

Review of Great Western Highway Upgrades West of Katoomba

INDEPENDENT REVIEW

Date 19 January 2012

Table of Contents

EXECUTIVE SUMMARY	3
1 INTRODUCTION	8
1.1 Project Overview	8
1.2 Timeline	10
1.3 Report Structure	10
2 REVIEW PROCESS	11
2.1 Terms of Reference	11
2.2 Approach	12
2.3 Chronology of Events	13
3 STAKEHOLDER CONSULTATION	14
3.1 Stakeholders engaged as part of this review	14
3.2 Summary of findings	15
4 DOCUMENTATION REVIEW	17
4.1 Documentation Reviewed	17
4.2 Strategic Context	17
4.3 RMS Route Development Process	21
4.4 Stakeholder Consultation	26
4.5 Cost Review	28
4.6 Project Implementation	30
4.7 Safety Projects between Mount Victoria to Lithgow	31
4.8 Bells Line of Road	32
5 COMMENTARY	34
5.1 Strategic Context	34
5.2 RMS Process and Community Impact	36
5.3 Cost Effectiveness	37
5.4 Project Implementation	37
5.5 Other project opportunities	40
6 REVIEW AND RECOMMENDATIONS	42
6.1 Best use of funding between Mount Victoria and Lithgow	42

List of Appendices

APPENDIX 1 LIST OF DOCUMENTS REVIEWED
APPENDIX 2 CHRONOLOGY OF EVENTS
APPENDIX 3 MAPS
APPENDIX 4 SAFETY REVIEW



List of Figures

- Figure 1 Mount Victoria to Lithgow Upgrade Study Area
- Figure 2 Evans & Peck Study Approach
- Figure 3 Location of Great Western Highway in New South Wales
- Figure 4 Existing Traffic volumes on Blue Mountains crossings
- Figure 5 Mount Victoria to Lithgow Corridors
- Figure 6 Corridor and Route Selection Process
- Figure 7 Approach to the Project (Consultation Process)
- Figure 8 Recent safety work at River Lett Hill
- Figure 9 Major Upgrade Projects Great Western Highway

List of Tables

- Table 1 Strategic Cost Estimate

EXECUTIVE SUMMARY

The proposed upgrade of the Great Western Highway between Mount Victoria and Lithgow was announced in May 2008. The project is proposed to upgrade the highway to a high standard highway between Mount Victoria and Lithgow, and would build on the program of upgrades east of Katoomba. The objectives of the Mount Victoria to Lithgow upgrade, as defined by the then Roads and Traffic Authority (now Roads and Maritime Services - RMS), are to:

- Improve road safety;
- Improve road freight efficiency;
- Cater for the mix of through, local and tourist traffic;
- Be sensitive to the area's natural environment, heritage and local communities.

As part of the Nation Building Program 2009-2014, \$250million was committed to the upgrade in May 2010, and included \$30 million for safety works. The funding is made up of \$200 million of Commonwealth funds and \$50 million of State funding. Under the agreement between the Commonwealth government and the former NSW Labor Government the funding may only be spent on 'Great Western Highway Upgrades' and is available for the period to 30 June 2014.

In September 2011, the NSW Government engaged Evans & Peck to undertake an independent review of the proposed upgrades west of Katoomba, focusing on the upgrade between Mount Victoria and Lithgow, and determine the best use of the available funding.

It has been determined that whilst the proposed upgrade projects achieve the RMS's overall objectives the upgrade has evolved in scope and on purely economic grounds does not represent value for money. As an outcome of this review, it has been identified that significant improvements could be made if the current funding was more appropriately allocated to directly improving road safety for road users and the local community. The \$250M available funding would be allocated in the following way, inclusive of project costs expended to date:

- Great Western Highway upgrade recommended works - \$122M
- Enhanced Safety Program - \$83M
- Other projects including Bells Line of Road - \$45M

The proposed highway upgrade between Mount Victoria and Lithgow is a continuation of the long term investment in the Great Western Highway by the State and Commonwealth Governments. Extensive work was completed by the RMS to determine a preferred highway corridor and route between Mount Victoria and Lithgow and define the proposed projects within the preferred route. RMS applied a rigorous and consistent consultation approach with various options being thoroughly investigated to minimise impact on the local community and mitigate significant risks.

However, as a result of this process the estimated scope and cost of the upgrade grew substantially throughout the project development phase from an original cost estimate of \$450 million in 2008 to \$1.4 billion (2011\$). The cost increase was driven by heritage and environmental constraints and design growth from 18.4km of mostly 3 lane highway to 20.4km of mostly 4 lane divided carriageway, including provision of 1.4km long twin bypass tunnels at Mt Victoria, a long

viaduct at Victoria Pass, and an additional service road connecting Hartley, Little Hartley and Victoria Pass (*Concept Design Overview Report, RMS, November 2011*).

It is understood that current and future traffic volumes between Mount Victoria and Lithgow are within the capacity of the existing highway until 2033 (*Central West Transport Needs Study, SKM, May 2009*). The proposed upgrade as currently designed is costly, technically challenging and responds to lower traffic volumes than the highway east of Katoomba. Although designed ultimately to preserve a corridor for future planning purposes, the scale of design as proposed exceeds both short and medium term transport requirements to 2033 and does not deliver value for money. This is particularly relevant to the eastern section comprising the Mount Victoria bypass, tunnels and Victoria Pass viaduct (which has an estimated cost in excess of \$1 billion). This is confirmed through the benefit-cost ratio (BCR) of 0.1 for the upgrade which compares poorly to the previous Great Western Highway investment east of Katoomba with BCR averaging 3.6. It is noted that the BCR for the proposed upgrade between Mount Victoria and Lithgow is based on a P90 cost estimate which includes significant contingency, whereas the BCRs for projects east of Katoomba are largely derived from actual contract prices. However, adjustment of the contingency allowance to a "most likely" position for the proposed upgrade would only marginally improve the BCR.

In May 2010 a Joint Commonwealth/State Ministerial Media Release committed to progressing the upgrade projects at River Lett Hill, Little Hartley and \$30M safety works program. Whilst the current \$250M funding could potentially support completion of two of the five upgrade projects, the low BCR will present challenges for achieving ongoing funding needed of approximately \$1.2B. Upgrading of the remaining three projects to four lanes may not be supported in the future when considering other infrastructure priorities in the state. In addition, prior to committing sizeable funding to the whole project there is a clear need to better understand the role of the Great Western Highway more strategically as part of the broader transport network connecting the Central West to the eastern seaboard across the mountains.

It is recommended that the current funding should be allocated to directly improving road safety for road users and the local community. The recommendations in this report are consistent with the RMS's project objectives for achieving improved road safety and freight efficiency whilst minimising impacts on the community and environment. This was supported through consultation carried out as part of the review which identified that the community desires action to address safety in the short term, combined with certainty about the future likelihood and strategic justification of the upgrade. The table below lists the proposed projects recommended for \$122 million of funding.

Great Western Highway upgrade recommended works - \$122M

Recommended Works	Funding
<i>Integrated Transport Study</i>	\$2M
<i>Forty Bends Project</i>	\$100M
<i>Allowance for project costs 20%</i>	\$20M
Total	\$122M

A comprehensive analysis that builds on the recommendations of the earlier *Central West Transport Needs Study (SKM, 2009)* and considers an integrated transport approach to freight and passenger movement between the Central West and the coast, including consideration of road, rail and port connectivity should now be undertaken. The study should be managed by Transport for NSW in partnership with other relevant State and Commonwealth Government departments to ensure agreement is achieved at all levels for the integrated transport approach.

At Forty Bends, the RMS proposed concept design provides an effective solution (informed by independent experts) that realigns the most critical section of highway away from the existing slope below Hassans Walls to minimise shading and reduce the risk of black ice formation on the pavement. The proposed upgrade achieves project objectives by providing safety and reliability improvements through an enhanced horizontal alignment and overtaking lanes, as well as improving freight efficiency by mitigating road closure risk on this section of the highway. Despite a BCR of just 0.2 for the project (*Draft Implementation Strategy, RTA Alliance, July 2011*) the estimated cost per kilometre represents about 60% of the average cost of highway upgrades east of Katoomba, and is considered the preferred way to achieve the project objectives through this section of the Great Western Highway. It is recommended that this project proceed to construction at the earliest opportunity.

Enhanced Safety Program - \$83M

Recommended Works	Funding
River Lett Hill Safety Works	\$15M
Little Hartley Intersection Upgrades	\$7M
Little Hartley to Hartley Pavement and Safety Upgrades	\$29M
Speed control	\$1M
Committed Safety Works (part of \$30M Safety Program)	\$20M
<i>Allowance for project costs 20%</i>	\$11M
Total	\$83M

Through Little Hartley and Hartley, safety can be improved via upgraded intersections on the existing highway alignment (at Baaners Lane, Browns Gap Road and Cox's River Road/Ambermere Drive), and rehabilitation and widening of pavements and shoulders within the existing road corridor. Whilst \$5M of safety improvement work has recently been completed at River Lett Hill, there is demand for further safety improvements particularly at the eastern end in relation to the safety of turning movements at the Jenolan Caves Road intersection, which realises over 500 truck movements per day. Safety issues previously assumed to be addressed through construction of the upgrade projects should be reconsidered and new designs developed appropriate for improving safety within the existing highway alignment. Further analysis of crash rates, traffic volumes and site investigations by the RMS will be required to determine the best allocation of resources.

As part of the Nation Building Program 2009-2014, \$250million was committed to the upgrade in May 2010, and included \$30 million for safety works. The \$30M safety works program should be reviewed taking into account the highway upgrade projects that are not recommended for completion, the committed safety works, and the additional safety projects outlined above.

Other projects, including Bells Line of Road - \$45M

The safety issues on Bells Line of Road require immediate attention and the RMS should work quickly to develop a suitable safety program. The road has a higher crash rate than Great Western Highway and safety improvements are supported by the local community and Councils alike. Whilst an RMS asset management strategy aimed at widening and sealing shoulders and widening the formation is in planning, this should be extended to provide regular overtaking lanes as part of a defined program of works between Lithgow and Kurrajong.

In addition to Bells Line of Road there has been strong support from local and surrounding stakeholders for investment in additional projects along the greater Great Western Highway. Although beyond the scope of this study, the RMS should in our opinion reinvestigate the option (raised during stakeholder consultation) of a pedestrian bridge at Bullaburra which could provide safety benefits and improve travel time savings in peak periods by mitigating the cumulative effects of traffic signals on traffic flow. With community input, the RMS should also explore cost effective projects on the Great Western Highway within the Blue Mountains and Lithgow LGAs that offer community benefit, paying particularly attention to towns such as Blackheath.

With remaining funds of \$45M, potential projects beyond the study area could include:

- Develop and implement a Bells Line of Road safety program including pavement widening and regular overtaking lanes
- Bullaburra upgrade new pedestrian overbridge to replace the proposed at-grade crossing
- Full synchronising of traffic signals through Blackheath including pedestrian activated signals
- Great Western Highway projects between Katoomba and Mount Victoria that offer community benefit (e.g. intersections at Evans Lookout Rd, Hat Hill Rd, Govetts Leap Rd/Bundarra St)
- Caltex Station Truck Stop alternative - investigate with the trucking industry potential rest area locations and amenities.

Recommendation Summary

The proposed upgrade of the Great Western Highway between Mount Victoria and Lithgow was announced in May 2008. Extensive work was completed by RMS to determine a preferred highway corridor and preferred route between Mount Victoria and Lithgow and define the proposed projects within the preferred route. The preferred corridor, being the Orange corridor, was announced in route was announced in August 2009.

In May 2010 a Joint Commonwealth/State Ministerial Media Release announced the preferred route and committed to progressing upgrade projects at River Lett Hill and Little Hartley, as well as a \$30M safety works program.

A *Draft Implementation Strategy* was prepared by the project Alliance in July 2011 which reassessed options for delivery and revised the recommendation to prioritise Forty Bends and River Lett Hill projects within the available funding. Whilst the current \$250M funding could potentially support completion of two of the five upgrade projects, ongoing funding of approximately \$1.2B will be needed to complete the upgrade. In addition, it has been determined that whilst the proposed upgrade projects achieve the RMS's overall objectives the upgrade has evolved in scope and on purely economic grounds does not represent value for money.

This review recommends that the \$250M funding be allocated to directly improving road safety for road users and the local community by progressing the Forty Bends upgrade project, providing an enhanced safety works program and conducting a series of other projects, including on the Bells Line of Road. It is also recommended that clearer strategic justification is needed for the upgrade and that a comprehensive study that considers an integrated transport approach to freight and passenger movement to the Central West should be undertaken.

The recommendations in this report are consistent with the RMS's project objectives for achieving improved road safety and freight efficiency whilst minimising impacts on the community and environment. If the recommendations contained in this report are accepted, then release of the RMS *Draft Implementation Strategy* will not be required. Furthermore, incorporation of revised corridor boundaries into the Council LEP should be deferred until the proposed Integrated Transport Study has considered the future long term planning for the Great Western Highway.

1 INTRODUCTION

1.1 Project Overview

The proposed upgrade of the Great Western Highway between Mount Victoria and Lithgow was announced in May 2008. The project is proposed to upgrade the highway to high standard highway between Mount Victoria and Lithgow. The project is part of a long term strategy for the upgrade of the Great Western Highway and continues the State and Commonwealth commitment to improve road safety and accessibility to communities in the Blue Mountains and Central West.

The Great Western Highway provides the major road freight, tourist and commercial link between Sydney and Central Western NSW. Between Mount Victoria and Lithgow the highway is also used by local residents to commute to employment centres (such as Sydney, Lithgow and Katoomba) and for local trips, for freight from local industries, and by tourists visiting Hartley Valley, Jenolan Caves and the Central West. The Bells Line of Road provides a supplementary mountain crossing route to the Great Western Highway.

As part of the Nation Building Program 2009-2014, \$250M has been committed to the Mount Victoria to Lithgow upgrade, including \$30M for safety works. The funding announced in May 2010 includes \$200M of Commonwealth funds and \$50M of State funding. It is a requirement of the Nation Building Program that this funding is available for the period to 30 June 2014 and under the agreement between the Commonwealth Government and the former NSW Labor Government the funding may only be spent on 'Great Western Highway Upgrade'.

The objectives of the upgrade, developed by RMS in response to a strategic needs analysis, are to:

- Improve road safety;
- Improve road freight efficiency;
- Cater for the mix of through, local and tourist traffic;
- Be sensitive to the area's natural environment, heritage and local communities.

The study area for the proposed upgrade extends along an 18.4 kilometre section of the Great Western Highway from the western end of the Soldiers Pinch road-widening project at Mount Victoria to one kilometre west of McKanes Falls Road at South Bowenfels, south of Lithgow. The study area includes the townships of Mount Victoria, Hartley, Little Hartley, Hartley Vale and South Bowenfels.

❑ **Commitment**

- May 2008 upgrade announced
- March 2010 safety works Victoria Pass & Mt Victoria

❑ **Objectives**

- Improve safety
- Improve freight efficiency
- Cater for mix of traffic
- Be sensitive to community, heritage, environment

❑ **Corridors**

- 4 options + Newnes Plateau Option
- Orange corridor selected as preferred

❑ **Preferred route - five projects**

- Mt Victoria Bypass
- Little Hartley
- Hartley
- River Lett Hill Bypass
- Forty Bends incl Fernhill

❑ **Funding**

- \$220M plus \$30M for safety works
- Available up to June 2014

In September 2011 the NSW Government engaged Evans & Peck to undertake an independent review of the proposed Great Western Highway upgrades west of Katoomba focusing on the upgrade between Mount Victoria and Lithgow. Evans & Peck was required to consider the project's cost effectiveness, its impact on the local community and the potential for directing funds to safety upgrades on the Bells Line of Road.

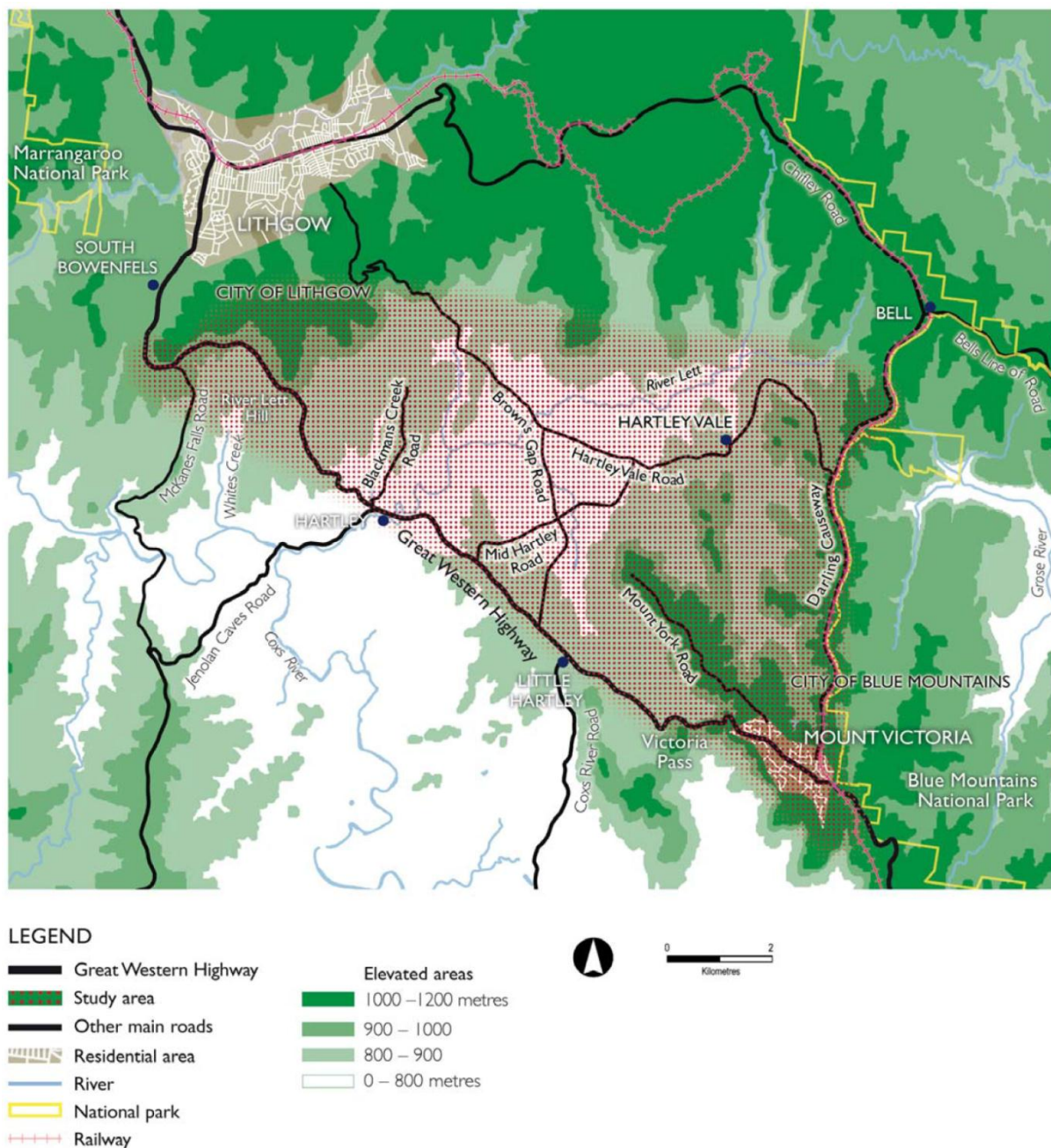


Figure 1 Mount Victoria to Lithgow Upgrade Study Area

(Background and Proposed Development Report, RTA, June 2008)

1.2 Timeline

Since 2008 the RMS has been working with the community and key stakeholder groups to carry out a detailed investigation of the study area, potential corridors and potential routes for the proposed upgrade. The project has been defined by the following key milestones and RMS community update announcements:

- Project announced in May 2008
- Study area investigations complete and initial corridor options announced in November 2008
- Potential corridors confirmed in April 2009
- Preferred corridor announced in August 2009
- Route options within preferred Corridor announced in October 2009, with the release of the Route Options Development Report
- Preferred route, priority projects and safety works program announced in May 2010 with the release of a Joint Commonwealth/State Ministerial Media Release
- Alliance engaged by RMS in February 2011 to progress concept design and environmental assessment for the project.

1.3 Report Structure

This report responds to RMS's Terms of Reference outlined in Section 2 and is structured as follows:

- Introduces the purpose of the study, our approach and provides a chronology of events during the review;
- Provides a summary of our findings from our engagement with key stakeholders and the community;
- Provides an overview of our findings arising from the document review;
- Provides commentary on key elements of the project and establishes context for our recommendations; and
- Provides our recommendations for best use of allocated funding and proposed further tasks.

2 REVIEW PROCESS

2.1 Terms of Reference

The aim of the study is defined in the *Terms of Reference (September 2011)* as follows:

To undertake a review of the proposed Great Western Highway upgrade projects west of Katoomba, focusing on:

1. *The cost effectiveness of the projects*
2. *Their impact on local communities*
3. *The potential for re-directing allocated funds towards safety upgrades on the Bells Line of Road*

The *Terms of Reference (September 2011)* sets out key tasks to fulfil the scope of the review as follows:

The review will consider whether the preferred corridor for Mount Victoria to Lithgow as announced in August 2009 and the projects along the preferred route provide cost effective outcomes and satisfactorily manage impacts on the local community. Study tasks include:

1. *Inception:*
 - a. *An inception meeting is to be held by 8 September. Any clarification to study tasks may be discussed as well as any additional information required.*
2. *Desktop review:*
 - a. *Review the corridor options and preferred route.*
 - b. *Review the strategic justification for the projects and proposed investment in the Great Western Highway program.*
 - c. *Review community consultation material including issues reports and community vision, value and priorities.*
 - d. *Review community generated material.*
 - e. *Review available information on performance measures for potential safety upgrades on Bells Line of Road such as crash rates, asset condition, travel speeds and impacts on the built and natural environment.*
3. *Analysis:*
 - a. *Examine the proposed projects taking into consideration their scope, estimated cost, economic performance, timeframes for implementation etc. in terms of cost effectiveness and local community impacts. Consider community vision, values and priorities.*
 - b. *Assess the priority of projects within current committed funding.*
 - c. *Assess the potential for safety upgrades on Bells Line of Road.*
4. *Recommendations:*
 - a. *Provide recommendations on the best use of the funding committed.*
 - b. *Provide commentary on whether the projects along the preferred corridor provide cost effective outcomes and satisfactorily manage impacts on the local community.*
 - c. *Provide commentary on the cost effectiveness of potential safety upgrades along the Bells Line of Road and the potential for redirecting allocated funds.*

In addition to the study tasks outlined above, Evans & Peck has included commentary on:

1. The appropriateness of the preferred corridor selection; and
2. The strategic context of the Mount Victoria to Lithgow Great Western Highway project in relation to broader transport needs of the region.

As part of the independent review Evans & Peck also conducted site visits of the study area and the Bells Line of Road, and met with a wide representation of stakeholder groups including local community action groups, local MPs, local Councils, local residents, and members of the project team.

2.2 Approach

Evans & Peck has undertaken the review in accordance with the Terms of Reference and additional tasks outlined above. The review has been completed based on the project information provided by RMS at the commencement of the review, additional documentation and clarifications in response to our specific information requests, and through our consultation with the project team and key stakeholders. Where relevant we have drawn on our knowledge of similar projects to complement our analysis. Our staged approach to undertaking the review is illustrated below.

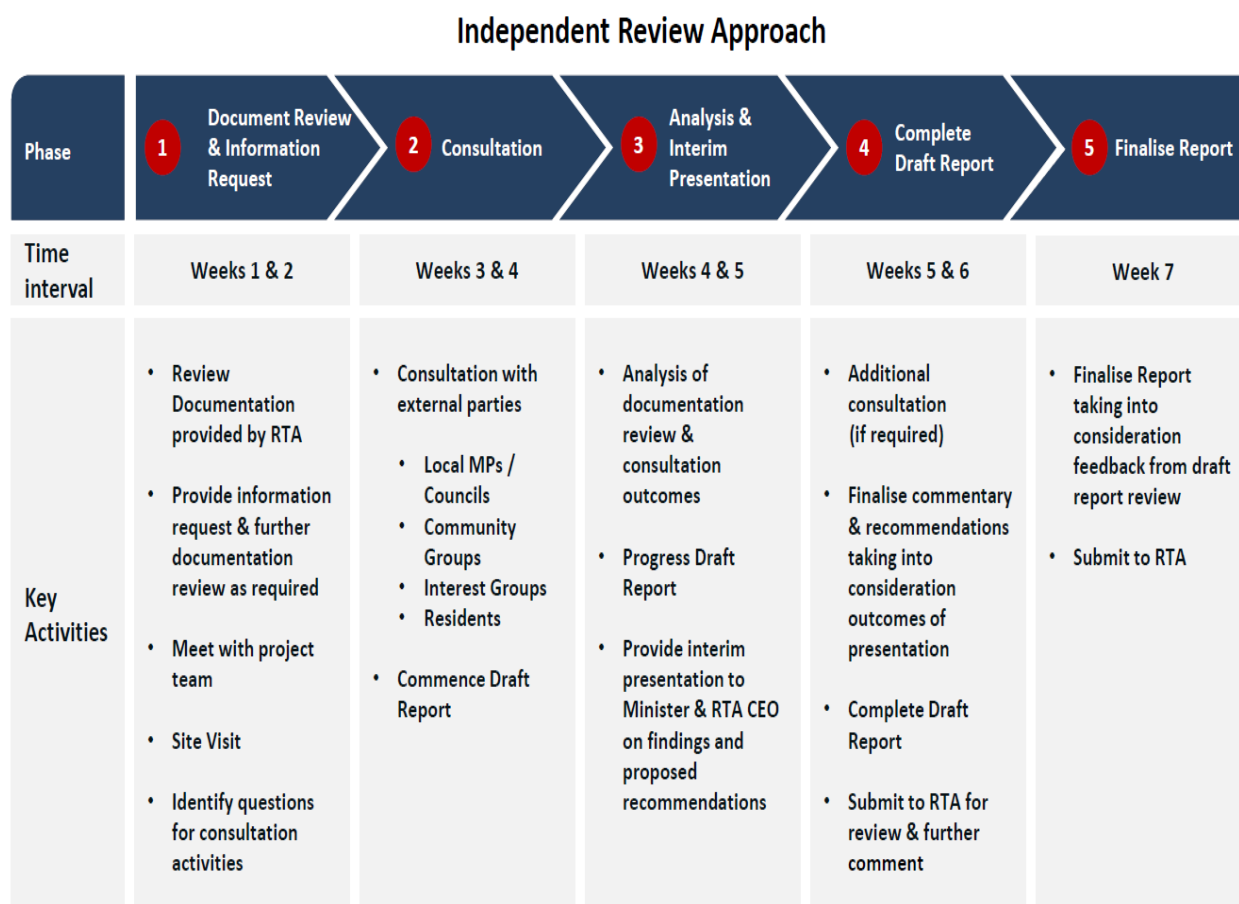


Figure 2 Evans & Peck Study Approach

2.3 Chronology of Events

Evans & Peck commenced the review in September 2011 and since then have attended a number of meetings including:

- Briefing meetings with the NSW Minister for Roads and Ports and the then RTA CEO;
- Various meetings with RMS;
- Site Visits; and
- Stakeholder consultation meetings and discussions with local MPs and councils, community interest groups, community action groups, and local residents (as listed in Section 3.1 below)

The meetings attended and discussions held during the review period are listed in Appendix 2.

3 STAKEHOLDER CONSULTATION

3.1 Stakeholders engaged as part of this review

Stakeholder engagement was an essential process element to assist Evans & Peck to formulate the commentary and recommendations required as part of this review. Evans & Peck held consultation meetings with stakeholder groups and individuals that have been active participants in the process to date, or who requested specific engagement. All stakeholders engaged are listed below. Evans & Peck are of the view that all stakeholders engaged as part of this review were generally articulate, pragmatic and particularly well researched in relation to this project.

Community Action Groups

- Hartley Highway Action Group
- Blue Mountains Commuter and Transport Users Association
- Blackheath Highway Action Group
- Mt Victoria Highway Bypass Action Group
- Bells Action Group against the Highway

Local Members and Council

- Member for Bathurst
- Member for Blue Mountains
- Lithgow City Council
- Blue Mountains City Council

Interest Groups

- Blue Mountains Sustainable Transport Alliance
- Katoomba Chamber of Commerce & Community
- Blue Mountains Conservation Society
- Blue Mountains Association of Cultural Heritage Organisations
- Bullaburra Township Committee
- Central West Transport Forum
- National Trust of Australia (NSW) Lithgow Branch

Local Residents from Little Hartley, River Lett Hill and Hartley Valley

It is important to acknowledge that no consultation was carried out by Evans & Peck with the Federal Department of Infrastructure, government rail agencies or the road trucking industry. At a local level consultation was not carried out with the local Aboriginal groups, Aboriginal Land Council organisations or other special interest groups relating of the Bells Line of Road.

3.2 Summary of findings

The stakeholders engaged as part of this review represented a variety of specialised interests and shared a number of common and different views in relation to the overall Mount Victoria to Lithgow upgrade project.

Virtually all stakeholders are concerned about the growth in heavy vehicle movements over the Blue Mountains and do not support the introduction of standard 26m B-Doubles on the Great Western Highway or Bells Line of Road. They recognise that although the government has previously committed to not allow standard B-Doubles on the road network crossing the Blue Mountains, the proposed upgrade is designed to suit standard B-Doubles if permitted in the future. The stakeholders stressed that in addition to providing a key freight route, the Great Western Highway is used as a local road by residents within and beyond the study area and is the only access route between local townships.

The majority of stakeholders argued that the Great Western Highway upgrade project as proposed requires further and clear strategic justification. They support a study that considers an integrated transport approach to freight movement across the Blue Mountains and provides a long term strategy for utilising both road and rail freight options. They are aware of options for freight movement from the Central West but also acknowledge complications such as differences in rail/road charges that would require Commonwealth Government consideration and have national implications.

All stakeholders agreed that safety is the most important issue in relation to this project and nominated the key areas of concern to be Victoria Pass, River Lett Hill, Forty Bends and intersections at Little Hartley. This is consistent with findings from the RMS's earlier consultation. Many stakeholders believe that safety could be addressed through improvements to the existing road including pavement rehabilitation, new overtaking lanes, intersection upgrades, shoulder widening and further improvements to Victoria Pass, rather than through a complete highway upgrade. Lithgow City Council raised concerns with traffic volumes using Browns Gap Road and the need for upgrading of this intersection in particular. The community and Council supports realignment at locations such as Forty Bends to rectify more complex safety issues (such as black ice risk). The stakeholders were particularly supportive of the introduction of additional speed control measures along the entire Mount Victoria to Lithgow route, although there were various views on the optimal control solution.

Heritage was also an important issue shared by most stakeholders, particularly in relation to the impact of the new highway on the historic Hartley Valley. The stakeholders were highly sensitive in relation to the impacts of the future highway on local amenity, access and community connectivity, particularly around Little Hartley. Of most importance was the desire for certainty about the future likelihood of the highway upgrade and confirmation of the impacts on private residents and the local community as a whole.

A common and strong view amongst stakeholders is their belief that the estimated cost for the Mount Victoria to Lithgow upgrade is excessive and unjustified. In particular they believe that the traffic volume and expected growth of the region does not warrant the spend required to deliver the proposed upgrade along the Orange corridor. They are sceptical as to whether additional funding to deliver the remaining projects will be made available in the future and are therefore uncertain about the timing of further impacts on the local community. In particular they are not convinced Mount Victoria bypass, at a cost of approximately \$1 billion, will ever be delivered. They

also have reservations about the appropriateness of the Mount Victoria bypass tunnel solution in relation to safe transport of hazardous goods which following RMS policy are generally not allowed to be transported through tunnels.

There were also a number of different views amongst stakeholders in relation to the RMS consultation process. Most stakeholders were highly complementary and commended the thoroughness of consultation and the opportunity to interact with RMS's project team, design team, and independent experts. Some stakeholders criticised elements of the consultation such as level of community representation at key events such as the Value Management Workshop.

Most stakeholders generally understood and agreed with the rationale for selection of the Orange Corridor, however mixed views were observed in relation to satisfaction with the outcome. Lithgow City Council was supportive of RMS developing the Orange Corridor. Some stakeholders were still supportive of the Newnes Plateau and Purple corridors, and in particular questioned the justification for discarding the Newnes Plateau corridor as a valid option. Stakeholders were aware of investigations commenced for the preparation of the Bells Line of Road Long Term Strategic Corridor Plan and believe that the Newnes Plateau and Purple corridor options would both provide good future connections. Other stakeholders were not supportive of the Newnes Plateau corridor due to the potential environmental impact. Most groups were supportive of the investigation into a future Bells Line of Road corridor, whilst some had concerns about the potential impact on World Heritage Areas through the region.

There were a number of suggestions offered relating to the need for improvements outside the study area and other specific projects. All stakeholders acknowledge the safety issues on Bells Line of Road and whilst most support implementation of safety improvements (such as overtaking lanes and shoulder widening), some stakeholders do not agree that funding should be allocated to works beyond the Great Western Highway. A number of stakeholders identified concerns about the impact of increased heavy vehicle traffic through Blackheath and Medlow Bath as a result of the highway upgrade and expressed apprehension about the RMS's plans for future widening of the highway through these towns. Some stakeholders identified a need for a safety management plan and intersection improvements through Blackheath, and particular traffic flow issues resulting from poorly synchronised traffic signals through the town. In regard to the current upgrade project through Bullaburra some concerns were raised about pedestrian safety at the proposed at-grade crossing including RMS not agreeing to community requests for a pedestrian overbridge. At Mt Victoria stakeholders raised the ongoing issue with trucks parking illegally at the 24 hour Caltex Station rather than using the allocated truck stop area, and requested that the RMS commence investigations into a suitable alternative.

Community views have been considered as part of this review in considering how project objectives can be best met within the available funding.

4 DOCUMENTATION REVIEW

4.1 Documentation Reviewed

An extensive volume of documentation relating to the project was reviewed by Evans & Peck to understand the history, context and justification for the proposed upgrade. The documentation reviewed includes:

- RMS Project Reports issued at key stages (Background, Corridors, Newnes Options, Route Options, Preferred Route);
- Strategic Reports including Central West Transport Study, Newnes Corridor Study, Bells Line Of Road studies and summaries of earlier transport studies;
- Consultation Material issued by RMS, presentations, meeting and workshops records, Submissions Summary Reports, community updates on website;
- Cost Data including cost estimate reports, draft Implementation Strategy, cost benefit analysis;
- Great Western Highway safety information including crash data, safety reviews, safety works schedule;
- Bells Line of Road information including crash data, corridor studies, safety works;
- RMS Project Team documentation including internal meeting and workshop records, Major Projects Review Committee presentations, ministerial announcements, CEO briefing reports, draft Implementation Strategy, Design Alliance Schedule, draft Concept Design report; and
- Community group newsletters, correspondence to MPs, position statements.

A complete list of documentation reviewed by Evans & Peck is included in Appendix 1.

4.2 Strategic Context

The Mount Victoria to Lithgow study area is located in the wider Blue Mountains region, about 130 kilometres west of Sydney, and incorporates residential and rural residential villages, agriculture, mining and a variety of tourist attractions. The Great Western Highway provides the major road freight, tourist and commercial link between Sydney and Central Western NSW. The highway between Mount Victoria to Lithgow is also used by local residents to commute to employment centres (such as Sydney, Lithgow and Katoomba) and for local trips.

Between Mount Victoria and Lithgow the highway is used by approximately 14,000 vehicles per day. Of this traffic approximately 15% is commercial heavy vehicles and 50% is through traffic. The Bells Line of Road provides a supplementary mountain crossing route to the Great Western Highway. Traffic flow on Bells Line of Road reaches 8,000 vehicles per day west of Bells, only 3,000 between Bell and Kurrajong, and 12,000 between Kurrajong and Richmond. Maps of wider Central West Region, the study area, the corridor options and the preferred route are contained in Appendix 3 of this report.



Figure 3 Location of Great Western Highway in New South Wales

(GWH Upgrade Program Cost Benefit Analysis Project, RMS, Feb 2011)

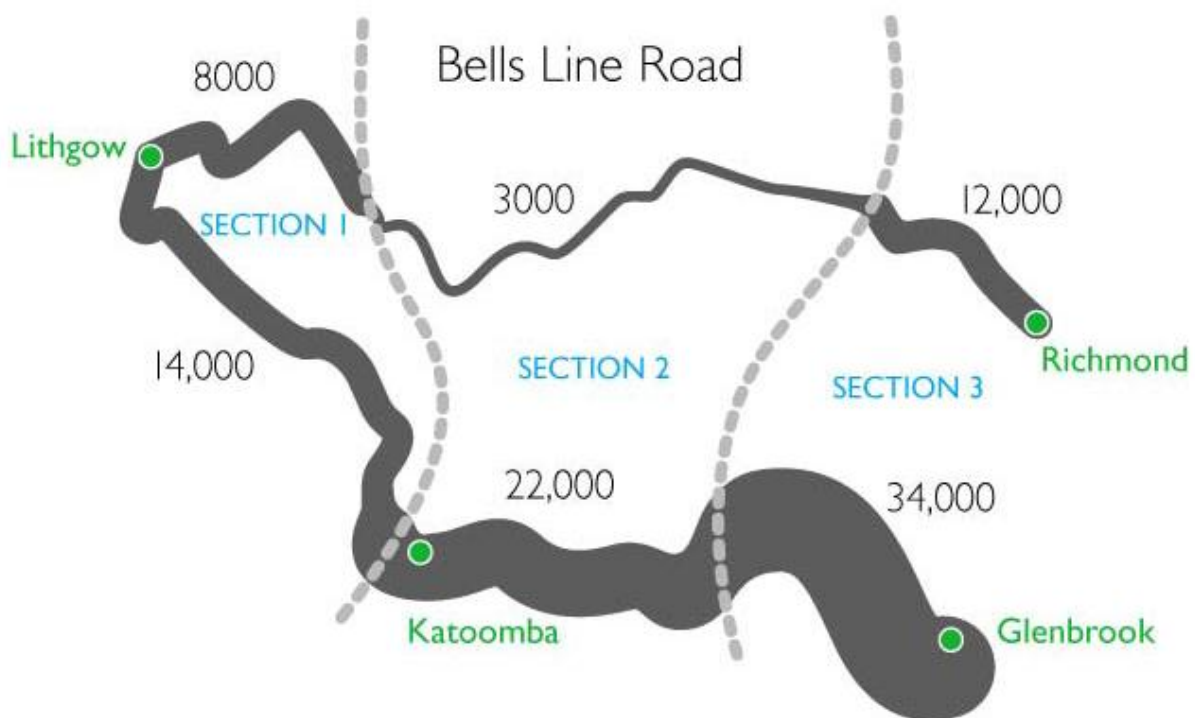


Figure 4 Existing Traffic volumes on Blue Mountains crossings

(Background and Proposed Development Report, RTA, June 2008)

The *Background and Proposed Project Development Report (RTA, June 2008)* notes that as the population of the Sydney metropolitan area, major townships and agricultural activity in the Central West continue to grow, traffic volumes along the Great Western Highway are expected to increase. The *Background and Proposed Project Development Report* highlights that the State and Commonwealth Governments have invested considerable funding into the upgrade of the Great Western Highway between Emu Plains and Mount Victoria. The RMS suggests that continuation of this project through an upgrade to the highway between Mount Victoria and Lithgow is required to fully realise the value of this previous investment. The report also states that "an upgrade would provide a more efficient crossing of the Blue Mountains".

The report identifies a number of existing challenges relating to the highway between Mount Victoria and Lithgow including high safety risk, severe and steep terrain conditions, low travel speeds, low service rating and inconsistent pavement and surfaces. These conditions present a number of immediate issues and will continue to impact on the ability of the highway to respond appropriately to this traffic increase in the future.

A number of studies have been undertaken between 1996 – 2008 relating to transport needs for the Central West area. The studies are identified in the *Background and Proposed Project Development Report (RTA, Jun 2008)* and *Route Options Report (RTA, Oct 2009)* and include:

- *Central West Transport Needs Study (SKM, 2009)*
- *Sydney–Dubbo Corridor Strategy (Auslink 2007)*
- *A New Direction for NSW (2006) – a NSW State Plan*

- *Bells Line of Road Corridor Study - Concept Design Report (SKM, 2004) and Summary Report (SKM Nov 2005)*
- *The Bells Line of Road Development Study (Maunsell McIntyre, 2000) on behalf of the RMS*
- *Great Western Highway Upgrade: Little Hartley Environmental Impact Statement (GHD, 1999) on behalf of the RMS*
- *The Regional Economics Research Unit Study (Charles Sturt University, 1999) on behalf of CENTROC*
- *Penrith to Orange Transport Strategy (RTA, 1998)*
- *NSW Regional Study (The Central West) (NRMA, 1997)*
- *Central West Transport Study (SMEC, 1996)*

The most recent study is the *Central West Transport Needs Study (SKM, May 2009)* which was coordinated by the RMS and funded by the then Australian Department of Infrastructure, Transport, Regional Development and Local Government. The study reviews the current performance of the existing land transport network (road and rail) in meeting the short and long term needs of the Central West NSW. The study considers growth in the region between 2008 - 2033, and provides a series of short and long term recommendations for road and rail network enhancement.

The study finds that the existing size of network (road lanes and the number of train paths required to move traffic on the network) to and from the Central West will have no additional capacity requirements before 2033. The study also provides a strategic level estimate of \$3B (2004\$) for a 4-lane B-Double standard upgrade of Bells Line of Road, and concludes that it is not an economically viable project. The study identifies that safety and road network enhancements would improve transport efficiency in the region and nominates the upgrade of the Great Western Highway between Mount Victoria and Lithgow as a short term network and safety candidate project. The study also recommends medium term safety and capacity enhancements to the Bells Line of Road and investigation into the preservation of a corridor reserve along Bells Line of Road to meet long term needs.

It is important to note that the Mount Victoria to Lithgow highway upgrade was announced and identification of a suitable route progressed prior to the *Central West Transport Needs Study* being completed. Whilst the study acknowledges that the Mount Victoria to Lithgow upgrade project had reached planning stage, it does not provide clear justification for continued investment in this route. Importantly the study also recognises the need for further investigation into the long term (beyond 2033) need for additional road and rail transport capacity across the Blue Mountains, consideration of improved rail freight and passenger services, safety programs and intermodal facilities. This is further discussed in Section 5 of this report.

4.3 RMS Route Development Process

The project objectives for the proposed Mt Victoria to Lithgow upgrade are defined by the then RTA in *The Background and Proposed Project Development Report (RTA, June 2008)* as follows:

- Improve road safety
- Improve road freight efficiency
- Cater for the mix of through, local and tourist traffic
- Be sensitive to the area's natural environment, heritage and local communities

The RMS's report states that "it is important to determine if an upgrade of the existing alignment can achieve the project objectives at an acceptable economic cost while minimising environmental and social impacts". The RMS acknowledges that in order to carry out this assessment alternate corridor and route options should be explored to determine the best possible outcome.

Extensive work has been completed by the RMS to arrive at the preferred route and determine the individual projects along the route. Since 2008 the RMS project team has been working with the community and key stakeholder groups to carry out a detailed investigation of the study area, potential corridors and potential routes for the proposed upgrade. The route development process has been undertaken across four main stages as outlined below.

Study Area Investigation

Study area investigations aimed at facilitating the identification of potential corridors were initiated in May 2008, and in June 2008 the community consultation process was commenced with the release of the *Mount Victoria to Lithgow Background and Proposed Project Development Report (RTA, June 2008)*.

Four potential corridors in which routes might be feasible were identified within the study area. For identification purposes the corridors were allocated colours and named the Orange, Red, Green and Purple corridors. Following suggestions by some community members, the RMS agreed to assess the feasibility of the Newnes Plateau as an alternative corridor. The Newnes Plateau corridor is located north of the main study area and runs between Marrangaroo and Bell. The potential corridors are shown in Figure 5 below.

The five corridors in which routes might be feasible were announced in November 2008 and outlined in the *Study Area Investigations and Corridor Identification Report (RTA, Nov 2008)* and the *Strategic Evaluation of the Newnes Plateau Corridor Report (RTA, 2008)*.

Corridor Selection

Work was carried out by the RMS to refine and confirm the corridor options and the community were given an opportunity to provide feedback on the appropriateness of the corridor options. The RMS determined that the Newnes Plateau corridor traversing Defence land at Marrangaroo would not be taken forward after the Department of Defence indicated a long-term need for its Marrangaroo facility.

The modified corridors were announced together with release of the *Submissions Report – corridors in which routes may be feasible* (RTA, April 2009), which reviews submissions from the community on the initial five corridors. The four modified corridors confirmed by RMS in April 2009 included:

- Modified Purple
- Modified Green
- Modified Red (Option 1 & 2)
- Modified Orange (Option 1 & 2)

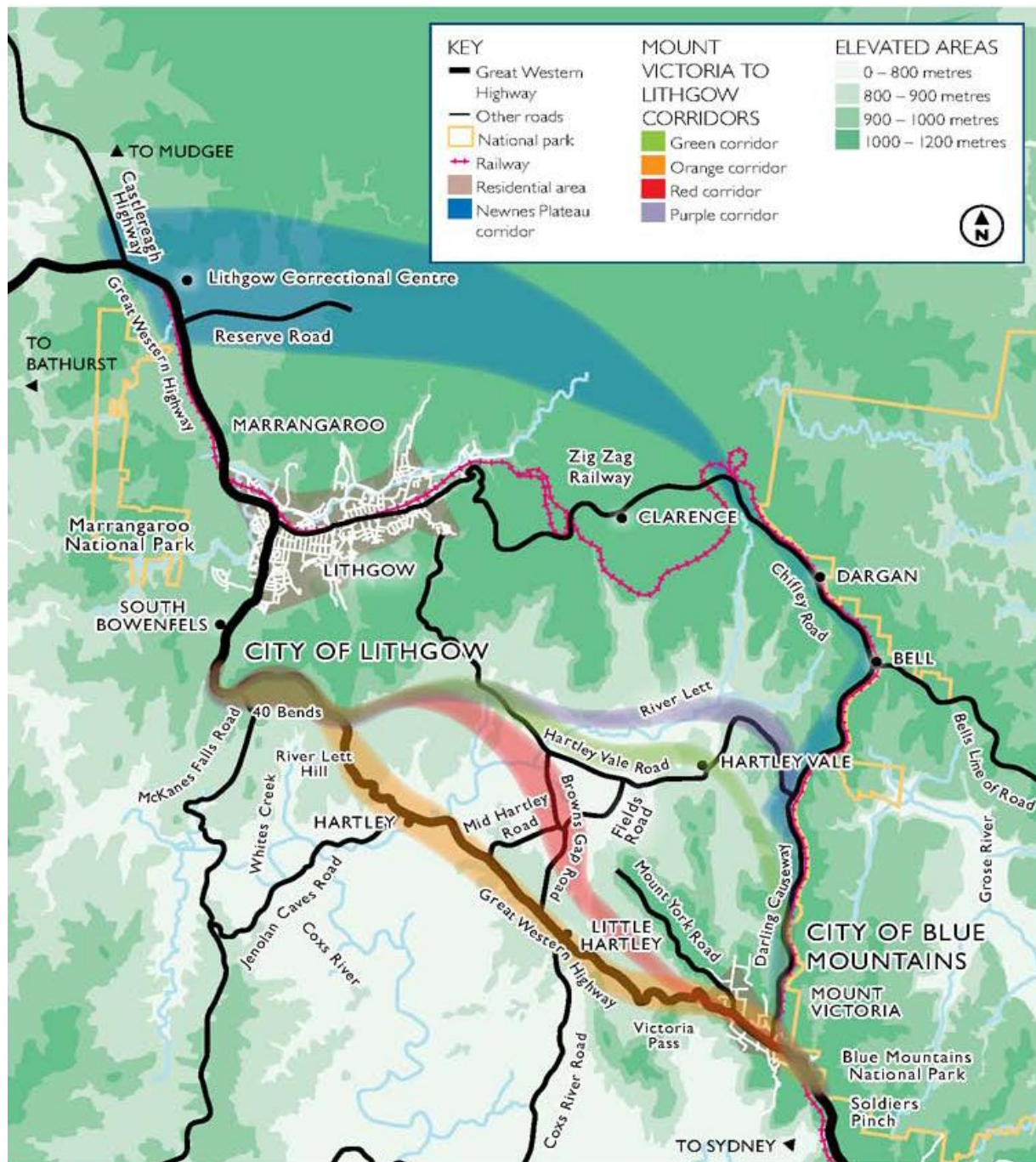


Figure 5 Mount Victoria to Lithgow Corridors
(Community Update, RTA, Nov 2008)

All the corridors started at Mount Victoria and, with the exception of the Newnes Plateau Corridor, shared a common section through Forty Bends and South Bowenfels where they re-joined the existing highway. There were two options common to the modified Orange and modified Red corridors to bypass the main village of Mount Victoria. One option included a tunnel about 600 metres long under Mount York Road; the other option would re-join the existing highway near its intersection with Mount York Road. The modified corridors varied significantly in relation to potential social, environmental and technical considerations.

In August 2009 the then NSW Minister for Roads announced that the plans for the upgrade of the Great Western Highway between Mount Victoria and Lithgow would concentrate solely on the corridor along the existing highway, known as the Modified Orange corridor (*Ministerial Release – resolution reached on the GWH Upgrade, Minister for Roads, Aug 2009*). The ministerial announcement states that the decision for choosing the Modified Orange corridor was based on “extensive research and consultation”, and that the corridor provides “the most practical and feasible option”.

A formal assessment of the corridor options had not been completed by the RMS prior to this announcement by the Minister, however technical reports included in *Route Options Report Working Papers Volume 2 & 3 (SKM, Oct 2009)* demonstrate RMS’s extensive consideration of each corridor against key environmental and social criteria, including heritage, biodiversity, hydrology, geotechnical, contaminated land and urban design. In addition RMS prepared a *Draft Route Options Development Report (RTA, Aug 2009)* which, whilst not conclusive nor complete, consolidates the initial work carried out by RMS to compare and assess the corridor options.

To assist in this review, Evans & Peck has considered these reports, and all information and data relevant to the modified corridors. It is important to note that at the time of corridor selection economic considerations such as project cost were excluded from the assessment criteria. From consideration of the corridor options it is clear that no one corridor satisfactorily addressed all environmental, social and technical issues associated with the proposed upgrade. The distinguishing factor relates to method of delivery and funding available to enable that delivery. East of the common alignment through Forty Bends, the Purple, Green and Red corridors would require delivery in one complete stage, whilst the Orange corridor is able to be delivered as a number of smaller projects due to its proximity to and interface with the existing highway. The Orange corridor also provides opportunities to maximise the benefits of recently completed safety works and to upgrade the existing highway where a full realignment cannot be justified.

Estimated cost for delivery of the four corridor options ranged up to \$2 billion and it was unlikely that sufficient funding would be granted to enable delivery of these options. Given this funding constraint, the RMS was obliged to proceed with the Orange Corridor with its unique advantage of staging the project delivery. It is also of note that a number of the key risks associated with the Orange corridor at corridor selection stage (primarily relating to heritage and property severance) have since been able to be mitigated through detailed route design.

Route Options Development

In May 2009 the RMS had commenced work on detailed environmental and technical investigations within the confirmed modified corridors, and carried out a series of community engagement activities, to help identify feasible route options within each corridor. Following announcement of the preferred corridor in August 2009 the RMS continued the detailed development of route options

within the Modified Orange corridor, including reviewing all community submissions, conducting community workshops, field investigations and detailed engineering design.

The outcomes of the route investigations were released in October 2009 and are provided in *Route Options Report (RTA, Oct 2009)* and supporting *Working Papers (RTA, Oct 2009)*. The Orange corridor was divided into eight precincts and route options considered in each precinct. The route options included various common sections through Mount Victoria East, Hartley, Fernhill and South Bowenfels, as well as sub-options in four precincts; Mount Victoria, Harp of Erin/Ambermere (Little Hartley), River Lett Hill and Forty Bends.

Preferred Route Selection

The preferred route selection process commenced with a two day Value Management Workshop held in November 2009 and attended by participants from the local community, government agencies, councils, the transport industry, local environmental groups and Aboriginal groups. The workshop aimed to gain a shared understanding of which route options provided the best balance across social, environmental, economic and engineering issues and provide recommendations to the RMS. Drawing on earlier research and consultation outcomes, the workshop developed weighted assessment criteria to select a preferred route. Cost was also introduced as a selection criteria to test cost sensitivity of the weighted outcomes (except for Mt Victoria Bypass) and develop a final evaluation matrix for the preferred option.

Community participants in the Value Management Workshop were limited to those that resided within the study area. Key representatives from local community action groups and interest groups who had been actively involved throughout the route development were not part of this process if they resided outside the study area. In considering issues identified as key community concerns through the corridor and route selection process the weighting of criteria placed more weight on heritage and residential impacts. It is noted that in the initial stages of the project when considering corridor options, the community concerns were focused primarily on environmental, engineering and social impacts.

An internal RMS Technical Workshop was held in February 2010 to review the outcomes of the Value Management Workshop, the findings of the additional geotechnical and constructability investigations, compiled stakeholder submissions and revised cost estimates for the various route options.

In May 2010 the RMS confirmed the preferred route across eight precincts as documented in the *Preferred Route Report (RTA, May 2010)*. The route was consolidated by the RMS into five core delivery projects including:

1. Mount Victoria (including Mount Victoria East and Mount Victoria northern outer bypass/tunnel)
2. Little Hartley (including Harp of Erin/Ambermere bypass)
3. Hartley alignment
4. River Lett Hill (southern bypass alignment)
5. Forty Bends (including Fernhill realignment, Forty Bends and South Bowenfels)

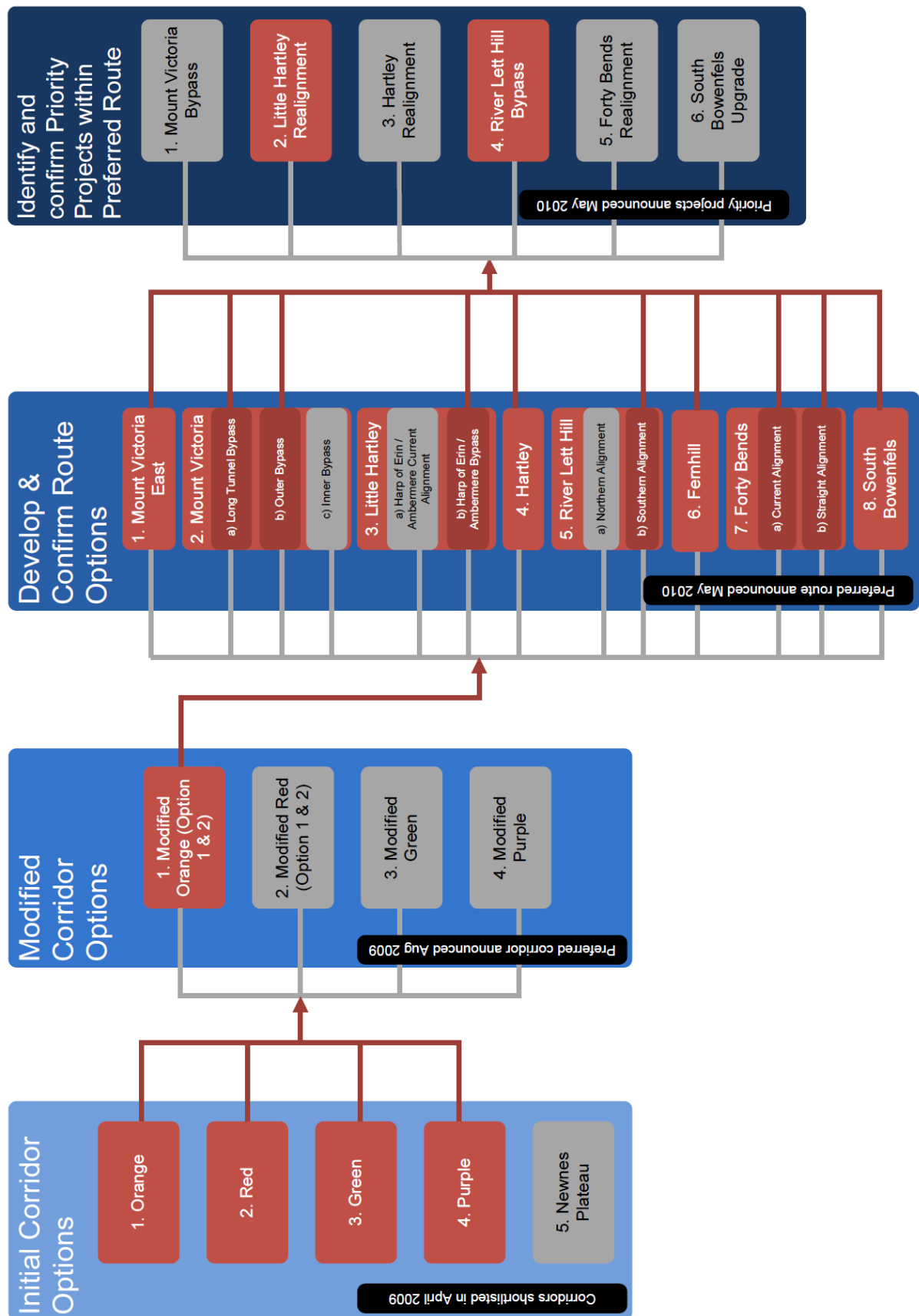


Figure 6 Corridor and Route Selection Process (selected route options shown in red)

At the same time, funding was committed jointly by Commonwealth and State Governments under the Nation Building Program 2009-2014, including \$220M to upgrade at River Lett Hill bypass and Little Hartley bypass, and the remaining \$30M allocated to safety improvements at Victoria Pass and the township of Mount Victoria (*Joint Ministerial Release, May 2010*). The joint media release states that progressing River Lett Hill, Little Hartley and the safety works “delivers the greatest immediate benefits within the funding available”. The statement also notes that the RMS would “prepare an implementation strategy for the upgrade”. In February 2011 the RMS established an Alliance with Parsons Brinckerhoff and Sinclair Knight Merz to commence the initial concept design and environmental assessment for the five projects listed above.

A *Draft Implementation Strategy (RTA Alliance, July 2011)* was prepared by the Alliance and re-assesses options for delivery of the projects within the available funding. The *Draft Implementation Strategy* identifies three project combination options considered deliverable within the \$220M funds. Based on improving road safety, freight efficiency and constructability, the draft strategy recommends that projects at River Lett Hill and Forty Bends be constructed initially. This latest recommendation does not have approval from the current government and varies the project priorities from that announced in May 2010 by the previous NSW Labor Government (that being Little Hartley Bypass and River Lett Hill bypass).

The Alliance has continued work to progress the concept design and studies required for the environmental assessment for all projects during this review.

4.4 Stakeholder Consultation

The RMS has consistently acknowledged the importance of stakeholders in defining project outcomes and has applied a rigorous and consistent consultation approach throughout the implementation of this project. A community consultation specialist, Straight Talk, was engaged at the commencement of the program to assist with consultation activities through to the selection of the preferred route. A separate Consultation Strategy was developed in July 2011 to guide the Alliance program which will deliver consultation activities through safety works, concept design, detailed design and REF phase.

The key objectives for the communication activities on the project are documented by RMS in the *Route Options Report (RTA, Oct 2009)* and include:

- Ensure all critical stakeholders are identified and included in the process;
- Ensure the engagement activities supporting the environmental and technical investigations are inclusive and accessible to all stakeholders and target audiences;
- Facilitate relationship building and the resolution of issues to progress the planning process; and
- Minimise the opportunity for speculation and misinformation about the planning process by providing good information.

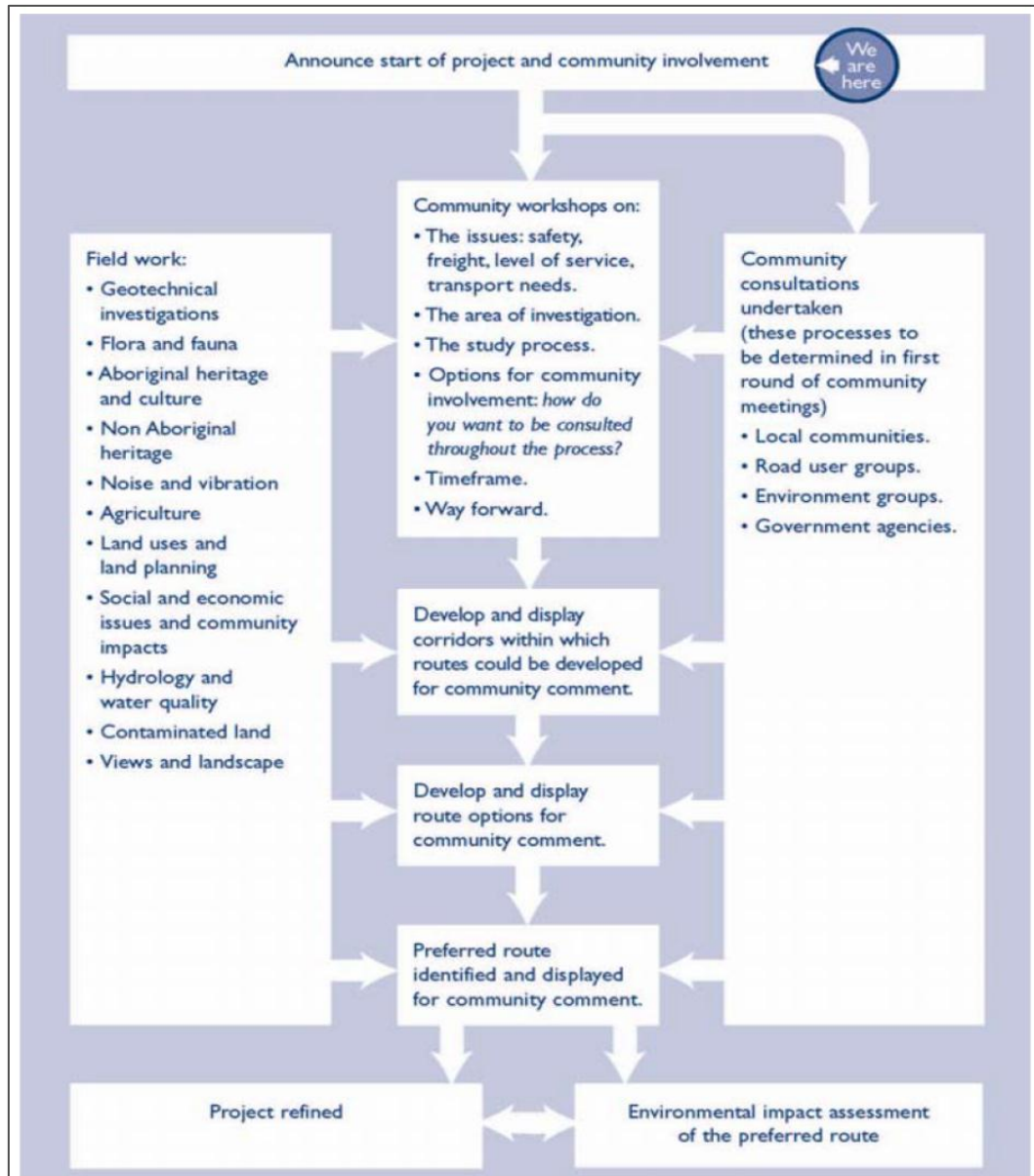


Figure 7 Approach to the Project (Consultation Process)

(Study area investigation and corridors identification, RTA, Nov 2008)

Consultation activities to date have been structured around four key phases including project inception and constraints identification, corridor selection, route options and preferred route selection. There is evidence that a wide representation of stakeholders have been consistently engaged in each of these phases including local community, interest groups, special industry bodies and Local and State Government agencies.

Attendance at community events varied throughout the program and in some cases was restricted to selected community representation at smaller events, such as the Value Management Workshop. The RMS has utilised a large range of consultation techniques to ensure the opportunity to comment was accessible to all relevant stakeholders including posting community updates and household letters, stakeholder and community meetings, large scale participative workshops, and staffed displays. In addition the RMS has been thorough in recording all issues, including introducing new technology solutions to capture and analyse data such as recording consultation

meetings and placing them on the RMS website. The RMS has been transparent in ensuring relevant information is made available to all stakeholders and responded to in an appropriate manner.

4.5 Cost Review

Funding of \$250M for the project was committed under the Nation Building program 2009-2014 jointly by Commonwealth and State Governments. The funding is made up of \$200 million of Commonwealth funds and \$50 million of State funding. As announced in May 2010, \$220M was allocated to the Great Western Highway upgrade between Mount Victoria and Lithgow, and the remaining \$30M allocated to safety improvements around Victoria Pass and the township of Mount Victoria, including installation of median barriers and road widening.

The estimated cost of the project has increased up to four-fold during the project development phase to as high as \$2 billion. The cost increase has been driven by heritage and environmental constraints and design growth from 18.4km of mostly 3 lane highway to 20.4km of mostly 4 lane divided carriageway, including provision of 1.4km long twin bypass tunnels at Mt Victoria, a long viaduct at Victoria Pass, and an additional service road connecting Hartley, Little Hartley and Victoria Pass (*Concept Design Overview Report (Draft)*, RMS, November 2011). The most recent cost estimate available for this review (*Full Project - Strategic Cost Estimate*, Mark Raven, June 2011) indicates project costs of approximately \$1.4B (2011\$) based on the preferred concept design. In this review, Evans & Peck has accepted the strategic cost estimates referenced herein as broadly indicative of the project cost. An independent review of the RMS's cost estimates has not been carried out by Evans & Peck.

Throughout the initial project development phase, RMS excluded cost as a key criteria in the selection of a preferred corridor and route for the upgrade, focussing instead on environmental, social and environmental considerations. Cost was not a selection criteria until introduced during the Value Management Workshop held in November 2009, to test cost sensitivity of the weighted outcomes (except for Mt Victoria Bypass) and develop a final evaluation matrix for the preferred option.

The RMS's early cost estimate for the upgrade from Mt Victoria to Lithgow was \$450M (*Study Area and Corridor Identification Report*, RTA, Nov 2008) based on 18.4km of highway upgrade. This equates to an average cost of \$24.5M per km. Prior to this in June 2008, RMS acknowledged previous concept development work relating to Hartley Valley that indicated heritage and environmental constraints would impose high costs and restricted working conditions (*Background Project Development Report*, RTA, Jun 2008).

Following identification of Route Options, Cardno (NSW) prepared a strategic cost estimate in November 2009 (*Mt Victoria Bypass Orange Corridor – Cost Estimate*, Cardno, Nov 2009) for route options within the Orange corridor, including costs for short and long tunnel options at Mt Victoria varying between \$1.57B and \$1.95B (2009\$) respectively.

Cardno's cost estimates were independently reviewed by Mark Raven Consulting (MRC) in February 2010 (*Estimate Report for Great Western Highway Upgrade Mt Victoria to Lithgow*, MRC, Feb 2010). Both reports compare the three options and include a breakdown of sub-options in each precinct. MRC prepared P90 cost plans in accordance with RMS policy (i.e. the actual cost of the project has 90% probability of not exceeding the estimate). The MRC cost estimates for the three

options range from \$1.73B to \$1.97B (2010\$), with the section at Mt Victoria Bypass contributing more than 60% of costs.

The RMS's Technical Workshop held in February 2010 to finalise the preferred route, adopted the Cardno and MRC cost estimates referred to above as a basis for comparison of route options.

RMS released their *Preferred Route Report* in May 2010 announcing the preferred route with a strategic cost estimate in the range \$1.35B to \$1.67B (2009\$). The report acknowledges that project costs are high, as a direct result of the topographical and geotechnical complexities at Mount Victoria that necessitate the use of tunnels and viaducts in the preferred route. Additionally the report refers to staging of construction to suit available funding and delivery of those sections offering best value for money in the short term.

Table 1- Strategic Cost Estimate (*Preferred Route Report, RTA, May 2010*)

Section	Low \$M	High \$M
Mt Victoria	900	1100
Little Hartley	50	60
Hartley	140	180
River Lett	120	150
Forty Bends including:		
Fernhill	60	80
Forty Bends	50	60
South Bowenfels	30	40
TOTAL	1,350	1,670

The most recent strategic cost estimate prepared in June 2011 by MRC (*Alliance Strategic Cost Estimate, MRC, June 2011*) assesses project costs at \$1.38B (2011\$) based on the preferred concept design. Clearly the cost estimate will continue to fluctuate with risk and scope adjustments as the detail design is further defined. However, this current estimate is a reasonable indicator of the order of magnitude of cost and equates to an average \$75M per km over 18.5km. Lowest cost are the sections at Forty Bends (including Fernhill and South Bowenfels) and Little Hartley at \$30M per km, whilst the Mt Victoria bypass is highest cost at \$135M per km.

RMS also prepared a cost benefit analysis for the overall Great Western Highway upgrade program in February 2011 (*Great Western Highway Upgrade Program Cost-Benefit Analysis Project, RTA, Feb 2011*) which considers projects across the entire highway upgrade between Lapstone Hill and Kelso. The benefit-cost ratio (BCR) assessed for the overall program is 1.9, increasing to 3.6 for the highway upgrade east of Katoomba with an average cost of \$50M/km. By contrast, the upgrade between Mount Victoria and Lithgow compares poorly, generating the lowest BCR of just 0.1. Individually the projects between Mount Victoria and Lithgow range between BCR 0.1 and 0.3, lower than all other projects on the highway upgrade program. The BCRs for the Mount Victoria to Lithgow projects are based on P90 cost estimates which include significant contingency, whereas the BCRs for projects east of Katoomba are largely derived from actual contract prices. Adjustment of the contingency allowance to a "most likely" position in the cost estimates for the proposed upgrade would marginally improve the BCR.

4.6 Project Implementation

The five core projects for the highway upgrade between Mount Victoria and Lithgow as identified in the *Preferred Route Report (RTA, May 2010)* include:

1. Mount Victoria Bypass
2. Little Hartley Bypass
3. Hartley
4. River Lett Hill Realignment
5. Forty Bends Realignment (including Fernhill and South Bowenfels)

Details of the concept design for the five projects are included in the *Draft Community Update (RTA, Aug 2011)* prepared by the Alliance. The concept design has extended the scope of the upgrade to 20.4km of mostly four lane divided carriageway including a local service road, additional overpasses, and major intersection upgrades.

A *Draft Implementation Strategy (RTA Alliance, July 2011)* prepared by the Alliance considers options for delivery of the five projects within the available funding. Contrary to the May 2010 announcement, the Draft Implementation Strategy recommends that the River Lett Hill and Forty Bends projects be constructed with the current funding. The Draft Strategy also excludes Mount Victoria bypass as a viable short term option recognising it exceeds the available funding. To arrive at this recommendation the draft strategy identifies a number of key factors to be considered in determining project priority including:

- The combined effect of projects in relation to road safety improvements;
- Those projects that will deliver the best short and long term benefits in relation to travel efficiency improvements;
- The immediate impact on communities;
- Achieving benefits from optimal application of environmental principles and management techniques;
- Opportunities for potential time savings to be gained through combining certain projects with similar characteristics and carrying out a single environmental assessment and planning approval application; and
- Consideration of capacity to balance cut and fill earthworks between projects, whether transfer of fill can be carried out 'off road' and whether construction can be carried out "off road" to minimise disruption to existing roadways and traffic mix.

The *Draft Implementation Strategy* does not assess the RMS's ability to deliver the recommended projects within the June 2014 time constraint, nor does it provide a plan for completing the remaining three projects, most notably Mt Victoria bypass, within an overall delivery program. As part of this review and in formulating our recommendations Evans & Peck has considered these additional factors in Section 5.

4.7 Safety Projects between Mount Victoria to Lithgow

In the period 2004-2008 the crash rate on the Great Western Highway between Mount Victoria and Lithgow was 46.6 per 100 million vehicles kilometres travelled (mvkt). This is approximately 53% higher than the state average crash rate of 30.4 mvkt for a similar road type category (*Background and Proposed Development Report, RMS, June 2008*). Safety performance on the route is impacted by poor alignment and width, level of service, pavement quality and access and intersection design. The highway between Mount Victoria and Lithgow is used by approximately 14,000 vehicles per day. Of this traffic approximately 15% is commercial heavy vehicles and 50% is through traffic.

The RMS's *Great Western Highway Safety Report (RTA, Oct 2010)* identifies that 43% of crashes on the highway can be attributed to speeding with 1/3 of all crashes (1/2 of fatal) occurring in high speed zones (>80km/h). In addition 62% of drivers and riders involved in crashes were local community members or country residents. Over 75% of crashes involved a vehicle leaving the carriageway or a head-on impact. Crashes are distributed throughout the route however there are four high severity safety zones identified including Victoria Pass, Little Hartley intersections, River Lett Hill including Jenolan Caves Rd intersection, and Forty Bends. A summary of the available safety information is included in Appendix 4.

Safety and traffic management were identified as key community concerns throughout the route development process. The RMS acknowledges in the *Background and Proposed Project Development Report (RTA, June 2008)* that without a significant improvement to safety performance the crash rate was anticipated to increase as a result of increasing urbanisation and traffic volumes along the route.

The annual crash rates for each project area as identified in the *Draft Implementation Strategy (RTA Alliance, July 2011)* and *GWH Upgrade Program Cost Benefit Analysis Project (RTA, Feb 2011)* are as follows:

1. Mount Victoria and Victoria Pass – 66 mvkt
2. River Lett Hill – 53.5 mvkt (theoretical post recent safety work)
3. Forty Bends – 49.5 mvkt
4. Hartley – 39.7 mvkt
5. Little Hartley – 37.6 mvkt

As part of the \$250M funding committed to the upgrade, \$30M was allocated to safety works around Victoria Pass and the township of Mount Victoria and some smaller projects elsewhere on the route (discussed in Appendix 4). Furthermore, since 2008 significant safety improvements have been completed on River Lett Hill including pavement widening, new guardrails and traffic separation via a central median barrier. In October 2010 the RMS completed a *Safety Review* of the Great Western Highway between Mount Victoria and Lithgow which identifies a series of safety recommendations including improvements to road alignments, road environment, and separation of opposing lanes, warning signage, delineation and junctions.



Figure 8 Recent safety work at River Lett Hill

(Great Western Highway Safety Review Presentation, RTA, Oct 2010)

The importance of improving the safety performance is reflected in the RMS's project objectives defined for the proposed Mount Victoria to Lithgow highway upgrade, and it is the RMS's intention to address safety requirements along the route through the highway upgrade projects. However it is considered equally valid that many of the safety issues could be addressed through a targeted safety improvement program on the existing alignment.

4.8 Bells Line of Road

The Bells Line of Road provides a supplementary mountain crossing route to the Great Western Highway, although it is not part of the National road network. Traffic flow on Bells Line of Road reaches 8,000 vehicles per day west of Bell, only 3,000 between Bell and Kurrajong, and 12,000 between Kurrajong and Richmond (*Background and Proposed Project Development Report, RTA, Jun 2008*).

The Bells Line of Road is subject of a Long Term Strategic Corridor Plan which commenced in 2010 aimed at investigating the potential for the preservation of a corridor reserve between the Sydney motorway network and Great Western Highway in the west, to meet long term needs. An upgrade of the road to a 4-lane B Double standard highway was considered in the *Central West Transport Need Study (SKM, May 2009)* and found not to be economically viable at \$3B (2004\$ strategic estimate), nor necessary to meet the current capacity requirements. Should it be determined that a Bells Line of Road corridor should be preserved, the Newnes Plateau corridor and the Purple corridor remain potential options for a future connection to an upgraded Bells Line of Road.

On Bells Line of Road the crash rate is highest through the Blue Mountains LGA at 74.1mvkt, followed by the Lithgow LGA at 48.7mvkt and the Hawkesbury LGA at 25.9mvkt. Analysis of crash statistics and maps provided by the RMS has revealed a number of zones along the Bells Line of

Road with high incident rates which would benefit from safety works. A detailed safety analysis is included in Appendix 4.

The *Central West Transport Needs Study (SKM, May 2009)* recommends medium term safety and capacity enhancements to improve the existing road condition. Chapter 4 of the *Draft Bells Line of Road Long Term Strategic Corridor Plan (SKM, Sep 2011)* states that the existing corridor is undivided road with typically narrow gravel shoulders and limited clear zones. Key safety issues include limited overtaking lanes, narrow shoulders, minimal physical separation and speeding. Stakeholder consultation carried out for the draft study identified additional safety concerns including the impact of overhanging trees, the effectiveness of reflectors both at night and in fog, and the proximity of power poles to the edge of pavement.

There are several current and future safety projects planned by RMS on Bells Line of Road. The projects include median barriers, pavement resurfacing works, maintenance of drainage, signs and line marking and installation of fixed assets such as retaining walls and guardrails. For the financial year 2012, RMS has approved \$2.5M for two projects to improve separation on Chifley Bends, and a further \$3.5M for pavement maintenance works at Bilpin and Berambing. Since 2001, the RMS has spent more than \$4M on maintenance work (*RMS email correspondence, Sept 2011*). Details of RMS's current and planned safety works for Bells Line of Road are included in Appendix 4.

5 COMMENTARY

5.1 Strategic Context

It is evident that over time the Great Western Highway has evolved into the dominant freight, tourist and commercial link between the Central West and Sydney, as well as functioning as a local road for communities. The *Study Area Investigation and Corridors Identification Report (RTA, Nov 2008)* notes that heavy vehicles comprised about 15% of the traffic mix across the mountains.

The future growth of the Central West region is fundamental to the timing of further upgrades, together with the propensity to move freight from road to rail. The current traffic volumes between Mount Victoria and Lithgow are relatively low and within the capacity of the existing highway, however there are a number of immediate challenges that should be addressed by the RMS, primarily focused around safety improvement.

A number of studies have been undertaken between 1996 – 2009 relating to transport needs for the Central West area. The most recent study is the *Central West Transport Needs Study (SKM, May 2009)*. The Central West Transport Needs Study considers growth forecast for the region between 2008-2033, and provides a series of short, medium and long term recommendations for necessary network enhancement. The study reports no capacity constraints on the existing road network in the medium term and provides no strategic justification for any sizeable investment by the RMS to upgrade between Mount Victoria and Lithgow.

The *Central West Transport Study* also considers the rail network servicing the Central West and connecting to the Sydney metropolitan area. The rail network serves both the domestic and export markets transporting about half of the freight task via the Sydney-Dubbo corridor, which consists primarily of bulk coal, grain and containerised minerals. The network is constrained by limited line speed, load capacity, multiple bridges and tunnels and a lack of refuge loops for passing opportunities. Over the Blue Mountains corridor segment, gradients and curvature place limits on the speed and length of trains. Regionally, freight restrictions during commuter peaks and limited train paths particularly to the Sydney metropolitan area impact the effectiveness and efficiency of rail transport to and from the Central West region. These factors, coupled with poorly located yard facilities and inter-modal terminals for road transfer, make it unattainable for freight trains to achieve competitive journey times, limiting the ability of rail to increase its market share. Additional investment, as well as Commonwealth Government support would be required to ensure future viability and growth of the rail freight industry between the Central West and the coastal region of New South Wales.

The proposed highway upgrade between Mount Victoria and Lithgow would build on the long term investment program by the State and Commonwealth governments into the upgrade of the whole Great Western Highway between Penrith and Bathurst. Completion of this section of the upgrade would link to the other Great Western Highway upgrade projects to provide a more efficient mountain crossing and transition to the Central West. However, the proposed upgrade between Mount Victoria and Lithgow is costly, technically challenging and has lower traffic volumes than sections east of Katoomba. The adverse factors combine to return a low benefit-cost ratio (BCR) for the upgrade of just 0.1 which compares poorly to the previous investment east of Katoomba with an average BCR of 3.6 (*GWH Benefit Cost Report, RTA, Feb 2011*). On purely economic grounds the proposed upgrade between Mt Victoria and Lithgow is not considered to represent value for money. In particular the eastern section comprising the Mount Victoria bypass is not considered economically viable at a cost of around \$1.0 billion. Prior to committing sizeable funding to the whole project there is clearly a need to better understand the role of the Great Western Highway

more strategically as part of the broader transport network connecting the Central West to the eastern seaboard across the mountains and to the coast.

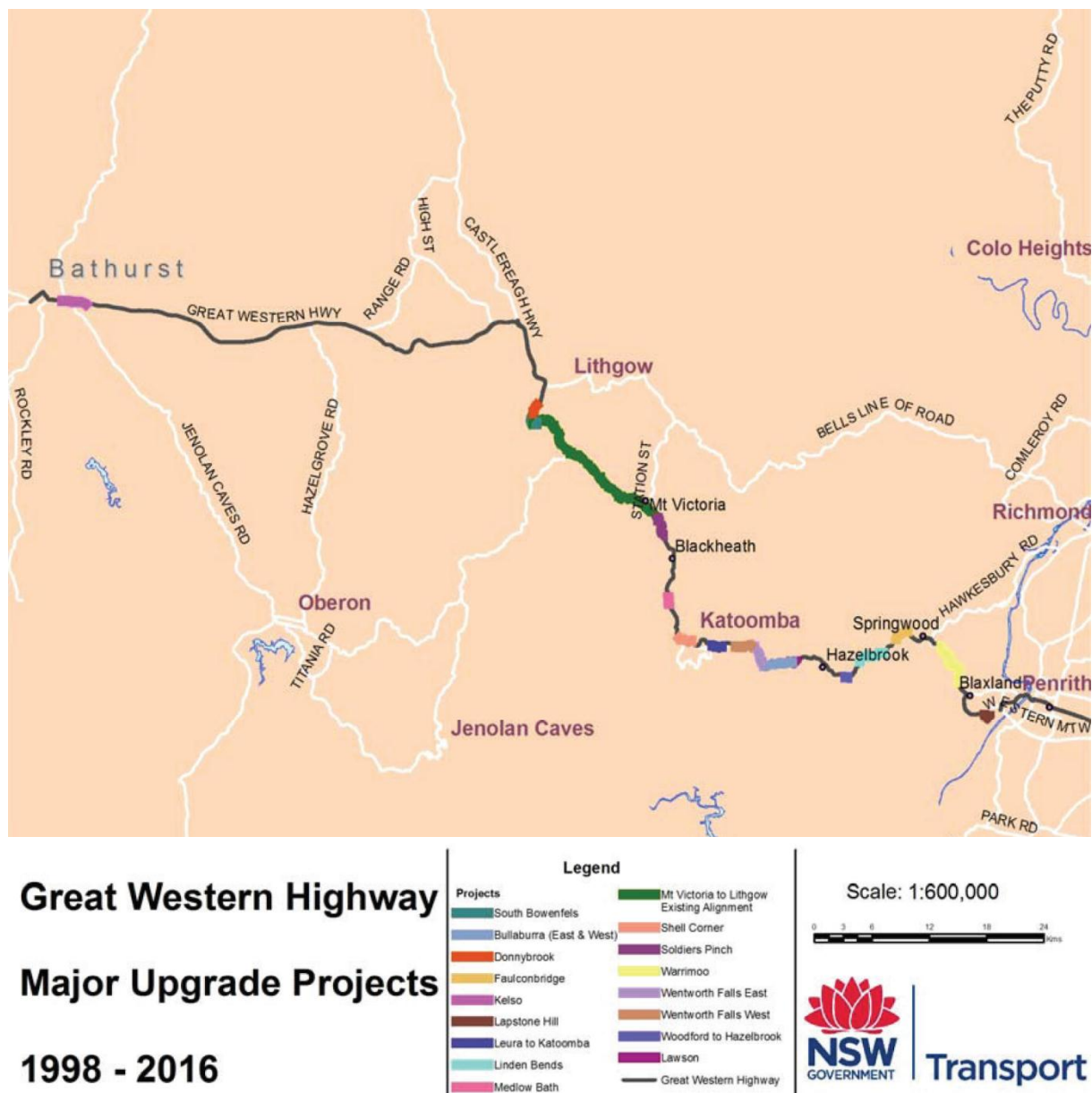


Figure 9 Major Upgrade Projects Great Western Highway

(GWH Benefit Cost Report, RTA, Feb 2011)

The *Central West Transport Needs Study* recognises the need for further investigations into the long term requirement (beyond 2033) for additional road and rail transport capacity across the Blue Mountains, consideration of improved rail freight and passenger services especially on the Main West Line, safety programs, and future investment into intermodal facilities. In line with the study recommendations the RMS has progressed some of the investigations listed including the Great Western Highway upgrade between Mount Victoria to Lithgow, and the long term corridor study into the Bells Line of Road. The study recommendations relating to rail are the responsibility of other agencies.

RMS studies to date have largely focused on road solutions. Furthermore information on freight movements to and from the Central West is poor, and the extent to which freight can be moved between road and rail is unclear. Future studies need to start with an understanding of the freight and passenger task and consider the most economic multi-modal solutions.

Comprehensive analysis is required that builds on the recommendations in the *Central West Transport Needs Study* and considers an integrated transport approach to freight and passenger movement between the Central West and the coast. The study should consider the Blue Mountains as part of a wider road and rail transport network and consider as a minimum the following key areas:

- Consider road, rail and port connectivity, the location of multimodal terminals and the connection to locations such as Port Kembla, Newcastle Port and Port Botany;
- Consider a long term approach to meeting demand through capacity growth, including the potential for use of different transport modes to satisfy the freight task into the future;
- Differentiating the role of the Great Western Highway and Bells Line of Road in the road transport network, as well as identifying possible connections to the Sydney motorway network;
- Consider socioeconomic and environmental impacts for future investment in new road and rail alignments; and
- Develop a long term capital investment program of works to deliver an integrated transport network solution.

The study should be managed by Transport for NSW in partnership with other relevant State and Commonwealth Government departments to ensure agreement is achieved at all levels for the integrated transport approach. The study should be completed in the near future to ensure that ongoing funding of the road and rail network is being applied purposefully, at the appropriate time, so as to provide maximum benefits and value for money

5.2 RMS Process and Community Impact

Extensive work has been completed by the RMS to arrive at a preferred corridor, route and projects since the project commenced in 2008 and the RMS Project Team should be commended for the quality of work delivered in that time. The RMS acknowledged the importance of stakeholders in defining project outcomes and applied a rigorous and consistent consultation approach throughout the implementation of this project. Both the Orange Corridor and the preferred route were thoroughly investigated to minimise impact on the local community and mitigate significant risks presented throughout the development process.

The community are mostly complimentary of the RMS's consultation process although many have commented that it has taken too long to conclude. Primarily the community desire action to address immediate needs (such as safety) in the short term, whilst longer term they wish to see the strategic justification for the upgrade project. The community is in general agreement that a \$1.4 billion upgrade is not value for money, nor is it likely to be delivered in the near future. The community between Katoomba and Lithgow require certainty on the future timeline and scope of changes to the Great Western Highway west of Katoomba. The community believes clearer strategic justification is required prior to committing significant funding to the Great Western Highway at this point in time. Once that strategy is determined, the government should ensure the community and stakeholders are informed of its policy for the Great Western Highway upgrade from Katoomba to Bathurst.

5.3 Cost Effectiveness

The estimated cost of the project has grown substantially throughout the life of the project. The current cost estimate is approximately \$1.4B (2011\$) based on the preferred concept design, although there are estimates as high as \$2 billion. The exclusion of cost as a criteria during the early stages of preferred corridor and route selection may have contributed to a lack of visibility of escalating costs. The benefit-cost ratio (BCR) of 0.1 for the proposed upgrade compares poorly to the upgrade projects east of Katoomba with an overall BCR of 3.6.

It is acknowledged that BCRs for the proposed upgrade projects between Mount Victoria and Lithgow are based on P90 cost estimates which include significant contingency, whereas the BCRs for projects east of Katoomba are largely derived from actual contract prices. However, adjustment of the contingency allowance to a "most likely" position in the cost estimates for the proposed upgrade would only marginally improve the BCR.

Although designed ultimately to preserve a corridor for future planning purposes, based on transport needs studies undertaken for the Central West area that the scale of design proposed for the upgrade exceeds both short and medium term transport requirements. The *Central West Transport Need Study (SKM 2009)* in particular reports no capacity constraints on the existing road network before 2033. Based on the cost benefit analysis by RMS and strategic cost estimates by MRC, the preferred route and concept design for the upgrade are not considered to represent value for money. This is particularly relevant to the Mount Victoria bypass and River Lett Hill bypass with an average cost per kilometre of \$114M and \$50M respectively, compared to the lower cost projects at Little Hartley and Forty Bends averaging approximately \$25M per kilometre.

Furthermore, whilst the current \$250M funding is sufficient to potentially support completion of two of the five upgrade projects, the low BCR will present challenges for achieving ongoing funding. Upgrading of the remaining three projects to four lanes may not be supported by Transport for NSW or Infrastructure NSW in the future when considering other infrastructure priorities in the state. This would result in a partly completed road with different standards along a short distance from Mount Victoria to Lithgow. Clearer strategic justification is required for the current State and Commonwealth Governments to commit significant further funding to the Great Western Highway at this point in time.

The current funding (\$250M) could be more appropriately allocated to directly improving road safety for road users and the local community. To achieve this, work is required to address immediate needs along the whole length of the existing Mount Victoria to Lithgow route, as well as elsewhere on Great Western Highway and extending to the Bells Line of Road. This is reflected in our recommendations in Section 6.

5.4 Project Implementation

The *Draft Implementation Strategy (RTA Alliance, July 2011)* prepared by the RMS and Alliance considers options for delivery of the five upgrade projects within the available funding and recommends that the River Lett Hill and Forty Bends projects proceed to construction. The *Draft Implementation Strategy* excludes Mount Victoria bypass as a viable short term option, as the RMS recognises it exceeds the available funding. The projects at River Lett Hill and Forty Bends address those areas with the highest crash rates. The Alliance concludes that these projects combined provide a reasonable balance of cut and fill earthworks, provide the highest travel time saving and result in only one change in travel conditions between Mount Victoria and Lithgow. On the other

hand, allocating priority to the two projects leaves other issues at Little Hartley and Hartley unresolved, particularly at some intersections which are a major community concern.

Whilst satisfying the project objectives, it is considered that the concept design for the proposed upgrade goes beyond addressing current needs and does not represent value for money, particularly given the relatively low traffic volumes. The proposed design includes both three and four lane sections separated by a median up to 11 metres wide, and with a speed limit up to 100km/hr. The *Draft Implementation Strategy* focuses on delivery of selected projects within the available funding, to the exclusion of addressing immediate needs on the remainder of the route. With no certainty of further funding to complete the other projects in the short term, there will be increasing pressure on the RMS to implement additional road safety improvements. Moreover, a clear statement of the strategic justification would be an essential component of the environmental assessment process and to demonstrate value for money.

It has been identified through this review an overwhelming consensus within the local communities for safety improvements along the entire length of highway between Mt Victoria and Lithgow. The key project objectives (including safety, community impacts, and catering for a mix of traffic) can largely be achieved through improvements to the existing highway and that the current funding (\$250M) could be more efficiently utilised. Whilst freight efficiency for heavy vehicles would be partly improved through enhanced service levels, it is acknowledged that without the full upgrade the steep gradients at Victoria Pass (13%) and River Lett Hill (10%) would remain, and the proposed travel time savings would not be realised. We note however that these conditions are similar to the 10% gradient which exists on the Great Western Highway east of the mountains at Lapstone Hill which will remain a constraint on the network for the foreseeable future.

In May 2010, the \$30M of safety works funded by the Nation Building Program was allocated to critical safety zones at Victoria Pass and through Mt Victoria. In October 2010 the RMS completed a *Safety Review of the Great Western Highway between Mount Victoria and Lithgow (RTA, Oct 2010)* which identifies a series of safety recommendations including improvements to road alignments, road environment, separation of opposing lanes, warning signage, delineation and junctions. The RMS has continued to consult widely for this safety program, particularly with the Mt Victoria community. As part of this review available crash data and RMS's proposed safety improvements (summarised in Appendix 4) has been considered for each of the other precincts.

In Little Hartley cross highway traffic movements contribute to the high crash history (41.4 mvkt) in this area. There is a staggered junction of four closely spaced intersections between Cox's River Road and Browns Gap Road with a history of crashes at this location (*MPRC Presentation, RTA, June 2011*). The RMS *Safety Review* notes that sight distances to and from side roads are inadequate especially through these areas and recommends protection for turning vehicles, minor road widening and sealing of property boundary accesses. Furthermore the RMS *Safety Review* identifies that pavement condition through Little Hartley and Hartley has not been maintained to RMS route standard (i.e. 2 metre wide shoulders and 3.5 metre wide travel lanes). The RMS's earlier *Background and Proposed Project Development Report (RTA, June 2008)* also notes that the existing pavement in the study area (particularly the spray sealed flexible pavements) needs replacement in the very near future, either as a full reconstruction or rehabilitation of the existing formation. Most sections were reported to be experiencing a continued growth in heavy patching activity and cost.

Safety through Little Hartley and Hartley can be significantly improved via upgraded intersections on the existing highway alignment (at Baaners Lane, Browns Gap Road and Cox's River Road/Ambermere Road), pavement rehabilitation and widening of pavements and shoulders within the existing road corridor. These safety works can be designed to mitigate the impact on items of heritage significance adjoining the existing highway.

Safety improvement work has recently been completed at River Lett Hill at a cost of \$5M. Whilst the success of this project has not yet been formally recorded, anecdotal evidence from conversations with community groups suggests a reduction in crashes at this location. By contrast, RMS notes in its *Draft Concept Design Recommendation MPRC Presentation (RTA, June 2011)* that vehicles continue to crash regularly on this section of highway. Community feedback confirms that further safety improvements are desired at the eastern end of River Lett Hill, particularly in relation to the intersection with Jenolan Caves Road, which realises over 500 truck movements per day. The RMS *Safety Review* which was prepared after the recent safety work commenced on River Lett Hill, recommended further road shoulder improvements, installation of an roadside drainage system, and installation of an additional safety barriers at the lower embankment. The RMS will need to consider appropriate design solutions to address safety concerns including turning movements at this location within the existing highway alignment.

The main safety issue at Forty Bends is the risk of black ice, particularly during the colder months, and the associated road closures which regularly occur. Without significant vegetation removal this issue is unable to be rectified on the existing alignment. The Forty Bends project concept design provides an effective solution that realigns the most critical section of highway away from the existing slope to reduce shading and the likelihood of ice formation on the pavement. The proposed design solution has been informed by independent experts and also provides safety enhancements through an improved horizontal alignment and overtaking lanes. This project will improve reliability and freight efficiency by mitigating road closure risk on this section of the highway. Despite a BCR of just 0.2 for the project (*Draft Implementation Strategy, RTA Alliance, July 2011*) the estimated cost per kilometre represents about 60% of the average cost of highway upgrades east of Katoomba, and is considered the preferred way to achieve the project objectives through this section of the Great Western Highway. It is recommended that this project proceed to construction at the earliest opportunity. Some re-engineering of the design may be required to reduce the volume of imported fill required and ensure the project is delivered in the most cost effective manner. The RMS should carefully review the delivery program and identify risks in meeting the June 2014 funding deadline. The planning approval required for this site may take up to 12 months, setting a challenge to complete construction within the remaining 18 months.

In addition to the specific items noted above safety improvements such as signage, guidance, warning and delineation should be carried out along the entire route. The RMS should also consider the need to take into account school bus areas to pick up and drop passengers in a safe manner and the provision of police speed enforcement bays.

It is recommended that the RMS's safety works review be updated taking into account the Alliance's proposed concept design for the upgrade, including highway realignment and bypasses, will not be progressed in the near future. Safety issues previously assumed to be addressed through construction of these upgrade projects should be reconsidered and new designs developed appropriate for improving safety within the existing highway alignment. A clear road safety engineering works program to resolve safety issues between Mount Victoria and River Lett Hill should be developed and implemented prior to June 2014.

The \$30M safety works program committed as part of the Nation Building funding should also be reviewed taking into account the RMS's proposal highway upgrade projects that are not recommended to proceed, the committed safety works, and the additional safety projects recommended above.

It is acknowledged that reducing the scope from Mount Victoria to River Lett Hill will impact on the role of the design Alliance which has been engaged to carry out detailed design and environmental assessment for selected projects. The RMS should retain the Alliance to prepare detail designs for the major safety works, consult with the community and local stakeholders to ensure the right design outcomes, and finalise environmental approvals as required. The Alliance should continue to fulfil their scope of services in relation to the Forty Bends project.

Prior to this review, RMS prepared a Draft Implementation Strategy recommending allocation of \$250M funding to proceed with two proposed projects prior to June 2014 (Forty Bends and River Lett Hill). The plan does not indicate timeframes for completion of the remaining upgrade projects requiring an additional funding required to complete the upgrade project as designed. A comparison of the recommendations from the RMS Draft Implementation Plan and this review is included in Section 6. If the recommendations contained in this report are accepted, then release of the Draft Implementation Strategy will not be required. Incorporation of revised corridor boundaries into the Council LEP should be deferred until the proposed Integrated Transport Study has considered the future long term planning for the Great Western Highway.

5.5 Other project opportunities

As a part of this review a number of additional projects have been identified that may assist to improve the overall road network to and from the Central West and satisfy the project objectives. It is recommended that they are considered for implementation within the existing funding.

We acknowledge that RMS has commenced a Long Term Strategic Corridor Plan for the Bells Line of Road to guide the future reservation of an upgraded road corridor between the Sydney motorway network and Great Western Highway in the west. Specifically however, safety issues on Bells Line of Road require immediate attention and the RMS should work quickly to develop a suitable safety program. Whilst not part of the National network, Bells Line of Road is an important regional and local route and supports a high proportion of heavy vehicles movements through the region. The road has a higher crash rate than Great Western Highway and safety improvements are supported by the local community and Councils alike. There has been limited investment to date which is discussed in Appendix 4. For the financial year 2012, RMS has approved \$2.5M for two projects to improve separation on Chifley Bends, and a further \$3.5M for pavement maintenance works at Bilpin and Berambing. This investment should be supplemented by the available funding and immediate needs addressed.

Community feedback has called for enhanced overtaking opportunities on Bells Line of Road. Whilst an RMS maintenance program is in planning (Bell to Kurrajong) aimed at widening and sealing shoulders, widening the formation, and improving clear zones to address safety concerns in the short term, these works should be extended to provide regular overtaking lanes. Signposting is also under review by RMS between Bell and Lithgow.

However a defined program of safety works has not been completed between Lithgow and Kurrajong and this should now be prioritised in consultation with the local community and stakeholders. RMS has recommended further detailed analysis of those areas of concern identified within their *Preliminary Crash Report for Bells Line of Road* (RTA, Oct 2011). Further funding over time may be required to complete a suitable program once the available funding recommended has been exhausted.

In addition to Bells Line of Road there has been strong support from local and surrounding stakeholders for investment in additional projects along the greater Great Western Highway. In our opinion, the RMS should reinvestigate the option of a pedestrian overbridge at Bullaburra which could provide safety benefits and improves travel time savings in peak periods by mitigating the cumulative effects of traffic signals on traffic flow. We also agree that the RMS should commence investigations into providing a suitable alternative to the default truck stop at the Caltex Service station at Mount Victoria. Additionally, in our opinion the RMS should commit time and resources to consult with the community and explore cost effective projects on the Great Western Highway within the Blue Mountains and Lithgow LGAs that offer community benefit, paying particularly attention to towns such as Blackheath.

6 REVIEW AND RECOMMENDATIONS

6.1 Best use of funding between Mount Victoria and Lithgow

The current funding should be allocated to directly improving road safety for road users and the local community. The recommendations in this report are consistent with the RMS's project objectives for achieving improved road safety and freight efficiency whilst minimising impacts on the community and environment.

Based on the commentary provided in the previous section the following projects between Mount Victoria and Lithgow be pursued within the available \$250M funding and restricted to the cost estimates provided.

- Great Western Highway upgrade recommended works - \$122M
- Enhanced Safety Program - \$83M
- Other projects including Bells Line of Road - \$45M

Great Western Highway upgrade recommended works - \$122M

Recommended works	Strategic Estimate (\$M)	Proposed Scope of Work
<i>Integrated Transport Study</i>	\$2M	Commence study as defined in Section 5.1
<i>Forty Bends Project</i>	\$100M	Scope includes South Bowenfels to Fernhill – cost estimate from MRC June 2011. \$5M added for imported fill. Re-engineering to be completed by RMS to reduce fill imbalance.
Allowance for project costs 20%	\$20M	
TOTAL PROJECT COST	\$122M	

Enhanced Safety Program - \$83

Recommended works	Strategic Estimate (\$M)	Proposed Scope of Work
<ul style="list-style-type: none"> <i>River Lett Hill Safety Works</i> 	\$15M	Additional safety improvements to compliment recently completed safety works. Scope includes pavement widening, turn lanes & medians to upgrade at-grade intersection with Jenolan Caves Road & Blackmans Creek Road, and extension of the pavement widening beyond the bottom curve. Possible cut earthworks on eastbound approach to River Lett. Additional advisory signage and linemarking at the top curve approach.
<ul style="list-style-type: none"> <i>Little Hartley Intersection Upgrades</i> 	\$7M	At-grade intersection upgrades at intersections with Baaners Lane, Browns Gap Road and Cox's River Road / Ambergmere Drive
<ul style="list-style-type: none"> <i>Little Hartley to Hartley Pavement & Safety Upgrades</i> 	\$29M	Scope includes 5.5km pavement rehabilitation or reconstruction, barriers and shoulder widening where road permits
<ul style="list-style-type: none"> <i>Speed control</i> 	\$1M	Optimal solution to be determined by RMS, to include use of technology and police enforcement bays
<ul style="list-style-type: none"> <i>Existing Safety Program (committed) - Victoria Pass & Mt Victoria</i> 	\$20M	Revisit the RMS's Safety Program (\$30M) considering the \$20M of committed safety works and the projects recommended above.
Allowance for project costs 20%	\$11M	
TOTAL PROJECT COST	\$83M	

In relation to safety issues previously assumed to be addressed through construction of the upgrade projects, these should be reconsidered and new designs developed appropriate for improving safety within the existing highway alignment.

Further analysis of crash rates, traffic volumes and site investigations by the RMS will be required to determine the best allocation of resources.

Other Works including Bells Line of Road - \$45M

The Nation Building funding committed by both the State and Commonwealth Government totals \$250M. Based on the projects above and including the Safety Program, the RMS is likely to have \$45M remaining funds to spend on additional projects beyond the study area. A list of potential projects are listed below:

- Develop and implement a Bells Line of Road safety program including pavement widening and regular overtaking lanes
- Bullaburra upgrade new pedestrian overbridge to replace the proposed at-grade crossing
- Full synchronising of traffic signals through Blackheath including pedestrian activated signals
- Explore other Great Western Highway projects between Katoomba and Mount Victoria that offer community benefit, and invest where appropriate (projects might include intersections at Evans Lookout Rd, Hat Hill Rd, Govetts Leap Rd/Bundarra St)
- Caltex Station Truck Stop alternative - investigate with the trucking industry potential rest area locations and amenities

It is important to note that it is a requirement of the Nation Building Program that all funding is available for the period to 30 June 2014 and that the funding may only be used for the 'Great Western Highway Upgrade'.

Recommendation Summary

The proposed upgrade of the Great Western Highway between Mount Victoria and Lithgow was announced in May 2008. Extensive work was completed by RMS to determine a preferred highway corridor and preferred route between Mount Victoria and Lithgow and define the proposed projects within the preferred route. The preferred corridor, being the Orange corridor, was announced in August 2009.

In May 2010 a Joint Commonwealth/State Ministerial Media Release announced the preferred route and committed to progressing upgrade projects at River Lett Hill and Little Hartley, as well as a \$30M safety works program.

A *Draft Implementation Strategy* was prepared by the project Alliance in July 2011 which reassessed options for delivery and revised the recommendation to prioritise Forty Bends and River Lett Hill projects within the available funding. Whilst the current \$250M funding could potentially support completion of two of the five upgrade projects, ongoing funding of approximately \$1.2B will be needed to complete the upgrade. In addition, it has been determined that whilst the proposed upgrade projects achieve the RMS's overall objectives the upgrade has evolved in scope and on purely economic grounds does not represent value for money.

This review recommends that the \$250M funding be allocated to directly improving road safety for road users and the local community by progressing the Forty Bends upgrade project, providing an enhanced safety works program and conducting a series of other projects, including on the Bells Line of Road. It is also recommended that clearer strategic justification is needed for the upgrade and that a comprehensive study that considers an integrated transport approach to freight and passenger movement to the Central West should be undertaken.

The recommendations in this report are consistent with the RMS's project objectives for achieving improved road safety and freight efficiency whilst minimising impacts on the community and environment. If the recommendations contained in this report are accepted, then release of the RMS *Draft Implementation Strategy* will not be required. Furthermore, incorporation of revised corridor boundaries into the Council LEP should be deferred until the proposed Integrated Transport Study has considered the future long term planning for the Great Western Highway.

Appendix 1 List of Documents Reviewed



Project Documents

Title	Author	Date
Route Assessment Guidelines for Restricted Access Vehicles – Edition 2, Rev 0	Roads & Traffic Authority	May 2002
Property Acquisition - Your property & RTA Projects	Roads & Traffic Authority	Jan 2008
Submission - Proposed Road Corridor through defence establishment Marrangaroo	Department of Defence	Mar 2008
MV2L Mailing List – All Group 1 May 2008 (introducing the project)	Roads & Traffic Authority	May 2008
Community Update MV2L – GWH Upgrade	Roads & Traffic Authority	May 2008
Background and Proposed Development Report	Roads & Traffic Authority	June 2008
Community Meeting Presentation and Minutes	Roads & Traffic Authority	June 2008
GWH Communications Plan (Straight Talk)	Roads & Traffic Authority	June 2008
Community Meeting Presentation and Minutes	Roads & Traffic Authority	July 2008
RTA Presentation to staff	Roads & Traffic Authority	July 2008
Community Update Mount Victoria to Lithgow	Roads & Traffic Authority	Aug 2008
Community Update – Great Western Highway Upgrade, An Overview	Roads & Traffic Authority	Sept 2008
Notes of Community Meeting	Roads & Traffic Authority	Sept 2008
Community Update – To the Householder Investigating options for the GWH Upgrade	Roads & Traffic Authority	Oct 2008
MLV2L reports mailing list	Roads & Traffic Authority	Nov 2008
Community Update – Corridors display – have your say	Roads & Traffic Authority	Nov 2008
Community Update - MV2L Update	Roads & Traffic Authority	Nov 2008
Terms of Reference and Strategic Review of a Newnes Plateau corridor	Roads & Traffic Authority	Nov 2008
Study area investigation and corridors identification	Sinclair Knight Merz	Nov 2008
Community Update – MV2L Four modified corridors are confirmed for further investigation	Roads & Traffic Authority	April 2009
Community Update – MV2L GWH upgrade	Roads & Traffic Authority	April 2009
Corridor Submissions Report	Sinclair Knight Merz	April 2009
MV2L Government Agencies and other group consulted in April 2009	Roads & Traffic Authority	April 2009
Confirmed Corridors Presentation	Roads & Traffic Authority	April 2009
Central West Transport Needs Study	Sinclair Knight Merz	May 2009
Noise – How is it assessed	Roads & Traffic Authority	July 2009
Ministerial Release – resolution reached on the GWH Upgrade	Minister for Roads	Aug 2009
Route Options Development Report (Draft and never completed)	Sinclair Knight Merz	Sept 2009
Community Update –MV2L GWHU Display of route options	Roads & Traffic Authority	Oct 2009
Route Options Report Appendix – detailed summary of all environmental and social issues and engaged reports	Sinclair Knight Merz	Oct 2009

Title	Author	Date
Route Options Report Volume 1: Main Report	Sinclair Knight Merz	Oct 2009
Route Options Report Volume 2: Working Papers – Part 1 of 2	Sinclair Knight Merz	Oct 2009
Route Options Report Volume 3: Working Papers – Part 2 of 2	Sinclair Knight Merz	Oct 2009
Route Options Submissions Summary	Sinclair Knight Merz	Oct 2009
MV2L Community meeting notes	Roads & Traffic Authority	Oct 2009
Cardno Cost Estimate report – Orange Corridor	Cardno	Nov 2009
Route Options Display Presentation	Roads & Traffic Authority	Nov 2009
MV2L Community meeting notes	Roads & Traffic Authority	Nov 2009
Value Management Workshop Briefing Paper	Roads & Traffic Authority	Nov 2009
Value Management Workshop Report	Parsons Brinckerhoff Australia Pty Limited	Nov 2009
Estimate Report for Great Western Highway Upgrade	M Raven Consulting Pty Ltd	Feb 2010
MPRC presentation – Preferred Route Presentation	Roads & Traffic Authority	Feb 2010
Technical Workshop	Parsons Brinckerhoff Australia Pty Limited	Feb 2010
Joint Ministerial News Release – GWH Project moves forward	Ministers for Infrastructure and Roads	May 2010
Preferred Route Report	Sinclair Knight Merz	May 2010
Community Update MV2L GWH Preferred route	Roads & Traffic Authority	May 2010
Documents supporting public meeting	The Future of Hartley Group www.hartleyforum.org	Sep 2010
MV2L Comms Strategy with Stakeholder matrix for discussion 'Comms Strategy v1'	Roads & Traffic Authority	Unknown
MV2L corridors options display distribution list – copies of SKM & Cardno reports sent to stakeholders	Roads & Traffic Authority	Unknown
Copy of Focus Group Invites – FINAL MV2L Corridor Investigation – Socio Economic Impacts	Roads & Traffic Authority	Unknown
Community Update – Safety works on the GWH bottom curve of Victoria Pass	Roads & Traffic Authority	Oct 2010
Communications and Stakeholder Relations Plan – Alliance	RTA Alliance	Dec 2010
Alliance communication Program – Communication Tasks for 2011 Draft Concept Design Display	RTA Alliance	2011
Email	MP NSW Leader of the National Party	Feb 2011
GWH Upgrade Program Cost Benefit Analysis Project	Roads & Traffic Authority	Feb 2011
Alliance Detailed program for Sections 2 & 4	RTA Alliance	May 2011
Alliance - FULL PROJECT - STRATEGIC COST ESTIMATE	Roads & Traffic Authority	June 2011
Community Update – Concept design of the upgraded highway begins	RTA Alliance	June 2011
MPRC Background Paper – Preferred Route	Roads & Traffic Authority	June 2011

Title	Author	Date
Draft Concept Design Recommendation		
GWH Upgrade Implementation Strategy DRAFT	RTA Alliance	July 2011
Alliance Communications & Stakeholder Relations Plan	RTA Alliance	July 2011
Alliance communications/consultation program	RTA Alliance	Aug 2011
MV2L Corridor Briefing Note	Roads & Traffic Authority	Aug 2011
MV2L Alliance Program	Roads & Traffic Authority	Aug2011
September Updates – Blackheath Highway action group	Blackheath Highway Action Group website	Sep 2011
Preliminary Crash Analysis – Bells Line of Road - 5 Year crash data 2006-2010 (RTA Memo)	Roads & Traffic Authority	Sep 2011
DRAFT Community Update	Roads & Maritime Services	Nov 2011
DRAFT GWH Upgrade MV2L – Concept Design Overview Report	Roads & Maritime Services	Nov 2011
Field Investigation Property Access – RTA investigation projects	Roads & Traffic Authority	Undated
RTA – Access to Private Property	Roads & Traffic Authority	Undated

Safety Documents

Title	Author	Date
SH5 Great Western Highway Upgrade Crash Report	Roads & Traffic Authority	Oct 2008
GWH Safety Review Report	Roads & Traffic Authority	Oct 2010
GWH Crash Analysis Presentation	Roads & Traffic Authority	Oct 2010
GWH Safety Review Scope Presentation	Roads & Traffic Authority	Oct 2010
To the Householder – Safety Works on the GWH bottom curve of Victoria Pass	Roads & Traffic Authority	Oct 2010
GWH Safety Projects Program / Schedule	Roads & Traffic Authority	Sep 2011
Safer roads – Freight on rail – Better public transport	Smart Transport Action Website	Sep 2011
Investigation into the burden of regulation in NSW and improving regulatory efficiency submission	Association of Concerned Mid-Mountains Residents “ACMMR”	Undated
Safer roads, freight on rail, better public transport	Blackheath Highway Action Group website	2011
Hartley Highway Action Group News	http://www.hartleyhighwayactiongroup.com/	June 2011
Roads Safety Meeting Presentation	Roads & Traffic Authority	June 2011
BLOR long term strategic corridor stakeholder meeting register	Roads & Traffic Authority	July 2011
National Heavy Vehicle Reform	Roads & Traffic Authority	Undated

Bells Line of Road Documents

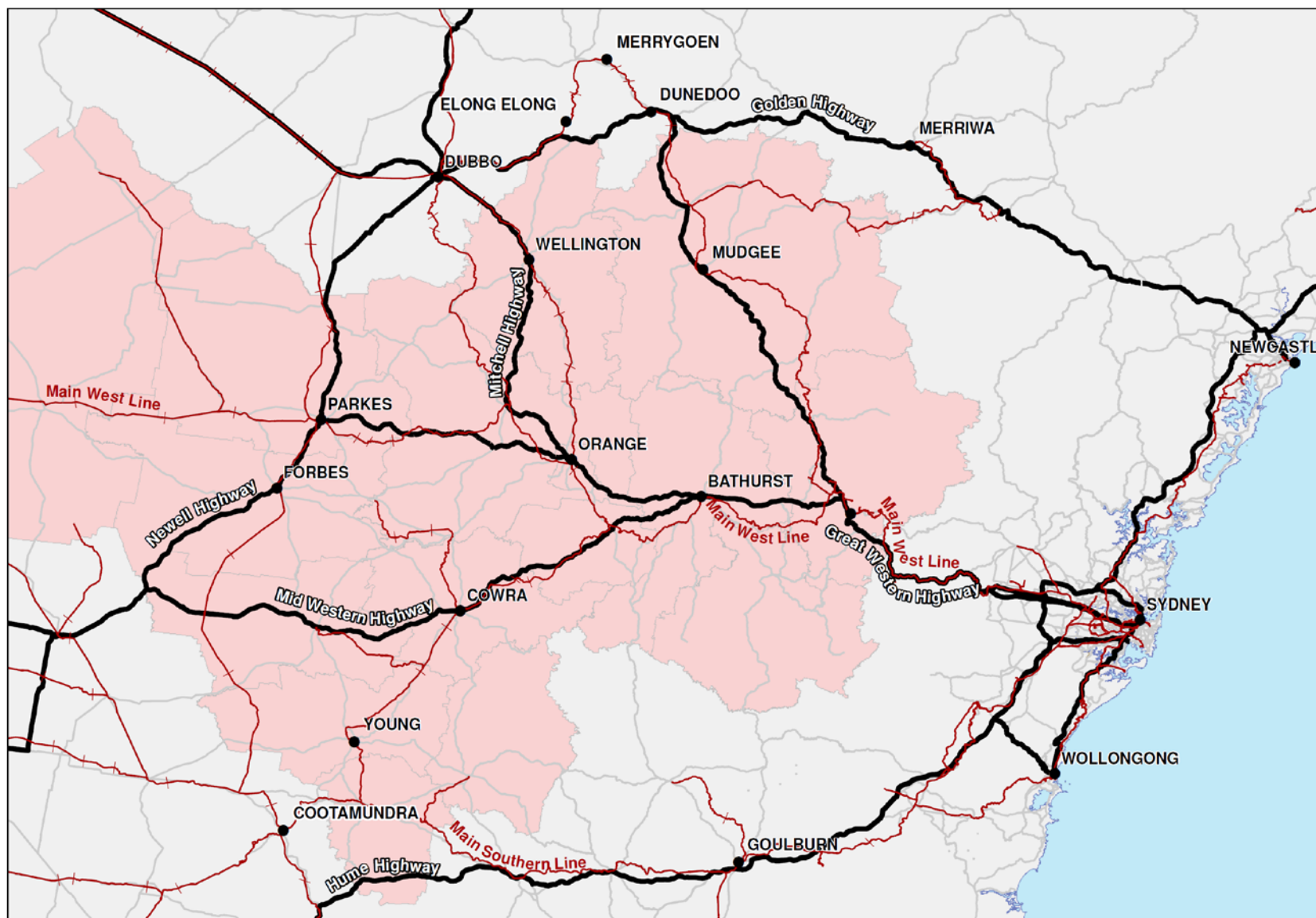
Title	Author	Date
BLOR Corridor Study Concept Design Report – Volume 1	Sinclair Knight Merz	Nov 2004
BLOR Corridor Study	Sinclair Knight Merz	Nov 2005
Long Term Strategic Plan Terms of Reference	Roads & Traffic Authority	Mar 2010
Community Involvement Strategy BLOR Long Term Strategic Corridor Plan	Roads & Traffic Authority	Oct 2011
Bells Line of Road Long Term Strategic Plan Community Issues Report	Roads & Traffic Authority	Aug 2011
DRAFT Chapter 4 Long Term Strategic Corridor Plan	Roads & Traffic Authority	Sep 2011
Preliminary Crash Analysis – Bells Line of Road Corridor	Roads & Traffic Authority	Oct 2011

Appendix 2 Chronology of Events

Date	Event Description	Location
8-Sep-11	Project Initiation Meeting	Parliament House
12-Sep-11	RMS Progress Meeting #1	Roads & Maritime Services, North Sydney
19-Sep-11	RMS Progress Meeting #2	Roads & Maritime Services, North Sydney
20-Sep-11	Site Visit	Study Area - Mt Victoria to South Bowenfels
22-Sep-11	RMS Project Team Q&A	Roads & Maritime Services, North Sydney
26-Sep-11	RMS Progress Meeting #3	Roads & Maritime Services, North Sydney
28-Sep-11	Stakeholder engagement: Lithgow City Council	Council Chambers, Lithgow
28-Sep-11	Stakeholder engagement: Member for Bathurst	Government Offices, Bathurst
28-Sep-11	Stakeholder engagement: Member for Blue Mountains	Macquarie Rd, Springwood
29-Sep-11	Stakeholder engagement: Mt Victoria Highway Bypass Action Group	Imperial Hotel, Mt Victoria
29-Sep-11	Stakeholder engagement: Bells Action Group against the Highway	Lilianfells, Katoomba
29-Sep-11	Stakeholder engagement: Katoomba Chamber of Commerce and Community	Merriwa Street, Katoomba
30-Sep-11	Stakeholder engagement: Blue Mountains Conservation Society	Conservation Hut, Wentworth Falls
30-Sep-11	Stakeholder engagement: Bullaburra Township Committee	Mid Mountains Neighbourhood Centre, Lawson

Date	Event Description	Location
30-Sep-11	Stakeholder engagement: Blue Mountains Association of Cultural Heritage Organisations	Springwood Library, Springwood
4-Oct-11	Stakeholder engagement: Blackheath Highway Action Group Blue Mountains Sustainable Transport Alliance Blue Mountains Commuter and Transport Users Association	Govetts Leap Road, Blackheath
4-Oct-11	Stakeholder engagement: Hartley Valley residents	Govetts Leap Road, Blackheath
4-Oct-11	Stakeholder engagement: Hartley Highway Action Group	Old Hartley Schoolhouse, Little Hartley
10-Oct-11	Draft presentation to RMS CEO	Roads & Maritime Services, North Sydney
11-Oct-11	Presentation to NSW Minister for Roads & Ports	Parliament House, Sydney
12-Oct-11	Presentation to RMS Wider Project Team	Roads & Maritime Services, North Sydney
13-Oct-11	Stakeholder engagement: Lithgow City Council	Council Chambers, Lithgow
14-Oct-11	Stakeholder engagement: Blue Mountains City Council	Council Chambers, Katoomba
17-Oct-11	Stakeholder engagement: Presentation to National Party Room	Parliament House, Sydney
25/10/11	Stakeholder engagement: National Trust, Lithgow Branch	Teleconference
28/10/11	Stakeholder engagement: Central West Transport Forum	Teleconference

Appendix 3 Maps



Central West Region

- Legend**
- NSW Main Highways
 - +— NSW Railways
 - National & State Roads
 - Central West Study Boundary

Note the following non-operation rail lines/segments:

- Cowra – Eugowra
- Greenethorpe – Grenfell
- Galong – Boorowa
- Cowra – Blayney
- Gulgong – Kandos
- Tarana – Oberon

Data Sources

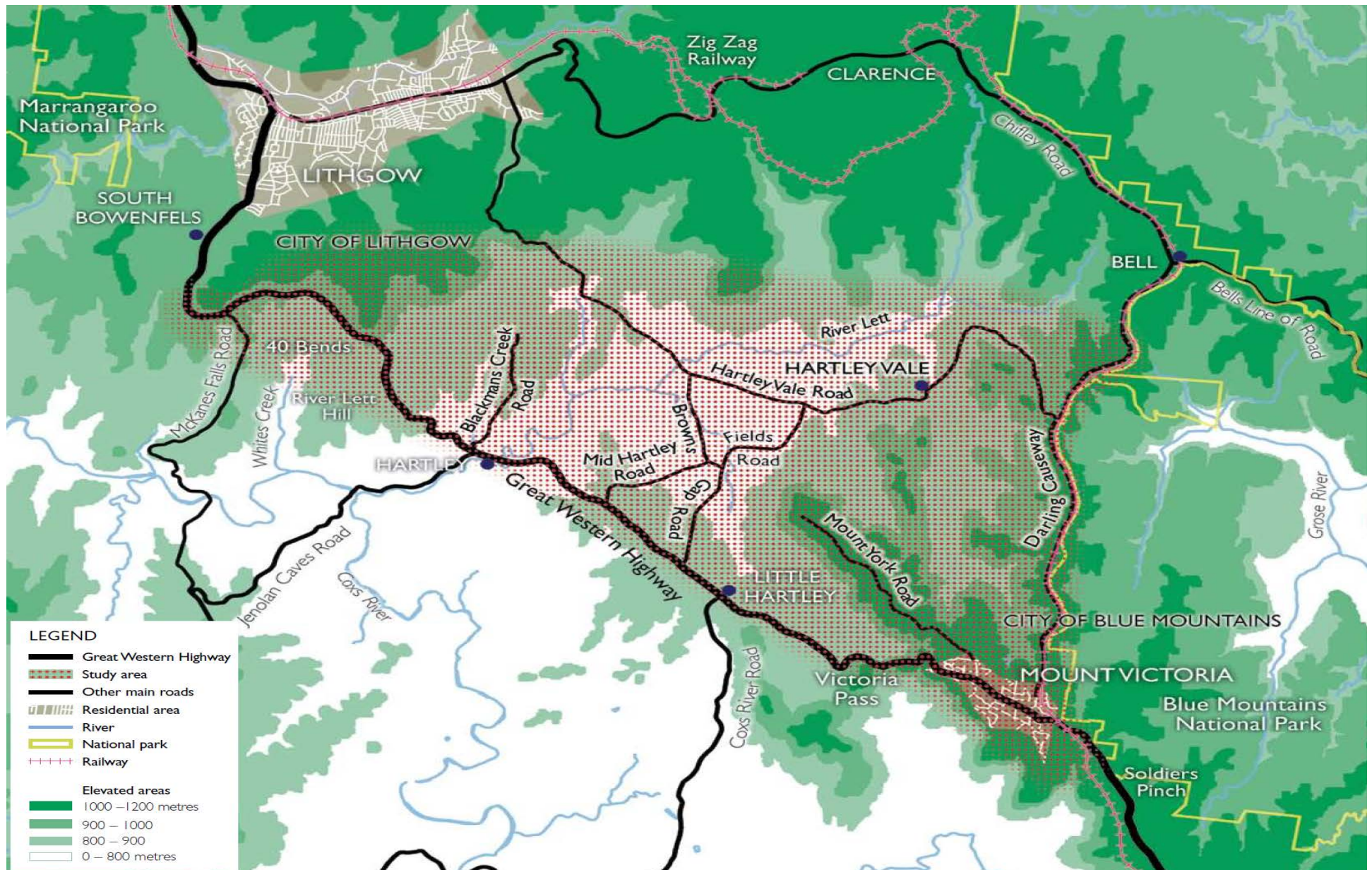
Streetworks

Sinclair Knight Merz does not warrant that this document is definitive nor free of error and does not accept liability for any loss caused or arising from reliance upon information provided herein.

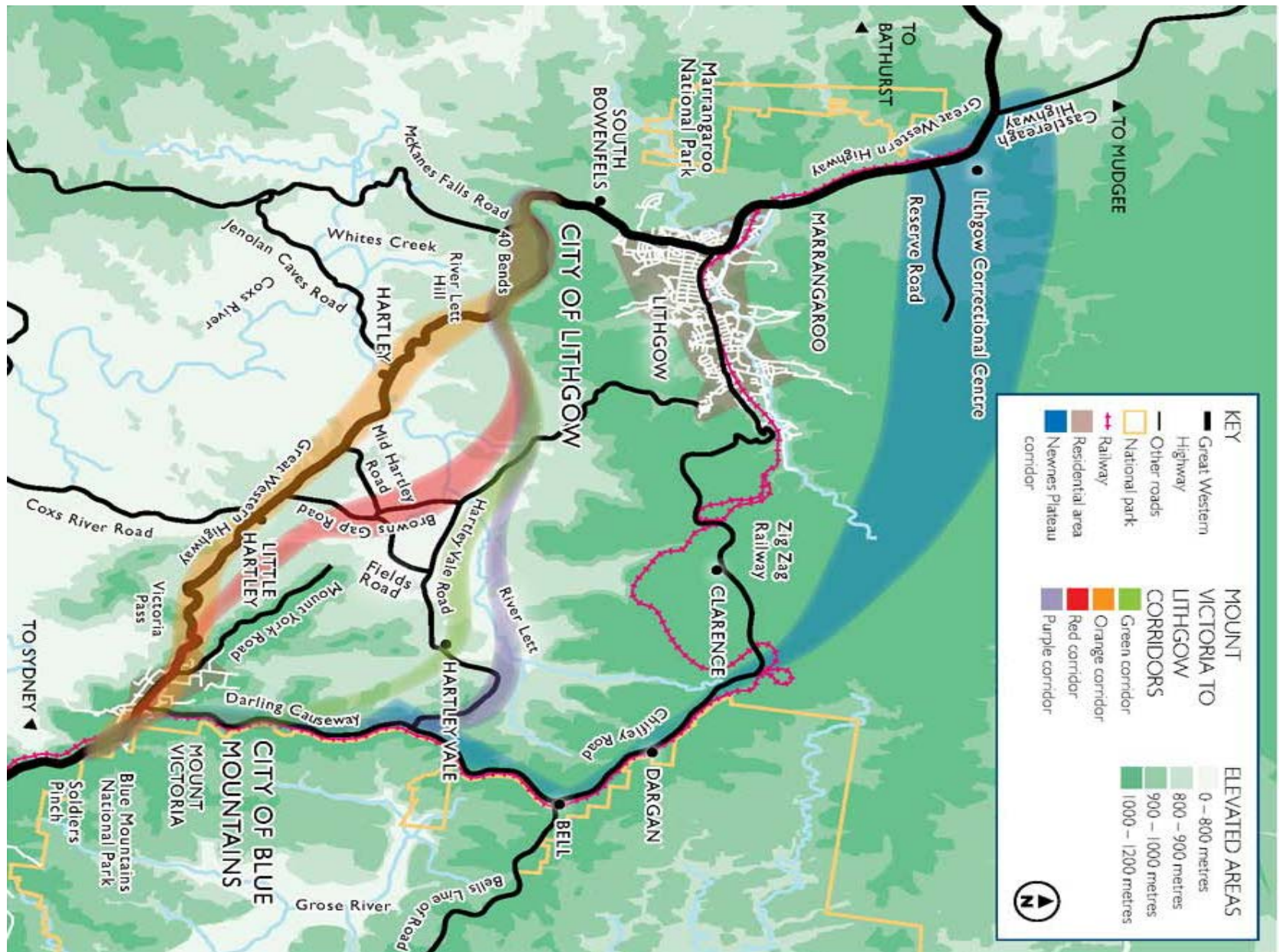


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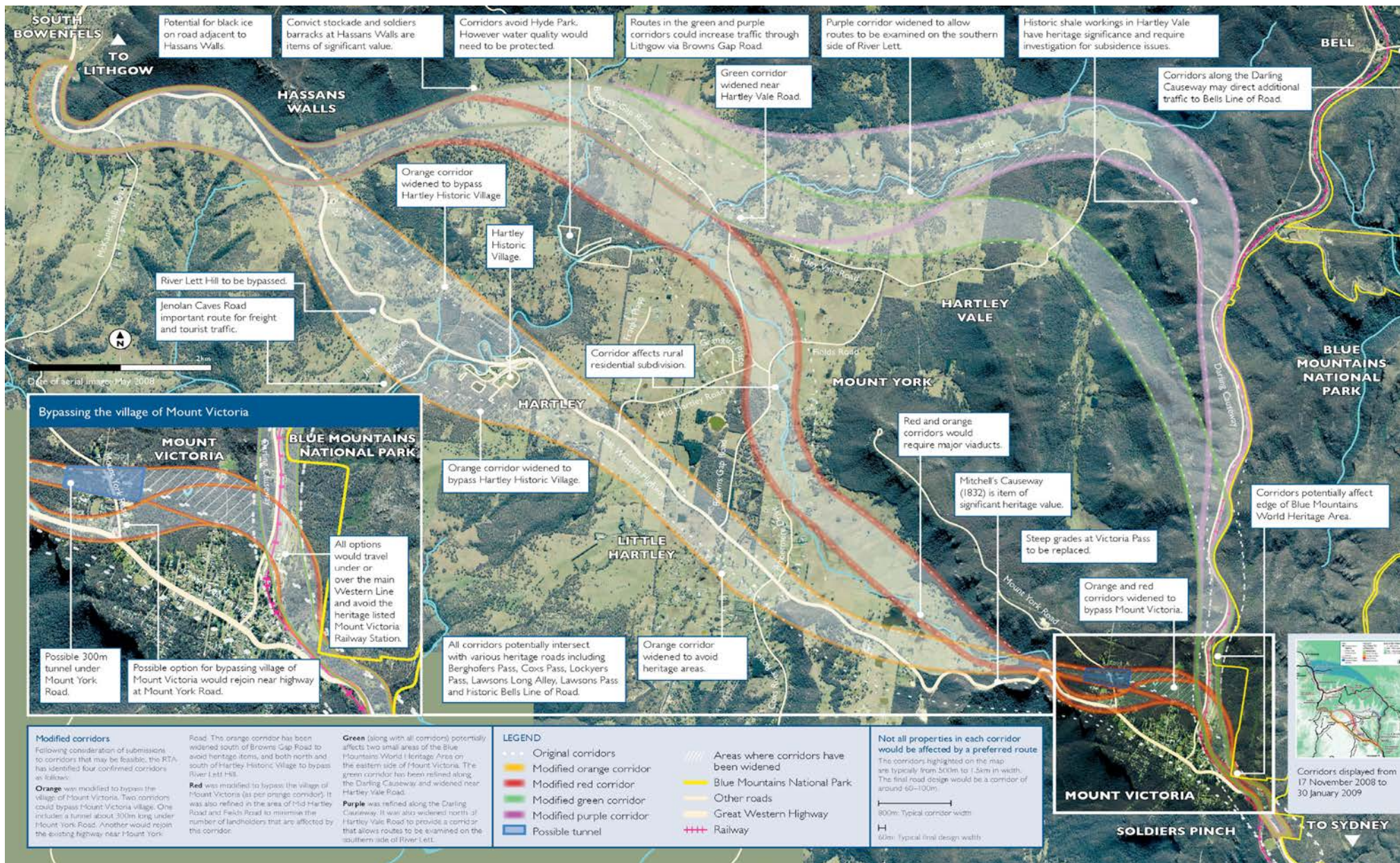




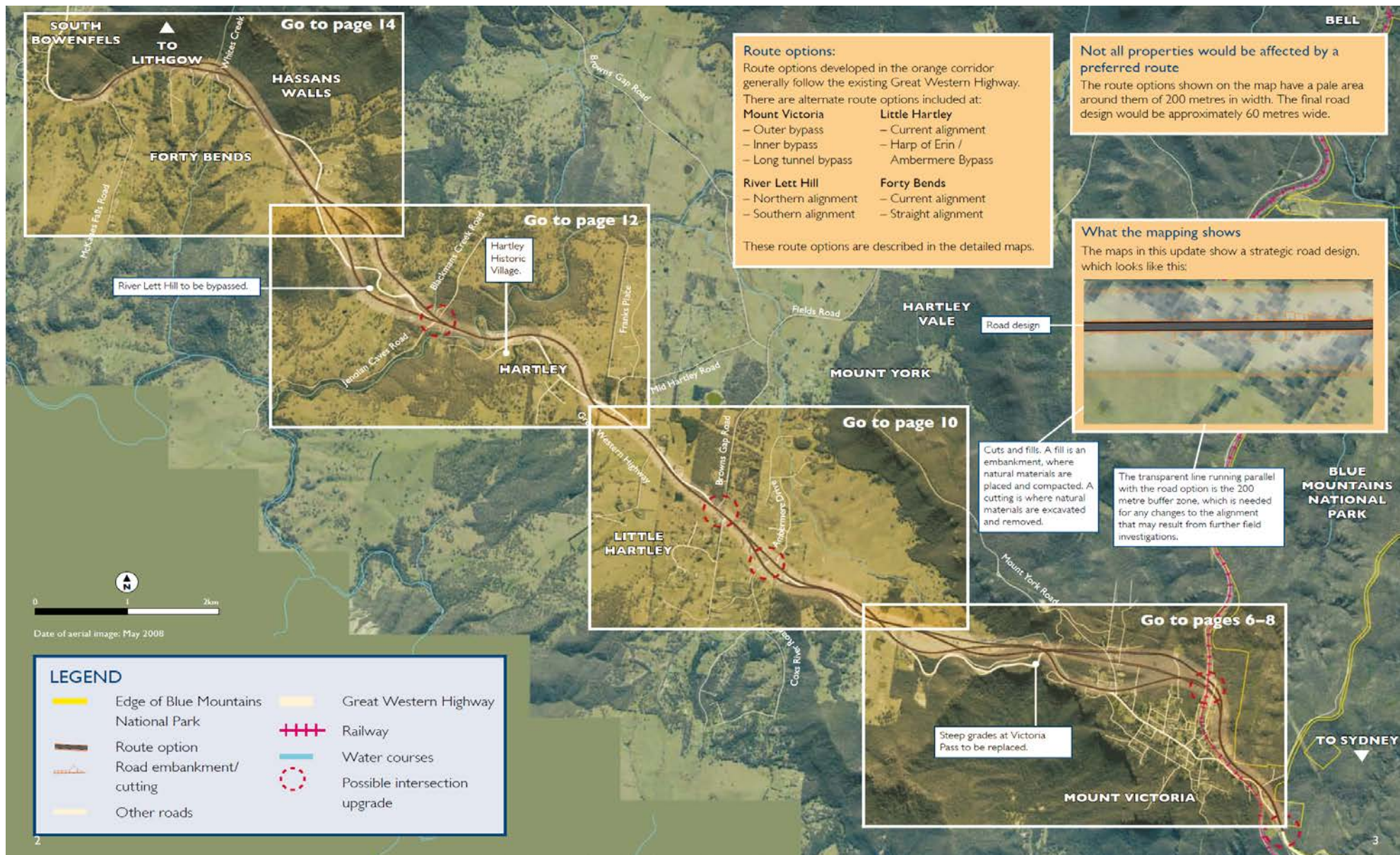
Mount Victoria to Lithgow Study Area



Corridor Options

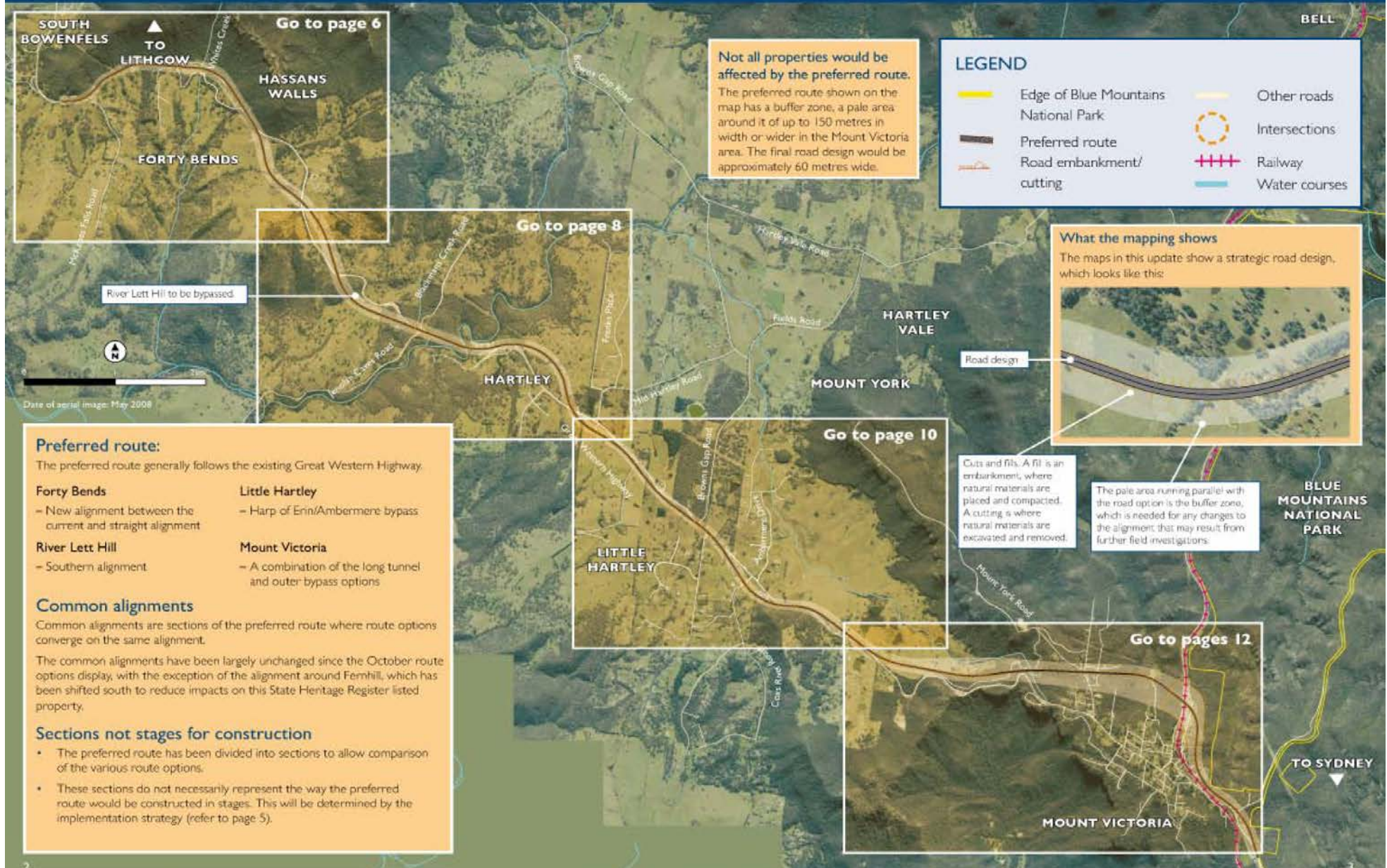


Detailed Corridor Overview



Preferred Corridor (Orange) – Route Options

Mount Victoria to Lithgow Great Western Highway preferred route



Preferred Route

Appendix 4 Safety Review

Great Western Highway Mount Victoria to Lithgow Safety Overview

Key characteristics

- Projects cover approximately 18.5km, which includes 10km of two lane, 5.6km of three lane and 3km of 4 lane carriageways
- Allowable speeds vary from 60 – 90km/h
- Lane widths vary but are generally 3.5m
- Intersections are at grade, however abutting properties have direct highway access
- The highway is used by approximately 14,000 vehicles per
- Approximately 15% is commercial heavy vehicles and 24% is trucks
- 50% of all traffic is through traffic

Key Safety Statistics

- Safety performance on the route is impacted by poor alignment and width, level of service, pavement quality and access and intersection design.
- In the period 2004-2008 the crash was 46.6 per 100 million vehicles kilometres travelled (mvkt) including 219 crashes including 180 injury crashes and 11 fatal crashes (MPRC Presentation June 2011).
- Approximately 53% higher than the state average crash rate of 30.4 (mvkt) for a similar road type category.
- 43% of crashes can be attributed to speeding
- > 75% of crashes involved a vehicle leaving the carriageway or a head on impact.
- 1/3 of all crashes (1/2 of fatal) occurring in high speed zones (>80km/h).
- 62% of drivers and riders involved in crashes were locals or country residents

Background and Project Development Report (RTA, June 2008)

MPRC Presentation Meeting Notes (RTA, June 2011)

\$30million Safety Program

As part of the \$250million funding committed to the upgrade, \$30million was allocated to carry out the following immediate safety works:

Project	Estimated Cost	Scope of Work	Status Sept 2011
P1 – Bottom Curve	\$2.8M	<i>Installation of median barrier and road widening</i>	Work completed
P2 – Top Curve	\$4.8M	<i>Installation of median barrier and road widening</i>	Design completed REF determined Property acquisition underway Construction scheduled to commence 17/10/11 Waiting for approval from Canberra

Project	Estimated Cost	Scope of Work	Status Sept 2011
P3 – Section between top and bottom curves	\$200k	<i>Upgrade existing safety barrier (guardrail) to current standard and the provision of wider centre lanes</i>	Safety barrier works completed Line marking schedule for October 11
P4 – Traffic/Road /Pedestrian improvements in Mount Victoria	\$6.0M	<i>Traffic and pedestrian improvements on Gt Western Hwy between Browntown Oval and Victoria St, Mt Victoria</i>	Traffic study currently underway
P5 – Installation of VMS and Pavement Temperature Detectors System	\$3.0M	<i>Installation of 4 VMS, 4 Ice warning and 7 Wet warning signs between Mt Victoria and Lithgow</i>	Locations identified Utility search and geotechnical investigation underway
P6 – Speed Limit Review and Enforcement – Mt Victoria to Lithgow	\$500k	<i>Review of the existing speed limit and implement changes as required including enforcement facilities</i>	Review is currently being planned
P7 – Signage / Line marking review – Mt Victoria - Lithgow	\$500K	<i>Review of the existing signage and line markings and implement changes as required</i>	Review is currently being undertaken
P8 – Miscellaneous Works			
M1 – Mid Hartley Road	\$500K	<i>Provision of Right Turn (CHR) facility into Mid Hartley Rd</i>	Design completed Construction scheduled to commence in November 11
M2 - Fernhill	\$1.0M	<i>Pavement sealing, tree removal and extending existing W-beam safety barrier</i>	Design work currently underway
M3 – 40 Bends	\$500k	<i>Installation of wire rope safety barrier</i>	Design completed Construction scheduled to commence in November 11
M4 – East of Mid Hartley Road	\$1.0M	<i>Road widening, tree removing and installation of wire rope safety barrier</i>	Design work currently underway
M5 – Adam's Shed	\$1.0M	<i>Road widening, tree removal and installation of wire rope safety barrier</i>	Design work currently underway
M6 – West of bottom curve	\$500k	<i>Road pavement rehabilitation</i>	Design completed Construction schedule to commence early 2012
M7 – Cox River Rd	\$500k	<i>Intersection improvement</i>	Design work currently underway

River Lett Hill

Prior to this, in 2008 significant safety improvements were completed on River Lett Hill including:

- Road and shoulder widening
- Installation of a central concrete median safety barrier
- Provision of earth embankments around downhill curves
- Guardrail adjacent to steep embankments

The Mount Victoria to Lithgow Safety Review

The *Mount Victoria to Lithgow Safety Review (Oct 2010)* identifies key road safety issues along the whole highway including:

- Signage: Inconsistent and insufficient signage to inform road users about the nature of the highway and key safety risks
- Delineation: Inconsistent and different standards are used along the route
- Line Marking: Marking is often insufficient at overtaking lanes, profile edges or centre lines
- Junction Treatments: Sight distances at some intersections and junctions are inadequate, and right turn movements are unprotected. Treatment of the intersections is inconsistent along the route.
- Road alignment: A number of curves rated Priority (RTA Study Retro Fitting Rural Roads) which require improved delineation, raised reflective pavement markers and signage, road shoulder widening and separation of opposing traffic lanes.
- Pavement and Shoulders: Narrow, uneven and unformed in sections and pavement condition in some areas not been maintained to route standard (2metre wide shoulders with 3.5m wide travel lanes)
- Safety Barriers: requires installation or extension to properly close off the hazard
- Clear zones: Trees, lights and power poles are close to the road or on the outside of curves
- Speed enforcement: minimal speed control along the route
- Safe pedestrian and cycle facilities: No defined network for pedestrian and cyclists especially through township areas, including key links to highway and public transport.

The Review provides recommendations to improve safety along the whole highway between Mount Victoria and Lithgow including:

- Improved road alignments
- Improved safety of the road environment
- Improved separation between opposing lanes
- Improved warning, signage and delineation
- Improved junctions

In addition the review provides commentary on site specific safety issues and provides recommendations which are identified in the table below.

The review does not identify a clear road safety engineering works program for ongoing improvement to the whole highway.

Precinct Summary of Safety Review and works completed or underway

	Mount Victoria and Victoria Pass	Little Hartley & Hartley Valley	River Lett Hill	Forty Bends
Approximate Length *	3.4	Little Hartley 2.7 Hartley: 2.8	2.4	3.8
Traffic Volume *	14000vpd	Little Hartley 10400 vpd Hartley: 8800 vpd	8800 vpd	7900 vpd
Annual Crash Rate *	66 (NB: From BCR Report)	Little Hartley 37.6 Hartley 39.7	53.5 (post barrier theoretical)	49.5
Key safety issues (identified by community and RTA) **	<ul style="list-style-type: none"> ▪ Inadequate drainage and clear zones adjacent to the carriage way. ▪ Speeding vehicles and heavy vehicles travelling down the pass ▪ Reaches grade 13% at Victoria Pass. Steepest section of classified road in NSW and the steepest section on any recognised freight route in NSW ▪ Inconsistent warning and advisory signage ▪ Light and power poles close to road ▪ Restricted sight distance east of Station Street ▪ Casualty clusters at top and bottom curve of Victoria Pass and east of Station Street ▪ 19 Priority rated curves ▪ Pavement and shoulders narrow and uneven through village ▪ Guardrail at Victoria Pass is damaged and no central median safety barriers ▪ Ice prone areas around the bottom curve ▪ The access to the safety ramps needs improvement 	<ul style="list-style-type: none"> ▪ Local traffic crosses at Coxs River Road and Browns Gap Road. ▪ Staggered junction of four closely spaced intersections – history of crashes at this area. ▪ Rural property and side road accesses ▪ Trees located in the clear zone and close to the edge of the road ▪ Restricted sight distance exiting from some side roads onto the highway ▪ 13 Priority rated curves between Victoria Pass and Lithgow ▪ Speeding vehicles ▪ Right turn access into side roads across oncoming traffic ▪ Pavement and shoulders narrow, uneven and unformed in sections ▪ Pavement condition not to route standard 	<ul style="list-style-type: none"> ▪ Reaches grade of 10% on River Lett Hill ▪ Heavy vehicle rest area does not meet standards ▪ Junction with Jenolan Caves Rd with high proportion of heavy vehicles turning ▪ Speeding vehicles ▪ Unprotected low embankments around River Lett Hill and some sections of road with an uneven road shoulder compared to the new road pavement ▪ 13 Priority rated curves between Victoria Pass and Lithgow 	<ul style="list-style-type: none"> ▪ Ice prone areas ▪ Road alignment ▪ Low availability of passing opportunities ▪ Right turn access out of side roads in South Bowenfels/Lithgow ▪ Insufficient pedestrian facilities to allow access across the highway in south Bowenfels/Lithgow. ▪ Pavement condition not to route standard ▪ 13 Priority rated curves between Victoria Pass and Lithgow

	Mount Victoria and Victoria Pass	Little Hartley & Hartley Valley	River Lett Hill	Forty Bends
	<ul style="list-style-type: none"> ▪ Merging traffic at the end of overtaking lanes ▪ No defined network for pedestrian and cyclist ▪ Heavy vehicle parking at Caltex Station 			
Specific work recommended **	<ul style="list-style-type: none"> ▪ Road and shoulder widening to reduce the severity of the top and bottom curves ▪ Installation of a median barrier to separate opposing traffic to top and bottom curves ▪ Upgrades to the signage and delineation on approach to and around the curve ▪ Separation of opposing traffic lanes ▪ Wide painted centreline east of Station Street and leading up to top and bottom curves ▪ Left in / left out only restrictions where right in/right out cannot be safely accommodated ▪ Oversized warning and advisory signs on approach to area 	<ul style="list-style-type: none"> ▪ Sight distance assessment ▪ Protection for turning vehicles into and out of side roads. ▪ Left in / left out only restrictions where right in/right out cannot be safely accommodated ▪ Rural property access upgraded to the minimum treatment of minor road widening and sealing of the access to the property boundary ▪ Wide painted centreline 	<ul style="list-style-type: none"> ▪ Road shoulder improvements and the replacement of the open concrete gutter with a more suitable roadside drainage system ▪ Installation of suitable safety barriers around embankments ▪ Oversized warning and advisory signs on approach to area ▪ Separation of opposing traffic lanes 	<ul style="list-style-type: none"> ▪ Oversized warning and advisory signs on approach to area ▪ Separation of opposing traffic lanes ▪ Extension of concrete median barrier
Work already completed or underway ***	<ul style="list-style-type: none"> ▪ \$30M program includes: ▪ Road widening and installation of concrete median barrier ▪ Closure of right in and out at Mitchells Lookout ▪ Installation of wider centreline markings 	<p>\$30M program includes:</p> <ul style="list-style-type: none"> ▪ Remove trees, widen and seal shoulder and install wire rope barrier near Adams Shed & East of Mid Hartley Rd ▪ Remove westbound overtaking lane and provide channelized right turn facility at Mid Hartley Rd <p>Other</p> <ul style="list-style-type: none"> ▪ Browns Gap Road has recently been reconstructed to address crashes 	<p>Other</p> <ul style="list-style-type: none"> ▪ Road and shoulder widening, installation of a central concrete median safety barrier, provision of earth embankments around downhill curves and guardrail adjacent to steep embankments 	<p>\$30M program includes:</p> <ul style="list-style-type: none"> ▪ Installation of wire barrier westbound

*Great Western Highway Upgrade, Mount Victoria to Lithgow Implementation Strategy (Alliance, 2011)

**Mount Victoria to Lithgow Safety Review (Oct 2010)

***Great Western Highway Mount Victoria to Lithgow Safety Works Presentation (June 2011)

Bells Line of Road Safety Review

Key characteristics

- The Bells Line of Road provides a supplementary mountain crossing route to the Great Western Highway.
- Traffic volumes are 8000 (Lithgow to Bell), 3000 (Bell to Kurrajong), 12000 (Kurrajong To Richmond)
- Existing corridor is undivided road with typically narrow gravel shoulders and limited clear zones

Key Safety Statistics

- Crash rate is highest through the Blue Mountains LGA at 74.1mvkt
- Lithgow LGA at 48.7mvkt
- Hawkesbury LGA at 25.9mvkt.
- Key safety issues include:
 - limited overtaking lanes
 - narrow shoulders
 - minimal physical separation
 - speeding
- Stakeholder concerns include:
 - impact of overhanging trees
 - effectiveness of reflectors both at night and in fog
 - proximity of power poles to the edge of pavement
- 452 crashes between 2006-2010 (Preliminary crash analysis – Memo – Sept 2011) increasing significantly up to 2010
- 168 injury crashes (227 people injured)
- 9 fatal crashes (13 people killed)
- Cars running off carriageway accounts for 59% of all accidents
- Majority of head on accidents are located on bends
- 51% of accidents occur when the road surfaces are wet
- In 56% of crashes the car was speeding
- Crashes numbers impacts due to weekend traffic, time of day and time of year

Chapter 4 Draft Long Term Corridor Study for Bells Line of Road (RTA, Sept 2011)

RTA Memo Preliminary Crash Analysis – Bells Line of Road (RTA, Sept 2011)

Safety hotspots on Bells Line of Road

Chapter 4 Draft Long Term Corridor Study for Bells Line of Road (Sept 2011) provides detailed crash analysis gathered between 2005 – 2009 and provides section by section analysis of the Bells Line of Road in relation to safety hazards. Maps accompanying the *RTA Memo Preliminary Crash Analysis – Bells Line of Road (RTA, Sept 2011)* shows crashes reported between 2006 – 2010 and types of crashes that occurred at different locations. Data from these two sources have been collated into the table below to consider the areas of highest concern.

There are several current and future safety projects planned by RTA on Bells Line of Road. The projects include median barriers, pavement resurfacing works, maintenance of drainage, signs and line marking and installation of fixed assets such as retaining walls and guardrails. Details of RTA's current and planned safety works for Bells Line of Road is included below. Data has been collected from a series of emails sent to Evans & Peck by the project team.



Crash hot spots – Bells Line of Road

Section	2	4	5	10	11	15	18
Location	Grose Vale Road to Kurmond Road	Comleroy Road to pecks Road at kurrajong heights	Kurrajong Heights to Bilpin	Blue Mountains National Park to Mount Wilson Road	Mount Wilson Road to Darling causeway at Bell	Zig Zag to Hartley Valley Way	Main Street, Lithgow to Great Western Highway
Length	4.3	6	11.9	4.2	7.4	5.4	1.7
Fatal Crashes	1	3	1	1	2	0	0
Injury Crashes	16	17	24	10	12	22	25
Total Crashes 2006-2010	43	45	49	20	29	106	47
Area description	Shoulder and clear zone widths are limited reducing the opportunity for drivers to take evasive action to avoid hazard	Least favourable in terms of grades, clear zones, sight distance and curvature. Overtaking lanes are short on the steep grades and tight curves on Bellbird Hill.	The road is generally good geometrically but lacks clear zones and overtaking opportunities	Narrow shoulders and 3 tight bends that could be contributing to crash clusters	Road geometry and overtaking opportunities are generally acceptable apart from two bends where crash clusters were identified	Road geometry worse than any other section along the route in terms of curvature, grades and shoulder widths.	Road geometry satisfactory, but high number of intersections and road junctions
Key crash data	More than 60% were not at intersections	77% of crashes involve vehicles driving off the road and into an object. 95% are off bends in the bell bird hill area. 75% involved only one vehicle	>80% crashes not at intersections 70% involved only one vehicle Large proportion of head on crashes and rear swipes compared with other sections	Two head on collisions where vehicle lost control at a bend 70% involved vehicle leaving the road way All in 80 or 100 km/hr zones	Highest number of head on collisions (6) 68% involved cars leaving the roadway 48% involved crashing into objects Crash clusters where all vehicles left carriageway while taking the bend	Highest crash area 90% off bends 66 into objects off straight road sections Crash clusters at sharp bends 85% in wet conditions No crashes at intersections	66% of crashes at intersections



Section	2	4	5	10	11	15	18
Community suggestions (where relevant)	Traffic signals for the intersection of the Bells Line of road and Gross Vale road, Kurrajong.	Lengthening the overtaking lane at kurrajong heights eastbound Traffic signals and the intersection arrangement near Kurrajong Village was reported as confusing.	Provision of overtaking lanes New overtaking lane at Hermitage Road Kurrajong Hills Bluebird Hills on Bells line of Road is not safe at current speed limits Provision of a right-turn lane into Hermitage Road, Kurrajong Hills westbound Concern about safety of the intersections				

Past, current and future safety projects on Bells Line of Road

Project Description	Date	Cost	Location
Road Safety Projects			
Widening, installation of central concrete median & re-seal pavement	FY2012	\$1.5M \$850,000	Chifley Bends - 4km east of Lithgow Chifley Bends - 5.7km to 6.9km east of Lithgow
Guardrail – a number of chain wired mesh fence were replaced by W-beam guardrail	2003/04	\$100k	BLOR
Guardrail – installed a new 200m long guardrail on the eastbound land Mt Wilson	2005	\$32k	BLOR Eastbound lane at Mt Wilson
Bridge railing – upgraded the joint of guardrail & bridge railing	2004/05	\$40k	BLOR Mt Wilson
Median NJB extension – extended 186m long median block barrier	2005	\$220k	BLOR Mt Wilson
Motorcycle signage – installed motorcycle guidance signs along the windy sections	2005/06	\$35k	BLOR
Tree removal – removed dead trees to improve safety of motorist	2005/06	\$200k	BLOR
Widened a number of shoulders along bends to improve safety to the motorists	2007/08		BLOR
Installed curve alignment markers – improved delineation of a number of bends	2006/11		BLOR
New traffic signal installed at intersection number 4254 – following a fatal crash	9/11/09		BLOR/Old BLOR/Mill Road
Pavement Maintenance Projects – 15 projects FY2003			
A/66611 Resurfacing	2002/03	\$93k	1.58 km to 2.97 km east of Bell weigh station
A/02144 Resurfacing	2004/05	\$167k	2.21 km west to 1.0 km east of Mt Wilson Rd
A/78835 Resurfacing	2001/02	\$201k	0.96 km to 3.32 km west from road to Mt Banks
A/02143 Resurfacing	2004/05	\$123k	3.33 km to 4.87 km east of Mt Wilson Rd
A/01783 Resurfacing	2003/04	\$233k	3.97 km to 8.57 km west from Mt Tomah botanic gardens
A/78840 Resurfacing	2001/02	\$115k	1.79 km to 3.79 km west from Mt Tomah botanic garden
A/06038 Resurfacing	2007/08	\$1.34m	0.27 km to 3.82 km west from Mt Tomah botanic garden
A/66609 Resurfacing	2002/03	\$236k	0.81 km west of Coach House Rd to 1.31 km west of Pittmans Rd
A/78836 Resurfacing	2001/02	\$169k	6.12 km to 8.33 km west from Mountain Lagoon Rd
A/07598 Resurfacing	2010/11	\$	Bellbird Echo Cafe to Cut Rock
A/07597 Strengthening	2010/11	\$	Little Wheeny Creek to Bellbird Echo Cafe
A/66607 Resurfacing	2003/04	\$531k	0.13 km east from Yeomans Rd to Comleroy Rd
A/666060	2002/03	\$65k	Resurfacing 0.07 km west of Redbank Creek to 0.19 km east of Colo High School
A/06646 Resurfacing	2008/09	\$405k	Hawkesbury River to Redbank Creek

Project Description	Date	Cost	Location
A/07267 Seal remediation (water blasting) (Glai Dixon to confirm)	2009/10	\$	selected sections over length between Bell and Kurrajong Heights
A/09043 Resurfacing	Current - 2012	\$2.1m	2.27 km west of Warks Hill Rd to 0.96 km west of Berambing Cres (2nd occ)
A/66800 Widening	Current - 2012	\$1.36m	from Bilpin Fruit Bowl to 1.53 km east of Powells Rd
Speed Control Projects			
Enforced reduced speed limits to 80km/h	20-24/10/08		<ul style="list-style-type: none"> ▪ Bells Line of Road, Kurrajong from west of Old Bells Line of Road to west of Springgrove Lane ▪ Bells Line of Road, Kurrajong Heights from west of Val Wheelers Drive to east of Pittmans Road ▪ Bells Line of Road, Kurrajong Heights from east of Pittmans Road to east of Bilpin Fruit Bowl ▪ Bells Line of Road, Bilpin from east of Johnsons Road to east of Mountain Lagoon Road ▪ Bells Line of Road, Bilpin from west of Burrakay Road to east of Berambing Crescent ▪ Bells Line of Road, from east of Mt Banks Road to west of Mt Wilson Road ▪ Chifley Road, between Bell and 5 km west of Darling Causeway
Enforced reduced speed limits to 60km/h	20-24/10/08		<ul style="list-style-type: none"> ▪ Bells Line of Road, Bilpin from east of Mountain Lagoon Road to west of Bilpin Springs Road ▪ Bells Line of Road, Bilpin from east of Bilpin Fruit Bowl to east of Johnsons Road
Operation Gateway targets speeding behaviour	Commenced Sep 2005		<ul style="list-style-type: none"> ▪ Bells Line of Road btwn Richmond & Lithgow, The GWH btwn Lapstone & Bathurst, Hawkesbury/Springwood Roads & The Darling Causeway