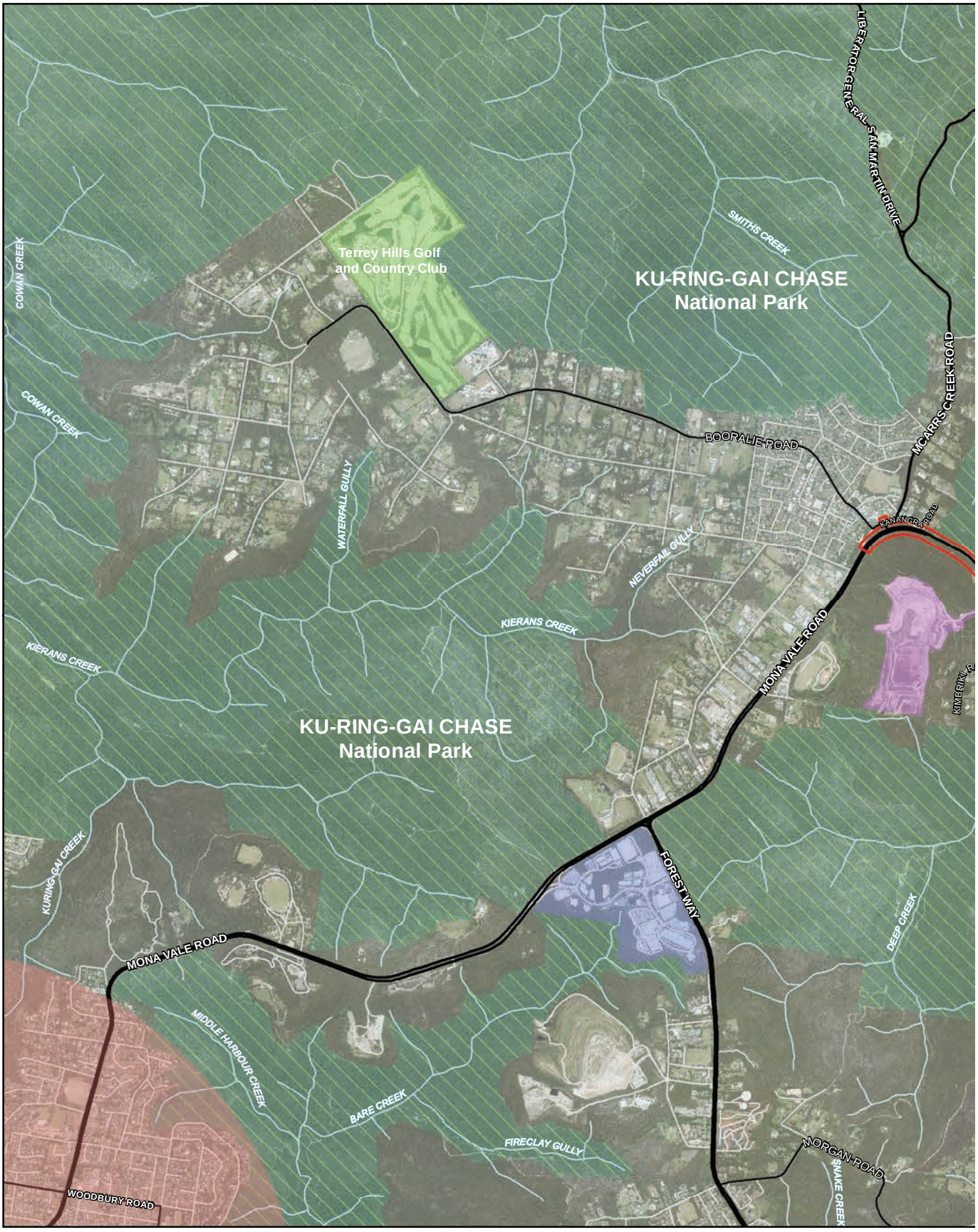
This section of Mona Vale Road is subject to traffic congestion during peak periods, and the upgrade of this section is identified as a short-term priority in the Mona Vale to Macquarie Park Corridor Strategy (RTA, 2009). After the strategy was released, RMS announced the start of the project in May 2011.

Since then, RMS has undertaken a preliminary environmental investigation (PEI) and other technical studies. These studies helped to define three feasible route options (refer to Figure 1-2), which were documented in a Route Options Report (RMS, 2012a), which RMS exhibited in October 2012. The three options have been named:

- Option 1: Existing corridor.
- Option 2: Northern alignment.
- Option 3: Split carriageway.

All three options generally follow the existing alignment of Mona Vale Road. The options differ in how they address the rock outcrop located to the east of Kimbriki Road. The outcrop is a key topographical constraint and has shaped the alignment of the route options. Option 1 follows the existing alignment of Mona Vale Road to the south of the rock outcrop, Option 2 extends to the north of the rock outcrop, and Option 3 splits around the rock outcrop with the eastbound carriageway to the north and the westbound carriageway to the south.

The three options are outlined in detail in Section 6 of the Route Options Report (RMS, 2012a). Since the release of the Route Options Report, RMS has refined the options and selected a preferred option, which is described in this report.



SKM

NSW GOVERNMENT Transport Roads & Maritime Services

PLAN TITLE

Figure 1-1

Overview of study area

PROJECT TITLE Mona Vale Options Reporting

PROJECT REF

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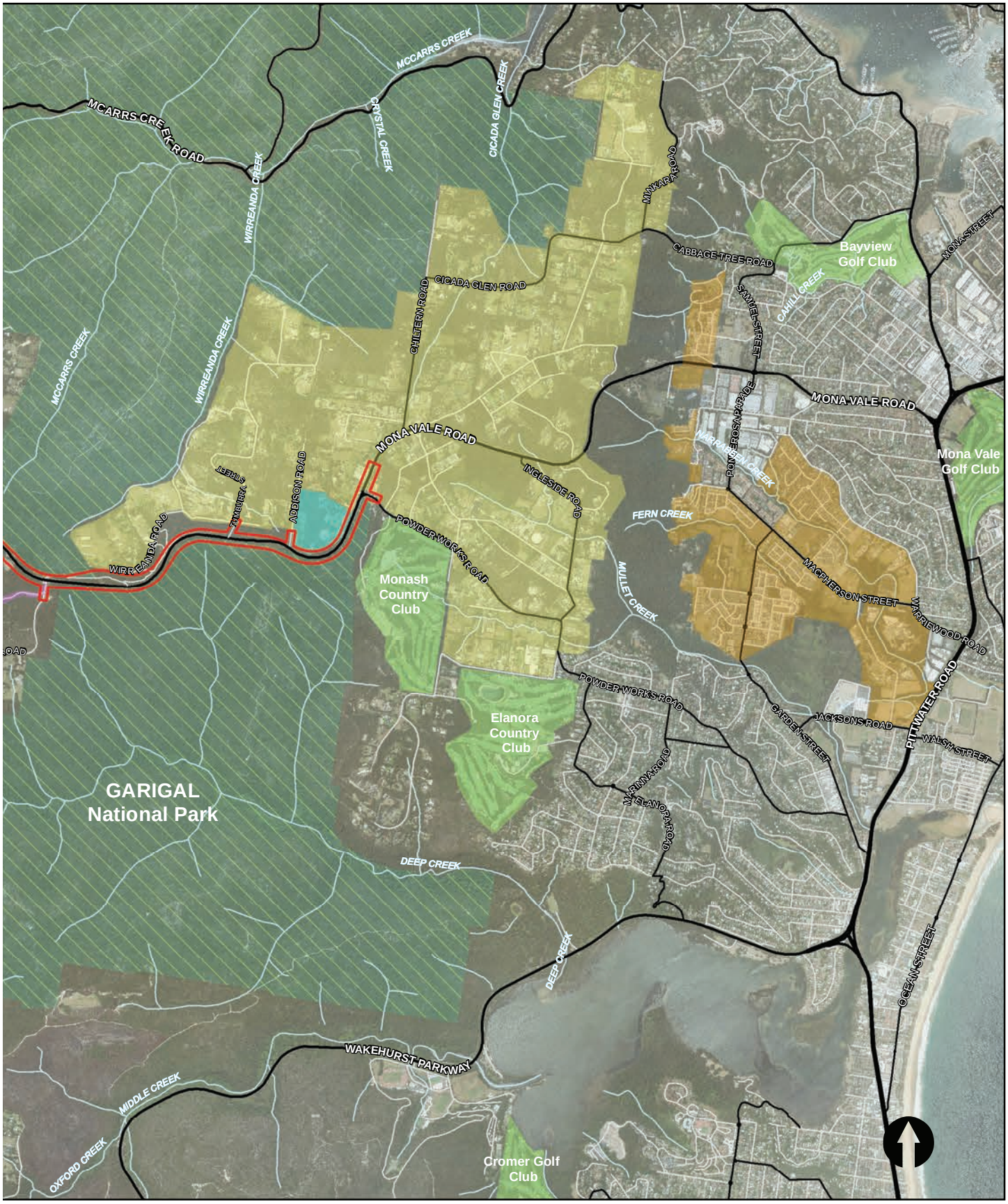
Sydney Spatial Team - Prepared by : MS
Checked by : JC

LOCALITY



LEGEND

- Mona Vale Road survey area
- Hydroline
- Arterial road
- Distributor road
- Local road
- National Park
- Ingleside Residential Release
- Kimbriki Resource Recovery Centre
- St Ives Town Centre
- Warriewood Urban Land Release
- Golf courses
- Industrial complex
- Baha'i Temple

GCS GDA 1994 | MGA Zone 56 UTM

A3 1:35,000

0 1,000

Metres

SKM

NSW GOVERNMENT Transport Roads & Maritime Services

PLAN TITLE

Figure 1.2

Mona Vale Road upgrade – route options

PROJECT TITLE Mona Vale Options Reporting

PROJECT REF

Path: I:\ENVR\Projects\EN03205\Technical\Spatial\GIS\GIS_Directory\ArcMap\EN03205_GIS_F202_r2v1.mxd
Sydney Spatial Team - Prepared by : MS
Checked by : JC

LOCALITY

LEGEND

- Option 1 corridor (50m)
- Centreline
- Option 2 corridor (50m)
- Centreline
- Option 3 corridor (50m)
- Centreline
- National Park
- Natural bushland (Crown land)

GCS GDA 1994 | MGA Zone 56 UTM

A3 1:10,000

0 400

Metres

1.3 This report

This report presents:

- A summary of community and stakeholder consultation to date, with particular focus on the feedback received on the Route Options Report (RMS, 2012a) (see **Chapter 2**).
- How RMS has refined the route options since exhibition, and the process leading to the selection of the preferred option (see **Chapter 3**).
- The reasons for selection of Option 2 as the preferred route, commentary on how this option meets the project objectives and an overview of its key features (see **Chapter 4**).
- The next steps in the development process (see **Chapter 5**).

This report builds on the detailed information provided in the Route Options Report. As such, it is important it is read in conjunction with that document.

2 Community and stakeholder consultation

2.1 Consultation objective

RMS' community involvement objective for the Mona Vale Road upgrade is to ensure that community input is incorporated into each phase of project development, from the identification of initial options to selection and refinement of the preferred option.

To enable this to occur, RMS developed a Community Involvement Strategy at the inception of the project. The community involvement strategy aims to:

- Introduce the project team to the community and provide a central point of contact in RMS.
- Raise awareness of the project and build relationships with stakeholders.
- Explain the need for the upgrade, its benefits and how potential impacts would be reduced.
- Help the community to understand the option selection process and the next steps.
- Clearly outline how stakeholders can participate in the project and how their input will be used in decision-making.
- Clearly explain the decision-making process.
- Provide appropriate and accessible information about the project, including regular information updates.
- Anticipate and manage issues as early as possible.
- Manage stakeholder feedback and complaints in a timely, respectful way.
- Monitor and evaluate community feedback to measure success and review planning as necessary.

Figure 2-1 provides an overview of the consultation phases and activities for the project. The project is currently at the 'selection of preferred option' stage.

2.2 Community consultation activities to date

RMS began community consultation in May 2011, with the project announcement. Since then, it has provided the community with a range of opportunities to comment on the project.

Early consultation activities included:

- Between September and November 2011, RMS sent a letter and postcard with information about the project to residents, businesses and stakeholders in the study area. These provided a link to an online survey and online mapping tool.
- RMS received 73 comments submitted via the online survey, 182 comments via the online mapping tool and 17 emails.
- In April 2012, RMS released a Community Consultation Summary Report, which documented findings up to that time.

Figure 2-1: Consultation phases and activities for the project

More recently, RMS has undertaken the following consultation activities:

- RMS placed the Route Options Report on public exhibition (from 26 October 2012 to 7 December 2013) and invited community comment. Further comments submitted outside the comment period were also accepted up to 11 January 2013. Documents were placed on display at Mona Vale Library, Warringah Mall Library and at the Frenchs Forest and Warriewood motor registries.
- RMS distributed a community update newsletter to 5000 homes and businesses in Terrey Hills, Ingleside, Duffys Forest, Belrose and Elanora Heights on 28 October 2012. RMS also made the newsletter available for download on the project website. The newsletter was the main communication tool outlining the project and providing instructions on how to leave feedback with RMS.
- RMS hosted displays at Belrose Supa Centa and Centro Warriewood where the community could speak to the project team. These displays were visited by 57 people.
- RMS hosted a community information session at the Terrey Hills Seniors and Youth Centre, where the community could discuss the project in detail with the project team. The information session was attended by 59 people.
- RMS used feedback response forms to record information and comments from members of the community at community information sessions and staffed displays, and when receiving telephone responses.
- RMS provided the project's toll-free telephone number and email address to facilitate public feedback.

Further detail is provided in the 2013 Route Options Community Consultation Summary Report (RMS, 2013), a copy of which is included in **Appendix 1**.

Apart from consulting with the local community, RMS has also been working with a number of stakeholders to ensure they are informed about, and have an opportunity to participate in, the project development process. These stakeholders include:

- Transport for NSW.
- Pittwater Council.
- Warringah Council.
- National Parks and Wildlife Service (NPWS).
- Office of Environment and Heritage (OEH).
- Northern Beaches Roadkill Prevention Committee.
- Metropolitan Local Aboriginal Land Council.

Representatives from these stakeholders attended project workshops during 2011 and 2012, and many of them attended the value management workshop held in February 2013 (refer to **Section 3.4**).

2.3 Summary of issues raised during consultation

The results of the initial round of consultation undertaken in 2011 are detailed in the Community Consultation Summary Report (RMS, 2012a) and summarised in Section 2.3 of the Route Options Report (RMS, 2012a).

The outcomes of the latest round of consultation (which accompanied the display of the Route Options Report) are detailed in the Route Options Community Consultation Summary Report (RMS, 2013) (refer to **Appendix 1**). In brief, RMS received 127 submissions via emails, feedback forms, written submissions and telephone calls and from face-to-face information sessions and meetings. RMS used these submissions to help refine the route options and select a preferred option (refer to **Chapter 3**).

In general, respondents supported the proposal to upgrade Mona Vale Road. The most common issues raised by respondents related to fauna, the project boundary, movement control, and road design. These concerns are summarised below.

2.3.1 Route Options

Many respondents expressed difficulty in choosing an option at this early stage of the project development process. Of the 16% who did rank the route options, a clear preference was noted for Option 3 (split carriageway), followed by Option 2 (northern alignment):

- Option 3 was preferred because it was thought there would be an opportunity to minimise traffic disruption during construction and it would provide a similar driving experience to other lengths of Mona Vale Road.
- Option 2 ranked second because it was thought this option would result in reduced traffic impacts and offer construction time savings.
- Those who preferred Option 1 generally felt it would offer the least disturbance to vegetation.

2.3.2 Fauna

Respondents highlighted the proximity of the proposed upgrade to Ku-ring-gai Chase and Garigal national parks. They voiced concerns about the implications for threatened ecological communities, plant and animal species, and the potential to exacerbate the current road kill along this section of Mona Vale Road.

The submissions emphasised the need for appropriate measures to avoid, manage or mitigate the impacts on fauna. The submissions highlighted the need for measures to enhance fauna connectivity (through fauna fencing, underpasses and overpasses) and to protect fauna by reducing speed limits.

2.3.3 Movement control

'Movement control' featured prominently in the submissions. This was largely due to the opposition to the proposed traffic lights at the intersections of Mona Vale Road and Kimbriki Road, and Mona Vale Road and Tumburra Road. Many respondents were concerned that these traffic lights would undermine any improvement in traffic efficiency associated with the road upgrade. There was also concern that traffic lights at the intersection with Tumburra Road (which is at the bottom of a steep grade) would have potential safety risks. There was a clear community preference for alternative design solutions at intersections, like the provision

of slip lanes and grade-separated roads (that is, building one of the intersecting roads on an overpass to go over the other road).

There were also submissions calling for either a faster or slower travel speed, and comments about the absence of appropriate alternative routes (for example, Wakehurst Parkway already experiences heavy traffic congestion and is prone to closures during flooding).

2.3.4 Project boundary

A significant number of respondents queried the appropriateness of the current project boundary. It was perceived that the section of Mona Vale Road further east, between Ingleside and Mona Vale, is subject to more congestion than the section to the west of Ingleside, primarily due to the steep grades when travelling west out of Mona Vale. Accordingly, respondents indicated a strong preference to either change the priorities for the upgrading of Mona Vale Road to focus on the eastern section first, or to add this eastern section to the current scope of work.

2.3.5 Road design

Many respondents commented on the issue of road design. Comments were varied but included the need for the design to be responsive to the topography, the geotechnical constraints and the natural environment, while enhancing travel efficiency, access and safety. Comments related to such diverse issues as gradient, provision of slip lanes and the need to improve curves.

2.3.6 Facilities for cyclists, pedestrians and horse riding

Some respondents said the upgrade would provide an opportunity for provision of appropriate facilities for pedestrians, cyclists and horse riders (it was stated these facilities are currently inadequate and/or lacking). Both individual community members and stakeholder organisations stated these facilities would be invaluable in reducing the risk of crashes involving vehicles and other road user groups. Some submissions suggested RMS should provide a barrier-separated shared path beside Mona Vale Road for these activities.

2.4 How the community can comment on the preferred option

RMS invites the community and stakeholders to comment on this Preferred Option Report.

RMS has released a community update newsletter for local residents, providing details of the preferred option as well as information about how to leave feedback with RMS or raise questions and concerns.

More information is available on the project website:

http://www.rms.nsw.gov.au/roadprojects/projects/sydney_region/northern_sydney_region/mona_vale_rd_upgrade/index.html.

Comments should be submitted via mail (RMS, PO Box 973 Parramatta NSW 2124), email (monavaleroad@rms.nsw.gov.au) and/or the project telephone number (1800 633 332).

RMS will hold information sessions and displays to provide the public with information about the preferred option and an opportunity to discuss it with the RMS project team

Ongoing consultation will be an integral part of the project as it moves into the concept design and environmental assessment stages. RMS welcomes comments from community members and stakeholders at any stage.

3 How RMS selected the preferred option

3.1 Project objectives

In developing route options, and then selecting a preferred option, RMS has sought to meet the project objectives and to avoid major technical, social and environmental constraints where possible.

The project objectives are to:

- Improve traffic capacity and efficiency for road users now and into the future.
- Improve road safety by providing a four-lane divided carriageway.
- Provide for a posted speed of 80 kilometres per hour.
- Minimise impacts on national parks, threatened species and heritage sites.
- Provide recreational and wildlife connectivity along the road corridor where appropriate.
- Provide on-road cycle facilities and an off-road path, where appropriate.
- Make provision for public transport.

The community and other stakeholders have been actively engaged in the development and consideration of the route options, and have contributed to the refinement of these objectives as the project development process has progressed.

3.2 Development of route options

RMS used an iterative process to develop the route options. This has involved a number of inputs, including field investigations, engineering designs, community submissions and technical workshops (**Figure 3-1** summarises the options development process).

Through this process, RMS identified three route options that only differ in their alignment around the rock outcrop adjacent to Mona Vale Road and to the east of Kimbriki Road. The remainder of the alignment for each option generally follows the existing road alignment and are considered common to all route options.

The route options are:

- Option 1: Existing corridor.
- Option 2: Northern alignment.
- Option 3: Split carriageway.

The three route options were presented in the Route Options Report (RMS, 2012a), which RMS put on public display from October 2012 to January 2013. The options were based on strategic designs that showed a typical arrangement for the upgrade.

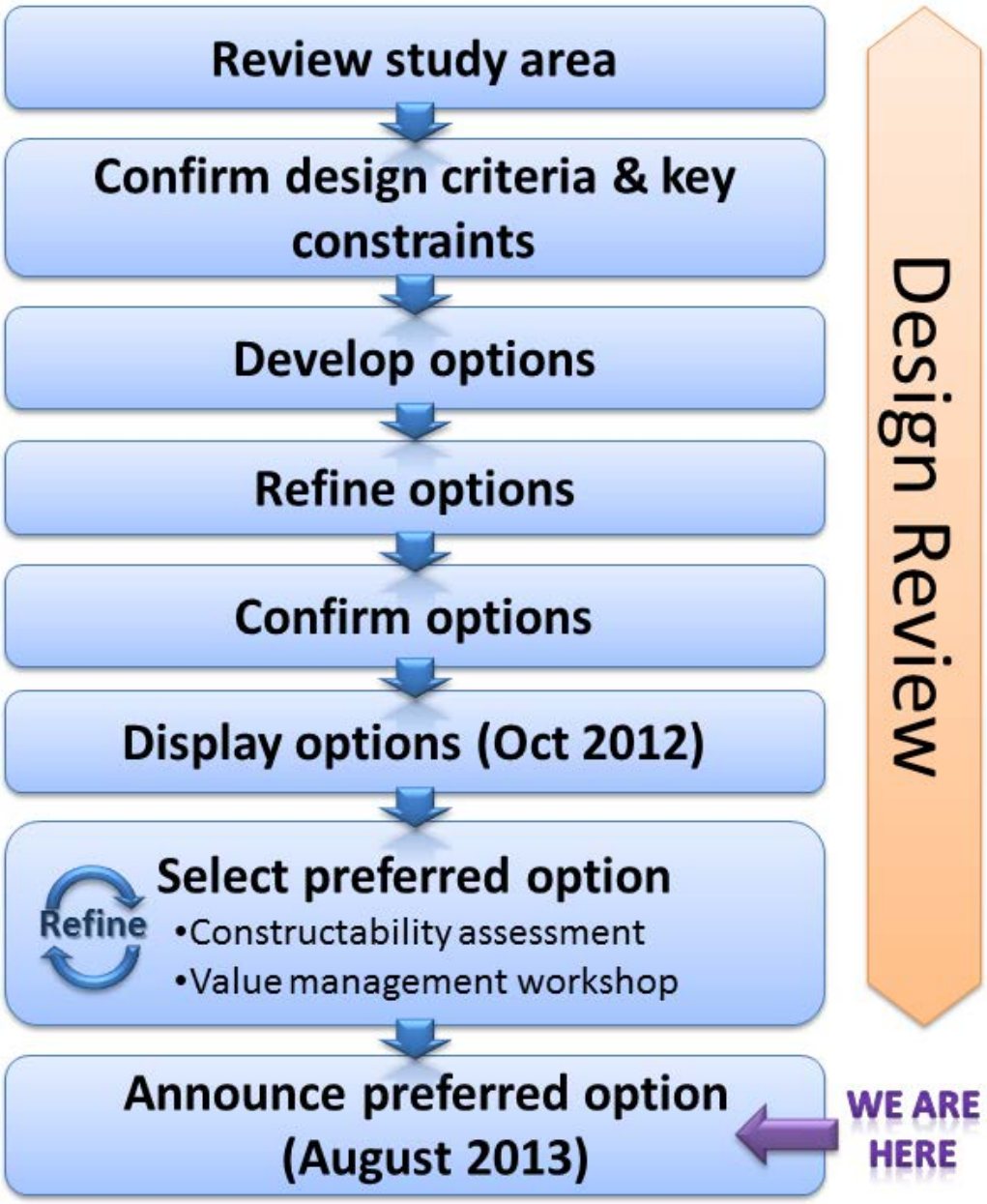


Figure 3-1: The options development process

3.3 Refinement of route options

Since the release of the Route Options Report to the public, and following on from the constructability workshop, RMS has continued to refine these options to take account of environmental, technical and community input. These refinements include:

- Small changes to the road alignment to allow for easier staging of roadwork.
- A reduction in the extent and heights of retaining walls.
- Consideration of the full signalisation of all legs of the McCarrs Creek Road intersection.
- A multi-use and utility corridor connected to Wirreanda Road, which would enable RMS to relocate utilities early in the project. This corridor would be sufficiently wide for the relocated utilities and for a multi-use path while minimising vegetation disturbance.

- A multi-use path following the proposed utility corridor on the north side of Mona Vale Road from Powder Works Road, Ingleside to Kanangra Road, Terrey Hills
- The inclusion of a new local road connection between Tumburra Street and Addison Road. Under the current proposal, the Addison Road intersection would be removed and connection made to Tumburra Street and Wirreanda Road. This new connection would:
    - Improve access to Addison Road.
    - Consolidate intersection traffic movements at a more manageable location.
    - Narrow the curved road alignment approaching the Baha'i Temple, further reducing impacts to the endangered ecological community.
    - Enable the connection of a multi-use path to the existing path that presently terminates at Addison Street
- Consideration of improvements at the intersection of Tumburra Street with Mona Vale Road, including:
    - A truck acceleration lane on the eastbound carriageway.
    - Grade-separated intersection scenarios.

Table 3-1 provides an updated summary of the three options in terms of technical, environmental, social and cost considerations.

Table 3-1: Technical, environmental, social and cost features of the options (values are approximate and will be refined as the design progresses)

Criteria [1]	Option 1 Existing alignment	Option 2 Northern alignment	Option 3 Split carriageway
Technical considerations			
Length	3.3 km	3.3 km	3.3 km
Maximum footprint width	32 m	32 m	32 m
Maximum grade and length	10% over 340 m	10% over 340 m	10% over 340 m
Minimum and maximum radius (m)	230 min 3000 max	230 min 1000 max	230 min\ 500 max
Deepest cut	7.5 m (Ch 1800)	5.8 m (Ch 1800)	7.5 m (Ch 1800)
Highest fill	7.1 m (Ch 1100)	6.5 m (Ch 700)	6.5 m (Ch 700)
Significant structures	Retaining wall Viaduct structure	Retaining wall	Retaining wall
Geotechnical considerations	Major geotechnical constraints associated with widening to the south, in the area west of Kimbriki Road	Avoids most of the geotechnical constraints associated with widening to the south	Avoids some of the geotechnical constraints associated with widening to the south
Environmental considerations			
Endangered ecological community within the strategic design footprint	1.8 ha (Duffys Forest)	1.8 ha (Duffys Forest)	1.8 ha (Duffys Forest)
Threatened flora within the study area (E = endangered, T = Threatened)	• Caley's Grevillea (E) • Angus's Onion Orchid (E) • Yellow-top Ash Mallee (T)	• Caley's Grevillea (E) • Angus's Onion Orchid (E) • Sunshine Wattle (T) • Yellow-top Ash Mallee (T)	• Caley's Grevillea (E) • Angus's Onion Orchid (E) • Sunshine Wattle (T) • Yellow-top Ash Mallee (T)
National park land within the strategic design footprint	0.5 ha (with potential to exceed 4 ha)	0.6 ha	0.5 ha
Social considerations			
Culturally sensitive areas	Avoided by carriageway	Avoided by carriageway	Isolated by carriageway
Number of dwellings within the strategic design footprint	1	1	1
Private property within the strategic design footprint	0.1 ha (residential & Baha'i Temple)	0.1 ha (residential & Baha'i Temple)	0.1 ha (residential & Baha'i Temple)
Time to construct (minimum)	3 years	2 years	2 years
Cost			
Cost estimate (as at Feb 2013)	$200 million	$140 million	$145 million

Note: [1]The items listed are not intended to be exhaustive but rather are those items that differentiate the three options.

3.4 Preliminary constructability assessment

Constructability (defined as the ease or feasibility of constructing the road upgrade) is an important consideration in the selection of a preferred option. Constructability issues include geotechnical constraints, traffic volumes and the constrained road corridor.

On 29 January 2013, RMS undertook a preliminary constructability assessment of the route options at a one-day workshop. The workshop was attended by technical specialists from RMS and a representative from a Tier 1 construction contractor engaged by RMS to help it understand the construction issues and to identify appropriate construction solutions. A copy of the workshop proceedings is included in **Appendix 2**.

During the constructability assessment, the route options were comparatively assessed against the seven constructability criteria described in **Table 3-2**.

Table 3-2 Criteria used in preliminary constructability assessment

Criteria	Definition
Ease and efficiency of construction	The extent to which construction can be undertaken using proven construction methodologies to achieve optimal productivity conditions whilst avoiding complex scenarios and potential WHS risk.
Staging of construction	The extent to which the stages of construction are safe and efficient.
Traffic management	The extent to which traffic controls required to facilitate construction, maintain safe and efficient traffic conditions.
Global site constraints	The extent to which alignment and construction avoids site constraints, including geology, steep topography and proximity to national parks
Utilities	The extent to which alignment and construction avoids utilities or minimises costs of relocating them.
Environment	The extent to which environmental impacts are effectively avoided, minimised, managed, or where environmental benefits are maximised.
Time	The extent to which timeframes required to complete investigations, obtain the necessary approvals and complete construction are minimised.

The outcomes of the constructability assessment workshop are summarised in **Table 3-3**. It shows that Option 2 was found to be the best performing option in terms of constructability, and would offer the following key advantages:

- It would provide the opportunity to access material when it was needed, using conventional methods, and would provide flexibility to improve earthwork balances leading to greater construction efficiency.
- It would provide the opportunity to manage road work away from the existing operating carriageway and reduced the need for traffic switching relatives to the other options. This would improve safety for construction workers, cyclists and pedestrians, and minimise night work.
- It would provide more certainty regarding geotechnical constraints, as it would avoid some of the key geotechnical issues to the east of Kimbriki Road. Access to carry out the geotechnical investigations would also be simplified as there are existing access tracks located away from traffic.
- It would provide greater flexibility in terms of fauna connectivity and would allow more space for erosion and sedimentation controls.
- It would provide a reduced construction timeframe and greater confidence in the anticipated duration.

Table 3-3: Constructability of the three route options

Criteria	Comparative assessment			Comments
	Option 1	Option 2	Option 3	
Ease and efficiency of construction	--	++	++	• Option 1 would have major geotechnical risks and may not be constructible without specialised construction techniques. These geotechnical risks would increase the chance of delays and construction cost increase. Space restrictions also pose risks to worker safety. • Option 2 would provide greater geotechnical certainty. It would require fewer retaining walls, but of greater height and can be built using conventional construction methods. • Option 3 would minimise the extent of retaining walls, provide for more efficient construction and enable some construction away from traffic and can be built using conventional construction methods. Option 3 would require some rework of the existing carriageway.
Staging of construction	--	++	+	• Option 1 would present access issues (particularly to viaducts) and staging would be difficult. • Option 2 would provide the best flexibility with respect to staging. It offers the opportunity for some sections to be constructed completely offline providing greater opportunity to access material when its needed. The existing alignment could be used for construction purposes once traffic has been switched to the new alignment. • Option 3 would involve an extra stage and a switch at Kimbriki Road. Overall, this option would entail more complex staging and would be less flexible. It would have a good earthworks balance. There is potential that only limited rework would be required to the existing alignment.
Traffic management	-	++	+	• Option 1 would require regular night work. It would also be difficult to separate construction and through traffic and would therefore pose a significant risk for accidents. It would not be able to accommodate cyclists on the existing road during construction. Construction would take longer than the other options, requiring prolonged traffic management. • Option 2 would allow off-carriageway management, less traffic switching and simpler maintenance (one formation instead of two) than the other options. This option would also have good traffic separation and provide an opportunity to separate cyclists from construction. • Option 3 would involve an extra stage and traffic switching at Kimbriki Road. Option 3 would not be able to accommodate cyclists on the existing road during construction; however there would be good traffic separation.
Global site constraints	0	+	+	• Option 1 would have most impact major geotechnical constraints creating complex access or rock stabilisation scenarios that would generate the highest impact to national parks. • Option 2 would have space on the existing alignment for use during construction and there is an opportunity to return land to Garigal National Park, which could offset the impacts on adjacent national park land. • Option 3 would provide more opportunity for batters, which are preferred from a maintenance and work health and safety (WHS) perspective, as construction workers would not be working at heights.
Utilities	0	0	0	• The rating for utilities remained neutral for all options as more information is required regarding time, cost and removal/relocation of utilities. All options would require a new utility corridor. Option 1 would impact upon fewer utilities but would still require a utility corridor north of the rock outcrop.

Criteria	Comparative assessment			Comments
	Option 1	Option 2	Option 3	
Environment	**0**	**+**	**+**	• Option 1 would retain access to the rock outcrop and further avoid Angus's Onion Orchid. It would require shorter fauna culverts although these would be challenging between the rock outcrop and Kimbriki Road. It would have the greatest risk of off-site impacts, which would pose a risk to adjacent national parks. • Option 2 would retain access to the rock outcrop. The rock outcrop would be consolidated into a contiguous area with Garigal National Park. It would require shorter culverts for fauna and provide more opportunity for runoff controls. However, it would be located closer to an area containing the Angus Onion Orchid. • Option 3 would be located closest to an area containing the Angus Onion Orchid. It would require the least vegetation removal. There would be restricted access to the rock outcrop and the isolated median could complicate fauna provisions with long culverts and complex fencing.
Time	**0**	**++**	**+**	• It is estimated that Option 1 would take about three years to construct. Option 2 would take about two years and Option 3 would take more than two years. • Construction period estimates will need to consider the timeframes for the environmental approval process, geotechnical investigations, utilities approvals, and revocation of National Park land in advance of physical work.

Note on scoring: ++ = much better, + = better, 0 = base case (in most cases this would be Option 1), - = worse, -- = much worse

As shown in **Table 3-3**, options 1 and 3 would provide certain opportunities but would offer less flexibility to manage constructability issues. For both of these options, further investigation would be required with respect to geotechnical and environmental risks (refer **Figure 3-2**) as well as traffic constraints, which are likely to result in a longer construction program than Option 2.

Figure 3-2: Geotechnical constraints to the south of the existing alignment, east of Kimbriki Road.

The main constructability issues for Option 1 relate to:

- The potential environmental impacts. Roadwork would have greater potential to impact on Ku-ring-gai Chase and Garigal national parks (due to vegetation clearing and potential land acquisition for construction access and water runoff control).
- The management of staging and traffic during construction.
- The inability to provide for on-road cycling on the main carriageway east of Kimbriki Road during construction.
- The likelihood of major geotechnical risks creating complex construction scenarios.
- The need for regular night work to avoid traffic impacts, resulting in a longer construction period. This may result in impacts on residents adjacent to construction and significant work health and safety (WHS) risks.

The main constructability issues for Option 3 relate to:

- The management of staging and traffic during construction. An extra stage and traffic switch would be required at Kimbriki Road.
- The inability to provide for on-road cycling on the main carriageway east of Kimbriki Road during construction.
- The difficulty in providing fauna crossings, as allowance would need to be made for the movement of fauna across the median created by this option. This in turn would necessitate additional fauna fencing and potentially longer culverts. At the constructability workshop, the effectiveness of long culverts as fauna crossings was questioned.

3.5 Value management study

RMS used the findings of the preliminary constructability assessment (see Section 3.3) to inform the subsequent value management study, in which the three route options were compared and a preferred option recommended.

The value management study included a value management workshop on 13 February 2013 at Ingleside. The intention of the workshop was to discuss the route options and gain a shared understanding of which option would provide the best balance across social, environmental, economic and engineering issues while also taking estimated costs into account. The workshop included 26 representatives from:

- The local community.
- The through-traffic community.
- The local business community.
- Northern Beaches Roadkill Prevention Committee.
- Warringah Council.
- Pittwater Council.
- NSW Office of Environment and Heritage (OEH).
- National Parks and Wildlife Service (NPWS).
- The project team.
- RMS technical experts from various disciplines.

The outcomes of the value management study are documented in the Value Management Study Report (RMS, 2013), which is included in **Appendix 3,** and summarised below.

3.5.1 The value management process

The value management process harnesses the detailed specialist knowledge and perspectives of workshop participants to generate value and improve ideas.

At the workshop, participants evaluated the route options for upgrading Mona Vale Road against the project objectives, value management workshop objectives and agreed assessment criteria.

As the three route options only vary in the vicinity of the rock outcrop to the east of Kimbriki Road, the workshop only sought to recommend a preferred route option for this section of the upgrade.

The outcome of the workshop was consensus in recommending Option 2 as the preferred option for the upgrade.

3.5.2 Evaluation criteria

The comparison of route options was underpinned by the development of evaluation criteria together with respective weightings. Draft evaluation criteria were developed prior to the workshop under three key categories – technical and functional, natural and built environment, and social and economic. These criteria were reviewed, amended, added to and ultimately endorsed by the workshop participants.

Issues that would not differentiate between route options were specifically excluded. Further, as cost is considered separately, it was not considered during the development of the evaluation criteria.

Following the identification of the criteria, the workshop used a paired comparison process, together with extensive discussion, to agree the weightings that would be attached to each of the criteria. The final evaluation criteria and weightings developed by workshop participants are listed in **Table 3-4**.

Table 3-4: Evaluation criteria and weightings used at the value management workshop

Criteria	Weighting
Technical & functional	
Improve safety for end users	33%
Enable ease of investigation and construction, minimise worker risk, and provide capacity for staging of works to minimise duration	23%
Minimise construction traffic and through traffic impacts	7%
Provide the best integration of public utilities with the transport solution	0%
Provide the best opportunity to accommodate public transport	13%
Provide the best ongoing operation and maintenance solution	23%
Natural & built environment	
Minimise impacts on threatened ecological communities and threatened species	42%
Minimise impacts on the national parks (including land acquisition)	8%
Provide opportunities for improved flora and fauna connectivity	33%
Minimise impacts on water quality	17%
Social & economic	
Minimise heritage and cultural impacts	40%
Minimise adverse impacts on local amenity (ie access, noise, air quality and quality of life, but excluding connectivity)	25%
Minimise adverse impacts on views and provide best fit with the tourist route aesthetics	0%
Minimise adverse impacts on the adjacent community and businesses	25%
Provide the best opportunity for recreational access between communities and the national parks (ie connectivity)	10%

3.5.3 Evaluation of options

Once the workshop participants had agreed on the criteria and weightings, they reviewed the three design options in detail to ensure they had a common understanding of each option and could share information on the opportunities and risks likely to be associated with each.

Following this review, the performance of each option with respect to each of the evaluation criteria was rated on a nominal scale of 1 to 5.

The best performing option against each assessment criterion was given the highest rating and the other options given a rating based on their performance against that criterion relative to the best performing option.

Once the qualitative evaluation was complete, the assessment was scored using the previously determined weightings (see **Table 3-4**). This established a relative overall ranking for each option with respect to each of the three key categories (ie technical and functional, natural and built environment, and social and economic). The results of this assessment are

presented in **Table 3-5** (refer to **Appendix 3** for the detailed scoring). As highlighted previously, cost was introduced following the initial options assessment. A summary of the rankings and cost estimates is presented in **Table 3-5**.

Table 3-5: Ranking of options based on qualitative assessment, together with strategic cost estimates

Option	Technical & functional	Natural & built environment	Social & economic	Strategic cost estimate ($M)
Option 1 – Existing corridor	3	3	2	200
Option 2 – Northern alignment	1	1	1	140
Option 3 – Split carriageway	2	2	2	145

Note on ranking: 1 (gold shading) = highest ranking, 2 (silver shading) = middle ranking, 3 (bronze shading) = lowest ranking

3.5.4 Recommendation

The workshop participants unanimously agreed that Option 2 (northern alignment) be recommended as the preferred option, although it was recognised that the project requires further planning and assessment (eg in relation to intersection treatments and environmental impacts).

At the conclusion of the workshop, the project objectives were reviewed and adjusted. The updated objectives are listed in **Section 3.1**

4 The preferred route option

4.1 Description of the preferred option

Option 2 (northern alignment) is the preferred route option for the upgrade of Mona Vale Road between McCarrs Creek Road and Powder Works Road. This option would avoid impacts on the rock outcrop east of Kimbriki Road by realigning Mona Vale Road to the north of it.

The preferred option is illustrated in **Figure 4-1** from west to east and shown in cross section in **Figure 4-2**.

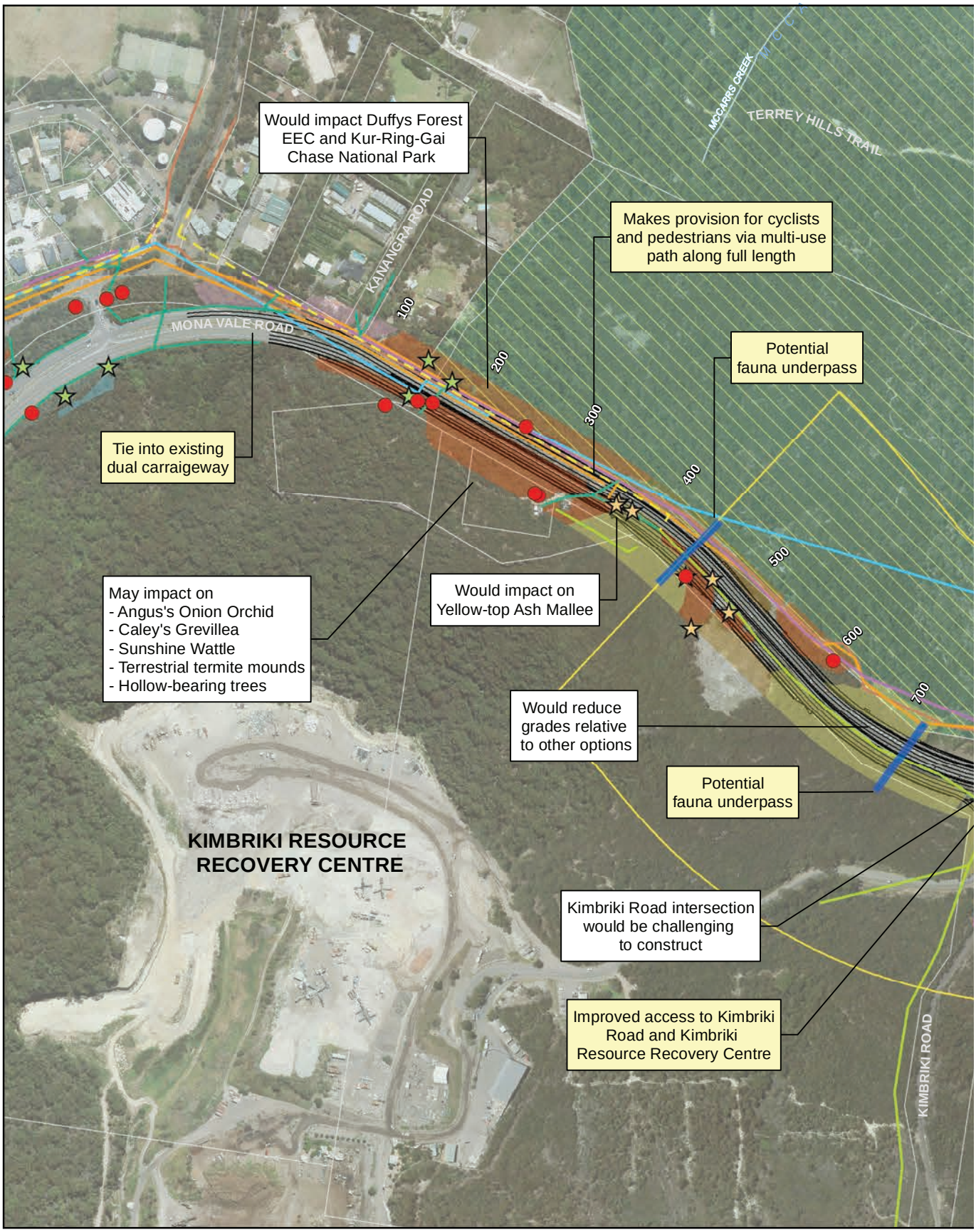
4.2 Why Option 2 was chosen as the preferred route

The value management study indicated that Option 2 would:

- Provide enhanced opportunities for fauna connectivity between the national parks and facilitate the early implementation of fauna mitigation measures during construction. It would also minimise fauna fencing and containment issues in the vicinity of the rocky outcrop.
- Provide the opportunity to consolidate a fragmented piece of bushland to the north of the road (including the rock outcrop) into a more contiguous area of Garigal National Park.
- Minimise vegetation fragmentation, especially for the national parks, and enable the old road alignment to be rehabilitated and consolidate into Garigal National Park.
- Offer certainty in terms of national park land acquisition and access provisions.
- Provide a larger area for stormwater control and treatment measures, which would facilitate more effective water quality controls during the construction and operation of the project.
- Entail less traffic disruption and simpler traffic staging, limiting inconvenience to the local community and businesses during construction.
- Utilise proven constructability methods, avoid major geotechnical risks and reduce Work Health and Safety (WHS) risks.
- Provide a consistent roadside verge and shoulder width.
- Provide an efficient solution with confidence in the planned cost.

Accordingly, Option 2 was chosen as the preferred option as it:

- Ranks well with the community and has greater potential to meet community expectations.
- Was the most flexible option and responsive to constructability issues.
- Was the best performing option across all evaluation criteria, including cost, examined during the value management workshop.
- Was recommended by the value management study.



SKM

NSW GOVERNMENT Transport Roads & Maritime Services

PLAN TITLE

Figure 4.1 Page 1 of 2

Mona Vale Road upgrade – key aspects of the preferred option

PROJECT TITLE Mona Vale Options Reporting

PROJECT REF

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Sydney Spatial Team - Prepared by : MS
Checked by : JC

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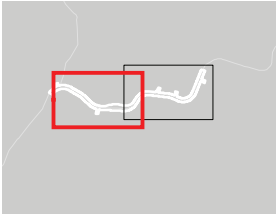

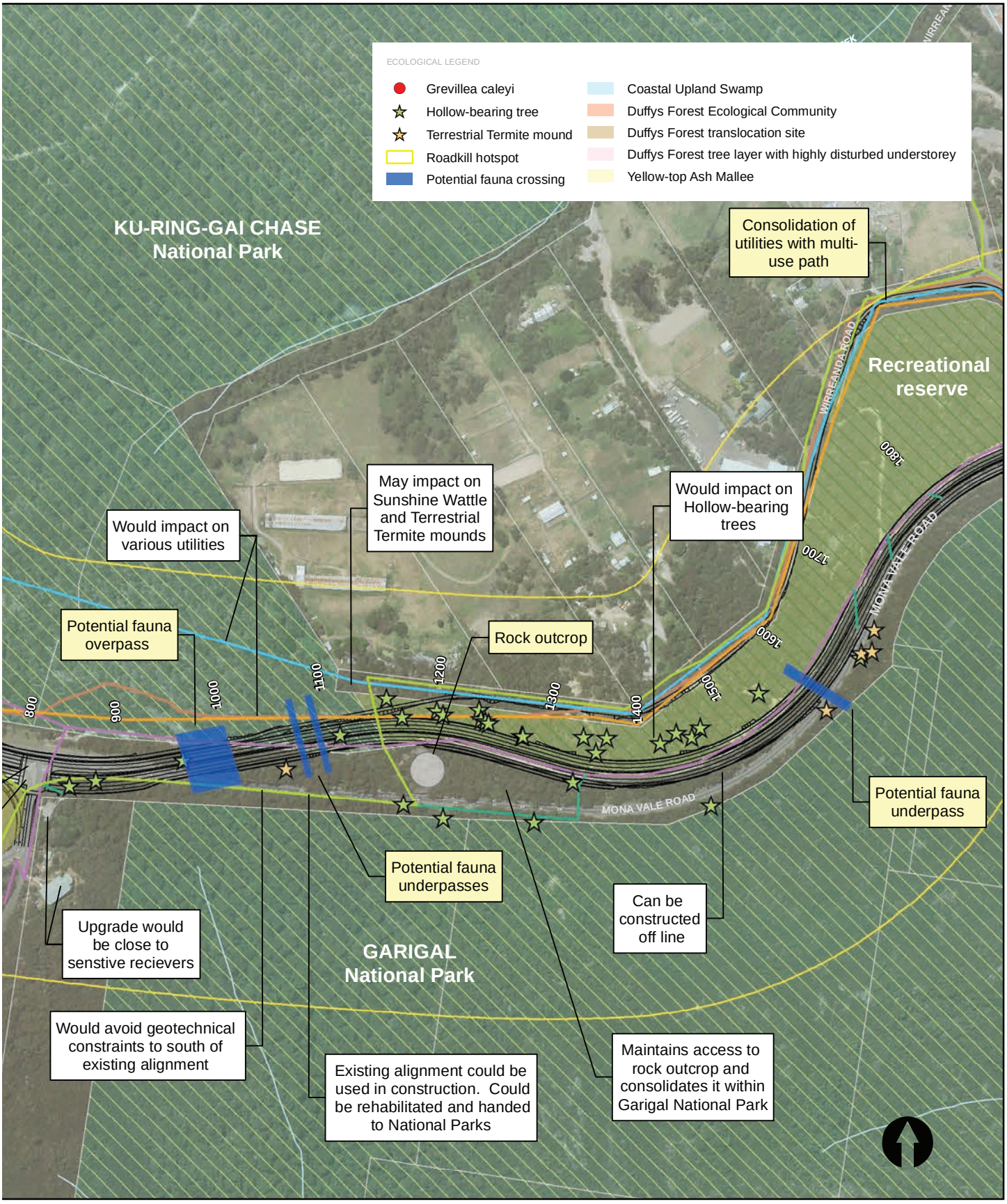

LEGEND

- Option 2 design detail
- National Park
- Recreational reserve
- Major electrical transmission line
- Minor electrical transmission line
- Underground electricity line
- Above ground Telstra line
- Underground Telstra line
- Gas line
- Optus line
- Sewer line

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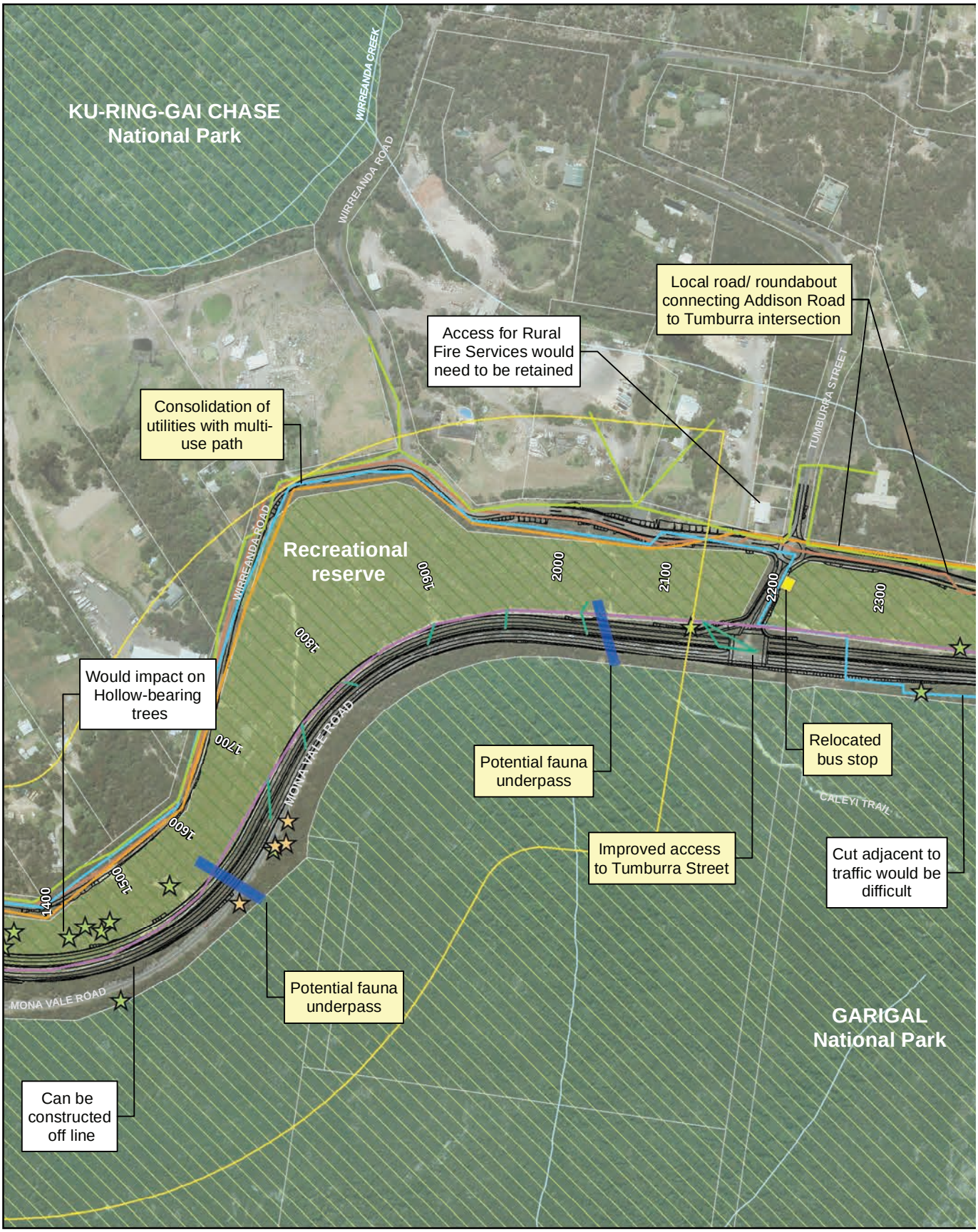
Metres



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NSW GOVERNMENT Transport Roads & Maritime Services

PLAN TITLE

Figure 4.1 Page 2 of 2

Mona Vale Road upgrade – key aspects of the preferred option

PROJECT TITLE Mona Vale Options Reporting

PROJECT REF

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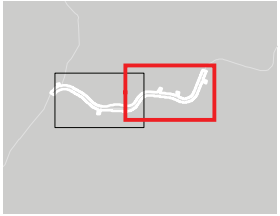

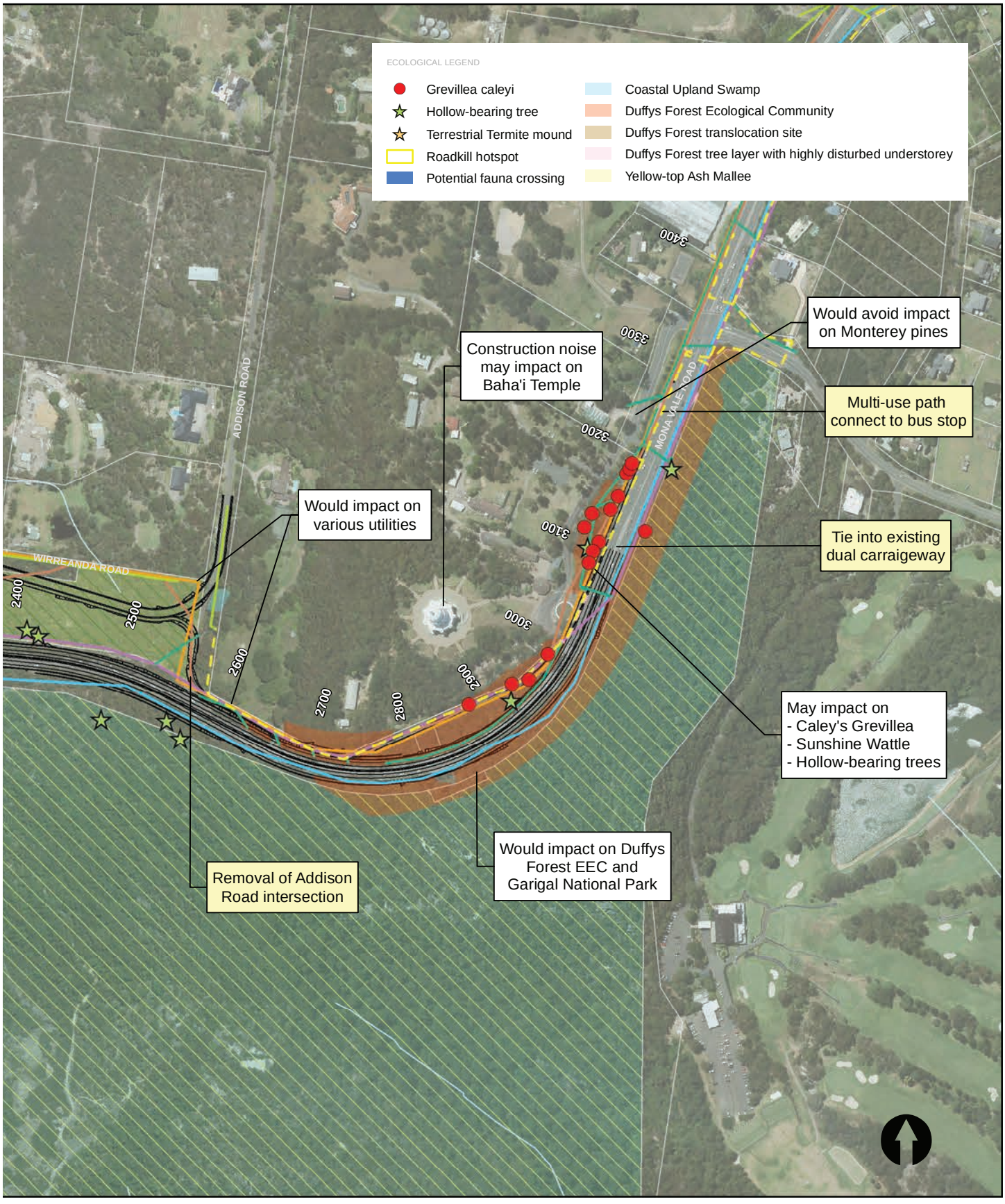

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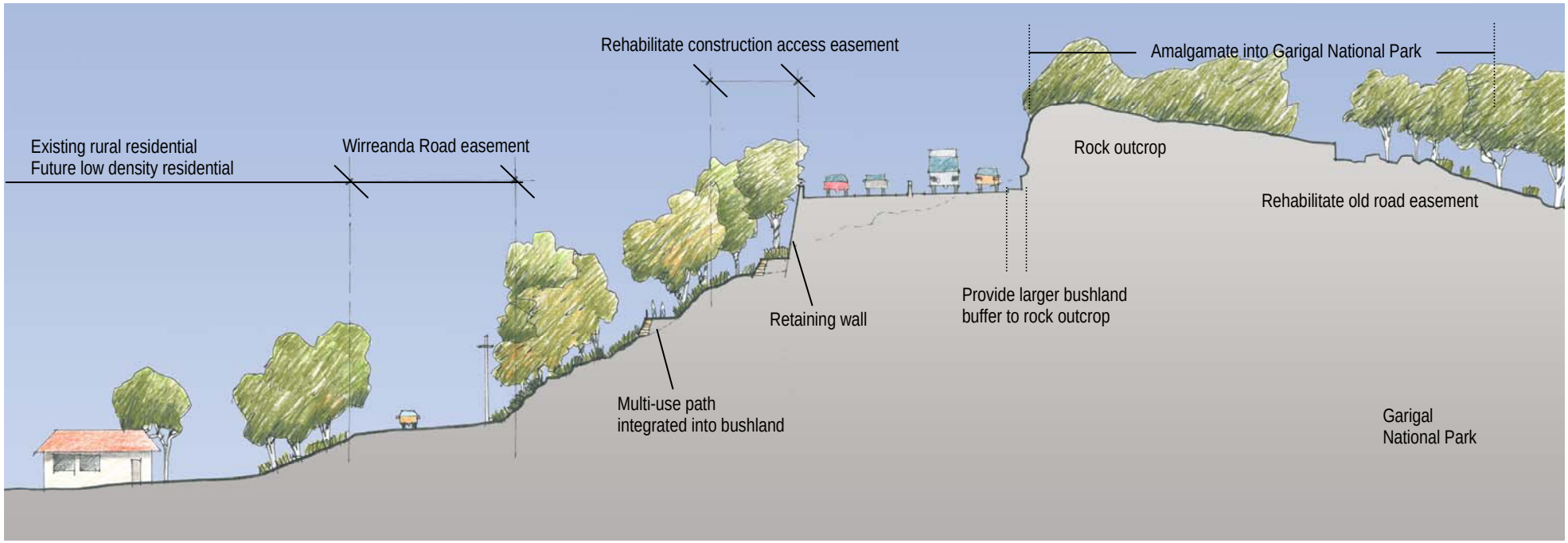


Figure 4-2: Mona Vale Road upgrade – typical cross section in the vicinity of the rock outcrop

4.3 Meeting the project objectives

The preferred option would meet the project objectives, namely:

- *Improve traffic capacity and efficiency for road users now and into the future.*

  The preferred option would improve the alignment and intersections, reduce steep grades, and provide adequate overtaking opportunities through the provision of four lanes that could also accommodate future growth.

- *Improve road safety by providing a four-lane divided carriageway.*

  The preferred option would provide a four-lane divided carriageway. Road safety would be enhanced by improving road geometry (both horizontal and vertical alignments), and by providing appropriate roadsides and barrier treatments to prevent errant vehicle crashes.

- *Provide for a posted speed of 80 kilometres per hour.*

  The preferred option would provide for a posted speed of 80 kilometres per hour for the full length of the upgrade.

- *Minimise impacts on national parks, threatened species and heritage sites.*

  To meet this objective, the preferred option needs to balance a range of environmental, social and technical considerations. While Option 2 would affect national park lands, endangered ecological communities and threatened species, it has been very carefully designed, through numerous revisions, to avoid or minimise the extent of these impacts. This option would also avoid direct impacts on Aboriginal and non-Aboriginal heritage.

- *Provide recreational and wildlife connectivity along the road corridor where appropriate*.

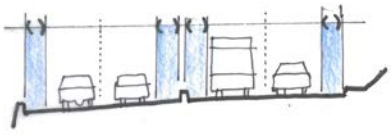
  The preferred option would provide connections for fauna via at least seven potential fauna crossing locations, which would link natural areas. The preferred option would also improve recreational connectivity along the length via the provision of a multi-use path for pedestrians, cyclists and other recreational users.

- *Provide on-road cycle facilities and an off-road path, where appropriate.*

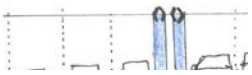
  The preferred option would provide for on-road cyclists via the provision of continuous shoulders 2.5 metres wide along the length of the upgraded road. The preferred option would also include a multi-use path (off-road) for pedestrians, cyclists and other recreational users.

- *Make provision for public transport.*

  The preferred option would provide for public transport. To date, RMS has considered bus priority lanes at intersections and 'hard shoulder running' (refer to **Figure 4-3**). Hard shoulder running allows buses and taxis to travel on the road shoulder at times of congestion or high traffic volumes. Further opportunities would be considered in the concept and detailed design stages.



Normal cross section – shoulders in blue



Hard should running cross section

Figure 4-3: Illustration of hard shoulder running

4.4 Key aspects of the preferred option

This section examines the impacts and opportunities that are likely to be associated with the preferred route. **Table 4-1** provides a comparison of the various technical and functional, natural and built environment, and social and economic considerations that are likely to be associated with each section of the preferred option.

It is intended that the information presented in **Table 4-1** will guide the approach to the concept design and environmental assessment stages. (The concept design and environmental assessment stages will provide further opportunity to minimise or avoid the potential impacts and issues identified.) As outlined in **Chapter 2**, consultation will continue to be a significant part of the development process through these stages.

4.5 Future refinement of the preferred option

The preferred option is based on strategic designs completed by RMS. These are 'high level' designs that show a typical arrangement for the upgrade. As the project development process continues, RMS will further refine the design to improve or optimise its functionality, environmental and social outcomes, urban design outcomes (refer to **Appendix 4**) and cost-benefits.

4.5.1 Fauna crossings

An important consideration in the design process will be to identify appropriate locations for fauna crossing structures.

RMS has identified potential locations for fauna underpasses in the vicinity of chainages 440, 730, 1100, 1120, 1580 and 2080 (refer to **Figure 4-1**), adjacent to national parks and recreational reserve, where wildlife is known to cross the road. These chainages correspond to low points in the topography along the proposed alignment.

A potential location for a fauna overpass (land bridge) was also identified at about chainage 980 during the value management workshop. The design of a land bridge crossing will be further investigated during the concept design stages. The design would be subject to further evaluation to determine the best value for money outcome for fauna connectivity over the full length of the project.

4.5.2 Tumburra Street intersection

As part of the design process, RMS will investigate intersection options for the Tumburra Street intersection. Options could include:

- Split traffic signals similar to the McCarrs Creek Road intersection.
- Full traffic signals with an eastbound truck climbing lane.
- Grade separation with Mona Vale Road running over the top of Tumburra Street.

Table 4-1: Key aspects of the preferred option

Criteria	Chainage 0 900	Chainage 900 1680	Chainage 1680 3320
Technical & functional			
Traffic & transport	■ Would tie into existing dual carriageway to the west. ■ Would provide improved access to the Kimbriki Resource Recovery Centre via the upgraded and signalised Kimbriki Road intersection. ■ Would make provision for cyclists, pedestrians and public transport.	■ Would reduce steep grades around the rock outcrop to the east of Kimbriki Road. ■ Would make provision for cyclists, pedestrians and public transport.	■ Would improve access to Tumburra Street and Addison Road for Ingleside residents and businesses via a new local road and upgraded Tumburra Street intersection. ■ Would tie into the existing dual carriageway to the east. ■ Would make provision for cyclists, pedestrians and public transport.
Geotechnical	■ No major geotechnical constraints anticipated, although further investigation is required.	■ Would require further geotechnical investigation. ■ Would avoid most of the geotechnical constraints associated with widening to the south, especially in the area to the west of Kimbriki Road.	■ No major geotechnical constraints anticipated, although further investigation is required.
Services & public utilities	■ Would impact on sewer, gas, electricity and telecommunications infrastructure.	■ Would impact on sewer, electricity and telecommunications infrastructure.	■ Would impact on gas, electricity and telecommunications infrastructure.
Constructability	■ Would be challenging to construct Kimbriki Road intersection (chainage 800) due to level differences and traffic switching. ■ The challenges associated with the construction of the Kimbriki Road intersection would be exacerbated due to its close proximity to a residence. ■ Would require a complex staging strategy due to the topography, geology and lack of alternative routes. ■ There would be limited space for site facilities and environmental controls. ■ There may be an opportunity to work with Kimbriki Resource Recovery Centre to accommodate site facilities.	■ Would require maintenance of access for Rural Fire Service (located off Tumburra Street) during construction. ■ Would enable a substantial length to be constructed off-line. ■ Could require accommodation/ maintenance of fauna connectivity during construction. ■ Would require a staging strategy due to the topography and geology restrictions ■ There could be limited space for site facilities and environmental controls on steep grades. ■ Would be an opportunity to use the existing alignment for site facilities once traffic has been switched to the new alignment.	■ Would be difficult to construct retaining walls (chainage 1800) and cut (chainage 2400) adjacent to traffic. ■ There would be constraints on construction due to the need to limit noise during services and activities at the Baha'i Temple. ■ Would require a complex staging strategy due to the topography, geology and lack of alternative routes. ■ There would be limited space for site facilities and environmental controls.

Criteria	Chainage 0 900	Chainage 900 1680	Chainage 1680 3320
Natural & built environmental			
Biodiversity	■ Would impact on the endangered Duffys Forest Ecological Community. ■ May impact on the endangered Angus's Onion Orchid and Caley's Grevillea. ■ May impact on the threatened Sunshine Wattle. ■ Would impact on the threatened Yellow-top Ash Mallee. ■ May impact on hollow-bearing trees. ■ May impact on terrestrial termite mounds (nesting site for threatened Rosenburg's Goanna). ■ Would include provision for fauna crossings (at about chainages 440 and 730).	■ May impact on the threatened Sunshine Wattle. ■ Would impact on hollow-bearing trees. ■ May impact on terrestrial termite mounds (nesting site for threatened Rosenburg's Goanna). ■ Would include provision for fauna crossings (at about chainages 1100, 1120 and 1580).	■ Would impact on the endangered Duffys Forest Ecological Community. ■ May impact on the endangered Caley's Grevillea. ■ May impact on the threatened Sunshine Wattle. ■ May impact on hollow-bearing trees. ■ Would include provision for a fauna crossing (at about chainage 2080).
Surface water (runoff)	■ Runoff would drain north through Ku-ring-gai Chase National Park to McCarrs Creek, and south towards the Kimbriki Resource Recovery Centre, Kimbriki Road or Garigal National Park.	■ Runoff would drain north to Wirreanda Creek (a tributary of McCarrs Creek) and south through Garigal National Park to Deep Creek (which flows into Narrabeen Lagoon).	■ Runoff would drain north to Wirreanda Creek (a tributary of McCarrs Creek) and could also drain south through Garigal National Park to Deep Creek (which flows into Narrabeen Lagoon).
Noise & vibration	■ Mona Vale Road would be brought closer to two sensitive receivers (residences) in the vicinity of the Kimbriki Road intersection.	■ Mona Vale Road would be brought closer to sensitive receivers located just north of Wirreanda Road.	■ The proposed local road linking Addison Road to Tumburra Street would be located close to one sensitive receiver (residence). ■ Mona Vale Road would be brought closer to the western extent of the Ingleside development area and any sensitive receivers that would be located there in the future. ■ Construction noise may impact on services and activities at the Baha'i Temple.

Criteria	Chainage 0 900	Chainage 900 1680	Chainage 1680 3320
Social & economic			
Heritage	■ There are no places of Aboriginal heritage significance in this section. ■ Would avoid impact on unlisted places or items of non-Aboriginal heritage significance.	■ Would avoid impact on places of Aboriginal heritage significance. ■ Would avoid impact on unlisted places or items of non-Aboriginal heritage significance.	■ Would avoid impact on places of Aboriginal heritage significance. ■ Would avoid impact on the LEP listed Baha'i Temple and group of Monterey Pines. ■ Would avoid impact on unlisted places or items of non-Aboriginal heritage significance.
Land use	■ Would impact on and include acquisition of land belonging to Ku-ring-gai Chase National Park. ■ Would require the acquisition of private and public property.	■ Would impact on and include acquisition of land belonging to Ku-ring-gai Chase National Park. ■ Would require the acquisition of recreational reserve to the north of the rock outcrop. ■ Would avoid direct impact on the rock outcrop east of Kimbriki Road, and maintain access to it. ■ Would consolidate a fragmented piece of bushland to the north of the road into a more contiguous area of Garigal National Park. ■ Would provide an opportunity for the old road to be rehabilitated.	■ Would impact on and include acquisition of land belonging to Garigal National Park. ■ Would require the acquisition of Baha'i Temple property, and Crown land.

4.5.3 Impacts on property

Following the value management workshop, the potential impacts on property associated with Option 2 are being further investigated and refined by RMS (refer to **Table 3.1**). As a result of advice from previous studies, the potential extent of national park land affected by the proposal has increased from about 0.5 to about 1.2 hectares, specifically:

- The area of Garigal National Park within the strategic design footprint has decreased from just less than 0.2 to about 0.1 hectare.
- The area of Ku-Ring-Gai Chase National Park within the strategic design footprint has increased from about 0.3 to just over 1 hectare.

This increase in the level of affectation is the result of additional allowance being made for utility relocations and stormwater runoff controls through the steep terrain north of Kimbriki Road down to Wirreanda Road. While the potential area of impact on Ku-Ring-Gai National Park has been expanded, no additional vegetation clearing would be required.

Further work will need to be undertaken to establish the project construction footprint as well as the road reserve boundaries. The environmental impact study area will also be expanded to accommodate the adjustments made to the strategic design footprint.

4.5.4 Meeting the urban design challenges

An urban design strategy has been prepared to guide the future design development stages to ensure the project is integrated into the surrounding bushland environment and visual impacts are minimised. A copy of the Preliminary Urban Design Strategy (Cloustons, 2013) is included in **Appendix 4**

Important recommendations identified in the urban design strategy include (refer to **Figure 4.4**):

- Utilising natural sandstone in cut embankments or facing sections with sandstone.
- Ensuring the top line of cut embankments have simple geometries by filling sections with large sandstone blocks recovered from site excavation.
- Limiting the use of shotcrete.
- Utilising concrete retaining walls with simple panelling and continuous parapets or sandstone blocks for downhill sides to prevent large expanses of fill batters.
- Utilising open metal railings as part of physical crash barriers to allow views to bushland, and thereby opening up the road corridor.
- Investigating road alignment refinements to provide a more substantial buffer to the large rock outcrop.
- Reviewing road construction and staging options to maximise bushland retention.
- Undertaking further detailed design on the alignment and construction methods of the utility corridor.
- Investigating ways the multi-use path could be better integrated into the steeply sloping bushland, while improving the grade wherever possible.
- Continuing to consider long term transport scenarios and growth that would facilitate modal shift by working with Transport for NSW.

- Continuing to liaise with Pittwater and Warringah Council's and Urban Growth NSW to accommodate future development, so Mona Vale Road does not become a barrier to connectivity.

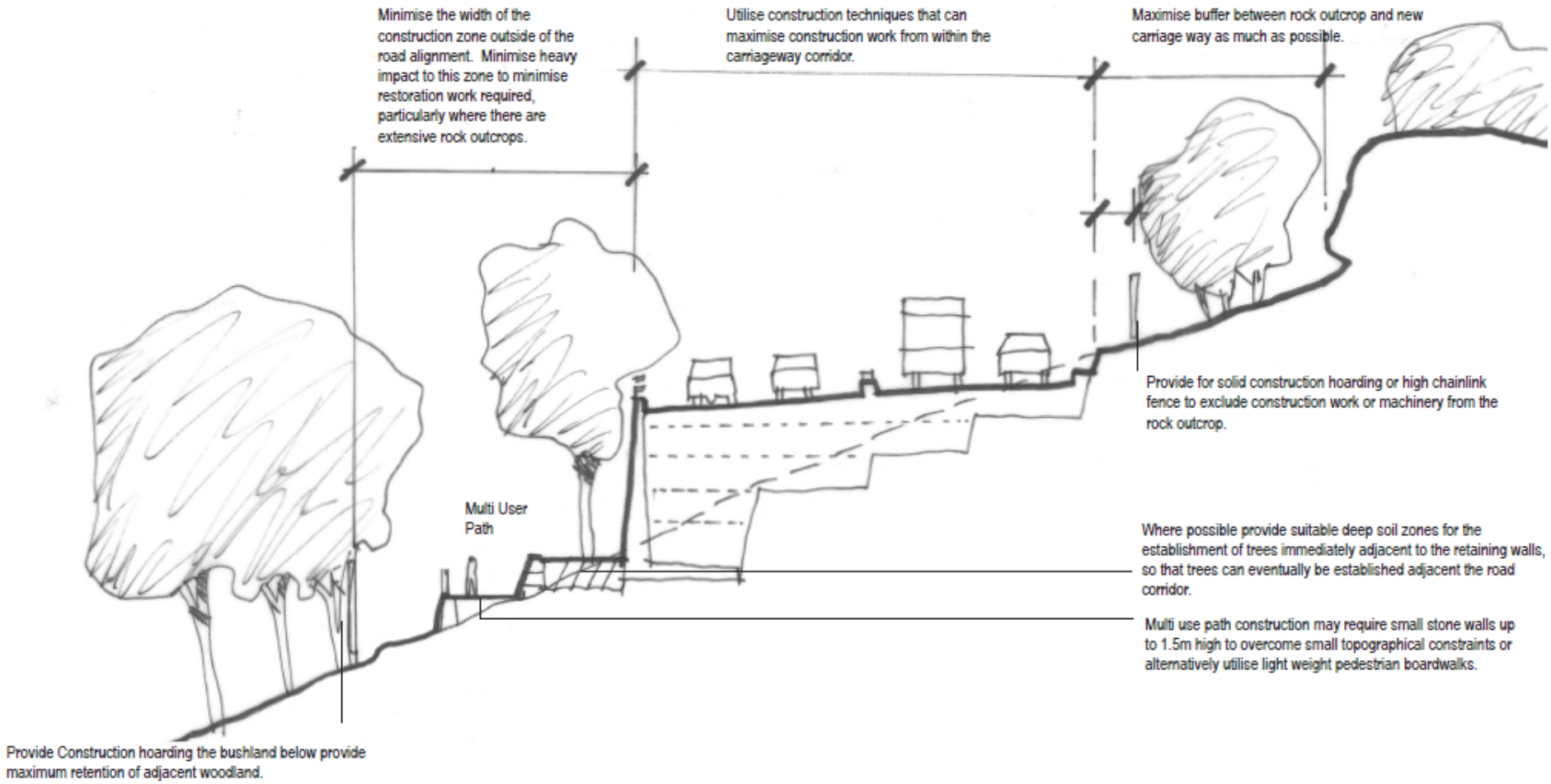


Figure 4-4: Illustration of some of the urban design guidelines in practice

5 What happens next

This chapter provides an overview of the next steps in the project development process.

Figure 5-1 illustrates the next steps, highlighting the opportunities for community input (see orange boxes). (Note the concept design and environmental assessment stages are likely to overlap or occur in parallel) Extensive and interactive consultation will continue to be a key part of the development process through the display of the preferred option, concept design, environmental impact assessment and detailed design.

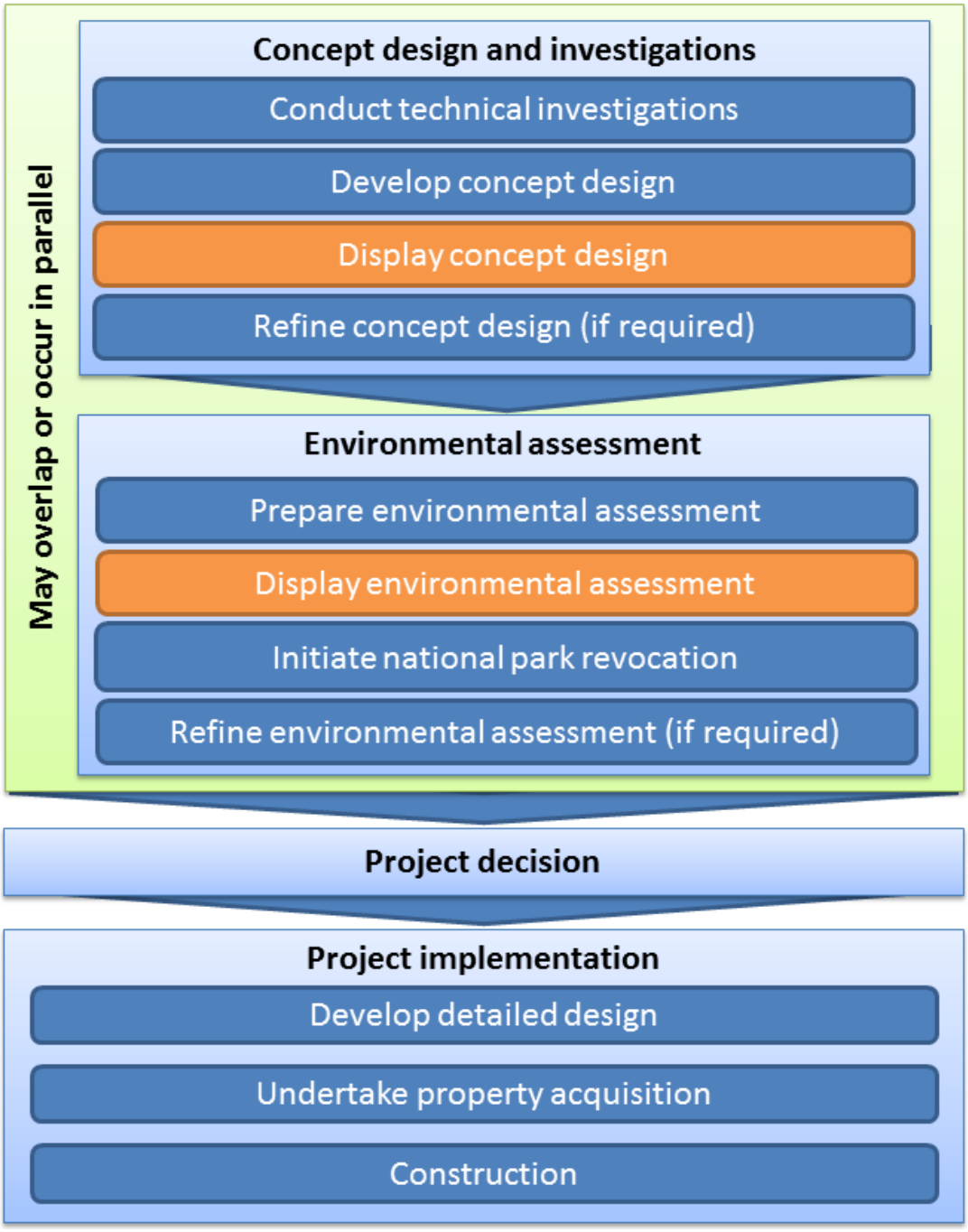


Figure 5-1: The next steps in the development process

5.1 Concept design and investigations

RMS will engage suitably qualified contractors to conduct the technical studies required for the concept design and subsequent environmental assessment. These studies will include seasonal fauna and flora monitoring surveys. This process is likely to take up to two years to complete prior to the start of the environmental impact assessment.

RMS is seeking public feedback on this preferred option report and will use all of the feedback collected to date, together with the technical studies, to inform the development of the concept design. Further consultation with the public will occur when the concept design is finalised (mid 2014).

RMS will seek to have the preferred option reserved on the Local Environmental Plans of Warringah and Pittwater councils. This will provide certainty for future planning within the Warringah and Pittwater council areas.

5.2 Environmental assessment

RMS will undertake a detailed environmental assessment of the concept design, in accordance with the requirements of the *Environmental Planning and Assessment Act 1979*, and *Environmental Protection and Biodiversity Conservation Act 1999*. The environmental impact assessment will consider the detailed input from technical investigations, the concept design and community consultation (undertaken previously.

Although all reasonable measures have been taken to avoid affecting national park land, acquisition would be required. This would require revocation of the land's national park status under the *National Parks and Wildlife Act 1974*, which would in turn require an Act of Parliament to amend the national park boundaries. The outcome of the revocation process is not a 'given', and a range of factors would be considered, including the project need, measures taken to avoid affecting national park land and provision for compensatory habitat. The process to acquire national park land would likely be initiated in parallel with the environmental assessment.

5.3 Project implementation

If the project is approved and funding is available, the project would progress to project implementation. The main tasks in project implementation include:

- Detailed design: This would involve creating detailed specifications and working drawings for the preferred option that could be used for detailed costing and construction.
- Property acquisition: Prior to the commencement of any construction activities, land affected by the project which is not owned by RMS, would need to be acquired. This would include private property, Crown land and national park land.

  Acquisition of private property would be undertaken in accordance with the *Land Acquisition (Just Terms Compensation) Act 1999* and the process outlined in RMS' Land Acquisition Information Guide (RMS, 2012c).
- Construction: Constructing the proposed upgrade could take two to three years including preliminary utility relocation work. The timing would be dependent on gaining necessary project approvals as well as the availability of funding.

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7 Terms and acronyms used in this report

Acronym	Definition
Alignment	The general route (eg of a roadway) in plan and elevation.
Amenity	The degree of pleasantness of an area or place.
Archaeological site	A site with any material evidence of past Aboriginal activity that remains within a context or place that can be reliably related to that activity.
ASS/ acid sulphate soils	Naturally acid clays, mud and other sediments usually found in swamps and estuaries. They may become extremely acidic when drained and exposed to oxygen, and may produce acidic leachate and runoff that can pollute receiving waters and liberate toxins. ASS are classified as materials which are above the groundwater, are undergoing oxidation and have a pH of less than 4.0.
At-grade intersection	A junction at which two or more transport axes cross at the same level (or grade).
Background noise level	The ambient sound pressure noise level in the absence of the sound under investigation exceeded for 90 per cent of the measurement period. Normally equated to the average minimum A-weighted sound pressure level.
Batter	The side slope of walls, embankments and cuttings or the degree of such slope, usually expressed as a ratio of horizontal distance to one vertical height. Fill batters are the result of the importation of material or fill, cut batters are the product of the removal or cutting of material.
Carriageway	The portion of a roadway devoted to vehicular traffic generally delineated by kerbs, a verge or a median.
Catchment	The area drained by a stream or body of water, or the area of land from which water is collected.
Chainage	The location along a road from a start point (in metres).
Concept design	The initial functional layout of a concept, such as a road or road system, to provide a level of understanding to later establish detailed design parameters.
Constructability	Defines the ease and efficiency with which structures can be built. Specifically, the term refers to the effective and timely integration of construction knowledge into the conceptual planning, design, construction and operations of a structure in order to achieve the overall project objectives in the best possible time, to the greatest accuracy and at the most cost-effective levels.
Curtilage	The area of land (including land covered by water) surrounding an item or area of heritage significance that is essential for retaining and interpreting its heritage significance.
Curve radius	The angle or tightness of a bend in the road.
Cutting	A formation resulting from the construction of the road below the existing ground level after material is cut out or excavated.
DECCW	Department of Environment, Climate Change and Water.
Decibel	Decibels are used to measure sound levels.
Design speed	A nominal speed used in designing a road's geometric features (such as curves).
Detailed design	The final detailed layout which completely describes the road or road system through solid modelling and drawings, and which forms the basis for construction.
Earthwork balance	Balance means that cut and fill quantities equal out so that cut material can be used as fill material and there is little waste material on the project. When cut volume is less than fill volume the contractor must purchase fill material; when the cut volume is greater than fill volume there is excess material that must be wasted or disposed of. Both of these situations are costly. A road design generally targets equal volumes of cut and fill materials, to give balanced earthworks.
Earthworks	The process of extracting, moving and depositing earth during construction.

Acronym	Definition
EEC	Endangered ecological community. An ecological community identified by relevant legislation as having endangered status.
EIA	Environmental impact assessment.
Embankment	A mound or bank of earth or stone formed to support a roadway incorporating sloping/battered faces.
EP&A Act	*Environmental Planning and Assessment Act 1979 (NSW).*
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999 (Commonwealth).*
Geotech/ geotechnical	Application of the methods of engineering and science to construction that involves natural soil and rock materials.
Grade/ gradient	Slope or steepness. Maximum grade is the maximum slope of the road.
Habitat	The place where an organism lives. Habitats are measurable and can be described by their flora and physical components.
Intersection	A junction between roads where the connection is made at the same level (grade). Traffic on the connecting road has to wait for a gap in the through road to join or cross that road. These are the types of junctions that exist between local roads and the existing Mona Vale Road.
LALC	Local Aboriginal land council.
LEP	Local environmental plan.
LGA	Local government area.
LoS	Level of service. A qualitative measure describing operational conditions within a traffic stream, and its perception by motorists and/or passengers.
NPW Act	*National Parks and Wildlife Act 1974 (NSW).*
NSW	New South Wales.
OEH	Office of Environment and Heritage.
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation.
PEI	Preliminary Environmental Investigation.
Posted speed	Signposted speed limit (can be different from the design speed).
RMS	Roads and Maritime Service (A NSW agency that brings together the former RTA and NSW Maritime Authority).
RTA	Roads and Traffic Authority (former NSW Authority).
SHR	State Heritage Register.
SKM	Sinclair Knight Merz.
TEC	Threatened Ecological Community.
TSC Act	*Threatened Species Conservation Act 1995 (NSW).*
Value management study	A systematic review of the essential functions or performance of a capital project to ensure that best value for money is achieved.

Appendix 1

Route Options Community Consultation Summary Report, 2013

Appendix 2

Preliminary constructability assessment workshop proceedings

Appendix 3

Value management workshop proceedings

Appendix 4

Preliminary urban design strategy