WATERFALL WAY
DRAFT CORRIDOR STRATEGY

July 2017

Draft for consultation

Draft only: actions subject to government priorities and funding availability
EXECUTIVE SUMMARY

The Waterfall Way Corridor is located in Northern NSW and extends from the Pacific Highway at Raleigh to the New England Highway at Armidale a distance of 170km. Traffic volumes along the Waterfall Way vary in the rural sections from around 750 vehicles per day (vpd) between Dorrigo and Ebor to over 6,700 vpd between the Pacific Highway and Bellingen.

This draft sets out the proposed strategic vision to manage and guide development of the Waterfall Way road corridor to improve safety, traffic efficiency and sustainability. There is no commitment to, or funding for, proposed actions identified in this draft. While feedback received during consultation will inform future planning, final actions will be subject to government priorities and funding availability.

The Waterfall Way provides:

- The Waterfall Way is an important transport corridor, providing an east – west connection between the Pacific and New England highways. It connects rural communities to the urban centres of Coffs Harbour and Armidale.
- It is a tourist route passing the waterfalls on the Dorrigo Mountain and provides access to the Dorrigo National Park.
- A transport route for the timber and agricultural industries.

Key customers along the corridor include:

- **Commuters;** trips to urban centres, such as Coffs Harbour, for employment and education.
- **Longer personal and work related educational, health, recreational and business trips;** including to and from regional and interstate locations.
EXECUTIVE SUMMARY

• Heavy and light freight movements generally between industrial (including agriculture) and commercial centres including to or from regional and interstate locations.

Current corridor challenges and performance include:

• Road safety: There were 314 reported crashes along the corridor between January 2010 and December 2014 resulting in 180 casualty crashes involving either an injury or fatality. Of the casualty crashes there were nine fatal, 61 serious injury, 53 moderate injury, 32 minor injury and 25 uncategorised injury crashes. This equates to a crash rate of 0.21 casualty crashes/km/year which is higher than 0.077 casualty crashes/km/year on other comparable roads of this standard across the State.

• Road safety risks associated with off carriageway crashes can be directly tied to narrow lane and shoulder widths, poor clear zones and tight curves.

• Overall the Waterfall Way has 76 per cent of the route with lane widths <3.5m and 68 per cent with shoulder widths less than the planning targets for this class of route.

• 88 per cent of the length between the Pacific Highway and Bellingen, a distance of 12km, has shoulder widths <2.0m.

• Level of Service (LoS): Bellingen to Pacific Highway has an AM peak LoS of ‘D’ and it is predicted by 2025 LoS in both the AM & PM peaks will both be ‘D’. The remainder of the route will remain at LoS ‘A’ to ‘C’.

• Pavement: Between the Pacific Highway and Thora a range of pavement deterioration conditions are evident, these are due to insufficient pavement thickness or issues related to the width of the pavement. From Thora and Dorrigo pavement issues in this section are typically related to insufficient pavement width in constricted locations and drainage. Between Dorrigo to Armidale pavement issues along this section typically result from insufficient pavement thickness, and degradation of pavement layers with some constraints also applied to the pavement due to narrow formation width.

• Road geometry: Challenges for the Dorrigo Mountain section include steep grades, sections with single travel lane, slope stability, lack of overtaking facilities.

• Environmental: Management of flora and fauna.
Proposed actions

- Improve safety on the one lane sections of the Dorrigo Mountain.
- Install permanent Vehicle Activated Signage at appropriate high risk locations.
- Improve provision of information along the corridor to better inform road customers on changing traffic conditions.
- Progressively improve the formation width, by widening sealed shoulder and improving lane widths on a priority basis particularly between:
  - The Pacific Highway and Bellingen
  - Ebor and Kempsey Road (Wollomombi).
- Upgrade table drains between Bellingen and Dorrigo Mountain top to improve pavement drainage and upgrade pavement width where appropriate.
- Develop a strategy to widen pavements to meet network targets.
- Investigate and implement edgelines on a priority basis.
- Progressively treat high risk isolated curves on the route to reduce the relatively high proportion of off road on curve crashes; particularly west of Thora near Darkwood Road and between Ebor and Armidale.
- Review and rationalise existing rest stop opportunities with better signage.
- Implement identified clear zones works to remove or provide protection from hazards including culverts within the clear zone taking into consideration the road geometry and environment/land use constraints particularly between Dorrigo and Ebor.
- Strengthen pavement and carry out pavement repair work along the corridor on a priority basis particularly between the Pacific Highway and Bellingen.
- Incorporate high visibility line marking, raised pavement markers and fluorescent signage to assist motorists during times of fog and rain, where appropriate.

- Implement road safety initiatives to address identified and emerging crash types and locations. Particularly crashes that occur on curves, those that are a result of speed, wet surface or those that involve motorcyclists.
- Carry out a route safety review between Dorrigo and Armidale.
- Carry out an audit and assessment of bridges along the corridor suitable for widening and investigate options to improve safety on a priority basis:
  - Sandy Creek Bridge
  - Bakers Creek Bridge
  - Pipe Culvert unnamed creek near fish hatchery.
- Address identified high risk slopes on a priority basis particularly between Bellingen and the Dorrigo Mountain top.
- Develop and implement management plans and rehabilitation of identified defective culverts on a priority basis to manage high risk locations.
- Work with council to investigate opportunities to improve flood immunity level and route reliability.
- Plan for minor realignment and formation widening between the Pacific Highway and Bellingen including accommodating for active transport users.
- Investigate and plan widening of Myers Bluff and the Gordonville realignment.
- Improve the operation and standard of key intersections, incorporating heavy vehicle turning paths where necessary to increase efficiency and safety including but not limited to:
  - Ebor Rd/Guyra Road intersection
  - Waterfall Way/Armidale Road intersection
  - Kentucky Street/Dangar Street
  - Waterfall Way/Miller Street intersection.

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• Review centre-line marking and consider removing overtaking opportunities less than the appropriate standard.
• Investigate and implement pull over bays in areas between Thora and Dorrigo to improve Level of Service, where appropriate.
• Continue to develop and implement the Bellingen main street upgrade.
• Continue to minimise and balance impacts to the natural environment and incorporate environment aspects in all future projects.
• Work with Armidale Regional Shire Council to develop a strategic traffic model to determine whole of network solutions addressing traffic and transport issues within Armidale.
• Improve eastbound and westbound overtaking opportunities between the Pacific Highway and Bellingen.

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CONTENTS

1 INTRODUCTION AND CORRIDOR DESCRIPTION 2
1.1 Why a corridor strategy? 2
1.2 Corridor function 2
1.3 Current population and employment in the corridor 4
1.4 Industry and economic development 4
1.5 Traffic volumes and heavy vehicles 5
1.6 Public and active transport in the corridor 5

2 A VISION FOR THE FUTURE AND CORRIDOR OBJECTIVES 8
2.1 Corridor vision 8
2.2 Corridor objectives 8

3 CURRENT CORRIDOR PERFORMANCE 10
3.1 Corridor planning sections and Road Hierarchy 10
3.2 Road Safety 12
3.3 Traffic 16
3.4 Road Geometry 24
3.5 Environment 34

4 CORRIDOR CHALLENGES AND PROPOSED ACTIONS 36
4.1 Short-term (0-5 years) 37
4.2 Medium-term (5-10 years) 40
4.3 Long-term (10-20 years) 42

5 COMMUNITY CONSULTATION 46

REFERENCES 48

APPENDICES 49
1 Austroads classification system 49

LIST OF FIGURES

Figure 1-1 Waterfall Way location map 3
Figure 3-1 Waterfall Way Corridor Planning Sections 11
Figure 3-2 Crash concentration map Pacific Highway to Ebor 13
Figure 3-3 Crash concentration map Ebor to Armidale 13
Figure 3-4 Waterfall Way Crash Summaries 14
Figure 3-5 Waterfall Way Rest Areas 15
Figure 3-6 Waterfall Way - traffic count locations 2015 17
Figure 3-7 Waterfall Way - daily traffic volumes 2015 17
Figure 3-8 Waterfall Way overtaking lanes 22
Figure 3-9 Waterfall Way curvature 25
Figure 3-10 Waterfall Way grades 25
Figure 3-11 Waterfall Way Sealed Pavement Width 26
Figure 3-12 Waterfall Way Flood locations 28
Figure 3-13 Waterfall Way high priority culverts 29
Figure 3-14 Waterfall Way high priority slopes 30
Figure 3-15 Pavement Health Index (State Network Roads 2R and 4R) 32
Figure 3-16 Pavement Health Index (Waterfall Way) 32
Figure 3-17 Condition Snapshot (State Network Roads 2R and 4R) 33
Figure 3-18 Condition Snapshot (Waterfall Way) 33
Figure 3-19 National parks, State forests, State Heritage and other protected areas 34

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1 INTRODUCTION AND CORRIDOR DESCRIPTION

Heading east past Sherrard Falls

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1 INTRODUCTION AND CORRIDOR DESCRIPTION

1.1 Why a corridor strategy?

Transport for NSW (TfNSW) and Roads and Maritime Services (Roads and Maritime) are progressively preparing network and corridor strategies to cover every State Road in regional NSW as a response to the challenge of how to best manage transport infrastructure to maximise benefits for our customers. Network and corridor strategies provide the following benefits for the State Road Network in regional NSW:

- A plan for network/corridor improvement with consideration to all modes of transport
- Transparency to the community, councils and other government agencies with regard to planning and investment decisions
- Consistency in planning, management and operation of roads
- Facilitate the integration of road safety, traffic and asset maintenance projects.

This draft sets out the proposed strategic vision to manage and guide development of the Waterfall Way road corridor to improve safety, traffic efficiency and sustainability. There is no commitment to, or funding for, proposed actions identified in this draft. While feedback received during consultation will inform future planning, final actions will be subject to government priorities and funding availability.

This corridor strategy is in line with the NSW Long Term Transport Master Plan (LTTMP), the NSW Freight and Ports Strategy (FPS), Mid North Coast and New England North West Regional Transport Plans (RTPs) and other State planning frameworks.

In 2014 Roads and Maritime worked with the Centre for Road Safety to complete a road safety review of the Waterfall Way which was published in September 2014. The review was completed for the section of the Waterfall Way between the Pacific Highway at Raleigh and Dorrigo. The review was a result of concerns raised by the community regarding the impact of the increase in truck movements due to the Megan Quarry expansion. The quarry expansion was linked to the haulage of materials to the Pacific Highway upgrade between Nambucca Heads and Urunga.

The Waterfall Way is a vital transport corridor, an east west connection between two of the major highways in NSW, the Pacific Highway and the New England Highway. It provides connections between the rural communities of Bellingen, Dorrigo and Ebor with the urban centres of Coffs Harbour and Armidale, it is a tourist route passing the waterfalls on the Dorrigo Mountain and it provides a transport route for the timber and agricultural industries.

The Mid North Coast Regional Transport Plan identified the need to upgrade the Waterfall Way between the Pacific Highway and Connells Creek to improve flood immunity, road safety and road surface conditions.

The New England North West Regional Transport Plan identified the need for future works on the Dorrigo Mountain.

1.2 Corridor function

The Waterfall Way is 170 kilometres in length and extends from the Pacific Highway at Raleigh to the New England Highway at Armidale.

The Waterfall Way passes through the Mid North Coast and New England North West Long Term Transport Master Plan regions.

“The Waterfall Way is 170 kilometres in length and extends from the Pacific Highway at Raleigh to the New England Highway at Armidale.”
The Waterfall Way passes directly through or next to the following towns and local government areas:

- Bellingen and Dorrigo, within Bellingen Shire
- Clarence Valley
- Armidale and Ebor within Armidale Regional.

The Waterfall Way intersects with:

- The Pacific Highway at Raleigh – connecting Sydney to the Queensland border
- The New England Highway at Armidale – connecting Newcastle to the Queensland border.

Although not specifically identified as a major regional infrastructure link, the Waterfall Way is identified as a significant component of the regional transport network in the Mid North Coast Regional Strategy.\(^4\)

The Waterfall Way performs an important role as an east-west link between the Pacific and the New England Highways. The region encompasses the traditional lands of the Gumbaynggirr, Nganyaywana and Dunghutti people.

The Waterfall Way provides:

- A route for inter-regional business, tourism and leisure travel between the New England Tablelands and the coastal area surrounding Coffs Harbour. It also forms part of the road connection to other mid north coast villages to the north and south of Raleigh and the mid north coast hinterland
- Access to the villages along the corridor for tourism, commuter trips and business trips
- A supporting route between Bellingen, an urban centre, and the major regional centre of Coffs Harbour
- Supporting access to the regional centre of Armidale for tourism, education and business services.

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4. Transport for NSW, December 2013, Mid North Coast Regional Transport Plan, TfNSW Sydney
An estimated 37,000 people live in the immediate vicinity of the Waterfall Way corridor, with about 24,000 of this number in major regional towns and centres including Bellingen, Dorrigo and Armidale (2011 ABS Census). Population and employment figures for each town are shown in Table 1-1.

The median age in Bellingen Shire is higher than the NSW State average, while the large number of university students in the Armidale area lowers the median age. The major employment by industries along the corridor include education, hospitality and agriculture.

The population projections from the Department of Planning & Environment shows small growth of 0.2 per cent for the Bellingen LGA and a larger growth rate of 1.3 per cent for the Armidale LGA.

### 1.3 Current population and employment in the corridor

The corridor has a diverse economy and the Waterfall Way is a road used by the tourism and primary production sectors. At the western end of the corridor there is a strong education based economy, centred on the University of New England. Primary production is a strong economic sector within the corridor, in particular west of Bellingen. The primary production of fine and superfine wool, merino sheep breeding and cattle and lamb production are particularly significant components of the corridor’s primary industry. There are two operational hard rock quarries directly accessed by the route on the Dorrigo Plateau with a third currently dormant. There are also gold mining and antimony reserves. Tourism is also a large economic sector in the corridor with an abundance of parks and natural features including waterfalls, gorges and mountains, and native flora and fauna attracting visitors to the corridor.
1.5 Traffic volumes and heavy vehicles

Average Daily Traffic (ADT) volumes along the Waterfall Way vary in the rural sections from around 750 vehicles per day (vpd) between Dorrigo and Ebor to over 6,700 vpd between the Pacific Highway and Bellingen. In the urban centres, average daily traffic volumes range from 2,500 vpd in Dorrigo and 5,411 vpd in Armidale to 6,600 vpd in Bellingen.

Heavy vehicle volumes are higher closer to the coast with numbers decreasing west of Dorrigo with the exception of Armidale (refer to appendix 1 for vehicle classification):

- **Bellingen**: 400 (6.1%) (301 rigid vehicles and 99 articulated vehicles)
- **Dorrigo**: 171 (6.8%) (131 rigid vehicles and 40 articulated vehicles)
- **Ebor**: 98 (9.7%) (64 rigid vehicles and 34 articulated vehicles)
- **Armidale**: 417 (7.1%) (329 rigid vehicles and 88 articulated vehicles).

1.6 Public and active transport in the corridor

Public bus services

Public transport in the corridor is generally restricted to urban areas. Very few of the towns located along the Waterfall Way have local bus services due to small populations. The bus services that do operate along the Waterfall Way are identified below:

- Busways offer a number of local bus services including six a day between Bellingen and Coffs Harbour on weekdays and two a day on Saturdays (Routes 361 and 358).
- Edwards Coaches operate a number of local bus services in Armidale.

School bus services

School bus routes are provided within and between each of the major towns and centres along the Waterfall Way corridor. These bus routes provide a service for students who live within the towns and in agricultural areas between the towns.

Busways operate a number of school bus services in the Raleigh and Bellingen areas.

Coaches

Kean’s Travel Express provides a coach service between Armidale and Coffs Harbour that stops at Ebor, Dorrigo and Bellingen.

Rail services

Countrylink’s Sydney to Brisbane XPT stops at both Urunga and Coffs Harbour and provide services between Brisbane and Sydney.

Countrylink’s Armidale Xplorer Sydney to Armidale train service runs daily in each direction and Countrylink offer a connecting coach service at Armidale to towns north and west of Armidale.

Air services

Armidale Regional Airport is the only airport located in the towns along the Waterfall Way. Although no airports are located at the eastern end of the corridor, Raleigh is in close proximity to Coffs Harbour Regional Airport.

There are currently two carriers (Qantas and Rex) that service Armidale Regional Airport and five carriers (QantasLink, Virgin Australia, Tigerair, Pelican and Fly Corporate) that service Coffs Harbour Regional Airport.

“Public transport in the corridor is generally restricted to urban areas.”
Active Transport

As with bus services, dedicated infrastructure for walking and cycling is generally restricted to urban centres where there is higher demand for such infrastructure. Between towns, a sealed road shoulder provides a minimum standard facility for bicycle travel. AUSTROADS (2010)\(^5\) recommends a two to three metre sealed shoulder width where a speed limit is up to 100km/h.

About 94 per cent of the Waterfall Way has sealed shoulders less than the recommended minimum sealed width. The Regional Transport Plans identify actions to improve opportunities for cycling and walking in urban sections of the corridor.

### Bellingen

Bellingen Shire Council has a draft Pedestrian Accessibility and Mobility Plan and Bicycle Plan\(^6\) that was adopted in 2015. The key findings included:

- Lack of footpaths/shared paths
- Poor pedestrian and cycle linkages
- Footpath obstructions
- Poor quality footpath surfaces
- Missing pedestrian links and crossings.

Bellingen shire has developed the Bellingen Main Street Plan, the plan seeks to:

1. ‘Keep Bello Real’ by making streetscapes that are lively, quirky and green, and which support the community’s unique identity

2. Create a friendly and walkable town centre, a place which allows everyone to move around easily.\(^7\)

### Armidale Regional

Armidale Regional Council Bicycle Strategy and Action Plan was adopted in 2012. The strategy seeks to improve the bicycle network within the local government area with respect to:

- Coherence
- Directness
- Safety
- Comfort
- Equal access for all user groups in the community.

Roads and Maritime will continue to work with local councils to improve the facilities and infrastructure for active transport users particularly in urban centres.

"Roads and Maritime will continue to work with local councils to improve the facilities and infrastructure for active transport users particularly in urban centres."
2 A VISION FOR THE FUTURE AND CORRIDOR OBJECTIVES

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2 A VISION FOR THE FUTURE AND CORRIDOR OBJECTIVES

2.1 Corridor vision

The vision for the Waterfall Way between the Pacific Highway at Raleigh and the New England Highway at Armidale over the next 20 years is to:

- Provide a safer route for all road users with the Safe System approach adopted
- Provide an accessible and efficient route to support the tourist link between the Mid North Coast and the New England regions of NSW, as well as a commuter link between Dorrigo, Bellingen and Cooffs Harbour
- Support regional development by maintaining a reliable link for key freight movements and all road users.

2.2 Corridor objectives

Table 2-1 Waterfall Way Corridor Objectives

<table>
<thead>
<tr>
<th>NSW Long Term Transport Master Plan objectives</th>
<th>Waterfall Way Corridor Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve liveability/ Reduce social disadvantage</td>
<td>Manage the effect of flooding.</td>
</tr>
<tr>
<td></td>
<td>Improve travel reliability between the Pacific Highway and Dorrigo.</td>
</tr>
<tr>
<td></td>
<td>Improving road widths and overtaking opportunities to safely cater for the current and forecast traffic volumes.</td>
</tr>
<tr>
<td></td>
<td>Address the active transport needs of cyclist, pedestrians and public transport users in key towns and regional centres.</td>
</tr>
<tr>
<td>Economic growth / productivity</td>
<td>Maintain the road in a sustainable manner to reduce whole of lifecycle costs.</td>
</tr>
<tr>
<td></td>
<td>Support key freight movements along the corridor, in particular those movements associated with agricultural, timber and quarry activities.</td>
</tr>
<tr>
<td>Regional development / accessibility</td>
<td>Maintaining travel smoothness along Dorrigo Mountain and improve delineation safety in locations affected by fog and low cloud.</td>
</tr>
<tr>
<td></td>
<td>Improve access to and from major regional facilities, as well as between existing and developing residential and commercial areas.</td>
</tr>
<tr>
<td></td>
<td>Minimise disruption to road users resulting from planned and unplanned road closures, recognising in particular the needs of isolated communities and those sections of the route which have no alternative access.</td>
</tr>
<tr>
<td></td>
<td>Maintain adequate access for emergency services during major flooding events and natural disasters (i.e. lane slippages) support local Emergency Management Plans.</td>
</tr>
<tr>
<td>Improve sustainability</td>
<td>Manage the impacts of road projects on the natural environment.</td>
</tr>
<tr>
<td>Safety and security</td>
<td>Enhance road safety for all road users over the length of the corridor by implementing the Safe System approach to the design and management of the road particularly by progressively improving sections of poor alignment, steep grades and narrow pavement.</td>
</tr>
<tr>
<td>Improve transport integration process</td>
<td>Working with Bellingen, Clarence Valley and Armidale Regional councils and stakeholders to provide a road that meets current and future transport needs.</td>
</tr>
</tbody>
</table>

Safe System principles

A holistic view of the road transport system and the interactions among roads and roadsides, travel speeds, vehicles and road users. It is an inclusive approach that caters for all groups using the road system, including drivers, motorcyclists, passengers, pedestrians, cyclists, and commercial and heavy vehicle drivers. It recognises that people will always make mistakes and may have road crashes - but the system should be forgiving and those crashes should not result in death or serious injury.
3  CURRENT CORRIDOR PERFORMANCE

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3 CURRENT CORRIDOR PERFORMANCE

TfNSW and Roads and Maritime measure and monitor roads performance against network performance measures and targets. Network measures enable current and future performance to be assessed. Network planning targets are either:

- Network wide targets – condition targets that apply to the entire network, unless otherwise specified
- Rural planning targets that apply to regional NSW, not including Wollongong, the Central Coast, Newcastle and Sydney.

To assess the Waterfall Way’s current corridor performance, the following sources have been used:

- Network Performance Measures and Network Planning Targets
- Network and Corridor Planning Practice Notes.

The summary represents the current corridor performance and is grouped into four sections:

1. Road safety
2. Traffic
3. Road geometry
4. Pavement condition.

3.1 Corridor planning sections and road hierarchy

For strategic planning purposes, the Road Network Management Hierarchy is used to rank all roads across the State Road Network according to their relative importance, with class 6 routes of the highest strategic importance and class 1 routes of the lowest strategic importance. Waterfall Way is classified as a class 4 rural road (4R) between the Pacific Highway and Bellingen and a class 2 rural road (2R) between Bellingen and the New England Highway at Armidale. This hierarchy is directly linked to the Roads and Maritime subnetwork ranking system used for asset management. Both hierarchies are consistent in order to meet the objectives of providing an integrated road management framework.

Road segmentation is needed so planning targets can be tailored to specific areas to respond to changes in nearby land use, terrain and property access arrangements. Planning sections are manageable lengths of road that are uniform in nature.

For the purpose of this analysis, the Waterfall Way corridor has been divided into ten corridor planning sections. These are shown in Table 3-1 (Mapped in Figure 3-1).
### Table 3-1 Waterfall Way Corridor Planning Sections

<table>
<thead>
<tr>
<th>Corridor planning section</th>
<th>Description</th>
<th>Land use (rural or urban)</th>
<th>Chainage (km)</th>
<th>Length (km)</th>
<th>Road Hierarchy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pacific Highway to Bellingen</td>
<td>R</td>
<td>0</td>
<td>11.441</td>
<td>11.441</td>
</tr>
<tr>
<td>2</td>
<td>Bellingen</td>
<td>U</td>
<td>11.441</td>
<td>12.143</td>
<td>0.702</td>
</tr>
<tr>
<td>3</td>
<td>Bellingen to Thora</td>
<td></td>
<td>12.143</td>
<td>25.756</td>
<td>13.613</td>
</tr>
<tr>
<td>4</td>
<td>Thora to Dorrigo</td>
<td>R</td>
<td>25.756</td>
<td>39.79</td>
<td>14.034</td>
</tr>
<tr>
<td>5</td>
<td>Dorrigo</td>
<td></td>
<td>39.79</td>
<td>42.001</td>
<td>2.211</td>
</tr>
<tr>
<td>6</td>
<td>Dorrigo to Grafton Road (including Ebor)</td>
<td></td>
<td>42.001</td>
<td>70.231</td>
<td>28.23</td>
</tr>
<tr>
<td>7</td>
<td>Bridge over Coutts Water to Grafton Road</td>
<td>R</td>
<td>70.231</td>
<td>77.949</td>
<td>7.718</td>
</tr>
<tr>
<td>8</td>
<td>Grafton Road to Guyra Road (including Ebor)</td>
<td></td>
<td>77.949</td>
<td>91.039</td>
<td>13.09</td>
</tr>
<tr>
<td>9</td>
<td>Guyra Road to Armidale</td>
<td>R</td>
<td>91.039</td>
<td>162.948</td>
<td>71.909</td>
</tr>
<tr>
<td>10</td>
<td>Armidale</td>
<td></td>
<td>162.948</td>
<td>170.217</td>
<td>7.269</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>170.217</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Figure 3-1 Waterfall Way Corridor Planning Sections

- **Legend**:
  - Major centres
  - Key towns
  - State Road
  - Regional Road
  - Railway
  - LTTMP Regions

- Draft only: actions subject to government priorities and funding availability

- Draft for consultation
3.2 Road Safety

Road safety review

In September 2014, the Waterfall Way, Pacific Highway to Dorrigo Road Safety Review was published. The review was undertaken by Roads and Maritime and NSW Centre for Road Safety, in response to community concern with increased haulage of rock material used on the Pacific Highway upgrade.\(^{10}\)

The Review made 32 short-term and five medium to long term recommendations. Since 2014, 25 out of 32 short term and all five medium to long term recommendations have been completed. These include:

- Improvements to signage including two vehicle activated speed monitoring devices
- Installation of concrete dish drains
- Completion of the Gordonville Cutting project
- Completion of the Myers Bluff project
- Development of the Bellingen Main Street improvements
- Monitoring of heavy vehicle movements
- Detailed speed zone review between Thora and Dorrigo, with a number of changes implemented
- Landslips repair and realignment work at Nut Farm and Weeping Jenny
- Construction of Stage 1 of the Sweedmans Lane project to rehabilitate the road, install one metre road shoulders and improve intersection
- Development of a strategy with NSW Police for opportunities to run joint operations
- Signage improvements at both Fernmount and Maynards Plain Road
- Completion of a Heavy Vehicle Action plan to proactively manage project truck movements.

The seven remaining recommendations are being progressively implemented as funding becomes available.

The road safety review has been used to inform the Draft Corridor Strategy.

Waterfall Way Road Safety

There were 314 reported crashes along the corridor between January 2010 and December 2014 resulting in 180 casualty crashes involving either an injury or fatality. Of the casualty crashes there were nine fatal, 61 serious injury, 53 moderate injury, 32 minor injury and 25 uncategorised injury crashes. This equates to a crash rate of 0.21 casualty crashes/ per kilometre/ per year which is higher than 0.093 casualty crashes/ per kilometre/ per year on other comparable roads of this standard across the state.\(^{11}\)

Two of the crash clusters identified were:

- A curve 1.7km north/west of Darkwood Road Thora with ten crashes resulting in seven injuries. Bellingen Shire Council has nominated this site for NSW Black Spot funding. As an interim measure an eastbound curve warning speed advisory, Vehicle Activated (VAS) sign, and static Chevron Alignment Markers (CAMs) were installed in December 2014
- The intersection of the Waterfall Way and Miller Street, Armidale had eight crashes resulting in two moderate injuries.

Compared to classified country roads in NSW, the Waterfall Way has a higher percentage of crashes where the contributing factor is speed or wet road surface or off road on curve crashes or those involving motorcycles.

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\(^{11}\) Roads and Maritime 2010, Network Performance Measures and Network Planning Targets, Roads and Maritime, Sydney
Figure 3-2 Crash concentration map Pacific Highway to Ebor

Curve 200m east of Fernbrook Loop Road had realignment and safety barrier works completed in 2014 under NSW Black Spot program.

Cluster of crashes on curve west of Darkwood Road, Thora. Ten crashes resulting in seven casualties. 82% of crashes had speed as a factor. A vehicle activated curve advisory sign was installed in December 2014 for eastbound traffic.

Figure 3-3 Crash concentration map Ebor to Armidale

Intersection of Waterfall Way and Miller Street Armidale with eight crashes resulting in two moderate injuries.

Twenty six crashes through a series of curves resulting in twenty six casualties including one fatality. Safety works to improve the shoulder width and implement guard fencing has been recently completed on part of this section.

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In 2005, the National Transport Commission released the National Guidelines for the Provision of Rest Area Facilities with guidelines for three categories of rest areas, including major and minor rest areas and truck parking bays:

“Major rest areas – designed for long rest breaks, offering a range of facilities and separate parking areas for heavy and light vehicles where possible.

Minor rest areas – These areas are designed for shorter rest breaks, and at a minimum should provide sufficient parking space for both heavy and light vehicles. While it is not anticipated that these stops will be used for long rest breaks/sleep opportunities, separate parking areas for heavy and light vehicles may be required at some locations.

Truck parking bays – These areas are primarily designed to allow drivers of heavy vehicle to conduct short, purpose-based stops including load checks, completing logbooks and addressing associated operational needs.”

There are 12 light vehicle rest areas, seven heavy vehicle rest areas and four truck parking bays on the Waterfall Way. Six of the light vehicle and one of the heavy vehicle rest areas have full facilities including toilets, shelters, picnic tables and litter bins. The Waterfall Way has sufficient rest areas in place to meet the National Guidelines by offering rest stops for heavy and light vehicles within the maximum distance of 100km. The short distance between key towns provide additional rest stop facilities. Investigation is required to rationalise the existing rest areas and provide improved signage.

Compared to classified country roads in NSW, the Waterfall Way has a higher percentage of crashes where the contributing factor is speed or wet road surface or off road on curve crashes or those involving motorcycles.

Figure 3-4 Waterfall Way Crash Summaries
Figure 3-5 Waterfall Way Rest Areas

LEGEND
- Major centres
- Key towns
- State Road
- Regional Road
- Railway
- LTMP Regions

Rest areas
- Heavy and light vehicles
- Light vehicles
- Truck parking bays

Armidale
A1
Waterfall Way
B78
B78
Ebor
Dorrigo
Bellingen
Gara River Rest Area

Figure 3-5 Waterfall Way Rest Areas

The traffic volumes are considerably higher towards the east of the corridor with approximately 6,700 vehicles per day (vpd) between the Pacific Highway at Raleigh and Bellingen. The traffic volumes drop heading west towards Dorrigo with about 2,500 vpd in Dorrigo, between Dorrigo and Armidale they continue to drop with around 700 to 1,000 vpd before increasing in the urban area of Armidale. Armidale is a major regional centre with around 5,411 vpd on the Waterfall Way.

### 3.3 Traffic

**Traffic Volumes**

For the purpose of the strategy traffic counts were carried out at various locations on the Waterfall Way between 10 June 2015 and 22 June 2015 to determine current traffic volumes. Figure 3-6 and Figure 3-7 shows the location of the conducted surveys and the average daily traffic volumes.

<table>
<thead>
<tr>
<th>Site</th>
<th>Description</th>
<th>Land Use (Rural or Urban)</th>
<th>(vehicles per day)</th>
<th>Average (HV)</th>
<th>HV-light (3-5)</th>
<th>HV-Articulated (6-12)</th>
<th>% heavy vehicles</th>
<th>% HV-light</th>
<th>% HV-articulated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>660m West of Hyde Street in Fernmount</td>
<td>R</td>
<td>6727</td>
<td>390</td>
<td>274</td>
<td>105</td>
<td>5.8%</td>
<td>4.1%</td>
<td>1.6%</td>
</tr>
<tr>
<td>2</td>
<td>520m west of Mill Street Bellingen</td>
<td>U</td>
<td>6601</td>
<td>400</td>
<td>301</td>
<td>99</td>
<td>6.1%</td>
<td>4.5%</td>
<td>1.5%</td>
</tr>
<tr>
<td>3</td>
<td>470m west of Wills Creek</td>
<td>R</td>
<td>2283</td>
<td>242</td>
<td>145</td>
<td>97</td>
<td>10.6%</td>
<td>6.4%</td>
<td>4.2%</td>
</tr>
<tr>
<td>4</td>
<td>4.4km east of Maynards Plains Road</td>
<td>R</td>
<td>1873</td>
<td>234</td>
<td>166</td>
<td>68</td>
<td>12.5%</td>
<td>8.9%</td>
<td>3.6%</td>
</tr>
<tr>
<td>5</td>
<td>Bielsdown River Bridge, Dorrigo</td>
<td>U</td>
<td>2501</td>
<td>171</td>
<td>131</td>
<td>40</td>
<td>6.8%</td>
<td>5.2%</td>
<td>1.6%</td>
</tr>
<tr>
<td>6</td>
<td>290m west of Deervale Road</td>
<td>R</td>
<td>1017</td>
<td>96</td>
<td>61</td>
<td>34</td>
<td>9.4%</td>
<td>6.0%</td>
<td>3.3%</td>
</tr>
<tr>
<td>7</td>
<td>273km west of Dorrigo - Mason’s Creek Culvert</td>
<td>R</td>
<td>775</td>
<td>95</td>
<td>62</td>
<td>35</td>
<td>12.3%</td>
<td>8.0%</td>
<td>4.5%</td>
</tr>
<tr>
<td>8</td>
<td>710m west of Montrose loop road</td>
<td>R</td>
<td>765</td>
<td>81</td>
<td>47</td>
<td>35</td>
<td>10.6%</td>
<td>6.1%</td>
<td>4.6%</td>
</tr>
<tr>
<td>9</td>
<td>6.73km west of Grafton/Ebor Road intersection</td>
<td>R</td>
<td>1006</td>
<td>98</td>
<td>64</td>
<td>34</td>
<td>9.7%</td>
<td>6.1%</td>
<td>3.6%</td>
</tr>
<tr>
<td>10</td>
<td>830m west of Kempsey Road, Wollomombi</td>
<td>R</td>
<td>941</td>
<td>130</td>
<td>94</td>
<td>36</td>
<td>13.8%</td>
<td>10.0%</td>
<td>3.8%</td>
</tr>
<tr>
<td>11</td>
<td>West of Douglas Street, Armidale</td>
<td>U</td>
<td>5411</td>
<td>378</td>
<td>331</td>
<td>47</td>
<td>7.0%</td>
<td>6.1%</td>
<td>0.9%</td>
</tr>
<tr>
<td>12</td>
<td>320m west of Butler Street, Armidale</td>
<td>U</td>
<td>3680</td>
<td>278</td>
<td>217</td>
<td>61</td>
<td>7.6%</td>
<td>5.9%</td>
<td>1.7%</td>
</tr>
</tbody>
</table>
Figure 3-6 Waterfall Way – traffic count locations 2015

Figure 3-7 Waterfall Way – daily traffic volumes 2015

Legend:
- Major centres
- Key towns
- State Road
- Regional Road
- Railway
- LTMP Regions

Average daily traffic volumes
- Count locations
- Site 1: Less than 1000
- Site 2: 1000 to 2000
- Site 3: 2000 to 3000
- Site 4: 3000 to 4000
- Site 5: 4000 to 5000
- Site 6: 5000 to 7000

Site 12 West
Armidale
Site 11 East
Armidale
Site 10
Wollomombi
Site 9 Ebor
Site 8
Deer Vale
Site 6 west of Dorrigo
Site 5 Dorrigo
Site 4
Dorrigo Mountain
Site 3
Wills Creek
Site 2 Bellingen
Site 1 Fernmount

Site 7 west of Dorrigo
Site 6 West
Dorrigo
Site 5
Dorrigo

Waterfall Way
Ebor
Dorrigo
Bellingen

Draft only: actions subject to government priorities and funding availability
Heavy vehicle numbers across the corridor vary considerably, with the average number of heavy vehicles being (refer to appendix 1 for vehicle classification):

- **Bellingen**: 400 (6.1%) (301 rigid vehicles and 99 articulated vehicles)
- **Dorrigo**: 171 (6.8%) (131 rigid vehicles and 40 articulated vehicles)
- **Ebor**: 98 (9.7%) (64 rigid vehicles and 34 articulated vehicles)
- **Armidale**: 417 (5.1%) (329 rigid vehicles and 88 articulated vehicles).

The heavy vehicle volume around Bellingen are equal to around six per cent of the total traffic volume. This highlights the high use of light vehicles used in this section.

The section around Ebor has a lower total traffic volume, however the heavy vehicle volume is equal to around 14 per cent, this highlights the importance of this section of the corridor being used by the agricultural and forestry industries.

**Number of lanes and Level of Service**

The number of through lanes needed can be calculated using the Level of Service (LoS) rating method. Level of service is related to the number of lanes in each direction on a road and the number of overtaking lanes.

The Waterfall Way corridor has one lane in each direction for majority of its length with the exception of three small lengths between Newell Falls and Sherrard Falls, which are shared one lane sections. Roads and Maritime Services Network Performance Measure and Network Planning Targets\(^{14}\) state that the number of through lanes on a 1-4R class road is two lanes generally, increased to four if requested to provide Level of Service C. If the travel demand for any particular road is such that target Level of Service C is forecast to be reached within the planning horizon, an assessment should be made as to the viability of increasing the number of lanes available.

**Level of Service (LoS)**

The LoS is a measure of how easily traffic flows on the road. It assesses the operating condition of a road based on various factors, including traffic volumes, proportion of heavy vehicles, terrain and frequency of intersections. Levels of service range from ‘A’ to ‘F’ with ‘A’ representing free-flowing traffic and ‘F’ representing severe congestion. On uninterrupted two-lane rural highways, the LoS is measured using per cent time spent following as shown in Table 3-3.

**The Austroads Guide to Traffic Management Part 3:**

Traffic Studies and Analysis outlines the process to calculate the level of service of a two-lane two-way road. The process is based on the Highway Capacity Manual 2010\(^{15}\). The manual distinguishes between three categories of two-lane highways as follows:\(^{16}\)

- **Class I** two-lane highways are generally major intercity routes, primary arterials, daily commuter routes or primary links in state or national highway networks. There is an expectation from motorists to travel at relatively high speeds. These facilities often serve long-distance trips or provide connecting links between facilities that serve long-distance trips.
- **Class II** two lane highways are generally those that function as access routes to Class I facilities, serve as scenic or recreational routes (except primary arterials), or pass through rugged terrain. Motorists do not necessarily expect to travel at high speeds. These facilities often serve relatively short trips, the beginning and ending of longer trips, or trips for which sightseeing plays a significant role.
- **Class III** two lane highways are generally those that serve moderately developed areas. They can be sections of Class I and Class II highways that pass through developed areas, where there is a mix between local and through traffic and the density of roadside access points is noticeably higher. These segments are often accompanied by reduced speed limits that reflect the higher activity level.

---

Waterfall Way has been identified as a Class II two lane highway. The Waterfall Way corridor performance has been evaluated to understand the existing LoS. The evaluation has been based on various factors including traffic volumes, proportion of heavy vehicles, speed limit and overtaking opportunities using ‘Traffic on Rural Roads’ (TRARR) modelling software developed by the Australian Road Research Board.

### Table 3-3 Level of service definitions

<table>
<thead>
<tr>
<th>Level of Service (LoS)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Motorists experience high operating speeds on Class I highways and little difficulty in passing. Platoons of three or more vehicles are rare.</td>
</tr>
<tr>
<td>B</td>
<td>Passing demand and passing capacity are balanced. On both Class I and Class II highways, the degree of bunching becomes noticeable. Some speed reductions are present on Class I highways.</td>
</tr>
<tr>
<td>C</td>
<td>Most vehicles are travelling in platoons. Speeds are noticeably curtailed on all three classes of highway.</td>
</tr>
<tr>
<td>D</td>
<td>Bunching increases significantly. Passing demand is high on both Class I and II facilities, but passing capacity approaches zero. A high percentage of vehicles are now travelling in platoons, and PTSF is quite noticeable.</td>
</tr>
<tr>
<td>E</td>
<td>Demand is approaching capacity. Passing on Class I and II highways is virtually impossible, and PTSF is more than 80%. Speeds are seriously curtailed.</td>
</tr>
<tr>
<td>F</td>
<td>Exists whenever arrival flow in one or both directions exceeds the capacity of the segment. Operating conditions are unstable, and heavy congestion exists on all classes of two-lane highway.</td>
</tr>
</tbody>
</table>

### Table 3-4 Level of service performance criteria

<table>
<thead>
<tr>
<th>Level of Service (LoS)</th>
<th>Class II Highway Per cent time-spent-following PTSF (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>≤40</td>
</tr>
<tr>
<td>B</td>
<td>&gt;40 – 55</td>
</tr>
<tr>
<td>C</td>
<td>&gt;55 – 70</td>
</tr>
<tr>
<td>D</td>
<td>&gt;70 – 85</td>
</tr>
<tr>
<td>E</td>
<td>&gt;85</td>
</tr>
</tbody>
</table>

**Traffic on rural roads (TRARR)**

TRARR analyses traffic flow on uninterrupted two lane rural road segments. Each vehicle’s progress is measured at one second intervals. The TRARR model can be used to simulate platooning and the percentage of vehicles following due to slower freight vehicles, for example on steeper grades where there are no overtaking opportunities. Results of a TRARR analysis provide guidance as to where additional overtaking opportunities might improve the LoS. Roads and Maritime Services Network Performance Measures and Network Planning Target\(^9\) recommend an overtaking lane should be provided at locations where 65 per cent of time is spent following other vehicles which means that the level of service is C.
### Table 3.5 Waterfall Way corridor performance - Westbound

<table>
<thead>
<tr>
<th>Corridor Section</th>
<th>% time spent following</th>
<th>% Following Level of Service</th>
<th>Average Speed Km/h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM peak hour</td>
<td>PM peak hour</td>
<td>Day time</td>
</tr>
<tr>
<td>2015</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pacific Highway to Bellingen</td>
<td>70.2</td>
<td>68.9</td>
<td>59.4</td>
</tr>
<tr>
<td>Thora to Dorrigo</td>
<td>56.4</td>
<td>59.4</td>
<td>54.6</td>
</tr>
<tr>
<td>Ebor to Armidale</td>
<td>21.5</td>
<td>25.6</td>
<td>25.7</td>
</tr>
<tr>
<td>2025</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pacific Highway to Bellingen</td>
<td>73.2</td>
<td>75.5</td>
<td>64.3</td>
</tr>
<tr>
<td>Thora to Dorrigo</td>
<td>58.8</td>
<td>64.5</td>
<td>58.8</td>
</tr>
<tr>
<td>Ebor to Armidale</td>
<td>23.7</td>
<td>27.5</td>
<td>28.4</td>
</tr>
<tr>
<td>2035</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pacific Highway to Bellingen</td>
<td>78.5</td>
<td>79.5</td>
<td>70.3</td>
</tr>
<tr>
<td>Thora to Dorrigo</td>
<td>63.4</td>
<td>66.2</td>
<td>58.9</td>
</tr>
<tr>
<td>Ebor to Armidale</td>
<td>20.5</td>
<td>31.1</td>
<td>30.5</td>
</tr>
</tbody>
</table>

### Table 3.6 Waterfall Way corridor performance - Eastbound

<table>
<thead>
<tr>
<th>Corridor Section</th>
<th>% time spent following</th>
<th>% Following Level of Service</th>
<th>Average Speed Km/h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM peak hour</td>
<td>PM peak hour</td>
<td>Day time</td>
</tr>
<tr>
<td>2015</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pacific Highway to Bellingen</td>
<td>67.1</td>
<td>65.2</td>
<td>58.0</td>
</tr>
<tr>
<td>Thora to Dorrigo</td>
<td>51.8</td>
<td>51.7</td>
<td>48.9</td>
</tr>
<tr>
<td>Ebor to Armidale</td>
<td>19.9</td>
<td>24.3</td>
<td>24.6</td>
</tr>
<tr>
<td>2025</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pacific Highway to Bellingen</td>
<td>72.5</td>
<td>71.3</td>
<td>60.2</td>
</tr>
<tr>
<td>Thora to Dorrigo</td>
<td>52.1</td>
<td>55.0</td>
<td>51.4</td>
</tr>
<tr>
<td>Ebor to Armidale</td>
<td>17.9</td>
<td>21.2</td>
<td>23.4</td>
</tr>
<tr>
<td>2035</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pacific Highway to Bellingen</td>
<td>76.2</td>
<td>77.4</td>
<td>67.2</td>
</tr>
<tr>
<td>Thora to Dorrigo</td>
<td>58.4</td>
<td>57.6</td>
<td>52.3</td>
</tr>
<tr>
<td>Ebor to Armidale</td>
<td>21.2</td>
<td>28.7</td>
<td>29.3</td>
</tr>
</tbody>
</table>

Draft only: actions subject to government priorities and funding availability
The Waterfall Way LoS was assessed based on the percent time spent following another vehicle along the stretch of the Waterfall Way with the performance criteria outlined in Table 3-4.

Level of service along the Waterfall Way varies between A and D throughout the day depending on the number of vehicles and section of the route.

The modelled LoS for the Waterfall Way is worst during the peak periods and in the peak directions. Traffic volumes used to model the LoS in 2025 and 2035 have been calculated from the traffic growth percentage in Table 3-7. Overnight generally sees free flowing conditions with LoS A or B at all locations. The LoS varies along the length of Waterfall Way and is presented in Table 3-5 and Table 3-6.

The one hour AM and PM peak period for each section were:

**Pacific Highway to Bellingen**
8-9am and 5-6pm

**Thora to Dorrigo**
9-10am and 3-4pm

**Ebor to Armidale**
8-9am and 3-4pm.

The lowest performing section is between the Pacific Highway and Bellingen, with a current LoS between C and D. This section is used for commuting between Bellingen and Coffs Harbour to access services including employment and education. In the short term an eastbound and westbound overtaking lane and road realignments would improve travel times during peak periods.

Between Thora and Dorrigo the LoS is between B and C. This section is also used for commuting to Coffs Harbour to access services however has lower traffic volumes. This is a 15 kilometre section of tight curves, steep grades and narrow formation with small sections of one lane road. This limits the overtaking opportunities and the tight curves and steep grades limit the speed that larger service vehicles and cars with caravans can reach, resulting in platooning of vehicles.

The LoS between Ebor and Armidale indicates adequate overtaking opportunities.

### Overtaking opportunities

Providing overtaking lanes and other opportunities to pass slower vehicles improves travel time and LoS. In addition, overtaking opportunities reduce driver frustration and unsafe behaviour, reducing the risk of road trauma.

Overtaking opportunities include formal ones, such as overtaking lanes, and informal ones, such as using opposing travel lane when safe. These are available along approximately 40 per cent of the entire corridor, although this varies greatly between sections. The minimum length for an informal overtaking opportunity (ie broken centre line) is 300 metres.

There is currently around seven kilometres of informal overtaking areas along the corridor which fall below this desired length. In these instances the informal overtaking opportunity should be assessed and removed if considered an unacceptable safety risk.

There are six formal overtaking lanes on the Waterfall Way (Figure 3-8). All six occur west of Ebor.

The three westbound overtaking lanes are at:
- 0.38 kilometres east of Wollomombi Falls Road, Hillgrove (0.94km in length)
- Four Mile Creek, Hillgrove (0.64km in length)
- Moore Park Road west of Armidale (0.85km in length).

The three eastbound overtaking lanes are at:
- 2 kilometres east of Gara River, Argyle (0.92km in length)
- East of St Helena Creek, Hillgrove (1.12km in length)
- 0.16 kilometres east of Kempsey Road, Wollomombi (0.89km in length).

There are no formal overtaking lanes between the Pacific Highway and Ebor. In the absence of overtaking lanes between Thora and Dorrigo, in order to reduce driver frustration and improve journey times. Pull Over Bays, in both directions, should be investigated. Pull Over Bays will enable slower vehicles to safely allow following vehicles to pass. This should be supplemented with appropriate signposting.
Future traffic volumes

In forecasting future traffic volumes Roads and Maritime takes into consideration historical traffic data and future land use, regulatory and industry changes that can influence growth rates. Roads and Maritime has been collecting traffic data on the Waterfall Way since 1967. Traffic growth has been forecast using linear historical growth rates. Forecast 2035 traffic volumes are detailed in Table 3-7.

Along the Waterfall Way the growth rate is around 1.6 per cent per annum with the highest growth, 1.9 per cent per annum in Fernmount between Raleigh and Bellingen. The lowest forecast traffic growth is expected in Dorrigo (site 5) at a rate of 1.3 per cent per annum.

Heavy vehicles

Common restrictions on access for freight vehicles along roads include inadequate width, substandard alignment, adjacent land use (geometric and access issues), steep grades and inadequate strength of the road and its structures.

On the Waterfall Way 25 metre B-doubles are allowed between the Pacific Highway and Thora in a westerly direction during daylight hours and travel is prohibited between 7am and 9:30am and 2:30pm and 5pm on school days.

25 metre B-doubles are also permitted between Dorrigo and Armidale.

Only general access vehicles (19m semi-trailers/b-doubles) are permitted between Thora and Dorrigo due to the steep grades and tight curves.

The Waterfall Way is not a key east-west freight route due to the challenging topography of the Great Dividing Range. The alternative freight east-west route is the Gwydir Highway.
Incident management

Traffic incident management refers to the delivery of planning and operational tasks by the responsible road authority in response to an unplanned incident. This is achieved through collaboration with emergency services and other key stakeholders to facilitate effective management of incidents for road users, the road network and infrastructure.

If an unplanned incident occurs on the Waterfall Way, for example flooding or land slips, the alternate routes are longer and not of the same standard of road. To ensure motorists are informed of incidents that may affect their journeys, the Transport Management Centre uses a range of channels to communicate with its customers, including radio announcements and interviews, advertising, social media, mobile apps, the 24 hour 132 701 Traffic Information Line, and the Live Traffic and Transport Info websites. There is an opportunity to provide more information on the route reliability along the corridor.

Intelligent Transport Systems (ITS) involve the application of computer and communication technologies to manage transport problems. The rapid advances in ITS technologies have enabled the collection of data or intelligence which provides relevant and timely information to road managers and users. There are no ITS on the Waterfall Way, in the short term installation of ITS such as vehicle activated signs would provide a more rapid response to unplanned incidents, allowing enhanced communication with the community and road users.

Table 3-7 Forecast traffic volumes – Waterfall Way

<table>
<thead>
<tr>
<th>Site</th>
<th>Description</th>
<th>% Growth per annum from historical data</th>
<th>2015 (vpd)</th>
<th>Predicted 2035 (vpd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 1</td>
<td>660m West of Hyde Street in Fernmount</td>
<td>1.9%</td>
<td>6727</td>
<td>9802</td>
</tr>
<tr>
<td>Site 2</td>
<td>520m west of Mill Street Bellingen</td>
<td>1.6%</td>
<td>6601</td>
<td>9067</td>
</tr>
<tr>
<td>Site 3</td>
<td>470m west of Wills Creek</td>
<td>1.6%</td>
<td>2283</td>
<td>3136</td>
</tr>
<tr>
<td>Site 4</td>
<td>150m West of Maynards Plain, Dorrigo Mountain</td>
<td>1.6%</td>
<td>1873</td>
<td>2573</td>
</tr>
<tr>
<td>Site 5</td>
<td>Bielsdown River Bridge, Dorrigo</td>
<td>1.3%</td>
<td>2501</td>
<td>3238</td>
</tr>
<tr>
<td>Site 6</td>
<td>290m west of Deervale Road, Deervale</td>
<td>1.5%</td>
<td>1017</td>
<td>1370</td>
</tr>
<tr>
<td>Site 7</td>
<td>27.1km west of Dorrigo - Mason’s Creek Culvert</td>
<td>1.5%</td>
<td>775</td>
<td>1044</td>
</tr>
<tr>
<td>Site 8</td>
<td>710m west of Montrose loop road, Deervale</td>
<td>1.6%</td>
<td>765</td>
<td>1051</td>
</tr>
<tr>
<td>Site 9</td>
<td>6.73km west of Grafton/Ebor Road intersection</td>
<td>1.6%</td>
<td>1006</td>
<td>1382</td>
</tr>
<tr>
<td>Site 10</td>
<td>830m west of Kempsey Road, Wollomombi</td>
<td>1.6%</td>
<td>941</td>
<td>1293</td>
</tr>
<tr>
<td>Site 11</td>
<td>320m west of Butler Street, Armidale</td>
<td>1.6%</td>
<td>3680</td>
<td>5055</td>
</tr>
</tbody>
</table>

3.4 Road Geometry

Road geometry includes anything which describes the road formation such as the grade, curvature, lane and shoulder widths, and the clear zones. These characteristics are important to consider when assessing road safety, traffic efficiency and freight performance of the road.

Vertical grades and horizontal curves

The Waterfall Way corridor climbs and descends the Great Dividing Range between Bellingen and Dorrigo. The section between Bellingen and Dorrigo is comprised of long steep sections of road with grades between six and ten per cent (Figure 3-10) which can pose challenges to travel efficiency and road safety.

The section between Dorrigo and Ebor also has steep grades ranging between six and nine per cent. In addition, there are limited opportunities for safe overtaking, which may increase the incidence of crashes due to driver frustration.

Grades are not a significant issue along the remainder of the corridor.

Curves designed to current standards allow a motorist to negotiate changes in the horizontal alignment of the road at a consistent rate. The design radius of the curve is dependent on the design speed, sight distance, superelevation and friction on the road. An important consideration in assessing the design radius of the curve is the sight distance relative to the design speed. Motorists need to be able to navigate through curves efficiently while at the same time assessing any potential danger on the roadway in enough time to avoid a crash. The Austroads Guide to Road Design and Roads and Maritime design supplements are used to determine the minimum horizontal curve radius for the Waterfall Way as shown in Table 3-8.

The horizontal radii and vertical grades for the Waterfall Way are shown in Figure 3-9 and Figure 3-10. The main concentration of deficient curves and steep grades is between Bellingen and Ebor including Myers Bluff and Gordonville Cutting. The combination of steep grades and tight curves increase the safety risk to motorists travelling on the road. This combination obstructs how far motorists can see ahead – reducing their capability to assess potential conflicts.

The terrain and formation of the corridor between Bellingen and Ebor, particularly between Bellingen and Dorrigo, can reduce the quality of road geometry, reduce travel speeds, increase travel times and road safety risks. Due to physical constraints such as river banks, large cuts and the location of the corridor on the Great Dividing Range major road improvements are generally not cost-effective on this section of the corridor.

There is a series of deficient curves (Section 2 of Figure 3-9) between Ebor and Armidale with a high casualty crash rate. Work has been recently undertaken along this segment of road to improve the shoulder width, implement guard rail fencing and remove hazards from the clear zone.

### Table 3-8: Calculated minimum horizontal radii

<table>
<thead>
<tr>
<th>Posted Speed</th>
<th>Maximum Superelevation</th>
<th>Maximum Side Friction</th>
<th>Minimum Horizontal Radii</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>6%</td>
<td>0.24</td>
<td>95</td>
</tr>
<tr>
<td>60</td>
<td>6%</td>
<td>0.19</td>
<td>155</td>
</tr>
<tr>
<td>70</td>
<td>6%</td>
<td>0.16</td>
<td>230</td>
</tr>
<tr>
<td>80</td>
<td>6%</td>
<td>0.13</td>
<td>336</td>
</tr>
<tr>
<td>100</td>
<td>6%</td>
<td>0.12</td>
<td>530</td>
</tr>
</tbody>
</table>

Draft only: actions subject to government priorities and funding availability
Figure 3-9 Waterfall Way curvature

Figure 3-10 Waterfall Way grades

Draft only: actions subject to government priorities and funding availability
Road width

Road width influences road capacity, comfort and safety. Wider lane widths increase clearance between opposing vehicles and therefore have potential to reduce the incidence of head-on and ‘run off road’ crashes. Sealed shoulders aid in prolonging pavement performance by reducing water ingress to the pavement under the wheel path.

The Waterfall Way was built on a narrow formation that has been widened over time with narrow clear zones. The target width between the Pacific Highway and Bellingen is 11 metres with 3.5 metre travel lanes and two metre shoulders. None of this section meets this target. 10 kilometres out of the 12 kilometres has a shoulder width less than two metres.

Para break Between Bellingen and Armidale the target width is nine metres with 3.5 metre travel lanes and one metre shoulders. Approximately 72 per cent of the corridor has a sealed formation width of less than nine metres. 22 per cent of the corridor has sealed formation width between nine and 11 metres and only six per cent of the corridor has sealed formation width greater than 11 metres.

Despite the incremental widening that has occurred in the past, 76 per cent of the corridor has lane widths less than 3.5 metres.

Approximately 68 per cent of the Waterfall Way has shoulder widths less than the respective targets. As mentioned previously, none of the section between the Pacific Highway and Bellingen meets the shoulder width targets and 105 kilometres out of the remaining 158 kilometres has a shoulder width less than one metre.
Delineation and signposting

Edgelines are important markings for motorists to provide guidance. Network planning targets recommend roadways across all types of terrain should have edgelines on class 4, 3 and 2 rural roads, provided there is sufficient pavement to accommodate a minimum three metre wide lane between the edgeline and centreline.\textsuperscript{21} The Waterfall Way has edgelines on approximately 69 per cent of the corridor. The largest portion of corridor without edgeline is 51 kilometres between Dorrigo and Armidale.

Low visibility is experienced, at times, between Dorrigo and Armidale due to low lying cloud, rain and fog this can cause safety issues for road uses. High visibility line marking, raised pavement markers and fluorescent signage can help assist road users during these times.

The lane and shoulder widths along Waterfall Way should be progressively widened and edgelines installed so that they meet minimum network targets where possible.

Bridge widths are also a significant factor, because they are generally the narrowest point along any route. The \textit{Performance Based Standards Scheme Network Guidelines}\textsuperscript{22} recommend a minimum width of 8.4 metres for bridges when the Average Annual Daily Traffic (AADT) is greater than 500 vehicles. Along the Waterfall Way there are two bridges and one culvert that are less than 8.4 metres wide, these include:

- Sandy Creek Bridge, 54.09 km east of Armidale width 7.50m
- Bakers Creek Bridge, 24.41 km east of Armidale width 7.80m
- Pipe Culvert unnamed creek near fish hatchery width 7.65m.

Clear zones and safety barriers

A clear zone is a width of roadside without any obstructions available for drivers to take corrective action in an emergency. The minimum desirable width of a clear zone depends on the traffic volumes, traffic speeds and road geometry. Roads and Maritime’s Network Performance Measures and Network Planning Targets indicate that for a class 4R and 2R road, such as the Waterfall Way, the width of the clear zone varies depending on the speed limit.

There is a significant portion of the corridor that has trees in the clear zone or embankments close to the edge of the road formation.

Of the existing safety barriers nine deficiencies were identified in the eastbound direction and seven in the westbound direction regarding insufficient approach or departure length to completely protect from collisions with objects in the case of off road on curve crashes.

In the short term existing deficiencies in safety barriers should be investigated to determine the appropriate approach or departure length. Locations with hazards in the clear zones should be further investigated to determine the appropriate treatment.

Intersections

The network planning targets identify required intersection treatments based on volumes of through traffic and turning traffic. Intersections along the Waterfall Way were assessed using section 4.8 of \textit{“Austroads Guide to Road Design - Part 4A: Unsignalised and Signalised Intersections”}\textsuperscript{23}.

A total of 120 intersections were identified. 104 are basic intersections, seven have auxiliary lanes, four are channelised, four are roundabouts and one is a signalised intersection. Of the 120 intersections, 64 were found to have deficiencies.

Some of the most common deficiencies that existed along the corridor included:

- Safe Intersection Sight Distance (SISD) not achieved
- A high proportion of intersections without any widening approaching the BAR (basic treatment right) minimum of 6.5m half road width in a 100 km/h speed zone.

\textsuperscript{23} Austroads Guide to Road Design - Part 4A: Unsignalised and Signalised Intersections, Section 4.8, Figure 4.9
The Waterfall Way corridor crosses a number of flood prone locations, rivers and creeks and is subject to both local flash flooding where waters are fast to recede, or larger scale flooding events where the road can be closed at multiple locations for prolonged periods. These flood events can isolate individuals or communities and impact on reliability, increasing travel times and cost of delays for all road users.

Overall reliability of the Waterfall Way corridor is considered adequate in terms of journey times. However, low flood immunity at a number of key locations on the road reduces the reliability. In particular the frequency and severity of inundation around Bellingen is likely to impact on commuter trips. Between 2010 and 2015 there were at least 14 occasions where the Waterfall Way was impacted by flooding, the duration for the majority of these incidents was less than half a day.

There are 16 key locations on the Waterfall Way where flooding frequently occurs. The majority of these locations are between the Pacific Highway and Bellingen and some locations south of Dorrigo. These are shown in Figure 3-12.

Flooding

The Waterfall Way crosses waterways that are subject to flooding. Flooding can result in corridor closure at multiple locations for hours and, at times, for several days.

There are a range of flood types. These include:

- Nuisance flooding – Causes public inconvenience, but little or no property damage. Water is typically not deep, is stagnant and generally localised. Nuisance flooding events may last several hours and may slow or prevent access along the corridor.
- Flooding caused by rising waterways – This type of flooding restricts access. To manage it, water is either directed under the road through culverts and pipes, or over the road through causeways and floodways, or in the case of defined waterways road structures, such as bridges, are specifically built over the waterway. During flooding, approaches to these bridges can be cut off even though the bridge is still above water. Flooding may also be localised, but the scale and volume of water may cause damage to property and infrastructure.

### Figure 3-12: Waterfall Way Flood locations

![Map of Waterfall Way showing flood locations](image-url)
Culverts, slopes and bridge sized structures

Assessment ratings are applied to culverts, slopes and bridges to assist with the determination of maintenance priorities. The risk for culverts and slopes is measured in terms of an Assessed Risk Level (ARL). ‘Highest Priority’ are those with a rating ARL 1 or 2, ‘Medium Priority’ are those with a rating ARL 3 and ‘Lowest Priority’ are those with a rating ARL 4 or 5.

Culverts are inspected routinely as part of maintenance activities and higher priority culverts are reassessed within a three year period. All 575 culverts on the Waterfall Way have been inspected, only culverts identified with defects undergo a formal assessment rating. These include 538 pipe culverts, 28 box culverts, 4 composite culverts and 5 arch culverts. Of the 575 culverts 162 required a formal assessment rating and 23 were assessed as highest priority, locations of the highest priority culverts are provided in Figure 3-13.

Annual maintenance on the Dorrigo Mountain and sections adjacent to the Bellinger River require higher focus due to the higher rain fall and potential for damage to the road from drainage system failure. Of particular focus is the ongoing work on table and catch drains on the Dorrigo Mountain section of the Waterfall Way.

<table>
<thead>
<tr>
<th>Very Low (ARL 5)</th>
<th>Low (ARL 4)</th>
<th>Medium (ARL 3)</th>
<th>High (ARL 2)</th>
<th>Very High (ARL 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>43</td>
<td>85</td>
<td>22</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 3-9 Waterfall Way culvert priorities

Figure 3-13 Waterfall Way high priority culverts
There are 222 identified slopes along the Waterfall Way, these can consist of embankments or cuttings. Of the 222, 176 have been assessed and 24 have a high priority rating. Slope risk management plans are in place for all higher priority slopes and these are linked to routine maintenance inspections. The location of the high priority slopes are provided in Figure 3-14.

There are two sites on the Waterfall Way considered complex and will require significant funding to remediate. These include

- Gordonville Cutting
- Newell Falls to Sherrard Falls west.

Remote monitoring is in place 900 metres west of Newell Falls which captures real time rain fall and other instruments are installed at several sites on Dorrigo Mountain to assist with monitoring and slope management.

Bridge health is measured using the Roads and Maritime Bridge Health Index (BHI). The BHI measures a bridges condition in terms of ‘poor’, ‘fair’, ‘good’, or ‘as built’ (very good).

There are a total of 48 bridges along the Waterfall Way, of these none have been assessed with a BHI of ‘poor’. There are six with a BHI of ‘As-Built’, seven with a BHI of ‘Fair’ and 35 with a BHI of ‘Good’.

**Table 3-10** Waterfall Way Bridge Health rating

<table>
<thead>
<tr>
<th>Very Low</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>Very High</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>35</td>
<td>7</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Table 3-11** Waterfall Way slopes rating

<table>
<thead>
<tr>
<th>Very Low (ARL 5)</th>
<th>Low (ARL 4)</th>
<th>Medium (ARL 3)</th>
<th>High (ARL 2)</th>
<th>Very High (ARL 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>67</td>
<td>53</td>
<td>15</td>
<td>9</td>
</tr>
</tbody>
</table>
Pavement condition

Pavements provide structural support for vehicles travelling along a route. Weaker or older pavements may become uneven, rutted or rough, leading to inferior travel conditions. Effectively managing the Waterfall Way pavement condition for the long term is a key task that involves estimating the pavements remaining service life to ensure appropriate rates of pavement rebuilding.

With an inadequate rate of pavement rebuilding, the network will deteriorate until the service level is eventually compromised. Alternatively, if the pavement rebuilding rate is too high, resources are spent unnecessarily and inefficiently.

To understand how pavement is performing and to forecast future pavement condition, the following three measures are considered:

- Overall pavement health
- Pavement structural remaining life
- Road surface roughness.

The Waterfall Way, passes through three general terrains:

Between the Pacific Highway and the foot of the Great Dividing Range at Thora the route travels over flood plains and follows the Bellinger River. Typically the pavements are constructed from granular materials, with short lengths being stabilised with cementitious materials to provide additional strength. Predominately the route has a sprayed seal wearing surface, except through the township of Bellingen which has an asphalt surface. With exception to the Marx Hill section of road which was realigned in 2010 and pavement rehabilitation in Fernmount in 2012, much of the pavement was last strengthened between the 1970s and 90s. A range of pavement deterioration conditions are evident, these are due to insufficient pavement thickness or issues related to the width of the pavement.

The Dorrigo Mountain section has pavements that were reconstructed in the late 1960’s and early 1970’s and currently has an asphalt wearing surface. Pavement issues in this section are typically related to insufficient pavement width in constricted locations and drainage. The current progressive construction of concrete gutter is assisting in preventing premature pavement failure.

The section of the network from Dorrigo to Armidale was last reconstructed at various periods from the 1960’s through to the present. It is typically a granular pavement, with some sections stabilised with a sprayed seal surface. Pavement issues along this section typically result from insufficient pavement thickness, and degradation of pavement layers. Some constraints are also applied to the pavement due to narrow formation width.

Pavement Health Index

The Pavement Health Index comprises a number of pavement and surface conditions to express an overall indication of pavement and surface performance of the road. The surfacing performance condition comprises of cracking, texture and surface remaining life. The pavement performance conditions comprises of remaining pavement structural life, roughness and rutting. All of these are included in the pavement health.

The Pavement Health Index for the Waterfall Way (Figure 3-16) is compared with the results from all State Network Roads 2R and 4R roads in the NSW network Figure 3-15.

The Waterfall Way has a slightly lower pavement health condition when compared to the other roads of the same classification across the network. The Waterfall Way has 49 per cent (83.3 km) of corridor with a pavement health index of good or higher, 37 per cent (62.9 km) with a fair and 14 per cent (23.8 km) of the corridor is calculated to be poor pavement health or below. Currently the pavement health indicated the Waterfall Way mostly in fair to good condition.

The roughness index, pavement remaining life index and pavement health index for the Waterfall Way (Figure 3-18) is also compared with the results from all State Network Roads 2R and 4R roads in the NSW network Figure 3-17.

The Waterfall Way has slightly worse roughness condition with 69 per cent (117.3 km) of corridor with a roughness index of good or higher, 22 per cent (37.4 km) with a fair and 9 per cent (15.3 km) of the corridor is calculated as poor or below. Currently the roughness index indicates the Waterfall Way is in mostly fair to very good condition.
The Pavement Health Index

Details relating to some of the conditions comprising the Pavement Health Index include:

- The surface layer on the road serves two main purposes, acting as a wearing course for vehicle movement, and serving as a waterproofing layer to protect the pavement layers underneath from damage due to water ingress.

- Road surfaces are designed for expected traffic and environment conditions with the consideration of the function of the road. These surfaces have expected performance lives for the given environment under which they need to perform. When the age of the surface exceeds this expected life, this risk of failure increases.

- Rutting is one of the major pavement performance indicators and occurs in the wheel paths of the road surface. The wheel paths represent areas of the road surface and pavement which is carrying the highest loads and the most vehicle/tyre movement. Due to the concentrated loading of the surface and pavement in these areas, the wheel paths are at highest risk structural deformation of a pavement. This deformation is caused by densification in the pavement layers due to the loading and in worst cases leads to pavement failures. Rutting is the visual representation of this pavement condition. In addition to the pavement performance aspects of high rutting, it also poses safety risks with regard to surface water ponding and vehicle aqua planning.
The pavement remaining life condition on the Waterfall Way has 98 per cent (166.6 km) of corridor with a pavement remaining life of good or higher and 2 per cent (3.4 km) with a fair. It is indicating no pavement remaining life in poor condition or below. This is slightly better to the State Network Road 2R and 4R which has 94 per cent with a pavement remaining life of good or higher.

**Figure 3-17** Condition Snapshot (State Network Roads 2R and 4R)

**Figure 3-18** Condition Snapshot (Waterfall Way)
3.5 Environment

The Waterfall Way corridor is a source of rich biodiversity, cultural heritage and agricultural production. It passes along and directly through a number of national parks, state conservation and state forest areas, with world heritage listed forest along the corridor such as Dorrigo National Park and New England National Park as shown in Figure 3-19.

There are extensive arrays of threatened plant communities and species, examples being New England peppermint (Endangered Ecological Community), Cool temperate rainforest of Antarctic beech, threatened Snake orchid and Austral toadflax plant species.

The road traverses across the tablelands though open grazing country, then back to thick native forest. There are numerous aboriginal places and historical heritage sites identified throughout the length of the Waterfall Way. The eastern portion of the Waterfall Way is listed as a heritage locality due to its scenic values.

Prior to implementation, all road infrastructure projects on the Waterfall Way would be subject to an appropriate environmental assessment. As a general principle proposals should consider options to minimise the impact on the environment. Where impact to items cannot be avoided, a justification for the impact should be provided, and appropriate mitigation, management or offset measures must be implemented in consultation with the relevant regulators and stakeholder groups.

At some locations trees of ecological value create a hazard to motorists. It is expected any projects at these locations would evaluate the ‘do nothing’ option, removal of trees and the provision of safety barriers as options, and a clear case for the preferred project be made.
4 CORRIDOR CHALLENGES AND PROPOSED ACTIONS

Draft only: actions subject to government priorities and funding availability
Corridor challenges are the main issues that need to be overcome to maintain or improve transport roles and services that the Waterfall Way provides for the community. They include challenges already evident and others that are expected to emerge as the result of future changes in land use, demographics, industry needs and the economy. These challenges have been mapped in this strategy. The proposed actions for responding to these challenges are also outlined below.

All proposed actions are subject to government priorities and funding availability. The proposed actions are divided into short, medium and long term actions.

The Waterfall Way corridor will continue to be monitored into the future to ensure ongoing opportunities are being considered. Proposed actions will be a shared responsibility with NSW Government in partnership with Councils and other state agencies.
### 4.1 Short-term (0-5 years)

<table>
<thead>
<tr>
<th>LTTPM Objectives linkage</th>
<th>Specific challenges</th>
<th>Proposed actions</th>
<th>Strategic response reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road safety risks associated with lengths of narrow lanes and shoulder width, poor clear zones and tight curves.</td>
<td>Investigate options/locations to improve safety on the one lane sections of the Dorrigo Mountain. Investigate opportunities/locations to install permanent Vehicle Activated Signage at appropriate high risk locations. Investigate options to improve provision of information along the corridor to better information road customers on changing traffic conditions.</td>
<td>Progressive improve the formation width, by widening sealed shoulder and improving lane widths on a priority basis particularly between: • The Pacific Highway and Bellingen. • Ebor and Kempsey Road (Wollomombi). Continue to investigate opportunities to upgrade table drains between Bellingen and Dorrigo Mountain top to improve pavement drainage and upgrade pavement width where appropriate. Develop a strategy to widen pavements to meet network targets. Investigate and implement edgelines on a priority basis.</td>
<td>4.2 Road Safety 4.3 Traffic Incident Management 4.4 Road Geometry Road Width 4.5 Pavement Condition Pavement remaining life</td>
</tr>
<tr>
<td>Adequate signage for rest area facilities.</td>
<td>Review and rationalise existing rest stop opportunities with better signage.</td>
<td></td>
<td>4.2 Road Safety Rest areas</td>
</tr>
<tr>
<td>Roadside hazards increase the severity of crashes with hazards including trees and power poles within the clear zone.</td>
<td>Implement identified clear zones works to remove or provide protection from hazards including culverts within the clear zone taking into consideration the road geometry and environment/land use constraints particularly between Dorrigo and Ebor.</td>
<td></td>
<td>4.2 Clear Zones and Safety Barriers</td>
</tr>
<tr>
<td>Poor pavement condition due to low subgrade strength.</td>
<td>Identify opportunities to strengthen pavement and carry out pavement repair work along the corridor on a priority basis particularly between the Pacific Highway and Bellingen.</td>
<td></td>
<td>4.2 Road Safety Road Safety Review</td>
</tr>
<tr>
<td>The reduction of safety risks associated with poor visibility due to fog, rain and wet conditions.</td>
<td>Investigate opportunities for high visibility line marking, raised pavement markers and fluorescent signage to assist motorists during times of fog and rain. Continue to implement road safety initiatives to address identified and emerging crash types and locations. Particularly crashes that occur on curves, those that are a result of speed, wet surface or those that involve motorcyclists. Complete a route safety review between Dorrigo and Armidale.</td>
<td></td>
<td>4.2 Road Safety 4.3 Traffic Incident Management</td>
</tr>
<tr>
<td>LTMP Objectives linkage</td>
<td>Specific challenges</td>
<td>Proposed actions</td>
<td>Strategic response reference</td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------------------</td>
<td>------------------</td>
<td>----------------------------</td>
</tr>
</tbody>
</table>
| Safety and security     | Narrow bridges along the corridor. | Complete an audit and assessment of bridges along the corridor suitable for widening and investigate options to improve safety on a priority basis:  
  - Sandy Creek Bridge  
  - Bakers Creek Bridge  
  - Pipe Culvert unnamed creek near fish hatchery. | 4.5 Pavement Condition  
  Culverts, Slopes and Bridge Sized Structures |
|                         | High risk slopes prone to landslips in heavy rainfall. | Progressively address identified high risk slopes on a priority basis particularly between Bellingen and the Dorrigo Mountain top. | 4.4 Road Geometry  
  Flooding |
|                         | High risk culverts prone to flooding in heavy rainfall. | Develop and implement management plans and rehabilitation of identified defective culverts on a priority basis to manage high risk locations. | 4.4 Road Geometry  
  Road width |
|                         | Flood immunity issues along the route between Pacific Highway and Dorrigo. | Work with council to investigate opportunities to improve flood immunity level and route reliability. | 4.4 Road Geometry  
  Flooding |
|                         | Inadequate road alignment and narrow shoulders to accommodate active transport users along the corridor. | Plan for minor realignment and formation widening between the Pacific Highway and Bellingen including accommodating for active transport users. | 4.4 Road Geometry  
  Road width |
|                         | Inadequate road alignment and narrow shoulders. | Investigate and plan widening of Myers Bluff and the Gordonville realignment. | 4.4 Road Geometry  
  Road width |
| Improve sustainability  | Management of threatened flora and fauna. | Investigate opportunities to improve the operation and standard of key intersections, incorporating heavy/vehicle turning paths where necessary to increase efficiency and safety including but not limited to:  
  - Ebor Rd/Guyra Road intersection  
  - Waterfall Way/Armidale Road intersection  
  - Kentucky Street/Dangar Street  
  - Waterfall Way/Miller Street intersection. | 4.2 Road Safety Intersections |
| Improve transport integration process | Improve transport integration process. | Work with Armidale Regional Shire Council to develop a strategic traffic model to determine whole of network solutions addressing traffic and transport issues within Armidale. | 4.6 Environment  
  3.1 An integrated, customer-focused transport network |
### B78 WATERFALL WAY DRAFT CORRIDOR STRATEGY
### JULY 2017

#### CORRIDOR CHALLENGES AND PROPOSED ACTIONS

<table>
<thead>
<tr>
<th>LTMP Objectives linkage</th>
<th>Specific challenges</th>
<th>Proposed actions</th>
<th>Strategic response reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional development/accessibility</td>
<td>The lack of overtaking lanes along the corridor especially between the Pacific Highway and Bellingen.</td>
<td>Improve eastbound and westbound overtaking opportunities between the Pacific Highway and Bellingen. Review centre-line marking and consider removing overtaking opportunities less than the appropriate standard.</td>
<td>4.3 Traffic Overtaking Opportunities</td>
</tr>
<tr>
<td></td>
<td>Limited opportunity for vehicles to overtake slower moving vehicles.</td>
<td>Investigate pull over bays in areas between Thora and Dorrigo to improve Level of Service.</td>
<td>4.3 Traffic Number of lanes and Level of Service</td>
</tr>
<tr>
<td></td>
<td>Access through Bellingen main street.</td>
<td>Continue to develop and implement the Bellingen main street upgrade.</td>
<td>3.1 Integrated, Customer-focused network</td>
</tr>
</tbody>
</table>

*Draft only: actions subject to government priorities and funding availability*
### 4.2 Medium-term (5-10 years)

<table>
<thead>
<tr>
<th>LTTP Objectives linkage</th>
<th>Specific challenges</th>
<th>Proposed actions</th>
<th>Strategic response reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Safety and security</strong></td>
<td>Safety risks associated with lengths of narrow lanes and shoulder width, poor clear zones and tight curves.</td>
<td>Implement identified options to improve safety on the one lane sections of the Dorrigo Mountain.</td>
<td>4.2 Road Safety</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continue to progressively improve the formation width, by widening sealed shoulder and improving lane widths on a priority basis.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continue to investigate opportunities to upgrade table drains between Bellingen and Dorrigo Mountain top to improve pavement drainage and upgrade pavement width where appropriate.</td>
<td>4.4 Road Geometry Road Width</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continue to implement edgelines on a priority basis.</td>
<td></td>
</tr>
<tr>
<td>Adequate signage for rest area facilities</td>
<td>Continue to review and rationalise existing rest stop opportunities with better signage.</td>
<td>4.2 Road Safety Rest areas</td>
<td></td>
</tr>
<tr>
<td>Roadside hazards increase the severity of crashes with hazards including trees and power poles within the clear zone.</td>
<td>Continue to implement identified clear zones works to remove or provide protection from hazards including culverts within the clear zone taking into consideration the road geometry and environment/land use constraints.</td>
<td>4.2 Clear Zones and Safety Barriers</td>
<td></td>
</tr>
<tr>
<td>Poor pavement condition due to low subgrade strength.</td>
<td>Continue identify opportunities to strengthen pavement and carry out pavement repair work along the corridor on a priority basis.</td>
<td>4.5 Pavement Condition Pavement remaining life</td>
<td></td>
</tr>
<tr>
<td>Safety risks associated with poor visibility due to fog, rain and wet conditions.</td>
<td>Continue to implement opportunities for high visibility line marking, raised pavement markers and fluorescent signage to assist motorists during times of fog and rain.</td>
<td>4.2 Road Safety Road Safety Review</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continue to implement road safety initiatives to address identified and emerging crash types and locations.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Implement outcomes of the route safety review process to include Dorrigo to Armidale.</td>
<td></td>
</tr>
<tr>
<td>Narrow bridges along the corridor.</td>
<td>Implement outcomes of the audit completed on the narrow bridges on a priority basis.</td>
<td>4.5 Pavement Condition Culverts, Slopes and Bridge Sized Structures</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sandy Creek Bridge</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Bakers Creek Bridge</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Pipe Culvert unnamed creek near fish hatchery.</td>
<td></td>
</tr>
<tr>
<td>High risk slopes prone to landslips in heavy rainfall.</td>
<td>Continue to address identified high risk slopes on a priority basis.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High risk culverts prone to flooding in heavy rainfall.</td>
<td>Continue to implement management plans and rehabilitation of identified defective culverts on a priority basis to manage high risk locations.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Draft only: actions subject to government priorities and funding availability
<table>
<thead>
<tr>
<th>LTMP Objectives linkage</th>
<th>Specific challenges</th>
<th>Proposed actions</th>
<th>Strategic response reference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Flood immunity issues along the route between Pacific Highway and Dorrigo.</td>
<td>Continue to work with council to investigate opportunities to improve flood immunity level and route reliability.</td>
<td>4.4 Road Geometry Flooding</td>
</tr>
<tr>
<td></td>
<td>Inadequate road alignment and narrow shoulders to accommodate active transport users along the corridor.</td>
<td>Continue to implement minor realignment and formation widening between Pacific Highway and Bellingen on any missing sections and cater for active transport users.</td>
<td>4.4 Road Geometry Road width</td>
</tr>
<tr>
<td></td>
<td>Road priorities at significant intersections and deficient intersections.</td>
<td>Continue to investigate opportunities to improve the operation and standard of key intersections, incorporating heavy vehicle turning paths where necessary to increase efficiency and safety.</td>
<td>4.2 Road Safety Intersections</td>
</tr>
<tr>
<td>Improve sustainability</td>
<td>Management of threatened flora and fauna.</td>
<td>Continue to minimise and balance impacts to the natural environment and incorporate environment aspects project to project.</td>
<td>4.6 Environment</td>
</tr>
<tr>
<td>Improve transport integration process</td>
<td>Improve transport integration process.</td>
<td>Develop recommendations of the Armidale traffic study to support residential growth and address traffic and transport issues.</td>
<td>3.1 An integrated, customer-focused transport network</td>
</tr>
<tr>
<td></td>
<td>Limited opportunity for vehicles to overtake slower moving vehicles.</td>
<td>Implement options for pull over bays in areas between Thora and Dorrigo.</td>
<td>4.3 Traffic Number of lanes and Level of Service</td>
</tr>
</tbody>
</table>

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4.3 Long-term (10-20 years)

Table 4-3 Key challenges and long-term proposed actions

<table>
<thead>
<tr>
<th>LTTMP Objectives linkage</th>
<th>Specific challenges</th>
<th>Proposed actions</th>
<th>Strategic response reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety and security</td>
<td>Safety risks associated with lengths of narrow lanes and shoulder width, poor clear zones and tight curves.</td>
<td>Implement identified options to improve safety on the one lane sections of the Dorrigo Mountain. Continue to progressively improve the formation width, by widening sealed shoulder and improving lane widths on a priority basis. Continue to investigate opportunities to upgrade table drains between Bellingen and Dorrigo mountain top to improve pavement drainage and upgrade pavement width where appropriate. Continue to implement edgelines on a priority basis.</td>
<td>4.2 Road Safety</td>
</tr>
<tr>
<td></td>
<td>Roadside hazards increase the severity of crashes with hazards including trees and power poles within the clear zone.</td>
<td></td>
<td>4.4 Road Geometry Road Width</td>
</tr>
<tr>
<td></td>
<td>Poor pavement condition due to low subgrade strength.</td>
<td>Continue to implement identified clear zones works to remove or provide protection from hazards including culverts within the clear zone taking into consideration the road geometry and environment/land use constraints. Continue to identify opportunities to strengthen pavement and carry out pavement repair work along the corridor on a priority basis.</td>
<td>4.5 Pavement Condition Pavement remaining life</td>
</tr>
<tr>
<td></td>
<td>Safety risks associated with poor visibility due to fog, rain and wet conditions.</td>
<td>Continue to investigate opportunities for high visibility line marking, raised pavement markers and fluorescent signage to assist motorists during times of fog and rain. Continue to implement road safety initiatives to address identified and emerging crash types and locations. Implement outcomes of the route safety review process to include Dorrigo to Armidale.</td>
<td>4.2 Road Safety Road Safety Review</td>
</tr>
<tr>
<td></td>
<td>Narrow bridges along the corridor.</td>
<td>Implement outcomes of the audit completed on the narrow bridges on a priority basis.</td>
<td>4.5 Pavement Condition Culverts, Slopes and Bridge Sized Structures</td>
</tr>
<tr>
<td></td>
<td>High risk slopes prone to landslips in heavy rainfall.</td>
<td>Continue to address identified high risk slopes on a priority basis.</td>
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<tr>
<td></td>
<td>Limited opportunity for vehicles to overtake slower moving vehicles.</td>
<td>Implement options from investigation into pull over bays in areas between Thora and Dorrigo to improve Level of Service.</td>
<td>4.3 Traffic Number of lanes and Level of Service</td>
</tr>
</tbody>
</table>
Thora Bridge

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5 COMMUNITY CONSULTATION

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Bellingen Main Street
5 COMMUNITY CONSULTATION

During development of the Waterfall Way Draft Corridor Strategy, Bellingen Shire, Clarence Valley and Armidale Regional councils and other government agencies were consulted and feedback has been included in the strategy. Issues raised were:

• The future increase of traffic volumes and change in travel patterns once the Pacific Highway upgrades are complete
• The lack of overtaking opportunities particularly on the eastern half of the corridor and pull over areas on Dorrigo Mountain
• The lack of shoulder widths along the corridor

• Inadequate lane widths along the corridor
• The access into rest areas and the signposting highlighting rest areas
• Give way signage at the one lane locations on Dorrigo Mountain is confusing.

Feedback from the community during a public display period of this draft corridor strategy will be invaluable in completing a final strategy that meets the needs of local communities and all other road customers. Issues raised from the community feedback will inform future planning.
Waterfall Way Route Safety Review

The Bellingen community raised concerns about the immediate impact from the increase in truck movements due to a quarry expansion. The quarry expansion was linked to the haulage of materials to the Nambucca Heads to Urunga Pacific Highway upgrade. The concerns raised by the community were considered by the NSW Government and a decision was made to carry out the Waterfall Way Route Safety Review.

Prior to field inspections and data analysis, community members and stakeholders were invited to express their views about issues on Waterfall Way at drop-in sessions, workshops, through the use of feedback forms and an online feedback process.

The communities of Bellingen and Dorrigo provided feedback at these presentations. Issues raised included:

- Road not maintained properly – potholes, crumbling edges, mud/rock landslides possible
- Lack of pull over bays
- Heavy vehicles using the road
- Narrowness of the road with trucks crossing the centreline
- Blind corners and lack of signage
- Cyclist and pedestrian facilities inadequate
- Speed limit was seen as too high
- People unfamiliar with road get confused (tourists).

Following the presentations, community members were invited to look at aerial photos of Waterfall Way and indicate on the maps other issues and areas of concern. These areas, along with others identified by Roads and Maritime had on site inspections undertaken.

A number of key stakeholders and community groups were involved in the community engagement process:

- Local council staff and elected representatives
- State and federal members of parliament
- Road safety associations and committees
- NSW Police
- NRMA
- Chambers of commerce
- Bus operators
- Heavy vehicle freight operators
- Members of the public, including local residents of Bellingen, Thora and Dorrigo
- Community groups:
  - People with an interest in road safety on Waterfall Way group
  - Bellingen Environment Centre.
- Transport for NSW – Centre for Road Safety.

For the purpose of the Waterfall Way Route Safety Review, Roads and Maritime used a number of tools to inform and involve the community.

A community update was issued in March 2014 and the Roads and Maritime website was updated with information. In addition, there were radio advertisements promoting the workshops, newspaper advertisements and media articles encouraging the community to participate in the review.24

The concerns raised over the increase in truck movements due to a quarry expansion by the community were considered by the NSW Government and a decision was made to carry out the Waterfall Way Route Safety Review.
REFERENCES

Note: All documents and references to Roads and Traffic Authority (RTA) have been replaced with Roads and Maritime Services (RMS).

Armidale Regional Council 2012, Bicycle Strategy and Action Plan

Australian Bureau of Statistics, 2011 Census Data, ABS, Canberra

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Bellingen Shire Council 2015, Draft Pedestrian Accessibility and Mobility Plan and Bicycle Plan

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Roads and Maritime Services 2008, Network and Corridor Planning Practice Notes, RMS, Sydney

Roads and Maritime Services 2010, Network Performance Measures and Network Planning Targets, RMS, Sydney

Transport for NSW, Long Term Transport Master Plan, Sydney

Transport for NSW, December 2013, Mid North Coast Regional Transport Plan, Sydney

Transport for NSW, December 2013, New England North West Regional Transport Plan, Sydney

# APPENDICES

## Appendix 1 - Austroads vehicle classification system

<table>
<thead>
<tr>
<th>CLASS</th>
<th>LIGHT VEHICLES</th>
<th>HEAVY VEHICLES</th>
<th>LONG VEHICLES AND ROAD TRAINS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SHORT Car, Van, Wagon, 4WD, Utility, Bicycle, Motorcycle</td>
<td>TWO AXLE TRUCK OR BUS: 2 axles</td>
<td>B DOUBLE or HEAVY TRUCK and TRAILER: 7+ axles, 4 axle groups</td>
</tr>
<tr>
<td>2</td>
<td>SHORT - TOWING Trailer, Caravan, Boat</td>
<td>THREE AXLE TRUCK OR BUS: 3 axles, 2 axle groups</td>
<td>DOUBLE ROAD TRAIN: 7+ axles, 5 or 6 axle groups</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>FOUR (or FIVE) AXLE TRUCK: 4 (or 5) axles, 2 axle groups</td>
<td>TRIPLE ROAD TRAIN: 7+ axles, 7+ axle groups</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>THREE AXLE ARTICULATED: 3 axles, 3 axle groups</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>FOUR AXLE ARTICULATED: 4 axles, 3 or 4 axle groups</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>FIVE AXLE ARTICULATED: 5 axles, 3+ axle groups</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>SIX AXLE ARTICULATED: 6 axles, 3+ axle groups or 7+ axles, 3 axle groups</td>
<td></td>
</tr>
</tbody>
</table>

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Waterfall Way Draft Corridor Strategy

July 2017

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Transport for NSW
18 Lee Street, Chippendale NSW 2008

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